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DEVELOPMENT AND VALIDATION OF 1.3 ATA PO_2-in-He DECOMPRESSION TABLES FOR THE MK 16 MOD 1 UBA

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The Navy Experimental Diving Unit (NEDU) was tasked by PMS-EOD to develop and validate repetitive helium-oxygen ($He-O_2$) decompression tables for use with the MK 16 MOD 1 Underwater Breathing Apparatus (UBA). The present report provides details of the work that was completed to meet this tasking and produce the tables published in NEDU Technical Report 14-01. The report includes a description of the probabilistic model used as the basis for the tables, and presents a novel method to map this model to an easily-used deterministic model. The latter produces a repetitive decompression table set of format similar to that for standard air diving in the current U.S. Navy Diving Manual, but with schedules that incur explicitly controlled estimated DCS risks.

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Table 1. he8n25 Calibration Data Set

Data Subset	Dives	DCS	Marginal	Comments
He-O_2:				
EDU185S	1582	57	2	NEDU Report 1-85: 0.7 ATA O_2 in He table trial
EDUHE70	264	31	3	Most 300-400 ft for 15-60 m. Lots O_2
NMR86H6	62	1	0	Long 40% O_2 No-D
NSMTMX	69	4	0	132 ft 'air sat.'/40%He decompression
DRATMXW	190	10	10	DERA wet trimix dives
DC8416W	182	4	0	230-265 ft/15-30 min, 84%He/16%O_2(1)
NMR9404(2)	472	26	22	NMRI Report 98-09, 1.3 ATA O_2 in He trial
(Before review)	(471)	(24)	(16)	
He-O_2 subtotals	2821	133	37	
N_2-O_2:				
EDU885A	483	30	0	Single Air
NMR94EOD	284	16	13	Single Air; O_2 decompression
EDU885M	81	4	0	Single Non-Air
EDU885S	94	4	0	"
EDU1180S	120	10	0	"
NMR8697	477	11	18	"
ASATNSM	132	18	21	Air Saturation
ASATEDU	120	13	27	"
NSM6HR	57	3	2	Non-Air saturation
N_2-O_2 subtotals	1848	109	81	
Grand Totals	4669	242	118	

(1) Data and report discrepancies unresolved.

(2) Figures for the NMR904 data set were modified from those in parentheses used to obtain **plemgenhe8n25_114.out** after a retrospective review of the cases in this data set by a panel of Diving Medical Officers. The review, performed on the written case records, resulted in addition of two definite and 9 marginal cases to the overall trial outcome. It also resulted in removal of three cases that had initially been labeled marginal, and correction of the number of subjects on profile FA from 18 to 19 (Flynn, *Personal Communication*). The corrected figures are shown here and in the final 1998 report.[6]

In preliminary work for the present program, an independent implementation of the probabilistic LEM model was developed. The implementation was validated by comparing its performance on the he8n25 calibration data to that of the original NMRI implementation. The present implementation was also re-optimized about this calibration data to ensure that a fully self-consistent model and parameter set was in hand. Results are summarized in Tables 2, 3, and 4.

In Tables 2 and 3, reference to the different versions of LEM is made using original nomenclature for historical traceability. The form of LEM adopted for present work was originally called "LEMGEN." Accordingly, the software implementation of this form developed at NMRI was called "NMRI LEMGEN," while the software implementation developed by the present senior author was called "Duke LEMGEN." The parameter set for the model calibrated about the he8n25 data set using NMRI LEMGEN was called "plemgenhe8n25_114." Subsequent references to "LEM" or the "LEM model" in the present report will refer to the "Duke LEMGEN" in Tables 2 and 3, and the parameter set in Table 4 obtained with this implementation about the he8n25 data set. A more complete description of LEM parameterization and performance in applications other than those in present work will be published elsewhere.

Table 2. Comparison of Observed DCS Incidences with Various Model-Estimated DCS Incidences for he8n25 Calibration Data Subsets

Data Set	# Dives	# DCS Observed[a]	# DCS Estimated: NMRI LEMGEN w/ plemgenhe8n25_114	# DCS Estimated: Duke LEMGEN w/ plemgenhe8n25_114	# DCS Estimated: Duke LEMGEN he8n25 (reoptimized)
EDU185S	1582	57.2	74.18	73.33	73.35
EDUHE70	264	31.3	30.86	30.40	30.37
NMR86H6	62	1.0	3.95	3.91	3.91
NSMTMX	69	4.0	4.90	3.41	3.41
DC8416W	182	4.0	16.75	16.60	16.60
DRATMXW	190	11.0	8.67	8.52	8.47
NMR9404	472	28.2	22.85	22.20	22.12
He-O_2 Subtotals	2821	136.7	162.16	158.37	158.23
NMR94EOD	284	17.3	14.65	14.30	14.28
NSM6HR	57	3.2	3.83	3.80	3.80
EDU885A	483	30.0	22.06	21.87	21.87
EDU885M	81	4.0	3.08	3.04	3.04
EDU885S	94	4.0	4.12	4.07	4.08
EDU1180S	120	10.0	6.39	6.33	6.33
NMR8697	477	12.8	14.47	14.33	14.33
ASATNSM	132	20.1	12.03	10.61	10.62
ASATEDU	120	15.7	9.26	8.44	8.44
N_2-O_2 Subtotals	1848	117.1	89.89	86.79	86.79
Grand totals	4669	253.8	252.05	245.16	245.02

[a] "Marginal" counted as 0.1 DCS

Results in Table 3 show that all of the LEM versions tested, including the independent reoptimized version implemented for present work, fail a chi-square goodness-of-fit test[10] to the full calibration data set. Examination of the Pearson residuals for the individual data subsets shows that the lack-of-fit in each case is concentrated on three particular subsets: the 84/16 (%He/%O_2) dive data set DC8416W, and the air saturation dive data sets ASATNSM and ASATEDU. Removal of these sets from the tests yields chi-squares that are too low to warrant rejection of the hypothesis that LEM-estimated DCS incidences equal the observed DCS incidences for the remaining data subsets.

The LEM model consequently remains arguably applicable to the types of dives in these latter data sets, but inapplicable to air saturation dives and He-O_2 dives of type in DC8416W.

Model inapplicability to air saturation diving was inconsequential with respect to the purposes of the present program; model use in present work entailed applications to sub-saturation He-O_2 dives. Model inapplicability to the types of dives in the DC8416W data subset was also of arguably limited consequence because many of the dives in the DC8416W data entailed use of He-O_2 mixes with higher PO_2 than encountered in MK 16 MOD 1 diving. In the context of the LEM model as presently parameterized, this feature of the dives made them substantially different from MK 16 MOD 1 He-O_2 dives. Other work that exceeds our present scope for description here indicates that LEM overestimation of the DCS incidence in the DC8416W dives is due to inordinate ascription of risk to the O_2 component of compartmental gas contents. This model feature does not come into play at the levels of inspired PO_2 encountered in MK 16 MOD 1 diving.

Table 3. Chi-Square Goodness-of-Fit Results for Various Implementations of LEM

Data Set	# Exposures	# DCS Incidents Observed	Predicted: NMRI LEMGEN w/plemgenhe8n25_114			Duke LEMGEN w/plemgenhe8n25_114			Duke LEMGEN he8n25 (reoptimized)		
	(N)	(f)	n	π	Pearson Residual (f-n)^2/n(1-π)	n	π	Pearson Residual (f-n)^2/n(1-π)	n	π	Pearson Residual (f-n)^2/n(1-π)
$He-O_2$											
EDU185S	1582	57.2	74.18	0.05	4.078	73.33	0.05	3.720	73.35	0.05	3.729
EDUHE70	264	31.3	30.86	0.12	0.007	30.40	0.12	0.030	30.37	0.12	0.032
NMR86H6	62	1	3.95	0.06	2.353	3.91	0.06	2.312	3.91	0.06	2.312
NSMTMX	69	4	4.90	0.07	0.178	3.41	0.05	0.107	3.41	0.05	0.107
DC8416W	182	4	16.75	0.09	10.689	16.60	0.09	10.524	16.60	0.09	10.524
DRATMXW	190	11	8.67	0.05	0.656	8.52	0.04	0.756	8.47	0.04	0.791
NMR9404	472	28.2	22.85	0.05	1.316	22.20	0.05	1.702	22.12	0.05	1.753
N_2-O_2											
NMR94EOD	284	17.3	14.65	0.05	0.505	14.30	0.05	0.663	14.28	0.05	0.672
NSM6HR	57	3.2	3.83	0.07	0.111	3.80	0.07	0.102	3.80	0.07	0.102
EDU885A	483	30	22.06	0.05	2.995	21.87	0.05	3.166	21.87	0.05	3.166
EDU885M	81	4	3.08	0.04	0.286	3.04	0.04	0.315	3.04	0.04	0.315
EDU885S	94	4	4.12	0.04	0.004	4.07	0.04	0.001	4.08	0.04	0.002
EDU1180S	120	10	6.39	0.05	2.154	6.33	0.05	2.246	6.33	0.05	2.246
NMR8697	477	12.8	14.47	0.03	0.199	14.33	0.03	0.168	14.33	0.03	0.168
ASATNSM	132	20.1	12.03	0.09	5.956	10.61	0.08	9.230	10.62	0.08	9.203
ASATEDU	120	15.7	9.26	0.08	4.853	8.44	0.07	6.717	8.44	0.07	6.717
TOTALS	4669	253.8	252.05	χ^2= (df=15)	36.341 P=0.0016	245.16	χ^2= (df=15)	41.759 P=0.0002	245.02	χ^2= (df=15)	41.839 P=0.0002
w/DC8416W and ASAT* data sets omitted:				χ^2= (df=12)	14.842 P=0.2502		χ^2= (df=12)	15.288 P=0.2261		χ^2= (df=12)	15.395 P=0.2205

Table 4. LEM Model Parameters

Parameter Description	Value	Standard Error*
PTH2O	0	
Respiratory Quotient.	1.000000E+00	
PTCO2=PVCO2; Tissue PCO2 == Venous PCO2 (mm-Hg).	0	
PTO2=PVO2; Tissue PO2 == Venous PO2 (mm-Hg).	0	
PACO2; Arterial PCO2 (mm-Hg).	0	
Gain/10**3 [/min], tis 1	1.458592E-06	4.895464E-07
Gain/10**3 [/min], tis 2	2.480900E-05	7.091730E-06
Gain/10**3 [/min], tis 3	5.780815E-07	3.982650E-08
alphab-O2(ml/ml) O2	2.610000E-02	
alphab-N2(ml/ml) N2	1.580000E-02	
alphab-HE(ml/ml) He	1.040000E-02	
alphat(t); O2 tissue solubility, ml/ml/atm, cmptmnt 1	0	
alphat(t); N2 tissue solubility, ml/ml/atm, cmptmnt 1	7.300000E-02	
alphat(t); HE tissue solubility, ml/ml/atm, cmptmnt 1	0	
alphat(t); O2 tissue solubility, ml/ml/atm, cmptmnt 2	0	
alphat(t); N2 tissue solubility, ml/ml/atm, cmptmnt 2	7.300000E-02	
alphat(t); HE tissue solubility, ml/ml/atm, cmptmnt 2	0	
alphat(t); O2 tissue solubility, ml/ml/atm, cmptmnt 3	0	
alphat(t); N2 tissue solubility, ml/ml/atm, cmptmnt 3	7.300000E-02	
alphat(t); HE tissue solubility, ml/ml/atm, cmptmnt 3	0	
PSET, O2 tracking threshold, (ATA), cmptmnt 1	9.900000E+01	
PSET, O2 tracking threshold, (ATA), cmptmnt 2	9.087054E-01	1.888563E-03
PSET, O2 tracking threshold, (ATA), cmptmnt 3	9.900000E+01	
TC(t); O2 exchange time constant [min], cmptmnt 1	1.000000E+00	
TC(t); N2 exchange time constant [min], cmptmnt 1	4.739182E+00	1.115894E+00
TC(t); HE exchange time constant [min], cmptmnt 1	1.507232E+01	2.283401E+00
TC(t); O2 exchange time constant [min], cmptmnt 2	2.322581E+01	2.070738E+00
TC(t); N2 exchange time constant [min], cmptmnt 2	4.756701E+01	6.067547E+00
TC(t); HE exchange time constant [min], cmptmnt 2	3.135001E+01	1.770515E+00
TC(t); O2 exchange time constant [min], cmptmnt 3	1.000000E+00	
TC(t); N2 exchange time constant [min], cmptmnt 3	3.277423E+02	6.377812E+00
TC(t); HE exchange time constant [min], cmptmnt 3	2.907310E+02	5.575822E+00
PXO(t); E->L kinetic threshold (atm), cmptmnt 1	5.789038E-01	1.634894E-01
PXO(t); E->L kinetic threshold (atm), cmptmnt 2	-2.710900E-02	
PXO(t); E->L kinetic threshold (atm), cmptmnt 3	1.000000E+10	
THR(t); risk threshold [atm], in cmptmnt 1	7.877900E-01	
THR(t); risk threshold [atm], in cmptmnt 2	1.978600E+00	
THR(t); risk threshold [atm], in cmptmnt 3	-1.492947E-01	6.157504E-04

* Parameters with no tabulated standard error were fixed at the values shown during optimization.

With this new methodology, schedules in 1.3 ATA PO2-in-He decompression tables computed by simple extrapolation of the deterministic EL-RTA with the HVAL 21 M-VAL set were found to have unacceptably high risks of DCS under the LEM model.

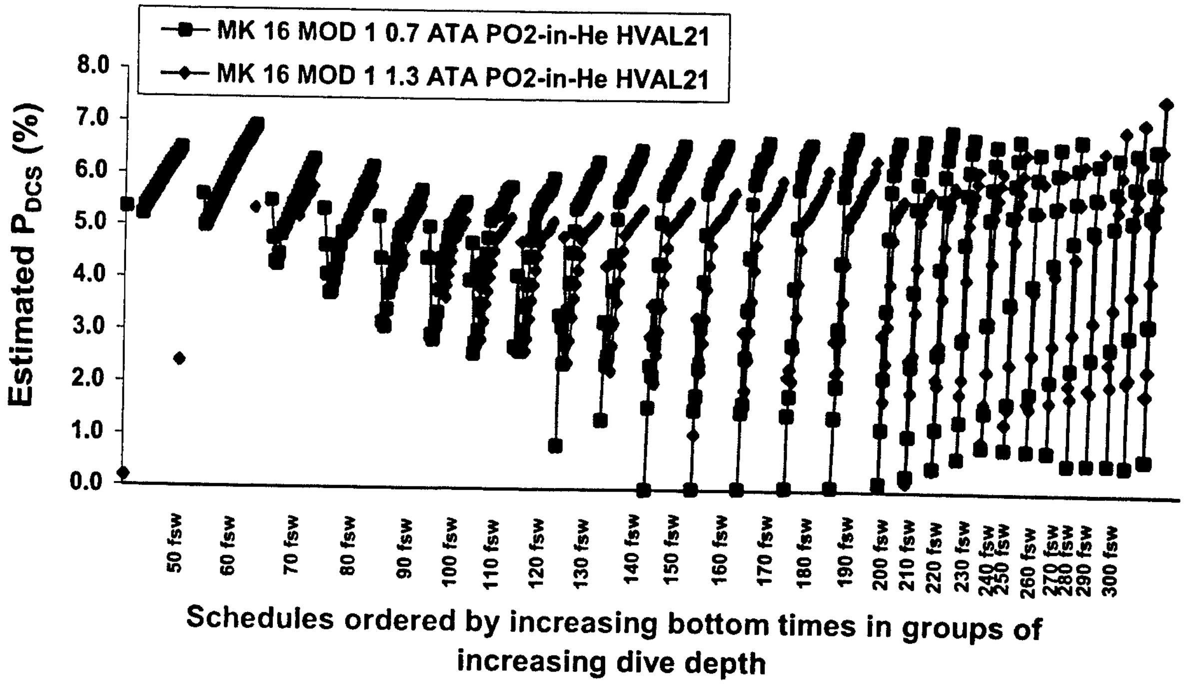

Figure 2. Comparison of estimated DCS risks of constant 0.7 ATA PO_2 and constant 1.3 ATA PO_2 decompression schedules. Schedules were computed using the deterministic MK 15/16 Exponential-Linear Real Time Algorithm (EL-RTA) with the HVAL21 M-VAL set. DCS risks were estimated using the probabilistic linear-exponential multigas model, or LEM.

The decision was therefore made to use LEM to compute the tables required for MK 16 MOD 1 diving with $He-O_2$ mixes for better control of DCS risk. Pursuit of the path following from this decision required solution of two problems:

1) Applicability of the LEM model to the problem. The he8n25 data set used to calibrate LEM lacked data for repetitive $He-O_2$ dives, so that LEM applications to compute decompression schedules for such dives were extrapolations from single dive data. It was therefore unclear at the outset of present work whether the LEM model required recalibration for valid application to such dives.

2) Computation of tables in U.S. Navy Diving Manual format. The LEM model can be used to directly generate tables of pre-specified DCS risk, but the parts of such tables that support repetitive diving are extremely difficult to cast in the familiar U. S. Navy Diving Manual format. The latter support repetitive diving via a single table of decompression schedules accompanied by a surface interval credit and residual gas table. On the other hand, tables produced using probabilistic models had been much more cumbersome, requiring a different table of decompression schedules for each repetitive group.[11]

1.3. PROGRAM OBJECTIVES AND APPROACH

The present program was undertaken to complete development and validation of decompression tables for MK 16 MOD 1 He-O_2 diving to meet the following requirements:

- No-decompression capability 40 - 200 fsw
- Decompression dive capability 40 – 320 fsw
- Repetitive diving capability 40 - 200 fsw.
  - No decompression: initial dive and up to 2 repetitive dives
  - Decompression: initial dive and 1 repetitive dive
  - Surface intervals as short as 30 min
- Descent rate: 60 fsw/min
- Ascent rate: 30 fsw/min
- Up to 140 min total dive time per day

The first program objective was to establish that the LEM model, on which the new tables were to be based, was applicable to repetitive diving. For this purpose, data from the Defence and Civil Institute of Environmental Medicine (DCIEM, Downsview, Ontario CA) for single 1.3 ATA PO_2-in-He dives and repetitive 1.3 ATA PO_2-in-He dives preceded by three and six hour surface intervals was obtained. Additional data for single 1.3 ATA PO_2-in-He dives was also obtained from the Defence Evaluation Research Agency (DERA, Alverstoke UK). However, there was still no data available for 1.3 ATA PO_2-in-He repetitive dives preceded by surface intervals less than three hours. Therefore, a series of repetitive dive profiles with 30-minute surface intervals was computed using the LEM model and man-tested in program Phase I to obtain data to address this deficiency.

After establishing that the LEM model was indeed applicable to the computation of repetitive 1.3 ATA PO_2-in-He dive schedules, a method was developed to use this model to compute a complete set of MK 16 MOD 1 He-O_2 decompression tables in U.S. Navy Dive Manual format. In program Phase II, these tables were validated by man-testing selected dive profiles representative of those prescribed by the tables. As in earlier programs, these profiles were not directly from the tables *per se*, but were computed using the same algorithm used to compute the tables. Tested profiles were consequently less conservative than their table-prescribed counterparts, a feature that was confirmed using the LEM model.

Diver inspired PO_2 was closely monitored throughout each dive in both program phases in order to characterize UBA O_2 delivery to the diver.

2. METHODS

2.1. DECOMPRESSION TABLE CALCULATION

While the LEM model can be used to directly compute schedules for repetitive dives, it is not readily used to produce repetitive dive tables in the convenient format that such tables for air and MK 16 MOD 0 N_2-O_2 diving currently have in the U.S. Navy Diving Manual. In order to produce such tables for MK 16 MOD 1 He-O_2 diving, a method was developed to map the probabilistic LEM model onto a deterministic overpressure model similar to that previously used[12] to produce the MK 16 MOD 1 N_2-O_2 tables. The method parameterizes the deterministic model to compute schedules at any pre-specified risk of DCS. The resultant model is then readily used to produce tables for repetitive diving in the desired U.S. Navy Diving Manual format.

2.2.1. LEM TO EL-RTA MAPPING

The method is based on the presumption that a sufficiently large and heterogeneous data set of completed dive profiles contains all information required to parameterize a deterministic overpressure model. While different models in this class may use different means to compute compartmental gas tensions, with different conceptualizations of blood-tissue gas exchange and the underlying compartments in which this exchange occurs, they share a common essential feature of the "Haldanian" method of computing decompression: Ascent decisions are based on the value of an overpressure with respect to a Maximum Permissible Tissue Tension (MPTT). The MPTT, also called an MVAL (M), for each of $i=1, 2, \ldots, n$ modeled compartments is generally a function of depth, D, and a vector, $\boldsymbol{\beta}_i$, of Ω fundamental parameters[1]:

$$M_{i,\mathrm{D}} = f(\boldsymbol{\beta}_i, D);\ \boldsymbol{\beta}_i = [\beta_{i,1}, \ldots, \beta_{i,\Omega}]. \qquad (1)$$

Note that the $\boldsymbol{\beta}_i$ are rows of an $n \times \Omega$ matrix, $\boldsymbol{\beta}$:

$$\boldsymbol{\beta} = \begin{bmatrix} \boldsymbol{\beta}_1 \\ \vdots \\ \boldsymbol{\beta}_n \end{bmatrix} = \begin{bmatrix} \beta_{1,1} & \cdots & \beta_{1,\Omega} \\ \vdots & & \\ \beta_{n,1} & \cdots & \beta_{n,\Omega} \end{bmatrix}. \qquad (2)$$

A Haldanian decompression is begun by ascending to the shallowest allowed stop depth, D_λ, at which no compartmental gas tension exceeds the corresponding M_{i,D_λ}. Ascent to the next stop is then allowed when compartmental gas tensions decay to the point where none exceed the corresponding MVAL for the next stop; i.e., when the overpressure with respect to MVAL in all compartments first satisfies $(p_i - M_{i,D_{\lambda-1}}) \leq 0$,

[1] Equivalently, ascent decisions may be based on the value of a prevailing compartmental tissue ratio, or TR_i, where $TR_i = M_{i,D}/D$.

where p_i is the gas tension in the i^{th} compartment, and $M_{i,D_{\lambda-1}}$ is the compartmental MVAL for the next stop at depth $D_{\lambda-1}$. Thus, ascent to the next stop is allowed when:

$$\max\left[\left(p_i - M_{i,D_{\lambda-1}}\right), i = 1, 2, \ldots, n\right] = 0 . \quad (3)$$

The compartment in which this end-stop maximum occurs is called the "controlling tissue" for that stop. Upon completion of ascent to the next stop, λ is decremented and the process is repeated with ascent to successively shallower stops until the diver is surfaced at depth D_0.

The objective is to find the values of parameters in a given deterministic overpressure model that enable it to produce decompression schedules that are as close as possible to those prescribed by another model, all essential features of which are considered to be embodied in a "standard" data set of *N* dive profiles completed by the other model. Ideally, all end-stop gas tensions in these profiles will satisfy Eq. (3) in the desired deterministic model. However, this satisfaction cannot generally be made exact, because the safe ascent criteria in the original model, as well as the number of compartments and their associated gas exchange kinetics, will not generally be the same as those in the deterministic model. The closest possible overall approximation is obtained by adjusting the $n \times \Omega$ elements of the β matrix in the deterministic model to minimize the sum of squares given by

$$ss = \sum_{\eta=1}^{N}\left\{\sum_{\delta=1}^{\Delta_\eta}\left\{\sum_{\lambda=\Lambda_{\eta,\delta}}^{1}\left(\max\left[\left(p_{i,\eta,\delta,\lambda} - M_{i,D_{\lambda-1}}\right), i = 1, 2, \ldots, n\right]\right)^2\right\}\right\}, \quad (4)$$

where the summation in the η^{th} profile is over all of the $\Lambda_{\eta,\Delta_\eta}$ decompression stops in each of the Δ_η dives in the profile, and $p_{i,\eta,\delta,\lambda}$ is the gas tension in the i^{th} compartment at the end of decompression stop λ in dive δ of the η^{th} profile as evaluated using the blood-tissue gas exchange kinetics of the deterministic model.

Depending on the structure of any given standard data set schedule, the pressure dependence of the MVALs, and the relation of surfacing MVALs to compartmental gas exchange kinetics, the argument of the square in Eq. (4) can be negative at any given stop. If this occurs at a sufficient number of stops throughout the standard data set schedules, *ss* minimization drives the M_i towards zero and the process fails. However, in what might be called "well-behaved" Haldanian models, the controlling tissue at any stop is also the tissue with the maximum prevailing gas tension at the end of the stop. Under such conditions, ascent occurs when the overpressure with respect to MVAL in the controlling tissue decays to zero, and Eq. (3) is replaced by:

$$\left(p_i - M_{i,D_{\lambda-1}}\right)_{p_{i,\max}} = 0 , \quad (5)$$

where $P_{i,max}$ is the maximum compartmental gas tension at the end of stop λ. This behavior is forced in the *ss* minimization process by using the following in place of Eq. (4):

$$ss = \sum_{\eta=1}^{N}\left\{\sum_{\delta=1}^{\Delta_\eta}\left\{\sum_{\lambda=\Lambda_{\eta,\delta}}^{1}\left(\left(p_{i,\eta,\delta,\lambda} - M_{i,D_{\lambda-1}}\right)_{p_{i,\eta,\delta,\lambda,\max}}\right)^2\right\}\right\}, \tag{6}$$

where the squared quantity is the overpressure with respect to MVAL in the controlling tissue at the end of decompression stop λ in dive δ of the η^{th} profile as evaluated using the blood-tissue gas exchange kinetics of the deterministic model. Use of Eq. (6) in place of Eq. (4) can avert failure of the *ss* minimization processes in these cases.

The $p_{i,\eta,\delta,\lambda}$ in either Eq. (4) or (6) also depend on additional parameters, such as the compartmental time constants for blood-tissue gas exchange, that in principle can also be adjusted in the *ss* minimization process. In present work, these parameters were considered to be intrinsic parts of the deterministic model definition, and were consequently fixed at pre-specified values. This left the β matrix as the only adjustable part of the deterministic algorithm, which reduced the overall number of adjustable parameters.

Minimization of either Eq. (4) or (6) requires a standard data set that is sufficiently large and heterogeneous to include profiles that exercise as much of the final MVAL domain as possible. Many of the profiles in the standard set may be well outside the range of profiles that one would advocate actually be dived.

The β extracted from the standard set by *ss* minimization is then used with the appropriate form of Eq. (1) to generate a table of MVALs that can in turn be used in the classical overpressure algorithm in real-time mode, or to generate decompression tables in U.S. Navy Diving Manual format. If the model approximated by the deterministic model is a probabilistic model, the resultant MVALs can be called PVALs to denote that the deterministic model embodies an essential feature of the probabilistic model; control of DCS risk according to an explicit acceptable risk scheme. An advantage of the approach in such cases is that decompression tables computed using the final deterministic model can be checked for conformance to the originally specified DCS risk scheme by evaluating the DCS risks of the schedules using the original probabilistic model. The entire process is schematized in Figure 3.

In the versions of the EL-RTA algorithm used to compute decompression tables for the MK 16 MOD 0 constant 0.7 ATA PO_2 UBA, a convention used by Workman[13] was adopted to make compartmental MPTT increase linearly with stop depth, *D*, giving Eq. (1) the following explicit form:

$$M_i = M_{0,i} + a_i D \,;\; i=1,\ \ldots,\ n\,, \tag{7}$$

where $M_{0,i}$ is the "surfacing" MPTT and a_i is a slope parameter. Referring to Eq. (1), the β_i vector under this convention is $\beta_i = [M_{0,i}, a_i]$, and an MPTT Table for n compartments with pre-specified blood-tissue gas exchange half-times is completely specified by nx2 parameters. This form for $f(\beta,D)$ was retained in present work, but it should be noted that the EL-RTA does not preclude use of more complex formulations.

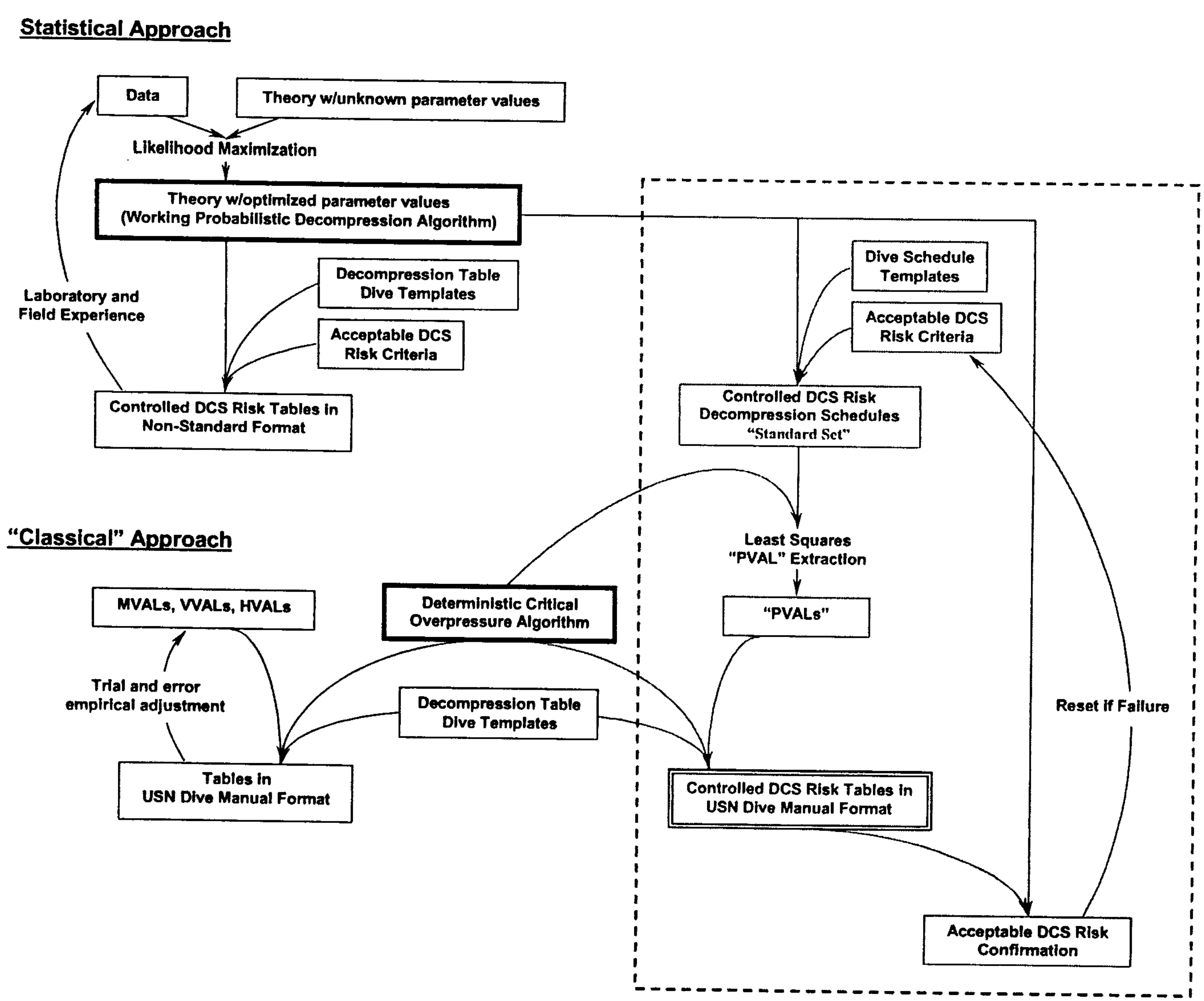

Figure 3. Table development schematic. Processes in the dotted line are used to parameterize a classical approximation of a statistical model and produce statistically based decompression tables in standard U.S. Navy Diving Manual format.

2.2. TRIAL DESIGN

2.2.1. OVERALL STRATEGY: SEQUENTIAL DESIGN, TEST REJECTION RULES AND POWER

Man-dives in each phase of the program were completed to test the hypothesis that DCS incidence in selected dive profiles is not higher than some specific value that is arguably representative of the DCS risk normally accepted in U.S. Navy diving. In Program Phase I, profiles were selected to test applicability of the LEM model to particular types of repetitive dives. In program Phase II, profiles representative of those prescribed by the new MK 16 MOD 1 He-O_2 decompression tables were tested.

In either case, the objective was to establish that the hypothesis could not be rejected according to pre-specified rejection rules. The rejection rules chosen for present work provided for rejection of any given profile with 95% binomial confidence that the true DCS risk of the profile exceeds 4% (Table 5). Occurrence of one significant DCS Type II case or one serious case (life threatening, paralysis, etc.), as agreed upon by the Principal Investigator and the NEDU Senior Medical Officer, were additional arbitrary causes for rejection of a profile.

TABLE 5. Number Of DCS Cases On Which To Reject At 95% Binomial Confidence That True DCS Risk Is Greater Than 4%.

# Exposures	# DCS
10-21	3
22-34	4
35-50	5
51-66	6
67-83	7
84-101	8
102-119	9
120-137	10
138-156	11
157-175	12
176-194	13
195-213	14
214-233	15
234-253	16
254-273	17
274-293	18
294-313	19

The rejection rules not only limited the overall risks to which the experimental divers were exposed, but also determined the probability that a schedule of given true DCS risk would in fact be rejected. This probability was estimated for profiles of various true DCS risks using a Monte Carlo simulation of 50,000 exposures at each true DCS risk to generate the power curve for prospective trials. Exposures in each simulated trial were taken 4 man-dives at a time and limited to maximum number of either 16 or 64. Results illustrated in Figure 4 show that the probability of reaching the reject criteria during trials of profiles of different true DCS risks is relatively low unless the true DCS risk is very high. For example, if the true underlying risk of a profile is 10%, the probability of rejecting the profile in a trial of 16 exposures is only 21.3% (Panel A). Similarly, if the true underlying risk of a profile is 5%, the probability of rejecting the profile in a trial of 16 exposures is only 4.3%. The situation is improved if the trial consists of 64 exposures, where the probability of rejecting a 10% risk profile is 69.6% (Panel B). However, the probability of rejecting a 5% risk profile is still only 16.9%. Rejection of the null hypothesis clearly requires as large a sample size as possible for each profile to be evaluated; i.e., that as many divers as possible perform each test profile. Indeed, it is practically impossible to perform the number of exposures required to attain the usually-sought statistical power of approximately 80% probability of rejecting an intrinsically unacceptable profile, even if all dives are made on only a single dive profile.

A B

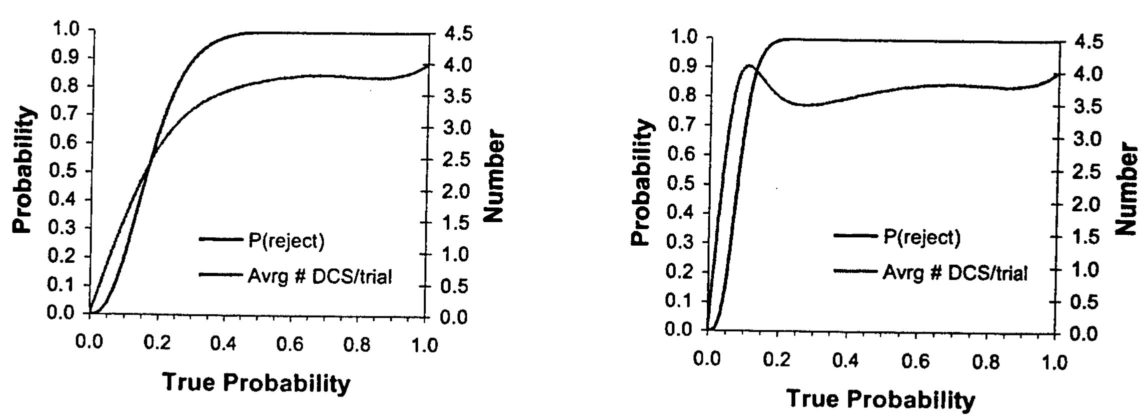

Figure 4. Power curves for sequential trials conducted under the rejection rules in Table 5 and consisting of: A) 16 exposures per trial, and B) 64 exposures per trial.

It was therefore decided to test as large a variety of dive profiles as possible and combine the results under the presumption that all profiles incurred nearly the same DCS risk. Trials of 228 or 300 exposures under this presumption then have power curves illustrated in Figure 5, which were generated as above using a Monte Carlo simulation of 50,000 exposures taken four at a time at each true DCS risk. The probability of rejecting 5 and 10% risk profiles in a trial of 228 exposures is 34.2 and 98.6%, respectively (Panel A), while the probability of rejecting such profiles in a trial of 300 exposures is 39.1 and 99.7%, respectively (Panel B).

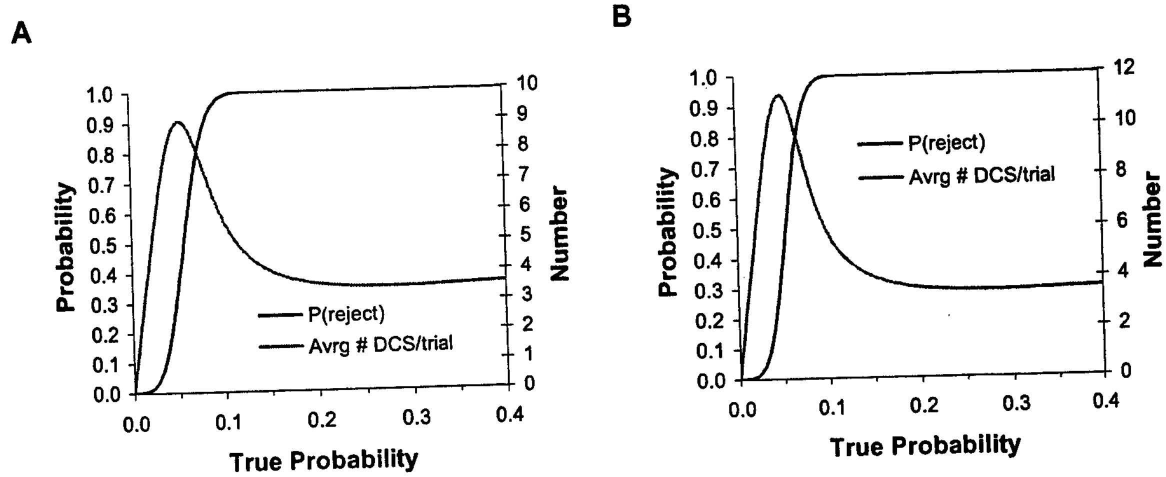

Figure 5. Power curves for sequential trials conducted under the rejection rules in Table 5 and consisting of: A) 228 exposures per trial, and B) 300 exposures per trial.

2.2.2. PROFILE SELECTION

PHASE I

The first 42 profiles in program Phase I were repetitive dive profiles consisting of two or three MK 16 MOD 1 He-O_2 dives separated by 30-minute surface intervals. The dives in each profile were to depths of 120, 160, or 200 fsw, with bottom times ranging from 15 to 25 minutes. The maximum total in-water time of each profile was 170 minutes. The profiles were generated by first building profile templates that each specified the number of dives per profile and the dive depths and bottom times. The number of dives per profile and the dive depths and bottom times were randomly selected for each template as follows:

Step	Description	Possible values
i	Randomly select the number of dives for the profile	2 or 3
ii	Randomly select the dive depth for the first dive	120, 160, or 200 fsw
iii	Randomly select the bottom time for the first dive	15, 20, or 25 min;
iv	Repeat steps (ii) and (iii) for each remaining dive	

Each template included breathing gas composition changes as per idealized MK 16 MOD 1 performance with 88/12 ($F_{I_{He}}/F_{I_{O_2}}$) as the diluent gas: The diver was assumed to breathe a 0.7 ATA PO_2-in-He mixture starting with descent from surface and continuing until arrival at 33 fsw, whereupon the inspired PO_2 was assumed to be 1.3 ATA-in-He for the remainder of the descent, time on the bottom, and subsequent ascent to 12 fsw. The inspired PO_2 was then assumed to be 0.7 ATA-in-He for the remaining ascent from 12 fsw to surface, after which the diver was assumed to breathe air. All descents were at 60 fsw/min and all ascents were at 30 fsw/min.

The templates were then completed by computing the decompression schedules for each dive in each profile to a certain pre-specified conditional DCS risk using the LEM model described in Section 1.2 and Appendix A. Throughout the present work, the conditional DCS risk was defined as the probability of DCS occurrence during and after any given dive, subject to the condition that DCS has not occurred up to the time of leaving surface on the dive. Final profiles for test were then taken as the first 42 in the series of completed profile templates that had total in-water times of 140-170 minutes.

Two series of dive profiles were generated. Dive Series A was generated under limiting conditional DCS risk of 2.3%, and Dive Series B was generated under a limiting conditional DCS risk of 2.0%. The latter series was intended for use if the incidence or severity of decompression sickness observed in divers participating in dive profiles from Series A was unacceptably high. Indeed, a diver participating in the first profile of Dive Series A experienced elbow pain and vertigo after completing the profile. As a result of this early outcome, it was decided to switch to the B series of dive profiles after completion of only the first four "A" series profiles.

Three additional single and repetitive MK 16 MOD 1 He-O_2 dive profiles to 80 fsw were also tested in this program phase. These dives were completed to obtain a "quick look" at a longer, potentially acceptable no-stop limit for MK 16 MOD 1 He-O_2 dives to this depth than prescribed by the LEM model at 2.3% DCS risk.

PHASE II

Profiles tested in study Phase II were selected to test schedules prescribed by the new MK 16 MOD 1 He-O_2 decompression tables. For dives to depths of 200 fsw or less, where the new tables were engineered to support repetitive diving, dive profile templates were constructed in which the depths, bottom times and surface intervals were randomly selected from pools of possible properties outlined in Table 8. The templates were then completed using the EL-RTA with the PVAL set derived from the LEM model as described in Section 2.1.1.

Single dives to depths from 120 to 300 fsw were also selected for test as considered relevant to EOD operational needs, or to test operationally relevant extremes of the tables. The distribution of the planned 296 exposures among the 37 different profiles finally selected is shown in Figure 6.

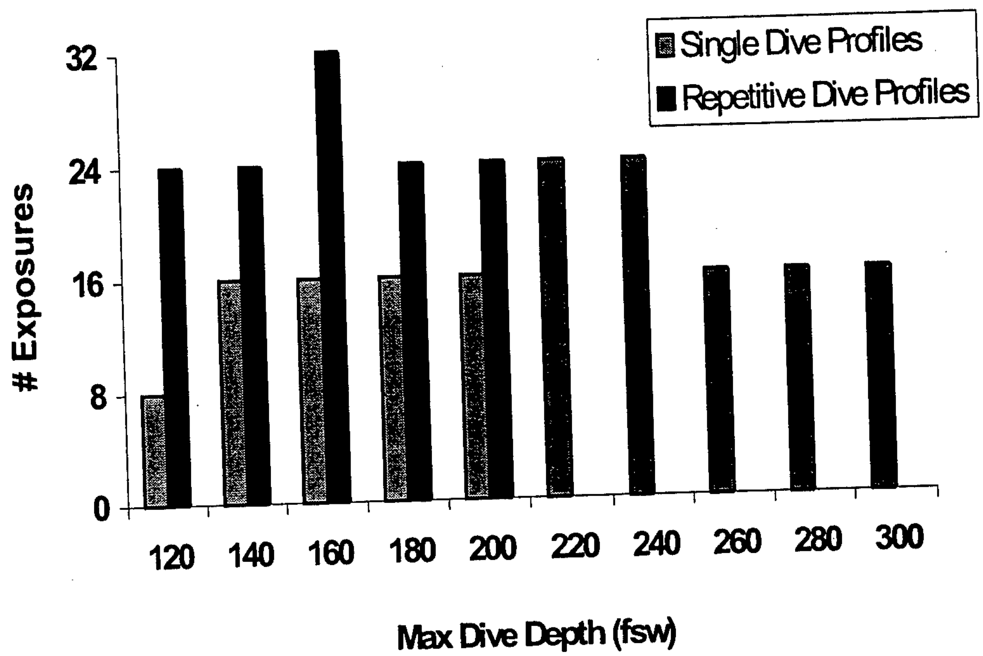

Figure 6. Distribution of 296 man-exposures on 37 dive profiles tested in Phase II. Eight exposures per profile were planned.

All of the profiles performed in program Phases I and II had an overall estimated DCS risk of less than 5.0%.

2.3. DIVE PROCEDURES

Each phase of the study was reviewed and approved by the NEDU Committee for the Protection of Human Subjects (CPHS) before any manned trials commenced. The study involved U.S. Navy military divers. In this report, the personnel acting as experimental divers are referred to as "divers". All the divers read and signed a consent form prior to the study. They were required to meet the usual physical qualifications criteria for diving. All divers were trained on the standard and emergency NEDU diving procedures before participating in the study.

Divers were allowed to participate in more than one dive profile in each program phase. To minimize the potential for having results of a dive profile confounded by effects of a preceding dive profile, the divers, unless otherwise noted, spent a minimum of 60 hours at sea level between profiles. If a diver did not experience any symptoms of decompression sickness (DCS) for 48 hours after completing an experimental dive profile, he was given the diagnosis of "no DCS" and could participate in another profile after an additional 12 hours had elapsed. If a diver was diagnosed with a Type I DCS injury, he could not participate in any study during the ensuing week. Further diver participation in the study after a Type II DCS injury or arterial gas embolism (AGE) was handled on a case-by-case basis. Physical attributes of the divers, along with the number of profiles dived by each diver in the two program phases, are summarized in Appendix C.

No systemic drugs except antibiotics and approved decongestants were allowed unless cleared by the diving medical officer (DMO). Since many divers normally take nonsteroidal anti-inflammatory drugs (NSAIDS) or vitamins daily, such use was allowed if 1) The DMO was notified and 2) No more than the diver's routine amount was taken while participating in the dive.

In the U.S. Navy dive decompression research programs, experimental divers have traditionally been instructed to abstain from alcohol for a minimum of 72 hours before and after participating in an experimental dive. However, this does not reflect operational diving practice. In an effort to make the experimental diver population a more accurate reflection of operational divers, the divers were allowed to engage in their usual social drinking behavior. Alcohol consumption was documented in the pre-dive medical screening. In this way there was no incentive for the divers to be less than completely forthright about their alcohol consumption. Divers were also instructed to engage in their regular physical training on the day of the experimental dive. This was another effort to make the experimental divers reflect operational divers more closely.

Three to four divers participated in each dive. Each diver had a tender to assist him with dressing for the dive, entering the chamber, supporting him during the surface interval between dives, and assisting him after the dive. The tenders were not exposed to a hyperbaric environment.

The divers were interviewed each morning by a Diving Medical Officer and the Dive Watch Supervisor (DWS) to verify their fitness to dive. Divers were kept on-site for 2 hours after surfacing from each dive. Each diver was queried about their status on surfacing and at 2 hours, 24 hours, and 48 hours after surfacing, and could volunteer information about symptoms at any time. Treatment of any decompression sickness was per standard U.S. Navy Standard Recompression Treatment Tables.

All diving was conducted with divers fully water immersed above a high-stand platform in the wet chamber of the NEDU OSF. The water temperature was 78-84°F (36-30°C) for all dives. Each diver wore a neoprene wet suit with booties, farmer johns, and weight belt as needed. A hot water hose was available for use if a diver became cold during a decompression stop or a surface interval.

Four pedal ergometers (W.E. Collins, Braintree, MA) were positioned on the high-stand platform to support diver exercise in the horizontal position during dive bottom times. The control room monitored all diving via in water video cameras.

The water level in the OSF wet pot was set at approximately 5 fsw above the high-stand platform. Because each diver was either at rest or working in the horns of his assigned bicycle ergometer, the water depth at the horns determined the diver's actual mid-chest depth. This water depth was measured on each dive day and was invariably from 0.8 to 1.0 fsw. All depths reported here are for diver at mid-chest depth, corrected for immersion.

All dives were performed with the divers breathing on the MK 16 MOD 1 UBA's with 88% Helium/12% Oxygen as the diluent gas. Each UBA was fitted with either a T-bit or a MK 24 Full Face Mask (FFM) configured to support communications between the diver and Control. The mouthpieces of the MK 24 FFMs were also fitted with a gas switch block that allowed the diver to select and breathe either emergency breathing (EGS) or UBA gas.

EGS gas was available throughout each dive for divers to breathe in the event of a gas monitoring system or UBA malfunction. This gas was available to all divers via an open circuit hooka secured at each bike. EGS gas to divers using a MK 24 FFM was also available via the selector valve on their mouthpiece gas switch block. Finally, a diver could also abort at any time by simply standing and breathing chamber air.

EGS gases were switched at various times throughout each dive so that a diver on an EGS abort could complete any remaining bottom time and ensuing decompression with the other MK 16 MOD 1 divers. Comprehensive sets of separate decompression schedules were on hand during each dive for use in the event of an air abort.

Preparation and Compression

The divers donned their UBA's in front of Alpha Chamber with the assistance of tenders and under the supervision of the Diving Watch Supervisor (DWS). When directed by the DWS, the dressed divers entered Alpha chamber of the OSF and proceeded directly to the trunk, where a tender made umbilical connections for diver inspired gas and temperature monitoring to each diver's UBA inhalation hose where it exits the body of the rig. The tender also connected a communications and EGS umbilical to the MK 24 FFM of divers so equipped. At surface, the EGS umbilical was charged with air. One-by-one, the divers then descended the trunk into the wet pot, entered the water and proceeded to their assigned bikes breathing air. (Divers using a T-bit simply stood during this period with head out of water breathing chamber air. Divers with a MK 24 FFM breathed EGS air from the mouthpiece of their FFM.) All bikes were situated in such a fashion that they were in full view of the video monitors. After all the divers had completed this procedure and were ready to dive, the DWS instructed them to "go on gas", meaning start breathing from the UBA and prepare to descend.

Immediately before descent to dive depths of 250 fsw or greater, divers performed a "breathe-down procedure" to mitigate the PO_2 overshoots in the MK 16 MOD 1 UBAs that accompany descent. The procedure, adopted from Royal Navy procedures for diving with the Royal Navy MK 16 MOD 1 analog, the Clearance Divers Breathing Apparatus (CDBA), was performed as follows:

a) Diver inhaled from the rig and held breath at end-inspiration;
b) While in end-inspiratory breath-hold, diver switched the barrel valve on his or her MK 24 Full Face Mask (FFM) or T-bit to the closed position;
c) Diver exhaled into surrounding water or air and held his or her breath at end-expiration;
d) Diver switched barrel valve on FFM or T-bit back to UBA gas;

e) Steps (a) through (d) were repeated two more times or until diluent valve was heard to fire;
f) Diver breathed normally and descent was commenced.

Three minutes after the divers went on gas, the OSF complex was pressed with air to the desired depth. The target compression rate was 60 fsw/min, but slower rates were more typically achieved. The divers gave OK's throughout descent. If there was a halt for a squeeze, the chamber was decompressed a few feet, and the affected diver was allowed to clear. The DWS then continued to press the chamber to the desired bottom depth.

At Depth

After arrival at bottom and giving OK's, the divers began exercising at a rate of approximately 35-50 watts/minute. The divers alternated between equal periods of exercise and rest in the horns of the bike while at depth (typically 5 minutes of exercise was alternated with 5 minutes of rest).

Decompression

Divers were instructed to remain at rest in an upright position during decompression, which was at a rate as close to 30 fsw/min as possible. The divers were instructed not to manually add O_2 to their UBAs unless specifically instructed to do so.

At Surface

Divers remained in the OSF wet pot, standing with head above water breathing air, during surface intervals before repetitive dives.

Instrumentation

Diver depth and diver inspired gas composition and temperature were monitored in real-time throughout every dive and automatically recorded in ASCII text file format. Data acquisition and post-dive processing are described in detail in Appendix G.

3. RESULTS

3.1. PHASE I DIVE TRIAL

A total of 228 man-exposures were completed on 45 different dive profiles in program Phase I. A description of the profiles, with the number of exposures and DCS outcome for each profile, is given in Appendix D.

3.1.1. DCS INCIDENCE AND OTHER OUTCOMES

Two DCS cases occurred in 228 exposures, yielding an overall observed DCS incidence of 0.88%. Under the null hypothesis that this observed incidence is in fact the true DCS risk of the 228 exposures, it can be asserted at 95% confidence that the overall DCS risk of the profiles is less than 3.13%. This figure compares favorably with the estimated DCS risks of the current U.S. Navy Standard Air Decompression schedules, which vary widely from fractions of 1% to greater than 10% under the probabilistic models available to make such estimates. Thus, the observed overall DCS incidence in the Phase I trials fell well within the range of DCS risks accepted under current U.S. Navy Standard Air diving practice. The LEM model used to compute the Phase I schedules could not be rejected as producing profiles of unacceptably high DCS risk.

Other medical events in the Phase I man dives are described in Appendix F.

3.1.2. MK 16 MOD 1 PO_2 CONTROL

MK 16 MOD 1 control of diver inspired PO_2 was closely monitored throughout each dive profile (see Appendix G). Various periods in each dive, defined as illustrated in Figure 7, were used to facilitate summarization of results, which are illustrated graphically in Figures 8 through 11, and in detail in Appendix H. In present work, the PO_2 Overshoot Period in each dive was defined as the period beginning after leaving surface when measured diver inspired PO_2 first exceeded 1.45 ATA, and ending after reaching bottom when measured diver inspired PO_2 first fell below 1.45 ATA. The Post-Overshoot Bottom Period was nearly equivalent to the "bottom control period" used in earlier work.[14]

Summary results include the time-weighted averages of measured diver inspired PO_2 over the bottom time and total dive time of each dive. These averages include the diver inspired PO_2 during descent and ascent when the MK 16 MOD 1 PO_2 set-point was at its shallow value of 0.75 ATA. The period during descent when diver inspired PO_2 was near 0.75 ATA constituted only a small fraction of the overall bottom or dive times, while UBA PO_2 during the short 12 fsw-to-surface stage of their ascents was effected predominantly by the Boyle's law-driven decrease in PO_2 that normally accompanies ascent. The influences of MK 16 MOD 1 PO_2 set-point transitions on the reported averages were consequently negligible.

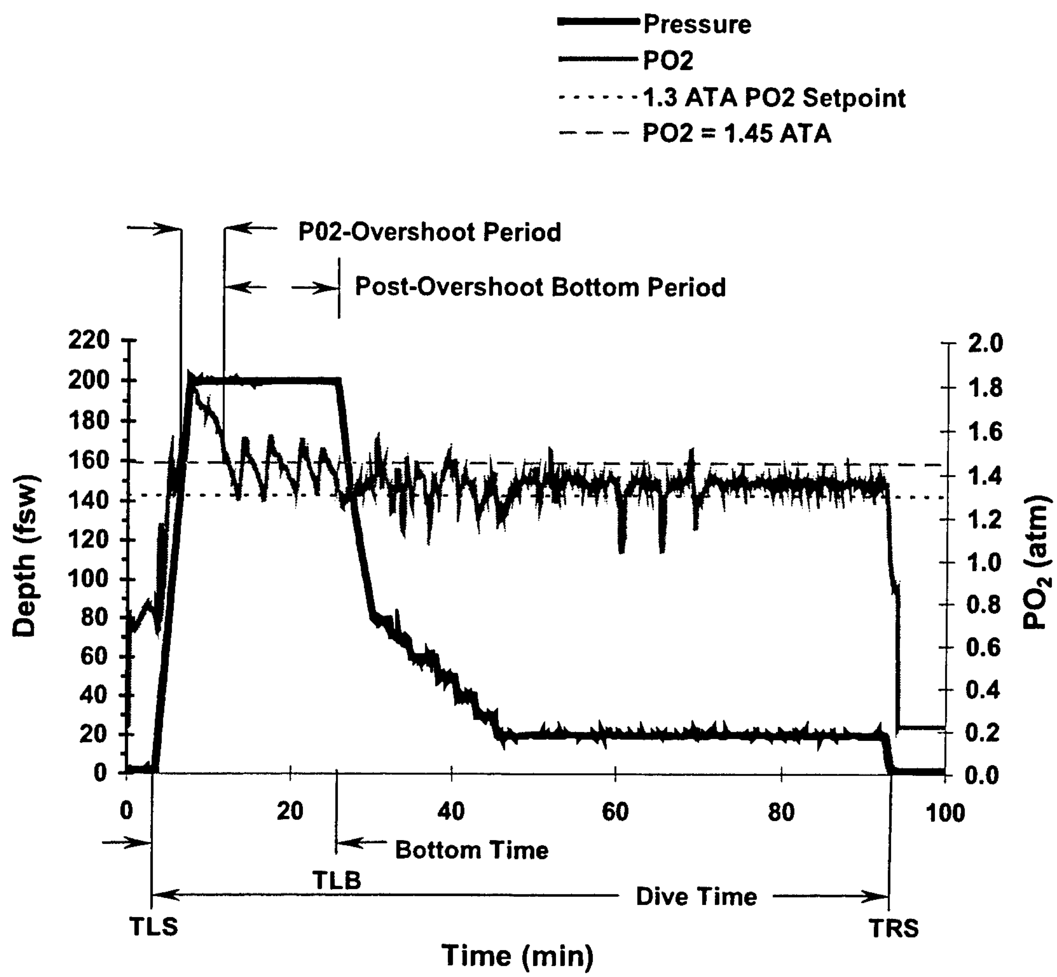

Figure 7. Illustration of different periods in a MK 16 MOD 1 dive used to characterize MK 16 MOD 1 PO_2 control. (First dive in profile 110600BN91.) TLS ≡ Time Leave Surface, TLB ≡ Time Leave Bottom, TRS ≡ Time Reach Surface.

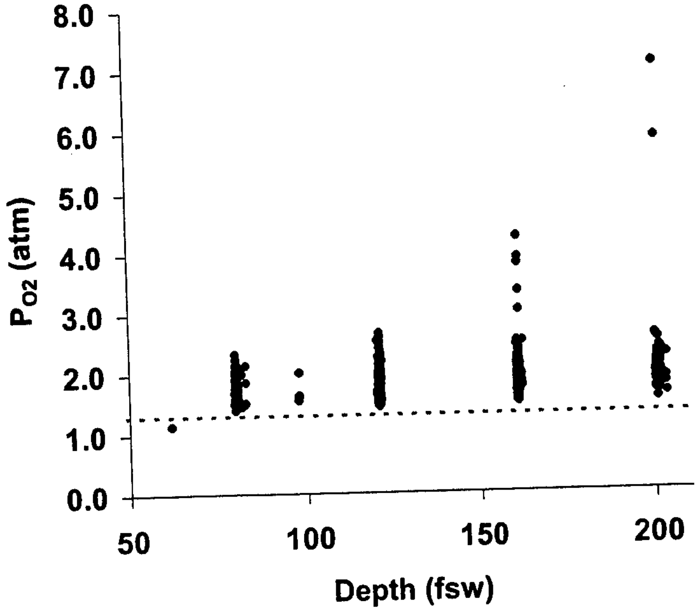

Figure 8. Maximum PO_2 during PO_2 overshoot periods in Phase I dives. Dotted line is the nominal 1.3 ATA PO_2 set-point of the MK 16 MOD 1 at the dive depths shown. The two illustrated peak PO_2 values in excess of 5 ATA occurred in profiles 112200AN05 and 112200AN36. Examination of these profiles in Appendix I reveals that these values are in obvious error. Similarly, all other peak PO_2 values in excess of 3.0 ATA can be traced to erroneous PO_2 spikes during descent (see profiles 111400AN** and 112000BN59 in Appendix I).

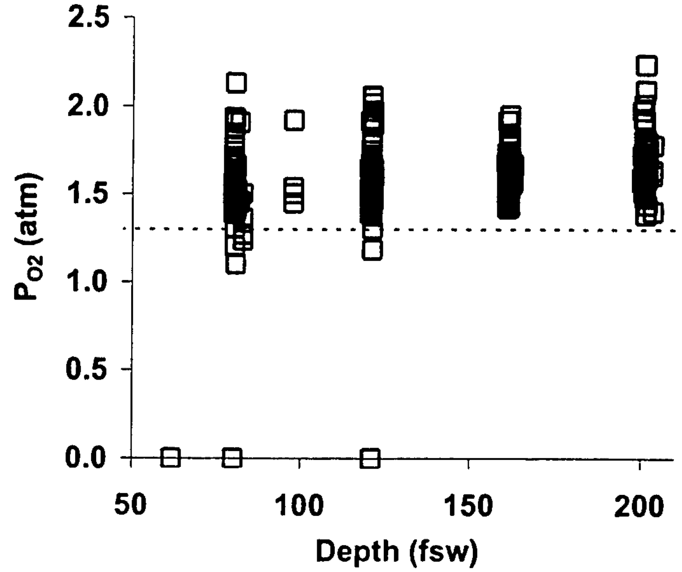

Figure 9. Time-weighted average PO_2 during PO_2 overshoot periods in Phase I dives. Dotted line is the nominal 1.3 ATA PO_2 set-point of the MK 16 MOD 1 at the dive depths shown. Time-weighted Average Overshoot PO_2 is zero for dives in which no overshoot occurred (PO_2 did not exceed 1.45 atm during and immediately after descent).

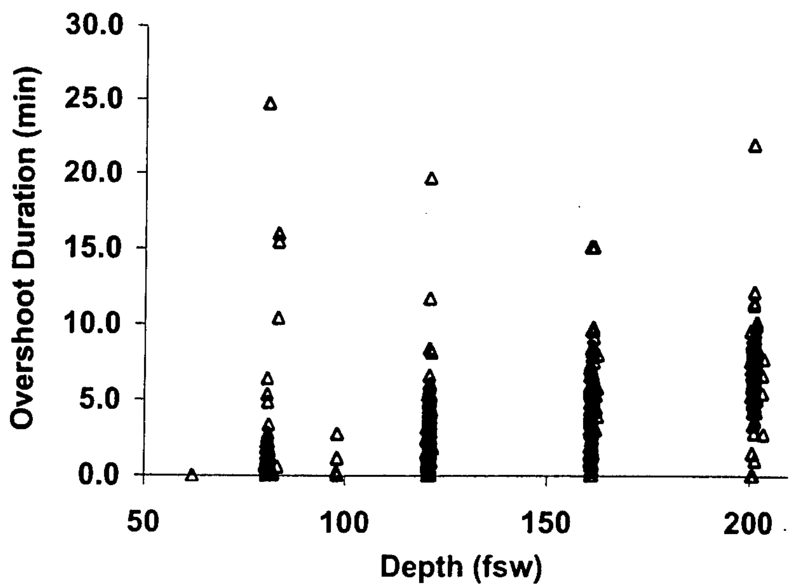

Figure 10. Duration of PO_2 overshoot periods in Phase I dives. PO_2 overshoot duration is zero for dives in which no overshoot occurred (PO_2 did not exceed 1.45 atm during and immediately after descent).

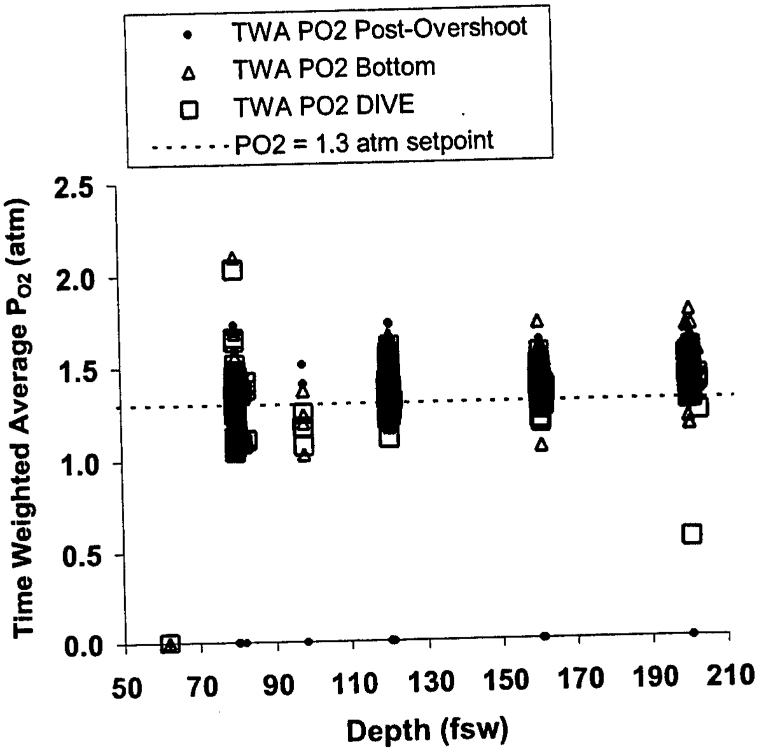

Figure 11. Summary of MK 16 MOD 1 PO_2 control characteristics at bottom after the PO_2 overshoot periods, during dive bottom times, and throughout the dives; Phase I dives. Time-weighted Average Post-Overshoot PO_2 is zero for dives in which no overshoot occurred (PO_2 did not exceed 1.45 atm during and immediately after descent).

3.2. LEM EVALUATION

Phase I dive trial results are summarized in Table 6, with 95% binomial confidence limits for the overall trial outcome, as well as LEM-estimated DCS incidence for the profiles. The table also includes data from man-trials completed at DCIEM with divers using the Canadian Underwater Mine Apparatus (CUMA). This latter data, some of which is reported in References 15 and 16, includes information from 1343 man-exposures; 913 of which were completed to test single and repetitive SURD O_2 schedules, and 430 of which were completed to test single-dive no-decompression and in-water decompression schedules.

Table 6. Summary DCS Outcomes; Present Program Phase I and DCIEM CUMA Trials.

Data Source	# Exposures	DCS, # (95% Confidence Limits)	
		Observed	LEM-Estimated (profiles as dived)
Phase I	228	2.0 (0.24-7.14)	5.8 (4.7-7.1)
DCIEM, CUMA	1343	4.2 (1.09-10.22)	7.5 (5.7-13.9)

The LEM probabilistic model tends to overestimate the number of DCS incidents in each case, but the estimates fall comfortably within the 95% binomial confidence limits of the observed incidences. Results from incorporation of these two new data sets with the other he8n25 calibration data into a chi-square goodness-of-fit test of LEM are given in Table 7. Pearson residuals for the new data sets are of magnitude similar to those for the other data subsets, excepting the DC8416W, ASATNSM and ASATEDU subsets that were concluded in Section 1.2 to fall outside the range of LEM model applicability. The overall chi-square with omission of these data subsets is associated with a relatively high probability (15%) that differences between observed and LEM-estimated DCS incidences are due to random chance alone. The test therefore fails to reject LEM as applicable to these new data. It was decided to proceed using LEM with parameters from preliminary work in Table 4.

Table 7. Results of Chi-Square Goodness-of-Fit of LEM Parameterized About he8n25 Calibration Data to Phase I and DCIEM CUMA Data.

Data Set	# Exposures	# DCS Incidents Observed	Predicted: Duke LEMGEN he8n25 (reoptimized)		Pearson Residual
	(N)	(f)	n	π	$(f-n)^2/n(1-\pi)$
He-O$_2$					
EDU185S	1582	57.2	73.35	0.05	3.729
EDUHE70	264	31.3	30.37	0.12	0.032
NMR86H6	62	1	3.91	0.06	2.312
NSMTMX	69	4	3.41	0.05	0.107
DC8416W	182	4	16.60	0.09	10.524
DRATMXW	190	11	8.47	0.04	0.791
NMR9404	472	28.2	22.12	0.05	1.753
Phase I	**228**	**2**	**5.80**	**0.03**	**2.555**
DCIEM, CUMA	**1343**	**4.2**	**7.50**	**0.01**	**1.460**
N$_2$-O$_2$					
NMR94EOD	284	17.3	14.28	0.05	0.672
NSM6HR	57	3.2	3.80	0.07	0.102
EDU885A	483	30	21.87	0.05	3.166
EDU885M	81	4	3.04	0.04	0.315
EDU885S	94	4	4.08	0.04	0.002
EDU1180S	120	10	6.33	0.05	2.246
NMR8697	477	12.8	14.33	0.03	0.168
ASATNSM	132	20.1	10.62	0.08	9.203
ASATEDU	120	15.7	8.44	0.07	6.717
TOTALS	6240	260.0	258.32	χ^2= (df=17)	45.854 P=0.0002
		w/DC8416W and ASAT* data sets omitted:		χ^2= (df=14)	19.410 P=0.1499

3.3. LEM TO EL-RTA MAP

The method described in Section 2.1.1. was new and required validation. Accordingly, the method was first confirmed able to correctly extract MVALs from a standard data set of 6,250 air dive profiles completed using a known deterministic overpressure model; namely, the EL MK 15/16 VVAL18 RTA. The standard set for this exercise was built by first assembling 6,250 dive profile templates using an elaboration of the random construction process described in Section 2.2.2. The steps for construction of each template in this elaborated process were:

Step	Description
i	Randomly select the number of dives, N_D, for the profile and start processing dive j=1
ii	Randomly select the dive depth for the j^{th} dive
iii	Randomly select the bottom time for the j^{th} dive
iv	Randomly select the ascent rate for the j^{th} dive
v	If $j<N_D$, then
v.a	Randomly select the surface interval time to precede dive j+1
v.b	Advance to next j and repeat steps (ii) through (v)
v.c	Else QUIT

The pools of possible profile and dive properties used for the various steps in this process are given in Table 8.

Table 8. Allowed Properties of Profiles in Standard Sets Used in Present Work.

Dives/Profile:	1, 2, or 3
Dive depths:	40 to 300 fsw, 10 fsw increments
Dive bottom times:	5 to 240 min, 5 min increments
Descent rates:	all 60 fsw/min
Ascent rates:	30-120 fsw/min, 5 fsw/min increments
Surface interval times:	30-720 min, 5 min increments

The single-gas EL MK 15/16 RTA with the VVAL18 MPTT table was then used to complete each profile template by adding any required decompression stops. Finally, the $M_{0,i}$ and a_i parameters were extracted using a nonlinear least-squares minimization routine based on Marquardt's algorithm. The routine included provisions to keep parameters from "dropping out" of the fit when parameter adjustments occurred that caused any $\frac{\partial ss}{\partial \beta_{i,\omega}} = 0$. The extracted parameters are compared in Table 9 to those used to construct the original VVAL18 MPTT Table.

Table 9. Original and Extracted β for EL-MK 15/16 VVAL18 RTA.

Compartmental Half-Time (min)	VVAL18 β (Original)		Extracted β			
	M_0 (atm)	Slope, *a*	M_0 (atm)	(+/-)	Slope, *a*	(+/-)
5	3.325473	1.000000	4.1573910640	1.0131884592E-01	5.1137431489D-01	2.5166007739E-02
10	2.660378	1.000000	2.6541991497	1.6602929540E-01	9.9755658436D-01	7.2896035543E-02
20	2.055747	1.000000	2.0520490650	1.0329812499E-01	9.9904887464D-01	2.9637214291E-02
40	1.390652	1.000000	1.3883417620	5.3197343128E-02	9.9944699327D-01	1.8477864659E-02
80	1.163916	1.000000	1.1603678985	1.0513980220E-01	9.9891507796D-01	4.9763959282E-02
120	1.073221	1.000000	1.0695265720	1.4716565177E-01	9.9823687284D-01	1.1470297775E-01
160	1.042989	1.000000	1.0395944062	2.2183738147E-01	9.9809734236D-01	1.7816022836E-01
200	1.027874	1.000000	1.0246291998	3.3186323300E-01	9.9787290260D-01	2.3631137136E-01
240	1.012758	1.000000	1.0098339679	1.0997956269E-01	9.9767216964D-01	7.3947386111E-02

All parameters of the β matrix for the $f(\beta, D)$ function were successfully recovered except those for the 5-minute half-time compartment.

The complete process outlined in Figure 3 was then used with Eq. (4) to extract PVALs for the EL MK 15/16 RTA from profiles completed by the LEM model described in Section 1.2 and Appendix A. A standard set of 6,250 MK 16 MOD 1 He-O_2 dive profiles was built by first assembling profile templates in which the properties of each profile were specified by random selection from the pools of possible properties given in Table 8. These templates included breathing gas composition changes as per idealized MK 16 MOD 1 performance with 88/12 ($F_{I_{He}}/F_{I_{O_2}}$) as the diluent gas: The diver was assumed to breathe a 0.7 ATA PO_2-in-He mixture starting with descent from surface and continuing until arrival at 33 fsw, whereupon the inspired PO_2 was assumed to be 1.3 ATA-in-He for the remainder of the descent, time on the bottom, and subsequent ascent to 12 fsw. The inspired PO_2 was then assumed to be 0.7 ATA-in-He for the remaining ascent from 12 fsw to surface, after which the diver was assumed to breathe air. The LEM model was used to complete these templates at 2.3% fixed conditional DCS risk with 20 fsw as the shallowest allowed decompression stop.

The β matrix for a 9-compartment single-gas deterministic EL-RTA was then extracted from these profiles after setting each inspired inert gas fraction equal to the sum of the inspired N_2 and He fractions:

$$F_{I_{N_2}} = 1 - F_{I_{O_2}} = F_{I_{N_2}} + F_{I_{He}}. \quad (8)$$

Results are given Table 10.

Table 10. Extracted β for Single-Gas EL RTA Approximation of LEM.

Compartmental Half-Time (min)	Extracted β	
	M_0 (atm)	Slope, a
5	3.8862658847	0.33419042769
10	3.2530411741	0.80040718224
20	1.6516881159	1.0244650367
40	2.1573713860	1.0501531224
80	1.9442800335	1.0875015513
120	0.88439535826	1.2477082949
160	0.71938369704	1.1325581371
200	1.0619074770	0.89880196526
240	0.77353416931	0.90032370927

Eq. (7) was then used with the extracted β in Table 10 to produce the table of Maximum Permissible Tissue Tensions (PVALs) given in Table 11 for final parameterization of the EL-RTA.

Table 11. PVAL Table for Single-Gas EL RTA Approximation of LEM.

TABLE OF MAXIMUM PERMISSIBLE TISSUE TENSIONS

(xval_he_4 - HELIUM)

TISSUE HALF-TIMES

DEPTH	5 MIN 1.00 SDR	10 MIN 1.00 SDR	20 MIN 1.00 SDR	40 MIN 1.00 SDR	80 MIN 1.00 SDR	120 MIN 1.00 SDR	160 MIN 1.00 SDR	200 MIN 1.00 SDR	240 MIN 1.00 SDR
10 FSW	131.892	115.608	64.879	81.863	75.188	41.731	35.121	44.114	34.590
20 FSW	135.234	123.613	75.124	92.365	86.063	54.208	46.447	53.102	43.594
30 FSW	138.576	131.617	85.369	102.866	96.938	66.685	57.773	62.090	52.597
40 FSW	141.918	139.621	95.613	113.368	107.813	79.162	69.098	71.078	61.600
50 FSW	145.260	147.625	105.858	123.869	118.688	91.640	80.424	80.066	70.603
60 FSW	148.602	155.629	116.103	134.371	129.563	104.117	91.749	89.054	79.606
70 FSW	151.944	163.633	126.347	144.872	140.438	116.594	103.075	98.042	88.610
80 FSW	155.286	171.637	136.592	155.374	151.313	129.071	114.401	107.030	97.613
90 FSW	158.627	179.641	146.837	165.876	162.188	141.548	125.726	116.018	106.616
100 FSW	161.969	187.645	157.081	176.377	173.063	154.025	137.052	125.006	115.619
110 FSW	165.311	195.649	167.326	186.879	183.938	166.502	148.377	133.994	124.623
120 FSW	168.653	203.653	177.570	197.380	194.813	178.979	159.703	142.982	133.626
130 FSW	171.995	211.657	187.815	207.882	205.688	191.456	171.028	151.970	142.629
140 FSW	175.337	219.661	198.060	218.383	216.563	203.933	182.354	160.958	151.632
150 FSW	178.679	227.666	208.304	228.885	227.438	216.410	193.680	169.946	160.636
160 FSW	182.021	235.670	218.549	239.386	238.313	228.887	205.005	178.934	169.639
170 FSW	185.363	243.674	228.794	249.888	249.188	241.365	216.331	187.922	178.642
180 FSW	188.705	251.678	239.038	260.389	260.063	253.842	227.656	196.910	187.645
190 FSW	192.046	259.682	249.283	270.891	270.938	266.319	238.982	205.898	196.649
200 FSW	195.388	267.686	259.528	281.392	281.813	278.796	250.307	214.886	205.652
210 FSW	198.730	275.690	269.772	291.894	292.688	291.273	261.633	223.874	214.655
220 FSW	202.072	283.694	280.017	302.395	303.563	303.750	272.959	232.862	223.658
230 FSW	205.414	291.698	290.262	312.897	314.438	316.227	284.284	241.850	232.661
240 FSW	208.756	299.702	300.506	323.398	325.313	328.704	295.610	250.838	241.665
250 FSW	212.098	307.706	310.751	333.900	336.188	341.181	306.935	259.826	250.668
260 FSW	215.440	315.710	320.996	344.401	347.063	353.658	318.261	268.814	259.671
270 FSW	218.782	323.714	331.240	354.903	357.938	366.135	329.587	277.802	268.674
280 FSW	222.124	331.718	341.485	365.405	368.813	378.612	340.912	286.790	277.678
290 FSW	225.465	339.722	351.730	375.906	379.688	391.089	352.238	295.778	286.681
300 FSW	228.807	347.726	361.974	386.408	390.563	403.567	363.563	304.766	295.684

BLOOD PARAMETERS

(PRESSURE IN FSW; 33 FSW/ATA)

PACO2	PH2O	PVCO2	PVO2	AMBAO2	PBOVP
1.50	0.00	2.30	2.00	0.00	0.000

The pressure dependence of the PVALs in Table 11 is illustrated in Figure 12. In accord with the form for the $f(\beta,D)$ function adopted in present work, PVALs exhibit the linearity typical of the VVALs and HVALs of Thalmann's earlier versions of the EL-RTA. However, the present PVALS for different half-time compartments increase with depth along different slopes, which departs from the parallelism of the lines for the different compartments in similar plots of the earlier MPTTs.

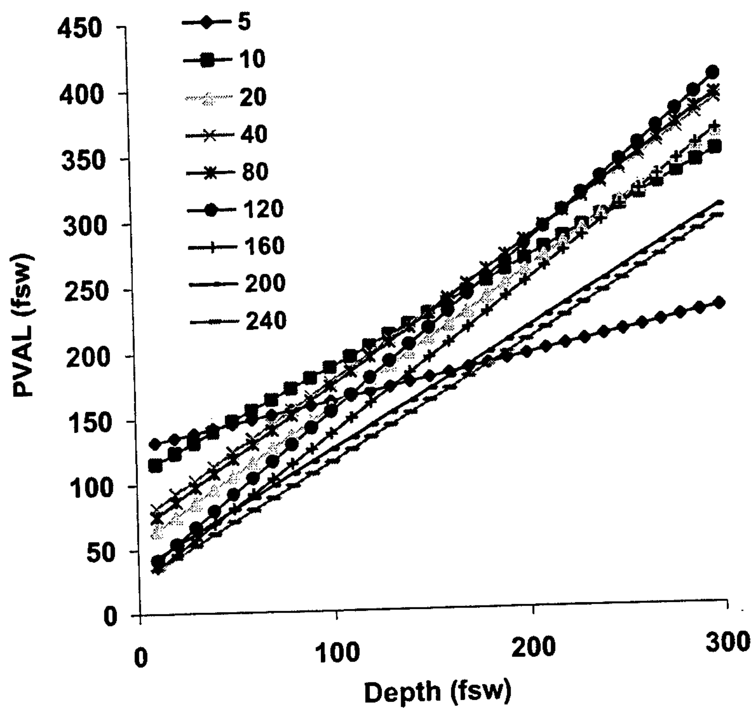

Figure 12. Depth-dependence of compartmental PVALs in the EL RTA approximation of LEM.

The EL-RTA with the XVAL-He-4 MPTT table was used to produce the parts of new MK 16 MOD 1 HeO_2 decompression tables in which repetitive diving is supported; *i.e.*, schedules for dives to depths of 200 fsw or less. The 120-minute half-time compartment was used as the reference compartment for repetitive group calculations. The remaining parts of the new tables in which repetitive diving is not supported; i.e., schedules for dives to depths of 210 fsw or greater; were computed using LEM directly. The latter schedules were computed using an acceptable estimated DCS risk of 2.3%. The complete set of final tables was published in an earlier preliminary report and is reproduced here in Appendix J.

Profiles representative of those prescribed by the new tables were then selected for man-test as described in Section 2.2.2. Decompressions in these profiles were computed using the EL-RTA in its "real-time" mode, where the schedule for each repetitive dive is based on the model state at the end of the preceding surface interval. Such schedules tend to be less conservative than those prescribed by the tables *per se* because in the latter

- washout of residual gas during surface intervals is presumed to be governed by a single, relatively slow 120-min half-time reference compartment;
- washout of residual gas from the reference compartment during surface intervals is presumed to start from the maximum gas tension allowed in the surfacing repetitive group, and;
- adjusted bottom times are rounded-up to the next largest tabulated bottom time.

A comparison of each repetitive dive schedule selected for test to its corresponding schedule as prescribed by the MK 16 MOD 1 He-O_2 decompression Tables is given in Appendix K.

3.4. PHASE II DIVE TRIAL

A total of 299 man-exposures were completed on 37 different dive profiles in Phase II of the program. A description of the profiles, with the number of exposures and DCS outcome for each profile, is given in Appendix D.

3.4.1. DCS INCIDENCE AND OTHER OUTCOMES

Six DCS cases occurred in the 299 exposures in this program phase, yielding an overall observed DCS incidence of 2.01%. Again, as in the description of the Phase I results, it can be asserted at 95% confidence that the overall DCS risk of the profiles is less than 4.32% under the null hypothesis that the observed DCS incidence was in fact the true DCS risk of the 299 exposures.

Other medical events in this program phase are described in Appendix F.

3.4.2. MK 16 MOD 1 PO_2 CONTROL AND OXYGEN SENSOR PERFORMANCE

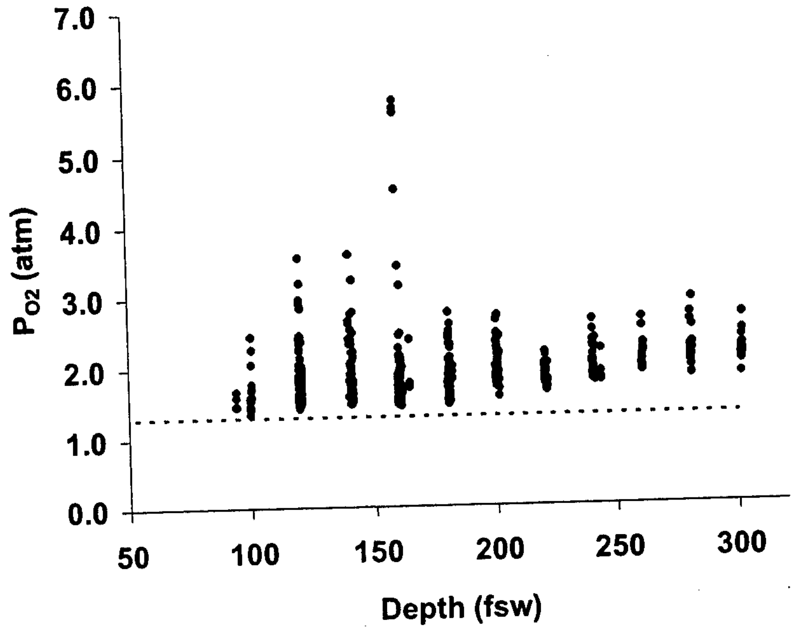

Figure 13. Peak PO_2 during PO_2 overshoot periods in Phase II dives. Dotted line is the nominal 1.3 ATA PO_2 set-point of the MK 16 MOD 1 at the dive depths shown. The four illustrated peak PO_2 values in excess of 4 ATA each occurred as a spike during descent in the profiles for divers on the same second dive (see profiles 05072001N04A, 05072001N09A, 05072001N14A, and 05072001N35A in Appendix I), and can thus be disregarded as artifact. Remaining peaks in excess of 3.0 ATA can be traced to similar spikes during descent (see profiles 04122001N34A, 04172001N31B, 04242001N09A, 04242001N10A, 04242001N30A, 04252001N521, 04262001N48B), and can also be disregarded.

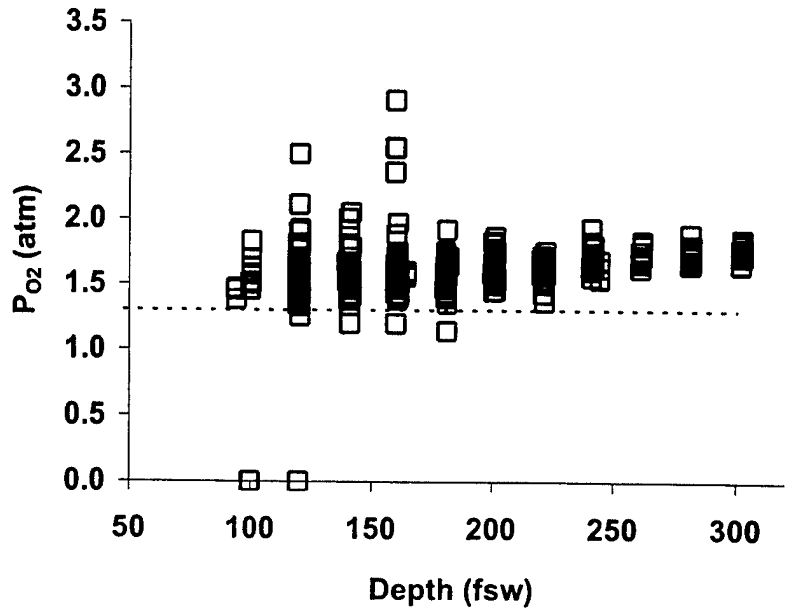

Figure 14. Time-weighted average PO_2 during PO_2 overshoot periods in Phase II dives. Dotted line is the nominal PO_2 set-point of the MK 16 MOD 1 at the dive depths shown. Time-weighted Average Overshoot PO_2 is zero for dives in which no overshoot occurred (PO_2 did not exceed 1.45 atm during and immediately after descent).

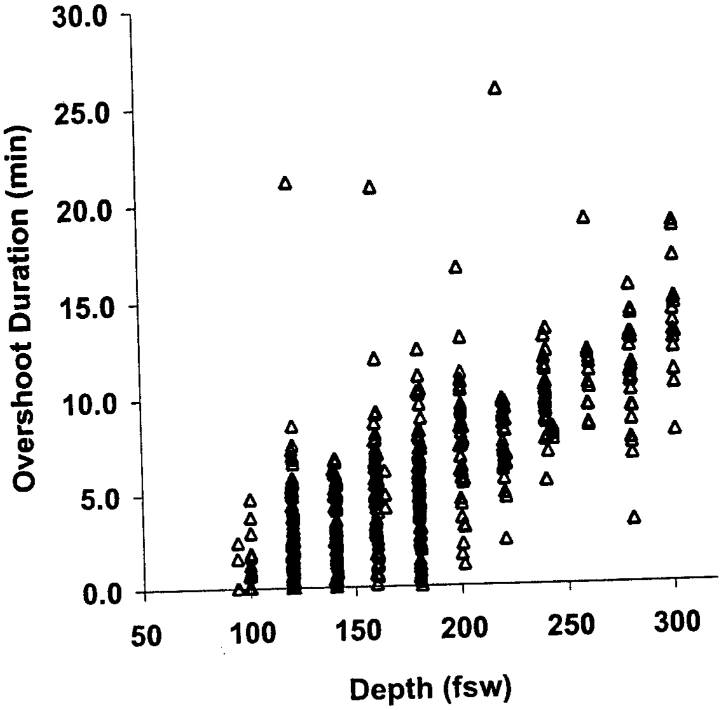

Figure 15. Duration of PO_2 overshoot periods in Phase II dives. PO_2 overshoot duration is zero for dives in which no overshoot occurred (PO_2 did not exceed 1.45 atm during and immediately after descent).

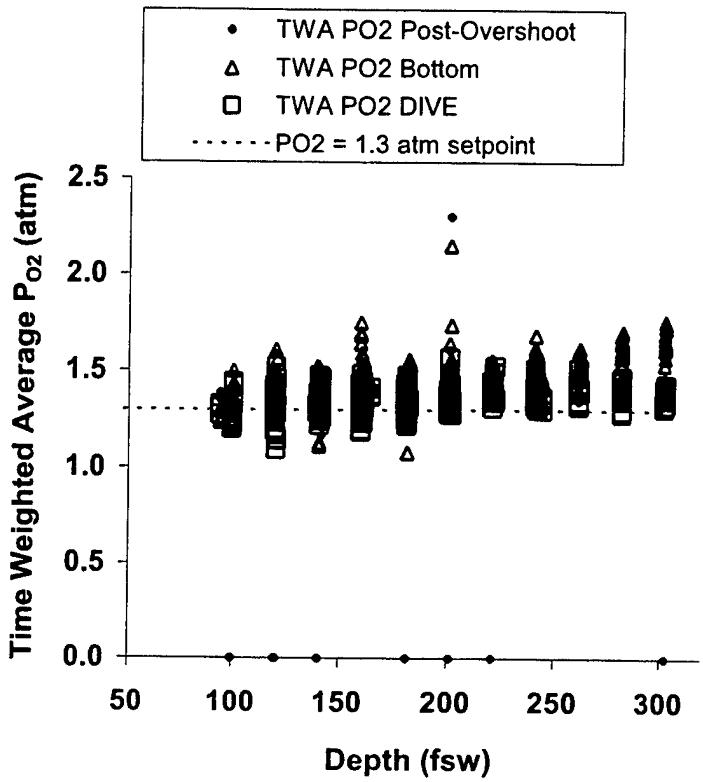

Figure 16. Summary of MK 16 MOD 1 PO_2 control characteristics at bottom after the PO_2 overshoot periods, during dive bottom times, and throughout the dives; Phase II dives. Dotted line is nominal PO_2 set-point of the MK 16 MOD 1 UBA at the depths shown. Post-Overshoot PO_2 is zero for dives in which no overshoot occurred (PO_2 did not exceed 1.45 atm during and immediately after descent). The two points at PO2 in excess of 2.0 ATA occurred in profile 04242001N38B, the real-time record for which is obviously corrupted by periods at depth with erroneous gas composition values (see Appendix I).

Uncontrolled Increases in Diver Inspired PO_2

In the course of the Phase I man-dives, it was observed that diver inspired PO_2 in some UBAs continued to increase throughout the bottom phase of the dives. This behavior, an example of which is illustrated in Figure 17, was typical of that expected with O_2 add valve failure in the open condition, but post-dive examination of the UBAs involved revealed no evidence of malfunction of these valves. Instead it was determined that the uncontrolled increases in UBA PO_2 were caused by nonideal behavior of the R10-DV PO_2 sensors in the rigs.

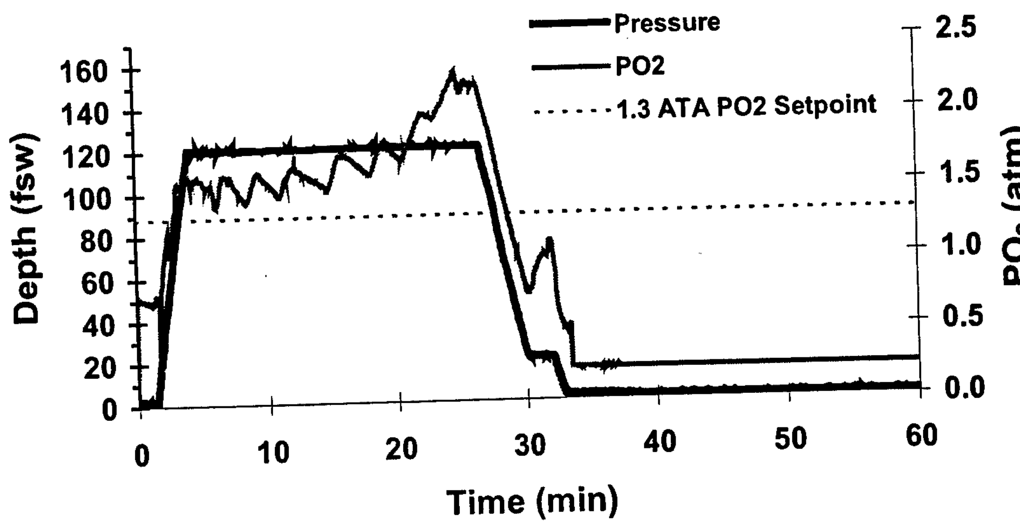

Figure 17. Example of "uncontrolled" PO_2 increase during bottom phase of first dive in profile 020501BN67. (The complete profile is illustrated in Appendix I. Also see profiles 020801AN67 and 021201AN12 in Appendix I.)

Nonideal sensor behavior is illustrated in Figure 18, along with a schematic of how this behavior causes improper, even catastrophic, P_{O2} regulation in the MK 16. (For clarity, we ignore the "voting" scheme by which outputs from the three sensors in the MK 16 are integrated and consider MK 16 P_{O2} to be controlled using output from only a single sensor.) Here, the P_{O2} set-point is assumed to be 1.3 atm, indicated on the abcissa at point A. This P_{O2} corresponds via the sensor calibration to a certain voltage (indicated by the height of point B on the ordinate, or 161 mv). However, because of sensor nonideality (deviation from the straight calibration line), a P_{O2} higher than 1.3 atm is required to obtain this voltage. Because the MK 16 MOD 1 PEA regulates the voltage it detects from each of its sensors, not the P_{O2} *per se*, the PEA will keep adding O_2 to the rig until the target voltage of 161 mv is attained. As indicated by the BC and CD arrows, this voltage actually corresponds to a P_{O2} of 1.43 atm, about 10% higher than the intended 1.3 atm. As the deviations from linearity increase over this operating range, the erroneous P_{O2} over-regulation also increases. Catastrophic failure occurs as actual sensor voltage output becomes independent of P_{O2} (voltage vs P_{O2} becomes flat). When this occurs, the PEA signals for indefinite addition of O_2 because sensor output cannot be elevated to the ideal value at 1.3 atm, no matter how high the P_{O2}.

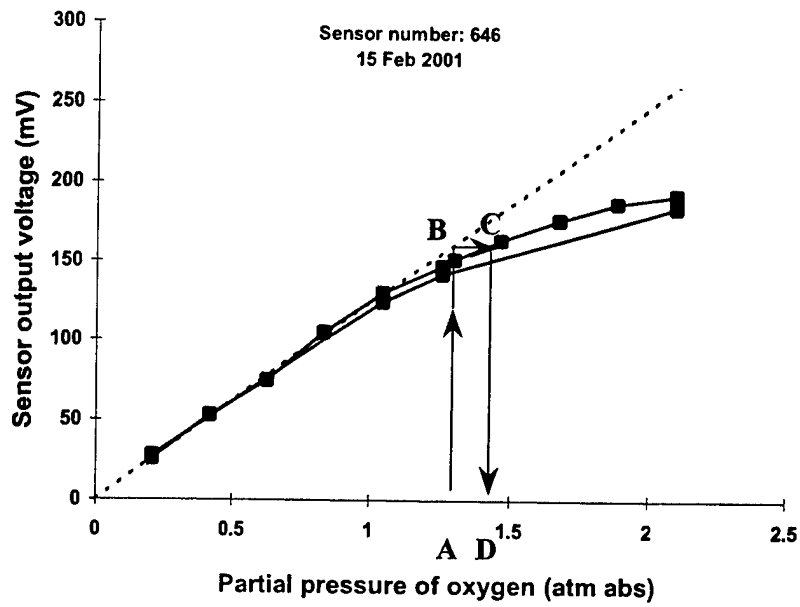

Figure 18. Mechanism of errant PO_2 regulation with nonideal O_2 sensor performance in the MK 16 MOD 1 UBA. Dotted line shows linear relationship between sensor voltage output and PO_2; the ideal performance assumed by the MK 16 MOD 1 Primary Electronics Assembly. The solid line through measured data is nonideal behavior leading to regulation of PO_2 in excess of the 1.3 ATA set-point in an otherwise properly set up MK 16 MOD 1. Note that this line is practically linear through a PO_2 of 1 ATA, the maximum PO_2 at which the O_2 sensors are checked in normal MK 16 MOD 1 setup.

This mode of MK 16 MOD 1 failure was recognized as a serious problem. First, the O_2 sensors are calibrated at a maximum PO_2 of only 1 atm in normal setup procedures, where sensor nonlinearity may not be evident (Cf., Figure 18). Thus, a UBA with malfunctioning sensors in the PO_2 range where proper operation is presumed can easily be inadvertently fielded for use. To compound the problem, UBA PO_2 in excess of 1.99 atm is not registered on the secondary display, so a diver using such a malfunctioning UBA will remain oblivious of the extent, and hence gravity, of the failure.

An upgraded O_2 sensor (Teledyne, Inc., R10DN) to replace the original equipment O_2 sensor (Teledyne, Inc., R10-DV) was identified as a solution to the problem. Samples of the upgrade R10-DN sensors were examined in the NEDU unmanned testing laboratory and, despite long ageing times in air, found to remain linear to within 5% with increasing PO_2 up to 2 atm (Figure 19). Moreover, the upgrade sensors were also found to have response times to changes in PO_2 that were substantially shorter than those for the original R10-DV sensors (Figure 20). As shown in Figure 21, these faster response times will tend to reduce the peak PO_2 attained in PO_2 overshoot periods.

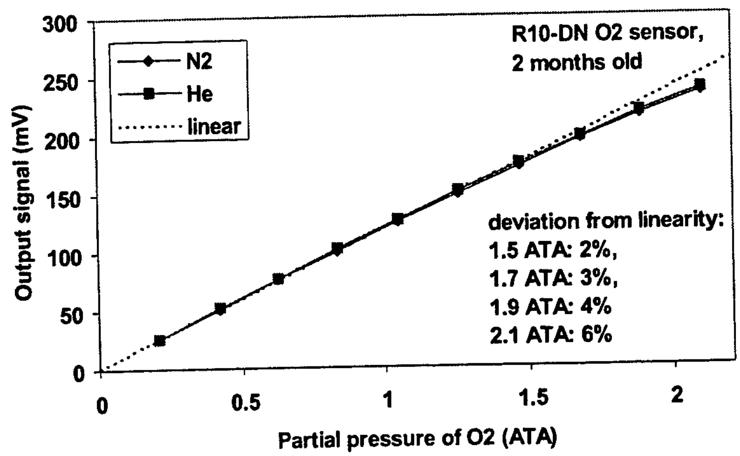

Figure 19. Output *vs.* PO_2 of upgrade R10-DN sensors with either N_2 or He as background gas. The sensors remain linear to within about 5% at PO_2 up to 2.0 ATA with either background inert gas.

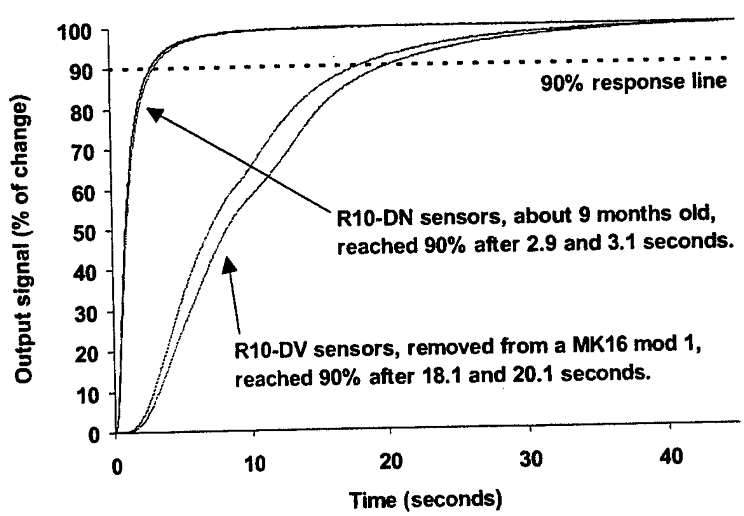

Figure 20. Responses of MK 16 MOD 1 PO_2 sensors to a step change in PO_2 from 0 to 1 ATA at time = 0. Data for two R10-DV and two upgrade R10-DN sensors are shown.

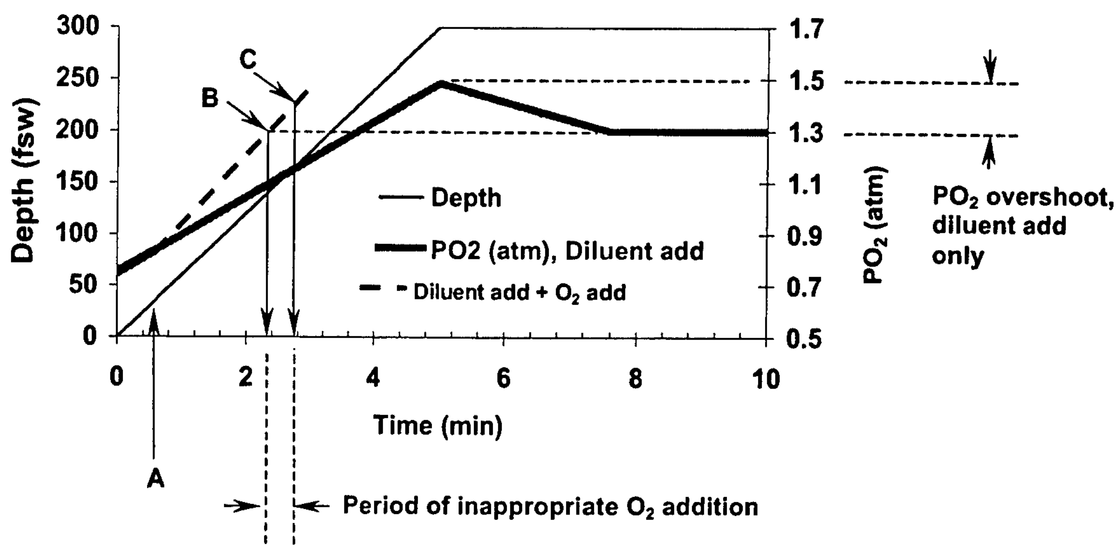

Figure 21. Sensor response time and PO_2 overshoot mitigation in a hypothetical MK 16 MOD 1 He-O_2 (88/12) dive to 300 fsw @ 60 fsw/min. The heavy solid line for UBA PO_2 was computed using equations derived in Appendix B with circuit volume = 13.5 l (8.5 l UBA volume + 5 l diver pulmonary vital capacity), and diver O_2 consumption = 1.0 l (STP)/min. Diver reaches 33 fsw, the MK 16 MOD 1 PO_2 set-point transition pressure, at point A. Because the UBA PO_2 does not exceed the new set-point PO_2 of 1.3 ATA at this point, the O_2 add valve will open. This sets the UBA PO_2 on a trajectory shown by the heavy dotted line towards a larger PO_2 overshoot than would occur if the O_2 add valve remained closed. The valve should then close at point B, when the UBA PO_2 attains a value of 1.3 ATA. However, due to the response latency of the O_2 sensors, the UBA control circuitry does not "learn" of the new PO_2 until point C, where the O_2 add valve will finally close. The period between B and C is consequently a period of inappropriate O_2 addition that exacerbates the PO_2 overshoot. Faster sensors reduce this period and mitigate the PO_2 overshoot.

Towards the end of the Phase II man-dive series, approval was obtained to use the upgrade R10-DN sensors in the MK 16 MOD 1 UBAs during the planned remaining dives. Thereafter, a total of twenty profiles were completed with divers using MK 16 MOD 1 UBAs fitted with the new sensors (a diver on an additional profile was aborted from the profile after completing only the first of two dives in the profile). Various aspects of measured diver inspired PO_2 during each of the dives in these profiles are summarized in Figures 22 – 25.

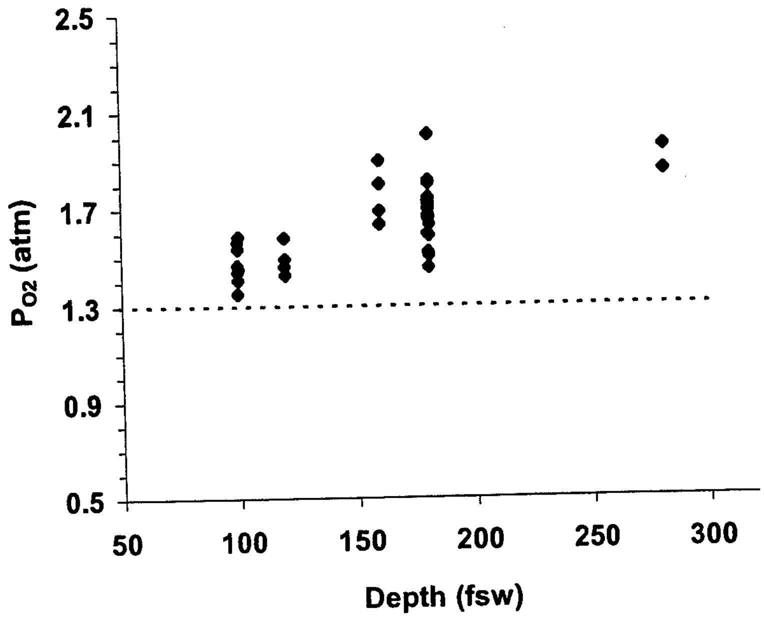

Figure 22. Peak PO_2 during PO_2 overshoots in Phase II dives completed using MK 16 MOD 1 UBAs fitted with upgrade R10-DN O_2 sensors. Dotted line is nominal PO_2 set-point of the MK 16 MOD 1 UBA at the depths shown.

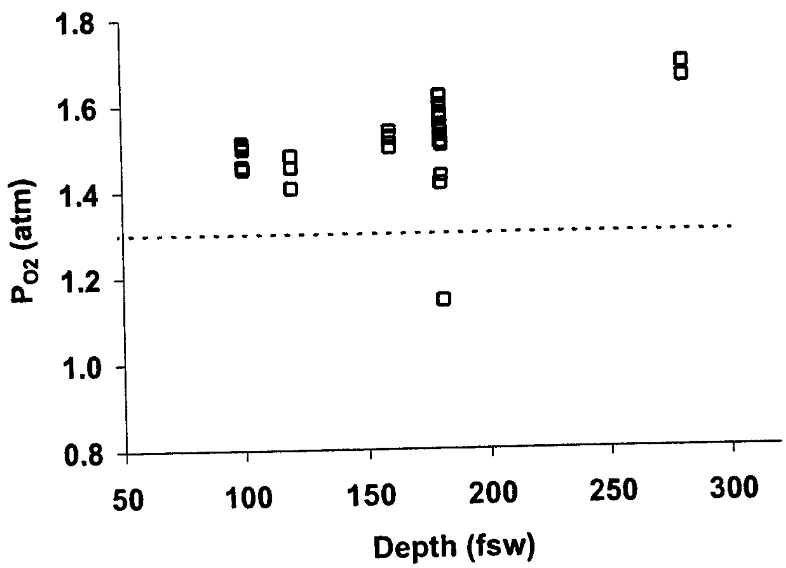

Figure 23. Time-weighted average PO_2 during PO_2 overshoot periods in Phase II dives completed using MK 16 MOD 1 UBAs fitted with upgrade R10-DN O_2 sensors. Dotted line is nominal PO_2 set-point of the MK 16 MOD 1 UBA at the depths shown.

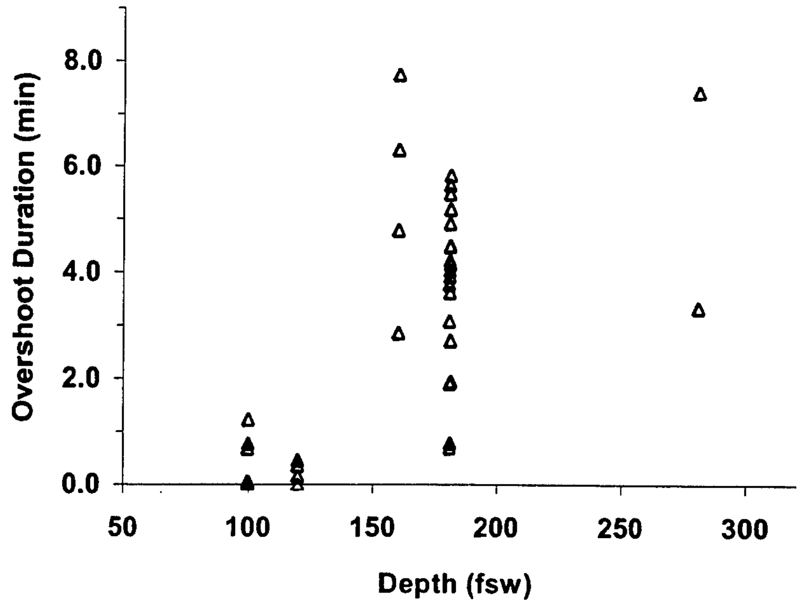

Figure 24. Duration of PO_2 overshoot periods in Phase II dives completed using MK 16 MOD 1 UBAs fitted with upgrade R10-DN O_2 sensors. PO_2 overshoot duration is zero for dives in which no overshoot occurred (PO_2 did not exceed 1.45 atm during and immediately after descent).

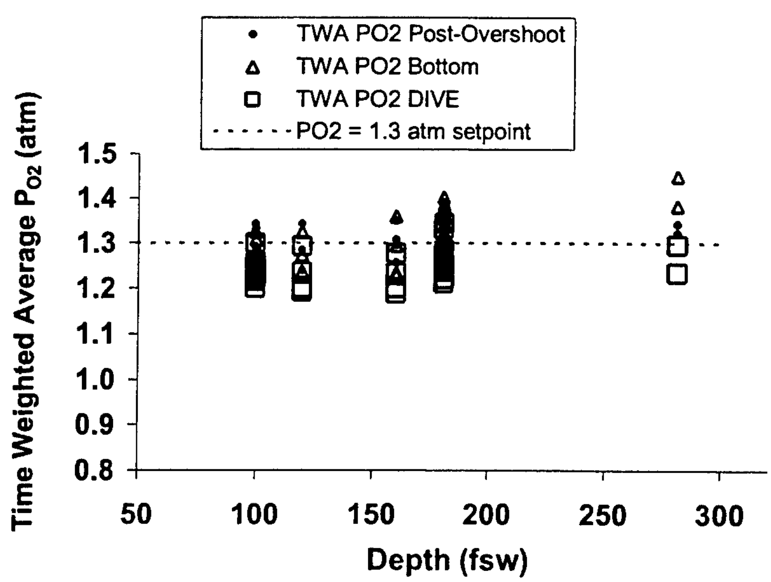

Figure 25. Summary of MK 16 MOD 1 PO_2 control characteristics at bottom after the PO_2 overshoot periods, during dive bottom times, and throughout the dives, Phase II dives using MK 16 MOD 1 UBAs fitted with upgrade R10 DN oxygen sensors.

3.5. THEORETICAL EVALUATION OF MK 16 MOD 1 He-O_2 DECOMPRESSION TABLES

The extent to which any decompression table set can be validated by direct man-testing is inevitably limited by time and funding constraints. However, confidence in a decompression table set can be enhanced beyond that obtained through direct man testing by using a probabilistic model to evaluate DCS risks of table-prescribed decompression schedules that are assembled in numbers much larger than can be directly tested. To support such an exercise, the implementation of the EL-RTA used in present work was outfitted with a capability to complete dive profile templates in "Table" mode. In this mode, the EL-RTA computes the same schedule for any given decompression as would be obtained through direct use of the tables. Sets of 6,250 hypothetical MK 16 MOD 1 He-O_2 dive templates were then constructed using the elaborated random assembly procedure described in Section 3.2. Different sets were constrained to cover possible dive profiles within different depth/bottom time/surface interval regions of the tables. After completing the templates in each set using the EL-RTA in table mode, the conditional DCS probability for each dive in each profile, and the cumulative DCS probability for each profile, was computed using LEM.

Distributions of conditional and cumulative DCS probabilities resulting from this process for the set encompassing the entire repetitive dive region of the tables are shown in Figure 26. For each profile with one or more repetitive dives, only the maximum conditional DCS probability was used. In accord with our design objectives, table-prescribed dives tend to incur estimated conditional DCS probabilities less than 3.0%, regardless of whether they are single or repetitive dives. The distribution of estimated cumulative DCS probabilities exhibits at least two modes: a maximum in the 2.0 – 3.0% range, obviously reflecting the contribution of single dive profiles, and another maximum in the 4.0 – 5.0% range. This second mode consists largely of cumulative risks associated with three-dive profiles, while cumulative risks of two-dive profiles tend to overlap with those of the single dive profiles. These cumulative DCS risks are conservative with respect to the estimated cumulative DCS risks of other currently accepted U.S. Navy repetitive air and He-O_2 diving procedures.

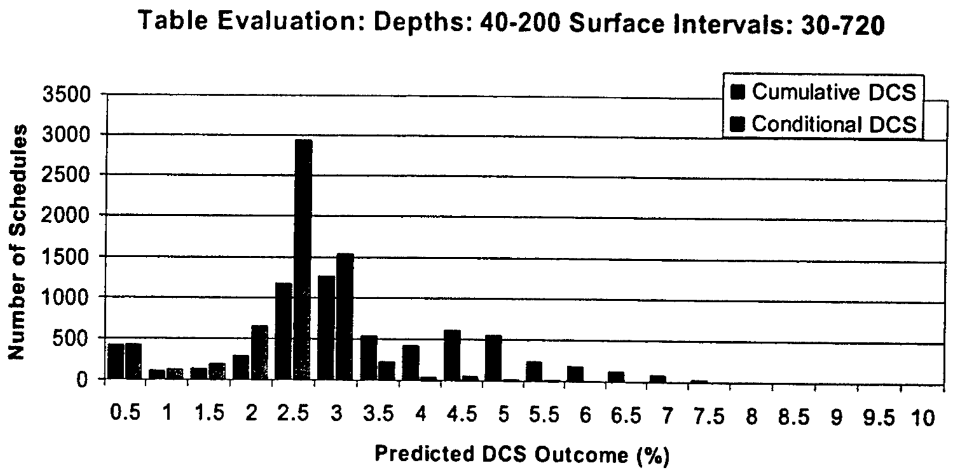

Figure 26. Frequency distribution of the estimated DCS risks of 6,250 MK 16 MOD 1 He-O_2 dive profiles randomly constructed from the new MK 16 MOD 1 He-O_2 decompression tables. The distribution of conditional DCS probabilities includes only the maximum conditional DCS probability from the dives in each repetitive dive profile.

Appendix M gives results of similar analyses focused on particular depth/bottom-time/surface interval regions of the tables. Results for each of the regions examined closely resemble those in Figure 26 for the entire repetitive dive region of the tables. Results overall thus indicate that DCS risks should remain within the presently used design limits for any dives conducted using the tables and their accompanying guidance.[17]

4. DISCUSSION

The present report provides details of the development and validation of the MK 16 MOD 1 He-O_2 Decompression Tables published in NEDU Technical Report 14-01.[17] Overall outcomes of the man-dives completed in the table development and validation process are summarized in Table 12.

Table 12. Summary of Completed Man-Dives

Profile	# Exposures	Completed # Dives	# DCS
Phase Ia			
40 Various 2- & 3-dive repetitive profiles; 30 min SIs	148	361	2
Phase Ib			
3 x (120/25)	23	69	0
2 x (160/25)	14	28	0
80/110 no-D	7	7	0
80/130 no-D	24	24	0
5 x (80/25) no-D	12	60	0
Phase Ib Totals	80	188	0
Phase I Totals	228*	549	2
Phase II			
21 Single Dive	185	185	2
13 Two-Dive	90	180	1
3 Three-Dive	24	72	3
Phase II Totals	299	437	6
GRAND TOTALS	527	986	8

* Differs from the Phase I total of 227 exposures reported in NEDU TR 14-01,[17] where a successfully completed exposure on profile I-A was inadvertently omitted.

Figures 27 and 28 illustrate that the new MK 16 MOD 1 He-O_2 tables realize the potential for decreased decompression obligations afforded by adoption of a higher diver inspired PO_2, while controlling estimated DCS risk to within more conservative limits than those for the earlier MK 16 MOD 0 He-O_2 tables.

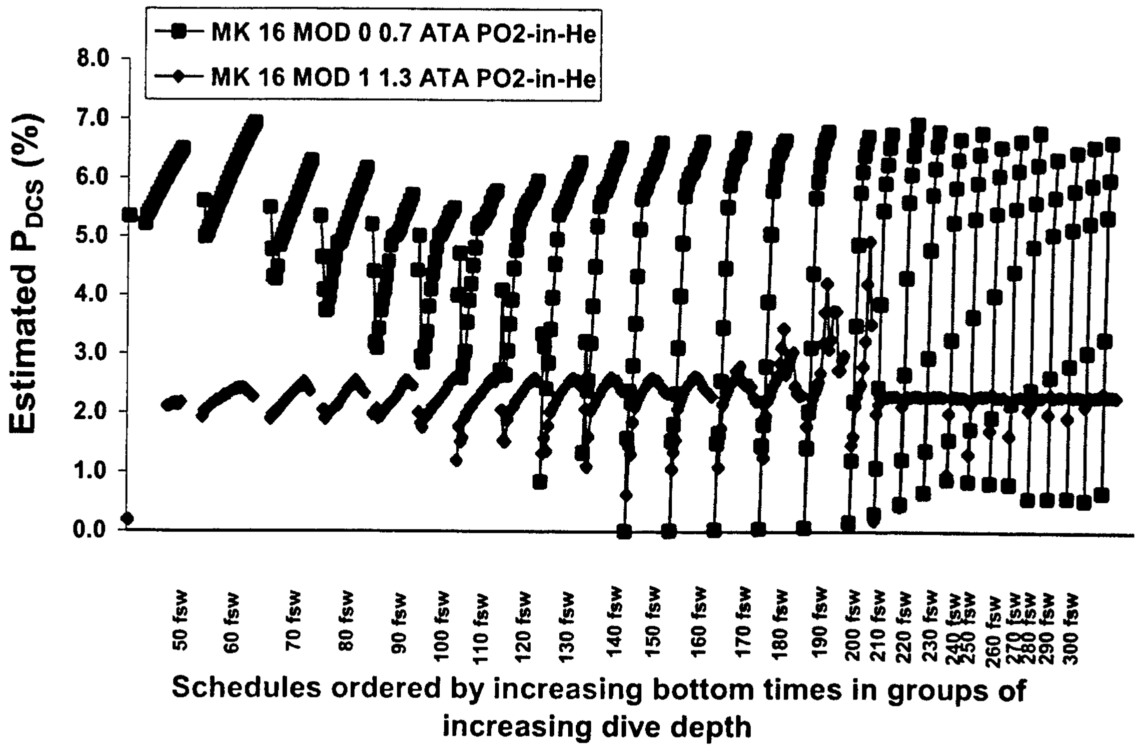

Figure 27. Comparison of estimated DCS risks of single dive schedules in the MK 16 MOD 0 Constant 0.7 ATA PO_2-in-He tables with those for single dive schedules in the new MK 16 MOD 1 1.3 ATA PO_2-in-He tables.

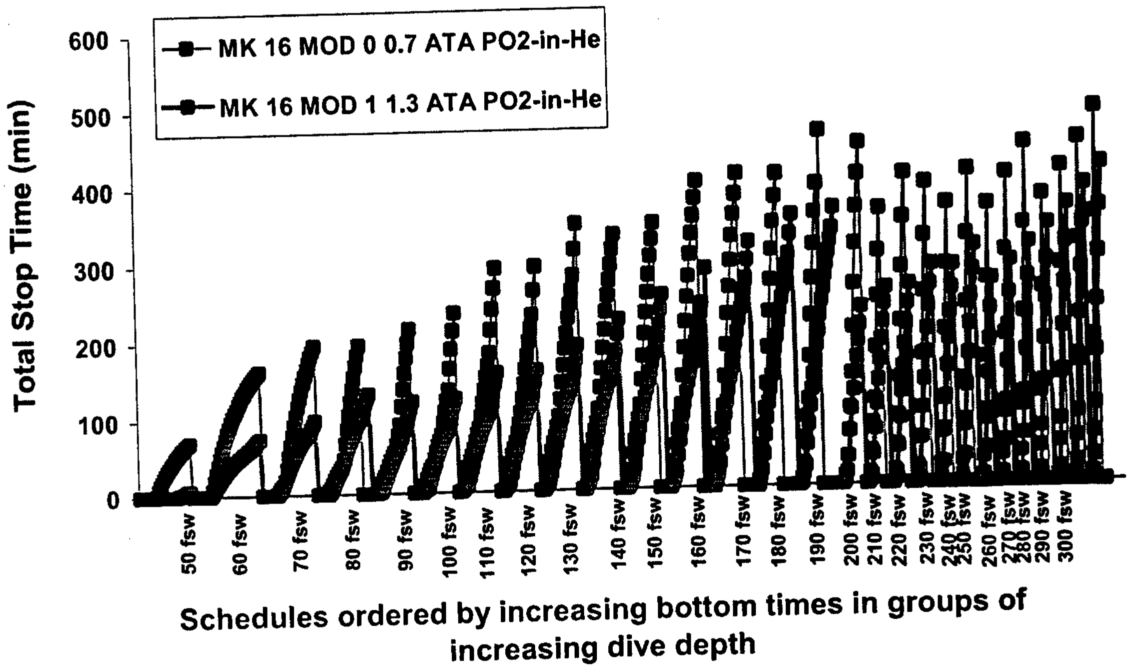

Figure 28. Comparison of total decompression stop times of single dive schedules in the MK 16 MOD 0 Constant 0.7 ATA PO_2-in-He tables with those of single dive schedules in the new MK 16 MOD 1 1.3 ATA PO_2-in-He tables.

The technique developed in present work to map a probabilistic algorithm onto a more operationally tractable deterministic algorithm provides a solution to long standing problems with probabilistic models; namely, that their use is very computation intensive, precluding their real-time operation in currently available diver-worn decompression computers, and that they are not readily used to produce decompression tables in the familiar U.S. Navy Dive Manual format. The method differs fundamentally from that used in earlier attempts to parameterize deterministic algorithms directly from DCS incidence data using maximum likelihood methods,[18] and is hence able to meet the requirement of practically-useful deterministic algorithms for more adjustable parameters than are statistically warranted by the data in hand. The product of the method, the EL-RTA map of LEM, uses the same logic and arithmetic that supports operation of the new U.S. Navy decompression computer,[19] the latter being distinguished from the present EL-RTA only its use of the VVAL18 MPTT table instead of the current XVAL_He_4 MPTT table.

Requirements for optimum application of this technique remain to be established. For example, the number of different profiles required in the standard data sets and the corresponding required ranges of profile properties are not known.

Subsaturation He-O_2 dives entail tri-mix decompressions, because nitrogen remaining in tissues from air breathing before the dives must be considered. Thus, the LEM model explicitly considers washout of such N_2 during the dives, along with N_2 uptake during surface intervals before repetitive dives. As described in Appendix A, LEM also includes provisions for a portion of compartmental O_2 contents to contribute to DCS risk, depending on parameterization. In contrast, the EL-RTA map of LEM is only a single-gas model in which consideration of the separate exchanges of He, N_2 and O_2 is precluded. Instead the net compartmental He, N_2, and O_2 contents in LEM are combined under the guise of a single nameless inert gas in the EL-RTA map of LEM. Thalmann considered the consequences of such a simplification in some detail,[3] and decided not to support a repetitive dive capability in the 0.7 ATA PO_2-in-He decompression tables developed for the MK 16 MOD 0. However, successful maintenance of target conditional DCS risks through repetitive dive schedules prescribed by the present EL-RTA map (Section 3.5) indicates that any essential nuances of the separate kinetics of the two inert gases and O_2 in LEM were captured in the extracted β for the EL-RTA.

The present series of MK 16 MOD 1 man dives is the most extensive to date in which diver inspired PO_2 with this UBA was monitored. Results confirmed the occurrence of PO_2 overshoots during descent and PO_2 undershoots during ascent, as well as the occurrence of control oscillations in PO_2 during prolonged isobaric periods at depth. The observed characteristics of MK 16 MOD 1 PO_2 control can be considered in view of the PO_2 control goals set forth for the MK 16 MOD 1:[20]

(a) $PO_2 \leq 1.9$ ATA during descent at rates not to exceed 60 fsw/min;
(b) Time-weighted average PO_2 after stabilization at depth = 1.30 ± 0.05 ATA, with control oscillations to remain within 1.15 – 1.45 ATA range;
(c) $PO_2 \geq 0.2$ ATA during ascents at rates not to exceed 30 fsw/min.

For this purpose, further condensation of results summarized in Figures 8-11, 13-16, and 22-25 is given in Table 13. Although the statistics for the Phase I and II dives completed with UBAs fitted with R10-DV O_2 sensors are somewhat high due to inclusion of erroneously high values flagged in Figures 8, 13, and 16, the conclusion is unavoidable that criteria (a) and (b) above were frequently violated in the present man-dives. Deviations from the PO_2 control goals were considerably less with use of upgrade R10-DN sensors in the UBAs, although the number of dives performed with these sensors was limited.

Table 13. Mean Time-Weighted Average PO_2 During Different Parts of Phases I and II Man Dives.

	Peak Overshoot PO_2 (ATA)	Time-Weighted Average PO_2, (ATA)			
		Overshoot*	Post Overshoot, Bottom*	Bottom Time* (LS→LB)	Dive Time* (LS→RS)
Phase I					
Mean:	1.889	1.612	1.413	1.398	1.339
Standard Deviation:	0.408	0.142	0.088	0.142	0.125
Phase II					
UBAs w/R10-DV Sensors					
Mean:	1.977	1.620	1.409	1.442	1.348
Standard Deviation:	0.469	0.162	0.061	0.125	0.087
UBAs w/R10-DN Sensors					
Mean:	1.663	1.518	1.310	1.307	1.250
Standard Deviation:	0.142	0.091	0.035	0.053	0.036

* Tabulated standard deviations are *not* measures of the amplitudes of PO_2 oscillations during the indicated periods, but are measures of the dispersion of the means about which these oscillations occurred over the different dives.

This experience is not inconsistent with that reported by earlier workers. For example, Long and Fennewald reported that UBA PO_2 was maintained to within 0.05 ATA of 1.30 ATA in MK 16 MOD 1 man-dives using N_2 or He in the diluent gas.[14] In this earlier work, however, PO_2 values from the R10-DV sensors in the UBA itself were used to reach this conclusion. As discussed in Section 3.4.2, such sensors can under-report the actual PO_2 if they have aged sufficiently to exhibit nonlinear response to increasing PO_2. Moreover, as illustrated in Figure 20, such sensors are relatively slow to respond to changes in PO_2. Consequent convolution of the actual PO_2 signal thus smooths PO_2 oscillations, leading to attenuation of the actual oscillatory amplitude and a mistaken tendency to indicate that the amplitude is low. Finally, the PO_2 control sensors in the MK 16 MOD 1 are located in such a fashion that they do not sample actual diver inspired gas. In contrast, present results were obtained using an independent measure of UBA PO_2 from faster-responding sensing equipment that was sampling actual diver inspired gas. Measures of diver inspired PO_2 were digitally smoothed in present work (see Appendix G), but the quadratic convolute method used preserves the relatively large-scale PO_2 oscillations associated with PO_2 control in the MK 16 MOD 1.

Present experience is also consistent with that obtained in use of similar UBAs. Peak PO_2 and time-weighted average PO_2 in the Canadian Underwater Mine Apparatus (CUMA) and the Royal Navy Clearance Divers Breathing Apparatus (CDBA) are illustrated *vs.* dive depth in Appendix N. Peak PO_2 in excess of 2.0 ATA is commonly attained in the CUMA UBA, particularly at depths greater than 150 fsw (Figure N1). PO_2 in the 1.3 to 1.5 ATA range is then sustained throughout the remainder of many CUMA dives (Figure N2). Peak overshoot PO_2 levels and time-weighted average overshoot PO_2 similar to those observed in the present MK 16 MOD 1 dives also occur in the CDBA (Figures N3 and N4).

High diver inspired PO_2 is of principal physiological concern for its impact on the risk of CNS O_2 toxicity. The CUMA has been in service for many years, and has supported thousands of dives without a single report of a CNS O_2 toxicity event. Similarly no diagnosed case of CNS O_2 toxicity has been reported during CDBA diving.

Parenthetically, the observed zero incidence of definite CNS O_2 toxicity events in present MK 16 MOD 1 man-dives does not agree with the 9.18 seizure incidents predicted for these dives by the Harabin model[21] (=sum of predicted $P_{CNS}(\%)$ for all the dives in Appendix L x 100). Thus, the Harabin model grossly overestimates the risk of seizures and therefore does not appear to be a useful model for these types of dives.

Recommendation to adopt the upgrade R10-DN O_2 sensors for routine use in the MK 16 MOD 1 is nearly a foregone conclusion to mitigate risks of CNS O_2 toxicity, but such use will have the consequence of increasing the DCS risks of dives undertaken with the UBA. It is of interest to establish that the attendant increases will not elevate DCS risk beyond the accepted limits for the new tables.

Most dives in the present program were completed using MK 16 MOD 1 UBAS fitted with original-issue R10-DV O_2 sensors. The consequent maintenance of relatively high diver inspired PO_2 throughout the dives reduced the DCS risk of the dives to levels often well below those accepted in planning the dives, where maintenance of diver inspired PO_2 in accord with ideal MK 16 MOD 1 performance was assumed. This can be seen by comparing the estimated DCS risk of any given profile as planned, given in Appendix K, with the estimated DCS risk of the profile as actually performed, given in Appendix L (via Appendix C). Such comparisons are left to the reader for dives completed using UBAs fitted with original-issue R10-DV O_2 sensors. However, Figure 30 shows such comparisons for the Phase II dives completed using UBAs fitted with upgrade R10-DN O_2 sensors. Although the gap between accepted and actual DCS risks is narrowed, estimated DCS risks of the dives as performed remain equal to or lower than the risks originally accepted in planning the dives. Evidence therefore indicates that use of the R10-DN O_2 sensors will not elevate DCS risk beyond acceptable limits.

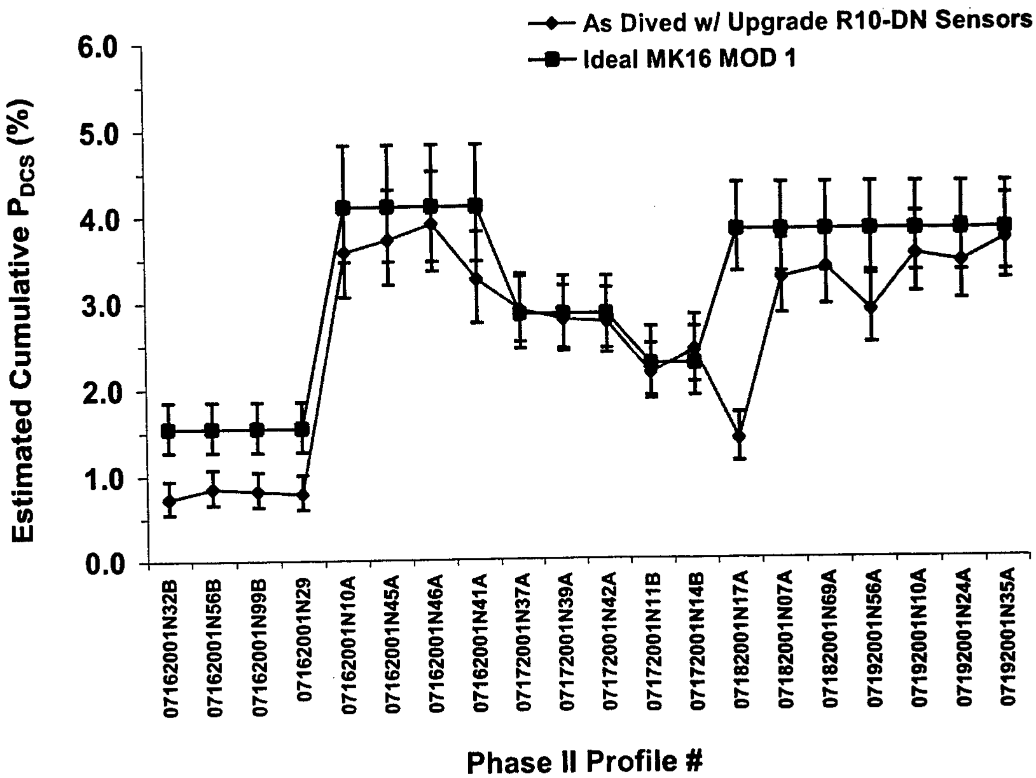

Figure 29. Estimated cumulative DCS risks of Phase II dives completed using MK 16 MOD 1 UBAs fitted with upgrade R10-DN O_2 sensors. Each filled circle is the DCS risk for the dive estimated using the measured pressure-PO_2 profile for the diver. Each filled square is the DCS risk for the dive estimated assuming that the dive was performed exactly as planned and with ideal MK 16 MOD 1 PO_2 delivery. Error bars on each data point give the ±95% confidence range of the estimate, while lines through the data points are for clarity only. Notes: Diver in profile 07182001N17A completed only the first of two dives in the planned profile. Data for another diver (#08), who successfully completed profile 07172001B using a MK 16 MOD 1 fitted with R10-DN O_2 sensors, was lost due to error in data acquisition setup.

As noted in our original report,[17] successful results of this trial are strictly applicable only to the schedules dived with the MK 16 MOD 1. If the MK 16 MOD 1 UBA is engineered to control diver inspired PO_2 to within tighter limits than obtained through use of the upgrade R10-DN O_2 sensors, including further reductions of PO_2 overshoots during and after descent, the suitability of these schedules for use with the new UBA will require re-evaluation.

5. CONCLUSIONS AND RECOMMENDATIONS

a. A complete set of new 1.3 ata PO_2-in-He decompression tables for MK 16 MOD 1 diving has been developed and tested. These tables, which were originally forwarded in an earlier communication and are reproduced in attached Appendix J, support repetitive diving as per USN EOD requirements at an approximate 2.3% risk of DCS.

b. We continue to recommend approval of the attached tables for use with the MK 16 MOD 1 UBA using 88/12 (%He/%O2) as the diluent gas under the operational limits and guidance that accompanied their original communication.

c. Although no clear-cut cases of CNS O_2 toxicity were observed in the present man-dives, it is recommended that the MK 16 MOD 1 UBA be used only with the upgrade R10-DN O_2 sensors, or their equivalent, to mitigate the risks of such toxicity.

d. New analytic technology has been developed to map a probabilistic model into a deterministic algorithm that readily produces decompression tables in USN Diving Manual format. This analytic technology can potentially be used to generate different tables for optimizing the balance between DCS risks and other hazards in different EOD operational scenarios. The algorithm produced by this technology is operable in currently available diver-worn dive computers.

6. Acknowledgements

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APPENDIX A.

DCS Model Descriptions

The different decompression algorithms used in the present work provide a means to compute gas contents of diver tissues throughout a dive profile so that the profile can be configured to keep those contents always within limits associated with acceptable incidences of DCS.

The algorithms are based on the conceptualization shown in Figure A1, when the diver is presumed to be breathing a mixture of oxygen in m inert gases. Parts of the body involved in the etiology of DCS are considered to consist of a series of n parallel-perfused, well-stirred gas exchange compartments, or "tissues," as shown in panel A. A detail of one compartment is shown in panel B. Subscript g for arterial, venous, and tissue gas tensions ranges from 1 to $m+j$, where $j=1$ if oxygen is considered to contribute dynamically to each compartmental sum of dissolved gas tensions in a multiple gas model, or $j=0$ otherwise. p_{fix} denotes the sum of the tensions of water vapor, carbon dioxide, and oxygen that are assumed constant and uniform throughout the modeled compartments [see Eq. (A4) below]. Gas exchange between tissue and blood in each compartment is assumed to be perfusion limited, so that the tension of a gas g in venous blood leaving the tissue equals the tension of that gas in the tissue: $p_{v,i,g} = p_{t,i,g}$.

In a subject breathing air or N_2O_2, arterial blood is assumed to be always equilibrated with alveolar gas having an N_2 partial pressure $P_{A_{N_2}}$ at ambient barometric pressure P_{amb} given by rearrangement of the alveolar gas equation[1] for no CO_2 in the inspired gas ($P_{I_{CO_2}} = 0$):

$$p_{a,N_2} = P_{A_{N_2}} = F_{I_{N_2}} \cdot \{(P_{amb} - P_{H_2O}) - P_{A_{CO_2}}(1 - 1/RQ)\}, \quad \text{(A1)}$$

where p_{a,N_2} is the arterial inert gas tension, $F_{I_{N_2}} = 1 - F_{I_{O_2}}$ is the N_2 fraction in dry inspired gas, RQ is the respiratory quotient, and $P_{A_{CO_2}}$ is the alveolar carbon dioxide partial pressure. The latter, along with water vapor pressure, P_{H_2O}, is assumed to remain constant. Equation (A1) is generalized for each of m inspired inert gases:

$$p_{a,g} = F_{I_g} \cdot \left\{(P_{amb} - P_{H_2O}) - P_{A_{CO_2}}(1 - 1/RQ)\right\}; \; g = 1, \ldots, m \quad \text{(A2)}$$

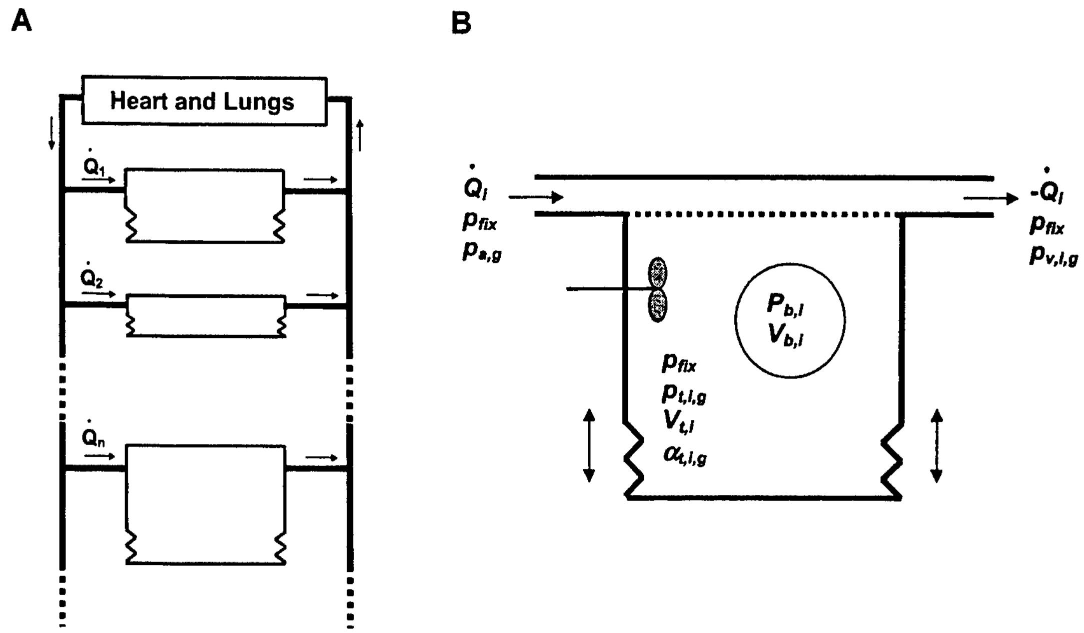

Figure A1. Schematic of the LEM model, in which the subject is assumed to be breathing a mixture of oxygen in m inert gases. A) n parallel-perfused compartment model of whole body. Association of compartments with specific anatomical sites is disclaimed, except to assert that the modeled compartments represent tissues or tissue components that are involved in the occurrence of DCS. B) Detail of compartment in (A). The jagged lines with double-headed arrows indicate that the overall volume of the compartment, $(V_{t,i}+V_{b,i})$, varies with bubble volume, while the compartmental liquid volume, $V_{t,i}$, remains constant.

The dissolved gas tension of gas g in the i^{th} compartment, $p_{t,i,g}$, at any time t in a profile stage is given generally by the expression for mass balance between bubble, tissue, and blood in a perfusion-limited system:

$$\frac{dp_{t,i,g}}{dt} = \frac{k_g \cdot t + (p^o_{a,g} - p_{t,i,g})}{\tau_{i,g}} - \left(\frac{1}{\alpha_{t,i,g} V_t}\right)\left(\frac{d(P_{b,i,g}V_{b,i})}{dt}\right) - Z_{met,i,g} \;;\; g=1, \ldots, m+j, \qquad \text{(A3)}$$

where $RT(P_{b,i,g}V_{b,i})$ is the number of moles of gas g at partial pressure $P_{b,i,g}$ in a bubble of volume $V_{b,i}$; $p^o_{a,g}$ is the arterial tension of the gas at t^o, the beginning of the stage; and $Z_{met,i,g}$ is the rate at which the gas is consumed by metabolic processes in the tissue. With $p_{a,g}$ equal to the arterial tension of the gas at time t, k_g is the rate of change of the arterial gas tension during the stage:

$$k_g = \frac{p_{a,g} - p^o_{a,g}}{t - t^o}. \qquad \text{(A3.a)}$$

The compartmental time constant, $\tau_{i,g}$, is given in terms of the Ostwald solubility of the gas in the compartment, $\alpha_{t,i,g}$; the compartmental volume, $V_{t,i}$; the compartmental blood flow, $\dot{Q}_i$; and the Ostwald solubility of the gas in blood, $\alpha_{blood,g}$:

$$\tau_{i,g} = \frac{\alpha_{t,i,g} V_{t,i}}{\alpha_{blood,g} \dot{Q}_i} . \qquad \text{(A3.b)}$$

The compartmental half-time, $t_{1/2,i,g}$, or the time required to halve an initial tissue-blood gas tension difference with constant $\tau_{i,g}$ and $p_{a,g}$, is then given by

$$t_{1/2,i,g} = \ln(2) \cdot \tau_{i,g} \cong 0.693 \cdot \tau_{i,g} \qquad \text{(A3.c)}$$

Note that $\dot{Q}_i$ in Eq. (A3.b) is the blood flow to the entire compartmental volume per unit time, not the perfusion rate obtained by normalizing this flow to the compartmental volume.

Unless otherwise noted, z_{met,i,O_2} for oxygen is assumed always to have values sufficient to keep the tissue p_{O_2} constant and the same in all compartments. The index j in the above equations is then 0, and the tissue p_{O_2} is added to the other fixed gas tensions, p_{CO_2} and P_{H_2O}, to define a compartment-independent constant:

$$p_{fix} = P_{H_2O} + p_{CO_2} + p_{O_2} . \qquad \text{(A4)}$$

On the other hand, if z_{met,i,O_2} is too small to keep the tissue p_{O_2} constant, oxygen may contribute dynamically to the overall compartmental dissolved gas content. In order to simulate and track these contributions, oxygen in excess of a certain arterial tension $PSET_i$ is considered to behave as an inert gas that follows Henry's law in blood and tissue. Under these conditions j=1, and quantities with subscript g=m+1 in the above equations correspond to compartmental O_2 contents that arise from this excess arterial O_2, where

$$p_{a,O_2} = 0 \qquad \text{if } P_{A_{O_2}} \le PSET_i \ , \qquad \text{(A5)}$$

$$p_{a,O_2} = P_{A_{O_2}} - PSET_i \qquad \text{if } P_{A_{O_2}} > PSET_i \ , \qquad \text{(A6)}$$

and [see Eq. (A2)]

$$P_{A_{O_2}} = P_{amb} - P_{H_2O} - P_{A_{CO_2}} - \sum_{g=1}^{m} p_{a,g} . \qquad \text{(A7)}$$

Note that specification of a sufficiently high value of $PSET_i$ forces a constant compartmental p_{O_2}, which is equivalent to setting j=0 for the compartment.

For each of the $m+j$ "inert" gases that by definition are not reactants or products of tissue metabolism, the $Z_{met,i,g}$ term vanishes and Eq. (A3) simplifies to

$$\frac{dp_{t,i,g}}{dt} = \frac{k_g \cdot t + (p_{a,g}^o - p_{t,i,g})}{\tau_{i,g}} - \left(\frac{1}{\alpha_{t,i,g} V_t}\right)\left(\frac{d(P_{b,i,g} V_{b,i})}{dt}\right);\ g=1, \ldots, m+j. \qquad \text{(A8)}$$

In the absence of a bubble, the rightmost term in Eq. (A8) vanishes so that each gas exchanges between tissue and blood independently. The analytic solution of the resultant expression is used to determine the tension of gas g in tissue at any time t:

$$p_{t,i,g} = p_{a,g}^o + \left(p_{t,i,g}^o - p_{a,g}^o\right) \cdot \exp\left(\frac{-t}{\tau_{i,g}}\right) + k_g t + k_g \tau_{i,g}\left\{\exp\left(\frac{-t}{\tau_{i,g}}\right) - 1\right\}, \qquad \text{(A9)}$$

where $p_{t,i,g}^o$ is the compartmental inert gas tension at t=0.

Impact of Bubble Evolution

Once a bubble has nucleated in a compartment at time t_{bf} in a profile stage, its subsequent evolution affects blood-tissue gas exchange kinetics and renders Eq. (A9) inapplicable. Blood-tissue gas exchange kinetics are then considered in terms of the compartmental inert gas burden $P_{t,i}^{'}$, defined as the sum of the dissolved inert gas tension and the inert gas tension that would be exerted by the undissolved inert gas in bubbles if that gas had remained in solution. The differential equation for $P_{t,i}^{'}$ is obtained by rearranging Eq. (A8) for each gas and collecting terms:

$$\frac{dP_{t,i}^{'}}{dt} = \sum_{g=1}^{m+j}\left\{\frac{dp_{t,i,g}}{dt} + \left(\frac{1}{\alpha_{t,i,g} V_{t,i}}\right)\left(\frac{d(P_{b,i,g} V_{b,i})}{dt}\right)\right\} = \sum_{g=1}^{m+j}\left\{\frac{\left[k_g t - \left(p_{t,i,g} - p_{a,g}^o\right)\right]}{\tau_{i,g}}\right\}. \qquad \text{(A10)}$$

Note that in the absence of bubbles, $P_{t,i}^{'} = \sum_{g=1}^{m+j} p_{t,i,g}$, where the $p_{t,i,g}$ are given by Eq. (A8).

The bubble is assumed to be always in equilibrium with its surroundings, so that $p_{t,i,g} = P_{b,i,g}$ for g=1, …, $m+j$ and $p_{fix} = P_{fix}$, where p_{fix} is given by Eq. (A4) and P_{fix} is the sum of the fixed gas partial pressures in the bubble. The sum of the inert gas partial pressures in the bubble is then given by the Laplace equation, which with neglect of mechanical effects from tissue deformation is

$$\sum_{g=1}^{m+j} P_{b,i,g} = P_{amb} - P_{fix} + \frac{2\sigma}{r_i} \ , \qquad \text{(A11)}$$

where σ is the gas-liquid surface tension and r_i is radius of the bubble. This equation indicates that the total gas pressure in the bubble exceeds the ambient pressure by an amount equal to the surface pressure, $2\sigma/r_i$. Neglecting the dependence of the surface pressure on r_i, the contribution of the surface pressure to the bubble pressure is simplified by setting the surface pressure equal to a constant of value PXO_i, so that Eq. (A11) is written

$$\sum_{g=1}^{m+j} P_{b,i,g} = P_{amb} - P_{fix} + PXO_i \, . \qquad \text{(A12)}$$

It follows from the assumed equilibrium between bubble and tissue that the sum of the tissue tensions equals the sum of the bubble partial pressures, so that we have from Eq. (A12) that

$$\sum_{g=1}^{m+j} p_{t,i,g} = \sum_{g=1}^{m+j} P_{b,i,g} = P_{amb} - P_{fix} + PXO_i \, , \qquad \text{(A13)}$$

which couples the sum of the tissue tensions to the ambient hydrostatic pressure.

Single inert gas dynamics: The Exponential-Linear Real-Time Algorithm (EL-RTA)

When a subject breathes a mix that contains only a single inert gas, m=1 and j=0, and Eq. (A13) reduces to

$$p_{t,i} = P_{b,i} = P_{amb} - P_{fix} + PXO_i \, , \qquad \text{(A14)}$$

where we suppress expression of the subscript g because it is always 1. The dissolved inert gas tension in tissue is given directly in terms of the ambient hydrostatic pressure, and the simple expressions for the exponential-linear (EL) model are obtained. Thus, if ambient pressure changes are also always considered time-linear, Equation (A14) becomes

$$p_{t,i} = P_{b,i} = k_p(t - t_{bf}) + P_{bf} - P_{fix} + PXO_i \, , \qquad \text{(A15)}$$

where k_p is the rate of change of the hydrostatic pressure during the stage and P_{bf} is the hydrostatic pressure at t=t_{bf}. If the stage was entered with a bubble already present, t_{bf}=0 and $P_{bf} = P^{o}_{amb}$. Substitution into Equation (A10) then yields

$$\frac{dP'_{t,i}}{dt} = TC_i \cdot \left[p_a^o + (k - k_p)(t - t_{bf}) - P_{bf} + P_{fix} - PXO_i\right], \quad \text{(A16)}$$

where $TC_i = 1/\tau_i$, p_a^o is evaluated at $t=t_{bf}$, and k is given for the single inert gas by Eq. (A3.a). Integration of this expression from t_{bf} to t yields the EL model expression for the compartmental inert gas burden at any time t in a profile stage when a bubble is present:

$$P'_{t,i} = P'^{o}_{t,i} + TC_i \cdot \left\{(p_a^o - p_{bf} + P_{fix} - PXO_i) \cdot (t - t_{bf}) + [(k - k_p)/2] \cdot (t - t_{bf})^2\right\}, \quad \text{(A17)}$$

where $P'^{o}_{t,i}$ is the inert gas burden at $t=t_{bf}$. Eq. (A17) is readily cast in the form given by Parker, *et al.*[2] by recalling that $p_a^o = P_{amb}^o - p_{a_{O_2}}^o - p_{a_{CO_2}}^o - P_{H_2O}$ and that arterial blood is assumed to be in equilibrium with alveolar gas:

$$P'_{t,i} = P'^{o}_{t,i} + TC_i \cdot \left\{(p_{t_{O_2}} + p_{t_{CO_2}} - P_{A_{O_2}}^o - P_{A_{CO_2}}^o - PXO_i) \cdot (t - t_{bf}) - [k_{O_2}/2] \cdot (t - t_{bf})^2\right\}, \quad \text{(A17.a)}$$

where $k_{O_2} = k_p - k$ is the rate of change of the alveolar oxygen pressure in the stage.

Under the assumed equilibrium of the bubble with its surroundings, Eq. (A8) is solved to obtain the following expression for the rate of change of bubble volume at constant ambient pressure and p_a:[3]

$$\frac{dV_{b,i}}{dt} = \alpha_{blood}\dot{Q}_i\left(\frac{p_a}{p_{t,i}} - 1\right). \quad \text{(A18)}$$

Eq. (A15) is readily shown to imply that the bubble volume must decrease monotonically during any isobaric stage in which p_a is constant after decompression. Eq. (A15) is also readily integrated to obtain an analytical solution for $V_{b,i}$, which contrasts with the required resort to numerical methods in the Linear-Exponential Multiple Gas, or LEM model below.

Multiple inert gas dynamics: The Linear-Exponential Multiple Gas Model (LEM)

When a gas mix with more than one inert gas is breathed, Eq. (A10) must be solved numerically. The individual $p_{t,i,g}$ are obtained by rearranging the expression for the total number of moles of each gas in the tissue;

$$n_{i,g} = \alpha_{t,i,g}\, p_{t,i,g} + \frac{p_{t,i,g} V_{b,i}}{RT}; \quad \text{(A19)}$$

to yield:

$$p_{t,i,g} = \frac{n_{i,g}}{\alpha_{t,i,g} + V_{b,i}/RT}\,. \qquad \text{(A20)}$$

The first term on the right of Eq. (A19) is the amount of gas g in solution, and the second term is the amount of undissolved gas g in one or more bubbles. If we let $X_i = V_{b,i}/RT$ and note that the contribution of gas g to the overall inert gas burden is simply $P'_{t,i,g} = \frac{n_{i,g}}{\alpha_{t,i,g}}$, Eq. (A20) becomes

$$p_{t,i,g} = \frac{P'_{t,i,g}}{1 + X_i/\alpha_{t,i,g}}\,. \qquad \text{(A21)}$$

At any time, all compartmental quantities except X_i are known for determination of the individual $p_{t,i,g}$. The unknown X_i is obtained by substituting Eq. (A20) into Eq. (A13). Rearrangement then yields a homogeneous polynomial of the order $m+j$ with positive real root equal to X_i. This root is determined by standard methods and updated for each time step in the numerical solution of Eq. (A10) as $n_{i,g}$ and $p_{t,i,g}$ change with time.

For example, when $m+j$=2, Eq. (A13) becomes

$$\sum_{g}^{m+j} p_{t,i,g} = \frac{n_{i,1}}{\alpha_{t,i,1} + V_{b,i}/RT} + \frac{n_{i,2}}{\alpha_{t,i,2} + V_{b,i}/RT} = P_{amb} - P_{fix} + PXO_i\,, \qquad \text{(A22)}$$

which rearranges to

$$0 = A_i X_i^2 + B_i X_i + C_i \qquad \text{(A23)}$$

where

$$A_i = P_{amb} - P_{fix} + PXO_i\,, \qquad \text{(A23.a)}$$

$$B_i = \{A_i(\alpha_{t,i,2} + \alpha_{t,i,1}) - (n_{i,1} + n_{i,2})\}, \qquad \text{(A23.b)}$$

$$C_i = \{A_i \alpha_{t,i,1}\alpha_{t,i,2} - (n_{i,1}\alpha_{t,i,2} + n_{i,2}\alpha_{t,i,1})\}. \qquad \text{(A23.c)}$$

The quadratic Equation (A23) has positive real root given by

$$X_i = \frac{-B_i + \sqrt{B_i^2 - 4A_iC_i}}{2A_i}\,. \qquad \text{(A24)}$$

Similarly, when $m+j=3$, Eq. (A13) becomes

$$0 = A_i X_i^3 + B_i X_i^2 + C_i X_i + D_i \tag{A25}$$

where A_i is as defined in Eq. (A23.a) and

$$B_i = \{A_i(\alpha_{t,i,1} + \alpha_{t,i,2} + \alpha_{t,i,3}) - (n_{i,1} + n_{i,2} + n_{i,3})\} \tag{A25.a}$$

$$\begin{aligned} C_i = {} & A_i(\alpha_{t,i,1}\alpha_{t,i,2} + \alpha_{t,i,1}\alpha_{t,i,3} + \alpha_{t,i,2}\alpha_{t,i,3}) - \\ & [n_{i,1}(\alpha_{t,i,2} + \alpha_{t,i,3}) + n_{i,2}(\alpha_{t,i,1} + \alpha_{t,i,3}) + n_{i,3}(\alpha_{t,i,1} + \alpha_{t,i,2})] \end{aligned} \tag{A25.b}$$

$$D_i = A_i\alpha_{t,i,1}\alpha_{t,i,2}\alpha_{t,i,3} - (n_{i,1}\alpha_{t,i,2}\alpha_{t,i,3} + n_{i,2}\alpha_{t,i,1}\alpha_{t,i,3} + n_{i,3}\alpha_{t,i,1}\alpha_{t,i,2}). \tag{A25.c}$$

The root X_i of Eq. (A25) is determined from Cardan's formula for cubic polynomials.[4]

Deterministic Models

Use of computed compartmental gas contents to schedule decompressions in deterministic or classical overpressure models is discussed in Section 2.2.1. Present work was commenced using software described by Thalmann, which implements the Haldanian method of computing decompression using the single-gas LE model of whole-body gas uptake and elimination.[5,6,7] This software was enhanced to support the added requirements of present work.

Probabilistic Models and DCS risk

Probabilistic models require an additional function to relate the inert gas burden to the probability of DCS occurrence. For these purposes, DCS, irrespective of its particular manifestation or severity, is assumed only to occur or not occur in any dive profile. The probability, $P_{DCS}(t)$, that an individual will suffer DCS by any time t in a profile started at $t=0$ is then given in terms of the DCS risk function, $h(t)$:

$$P_{DCS}(t) = 1.0 - S(t) = 1.0 - \exp\left\{-\int_0^t h(t)dt\right\}, \tag{A26}$$

where the survivor function, $S(t)$, is the probability that the individual will remain free of DCS up to time t.[8,9] The latter is defined as the joint probability of remaining DCS-free in each of the n compartments of the model schematized in Figure A1. Statistical independence of the compartmental outcomes is then assumed to define the risk function in terms of the time courses of the ambient pressure and inspired gas composition and their influences on compartmental dissolved gas contents and bubble volumes.

The instantaneous risk, $h(t)$, is defined as the weighted sum of the prevailing compartmental gas supersaturations, $SS_i(t)$, in excess of compartmental threshold values, Thr_i, relative to the ambient hydrostatic pressure, P_{amb}:[2]

$$h(t)=\sum_{i=1}^{n} G_i\left(SS_i(t)-Thr_i\right)/P_{amb} \ ; \quad SS_i(t)-Thr_i>0\ ,$$

$$h(t)=0\ ; \quad SS_i(t)-Thr_i\le 0\ , \tag{A27}$$

where G_i is a constant compartmental gain, and $SS_i(t)$ is given in terms of the prevailing compartmental inert gas burden:

$$SS_i(t)=P'_{t,i}-\left(P_{amb}-P_{fix}\right)\ . \tag{A27.a}$$

Implementation

In order to compute $h(t)$ throughout an arbitrarily complex profile of pressure and respired gas, the profile is encoded as a sequence of nodes each characterized by a pressure or depth, an inspired O_2 fraction, and a time elapsed since the preceding node. An unbroken description of the exposure profile is then obtained by linear interpolation in the time domain between pressures and respired O_2 fractions at successive nodes. Each node consequently describes the conditions prevailing at the end of a profile stage that is either a travel (compression or decompression) stage, an isobaric stage, a breathing gas switch stage, or a combination travel and breathing gas switch stage. The model is exercised on the profile by sequentially processing these stages, preserving the model state at the end of each stage as the initial state for the next.

Compartmental contributions to the cumulative DCS risk in Eq. (A26) were determined numerically by trapezoidal integration. DCS risk accumulation does not require the presence of a bubble, but occurs in any compartment whenever the hydrostatic pressure is less than a risk accumulation threshold pressure given by $\left(P'_{t,i}+P_{fix}-Thr_i\right)$. However, bubble formation and resolution still must be tracked in order to properly transition between the exponential kinetics of Eq. (A9) and the more complex kinetics that prevail after bubble formation (linear/quadratic kinetics, Eq. (A17), if $m+j=1$; nonlinear kinetics if $m+j>1$). Model equations for a compartment are consequently solved over small time steps as long as risk continues to accumulate or a bubble is present in the compartment. During most other periods, compartmental dissolved inert gas tensions are tracked analytically from node to node using Eq. (A9).

If a bubble is not present or DCS risk is not already accumulating in a compartment on advance to a new stage, the compartmental dissolved gas tensions at the stage start node and at the stage end node as evaluated with Eq. (A9) are examined to determine whether a bubble will nucleate or DCS risk will begin to accumulate in the stage. Risk accumulation, bubble nucleation, or both will occur if the hydrostatic pressure is less than the risk accumulation threshold pressure or the EL bubble formation pressure, $\left(\sum_{g=1}^{m+j} p_{t,i,g} + P_{fix} - PXO_i\right)$, at either of the nodes.

At the start of a stage in which bubble nucleation or DCS risk accumulation occurs, processing is undertaken over dt_{min} time steps, switching from use of Eq. (A9) to Eq. (A17) or numerical solution of Eq. (A10), as appropriate. The integral compartmental contribution to the cumulative DCS risk is updated for each time step that starts or ends with a hydrostatic pressure less than the concurrent risk accumulation threshold pressure.

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APPENDIX B

Oxygen Content and Partial Pressure in a Closed-Circuit Rebreather During and After Constant Volume, Constant Temperature Compressions

Nukols[1] described the theoretical basis for PO_2 overshoots that occur during descent in closed circuit rebreathers by examining the consequences of mass conservation in the diver-UBA system. The theoretical development, however, was based on conservation of mass *per se*, which required gas mix dependent ideal gas constants that complicated the final equations. In this appendix, we follow the development used by Nukols, but obtain simpler expressions by considering the problem in terms of conservation of moles rather than conservation of mass.

We assume that the gas in the circuit is ideal: *i.e.*,

$$N_C = P_C V_C / RT_C, \qquad \text{(B.1)}$$

where N_C is the total number of moles of gas in the circuit, P_C is the circuit gas pressure assumed always equal to the ambient hydrostatic pressure, V_C is the circuit volume consisting of rig volume *per se* and diver pulmonary vital capacity, R is the gas constant, and T_C is the circuit gas temperature. We also assume that the circuit remains well mixed at a constant known volume and temperature. (Water vapor is neglected in the following equations, but the water vapor content of the circuit will not change if the circuit is saturated with water vapor at the start of any constant volume, constant temperature transition.)

Mass balance requires that the overall gas contents of the circuit change according to

$$\frac{dN_C}{dt} = \frac{dN_D}{dt} - \frac{dN_{met}}{dt} - \frac{dN_{ex}}{dt}, \qquad \text{(B.2)}$$

where N_D is the number of moles of diluent gas added, N_{met} is the net number of moles of gas removed (or added) by diver metabolism, and N_{ex} is the number of moles of gas vented from the rig via exhaust. We confine ourselves to conditions in which no venting occurs: i.e., changes in rig pressure, P_C, are non-negative, so the last term in Eq. (B.2) vanishes. The remaining terms in Eq. (B.2) are then rearranged to give the rate of diluent gas addition:

$$\frac{dN_D}{dt} = \frac{dN_C}{dt} + \frac{dN_{met}}{dt}. \qquad \text{(B.3)}$$

When Eq. (B.1) is used, the first term on the right of Eq. (B.3) becomes

$$\frac{dN_C}{dt} = \frac{d}{dt}\left(\frac{P_C V_C}{RT_C}\right)$$
$$= \frac{1}{RT_C}\left[V_C\left(\frac{dP_C}{dt}\right) + P_C\left(\frac{dV_C}{dt}\right)\right] \tag{B.4}$$

in which the last term vanishes under the constant volume assumption, $\left(\frac{dV_C}{dt}\right) = 0$. If all CO_2 is scrubbed from the rig, the second term on the right of Eq. (B.3) is

$$\frac{dN_{met}}{dt} = \frac{P^o V^o_{O_2}}{RT^o}, \tag{B.5}$$

where $V^o_{O_2}$ is the diver standard O_2 consumption rate (e.g., 1 STPD/min, if the equations are to be solved in units of liters for volume and minutes for time), P^o is standard pressure, and T^o is standard temperature. Eqs. (B.4) and (B.5) are substituted into Eq. (B.3) to yield the following expression for the rate of diluent gas addition as the rig changes pressure at rate $\left(\frac{dP_C}{dt}\right)$:

$$\frac{dN_D}{dt} = \frac{V_C}{RT_C}\left(\frac{dP_C}{dt}\right) + \frac{P^o V^o_{O_2}}{RT^o}. \tag{B.6}$$

It follows from Eq. (B.1) that, after subscripts are changed to refer to the diluent gas, the volume of added diluent gas at standard temperature and pressure is

$$\frac{dV^o_D}{dt} = \frac{RT^o}{P^o}\left(\frac{dN_D}{dt}\right), \tag{B.7}$$

which, after substitution of Eq. (B.6), becomes

$$\frac{dV^o_D}{dt} = \frac{V_C T^o}{T_C P^o}\left(\frac{dP_C}{dt}\right) + V^o_{O_2}. \tag{B.8}$$

The time to complete a known constant volume circuit compression from P_1 to P_2 at a constant compression rate, $\left(\frac{dP_C}{dt}\right)$, is

$$\Delta t = \frac{(P_2 - P_1)}{\left(\frac{dP_C}{dt}\right)}. \tag{B.9}$$

Eq. (B.8) is readily integrated to yield the volume of diluent (STPD) added during the compression:

$$\Delta V_D^o = \Delta t \cdot \left\{ \frac{V_C T^o}{T_C P^o} \left(\frac{dP_C}{dt} \right) + V_{O_2}^o \right\}. \tag{B.10}$$

For a two-component gas mix containing O_2 and an inert gas, we have from Dalton's law of partial pressures that

$$\begin{aligned} N_C &= n_I + n_{O_2} \\ &= \frac{p_I V_C}{RT_C} + \frac{p_{O_2} V_C}{RT_C} \end{aligned} \tag{B.11}$$

where p_I and p_{O_2} are the respective circuit inert gas and O_2 partial pressures.

The rate of change in the circuit O_2 contents must equal the rate of the O_2 addition via diluent gas minus the rate of O_2 consumption by the diver:

$$\frac{dn_{O_2}}{dt} = X_{O_2} \left(\frac{dN_D}{dt} \right) - \frac{P^o V_{O_2}^o}{RT^o}, \tag{B.12}$$

where X_{O_2} is the known O_2 fraction of the diluent gas. Substitution of Eq. (B.6) yields, after simplification,

$$\frac{dn_{O_2}}{dt} = \left(\frac{X_{O_2} V_C}{RT_C} \right) \left(\frac{dP_C}{dt} \right) + \left(X_{O_2} - 1 \right) \frac{P^o V_{O_2}^o}{RT^o}. \tag{B.13}$$

The corresponding rate of change for circuit P_{O_2} is then obtained with the terms for the O_2 fraction in Eq. (B.11):

$$\begin{aligned} \frac{dP_{O_2}}{dt} &= \frac{RT_C}{V_C} \left(\frac{dn_{O_2}}{dt} \right) \\ &= X_{O_2} \left(\frac{dP_C}{dt} \right) + \left(X_{O_2} - 1 \right) \frac{T_C P^o V_{O_2}^o}{T^o V_C} \end{aligned} \tag{B.14}$$

Note that solving Eq. (B.14) for (dP_C/dt) with $(dP_{O_2}/dt) = 0$ gives the maximum compression rate at which diver O_2 consumption prevents circuit P_{O_2} increases:

$$\left(\frac{dP_C}{dt}\right)=\frac{\left(1-X_{O_2}\right)\cdot T_C P^o V^o_{O_2}}{X_{O_2} T^o V_C}. \tag{B.15}$$

For given X_{O_2}, T_C, V_C, and $V^o_{O_2}$, compression rates greater than that given by Eq. (B.15) will be accompanied by circuit P_{O_2} increases, while compression rates less than that given by Eq. (B15) will be accompanied by circuit P_{O_2} decreases.

For a constant volume circuit compression from P_1 to P_2 at constant compression rate, $\left(\frac{dP_C}{dt}\right)$, the peak circuit O_2 content, $n^f_{O_2}$, is obtained by integration of Eq. (B.13),

$$n^f_{O_2}=n^i_{O_2}+\Delta t\cdot\left\{\left(\frac{X_{O_2}V_C}{RT_C}\right)\left(\frac{dP_C}{dt}\right)+\left(X_{O_2}-1\right)\frac{P^o V^o_{O_2}}{RT^o}\right\}, \tag{B.16}$$

where $n^i_{O_2}$ is the initial circuit O_2 contents and Δt is given by Eq. (B.9). If the compression is assumed to start with the circuit at $P_{O_2 set}$, its nominal P_{O_2} set point, $n^i_{O_2}$ is given by

$$n^i_{O_2}=\frac{P_{O_2 set}\cdot V_C}{RT_C}. \tag{B.17}$$

The peak circuit P_{O_2} at completion of the compression is then

$$P_{O_2\max}=\frac{n^f_{O_2}}{N^f_C}P_2, \tag{B.18}$$

where N^f_C is the circuit gas content given at P_2 by

$$N^f_C=\frac{P_2 V_C}{RT_C}. \tag{B.19}$$

After completion of the compression, the time to recover a known circuit P_{O_2} set point, $P_{O_2 set}$, is given by

$$t_{rec}=\frac{P_{O_2 set}-P_{O_2\max}}{\left(dP_{O_2}/dt\right)}, \tag{B.20}$$

where $\left(\frac{dP_{O_2}}{dt}\right)$ is given by Eq. (B.14) with $\left(\frac{dP_C}{dt}\right) = 0$.

All of the above equations are readily solved with consistent use of units for time, volume, temperature, and pressure. For example, with volume in liters, temperature in degrees Kelvin, and pressure in atmospheres, R=0.08205 l-atm/gm-mole °K, P^o=1 atm, and T^o=273.15 °K. The effects of diluent X_{O_2} on the peak P_{O_2} and duration of the P_{O_2} overshoot in a hypothetical MK 16 MOD 1 dive are shown in Figure B1.

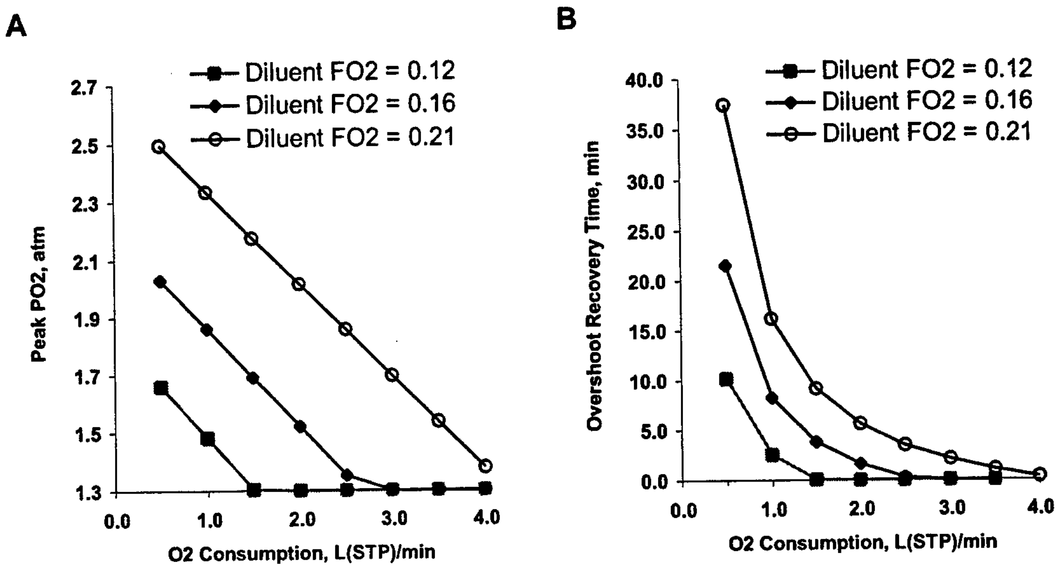

Figure B1. Effects of diluent X_{O_2} (= diluent FO2) on the peak P_{O_2} (Panel A) and duration of the P_{O_2} overshoot (Panel B) in a diver with 5 l pulmonary vital capacity compressed on the MK 16 MOD 1 to 300 fsw at 60 fsw/min.

It must be noted that any influence of O_2 addition from opening of the O_2 add valve during descent is neglected in this derivation. That the O_2 add valve must open in the MK 16 MOD 1 during slow descents as its P_{O_2} set-point transitions from 0.75 ATA to 1.3 ATA can be shown by integrating Eq. (B.14) and solving for Δt to obtain:

$$\Delta t = \frac{P_{O_2}^f - P_{O_2}^i}{\left\{ X_{O_2}\left(\frac{dP_C}{dt}\right) + \left(X_{O_2} - 1\right)\frac{T_C P^o \dot{V}_{O_2}^o}{T^o V_C} \right\}}. \qquad \text{(B.21)}$$

With $P_{O_2}^f$=1.3 ATA and $P_{O_2}^i$=0.75 ATA, Δt is the time during descent at which a circuit P_{O_2} of 1.3 ATA is attained by compression alone. The O_2 add valve will open before Δt if Δt

is after the time at which the diver reaches the P_{O_2} set-point transition pressure of the MK 16 MOD 1 at 33 fsw. Note that because Δt decreases as the compression rate increases, more rapid compression rates will tend to obviate O_2 add valve opening during descent.

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APPENDIX C.

Diver Attributes

Diver ID #	D.O.B. (dd/m/yr)	HT (in)	WT (lb)	BODY FAT* (%)	# Profiles Phase I	# Profiles Phase II
2	26/08/72	73	195	13	3	4
1	21/12/67	59	225	20	0	3
4	02/04/62	67	175	17	2	6
3	19/09/59	70	175	18	0	1
5	16/04/58	71	165	12	8	8
7	08/10/55	70	190	17	3	5
8	08/05/70	68	212	17	3	8
9	23/07/57	74.5	230	18	4	5
10	05/06/67	69	160	25	2	10
11	30/08/64	65	150	15.5	1	1
79	22/09/57	67	180	--	7	0
12	30/09/52	70	195	13	4	6
13	01/07/62	69	180	14	0	2
14	27/08/61	72	190	12	3	3
91	11/05/61	68	165	34	2	0
15	18/08/71	--	--	--	0	1
16	24/07/52	72	227	20	0	1
17	04/08/70	--	--	10	1	4
18	30/12/62	75	196	12	1	5
19	03/07/60	69	175	15	1	4
20	08/02/64	69	185	16	4	6
21	12/6/61	71	--	28	7	1
22	25/12/63	--	--	13	3	6
23	--	--	--	--	0	1
24	30/5/70	68	174	16	0	12
99	30/04/70	--	--	--	0	3
25	02/05/65	--	--	15	2	8
30	12/04/57	72	190	18	2	4
26	18/03/69	70	170	14	0	2
80	03/10/70	67	--	--	4	0
27	01/11/57	--	--	--	0	1
28	08/10/62	70	190	18	0	2
29	21/06/65	73	170	16	6	2
31	11/02/63	73	200	12	5	6
32	08/08/69	74	210	21	5	10
33	19/01/62	--	--	17.5	3	2
34	02/10/59	72	185	14	9	7
35	02/06/63	72	172	16	8	11
36	14/08/57	72	210	20	7	3
37	26/09/62	73	236	8	4	7
38	30/11/52	64	120	18	2	1
39	06/06/60	72	184	11	7	5
85	--	--	--	--	1	0
88	--	--	--	--	1	0
40	24/10/69	73	195	11	0	3
42	24/02/69	69	188	13	4	3

Diver ID #	D.O.B. (dd/m/yr)	HT (in)	WT (lb)	BODY FAT* (%)	# Profiles Phase I	# Profiles Phase II
89	17/10/56	67	--	--	2	0
43	--	--	--	--	0	1
44	--	74	230	16	0	1
45	09/10/59	72	200	18	5	10
87	--	--	--	--	1	0
41	15/11/69		195	13	3	6
81	07/01/48	69	165	20%	3	0
48	23/02/64	71	189	16	5	8
47	02/10/64	74	200	15	0	1
49	29/03/64	70	178	21	4	1
86	22/04/56	72	--	--	3	0
50	01/02/56	74	224	22	3	1
51	8/11/68	69	180	16	0	1
92	--	--	--	--	1	0
52	12/02/72	74	220	22	6	7
53	12/07/61	73.5	192	16	7	4
83	10/10/57	--	--	13	5	0
55	270/3/57	68	165	13.5	8	2
46	20/11/62	68	166	15	2	7
56	30/11/61	72	175	16	2	12
57	24/10/71	--	--	--	1	6
58	19/01/67	72	199	14	9	8
60	28/08/62	72	207	20	3	12
94	27/03/64	--	--	--	0	0
61	02/05/68	71	195	15	1	2
59	07/02/70	68	185	14	2	8
62	20/09/56	--	--	20	2	6
63	18/08/70	69	162	12	1	0
90	19/11/58	70	190	--	0	0
64	01/02/78	--	--	15	1	2
65	24/07/70	--	--	--	3	4
66	31/05/71	72	194	--	2	7
84	21/10/59		205	--	2	0
67	14/11/62	71	203	21	6	5
68	28/02/67	70	160	12	0	4
93	20/09/68	--	--	--	2	0
69	20/05/69	69	200	19	4	7
70	06/07/60	72	247	20	2	2
71	25/09/56	72.5	182	13	0	2
72	08/1/69	68	175	13	4	2
73	10/02/67	58	170	13	0	1
74	28/10/68	69	186	12	6	6
75	29/10/57	67	188	21	4	4
76	--	--	--	--	0	1
77	18/11/64	69	210	25	6	3
78	18/10/62	71	185	11	5	4

* From self-reported abdomen and neck circumferences and height, as per OPNAVINST 6110.1E.

APPENDIX D.

Test Dives Completed

The dive profiles tested in Phases I and II of the study are listed in the following table, where "- SI30 -" indicates a 30 minute surface interval; or "-SI180-" indicates a 180 minute surface interval. Divers breathed air during all but the last 3 min of any surface interval, when they breathed 0.7 ATA O_2 in He from the MK 16 MOD 1. Any required decompression stops (Depth/Stop time) are listed in order of decreasing depth under each dive. The dive numbers range from one to five, depending on the number of repetitive dives in the profile. All depths are in fsw and all times are in minutes. Bottom times include descent time. Ascent times to stops are not included in the stop times. The number of exposures and number of DCS cases on each profile are in the two right-most columns.

Phase I.

Profile #	Dive 1		Dive 2		Dive 3	# Exposures	# DCS
1	160/ 25 50/ 2 40/ 2 30/ 3 20/ 6	- SI30 -	160/ 25 50/ 2 40/ 3 30/ 4 20/ 79			3	1
2	120/ 20	- SI30 -	160/ 15 30/ 2 20/ 14	- SI30 -	160/ 20 40/ 2 30/ 3 20/ 65	3	0
3	200/ 15 50/ 1 40/ 2 30/ 3 20/ 4	- SI30 -	160/ 15 30/ 2 20/ 36	- SI30 -	160/ 15 30/ 1 20/ 49	4	0
4	200/ 15 50/ 1 40/ 2 30/ 3 20/ 4	- SI30 -	200/ 20 70/ 2 60/ 2 50/ 2 40/ 3 30/ 12 20/ 73			3	0
5-B	200/ 22 80/ 2 70/ 2 60/ 3 50/ 2 40/ 2 30/ 2 20/ 47	- SI30 -	160/ 15 30/ 1 20/ 49			4	0
6-B	120/ 15	- SI30 -	200/ 23 80/ 2 70/ 3 60/ 2 50/ 2 40/ 2 30/ 12 20/ 71			4	0
7-B	160/ 15 30/ 1 20/ 2	- SI30 -	200/ 23 80/ 2 70/ 3 60/ 2 50/ 3 40/ 7 30/ 12 20/ 81			4	0

Profile #	Dive 1		Dive 2		Dive 3	# Exposures	# DCS
8-B	120/ 15	- SI30 -	160/ 20 40/ 2 30/ 2 20/ 23	- SI30 -	120/ 21 20/ 52	4	0
9-B	120/ 19 20/ 2	- SI30 -	120/ 15 20/ 2	- SI30 -	200/ 15 50/ 2 40/ 2 30/ 3 20/ 68	4	0
10-B	160/ 20 40/ 2 30/ 2 20/ 4	- SI30 -	120/ 15 20/ 13	- SI30 -	160/ 17 40/ 2 30/ 3 20/ 65	4	0
11-B	200/ 22 80/ 2 70/ 2 60/ 3 50/ 2 40/ 2 30/ 2 20/ 47	- SI30 -	120/ 20 20/ 40			4	0
12-B	120/ 15	- SI30 -	160/ 15 30/ 2 20/ 14	- SI30 -	200/ 15 50/ 2 40/ 2 30/ 2 20/ 69	4	0
13-B	160/ 20 40/ 2 30/ 2 20/ 4	- SI30 -	200/ 18 70/ 2 60/ 2 50/ 2 40/ 2 30/ 12 20/ 72			4	1
14-B	200/ 15 50/ 1 40/ 2 30/ 3 20/ 4	- SI30 -	120/ 15 20/ 15	- SI30 -	200/ 13 50/ 2 40/ 2 30/ 3 20/ 68	3	0
15-B	120/ 20	- SI30 -	160/ 16 40/ 2 30/ 3 20/ 34	- SI30 -	160/ 15 30/ 1 20/ 48	3	0

Profile #	Dive 1		Dive 2		Dive 3	# Exposures	# DCS
16-B	160/ 20 40/ 2 30/ 2 20/ 4	- SI30 -	120/ 25 20/ 40	- SI30 -	120/ 16 20/ 40	4	0
17-B	200/ 20 70/ 1 60/ 2 50/ 2 40/ 3 30/ 2 20/ 18	- SI30 -	160/ 17 40/ 2 30/ 3 20/ 64			4	0
18-B	120/ 20	- SI30 -	120/ 20 20/ 20	- SI30 -	160/ 15 30/ 1 20/ 49	3	0
19-B	160/ 15 30/ 1 20/ 2	- SI30 -	200/ 11 50/ 2 40/ 3 30/ 2 20/ 42	- SI30 -	120/ 15 20/ 28	3	0
20-B	200/ 17 70/ 1 60/ 2 50/ 2 40/ 3 30/ 2 20/ 18	- SI30 -	200/ 15 50/ 2 40/ 2 30/ 2 20/ 68			4	0
21-B	120/ 25 20/ 2	- SI30 -	120/ 20 20/ 17	- SI30 -	200/ 13 50/ 2 40/ 2 30/ 3 20/ 67	4	0
22-B	120/ 25 20/ 2	- SI30 -	200/ 18 70/ 2 60/ 2 50/ 3 40/ 2 30/ 7 20/ 68			4	0
23-B	200/ 17 70/ 1 60/ 2 50/ 2 40/ 3 30/ 2 20/ 18	- SI30 -	200/ 15 50/ 2 40/ 2 30/ 2 20/ 68			4	0

Profile #	Dive 1		Dive 2		Dive 3	# Exposures	# DCS
24-B	160/ 25 50/ 2 40/ 2 30/ 3 20/ 6	- SI30 -	160/ 22 50/ 2 40/ 3 30/ 4 20/ 79			4	0
25-B	120/ 25 20/ 2	- SI30 -	200/ 18 70/ 2 60/ 2 50/ 3 40/ 2 30/ 7 20/ 68			4	0
26-B	160/ 20 40/ 2 30/ 2 20/ 4	- SI30 -	200/ 18 70/ 2 60/ 2 50/ 2 40/ 2 30/ 12 20/ 72			3	0
27-B	200/ 22 80/ 2 70/ 2 60/ 3 50/ 2 40/ 2 30/ 2 20/ 47	- SI30 -	120/ 20 20/ 40			4	0
28-B	160/ 25 50/ 2 40/ 2 30/ 3 20/ 6	- SI30 -	160/ 22 50/ 2 40/ 3 30/ 4 20/ 79			4	0
29-B	160/ 15 30/ 1 20/ 2	- SI30 -	200/ 23 80/ 2 70/ 3 60/ 2 50/ 3 40/ 7 30/ 12 20/ 81			4	0
30-B	200/ 15 50/ 1 40/ 2 30/ 3 20/ 4	- SI30 -	120/ 20 20/ 28	- SI30 -	120/ 16 20/ 41	4	0

Profile #	Dive 1		Dive 2		Dive 3	# Exposures	# DCS
31-B	120/ 25 20/ 2	- SI30 -	120/ 15 20/ 2	- SI30 -	200/ 13 50/ 2 40/ 2 30/ 3 20/ 68	4	0
32-B	160/ 15 30/ 1 20/ 2	- SI30 -	200/ 23 80/ 2 70/ 3 60/ 2 50/ 3 40/ 7 30/ 12 20/ 81			3	0
33-B	120/ 20	- SI30 -	200/ 23 80/ 2 70/ 3 60/ 2 50/ 3 40/ 4 30/ 12 20/ 79			3	0
35-B	200/ 17 70/ 1 60/ 2 50/ 2 40/ 3 30/ 2 20/ 18	- SI30 -	200/ 15 50/ 2 40/ 2 30/ 2 20/ 68			4	0
36-B	120/ 15	- SI30 -	120/ 15	- SI30 -	160/ 22 50/ 2 40/ 3 30/ 2 20/ 68	4	0
37-B	200/ 22 80/ 2 70/ 2 60/ 3 50/ 2 40/ 2 30/ 2 20/ 47	- SI30 -	120/ 20 20/ 40			4	0
38-B	120/ 15	- SI30 -	160/ 21 50/ 2 40/ 3 30/ 2 20/ 42	- SI30 -	120/ 20 20/ 40	3	0

Profile #	Dive 1		Dive 2		Dive 3	# Exposures	# DCS
40-B	120/ 20	- SI30 -	160/ 15 30/ 2 20/ 14	- SI30 -	120/ 21 20/ 53	4	0
41-B	120/ 20	- SI30 -	120/ 25 20/ 20	- SI30 -	200/ 13 50/ 2 40/ 2 30/ 3 20/ 67	3	0
42-B	160/ 20 40/ 2 30/ 2 20/ 4	- SI30 -	200/ 18 70/ 2 60/ 2 50/ 2 40/ 2 30/ 12 20/ 72			4	0
43	120/ 25 20/ 2	- SI30 -	120/ 25 20/ 30	- SI30 -	120/ 25 20/ 53	23	0
44	160/ 25 50/ 2 40/ 2 30/ 3 20/ 6	- SI30 -	160/ 25 50/ 2 40/ 3 30/ 4 20/ 79			14	0
45	80/ 110					7	0
46	80/ 130					24	0

Profile #	Dv 1		Dv 2		Dv 3		Dv 4		Dv 5	# Exposures	# DCS
47	80/25	- SI30 -	80/25	- SI30 -	80/25	- SI30 -	80/25	- SI30 -	80/25	12	0

Phase II.

Profile #	Dive 1	Dive 2	Dive 3	# Exposures	# DCS
II.1	120/ 60 30/ 7 20/ 60			14	0
II.2	140/ 20 20/ 7			9	0
II.3	140/ 45 40/ 6 30/ 7 20/ 52			8	0
II.4	160/ 20 20/ 13			8	0
II.5	160/ 45 60/ 2 50/ 8 40/ 7 30/ 7 20/73			10	0
II.6	180/ 15 20/ 11			7	0
II.7	180/ 40 70/ 2 60/ 7 50/ 7 40/ 7 30/ 7 20/ 79			11	0
II.8	200/ 15 40/ 1 30/ 1 20/ 14			4	0
II.9	200/ 35 160/ 1 140/ 1 100/ 1 70/ 6 60/ 7 50/ 7 40/ 7 30/ 7 20/ 87			4	0

Profile #	Dive 1	Dive 2	Dive 3	# Exposures	# DCS
II.10	220/ 15 60/ 2 50/ 2 40/ 2 30/ 3 20/ 5			13	0
II.11	220/ 25 100/ 1 90/ 2 80/ 2 70/ 2 60/ 3 50/ 2 40/ 2 30/ 8 20/ 64			12	1
II.12	220/ 35 120/ 1 110/ 2 100/ 2 90/ 3 80/ 3 70/ 1 60/ 2 50/ 11 40/ 12 30/ 12 20/ 104			7	0
II.13	240/ 15 70/ 2 60/ 2 50/ 2 40/ 3 30/ 2 20/ 16			12	0
II.14	240/ 20 90/ 2 80/ 3 70/ 2 60/ 2 50/ 2 40/ 3 30/ 2 20/ 54			8	0

Profile #	Dive 1	Dive 2	Dive 3	# Exposures	# DCS
II.15	240/ 25			8	0
	110/ 2				
	100/ 2				
	90/ 3				
	80/ 2				
	70/ 2				
	60/ 3				
	50/ 2				
	40/ 7				
	30/ 11				
	20/ 79				
II.16	260/ 15			4	0
	80/ 2				
	70/ 2				
	60/ 3				
	50/ 2				
	40/ 2				
	30/ 3				
	20/ 31				
II.17	260/ 25			3	0
	120/ 3				
	110/ 3				
	100/ 2				
	90/ 2				
	80/ 2				
	70/ 2				
	60/ 2				
	50/ 7				
	40/ 12				
	30/ 12				
	20/ 95				
II.18	280/ 15			20	0
	90/ 3				
	80/ 2				
	70/ 2				
	60/ 2				
	50/ 3				
	40/ 2				
	30/ 2				
	20/ 47				

Profile #	Dive 1		Dive 2		Dive 3	# Exposures	# DCS
II.19	280/ 20					8	1
	120/ 1						
	110/ 3						
	100/ 3						
	90/ 2						
	80/ 2						
	70/ 3						
	60/ 1						
	50/ 2						
	40/ 9						
	30/ 12						
	20/ 80						
II.20	300/ 15					8	0
	100/ 3						
	90/ 2						
	80/ 2						
	70/ 3						
	60/ 2						
	50/ 2						
	40/ 2						
	30/ 5						
	20/ 60						
II.21	300/ 20					7	0
	130/ 1						
	120/ 4						
	110/ 2						
	100/ 2						
	90/ 3						
	80/ 2						
	70/ 2						
	60/ 2						
	50/ 7						
	40/ 12						
	30/ 12						
	20/ 95						
II.22	120/ 30	- SI30 -	120/ 35	- SI30 -	120/ 25	10	0
	20/ 8		30/ 4		20/ 53		
			20/ 62				
II.23	100/ 15	- SI180 -	100/ 30	- SI180 -	120/ 30	8	0
					20/ 39		
II.24	120/ 35	- SI30 -	100/ 35			8	0
	20/ 12		20/ 52				
II.25	140/ 35[1]	- SI30 -	120/ 30			6	0
	30/ 3		30/ 1				
	20/ 16		20/ 62				

[1] Profile II.25 was computed with first dive as 140/30, but dove with first dive as shown due to typographical error.

Profile #	Dive 1		Dive 2		Dive 3	# Exposures	# DCS
II.26	140/ 30 30/ 3 20/ 16	- SI180 -	140/ 30 30/ 5 20/ 60			5	0
II.27	140/ 20 20/ 7	- SI30 -	140/ 30 40/ 4 30/ 7 20/ 57			7	0
II.28	160/ 30 40/ 4 30/ 7 20/ 31	- SI30 -	160/ 25 40/ 2 30/ 7 20/ 74			8	0
II.29	120/ 25 20/ 4	- SI180 -	160/ 20 30/ 3 20/ 32	- SI30 -	140/ 15 20/ 42	6	3[2]
II.30	160/ 25 30/ 6 20/ 15	- SI180 -	120/ 35 20/ 57			8	0
II.31	140/ 20 20/ 7	- SI30 -	160/ 30 50/ 5 40/ 7 30/ 7 20/ 70			7	0
II.32	180/ 25 40/ 6 30/ 7 20/ 29	- SI180 -	160/ 30 40/ 4 30/ 7 20/ 72			6	0
II.33	180/ 20 30/ 6 20/ 14	- SI180 -	180/ 35 60/ 7 50/ 7 40/ 7 30/ 7 20/ 95			7	0
II.34	180/ 20 30/ 6 20/ 14	- SI30 -	180/ 25 60/ 2 50/ 7 40/ 7 30/ 7 20/ 80			11	1

[2] This profile is outside the recommended limit of only one repetitive dive after a decompression stop dive (see item 3 in Conclusions and Recommendations, NEDU TR 14-01).

Profile #	Dive 1		Dive 2	Dive 3	# Exposures	# DCS
II.35	200/ 20[3] 140/ 1 100/ 1 60/ 1 50/ 6 40/ 7 30/ 7 20/ 47	- SI30 -	180/ 25 40/ 6 30/ 6 20/ 84		3	0
II.36	200/ 15 40/ 1 30/ 1 20/ 14	- SI180 -	180/ 35 60/ 7 50/ 7 40/ 7 30/ 7 20/ 91		8	0
II.37	200/ 20 100/ 1 70/ 1 40/ 4 30/ 7 20/ 24	- SI30 -	180/ 15 30/ 4 20/ 57		6	0

[3] Profile II.35 was computed with the first dive as 200/25, but dived with the first dive as shown due to typographical error.

APPENDIX E.

SPECIFIC COMMENTS ON DIVES PERFORMED

PHASE I

DIVE DATE	PRO-FILE #	Diver ID #	COMMENTS
11/01/00	110100A (1-A)	79 83 72 39	(NOTE: Diver #39 was scrubbed from the profile after splash due to an irreparable break in the gas sampling line at the gas sample block.) Diver #83 experienced a feeling of fullness in his left elbow on the last decompression stop of the second dive. When he was climbing up the ladder in the trunk of the OSF after the dive, he may also have briefly felt "dizzy." About one hour after the event, he noted the gradual onset of left elbow pain. He was seen and evaluated by a Diving Medical Officer (DMO) and noted to have an abnormal Romberg test: he fell to the left side. He was diagnosed with Type II DCS and treated with TT 6. He had a full resolution of symptoms. The next day, unknown to the DMO, he felt somewhat dizzy and briefly felt nauseated. Two days after the dive he reported to medical personnel and complained that his sensation of feeling dizzy and his arm pain had returned. His neurologic examination at that time revealed horizontal nystagmus with head shake and Dix-Hallpike manuevers. There appeared to be a component of latency, and the nystagmus fatigued and disappeared after a few seconds. He also had a positive Romberg. He was treated again with a TT 6 and his symptoms resolved. Three days after the dive he felt fine, and a neurological exam was normal. Four days after the dive he had a return of the left arm pain and a sensation of feeling dizzy, albeit milder than before. He had felt a little "dizzy" after head shake manuevers but had an otherwise normal neurologic examination, including a normal Romberg. He was treated again with a TT 6, with full resolution of symptoms. He had two subsequent treatments with TT 9s over the next two days, with no recurrence of his symptoms. This patient was seen and evaluated over the next

DIVE DATE	PRO-FILE #	Diver ID #	COMMENTS
			four weeks after the event. An ENT evaluation was normal. He had an MRI of the brain with fine cuts of the posterior fossa as well as the region of the thalamus, cuts which revealed a normal brain. He had a CT of the head with fine cuts of the mastoids, which were normal. Several weeks after the event, he noted episodic recurrence of the elbow pain after doing pull-ups. This was treated with a steroid injection and resolved completely.
11/01/00	110100B (2-A)	12 21 58 60	Diver #60 was placed on EGS because UBA failed to maintain satisfactory PO_2, and diluent bottle pressure was low. O_2 add valve and diluent add valve failures (?)
11/02/00	110200A (3-A)	22 31 32 89	Diver #32 added oxygen manually on descent. Diver #89 noted that his UBA was "gurgling" during the 20 fsw stop of the first dive, due to water in the breathing system. His UBA had flooded, and he was placed on EGS. His flooded rig was replaced during the subsequent surface interval. His second dive was completed OK, but his replacement rig failed to reach 0.7 ATA PO_2 during predive for a third dive. Diver #89 was aborted from the profile before the 3rd dive. As a result, the surface interval before the 3rd dive was a few minutes longer than the 30 minutes prescribed by the protocol.
11/02/00	110200B (4-A)	35 80 53	Diver #80 experienced a caustic cocktail during the pre-dive stabilization period before the 2nd dive. He was aborted from the profile. (NOTE: Diver #69 also splashed for this dive. However, his monitoring umbilical failed during the predive stabilization period for the dive and he was aborted from the profile.)
11/06/00	110600B (5-B)	60 65 35 91	Diver #91 became short of breath during his work cycle; he was instructed to stop work and was switched to EGS. Diver #65 added oxygen on his own initiative during the dive.
11/07/00	110700A (6-B)	55 89 39 79	Diver #55 became short of breath and was switched to EGS. Diver #39 measured inspired PO_2 low; diver switched to EGS during the dive.

DIVE DATE	PRO-FILE #	Diver ID #	COMMENTS
11/08/00	110800A (7-B)	7 84 69 53	Diver #7 had a cramp in his left thigh while exercising on the bottom during 2nd dive; cramp was relieved with rest. Diver #69 UBA O_2 add valve stuck open during 20 fsw stop in 2nd dive decompression.
11/09/00	110900A (8-B)	42 81 58 45	Uneventful dive.
11/13/00	111300A (9-B)	25 79 60 39	Left arm of Diver #25 was struck by a weight while he was in the trunk. During subsequent dive, this diver had transient arm pain due to this mechanical injury; he also had a cramp in the groin area during exercise. He was told not to pedal, and his pains resolved.
11/14/00	111400A (10-B)	48 32 37 9	Diver #48 inspired PO_2 low during bottom time of 2nd dive, even after repeated manual O_2 adds; he was switched to EGS during decompression. Diver # 48 rig was changed out during subsequent surface interval.
11/14/00	111400B (11-B)	53 22 5 69	Uneventful dive.
11/15/00	111500A (12-B)	29 84 74 77	Diver #29 was told to add diluent, because his PO_2 values were high.
11/15/00	111500B (13-B)	34 65 70 50	Diver #70 had transient episode nausea and vomited while on the bottom. The DMO was notified and the diver removed from the OSF. Over the next several hours, the diver developed an abdominal rash that was pruritic and purplish in color. It was not clear whether this presentation was skin bends or some other manifestation of DCS. The diver was treated with a TT 6, with full resolution of symptoms.
11/16/00	111600A (14-B)	75 55 14 35	Diver #75 had a hold during his descent because of difficulty clearing.
11/17/00	111700A (15-B)	5 79 36	Only three divers participated in this profile due to problems with the medical deck equipment, but it was otherwise an uneventful dive.

DIVE DATE	PRO-FILE #	Diver ID #	COMMENTS
11/20/00	112000A (16-B)	67 77 74 29	R-10 functioned sporadically for diver #74.
11/20/00	112000B (17-B)	59 41 58	Uneventful dive.
11/21/00	112100A (18-B)	35 12 78 55	Diver #12 aborted due to tooth squeeze.
11/21/00	112100B (19-B)	60 52 80 34	Diver #52 had R-10 failure in his first dive and was aborted from the profile during the surface interval after that dive. The software system for the divers had to be rebooted during the first dive.
11/22/00	112200A (2O-B)	5 36 32 7	Diver #5 and #36 readings were suspect: water was in the mass spec and in the gas sample line. Diver #32 was switched to EGS because of low bottle pressure.
11/22/00	112200B (21-B)	53 31 37 48	Divers #31 and 53 had unreliable depth readings on descent due to problems with the data collection system.
11/27/00	112700A (22-B)	77 34 29 74	Uneventful dive.
11/27/00	112700B (23-B)	45 2 20 30	Uneventful dive.
11/28/00	112800A (24-B)	9 79 18 55	Diver #79 noted gurgling in UBA: suspecting that water had entered his system, he was switched to EGS.
11/28/00	112800B (25-B)	58 21 38	Diver #58 noted a sensation of increased work of breathing. He added diluent, oxygen with no relief of this sensation.
11/29/00	112900B (26-B)	33 22 5 36	Diver #33 suffered a sinus squeeze during first dive descent; was aborted from the profile during the surface interval after this dive. Diver #36 was switched to EGS during the 60 fsw stop in decompression from the second dive: his rig was not controlling his PO_2.

DIVE DATE	PRO-FILE #	Diver ID #	COMMENTS
11/30/00	113000A (27-B)	49 67 34 74	Diver #67 had a hold during descent due to problems in equalizing left ear pressure; these were resolved and his dive was continued.
11/30/00	113000B (28-B)	80 62 20 35	Uneventful dive.
12/04/00	120400A (29-B)	21 79 75 78	Uneventful dive.
12/04/00	120400B (30-B)	55 80 72 45	Uneventful dive.
12/05/00	120500A (31-B)	36 48 69 5	Diver #48 was pulled from the dive profile during his surface interval because of problems clearing during his descent on the first dive.
12/05/00	120500B (32-B)	7 50 2 38	Diver #2 had a hold on descent because the nosepiece in his face mask fell out of place; diver #50 aborted due to problems in using the mask nosepiece to clear his ears.
12/06/00	120600A (33-B)	30 67 74 62	Diver #67 aborted because of problems clearing his ears.
12/07/00	120700A (35-B)	79 72 45 81	Uneventful dive.
12/07/00	120700B (36-B)	78 21 52 75	Uneventful dive.
12/11/00	121100A (37-B)	69 37 85 5	Uneventful dive.

DIVE DATE	PRO-FILE #	Diver ID #	COMMENTS
12/12/00	121200A (38-B)	33 9 86 49	Surface interval before second dive was prolonged to 75 minutes due to time required to remedy problem with mass spectrometer on MED Deck. Diver #9 UBA primary display failure during ascent in 2nd dive. Diver #49 was aborted from profile during surface interval before third dive due to problems clearing ears on 2nd dive descent. Diver #9 complained of chest pain with deep inspiration during 20 fsw stop of 3rd dive, which resolved within 5 min after following instruction to assume upright position. The DMO was notified; the diver was evaluated and diagnosed as having musculoskeletal pain.
12/13/00	121300A (40-B)	87 92 57	Uneventful dive.
12/14/00	121400A (41-B)	58 53 32 14	Diver # 58 was scrubbed from profile after splash before the first dive with report of excessive bubbling in rig. The UBA was checked out and cleared for use in next dive on this date. Remaining divers completed the profile uneventfully.
12/14/00	121400B (42-B)	31 88 48 5	Diver #31 UBA O_2 add valve stuck open or leaking during end of 30 fsw stop and throughout 20 fsw stop. (Same UBA used by aborted Diver #58 in AM dive.)
2/5/01	(43-B)	34 77 83 67	Diver #67 was switched to EGS due to elevated PO_2 values.
2/6/01	(43-B)	52 21 4 35	Uneventful dive. Data acquisition failure for Diver 4; no pressure/gas profile.
2/7/01	(44-B)	93 8 53	One of the R-10 cells malfunctioned, so only three divers were in the OSF when this profile was tested. Otherwise, uneventful dive.
2/8/01	(43-B)	67 58 86 77	Diver #67 was switched to EGS while on the bottom during the third dive of profile, due to high measured inspired PO_2. The diver remained on EGS for the remainder of the profile.

DIVE DATE	PRO-FILE #	Diver ID #	COMMENTS
2/8/01	(44-B)	56 45 46 65	Diver #65 was switched to EGS near the end of the 30 fsw stop of first dive in profile, due to low diver inspired PO_2 readings on Med Deck. He remained on EGS for the remainder of the dive, but he was put back on the UBA for his second dive. He was switched to EGS during the 30 fsw stop of his second dive, again due to low measured inspired PO_2 values. He completed the profile on EGS.
2/12/01	(43-B)	19 58 12 52	Diver #58 was switched to EGS shortly after arrival at bottom in first dive, due to low measured inspired PO_2 values. He completed the dive on EGS and was successfully put back on his rig for the entire second dive. Diver #12 UBA exhibited uncontrolled PO_2 increase during first dive, but was kept on rig. Completed second dive normally. Uncontrolled PO_2 increase recurred in third dive shortly after arrival on bottom and he was switched to EGS. He completed the profile on EGS. UBA PO2 increases typical of O_2 sensor failure.
2/12/01	(44-B)	70 39 11 94	Diver #11 had a hold during descent on the first dive of the profile. His rig appeared to fail to transition to 1.3 ATA PO_2 mode during subsequent descent, and he was put on EGS for the remainder of the dive. The diver was aborted from the profile and removed from the OSF during the following surface interval. Diver #39 had a hold on descent during the second dive of the profile. (R10-DS gas monitoring system failed on Diver #94 after splash for first dive. Diver #94 was aborted from profile.)
2/13/01	(43-B)	61 36 63 33	Divers #61 and 36 were placed on EGS due to elevated PO_2 values. Diver #63 added oxygen to his UBA.
2/14/01	(43-B)	49 53 34 83	Diver #49 aborted during the surface interval due to difficulty clearing his ear.
2/15/01	(44-B)	55 21 4 78	Diver #55 had a leak in his mask; he was told to stop cycling. Diver #21 reported an excessive workload on his bike.

DIVE DATE	PRO-FILE #	Diver ID #	COMMENTS
2/20/01	45-B	48 35 31 60	Diver #60 aborted due to a gas sampling system failure.
2/20/01	45-B	5 61 59 66	Uneventful dive.
2/21/01	46-B	2 20 77 34	Uneventful dive.
2/21/01	47-B	29 41 83 10	Diver #83 directed to go on EGS at ends of dives 2, 3, and 4 for high measured inspired PO_2 readings on Med Deck. High inspired PO_2 not substantiated on review of computer-logged data.
2/22/01	022201C (46-B)	52 36 42 46	Problems with mass spectrometer in Med Deck gas monitoring system for Divers #42 and 46 beginning in second dive: apparent systematic over-estimation of diver inspired PO2. Efforts to diagnose problem may have led to corruption of data for Diver # 52 during 5^{th} dive.
2/22/01	47-B	8 21 37 4	Diver #4 had a hold due to an ear squeeze. Med Deck data acquisition system failure for Divers #37 and #4; recorded inspired gas data for these divers incorrectly shows divers on EGS gas, when they in fact remained on rig throughout the dive.
2/23/01	46-B	75 7 59 22	R10-DS PO_2 data only for Divers #59 and #22 due to mass spectrometer off-line. Diver #75 was switched to EGS for violation of monitored inspired PO2 > 1.45 for more than 15 minutes (probable incipient O_2 sensor linearity failure in rig).
2/26/01	022601A (46-B)	10 20 67 34	Divers #34 and #67 had a hold on their descents. Mass spectrometer failure for Divers #34 and #67 shortly after arrival on bottom; Divers were switched to EGS to complete the remainder of their dives.
2/26/01	022601B (47-B)	9 56 83 74	Mass spectrometer for Divers #74 and #83 off-line (see 022601A). Divers #74 and #83 completed all five dives of the profile on EGS.

DIVE DATE	PRO-FILE #	Diver ID #	COMMENTS
2/27/01	46-B	58 55 86 25	Uneventful dive.
2/27/01	47-B	8 14 39 78	Divers #8, 14, and 78 were placed on EGS due to an R-10 failure; diver #39 had a hold on his descent.
2/28/01	022801B 46-B	32 57 35 66	Diver #32's sampling system PO_2 values were high, and he was switched to EGS.

PHASE II

DIVE DATE	PRO-FILE #	Diver ID #	COMMENT
4/11/01	II-28	19 59 36 5	Uneventful dive.
4/11/01	04112001B (II-5)	32 66 69 47	Diver #69 had a hold due to a left ear squeeze. Divers #32 and #69 were switched to EGS, due to system and communication problems.
4/12/01	04112001A II-28	34 24 30 56	Uneventful dive.
4/16/01	II-24	55 72 75 21	Diver #75 had a hold due to an ear squeeze.
4/16/01	II-5	78 52 41 8	Uneventful dive.
4/17/01	II-24	32 59 69 7	R-10 cells malfunctioned for all the divers; otherwise, the dive was uneventful.
4/17/01	II-5	60 31 22 5	Uneventful dive.
4/18/01	II-7	24 49 10 35	Diver #49 to EGS at bottom due to reported difficulty with exhalation; gurgling sounds in rig. Completed dive on EGS
4/18/01	II-37	45 58 34 67	Uneventful dive.
4/19/01	II-37	18 2 75 25	Diver #18 had problems clearing; he aborted during the surface interval. Diver #2 added oxygen because his UBA gas sample readings revealed low PO_2. He was later noted to have elevated PO_2 and was eventually shifted to EGS.

DIVE DATE	PRO-FILE #	Diver ID #	COMMENT
4/19/01	II-7	46 4 50 40	Diver #50 had many holds due to problems with his mask.
4/23/01	II-25	60 61 5 58	Uneventful dive after Diver #58 aborted at surface before first dive for failure of rig PO_2 to reach and maintain 0.7 ata.
4/23/01	II-9	17 31 66 32	Diver #66 had a hold on his descent due to an ear squeeze.
4/24/01	II-25	9 30 10 33	Water in diver #30 gas sample line; real-time inspired gas profile corrupted. Dive otherwise uneventful.
4/24/01	II-9	38 64 56 74	Divers #38 and #64 had water in their gas sampling lines to mass spectrometer; both divers completed the profile on EGS. Real-time inspired gas profiles corrupted.
4/25/01	II-31	70 53 52 4	Diver #53 had a hold due to an ear squeeze. An R10-DS cell for diver #52 malfunctioned.
4/25/01	II-3	12 57 18 45	R10-DS cell for diver #18 malfunctioned.
4/26/01	II-31	22 32 7 66	Uneventful dive.
4/26/01	II-3	25 48 35 60	Diver #48 had malfunctions of both his gas sample line and his R10-DS cell.
4/30/01	II-27	34 56 37 9	Uneventful dive.
4/30/01	II-1	77 71 29 35	Uneventful dive.

DIVE DATE	PRO-FILE #	Diver ID #	COMMENT
5/1/01	II-27	58 63 74 45	Diver #58 put his head out of the water to adjust his mask. Diver #58's gas sampling system PO_2 values were high, so he was switched to EGS.
5/1/01	II-1	4 75 78 52	Diver # 52 had an episode of decreased level of consciousness while on the bottom. His dive was aborted and he was taken into the dry chamber at his 20 fsw stop. His symptoms resolved while on ascent, and he had normal neurologic and physical examinations at the 20 fsw decompression stop and at the surface. Diver #75 was switched to EGS after he complained that his rig was "gurgling."
5/2/01	II-26	61 60 28 69	Diver #28 manually added O_2 to his rig on the bottom during his first dive; he was placed on EGS during his 20 fsw stop. Diver #60 added O_2 to his rig during the second dive; he was placed on EGS before starting his ascent.
5/2/01	II-2	48 31 59 66	Diver #31's UBA leaked water during his first dive; he was switched to EGS for the remainder of the profile.
5/3/01	II-26	56 20 77 2	Diver #20 was placed on EGS near the end of his 30 fsw stop due to low measured inspired PO_2. Diver #2 had an episode of mask flooding on bottom, with a decreased level of consciousness within 30 minutes of surfacing after the first dive of this repetitive dive profile. He was diagnosed with AGE, treated with TT 6A that day, and then two TT 9s, with full recovery. His labwork, MRI brain, and cardiac echo bubble study were all normal.
5/3/01	II-2	49 10 24 30	Diver #49 had a left ear squeeze during descent. All divers returned to surface and Diver #49 was pulled from the profile. Remaining divers continued with restart of profile. Diver #10 was switched to EGS during the dive, due to low measured inspired PO_2.

DIVE DATE	PRO-FILE #	Diver ID #	COMMENT
5/7/01	II-29	9 4 35 14	Uneventful dive. Diver #9 complained of excess fatigue the next day; he was seen and examined by the DMO. Diver #9 had a normal neurologic examination, but he was treated with a TT 6 for presumptive Type II DCS, with full resolution of his subjective complaints. Diver #4 complained of paresthesias in a patchy distribution on the left chest the day after the dive. When he was seen and examined by the DMO, he had subjective sensory changes on the left side, patchy in distribution, and an otherwise normal neurologic examination. He was treated with a TT 6 for presumptive Type II DCS, with full resolution of his complaints.
5/7/01	II-6	58 8 3 17	Problems occurred with Diver #8's rig during predive of his first dive: his rig was not reaching the target 0.7 ATA PO_2.
5/8/01	II-29	66 60 69 48	Diver #66 had a hold on his descent due to an ear squeeze; he was subsequently placed on EGS due to a system malfunction. Diver #69 felt some shoulder and arm paresthesias. He reported this to the DMO the next day. Neurologic examination then revealed some subjective changes during sensory examination of the shoulder and arm, but exam results were otherwise normal. The diver was treated with a single TT 6, with full resolution of symptoms.
5/8/01	II-6	61 7 28 22	Diver #7 had a hold due to an ear squeeze.
5/9/01	II-1	67 44 77 51	Uneventful dive.
5/9/01	II-11	56 24 32 34	Diver #32 had two holds on his descent due to an ear squeeze.

DIVE DATE	PRO-FILE #	Diver ID #	COMMENT
5/10/01	II-11	53 11 35 45	Diver #11 was placed on EGS due to a system malfunction; no real-time inspired gas data. Diver #53 had transient blurry vision in his eye and was seen and evaluated by the duty DMO, diver #53 was determined to have NID in his eye.
5/14/01	II-15	59 74 22 48	Uneventful dive.
5/14/01	II-14	60 41 45 72	Uneventful dive.
5/15/01	II-8	67 20 34 73	Diver #34 and diver #73 added oxygen.
5/15/01	II-8	65 36 70 56	Diver #70 had a hold due to an ear squeeze on descent.
5/15/01	II-8	58 35 57 55	Uneventful dive.
5/16/01	II-22	8 26 78 13	Diver #13 had a hold due to an ear squeeze on descent.
5/16/01	II-4	24 15 46 76	Uneventful dive.
5/17/01	II-22	23 16 32 43	Diver #16 had hold on descent due to an ear squeeze on the first dive; subsequently he was removed from the OSF during the surface interval. Diver #32 had a hold on descent due to an ear squeeze on the second dive.
5/23/01	II-13	31 36 60 13	Uneventful dive.

DIVE DATE	PRO-FILE #	Diver ID #	COMMENT
5/24/01	II-16	45 20 56 26	Uneventful dive.
5/24/01	II-16	25 24 10 35	Uneventful dive.
5/29/01	11 14	39 37 11 64	Uneventful dive.
5/30/01	11 13	5 71 66 32	Uneventful dive.
5/30/01	II-16	59 48 31 58	Diver #58's gas sample readings revealed low PO_2, so he was switched to EGS
5/31/01	II-18	46 24 20 34	Uneventful dive.
5/31/01	II-19	65 10 30 41	Uneventful dive.
6/1/01	II-19	78 25 42 37	Uneventful dive. Diver #78 complained of excessive fatigue and decreased mental alertness, but he did not report it to the DMO for two days. After he reported his symptoms, he was immediately seen and evaluated. He had a normal neurological examination, other than his subjective complaints; he was treated with a TT 6, with full recovery.
6/1/01	II-18	39 14 53 12	Uneventful dive.
6/4/01	II-12	48 57 59 31	Uneventful dive.

DIVE DATE	PRO-FILE #	Diver ID #	COMMENT
6/4/01	II-10	32 37 1 36	Uneventful dive. After the dive, diver #36 complained of shoulder pain and upper extremity numbness. He was diagnosed with Type II DCS and treated with a TT 6, with full recovery.
6/5/01	II-21	60 10 24 74	Uneventful dive.
6/5/01	II-20	67 65 46 56	Dive abort due to unresolvable ear squeeze in Diver #67. Divers decompressed breathing MK 16 MOD 1s on air abort schedule.
6/6/01	II-21	18 45 35 12	Uneventful dive.
6/6/01	II-20	39 25 58 42	Uneventful dive.
6/7/01	II-20	8 1 57 31	Uneventful dive.
6/8/01	II-10	4 41 20 33	Uneventful dive.
6/8/01	II-13	56 10 24 65	Diver #10 had a hold due to an ear squeeze.
6/18/01	II-11	64 74 27 40	Uneventful dive.
6/18/01	II-35	37 68 25 18	Diver #18 had a hold due to an ear squeeze.
6/19/01	II-35	5 60 7 59	Diver #59 was shifted to EGS due to an R-10 cell malfunction.

DIVE DATE	PRO-FILE #	Diver ID #	COMMENT
6/20/01	II-34	34 10 45 20	Temperature measurements malfunctioned on Diver #10. Diver #20 noted excess fatigue approximately one hour after surfacing. Seen and evaluated by the DMO, this diver had the subjective complaint of fatigue; results from his neurological examination were normal. He was diagnosed with Type II DCS and treated with a TT 6, with full resolution of symptoms.
6/21/01	II-34	68 25 62 52	Diver #68 had a hold due to an ear squeeze.
6/21/01	II-7	46 8 9 42	Uneventful dive.
6/25/01	II-32	66 48 32 57	Diver #66 felt "dizzy" upon surfacing from the first dive. His symptoms resolved in a few minutes, but he was aborted from the second dive and pulled from the OSF. The duty DMO was called, and the diver underwent a physical examination, EKG, chemistries, and CBC, which were all normal. No further workup was pursued.
6/25/01	II-10	5 69 60 68	Uneventful dive.
6/26/01	II-32	34 56 24 99	Uneventful dive.
6/27/01	II-36	45 8 4 74	Diver #45's R-10 was inaccurate.
6/27/01	II-4	52 63 19 12	Diver #63 had a hold on descent.
6/28/01	II-36	69 68 48 58	R-10 and temperature readings were inaccurate because of a calibration error.

DIVE DATE	PRO-FILE #	Diver ID #	COMMENT
7/02/01	II-12	35 5 8	Only three divers participated in this profile, due to instrumentation problems.
7/02/01	II-10	10 46 67	Uneventful dive.
7/03/01	II-15	52 53 19 25	Uneventful dive.
7/03/01	II-14	12 40 63 37	Diver #63 had a hold due to an ear squeeze on descent.
7/09/01	II-22	5 60 2 22	Diver #2 added oxygen.
7/09/01	II-18	58 99 57 69	Uneventful dive.
7/10/01	II-5	63 41 8 52	Uneventful dive.
7/11/01	II-30	39 37 18 19	Uneventful dive.
7/12/01	II-30	59 9 24 17	Uneventful dive.
7/16/01	II-23	10* 46* 45* 41*	Diver #45 added oxygen. *Used MK 16 MOD 1 UBA fitted w/R10-DN O_2 sensors.
7/16/01	II-4	29* 56* 99* 32*	Uneventful dive. *Used MK 16 MOD 1 UBA fitted w/R10-DN O_2 sensors.

DIVE DATE	PRO-FILE #	Diver ID #	COMMENT
7/17/01	II-34	39* 42* 37* 2	Uneventful dive. *Used MK 16 MOD 1 UBA fitted w/R10-DN O_2 sensors.
7/17/01	II-18	14* 11* 8* 63	Real-time pressure and inspired gas data lost for Diver #8 and corrupted for Diver #63 due to user error in setup of mass spectrometer and data acquisition system. *Used MK 16 MOD 1 UBA fitted w/R10-DN O_2 sensors.
7/18/01	II-33	69* 17* 7* 22	Diver #17 experienced mild upper extremity pain when he was leaving the bottom on the first dive of the profile. He was aborted from the profile and removed from the OSF during the subsequent surface interval. A DMO determined during subsequent examination that this diver's pain was musculoskeletal. *Used MK 16 MOD 1 UBA fitted w/R10-DN O_2 sensors.
7/19/01	II-33	10* 35* 24* 56*	Uneventful dive. *Used MK 16 MOD 1 UBA fitted w/R10-DN O_2 sensors.

APPENDIX F.

Case Reports for Medical Events

Phase I

PROFILE: 110100AN83
The diver was a 43-year-old male who completed Profile 1-A (160 fsw for 25 minutes) with 2-, 2-, 3-, and 6-minute decompression stops at 50, 40, 30, and 20 fsw, respectively. After a 30-minute surface interval, the profile continued with a second dive to 160 fsw for 25 minutes, with 2-, 3-, 4-, and 79-minute decompression stops at 50, 40, 30, and 20 fsw, respectively. The diver reported having had a vague feeling of fullness in his left elbow during the last decompression stop of the second dive. When he was climbing up the ladder to the trunk of the OSF after the second dive, he may have also had a brief episode of feeling "dizzy." About one hour after the event, he noted the gradual onset of left elbow pain. He was seen and evaluated by a Diving Medical Officer (DMO). His examination was remarkable for the elbow pain and a propensity to fall to the left during the Romberg test. He was diagnosed as a case of Type II DCS. He was treated with TT 6, and his symptoms resolved: his elbow pain was gone, and he had a normal neurologic examination. The next day he felt somewhat dizzy and had a brief episode of nausea, but he failed to report these developments to the DMO. On 3 November he reported to medical personnel that his sensation of feeling dizzy and his arm pain had returned. His neurologic examination at that time revealed horizontal nystagmus to the left with head shake and Dix-Hallpike maneuvers. There appeared to be a component of latency, and the nystagmus fatigued and disappeared after a few seconds. He also had a positive Romberg. He was treated again with a TT 6 and his symptoms resolved. On 4 November he felt fine, and a brief neurological exam was normal. On 5 November his dizzy feeling returned, albeit milder than it had been before, and he had left arm pain. He felt a little "dizzy" after head shake maneuvers, but he had an otherwise normal neurologic examination, including a normal Romberg. He was treated again with a TT 6, and two TT 9s.After these treatments he had no complaints and a normal physical and neurological examination.

The patient was seen by an Ear Nose and Throat specialist on 13 November 2000 and found to have bilateral high frequency hearing loss, but his exam was otherwise normal. On 21 November 2000 he had an MRI of the brain with fine cuts of the posterior fossa, as well as the region of the thalamus: the grey and white matter was normal, but the scan suggested a left mastoid effusion. On 7 December 2000, the patient had a CT of the head with fine cuts of the mastoids to better visualize that area of the skull, which was normal. His left elbow pain recurred several months later after performing multiple sets of pull ups. The elbow was injected with steroids, and his symptoms resolved

PROFILE: 111500bN701

The diver was a 40-year-old male who dove to 160 fsw for 20 minutes, with 2-, 2-, and 4-minute decompression stops at 40, 30, and 20 fsw, respectively. He states that he had an excessively large amount of Chinese food for lunch just prior to the dive. While on descent he experienced some nausea, and subsequently experienced transient vomiting while on the bottom. He was aborted from the remaining 200 fsw dive of the profile and removed from the OSF during the intervening surface interval. Over the next several hours he developed a purple, pruritic abdominal rash. He had no other symptoms. It was not clear exactly what was causing the rash (the diver's wet suit did not fit well and may have contributed to it). The diver was treated with a TT 6, during which the rash improved. It resolved completely several hours after the TT 6.

Phase II

PROFILE: 04192001N02a

Diver was a 29-year-old male who dove to 140 fsw for 30 minutes, with a 3-minute decompression stop at 30 fsw and a 16-minute decompression stop at 20 fsw. During the dive his mask flooded while on the bottom, but the dive was otherwise uneventful. Upon surfacing, he was noted to have a flattened affect, and his level of consciousness decreased while he was being escorted to the recompression chamber. He was diagnosed with AGE and was treated with TT 6A that day and two TT 9s on subsequent days. He recovered fully. His labwork, MRI brain, and cardiac echo bubble studies were all normal.

PROFILE: 05072001N09a

The diver was a 43-year-old male who dove to 120 fsw for 25 minutes. He had a 4-minute decompression stop at 20 fsw. He had a 180-minute surface interval before diving to 160 fsw — with decompression stops for 3 minutes at 30 fsw and 32 minutes at 20 fsw before a 30-minute surface interval. He then dove to 140 fsw for 15 minutes, with a 42-minute decompression stop at 20 fsw. He complained of excess fatigue the day after the dive. He was seen and examined by the DMO. Hehad a normal neurologic examination but was treated with a TT 6 for presumptive Type II DCS. His subjective complaints resolved.

PROFILE: 05072001N04a

The diver was a 39-year-old male who dove to 120 fsw for 25 minutes. He had a 4-minute decompression stop at 20 fsw. He had a 180-minute surface interval before diving to 160 fsw — with decompression stops for 3 minutes at 30 fsw and 32 minutes at 20 fsw before a 30-minute surface interval. He then dove to 140 fsw for 15 minutes with a 42-minute decompression stop at 20 fsw. The day after the dive he complained of excess fatigue and paresthesias in a patchy distribution on the left chest. Examination by the DMO revealed that the diver had subjective sensory changes, patchy in distribution on the left side. Hisneurologic examination was otherwise normal. He was treated with a TT 6 for presumptive Type II DCS, and his complaints resolved.

PROFILE: 05082001N69a
The diver was a 39-year-old male who dove to 120 fsw for 25 minutes, with a 4-minute decompression stop at 20 fsw before a 180-minute surface interval. He then dove to 160 fsw — with decompression stops for 3 minutes at 30 fsw and 32 minutes at 20 fsw before a 30-minute surface interval. He then dove to 140 fsw for 15 minutes, with a 42-minute decompression stop at 20 fsw. Several hours after the dive, he felt some right shoulder and arm paresthesias and some "fuzziness" in thinking. He reported these symptoms to the DMO the next day. Neurologic examination then revealed some subjective sensory changes in the right shoulder and arm, but results from the examination were otherwise normal. The diver was treated with a single TT 6, and his symptoms resolved.

PROFILE: 06012001N78a
The diver was a 38-year-old male who dove to 280 fsw for 20 minutes, with decompression stops for 1 minute at 120 fsw, 3 minutes at 110 fsw, 3 minutes at 100 fsw, 2 minutes at 90 fsw, 2 minutes at 80 fsw, 3 minutes at 70 fsw, 1 minute at 60 fsw, 2 minutes at 50 fsw, 9 minutes at 40 fsw, 12 minutes at 30 fsw, and 80 minutes at 20 fsw. Upon surfacing from the dive, he experienced excessive fatigue and decreased mental alertness, but did not report these symptoms to the DMO for two days: he attributed his symptoms to normal fatigue from a busy work schedule. After he reported his symptoms, he was immediately evaluated. Results from his neurological examination were normal, despite his subjective complaints. He was treated with a TT 6, and he recovered fully.

PROFILE: 06042001N36b
The diver was 40-year-old man who dove to 220 fsw for 15 minutes, with a 2-minute decompression stop at 60 fsw, a 2-minute stop at 50 fsw, a 2-minute stop at 40 fsw, a 3-minute stop at 30 fsw, and a 5-minute stop at 20 fsw. Within 10 minutes of reaching the surface, he complained of shoulder pain and upper extremity numbness. This was confirmed by examination by the DMO. He was diagnosed with Type II DCS and treated with a TT 6. He recovered fully.

PROFILE: 06202001N20a
The diver was a 37-year-old man who dove to 180 fsw for 20 minutes, with a 6-minute decompression stop at 30 fsw and a 14-minute stop at 20 fsw. He began experiencing excess fatigue approximately one hour after surfacing. He was seen and evaluated by the DMO, who noted the diver's subjective complaint of fatigue and conducted a neurological examination that yielded normal results. The diver was diagnosed with Type II DCS and treated with a TT 6. His symptoms were fully resolved.

OTHER EVENTS

PROFILE: 05012001N521
The diver was a 39-year-old male whose mask leaked where a screw was anchoring the primary display holder. As a result of this mechanical problem, he was leaning forward in an awkward position on the bicycle and was having difficulty pedaling. . He began to feel "woozy" and appeared to be falling off his bike. His dive buddy, who found the diver awake, responsive, but apparently confused, assisted the stricken diver by switching him to EGS. The dive was aborted. At the 30 fsw stop, the diver felt "8/10," and at the 20 fsw stop he felt "9/10." He was transferred to a dry chamber, and after 10–20 minutes in the chamber he felt completely normal.

PROFILE: 06252001N66a
The diver was a 29-year-old male who felt "dizzy" upon surfacing from a dive to 180 fsw for 25 minutes, with 6-, 7-, and 29-minute decompression stops at 40, 30, and 20 fsw, respectively. His symptoms resolved in a few minutes, and the duty DMO was called. The diver underwent a physical examination, an EKG, blood chemistries, and a CBC, which were all normal. Because the diver was asymptomatic and the examination and tests were normal, no further workup was pursued.

APPENDIX G.

DIVER INSPIRED GAS ANALYSIS

Diver inspired gas was analyzed throughout the study using two independent methods in order to characterize MK 16 MOD 1 O_2 delivery. The first method entailed use of an O_2 fuel cell (Teledyne, Inc., R10-DS) located in a gas sampling fitting mounted at the base of each MK 16 MOD 1 inhalation hose. The other method entailed transport of a continuous stream of gas from a port in the same gas sampling fitting through approximately 110 feet of 0.032 inch inner diameter nylon tubing to one of two mass spectrometers (Extrel MS 250 Gas Analyzer; Extrel Corporation, Pittsburgh, PA) on the OSF Medical Deck for fractional analysis.

The fuel cell PO_2 reading and chamber pressure for each diver were sampled in real-time throughout each dive at 2 sec intervals and recorded in computer data files. Each mass spectrometer was used to analyze the sampled gas from two divers, with gas switching from diver to diver effected via a computer-controlled motorized rotary sampling valve under control of the respective Extrel control computer. RED and GRN divers were monitored using RED Extrel, and YEL and BLU divers were monitored using GRN Extrel. Because of valve switching and line washout times, a mass spectrometer record of each diver's inspired gas composition was available at only about 35-40 sec intervals.

The product of measured diver depth and inspired O_2 fraction yielded instantaneous diver inspired PO_2. While the measured diver depth was obtained in real-time without appreciable time delay, measured inspired FO_2 values had to be corrected for the transit delay between the gas sample inlet at the diver and the gas analyzer on the Med Deck.

Mass Spectrometer Response Characterization

The mass spectrometer gas sampling and analysis system is schematized, with components used to characterize mass spectrometer response, in Figure G-1.

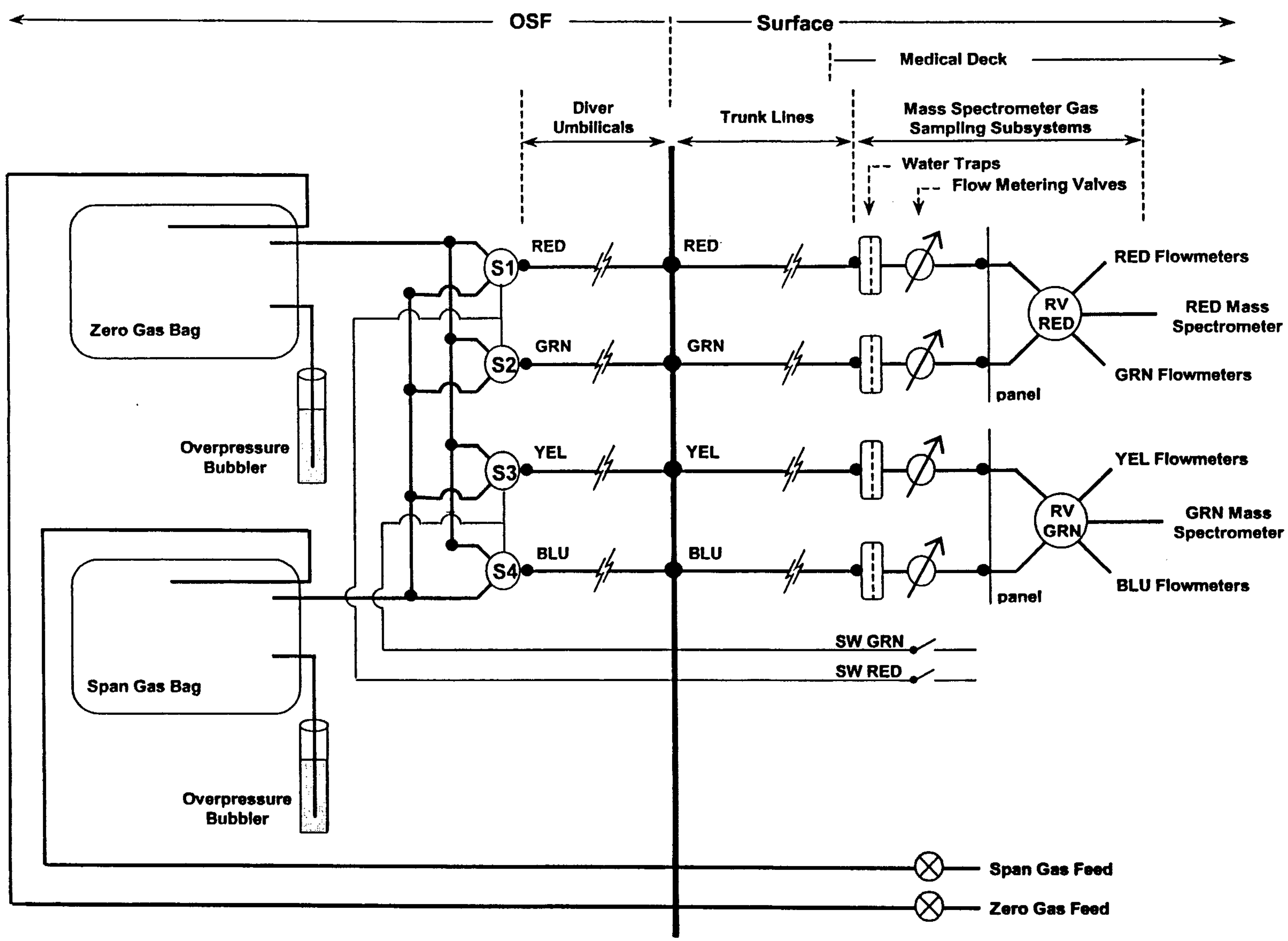


Figure G-1. Schematic of the mass spectrometer gas sampling and analysis system. The response characterization sub-system is shown connected to the ends of the diver umbilicals on the left side of the figure.

The sampling latency and response time for each diver-mass spectrometer sampling line was determined as follows: The OSF was pressurized to various depths with the sampling system drawing low oxygen fraction gas from a bag at a pressure slightly higher than ambient chamber pressure. At each depth, a switch was closed on the OSF Medical Deck to energize a solenoid valve, which opened the gas sample line to a bag containing high oxygen fraction gas, also at a pressure slightly greater than chamber pressure. The change in voltage passed by the switch provided an exact time for the low-to-high oxygen switch at the gas sample line inlet. After the ON response was complete several seconds later, the process was reversed to obtain the OFF response by opening the switch on the Medical Deck to open the sample inlet back to the low oxygen fraction gas. Again, the change in voltage passed by the switch provided an exact time for the high-to-low oxygen switch at the gas sample line inlet. Elapsed time, switch voltage, and mass spectrometer O_2 channel voltage were recorded in real time at 100Hz throughout the procedure for later analysis. While the gas sample flow from one line was being analyzed by the mass spectrometer, the gas sample flow from the other line was vented to atmosphere through a bubble flowmeter and manually maintained at 150 ± 5 ml/minute (Figure G-1). Typical "ON/OFF" response data are illustrated in Figure G-2.

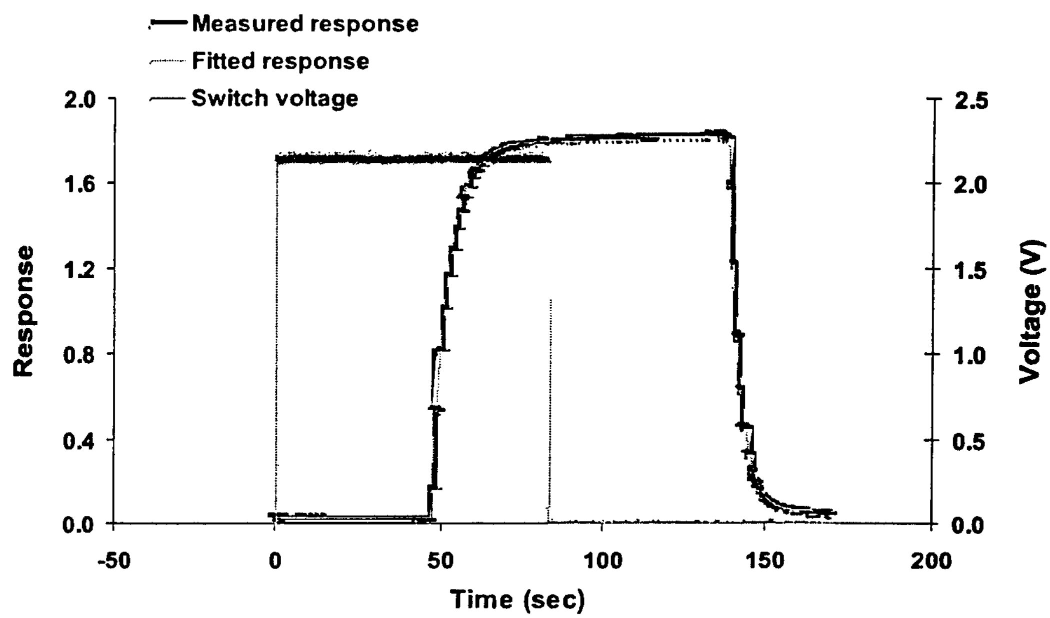


Figure G-2. Typical "ON/OFF" response of mass spectrometer O_2 channel output to near-instantaneous changes in gas concentration at the diver end of the gas sampling umbilical.

Six ON/OFF response curves were obtained at each depth from 20 to 200 fsw in 10 fsw increments. Separate ON and OFF latencies and response half-times were determined from each "ON/OFF" response curve by fitting the following equations to the mass spectrometer O_2 channel output using nonlinear least squares:

$$y^{ON}(t^{ON}) = y_0^{ON} + A^{ON} \cdot \left\{1 - \exp\left[\left(\frac{\ln(0.5)}{t_{1/2,D}^{ON}}\right)\left(t^{ON} - t_{lat,D}^{ON}\right)\right]\right\} \qquad \text{(G-1)}$$

$$t^{ON} = t - t_{SW}^{ON};\ t_{SW}^{ON} \le t < t_{SW}^{OFF}$$

$$y^{OFF}(t^{OFF}) = y_0^{OFF} + A^{OFF} \cdot \exp\left[\left(\frac{\ln(0.5)}{t_{1/2,D}^{OFF}}\right)\left(t^{OFF} - t_{lat,D}^{OFF}\right)\right] \qquad \text{(G-2)}$$

$$t^{OFF} = t - t_{SW}^{OFF};\ t_{SW}^{OFF} \le t < \infty$$

where y^{ON} is the mass spectrometer O_2 channel ON response;
t^{ON} is the time (sec) from solenoid switch closing at t_{SW}^{ON};

y_0^{ON} is the baseline mass spectrometer O_2 channel signal;
A^{ON} is the mass spectrometer O_2 channel ON amplitude;
$t_{1/2,D}^{ON}$ is the mass spectrometer O_2 channel ON response half-time (sec);
$t_{lat,D}^{ON}$ is the mass spectrometer O_2 channel ON response latency (sec).

Variables with "*OFF*" superscripts denote the analogous parameters for the OFF response.

As illustrated in Figure G-3, the ON latency at each depth, *D*, tended to be lower than the corresponding OFF latency, while the ON response time tended to be higher than the corresponding OFF response time. These were collapsed into a single metric for each measured ON/OFF response curve, the effective latency, or $t_{el,D}$, defined as the mean of the ON and OFF latencies plus the mean of the ON and OFF 0-90% response times:

$$t_{\mathrm{el,D}} = \frac{\left(t_{lat,D}^{ON} + t_{lat,D}^{OFF}\right)}{2} + \frac{\ln(0.9)}{\ln(0.5)}\left[\frac{t_{1/2,D}^{ON} + t_{1/2,D}^{OFF}}{2}\right]. \qquad \text{(G-3)}$$

Effective latencies from all depths, including repeat measures at given depths, were then collected and fitted by the following 5th-order polynomial to obtain a quantitative expression for the relationship between effective mass spectrometer latency and depth:

$$t_{\mathrm{el}}(D) = b_0 + b_i D^i, \quad I=1, 2, \quad , 5 \qquad \text{(G-4)}$$

The depth dependence of the effective latency for the GRN diver mass spectrometer sampling line, as measured and as reproduced by the fitted Eq. (G-4), is shown in Figure G-3.

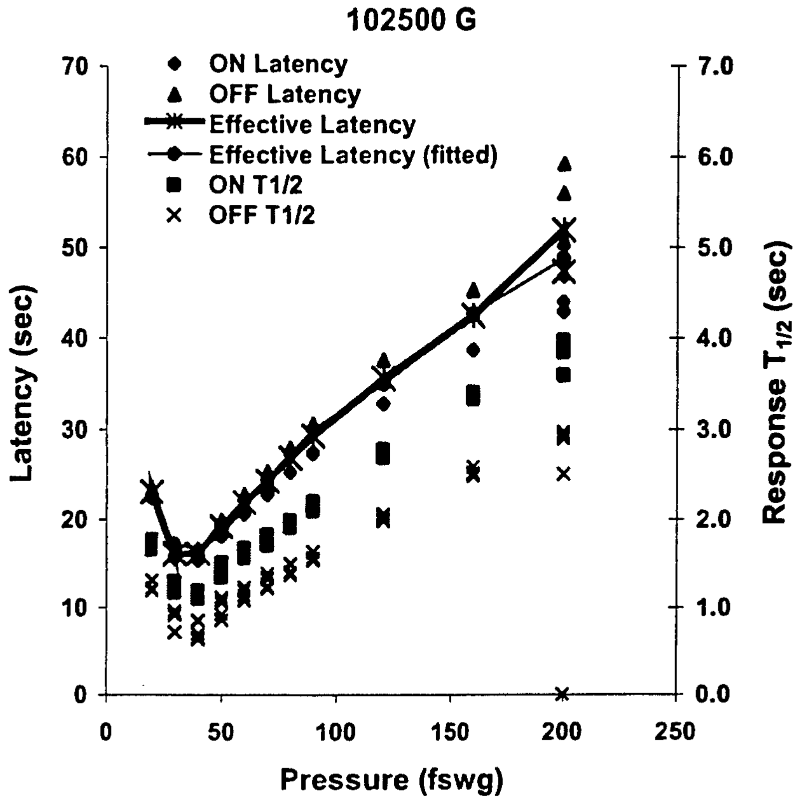


Figure G-3. Effective mass spectrometer latency *vs.* depth, GRN diver umbilical.

Separate accommodation of analyzer sampling latency with signal deconvolution for analyzer 0-95% response time was not considered necessary.

Fuel cell data were smoothed using a 25-point moving quadratic convolute.

Mass Spectrometer Data:

Corrections for mass spectrometer calibration drift.

Each diver profile was preceded and followed by an automatic run through xx calibration gases to acquire information to quantify mass spectrometer linearity and calibration drift through the course of a profile. Raw mass spectrometer data were corrected for drift if both pre-run and post-run calibration curves were linear to within an r^2 >95% by linear regression. Mass spectrometer linearity in the O_2 channel is typified by the calibration data from one of the runs shown in Figure G-4.

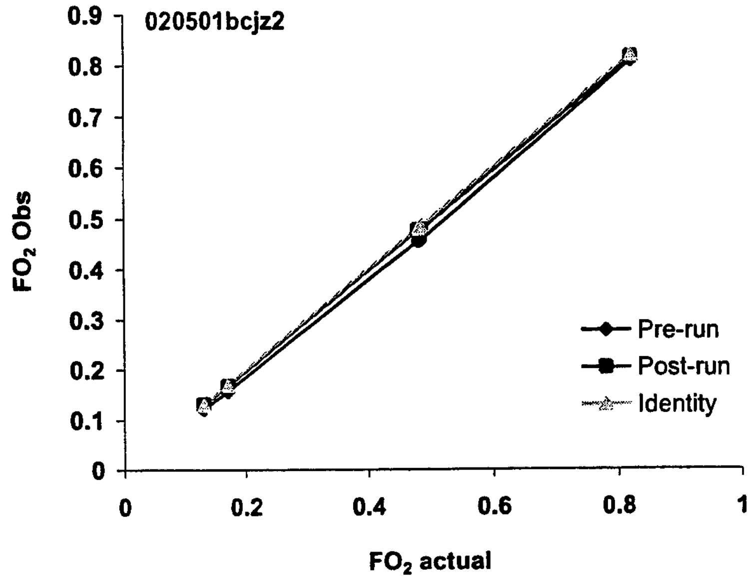


Figure G-4. Mass spectrometer linearity. Post-run calibration curve is graphically indistinguishable from the identity, or ideal calibration, line.

Corrections for effective latency and interpolation between records using fuel cell data.

Raw recorded mass spectrometer data were time-lagged by the effective mass spectrometer latency, t_{el}. A simple approach to correcting the data for this latency would have been to shift each measured mass spectrometer record backward in time by t_{el}. However, as noted above, fuel cell PO_2 data were also available at a much higher temporal frequency than the mass spectrometer data, providing information to interpolate FO_2 data between actual mass spectrometer records. Interpolation and correction for effective latency were thus completed using a combined procedure described following.

With record-by-record advance through the combined fuel cell PO_2 and mass spectrometer profile for a given diver, the mass spectrometer reading appropriate to a given current time, t_c, was obtained by looking forward in the profile by the effective latency to the raw recorded mass spectrometer data at time t_F given by

$$t_F = t_c + t_{el},$$

where t_{el} was obtained by solution of Eq. (G-4) at the current time depth D. If a mass spectrometer record was available at t_F, as in the case illustrated in Figure G-5, it was used directly as the corrected mass spectrometer value at the current time, $FO_{2,ms}(t_c)$. More often, however, a mass spectrometer record was not available at t_F, as illustrated in Figures G-6 and G-7.

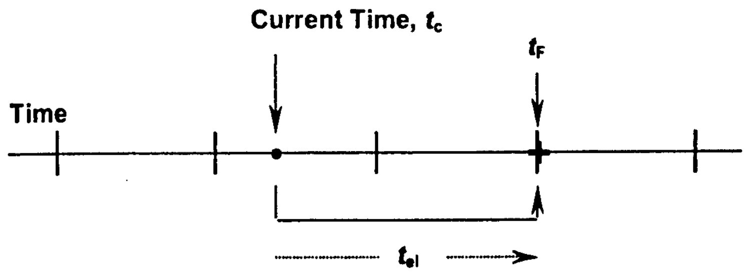


Figure G-5. Schematization of real-time data matrix with mass spectrometer values only at tick marks and fuel cell PO_2 values at tick marks and at 2 sec intervals in between. In the case illustrated, mass spectrometer data are available at t_F to obtain latency-corrected interpolated values for the current time, t_c.

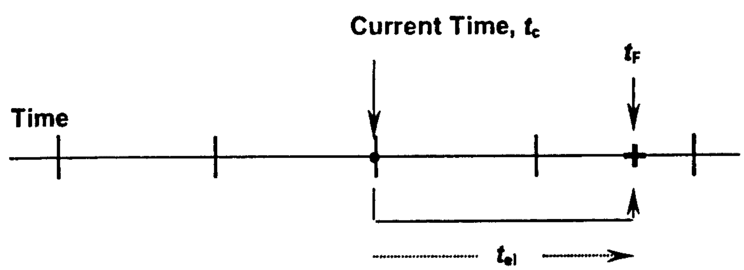


Figure G-6. Schematization of real-time data matrix as in Figure G-5. Here, however, mass spectrometer data are not available at t_F to obtain latency-corrected values for the current time, t_c. Note that the mass spectrometer data at t_c apply to an earlier real time, as illustrated in Figure G-5, and the latency-corrected value at t_c must be determined by interpolation of the value at t_F.

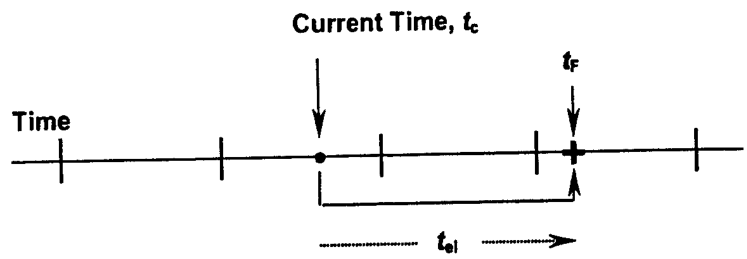


Figure G-7. Generalized instance of the case illustrated in Figure G-6, where mass spectrometer data are not available at t_F. Latency-corrected interpolated value at t_c was obtained as schematized in Figure G-8.

In these cases, the latency-corrected $FO_{2,ms}(t_c)$ was determined by interpolation as schematized in Figure G-8. The nearest mass spectrometer record applicable to the current time was first located at time t_N. The applicable fuel cell value for this record was then obtained by looking back from t_N by the effective latency to time t_B:

$$t_B = t_N - t_{el}.$$

The fuel cell OFFSET at t_N was determined from the recorded mass spectrometer value at t_N and the fuel cell value at t_B:

$$OFFSET=FO_{2,FC}(t_B)-FO_{2,ms}(t_N).$$

Finally, the latency-corrected interpolated mass spectrometer value at the current time was calculated using:

$$FO_{2,ms}(t_c)= FO_{2,FC}(t_c) - OFFSET.$$

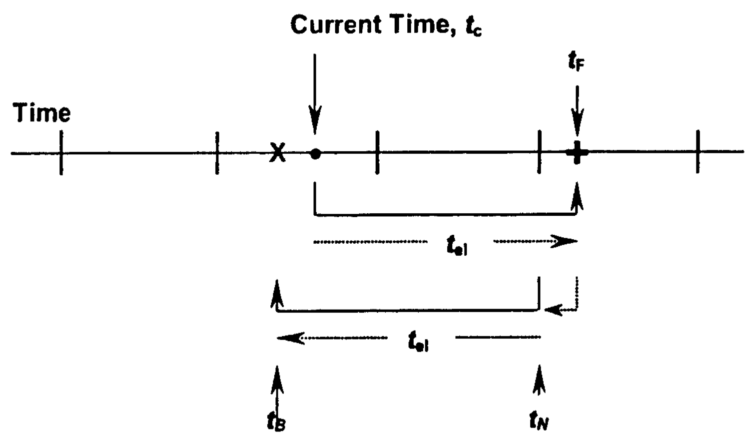


Figure G-8. Determination of the latency-corrected interpolated mass spectrometer data at current time, t_c, using mass spectrometer data at t_N and fuel cell data at t_B when directly measured mass spectrometer data at t_F were not available.

The effect of these mass spectrometer FO_2 corrections and interpolations is illustrated for a section of a profile in Figure G-9.

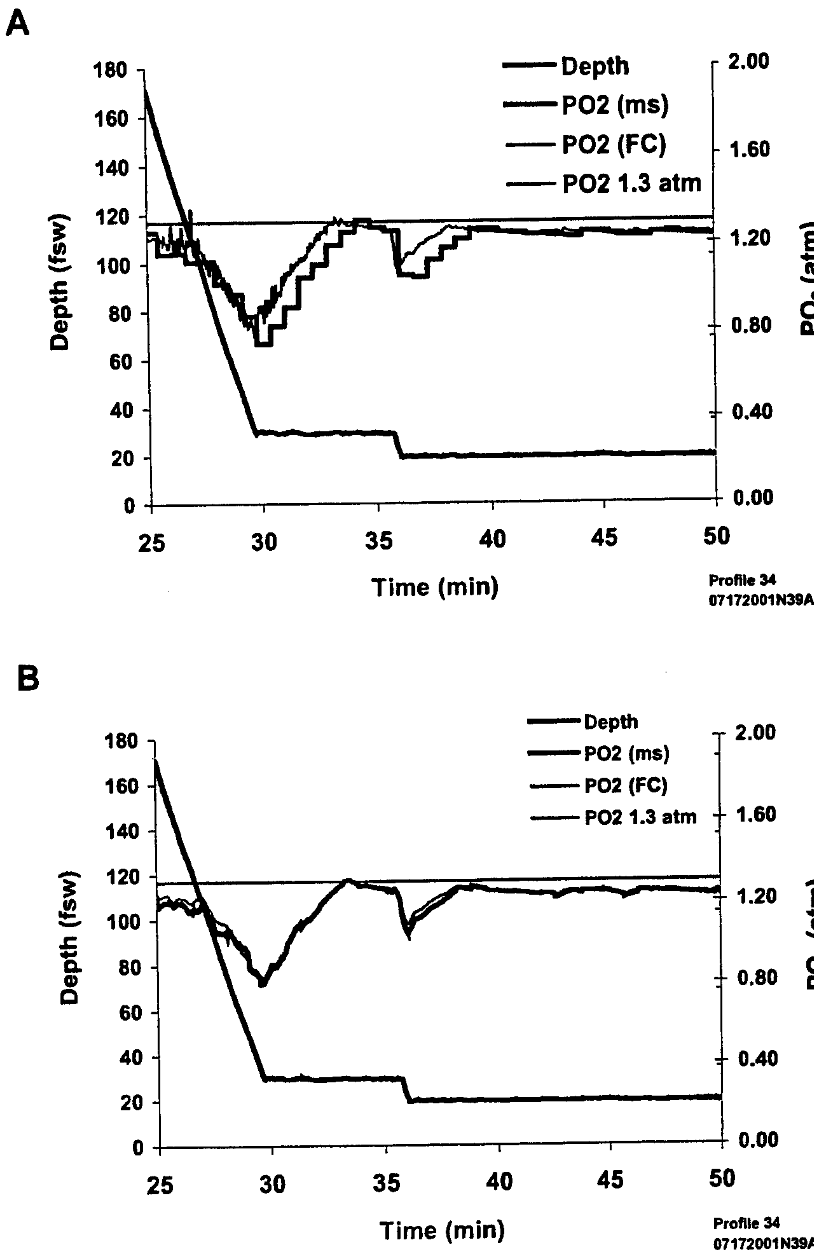


Figure G-9. Section of a profile: A) before fuel cell PO_2 data smoothing and correction and interpolation of mass spectrometer FO_2 data, and; B) after fuel cell PO_2 data smoothing and correction and interpolation of mass spectrometer FO_2 data.

PO_2 Overshoots

PO_2 overshoots accompanying descent were a feature of MK 16 MOD 1 performance of particular interest. The overshoot accompanying each descent was characterized from the measured and corrected PO_2-depth profile during the course of the above data processing procedures. For these purposes, the PO_2 overshoot period was considered to begin during descent when the PO_2 first exceeded 1.45 atm, and end when the PO_2 first decreased to below 1.45 atm thereafter. Characteristics of interest during this period were the average descent rate, the maximum depth attained, the peak PO_2 attained, and the time-weighted average PO_2 during the period.

APPENDIX H.

Dive-by-Dive MK 16 MOD 1 PO₂ Control Summaries

PHASE I

Profile	Dive Depth (fsw)	DSCNT RATE (fsw/min)	BOTTOM Time (min)	Total Dive Time (min)	---PO2 Overshoot Data--- PO2 MAX (atm)	Time PO2>1.45 (min)	TWA PO2 (atm)	Pst OS TWA PO2 (atm)	BT TWA PO2 (atm)	Dive TWA PO2 (atm)
103100AN91	161.4	49.4	25.43	43.80	1.666	3.211	1.580	1.428	1.410	1.420
103100AN29	161.4	48.4	25.43	43.80	1.880	6.165	1.641	1.453	1.473	1.457
110100AN83	161.3	48.3	25.47	43.75	1.987	6.009	1.605	1.455	1.479	1.427
	161.2	36.2	25.53	118.67	2.098	6.568	1.626	1.463	1.452	1.389
110100AN79	161.1	48.4	25.40	43.77	2.185	6.516	1.719	1.380	1.443	1.381
	161.1	39.4	25.57	118.67	2.154	7.955	1.703	1.413	1.459	1.416
110100AN72	161.3	48.3	25.41	43.75	2.125	2.366	1.820	1.442	1.452	1.394
	161.2	37.3	25.53	118.70	1.785	4.687	1.581	1.434	1.420	1.400
110100BN121	120.8	52.4	20.40	24.07	1.917	3.082	1.667	1.441	1.445	1.372
	160.6	51.8	15.67	36.56	2.110	7.334	1.706	1.446	1.537	1.351
	160.9	49.6	20.43	95.64	2.173	8.441	1.691	1.409	1.517	1.394
110100BN601	120.9	52.0	20.40	24.07	1.713	3.947	1.505	1.442	1.436	1.368
	160.8	51.8	15.60	36.57	2.163	6.734	1.673	1.441	1.520	1.381
	160.8	49.7	20.47	95.64	2.251	4.299	1.670	1.426	1.463	1.434
110100BN581	120.9	53.5	20.43	24.10	1.527	0.346	1.496	1.409	1.369	1.320
	160.7	51.6	15.60	36.57	1.668	3.565	1.487	1.428	1.374	1.325
	160.8	49.2	20.44	95.64	1.725	4.133	1.524	1.452	1.426	1.438
110100BN211	120.9	53.4	20.47	24.07	2.407	5.770	1.808	1.450	1.537	1.461
	160.6	53.0	15.67	36.57	1.961	7.113	1.593	1.479	1.515	1.395
	160.9	49.9	20.47	95.64	2.090	5.626	1.651	1.496	1.503	1.486
110200AN321	203.4	48.0	15.37	32.27	1.609	2.760	1.402	1.424	1.361	1.234
	161.3	52.1	15.53	58.63	1.975	1.974	1.644	1.423	1.424	1.361
	160.9	50.3	15.43	70.63	1.828	4.068	1.541	1.419	1.404	1.371
110200AN221	203.2	49.6	15.68	32.23	1.876	6.716	1.636	1.387	1.445	1.424
	161.3	50.7	15.30	58.66	1.742	4.565	1.599	1.392	1.408	1.368
	160.8	49.9	15.50	70.67	1.877	3.408	1.601	1.434	1.409	1.365
110200AN891	203.4	48.8	15.57	32.27	2.260	7.776	1.782	1.375	1.557	1.397
	161.3	51.4	15.60	58.63	2.036	6.682	1.662	1.418	1.491	1.384
110200AN311	203.2	49.2	15.50	32.27	1.775	5.498	1.608	1.385	1.399	1.390
	161.3	51.5	15.43	58.63	1.728	0.809	1.579	1.435	1.376	1.364
	160.8	50.1	15.47	70.64	2.011	0.048	1.919	0.000	1.251	1.504
110200BN531	201.5	49.8	15.53	32.00	1.891	6.128	1.637	1.445	1.472	1.348
	200.8	48.7	20.70	120.90	2.129	7.028	1.655	1.431	1.497	1.405
110200BN80	201.4	50.3	15.70	32.00	1.715	1.057	1.578	1.468	1.401	1.369
110200BN35	201.4	50.0	15.47	32.00	2.077	8.071	1.647	1.414	1.517	1.366
	200.7	49.3	20.67	120.90	2.045	6.392	1.671	1.399	1.468	1.392
110600BN652	200.2	51.2	22.50	89.63	2.576	9.621	1.978	1.527	1.694	1.535
	160.7	49.7	15.50	70.47	2.501	15.167	1.738	0.000	1.721	1.459
110600BN602	200.2	50.3	22.53	89.63	1.966	7.616	1.720	1.496	1.546	1.426
	160.7	49.9	15.47	70.47	1.852	3.029	1.627	1.440	1.426	1.351
110600BN912	200.3	50.8	22.56	89.63	1.826	7.128	1.598	1.420	1.449	1.370
	160.8	49.2	15.50	70.47	1.816	6.643	1.626	1.394	1.456	1.336
110600BN352	200.3	50.5	22.53	89.63	1.687	5.342	1.566	1.409	1.414	1.398
	160.8	49.5	15.50	70.47	1.576	0.957	1.446	1.441	1.387	1.372
110700AN392	120.5	50.6	15.47	18.97	2.011	0.049	1.917	0.000	1.223	1.212
	200.5	49.3	23.60	124.17	2.029	0.047	1.932	0.000	1.204	1.472
110700AN893	120.5	50.8	15.40	18.97	1.549	1.699	1.512	1.482	1.413	1.353
	200.5	48.8	23.50	124.13	1.838	8.802	1.577	1.605	1.582	1.540
110700AN553	120.5	51.3	15.40	18.97	1.571	0.656	1.511	1.471	1.403	1.353
	200.5	48.6	23.46	124.13	1.793	5.944	1.625	1.311	1.358	1.501
110700N792	120.5	52.3	15.47	18.97	1.495	1.119	1.390	1.434	1.390	1.327
	200.5	49.7	23.60	124.17	1.917	7.817	1.709	1.477	1.528	1.453
110800AN531	161.4	50.6	15.60	23.43	1.706	1.442	1.582	1.369	1.334	1.205
	200.6	50.8	23.40	139.70	1.999	5.499	1.700	1.399	1.431	1.348
110800AN071	161.3	48.9	15.33	23.43	2.002	5.500	1.615	1.441	1.471	1.337
	200.6	51.2	23.37	139.73	2.163	8.535	1.712	1.533	1.585	1.453

Profile	Dive Depth (fsw)	DSCNT RATE (fsw/min)	BOTTOM Time (min)	Total Dive Time (min)	---PO2 Overshoot Data--- PO2 MAX (atm)	Time PO2>1.45 (min)	TWA PO2 (atm)	Pst OS TWA PO2 (atm)	BT TWA PO2 (atm)	Dive TWA PO2 (atm)
110800AN691	161.4	50.3	15.57	23.43	1.795	4.566	1.571	1.384	1.397	1.286
	200.6	52.1	23.60	139.70	1.855	5.964	1.626	1.433	1.456	1.516
110800AN841	161.3	33.8	15.27	23.42	2.203	6.295	1.725	1.551	1.569	1.399
	200.6	51.4	23.37	139.74	2.547	22.021	1.729	0.000	1.688	1.466
110900AN581	120.9	21.7	15.30	19.27	1.740	4.985	1.621	1.404	1.438	1.366
	161.2	54.1	20.53	52.03	1.787	5.974	1.628	1.438	1.468	1.373
	120.8	54.8	21.54	76.84	1.905	4.303	1.617	1.475	1.476	1.452
110900AN451	120.9	36.5	15.37	19.30	1.634	1.161	1.540	1.389	1.337	1.278
	161.2	54.0	20.33	52.03	1.494	0.846	1.459	1.399	1.374	1.326
	120.7	55.0	21.57	76.84	1.492	0.258	1.474	1.380	1.348	1.318
110900AN813	120.8	37.1	15.73	19.27	1.465	0.622	1.395	1.421	1.357	1.314
	161.1	54.0	20.57	52.00	1.668	2.773	1.561	1.417	1.403	1.367
	120.7	55.2	21.57	76.84	1.454	0.534	1.431	1.400	1.363	1.343
110900AN423	120.8	36.0	15.77	19.27	1.756	3.019	1.572	1.381	1.364	1.294
	161.1	53.9	20.57	52.00	1.917	5.265	1.532	1.435	1.452	1.396
	120.7	55.3	21.57	76.84	2.259	1.795	1.566	1.424	1.424	1.396
111300AN251	121.1	53.3	19.54	25.03	1.624	0.298	1.545	1.398	1.357	1.316
	120.8	52.4	15.53	21.10	2.017	0.047	1.922	0.000	1.226	1.253
	200.7	50.9	15.33	96.80	2.043	0.032	2.011	0.000	1.160	1.487
111300AN391	121.1	53.8	19.43	25.03	1.668	2.004	1.586	1.469	1.446	1.356
	121.0	52.7	15.47	21.13	1.783	2.411	1.582	1.489	1.454	1.351
	200.9	50.6	15.50	96.81	1.518	11.526	1.508	1.427	1.350	0.546
111300AN601	121.1	53.3	19.47	25.07	1.608	3.339	1.522	1.434	1.417	1.329
	121.0	53.0	15.42	21.13	1.696	2.795	1.550	1.443	1.418	1.308
	200.9	50.7	15.50	96.80	2.008	0.047	1.918	0.000	1.160	1.487
111400AN372	161.4	195.0	18.93	32.24	3.889	6.455	1.790	1.444	1.562	1.409
	121.2	51.9	15.27	32.20	2.255	2.433	1.668	1.429	1.450	1.320
	161.2	50.3	17.57	92.51	2.302	7.932	1.669	1.410	1.510	1.361
111400AN322	161.3	189.8	19.03	32.27	3.793	2.708	1.834	1.448	1.503	1.372
	121.2	50.4	15.30	32.20	1.646	2.525	1.428	1.437	1.402	1.303
	161.0	50.5	17.54	92.51	2.210	4.819	1.667	1.460	1.503	1.379
111400AN092	161.4	185.1	18.97	32.24	3.334	1.311	1.456	1.420	1.422	1.357
	121.2	50.6	15.33	32.20	1.645	1.204	1.564	1.480	1.431	1.360
	161.2	50.9	17.47	92.51	1.607	3.482	1.529	1.502	1.474	1.444
111400AN482	161.3	188.2	19.07	32.27	4.232	5.435	1.948	1.421	1.571	1.370
	121.2	51.1	15.27	32.20	2.216	2.367	1.517	1.451	1.450	1.373
	161.0	50.1	17.53	92.51	1.849	1.232	1.608	1.432	1.392	1.375
111400BN22	200.8	51.8	22.63	89.03	1.721	4.966	1.574	1.444	1.422	1.432
	121.0	54.4	20.43	64.20	1.517	0.577	1.503	1.430	1.383	1.366
111400BN53	200.8	52.0	22.40	89.03	1.876	6.235	1.591	1.402	1.435	1.374
	121.1	54.9	20.50	64.20	2.601	1.423	1.783	1.379	1.388	1.331
111400BN69	200.9	50.1	22.37	89.03	2.057	5.681	1.640	1.418	1.442	1.428
	121.0	55.0	20.53	64.24	2.659	2.444	2.017	1.466	1.512	1.409
111400BN05	200.9	50.8	22.37	89.04	1.705	5.906	1.566	1.395	1.414	1.377
	121.0	54.6	20.53	64.24	2.223	2.643	1.725	1.403	1.427	1.337
111500AN771	121.0	50.6	15.53	18.93	1.963	2.470	1.622	1.402	1.397	1.319
	161.2	49.2	15.50	36.07	2.106	6.065	1.556	1.448	1.471	1.363
	201.5	50.5	15.40	96.67	2.103	7.545	1.644	1.450	1.517	1.412
111500AN741	121.0	50.8	15.57	18.94	1.798	3.595	1.555	1.412	1.390	1.315
	161.2	48.8	15.43	36.07	1.832	6.697	1.601	1.459	1.470	1.361
	201.5	49.6	15.44	96.67	1.781	7.109	1.601	1.483	1.484	1.384
111500AN841	121.1	50.8	15.37	18.93	1.862	5.055	1.543	1.373	1.416	1.330
	161.2	48.9	15.33	36.07	2.291	8.574	1.747	1.391	1.575	1.382
	201.4	49.6	15.33	96.64	2.250	9.102	1.735	1.415	1.594	1.369
111500AN291	121.1	50.0	15.33	18.92	1.543	0.622	1.496	1.342	1.296	1.225
	161.2	48.4	15.33	36.06	1.516	0.675	1.475	1.382	1.326	1.358
	201.4	49.6	15.37	96.67	2.009	4.630	1.705	1.405	1.457	1.508
111500BN701	161.3	53.9	20.40	33.33	1.511	1.781	1.428	1.396	1.344	1.317
111500BN651	161.4	52.7	20.37	33.34	2.370	4.300	1.650	1.424	1.462	1.362
	201.1	53.9	18.53	117.07	2.191	7.862	1.685	1.474	1.555	1.434
111500BN501	161.4	53.1	20.43	33.34	1.646	3.246	1.533	1.427	1.407	1.348
111500BN341	161.3	52.6	20.47	33.33	1.722	2.896	1.524	1.366	1.358	1.260
	201.1	53.4	18.33	117.07	1.741	4.538	1.558	1.409	1.400	1.401
111600AN141	200.8	47.2	15.36	31.89	1.843	7.224	1.630	1.434	1.491	1.392
	120.8	40.8	15.33	33.90	1.570	1.610	1.505	1.416	1.391	1.311

Profile	Dive Depth (fsw)	DSCNT RATE (fsw/min)	BOTTOM Time (min)	Total Dive Time (min)	---PO2 Overshoot Data--- PO2 MAX (atm)	Time PO2>1.45 (min)	TWA PO2 (atm)	Pst OS TWA PO2 (atm)	BT TWA PO2 (atm)	Dive TWA PO2 (atm)
111600AN751	200.8	47.2	15.37	31.90	1.858	3.359	1.689	1.374	1.412	1.315
	120.7	40.6	15.36	33.93	1.972	2.719	1.435	1.333	1.341	1.255
	200.8	39.0	13.19	95.07	1.795	6.734	1.507	1.341	1.405	1.325
111600AN551	200.7	47.8	15.37	31.90	1.990	6.967	1.667	1.354	1.448	1.343
	120.8	39.6	15.37	33.93	2.126	2.583	1.597	1.421	1.431	1.330
	200.8	40.3	13.20	95.07	2.036	8.369	1.687	1.418	1.520	1.404
111600AN351	200.8	47.4	15.61	31.90	2.297	8.071	1.713	1.414	1.547	1.347
	120.8	41.0	15.53	33.90	1.909	4.489	1.638	1.493	1.514	1.372
	200.9	42.1	13.40	95.11	2.154	11.338	1.697	1.423	1.612	1.489
111700AN361	121.1	52.5	20.44	23.97	1.512	0.990	1.420	1.389	1.363	1.317
	161.1	49.6	16.47	60.43	2.155	2.497	1.786	1.492	1.481	1.412
	161.4	48.9	15.53	69.57	1.731	1.548	1.542	1.524	1.479	1.397
111700AN791	121.1	52.6	20.50	23.97	1.556	1.653	1.528	1.354	1.333	1.289
	161.1	48.6	16.53	60.43	1.746	4.457	1.621	1.353	1.386	1.341
	161.4	48.6	15.51	69.57	1.681	5.110	1.550	1.349	1.366	1.310
111700AN05	121.0	52.7	20.53	23.97	1.450	0.027	1.450	1.408	1.341	1.312
	161.0	49.0	16.53	60.43	1.496	1.982	1.478	1.375	1.331	1.346
	161.3	49.0	15.50	69.54	1.561	2.430	1.495	1.422	1.361	1.348
112000AN671	161.5	42.2	20.40	33.43	2.043	6.315	1.674	1.489	1.525	1.415
	121.4	48.1	25.53	69.00	1.957	3.894	1.575	1.521	1.511	1.449
	121.4	50.0	16.44	60.11	2.117	8.188	1.591	1.498	1.531	1.451
112000AN771	161.5	42.4	20.43	33.43	2.080	7.537	1.572	1.385	1.443	1.353
	121.4	48.5	25.46	69.00	1.806	2.871	1.594	1.373	1.375	1.312
	121.4	48.8	16.37	60.11	1.793	1.894	1.525	1.336	1.334	1.280
112000AN742	161.5	42.4	20.40	33.44	1.866	4.592	1.559	1.436	1.431	1.328
	121.4	48.1	25.43	69.00	1.834	1.482	1.631	1.443	1.421	1.368
	121.5	49.4	16.37	60.11	1.808	4.188	1.550	1.475	1.451	1.378
112000AN292	161.6	42.2	20.43	33.44	2.121	4.990	1.708	1.364	1.411	1.324
	121.4	48.1	25.43	69.00	1.966	2.916	1.473	1.374	1.378	1.308
	121.5	49.3	16.37	60.11	2.303	2.093	1.611	1.382	1.399	1.301
112000BN591	201.8	52.0	20.27	54.30	2.279	8.125	1.759	1.479	1.564	1.484
	161.4	51.0	17.66	91.10	3.017	9.156	1.681	1.525	1.594	1.485
112000BN581	201.8	52.2	20.30	54.30	1.973	5.069	1.591	1.360	1.387	1.297
	161.3	51.4	17.67	91.10	1.956	3.145	1.638	1.347	1.377	1.294
112000BN411	201.8	52.5	20.33	54.30	2.331	8.343	1.709	1.441	1.537	1.405
	161.3	51.4	17.67	91.10	2.111	6.724	1.652	1.393	1.476	1.341
112100AN122	121.0	45.7	20.49	24.06	1.482	0.152	1.468	1.397	1.344	1.317
112100AN782	121.0	45.6	20.37	24.03	2.548	1.154	1.500	1.391	1.365	1.315
	120.9	49.1	20.47	44.03	1.643	4.178	1.469	1.435	1.424	1.368
	160.8	46.9	15.33	70.47	1.714	5.834	1.608	1.470	1.494	1.399
112100AN552	121.0	47.6	20.43	24.03	1.920	3.830	1.601	1.398	1.400	1.343
	121.0	49.6	20.43	44.03	1.772	1.887	1.604	1.497	1.478	1.405
	160.8	46.0	15.50	70.50	1.798	5.383	1.631	1.530	1.515	1.420
112100AN352	121.0	46.4	20.50	24.07	1.709	2.672	1.377	1.346	1.336	1.279
	120.8	32.8	20.30	44.00	1.748	4.572	1.474	1.324	1.347	1.275
	160.9	45.8	15.47	70.47	1.964	5.281	1.563	1.348	1.403	1.292
112100BN521	160.8	49.6	15.37	23.53	1.507	0.336	1.486	1.411	1.342	1.273
112100BN341	160.8	49.1	15.47	23.57	1.730	1.490	1.600	1.391	1.369	1.272
	201.2	54.7	11.47	66.73	1.644	4.752	1.527	1.599	1.450	1.432
	120.8	43.4	15.33	47.07	1.512	0.101	1.485	1.489	1.424	1.371
112100BN801	160.8	50.1	15.50	23.57	1.586	0.735	1.626	1.424	1.390	1.295
	201.2	55.6	11.50	66.73	1.918	8.435	1.634	1.420	1.513	1.424
	120.8	43.8	15.33	47.07	1.687	1.878	1.556	1.485	1.417	1.358
112200AN321	201.6	48.0	17.30	52.30	2.196	4.251	1.441	1.407	1.399	1.301
	201.3	48.7	15.80	95.94	2.379	3.699	1.386	1.411	1.381	1.470
112200AN071	201.6	49.0	17.33	52.29	1.862	5.268	1.651	1.392	1.430	1.393
	201.2	48.7	15.80	95.94	1.958	4.627	1.718	1.466	1.488	1.421
112200AN361	201.5	48.5	17.60	52.27	2.362	9.928	1.781	1.486	1.636	1.563
	201.2	49.0	15.73	95.94	5.841	6.800	2.238	1.456	1.774	1.455
112200AN051	201.6	48.6	17.60	52.30	2.181	10.155	1.802	1.620	1.700	1.577
	201.2	49.1	15.77	95.94	7.063	6.490	2.089	1.351	1.627	1.330
112200BN37	121.0	47.7	25.37	30.94	1.570	1.078	1.516	1.404	1.384	1.316
	121.0	46.6	20.33	40.87	1.719	4.290	1.579	1.381	1.386	1.302
	200.9	46.5	13.63	93.57	1.844	8.159	1.649	1.374	1.495	1.327

Profile	Dive Depth (fsw)	DSCNT RATE (fsw/min)	BOTTOM Time (min)	Total Dive Time (min)	---PO2 Overshoot Data--- PO2 MAX (atm)	Time PO2>1.45 (min)	TWA PO2 (atm)	Pst OS TWA PO2 (atm)	BT TWA PO2 (atm)	Dive TWA PO2 (atm)
112200BN531	121.1	47.8	25.44	30.93	2.323	2.643	2.050	1.320	1.382	1.295
	121.0	46.4	20.43	40.90	1.955	2.951	1.585	1.334	1.358	1.265
	200.9	46.7	13.37	93.57	1.768	8.241	1.565	1.360	1.472	1.310
112200BN481	121.1	48.1	25.37	30.94	1.965	3.536	1.526	1.416	1.419	1.331
	121.0	46.9	20.30	40.86	1.943	4.089	1.558	1.539	1.530	1.411
	200.9	46.5	13.43	93.60	2.282	12.201	1.651	1.369	1.611	1.458
112200BN311	121.1	48.3	25.47	30.93	2.421	2.336	2.059	1.368	1.415	1.337
	120.9	46.5	20.40	40.90	1.891	2.773	1.541	1.440	1.435	1.348
	200.9	47.1	13.38	93.57	2.508	6.736	1.674	1.484	1.556	1.431
112700AN771	120.6	46.5	25.56	31.12	1.830	0.586	1.679	1.341	1.322	1.254
	200.6	49.3	18.73	108.97	1.897	7.961	1.595	1.431	1.491	1.415
112700AN341	120.6	47.2	25.50	31.14	1.638	0.967	1.511	1.351	1.320	1.243
	200.6	49.6	18.76	108.97	2.124	7.951	1.556	1.396	1.447	1.352
112700AN741	120.6	47.3	25.50	31.13	1.592	0.577	1.542	1.400	1.376	1.311
	200.8	49.2	18.70	108.97	1.970	8.374	1.672	1.400	1.486	1.358
112700AN291	120.6	47.2	25.50	31.14	1.733	0.700	1.623	1.400	1.380	1.308
	200.8	50.0	18.73	108.97	1.873	8.052	1.612	1.395	1.461	1.346
112700BN20	200.8	48.7	17.63	52.17	1.657	5.533	1.554	1.361	1.372	1.315
	200.6	54.0	15.36	95.70	1.692	1.530	1.552	1.434	1.391	1.293
112700BN45	200.8	48.9	17.47	52.17	1.658	4.833	1.584	1.483	1.421	1.434
	200.5	55.2	15.27	95.69	1.659	6.726	1.542	1.500	1.426	1.411
112700BN30	200.8	48.0	17.63	52.17	1.795	7.268	1.626	1.370	1.442	1.378
	200.6	54.3	15.27	95.70	1.847	5.826	1.634	1.373	1.433	1.341
112700BN02	200.8	49.8	17.63	52.17	2.514	9.192	1.717	1.497	1.587	1.431
	200.6	54.0	15.30	95.70	2.095	9.169	1.714	1.459	1.586	1.366
112800AN091	160.8	50.1	25.30	43.47	1.583	1.375	1.419	1.347	1.302	1.280
	160.7	52.0	22.53	115.37	1.896	1.452	1.640	1.340	1.328	1.342
112800AN181	160.7	50.9	25.41	43.50	1.587	0.961	1.498	1.374	1.353	1.310
	160.7	51.3	22.27	115.34	1.781	1.943	1.561	1.398	1.384	1.316
112800AN791	160.8	50.3	25.47	43.47	2.174	5.530	1.670	1.344	1.353	1.310
	160.7	51.3	22.50	115.34	1.922	5.990	1.591	1.364	1.413	1.495
112800AN551	160.7	49.7	25.42	43.49	1.876	5.778	1.620	1.391	1.418	1.362
	160.7	51.2	22.33	115.34	1.785	4.854	1.594	1.379	1.405	1.335
112800BN381	121.1	51.8	25.37	31.00	1.632	0.599	1.585	1.382	1.363	1.301
	201.1	46.6	18.40	108.67	1.650	2.842	1.503	1.368	1.358	1.351
112800BN581	121.1	51.2	25.44	31.00	1.756	0.914	1.643	1.466	1.443	1.371
	201.1	46.7	18.50	108.70	1.876	7.536	1.590	1.415	1.470	1.362
112800BN211	121.1	51.8	25.44	31.00	1.827	5.140	1.557	1.350	1.378	1.298
	201.1	47.4	18.46	108.67	2.092	8.916	1.670	1.392	1.493	1.359
112900BN221	162.1	50.8	20.44	33.47	1.955	4.544	1.556	1.302	1.348	1.269
	200.8	51.4	18.37	116.84	1.760	4.252	1.592	1.285	1.336	1.299
112900BN331	162.1	49.5	20.44	33.47	1.923	3.065	1.660	1.337	1.352	1.298
112900BN361	162.1	50.2	20.43	33.47	1.828	5.344	1.643	1.427	1.448	1.321
	200.8	52.0	18.60	116.84	2.250	5.804	1.805	1.419	1.514	1.550
112900BN051	162.1	50.3	20.43	33.47	1.772	4.423	1.666	1.480	1.477	1.387
	200.8	52.5	18.60	116.83	1.909	7.357	1.647	1.553	1.544	1.452
113000AN491	201.2	52.8	22.64	89.37	1.963	5.817	1.681	1.371	1.430	1.344
	121.2	46.9	20.47	64.04	1.862	1.904	1.498	1.333	1.333	1.272
113000AN671	201.2	52.5	22.64	89.37	2.035	6.543	1.729	1.418	1.474	1.351
	121.2	48.5	20.50	64.04	2.357	2.410	1.598	1.345	1.364	1.285
113000AN341	201.3	52.2	22.57	89.34	2.061	9.562	1.691	1.487	1.558	1.442
	121.1	45.4	20.47	64.04	2.508	6.136	1.682	1.542	1.572	1.437
113000AN741	201.3	52.9	22.70	89.34	1.970	7.367	1.670	1.401	1.451	1.349
	121.1	49.1	20.43	64.04	1.928	5.957	1.602	1.420	1.454	1.347
113000BN621	160.9	53.7	25.37	43.50	2.342	4.741	1.630	1.373	1.411	1.343
	161.0	48.3	22.44	115.57	2.214	5.412	1.497	1.361	1.385	1.337
113000BN801	160.9	52.6	25.37	43.50	1.881	3.670	1.631	1.383	1.379	1.378
	161.0	49.3	22.40	115.57	1.645	3.226	1.555	1.367	1.348	1.340
113000BN201	161.0	53.8	25.40	43.54	1.879	4.763	1.618	1.413	1.420	1.371
	160.9	49.1	22.41	115.57	1.849	5.560	1.629	1.482	1.465	1.412
113000BN351	160.9	53.0	25.37	43.54	1.558	1.602	1.497	1.385	1.364	1.356
	160.9	48.2	22.40	115.57	1.638	1.656	1.541	1.411	1.389	1.379
120400AN791	160.9	41.9	15.33	23.74	1.904	7.069	1.647	1.443	1.460	1.317
	201.6	49.2	23.30	140.14	2.139	8.532	1.713	1.452	1.529	1.354
120400AN781	161.1	41.4	15.33	23.70	1.844	8.366	1.668	1.434	1.514	1.382
	201.7	48.5	23.36	140.13	1.928	7.796	1.723	1.488	1.535	1.444

Profile	Dive Depth (fsw)	DSCNT RATE (fsw/min)	BOTTOM Time (min)	Total Dive Time (min)	---PO2 Overshoot Data--- PO2 MAX (atm)	Time PO2>1.45 (min)	TWA PO2 (atm)	Pst OS TWA PO2 (atm)	BT TWA PO2 (atm)	Dive TWA PO2 (atm)
120400AN751	161.0	40.4	15.30	23.70	1.808	6.932	1.639	1.432	1.486	1.361
	201.7	49.4	23.47	140.14	1.881	6.646	1.693	1.491	1.522	1.428
120400AN211	160.9	41.9	15.34	23.70	2.133	9.678	1.706	1.454	1.573	1.384
	201.6	49.0	23.30	140.14	1.982	10.175	1.661	1.483	1.552	1.381
120400BN551	201.2	52.3	15.30	31.87	1.779	6.257	1.616	1.425	1.457	1.381
	121.0	50.4	20.30	51.90	1.662	2.430	1.554	1.481	1.453	1.377
	120.9	55.8	16.64	61.11	1.633	1.407	1.488	1.483	1.451	1.383
120400BN451	201.1	41.5	15.20	31.87	1.948	7.243	1.677	1.436	1.508	1.341
	121.0	50.8	20.45	51.90	1.812	2.187	1.480	1.398	1.395	1.297
	120.9	53.7	16.57	61.11	2.139	1.829	1.545	1.385	1.385	1.284
120400BN801	201.1	53.0	15.30	31.87	2.516	8.565	1.678	1.472	1.562	1.379
	120.9	51.0	20.43	51.90	2.185	3.667	1.563	1.437	1.439	1.320
	120.9	55.6	16.53	61.07	1.941	4.272	1.646	1.403	1.429	1.301
120400BN721	201.1	52.7	15.40	31.87	2.148	7.948	1.600	1.408	1.480	1.387
	121.0	52.1	20.33	51.90	1.644	0.965	1.395	1.483	1.447	1.365
	120.9	56.5	16.60	61.11	1.793	2.314	1.639	1.471	1.446	1.363
120500AN691	121.1	53.3	25.47	30.87	1.534	2.153	1.488	1.372	1.351	1.292
	121.5	52.9	15.53	20.93	1.615	3.778	1.558	1.391	1.403	1.296
	201.2	52.0	13.43	94.71	1.875	8.692	1.657	1.329	1.513	1.334
120500AN361	121.1	53.9	25.50	30.90	1.875	3.444	1.656	1.369	1.391	1.314
	121.8	52.6	15.40	20.93	2.196	1.833	1.602	1.424	1.428	1.309
	201.2	52.9	13.43	94.74	2.056	4.300	1.709	1.448	1.454	1.419
120500AN481	121.1	53.4	25.50	30.90	1.685	3.179	1.575	1.395	1.385	1.313
	121.6	52.5	15.43	20.93	1.898	4.321	1.650	1.423	1.441	1.308
	201.2	51.9	13.47	94.74	2.048	7.279	1.644	1.448	1.531	1.396
120500AN051	121.1	53.2	25.50	30.87	1.545	0.062	1.927	1.390	1.362	1.298
	121.6	52.0	15.53	20.93	1.550	0.903	1.518	1.386	1.343	1.252
	201.2	52.1	13.43	94.70	1.749	5.835	1.610	1.354	1.422	1.323
120500BN501	160.9	46.2	15.63	23.67	1.633	1.326	1.577	1.399	1.320	1.259
120500BN071	160.9	45.4	15.60	23.67	2.101	2.345	1.829	1.365	1.387	1.263
	200.9	51.6	23.63	139.97	2.047	6.180	1.739	1.435	1.495	1.421
120500BN381	160.9	44.4	15.57	23.63	1.729	5.422	1.563	1.371	1.388	1.254
	201.0	51.5	23.33	139.97	2.048	7.013	1.706	1.394	1.459	1.369
120500BN021	160.9	44.7	15.57	23.64	1.599	0.301	1.545	1.355	1.266	1.201
	201.0	51.3	23.36	139.97	1.818	7.809	1.656	1.350	1.434	1.339
120600AN671	121.2	56.3	20.60	24.07	1.552	1.243	1.519	1.416	1.387	1.350
120600AN621	121.2	55.6	20.73	24.10	1.542	1.181	1.490	1.331	1.313	1.266
	201.3	54.3	23.67	134.97	1.765	4.970	1.633	1.352	1.392	1.317
120600AN741	121.2	56.1	20.73	24.10	1.700	4.179	1.565	1.434	1.422	1.358
	201.3	53.3	23.37	134.97	1.872	7.833	1.642	1.501	1.521	1.438
120600AN301	121.2	55.2	20.64	24.07	1.660	1.702	1.185	1.371	1.345	1.292
	201.3	54.0	23.60	135.00	2.214	7.716	1.687	1.446	1.518	1.433
120600BN391	121.3	56.5	20.50	24.10	1.626	0.500	1.594	1.452	1.414	1.361
	121.1	54.8	20.53	30.03	1.841	4.137	1.544	1.461	1.449	1.344
	32.8	19.4	3.27	3.70	1.092	0.000	0.000	0.000	0.928	0.903
120600BN641	121.2	56.6	20.53	24.10	1.514	0.135	1.482	1.304	1.268	1.223
	121.1	56.2	20.56	30.06	1.448	0.000	0.000	0.000	1.320	1.241
	32.6	19.5	3.30	3.70	1.195	0.000	0.000	0.000	0.759	0.737
120600BN341	121.1	56.5	20.60	24.14	1.504	0.107	1.477	1.370	1.339	1.284
	121.0	56.0	20.63	30.03	1.910	2.753	1.492	1.471	1.460	1.335
	61.8	1512.2	0.00	0.00	1.144	0.000	0.000	0.000	0.000	0.000
120700AN791	201.3	46.8	17.67	52.10	2.006	8.428	1.740	1.376	1.519	1.426
	201.1	51.8	15.60	95.84	2.193	8.529	1.815	1.445	1.631	1.443
120700AN451	201.3	46.7	17.40	52.10	1.841	6.124	1.598	1.372	1.411	1.354
	201.1	49.1	15.30	95.87	1.711	7.272	1.505	1.462	1.434	1.359
120700AN811	201.2	46.7	17.43	52.10	2.043	6.381	1.571	1.347	1.411	1.320
	201.2	51.4	15.30	95.87	2.049	7.208	1.697	1.336	1.493	1.305
120700AN721	201.3	46.9	17.63	52.10	1.956	6.044	1.689	1.387	1.461	1.358
	201.0	51.0	15.60	95.84	1.912	5.129	1.681	1.365	1.421	1.334
120700BN521	121.0	53.0	15.47	19.07	1.541	0.974	1.458	1.359	1.330	1.273
	120.8	56.2	15.61	19.10	1.623	3.525	1.513	1.425	1.413	1.343
	160.9	51.7	22.53	102.67	1.888	6.134	1.680	1.434	1.481	1.409
120700BN781	120.9	52.4	15.50	19.10	1.907	3.499	1.552	1.345	1.375	1.299
	121.0	57.9	15.47	19.07	2.273	3.066	1.683	1.415	1.452	1.373
	160.8	51.7	22.47	102.67	2.429	5.995	1.740	1.438	1.510	1.437

Profile	Dive Depth (fsw)	DSCNT RATE (fsw/min)	BOTTOM Time (min)	Total Dive Time (min)	---PO2 Overshoot Data--- PO2 MAX (atm)	Time PO2>1.45 (min)	TWA PO2 (atm)	Pst OS TWA PO2 (atm)	BT TWA PO2 (atm)	Dive TWA PO2 (atm)
120700BN751	121.0	53.1	15.43	19.07	1.434	0.000	0.000	0.000	1.269	1.226
	120.8	56.2	15.57	19.10	1.505	0.402	1.472	1.339	1.319	1.264
	160.9	51.7	22.53	102.67	2.205	5.234	1.718	1.335	1.405	1.329
120700BN211	120.9	53.2	15.50	19.10	1.807	3.792	1.554	1.305	1.340	1.266
	121.0	56.9	15.50	19.07	1.860	3.205	1.620	1.382	1.405	1.323
	160.9	52.7	22.50	102.67	2.229	5.930	1.644	1.374	1.430	1.352
121100AN372	200.8	43.7	22.47	89.07	1.863	6.529	1.609	1.398	1.409	1.386
	120.3	45.6	20.50	64.27	2.530	2.436	1.653	1.407	1.418	1.361
121100AN851	200.8	44.6	22.73	89.07	1.831	8.143	1.604	1.440	1.468	1.414
	120.3	45.5	20.40	64.27	1.637	1.501	1.485	1.449	1.430	1.381
121100AN692	200.8	44.7	22.50	89.07	1.743	5.527	1.600	1.470	1.431	1.491
	120.3	44.7	20.40	64.27	1.694	2.374	1.533	1.392	1.373	1.358
121100AN051	200.8	44.3	22.73	89.07	1.885	7.957	1.682	1.408	1.480	1.400
	120.3	45.6	20.38	64.27	1.625	3.159	1.496	1.388	1.375	1.320
121200AN491	120.9	45.9	15.47	19.03	1.604	3.266	1.522	1.413	1.396	1.335
	161.1	57.7	21.67	61.37	1.651	3.439	1.538	1.431	1.425	1.360
121200AN091	120.8	45.6	15.50	19.07	1.518	0.638	1.486	1.190	1.166	1.111
	161.1	57.1	21.67	61.37	1.882	3.181	1.541	1.438	1.432	1.377
	121.0	53.4	20.60	67.00	2.266	1.945	1.576	1.408	1.414	1.370
121200AN331	120.8	45.7	15.53	19.07	1.927	2.881	1.575	1.231	1.275	1.199
	161.1	57.4	21.67	61.37	2.180	3.599	1.745	1.445	1.484	1.417
	121.0	53.1	20.57	67.01	1.613	1.535	1.574	1.446	1.420	1.384
121200AN861	120.9	45.8	15.46	19.04	1.900	5.065	1.574	1.426	1.437	1.349
	161.1	57.9	21.57	61.37	2.164	8.210	1.702	1.476	1.551	1.428
	121.0	53.7	20.54	66.97	1.970	4.924	1.641	1.479	1.487	1.403
121300AN791	201.0	50.2	20.40	55.07	2.089	8.486	1.771	1.411	1.535	1.434
121300AN751	201.0	50.7	20.43	55.07	1.824	7.348	1.661	1.431	1.492	1.427
121300AN411	201.1	51.1	20.63	55.03	1.930	6.965	1.666	1.418	1.483	1.389
121300BN922	120.9	53.8	20.47	23.87	1.953	2.789	1.665	1.397	1.407	1.341
	160.8	54.8	15.43	36.30	2.213	6.702	1.686	1.428	1.524	1.349
	120.7	53.8	21.43	77.91	1.947	1.255	1.582	1.471	1.448	1.368
121300BN872	120.8	54.3	20.57	23.87	1.715	1.578	1.619	1.370	1.364	1.307
	160.9	54.7	15.30	36.30	1.857	5.583	1.569	1.364	1.425	1.287
	120.9	55.2	21.50	77.94	2.114	4.781	1.640	1.362	1.416	1.322
121300BN57	120.9	54.5	20.47	23.87	2.159	4.898	1.624	1.358	1.410	1.347
	160.8	55.0	15.37	36.30	2.129	6.959	1.679	1.397	1.514	1.339
	120.7	54.4	21.27	77.91	2.240	4.851	1.644	1.385	1.435	1.335
121400AN531-2	120.9	53.4	20.50	24.14	1.945	1.207	1.674	1.393	1.365	1.306
	120.9	53.7	25.40	49.06	1.831	1.230	1.473	1.387	1.373	1.314
	201.1	51.6	13.50	93.78	2.132	3.571	1.481	1.295	1.333	1.311
121400AN321-2	120.7	53.0	20.47	24.14	1.531	0.466	1.499	1.410	1.383	1.324
	120.9	53.2	25.50	49.10	1.501	0.485	1.483	1.444	1.418	1.343
	201.1	52.7	13.50	93.78	1.866	8.626	1.648	1.583	1.579	1.406
121400AN141-2	120.7	52.7	20.53	24.13	1.583	1.054	1.508	1.408	1.391	1.343
	120.9	54.2	25.43	49.10	1.569	2.852	1.501	1.401	1.391	1.353
	201.1	52.5	13.52	93.77	1.757	5.417	1.629	1.452	1.474	1.403
121400BN881	162.4	53.5	20.43	33.47	2.498	8.027	1.674	1.433	1.511	1.374
	200.8	52.9	18.40	117.00	2.198	8.309	1.679	1.414	1.525	1.395
121400BN481	162.4	32.2	20.24	33.50	1.750	5.823	1.594	1.414	1.420	1.337
	200.8	52.0	18.26	117.03	1.948	6.505	1.631	1.419	1.471	1.427
121400BN311	162.4	53.2	20.44	33.47	1.757	3.925	1.573	1.462	1.422	1.376
	200.8	52.7	18.20	117.00	1.819	4.763	1.655	1.435	1.426	1.539
020501AN491	97.9	35.5	4.93	7.90	1.553	0.231	1.504	1.513	1.198	1.179
020501AN291	98.0	34.4	4.90	7.93	1.631	2.755	1.541	1.412	1.372	1.249
020501AN551	98.0	33.6	4.93	7.90	1.620	1.175	1.451	1.409	1.240	1.173
020501BN671	121.0	45.4	25.44	31.37	1.617	2.933	1.547	1.731	1.662	1.564
	121.2	31.2	25.36	59.26	1.633	3.229	1.535	1.438	1.422	1.343
	121.1	45.8	25.54	82.17	1.617	3.015	1.533	1.431	1.424	1.334
020501BN772	121.0	45.7	25.43	31.40	1.797	4.900	1.617	1.393	1.425	1.333
	121.1	41.2	25.40	59.30	1.693	3.432	1.570	1.386	1.393	1.439
	121.2	46.7	25.50	82.17	1.756	4.377	1.589	1.400	1.413	1.475
020501BN342	120.9	45.2	25.53	31.40	1.487	0.208	1.477	1.435	1.383	1.337
	121.2	42.2	25.47	59.30	1.472	0.078	1.464	1.413	1.362	1.355
	121.1	44.6	25.50	82.17	1.562	0.438	1.515	1.422	1.380	1.362

Profile	Dive Depth (fsw)	DSCNT RATE (fsw/min)	BOTTOM Time (min)	Total Dive Time (min)	---PO2 Overshoot Data--- PO2 MAX (atm)	Time PO2>1.45 (min)	TWA PO2 (atm)	Pst OS TWA PO2 (atm)	BT TWA PO2 (atm)	Dive TWA PO2 (atm)
020501BN831	120.9	44.9	25.40	31.40	1.603	1.548	1.524	1.477	1.450	1.404
	121.2	28.8	25.33	59.26	1.672	3.484	1.466	1.471	1.445	1.382
	121.1	46.0	25.53	82.17	1.719	3.101	1.545	1.473	1.451	1.372
020501AN581	98.0	35.0	4.90	7.93	2.014	0.047	1.922	0.000	1.028	1.076
020601AN501	29.0	45.3	2.57	3.47	0.930	0.000	0.000	0.000	0.745	0.714
020601AN391	28.9	44.9	2.70	3.50	0.961	0.000	0.000	0.000	0.821	0.780
020601AN121	28.9	45.3	2.73	3.47	0.893	0.000	0.000	0.000	0.749	0.728
020601AN421	29.0	45.2	2.60	3.47	1.003	0.000	0.000	0.000	0.808	0.771
020601BN521	120.7	44.6	25.47	31.03	1.944	2.322	1.589	1.424	1.425	1.340
	120.5	44.4	25.33	59.00	1.785	0.795	1.604	1.434	1.410	1.353
	120.5	42.9	25.37	81.97	1.550	1.288	1.461	1.433	1.405	1.356
020601BN351	120.7	45.9	25.40	31.00	1.682	0.906	1.593	1.547	1.512	1.438
	120.5	45.5	25.40	59.00	1.587	1.433	1.494	1.559	1.534	1.417
	120.5	44.2	25.34	82.01	1.534	0.932	1.476	1.547	1.517	1.408
020601BN211	120.7	45.1	25.50	31.03	1.980	3.901	1.676	1.462	1.472	1.382
	120.5	44.7	25.36	59.00	1.910	5.355	1.543	1.463	1.467	1.379
	120.5	42.9	25.37	81.97	2.269	2.426	1.607	1.459	1.461	1.381
020701N531	160.8	45.2	25.47	43.74	1.921	5.366	1.551	1.399	1.417	1.361
	160.6	47.5	25.37	118.64	2.129	5.454	1.636	1.405	1.446	1.369
020701N172	40.8	12.8	7.03	7.90	1.555	0.520	1.503	1.220	1.063	1.051
020701N662	40.9	33.4	7.07	7.93	2.017	0.381	1.858	0.000	0.640	0.725
020701N362	40.9	14.3	6.97	7.93	1.662	1.115	1.578	0.457	0.996	0.942
020701N312	40.8	14.2	7.00	7.90	1.424	0.000	0.000	0.000	1.021	1.012
020701N931	160.8	44.8	25.47	43.73	1.953	5.568	1.619	1.397	1.412	1.368
	160.5	48.0	25.40	118.63	2.439	5.562	1.682	1.447	1.488	1.420
020701N081	160.8	45.1	25.47	43.74	1.758	2.861	1.578	1.462	1.441	1.403
	160.6	47.9	25.47	118.64	1.664	3.799	1.518	1.454	1.436	1.379
020801AN671	120.8	45.9	25.43	30.97	1.565	2.393	1.505	1.537	1.491	1.441
	121.0	44.2	25.47	58.96	1.454	0.016	1.452	1.517	1.474	1.447
	120.8	48.3	25.43	81.90	2.575	8.408	1.908	1.298	1.483	1.548
020801AN771	120.9	45.4	25.53	30.97	1.640	0.807	1.562	1.425	1.396	1.338
	121.1	43.7	25.40	58.96	1.775	2.625	1.646	1.443	1.435	1.347
	120.8	47.1	25.50	81.91	1.696	2.632	1.550	1.443	1.420	1.344
020801AN581	120.8	45.8	25.53	30.97	2.133	2.375	1.660	1.414	1.422	1.336
	120.9	43.4	25.46	58.96	2.110	3.029	1.700	1.431	1.451	1.349
	120.8	46.2	25.53	81.90	2.139	3.043	1.661	1.419	1.433	1.343
020801AN861	120.9	46.5	25.53	30.97	1.755	3.420	1.601	1.412	1.400	1.322
	121.1	43.3	25.47	58.96	1.786	2.266	1.408	1.425	1.402	1.328
	120.8	46.6	25.50	81.91	2.051	3.545	1.571	1.414	1.427	1.346
020801BN651	161.2	43.1	25.47	43.47	1.866	6.232	1.668	1.405	1.450	1.422
	161.0	45.3	25.57	118.50	1.790	3.061	1.648	1.629	1.595	1.560
020801BN561	161.1	42.9	25.47	43.47	1.633	3.132	1.550	1.389	1.362	1.378
	161.0	44.7	25.56	118.50	1.670	3.877	1.585	1.398	1.383	1.397
020801BN451	161.2	43.8	25.47	43.47	1.497	0.396	1.477	1.367	1.318	1.321
	161.0	45.4	25.60	118.50	1.550	1.096	1.493	1.382	1.345	1.337
020801BN461	161.2	43.8	25.47	43.47	2.182	9.637	1.674	1.471	1.539	1.422
	161.0	45.7	25.47	118.50	2.082	5.454	1.703	1.474	1.514	1.377
021201AN521	121.2	39.7	25.40	31.02	2.010	4.452	1.525	1.435	1.438	1.354
	121.4	46.1	25.43	59.00	1.917	5.344	1.569	1.414	1.437	1.354
	121.4	46.1	25.47	82.07	2.053	2.457	1.650	1.405	1.415	1.346
021201AN121	121.2	39.6	25.40	31.04	1.641	4.677	1.518	1.726	1.633	1.605
	121.4	45.7	25.50	59.00	1.675	3.417	1.533	1.579	1.538	1.456
	121.3	46.0	25.53	82.07	2.281	4.970	1.895	1.301	1.399	1.528
021201AN192	121.3	39.1	25.47	31.03	1.467	0.134	1.462	1.445	1.396	1.344
	121.5	46.9	25.47	59.00	1.556	0.928	1.479	1.435	1.399	1.374
	121.3	46.0	25.53	82.07	1.524	1.868	1.501	1.441	1.394	1.384
021201AN582	121.3	39.6	25.43	31.03	2.038	0.040	1.973	0.000	1.203	1.227
	121.4	45.3	25.43	59.00	1.671	3.428	1.547	1.465	1.443	1.404
	121.3	46.3	25.57	82.07	1.996	0.047	1.905	0.000	1.252	1.482
021201BN701	161.3	17.2	25.37	43.40	1.938	15.172	1.575	1.436	1.285	1.274
	161.1	38.7	25.43	118.60	1.966	5.304	1.662	1.467	1.473	1.401
021201BN391	161.3	18.3	25.50	43.40	2.364	9.816	1.817	1.506	1.365	1.327
	161.2	40.0	25.40	118.60	2.278	9.767	1.777	1.506	1.598	1.460
021201BN111	161.2	18.3	25.60	43.42	2.011	0.047	1.919	0.000	1.054	1.180

Profile	Dive Depth (fsw)	DSCNT RATE (fsw/min)	BOTTOM Time (min)	Total Dive Time (min)	---PO2 Overshoot Data--- PO2 MAX (atm)	Time PO2>1.45 (min)	TWA PO2 (atm)	Pst OS TWA PO2 (atm)	BT TWA PO2 (atm)	Dive TWA PO2 (atm)
022701BN3912	80.4	39.1	25.60	27.57	2.017	0.048	1.930	0.000	1.054	1.064
	80.3	49.6	25.53	27.63	2.023	0.047	1.934	0.000	1.069	1.079
	80.3	49.0	25.30	27.57	2.023	0.047	1.928	0.000	1.068	1.075
	80.2	50.8	25.67	27.67	2.008	0.048	1.917	0.000	1.069	1.080
	80.4	42.9	25.63	27.56	2.017	0.047	1.928	0.000	1.065	1.075
021301AN331	121.0	46.5	25.44	31.10	1.999	0.046	1.912	0.000	1.249	1.258
	120.9	43.1	25.57	59.10	2.010	19.752	1.660	1.290	1.567	1.565
	120.9	45.9	25.37	82.04	2.031	6.638	1.574	1.514	1.518	1.439
021301AN361	121.2	46.7	25.40	31.07	1.718	1.092	1.305	1.469	1.424	1.363
	120.8	43.5	25.57	59.07	1.667	0.313	1.594	1.452	1.404	1.375
	120.9	44.6	25.36	82.03	1.851	0.661	1.748	1.365	1.351	1.507
021301N611	121.2	45.4	25.40	31.10	2.002	0.047	1.906	0.000	1.223	1.236
	120.8	43.9	25.60	59.07	1.882	4.018	1.620	1.423	1.422	1.400
	120.9	45.5	25.37	82.04	1.514	0.370	1.487	1.448	1.408	1.423
021301AN631	121.0	46.1	25.44	31.10	2.002	0.048	1.915	0.000	1.249	1.258
	120.8	43.7	25.60	59.10	1.544	0.857	1.518	1.578	1.538	1.432
	120.9	45.5	25.40	82.04	1.935	11.732	1.648	1.613	1.596	1.450
021401AN491	121.1	43.0	25.63	31.28	1.490	0.204	1.466	1.362	1.327	1.289
021401AN531	121.0	42.0	25.63	31.30	1.740	1.764	1.618	1.416	1.390	1.302
	121.1	45.4	25.36	58.96	1.992	3.569	1.564	1.490	1.488	1.402
	120.9	45.9	25.37	81.94	2.056	2.319	1.517	1.485	1.480	1.416
021401AN34	121.1	42.2	25.37	31.30	1.715	1.684	1.509	1.495	1.464	1.387
	121.1	46.5	25.33	58.96	1.756	3.911	1.568	1.524	1.501	1.412
	120.9	46.7	25.47	81.97	1.654	2.507	1.553	1.524	1.501	1.409
021401AN83	121.1	42.8	25.40	31.30	1.605	3.827	1.515	1.422	1.409	1.349
	121.1	46.2	25.37	58.96	1.673	4.182	1.581	1.460	1.453	1.370
	120.8	46.7	25.53	81.97	1.599	2.109	1.513	1.458	1.437	1.352
021501AN041	120.9	47.3	25.40	31.20	1.842	6.085	1.599	1.553	1.531	1.452
021501AN781	120.9	46.0	25.46	31.19	1.716	5.627	1.615	1.540	1.530	1.457
021501AN551	120.9	46.1	25.40	31.17	1.451	0.019	1.451	1.469	1.431	1.374
021501AN211	120.9	47.1	25.43	31.17	1.502	0.151	1.476	1.388	1.333	1.306
021501BN521	161.1	44.9	25.50	43.57	1.546	1.664	1.500	1.408	1.372	1.395
	160.7	46.8	25.37	118.54	1.701	4.062	1.608	1.415	1.413	1.461
021501BN581	161.1	45.5	25.47	43.57	1.909	3.105	1.668	1.320	1.339	1.271
	160.7	44.2	25.56	118.56	1.956	4.401	1.618	1.292	1.330	1.297
021501BN421	161.1	44.8	25.57	43.57	2.004	1.734	1.712	1.434	1.423	1.367
	160.7	45.0	25.40	118.54	2.056	7.159	1.657	1.416	1.473	1.364
021501BN721	160.9	45.2	25.43	43.57	1.716	5.302	1.558	1.410	1.413	1.385
	160.7	45.5	25.46	118.54	1.880	6.644	1.618	1.431	1.461	1.389
022001AN481	80.6	48.3	110.33	112.73	1.738	0.883	1.312	1.420	1.417	1.406
022001AN311	80.7	48.1	110.33	112.73	1.451	-0.348	1.398	1.446	1.441	1.431
022001AN351	80.6	48.7	110.33	112.73	1.543	1.811	1.512	1.503	1.492	1.482
022001BN591	80.9	46.5	110.47	112.57	1.721	1.584	1.560	1.431	1.428	1.420
022001BN661	80.9	44.8	110.50	112.60	1.465	0.213	1.458	1.460	1.453	1.444
022001BN051	80.9	45.3	110.53	112.60	1.537	3.367	1.104	1.419	1.406	1.397
022101AN021	80.7	43.9	130.53	132.70	1.456	0.067	1.455	1.428	1.420	1.413
022101AN771	80.7	43.8	130.64	132.70	1.546	0.659	1.516	1.328	1.318	1.312
022101AN341	80.7	44.1	130.67	132.70	1.557	0.598	1.534	1.327	1.316	1.309
022101AN201	80.7	43.3	130.53	132.70	1.461	0.310	1.456	1.442	1.432	1.425
022101BN832	80.4	45.4	25.57	27.60	1.494	0.447	1.471	1.401	1.353	1.324
	80.3	44.6	25.63	27.76	1.574	0.377	1.530	1.371	1.346	1.337
	80.4	42.0	25.44	27.80	1.621	2.526	1.526	1.367	1.355	1.339
	80.7	47.1	25.57	27.63	1.574	2.820	1.494	1.364	1.355	1.339
	80.8	47.2	25.57	27.60	1.515	1.867	1.479	1.416	1.392	1.360
022101BN102	80.3	46.9	25.67	27.63	1.477	0.252	1.465	1.378	1.356	1.326
	80.3	44.4	25.56	27.76	1.527	0.150	1.492	1.425	1.401	1.367
	80.4	41.6	25.34	27.80	1.872	5.416	1.585	1.415	1.437	1.399
	80.7	48.5	25.37	27.67	1.669	2.720	1.580	1.418	1.423	1.388
	80.7	46.0	25.53	27.60	1.455	0.192	1.392	1.429	1.411	1.375
022101BN291	80.4	47.5	25.60	27.63	1.568	0.328	1.528	1.328	1.313	1.280
	80.3	45.2	25.60	27.76	1.759	0.932	1.416	1.373	1.365	1.326
	80.4	41.8	25.47	27.80	1.659	0.744	1.569	1.402	1.392	1.354
	80.5	47.9	25.57	27.67	1.780	2.167	1.508	1.396	1.395	1.363
	80.9	46.6	25.60	27.60	1.955	1.079	1.506	1.406	1.402	1.365

Profile	Dive Depth (fsw)	DSCNT RATE (fsw/min)	BOTTOM Time (min)	Total Dive Time (min)	---PO2 Overshoot Data--- PO2 MAX (atm)	Time PO2>1.45 (min)	TWA PO2 (atm)	Pst OS TWA PO2 (atm)	BT TWA PO2 (atm)	Dive TWA PO2 (atm)
022101BN411	80.4	45.7	25.60	27.63	1.495	0.195	1.473	1.355	1.335	1.308
	80.3	43.2	25.60	27.76	1.488	0.192	1.472	1.394	1.372	1.343
	80.4	42.0	25.70	27.80	1.568	1.173	1.520	1.410	1.391	1.362
	80.5	47.3	25.57	27.67	1.529	0.263	1.491	1.433	1.414	1.387
	80.9	46.2	25.40	27.60	1.517	1.549	1.480	1.425	1.408	1.379
022201BN371	80.8	44.4	130.69	132.65	1.469	0.620	1.466	1.210	1.229	1.229
022201BN041	80.9	43.7	130.63	132.67	1.614	2.220	1.514	1.159	1.163	1.164
022201BN211	80.8	43.8	130.63	132.66	1.677	0.702	1.638	1.424	1.420	1.412
022201BN081	80.8	42.9	130.63	132.66	1.681	0.759	1.560	1.449	1.447	1.437
022201cN5212	80.4	48.1	25.37	27.63	1.706	0.905	1.439	1.350	1.343	1.309
	80.5	28.0	25.56	27.66	1.974	4.883	1.448	1.354	1.363	1.328
	80.4	45.5	25.60	27.60	1.532	0.840	1.519	1.354	1.343	1.309
	80.4	43.1	25.60	27.60	1.542	0.325	1.517	1.345	1.328	1.300
	80.2	47.9	25.57	27.63	2.008	0.047	1.916	0.000	1.065	1.073
022201cN3612	80.4	47.1	25.37	27.63	2.236	0.885	1.780	1.311	1.309	1.272
	80.5	25.2	25.60	27.66	1.964	2.462	1.640	1.375	1.375	1.338
	80.4	45.1	25.64	27.64	2.153	1.179	1.618	1.394	1.392	1.357
	80.5	42.8	25.64	27.60	1.803	1.145	1.632	1.393	1.387	1.352
	80.2	47.6	25.33	27.63	1.771	1.052	1.440	1.411	1.395	1.356
022201cN46123	80.2	48.2	25.37	27.64	1.755	1.451	1.540	1.285	1.294	1.259
	80.4	24.8	25.56	27.66	1.981	6.458	1.639	1.492	1.494	1.453
	80.4	45.5	25.64	27.64	1.894	24.761	1.707	1.425	1.687	1.638
	80.5	43.2	25.64	27.60	2.160	24.736	2.132	0.000	2.096	2.033
	80.2	47.3	25.33	27.63	2.032	0.047	1.934	0.000	1.066	1.075
022201cN42123	80.2	47.6	25.37	27.64	1.399	0.000	0.000	0.000	1.274	1.245
	80.4	24.9	25.56	27.67	1.846	1.289	1.620	1.511	1.481	1.447
	80.4	44.4	25.47	27.60	1.904	0.953	1.633	1.733	1.704	1.659
	80.5	43.5	25.64	27.60	1.641	0.563	1.569	1.588	1.558	1.518
	80.2	47.7	25.37	27.63	2.035	0.047	1.935	0.000	1.066	1.075
022301AN591	82.0	45.1	130.53	132.57	2.002	0.047	1.910	0.000	1.093	1.093
022301AN221	82.0	32.5	130.30	132.60	1.999	0.046	1.906	0.000	1.093	1.093
022301AN071	82.0	43.8	130.33	132.60	1.467	0.191	1.461	1.373	1.368	1.362
022301AN751	82.0	44.0	130.30	132.60	1.454	0.101	1.452	1.391	1.383	1.379
022601AN671	83.1	11.9	130.47	132.77	2.139	16.006	1.274	1.088	1.111	1.112
022601AN341	83.1	12.3	130.47	132.77	1.861	15.496	1.239	1.088	1.106	1.107
022601AN101	83.1	11.8	130.43	132.76	1.518	10.410	1.363	1.393	1.384	1.377
022601AN201	83.1	12.1	130.46	132.76	1.507	0.600	1.505	1.466	1.428	1.420
022601BN091	80.0	50.8	25.70	27.70	1.680	0.769	1.561	1.396	1.389	1.352
	80.2	50.3	25.63	27.60	2.136	2.219	1.698	1.445	1.460	1.422
	81.1	49.2	25.40	27.70	2.089	1.225	1.670	1.457	1.456	1.415
	80.3	48.1	25.64	27.60	1.850	0.694	1.593	1.466	1.452	1.414
	80.5	45.8	25.66	27.63	1.866	1.058	1.578	1.451	1.446	1.410
022601BN561	80.0	50.4	25.67	27.70	1.499	0.608	1.494	1.338	1.324	1.292
	80.2	48.2	25.66	27.60	1.510	0.417	1.389	1.385	1.369	1.336
	81.1	50.9	25.40	27.70	2.116	1.627	1.407	1.424	1.413	1.372
	80.4	48.3	25.67	27.60	2.091	1.229	1.516	1.408	1.401	1.369
	80.5	45.3	25.66	27.62	1.963	1.358	1.458	1.419	1.415	1.381
022601BN831	80.1	50.6	25.70	27.70	1.911	0.727	1.714	1.087	1.104	1.112
	80.2	49.0	25.73	27.63	2.008	0.047	1.915	0.000	1.035	1.046
	81.1	49.9	25.67	27.70	1.728	0.764	1.645	1.090	1.106	1.111
	80.2	47.6	25.44	27.60	1.776	1.425	1.399	1.085	1.101	1.106
	80.4	47.1	25.40	27.64	1.513	0.403	1.497	1.092	1.097	1.103
022601BN741	80.1	51.6	25.73	27.73	2.010	0.810	1.771	1.087	1.108	1.116
	80.2	49.0	25.63	27.63	1.756	0.836	1.668	1.088	1.106	1.111
	81.2	50.3	25.67	27.70	1.552	0.518	1.529	1.091	1.096	1.102
	80.2	48.2	25.47	27.60	2.335	1.812	1.592	1.084	1.121	1.124
	80.4	45.3	25.40	27.63	2.014	0.048	1.923	0.000	1.082	1.089
022701AN251	80.9	44.8	130.57	132.60	1.591	0.413	1.530	1.421	1.417	1.410
022701AN581	80.9	46.7	130.59	132.63	1.814	1.023	1.431	1.410	1.408	1.400
022701AN551	80.9	46.1	130.60	132.63	1.627	0.599	1.619	1.470	1.464	1.457
022701AN861	80.9	45.0	130.54	132.60	1.451	0.012	1.450	1.379	1.375	1.368
022701BN3912	80.4	39.1	25.60	27.57	2.017	0.048	1.930	0.000	1.054	1.064
	80.3	49.6	25.53	27.63	2.023	0.047	1.934	0.000	1.069	1.079
	80.3	49.0	25.30	27.57	2.023	0.047	1.928	0.000	1.068	1.075
	80.2	50.8	25.67	27.67	2.008	0.048	1.917	0.000	1.069	1.080
	80.4	42.9	25.63	27.56	2.017	0.047	1.928	0.000	1.065	1.075

Profile	Dive Depth (fsw)	DSCNT RATE (fsw/min)	BOTTOM Time (min)	Total Dive Time (min)	---PO2 Overshoot Data--- PO2 MAX (atm)	Time PO2>1.45 (min)	TWA PO2 (atm)	Pst OS TWA PO2 (atm)	BT TWA PO2 (atm)	Dive TWA PO2 (atm)
022701BN1412	80.4	39.3	25.63	27.57	1.497	0.571	1.491	1.411	1.380	1.352
	80.4	50.5	25.36	27.66	1.500	1.774	1.477	1.475	1.440	1.409
	80.3	49.4	25.53	27.57	1.542	1.883	1.503	1.483	1.462	1.429
	80.3	51.4	25.64	27.67	1.507	0.120	1.479	1.486	1.462	1.429
	80.5	43.1	25.63	27.57	1.493	1.219	1.204	1.458	1.439	1.409
022701BN7812	80.4	37.4	25.60	27.57	2.017	0.047	1.928	0.000	1.040	1.050
	80.4	50.3	25.67	27.67	2.026	0.018	1.847	0.000	1.067	1.079
	80.3	48.1	25.37	27.57	2.020	0.047	1.924	0.000	1.068	1.075
	80.2	51.3	25.67	27.67	2.008	0.047	1.916	0.000	1.069	1.080
	80.4	42.0	25.63	27.56	2.014	0.047	1.924	0.000	1.065	1.075
022701BN0812	80.4	37.5	25.63	27.57	2.017	0.047	1.928	0.000	1.054	1.064
	80.4	49.9	25.33	27.66	2.023	0.047	1.930	0.000	1.069	1.078
	80.3	48.1	25.53	27.57	2.026	0.039	1.919	0.000	1.067	1.076
	80.3	50.9	25.63	27.65	2.005	0.046	1.912	0.000	1.069	1.079
	80.5	43.2	25.67	27.57	2.008	0.046	1.929	0.000	1.064	1.074
022801BN321	80.4	44.5	130.23	132.39	1.759	1.109	1.476	1.287	1.287	1.284
022801BN812	80.4	45.1	130.27	132.40	1.636	0.497	1.533	1.377	1.373	1.366
022801BN631	80.4	45.8	130.26	132.40	1.522	0.596	1.493	1.432	1.425	1.419
022801BN352	80.4	45.8	130.27	132.40	1.479	0.235	1.466	1.422	1.417	1.409

PHASE II

Profile	Dive Depth (fsw)	DSCNT RATE (fsw/min)	BOTTOM Time (min)	Total Dive Time (min)	---PO2 Overshoot Data--- PO2 MAX (atm)	Time PO2>1.45 (min)	TWA PO2 (atm)	Pst OS TWA PO2 (atm)	BT TWA PO2 (atm)	Dive TWA PO2 (atm)
04102001N39	43.6	30.5	0.00	1.37	1.156	0.000	0.000	0.000	0.000	0.922
	120.5	68.2	23.50	41.20	1.831	5.483	1.593	1.434	1.470	1.171
04102001N04	43.4	27.5	1.30	1.37	1.033	0.000	0.000	0.000	0.866	0.866
	120.5	65.1	23.50	41.20	1.479	1.512	1.467	1.398	1.376	1.096
04102001N14	44.7	28.0	1.43	1.50	1.031	0.000	0.000	0.000	0.800	0.798
	120.9	25.8	23.27	41.30	1.557	7.585	1.377	1.396	1.389	1.149
04102001N75	44.8	27.2	1.47	1.53	1.446	0.000	0.000	0.000	1.105	1.110
	120.9	39.5	23.33	41.30	1.642	2.509	1.524	1.383	1.397	1.145
04112001N32B	160.9	27.2	45.26	147.99	1.461	1.579	1.382	1.386	1.349	1.399
04112001N59A	160.7	40.7	30.37	77.49	1.916	7.144	1.539	1.425	1.441	1.351
	160.7	49.7	24.83	113.00	2.478	8.078	1.741	1.423	1.520	1.384
04112001N19A	160.7	39.9	30.30	77.49	1.849	9.134	1.648	1.460	1.498	1.398
	160.7	44.3	24.87	113.00	1.644	2.875	1.580	1.491	1.479	1.367
04112001N66B	160.8	26.8	45.30	147.99	1.664	6.042	1.535	1.363	1.362	1.358
04112001N36A	160.9	39.8	30.56	77.59	1.857	1.166	1.698	1.415	1.398	1.353
	160.9	50.0	25.03	113.06	1.642	2.192	1.426	1.406	1.395	1.331
04112001N47B	161.0	26.2	45.34	148.08	2.004	11.988	1.710	1.466	1.499	1.387
04112001N05A	161.0	40.1	30.50	77.59	1.690	5.073	1.567	1.493	1.474	1.447
	160.9	52.4	24.97	113.07	1.730	20.845	1.604	1.519	1.566	1.414
04122001N56A	160.4	41.4	30.47	78.00	2.111	2.955	1.689	1.402	1.402	1.361
	160.3	45.6	25.40	113.90	1.688	4.405	1.528	1.392	1.395	1.333
04122001N34A	160.4	41.3	30.40	78.00	1.842	7.292	1.558	1.448	1.462	1.396
	160.3	44.1	25.50	113.90	3.430	6.852	1.886	1.498	1.592	1.452
04122001N30A	160.4	40.4	30.40	78.00	2.172	6.583	1.601	1.382	1.417	1.368
	160.3	45.3	25.40	113.90	1.942	3.363	1.627	1.401	1.415	1.363
04122001N24A	160.4	41.5	30.40	78.00	1.755	6.301	1.553	1.438	1.454	1.402
	160.3	45.9	25.50	113.90	2.451	6.991	1.706	1.463	1.521	1.419
04162001N522	164.4	44.7	45.33	147.79	1.714	4.176	1.558	1.437	1.436	1.413
04162001N782	164.4	45.2	45.33	147.79	1.731	4.866	1.601	1.392	1.400	1.369
04162001N751	120.5	29.9	35.44	50.84	1.489	0.612	1.457	1.402	1.342	1.306
	100.6	40.1	35.26	90.40	1.598	2.960	1.521	1.427	1.417	1.367
04162001N551	120.5	30.9	35.40	50.86	1.887	3.068	1.625	1.421	1.379	1.320
	100.6	38.8	35.26	90.36	1.714	0.720	1.572	1.420	1.402	1.335
04162001N412	164.4	45.6	45.26	147.79	2.392	6.150	1.577	1.412	1.427	1.379
04162001N211	120.5	32.2	35.43	50.86	1.557	1.113	1.453	1.426	1.364	1.322
	100.6	39.2	35.23	90.36	1.777	3.762	1.633	1.396	1.403	1.349
04162001N721	120.5	30.2	35.37	50.86	2.014	1.591	1.564	1.407	1.364	1.294
	100.6	39.5	35.30	90.40	2.267	1.872	1.623	1.435	1.437	1.366
04162001N082	164.4	45.5	45.33	147.79	1.781	4.850	1.602	1.414	1.420	1.372
04172001N321	120.6	45.1	35.50	51.33	1.596	2.460	1.516	1.398	1.379	1.330
	100.5	54.7	35.43	90.26	1.556	0.945	1.503	1.365	1.357	1.325
04172001N591	120.6	45.7	35.47	51.33	1.882	4.843	1.582	1.383	1.388	1.321
	100.5	54.1	35.43	90.26	2.447	1.729	1.828	1.383	1.400	1.348
04172001N22B	160.8	52.2	45.70	147.59	1.999	5.959	1.603	1.388	1.409	1.352
04172001N60B	160.8	52.0	45.46	147.56	1.847	6.122	1.572	1.409	1.421	1.356
04172001N071	120.5	45.9	35.50	51.33	2.135	7.305	1.627	1.440	1.469	1.386
	100.5	54.5	35.16	90.26	2.061	4.762	1.698	1.475	1.499	1.441
04172001N691	120.6	45.1	35.53	51.33	1.922	5.830	1.643	1.408	1.425	1.374
	100.5	53.7	35.19	90.26	1.691	4.758	1.582	1.383	1.400	1.347
04172001N31B	160.8	52.6	45.63	147.59	3.152	2.489	1.972	1.385	1.407	1.374
04172001N05B	160.7	52.4	45.73	147.56	2.155	7.821	1.609	1.454	1.477	1.415
04182001N491	181.3	47.1	40.50	155.39	1.870	6.470	1.589	1.340	1.367	1.418
04182001N67B	201.0	51.8	20.77	64.20	1.719	6.323	1.597	1.403	1.437	1.363
	181.2	47.5	15.36	82.10	1.783	5.527	1.614	1.422	1.455	1.343
04182001N34B	201.0	53.0	20.53	64.20	2.010	9.111	1.684	1.424	1.522	1.404
	181.2	47.7	15.53	82.10	2.264	4.299	1.601	1.489	1.505	1.354
04182001N581	201.0	51.8	20.50	64.20	2.126	8.700	1.689	1.386	1.497	1.373
	181.2	47.6	15.43	82.10	2.593	6.857	1.652	1.429	1.510	1.344
04182001N101	181.3	47.3	40.40	155.39	1.935	9.588	1.708	1.449	1.498	1.405
04182001N451	201.0	53.1	20.57	64.20	2.708	9.392	1.602	1.419	1.496	1.402
	181.2	47.6	15.63	82.10	1.712	3.064	1.560	1.456	1.424	1.368
04182001N241	181.3	47.0	40.57	155.39	1.861	8.213	1.678	1.462	1.489	1.427
04182001N351	181.3	46.9	40.46	155.39	1.801	3.077	1.562	1.406	1.387	1.366

Profile	Dive Depth (fsw)	DSCNT RATE (fsw/min)	BOTTOM Time (min)	Total Dive Time (min)	---PO2 Overshoot Data--- PO2 MAX (atm)	Time PO2>1.45 (min)	TWA PO2 (atm)	Pst OS TWA PO2 (atm)	BT TWA PO2 (atm)	Dive TWA PO2 (atm)
04192001N25A	200.7	35.3	20.53	64.16	2.053	10.828	1.642	1.423	1.505	1.364
	181.2	52.3	15.60	81.86	1.904	2.131	1.697	1.416	1.419	1.327
04192001N50B	181.2	18.1	40.33	155.32	1.510	6.692	1.352	1.403	1.294	1.333
04192001N40B	181.2	17.3	40.26	155.32	1.797	11.067	1.657	1.452	1.435	1.362
04192001N04B	181.2	18.2	40.27	155.32	1.987	12.427	1.715	1.448	1.420	1.398
04192001N18A	200.6	34.1	20.53	64.16	1.753	8.346	1.613	1.414	1.435	1.382
04192001N75A	200.7	34.3	20.53	64.16	1.999	10.475	1.678	1.402	1.500	1.379
	181.2	50.8	15.56	81.83	2.135	7.814	1.659	1.415	1.527	1.365
04192001N46B	181.2	17.1	40.23	155.32	1.635	10.127	1.483	1.478	1.379	1.371
04192001N02A	200.6	34.1	20.57	64.16	2.050	10.325	1.777	1.383	1.529	1.486
	181.2	50.6	15.58	81.81	2.011	0.047	1.920	0.000	1.080	1.476
04232001N60A	140.3	60.8	30.40	53.56	2.335	4.292	1.643	1.423	1.443	1.326
	120.2	57.6	30.56	96.90	2.913	5.531	1.803	1.397	1.461	1.355
04232001N17B	200.9	33.0	35.57	165.86	2.092	11.203	1.725	1.418	1.489	1.326
04232001N32B	200.9	33.9	35.57	165.86	2.148	9.566	1.580	1.339	1.396	1.336
04232001N60A	140.3	61.3	30.40	53.56	1.821	6.059	1.615	1.489	1.496	1.384
	120.1	55.8	30.37	96.90	1.895	3.756	1.555	1.429	1.430	1.352
04232001N66B	200.9	33.2	35.60	165.86	2.014	5.962	1.495	1.400	1.411	1.327
04232001N31B	200.9	32.9	35.57	165.86	2.000	10.310	1.586	1.374	1.426	1.391
04232001N05A	140.3	61.9	30.33	53.56	1.816	5.225	1.532	1.384	1.402	1.304
	120.2	56.4	30.48	96.90	2.460	4.903	1.701	1.362	1.409	1.317
04242001N09A	141.1	57.1	30.57	54.03	2.761	5.625	1.650	1.431	1.460	1.327
	120.3	62.1	30.43	97.23	3.560	1.244	2.499	1.464	1.494	1.354
04242001N56B	200.7	44.7	35.63	166.76	1.983	9.243	1.662	1.427	1.463	1.349
04242001N33A	141.1	56.1	30.50	54.03	2.009	4.779	1.630	1.416	1.424	1.330
	120.4	62.7	30.59	97.23	2.845	4.890	1.706	1.385	1.425	1.344
04242001N74B	200.7	44.9	35.82	166.76	2.229	6.071	1.678	1.426	1.451	1.423
04242001N38B	200.7	45.3	35.83	166.76	1.717	6.260	1.523	2.303	2.151	1.567
04242001N10A	141.1	57.6	30.53	54.03	1.978	6.005	1.604	1.412	1.449	1.351
	120.4	62.4	30.36	97.23	3.203	5.596	1.904	1.335	1.440	1.520
04242001N30A	141.1	57.2	30.77	54.03	2.092	5.522	1.656	1.411	1.449	1.327
	120.3	61.8	30.50	97.23	2.963	1.880	2.114	1.585	1.609	1.396
04252001N701	140.6	59.4	20.36	32.11	2.057	4.232	1.562	1.393	1.413	1.280
	160.5	45.4	30.43	125.07	1.750	5.772	1.529	1.420	1.414	1.338
04252001N531	140.7	59.2	20.50	32.10	2.533	2.021	1.632	1.404	1.406	1.271
	160.6	43.7	30.50	125.07	1.851	3.520	1.578	1.456	1.443	1.392
04252001N521	140.6	60.2	20.37	32.10	3.600	6.097	1.811	1.431	1.509	1.340
	160.5	47.2	30.46	125.06	1.978	7.297	1.489	1.464	1.458	1.374
04252001N122	141.2	66.3	45.70	114.93	2.100	2.918	1.507	1.345	1.352	1.331
04252001N041	140.6	59.1	20.33	32.10	1.905	6.732	1.709	1.458	1.518	1.384
	160.6	44.4	30.46	125.06	1.658	0.689	1.640	1.498	1.456	1.389
04252001N182	141.1	64.3	45.60	114.92	2.220	1.505	1.199	1.421	1.403	1.372
04252001N452	141.1	65.2	45.53	114.92	2.329	1.823	1.585	1.432	1.428	1.373
04252001N572	141.2	65.9	45.63	114.92	1.844	1.816	1.586	1.356	1.356	1.337
04262001N32A	141.8	72.9	20.13	31.53	1.545	0.790	1.511	1.352	1.346	1.259
	161.5	51.6	30.56	124.83	1.726	4.767	1.410	1.328	1.336	1.309
04262001N25B	141.6	56.6	45.60	114.66	2.785	2.163	1.662	1.392	1.401	1.349
04262001N22A	141.8	71.2	20.13	31.53	1.555	4.352	1.408	1.357	1.367	1.266
	161.5	50.5	30.53	124.83	1.633	5.635	1.530	1.401	1.404	1.340
04262001N60B	141.6	56.0	45.40	114.66	1.811	5.044	1.588	1.489	1.496	1.419
04262001N07A	141.8	74.3	20.03	31.50	1.804	5.745	1.503	1.414	1.439	1.344
	161.5	51.7	30.46	124.79	2.001	7.023	1.584	1.402	1.440	1.376
04262001N66A	141.8	54.6	20.00	31.50	1.783	4.848	1.511	1.444	1.460	1.347
	161.5	50.8	30.43	124.79	1.648	4.594	1.525	1.461	1.456	1.389
04262001N48B	141.6	56.2	45.57	114.66	3.238	2.962	2.052	1.355	1.396	1.347
04262001N35B	141.6	55.6	45.36	114.66	2.225	2.393	1.568	1.427	1.429	1.367
04302001N37A	141.2	53.6	20.53	31.83	1.490	1.708	1.337	1.474	1.428	1.354
	141.6	47.0	30.53	102.89	1.632	3.538	1.548	1.443	1.426	1.333
04302001N77B	120.9	51.0	60.43	131.32	1.737	2.124	1.442	1.415	1.409	1.371
04302001N09A	141.2	53.5	20.47	31.83	1.594	2.775	1.511	1.442	1.430	1.345
	141.5	44.5	30.50	102.89	1.695	2.486	1.569	1.407	1.402	1.362
04302001N56A	141.2	53.6	20.50	31.83	1.609	0.364	1.535	1.382	1.359	1.270
	141.6	45.7	30.46	102.93	1.528	3.173	1.488	1.393	1.368	1.334
04302001N34A	141.2	54.1	20.53	31.83	1.502	0.744	1.423	1.366	1.329	1.243
	141.5	46.3	30.46	102.93	1.623	3.556	1.505	1.409	1.398	1.376
04302001N71B	120.9	50.5	60.40	131.32	1.510	0.311	1.483	1.381	1.361	1.315

Profile	Dive Depth (fsw)	DSCNT RATE (fsw/min)	BOTTOM Time (min)	Total Dive Time (min)	---PO2 Overshoot Data--- PO2 MAX (atm)	Time PO2>1.45 (min)	TWA PO2 (atm)	Pst OS TWA PO2 (atm)	BT TWA PO2 (atm)	Dive TWA PO2 (atm)
04302001N29B	120.9	47.2	60.36	131.29	1.997	2.902	1.471	1.413	1.413	1.372
04302001N35B	120.9	47.6	60.36	131.29	2.370	2.459	1.651	1.436	1.439	1.374
05012001N522	120.8	63.1	50.70	175.08	1.731	4.200	1.599	1.408	1.415	1.406
05012001N042	120.8	63.2	50.67	101.76	1.997	6.981	1.703	1.442	1.461	1.384
05012001N741	141.3	56.5	20.60	31.66	1.919	2.241	1.485	1.433	1.428	1.304
	141.8	39.9	30.40	102.89	2.153	5.433	1.533	1.413	1.410	1.343
05012001N782	120.8	63.1	50.76	101.79	1.706	3.657	1.606	1.407	1.409	1.313
05012001N581	141.4	56.9	20.67	31.67	1.647	4.188	1.539	1.458	1.447	1.297
	141.8	32.0	30.30	102.89	2.490	5.648	1.790	1.168	1.273	1.462
05012001N752	120.8	61.5	50.57	101.76	2.848	1.562	1.923	1.453	1.463	1.412
05012001N451	141.3	56.5	20.60	31.66	1.653	5.967	1.469	1.422	1.424	1.331
	141.8	41.8	30.46	102.89	1.769	5.560	1.585	1.404	1.402	1.333
05012001N621	141.4	55.8	20.57	31.67	1.629	1.106	1.548	1.438	1.423	1.317
	141.8	40.4	30.53	102.93	1.657	4.993	1.529	1.451	1.428	1.396
05022001N611	140.9	59.7	30.56	53.73	1.793	2.676	1.636	1.438	1.434	1.362
	141.0	62.7	30.56	99.58	1.733	4.250	1.564	1.408	1.412	1.360
05022001N59B	140.8	62.8	20.50	31.76	1.769	4.377	1.553	1.423	1.429	1.321
05022001N28A	140.9	60.7	30.63	53.70	1.719	3.296	1.587	1.497	1.494	1.443
	140.9	62.7	30.56	99.58	1.653	1.702	1.376	1.432	1.424	1.372
05022001N60A	140.9	60.8	30.57	53.73	1.697	3.105	1.563	1.418	1.408	1.353
	140.9	62.4	30.43	99.58	2.014	0.047	1.921	0.000	1.130	1.435
05022001N66B	140.8	62.0	20.53	31.76	1.582	1.285	1.530	1.383	1.367	1.287
05022001N69A	140.9	60.5	30.60	53.73	1.578	0.685	1.495	1.416	1.387	1.355
	140.9	63.1	30.56	99.58	1.603	1.448	1.423	1.412	1.388	1.370
05022001N48A	140.8	62.5	20.53	31.77	1.836	6.629	1.638	1.482	1.495	1.352
05022001N31B	140.7	62.9	20.67	31.79	2.029	0.032	2.006	0.000	1.114	1.222
05032001N77A	140.9	61.2	30.43	53.93	1.542	0.548	1.516	1.431	1.408	1.352
	141.1	32.7	30.26	99.71	1.580	4.123	1.473	1.449	1.431	1.362
05032001N56A	140.9	60.7	30.57	53.93	1.493	1.508	1.425	1.431	1.409	1.341
	141.1	31.4	30.33	99.71	1.645	4.433	1.519	1.437	1.431	1.349
05032001N10B	12.4	64.6	2.83	2.90	0.822	0.000	0.000	0.000	0.752	0.751
	141.3	45.6	20.47	31.80	1.840	4.919	1.634	1.235	1.304	1.349
05032001N20A	140.9	61.2	30.57	53.93	1.859	3.235	1.673	1.442	1.451	1.431
	141.1	32.9	30.26	99.71	1.642	6.704	1.456	1.396	1.395	1.354
05032001N30B	12.5	63.7	2.83	2.90	0.844	0.000	0.000	0.000	0.795	0.794
	141.4	44.4	20.43	31.80	1.669	4.724	1.567	1.438	1.439	1.321
05032001N24A	12.5	57.6	2.83	2.90	0.858	0.000	0.000	0.000	0.759	0.758
	141.4	44.9	20.47	31.80	1.640	4.153	1.541	1.434	1.431	1.332
05032001N02A	140.9	60.0	30.54	53.91	1.711	2.884	1.582	1.409	1.401	1.356
05072001N17A	180.9	60.1	15.50	31.76	2.011	6.196	1.649	1.410	1.458	1.313
05072001N09A	119.8	43.5	25.47	32.77	1.822	1.319	1.668	1.418	1.390	1.304
	159.7	52.5	20.86	60.45	5.741	5.711	2.553	1.459	1.750	1.436
	140.0	63.9	15.43	61.42	2.412	2.454	1.642	1.419	1.445	1.321
05072001N04A	119.8	44.0	25.47	32.77	1.989	5.329	1.586	1.388	1.412	1.321
	159.7	52.5	20.79	60.45	4.505	3.256	2.911	1.429	1.642	1.383
	139.9	56.4	15.20	61.42	2.630	6.231	1.672	1.445	1.521	1.325
05072001N03A	180.9	59.9	15.53	31.76	1.747	4.014	1.627	1.444	1.463	1.331
05072001N14A	119.9	44.2	25.40	32.73	1.644	1.781	1.553	1.395	1.381	1.297
	159.7	52.4	20.82	60.49	5.571	6.622	2.362	1.396	1.696	1.412
	140.0	63.7	15.43	61.42	1.588	0.414	1.520	1.395	1.367	1.286
05072001N58A	180.8	59.4	15.50	31.77	1.923	6.341	1.635	1.451	1.492	1.340
05072001N35A	119.8	44.1	25.40	32.73	1.785	0.635	1.619	1.381	1.359	1.257
	159.8	52.4	20.82	60.45	5.641	5.724	2.546	1.368	1.685	1.397
	140.0	64.1	15.46	61.42	2.659	4.867	1.676	1.398	1.472	1.312
05072001N08A	180.8	60.2	15.43	31.77	1.816	2.209	1.612	1.442	1.283	1.302
05082001N61B	182.0	34.2	15.43	32.43	2.003	8.867	1.713	1.399	1.549	1.355
05082001N22B	182.0	35.6	15.40	32.43	1.918	10.358	1.655	1.388	1.559	1.312
05082001N60A	120.9	30.2	25.30	33.00	1.982	8.580	1.573	1.392	1.445	1.338
	161.1	46.8	20.80	60.53	2.037	9.228	1.673	1.447	1.534	1.370
	140.8	49.0	15.43	61.48	2.387	6.834	1.649	1.401	1.493	1.335
05082001N28B	182.0	35.9	15.37	32.43	1.835	7.282	1.647	1.373	1.467	1.316
05082001N07B	182.0	34.5	15.40	32.43	1.826	7.536	1.640	1.397	1.488	1.353
05082001N66A	120.9	32.4	25.32	32.98	1.810	3.153	1.482	1.402	1.387	1.299
	161.1	46.7	20.70	60.53	1.453	1.745	1.407	1.404	1.370	1.289
	140.8	49.4	15.43	61.48	1.596	2.823	1.510	1.465	1.439	1.474

Profile	Dive Depth (fsw)	DSCNT RATE (fsw/min)	BOTTOM Time (min)	Total Dive Time (min)	---PO2 Overshoot Data--- PO2 MAX (atm)	Time PO2>1.45 (min)	TWA PO2 (atm)	Pst OS TWA PO2 (atm)	BT TWA PO2 (atm)	Dive TWA PO2 (atm)
05082001N69A	121.0	35.3	25.33	33.00	1.868	6.625	1.613	1.402	1.434	1.326
	161.1	46.3	20.69	60.53	2.102	6.435	1.750	1.433	1.491	1.385
	140.8	50.4	15.53	61.52	1.869	3.474	1.493	1.518	1.495	1.349
05082001N48A	120.9	34.4	25.33	33.00	1.740	5.563	1.532	1.380	1.385	1.281
	161.1	45.8	20.67	60.53	1.963	3.927	1.476	1.381	1.391	1.331
	140.7	50.4	15.50	61.52	1.490	0.232	1.401	1.379	1.322	1.312
05092001N67A	120.8	42.1	60.40	130.99	1.587	2.027	1.530	1.430	1.423	1.360
05092001N77A	120.7	39.9	60.40	130.99	1.513	1.326	1.332	1.441	1.427	1.366
05092001N32B	221.5	36.3	24.67	118.22	1.689	4.665	1.369	1.458	1.406	1.493
05092001N56B	221.5	34.8	24.50	118.22	1.659	8.169	1.524	1.356	1.374	1.345
05092001N34B	221.5	35.0	24.53	118.22	1.640	6.378	1.500	1.391	1.385	1.389
05092001N51A	120.7	40.3	60.36	130.99	1.479	1.049	1.434	1.432	1.419	1.378
05092001N45B	244.2	58.5	20.43	98.63	1.899	8.339	1.539	1.389	1.440	1.299
05092001N44A	120.8	40.9	60.40	130.99	2.037	2.487	1.610	1.424	1.425	1.356
05092001N24B	221.5	34.7	24.47	118.22	1.794	9.680	1.680	1.393	1.489	1.373
05102001N53A	221.9	48.4	24.47	117.66	1.799	8.705	1.652	1.414	1.467	1.344
05102001N12A	221.9	47.6	24.33	117.62	2.028	9.337	1.756	1.386	1.509	1.523
05102001N45A	222.0	47.6	24.40	117.66	1.772	6.927	1.629	1.396	1.430	1.349
05102001N35A	222.0	48.1	24.33	117.66	1.697	6.417	1.569	1.391	1.411	1.361
05142001N59A	241.7	54.8	25.60	146.89	2.238	12.239	1.729	1.422	1.554	1.364
05142001N22A	241.7	54.4	25.53	146.89	1.773	7.017	1.638	1.361	1.411	1.305
05142001N60B	244.1	57.6	20.40	98.66	1.815	8.199	1.629	1.400	1.469	1.352
05142001N74A	241.7	55.6	25.53	146.89	1.888	7.884	1.704	1.411	1.473	1.368
05142001N48A	241.7	55.1	25.66	146.89	2.366	13.381	1.800	1.393	1.593	1.388
05142001N41B	244.2	57.7	20.33	98.66	1.769	7.687	1.546	1.395	1.441	1.367
05142001N72B	244.2	58.1	20.43	98.63	2.221	7.964	1.684	1.362	1.449	1.336
05152001N702	42.3	27.5	3.07	3.70	1.311	0.000	0.000	0.000	0.985	0.955
	201.2	43.4	15.40	37.66	2.132	12.999	1.869	0.000	1.737	1.430
05152001N671	201.3	64.5	14.80	37.13	1.923	7.530	1.702	1.354	1.516	1.338
05152001N652	42.3	28.0	2.90	3.70	1.427	0.000	0.000	0.000	1.068	1.043
	201.2	45.8	15.43	37.70	1.844	3.190	1.563	1.530	1.427	1.310
05152001N562	42.3	29.0	3.07	3.70	1.523	2.044	1.126	1.244	1.089	1.054
	201.2	43.7	15.43	37.66	2.199	10.750	1.708	1.339	1.561	1.339
05152001N731	201.3	65.4	14.96	37.12	1.916	5.469	1.686	1.388	1.478	1.325
05152001N341	201.3	64.5	14.93	37.13	1.573	1.140	1.455	1.422	1.383	1.284
05152001N583	201.7	58.0	15.40	37.60	2.420	3.105	1.759	1.475	1.511	1.319
05152001N553	201.7	58.6	15.38	37.63	2.188	8.366	1.743	1.377	1.547	1.328
05152001N201	201.3	64.4	14.83	37.13	1.915	5.665	1.642	1.384	1.453	1.309
05152001N573	201.7	58.1	15.40	37.63	1.794	7.697	1.551	1.413	1.454	1.350
05152001N353	201.7	57.7	15.37	37.60	1.678	5.596	1.527	1.357	1.386	1.278
05162001N26A	120.8	50.6	30.33	41.93	1.585	0.776	1.522	1.441	1.428	1.355
	120.9	59.7	35.43	104.96	1.902	6.871	1.649	1.408	1.446	1.358
	120.7	43.2	25.43	81.92	1.653	5.136	1.539	1.429	1.432	1.337
05162001N15B	161.1	52.6	20.33	38.27	1.755	5.563	1.615	1.383	1.406	1.317
05162001N13A	120.8	53.9	30.43	41.93	1.672	2.607	1.547	1.400	1.394	1.315
	120.9	60.4	35.43	104.96	1.632	2.906	1.566	1.393	1.394	1.345
	120.6	44.4	25.40	81.92	1.591	3.214	1.492	1.399	1.373	1.319
05162001N78A	120.8	38.9	30.30	41.93	1.813	3.418	1.574	1.366	1.372	1.281
	120.9	59.8	35.53	104.96	1.923	3.973	1.581	1.363	1.378	1.307
	120.6	45.4	25.43	81.92	1.722	2.606	1.384	1.356	1.341	1.276
05162001N76B	161.0	54.4	20.37	38.26	1.502	0.582	1.478	1.363	1.342	1.273
05162001N24B	161.0	54.7	20.40	38.27	1.757	5.194	1.575	1.390	1.406	1.308
05162001N46B	161.0	54.8	20.60	38.26	1.567	1.273	1.487	1.333	1.322	1.236
05162001N08A	120.8	22.7	30.27	41.93	1.529	5.534	1.409	1.408	1.387	1.316
05172001N32A	120.8	25.0	30.47	42.70	1.799	4.106	1.533	1.381	1.373	1.289
	120.5	38.0	35.49	104.93	2.455	4.399	1.424	1.380	1.380	1.331
	120.7	49.7	25.40	81.82	2.385	1.861	1.653	1.375	1.384	1.325
05172001N23A	121.0	24.0	30.33	42.67	1.631	******	1.425	1.418	1.387	1.326
	120.6	37.2	35.46	104.89	1.525	3.160	1.389	1.383	1.372	1.320
	120.6	50.6	25.34	81.82	1.916	2.822	1.647	1.295	1.325	1.476
05172001N16A	121.0	24.1	30.43	42.67	2.016	21.139	1.796	0.000	1.564	1.458
05172001N43A	120.8	25.4	30.44	42.66	1.533	3.792	1.351	1.393	1.365	1.316
	120.6	36.8	35.43	104.93	1.608	1.910	1.482	1.356	1.345	1.315
	120.6	50.7	25.33	81.82	1.512	0.979	1.256	1.409	1.380	1.307
05232001N13A	240.8	50.0	15.63	50.25	2.336	11.336	1.827	1.450	1.684	1.447
05232001N60A	240.8	50.3	15.67	50.26	1.902	9.492	1.690	1.456	1.550	1.456

Profile	Dive Depth (fsw)	DSCNT RATE (fsw/min)	BOTTOM Time (min)	Total Dive Time (min)	---PO2 Overshoot Data--- PO2 MAX (atm)	Time PO2>1.45 (min)	TWA PO2 (atm)	Pst OS TWA PO2 (atm)	BT TWA PO2 (atm)	Dive TWA PO2 (atm)
05232001N36A	240.8	50.0	15.62	50.23	1.951	8.616	1.555	1.384	1.464	1.381
05232001N31A	240.8	38.5	15.50	50.26	2.061	10.619	1.744	1.414	1.604	1.404
05242001N26A	261.0	56.3	15.63	69.36	2.119	12.097	1.700	1.357	1.604	1.433
05242001N25B	261.0	56.0	25.69	176.32	2.062	12.249	1.623	1.381	1.491	1.334
05242001N56A	260.9	56.1	15.63	69.36	1.995	9.468	1.688	1.410	1.533	1.409
05242001N20A	261.0	56.6	15.67	69.36	2.647	10.573	1.753	1.355	1.603	1.348
05242001N10B	261.1	56.2	25.67	176.32	2.521	19.018	1.696	1.377	1.601	1.401
05242001N45A	261.0	56.2	15.53	69.36	1.903	9.445	1.685	1.348	1.520	1.347
05242001N24B	261.0	56.6	25.63	176.32	1.947	8.360	1.721	1.396	1.481	1.322
05242001N35B	261.1	55.8	25.63	176.32	1.964	8.506	1.660	1.398	1.461	1.513
05292001N37A	240.7	51.3	20.40	98.19	1.798	5.506	1.634	1.387	1.412	1.364
05292001N39A	240.7	51.6	20.53	98.19	2.137	12.986	1.743	1.464	1.617	1.419
05292001N64A	240.8	50.9	20.53	98.16	2.489	8.805	1.936	1.383	1.605	1.510
05292001N11A	240.8	50.9	20.37	98.16	2.050	9.309	1.707	1.407	1.516	1.411
05302001N32A	241.0	55.8	15.90	50.66	2.061	8.626	1.723	1.405	1.540	1.400
05302001N59B	261.6	49.3	25.33	176.22	2.287	11.205	1.713	1.471	1.560	1.391
05302001N71	241.1	56.1	16.00	50.70	1.989	9.979	1.716	1.417	1.573	1.384
05302001N66A	241.0	55.8	15.93	50.66	1.894	9.693	1.660	1.468	1.541	1.422
05302001N58B	261.6	53.6	25.67	176.26	2.163	10.366	1.726	1.432	1.539	1.393
05302001N48B	261.6	49.0	25.33	176.22	2.270	11.798	1.836	1.446	1.617	1.397
05302001N31B	261.6	53.3	25.67	176.26	2.214	11.628	1.807	1.455	1.591	1.415
05302001N05	241.1	56.1	15.97	50.70	1.871	9.159	1.669	1.423	1.504	1.352
05312001N65B	281.1	53.1	15.70	87.86	2.242	12.427	1.769	1.355	1.656	1.408
05312001N20A	281.2	52.5	20.63	148.42	2.135	10.786	1.684	1.422	1.539	1.382
05312001N10B	281.1	52.5	15.67	87.86	2.052	11.170	1.718	1.362	1.576	1.396
05312001N30B	281.2	54.1	15.63	87.86	2.593	9.336	1.891	1.444	1.646	1.460
05312001N24A	281.2	52.7	20.53	148.42	2.021	8.644	1.770	1.436	1.547	1.378
05312001N46A	281.2	53.3	20.60	148.42	2.208	15.554	1.798	1.454	1.687	1.408
05312001N41B	281.2	53.7	15.60	87.86	2.697	10.172	1.788	1.386	1.610	1.396
05312001N35A	281.2	52.6	20.67	148.42	2.152	13.102	1.775	1.402	1.592	1.350
06012001N37A	281.8	57.5	20.60	147.69	2.271	10.774	1.791	1.482	1.598	1.470
06012001N53B	281.7	58.5	15.53	87.69	2.107	11.543	1.678	1.392	1.579	1.372
06012001N25A	281.7	57.9	20.59	147.66	2.259	14.262	1.789	1.406	1.647	1.377
06012001N39B	281.8	58.3	15.50	87.66	2.523	13.058	1.787	1.374	1.705	1.423
06012001N12B	281.8	58.6	15.73	87.69	2.194	11.362	1.775	1.421	1.630	1.458
06012001N14B	281.8	58.2	15.50	87.66	2.913	9.333	1.769	1.391	1.589	1.381
06012001N78A	281.7	57.6	20.57	147.66	2.100	14.095	1.764	1.412	1.608	1.423
06012001N42A	281.8	58.0	20.63	147.69	2.283	12.822	1.806	1.463	1.657	1.393
06042001N37B	221.0	44.3	15.40	36.87	1.764	4.923	1.603	1.419	1.428	1.381
06042001N32B	221.0	51.0	15.43	36.87	1.748	6.784	1.614	1.439	1.464	1.418
06042001N59A	221.1	46.3	35.40	195.92	1.901	8.799	1.621	1.411	1.449	1.352
06042001N36B	221.0	51.1	15.73	36.83	1.808	2.412	1.536	1.479	1.433	1.382
06042001N48A	221.0	46.4	35.37	195.92	2.139	9.328	1.617	1.497	1.518	1.452
06042001N01B	221.0	26.8	15.37	36.86	1.906	25.771	1.430	0.000	1.485	1.414
06042001N57A	221.0	46.0	35.50	195.92	1.904	7.013	1.647	1.439	1.465	1.429
06042001N31A	221.1	46.8	35.50	195.95	1.935	8.194	1.665	1.452	1.474	1.383
06052001N67B	94.1	33.0	6.10	27.53	1.461	0.042	1.456	1.308	1.238	1.307
06052001N65B	94.2	33.3	6.10	27.53	1.677	1.619	1.383	1.292	1.251	1.274
06052001N56B	94.4	33.2	6.10	27.53	1.458	0.029	1.454	1.349	1.234	1.274
06052001N60A	302.2	46.0	20.53	174.76	2.364	18.783	1.840	1.439	1.761	1.411
06052001N74A	302.3	45.9	20.60	174.77	2.252	18.563	1.814	1.444	1.739	1.422
06052001N10A	302.2	46.1	20.57	174.76	2.196	14.800	1.720	1.347	1.575	1.358
06052001N24A	302.3	46.2	20.63	174.79	2.449	17.035	1.852	1.407	1.735	1.416
06052001N46B	94.3	34.3	6.10	27.53	1.594	2.455	1.470	1.388	1.309	1.326
06062001N25B	302.4	44.5	15.30	106.42	2.680	13.078	1.732	1.396	1.651	1.329
06062001N39B	302.5	45.2	15.40	106.42	2.116	14.875	1.753	0.000	1.724	1.434
06062001N12A	301.8	47.8	20.47	174.82	2.154	14.217	1.734	1.427	1.625	1.371
06062001N18A	301.7	47.2	20.38	174.89	2.114	10.468	1.662	1.459	1.540	1.382
06062001N58B	302.5	44.5	15.37	106.46	2.254	14.563	1.785	1.393	1.750	1.382
06062001N45A	301.7	47.0	20.30	174.86	1.845	8.022	1.658	1.412	1.461	1.314
06062001N42B	302.5	44.6	15.40	106.46	2.159	13.053	1.716	1.398	1.625	1.405
06062001N35A	301.8	46.7	20.37	174.82	2.123	12.767	1.764	1.408	1.611	1.369
06072001N01A	301.8	54.3	15.50	106.69	2.059	11.133	1.756	1.378	1.614	1.409
06072001N57A	301.8	34.6	15.27	106.66	2.225	13.677	1.777	1.412	1.694	1.395
06072001N08A	301.8	54.4	15.50	106.69	2.032	12.324	1.750	1.351	1.646	1.357
06072001N31A	301.8	54.3	15.60	106.66	2.184	13.149	1.769	1.401	1.668	1.398

Profile	Dive Depth (fsw)	DSCNT RATE (fsw/min)	BOTTOM Time (min)	Total Dive Time (min)	---PO2 Overshoot Data--- PO2 MAX (atm)	Time PO2>1.45 (min)	TWA PO2 (atm)	Pst OS TWA PO2 (atm)	BT TWA PO2 (atm)	Dive TWA PO2 (atm)
06082001N04A	220.3	48.8	15.47	36.73	1.998	9.837	1.683	1.397	1.553	1.445
06082001N65B	241.0	44.3	15.43	50.16	1.924	8.594	1.714	1.366	1.529	1.367
06082001N56B	241.0	44.9	15.37	50.20	1.892	8.819	1.677	1.469	1.554	1.451
06082001N33A	220.4	49.8	15.43	36.73	1.998	8.884	1.697	1.361	1.511	1.393
06082001N10B	241.0	41.9	15.27	50.20	1.959	10.204	1.705	1.432	1.564	1.425
06082001N20A	220.4	49.2	15.43	36.73	2.026	9.678	1.616	1.379	1.515	1.418
06082001N24B	241.0	43.7	15.37	50.16	1.974	10.639	1.739	1.392	1.609	1.411
06082001N41A	220.4	49.0	15.47	36.73	1.874	8.566	1.570	1.381	1.468	1.388
06182001N37B	200.3	17.0	25.33	102.16	1.713	16.635	1.448	1.393	1.408	1.365
	180.8	44.7	25.43	128.87	1.679	5.138	1.544	1.383	1.362	1.326
06182001N25B	200.1	64.6	25.50	102.16	1.883	1.673	1.599	1.472	1.450	1.337
	180.8	44.3	25.54	128.90	1.844	2.300	1.662	1.391	1.370	1.292
06182001N40A	220.8	60.7	25.50	119.06	2.187	8.286	1.718	1.386	1.483	1.342
06182001N64A	220.7	60.3	25.43	119.02	1.922	7.118	1.721	1.416	1.474	1.372
06182001N18B	200.1	65.6	25.50	102.16	2.344	8.408	1.831	1.380	1.520	1.374
	180.8	45.4	25.50	128.90	1.851	5.801	1.639	1.348	1.388	1.313
06182001N74A	220.8	61.1	25.47	119.06	1.756	6.732	1.627	1.437	1.464	1.410
06182001N27A	220.8	60.4	25.50	119.06	1.807	6.572	1.656	1.437	1.469	1.416
06182001N68B	200.3	63.4	25.58	102.14	1.945	4.335	1.608	1.421	1.431	1.402
	180.7	45.5	25.43	128.87	1.899	5.061	1.600	1.468	1.446	1.380
06192001N59A	200.8	57.6	25.40	102.06	1.855	2.241	1.728	1.453	1.439	1.366
	181.2	59.0	25.60	129.39	1.858	5.564	1.636	1.364	1.398	1.237
06192001N60A	200.7	59.9	25.67	102.06	2.167	7.405	1.710	1.447	1.511	1.386
	181.1	59.4	25.53	129.43	2.059	6.419	1.632	1.385	1.432	1.383
06192001N07A	200.7	60.0	25.60	102.02	2.419	6.109	1.663	1.422	1.469	1.429
	181.2	58.5	25.63	129.39	2.314	6.768	1.662	1.435	1.485	1.418
06192001N05A	200.7	56.2	25.37	102.06	2.702	8.088	1.770	1.439	1.529	1.360
	181.1	58.8	25.53	129.40	2.304	6.765	1.564	1.380	1.424	1.312
06202001N34A	180.3	64.6	20.37	46.07	1.534	0.485	1.488	1.441	1.402	1.338
	180.6	63.7	25.60	134.63	1.578	1.187	1.460	1.449	1.417	1.352
06202001N10A	180.3	48.5	20.33	46.07	1.879	5.294	1.647	1.379	1.410	1.352
	180.6	63.3	25.63	134.63	1.972	6.308	1.723	1.379	1.438	1.340
06202001N20A	180.4	64.0	20.43	46.06	1.754	4.481	1.625	1.352	1.357	1.287
	180.6	64.4	25.43	134.63	2.760	7.951	1.725	1.350	1.456	1.330
06202001N45A	180.4	48.9	20.33	46.06	1.700	3.894	1.554	1.393	1.388	1.310
	180.6	64.8	25.36	134.63	1.665	3.097	1.570	1.465	1.438	1.372
06212001N25A	180.6	30.7	20.33	46.03	1.913	3.738	1.599	1.385	1.289	1.284
	180.6	63.9	25.36	134.58	1.606	3.849	1.488	1.365	1.361	1.331
06212001N62A	180.6	30.5	20.33	46.03	1.758	6.912	1.569	1.445	1.378	1.337
	180.8	64.0	25.40	134.59	1.820	5.032	1.640	1.491	1.495	1.430
06212001N52A	180.6	30.8	20.37	46.03	2.401	10.268	1.754	1.388	1.502	1.350
	180.8	64.3	25.50	134.59	2.500	7.312	1.583	1.364	1.419	1.316
06212001N09B	180.6	60.7	40.36	155.12	1.591	1.013	1.509	1.472	1.450	1.434
06212001N68A	180.6	31.3	20.33	46.03	1.835	6.987	1.663	1.413	1.398	1.330
06212001N01B	180.6	60.8	40.36	155.12	2.454	2.652	1.550	1.401	1.403	1.354
06212001N46B	180.6	60.0	40.41	155.12	1.842	5.874	1.625	1.423	1.441	1.365
06212001N08B	180.6	60.2	40.50	155.12	2.325	4.309	1.582	1.375	1.393	1.337
06252001N32	180.7	34.0	25.57	73.00	1.697	4.973	1.552	1.469	1.404	1.381
	160.2	43.3	30.46	118.93	1.527	1.811	1.478	1.421	1.398	1.412
06252001N60B	220.6	48.0	15.53	36.50	1.949	8.988	1.690	1.486	1.553	1.438
06252001N66A	180.7	33.9	25.37	73.00	1.671	3.753	1.486	1.371	1.321	1.305
06252001N69B	220.6	47.9	15.60	36.50	1.835	7.074	1.589	1.368	1.436	1.447
06252001N68B.	220.6	48.0	15.57	36.50	1.936	9.771	1.665	1.357	1.539	1.314
06252001N48A	180.7	33.8	25.40	73.00	1.888	6.853	1.596	1.364	1.372	1.323
	160.2	43.7	30.42	118.97	1.880	3.584	1.520	1.451	1.446	1.418
06252001N57A	180.7	34.1	25.40	72.98	1.894	4.298	1.543	1.414	1.365	1.329
	160.2	43.2	30.49	118.93	2.080	3.400	1.196	1.313	1.289	1.481
06252001N05B	220.6	48.0	15.53	36.50	1.786	6.357	1.619	1.411	1.458	1.393
06262001N56A	180.2	50.3	25.43	73.16	1.775	6.322	1.462	1.442	1.435	1.406
	159.9	48.0	30.46	118.54	1.732	4.452	1.554	1.442	1.436	1.413
06262001N34A	180.3	50.0	25.50	73.19	1.788	4.722	1.561	1.389	1.391	1.350
	159.9	47.4	30.46	118.54	1.510	1.738	1.487	1.390	1.364	1.337
06262001N99A	180.3	49.6	25.43	73.19	1.808	5.713	1.560	1.383	1.391	1.331
	160.0	47.6	30.49	118.57	1.686	2.985	1.566	1.350	1.346	1.313
06262001N24A	180.3	49.8	25.50	73.19	1.712	5.950	1.570	1.364	1.391	1.323
	160.0	48.0	30.49	118.57	1.691	2.751	1.572	1.322	1.323	1.295

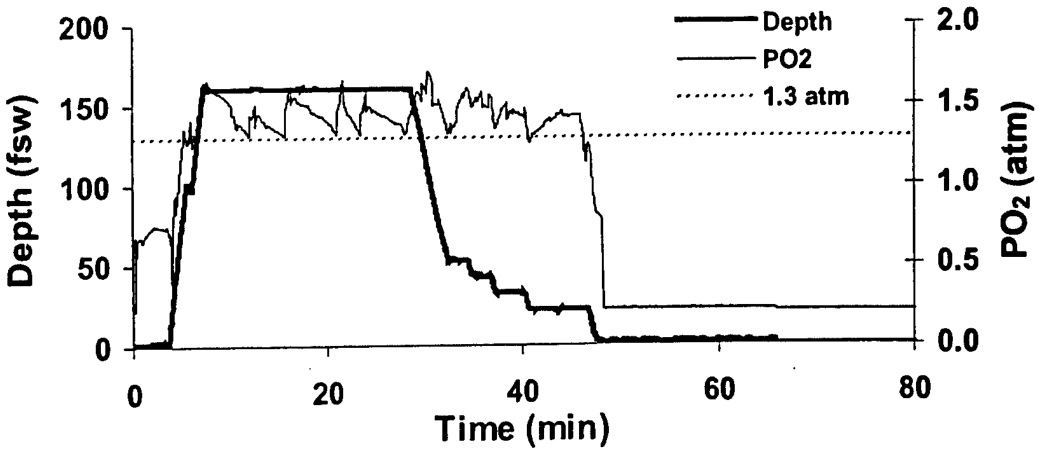
Profile	Dive Depth (fsw)	DSCNT RATE (fsw/min)	BOTTOM Time (min)	Total Dive Time (min)	---PO2 Overshoot Data--- PO2 MAX (atm)	Time PO2>1.45 (min)	TWA PO2 (atm)	Pst OS TWA PO2 (atm)	BT TWA PO2 (atm)	Dive TWA PO2 (atm)
06272001N52B	159.9	30.3	20.47	38.53	1.849	8.702	1.568	1.345	1.396	1.265
06272001N12B	159.9	29.8	20.47	38.53	1.570	6.380	1.470	1.427	1.413	1.328
06272001N04A	200.5	58.1	15.33	38.00	2.647	3.613	1.818	1.607	1.642	1.403
	180.7	65.9	35.50	160.07	1.971	8.227	1.601	1.416	1.452	1.392
06272001N19B	159.9	30.2	20.50	38.53	1.745	6.539	1.460	1.414	1.407	1.330
06272001N74A	200.5	55.9	15.33	38.00	2.264	5.702	1.668	1.406	1.448	1.354
	180.6	65.6	35.50	160.07	1.688	3.757	1.586	1.432	1.424	1.420
06272001N45A	200.4	57.6	15.27	37.97	2.459	6.835	1.614	1.358	1.450	1.282
	180.6	64.3	35.40	160.03	1.568	1.385	1.396	1.370	1.344	1.308
06272001N62B	159.9	30.7	20.60	38.53	1.477	0.160	1.464	1.346	1.317	1.254
06272001N08A	200.4	57.3	15.30	37.97	2.319	7.447	1.617	1.354	1.468	1.319
	180.6	65.0	35.53	160.07	2.100	2.402	1.659	1.399	1.409	1.349
06282001N69A	200.0	48.2	15.43	38.13	2.004	7.385	1.594	1.369	1.449	1.300
	180.7	54.2	35.53	160.17	2.093	6.778	1.698	1.395	1.442	1.345
06282001N58A	200.1	48.1	15.57	38.10	1.960	6.836	1.598	1.335	1.432	1.292
	180.6	54.1	35.57	160.17	2.107	3.631	1.740	1.355	1.385	1.316
06282001N68A	200.0	48.5	15.60	38.13	1.830	6.118	1.574	1.458	1.447	1.323
	180.7	54.0	35.50	160.17	1.710	5.366	1.585	1.492	1.487	1.435
06282001N48A	200.1	47.3	15.53	38.10	1.760	4.590	1.593	1.365	1.391	1.332
	180.7	54.2	35.47	160.13	1.469	1.093	1.408	1.422	1.390	1.400
07022001N67B	220.6	52.5	15.50	36.53	1.819	5.636	1.613	1.388	1.438	1.358
07022001N10B	220.5	52.1	15.33	36.50	1.885	6.262	1.651	1.357	1.429	1.343
07022001N46B	220.6	52.6	15.47	36.50	1.922	9.093	1.596	1.352	1.486	1.354
07022001N35A	220.4	55.0	35.60	195.99	1.949	7.586	1.699	1.396	1.435	1.350
07022001N08A	220.5	54.9	35.38	195.97	1.804	6.130	1.646	1.458	1.468	1.377
07022001N05A	220.5	55.4	35.43	195.99	1.977	7.293	1.662	1.393	1.424	1.344
07032001N37B	240.5	37.7	20.33	98.13	2.064	11.898	1.632	1.417	1.523	1.386
07032001N53A	240.7	64.1	25.27	146.59	2.628	8.729	1.713	1.388	1.489	1.349
07032001N25A	240.8	64.6	25.47	146.59	2.062	9.595	1.699	1.420	1.515	1.377
07032001N52A	240.7	64.5	25.30	146.63	2.241	9.738	1.832	1.456	1.587	1.394
07032001N12B	240.5	37.0	20.40	98.09	2.025	11.504	1.643	1.414	1.528	1.375
07032001N40B	240.6	37.3	20.50	98.13	2.028	10.479	1.604	1.341	1.453	1.321
07032001N19A	240.8	64.4	25.47	146.62	2.280	10.326	1.787	1.417	1.554	1.365
07032001N62B	240.5	38.2	20.33	98.13	1.866	7.669	1.626	1.350	1.417	1.343
07092001N22A	120.3	43.6	30.40	42.10	1.473	0.322	1.461	1.353	1.331	1.283
	119.9	52.2	35.40	104.96	1.588	0.609	1.557	1.350	1.336	1.297
	119.9	54.0	25.40	81.99	1.456	0.065	1.454	1.338	1.311	1.278
07092001N60A	120.1	44.9	30.67	42.07	1.548	0.322	1.559	1.436	1.411	1.334
	119.9	53.9	35.43	104.96	1.798	2.365	1.339	1.500	1.484	1.425
	119.8	54.0	25.37	81.99	1.583	0.653	1.506	1.483	1.455	1.406
07092001N69B	281.1	46.1	15.63	87.76	2.065	7.667	1.751	1.400	1.462	1.366
07092001N58B	281.1	45.6	15.60	87.73	2.074	11.073	1.733	1.399	1.592	1.383
07092001N99B	281.1	46.0	15.67	87.76	2.182	10.629	1.741	1.395	1.573	1.448
07092001N57B	281.1	46.7	15.43	87.76	2.143	12.935	1.775	1.425	1.647	1.366
07092001N02A	120.3	44.6	30.67	42.06	1.751	0.972	1.463	1.376	1.356	1.279
	119.9	52.6	35.40	104.96	2.267	1.863	1.818	1.340	1.356	1.297
	119.9	53.8	25.43	82.02	2.243	2.454	1.685	1.341	1.367	1.287
07092001N05A	120.1	45.1	30.66	42.07	2.154	2.345	1.411	1.411	1.395	1.308
	119.8	53.5	35.43	104.96	2.418	4.351	1.544	1.395	1.404	1.340
	119.9	54.0	25.33	81.99	2.349	1.656	1.643	1.383	1.383	1.312
07102001N52B	159.8	45.4	45.47	147.89	1.634	4.932	1.519	1.436	1.431	1.431
07102001N41B	159.8	45.8	45.40	147.89	1.726	4.502	1.597	1.380	1.389	1.341
07102001N62B	159.8	46.0	45.37	147.89	1.872	5.452	1.559	1.358	1.376	1.333
07102001N08B	159.8	45.8	45.47	147.89	1.538	0.677	1.509	1.430	1.416	1.377
07112001N37A	160.1	50.4	25.43	51.20	1.705	4.778	1.542	1.390	1.398	1.345
	119.8	58.6	35.49	95.85	1.618	2.591	1.352	1.379	1.372	1.327
07112001N39A	160.2	50.2	25.47	51.20	1.569	1.105	1.427	1.383	1.361	1.314
	119.8	58.5	35.33	95.85	1.874	2.264	1.605	1.376	1.375	1.332
07112001N19A	160.3	50.7	25.47	51.16	1.695	1.190	1.480	1.388	1.365	1.305
	119.8	59.3	35.36	95.87	1.530	1.163	1.461	1.385	1.374	1.320
07112001N18A	160.2	40.6	25.33	51.16	1.888	4.181	1.500	1.341	1.357	1.269
	119.8	59.2	35.63	95.88	2.058	2.349	1.528	1.340	1.346	1.272
07122001N17A	160.0	49.3	25.53	51.30	2.148	3.553	1.660	1.408	1.436	1.349
	119.9	46.4	35.46	96.01	1.910	1.823	1.472	1.365	1.363	1.324
07122001N59A	160.0	48.7	25.50	51.29	1.781	4.938	1.575	1.373	1.395	1.336
	119.8	45.9	35.63	95.98	1.612	1.396	1.516	1.368	1.361	1.317

Profile	Dive Depth (fsw)	DSCNT RATE (fsw/min)	BOTTOM Time (min)	Total Dive Time (min)	---PO2 Overshoot Data--- PO2 MAX (atm)	Time PO2>1.45 (min)	TWA PO2 (atm)	Pst OS TWA PO2 (atm)	BT TWA PO2 (atm)	Dive TWA PO2 (atm)
07122001N09A	160.1	49.1	25.53	51.30	2.269	3.104	1.582	1.387	1.397	1.332
	119.8	46.3	35.43	96.01	1.894	2.320	1.406	1.358	1.353	1.313
07122001N24A	160.0	49.6	25.60	51.30	1.776	4.778	1.625	1.396	1.420	1.356
	119.8	45.5	35.50	96.01	1.719	5.058	1.524	1.362	1.380	1.327
07162001N32B	159.8	21.8	20.27	38.20	1.802	7.736	1.537	1.350	1.360	1.278
07162001N56B	159.8	22.5	20.20	38.20	1.636	2.862	1.522	1.258	1.228	1.189
07162001N10A	100.2	47.0	15.67	18.27	1.588	1.236	1.498	1.290	1.278	1.230
	99.8	48.7	30.43	33.23	1.565	0.682	1.513	1.293	1.278	1.250
	119.9	44.8	30.69	73.02	1.582	0.463	1.407	1.286	1.274	1.236
07162001N99B	159.8	21.3	20.23	38.20	1.898	6.313	1.525	1.297	1.235	1.201
07162001N29	159.8	22.8	20.27	38.20	1.691	4.787	1.501	1.308	1.295	1.234
07162001N45A	100.1	46.6	15.50	18.27	1.407	0.000	0.000	0.000	1.267	1.223
	99.8	49.1	30.47	33.23	1.351	0.000	0.000	0.000	1.241	1.216
	120.0	44.5	30.56	73.01	1.427	0.000	0.000	0.000	1.238	1.202
07162001N46A	100.2	47.0	15.67	18.27	1.452	0.054	1.451	1.316	1.284	1.239
	99.8	49.3	30.43	33.23	1.440	0.000	0.000	0.000	1.226	1.202
	119.9	44.1	30.56	73.02	1.463	0.161	1.456	1.241	1.238	1.193
07162001N41A	100.1	47.0	15.40	18.26	1.537	0.786	1.506	1.334	1.308	1.259
	99.8	48.6	30.47	33.23	1.468	0.056	1.458	1.343	1.326	1.300
	120.0	44.8	30.42	73.01	1.494	0.362	1.484	1.343	1.324	1.294
07172001N37A	180.8	56.9	20.47	46.03	1.519	0.787	1.435	1.351	1.312	1.259
	181.0	57.6	25.40	134.53	1.504	2.715	1.143	1.272	1.252	1.221
07172001N39A	180.8	55.9	20.40	46.00	1.697	5.824	1.578	1.328	1.380	1.267
	181.0	57.4	25.63	134.53	1.586	4.504	1.506	1.297	1.319	1.247
07172001N11B	281.4	61.3	15.67	87.76	1.850	7.431	1.657	1.323	1.451	1.297
07172001N14B	281.4	61.3	15.60	87.76	1.952	3.336	1.689	1.344	1.384	1.235
07172001N42A	180.8	56.2	20.44	46.00	1.731	4.156	1.566	1.342	1.372	1.285
	181.1	57.8	25.43	134.53	1.633	1.944	1.510	1.307	1.309	1.241
07172001N02A	180.9	57.4	20.63	46.03	1.856	4.869	1.631	1.473	1.477	1.418
	181.0	57.6	25.43	134.53	2.057	2.109	1.619	1.455	1.440	1.423
07172001N63B	281.3	61.1	15.47	87.76	1.839	6.868	1.651	1.370	1.444	1.403
07182001N17	180.8	49.3	20.33	46.17	1.661	5.192	1.536	1.325	1.339	1.263
07182001N22A	180.8	47.6	20.33	46.17	1.531	0.244	1.489	1.405	1.353	1.325
	180.6	58.5	35.46	164.16	1.512	0.640	1.416	1.427	1.403	1.386
07182001N07A	180.7	47.6	20.47	46.17	1.717	5.642	1.569	1.317	1.342	1.284
	180.5	57.9	35.36	164.16	1.596	3.077	1.513	1.264	1.272	1.251
07182001N69A	180.7	48.3	20.47	46.17	1.673	4.219	1.528	1.294	1.294	1.238
	180.5	57.8	35.33	164.16	1.731	3.765	1.618	1.282	1.301	1.253
07192001N56A	180.6	55.0	20.50	46.10	1.816	4.914	1.599	1.377	1.402	1.332
	180.7	54.4	35.50	164.63	1.700	4.034	1.544	1.388	1.386	1.345
07192001N10A	180.6	54.8	20.57	46.10	1.802	4.486	1.617	1.321	1.356	1.275
	180.7	54.6	35.53	164.66	1.456	0.699	1.416	1.325	1.308	1.245
07192001N24A	180.6	54.9	20.50	46.10	1.655	3.919	1.549	1.298	1.323	1.260
	180.7	54.0	35.50	164.66	1.667	3.613	1.581	1.247	1.273	1.263
07192001N35A	180.6	54.4	20.53	46.10	1.745	1.918	1.542	1.306	1.287	1.212
	180.7	54.2	35.50	164.66	2.005	5.480	1.549	1.269	1.305	1.239

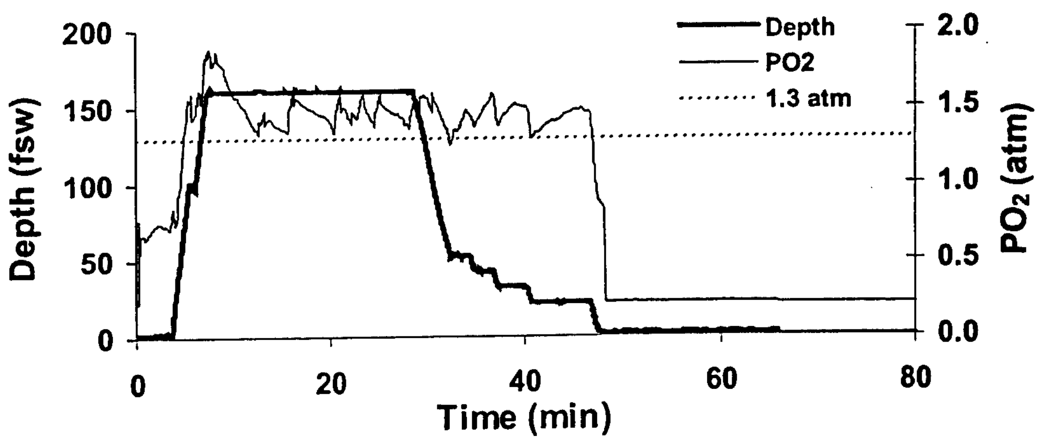
Appendix I.

Individual Dive Depth-Inspired PO_2 Profiles for Dives Performed

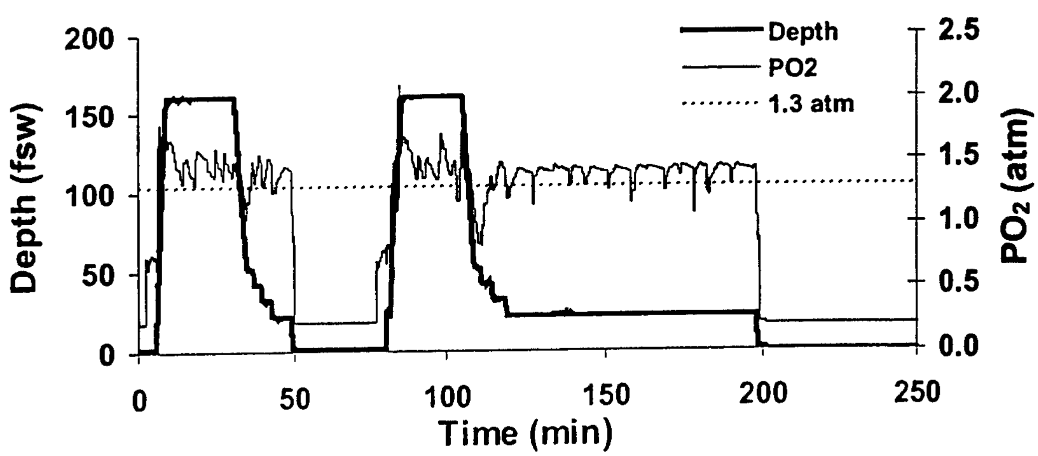
Phase I Profiles



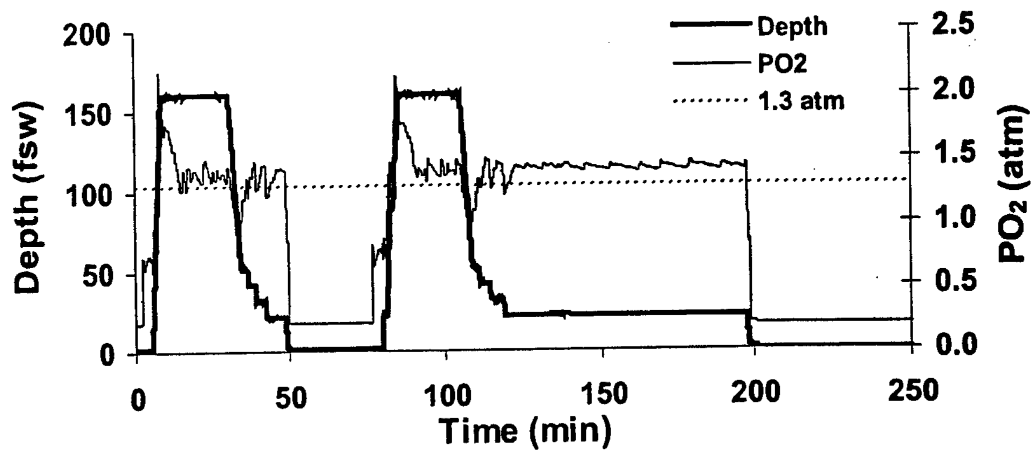
Profile 103100AN91



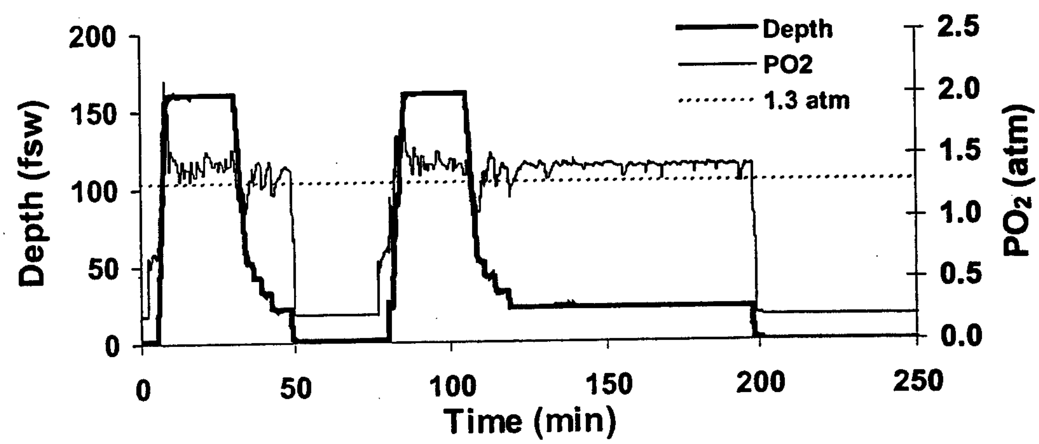
Profile 103100AN29



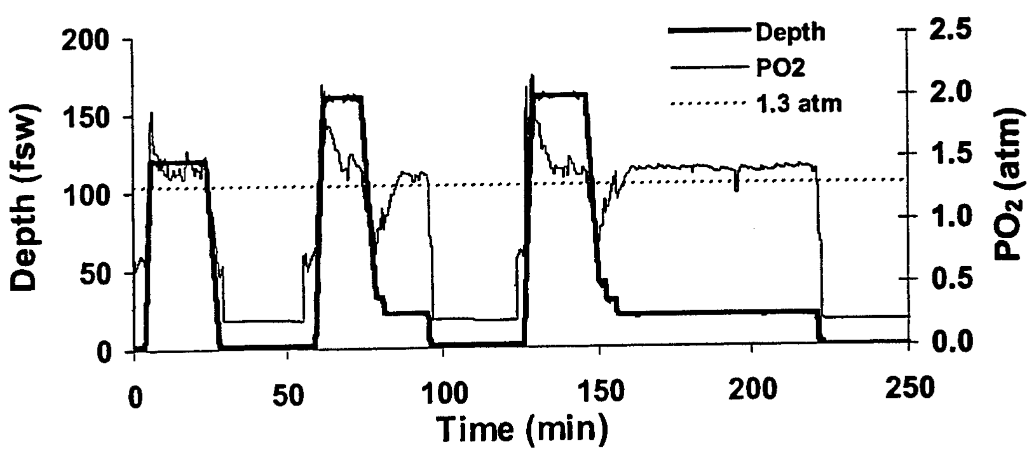
Profile 110100AN83



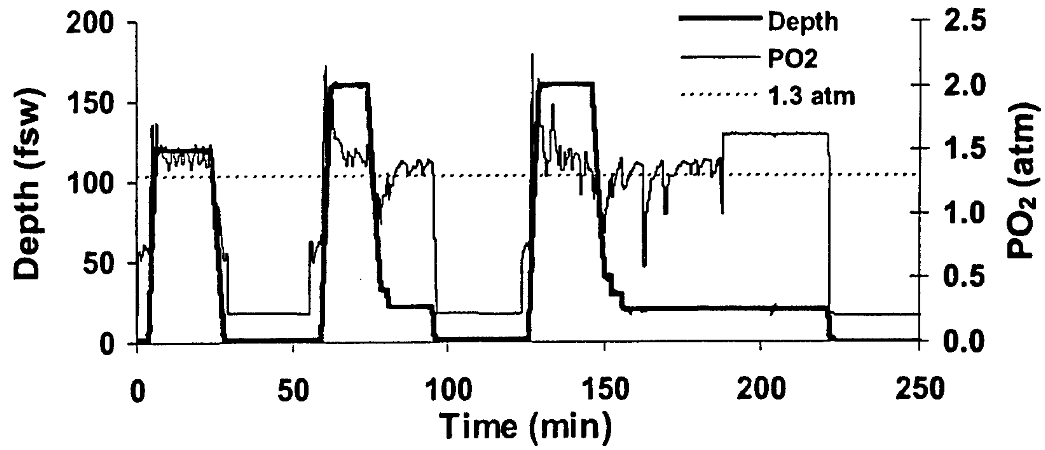
Profile 110100AN79



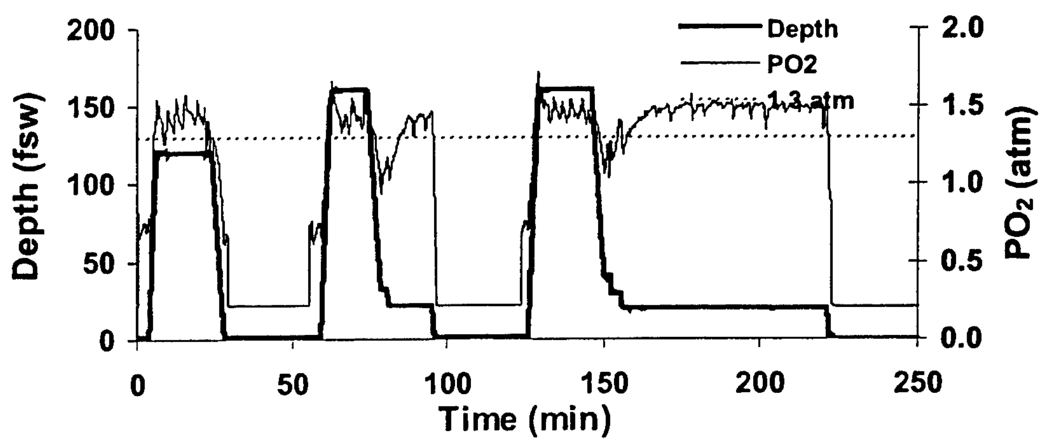
Profile 110100AN72



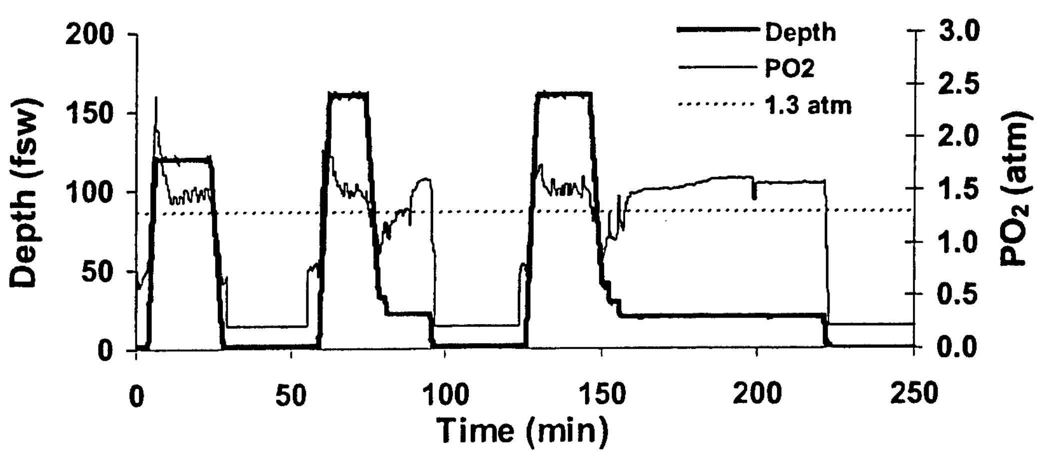
Profile 110100BN12



Profile 110100BN60



Profile 110100BN58



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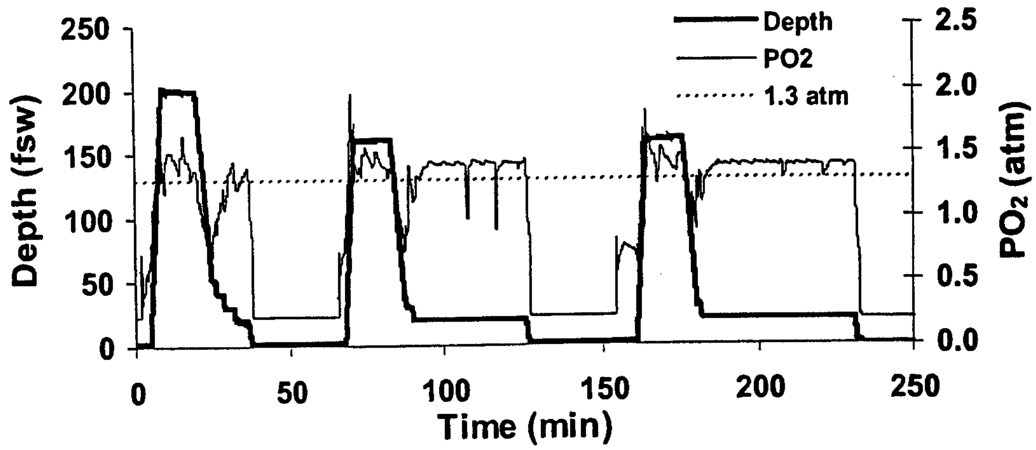

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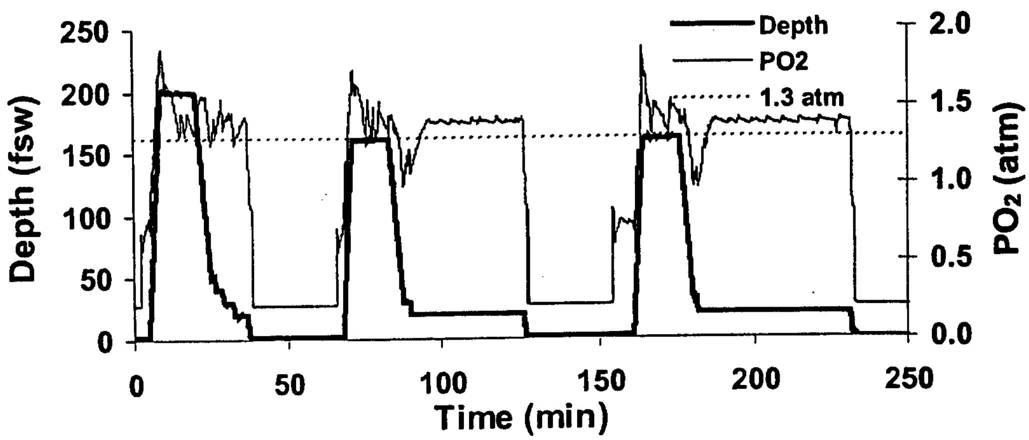

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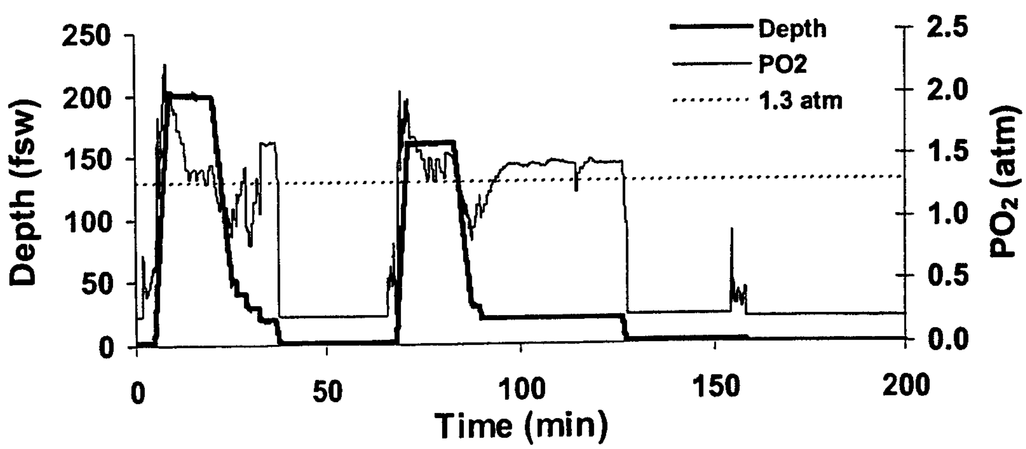

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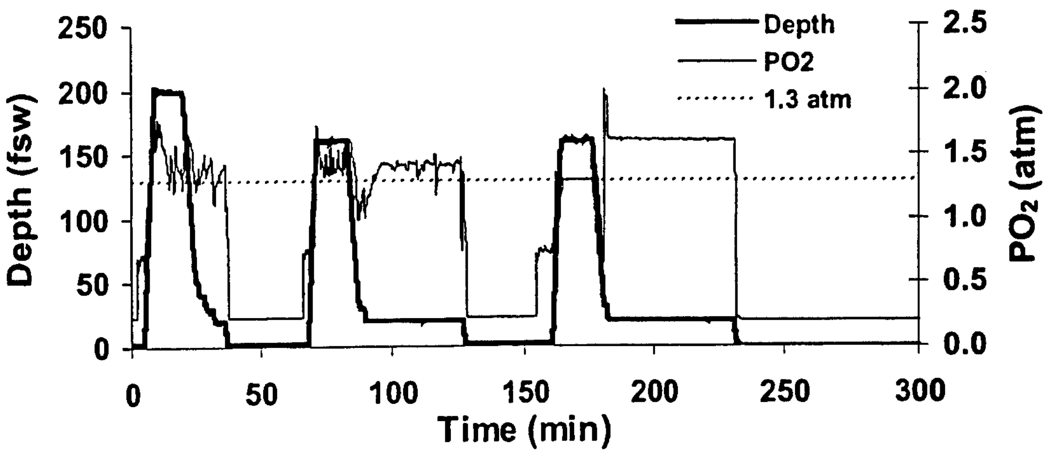

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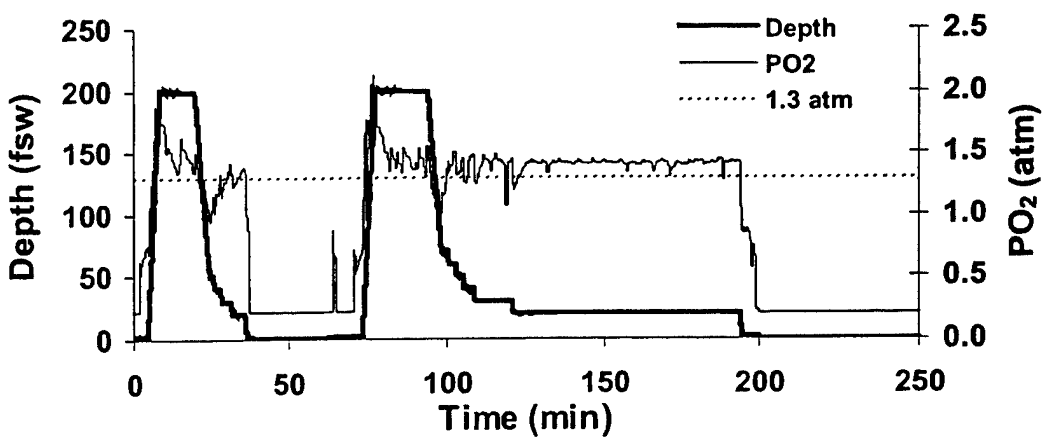

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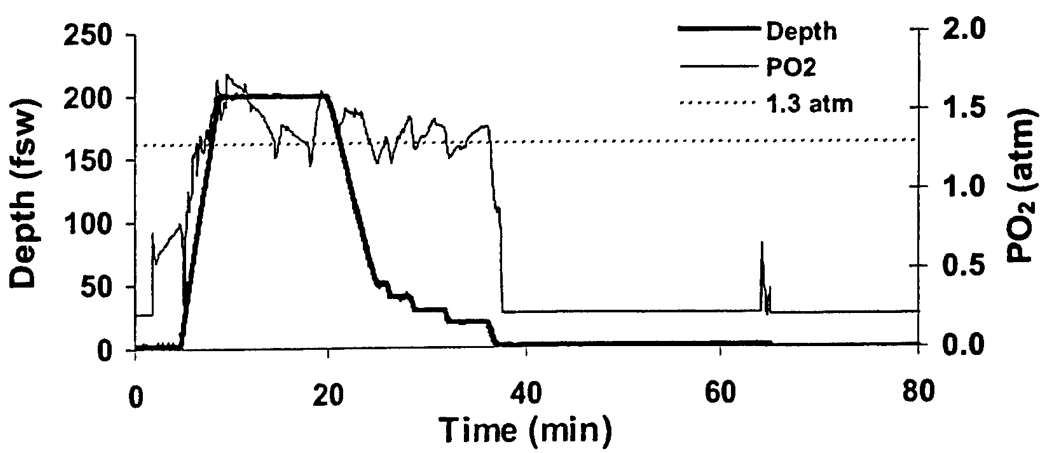

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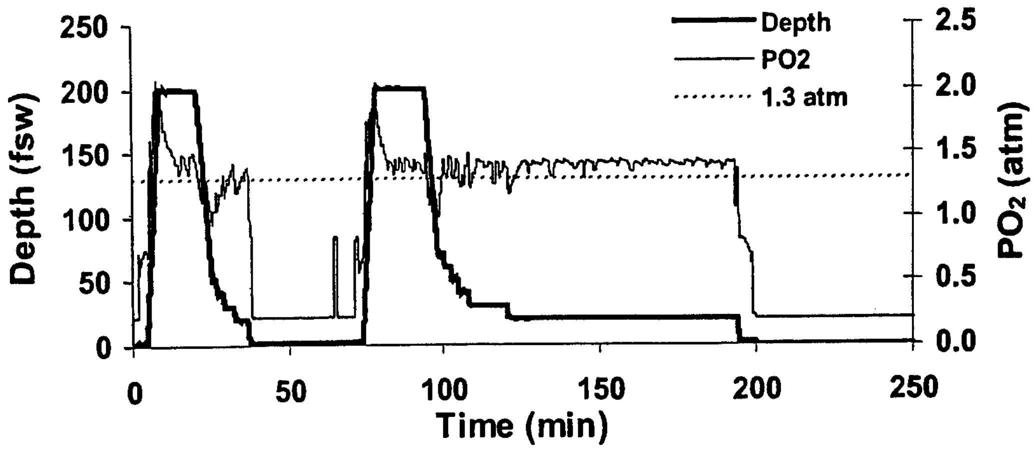

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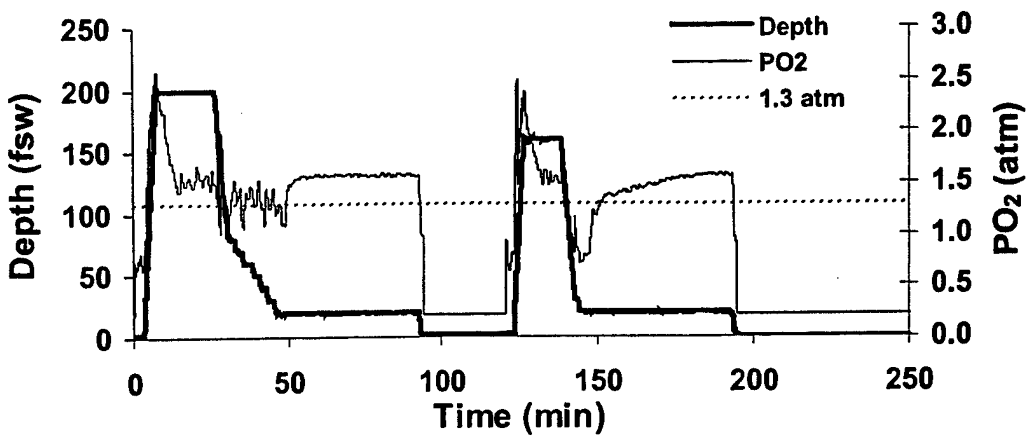

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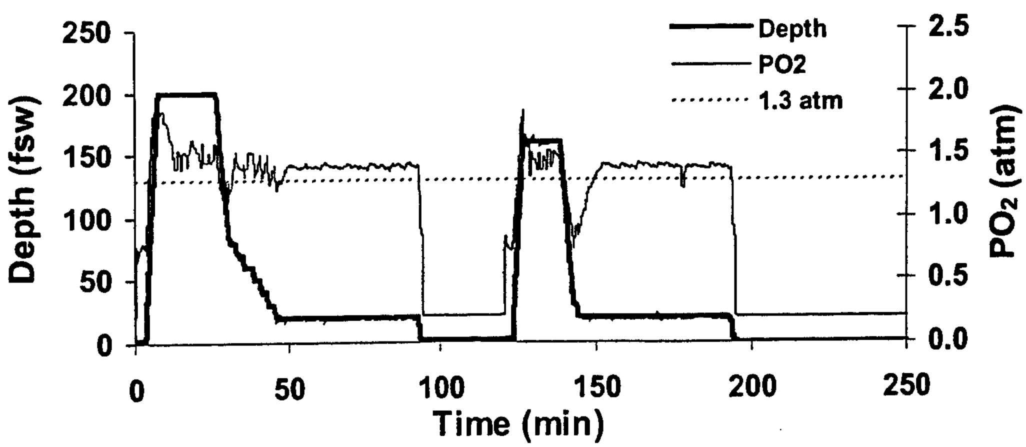

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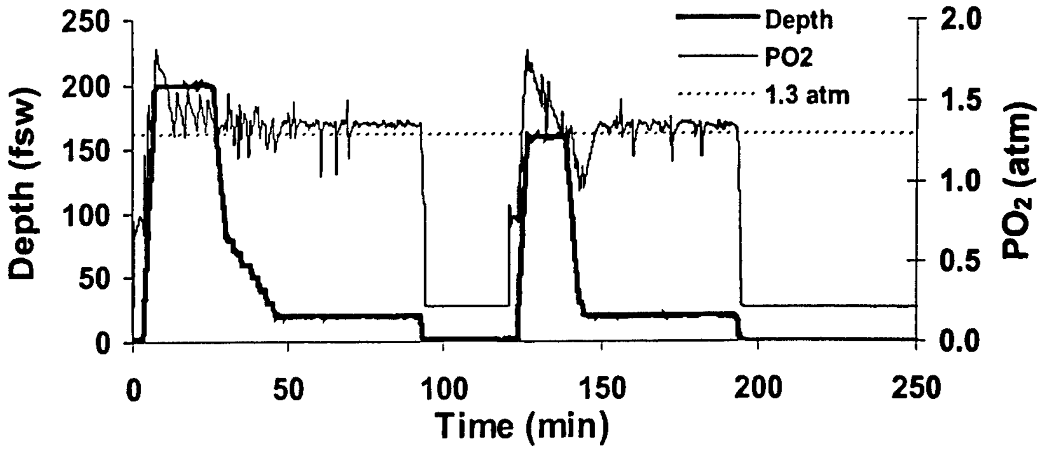

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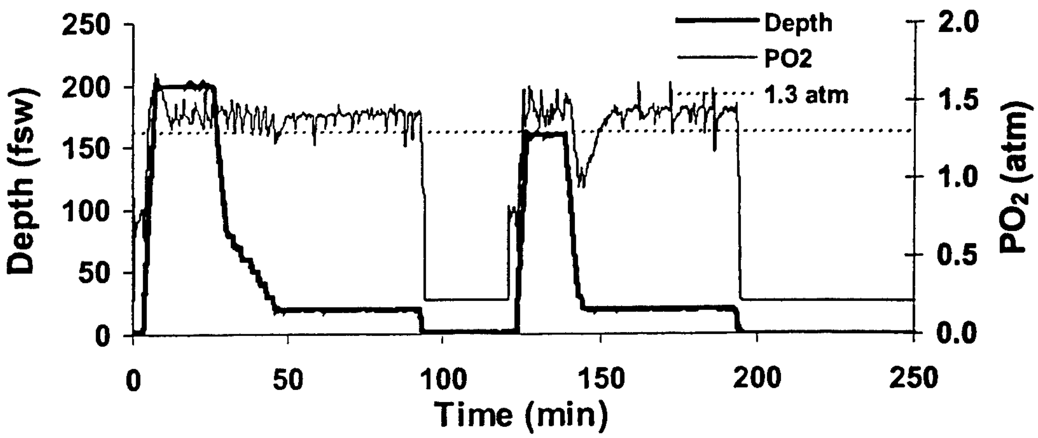

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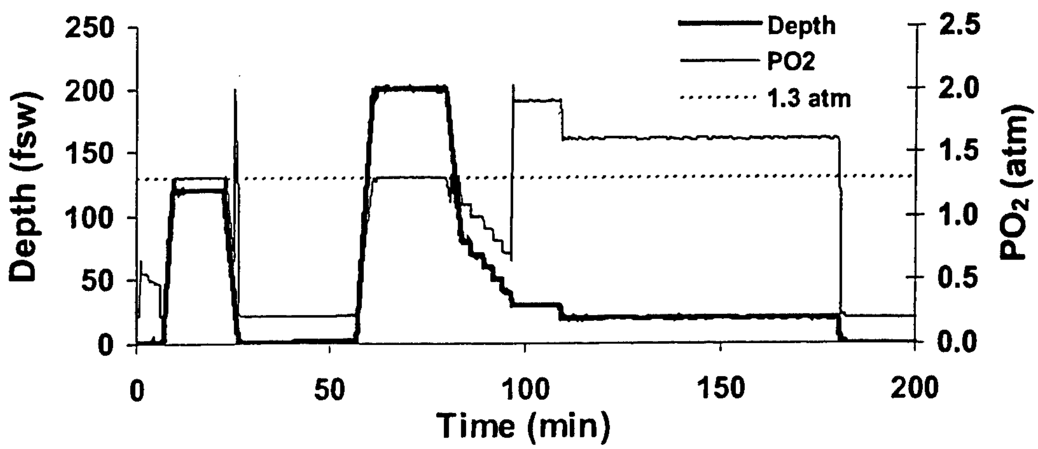

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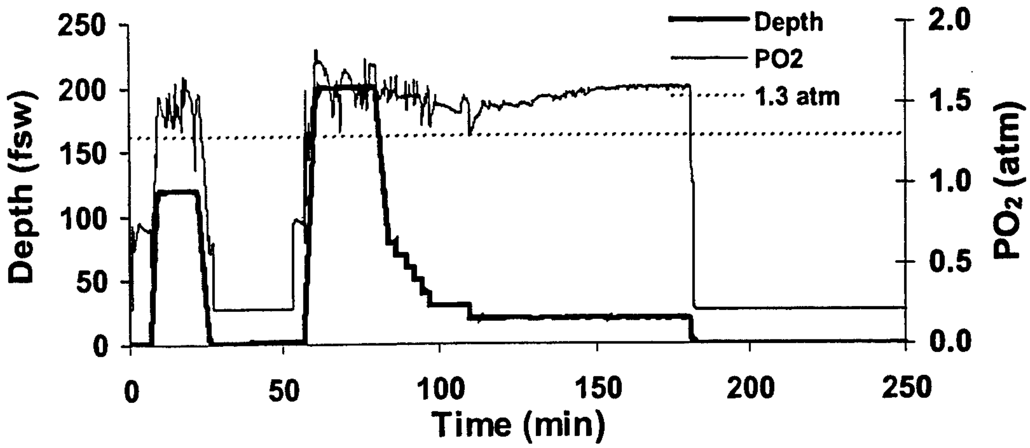

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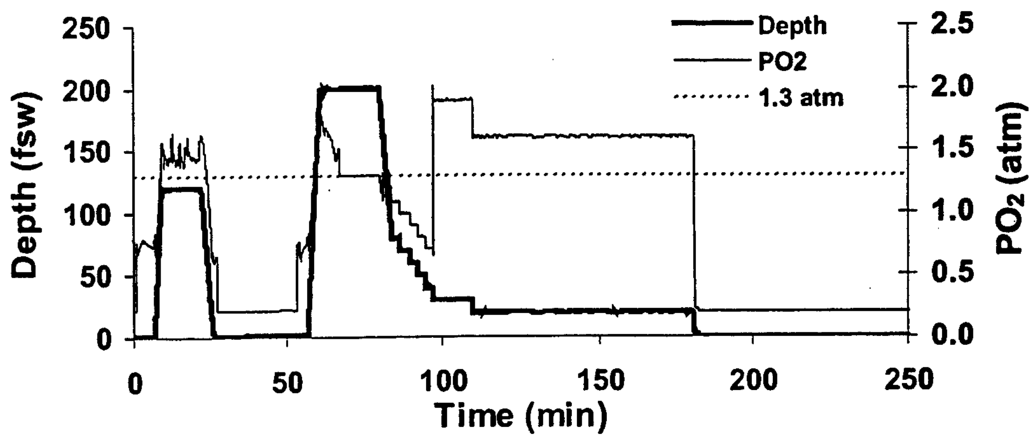

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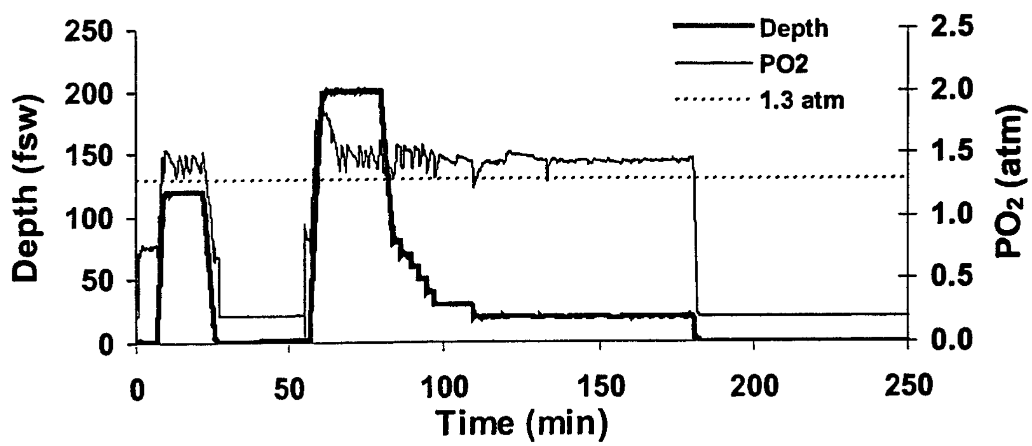

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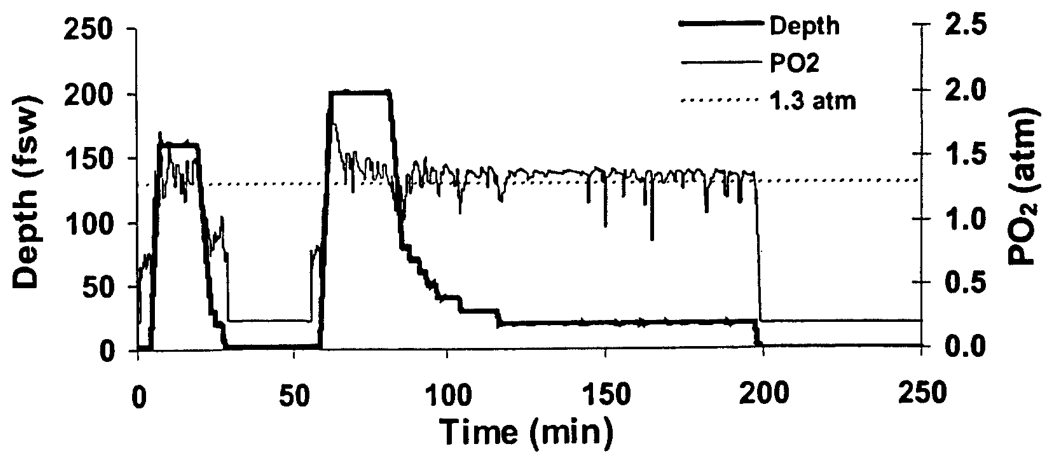

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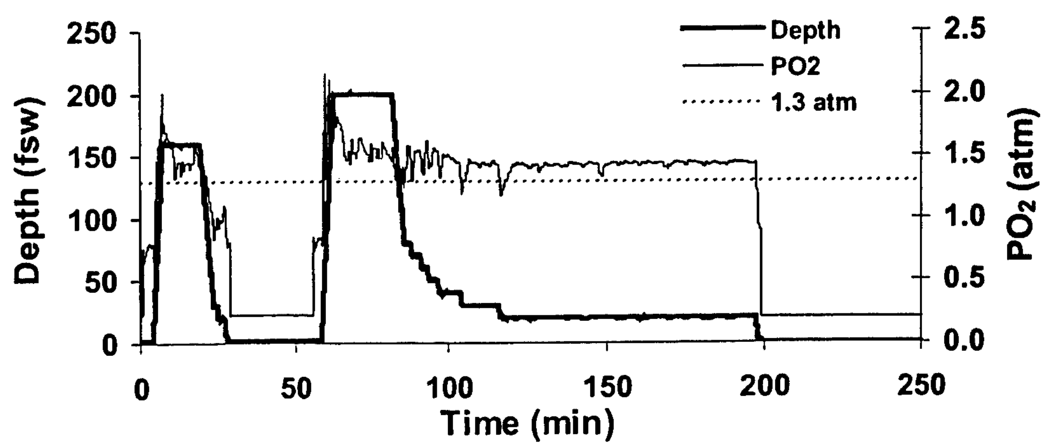

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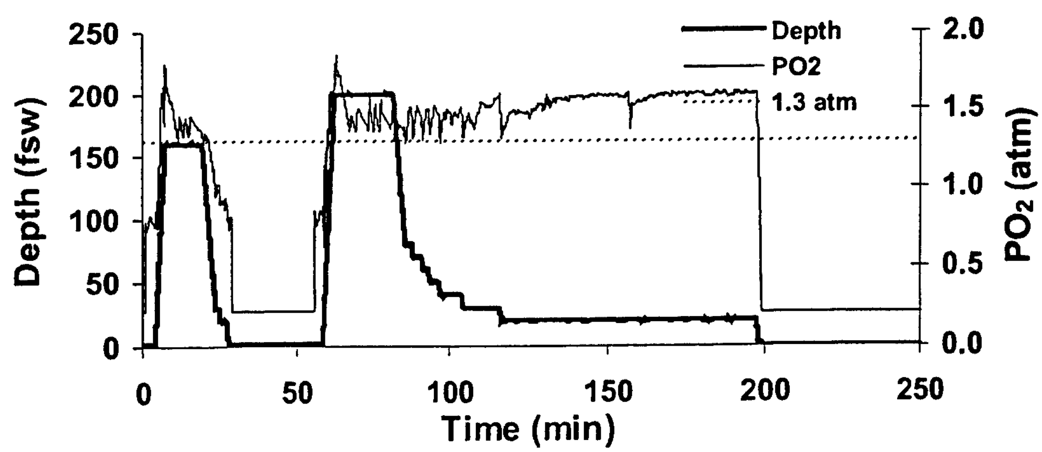

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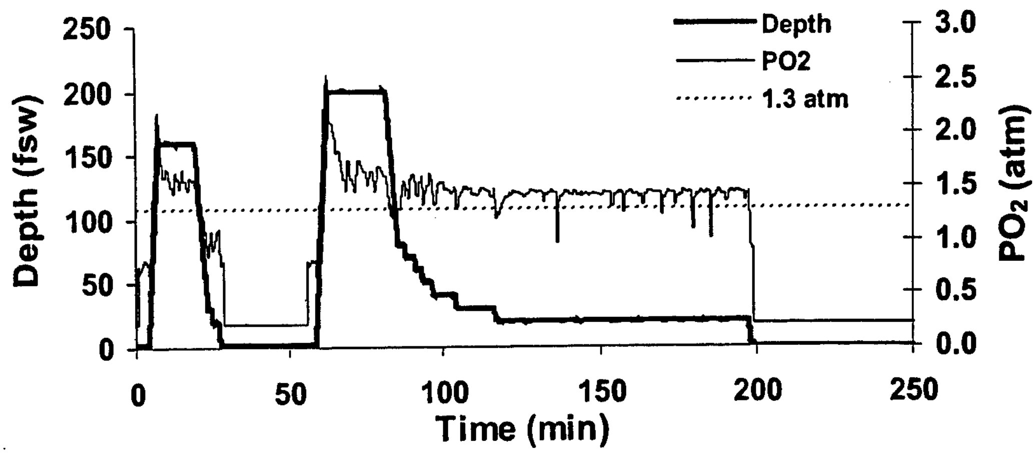

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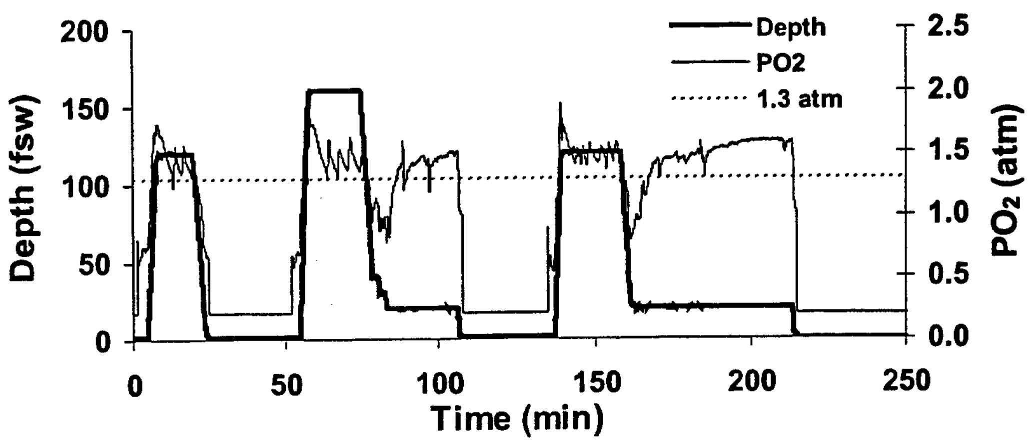

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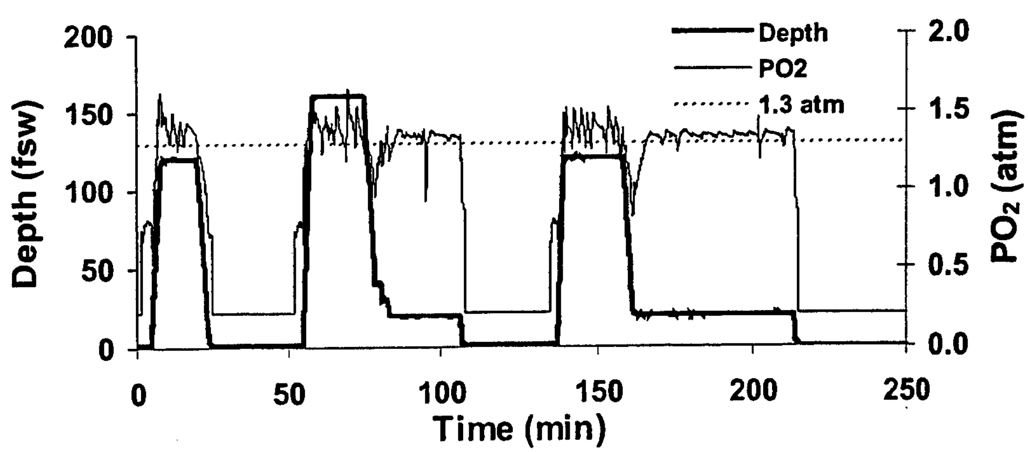

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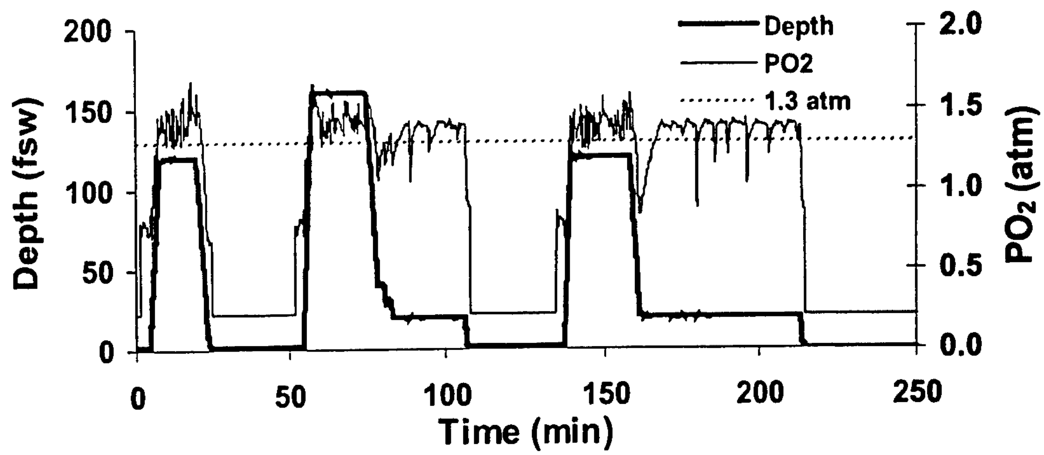

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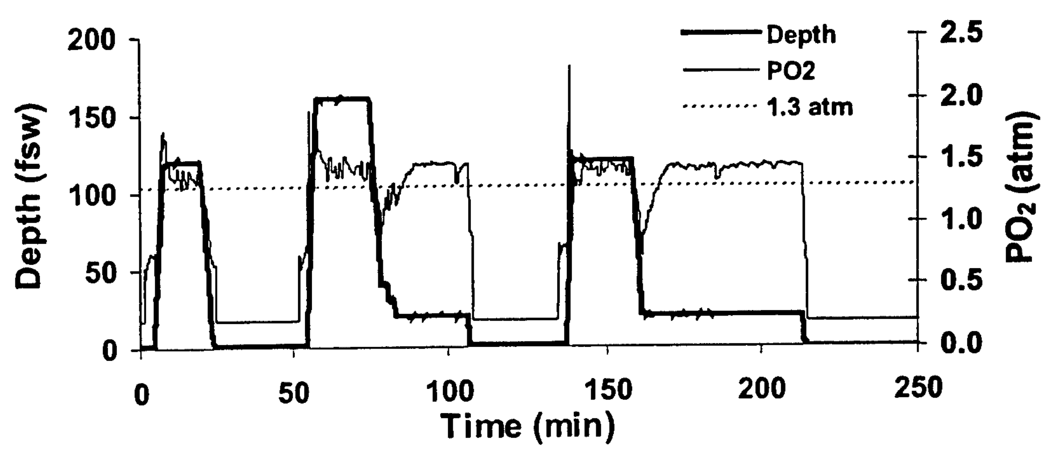

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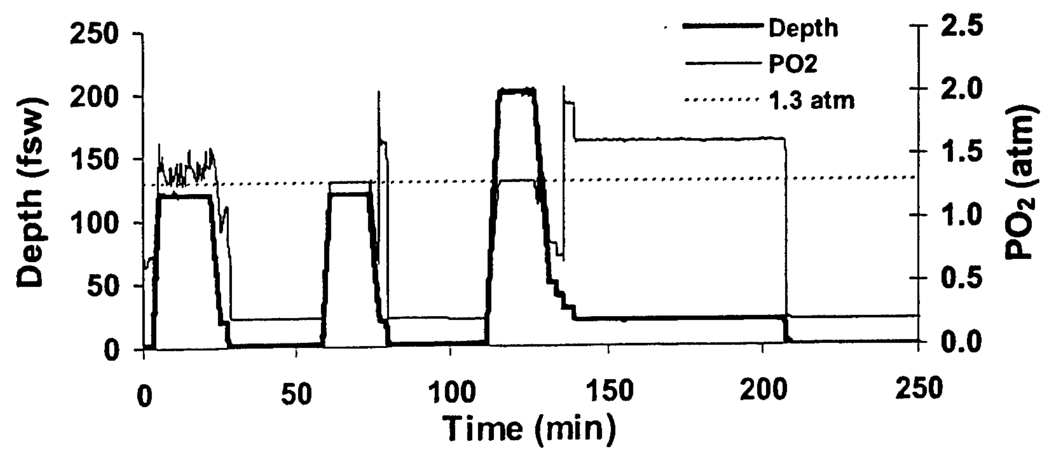

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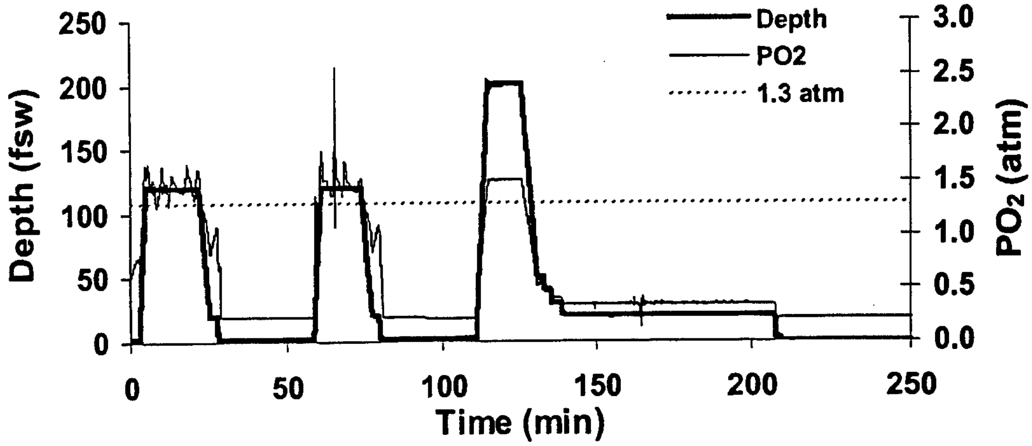

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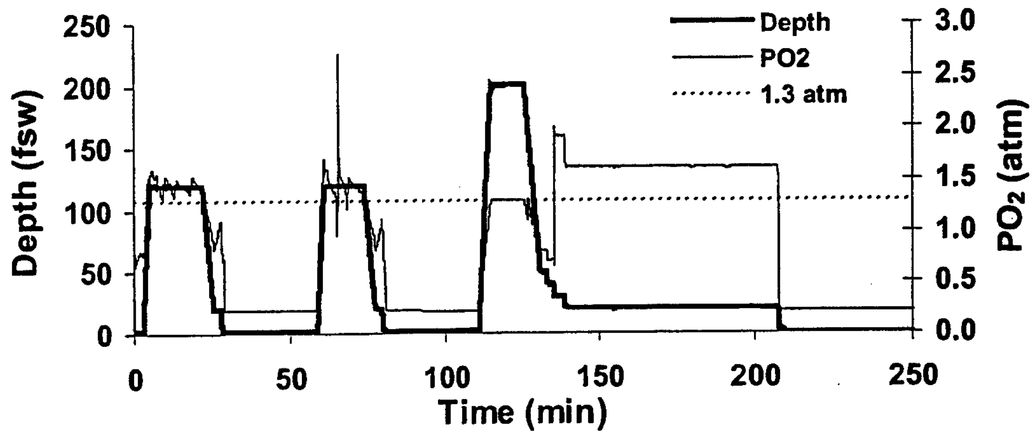

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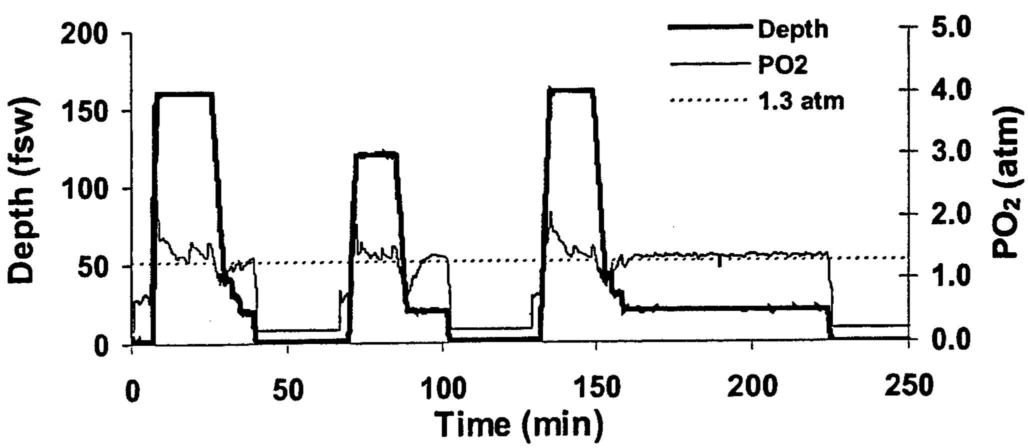

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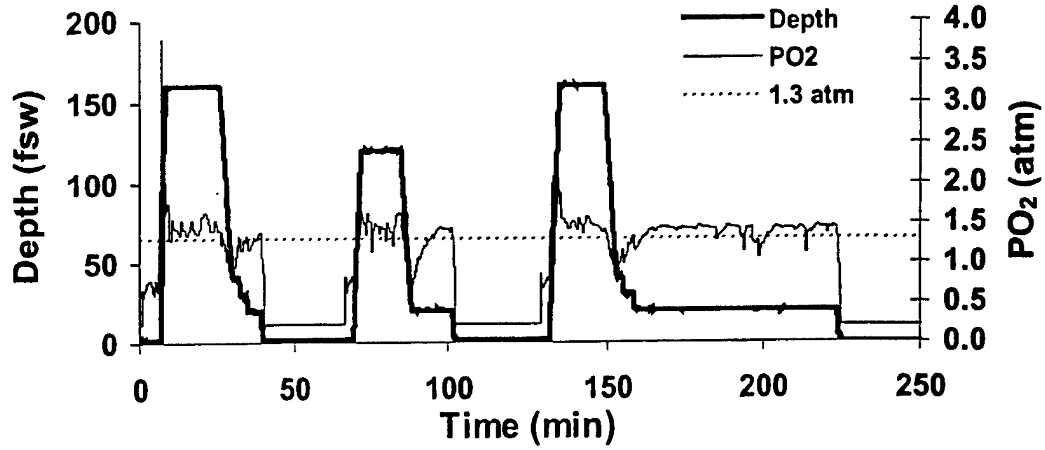

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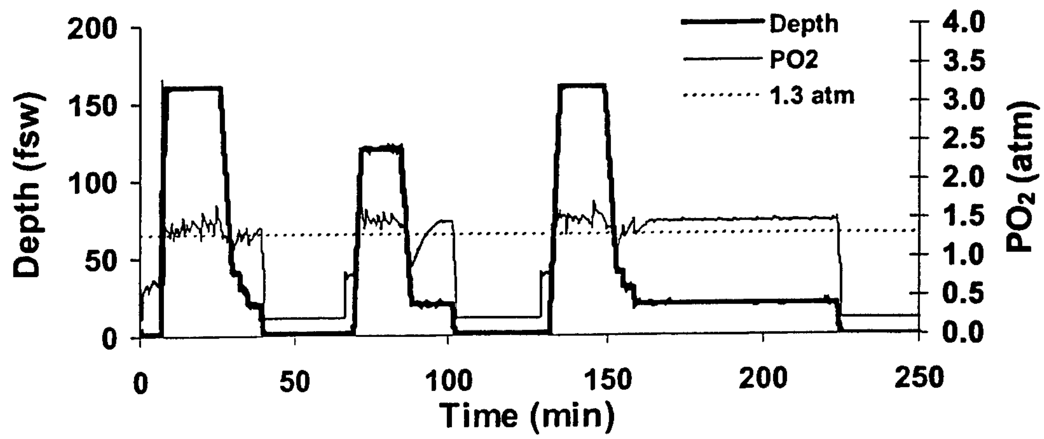

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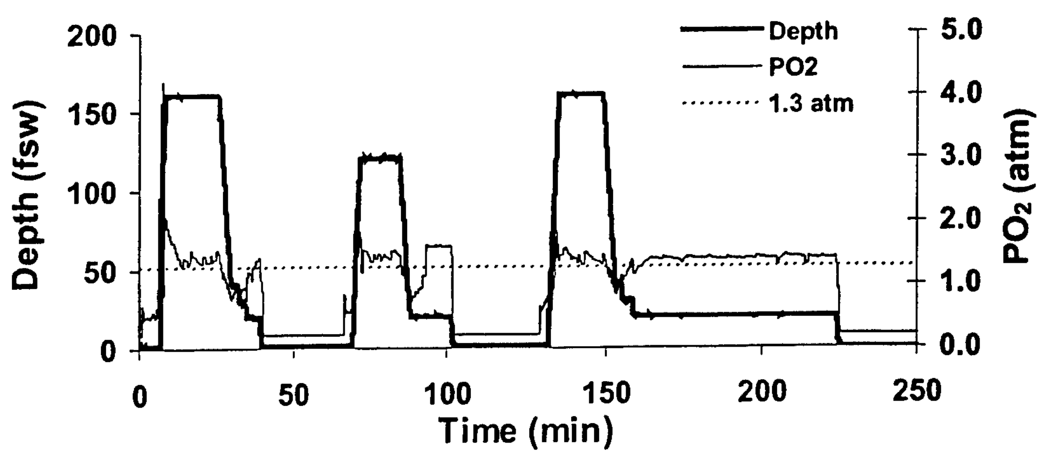

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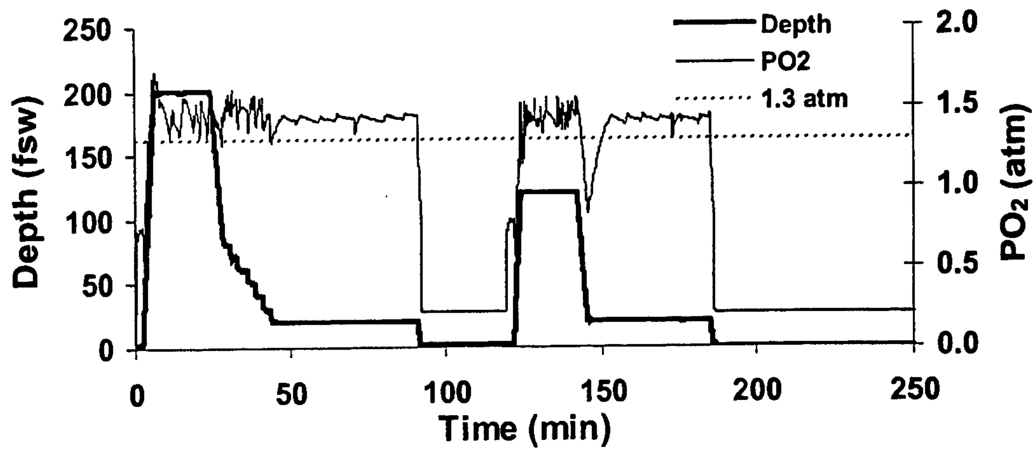

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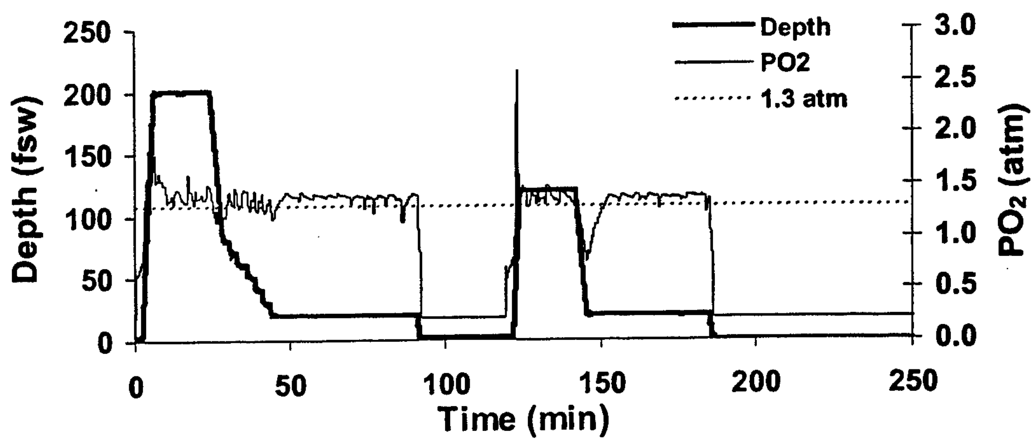

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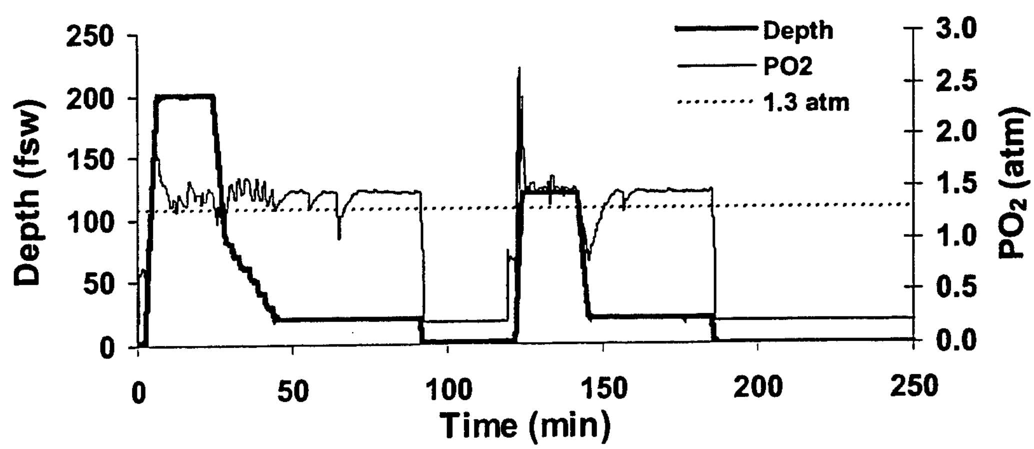

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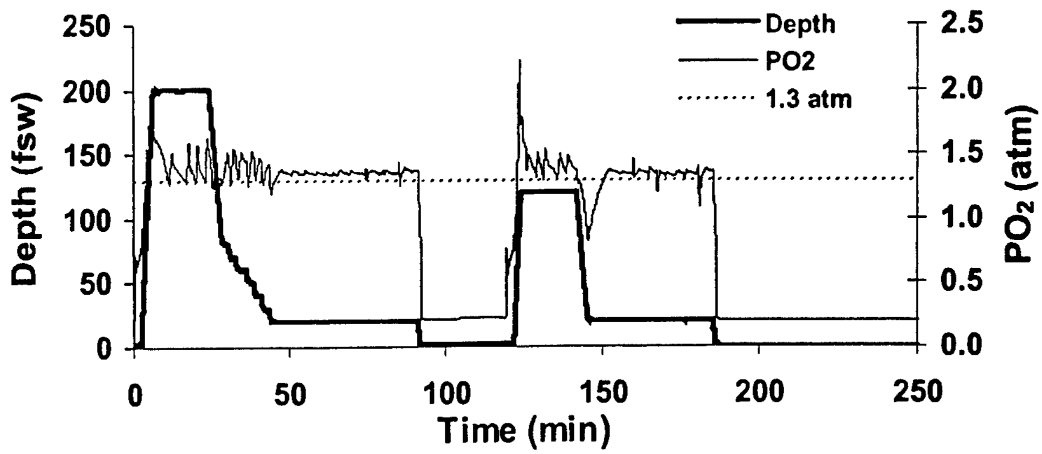

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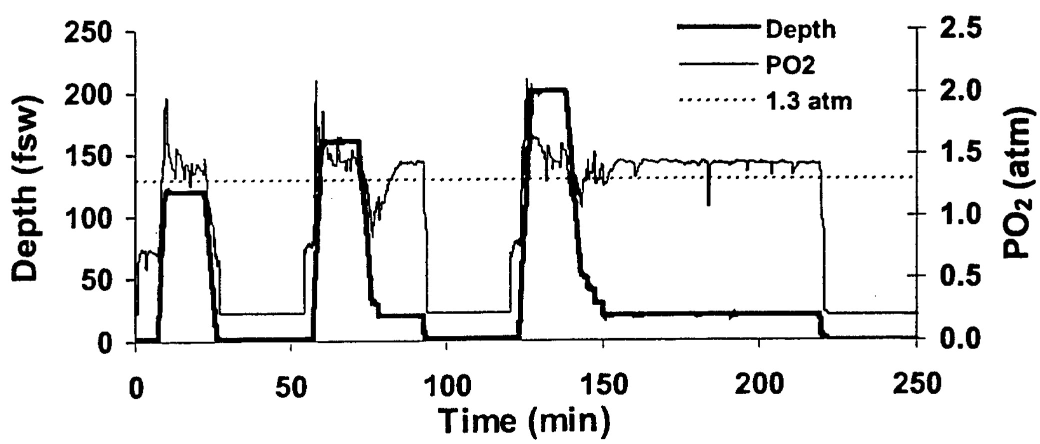

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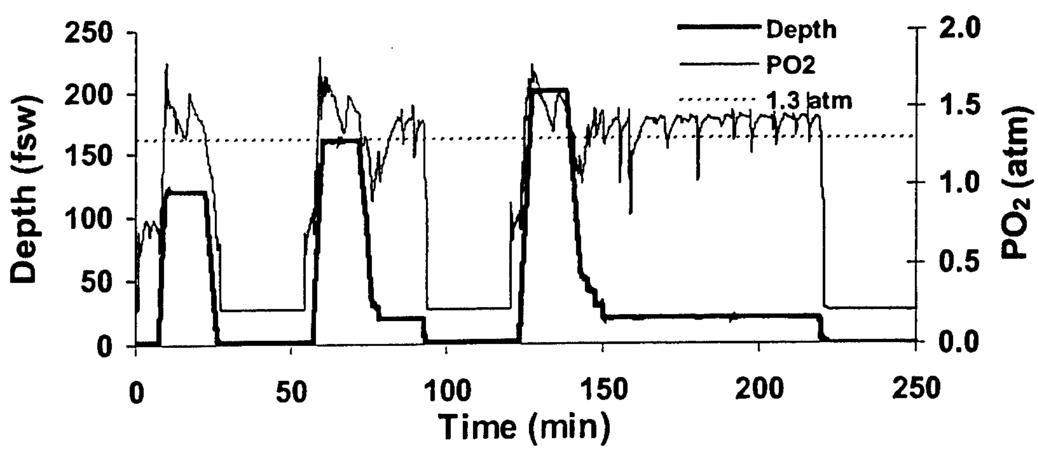

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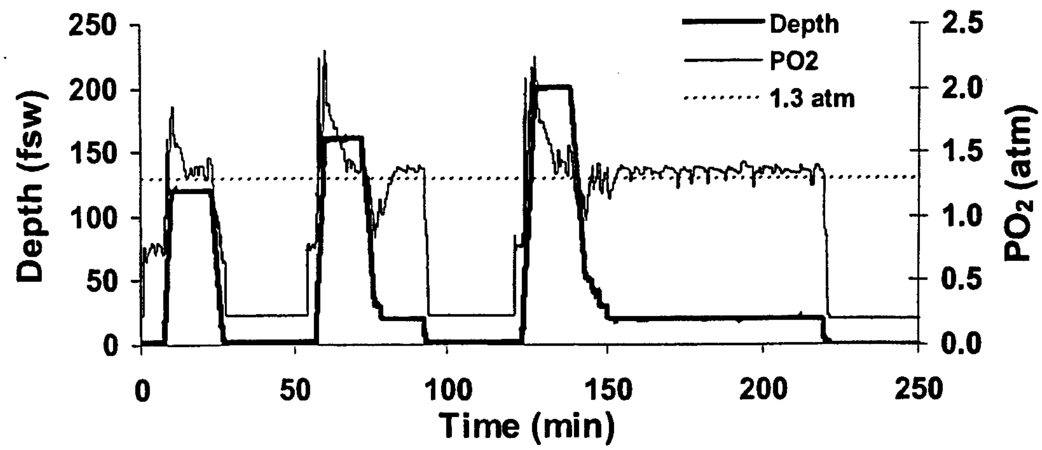

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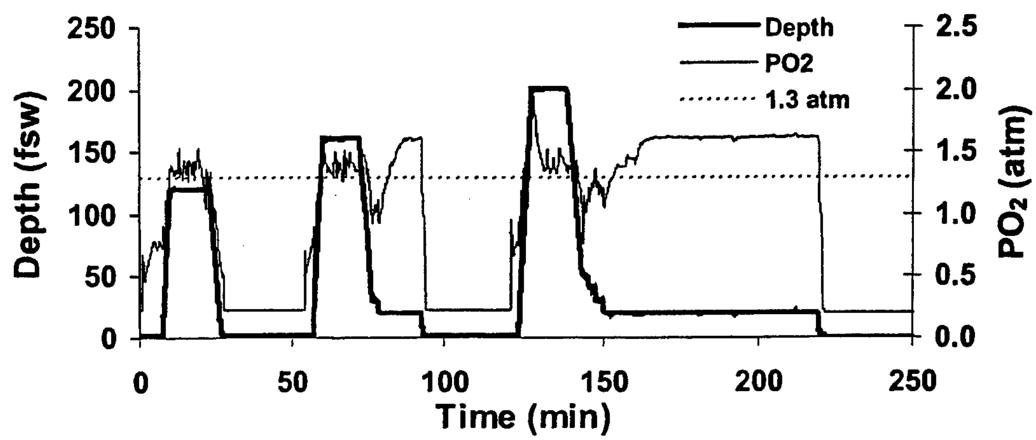

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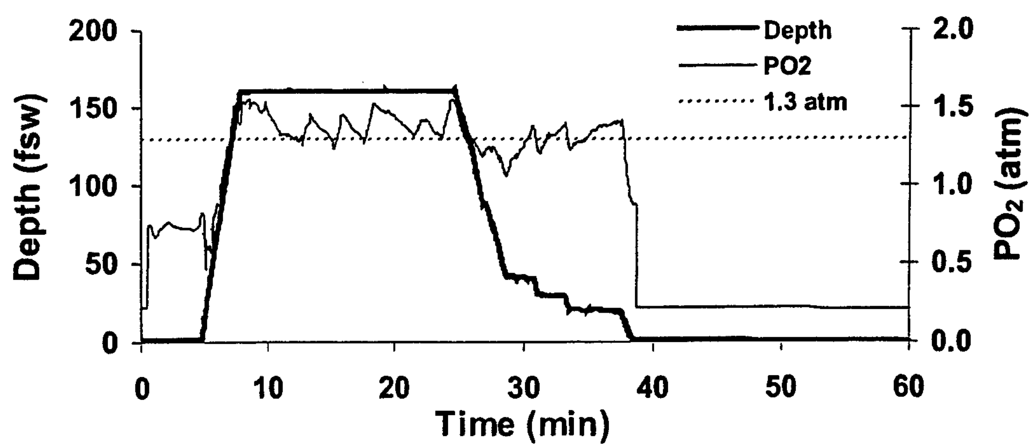

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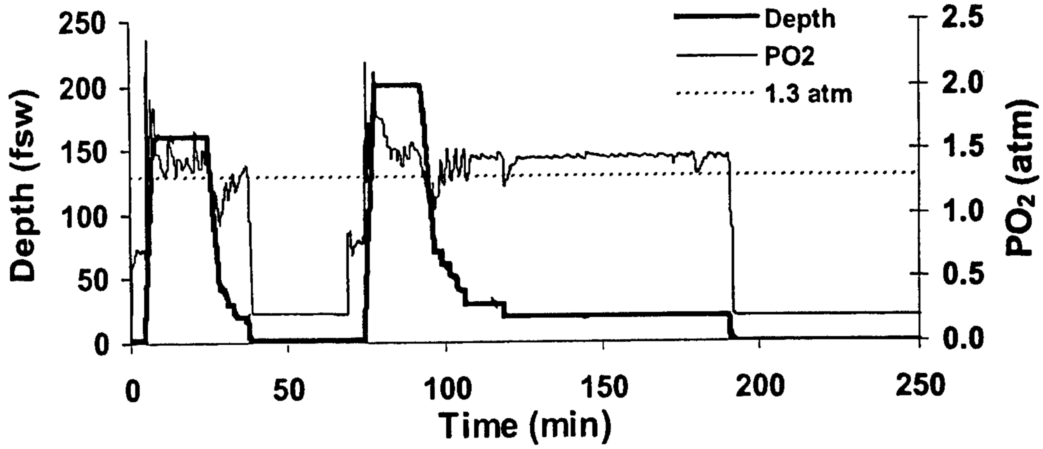

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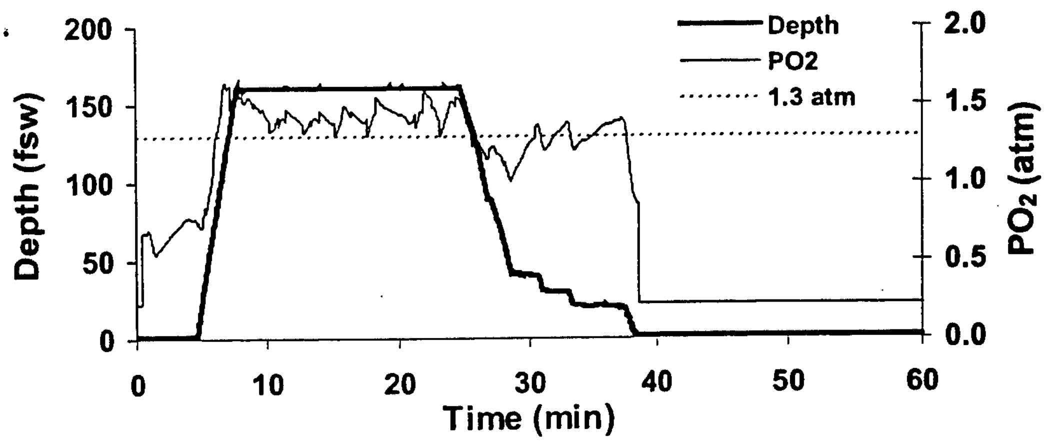

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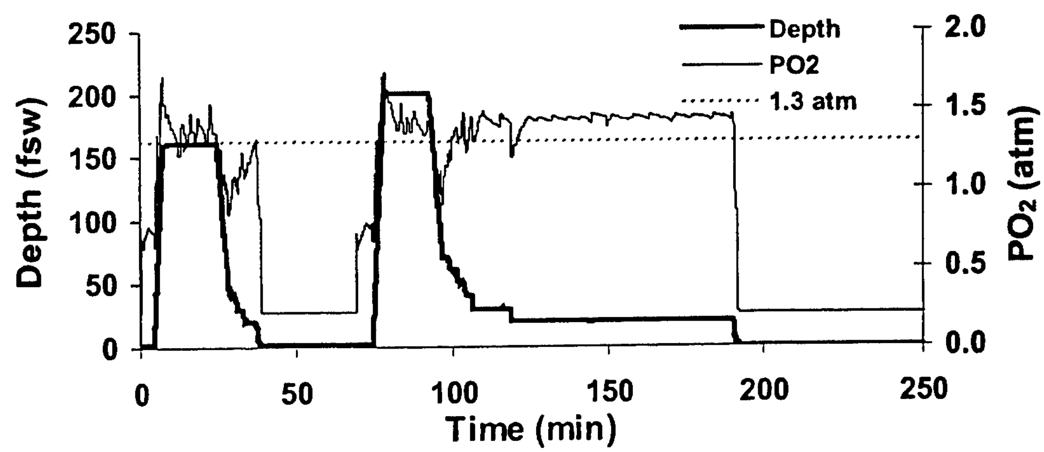

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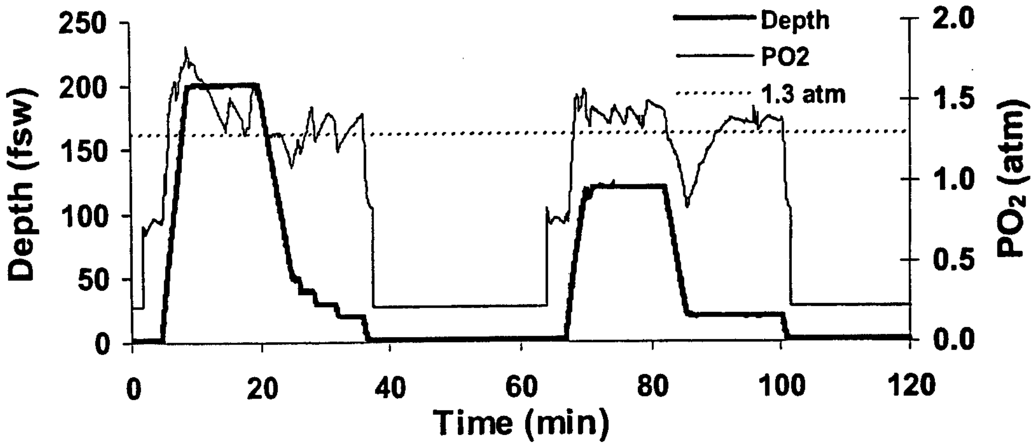

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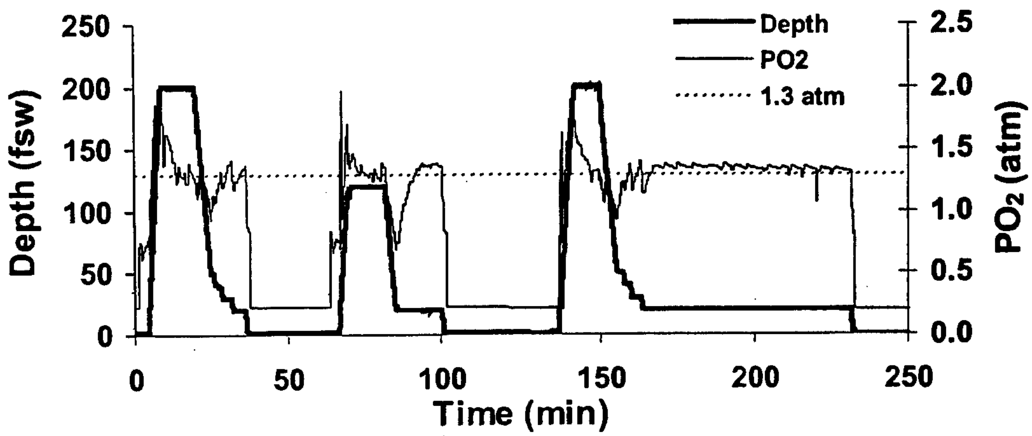

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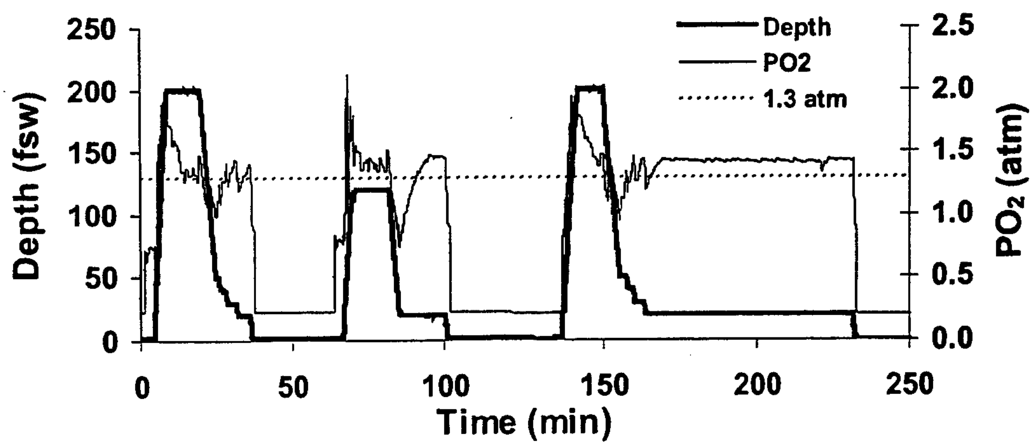

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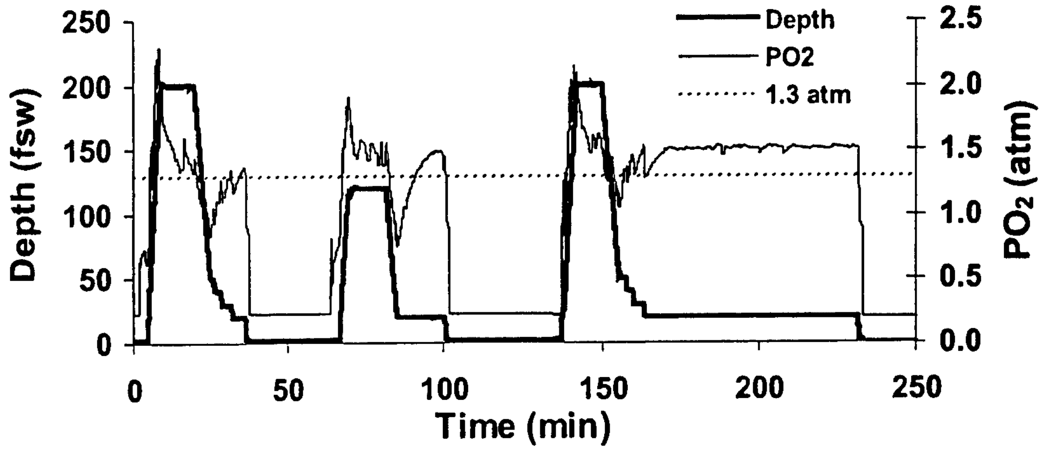

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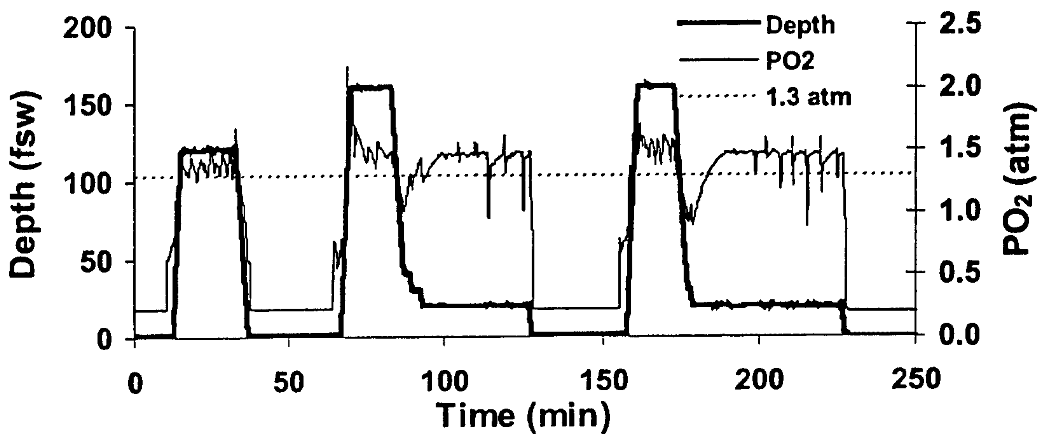

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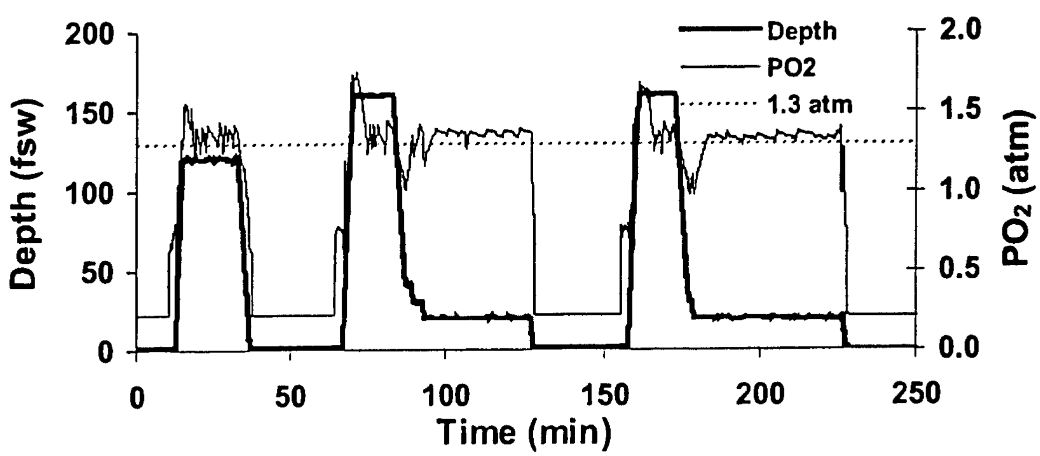

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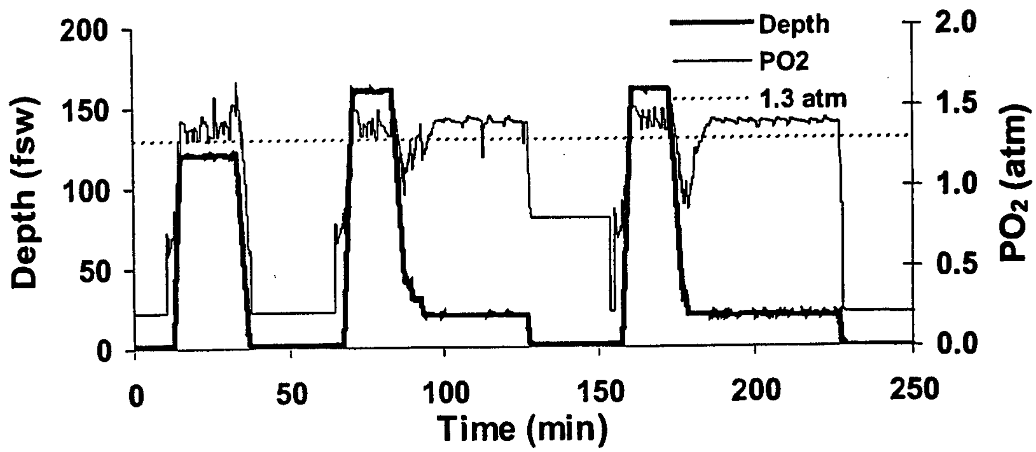

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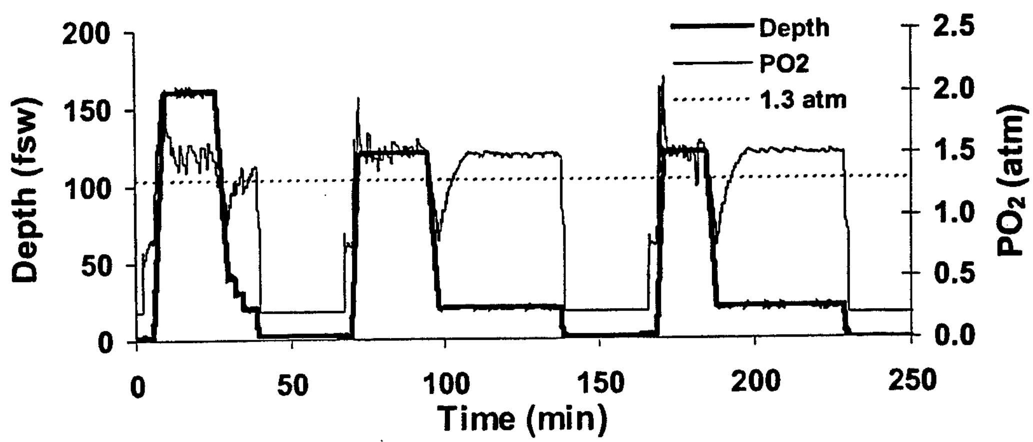

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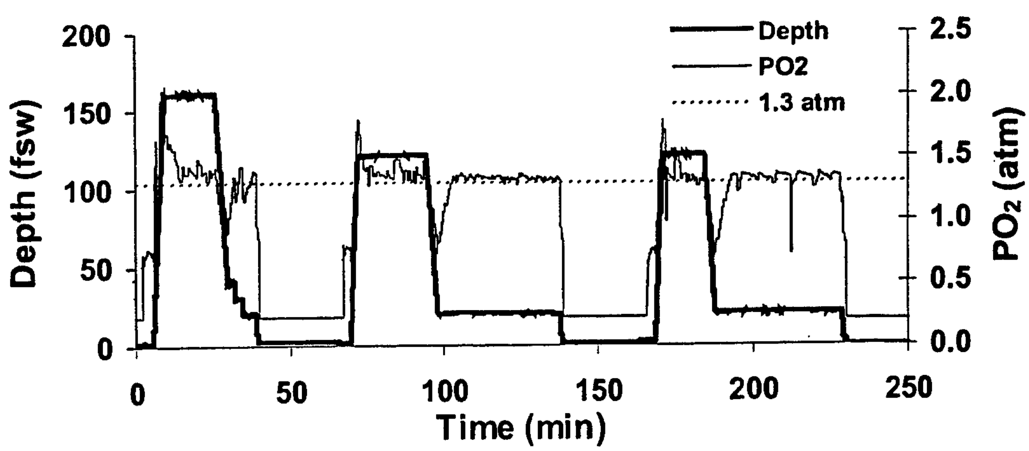

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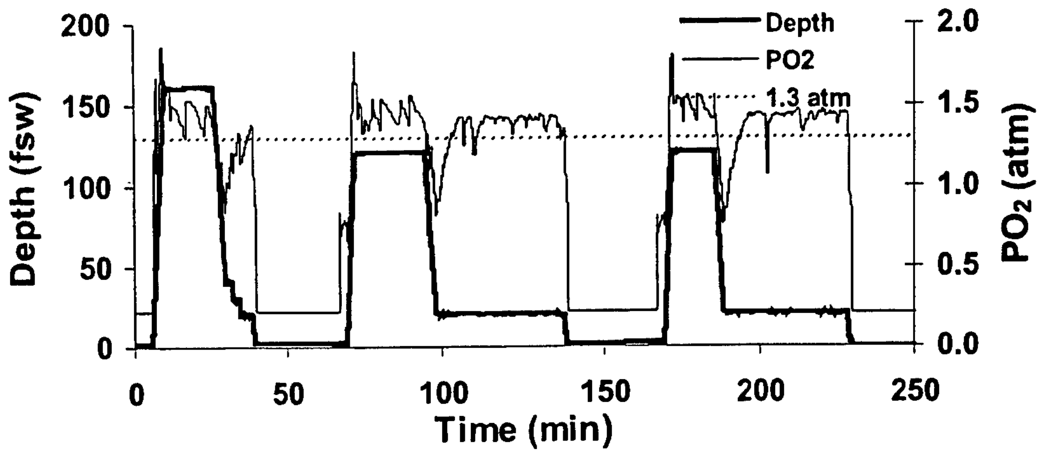

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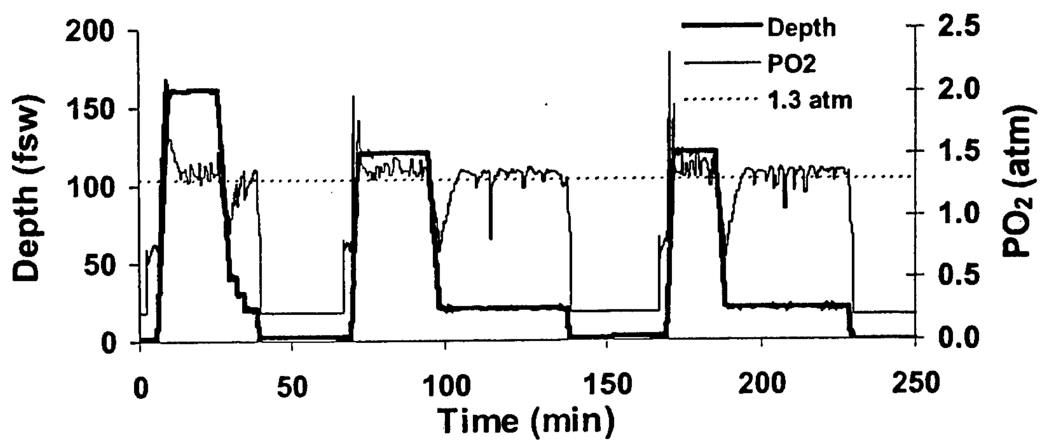

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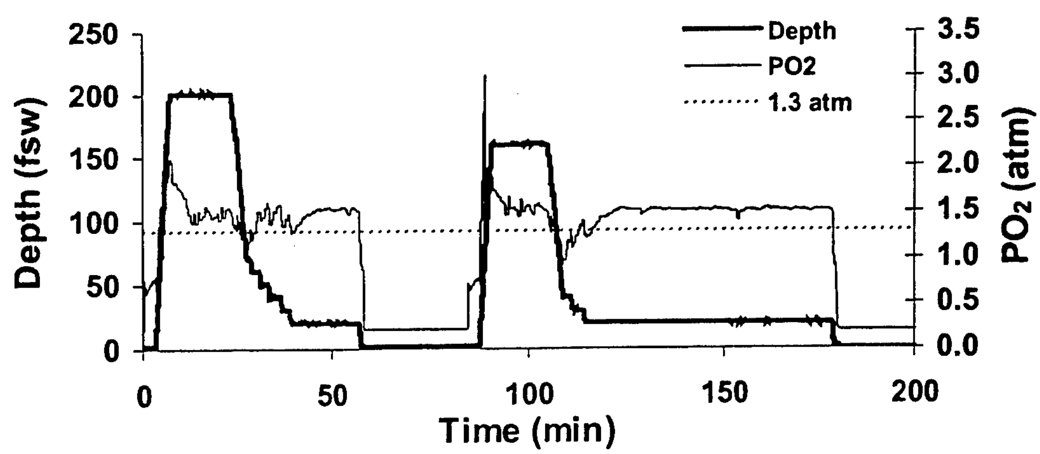

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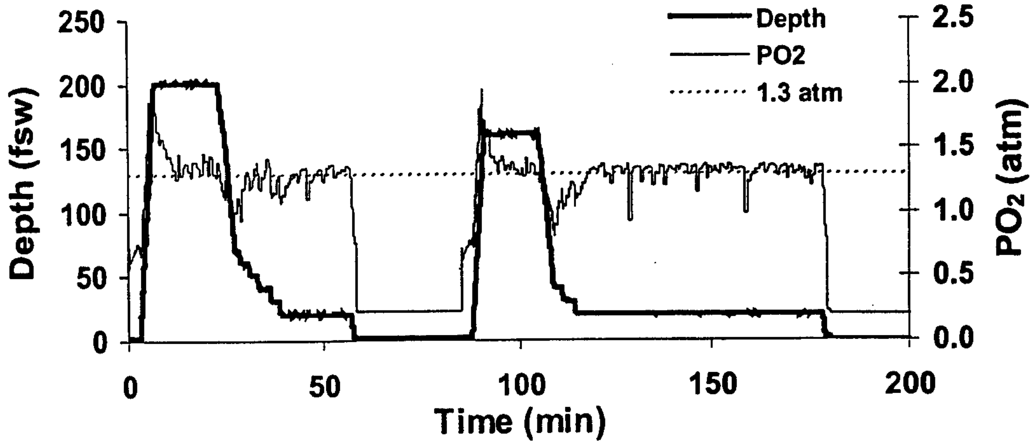

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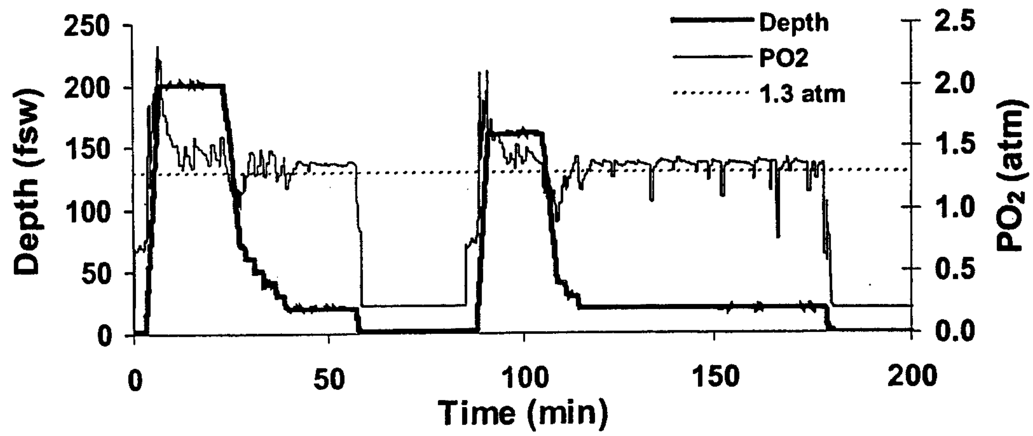

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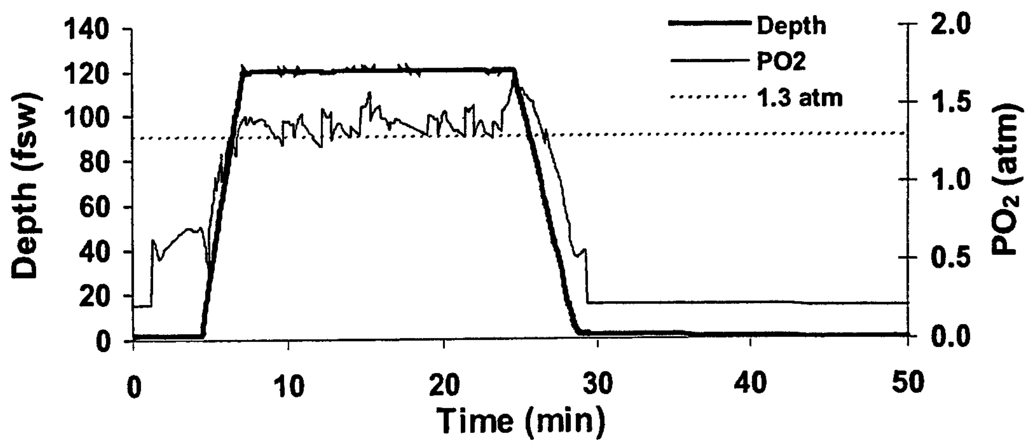

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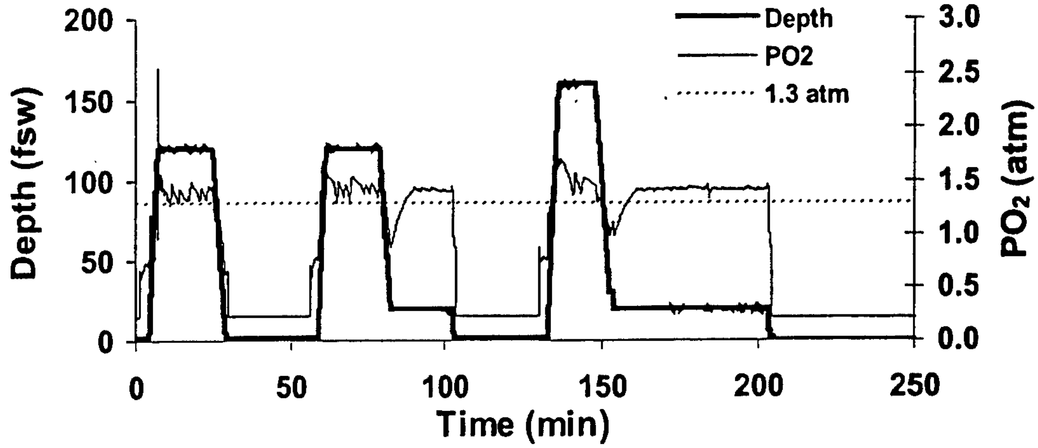

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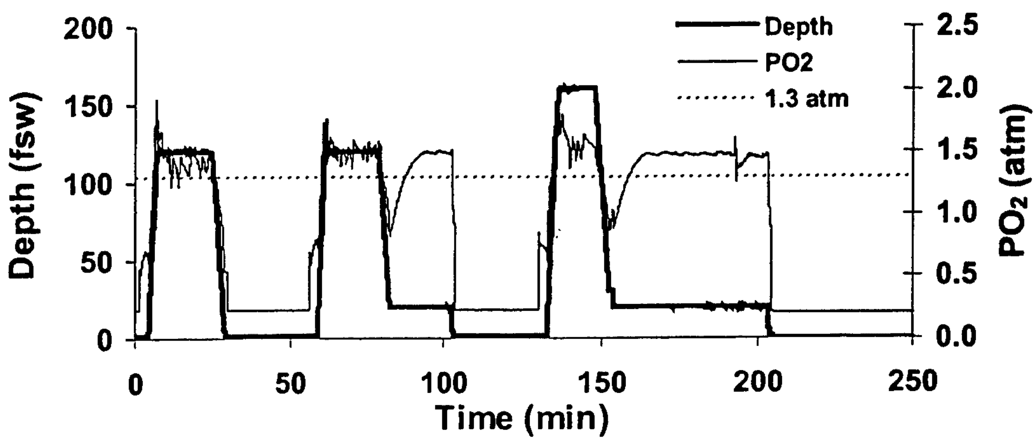

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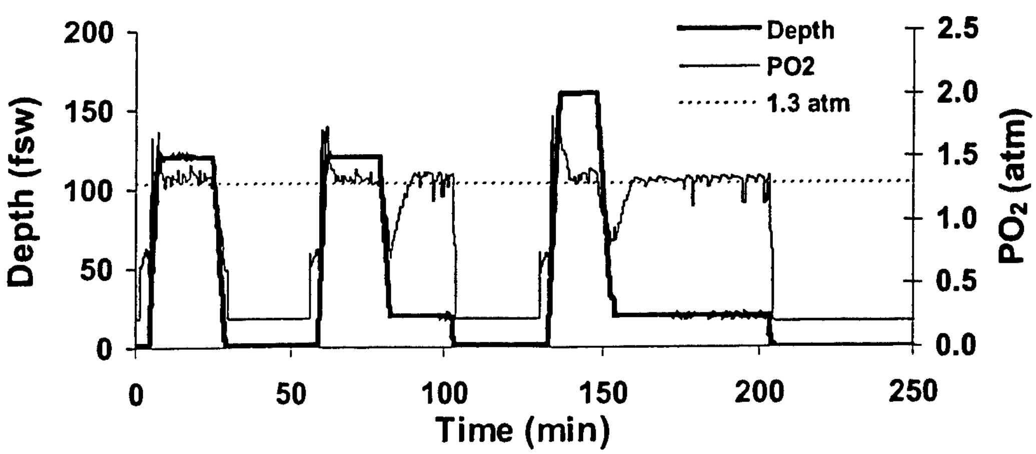

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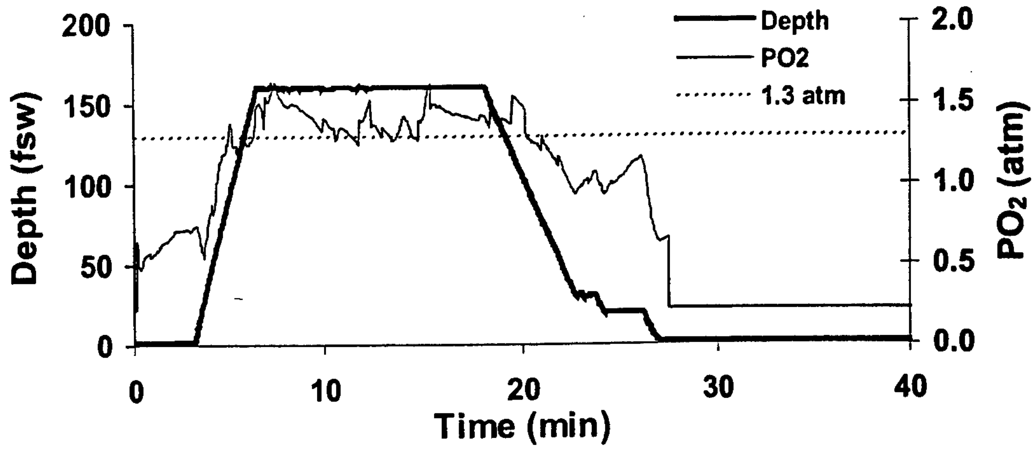

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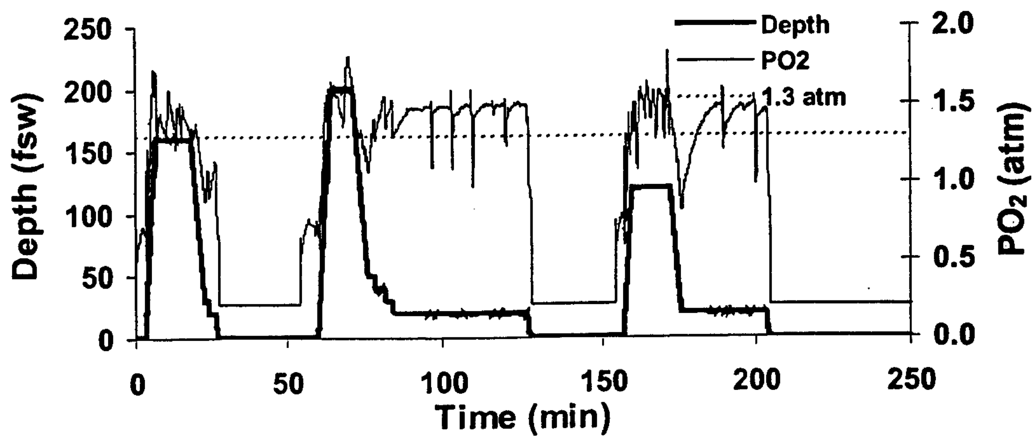

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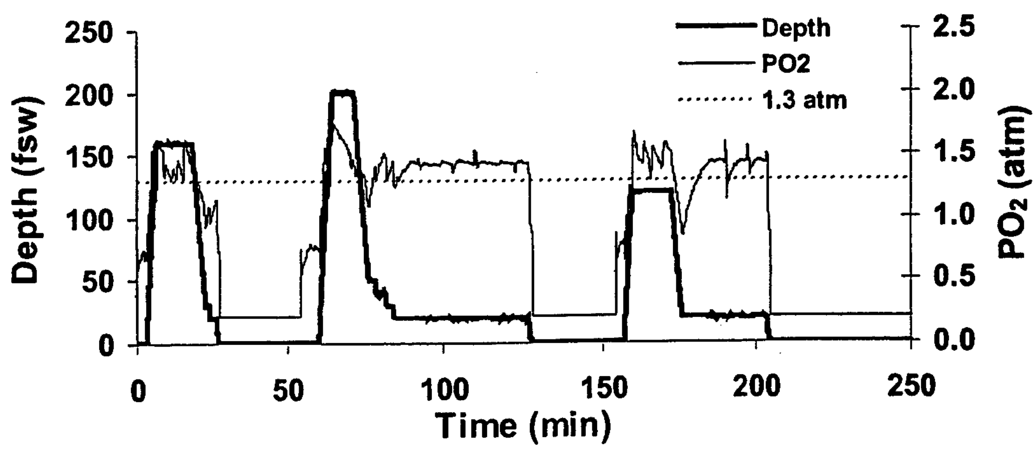

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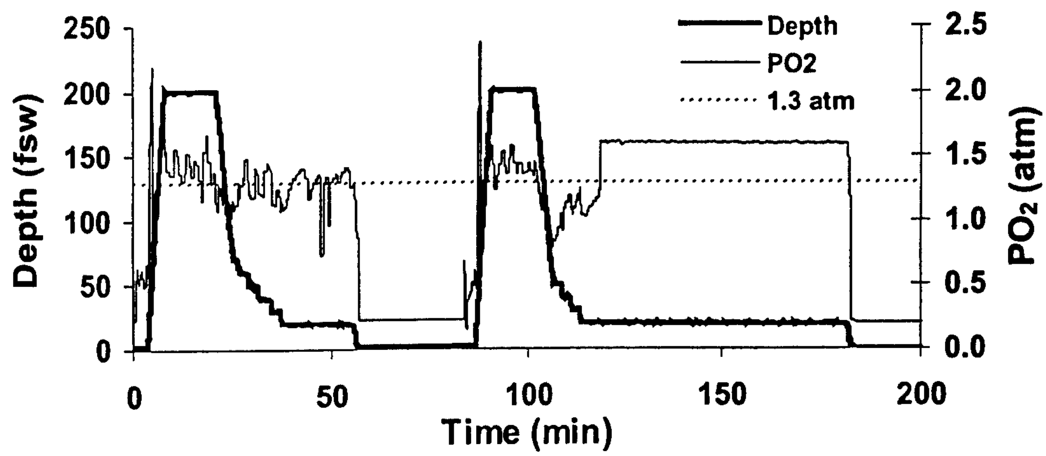

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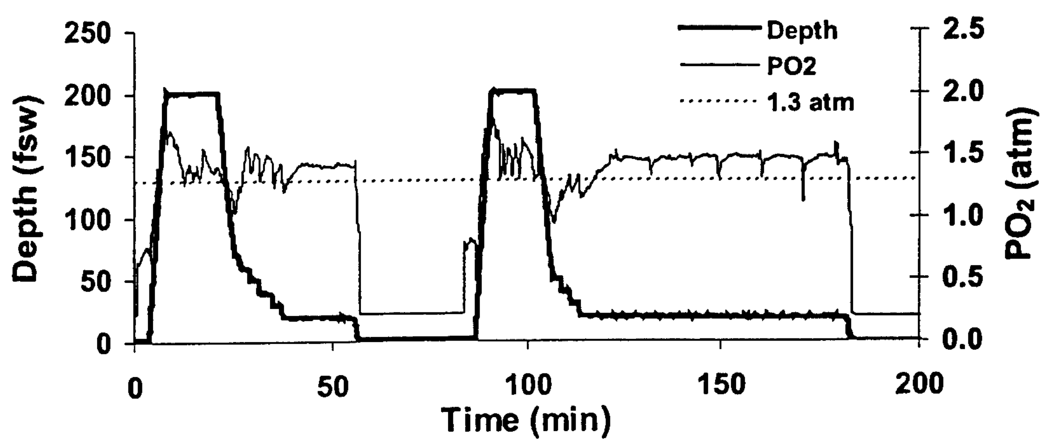

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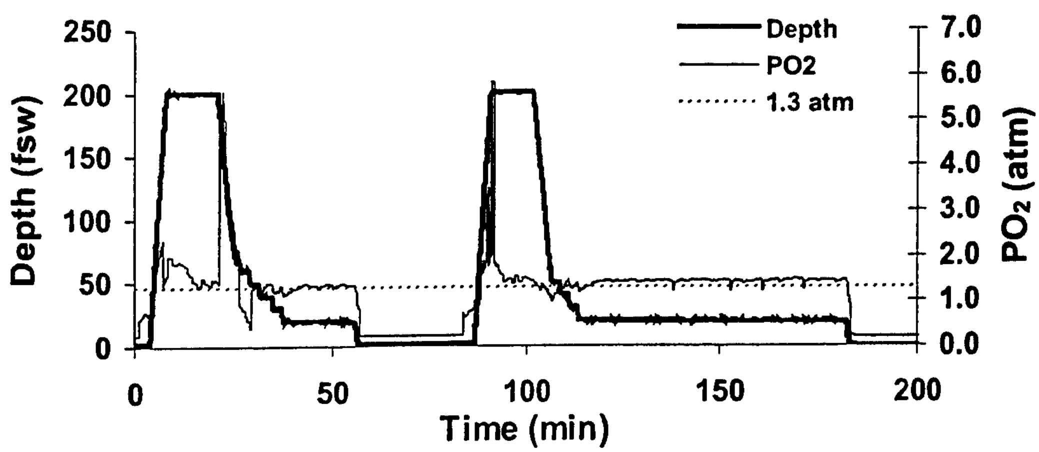

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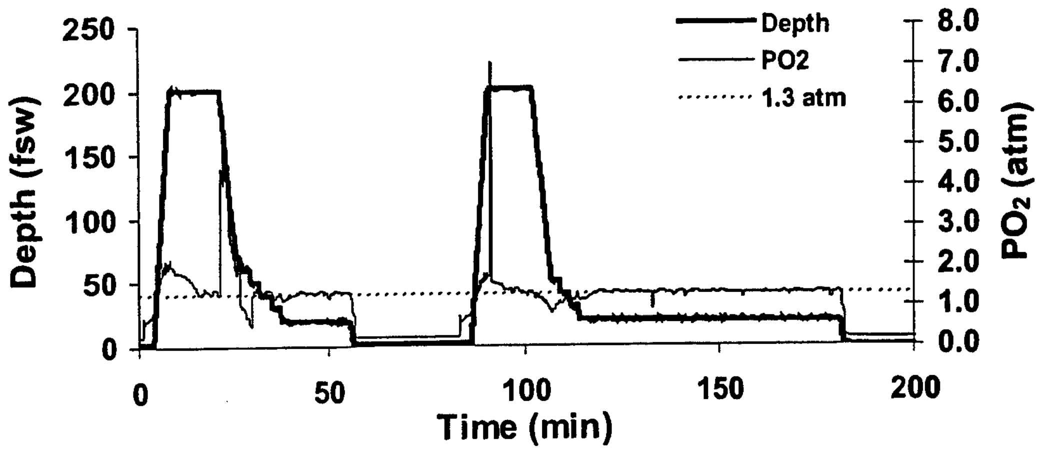

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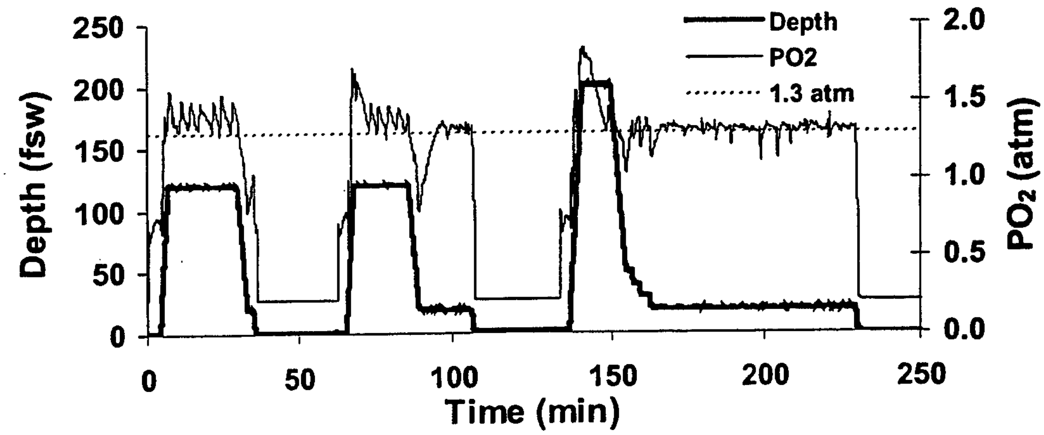

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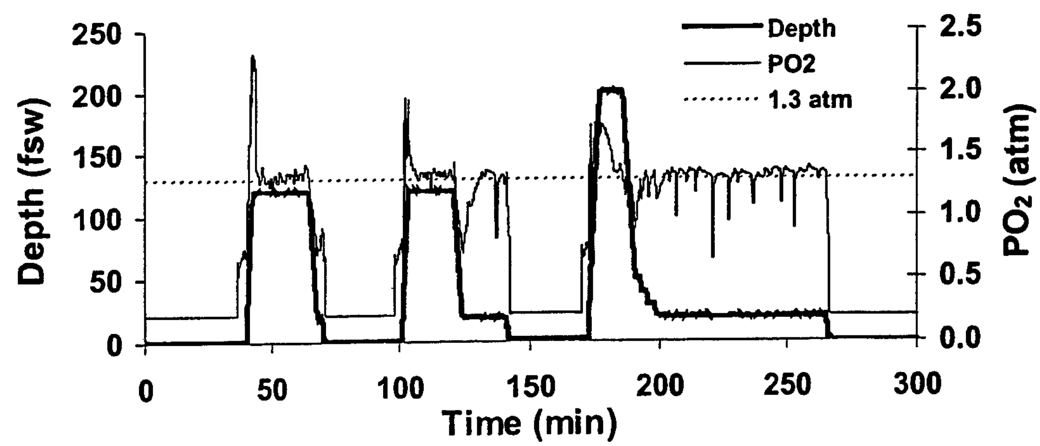

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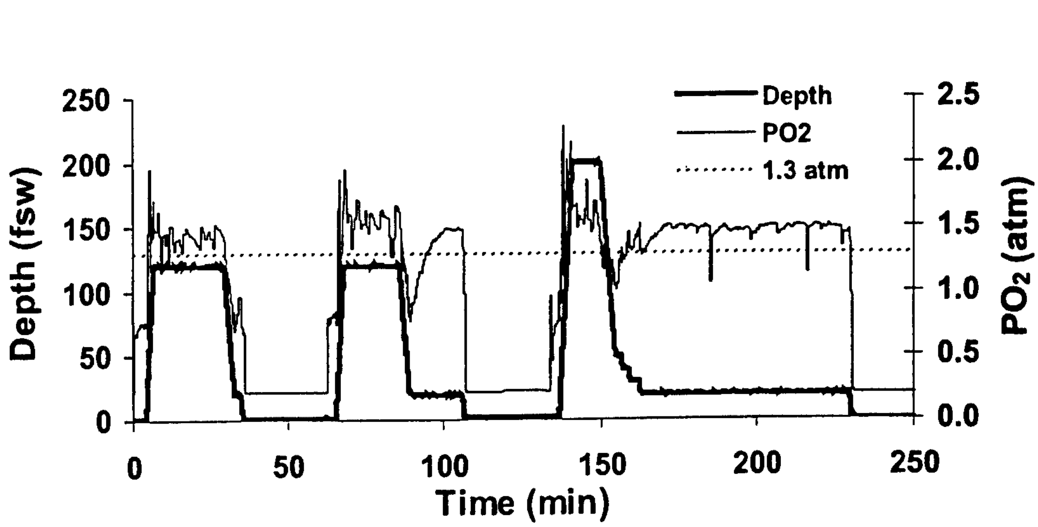

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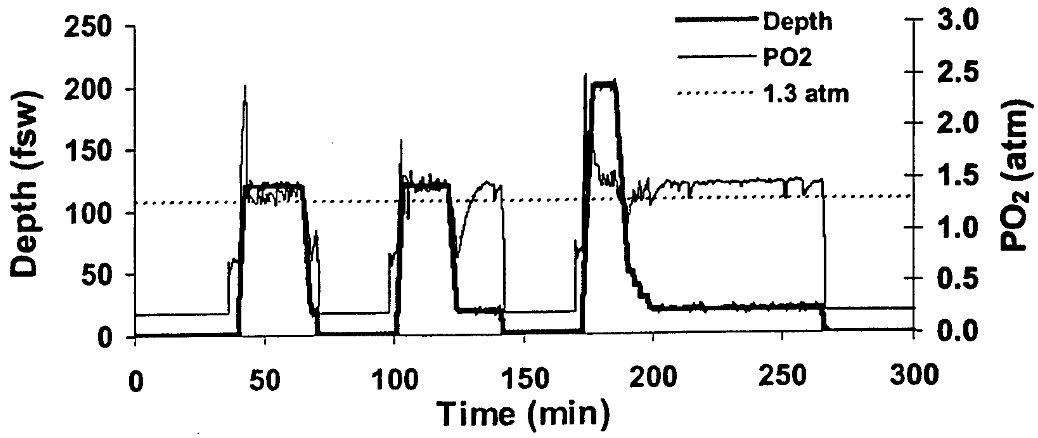

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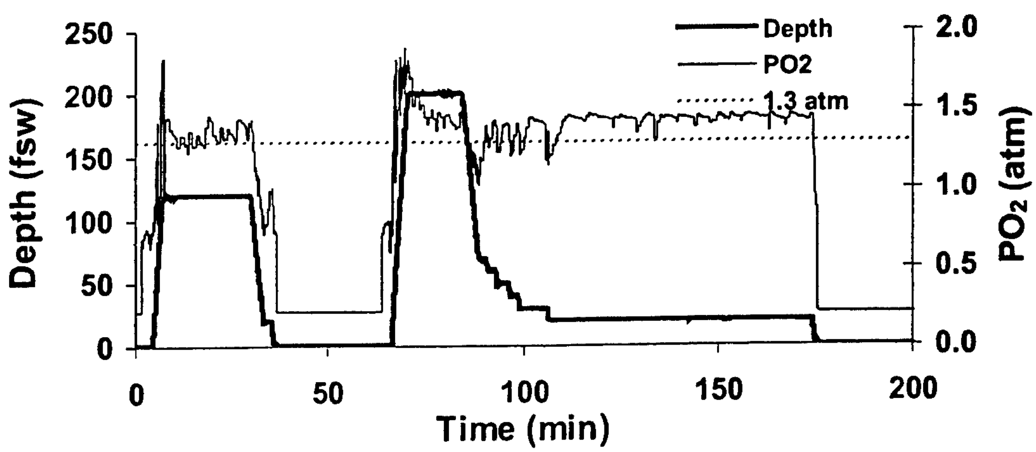

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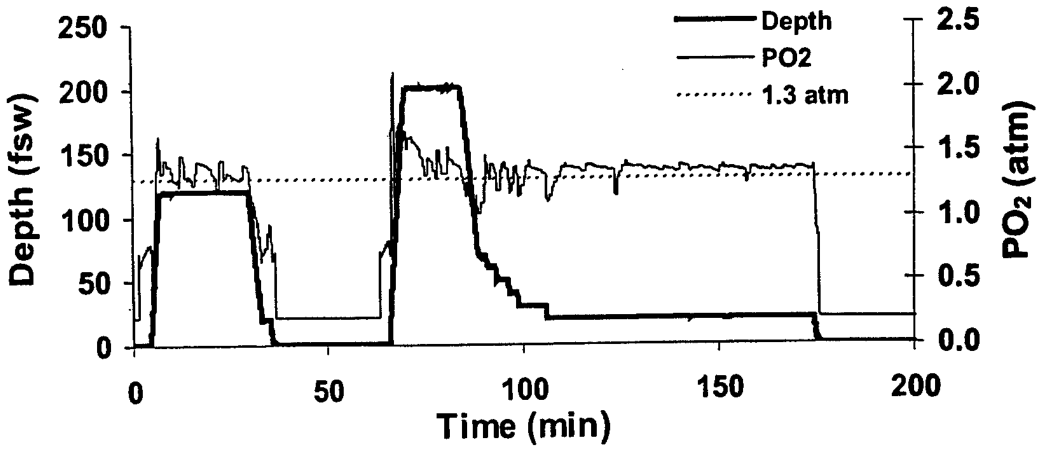

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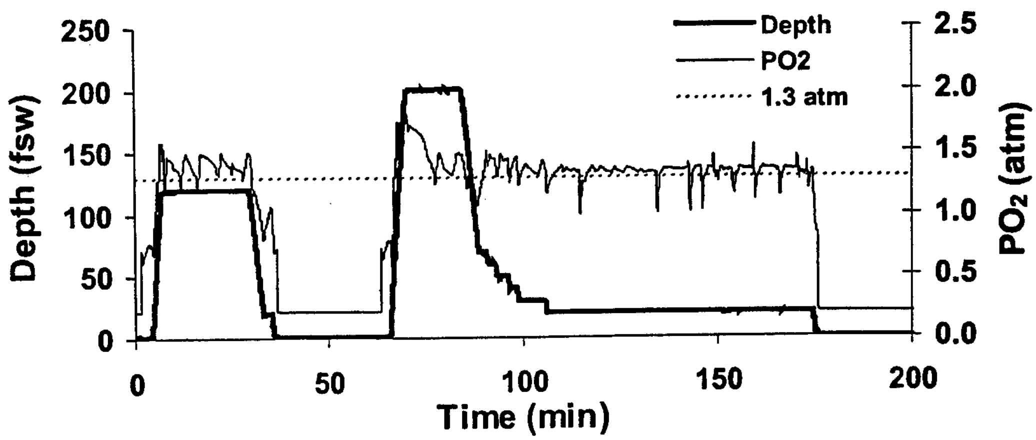

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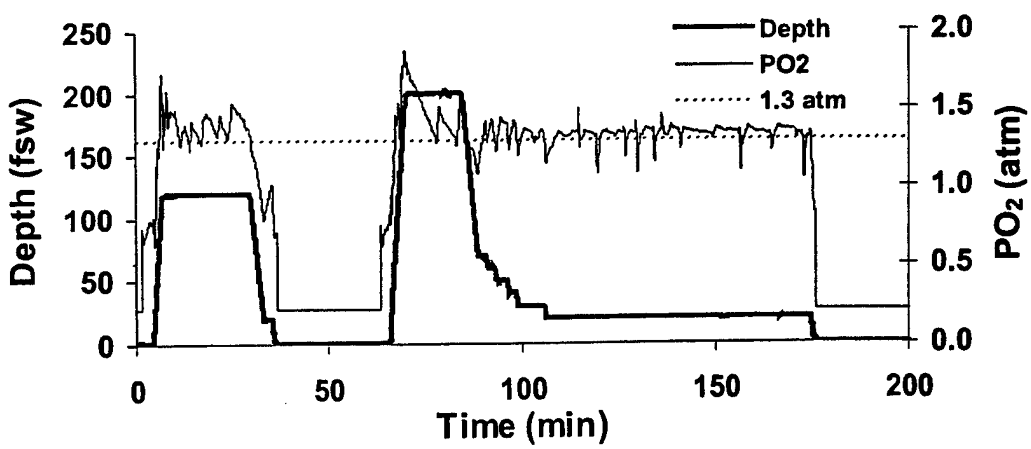

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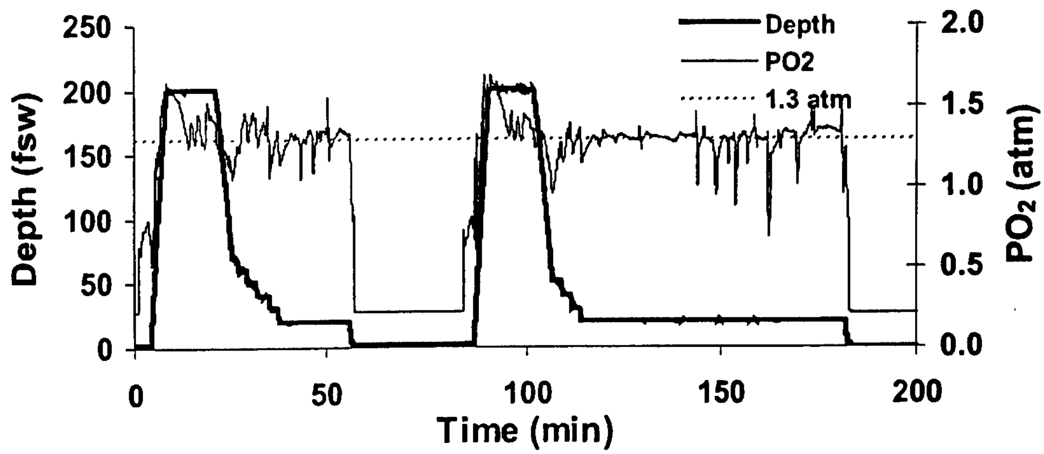

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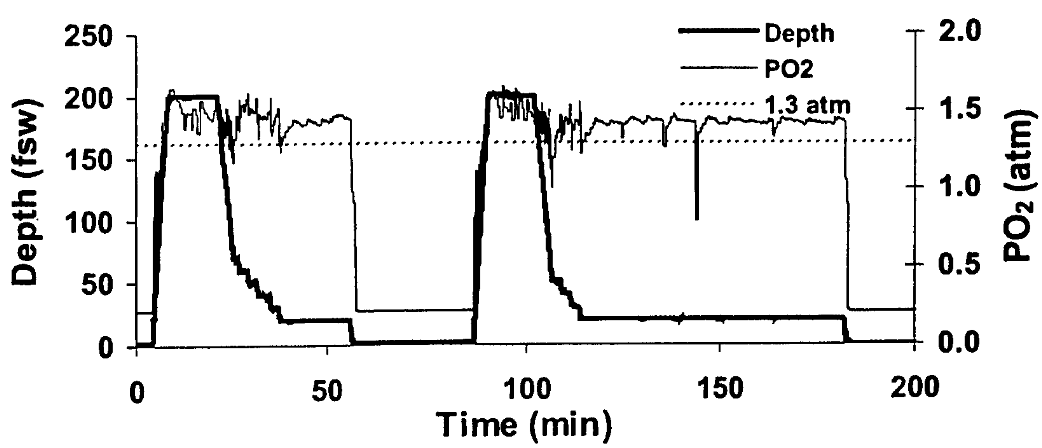

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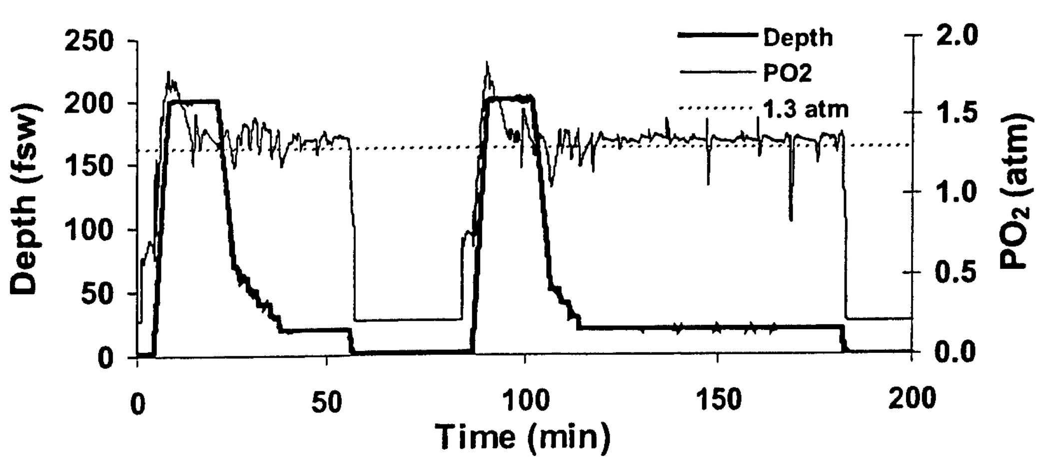

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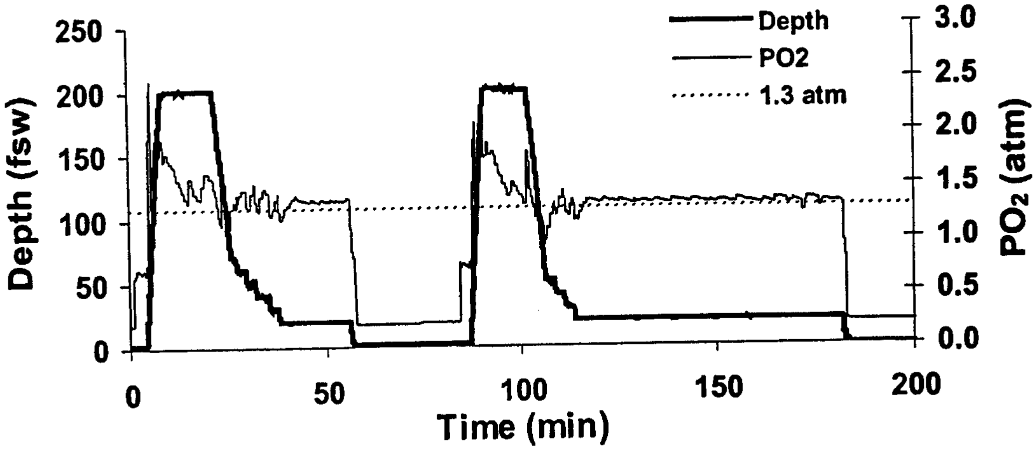

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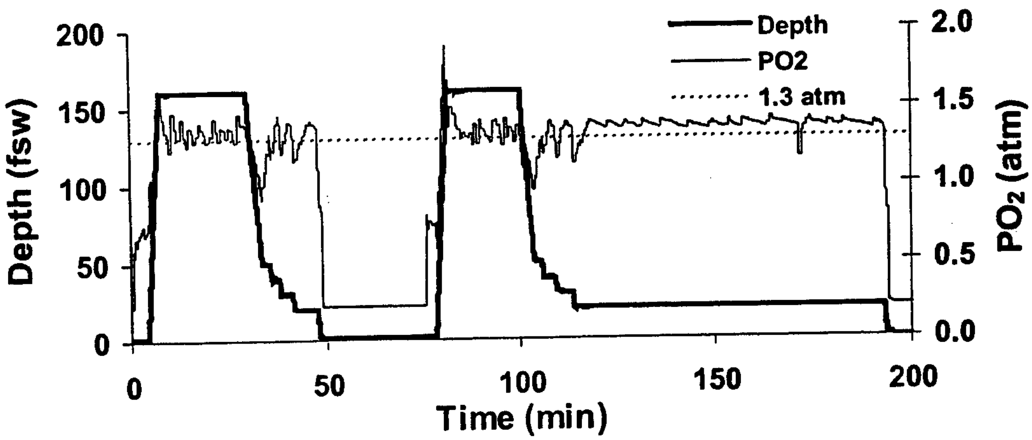

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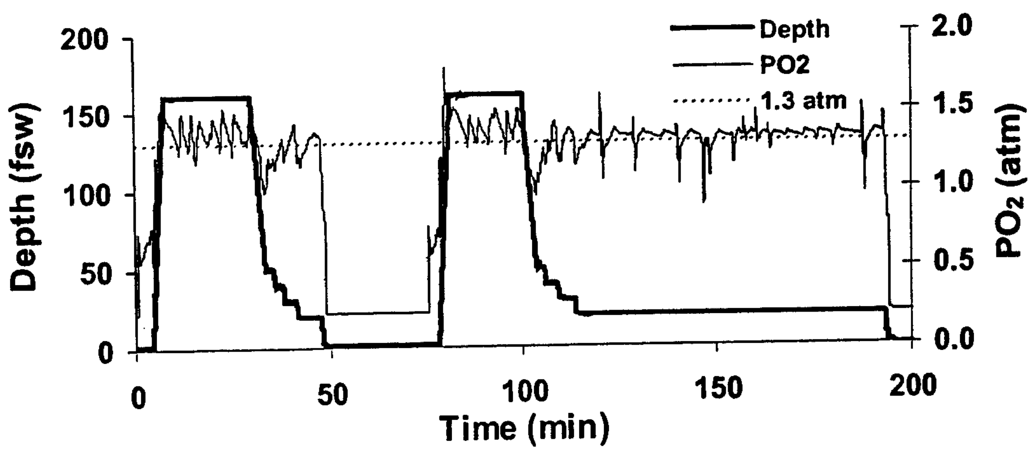

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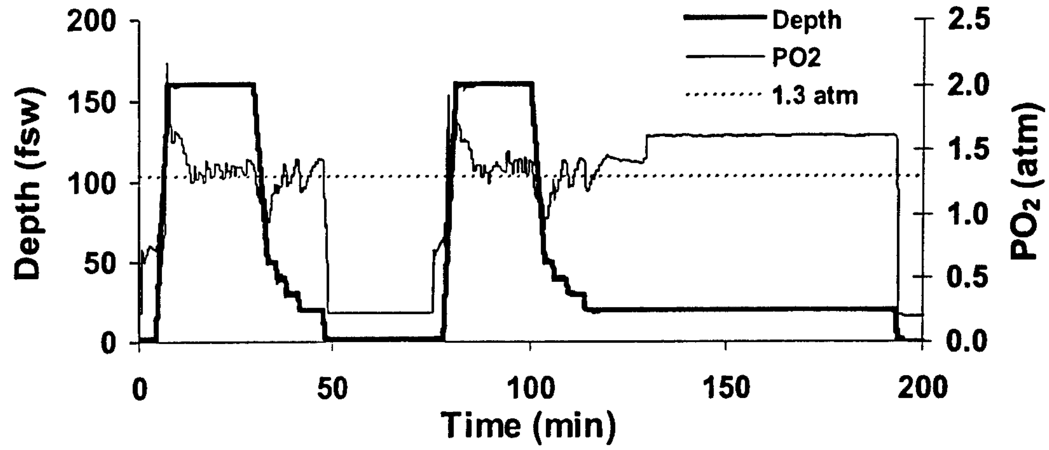

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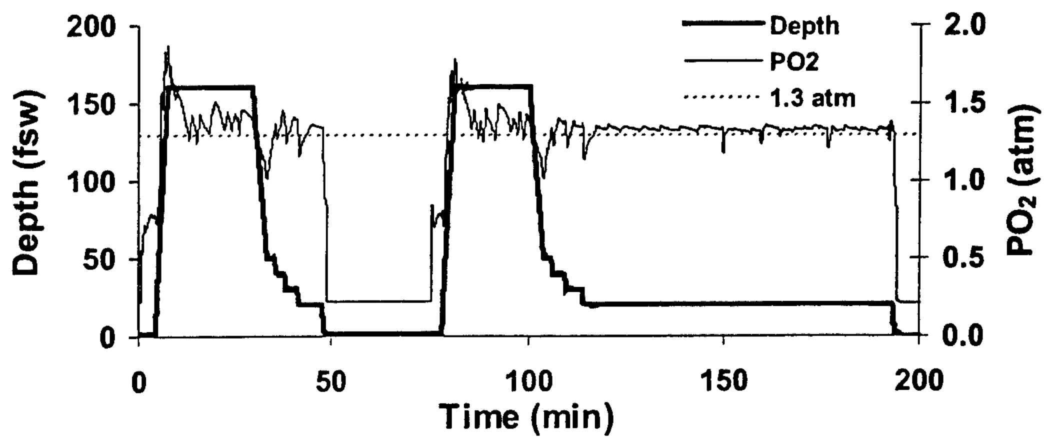

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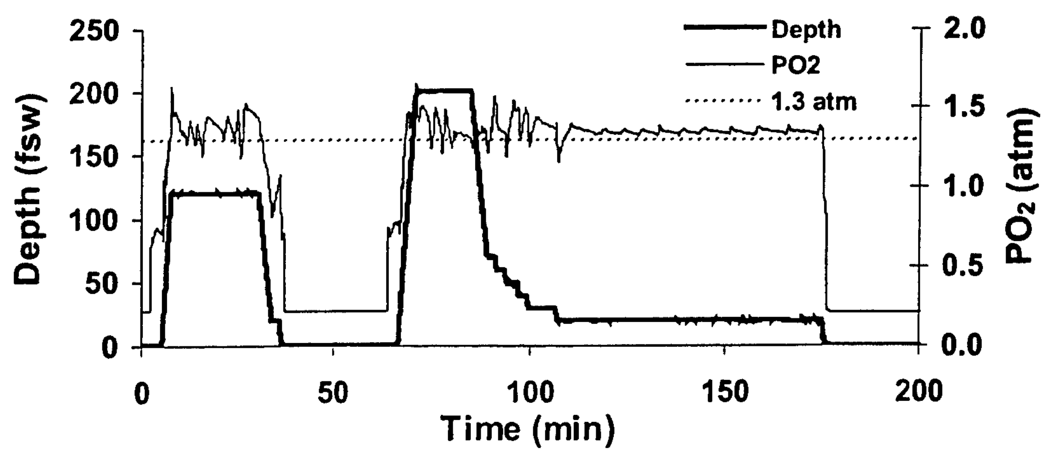

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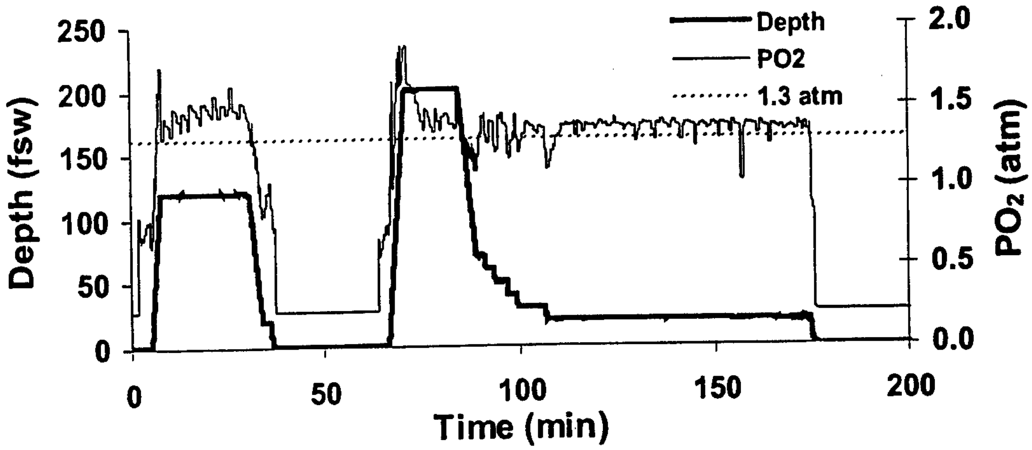

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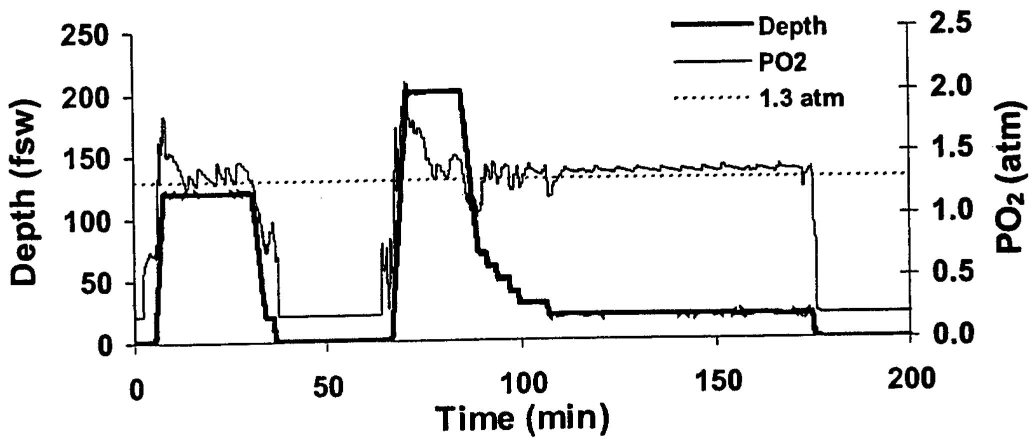

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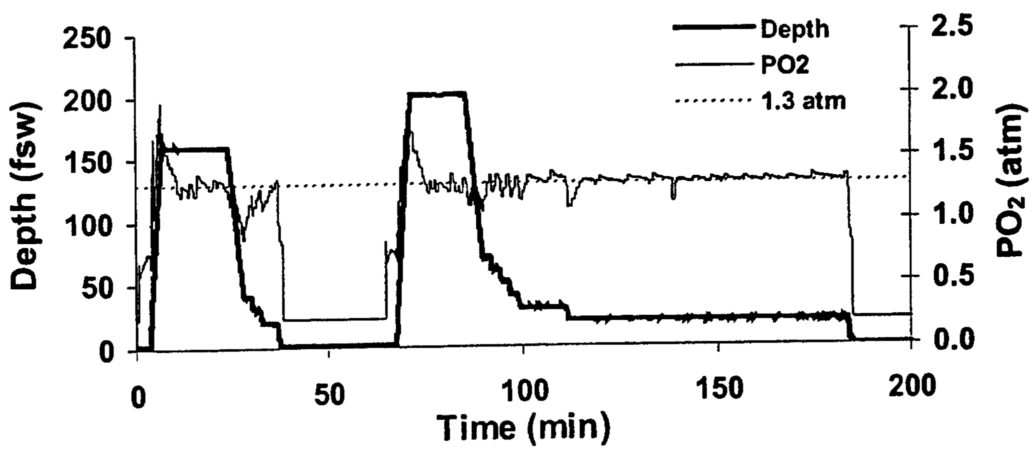

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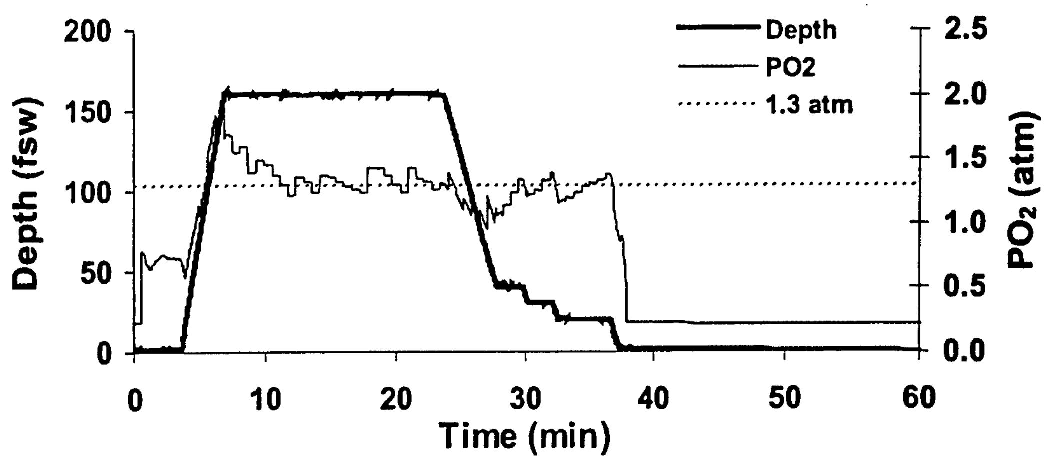

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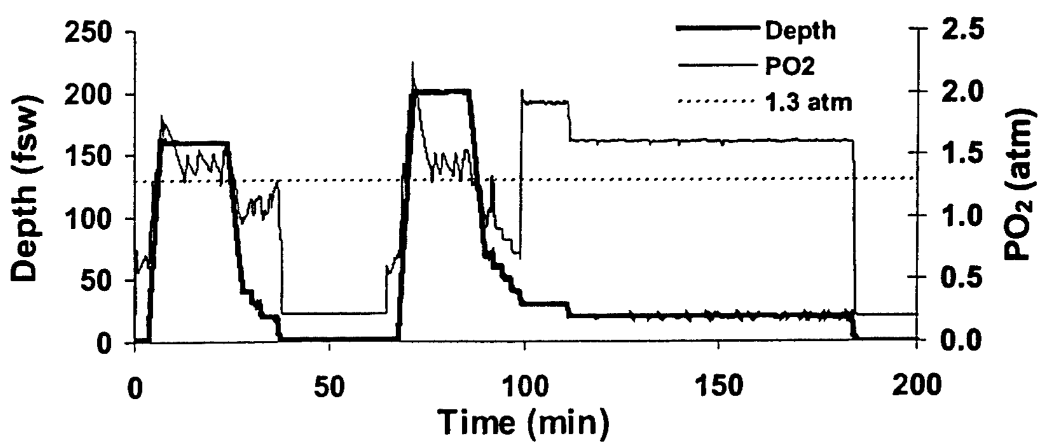

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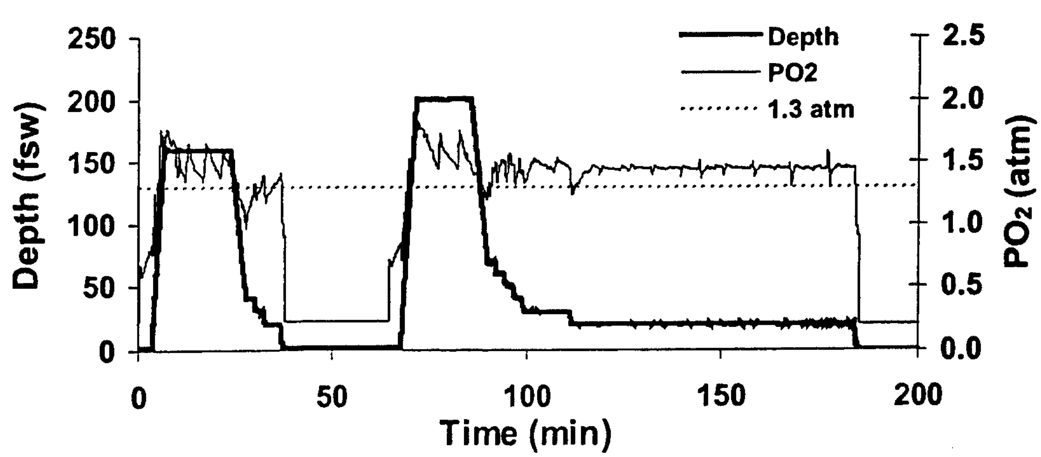

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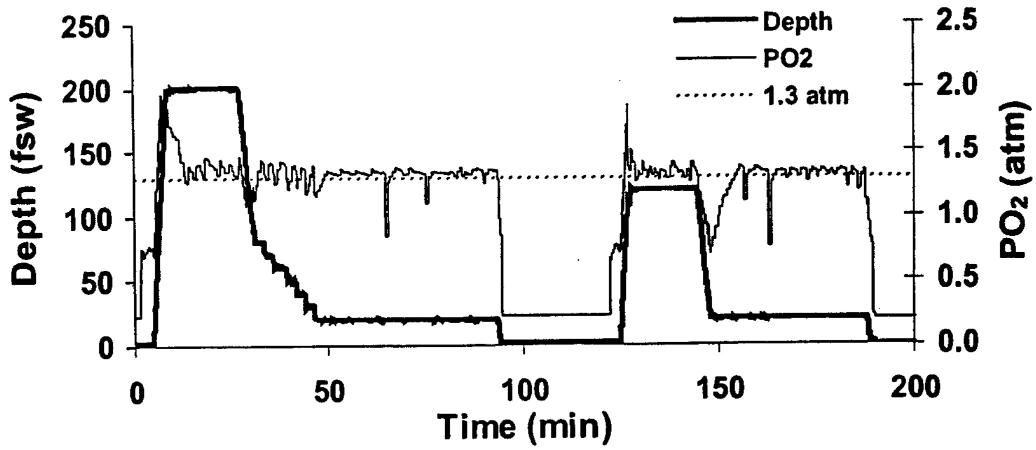

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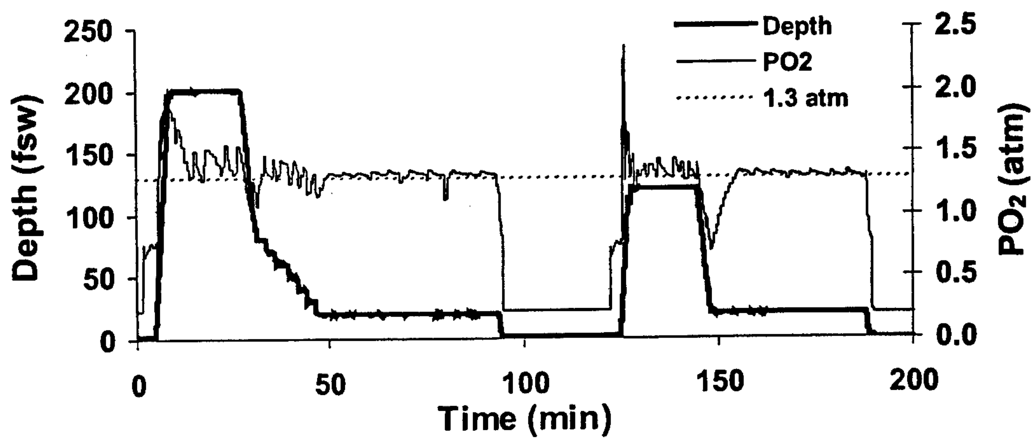

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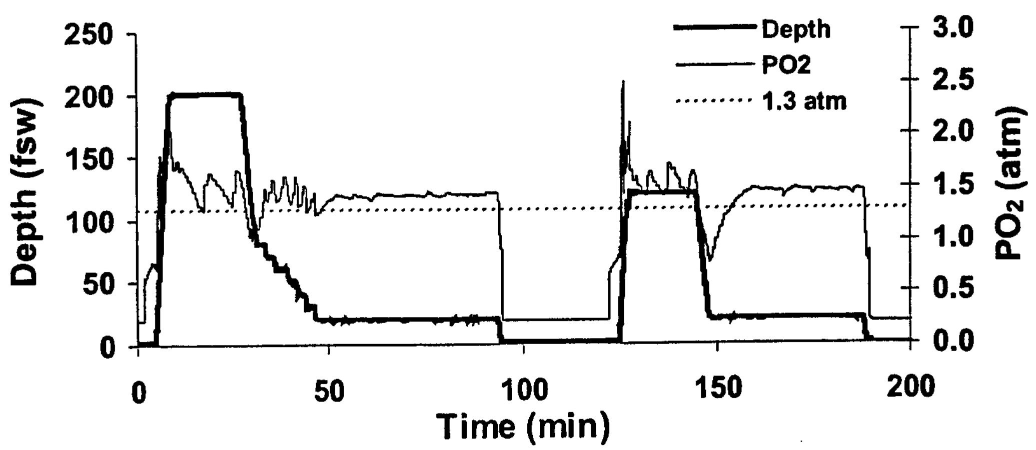

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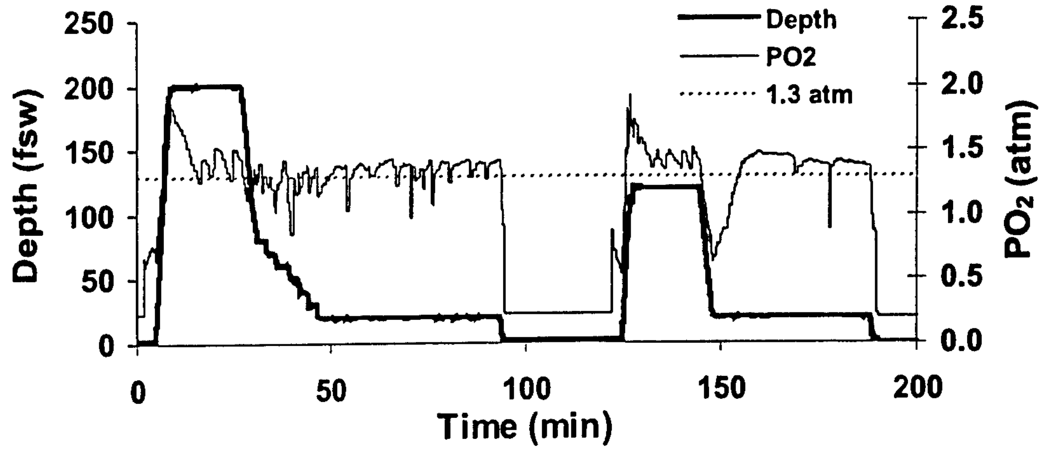

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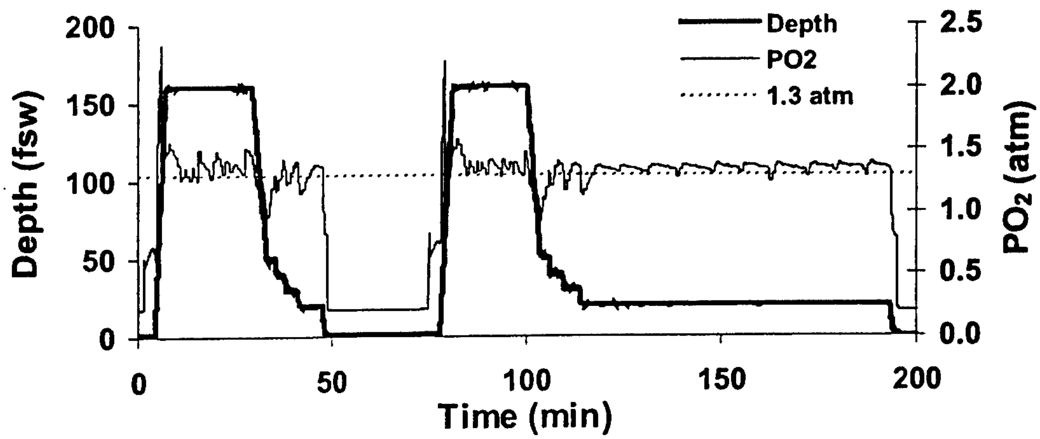

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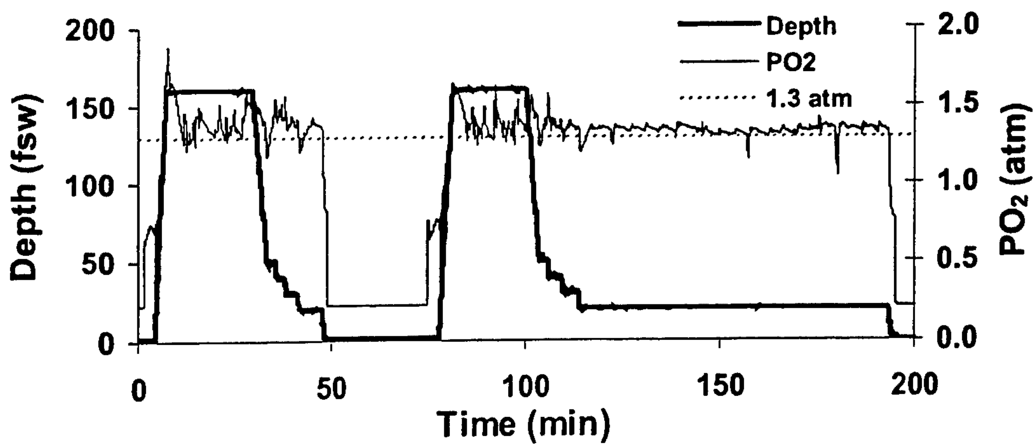

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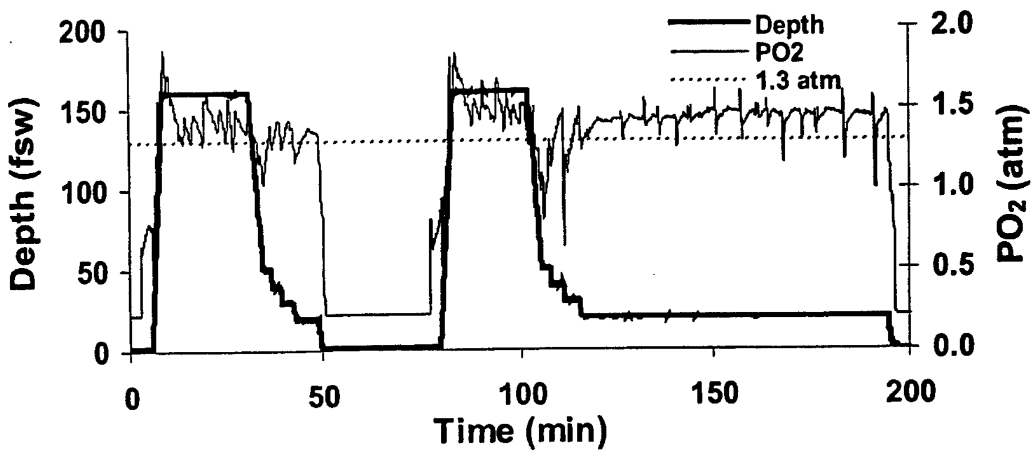

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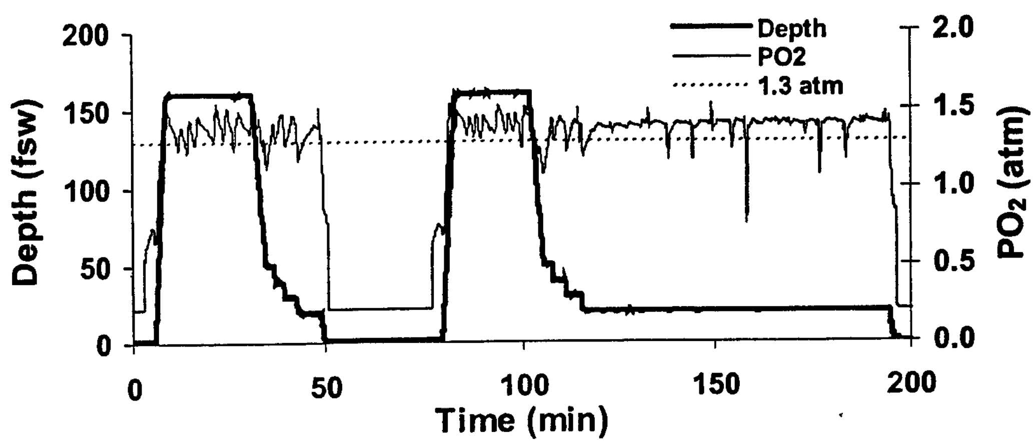

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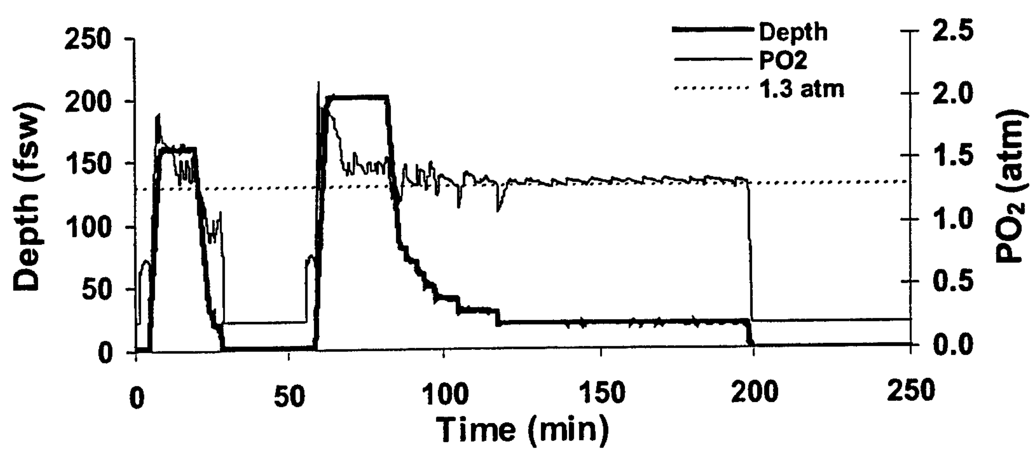

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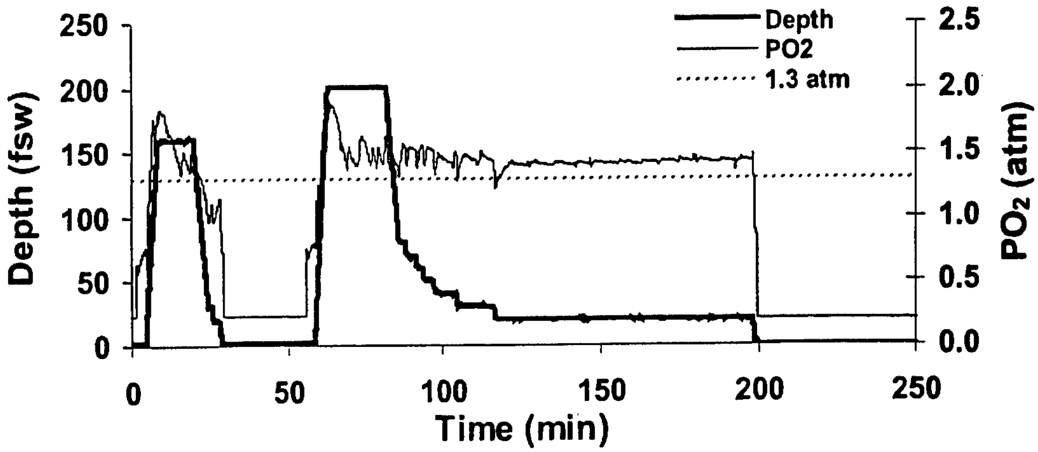

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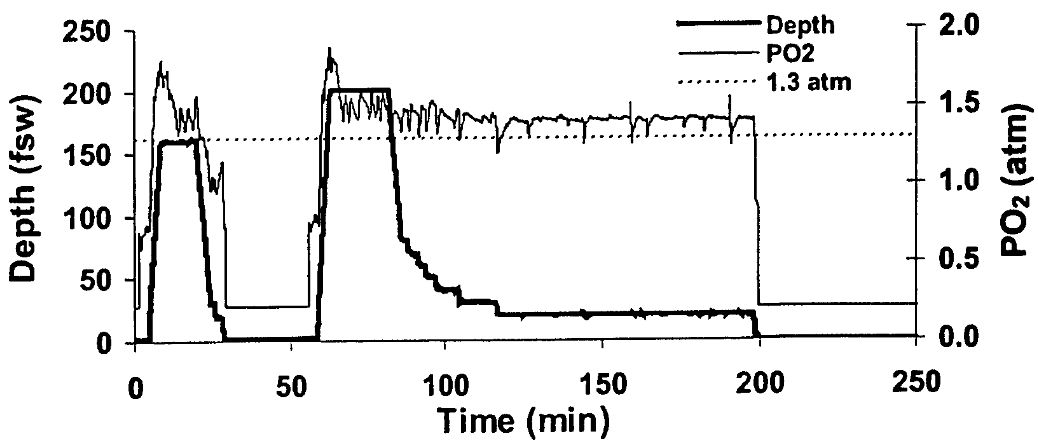

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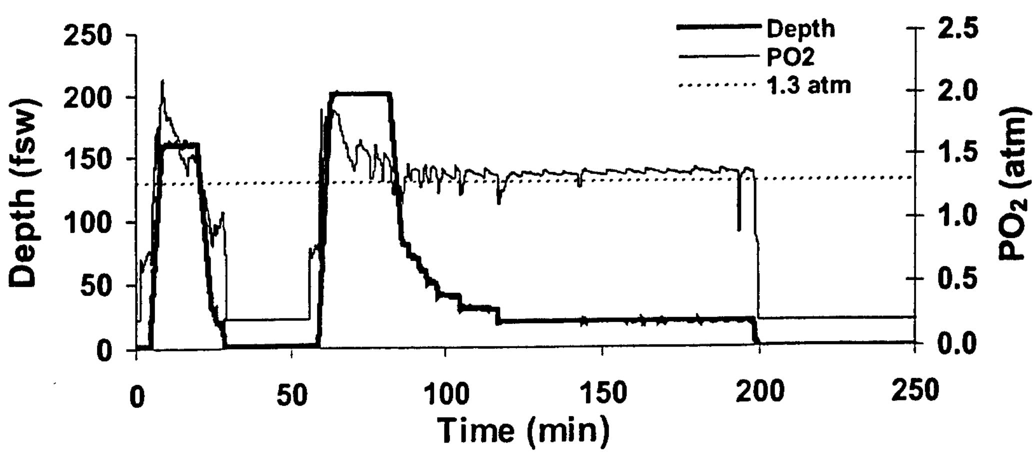

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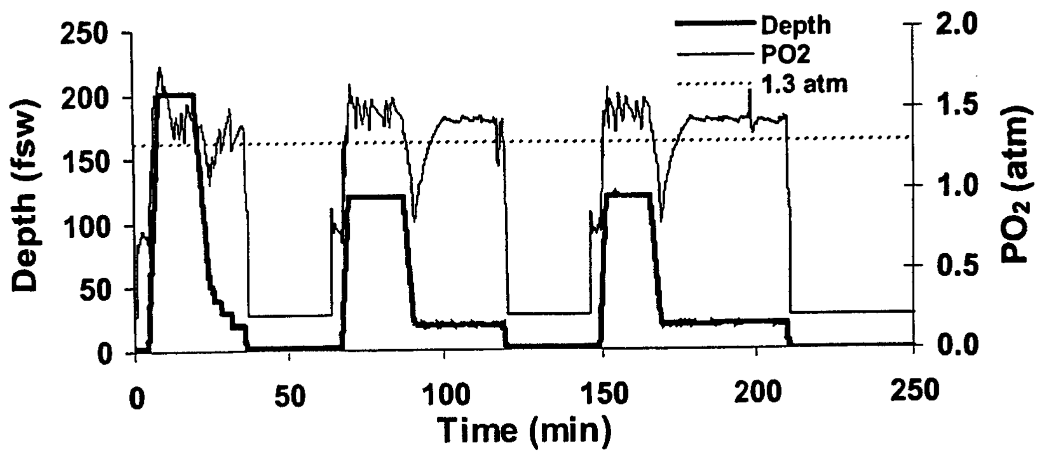

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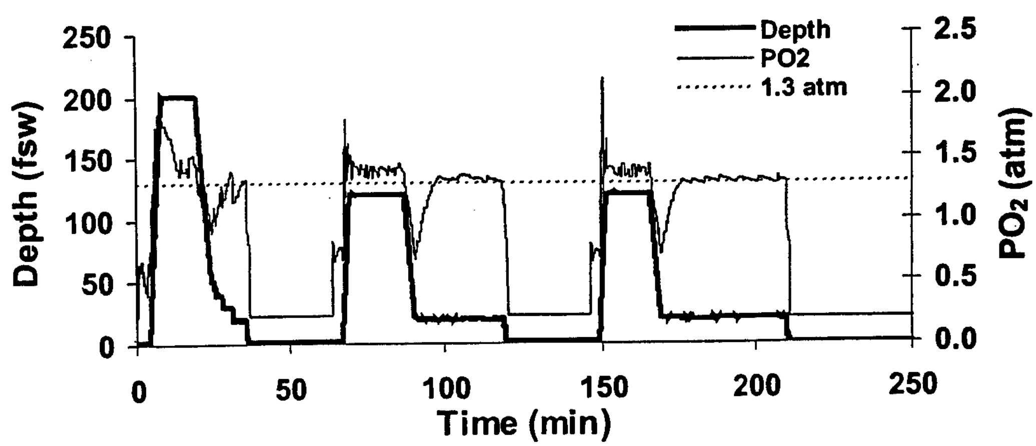

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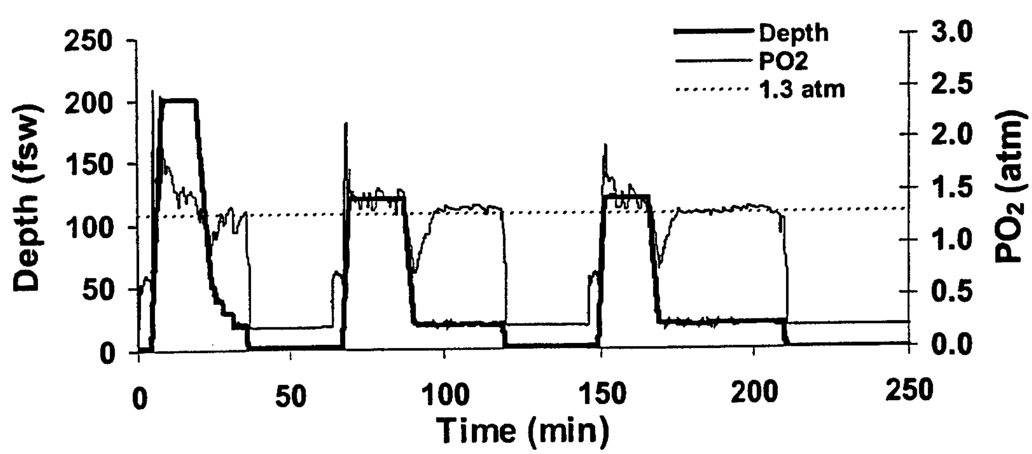

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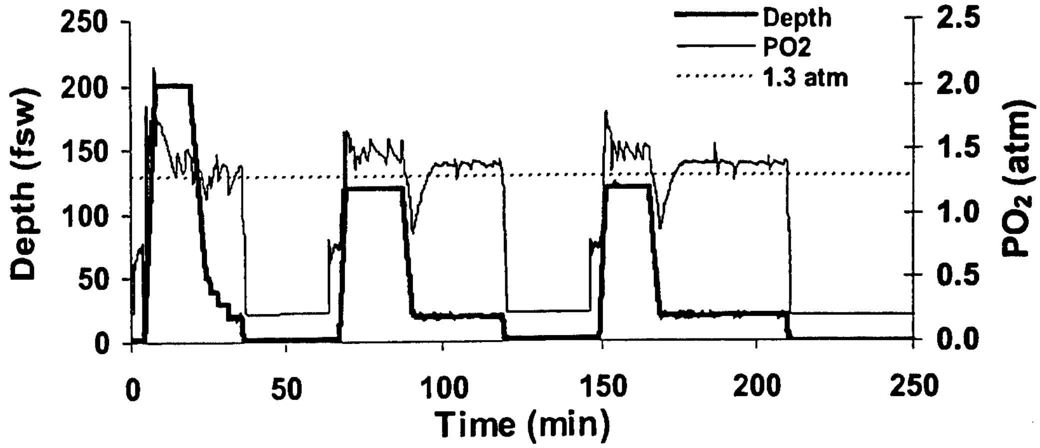

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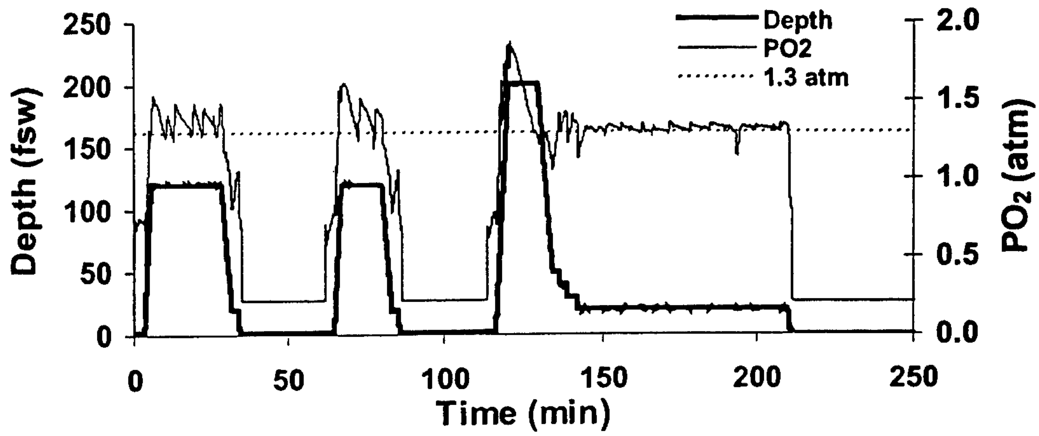

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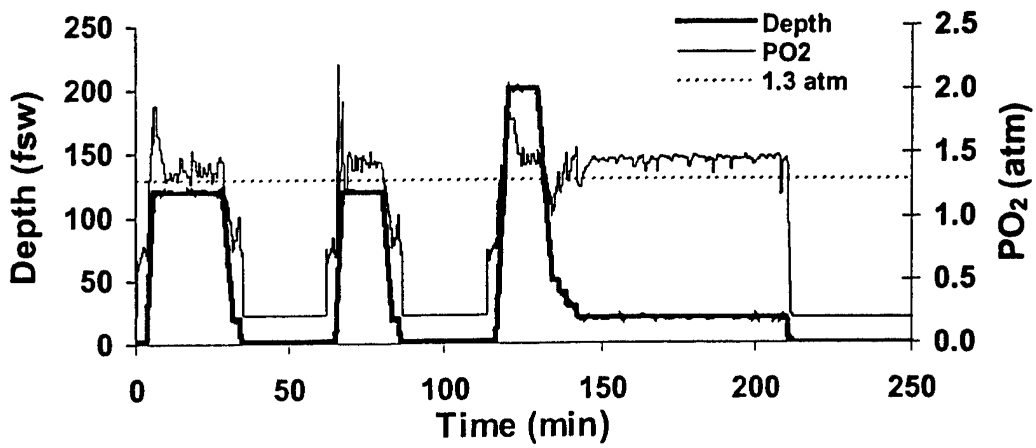

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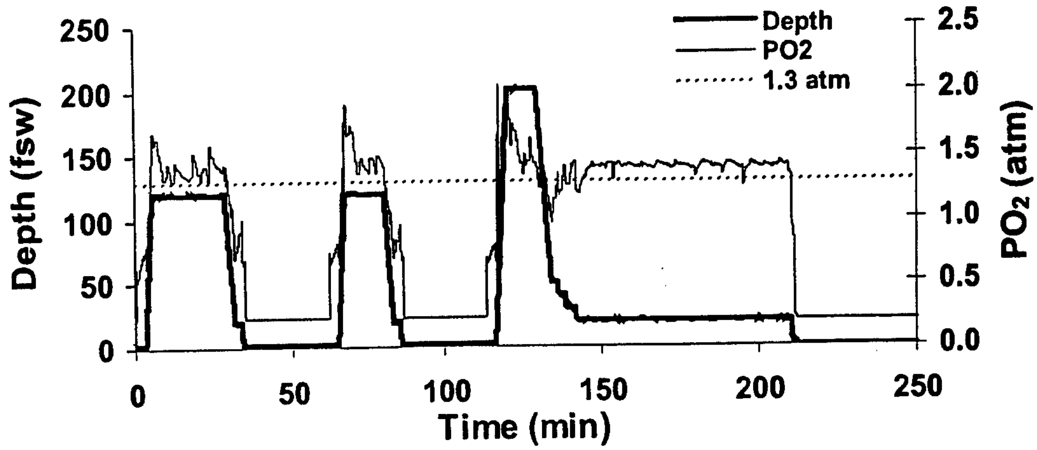

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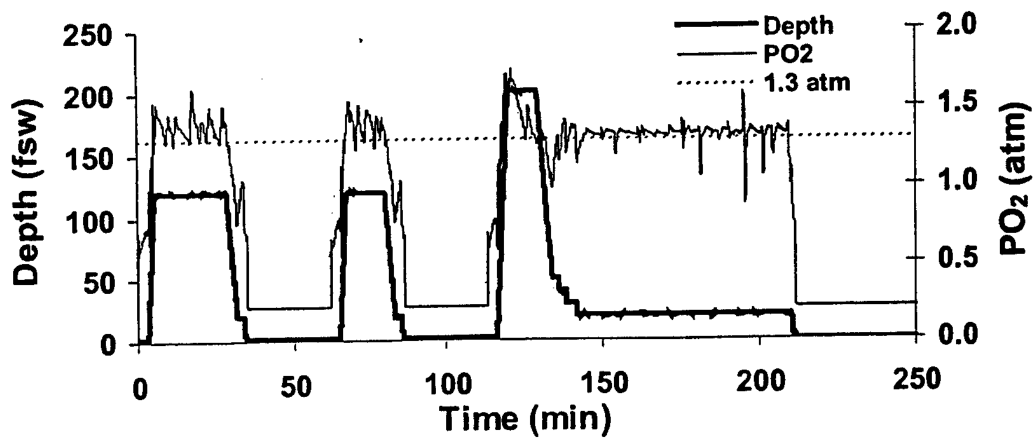

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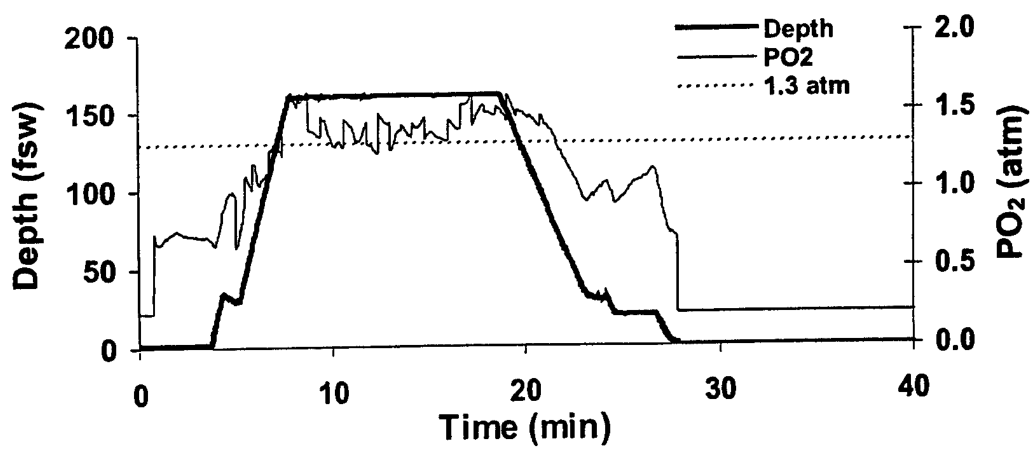

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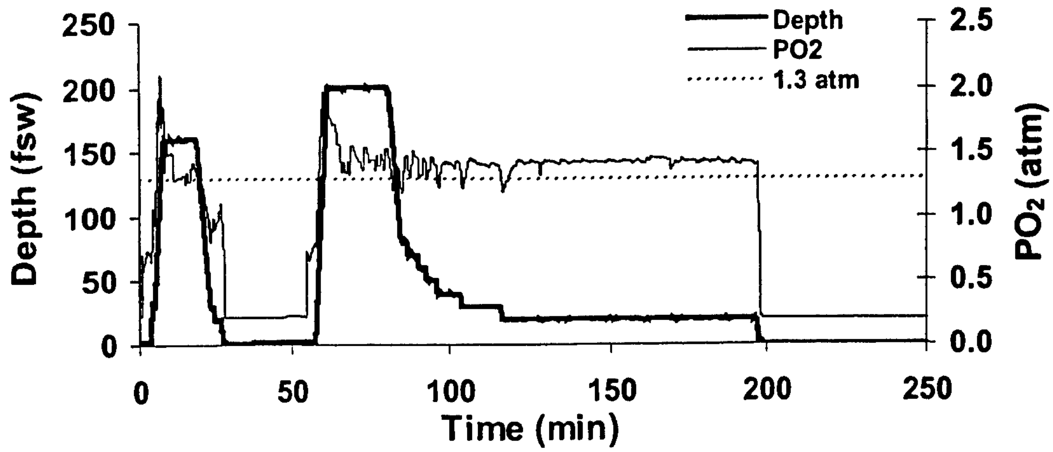

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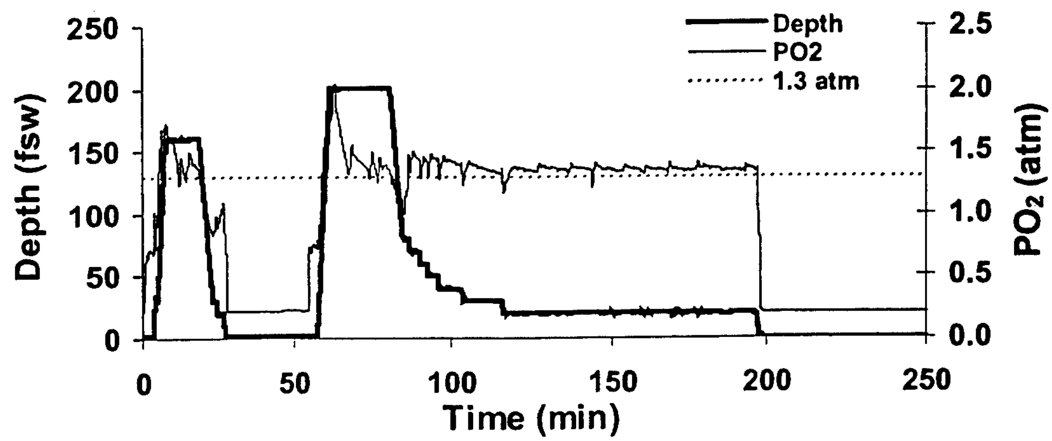

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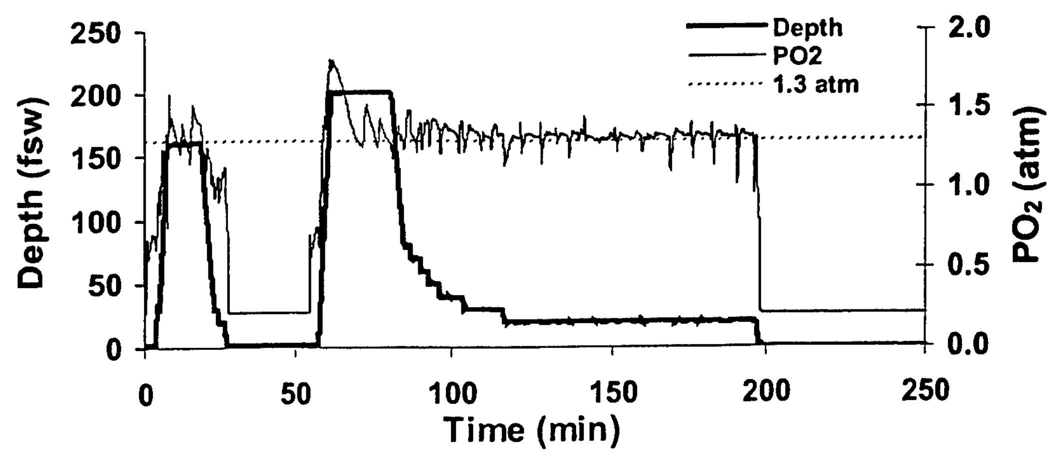

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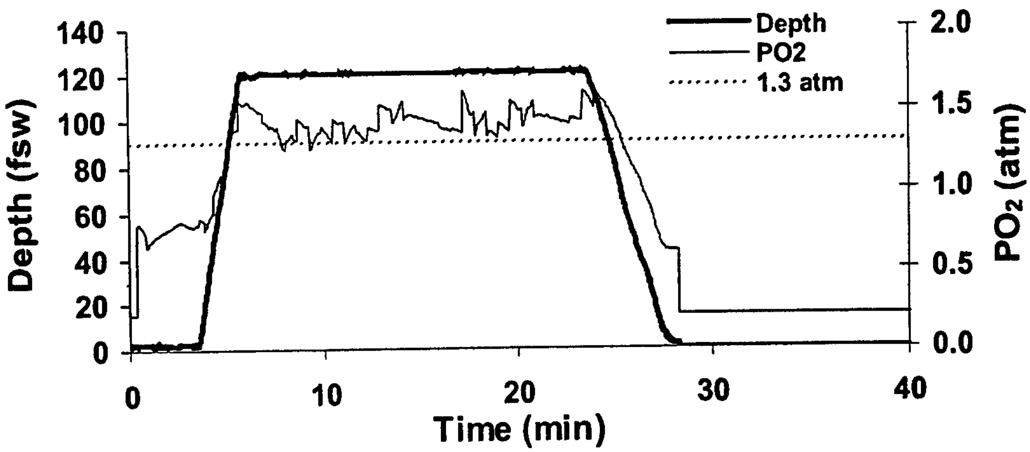

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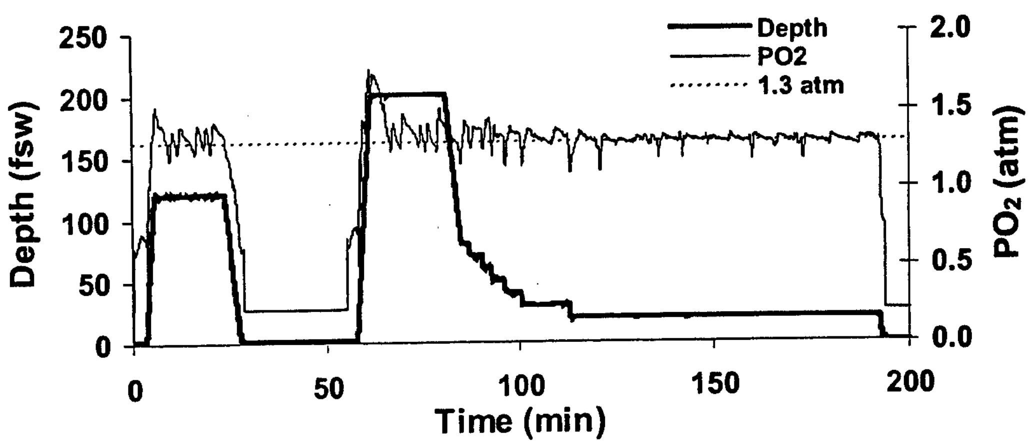

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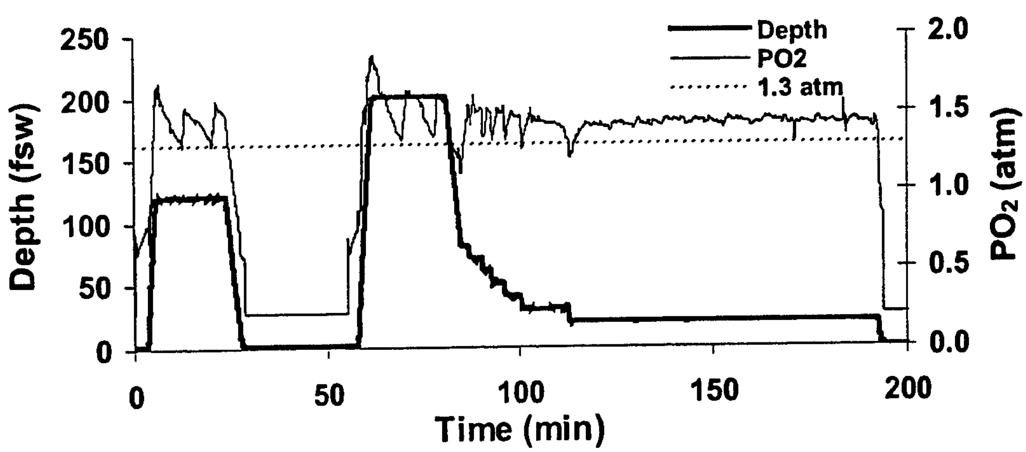

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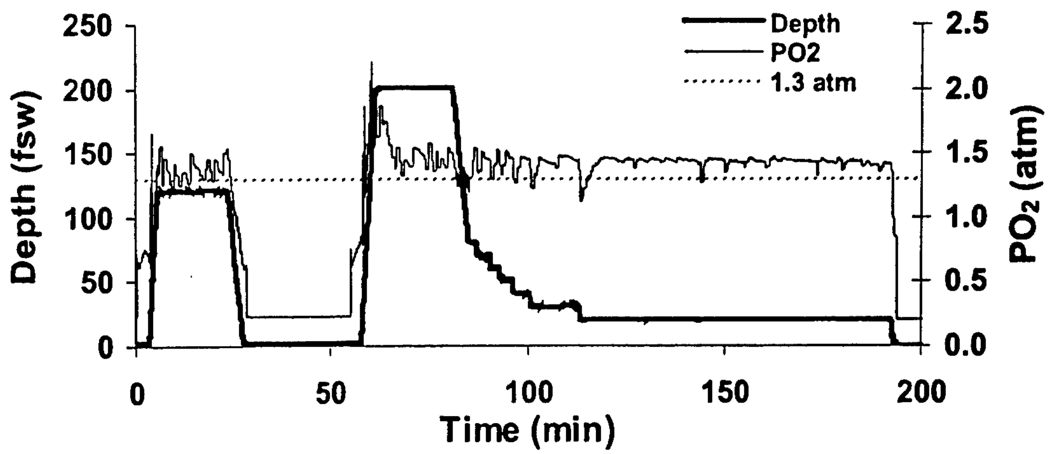

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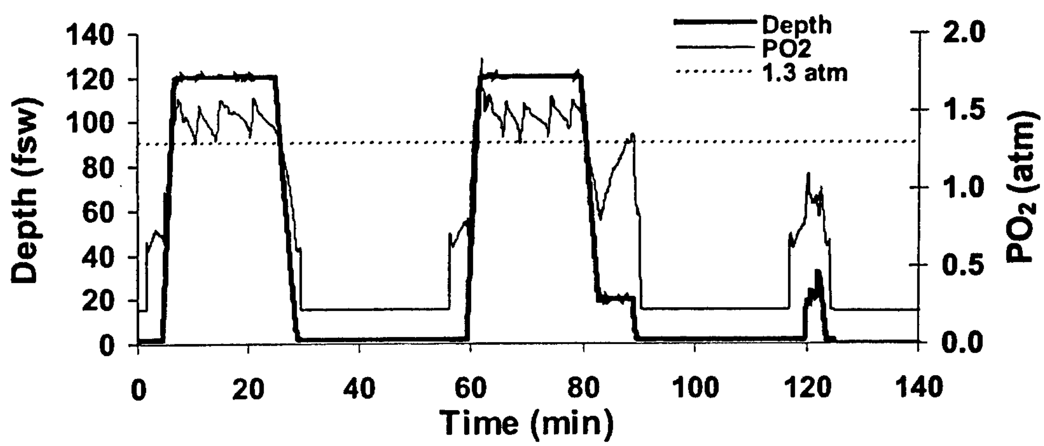

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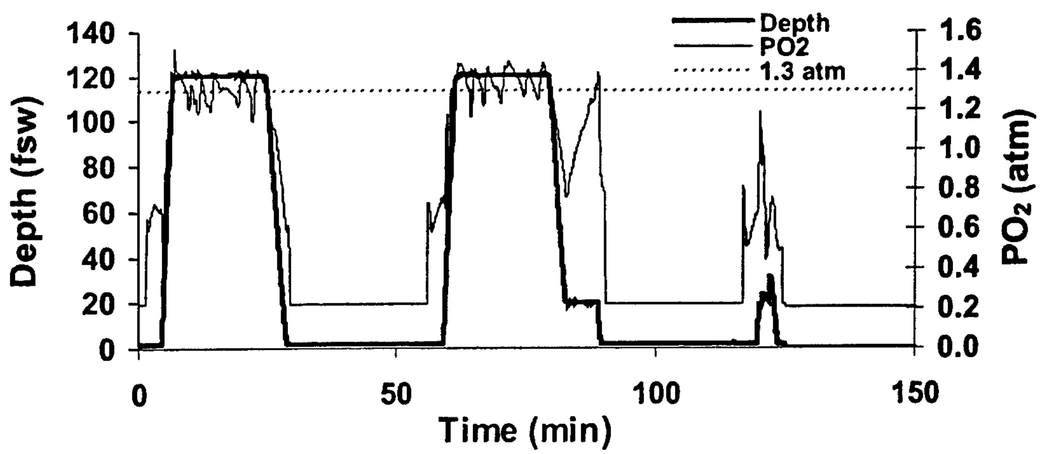

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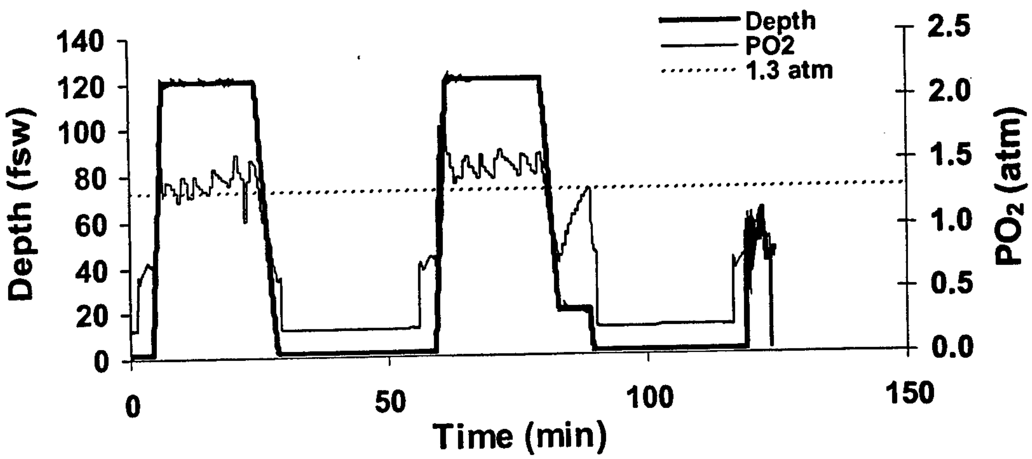

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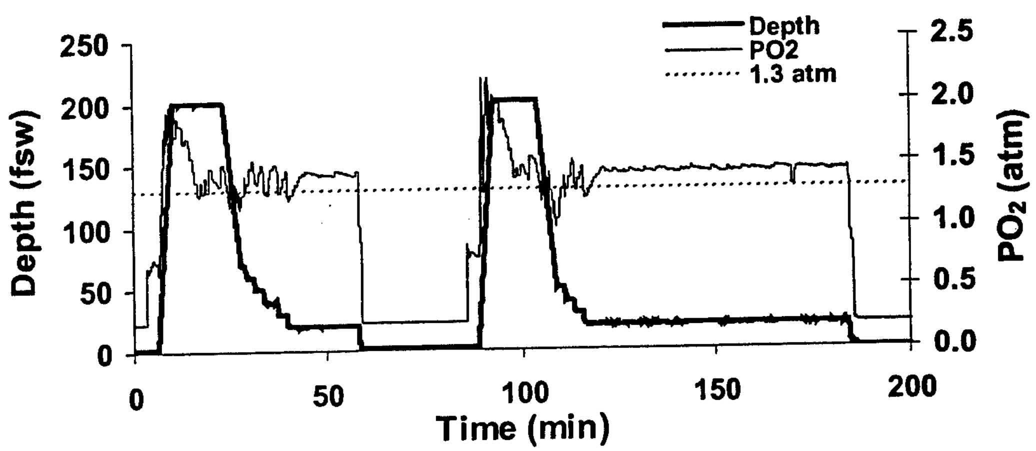

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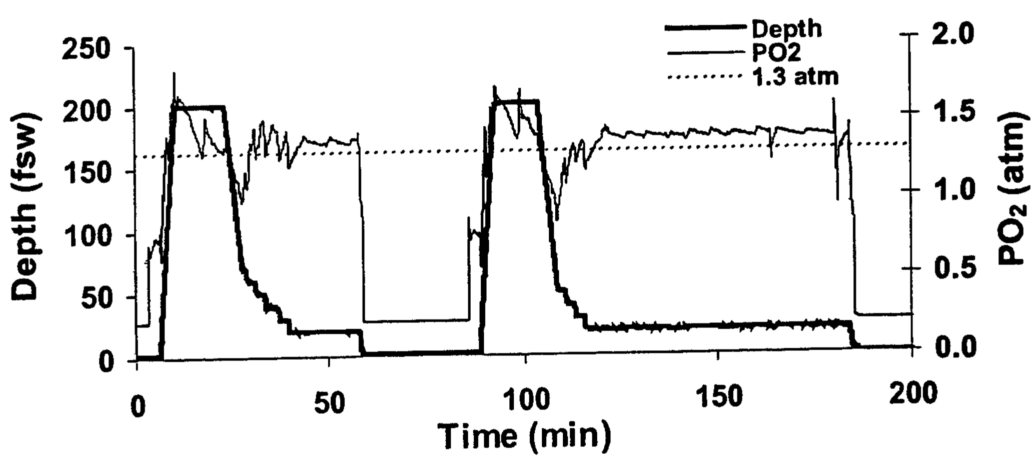

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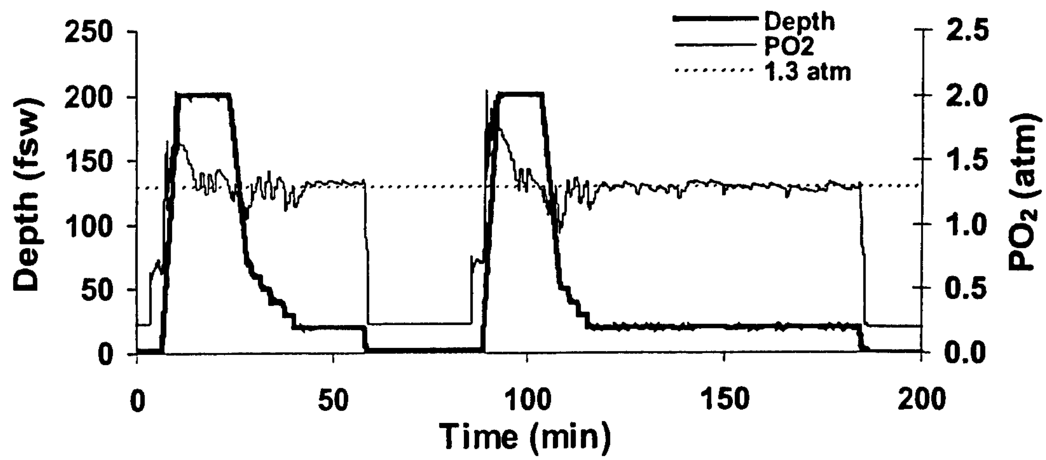

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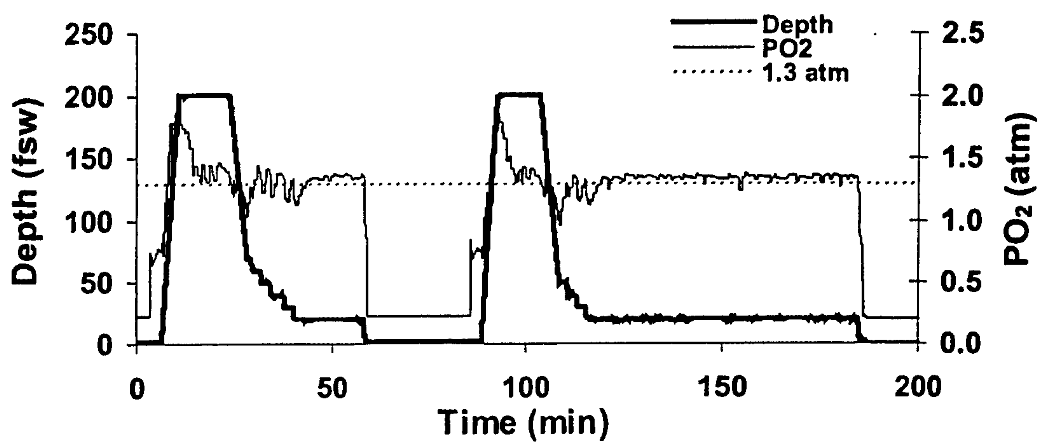

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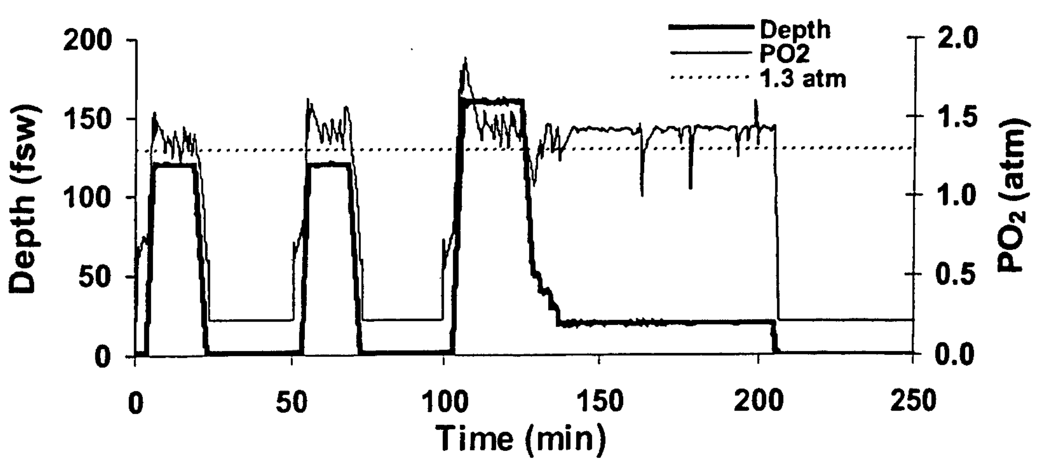

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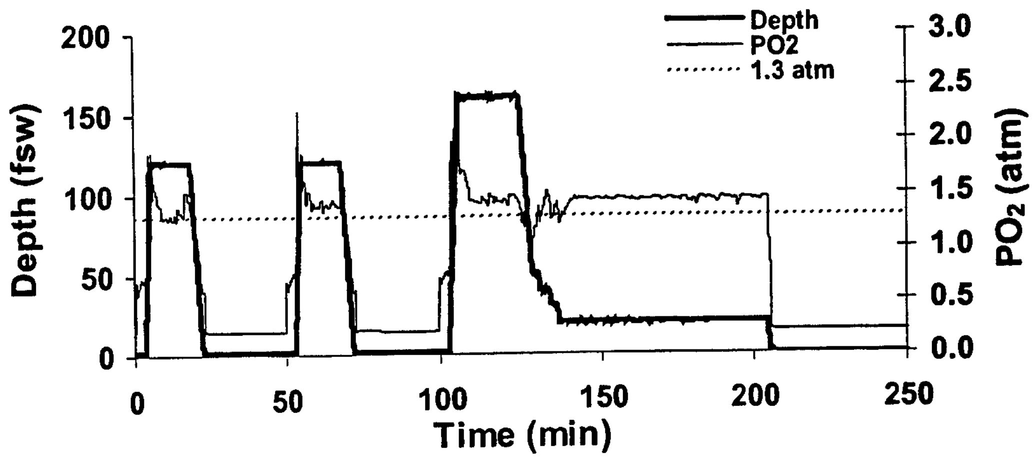

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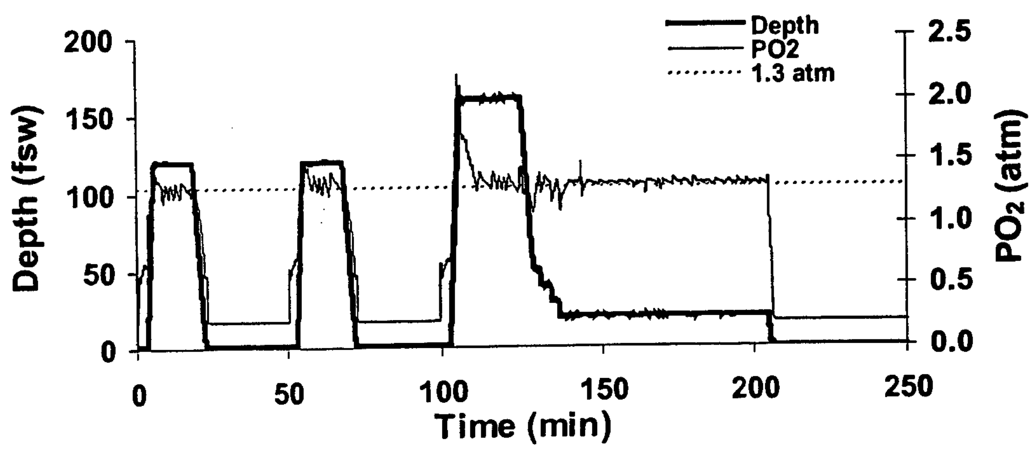

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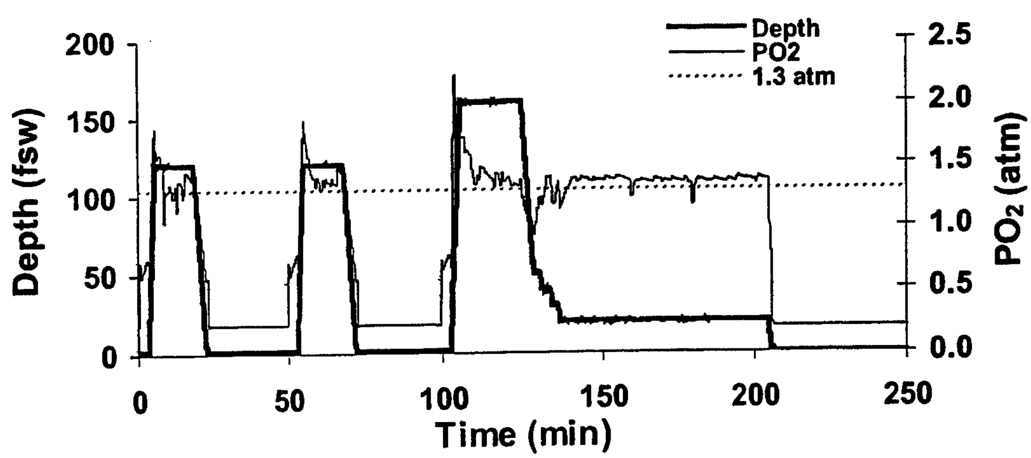

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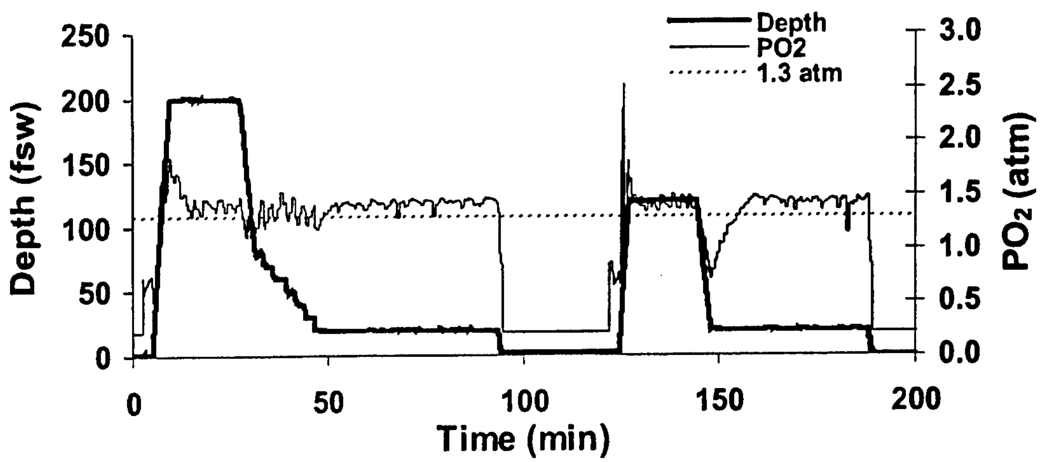

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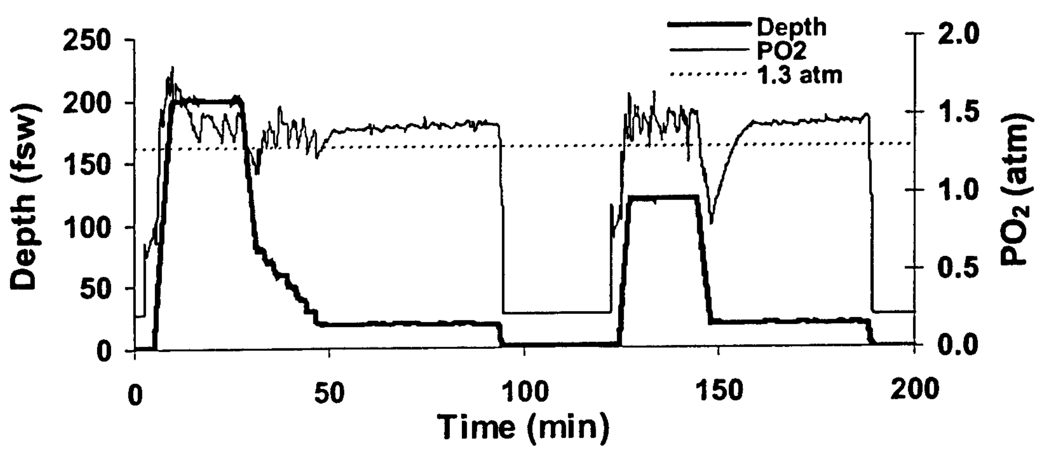

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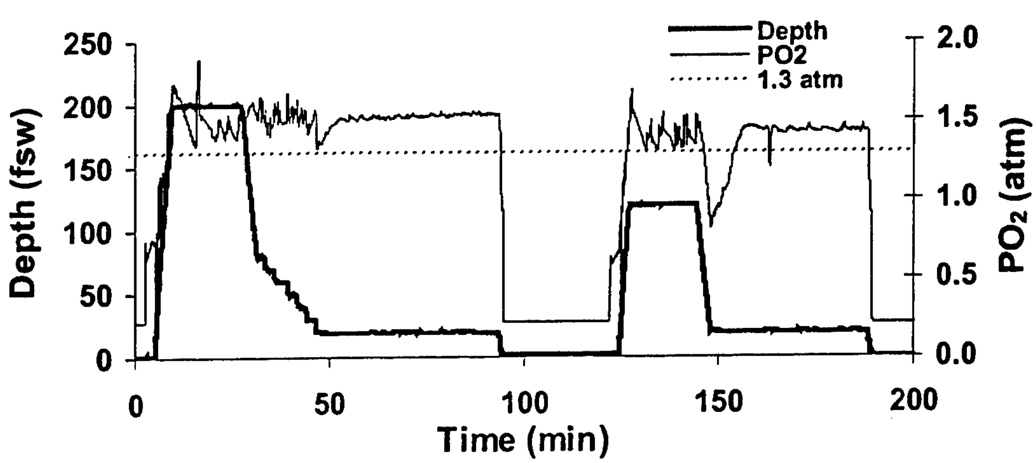

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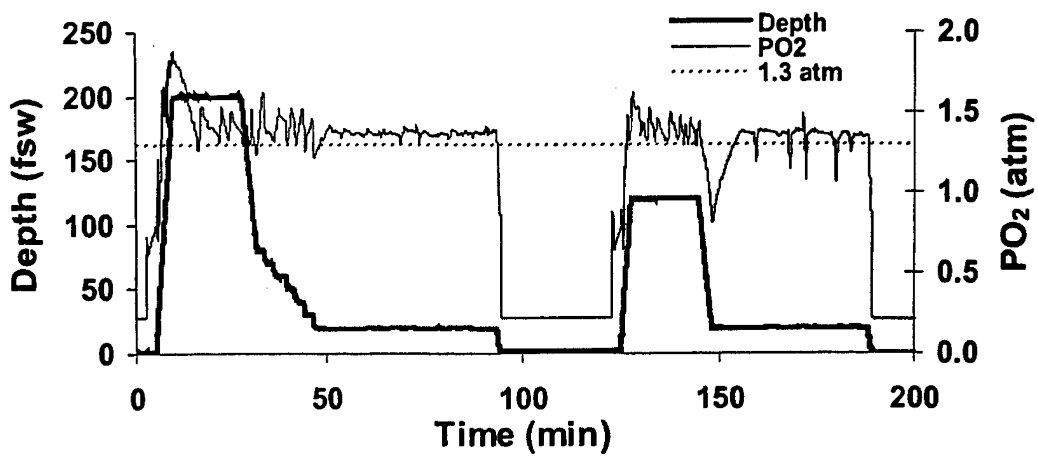

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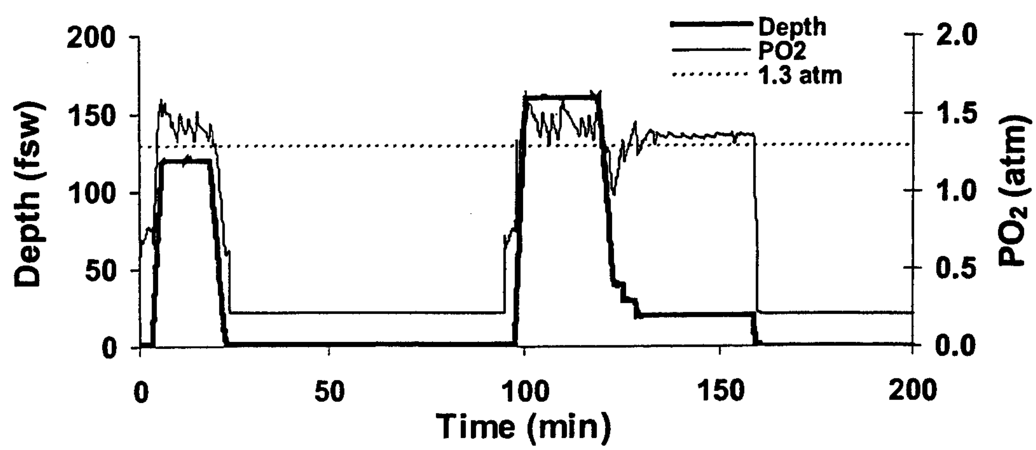

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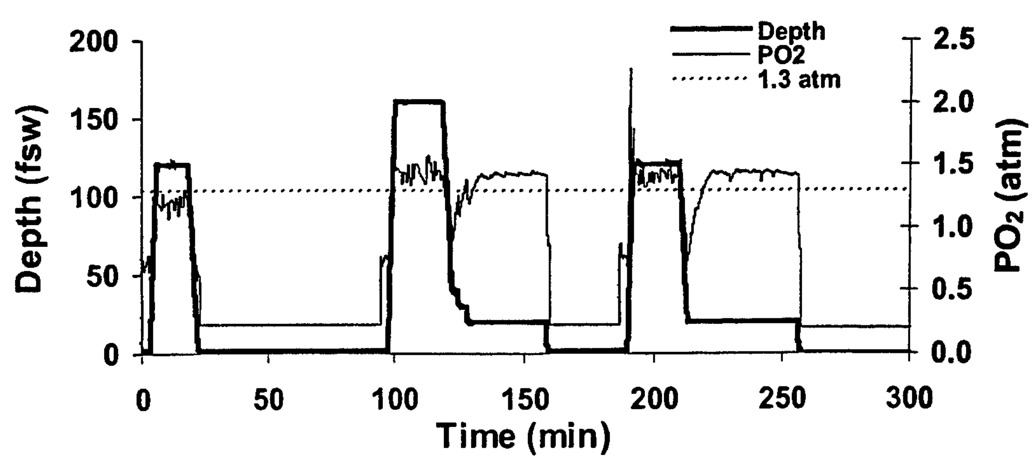

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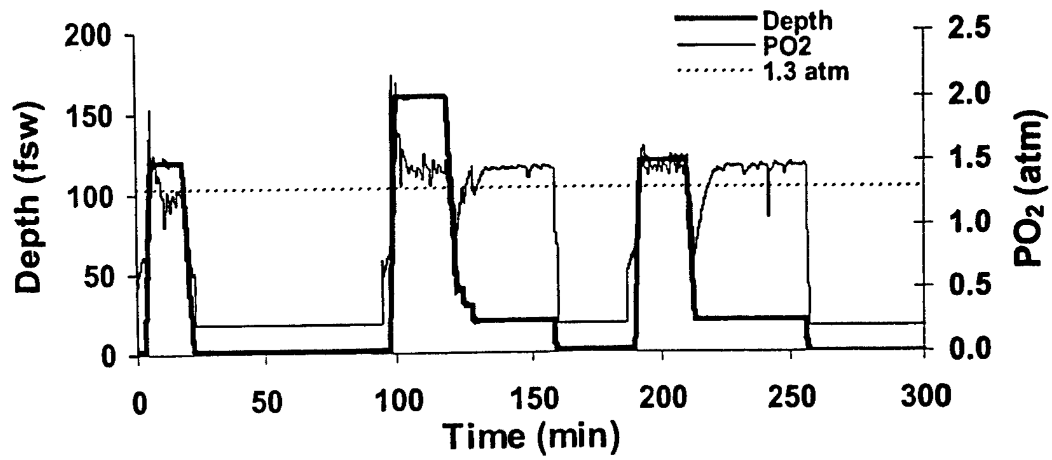

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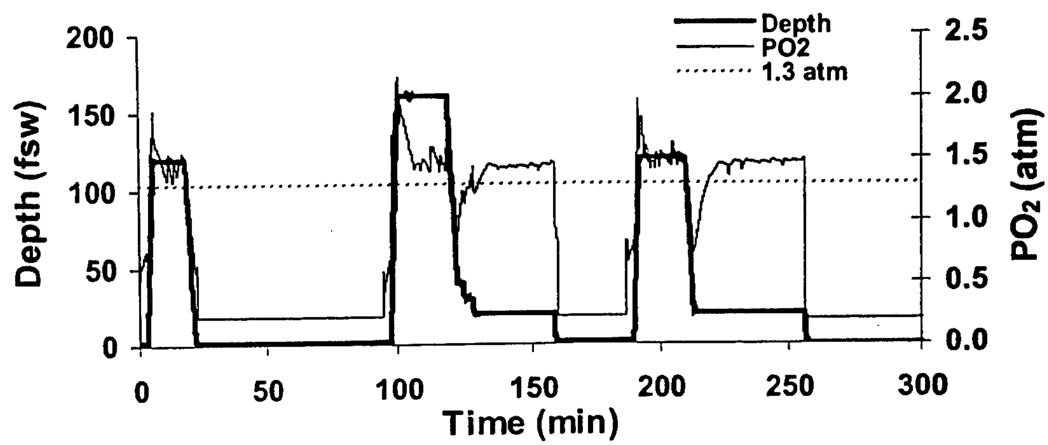

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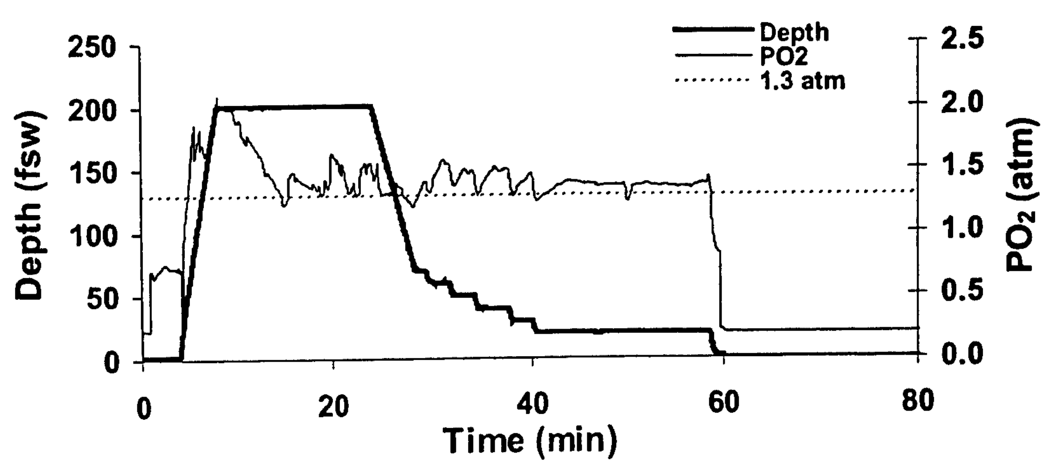

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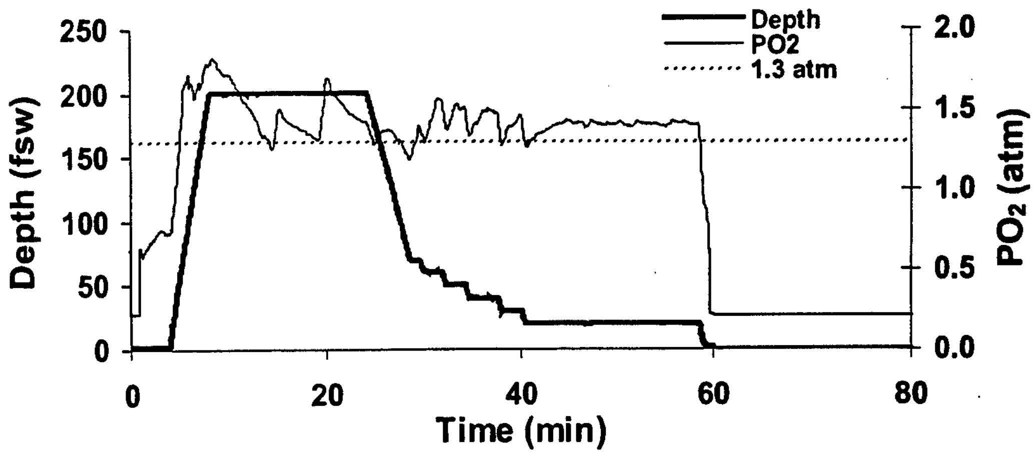

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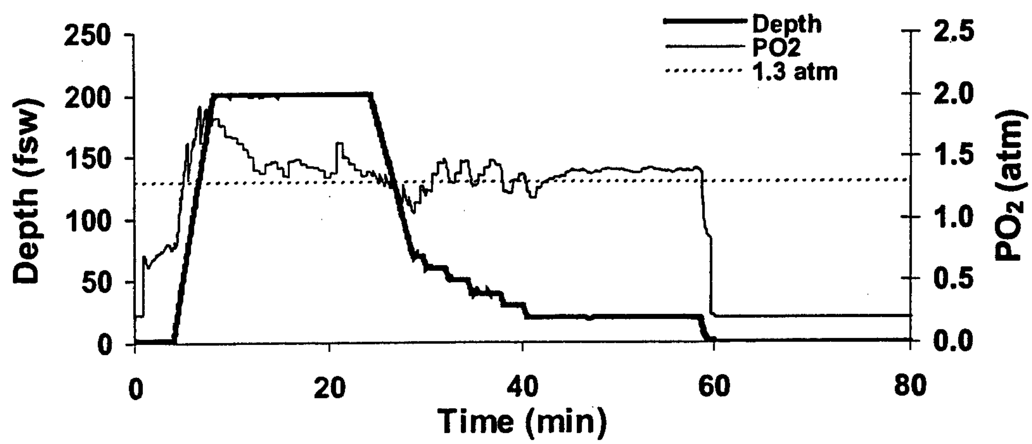

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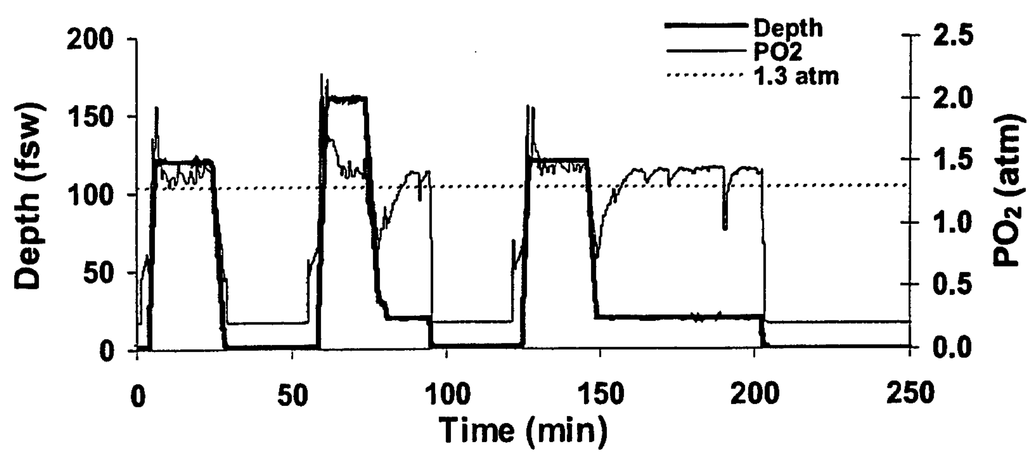

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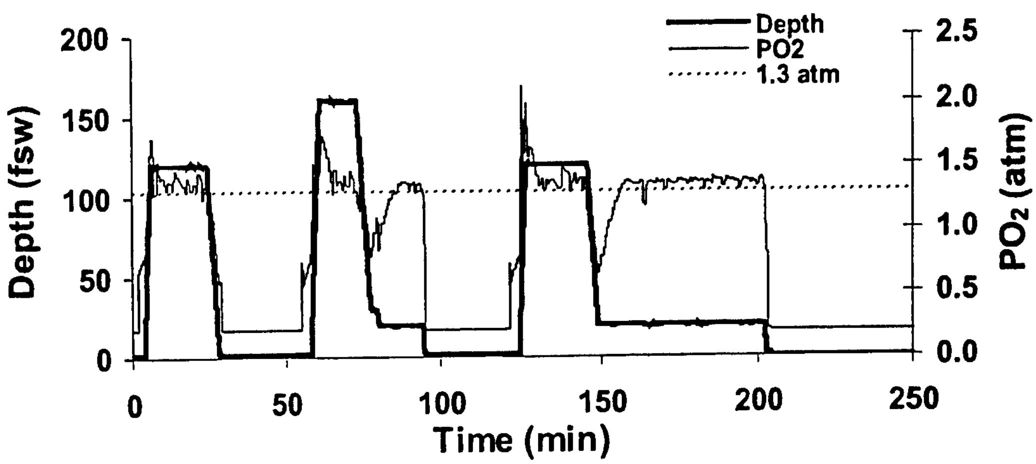

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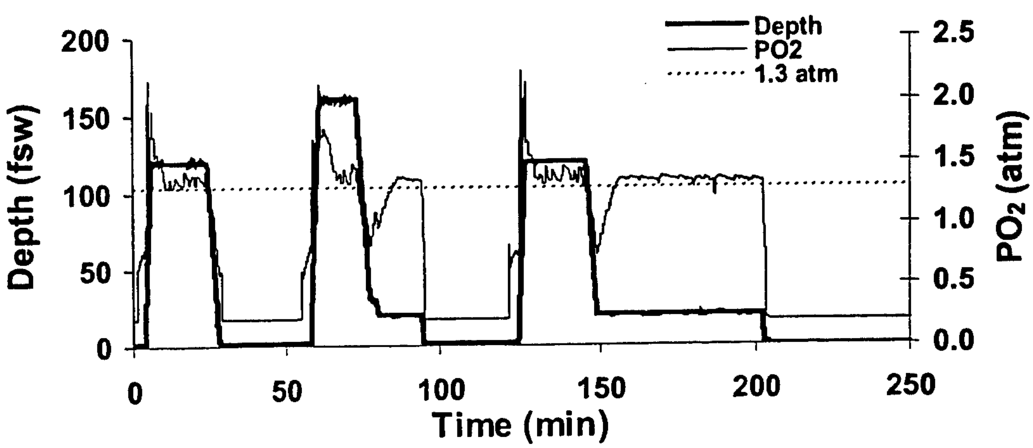

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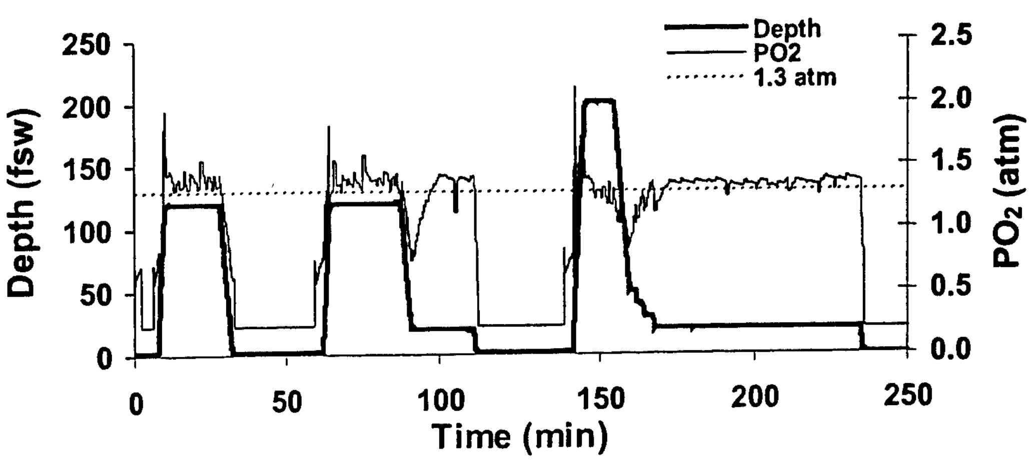

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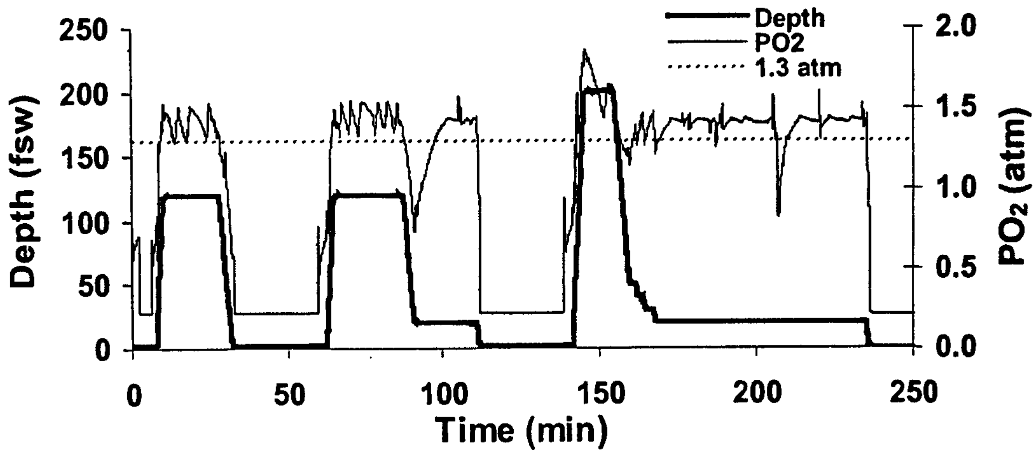

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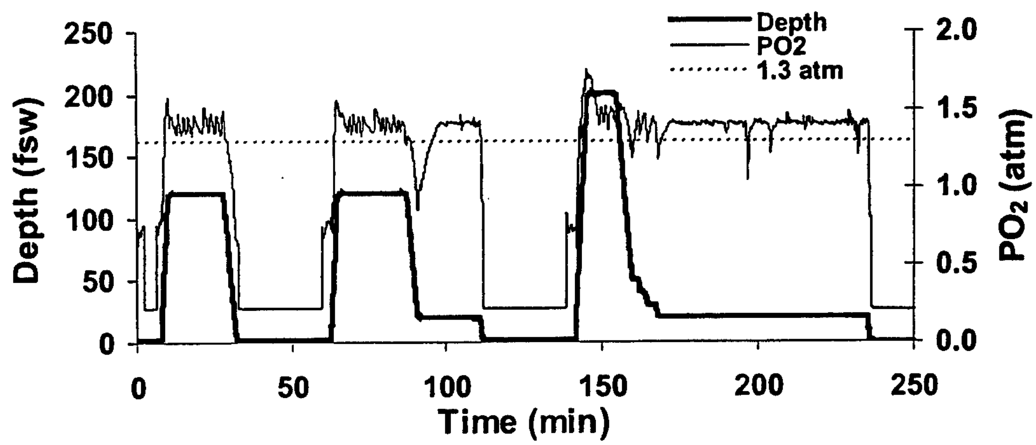

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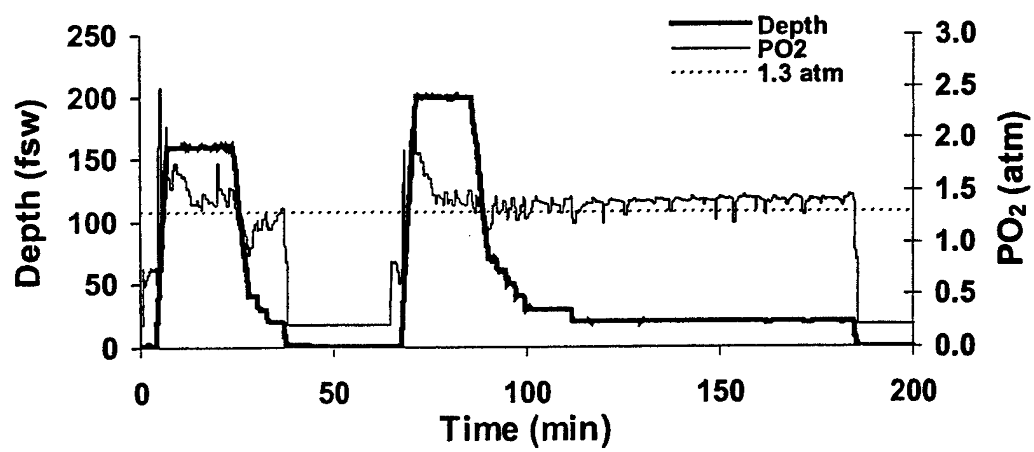

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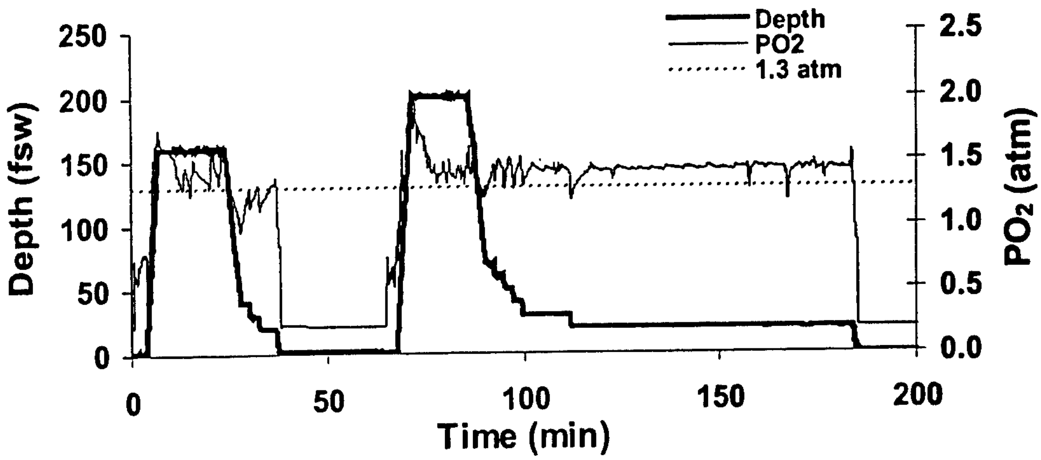

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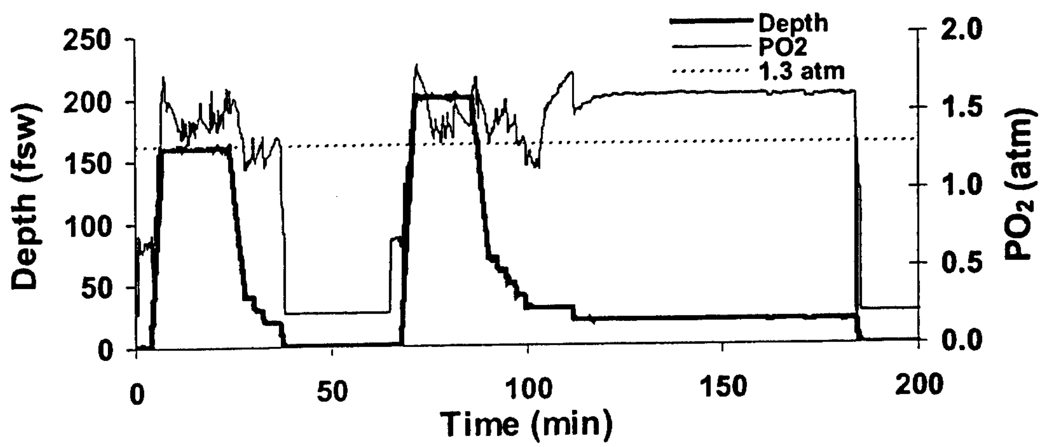

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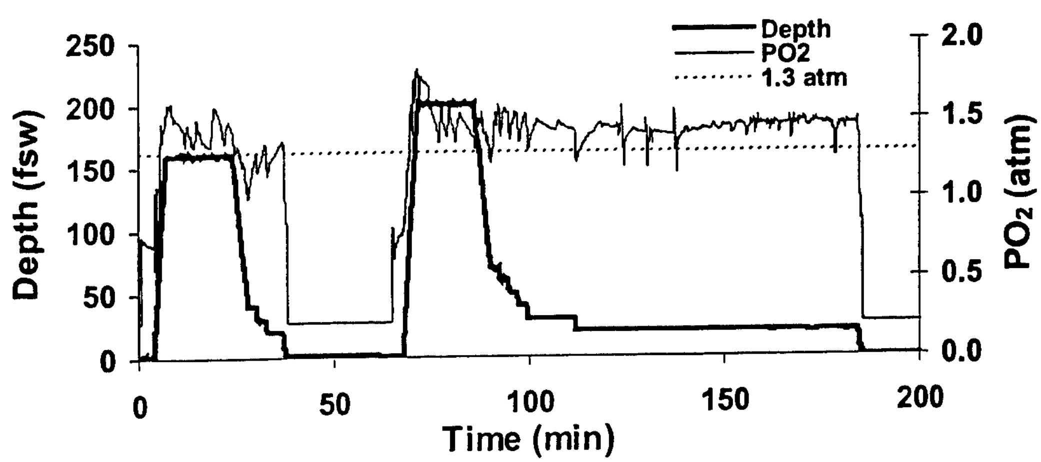

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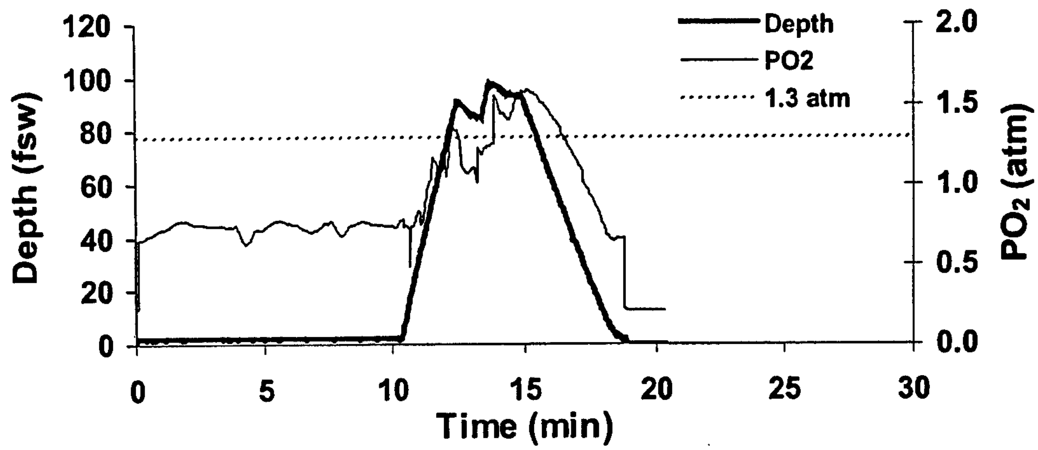

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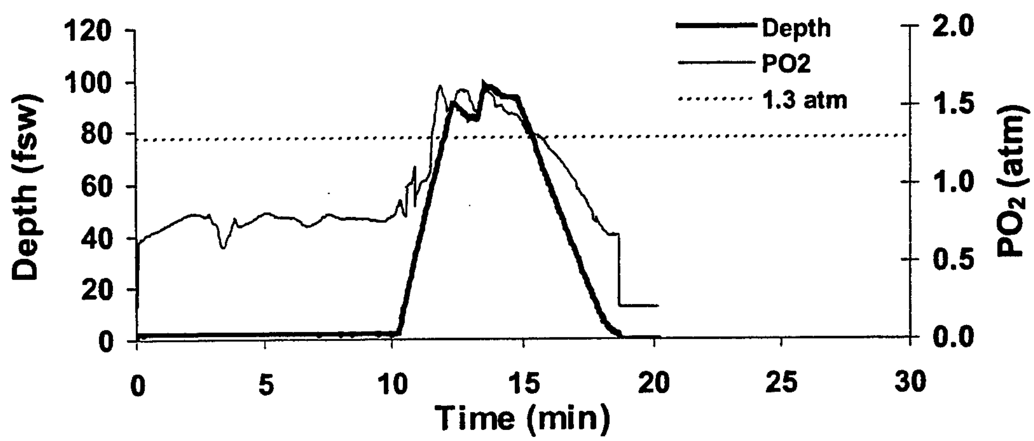

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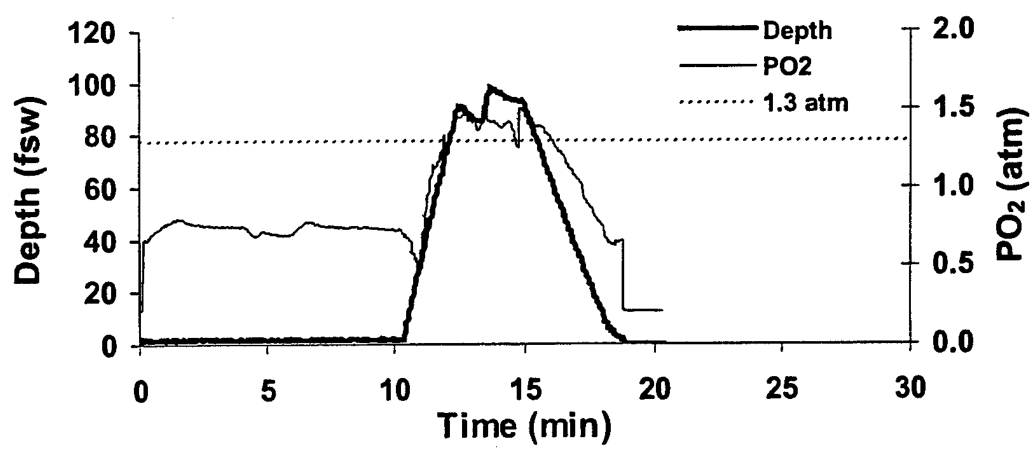

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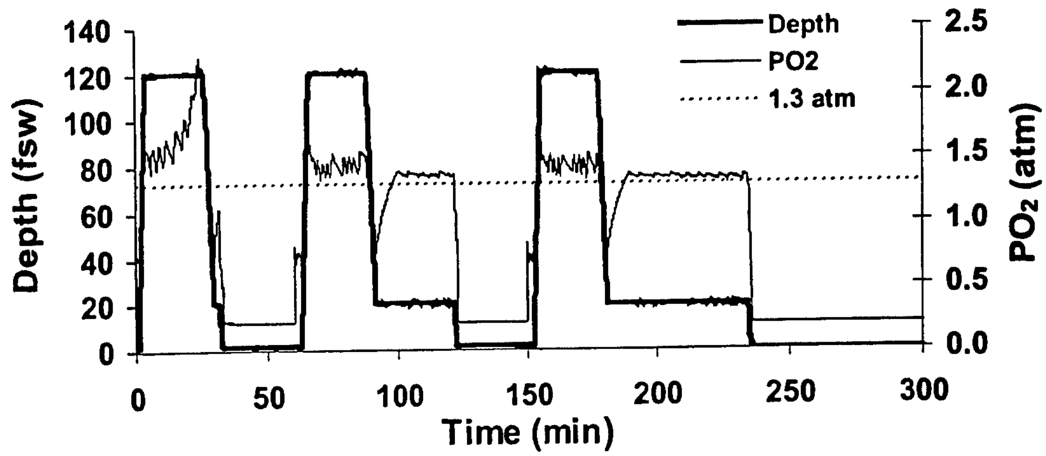

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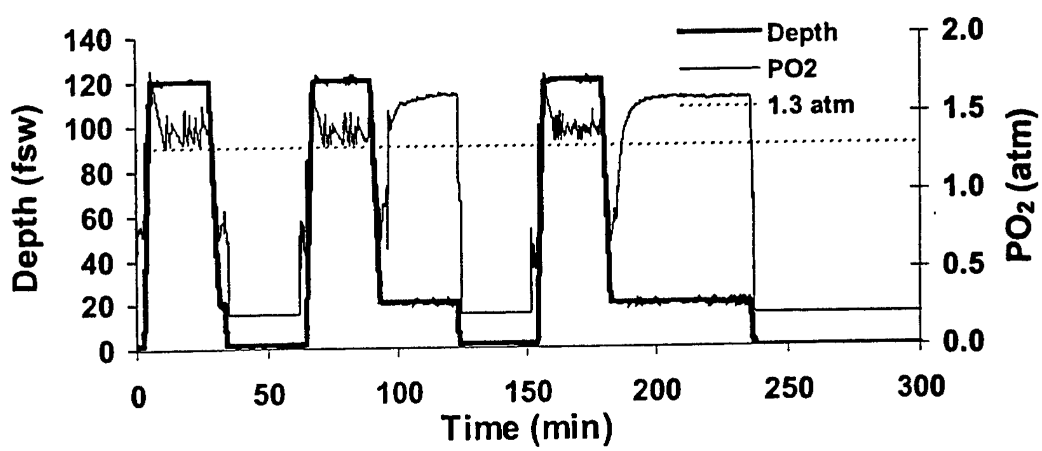

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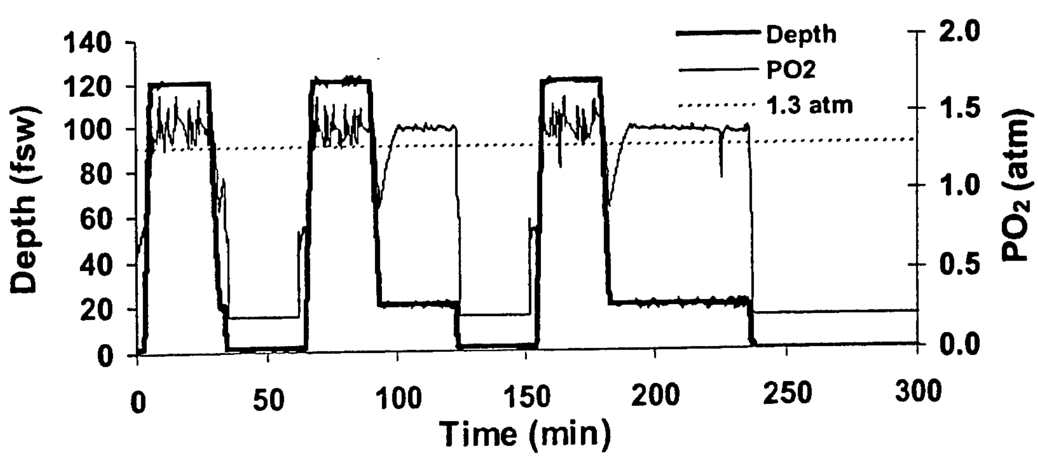

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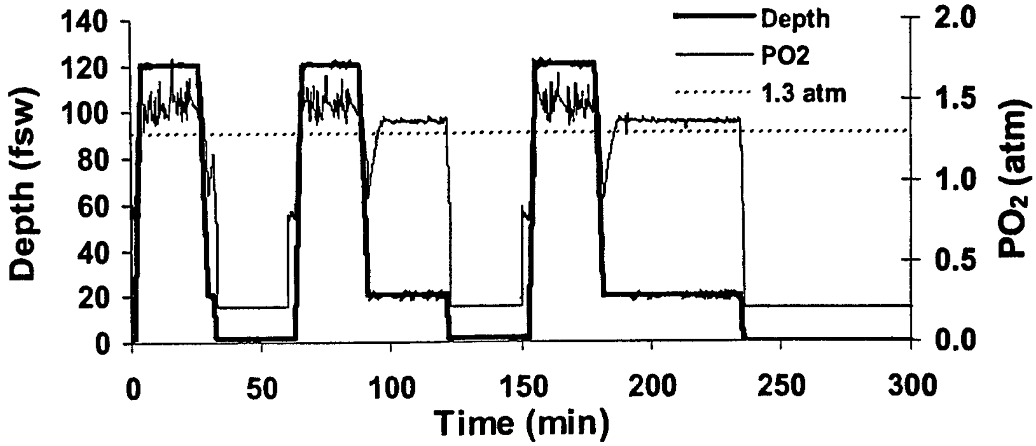

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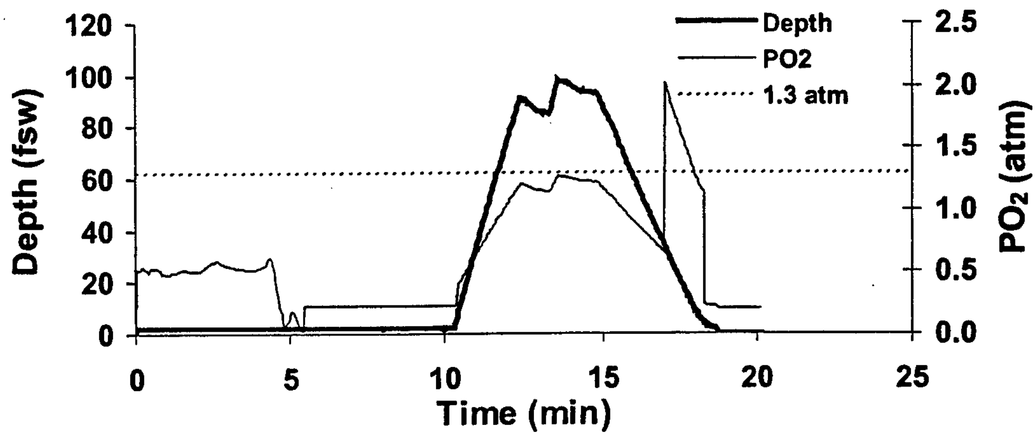

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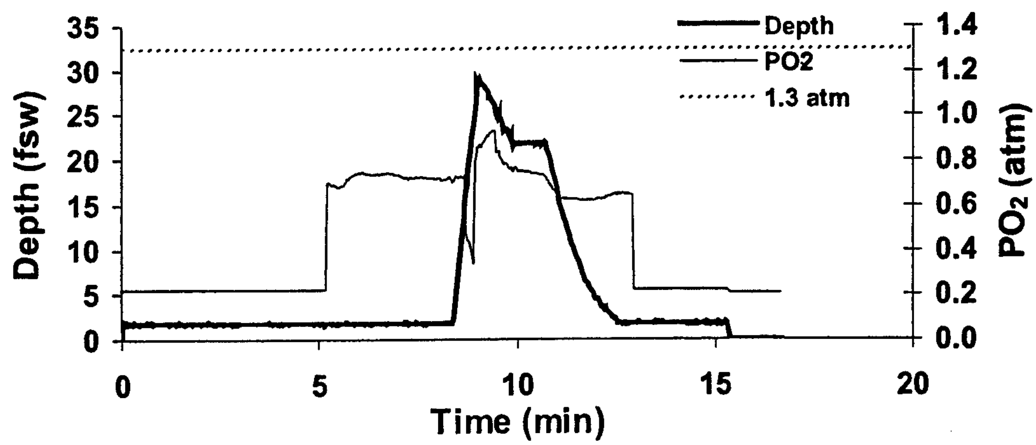

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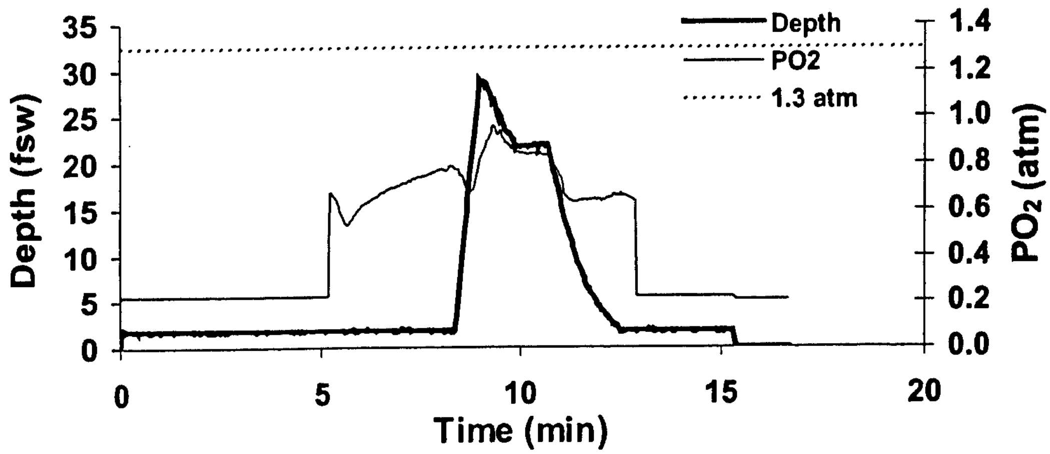

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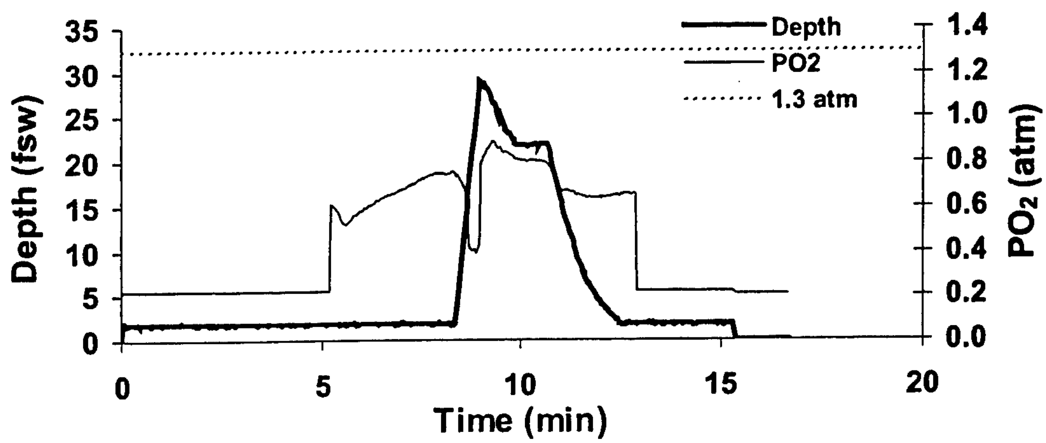

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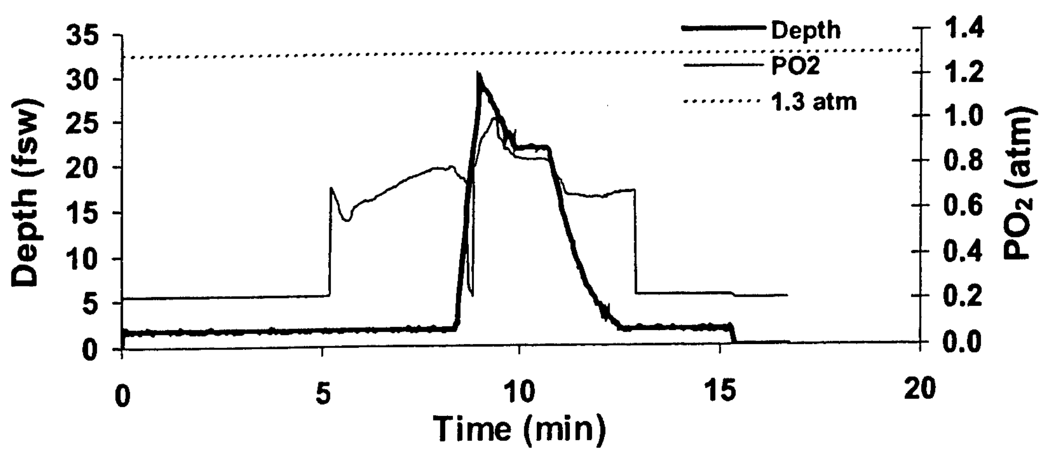

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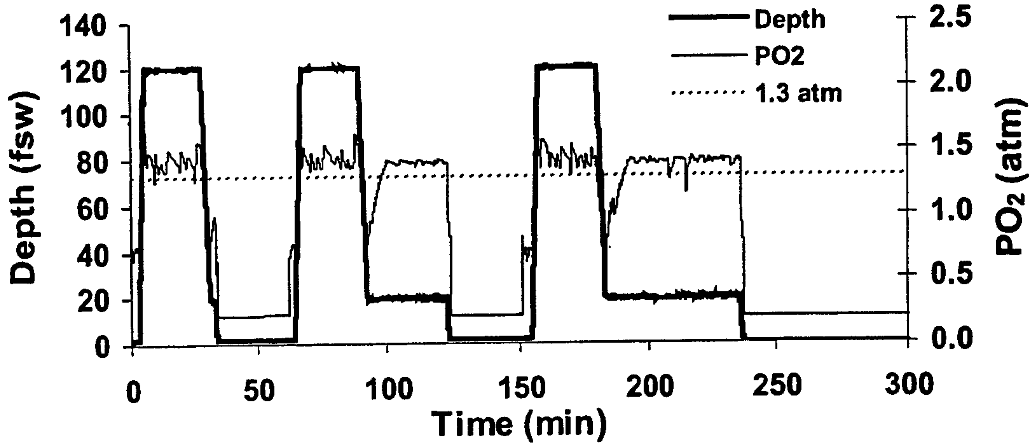

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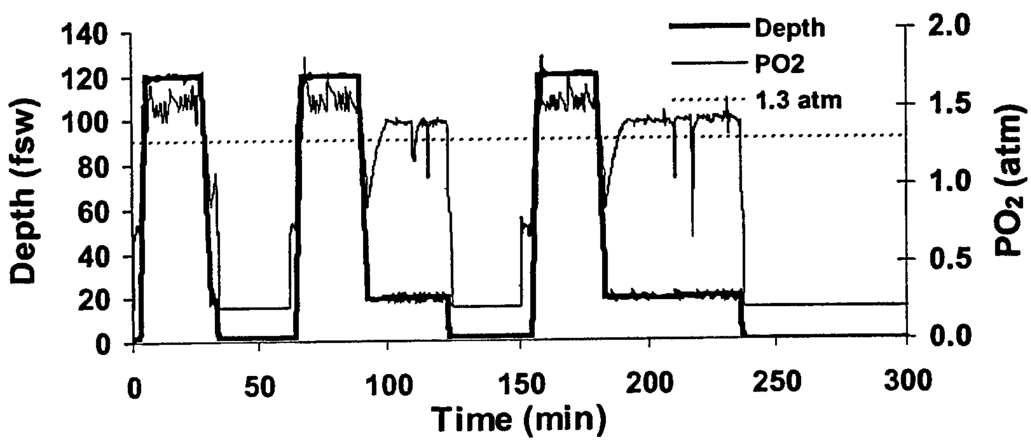

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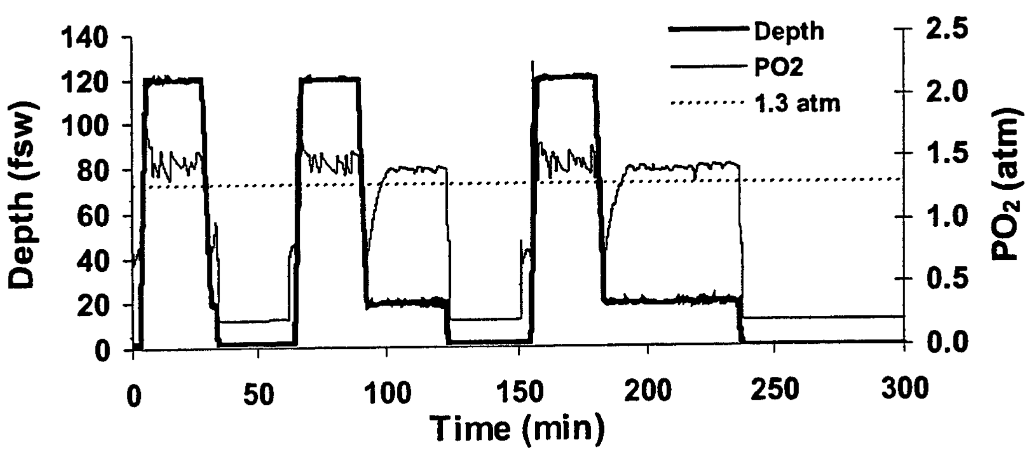

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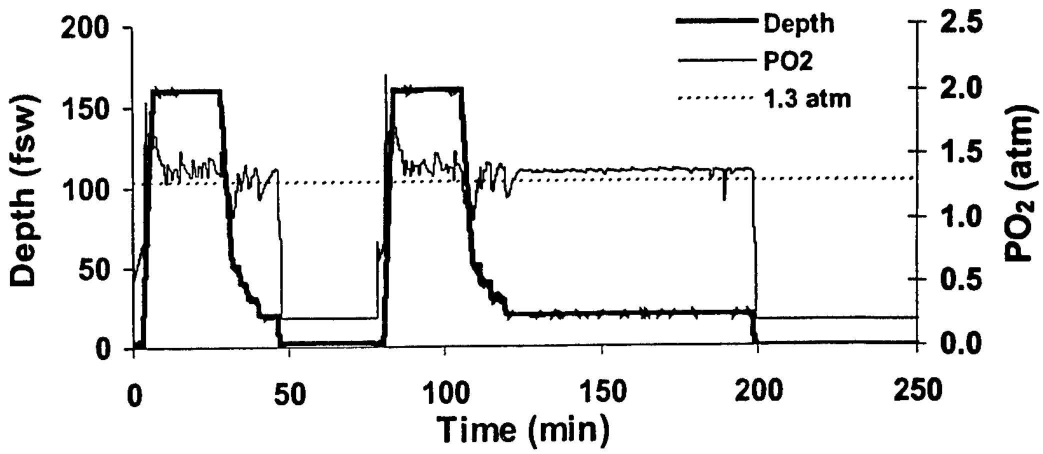

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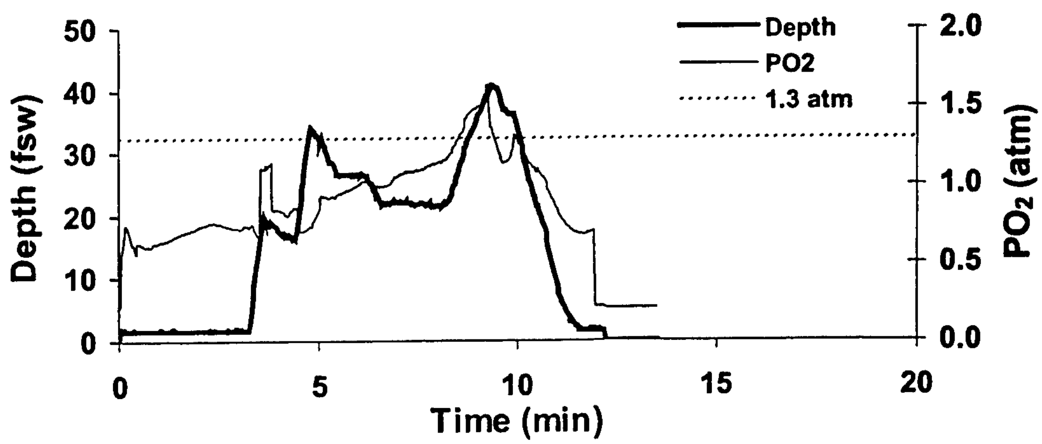

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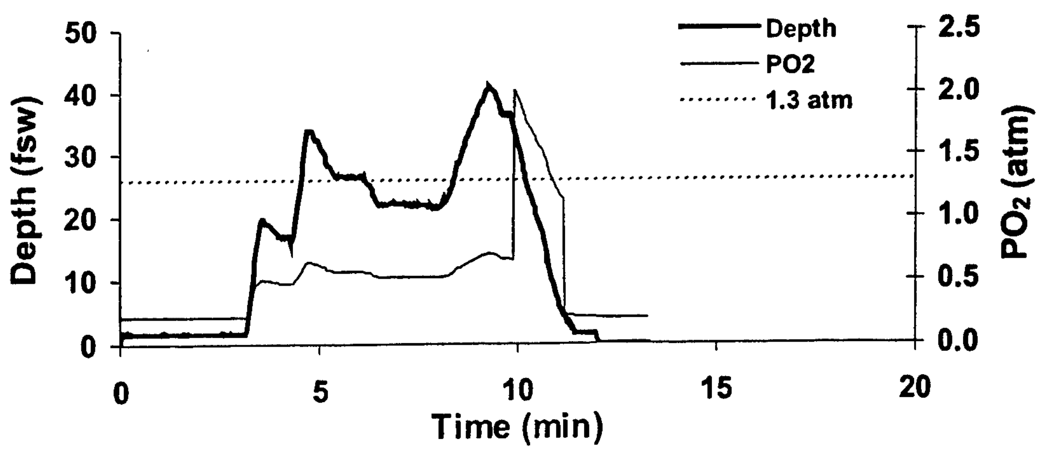

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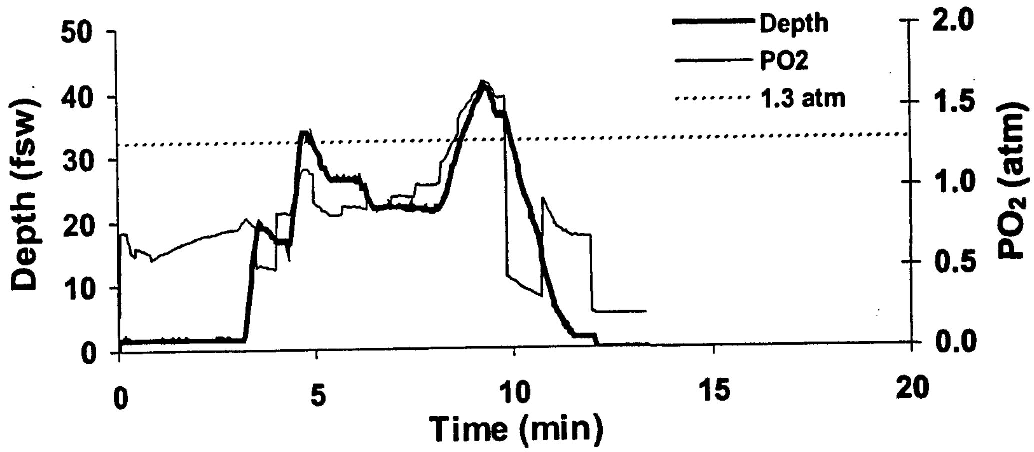

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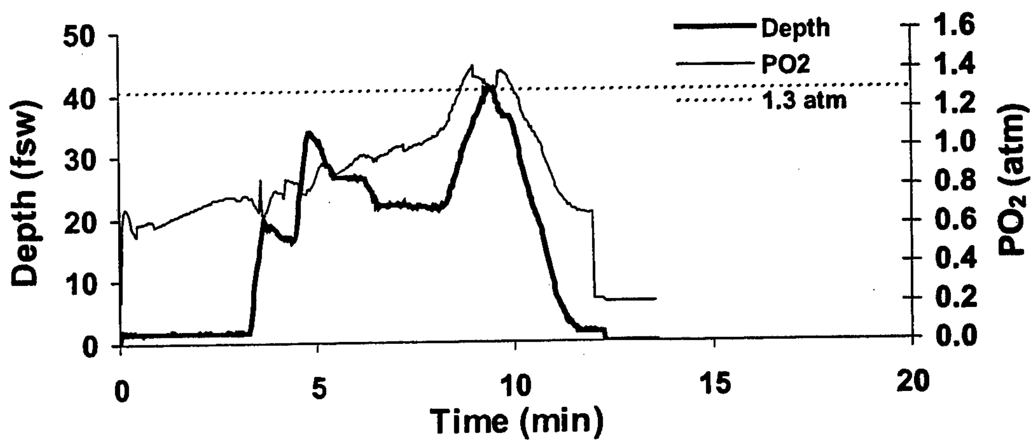

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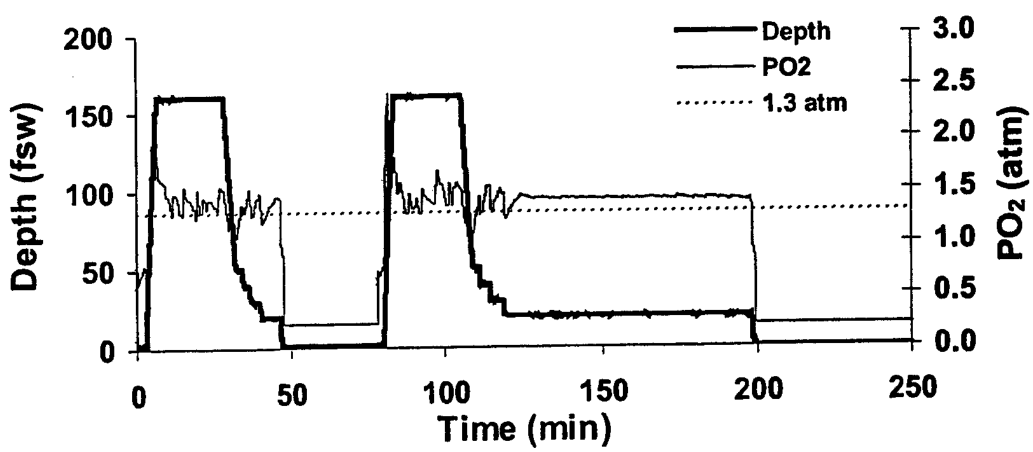

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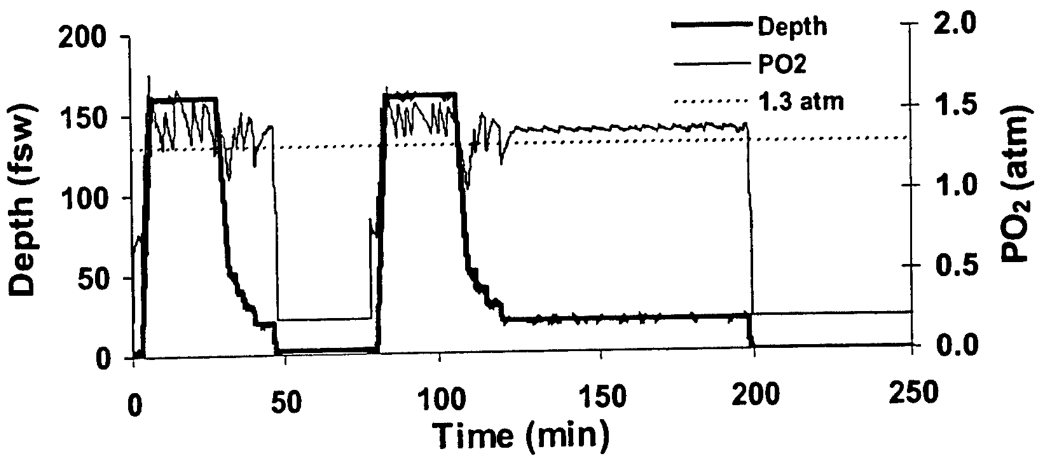

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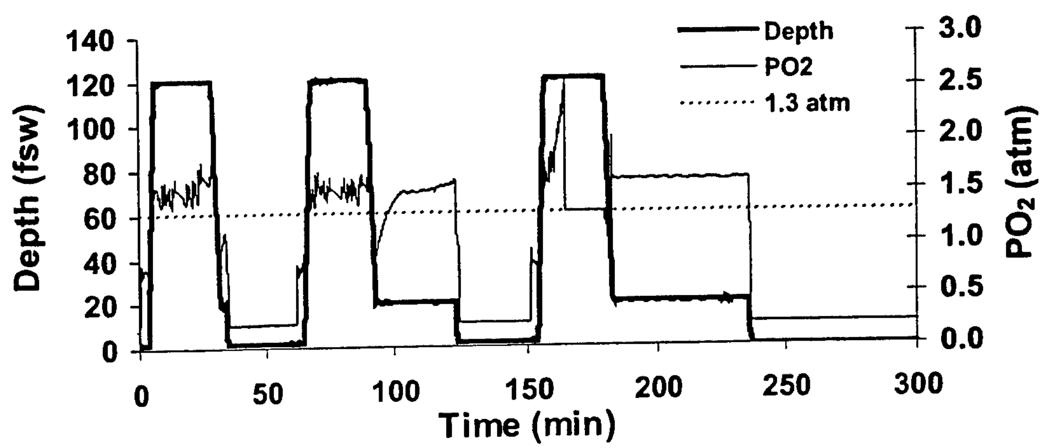

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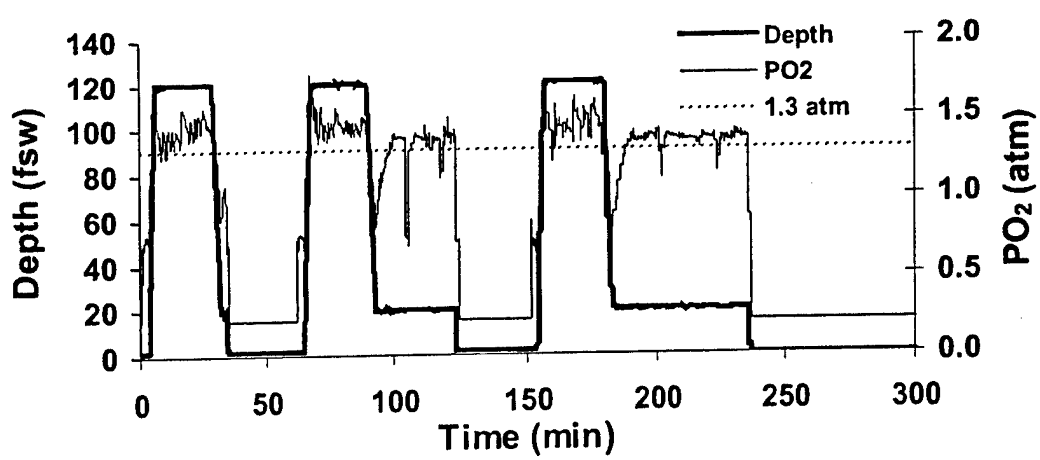

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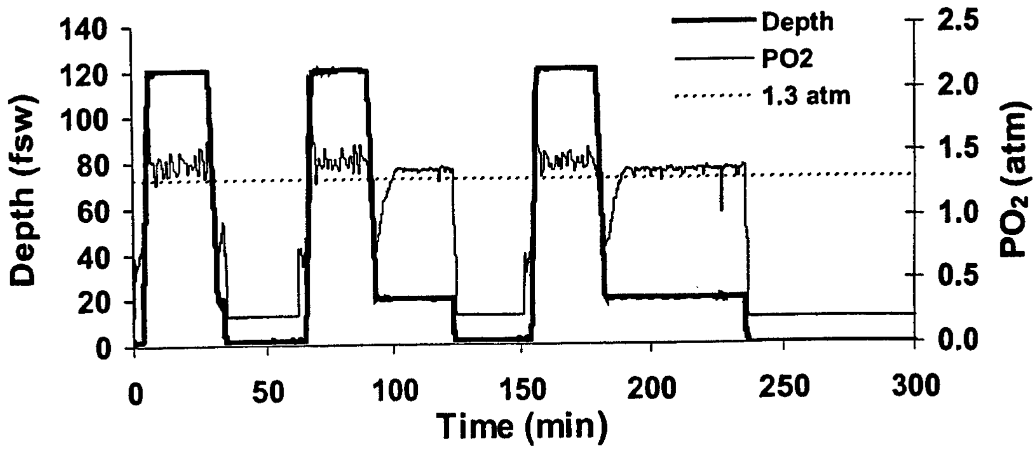

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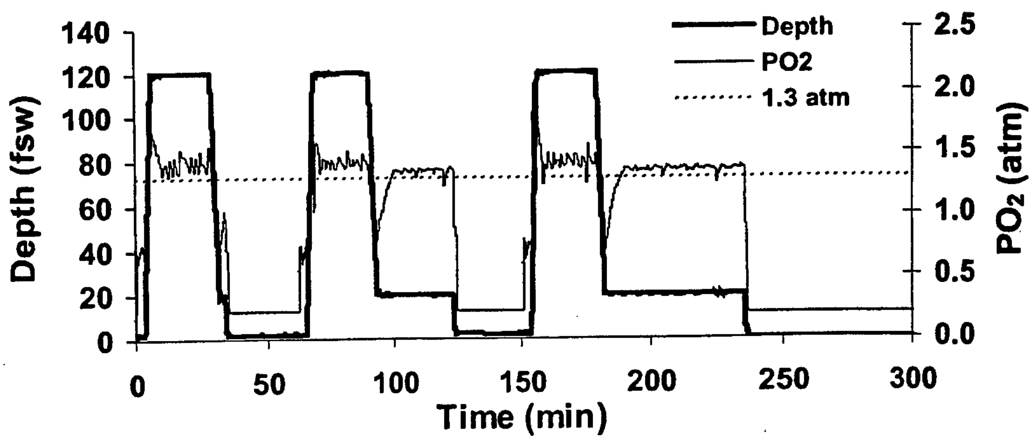

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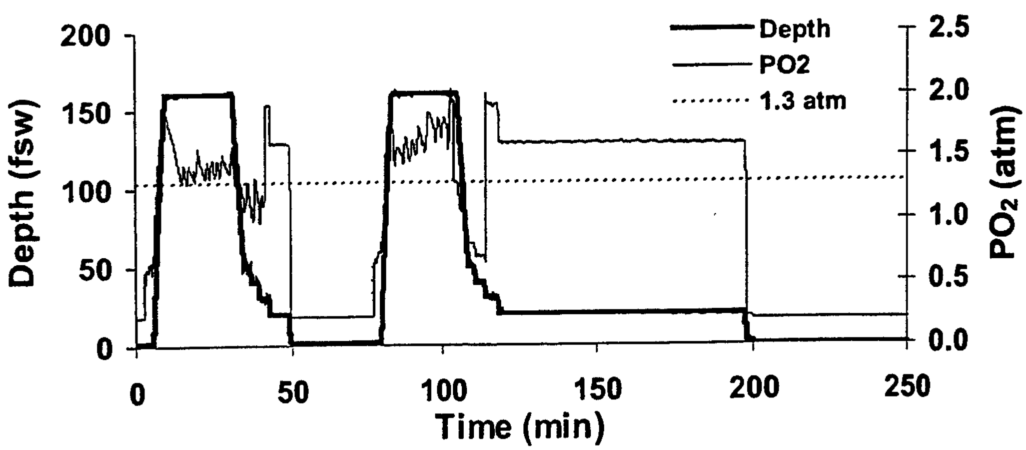

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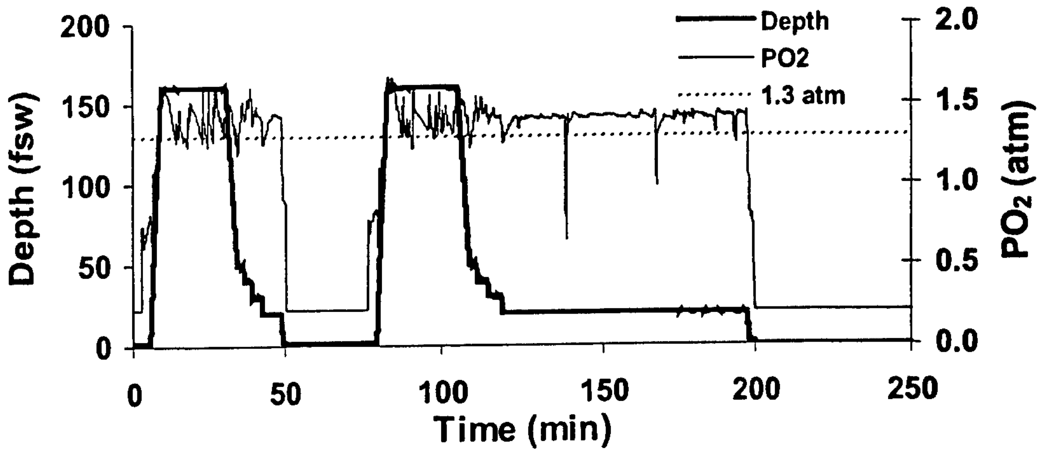

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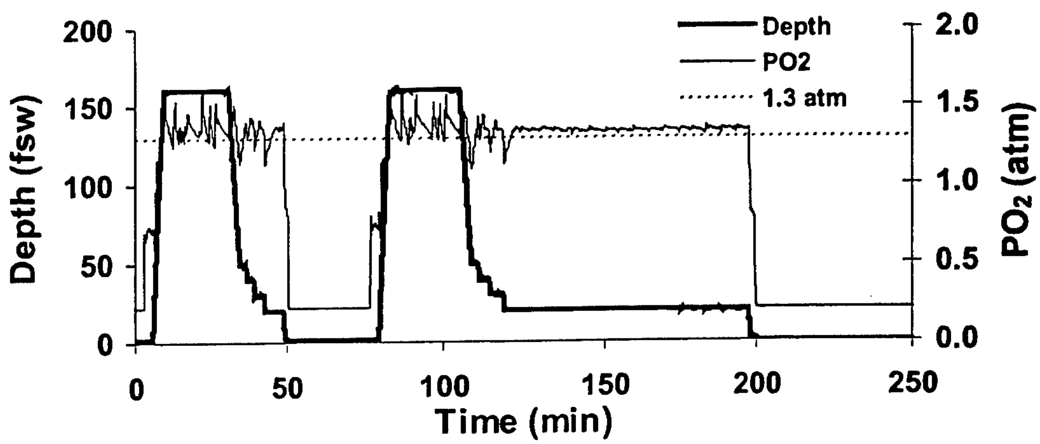

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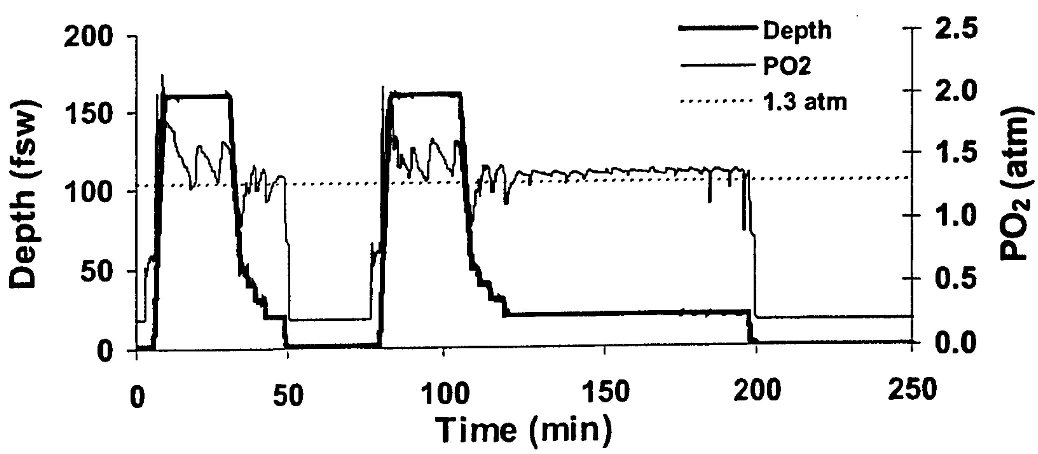

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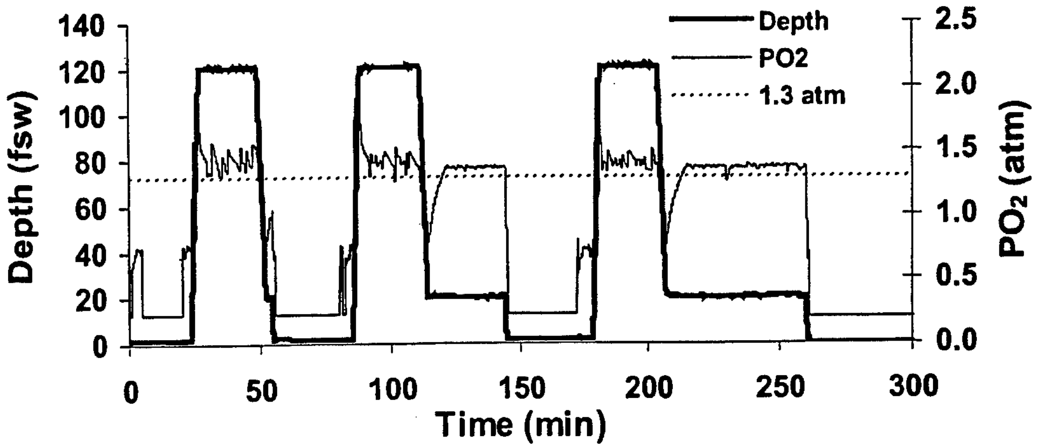

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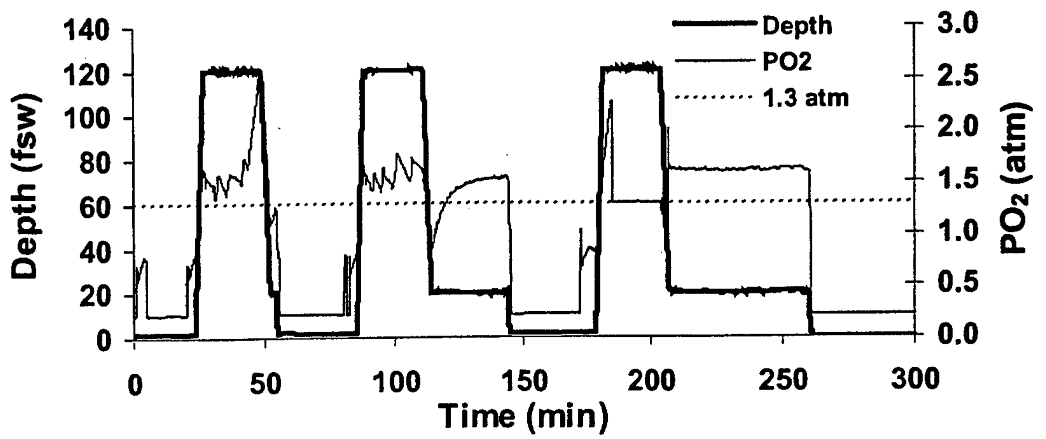

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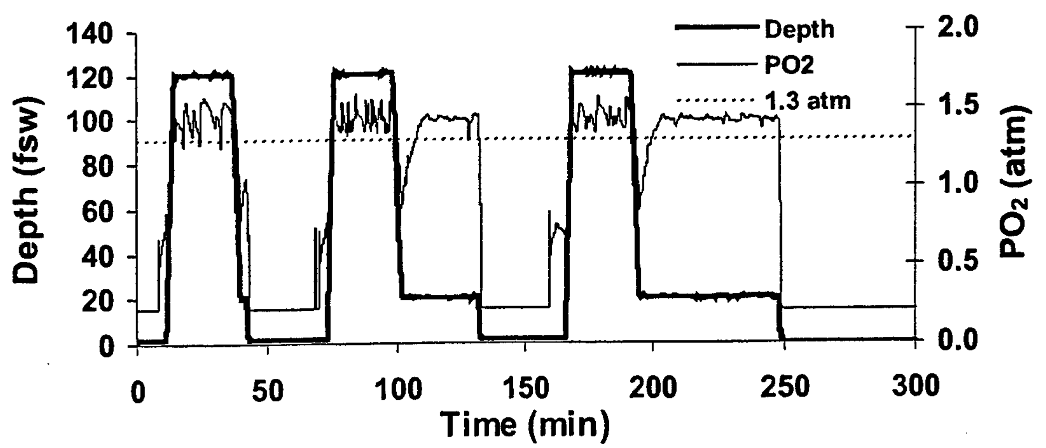

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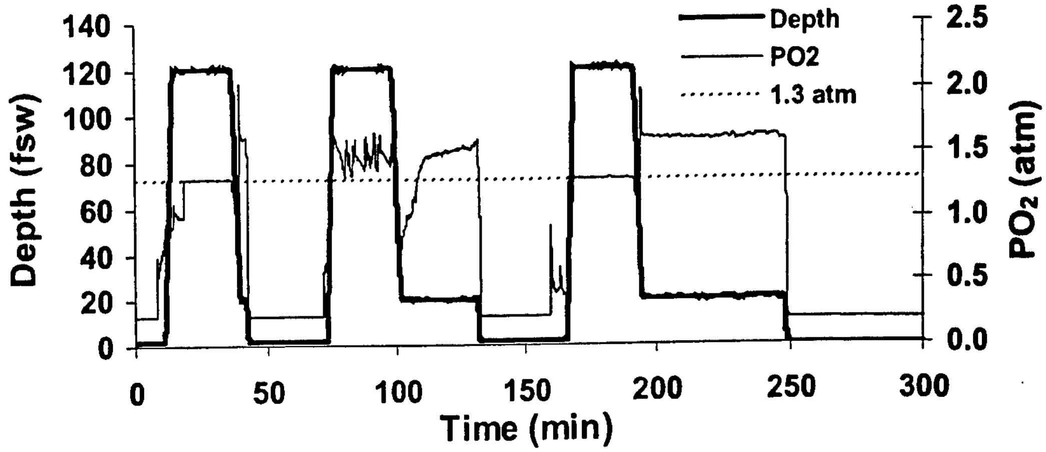

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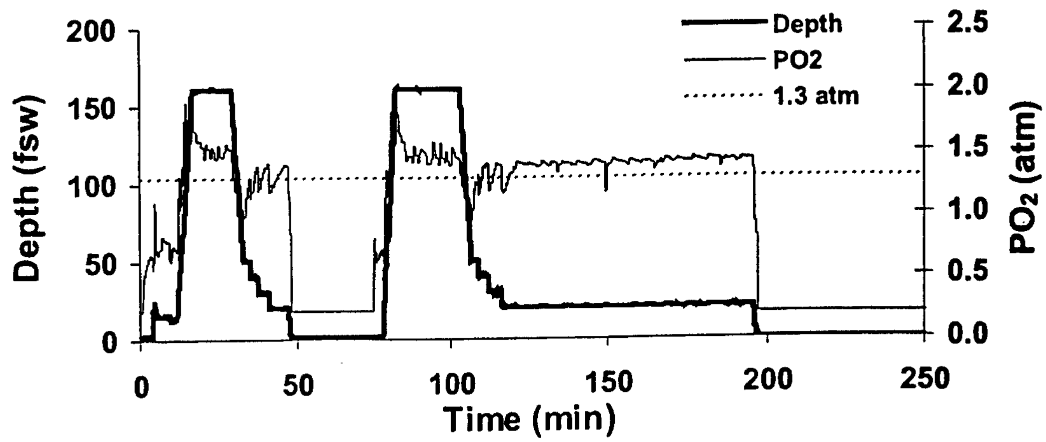

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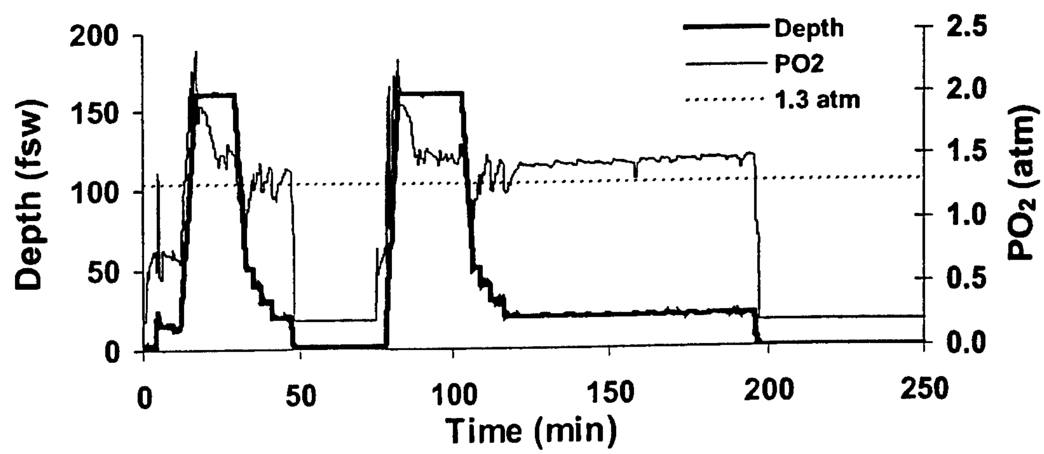

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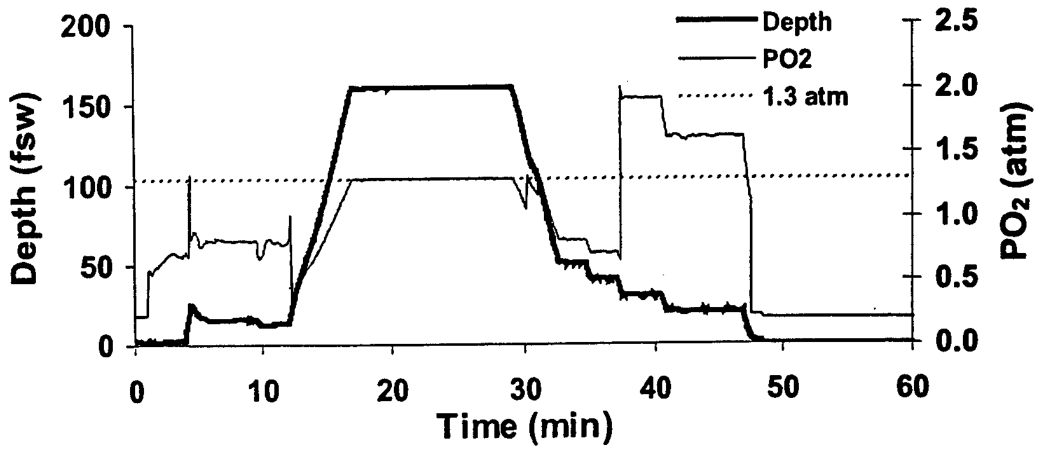

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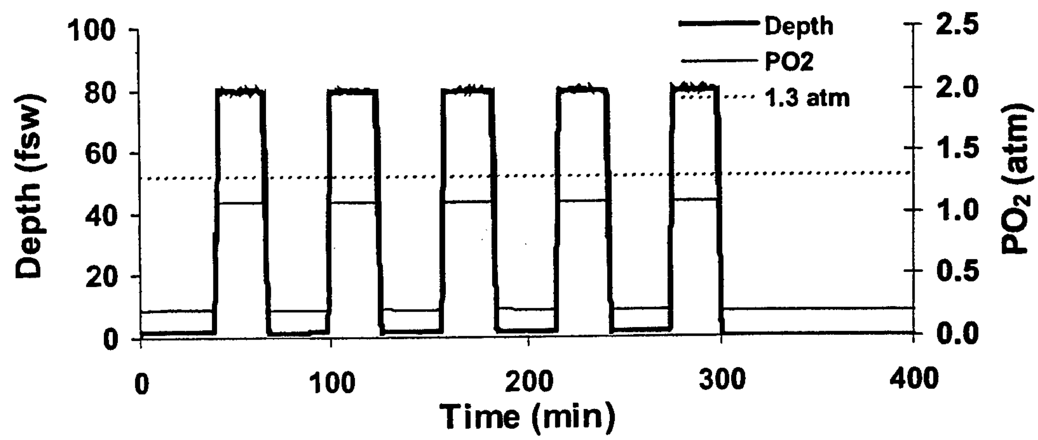

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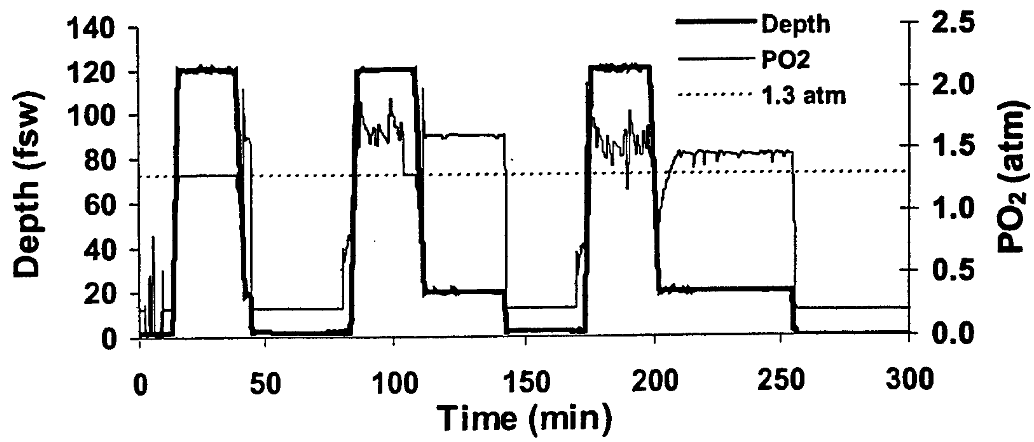

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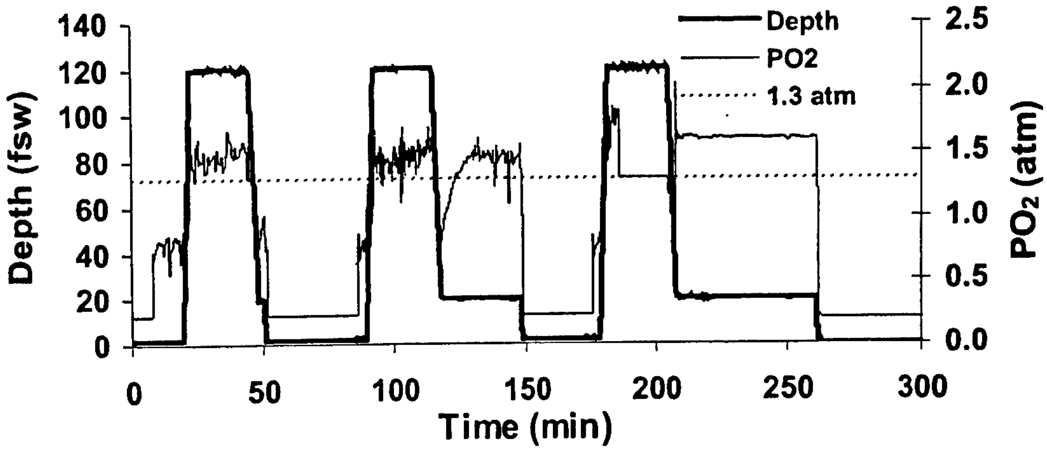

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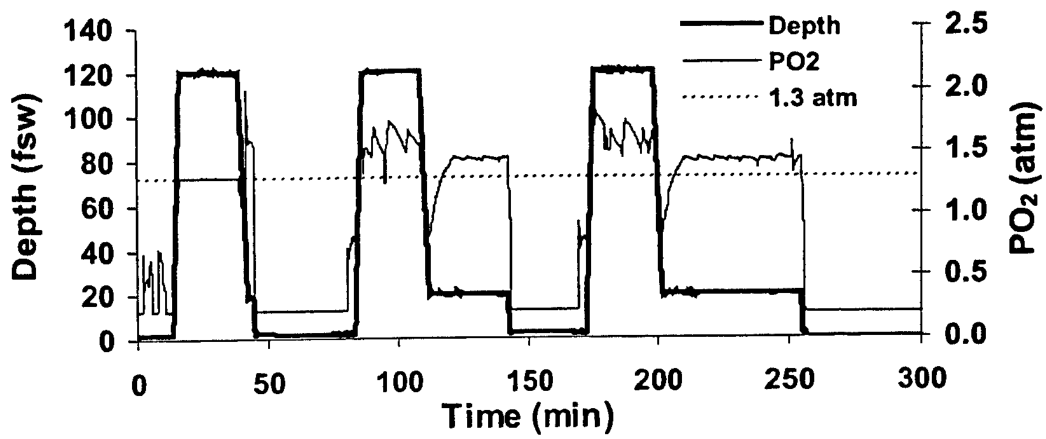

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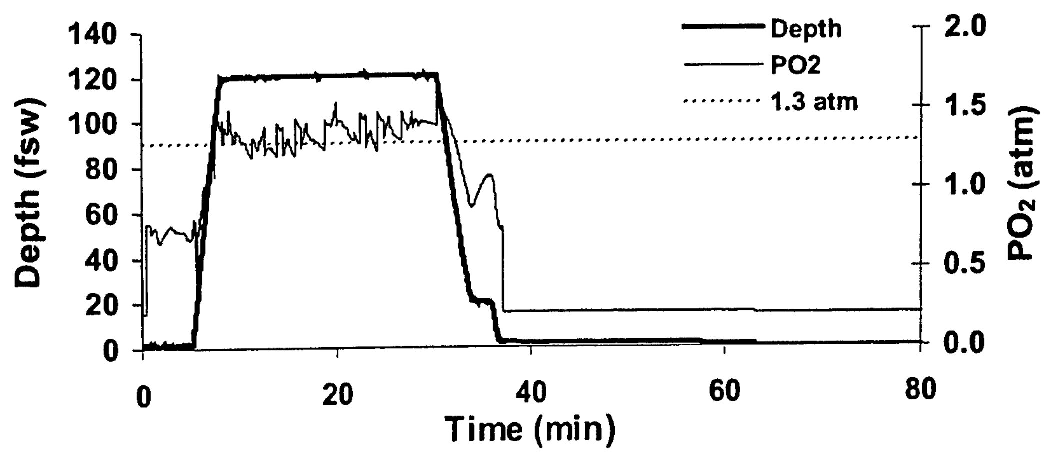

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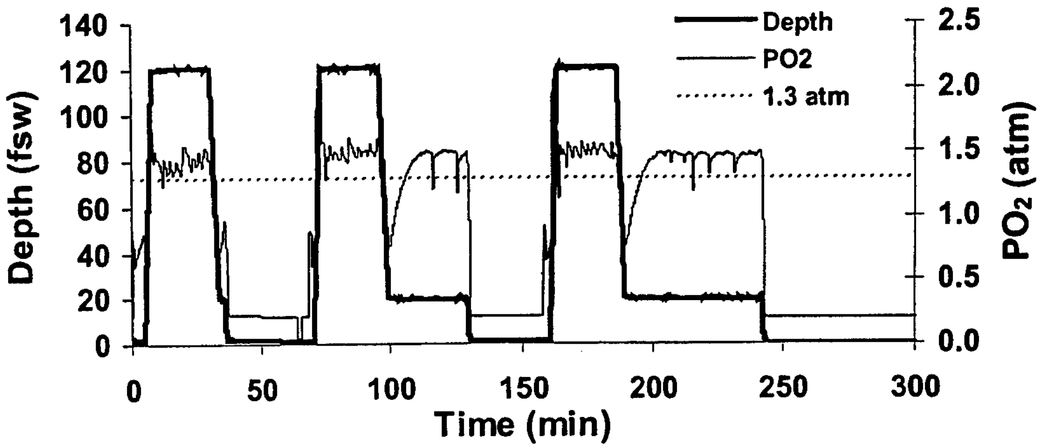

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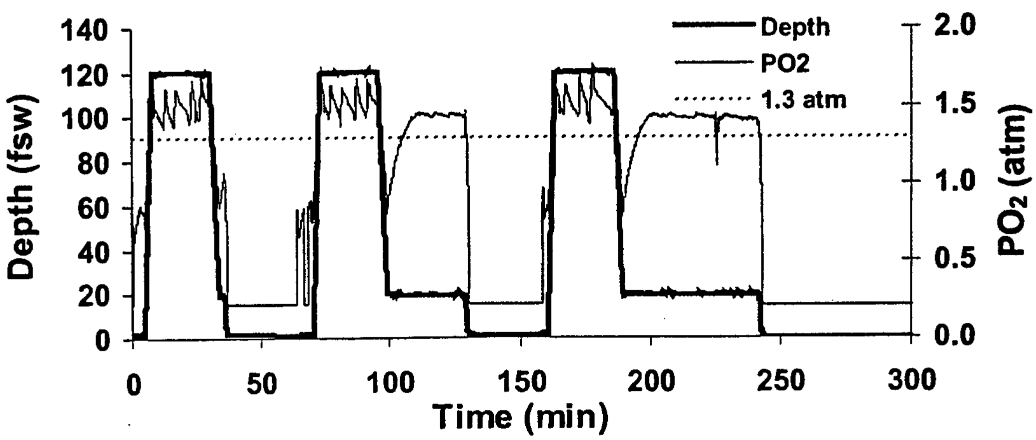

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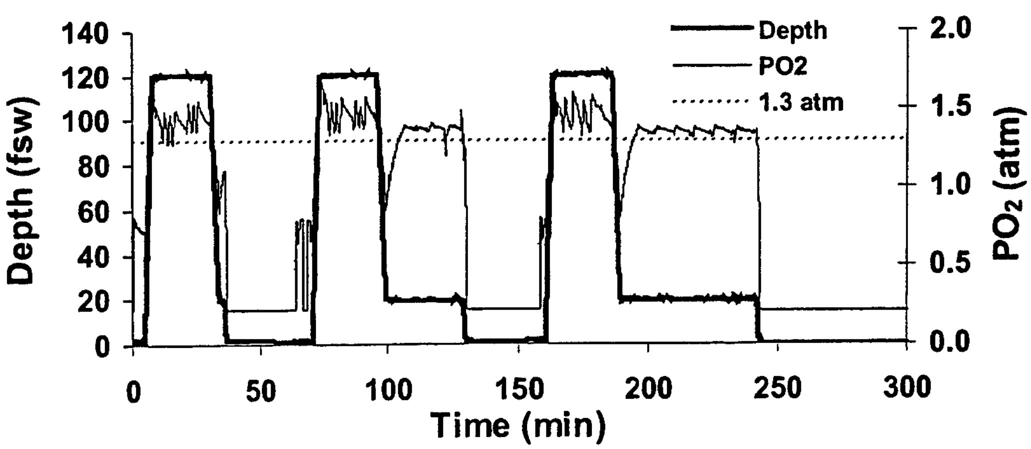

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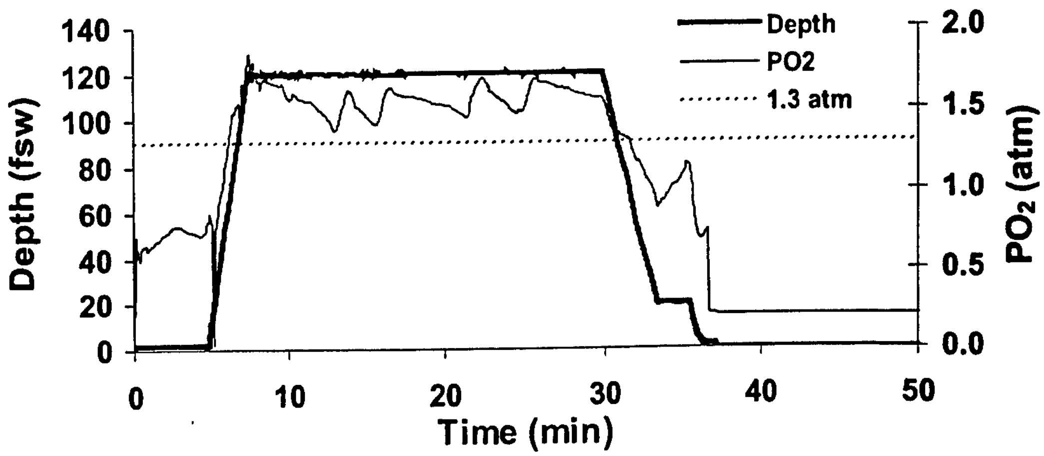

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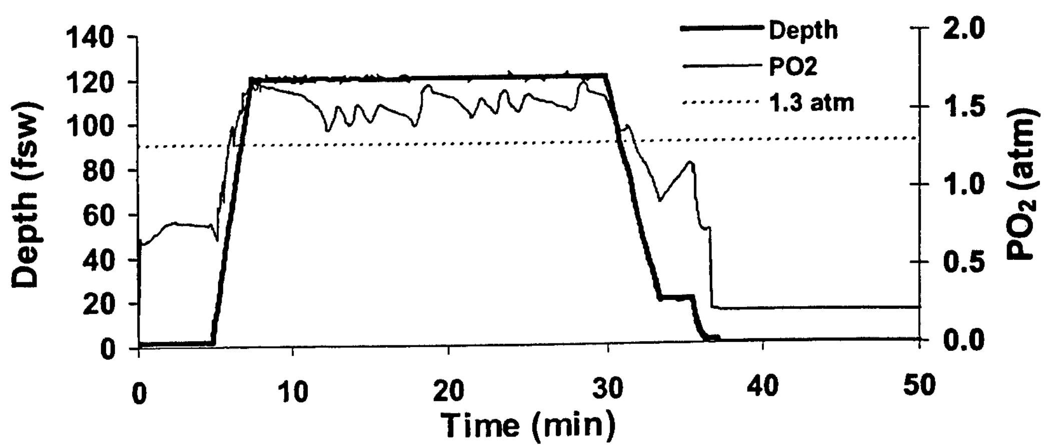

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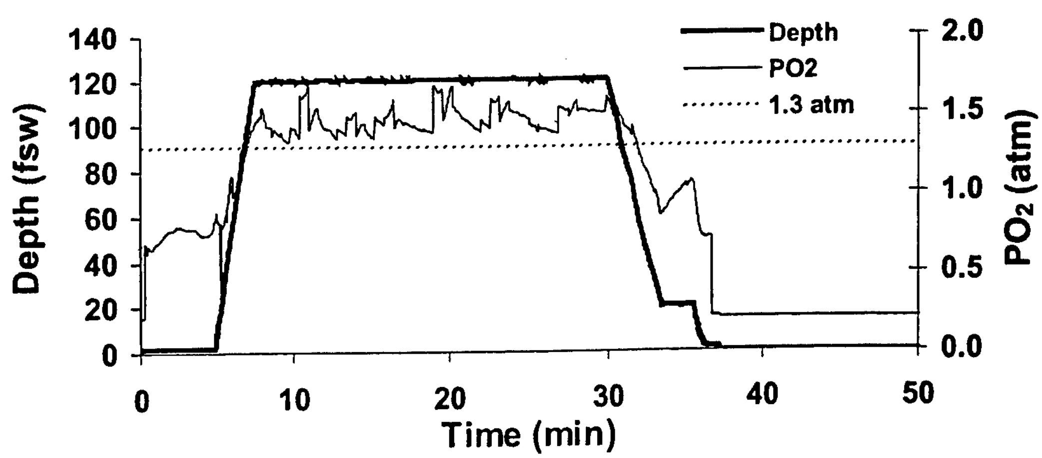

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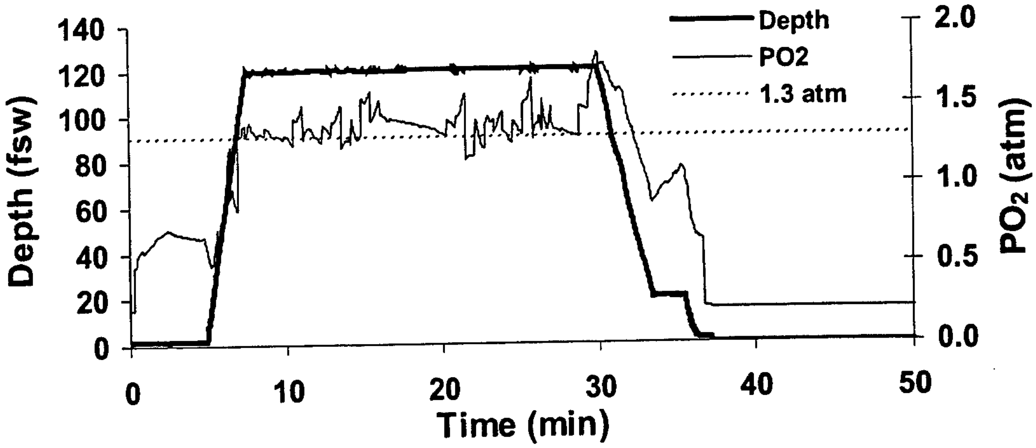

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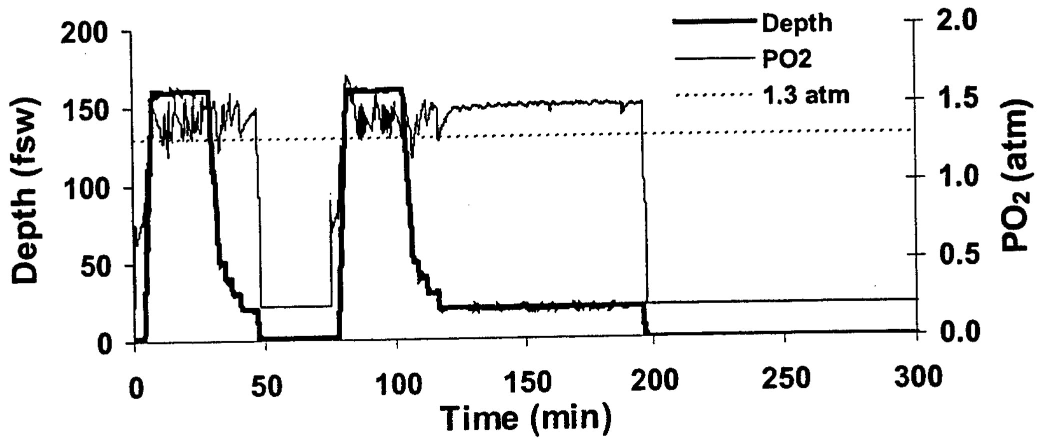

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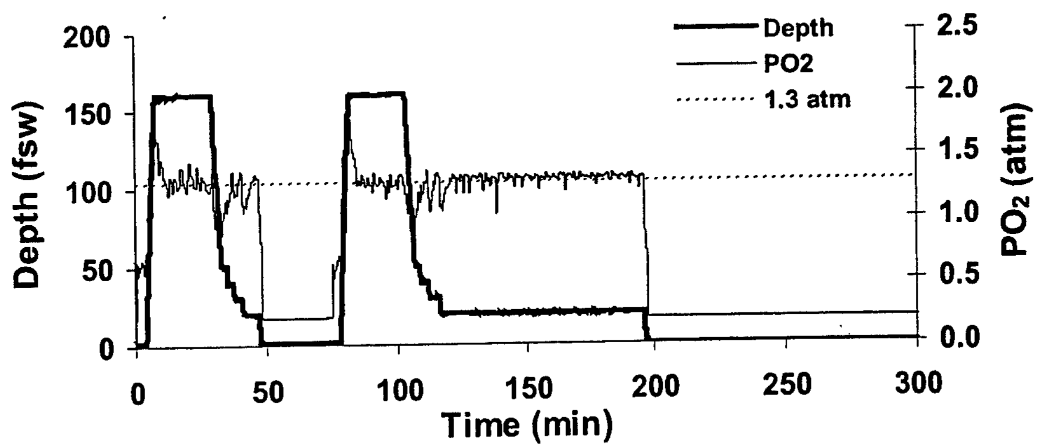

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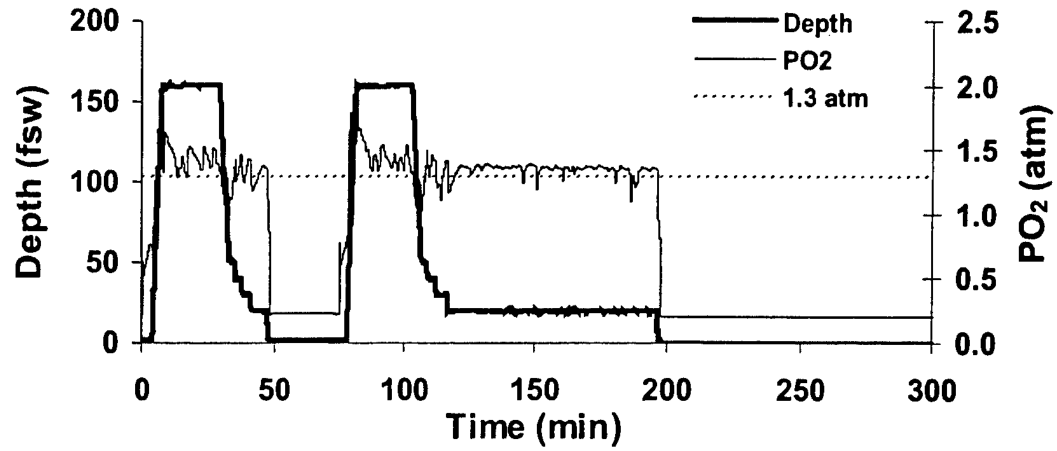

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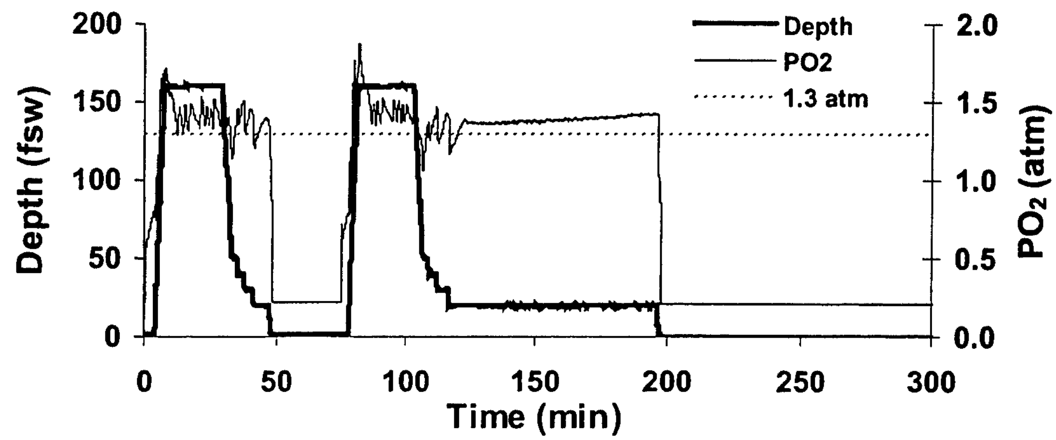

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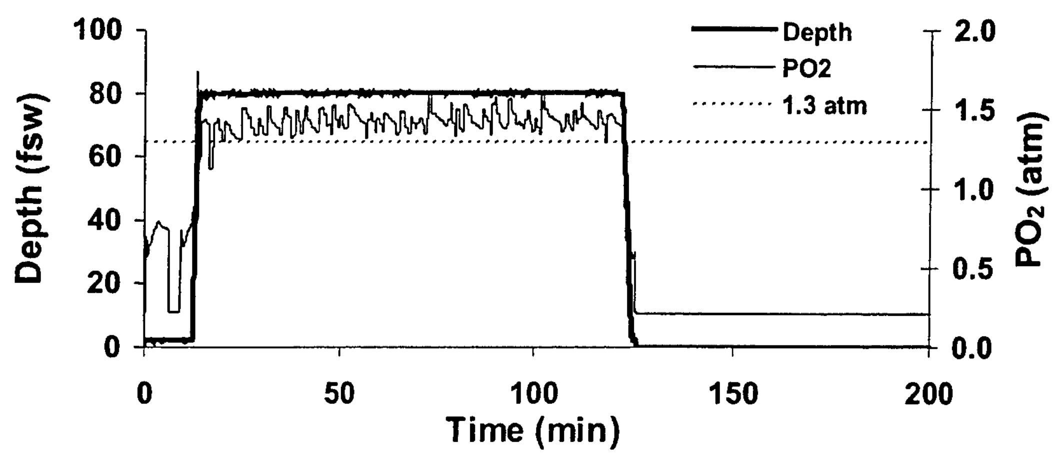

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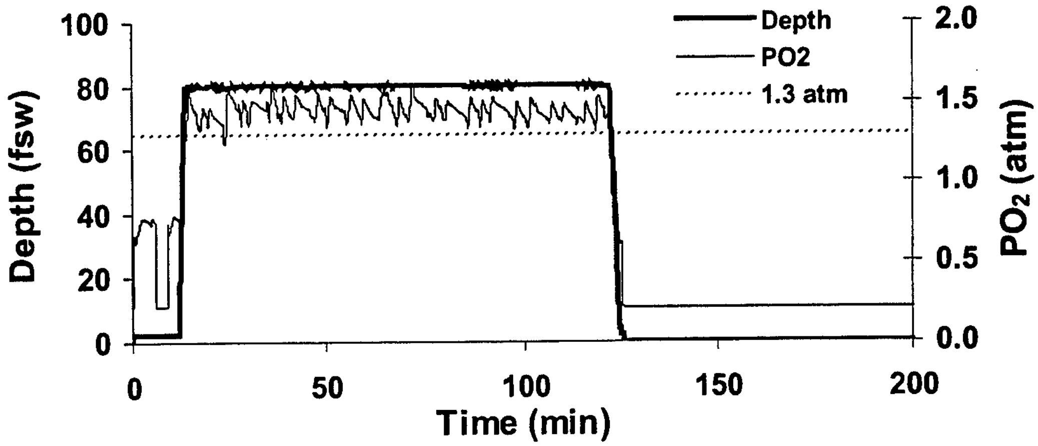

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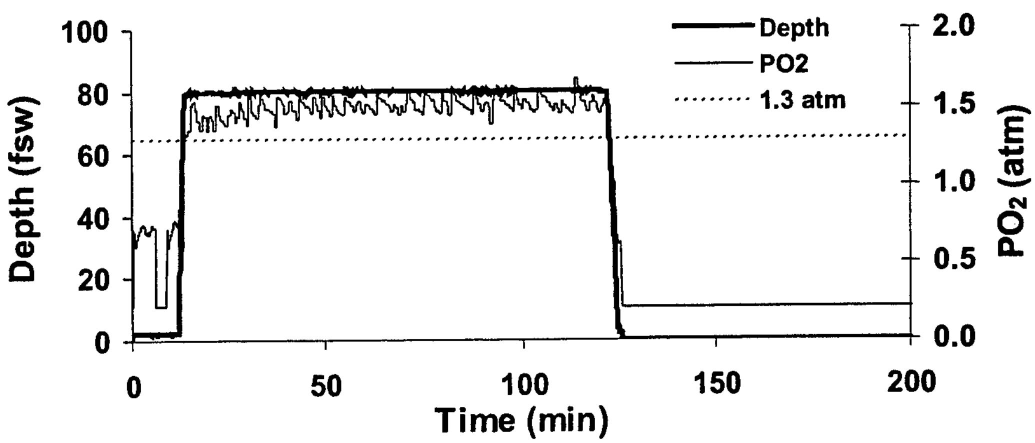

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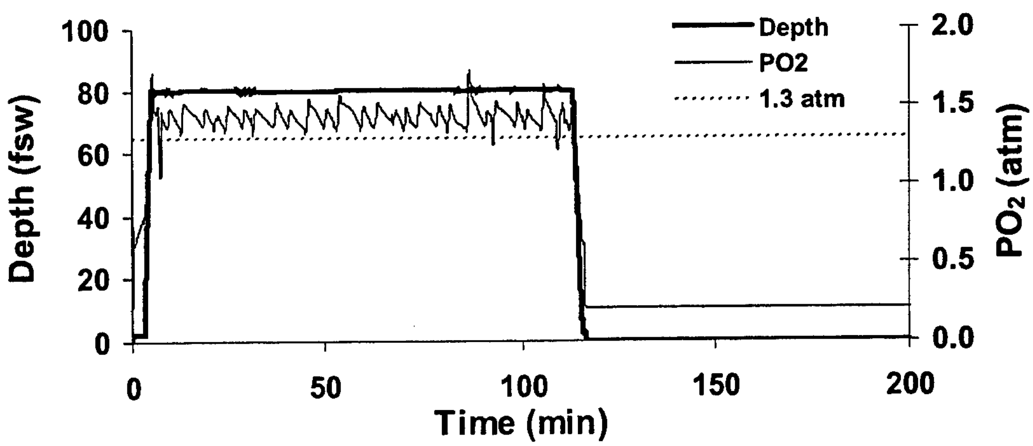

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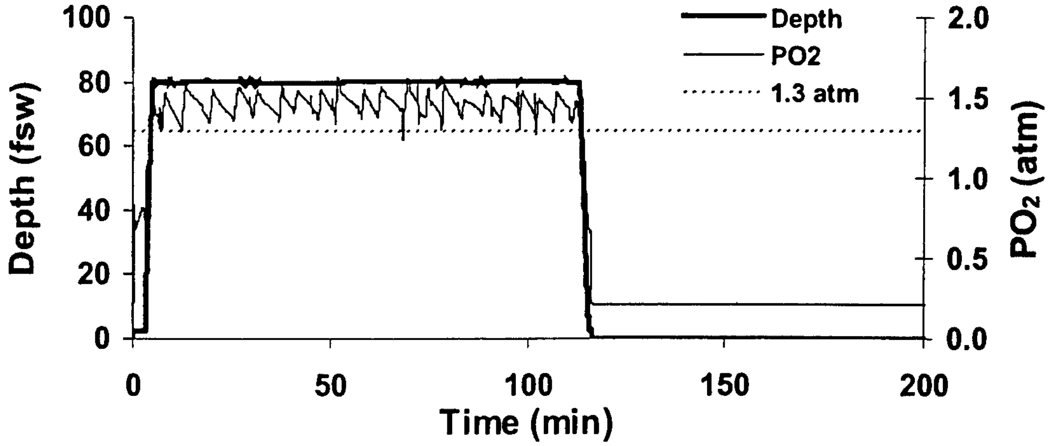

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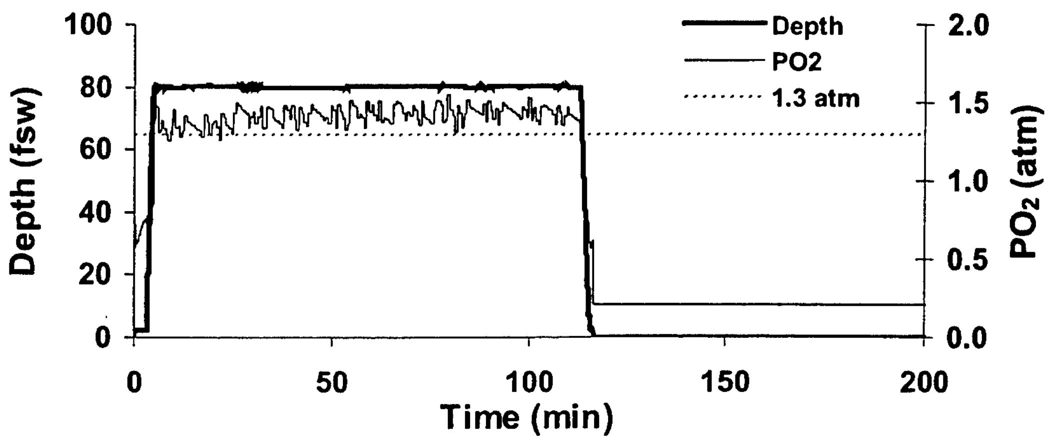

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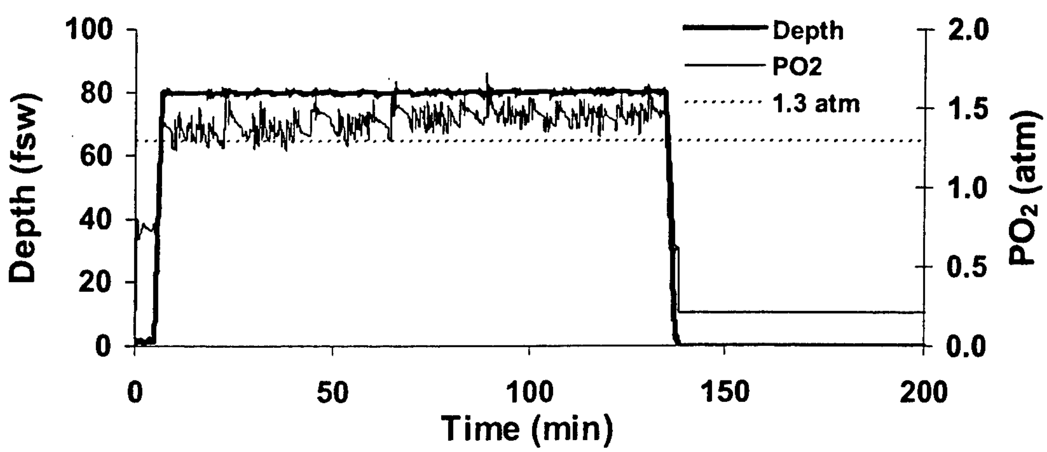

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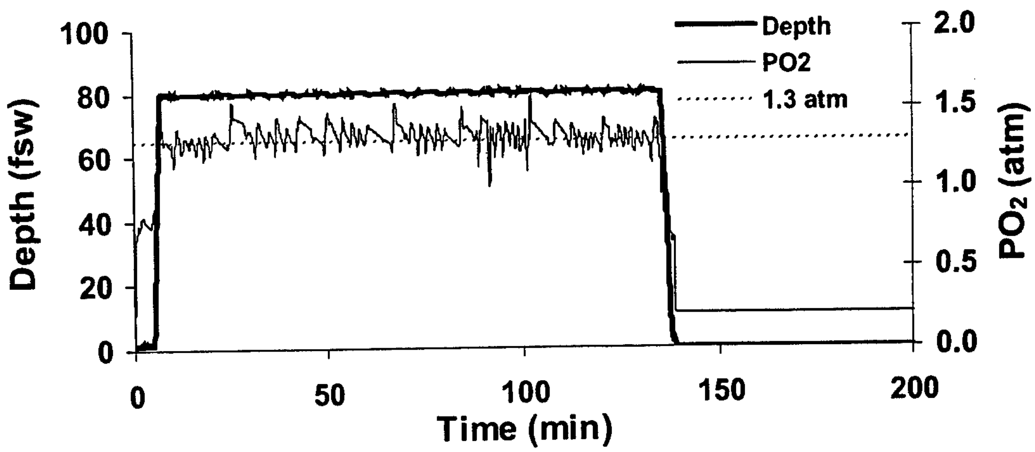

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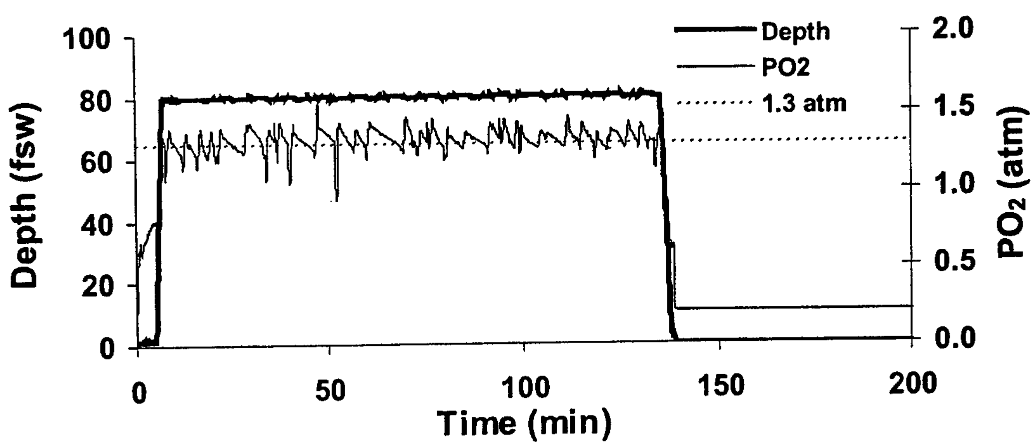

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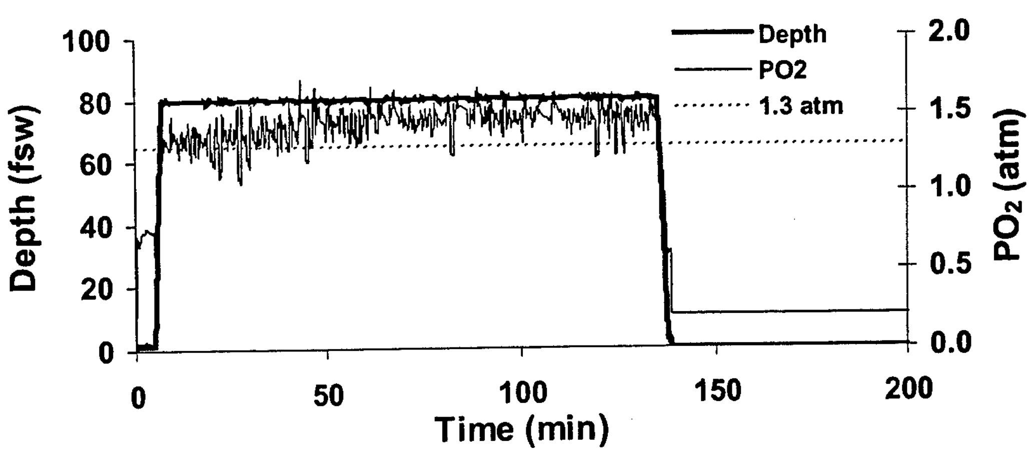

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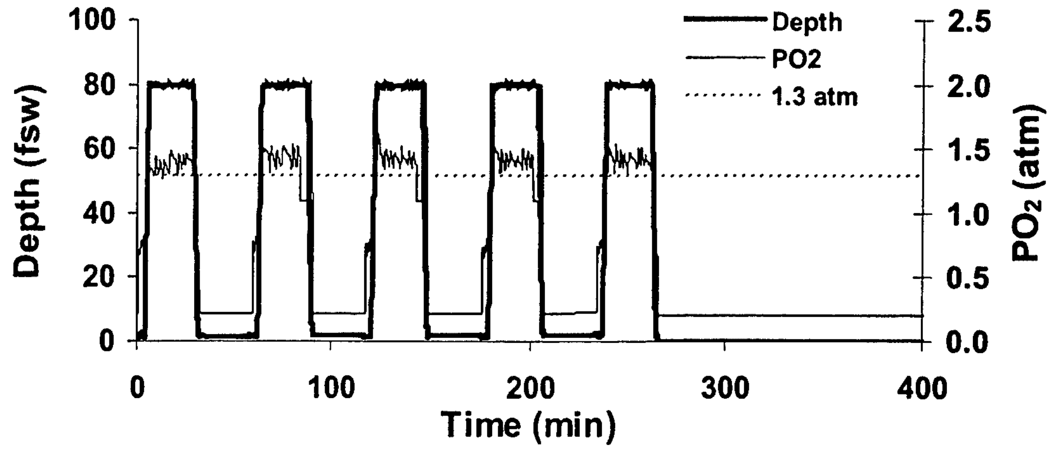

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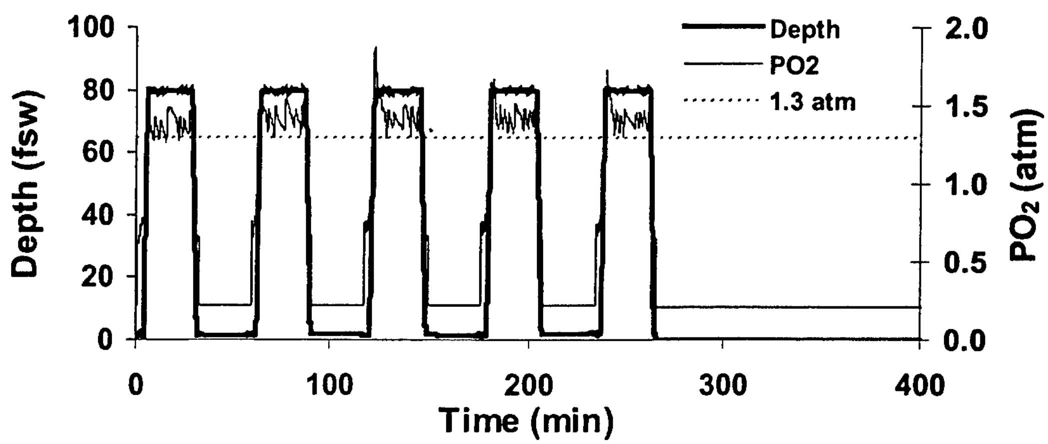

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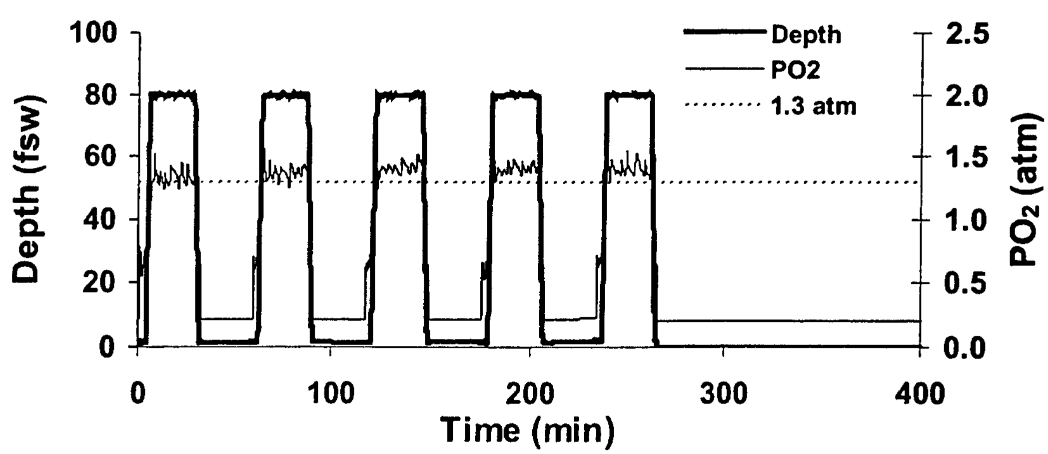

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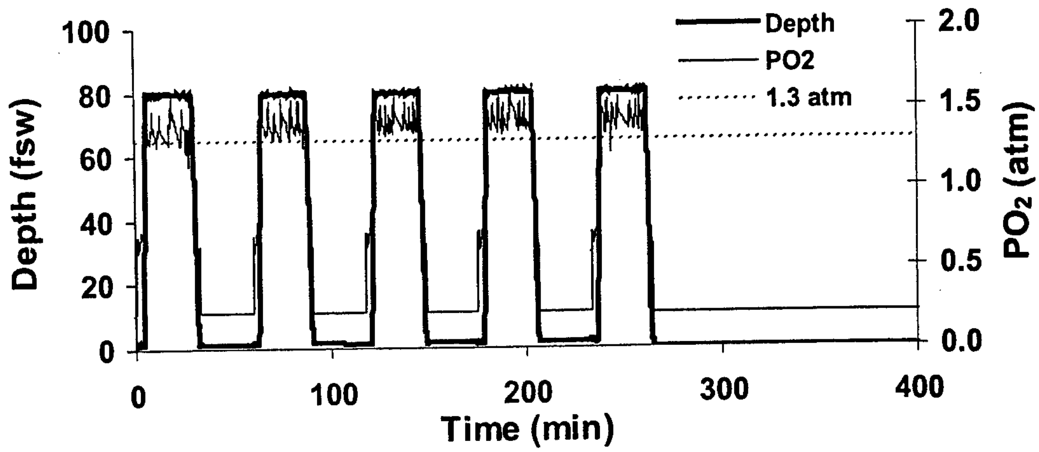

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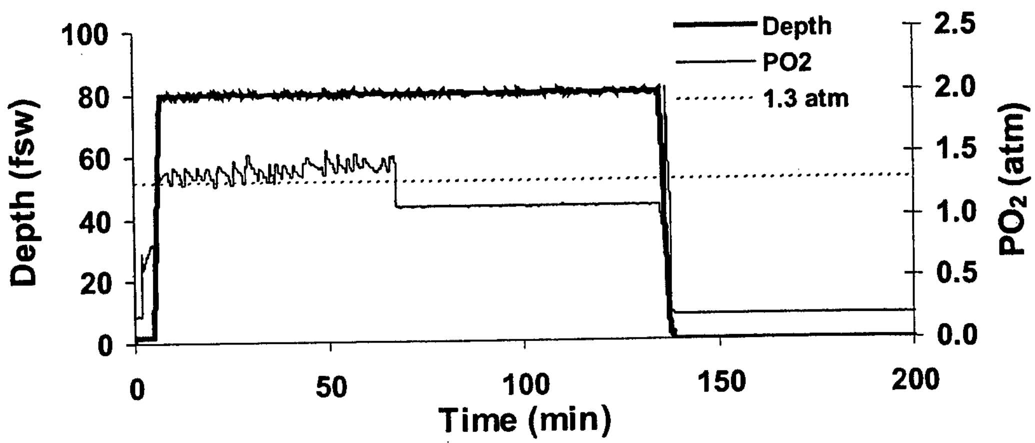

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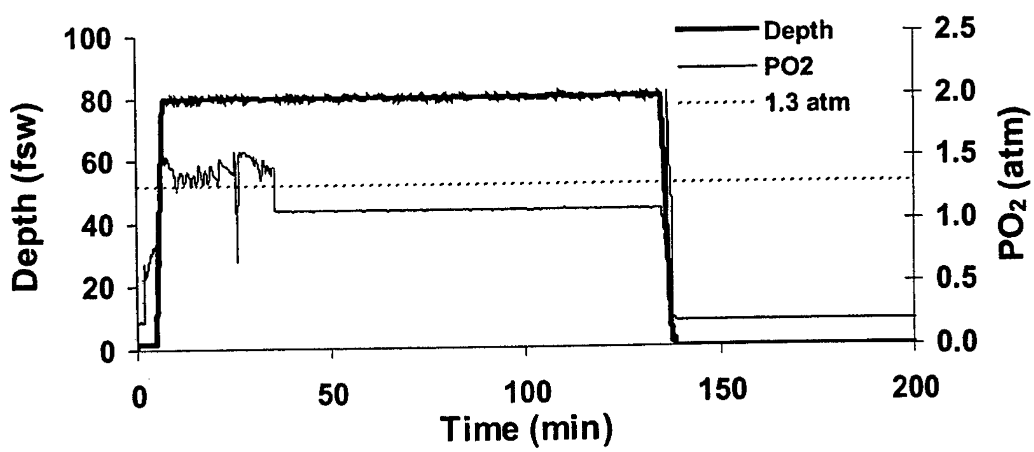

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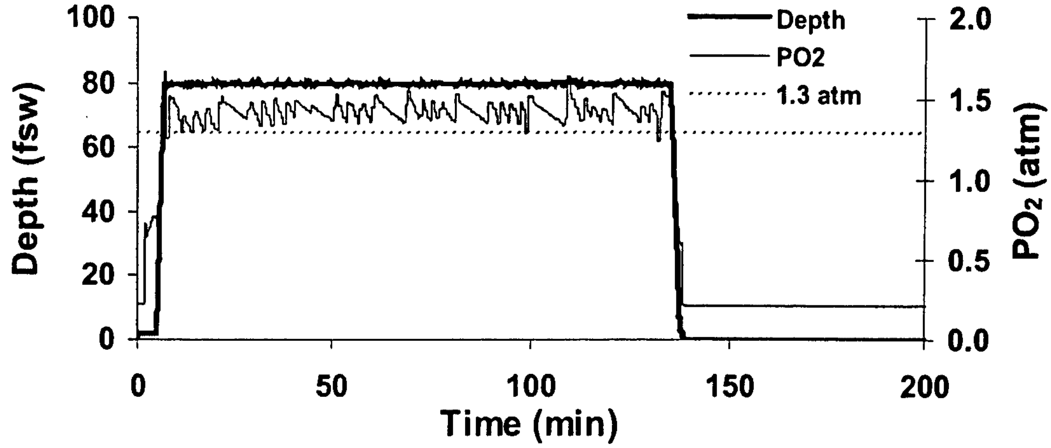

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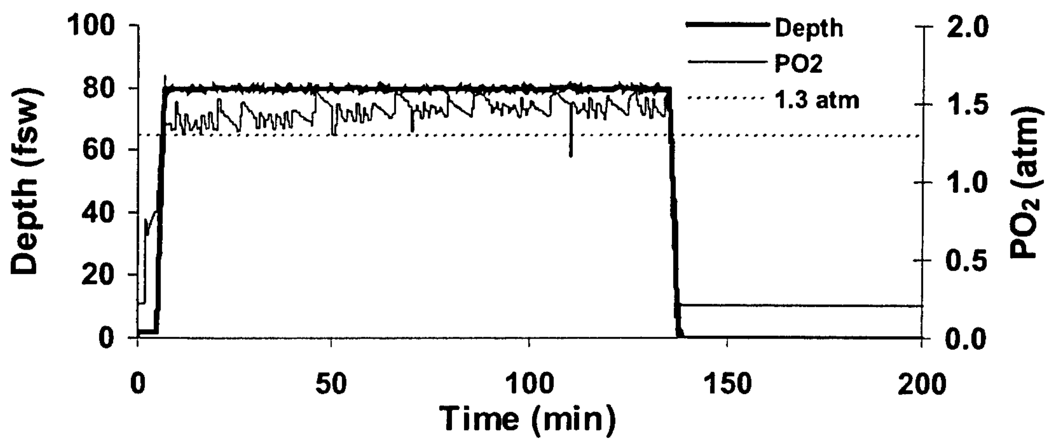

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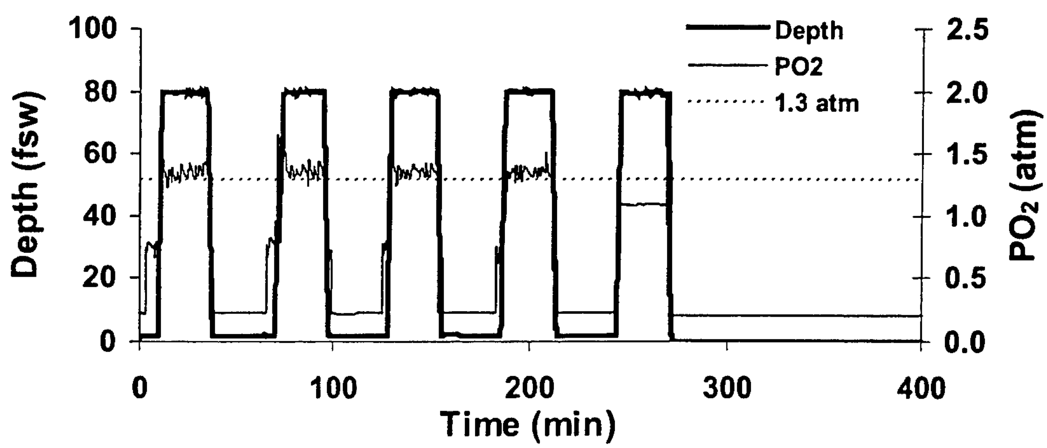

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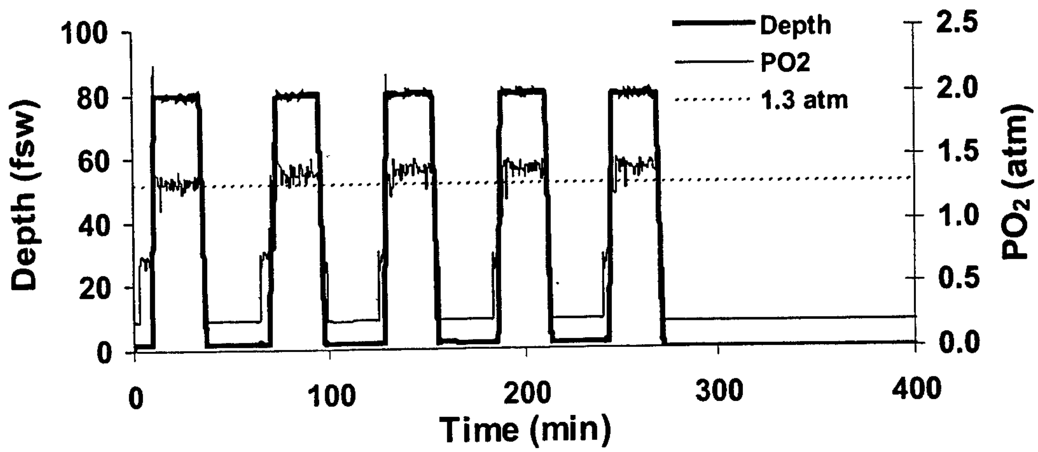

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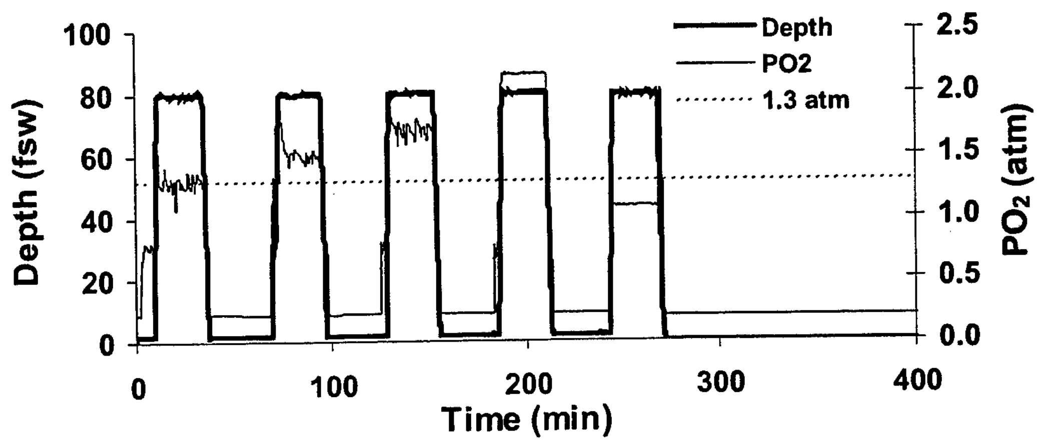

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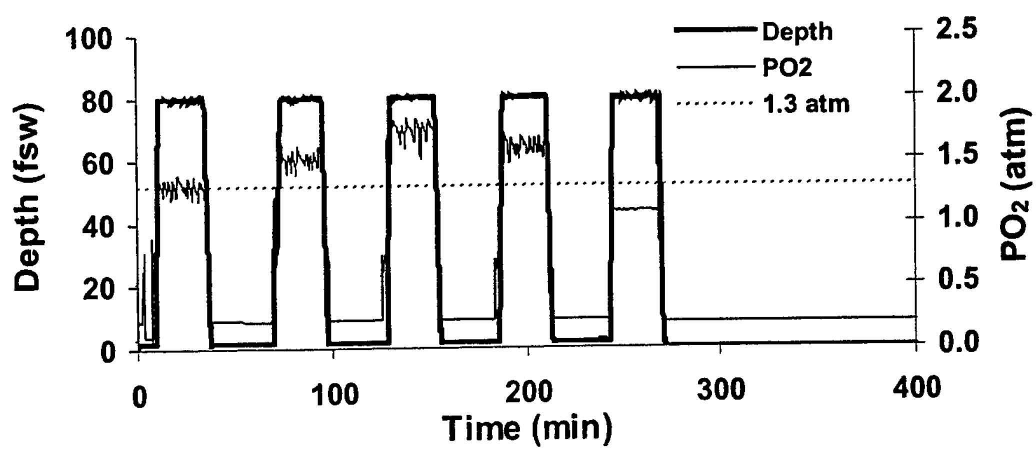

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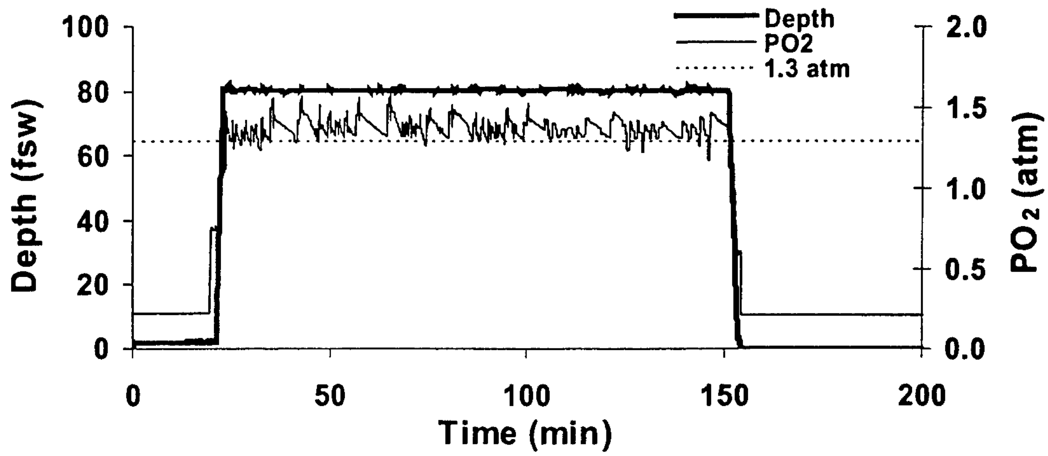

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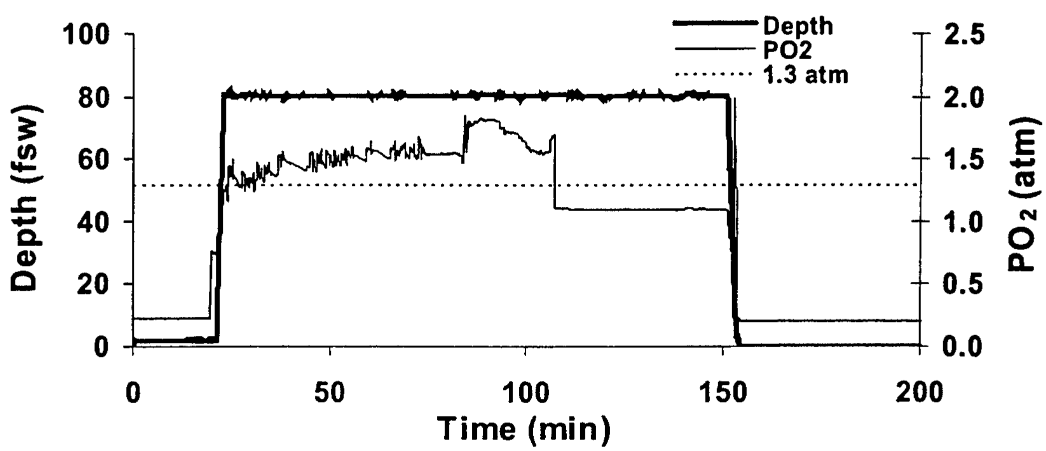

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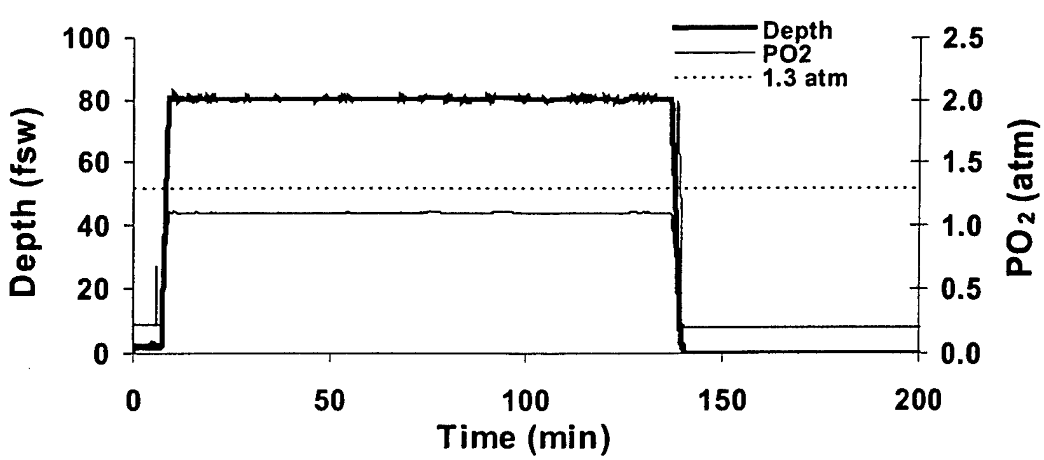

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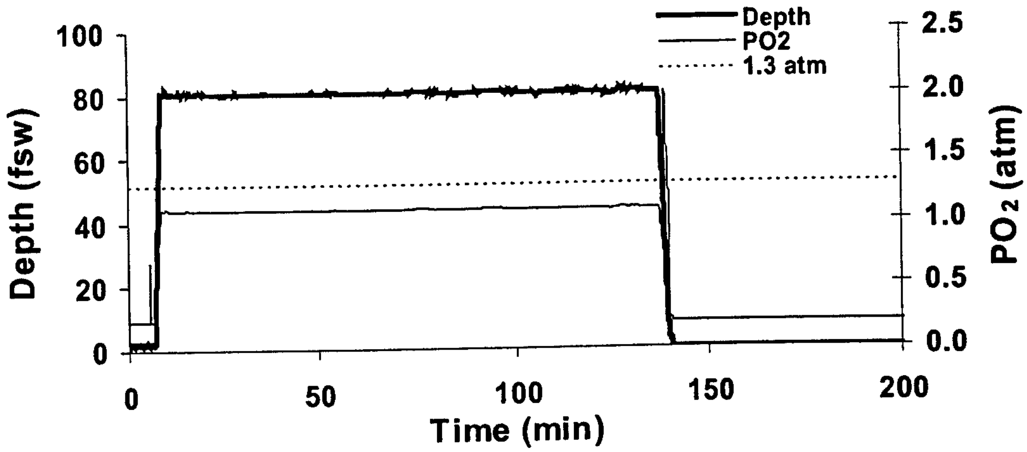

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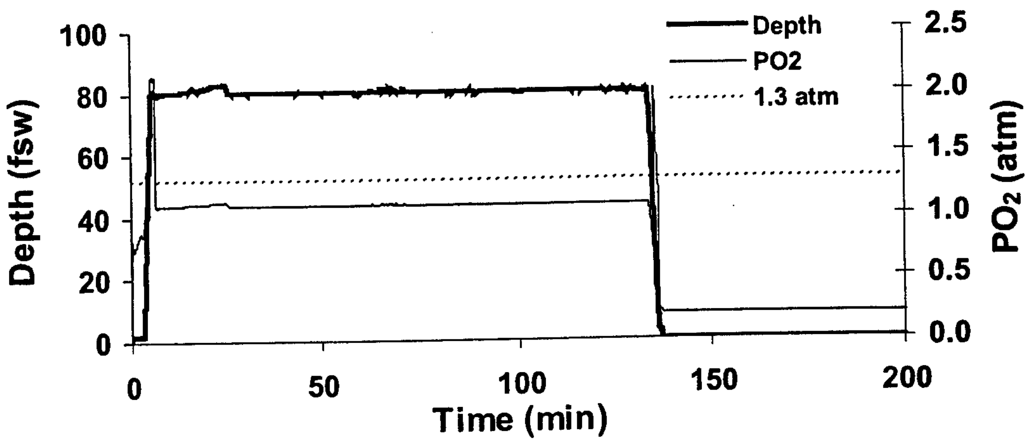

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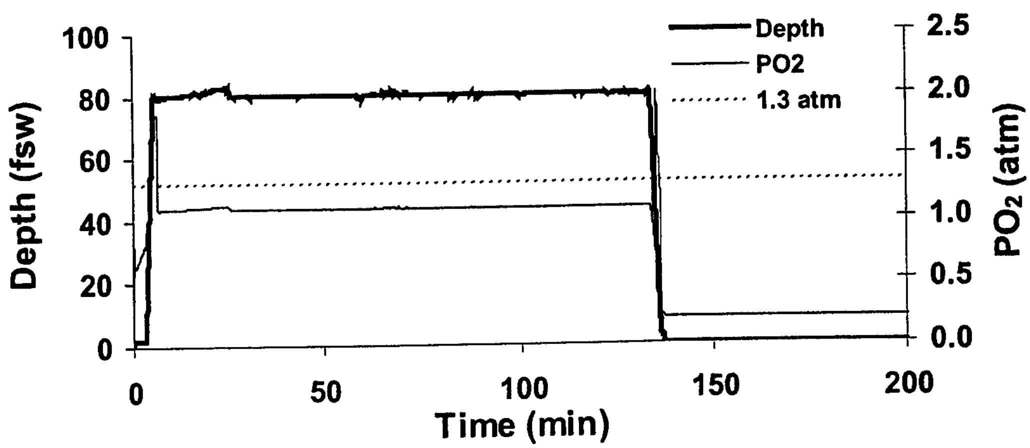

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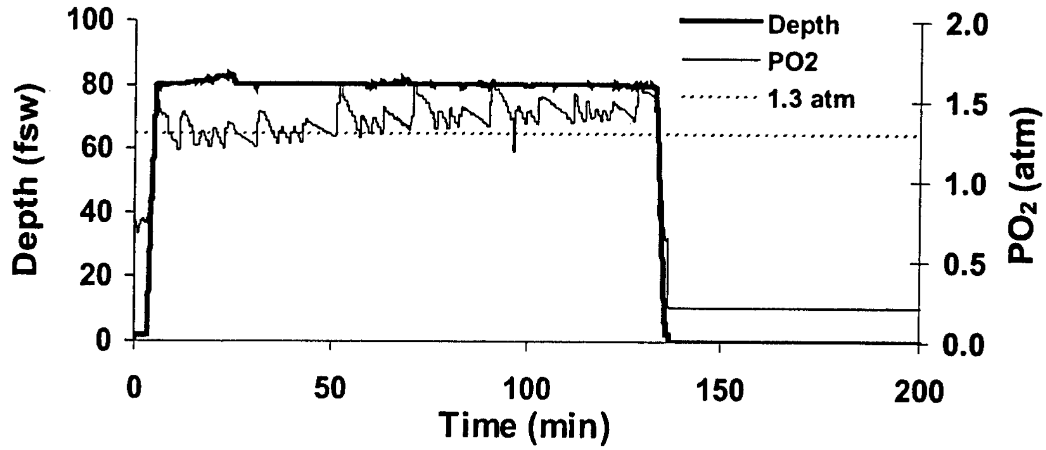

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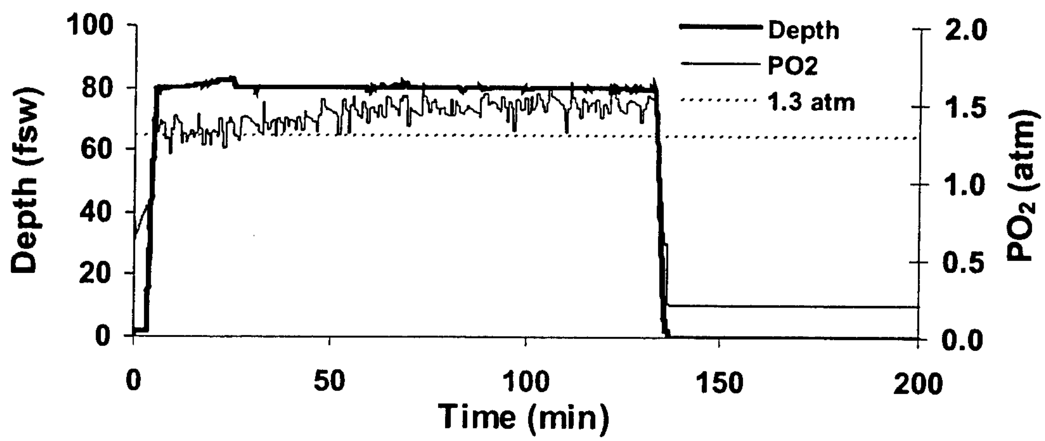

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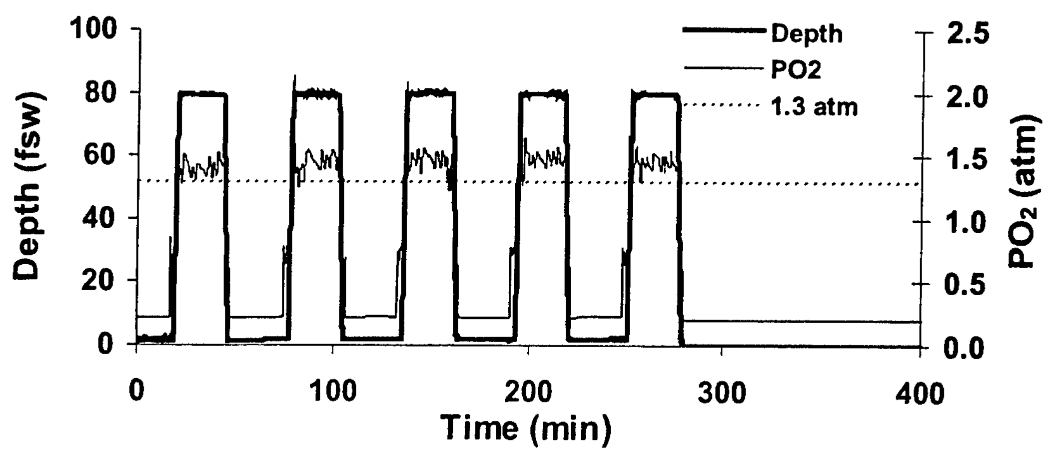

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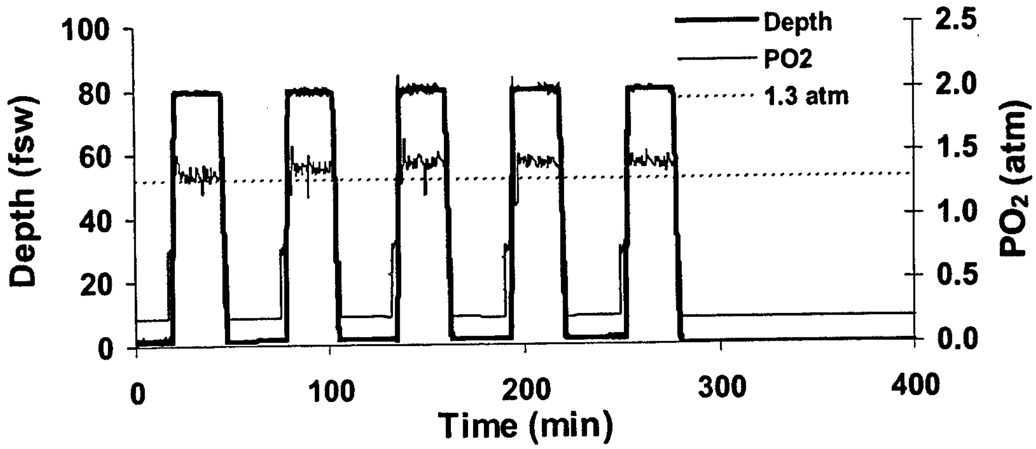

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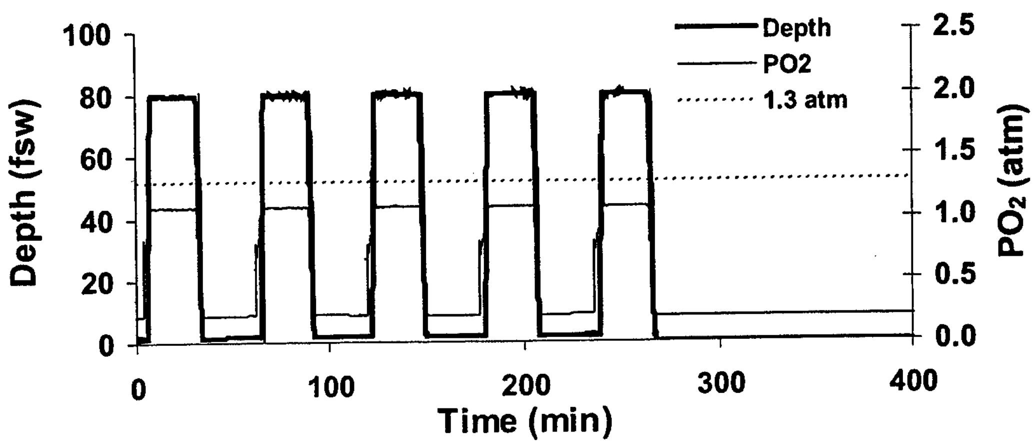

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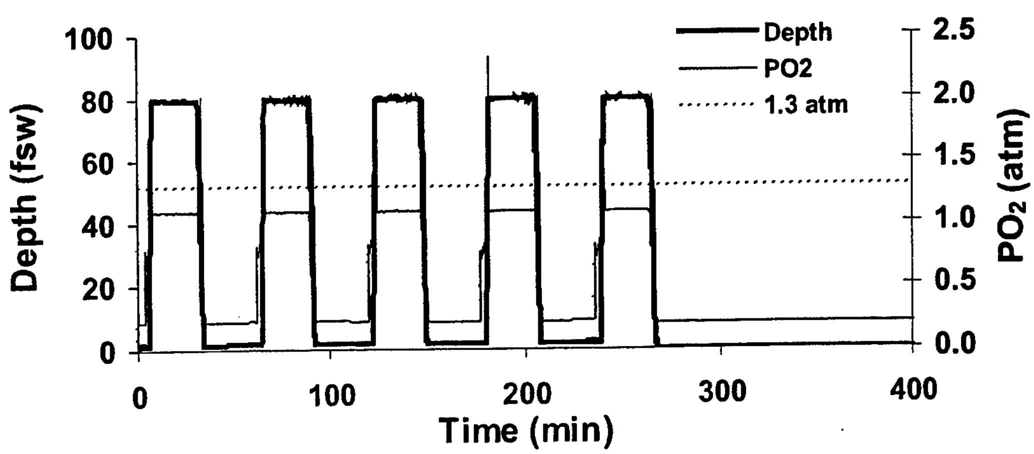

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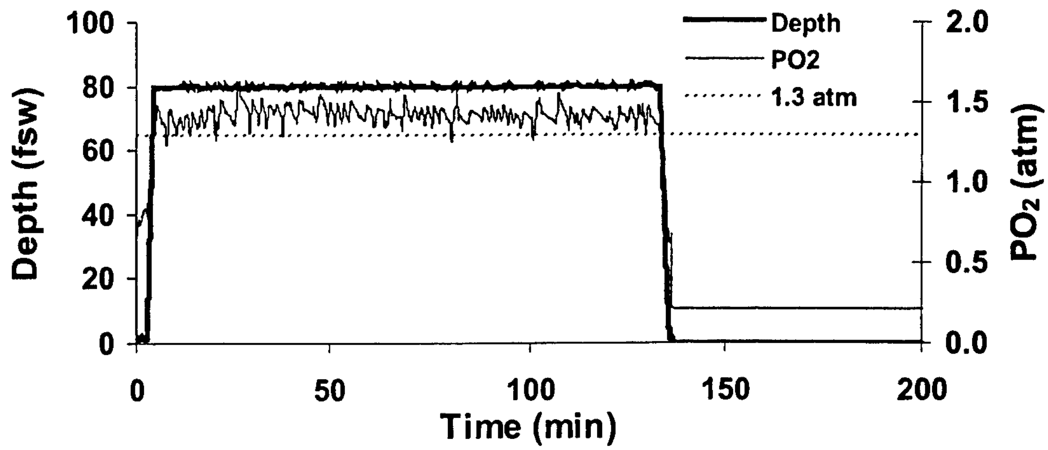

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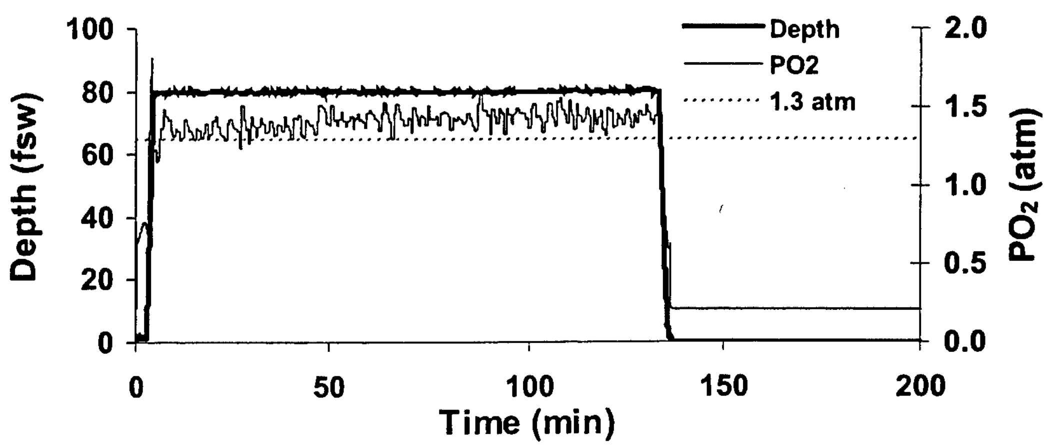

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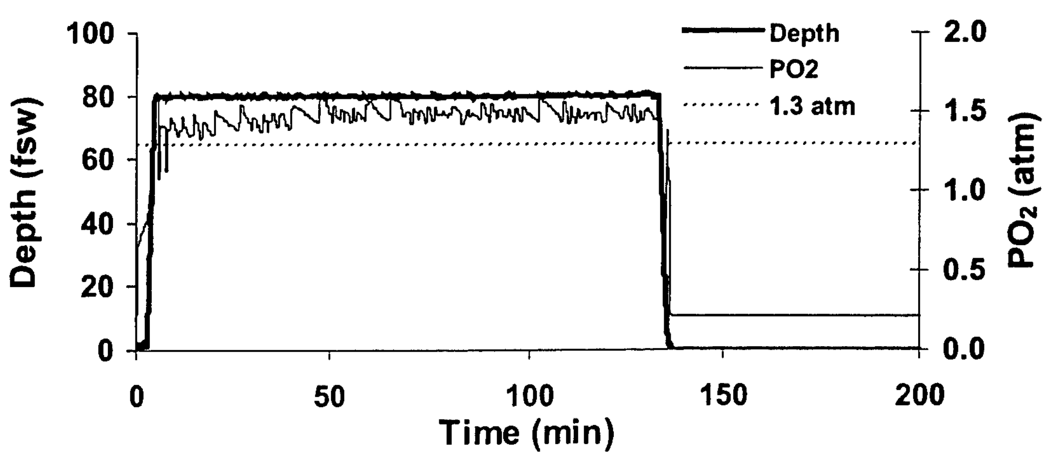

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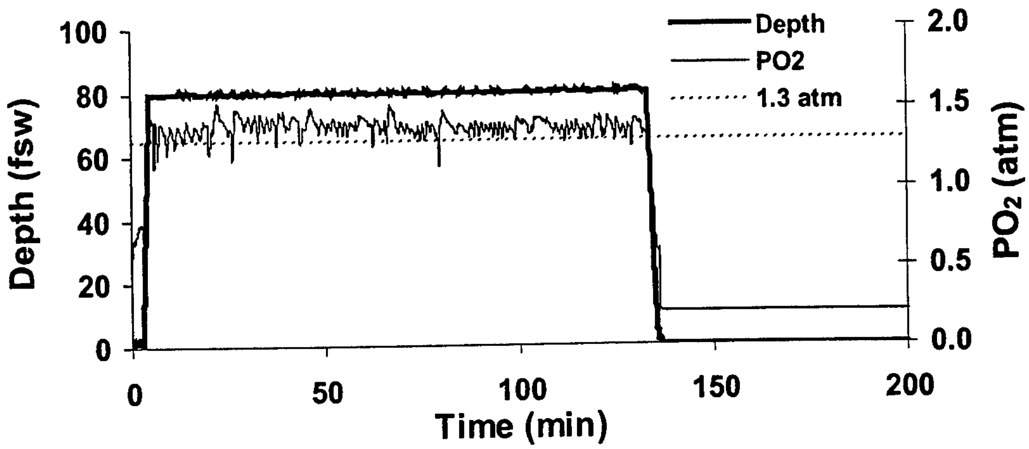

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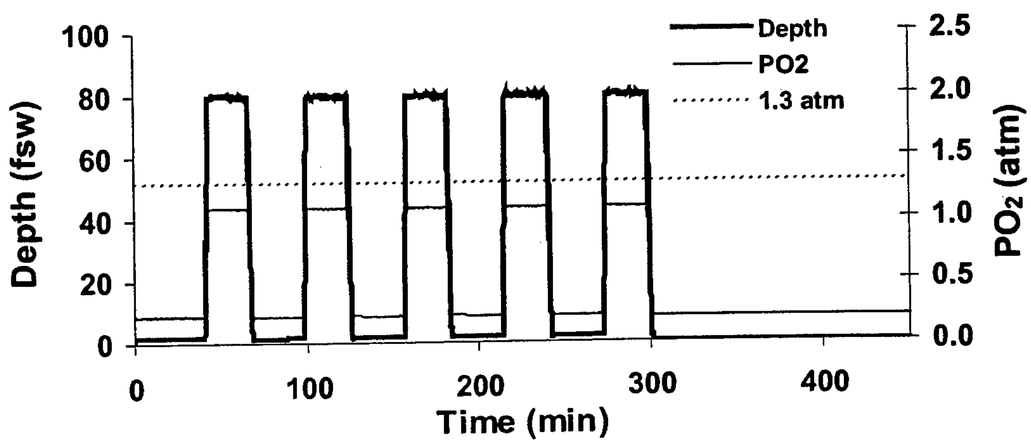

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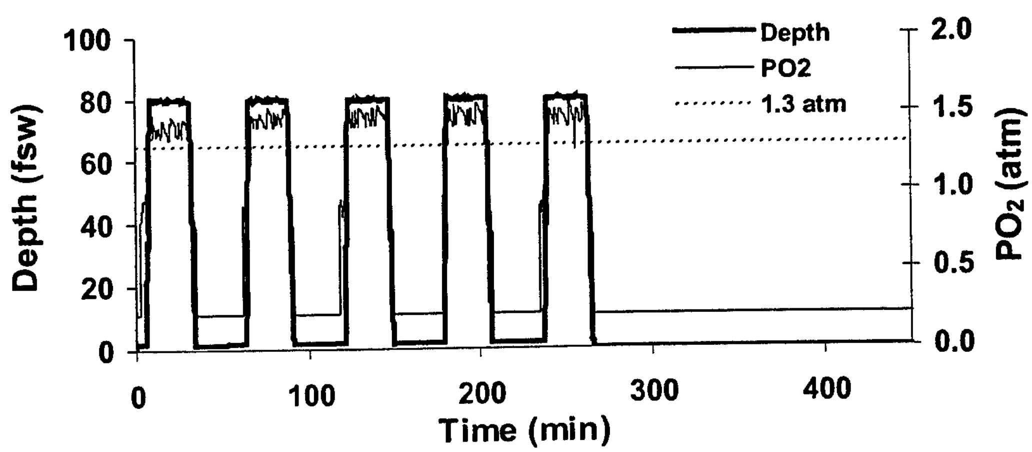

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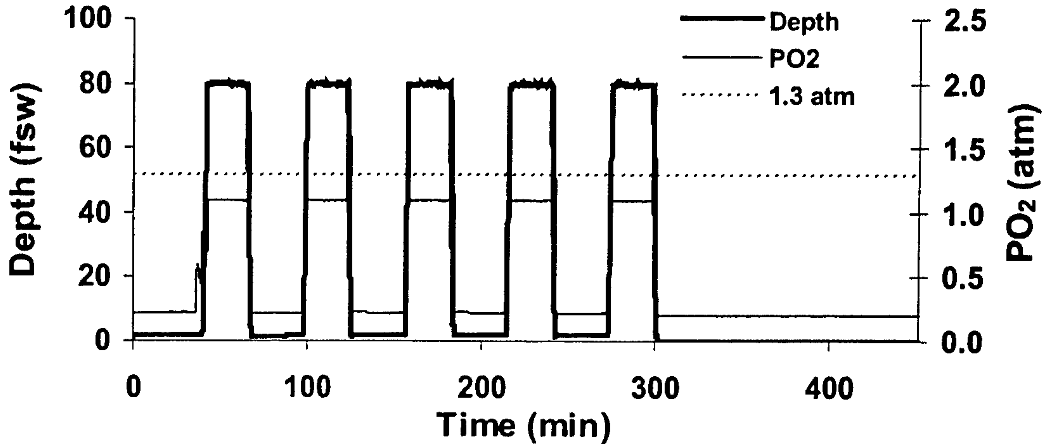

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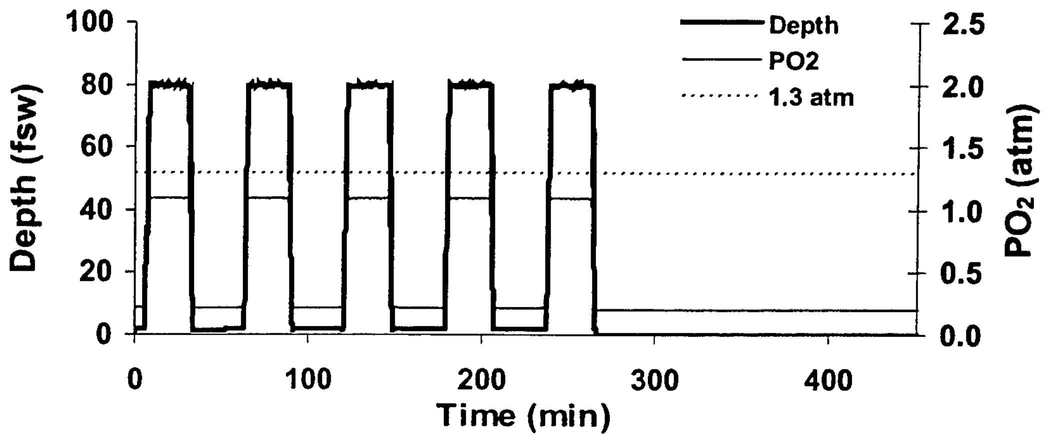

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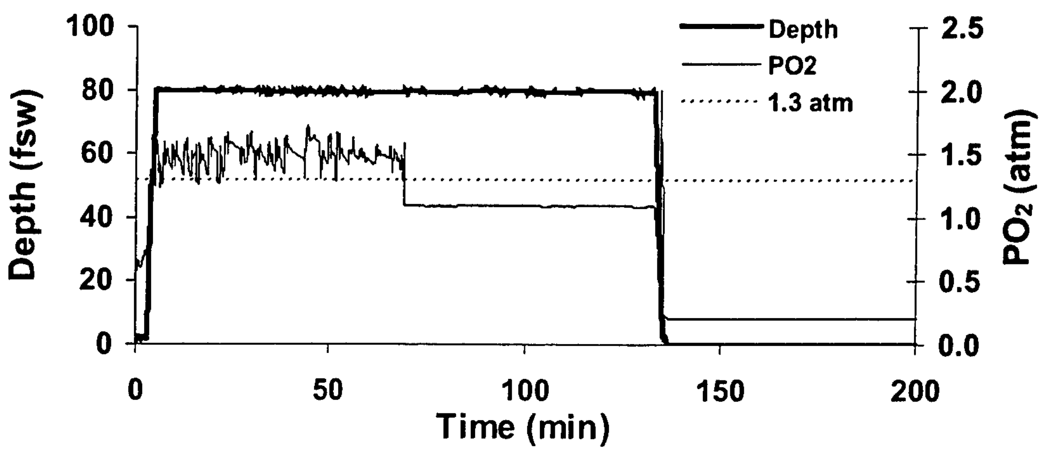

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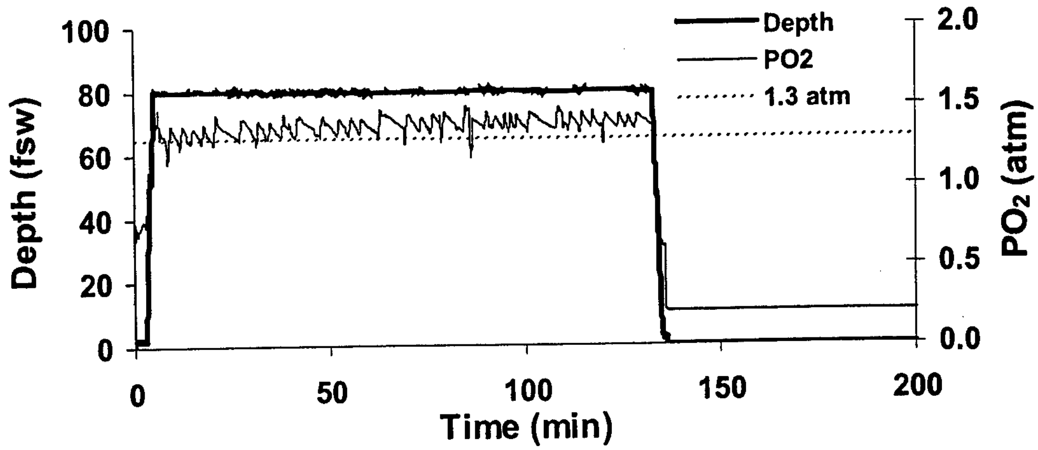

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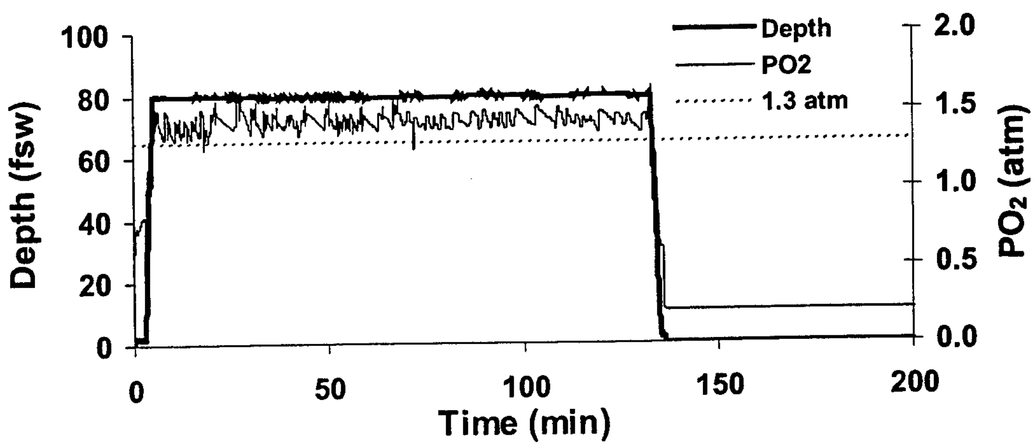

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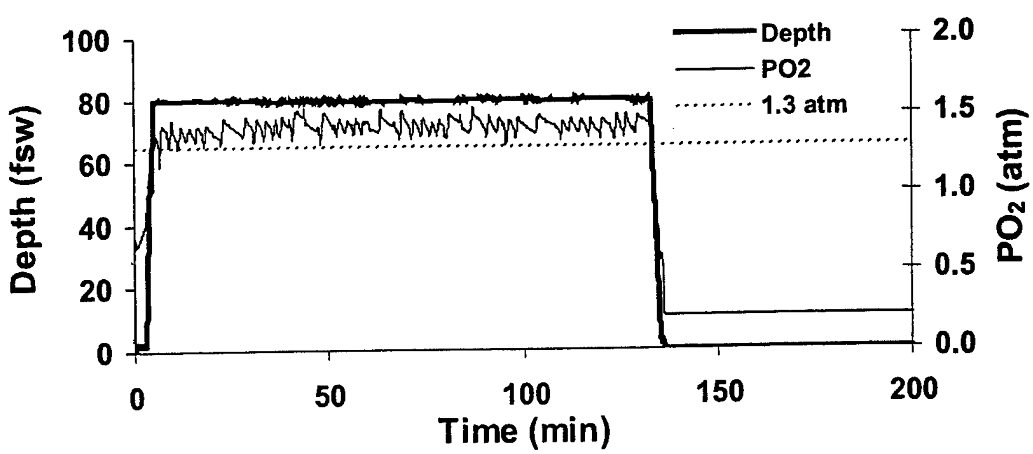

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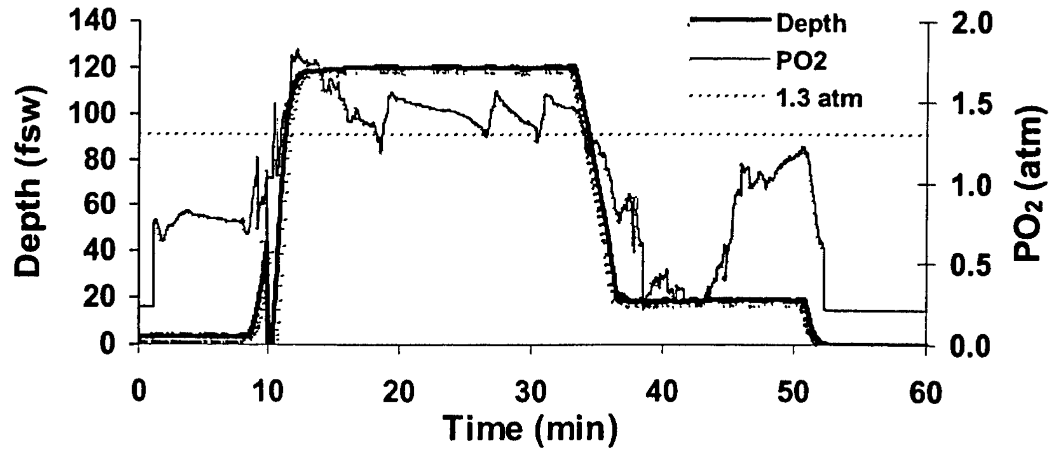
Phase II Profiles



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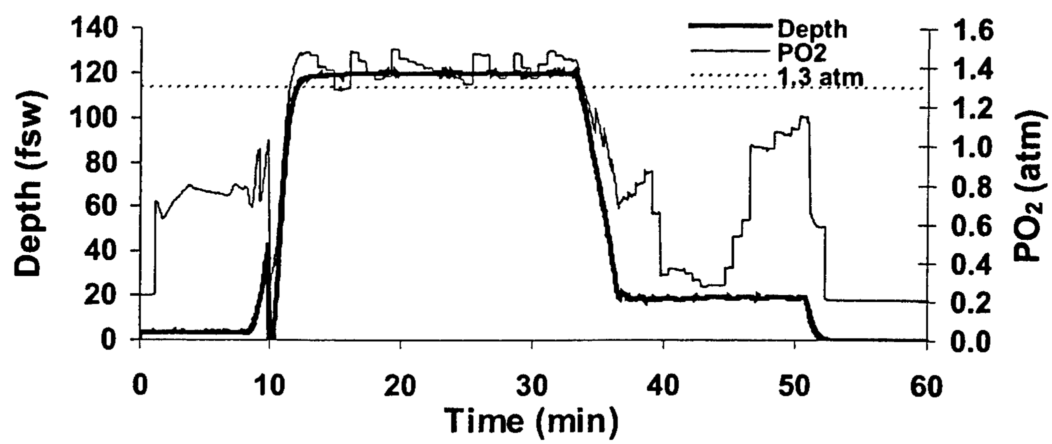

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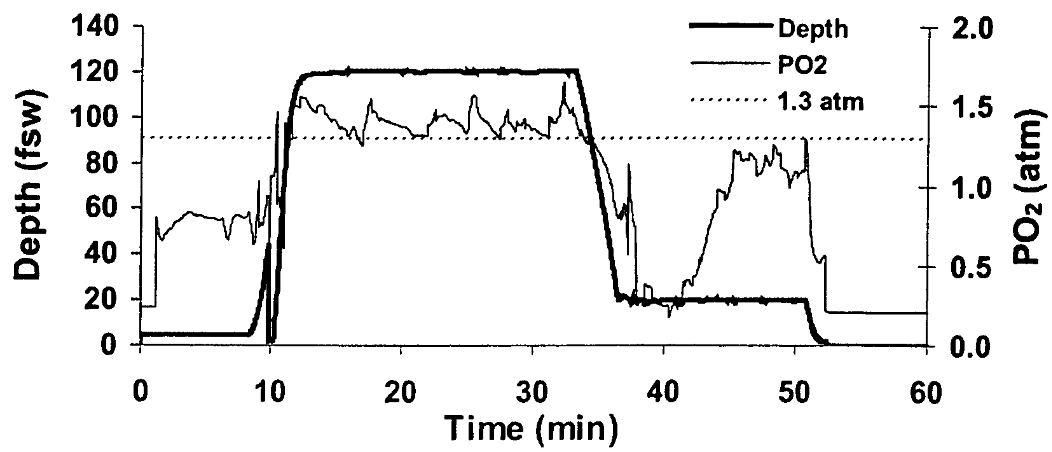

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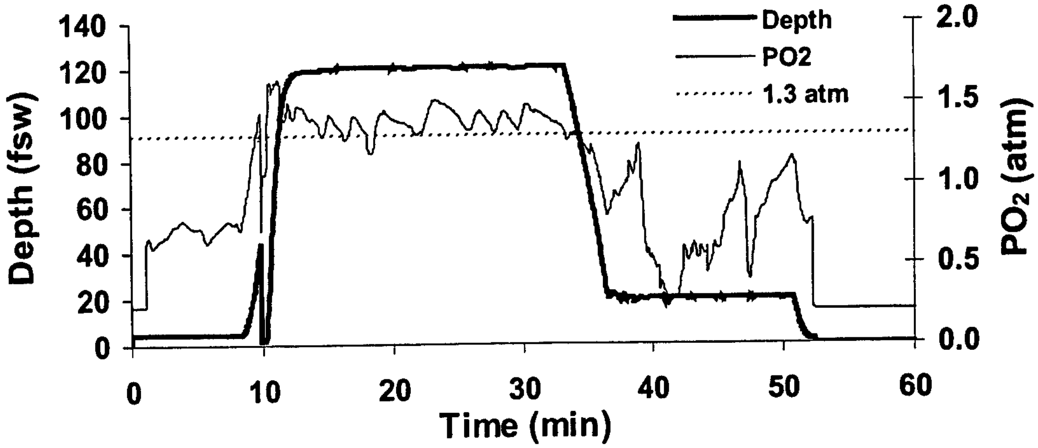

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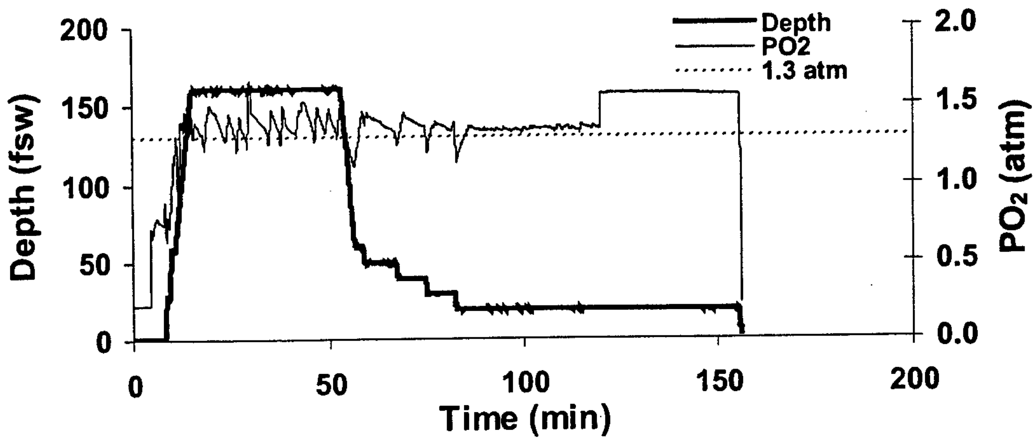

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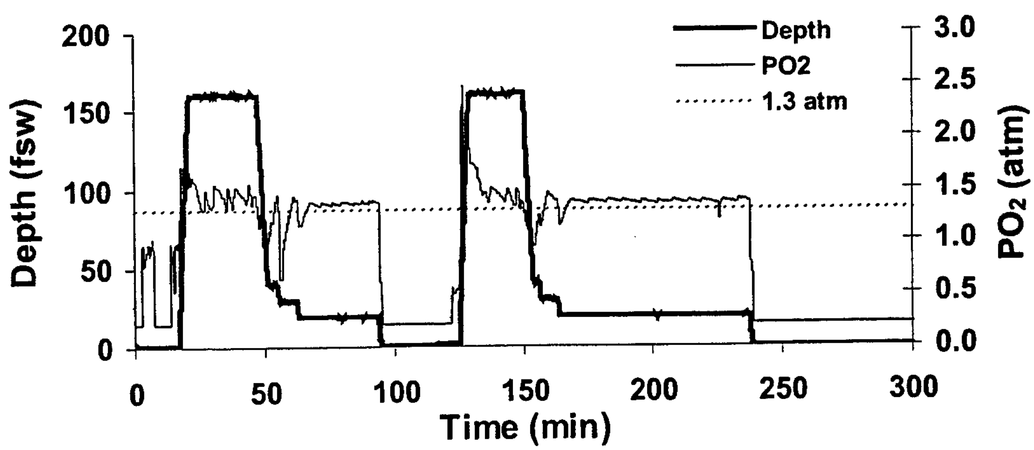

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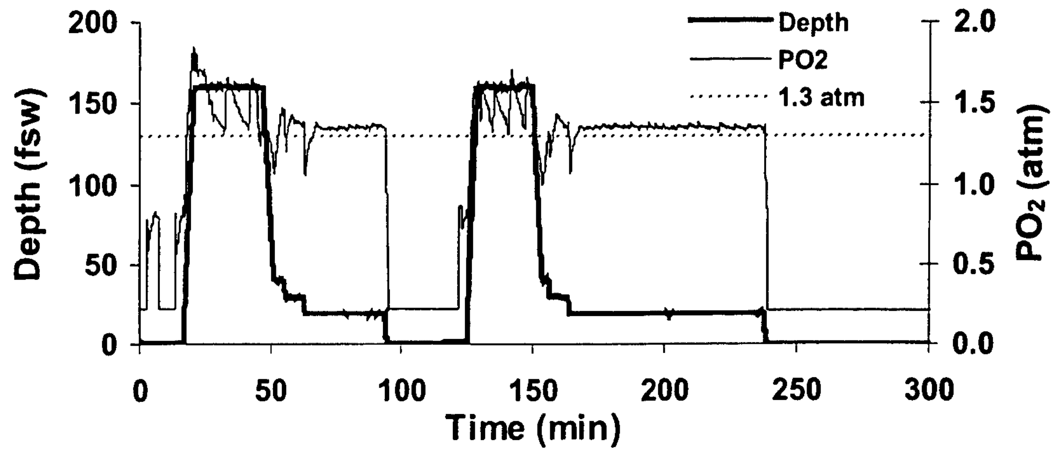

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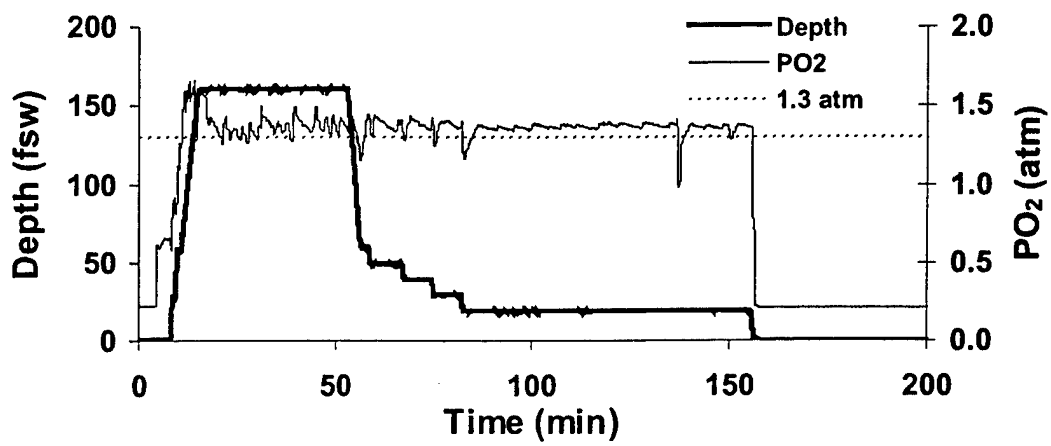

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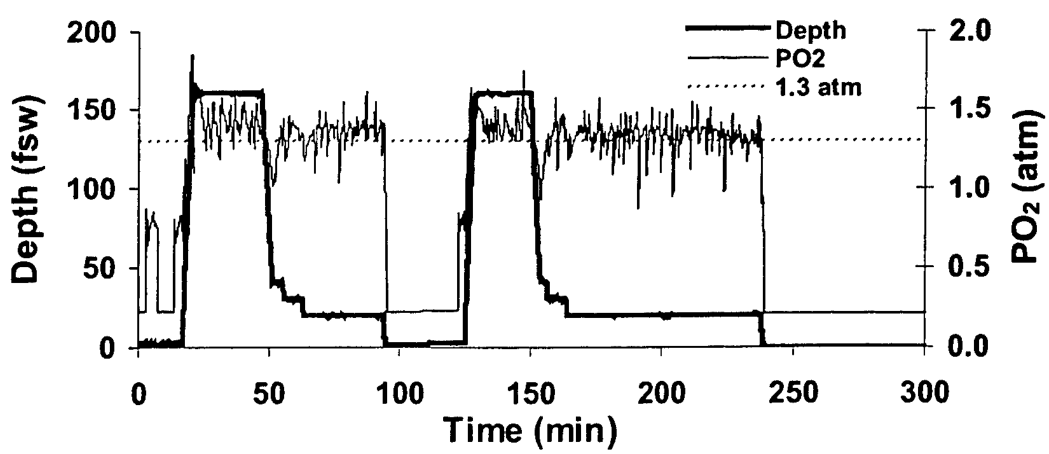

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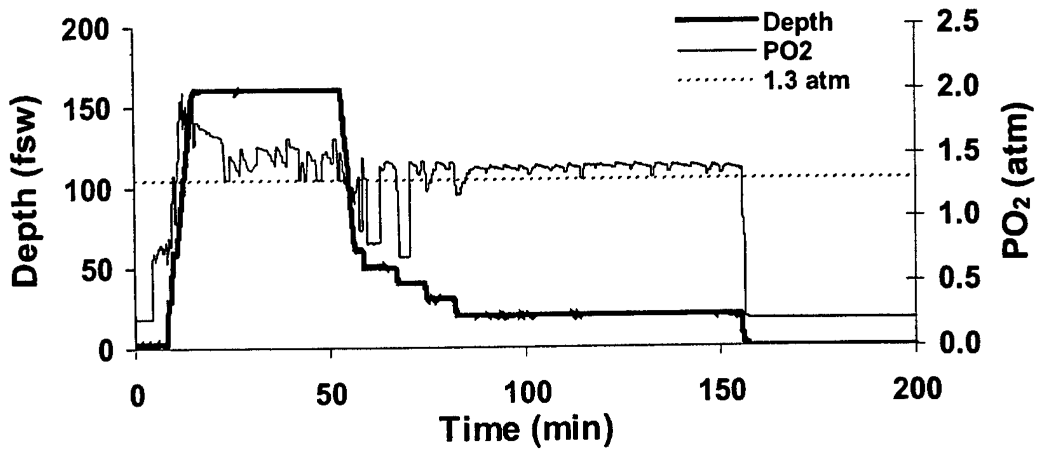

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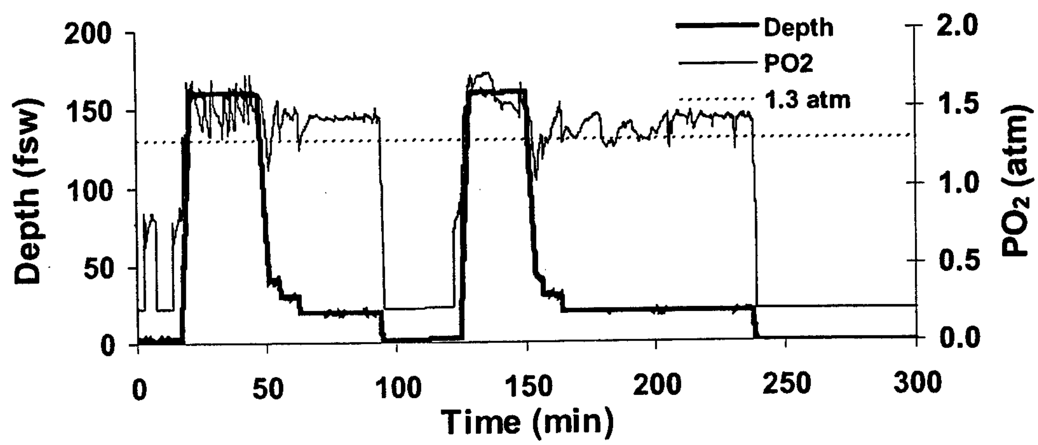

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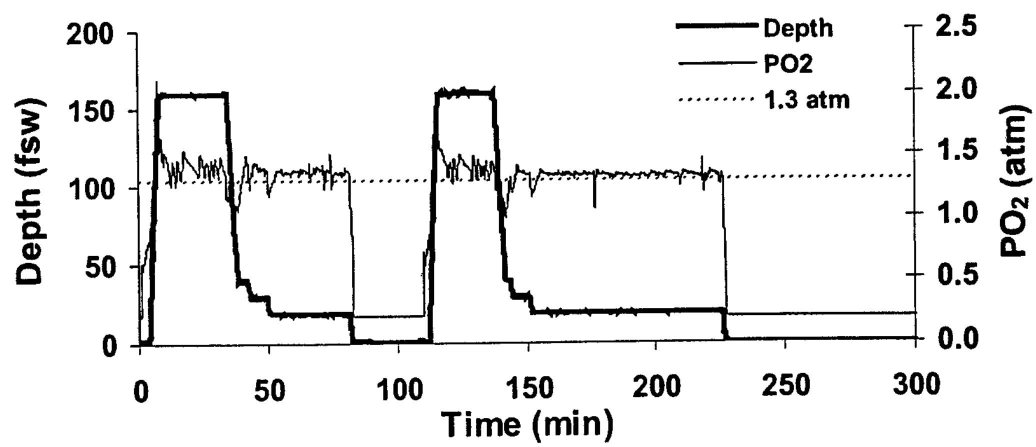

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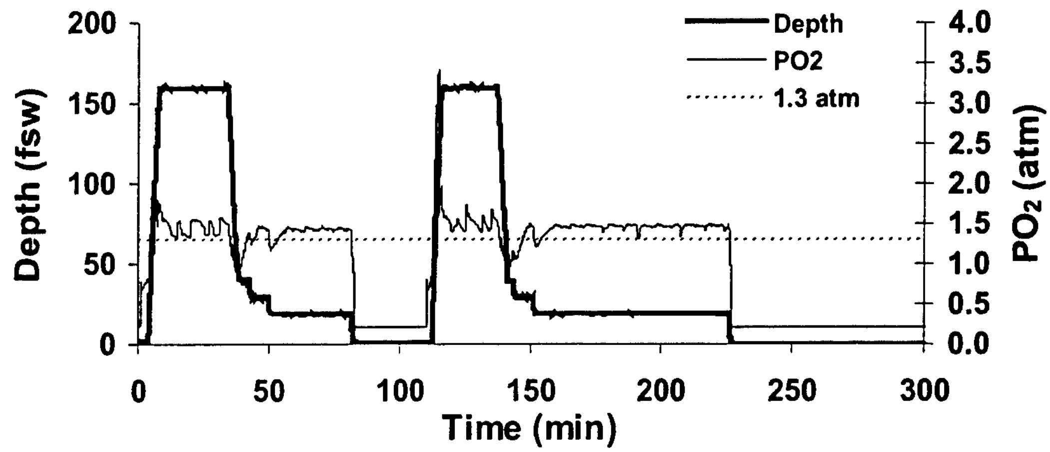

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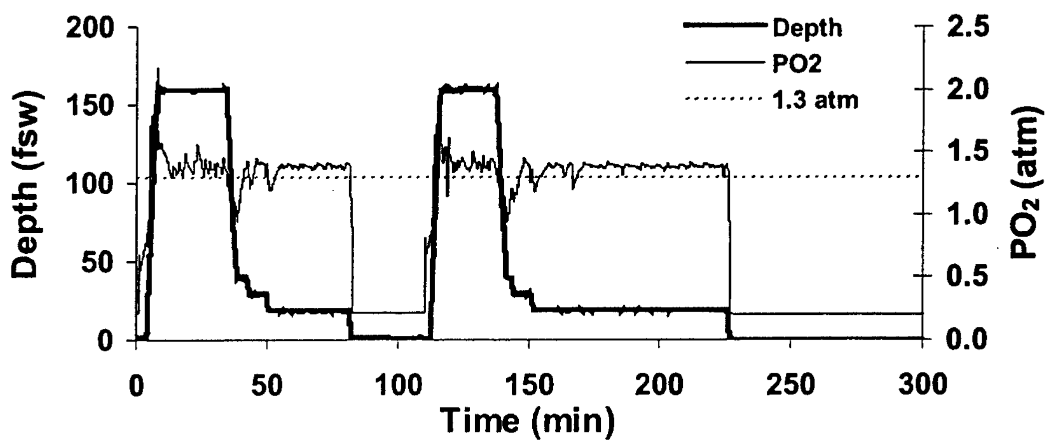

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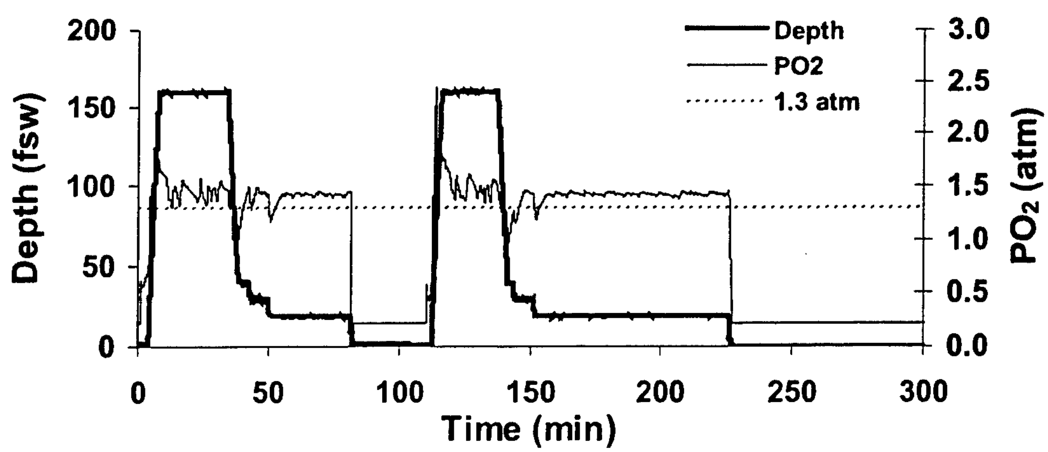

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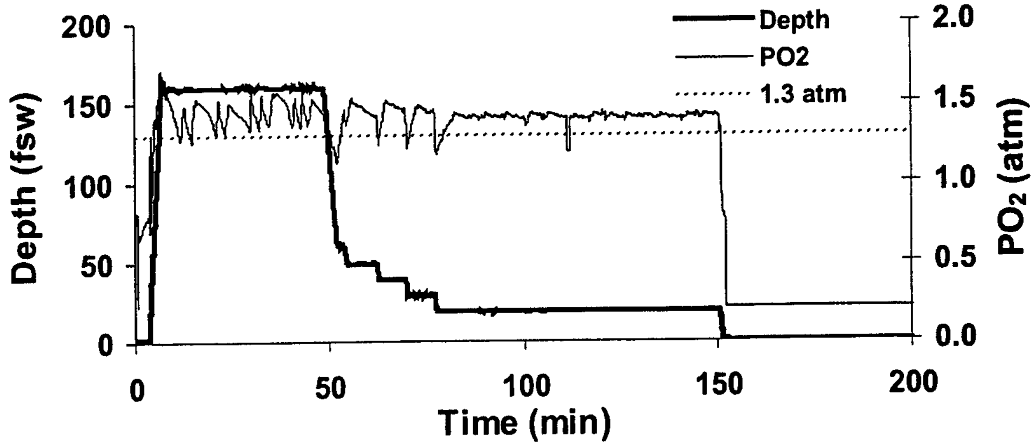

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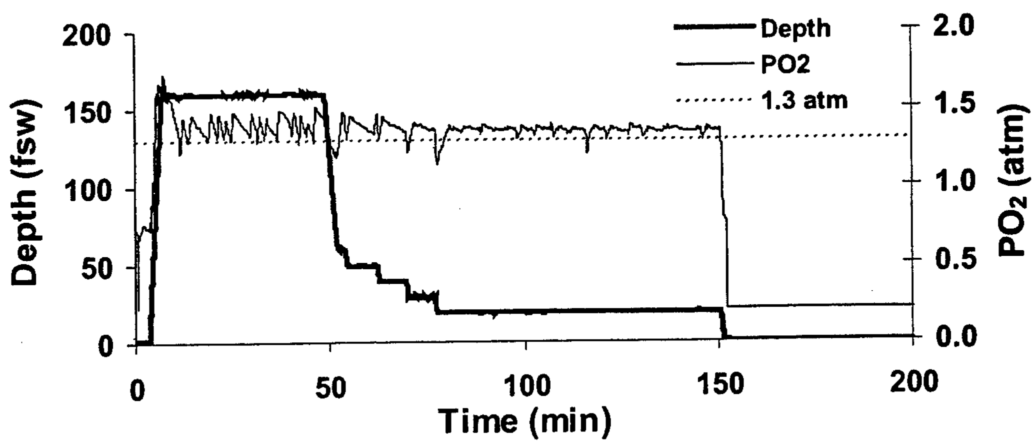

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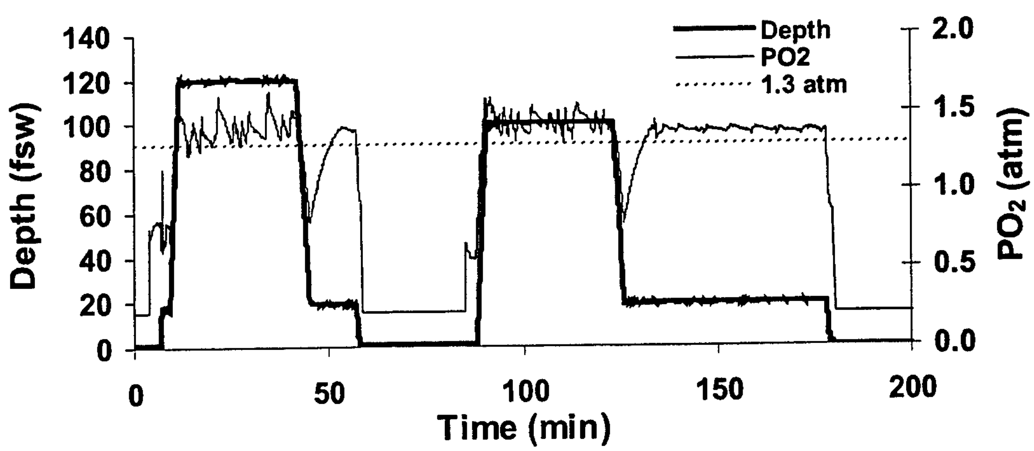

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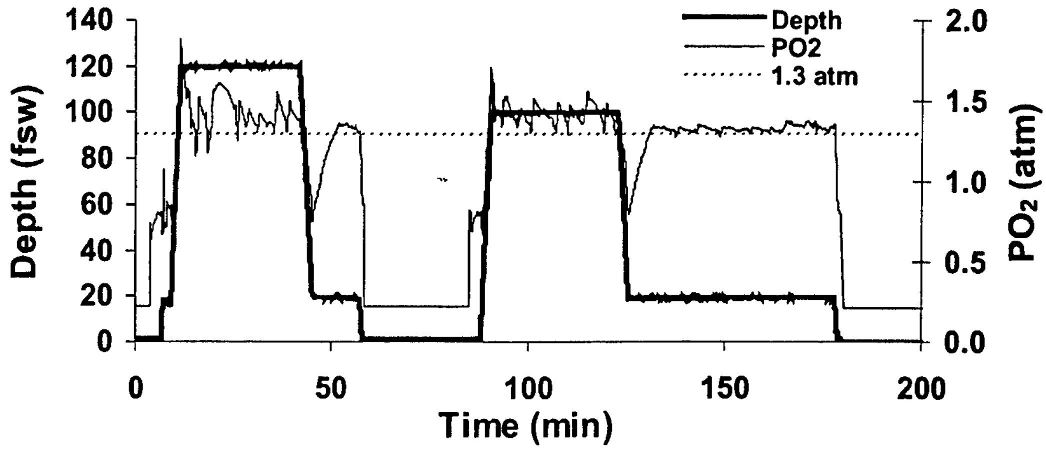

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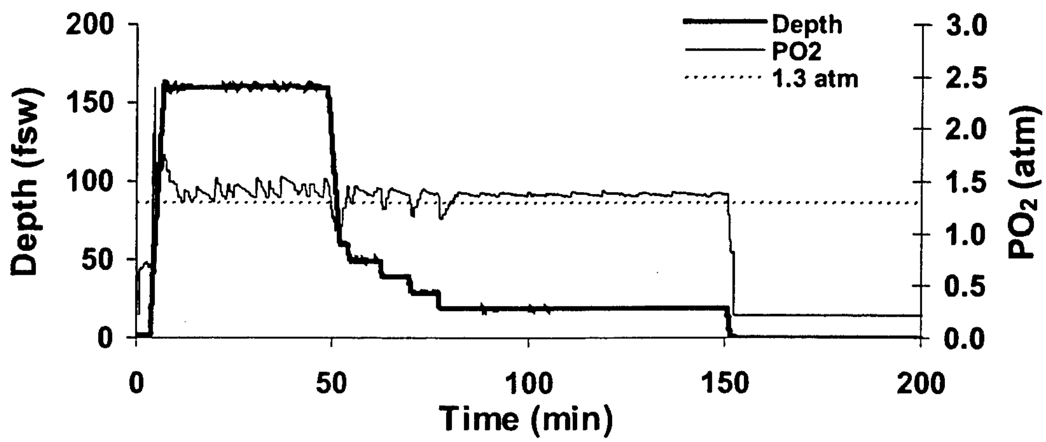

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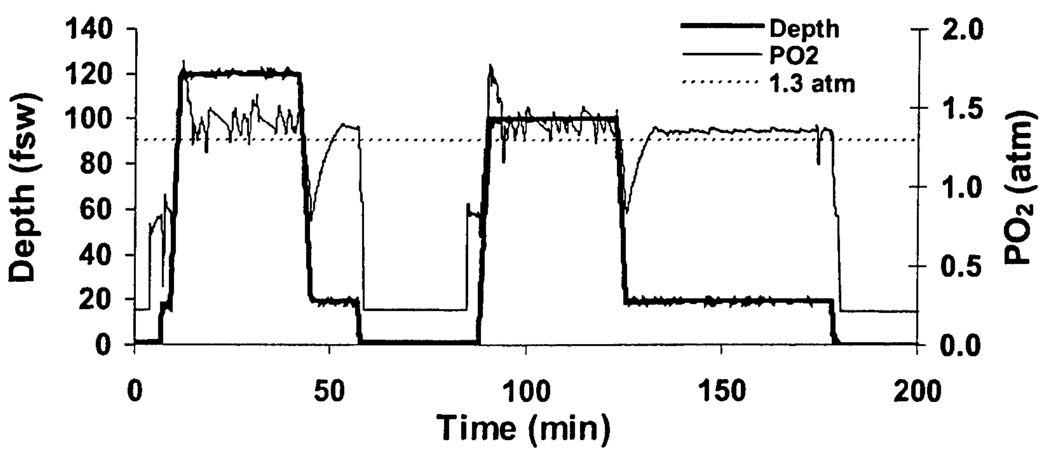

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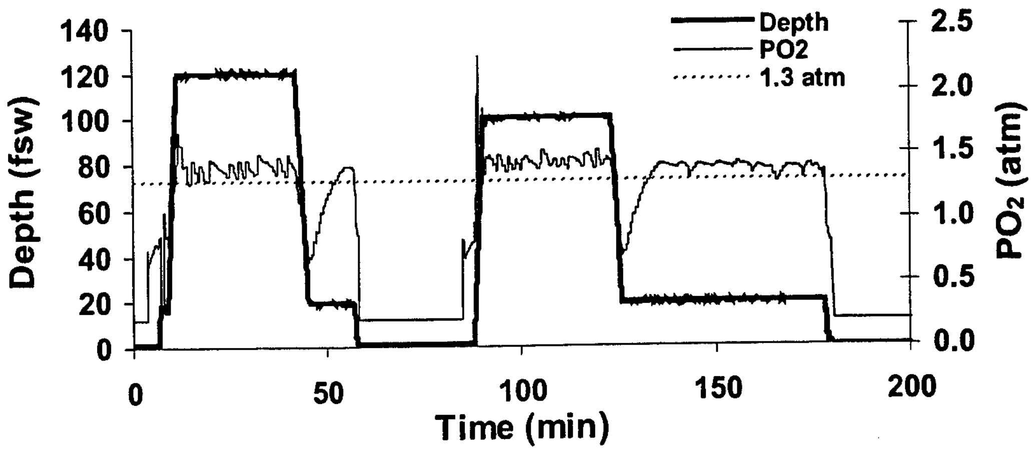

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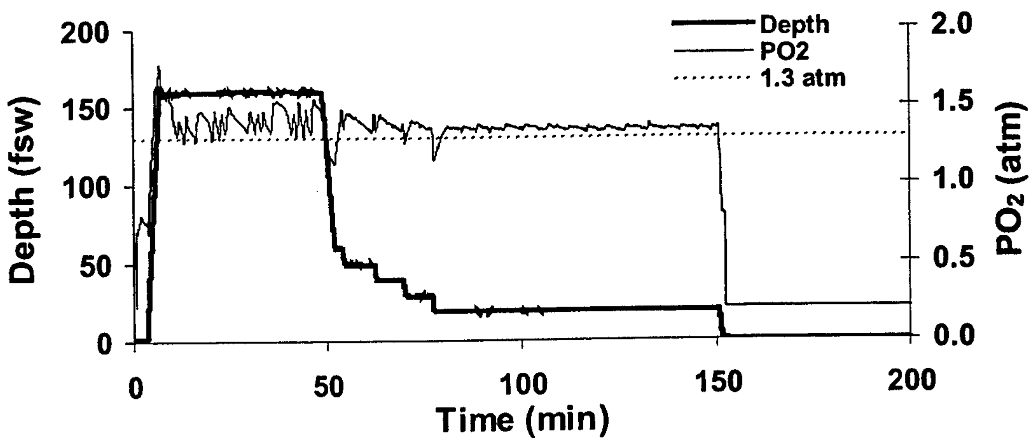

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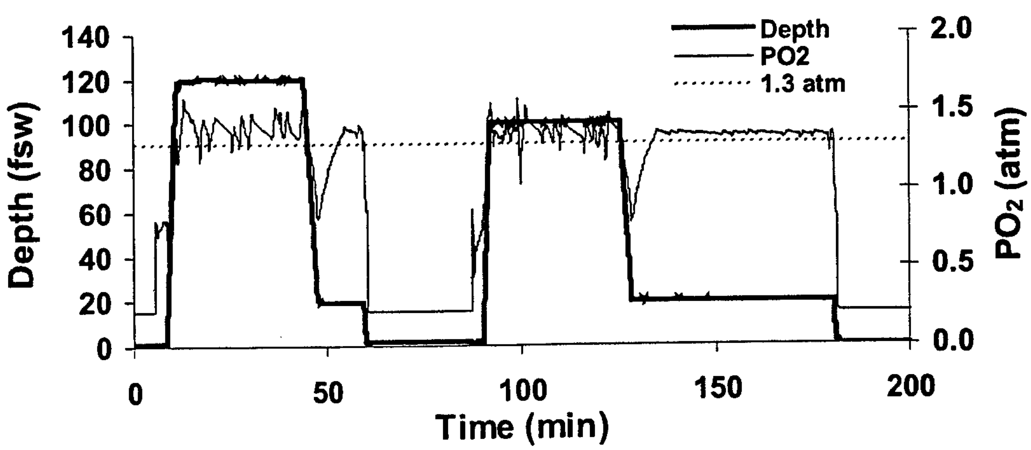

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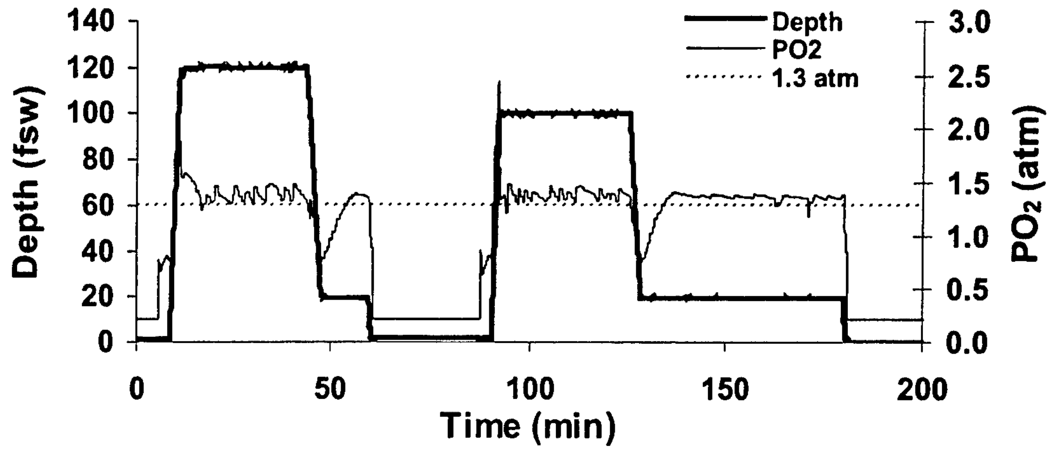

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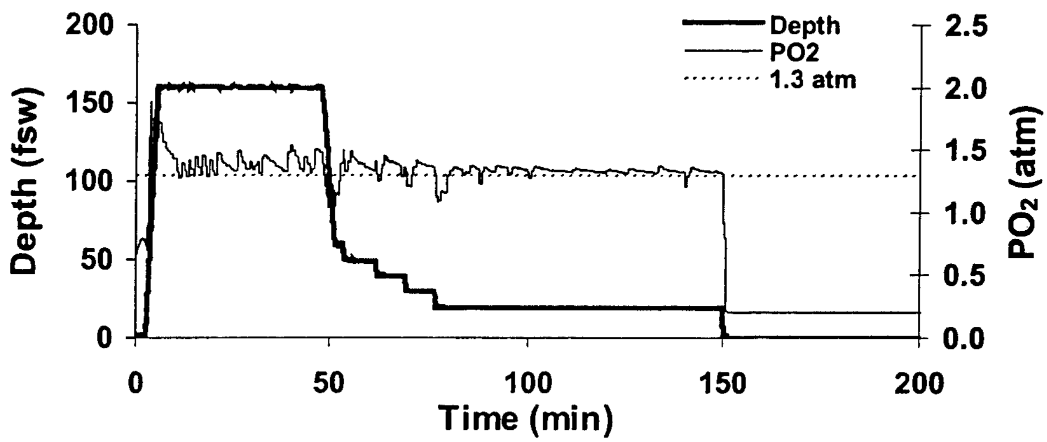

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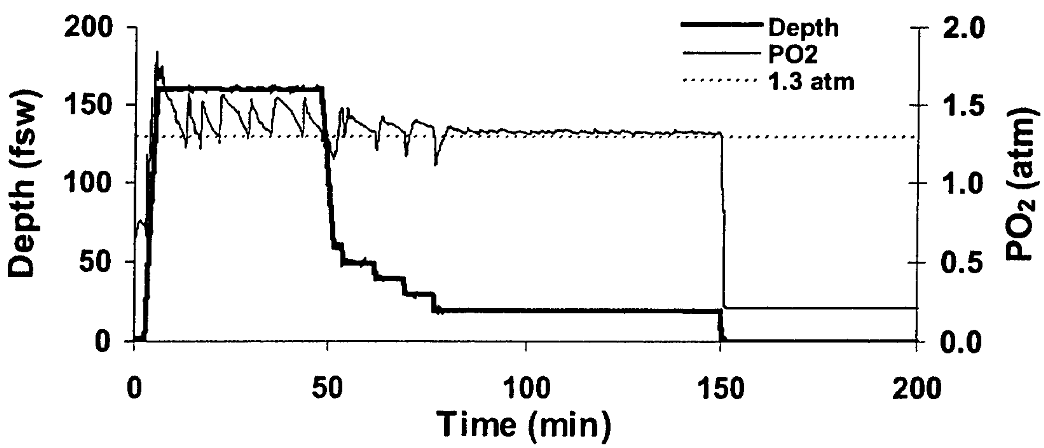

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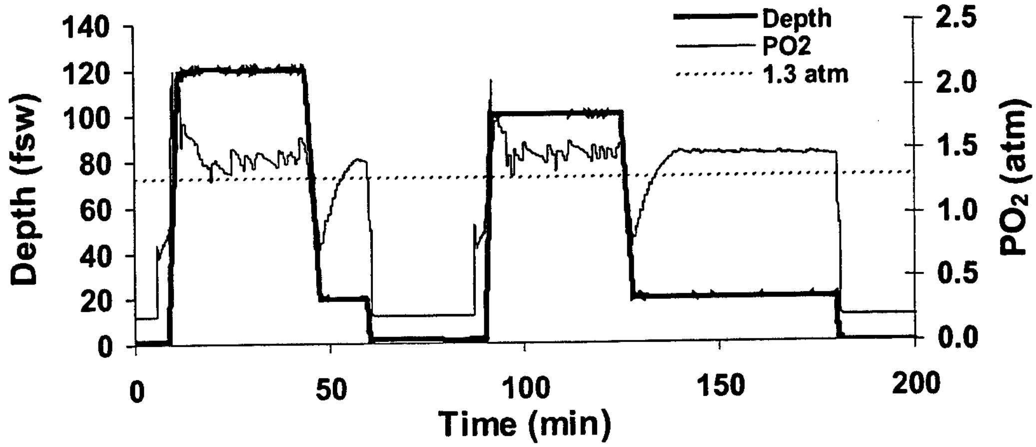

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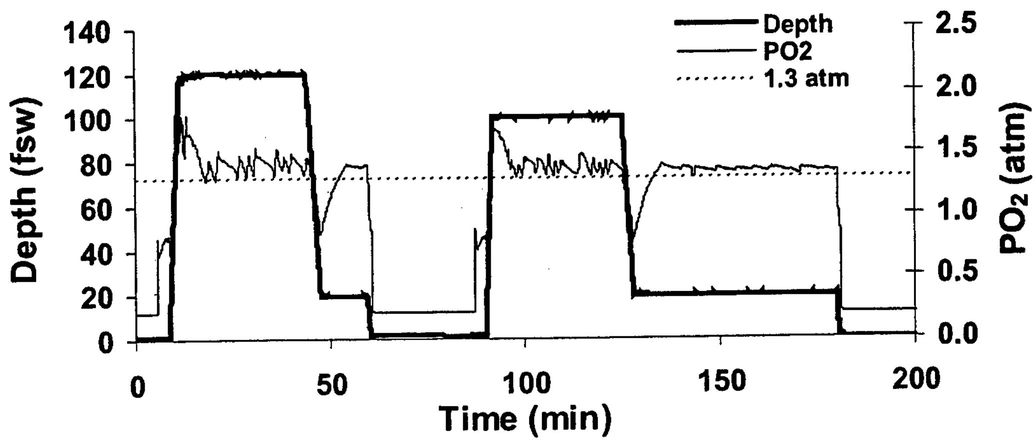

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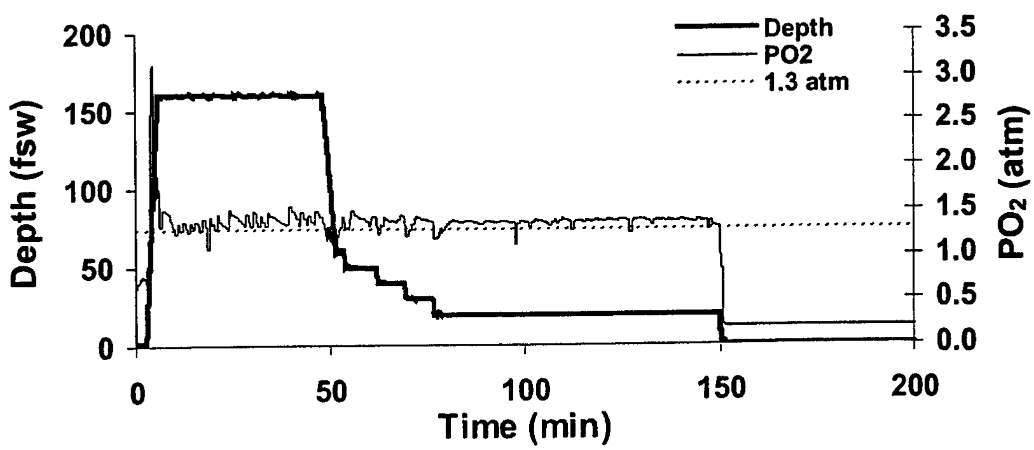

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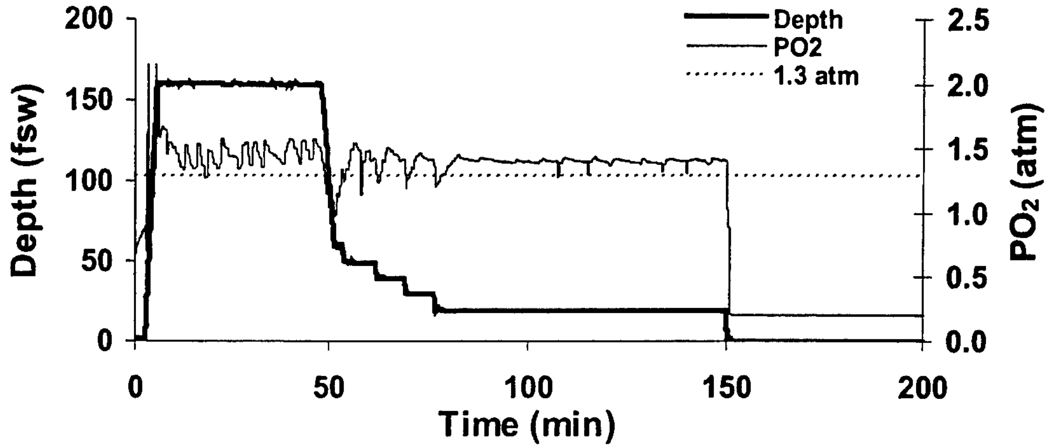

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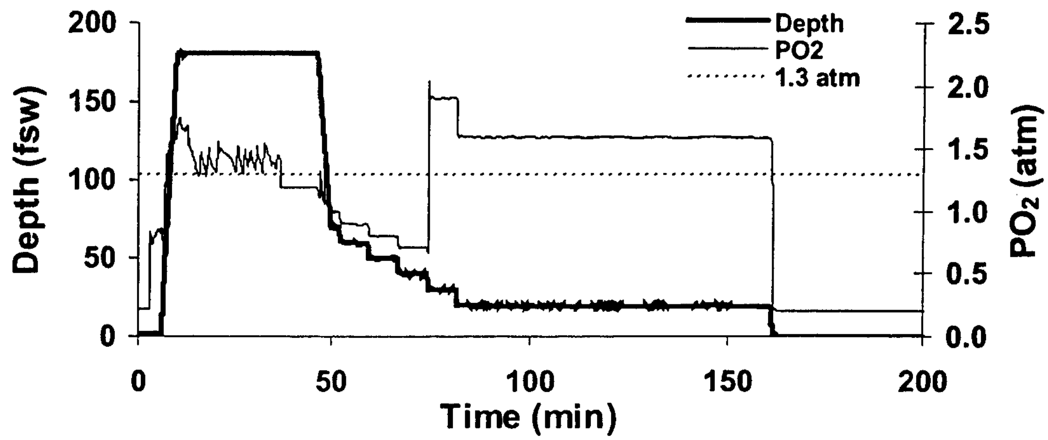

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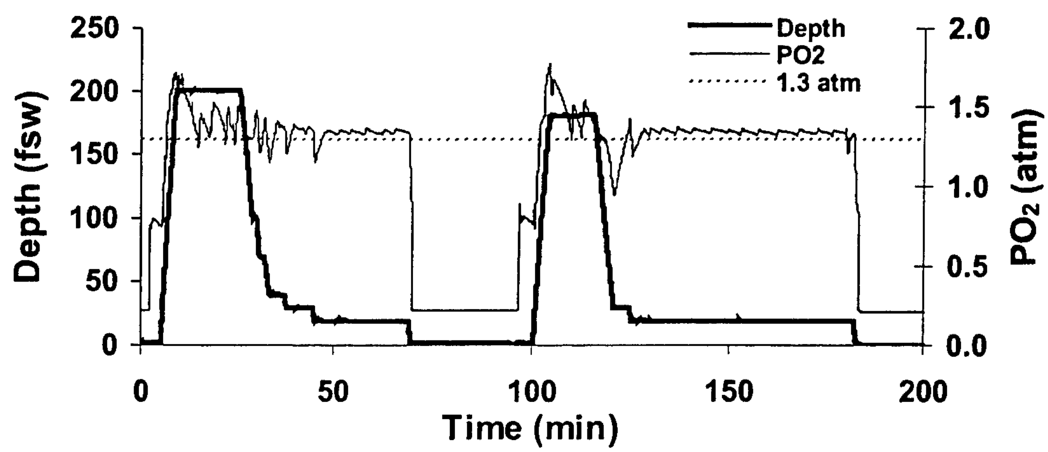

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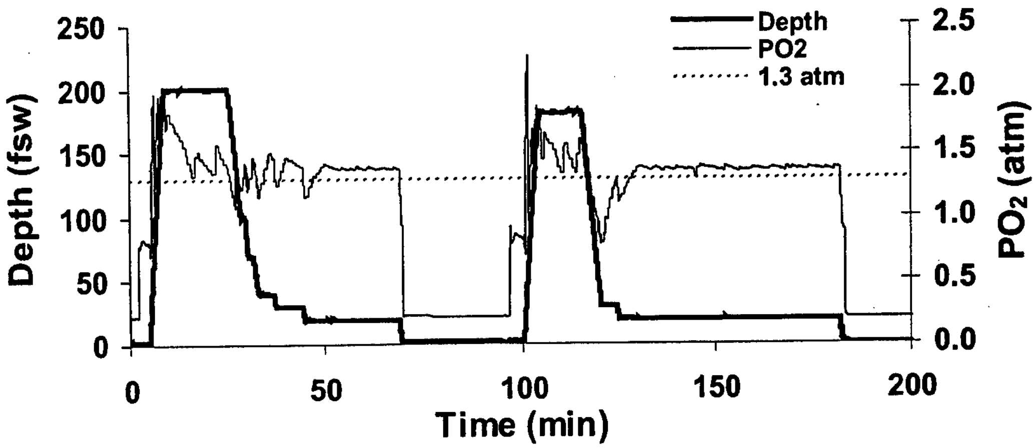

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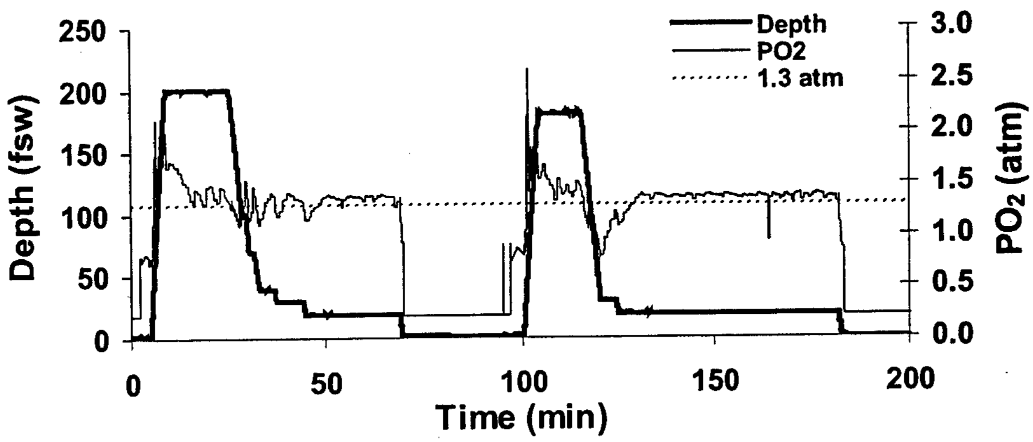

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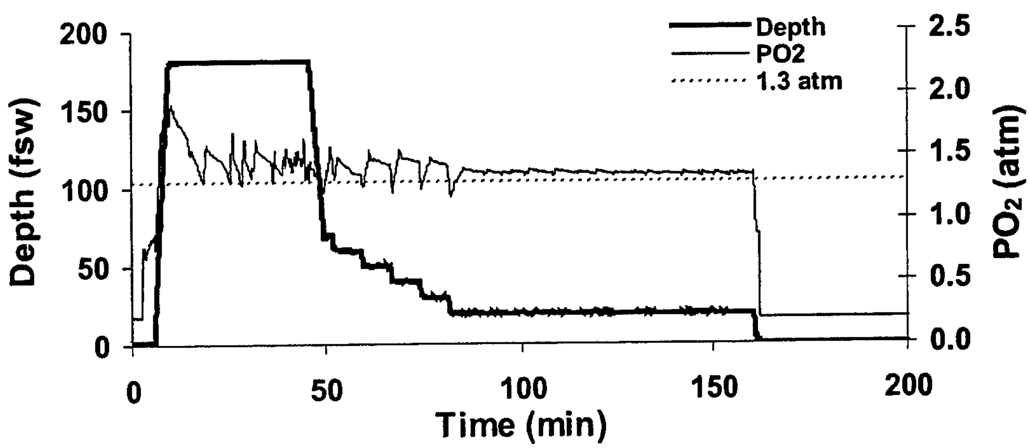

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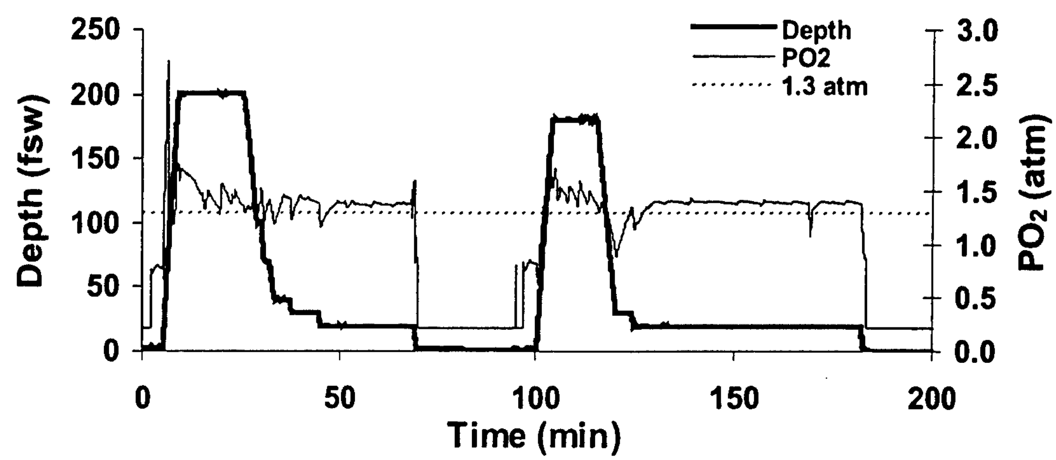

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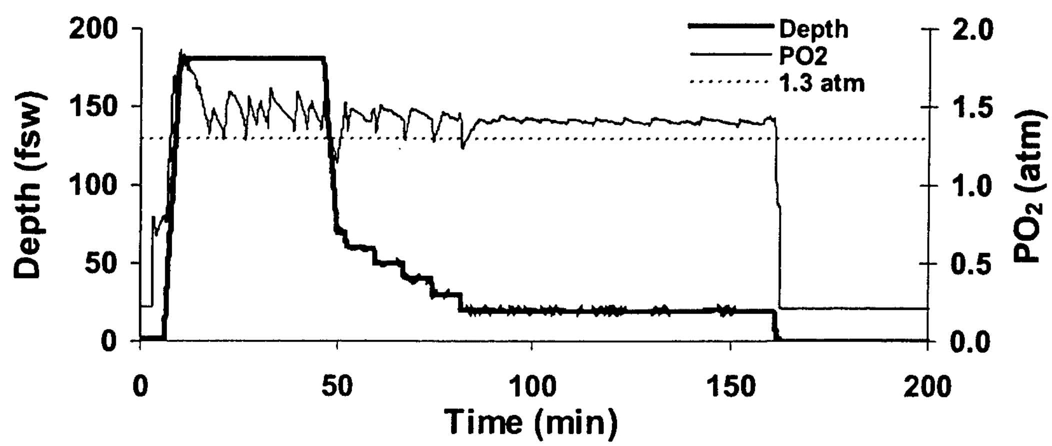

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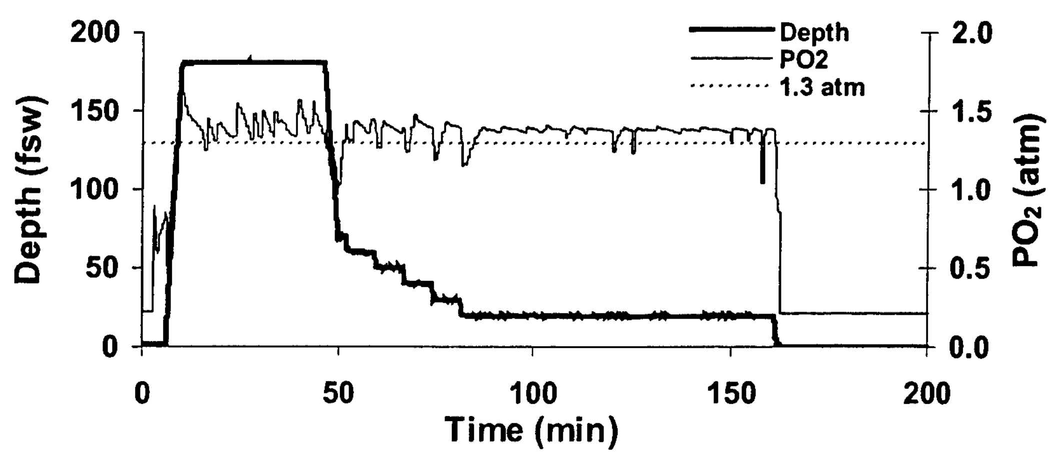

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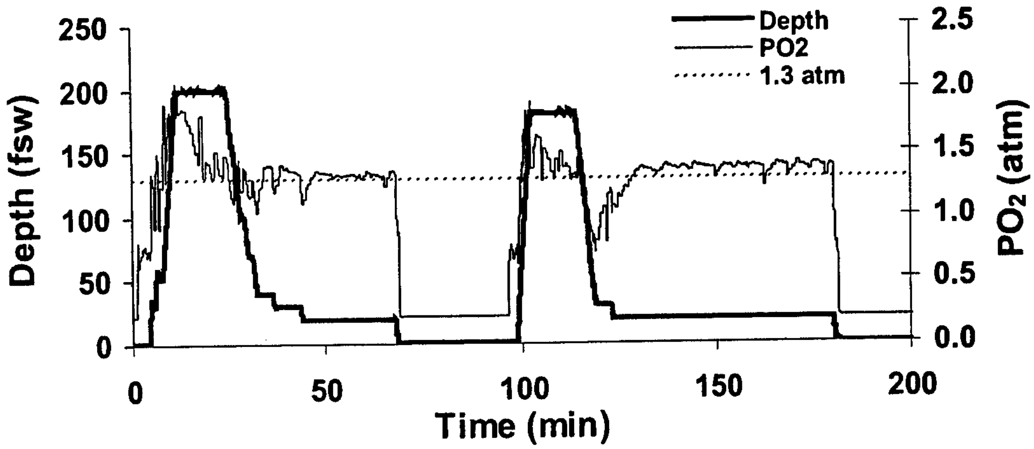

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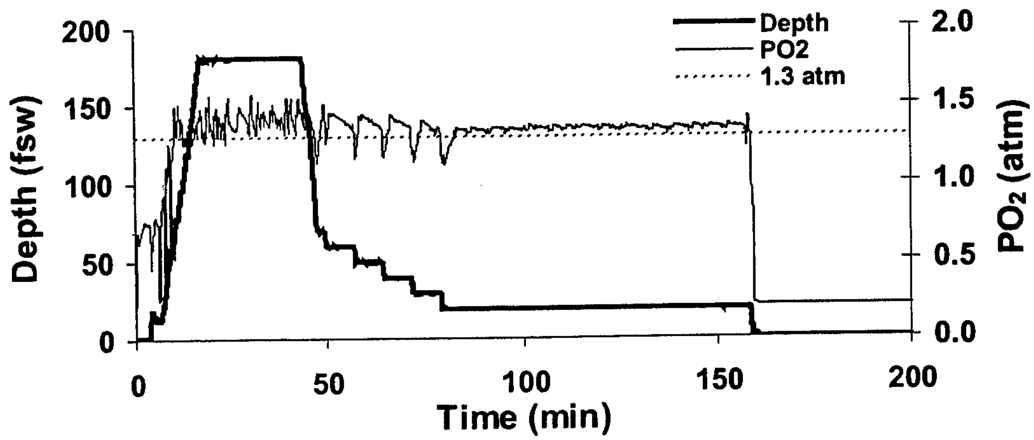

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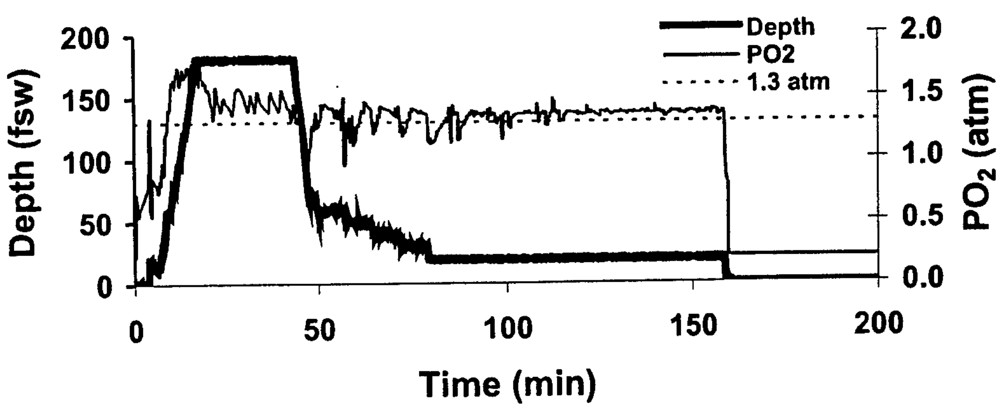

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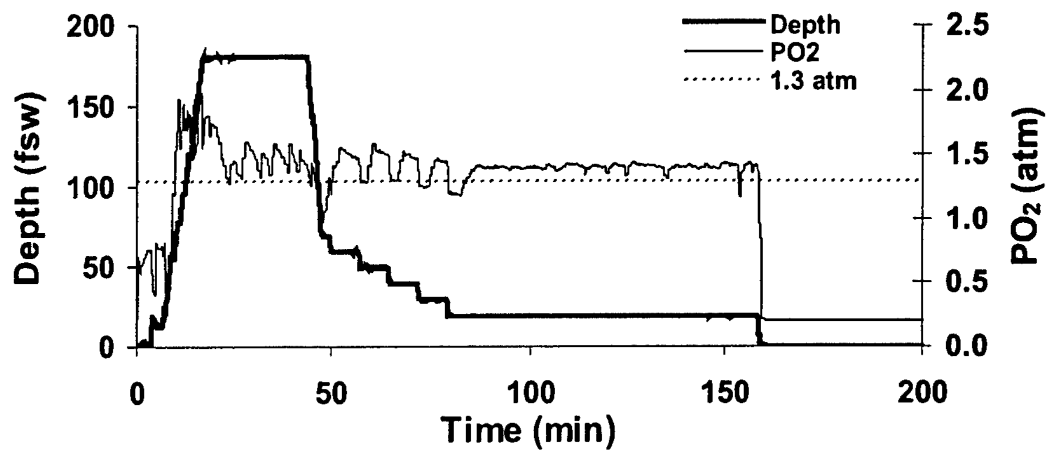

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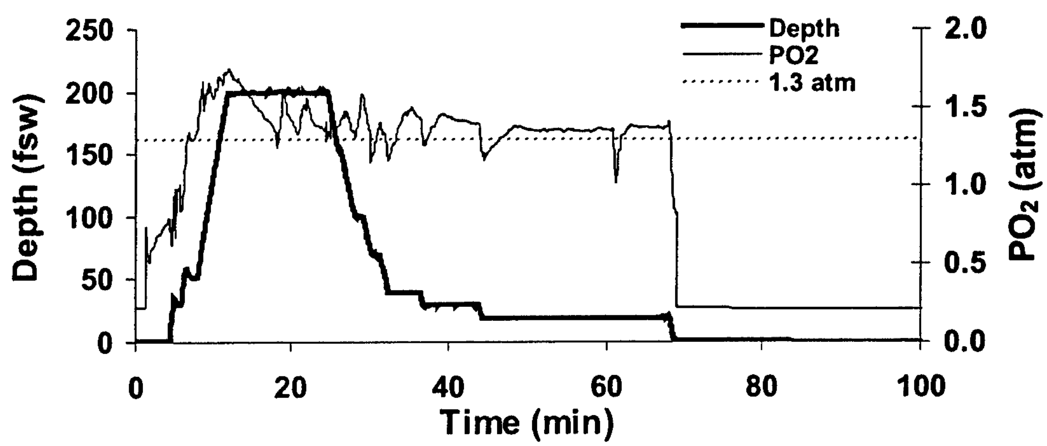

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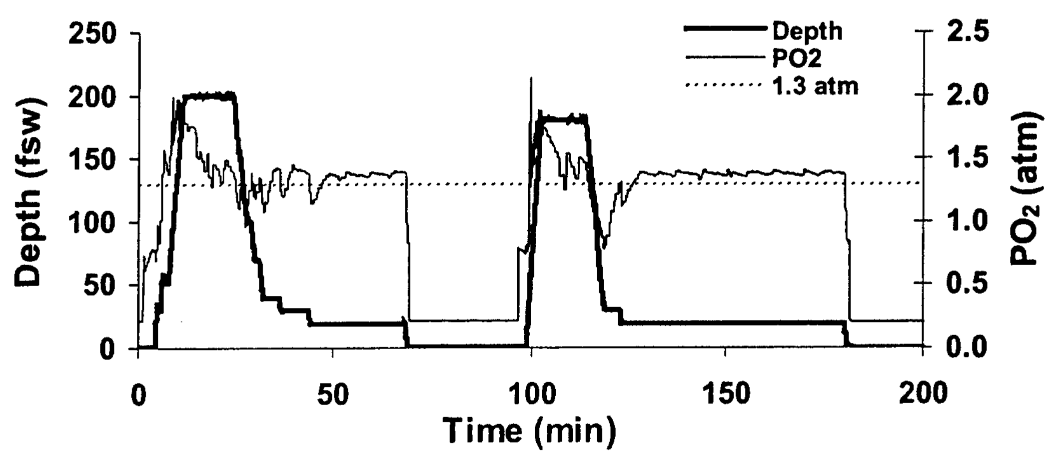

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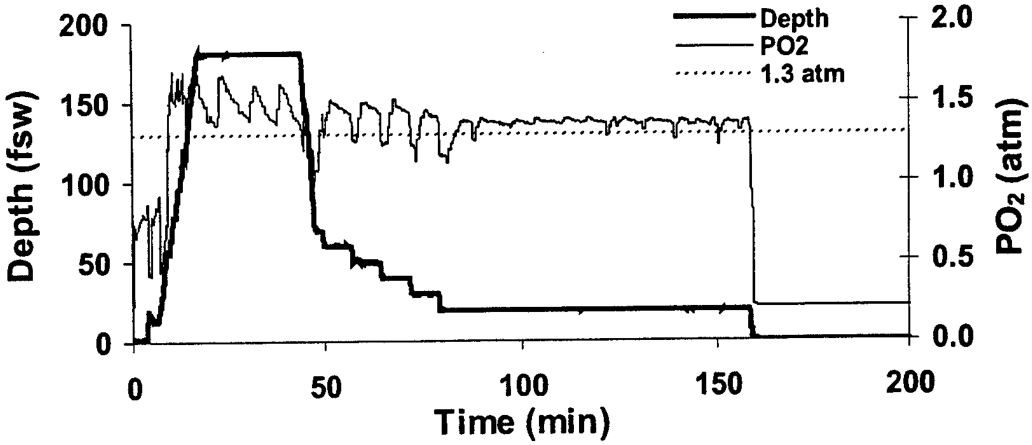

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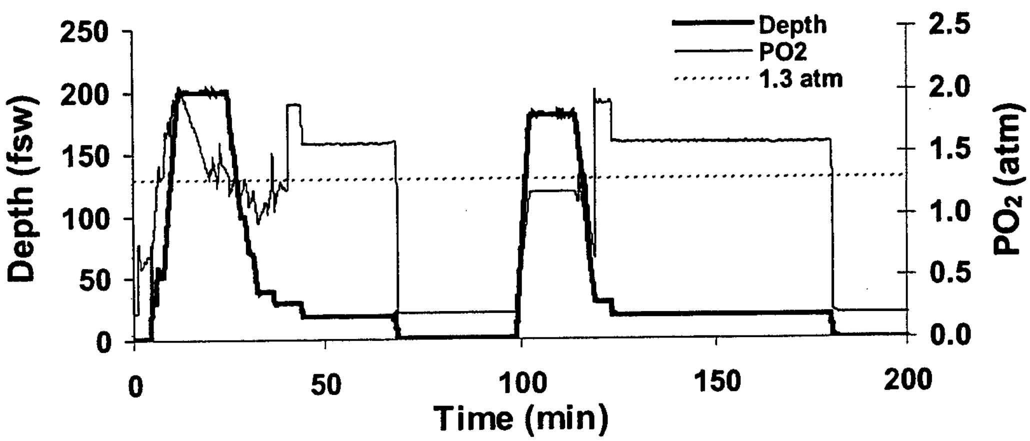

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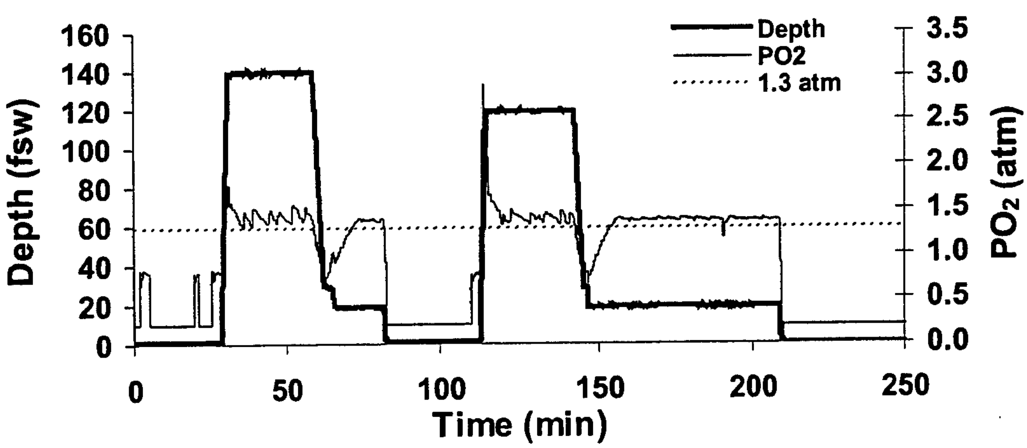

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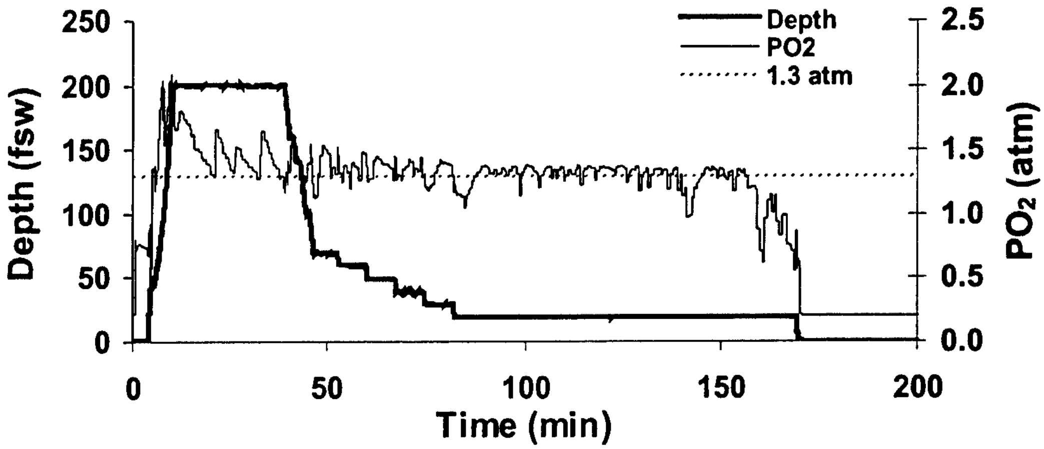

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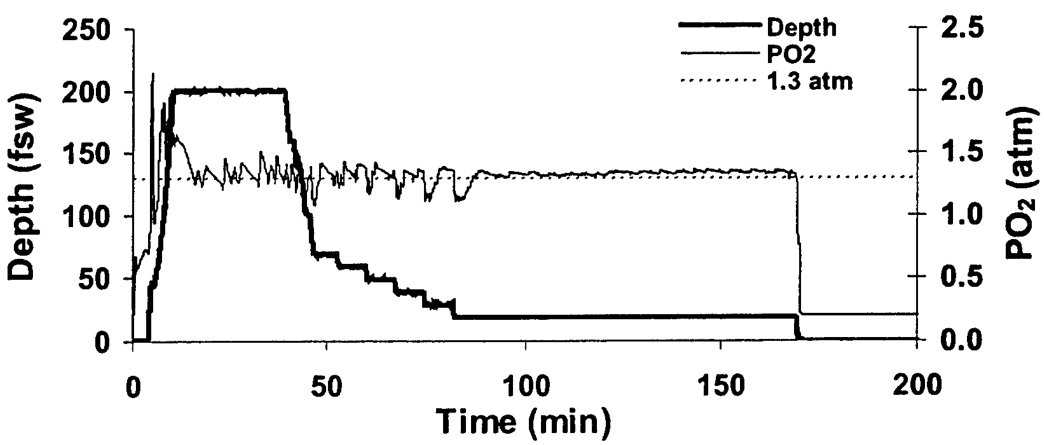

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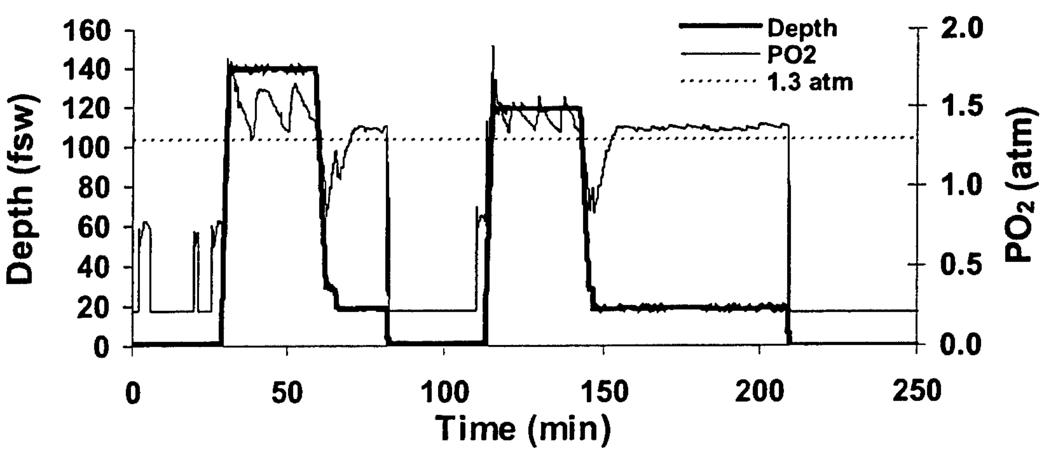

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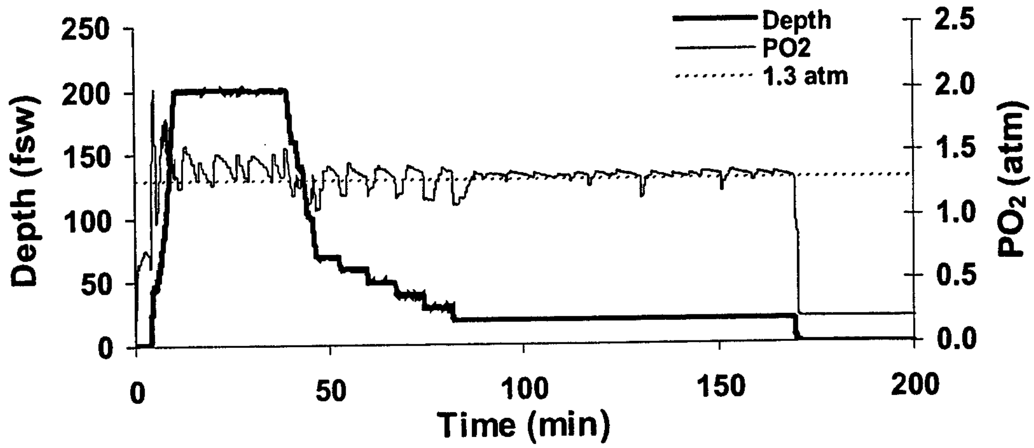

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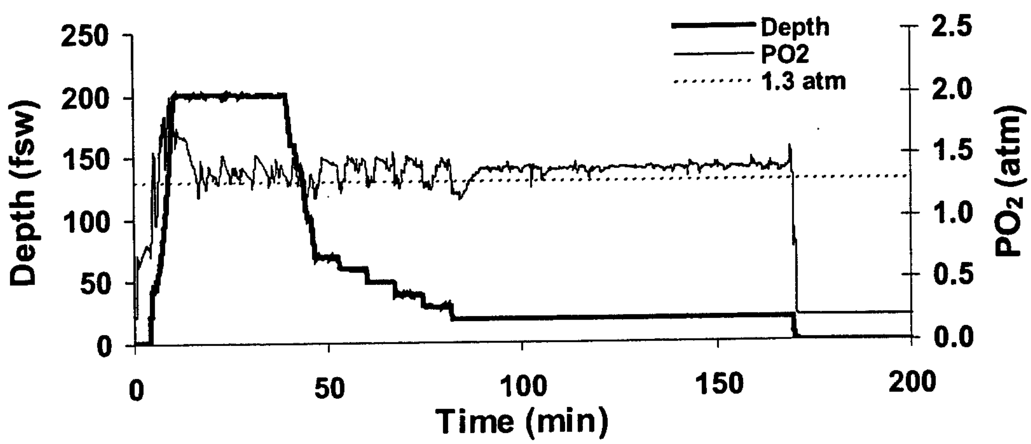

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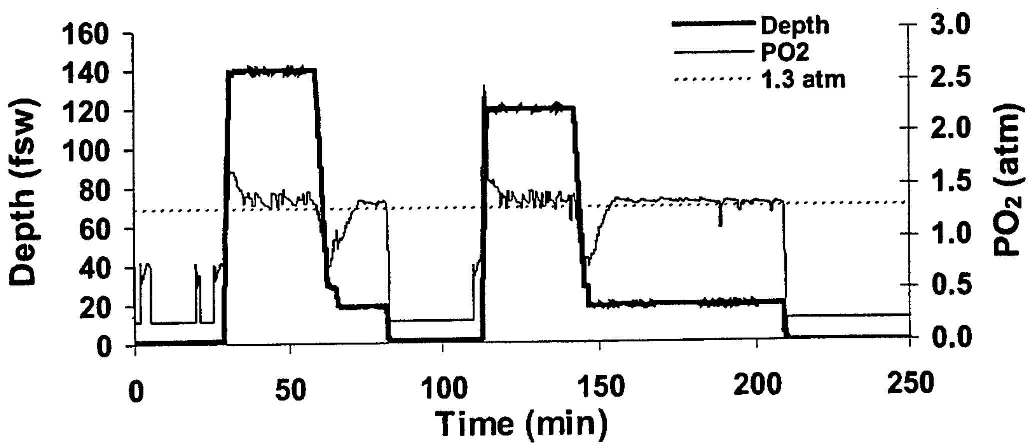

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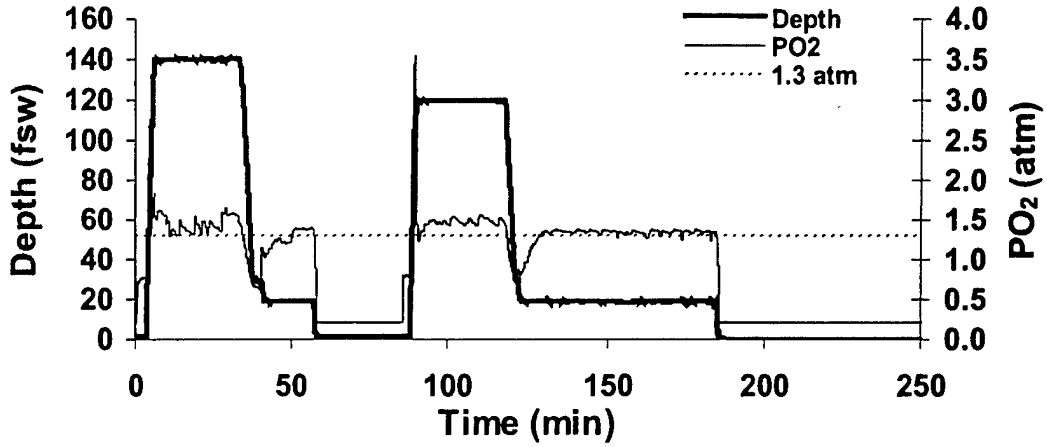

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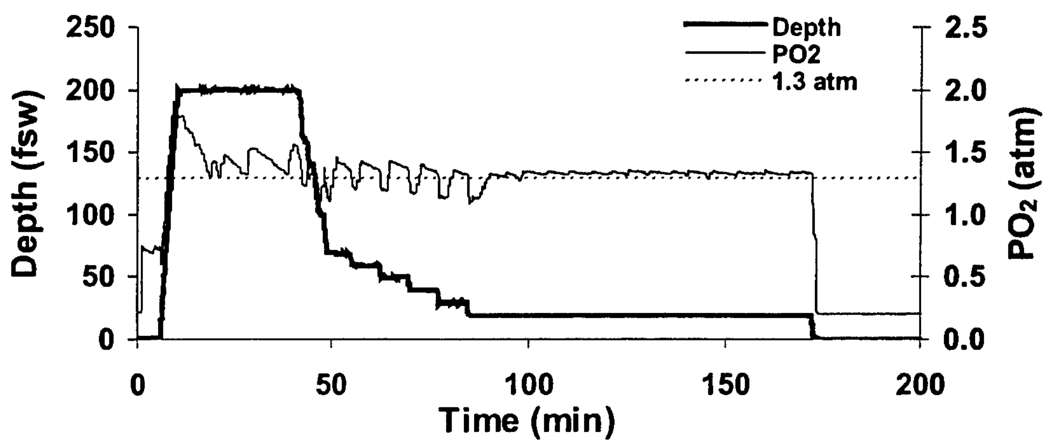

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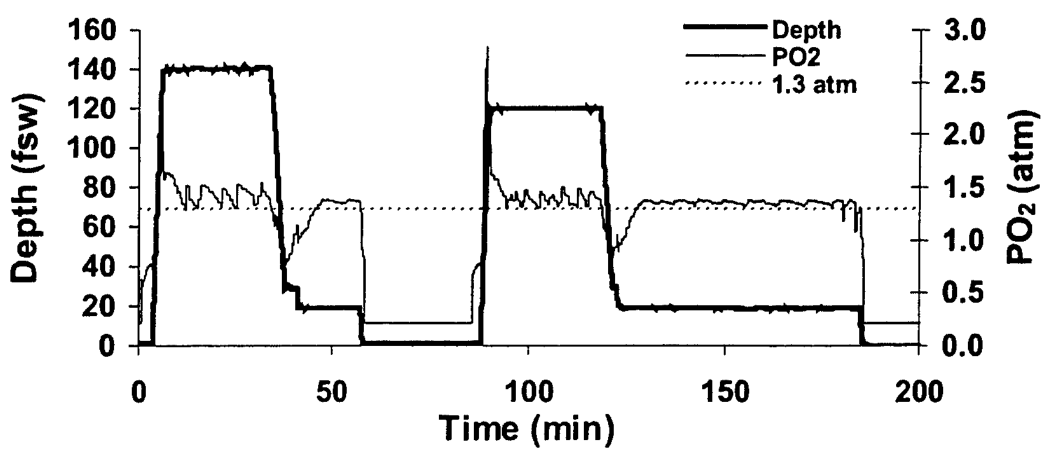

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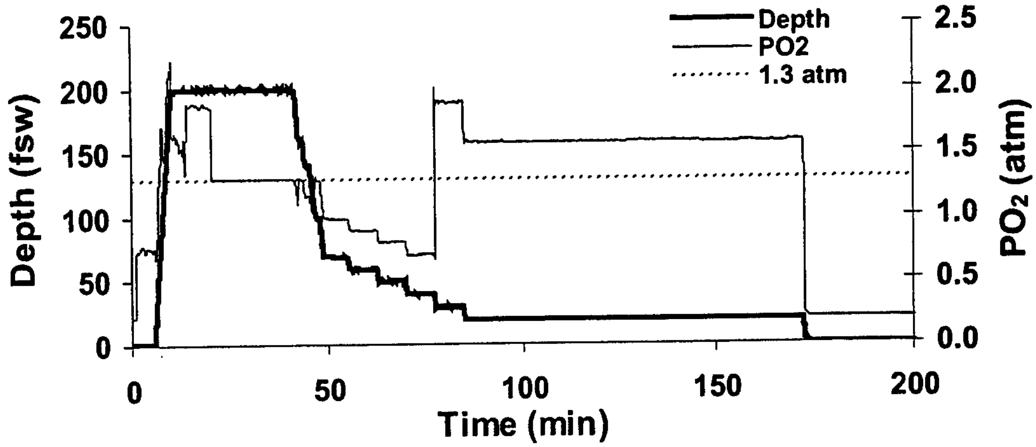

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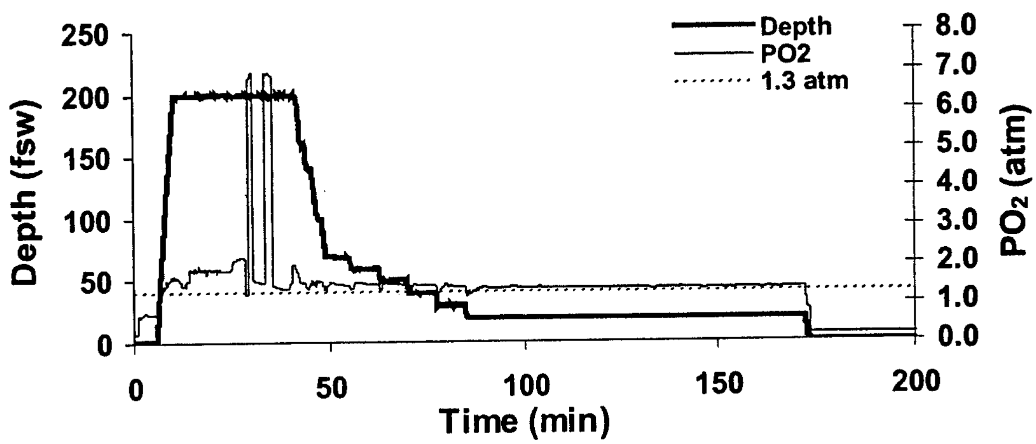

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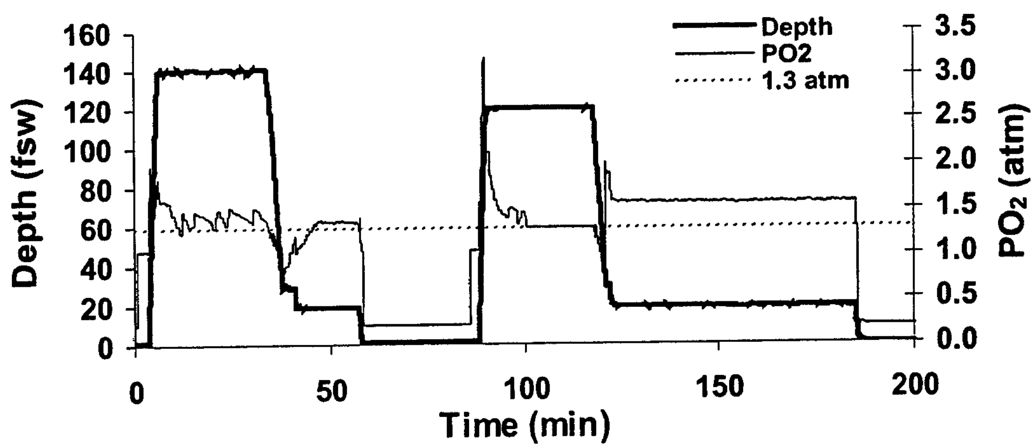

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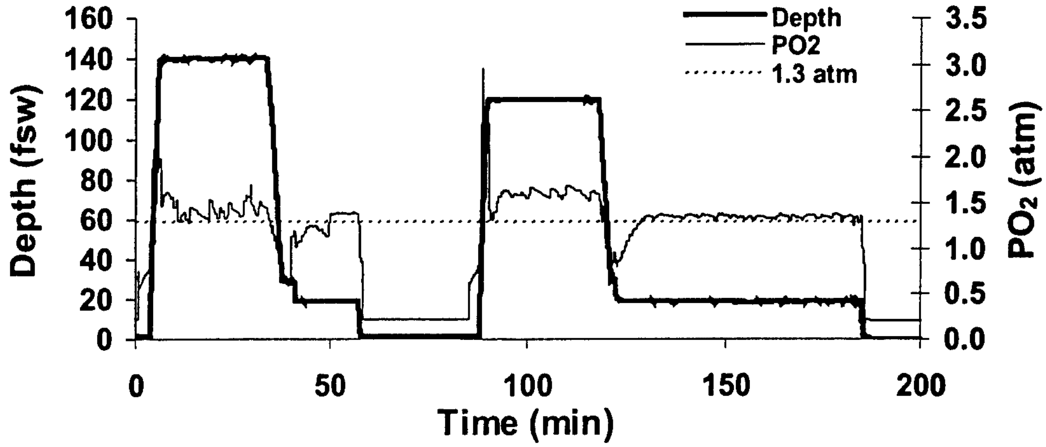

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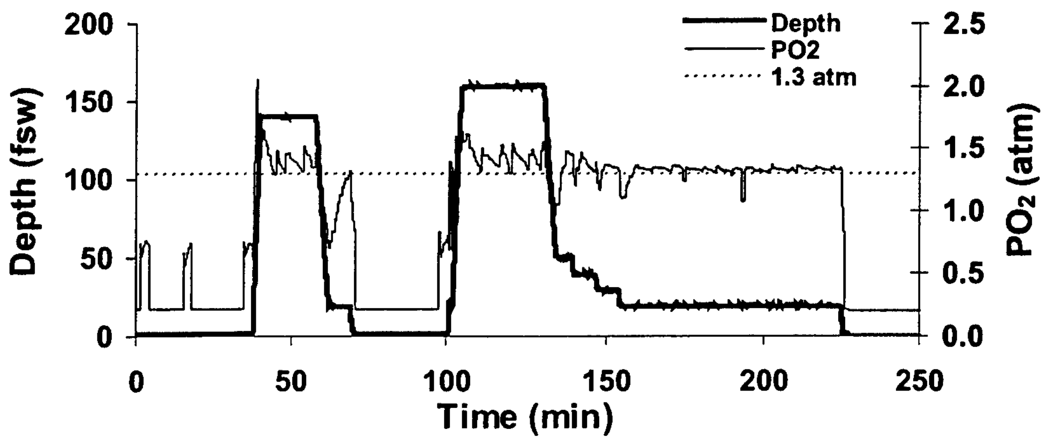

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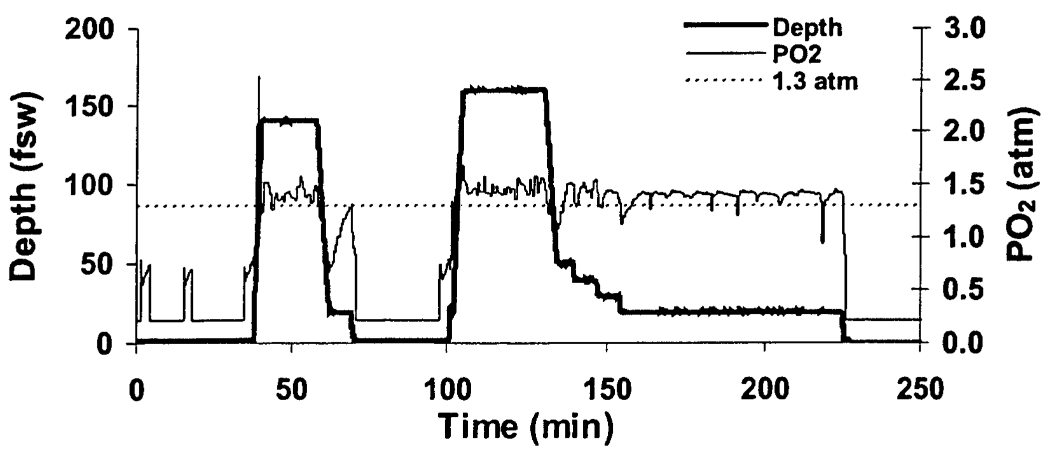

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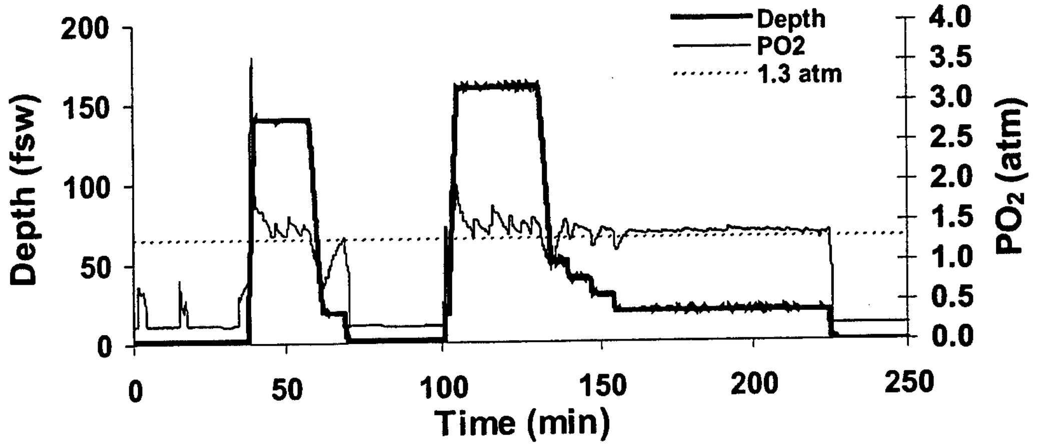

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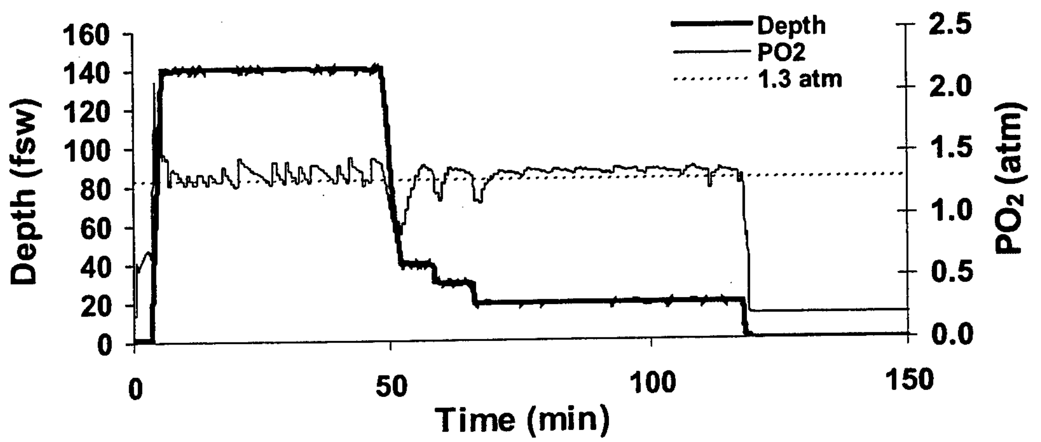

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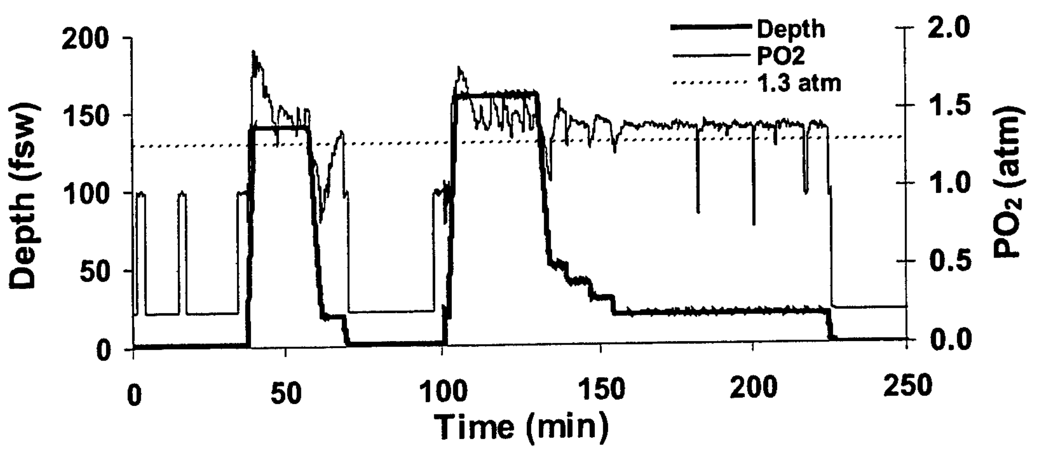

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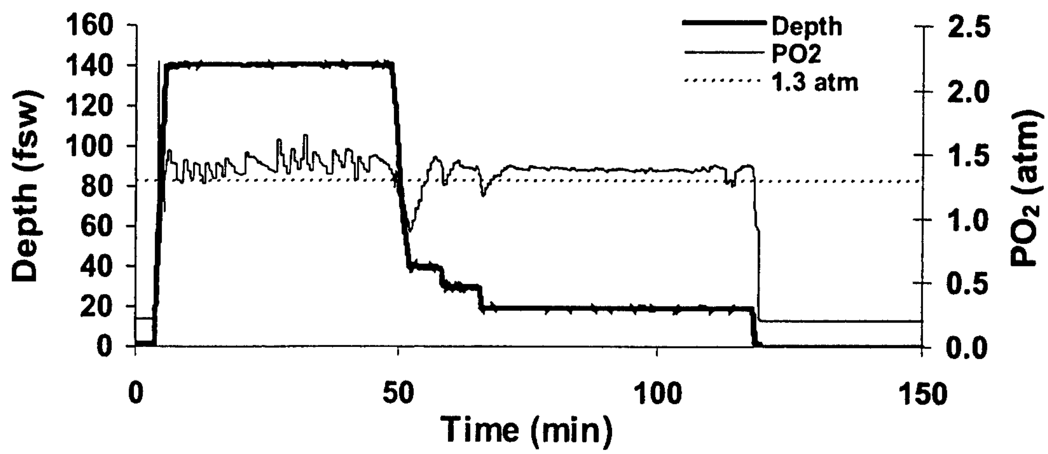

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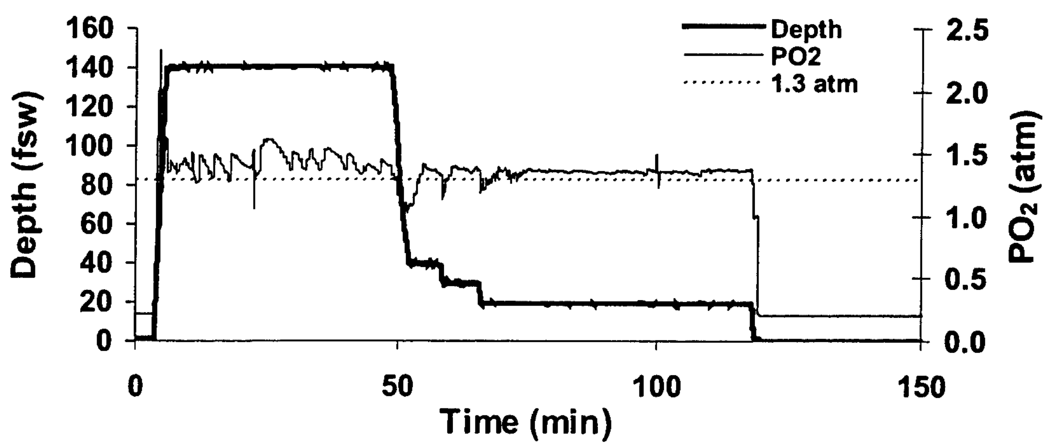

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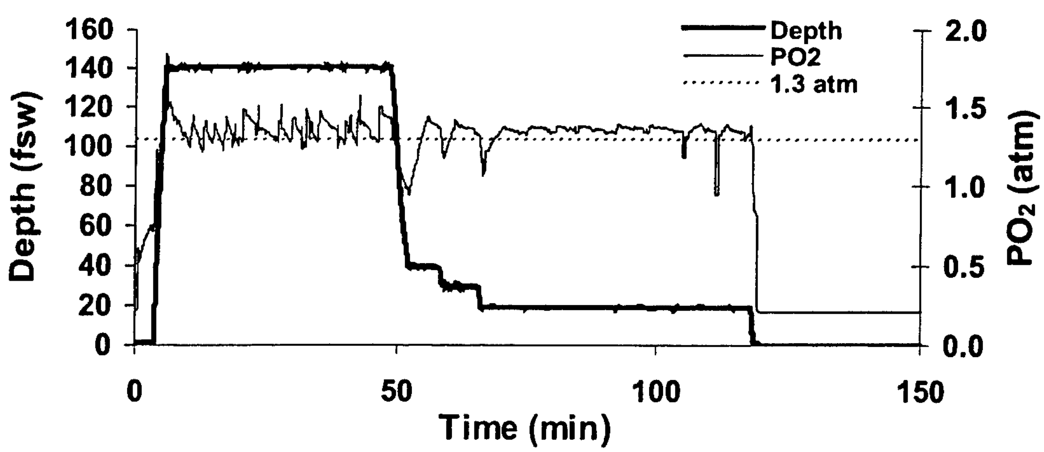

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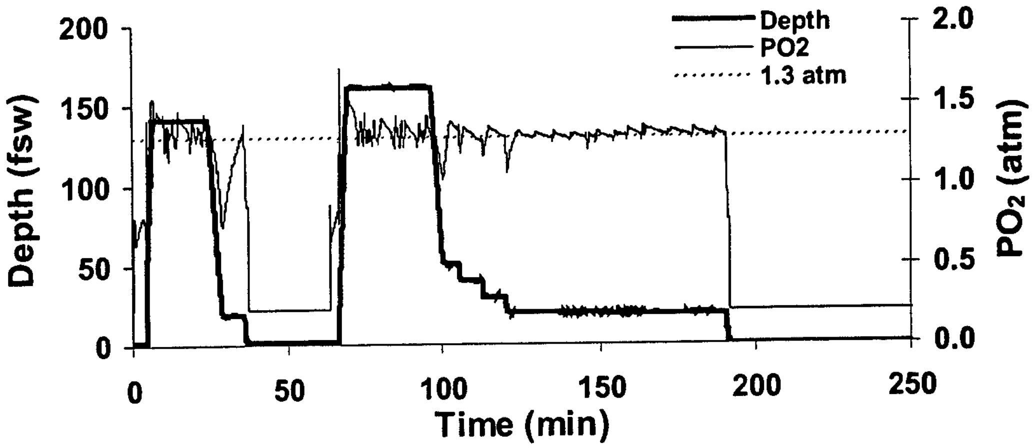

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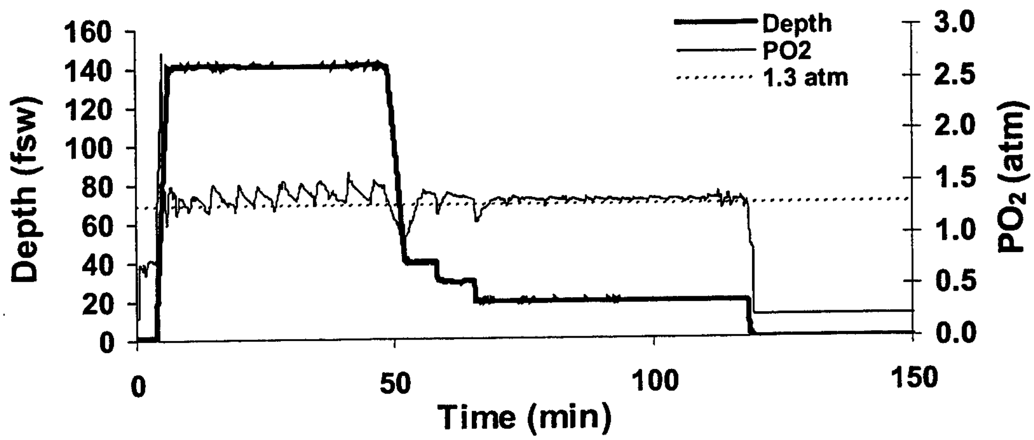

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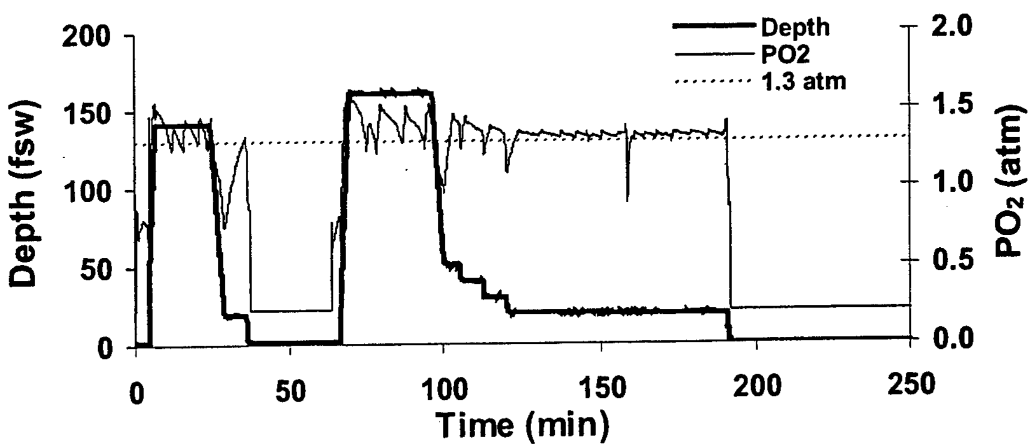

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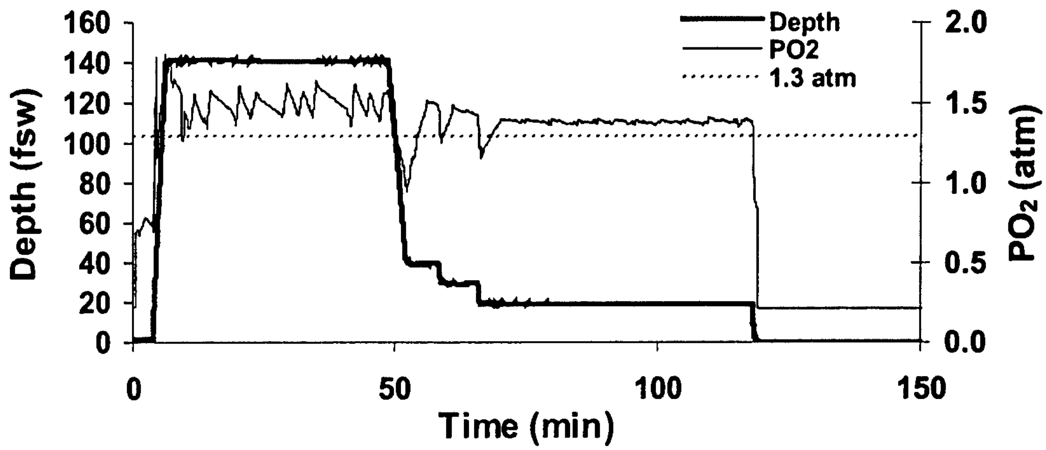

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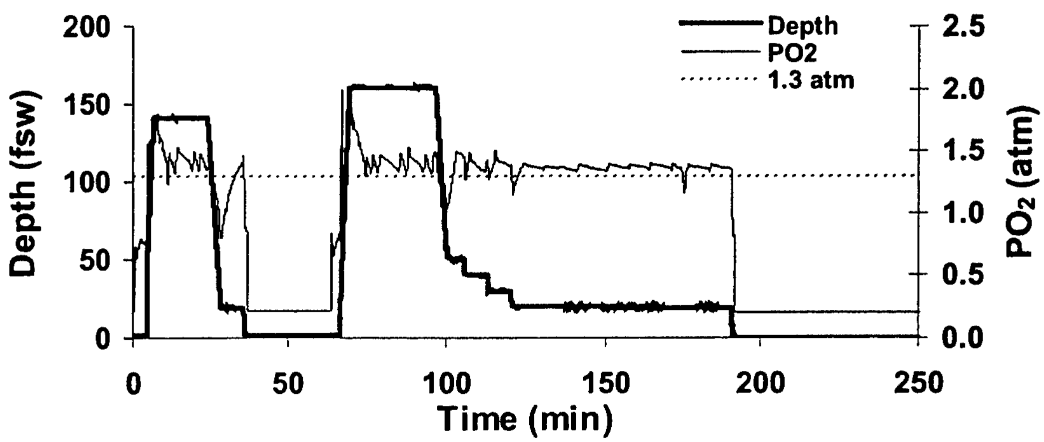

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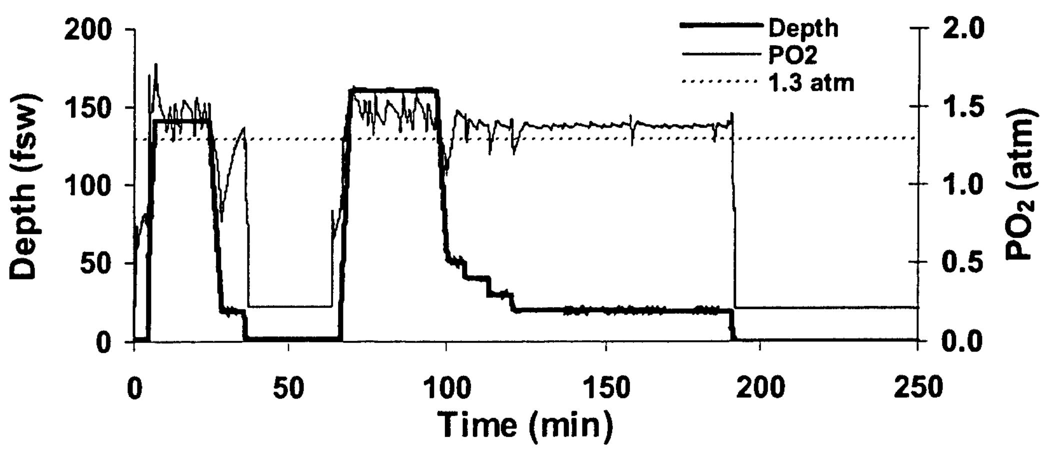

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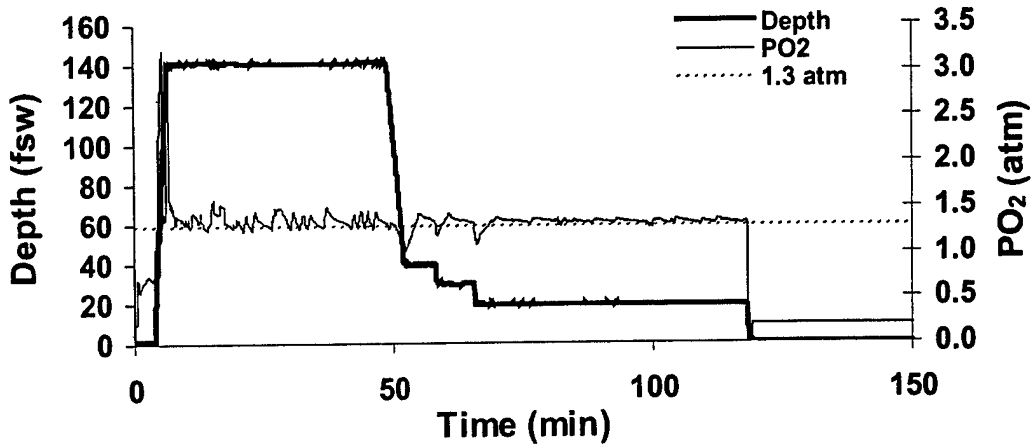

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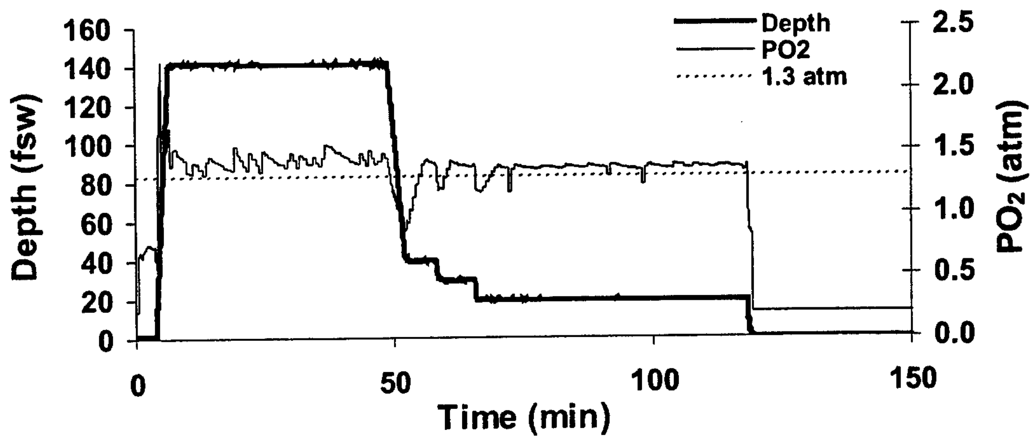

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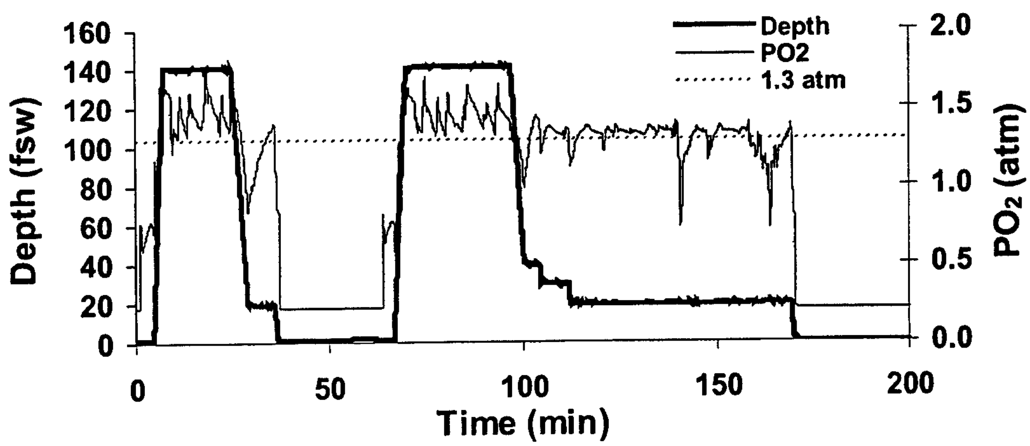

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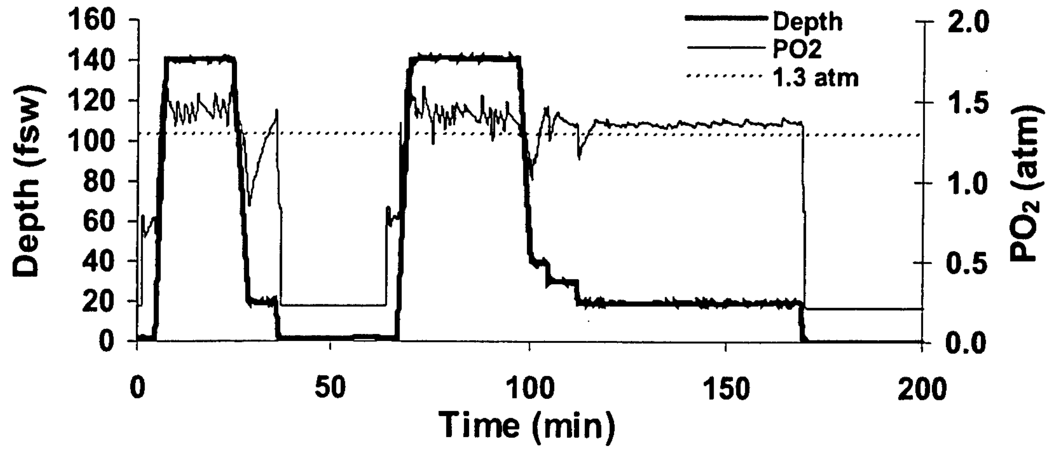

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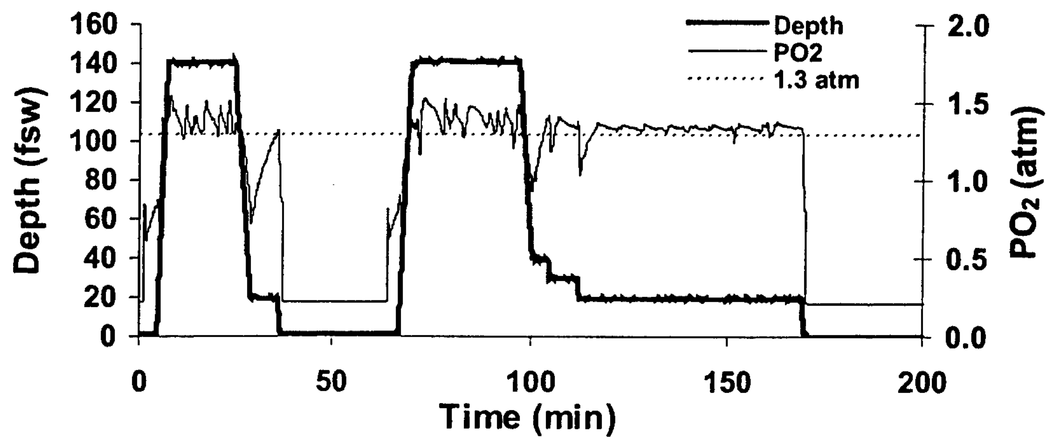

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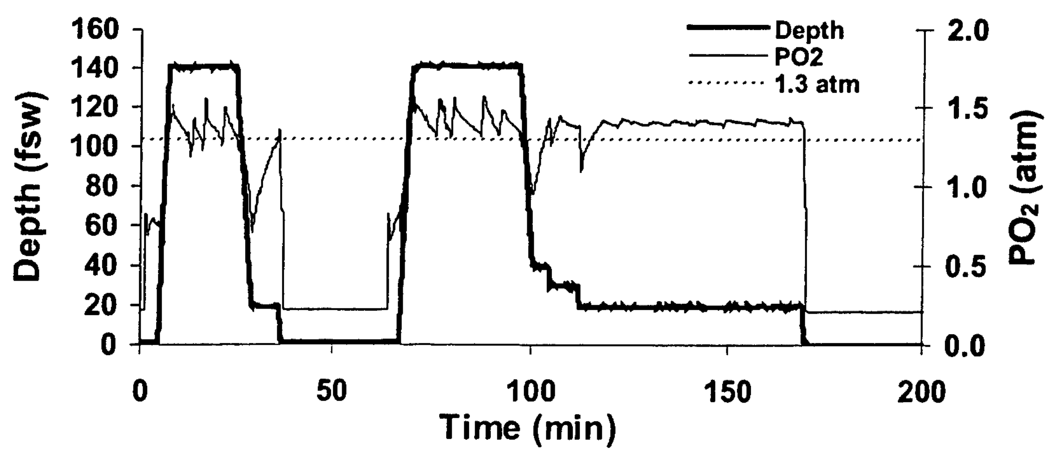

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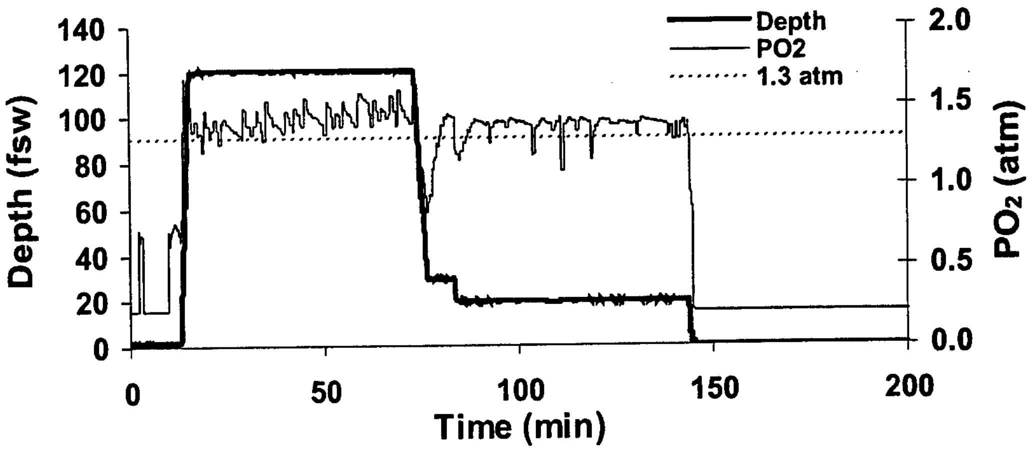

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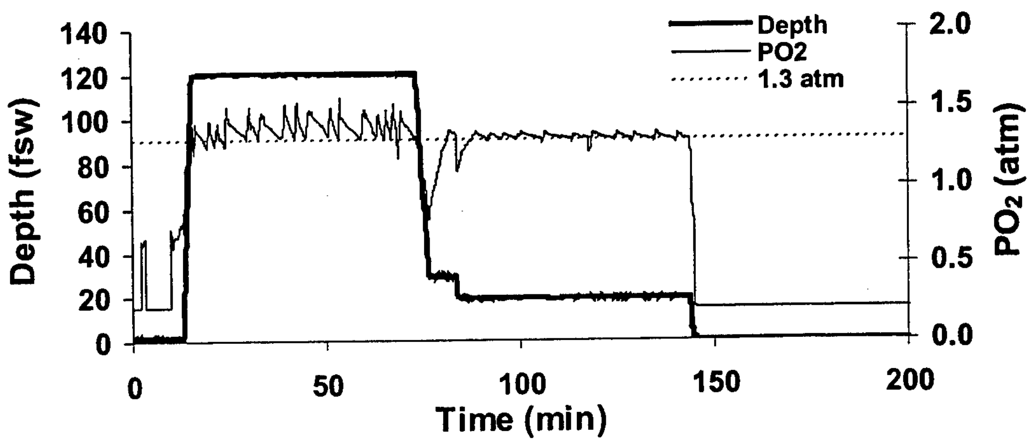

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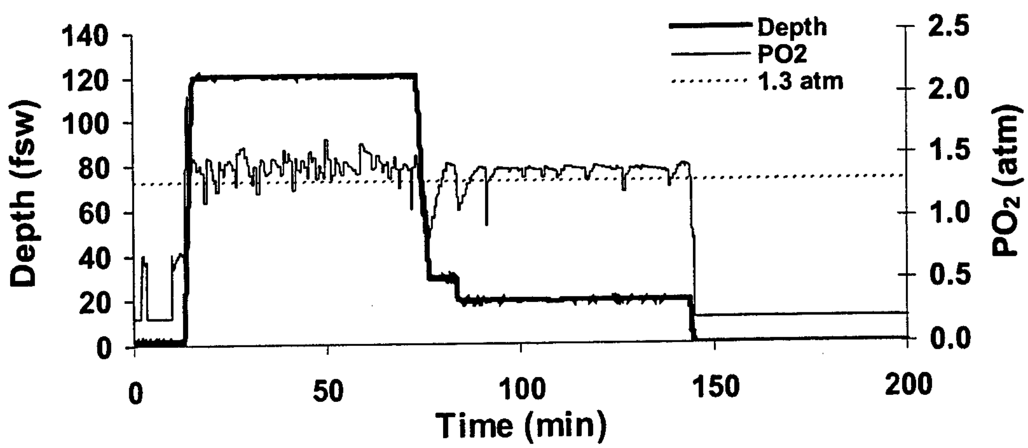

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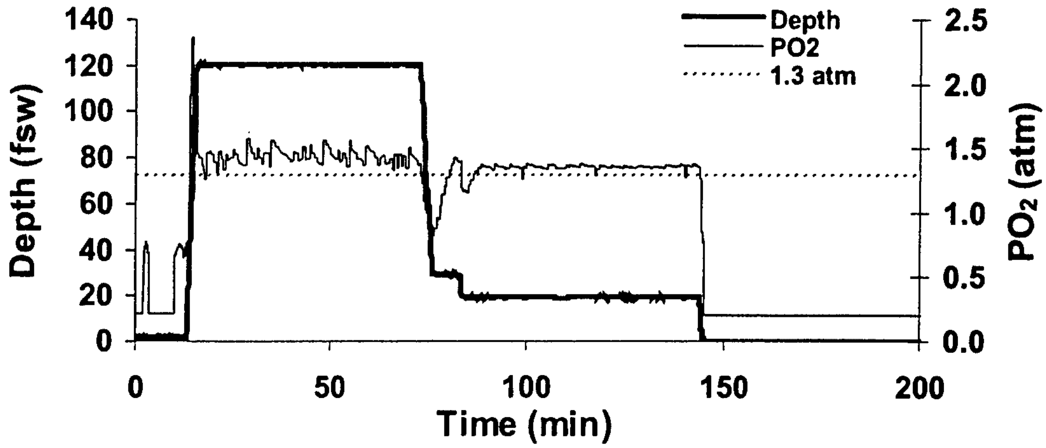

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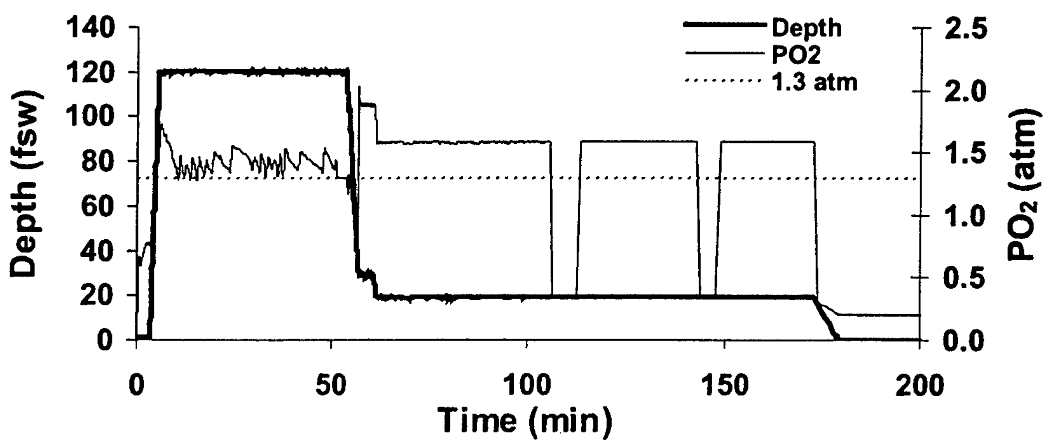

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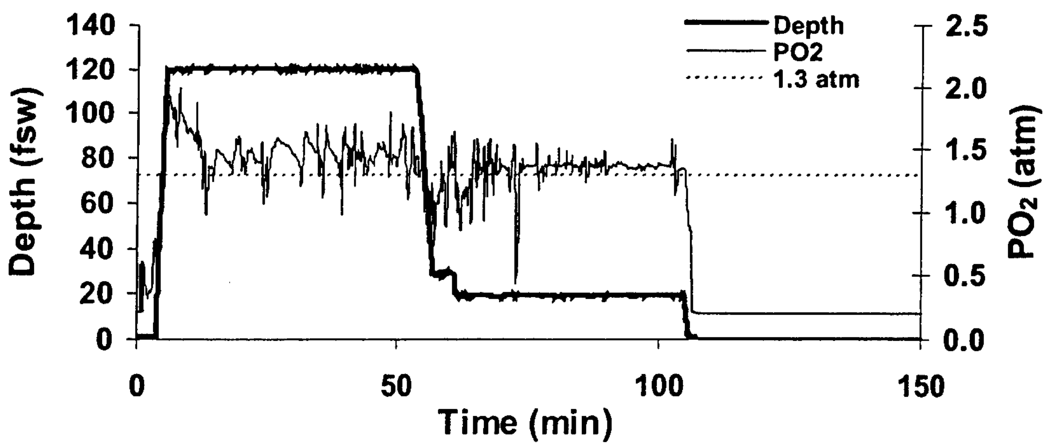

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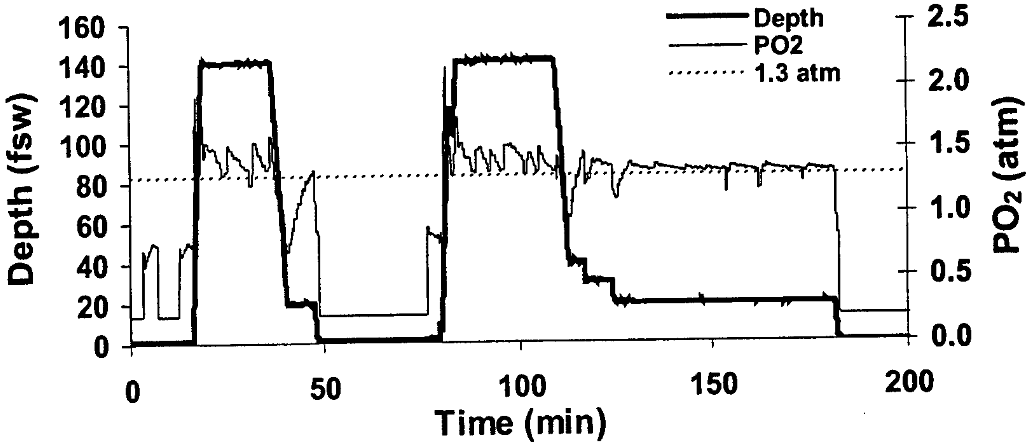

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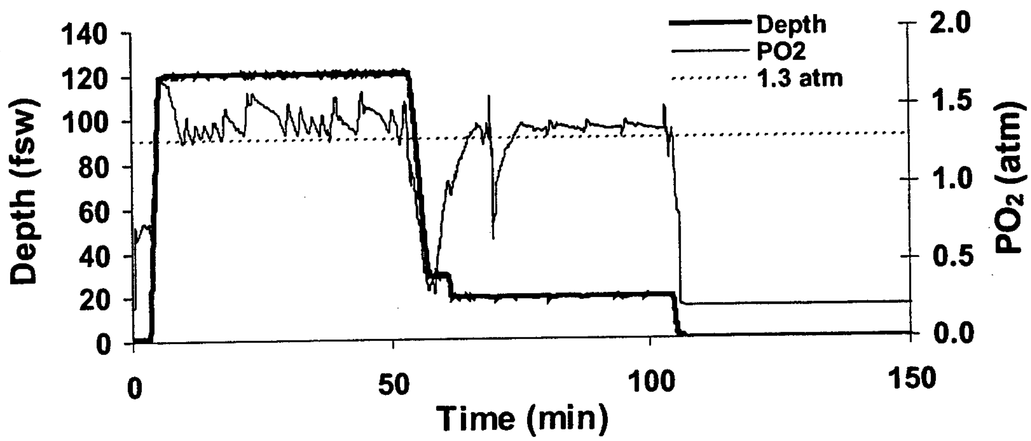

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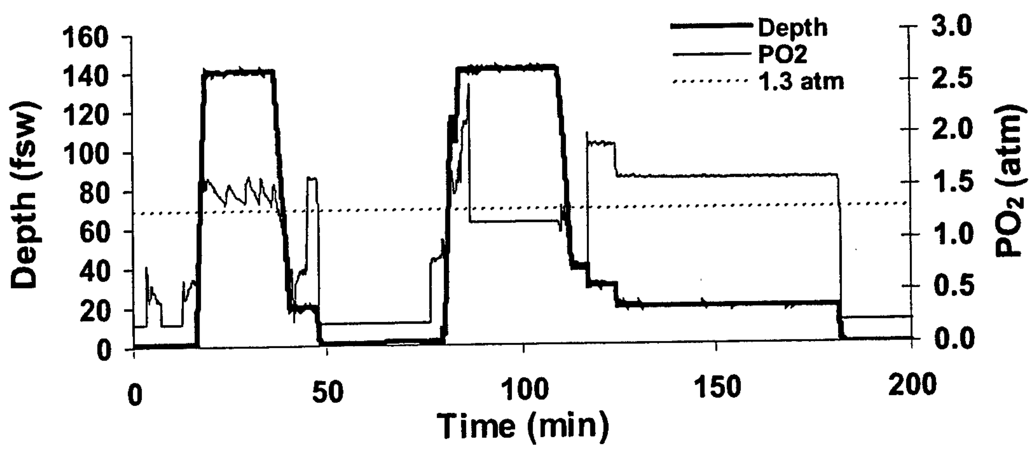

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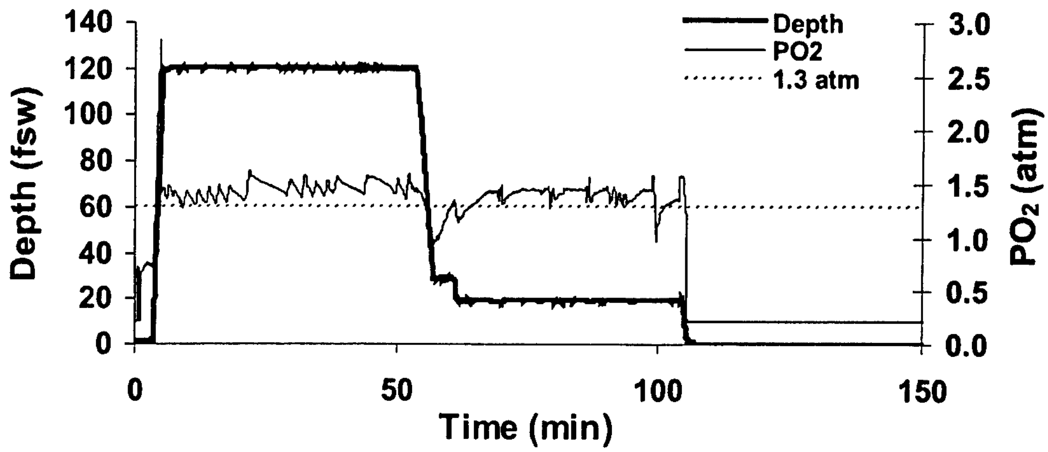

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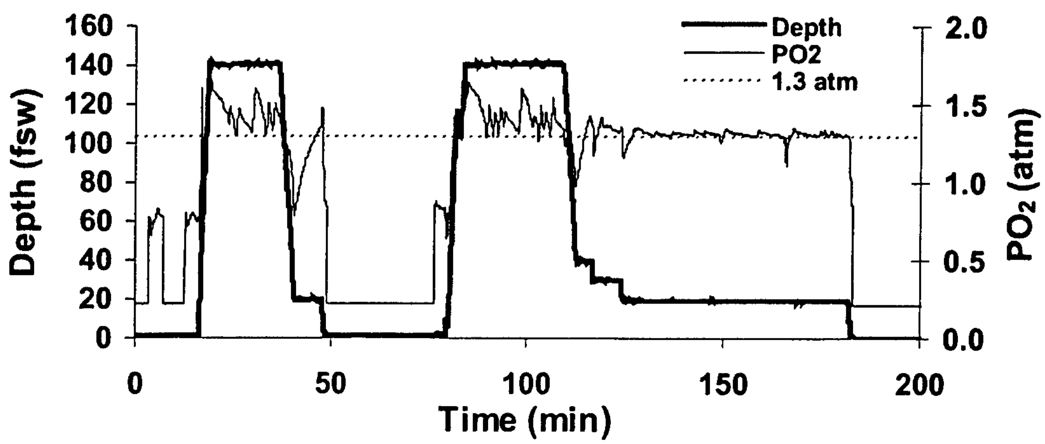

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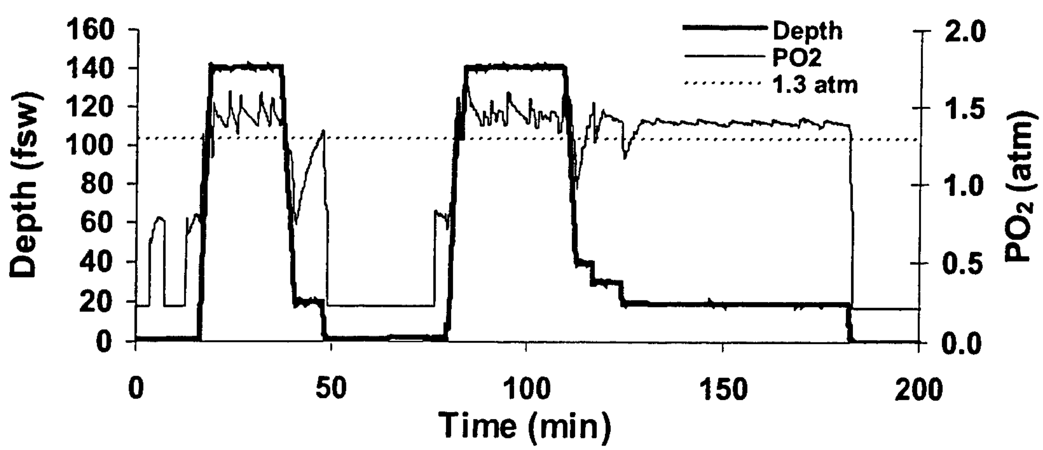

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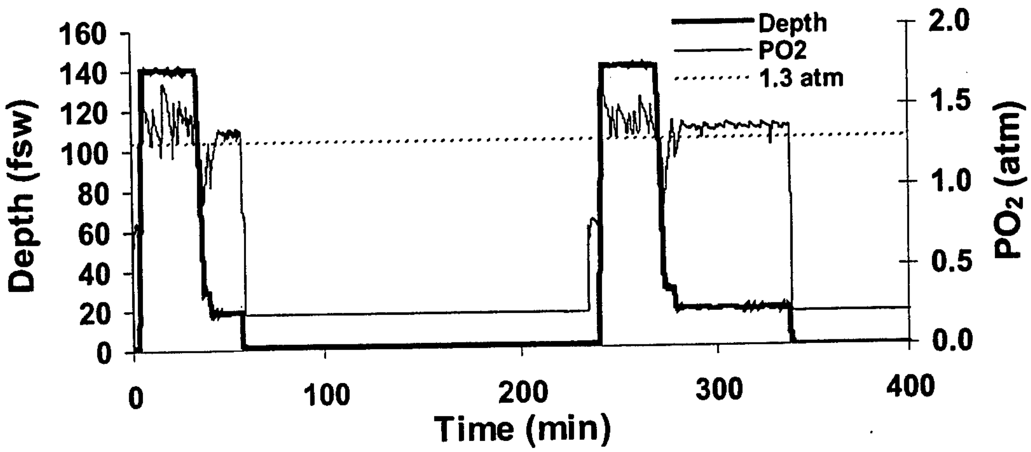

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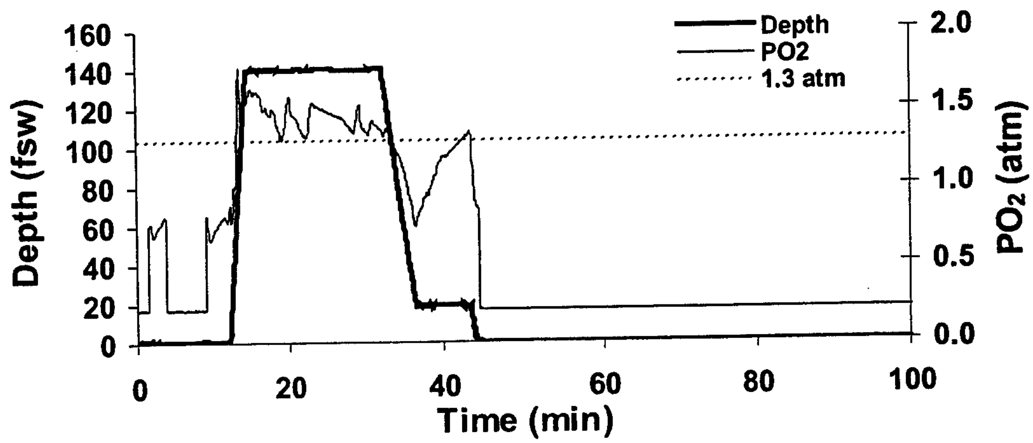

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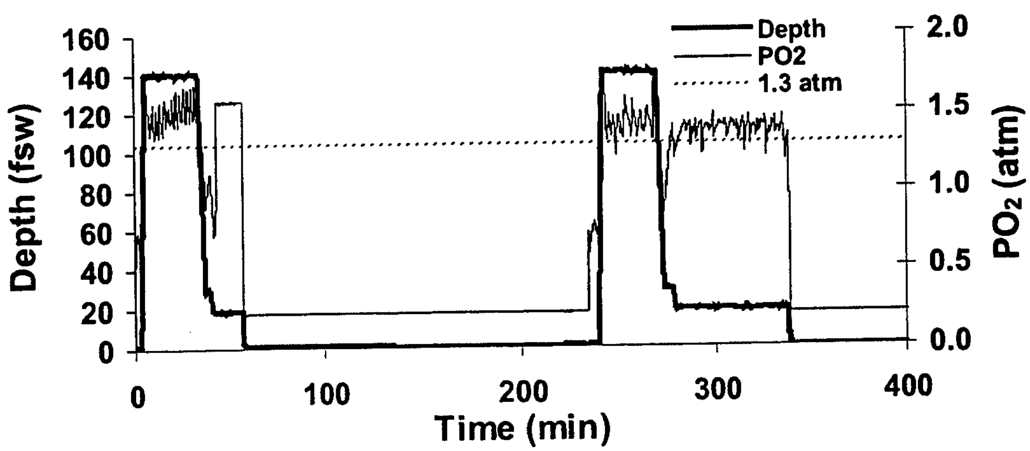

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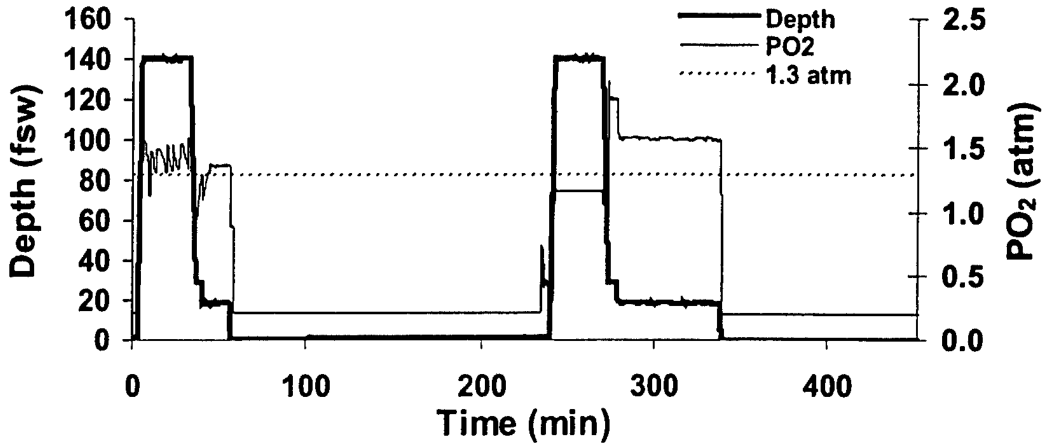

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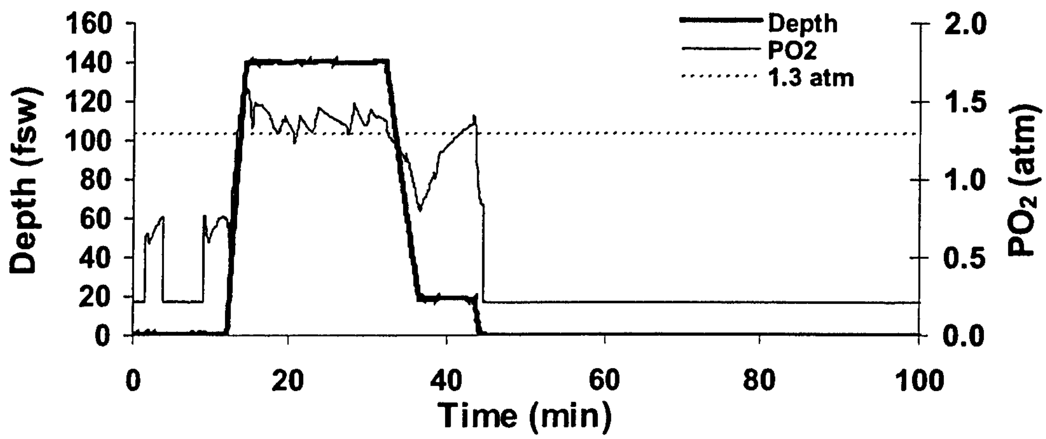

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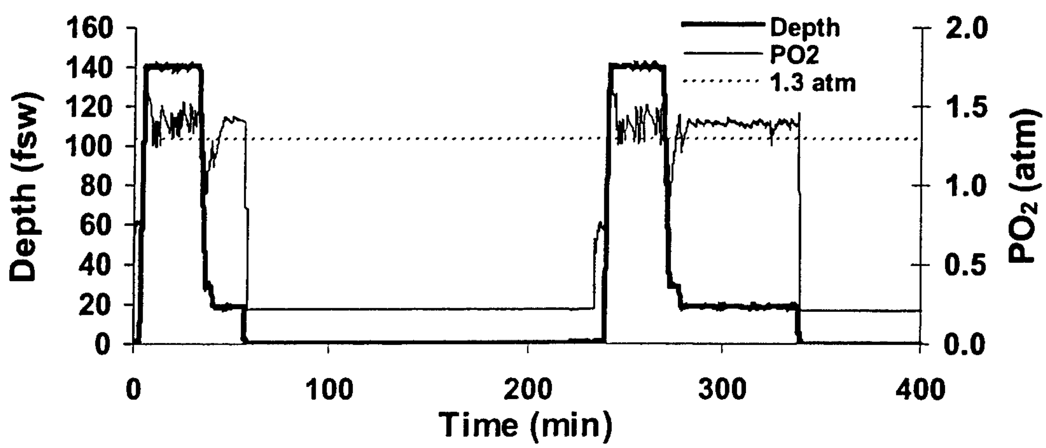

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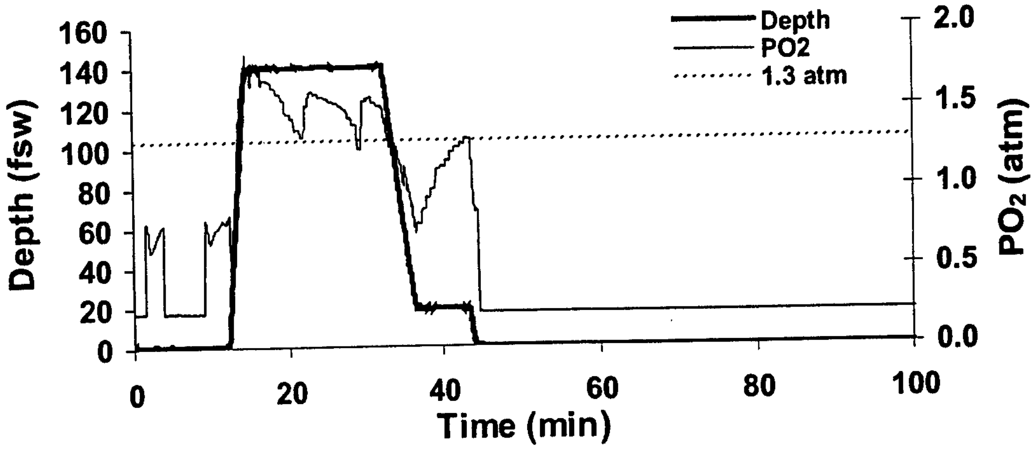

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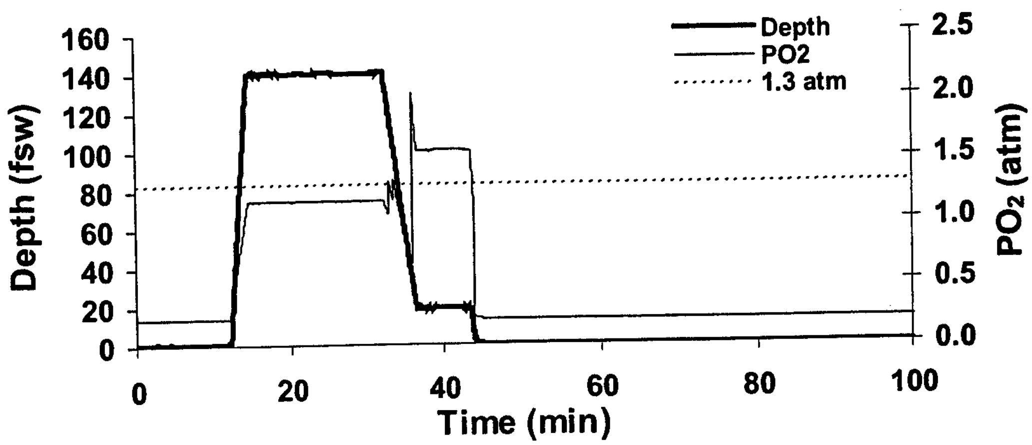

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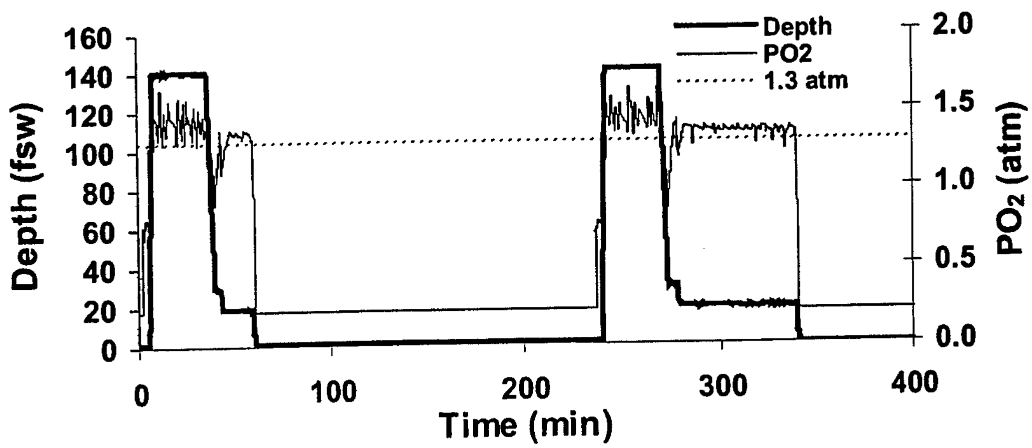

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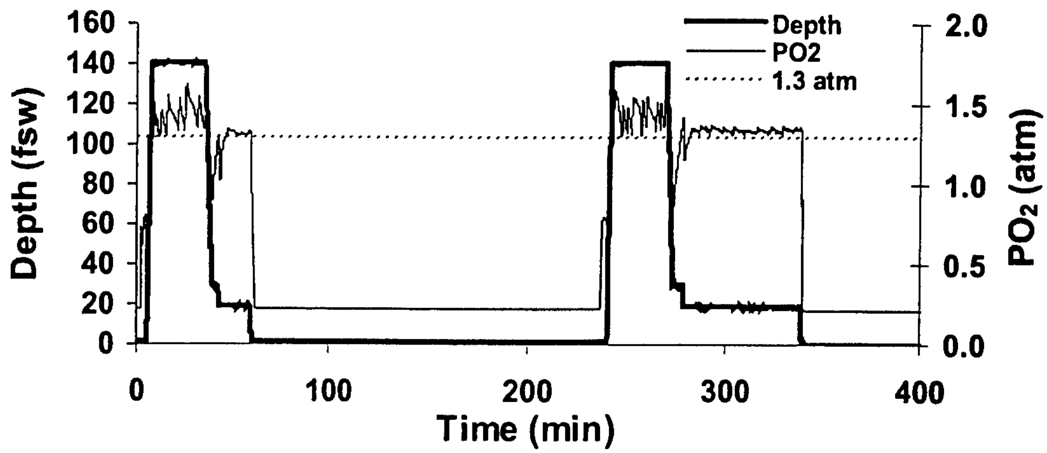

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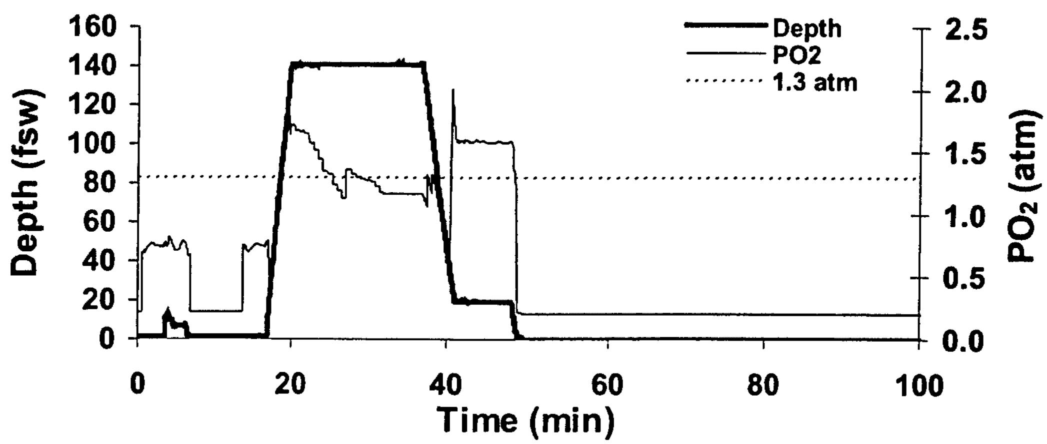

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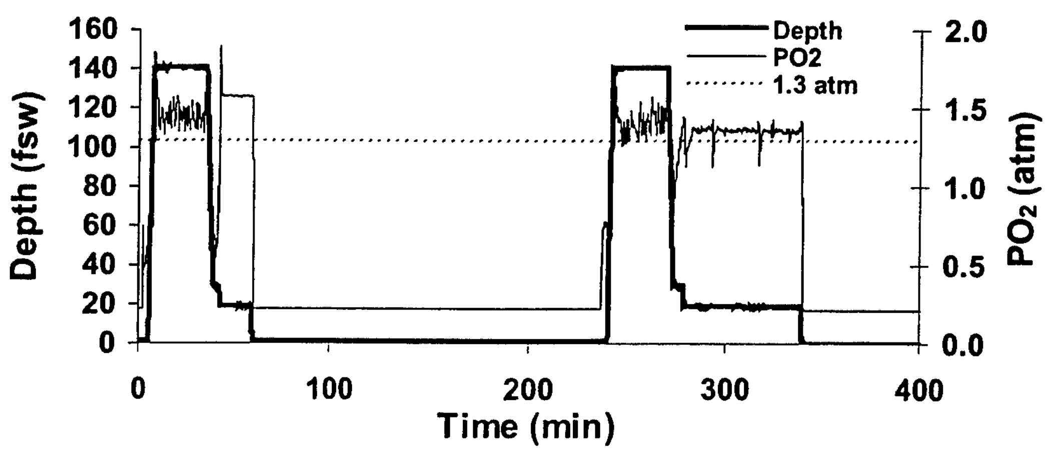

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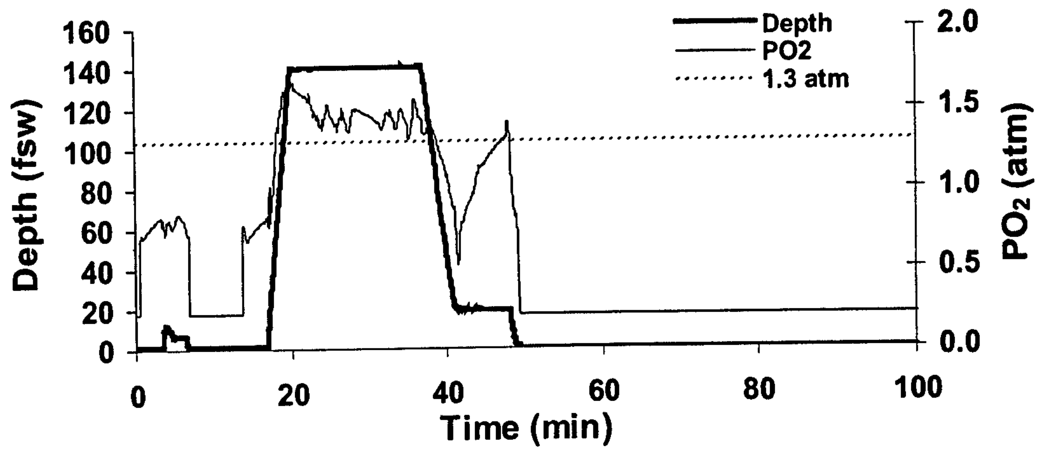

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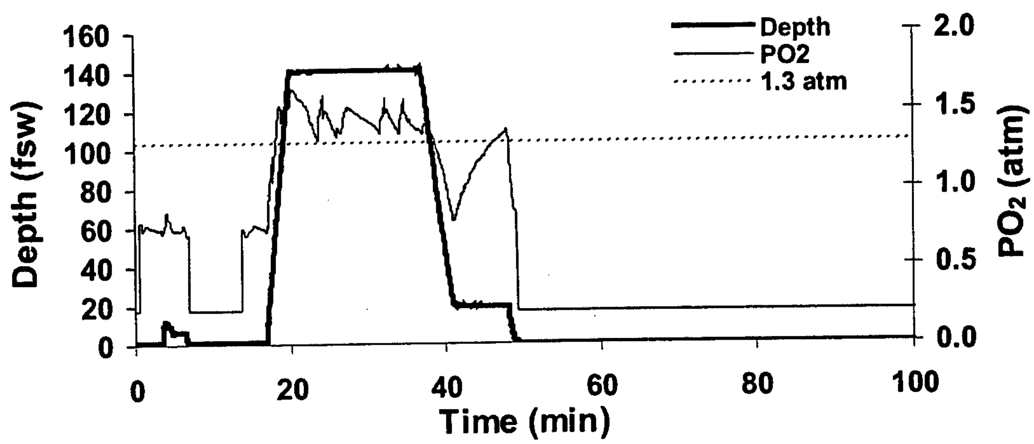

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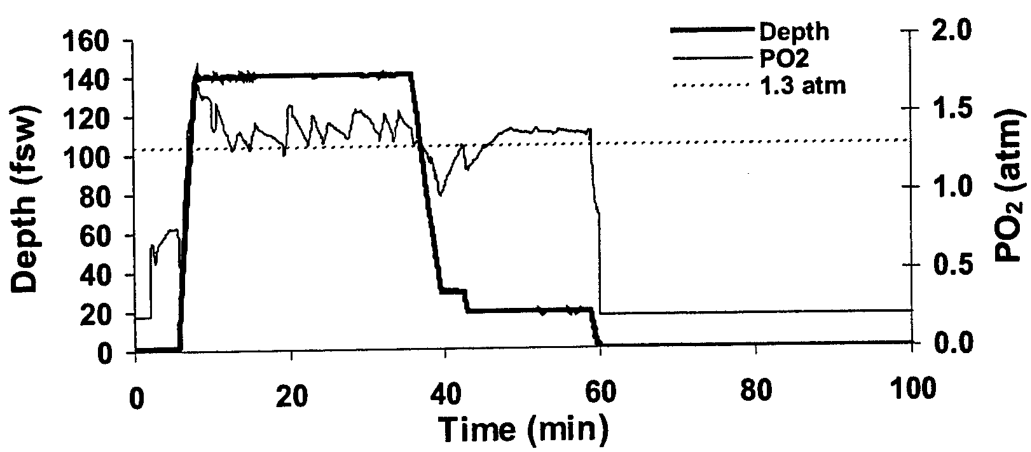

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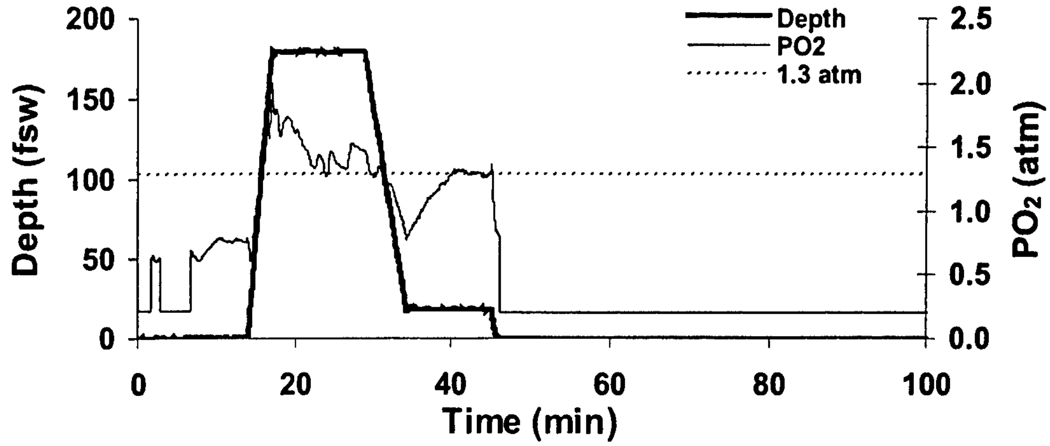

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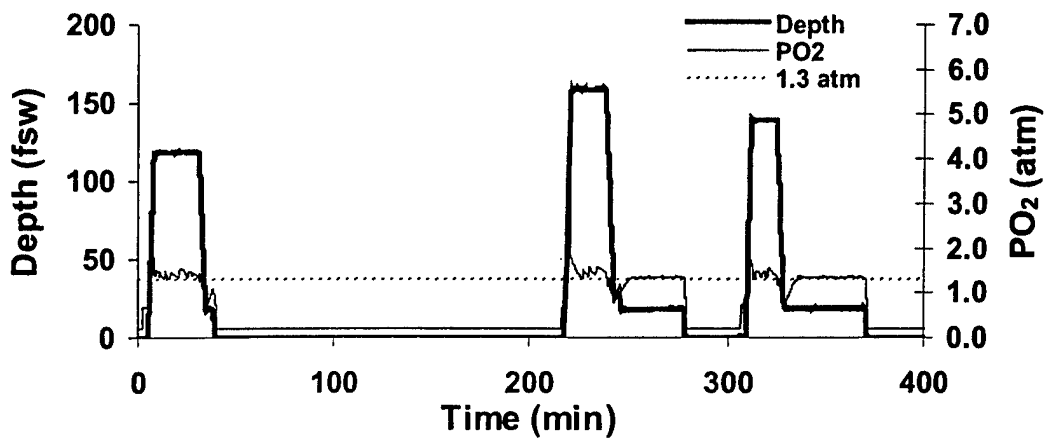

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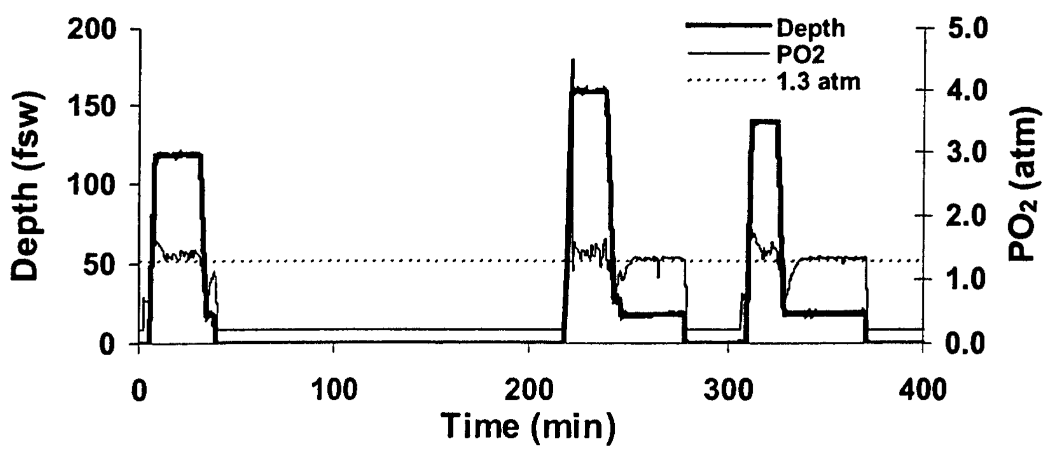

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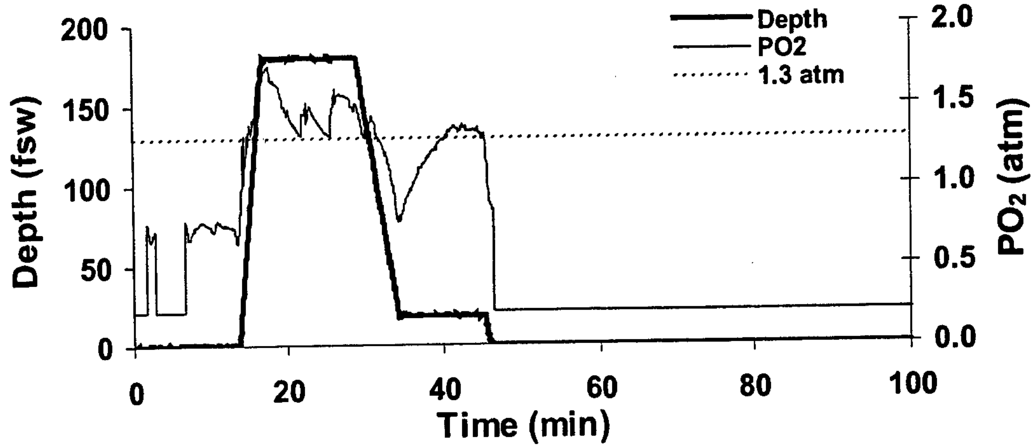

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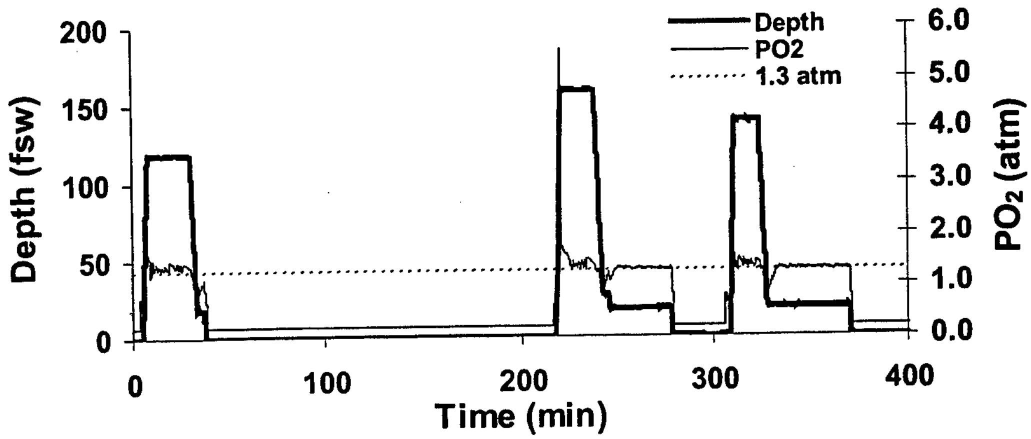

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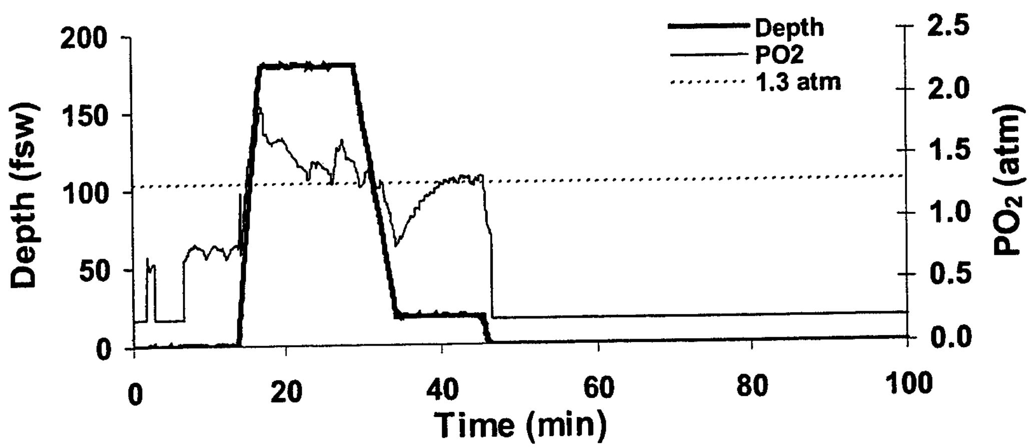

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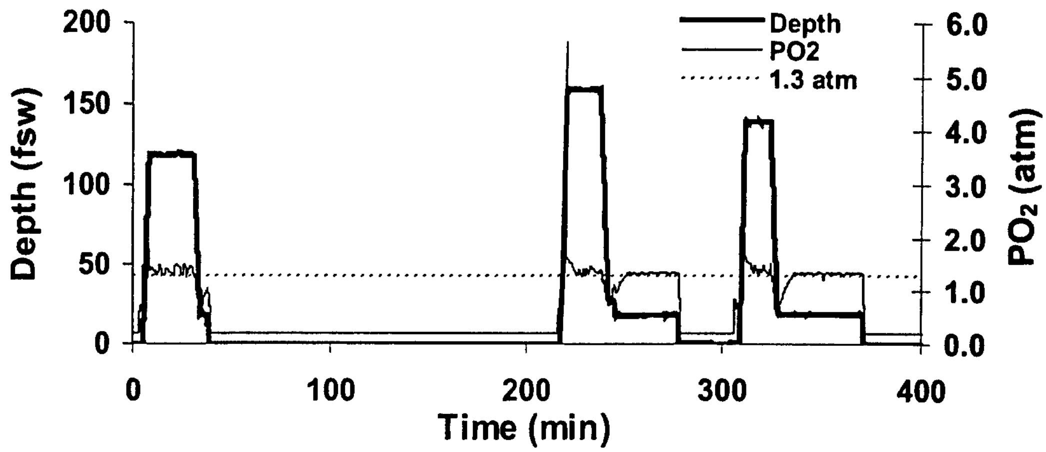

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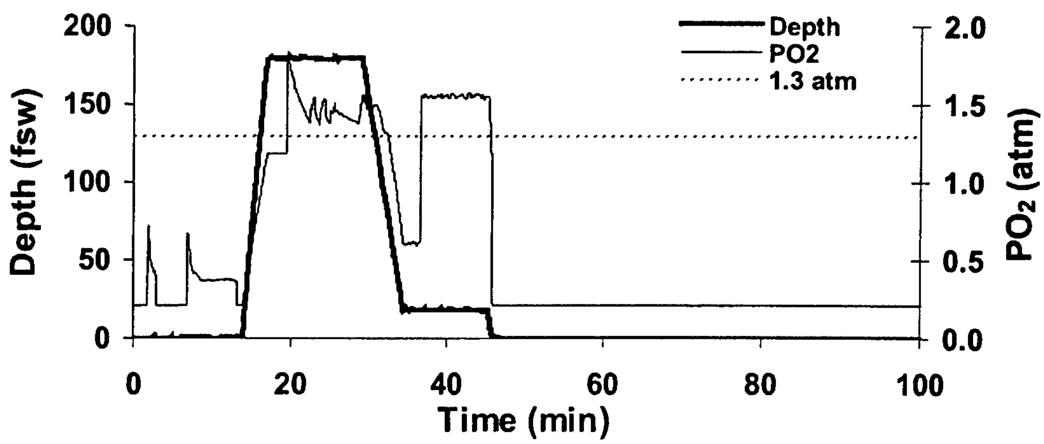

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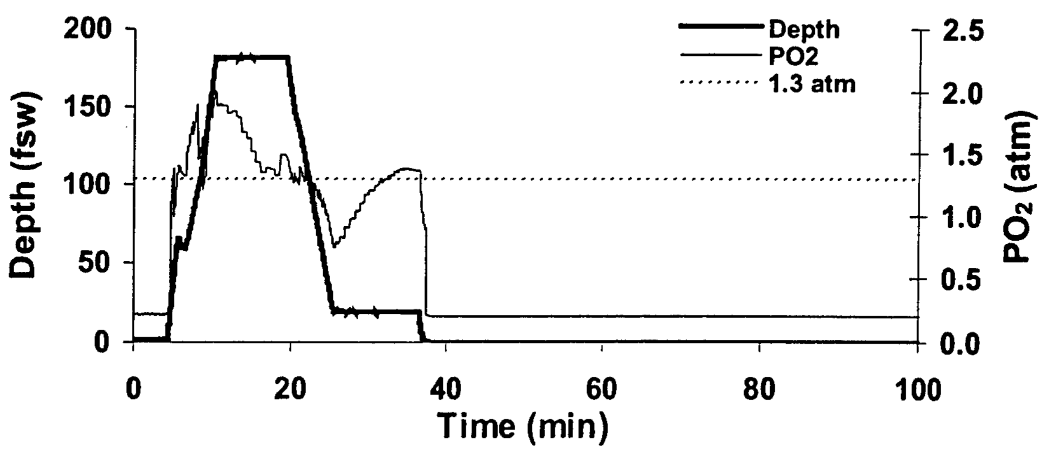

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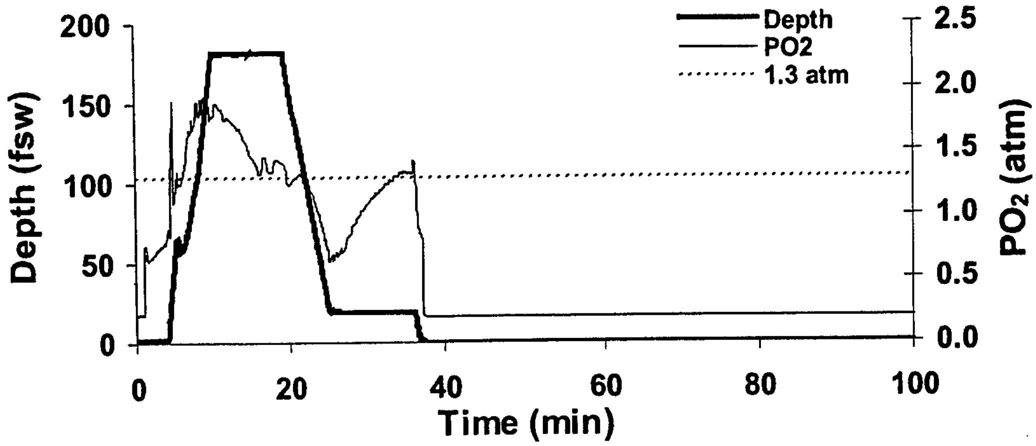

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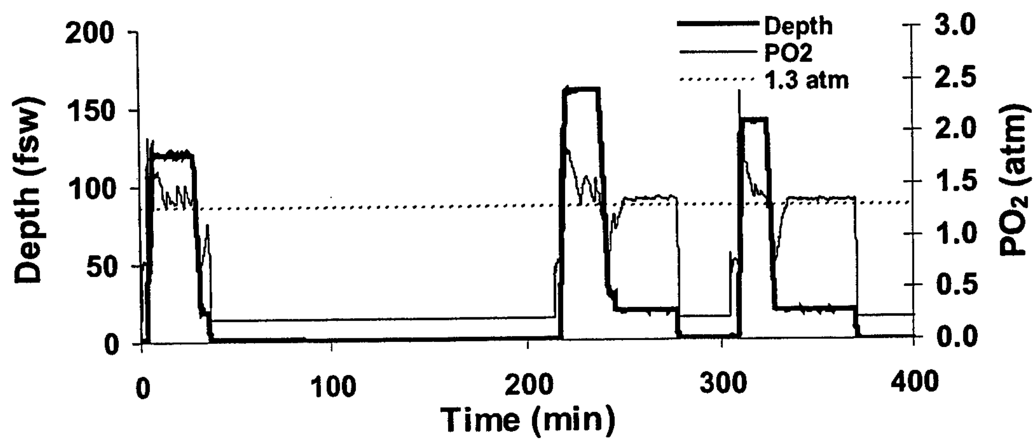

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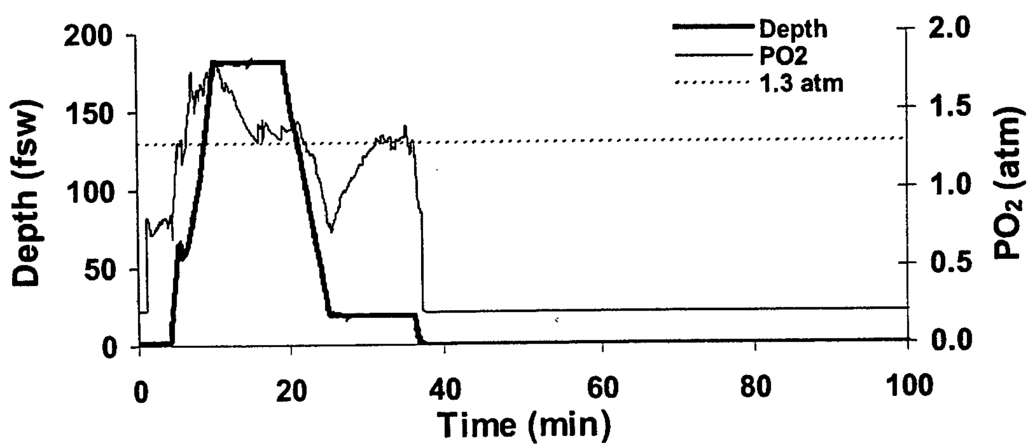

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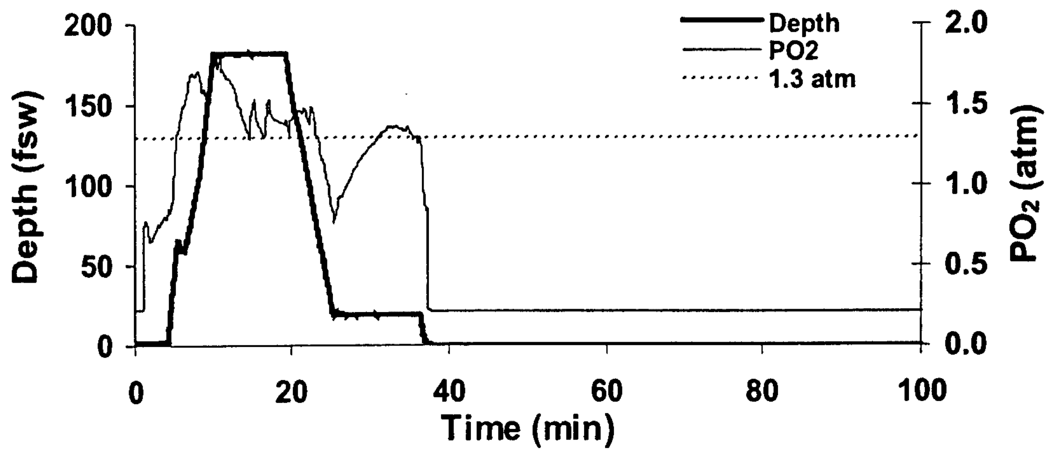

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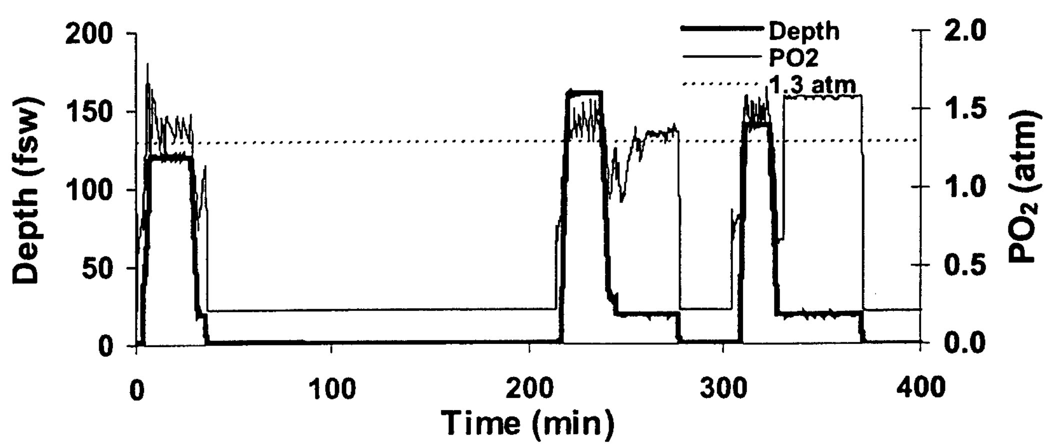

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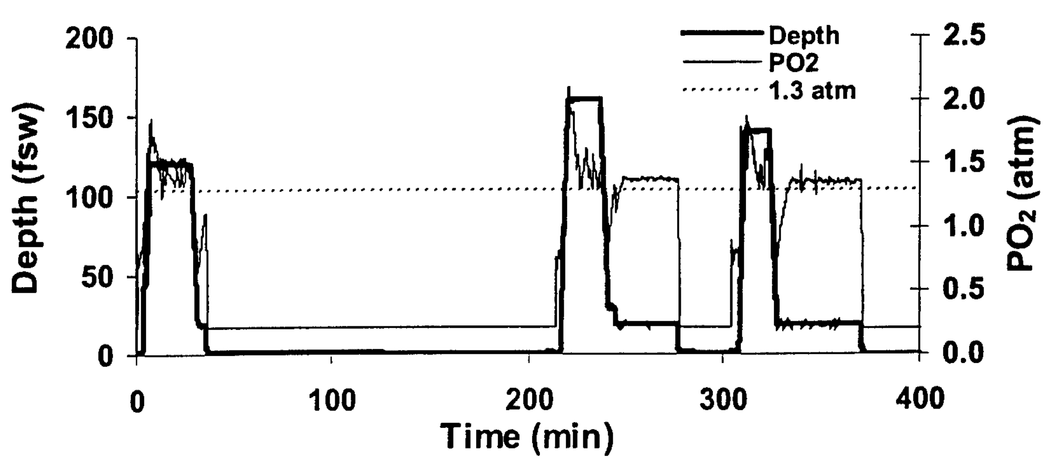

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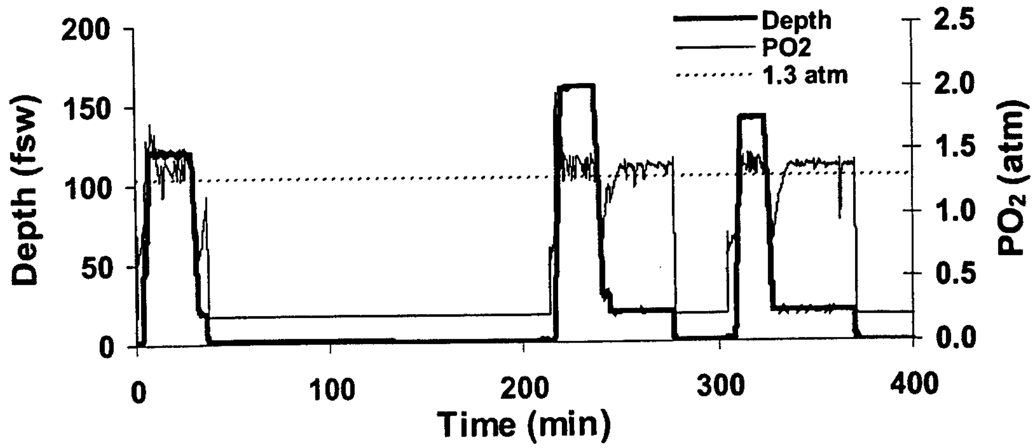

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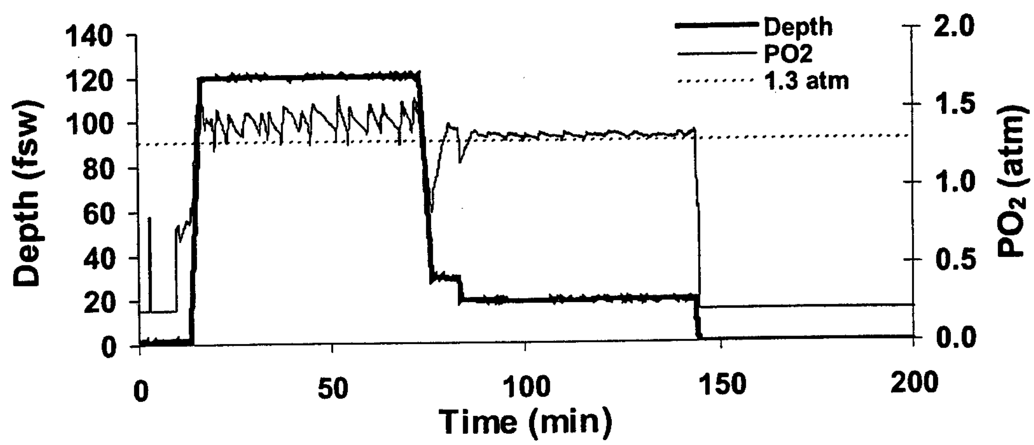

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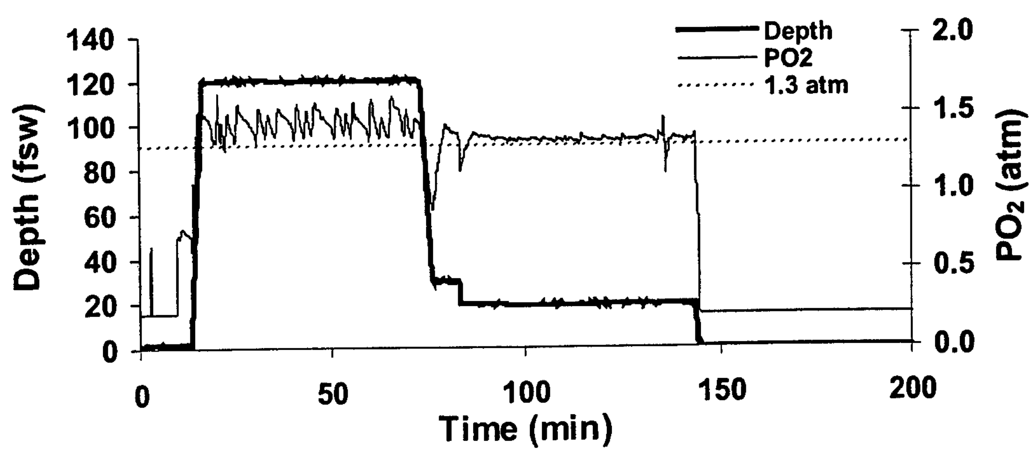

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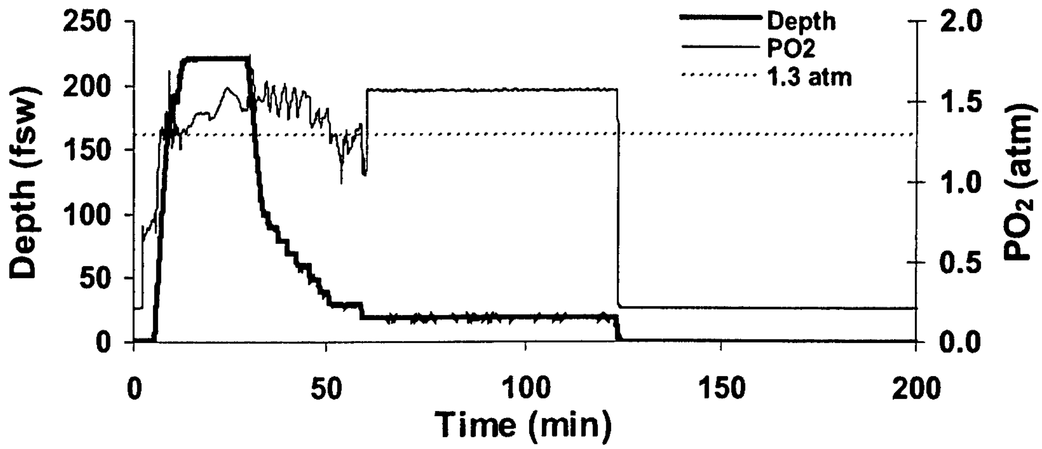

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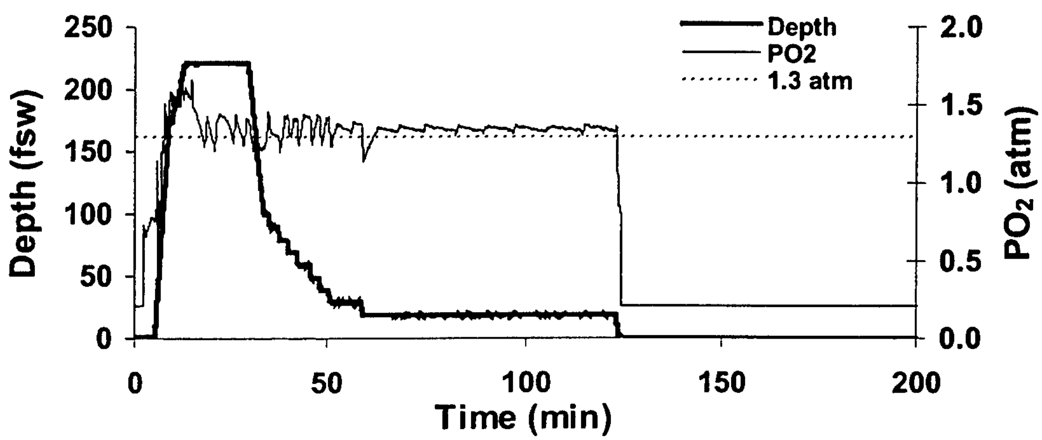

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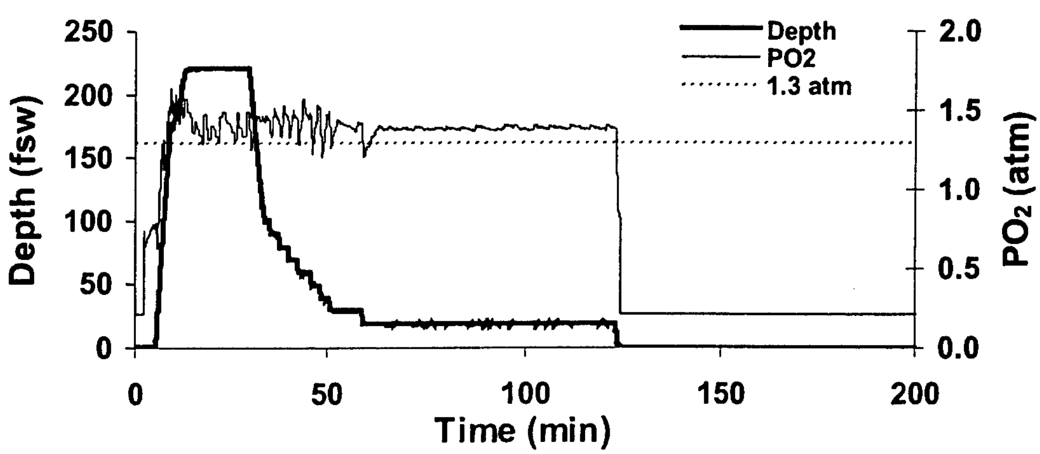

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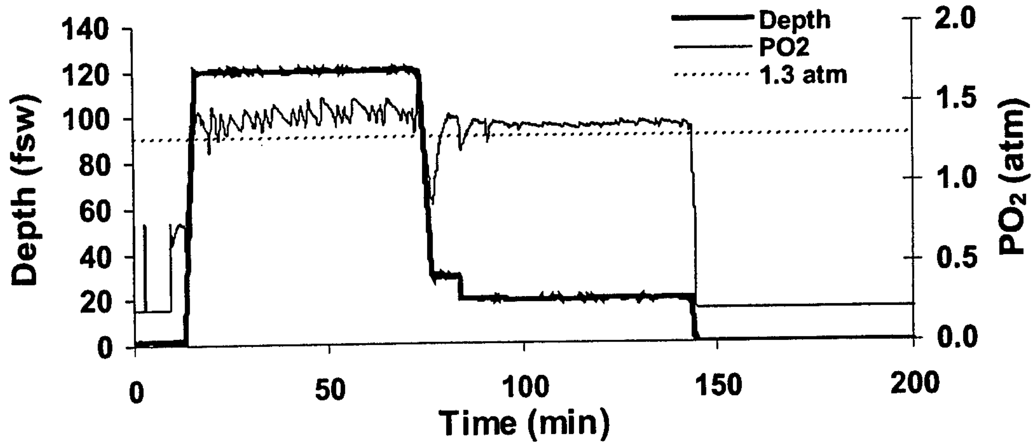

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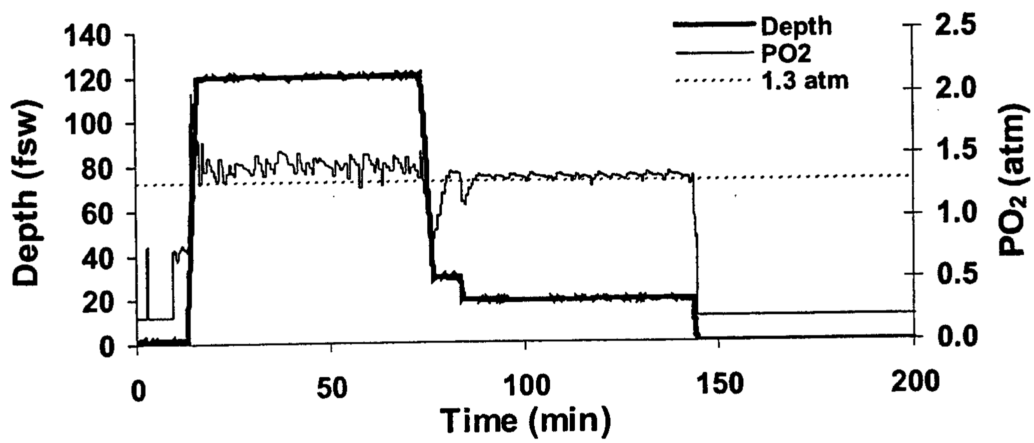

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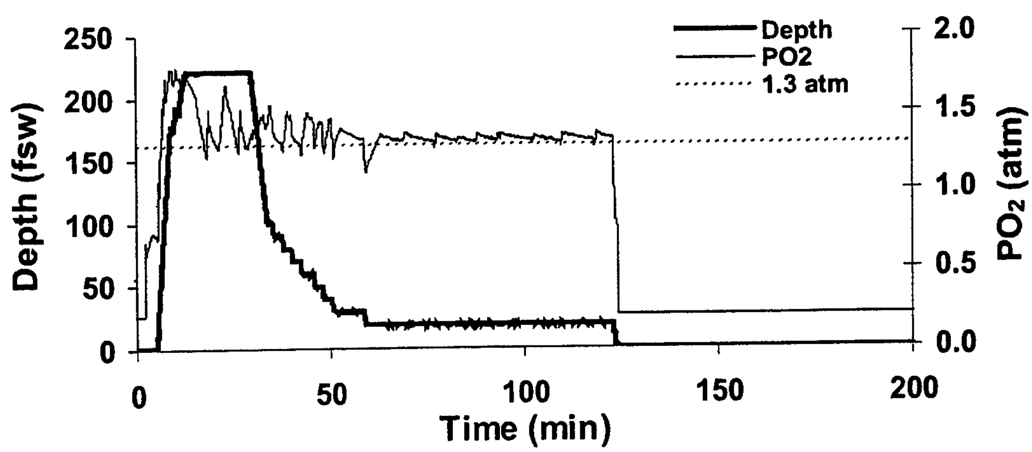

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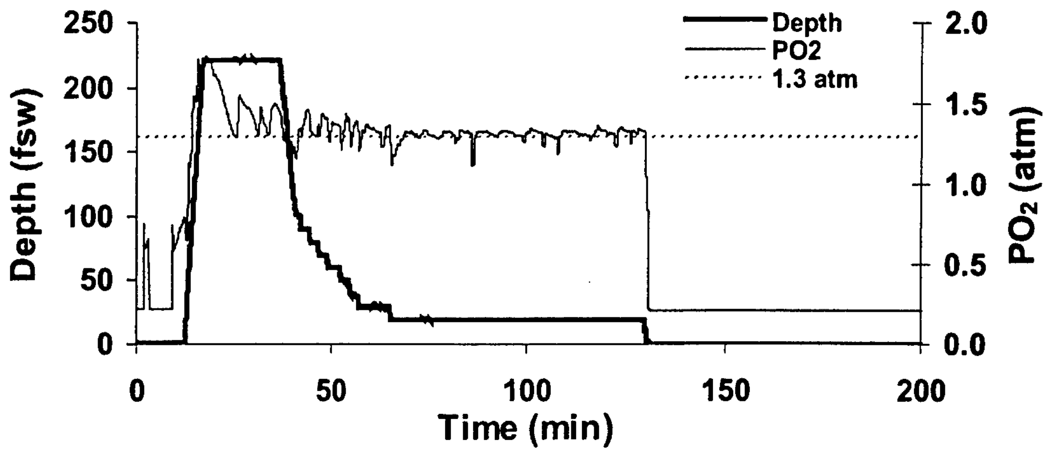

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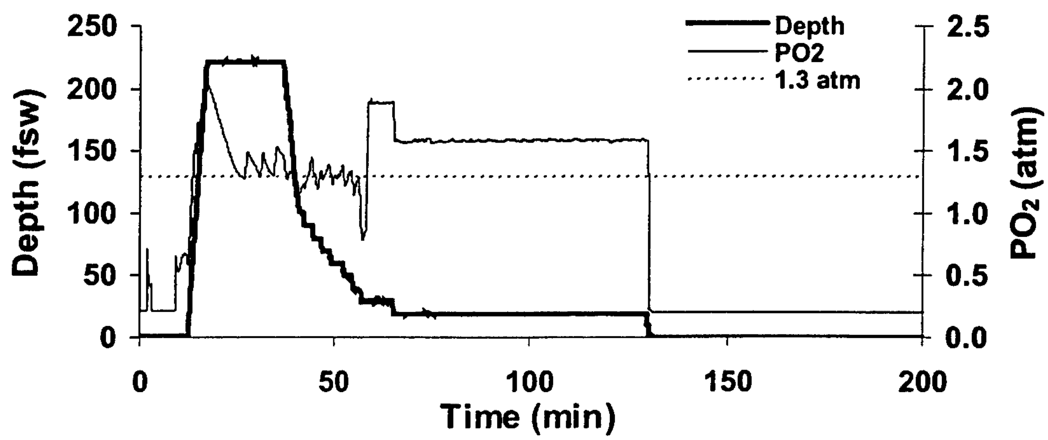

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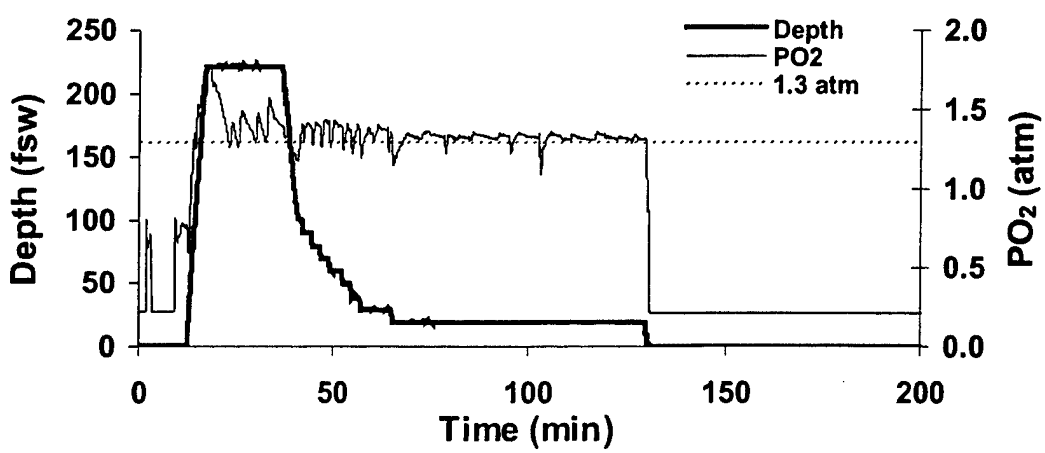

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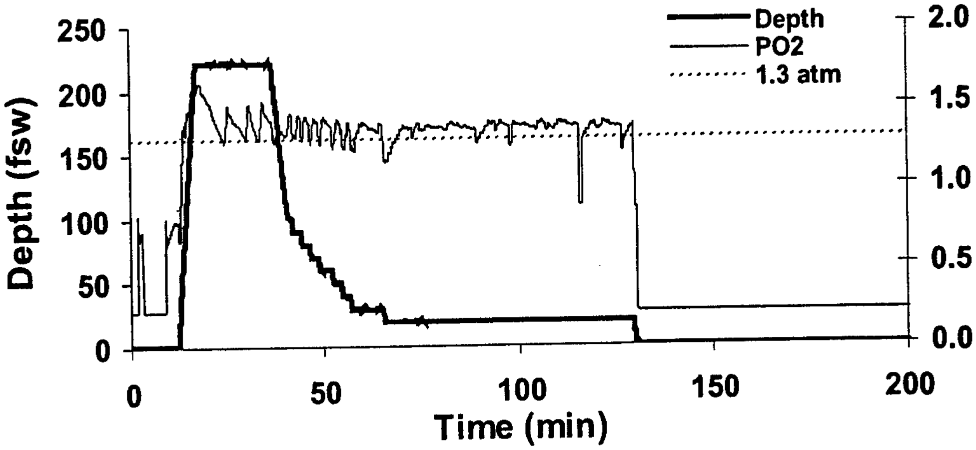

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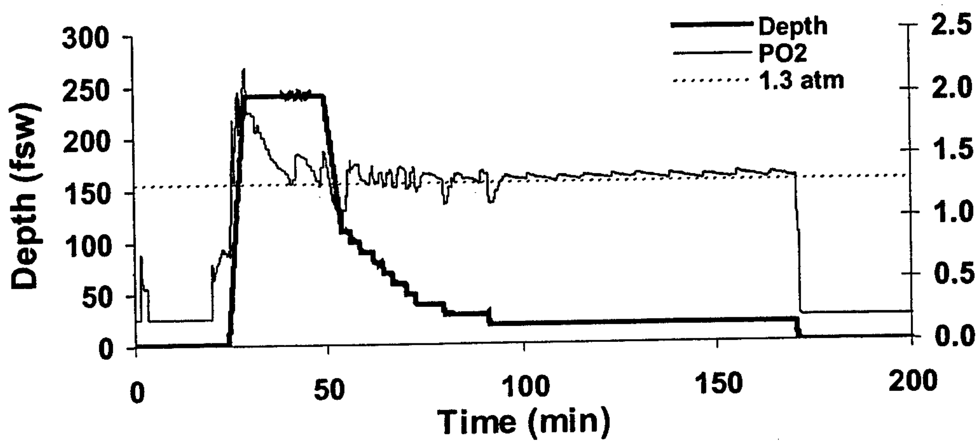

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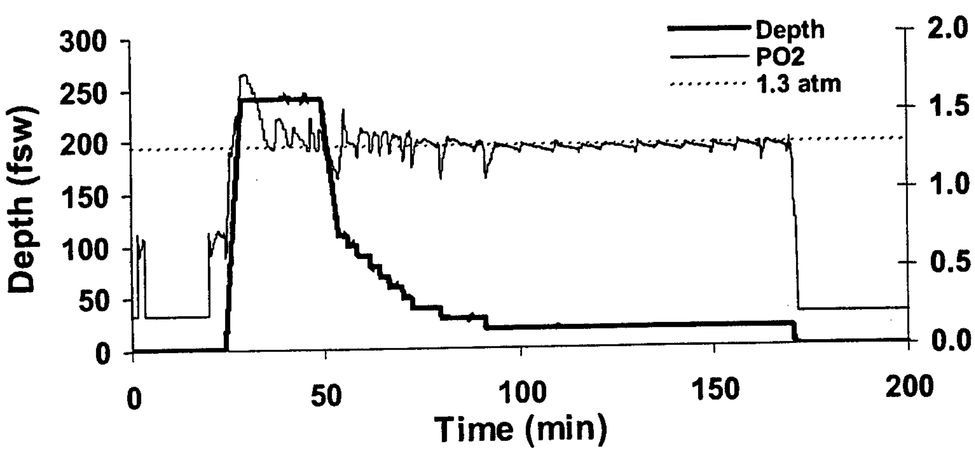

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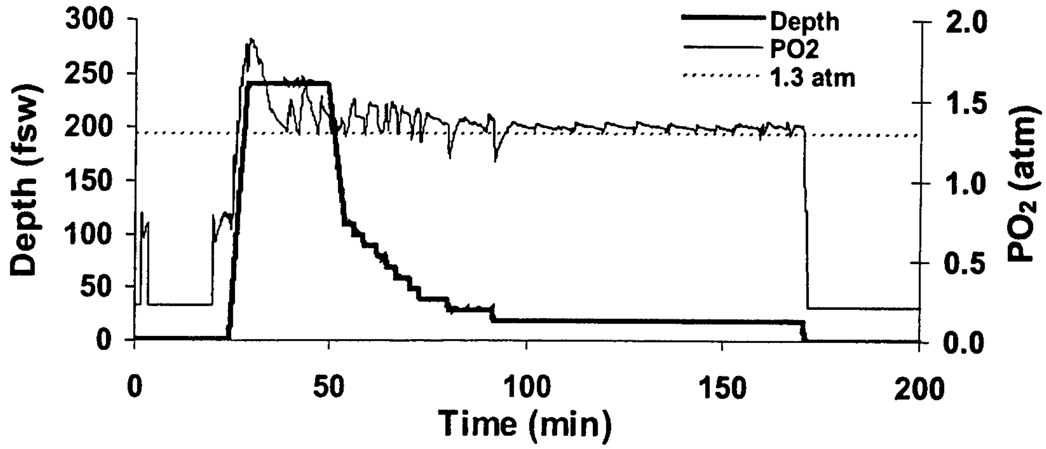

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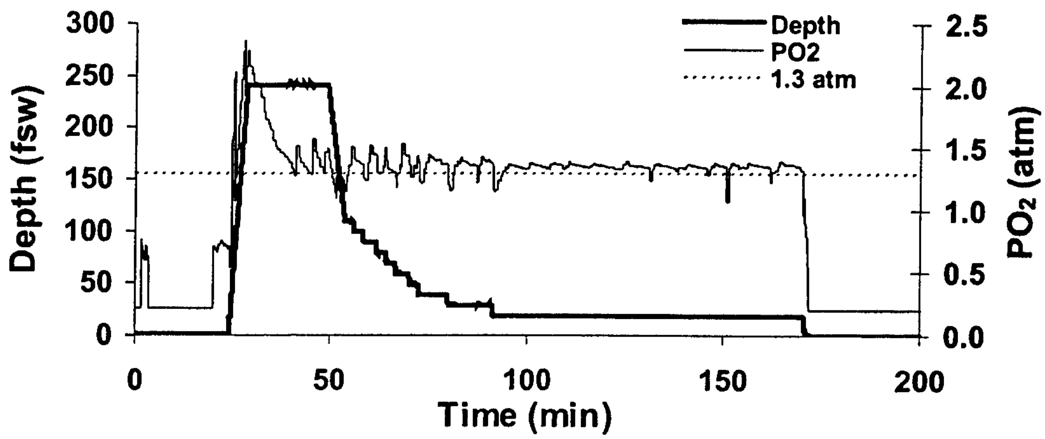

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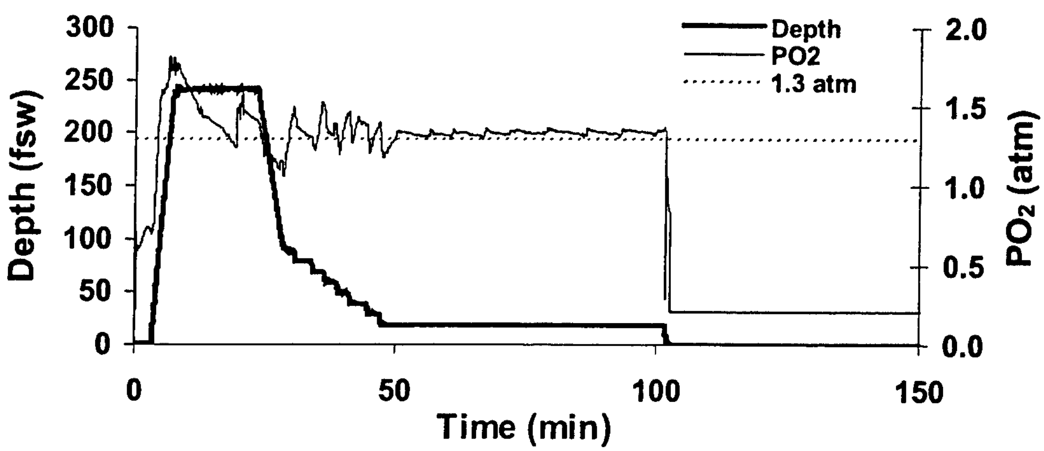

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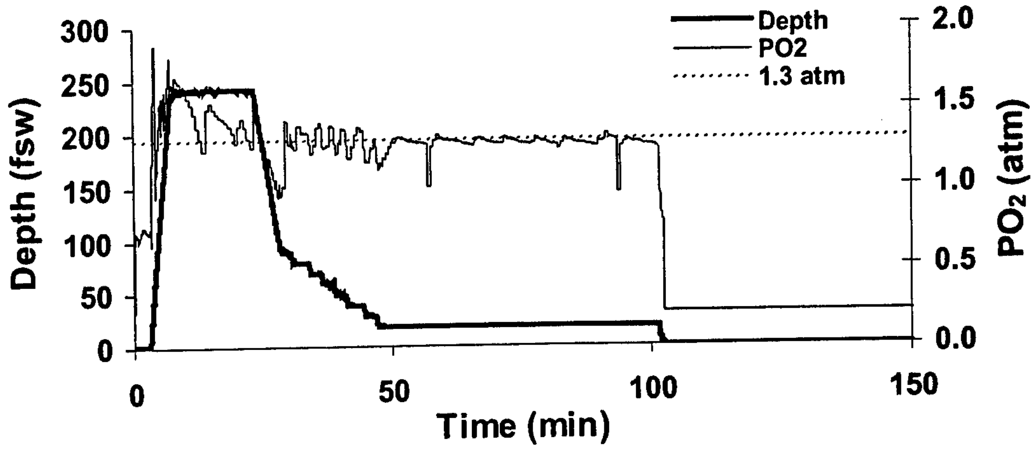

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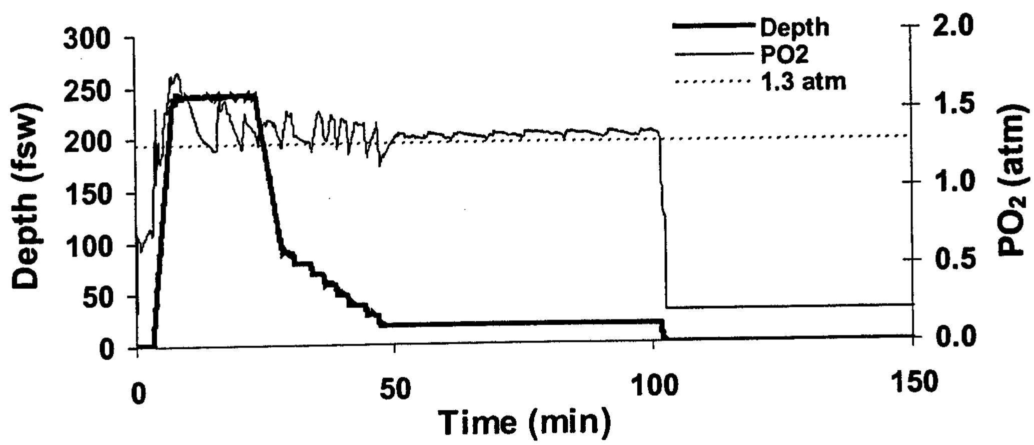

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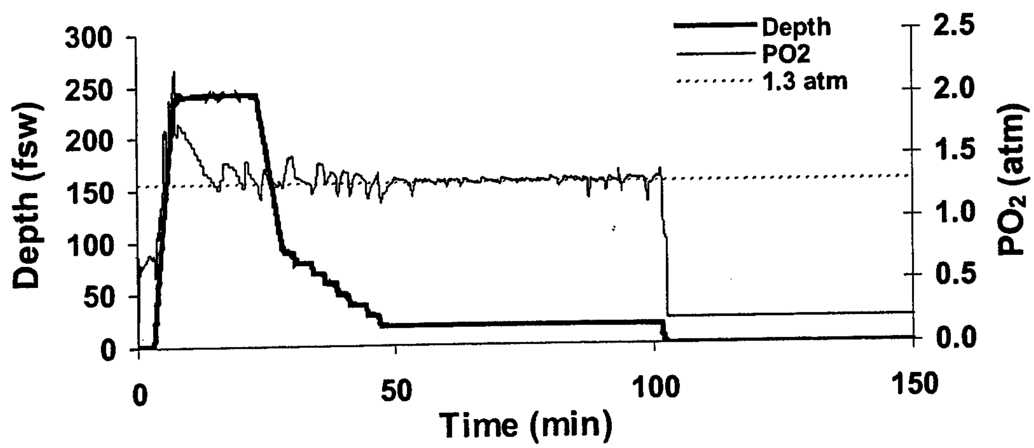

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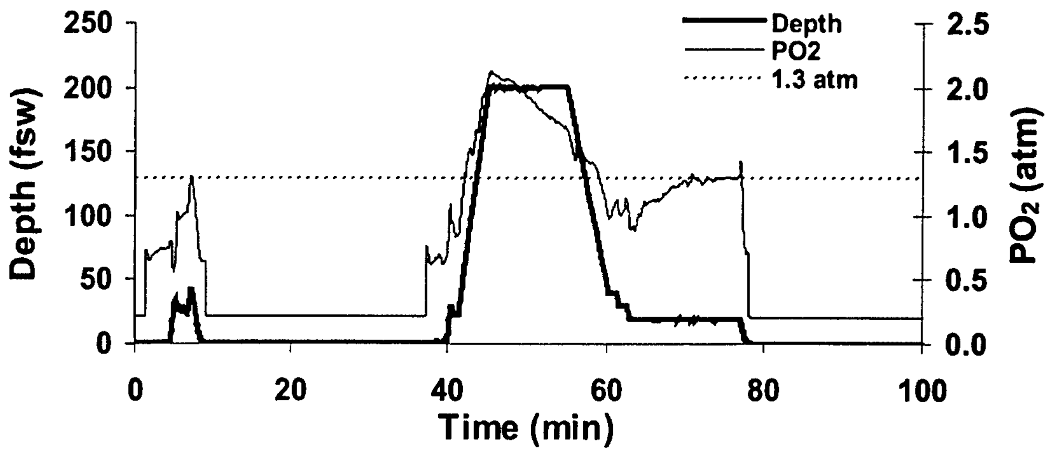

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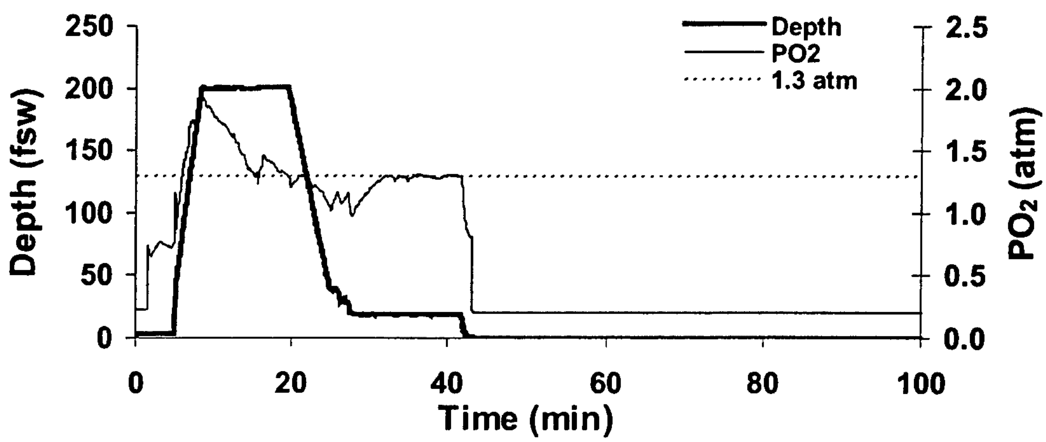

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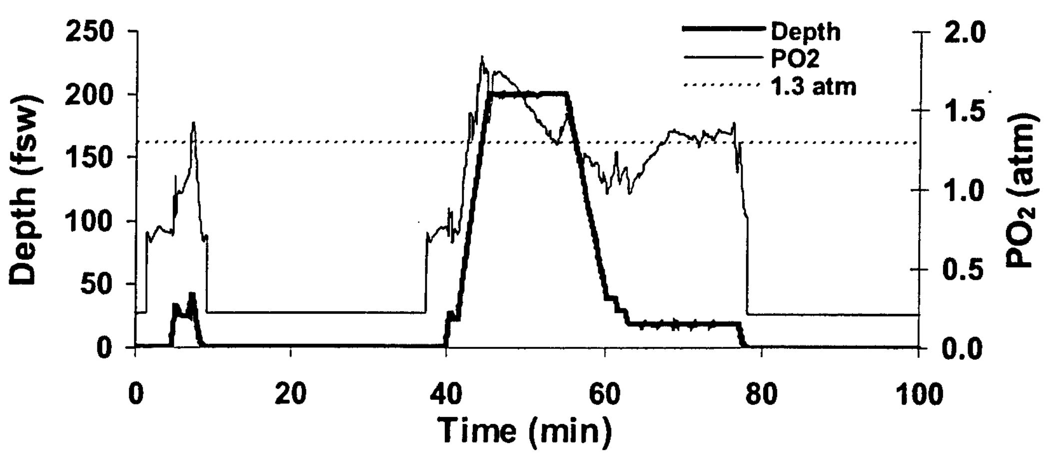

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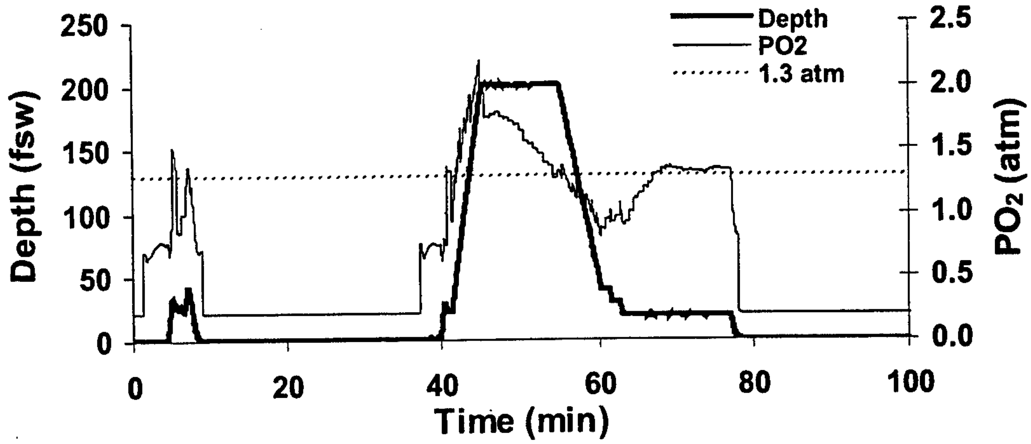

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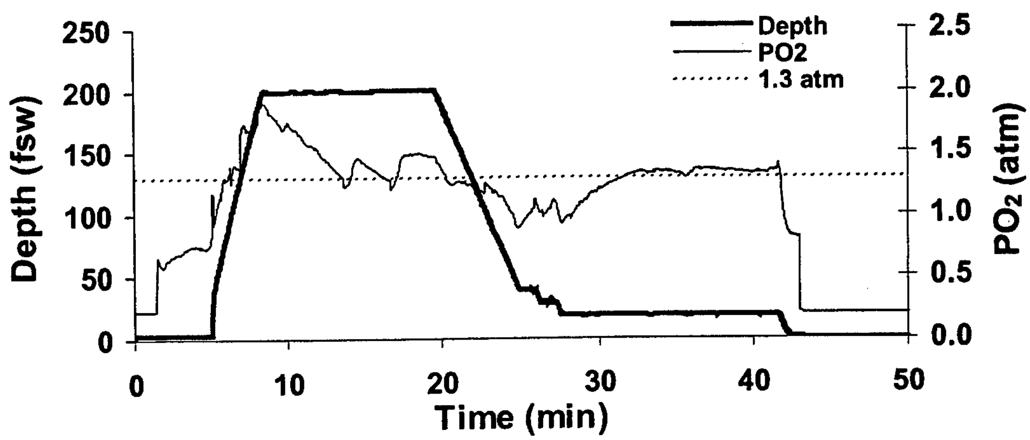

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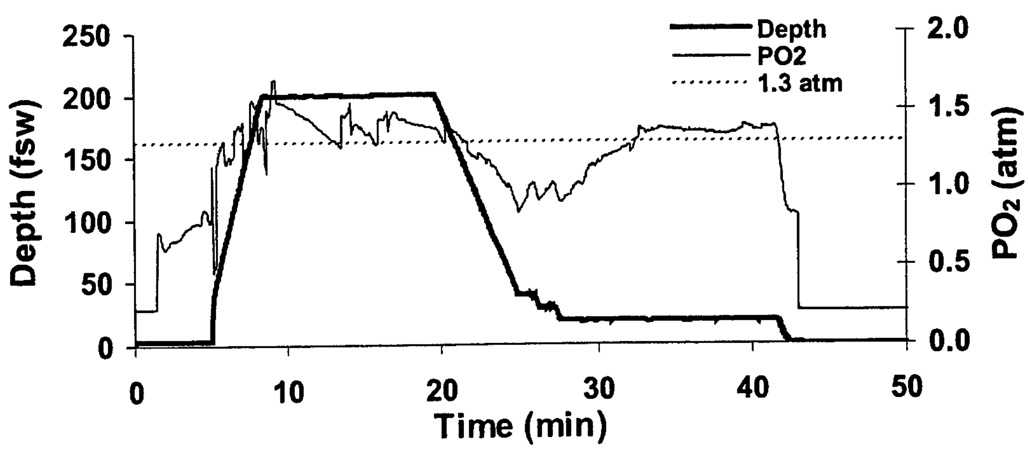

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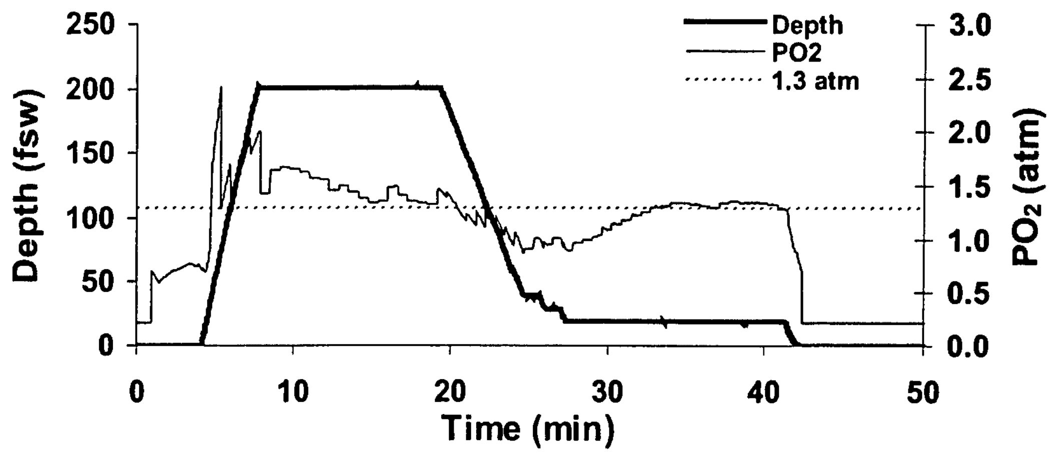

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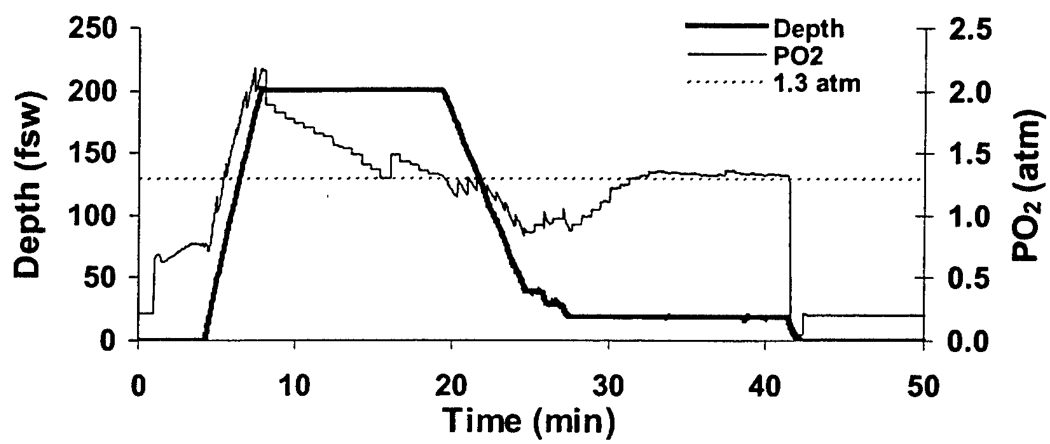

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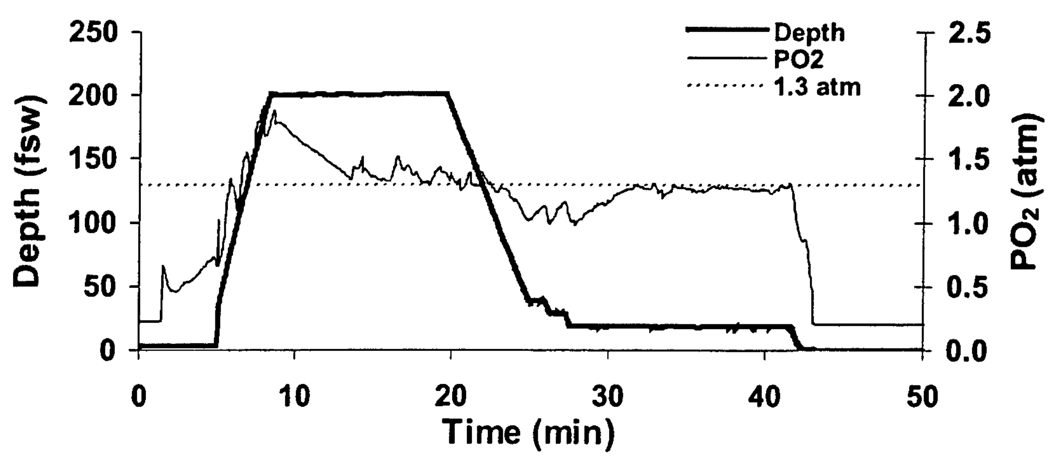

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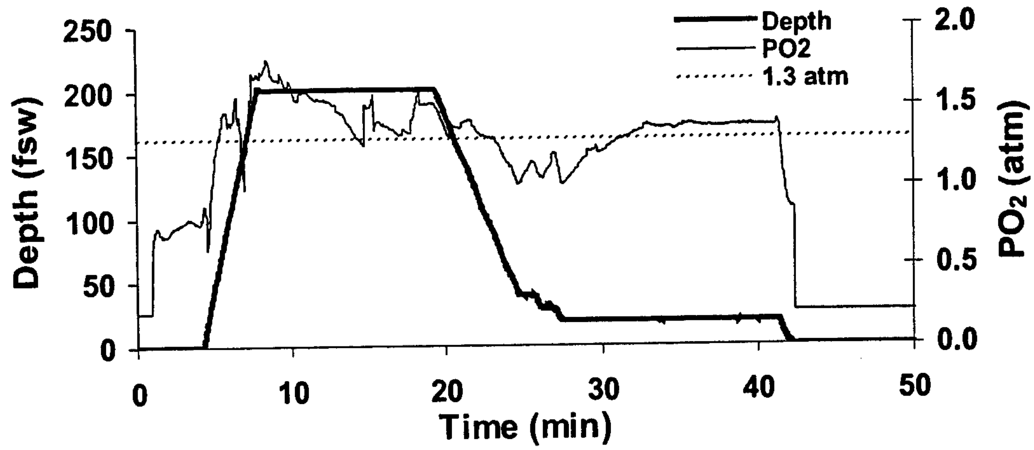

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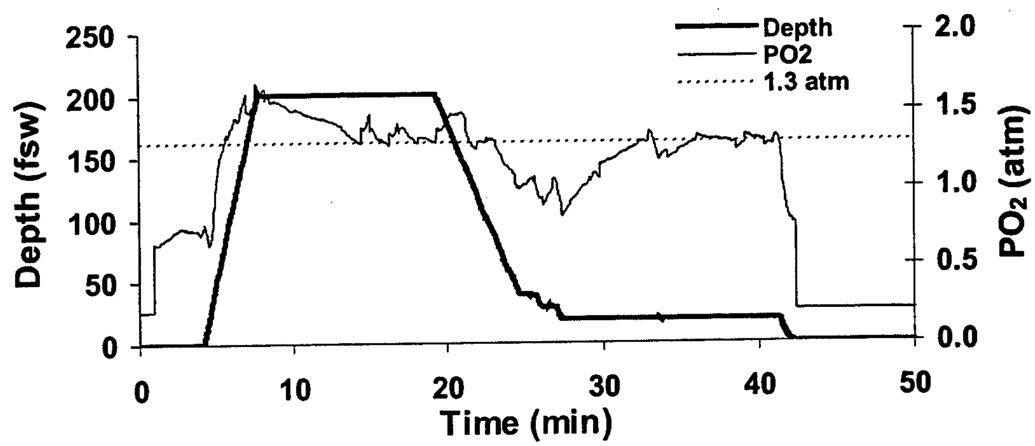

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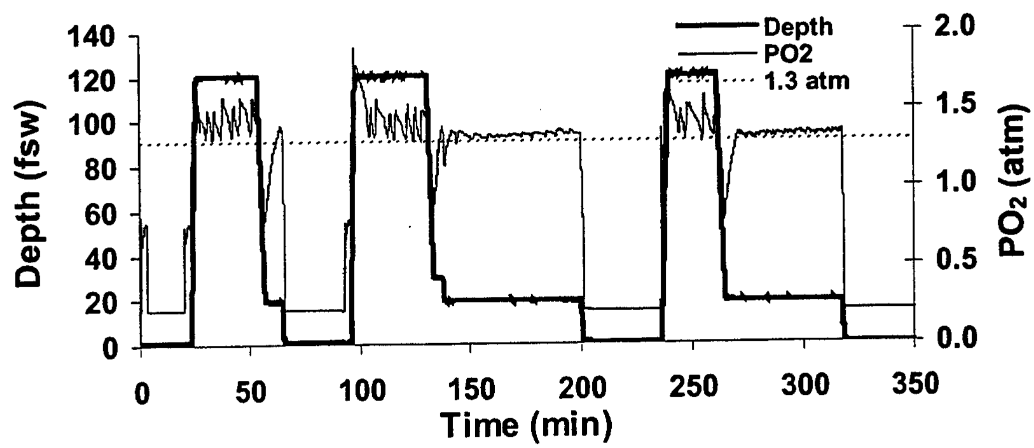

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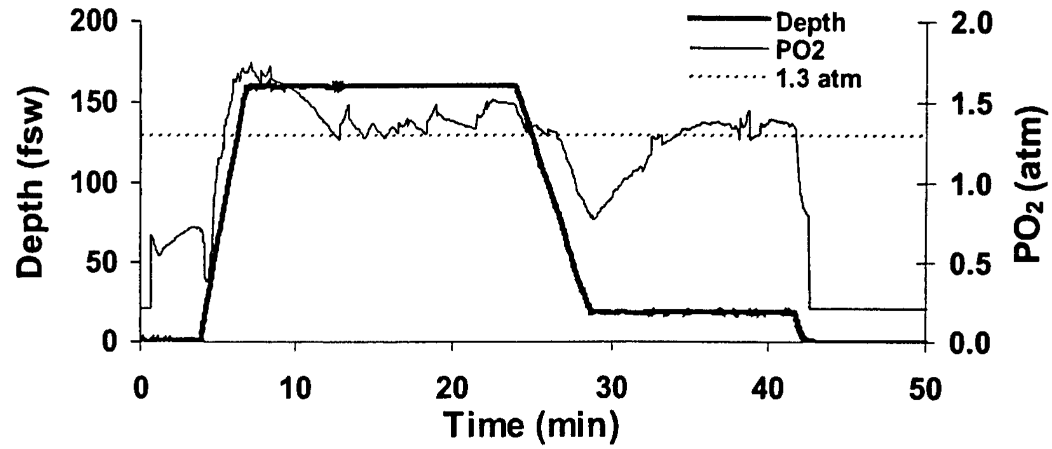

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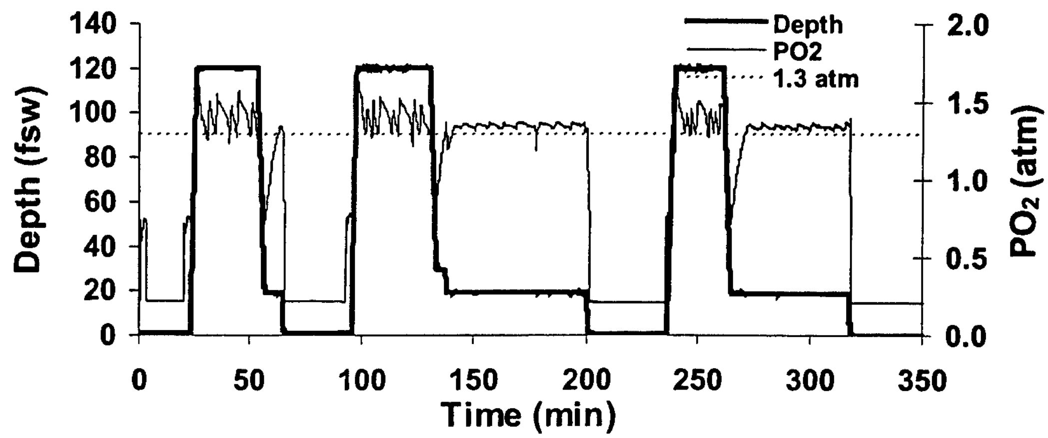

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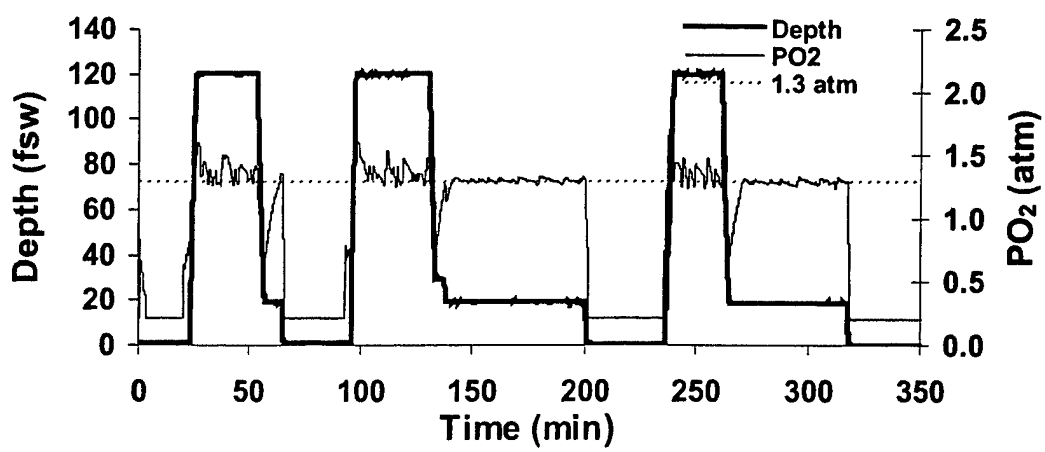

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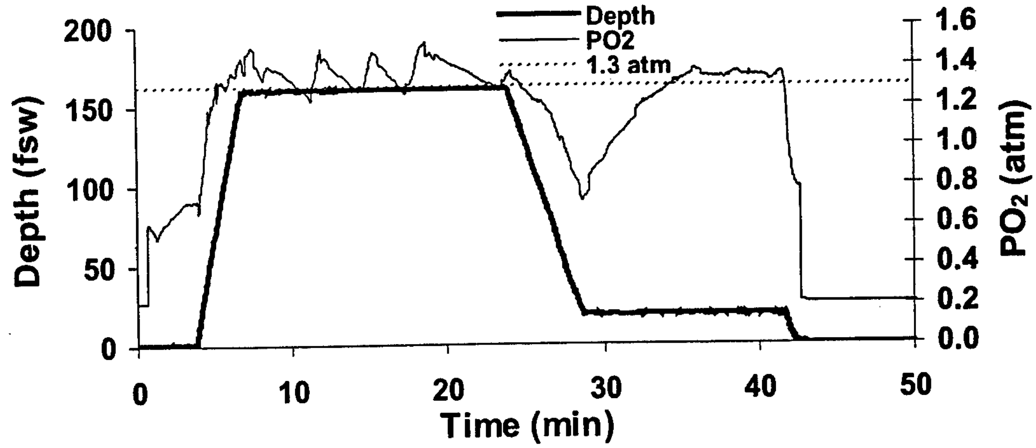

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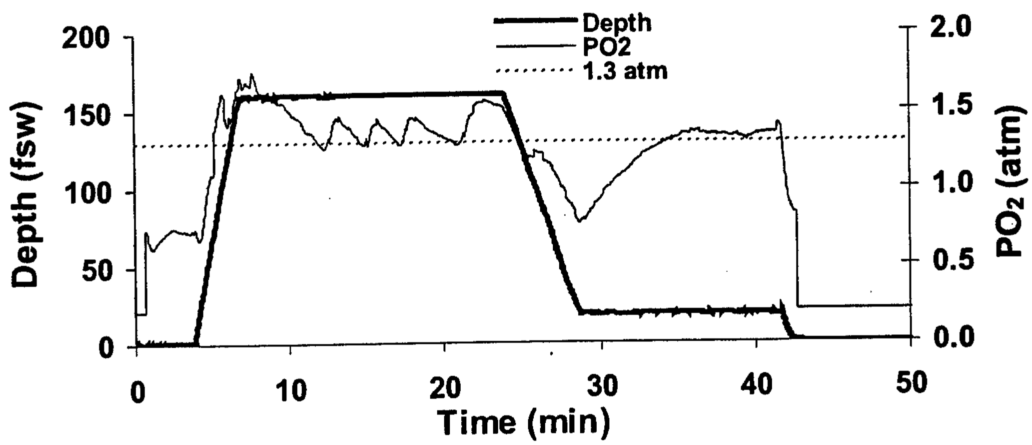

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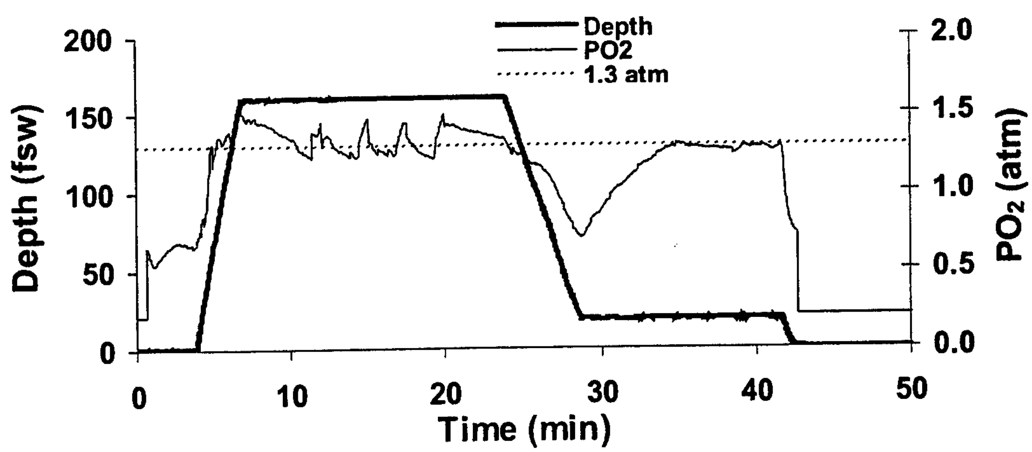

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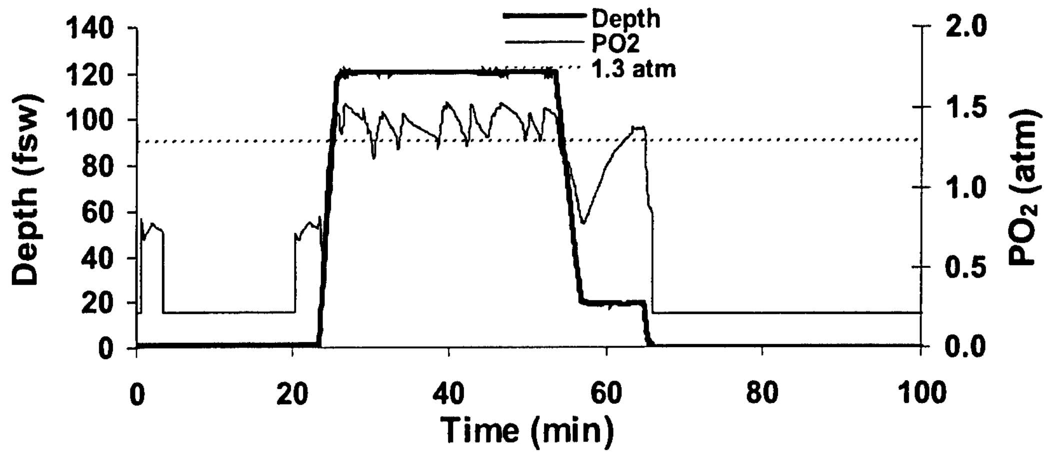

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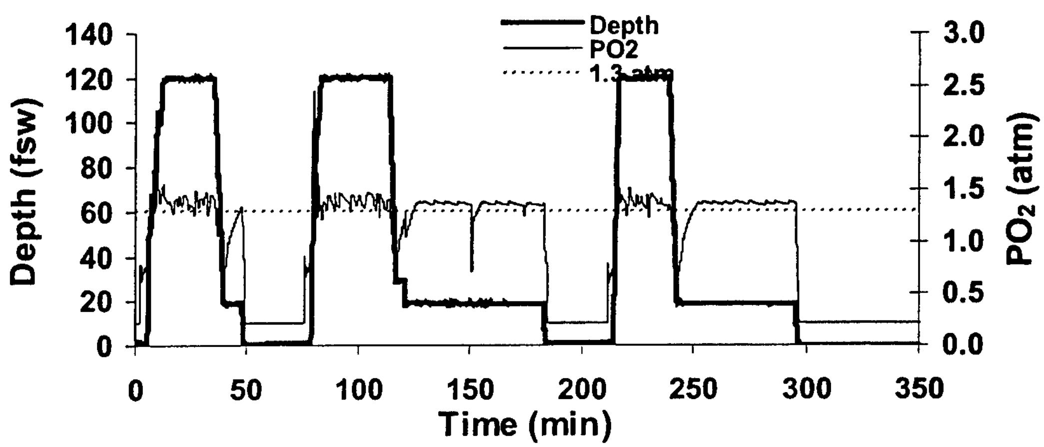

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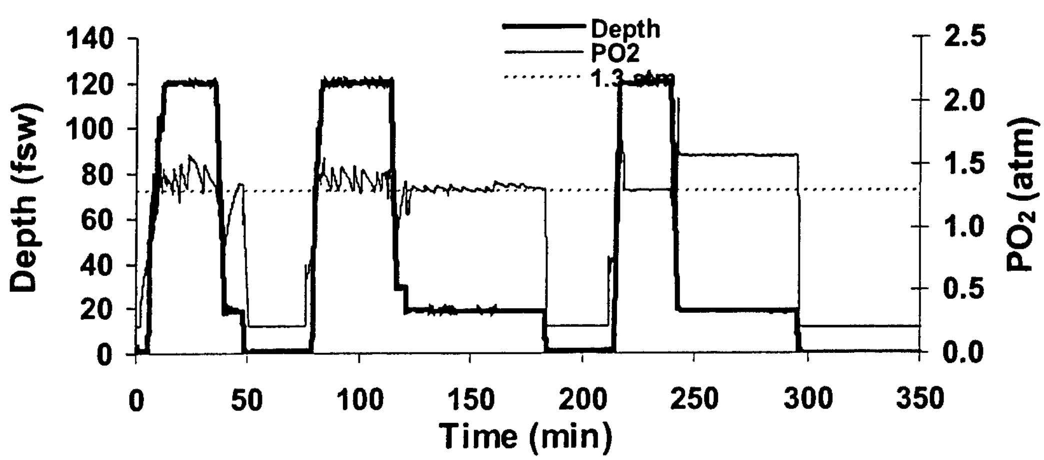

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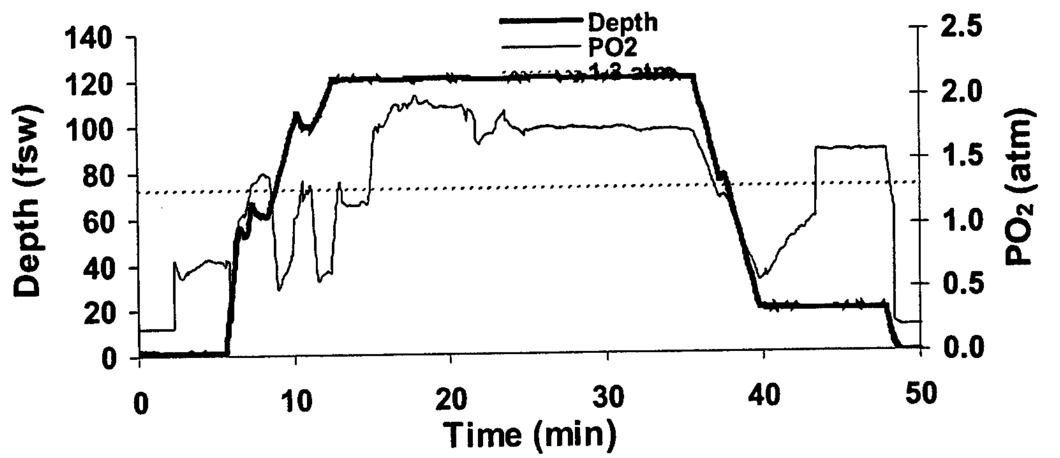

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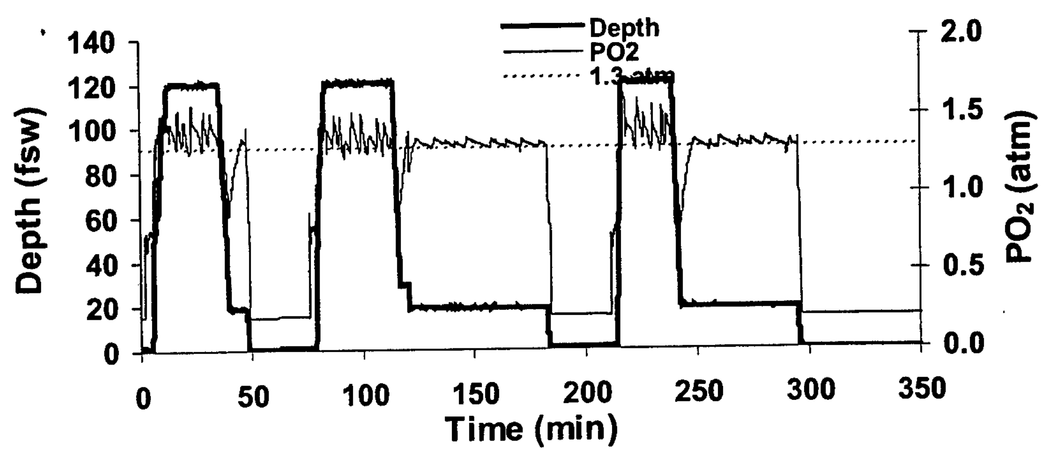

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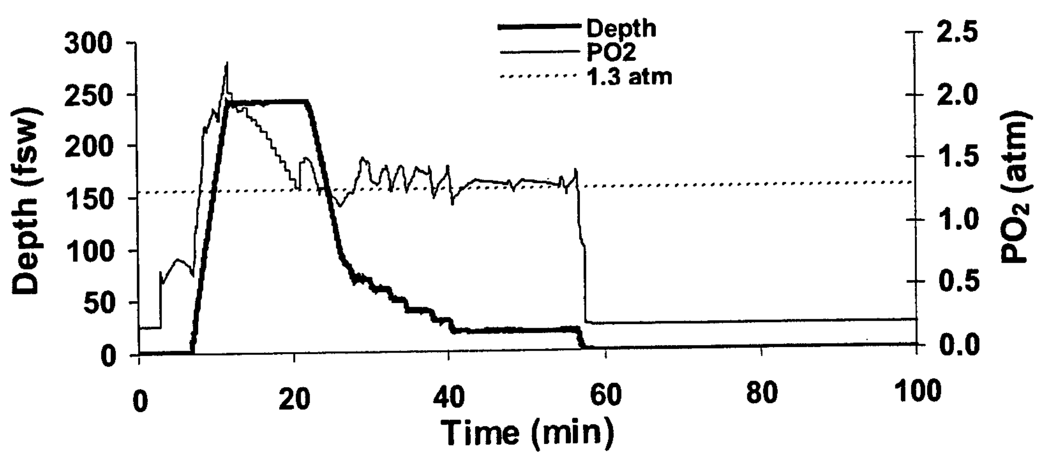

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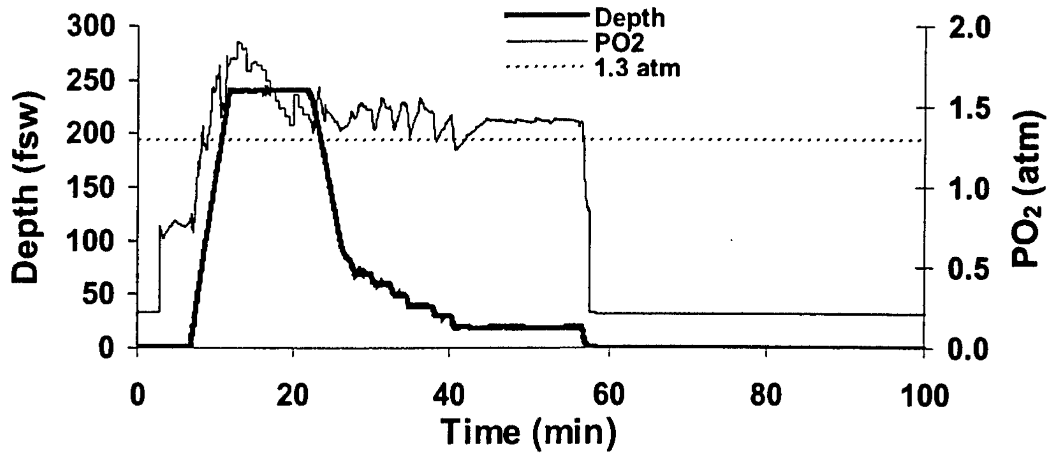

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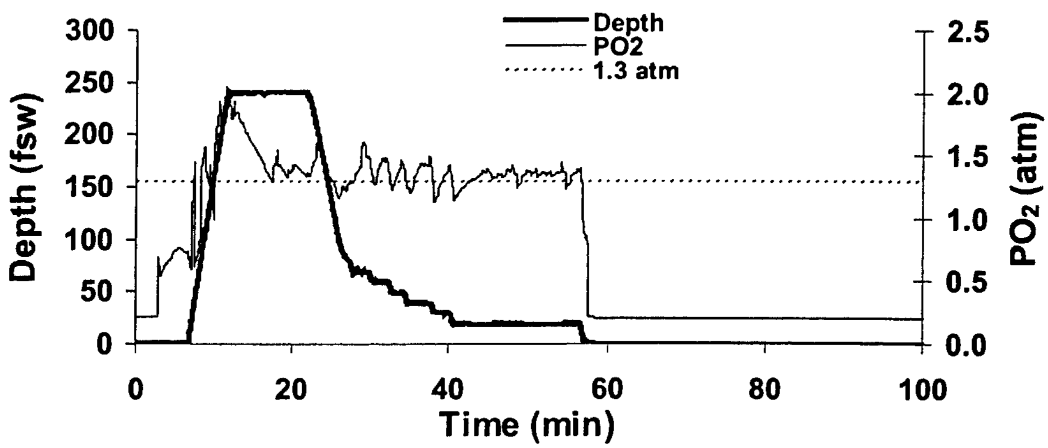

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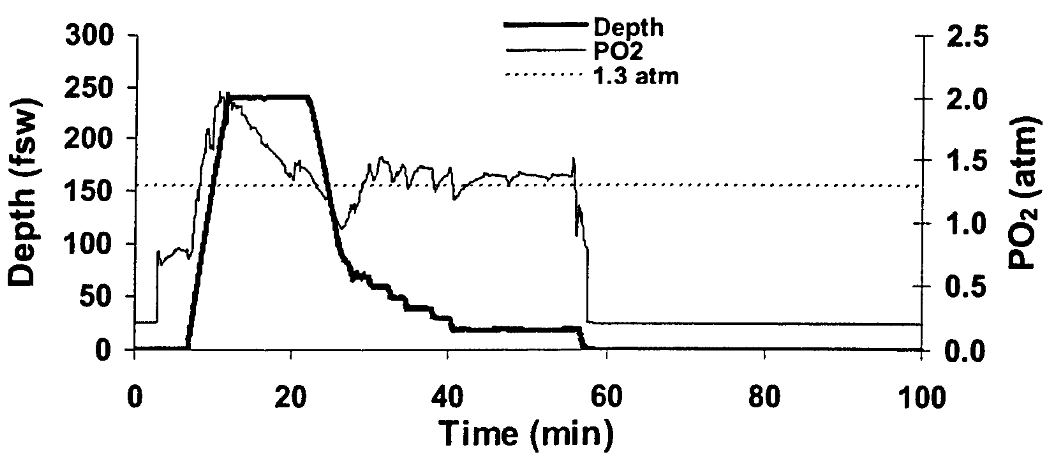

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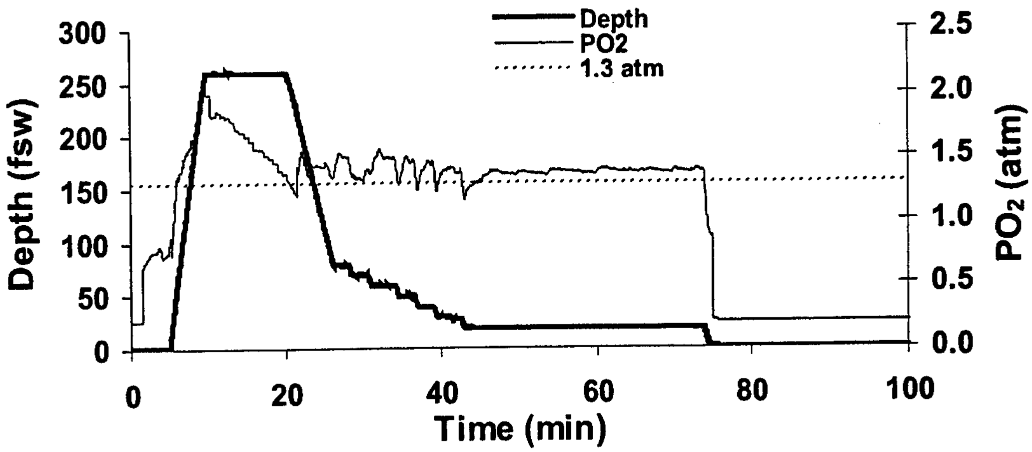

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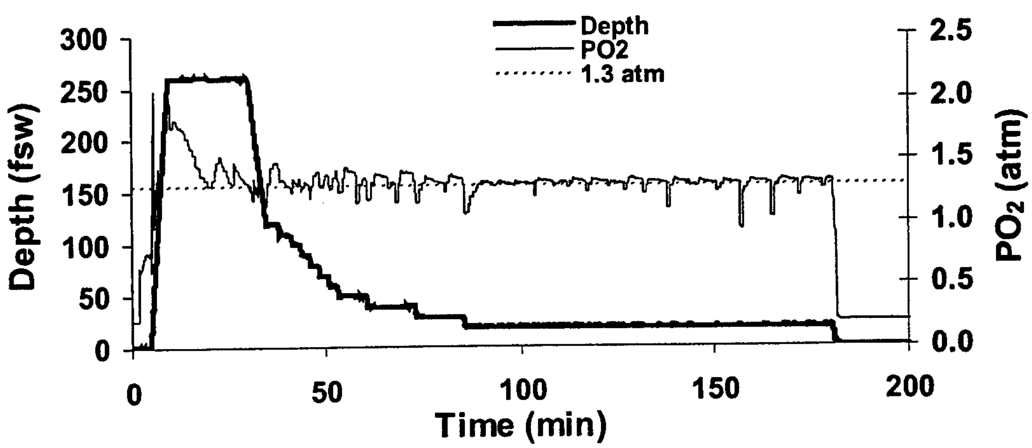

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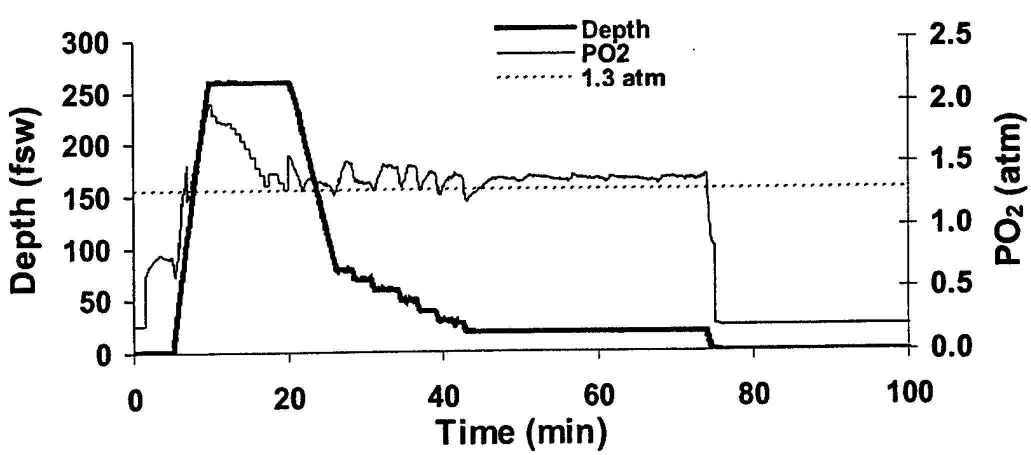

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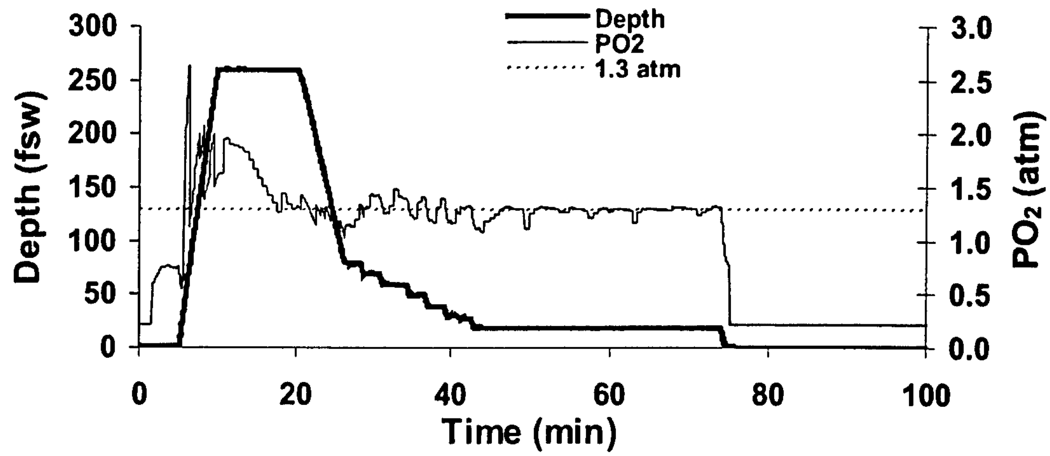

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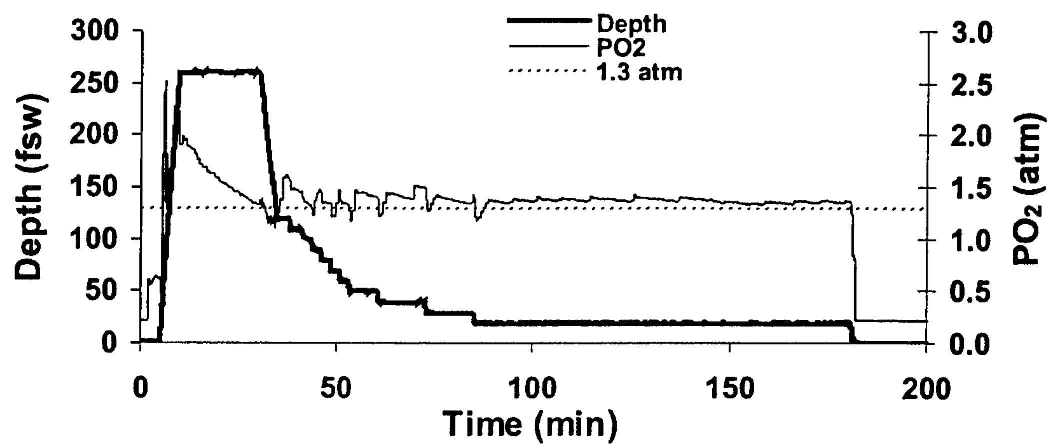

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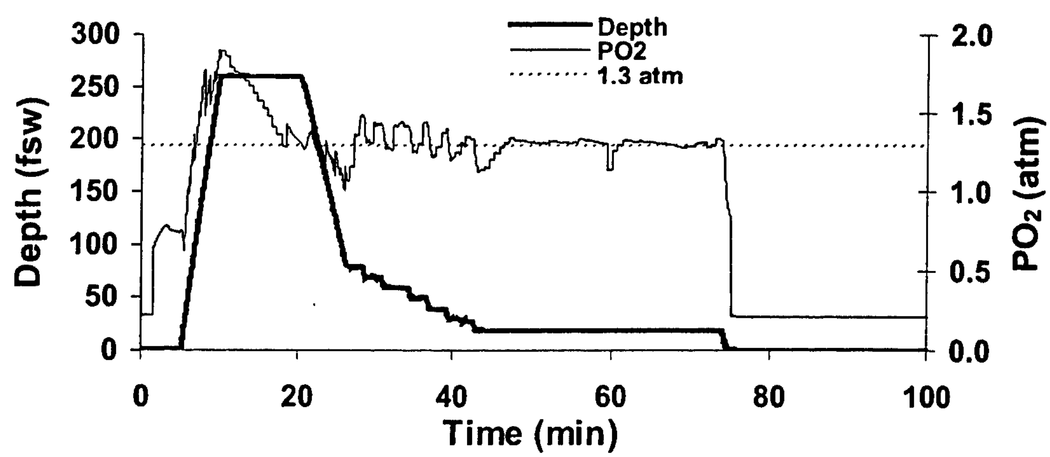

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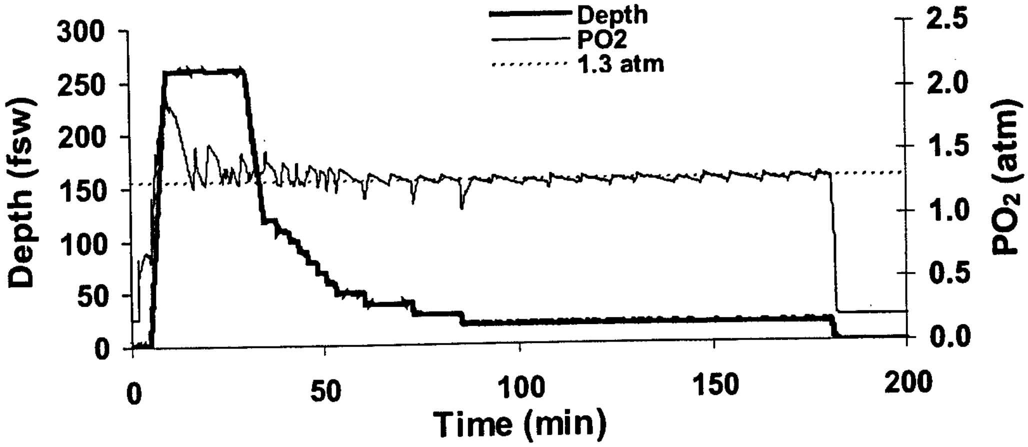

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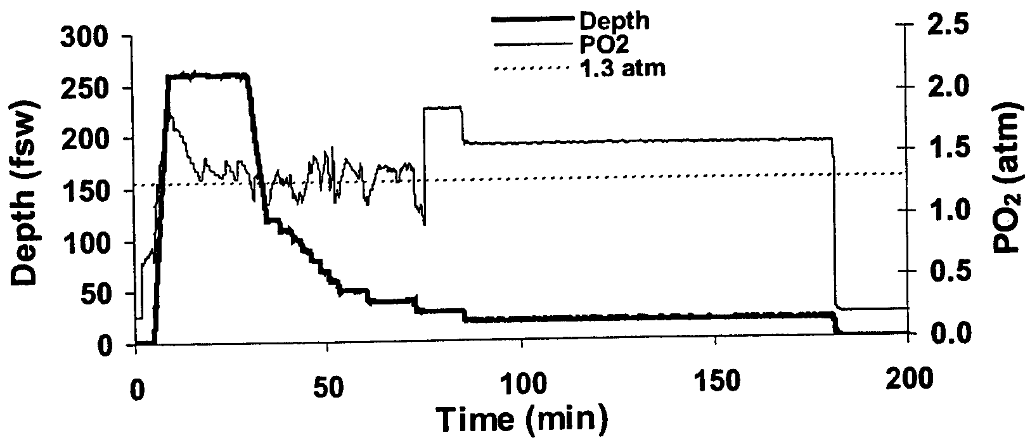

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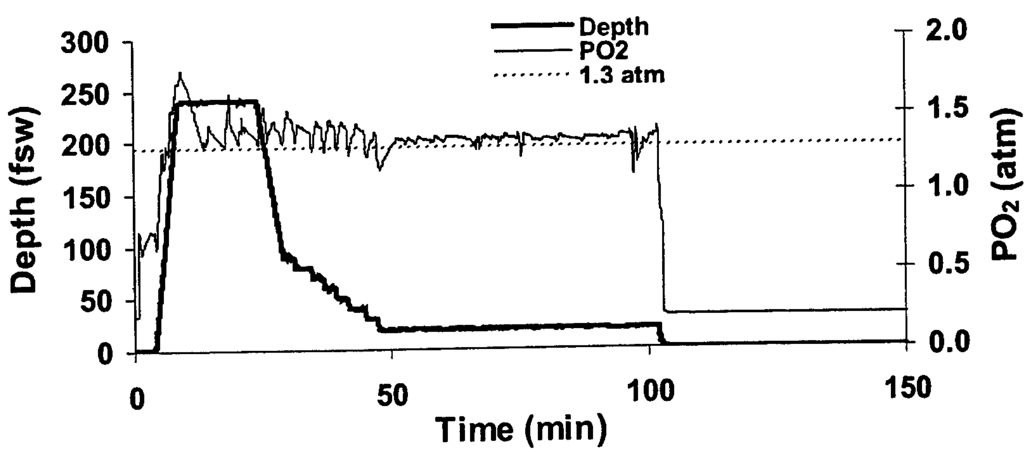

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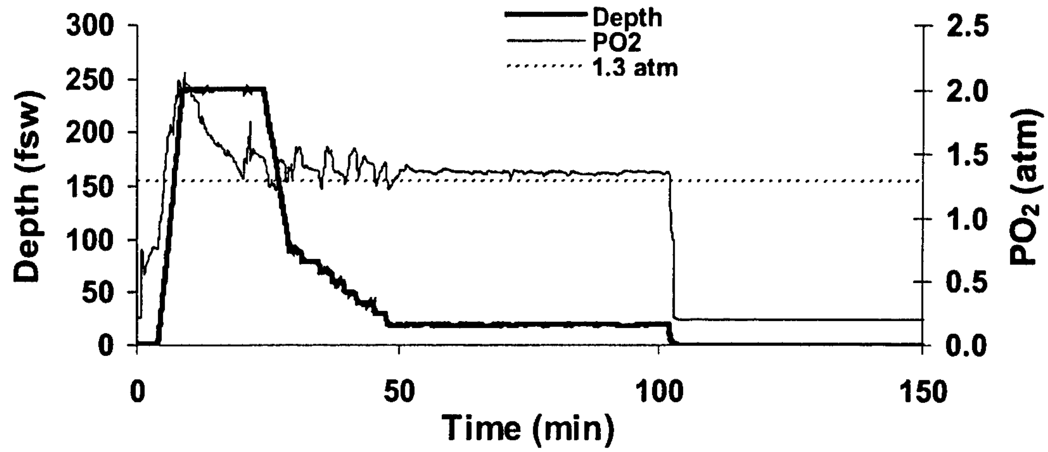

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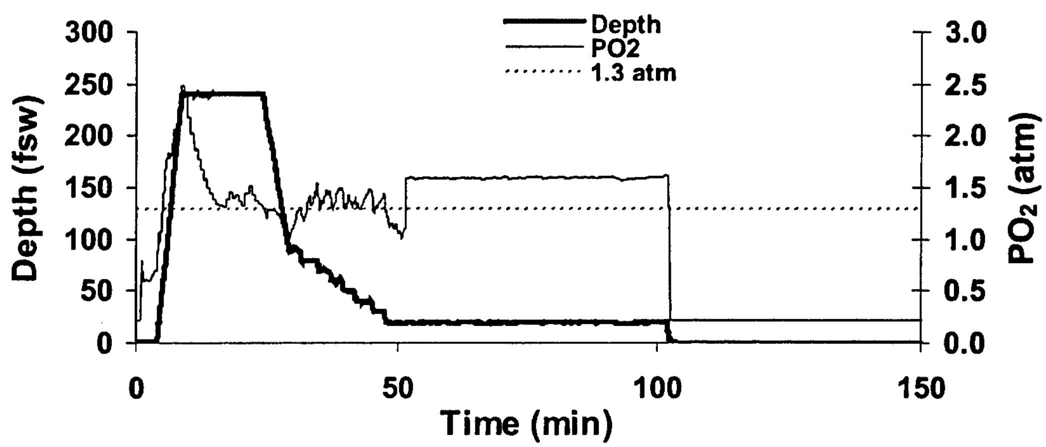

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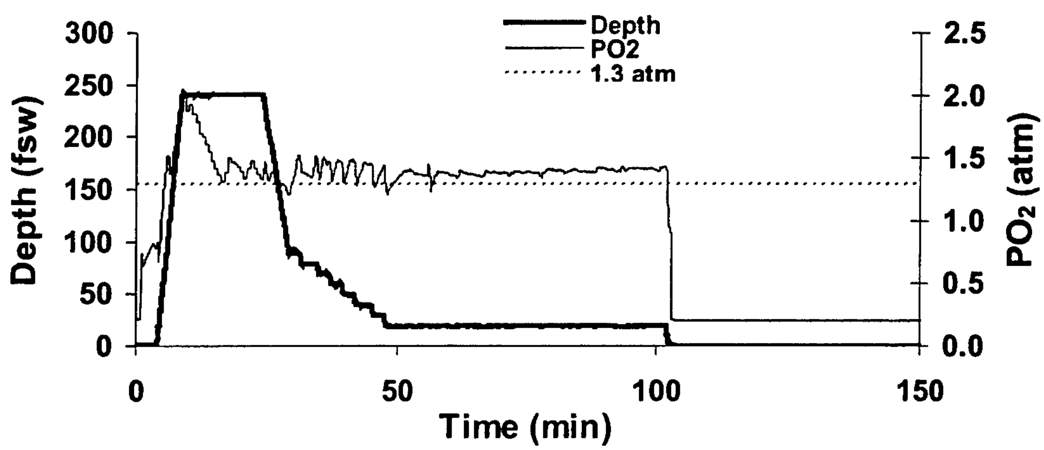

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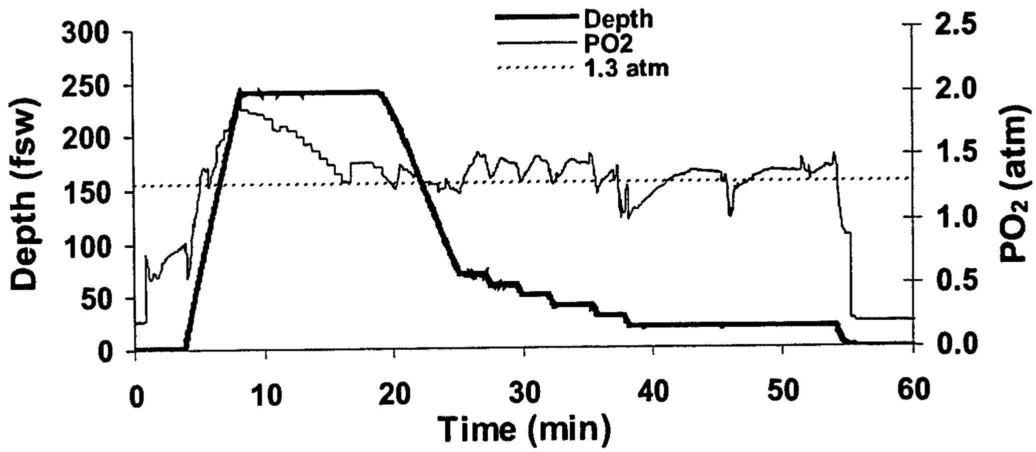

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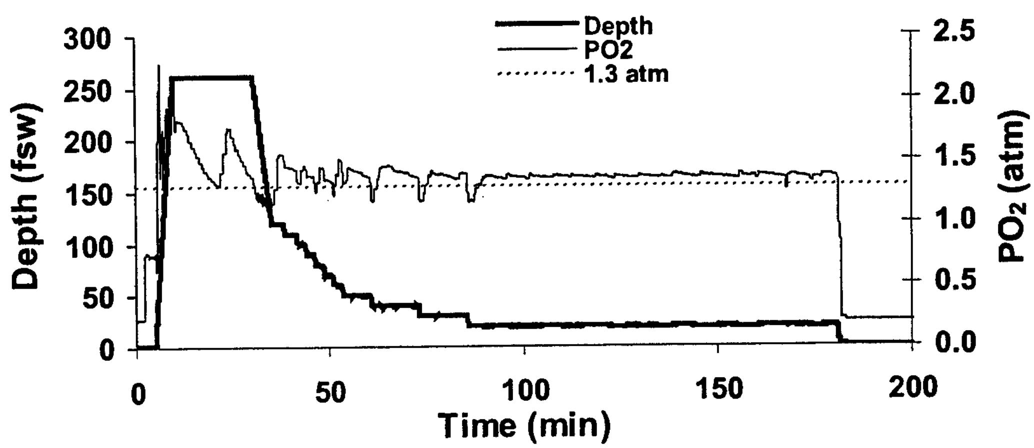

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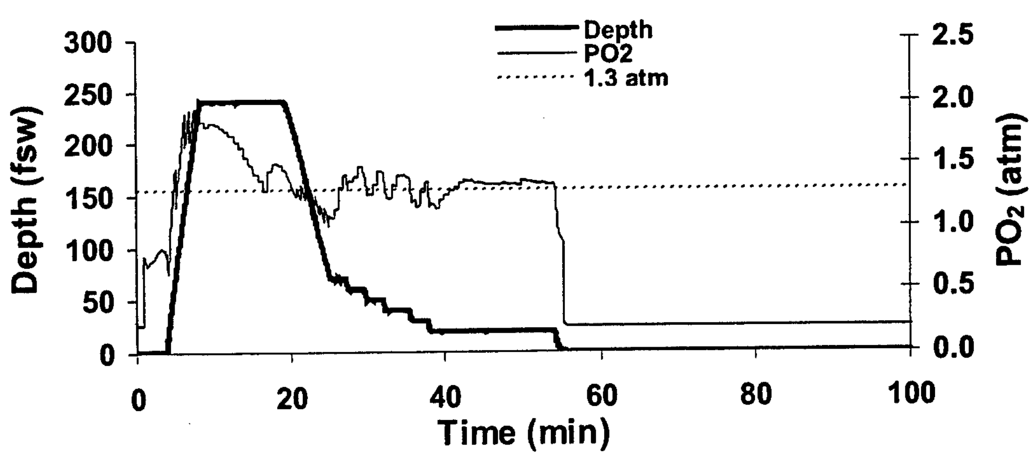

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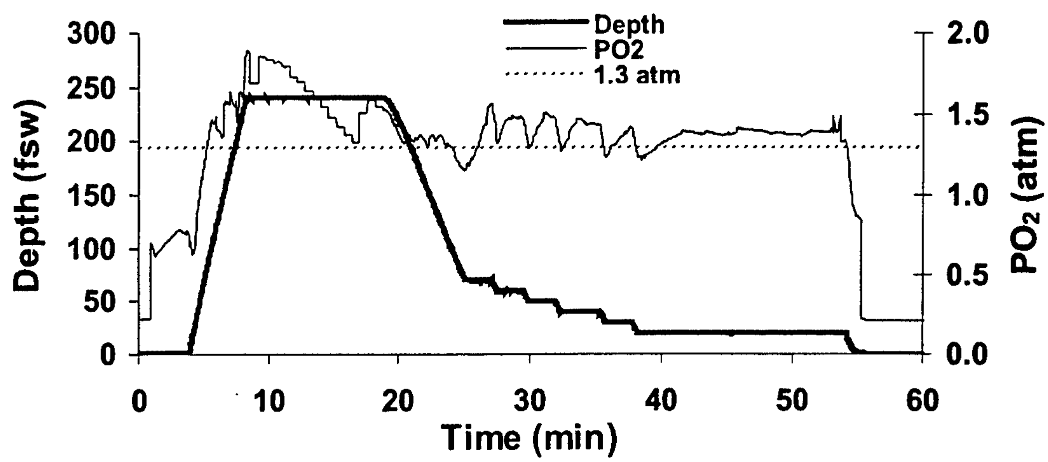

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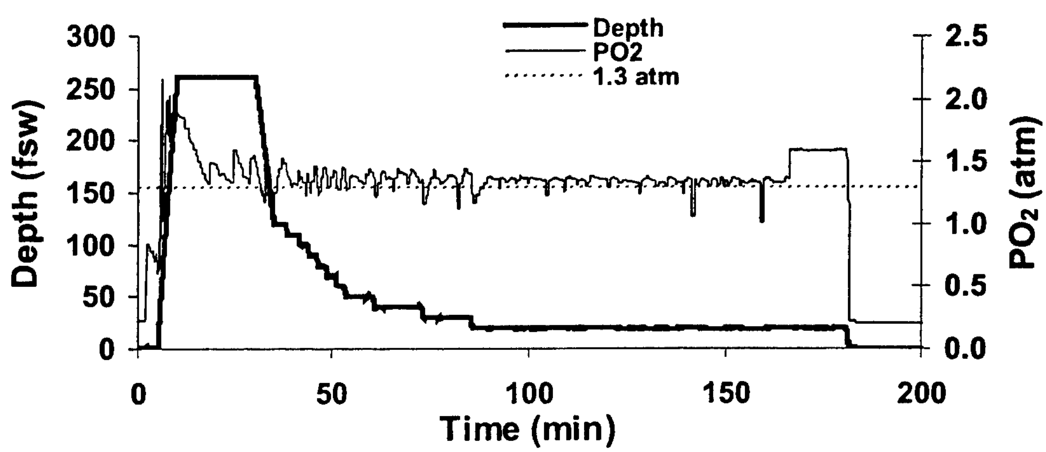

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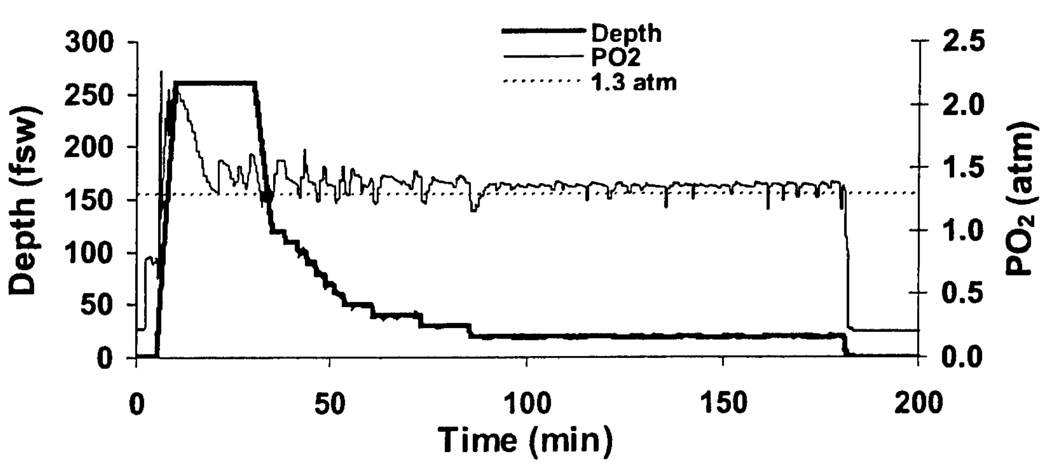

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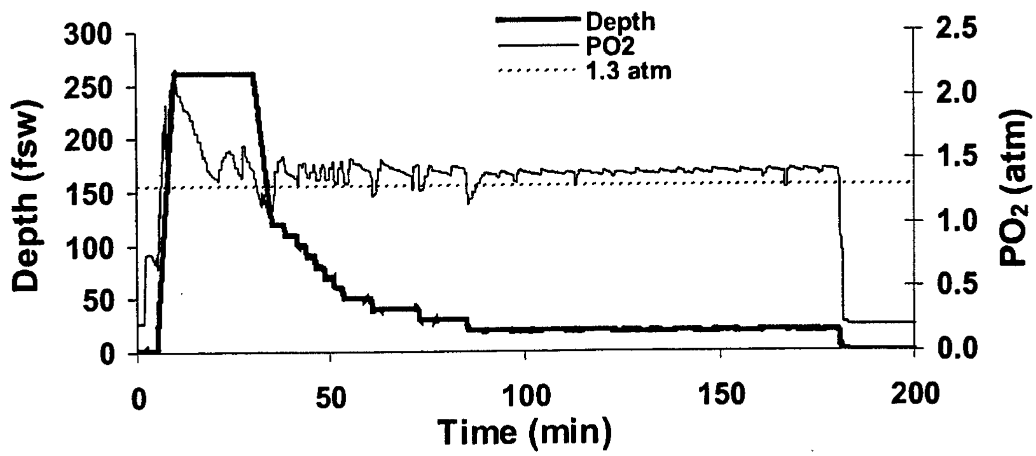

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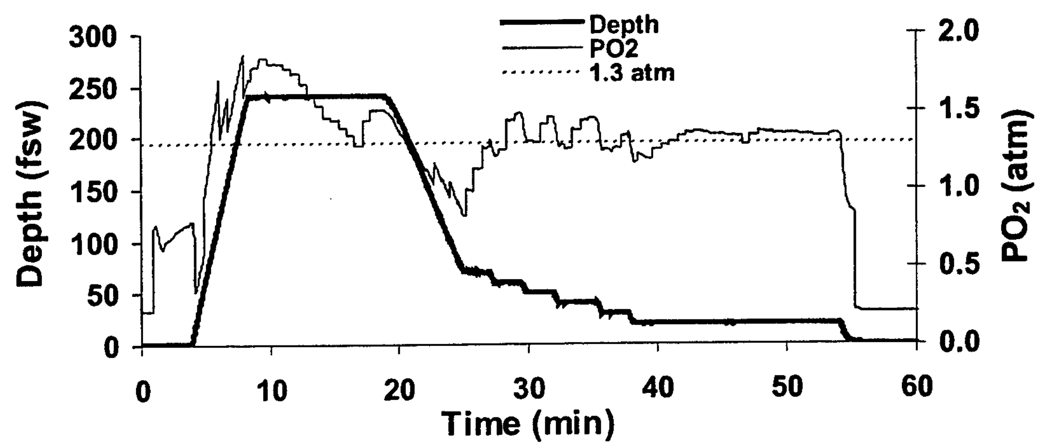

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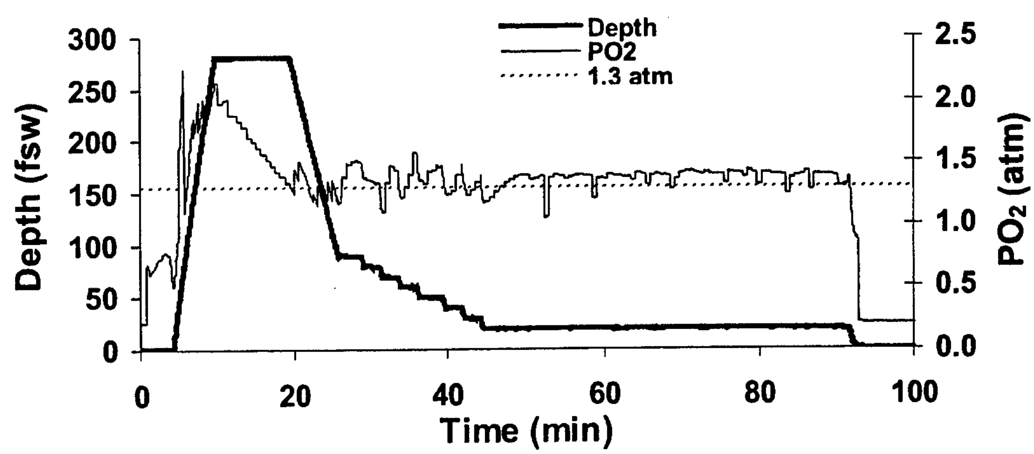

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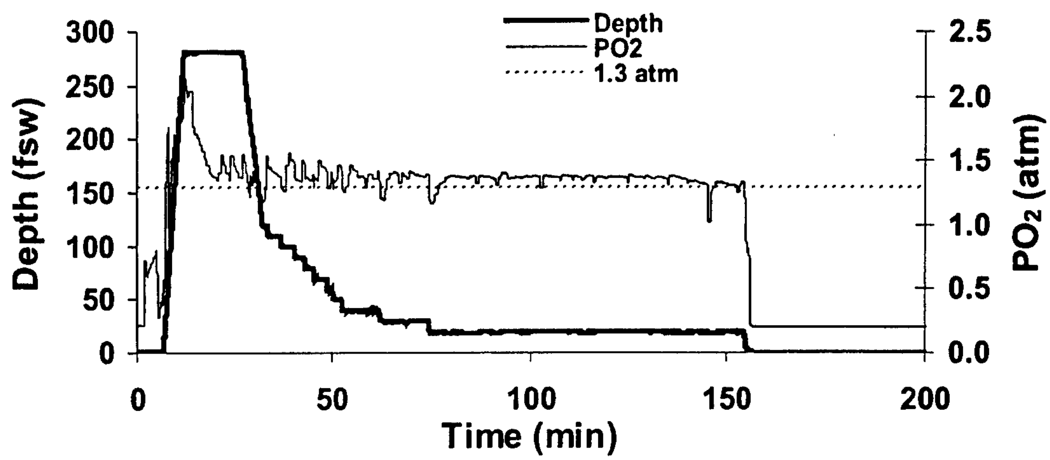

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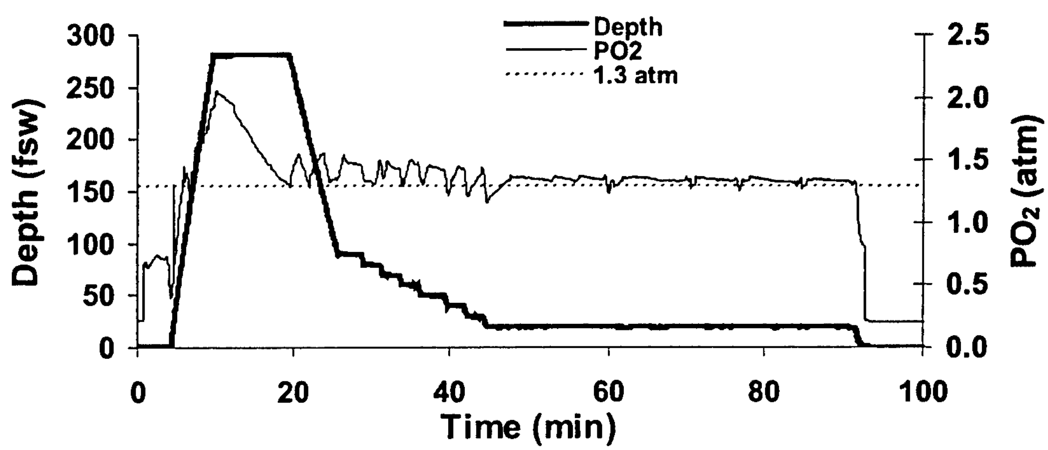

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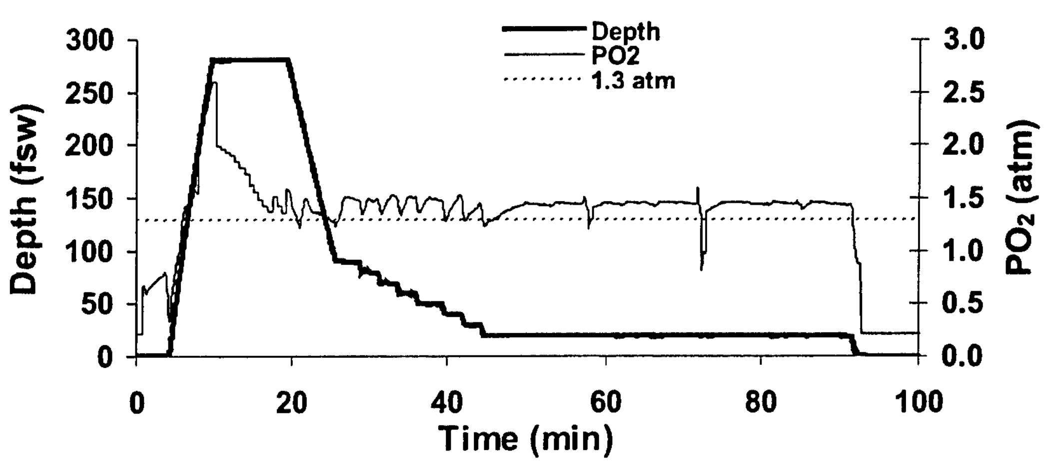

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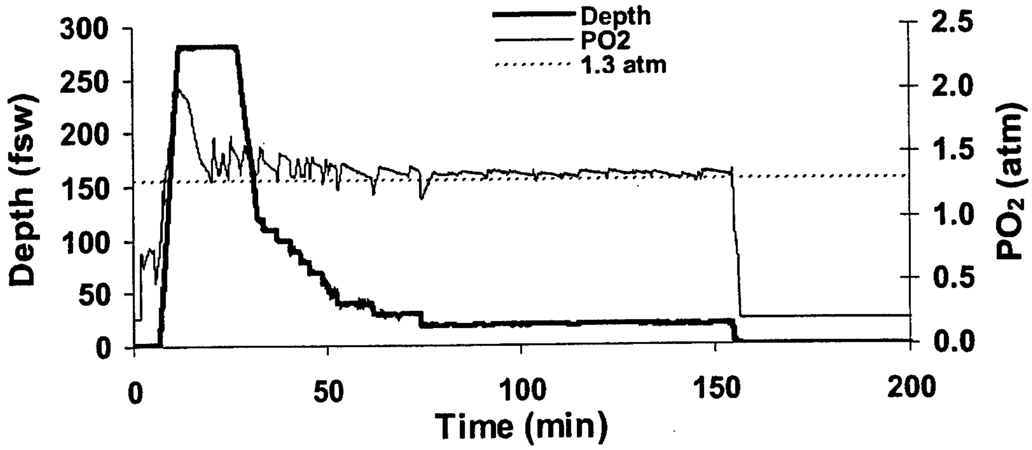

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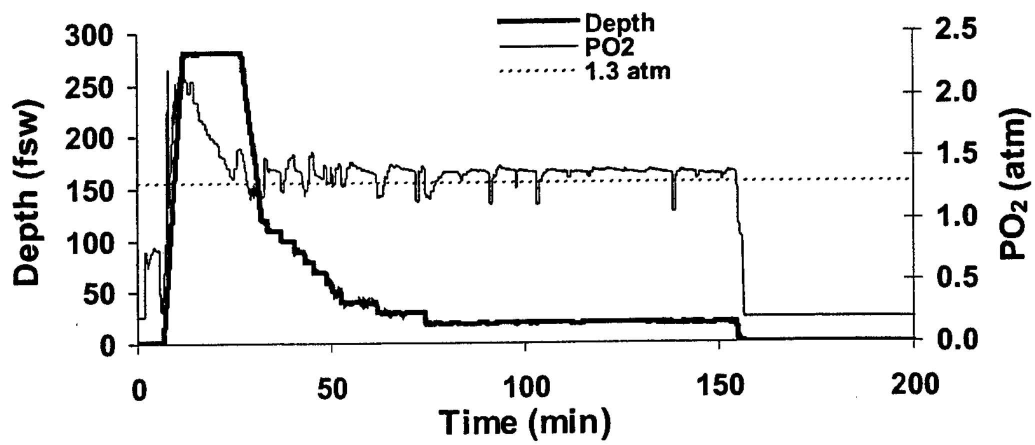

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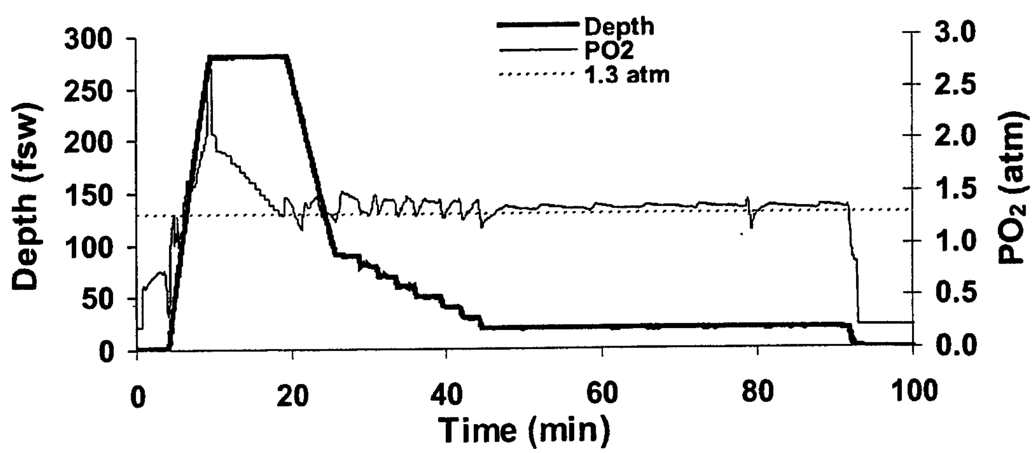

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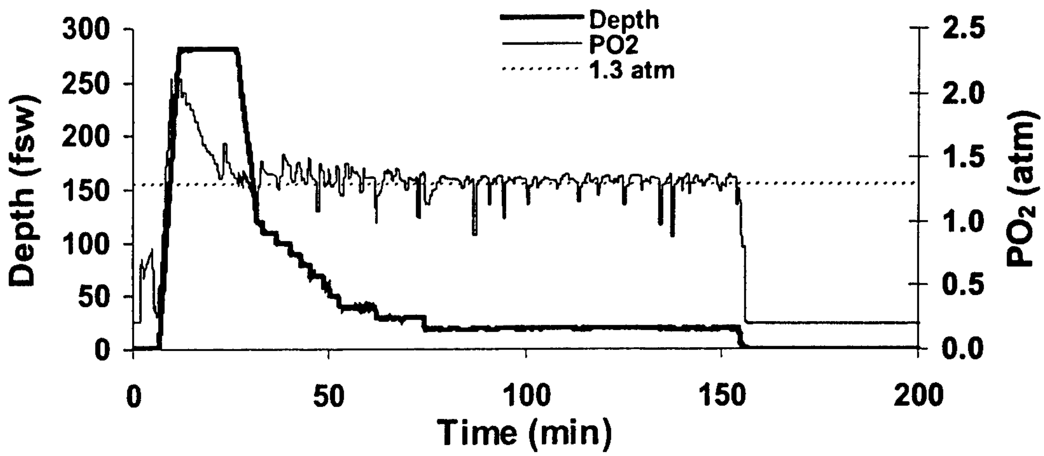

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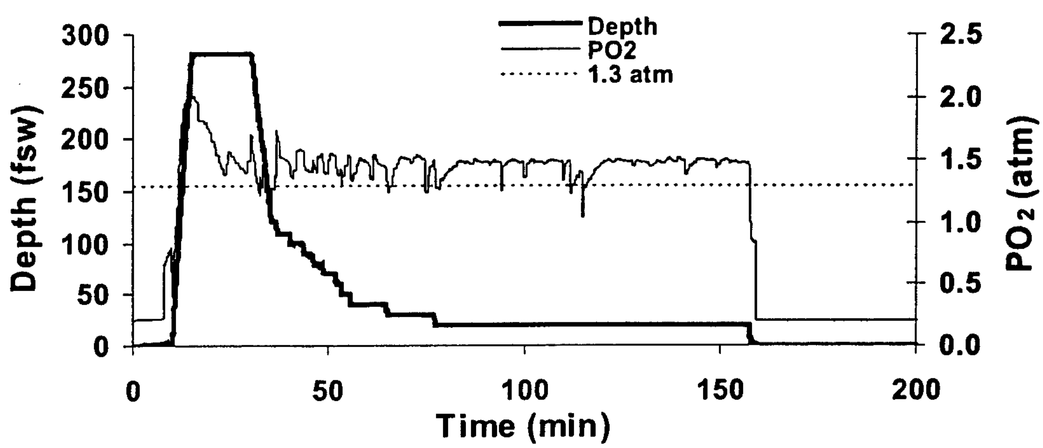

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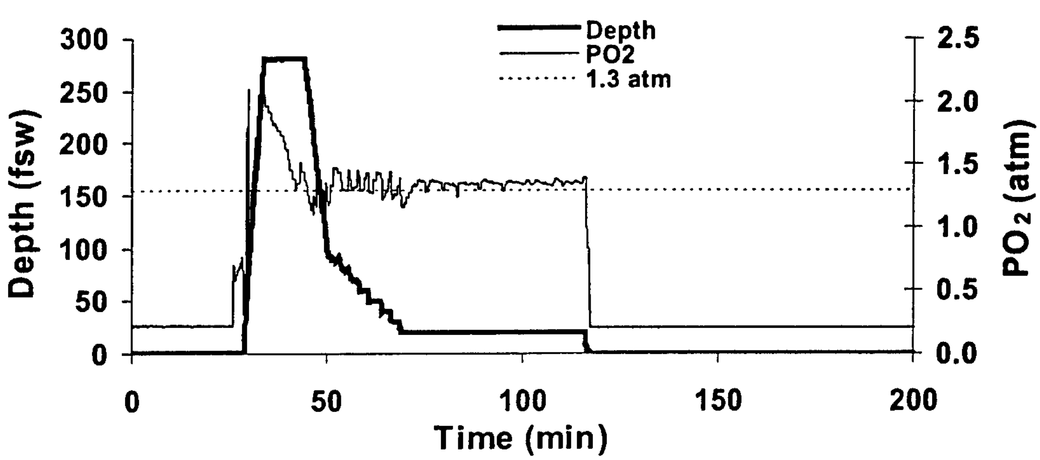

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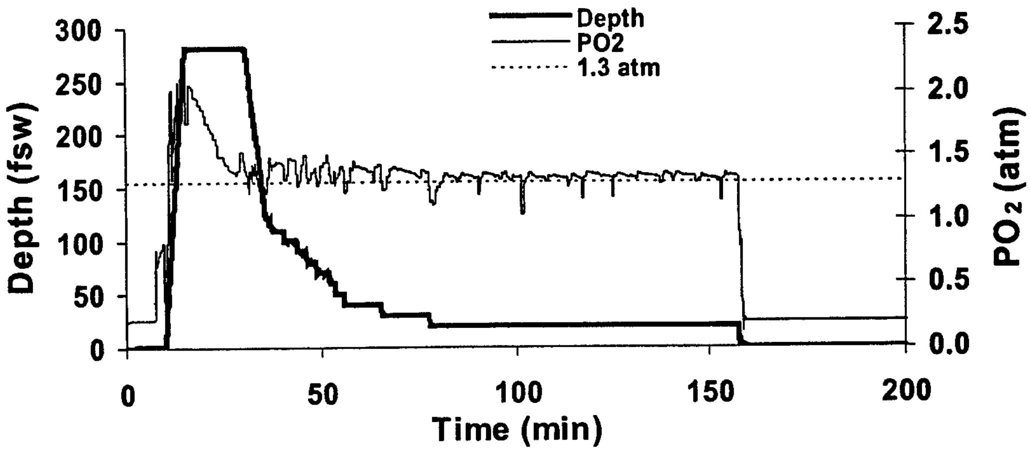

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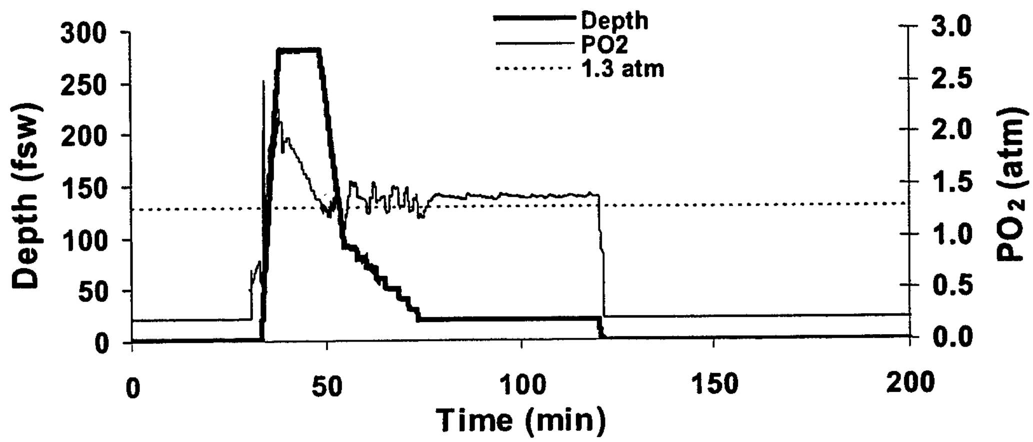

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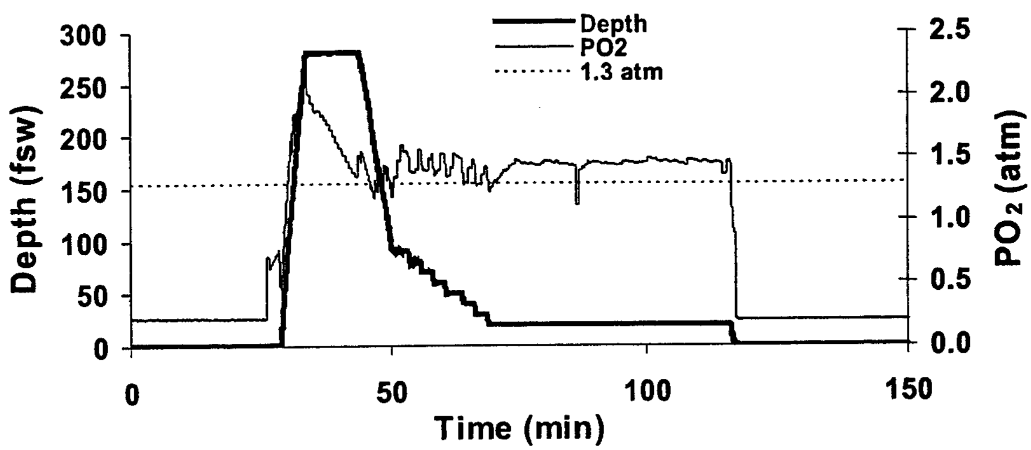

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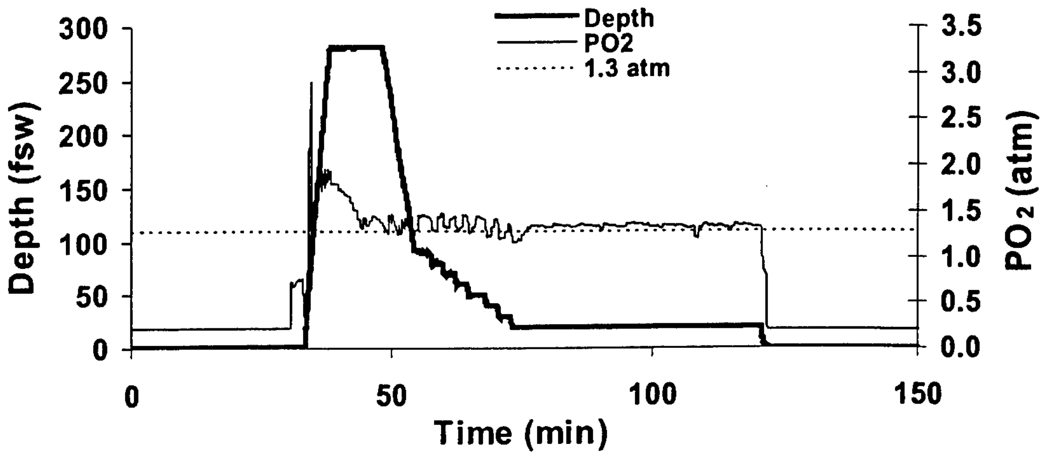

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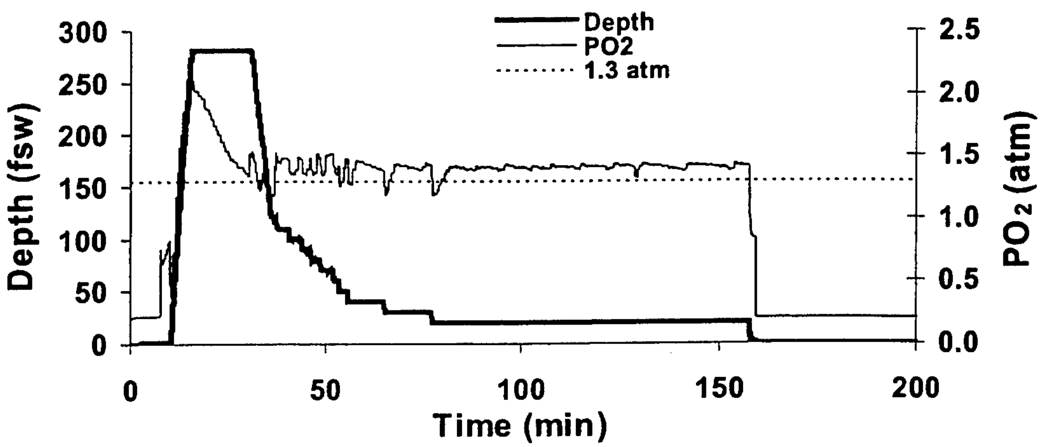

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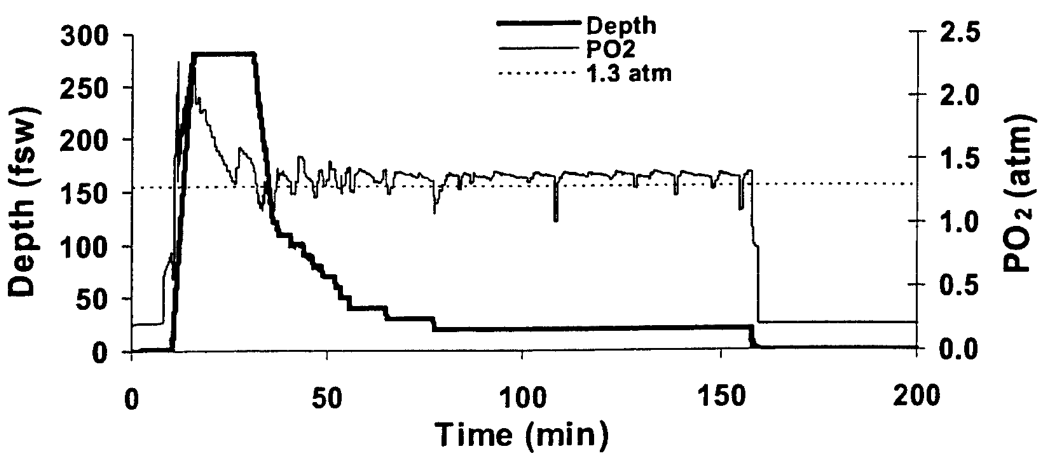

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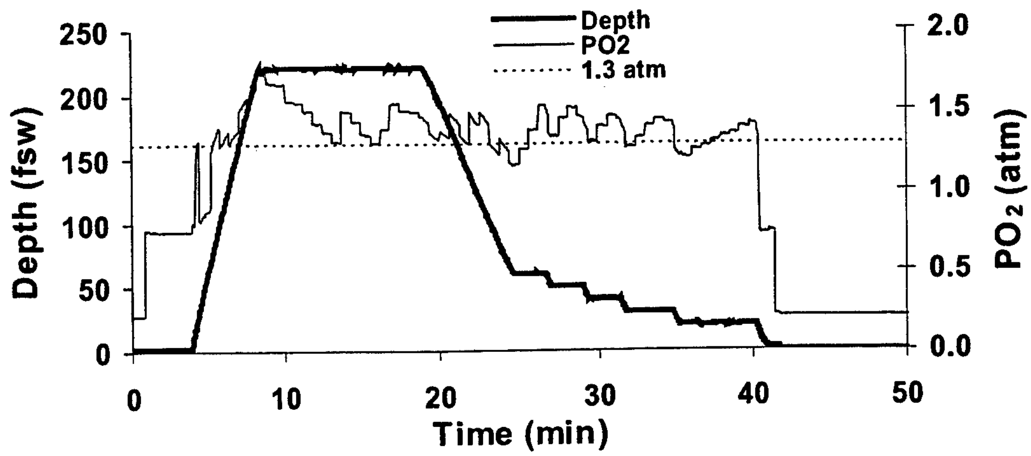

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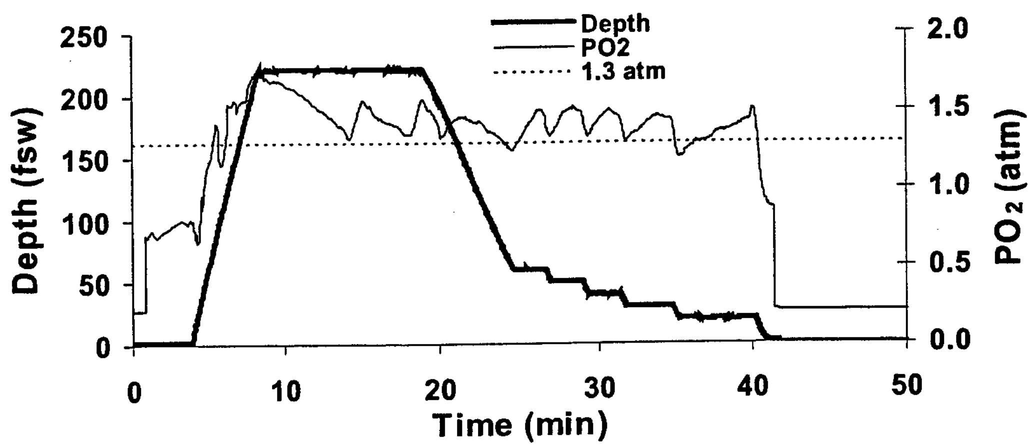

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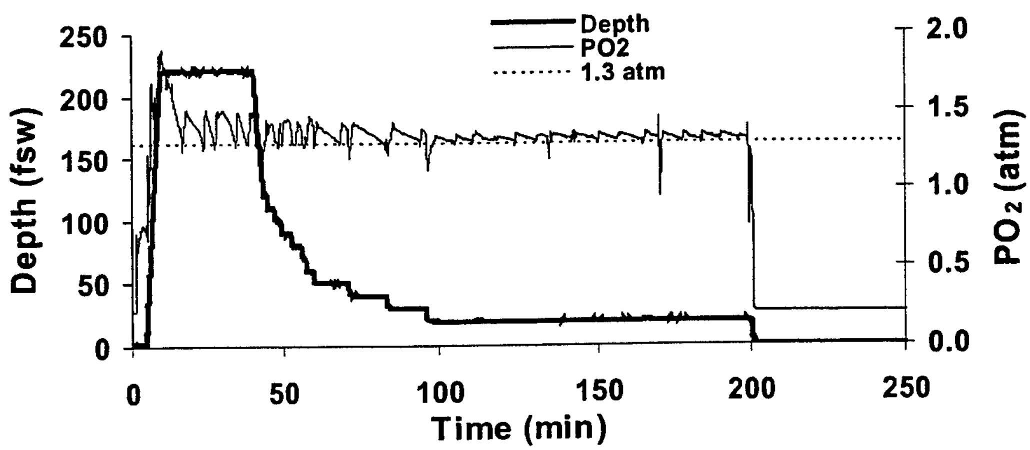

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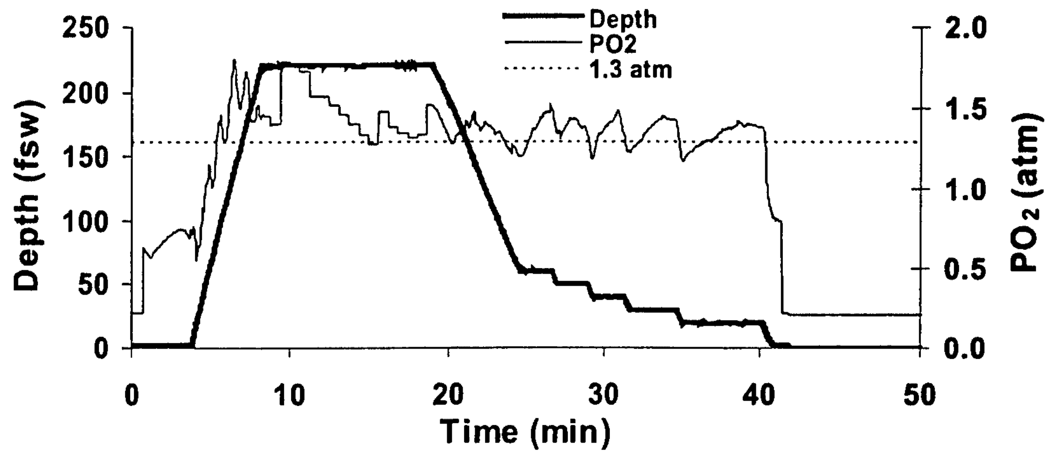

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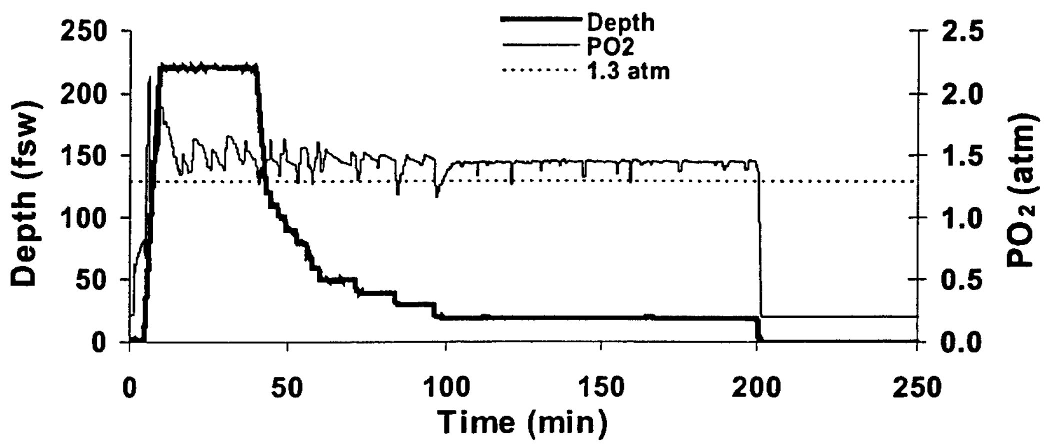

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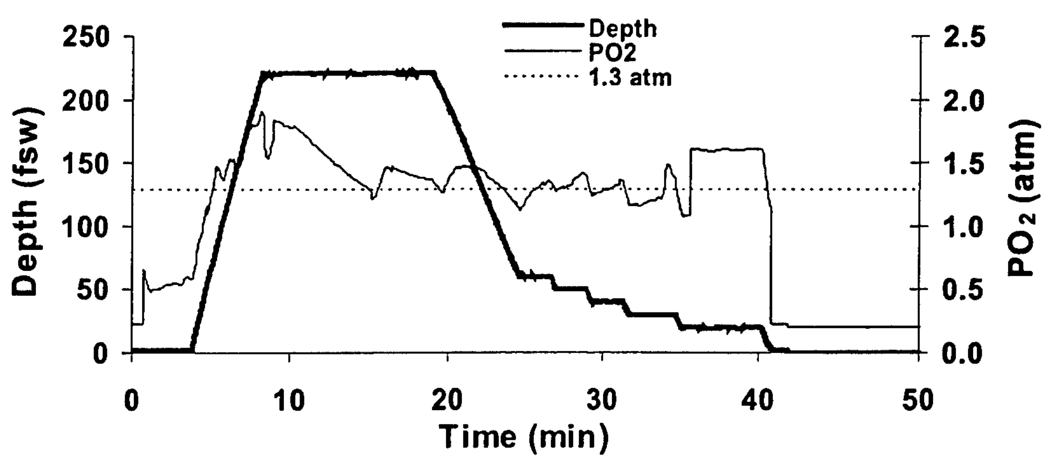

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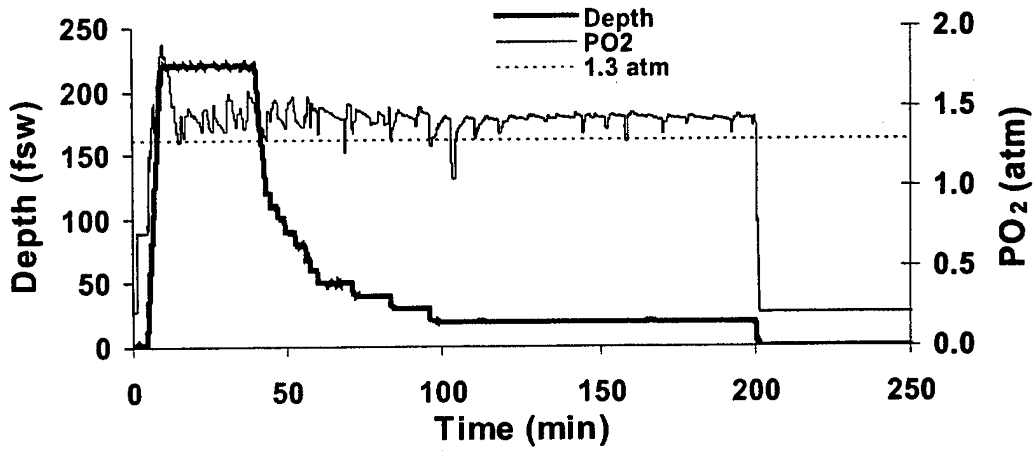

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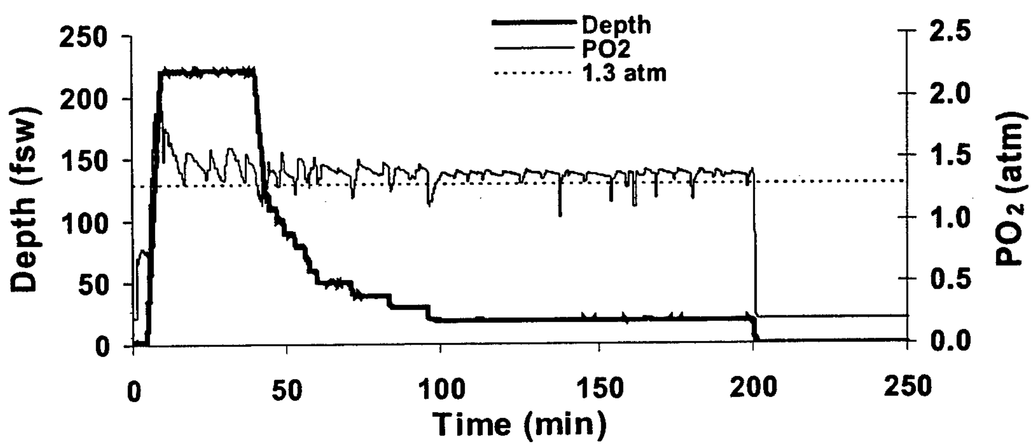

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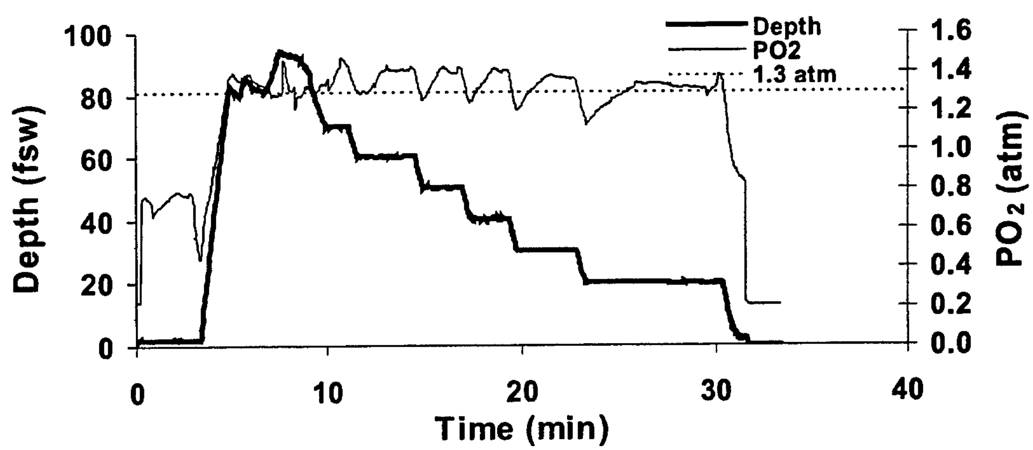

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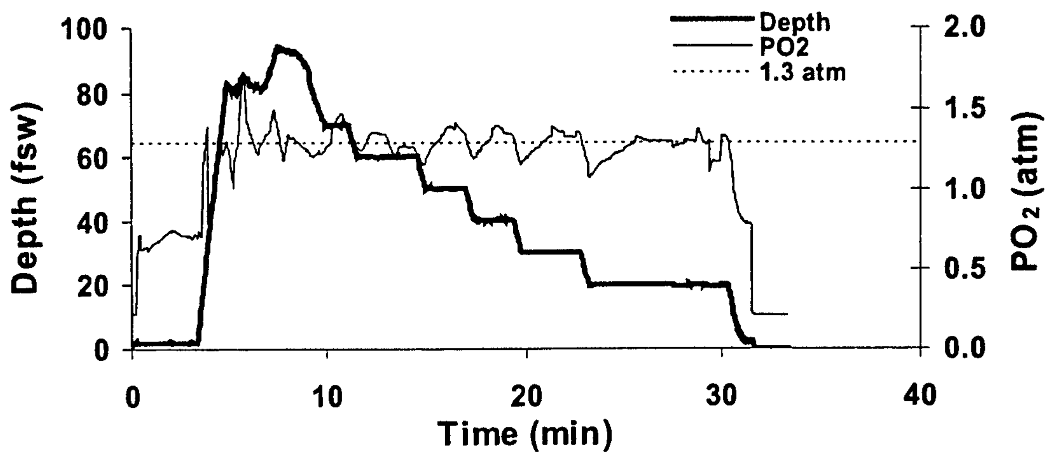

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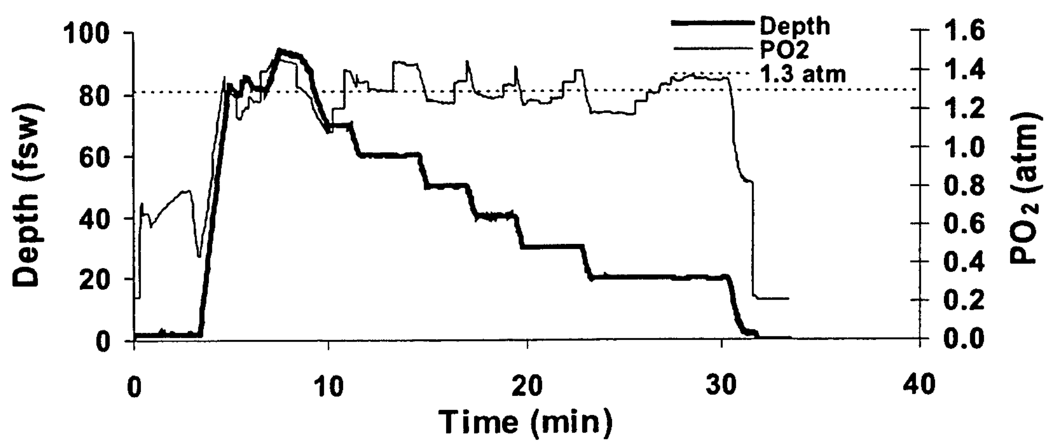

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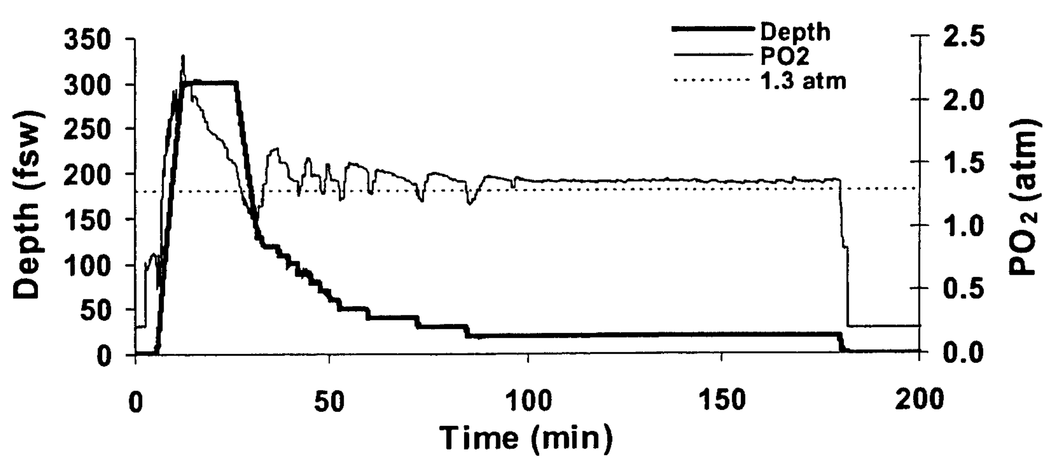

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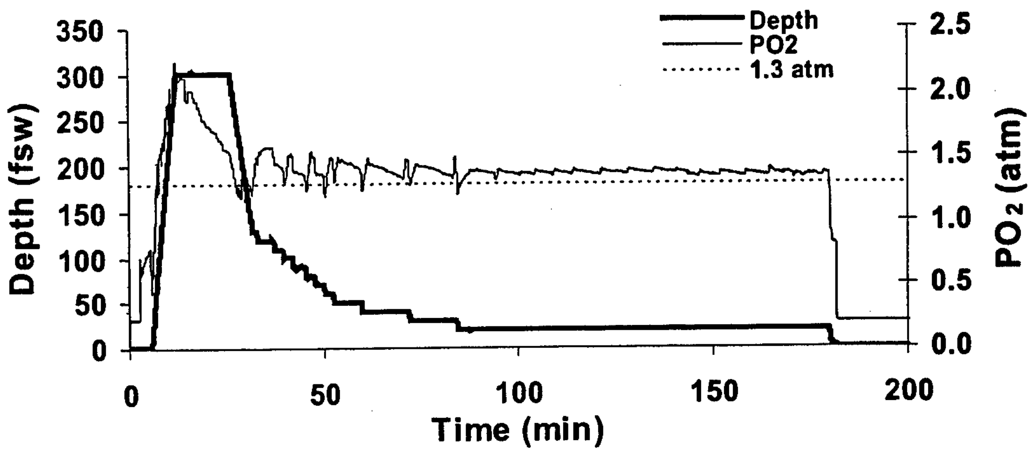

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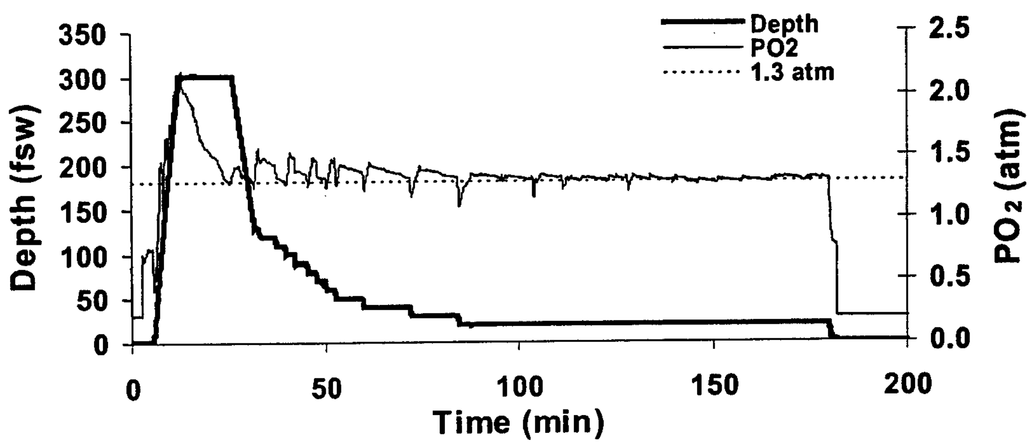

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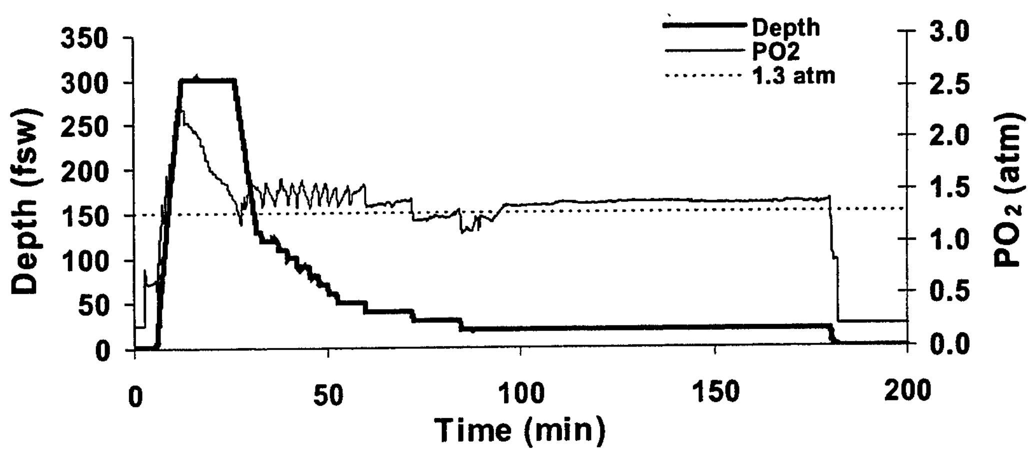

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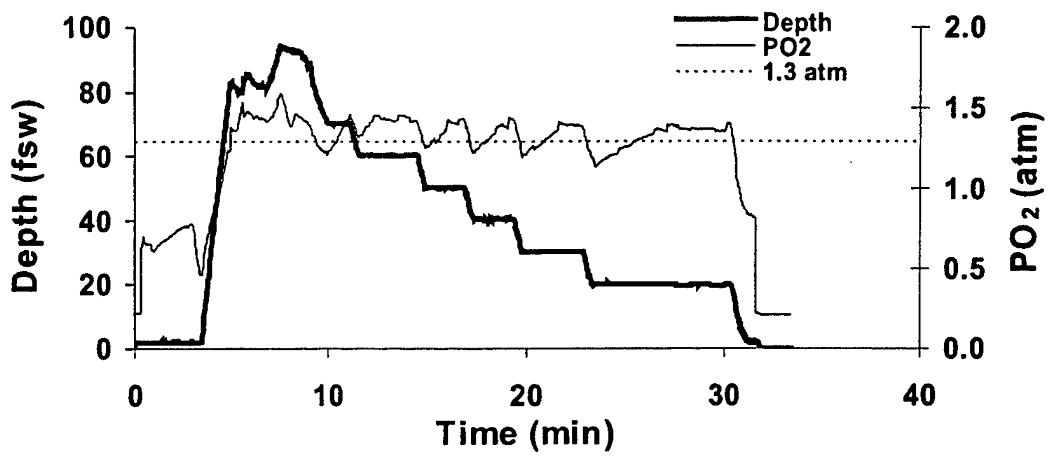

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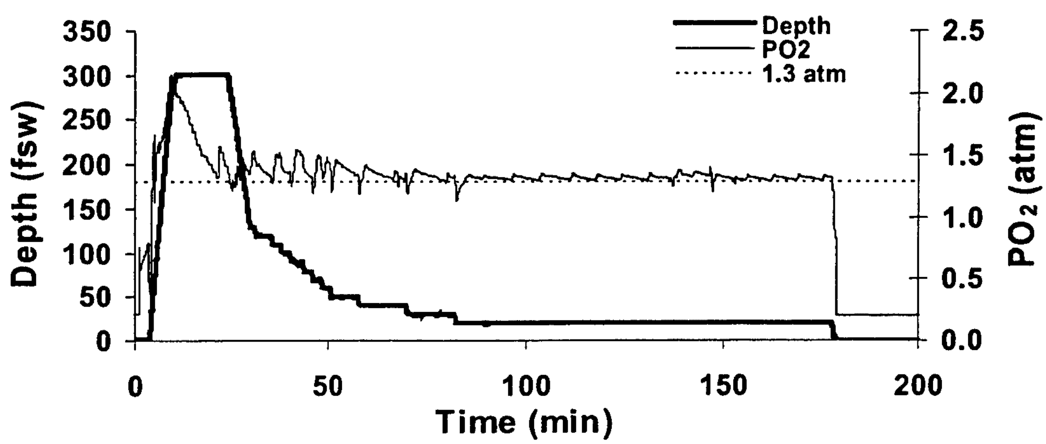

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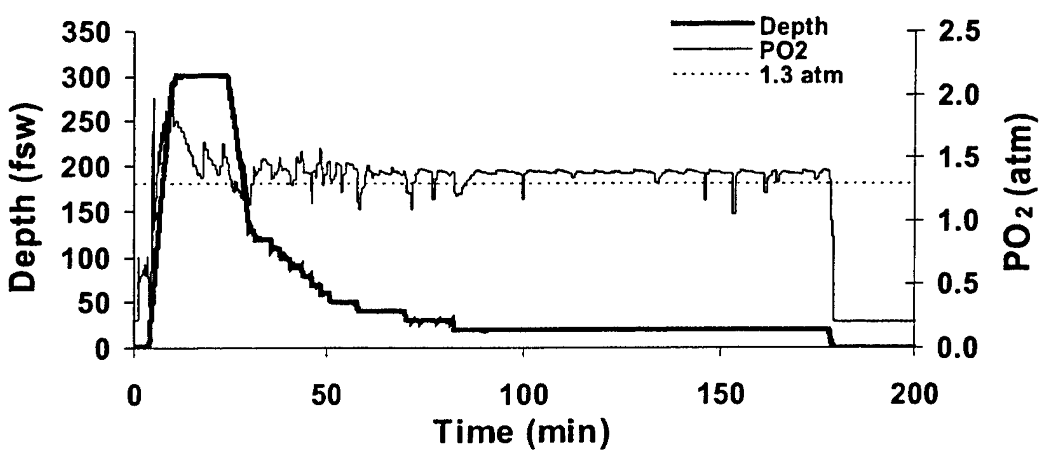

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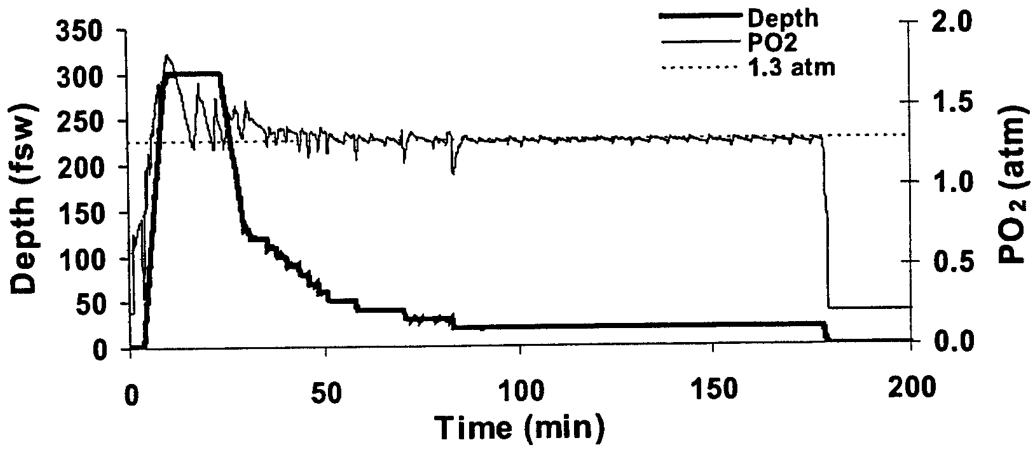

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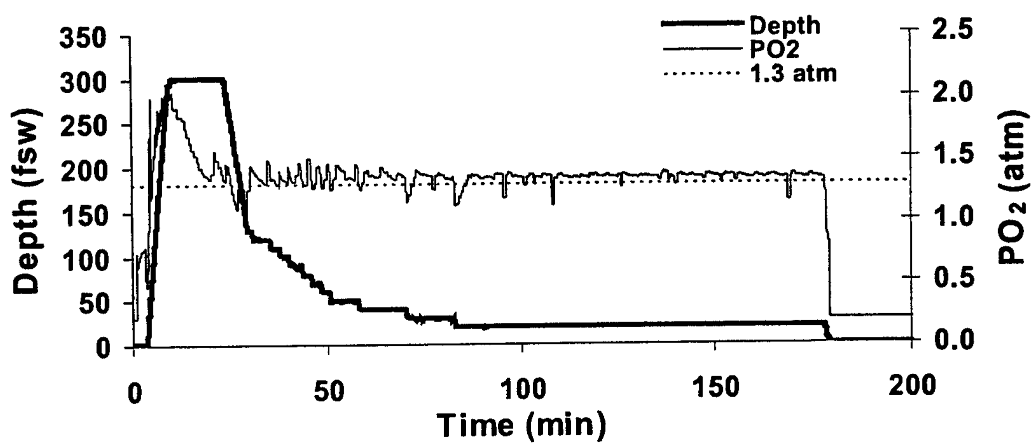

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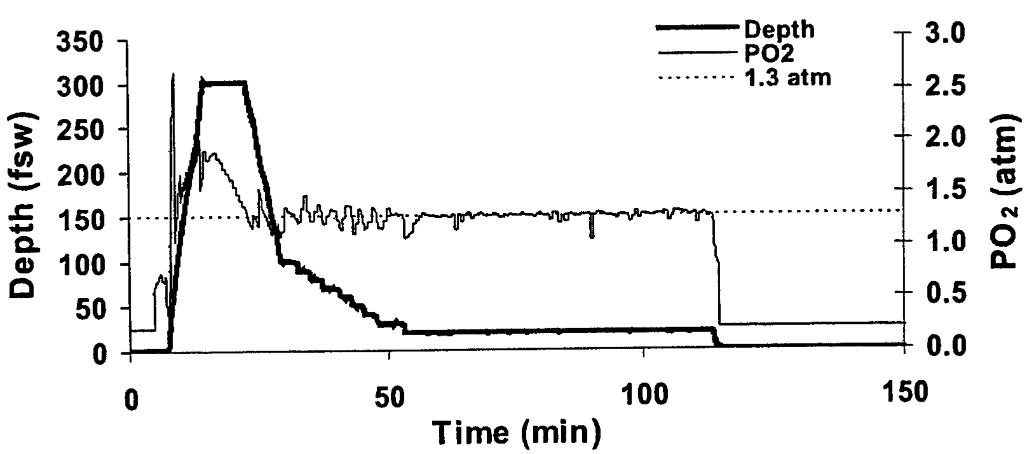

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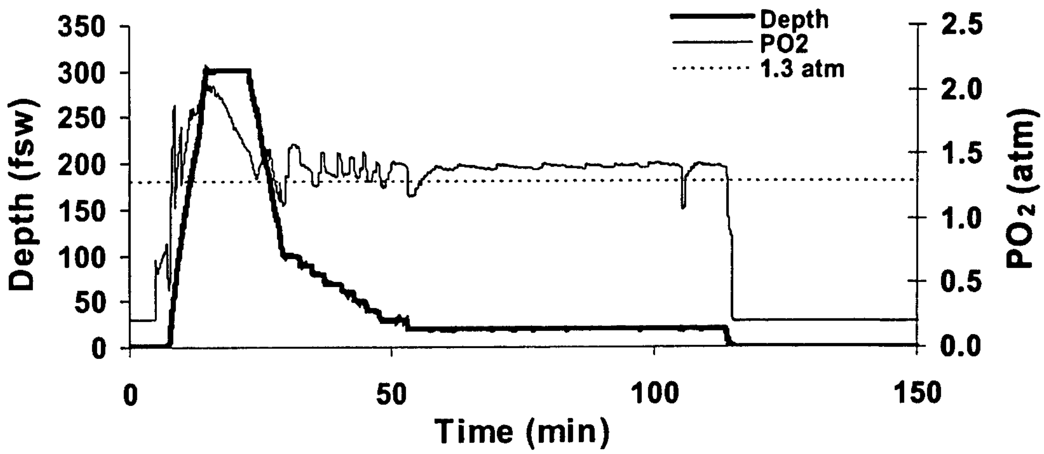

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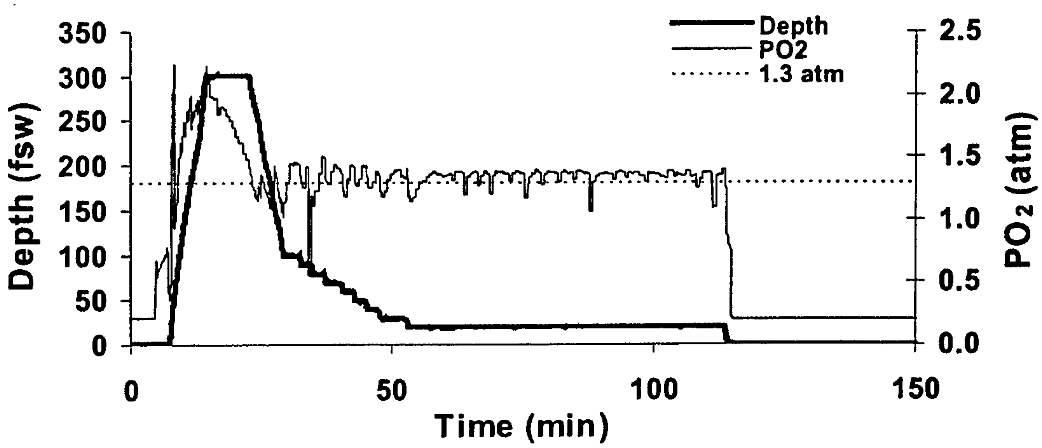

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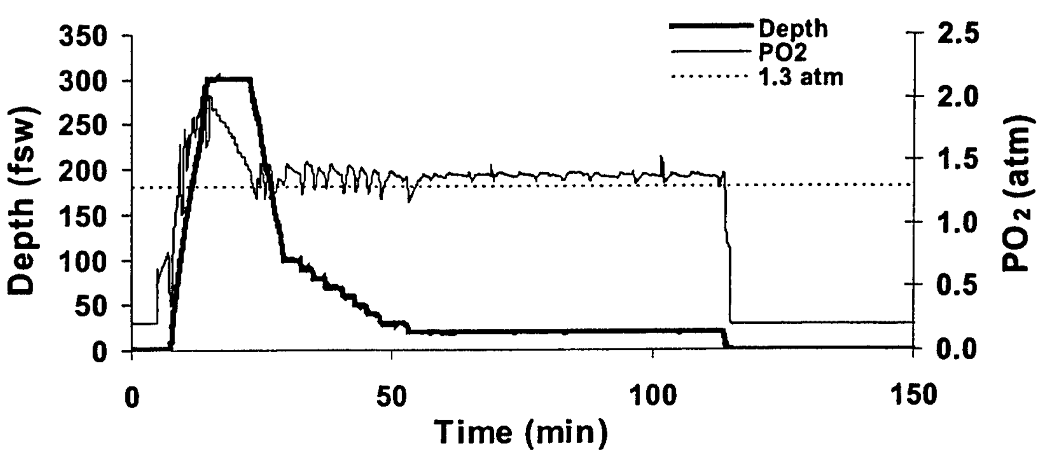

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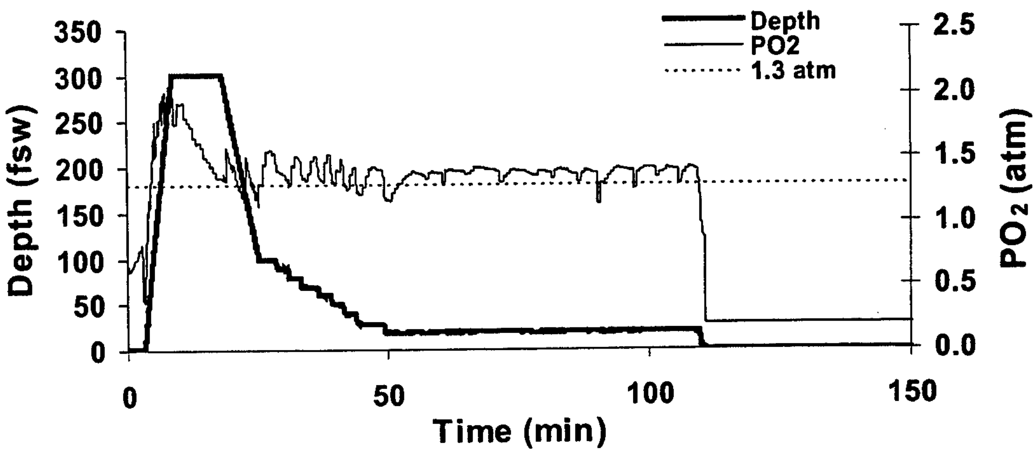

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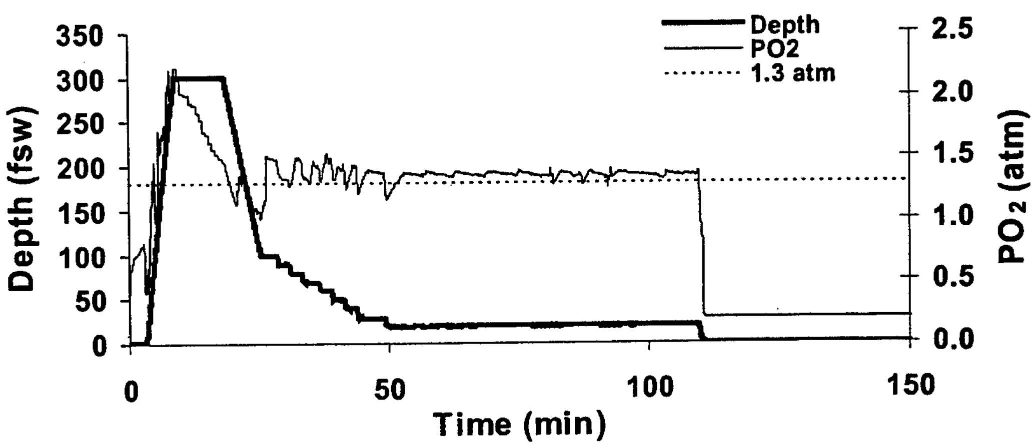

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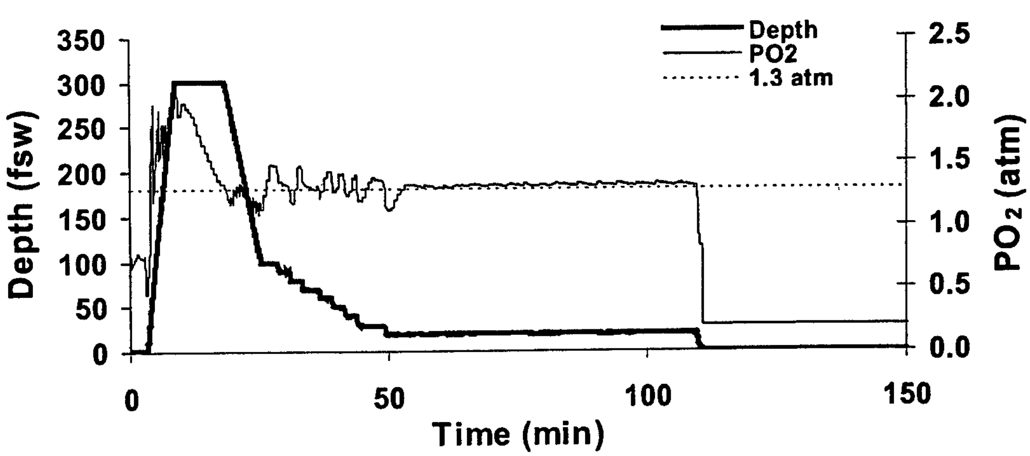

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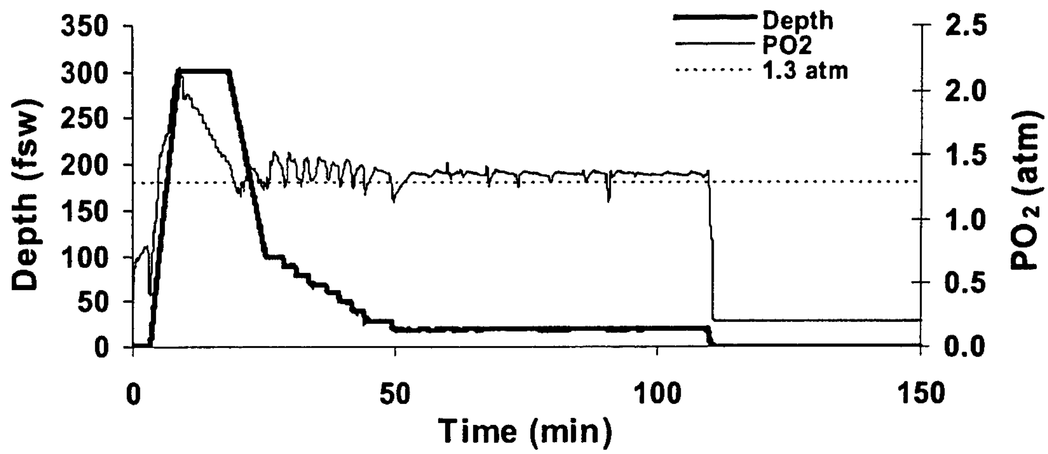

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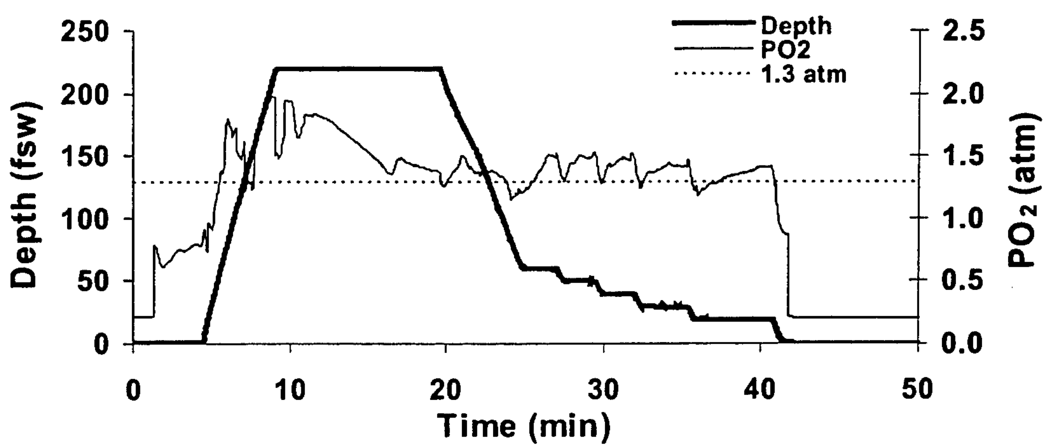

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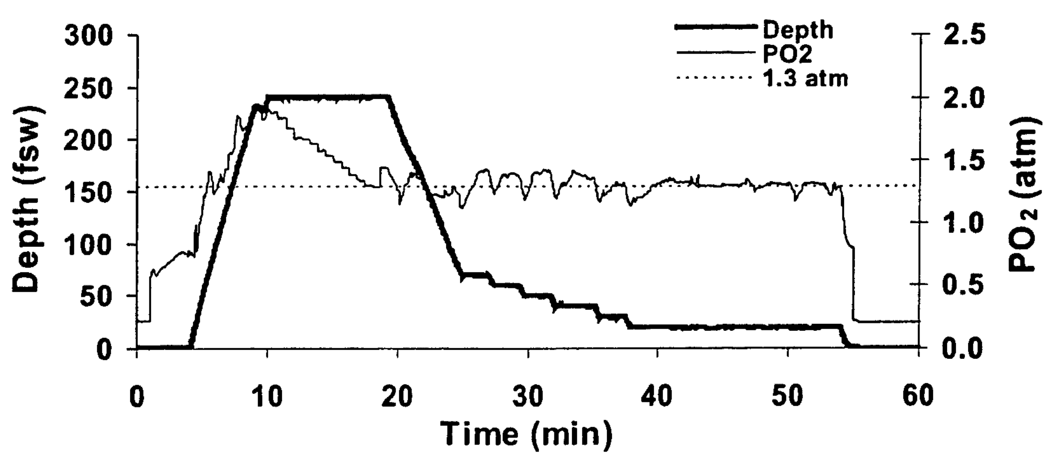

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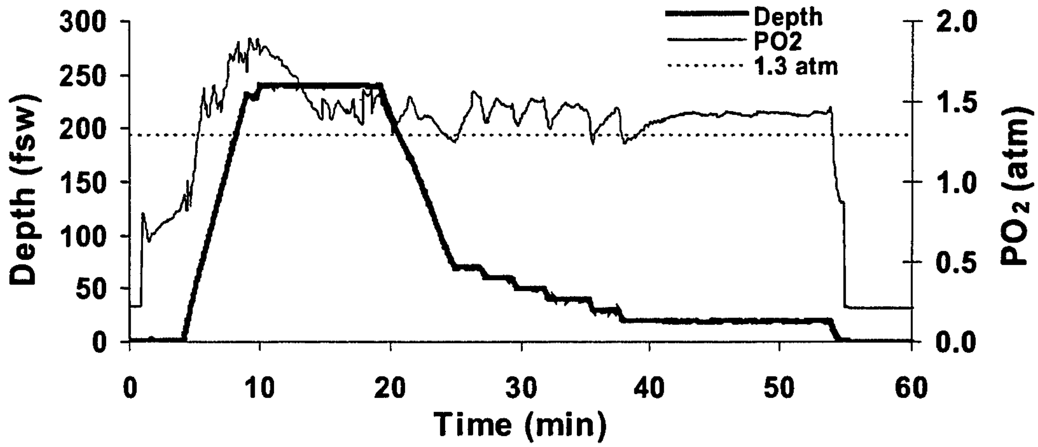

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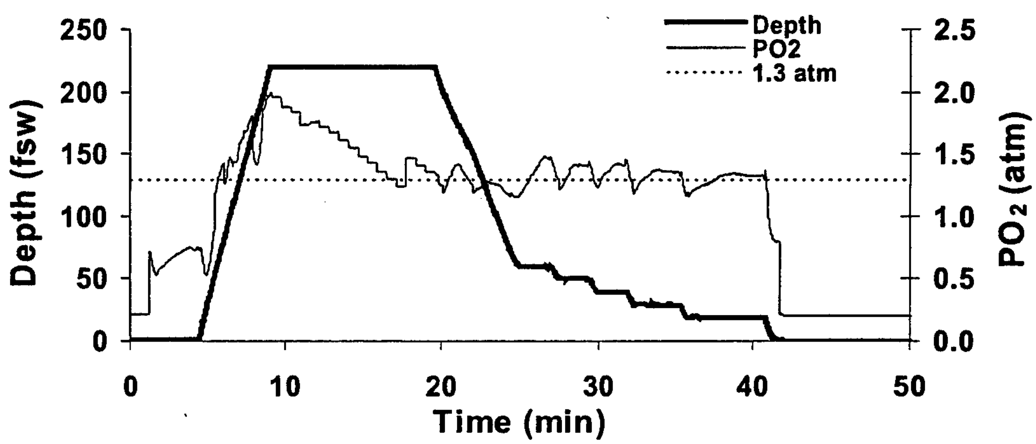

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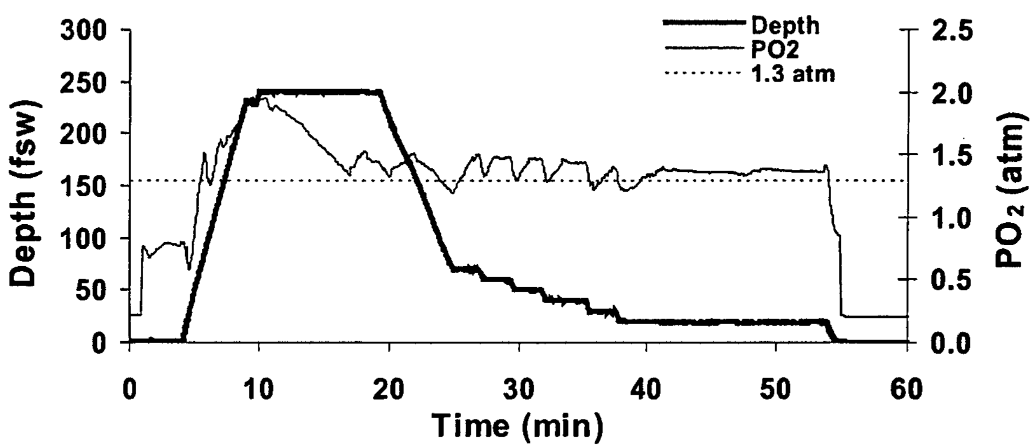

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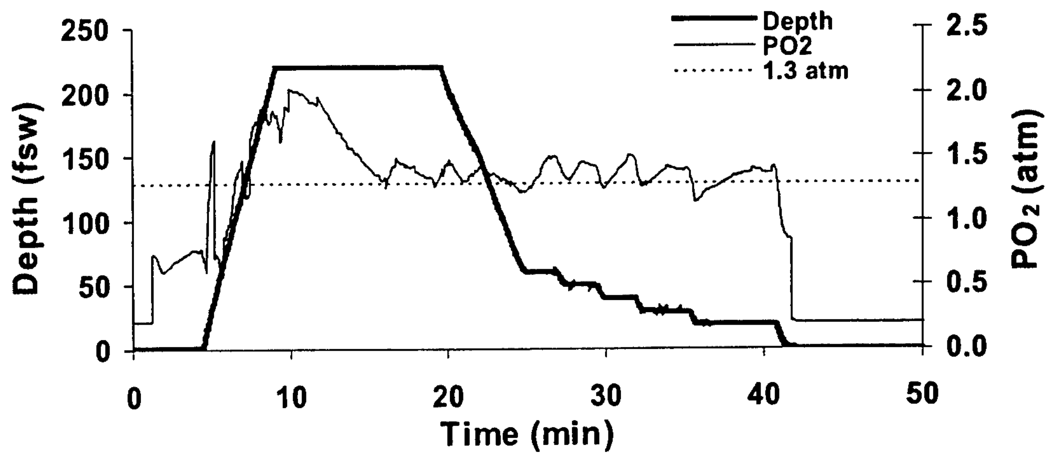

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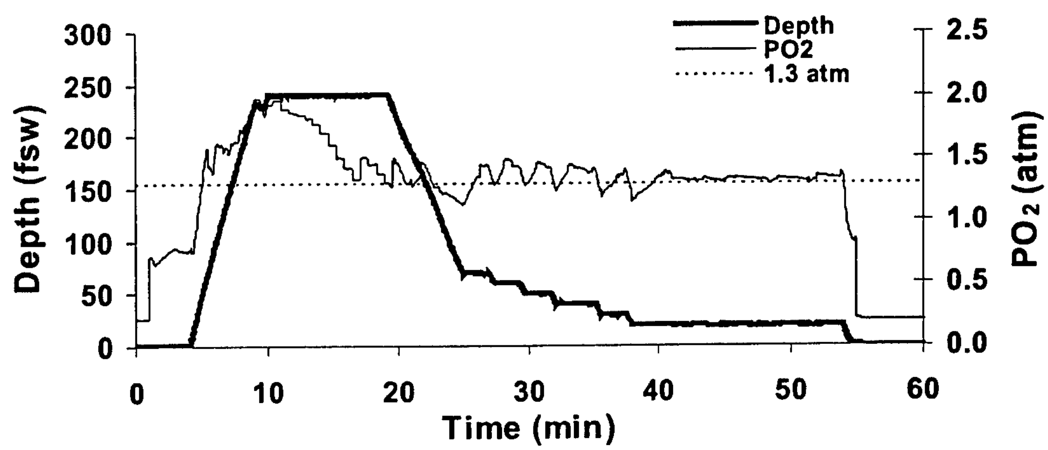

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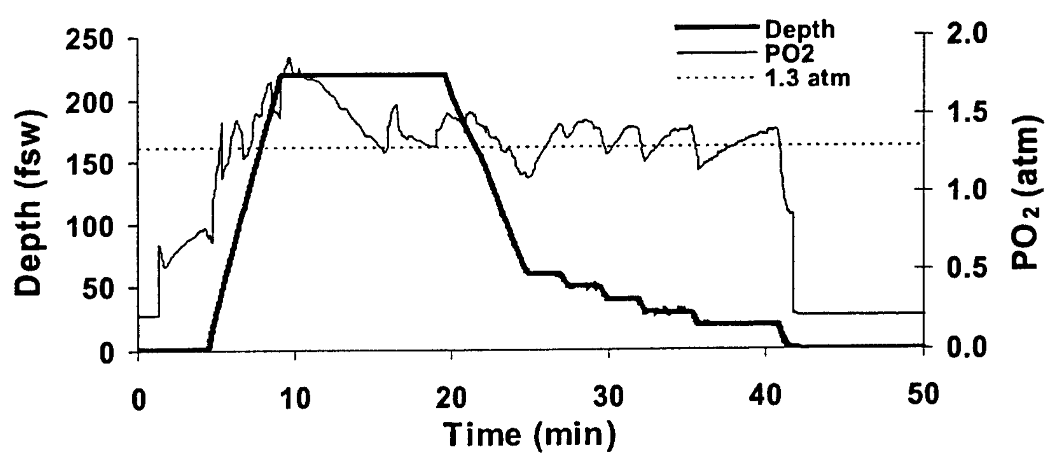

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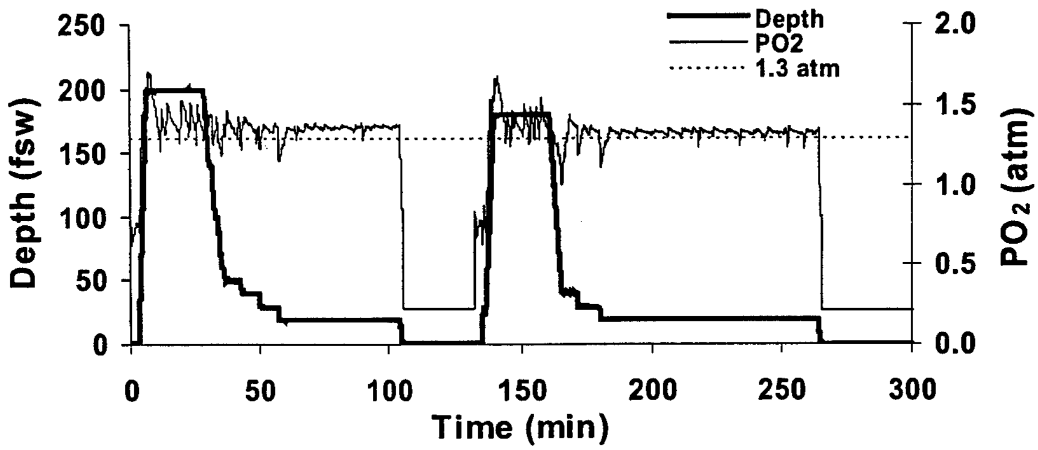

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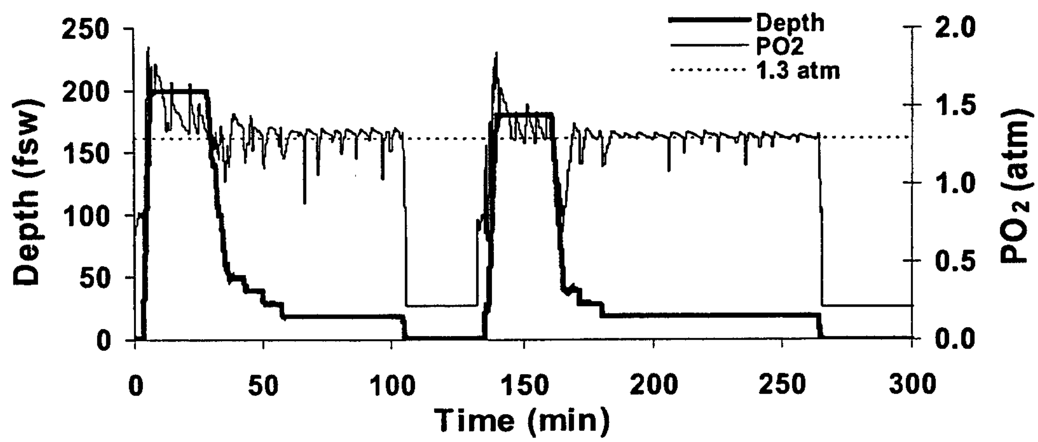

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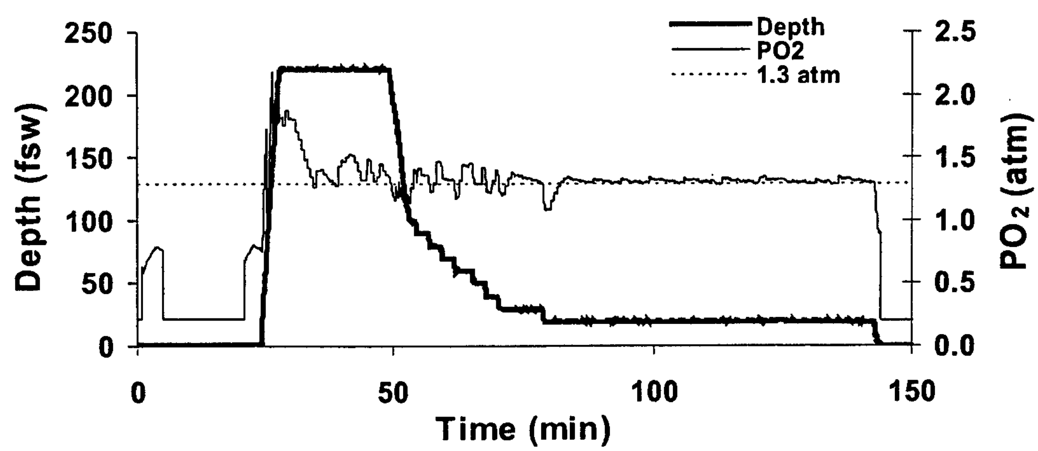

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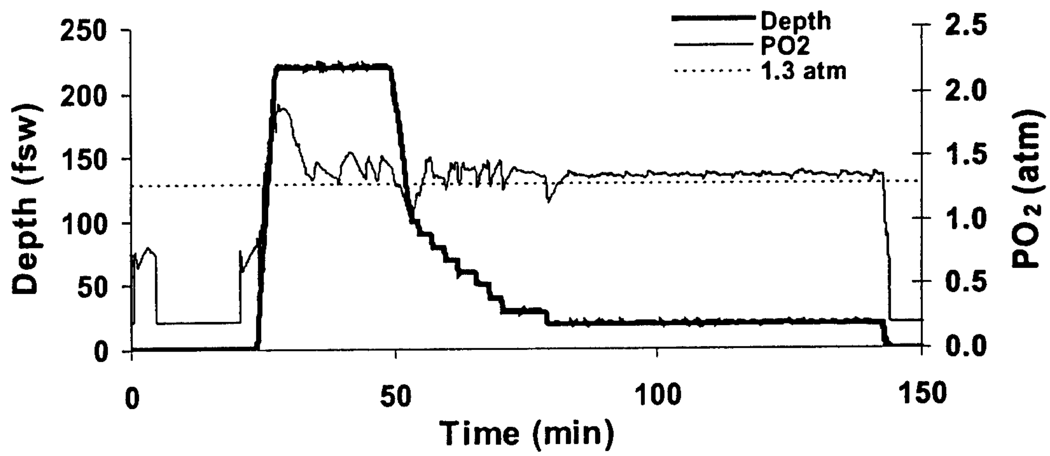

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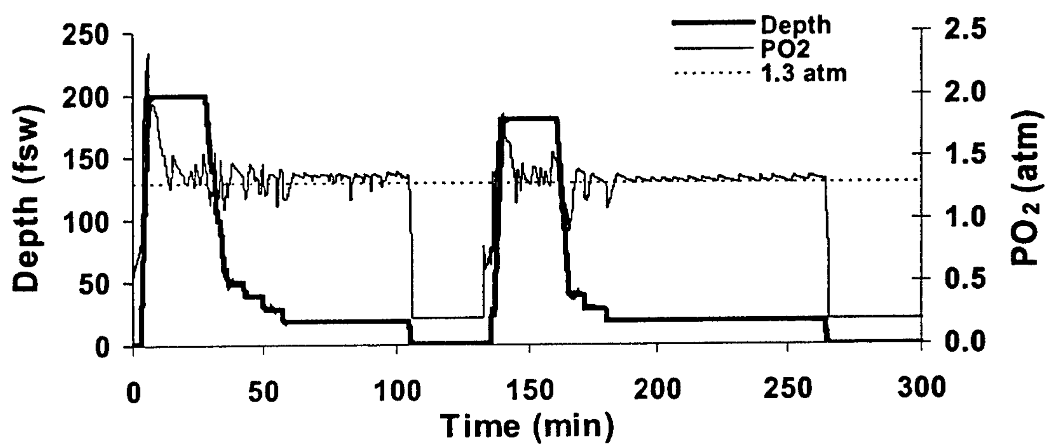

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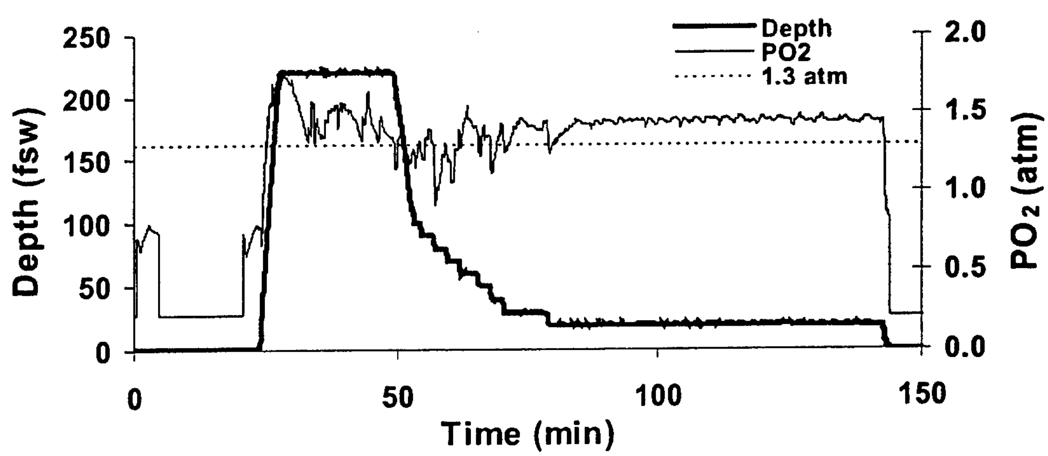

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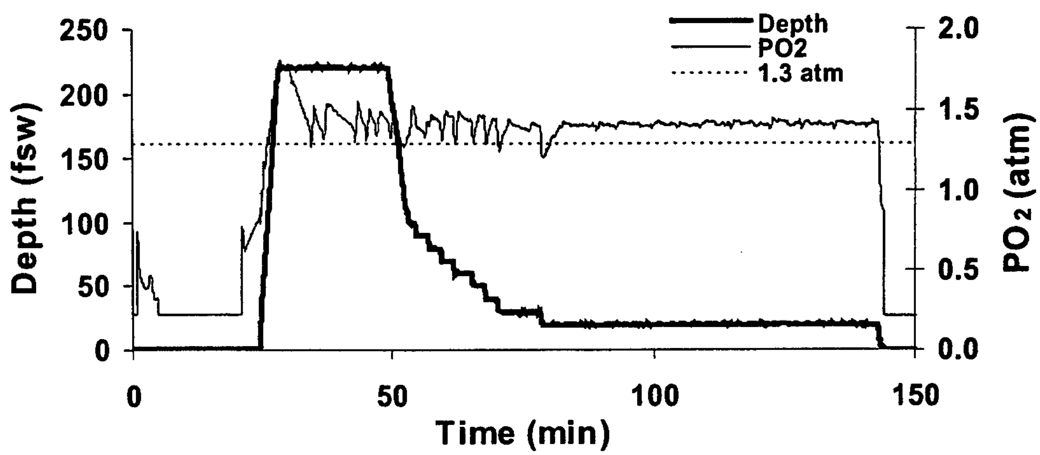

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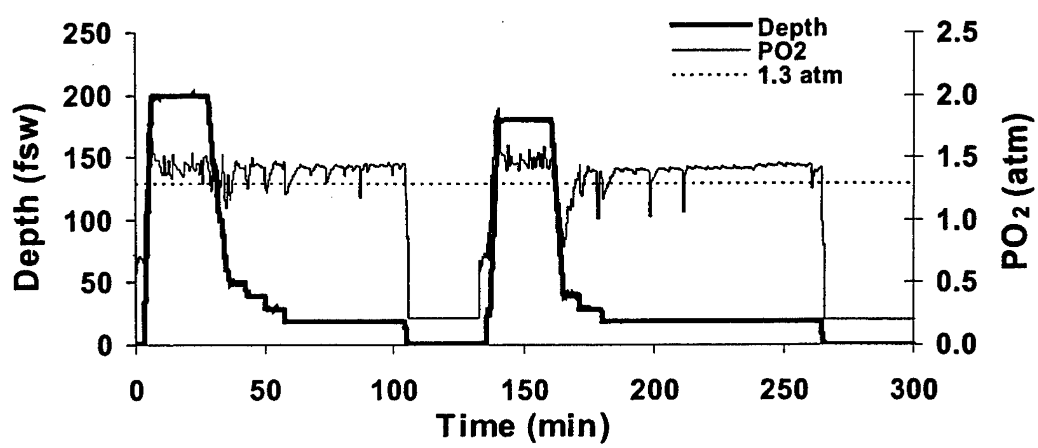

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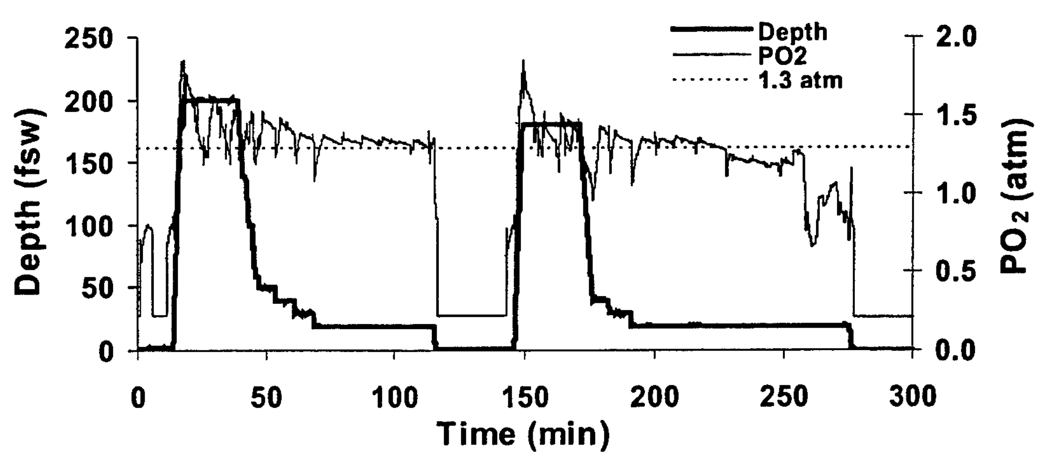

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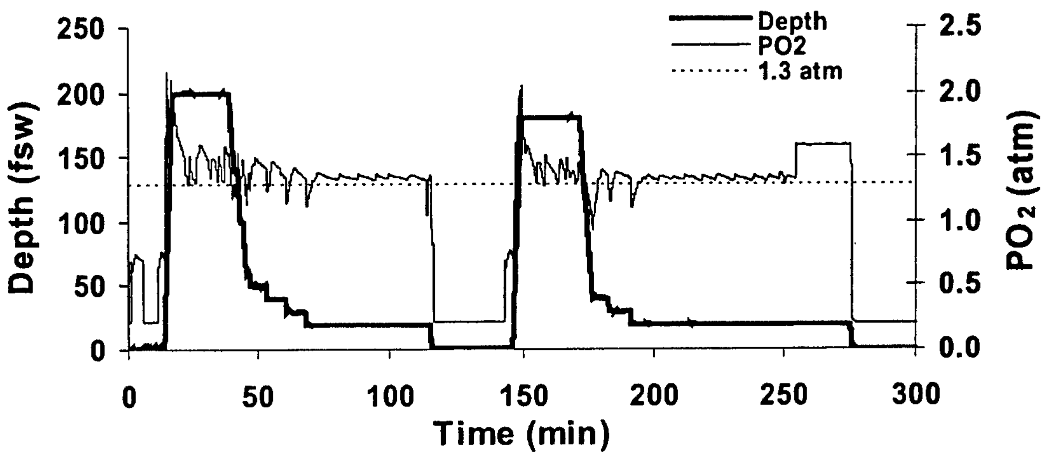

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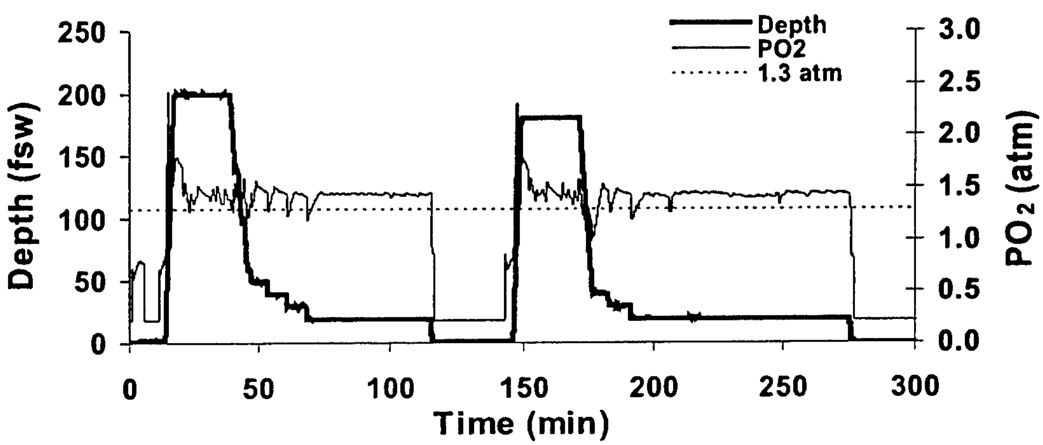

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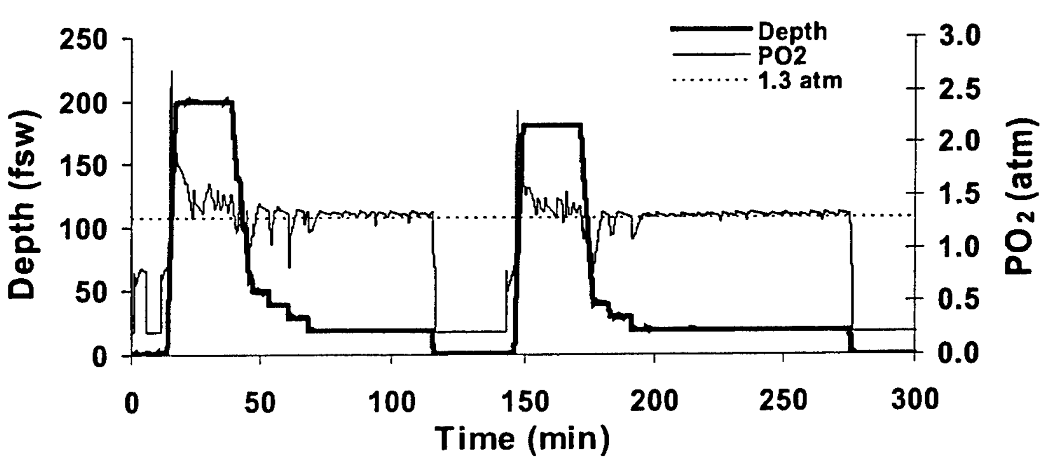

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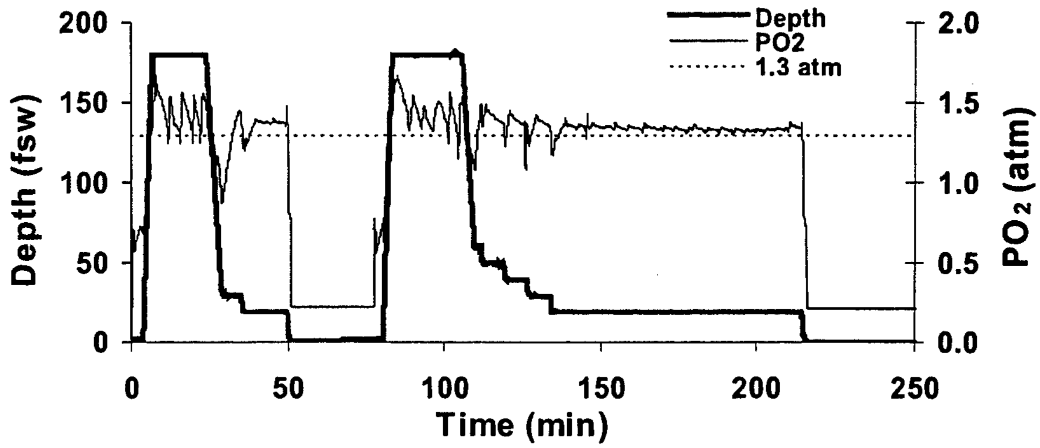

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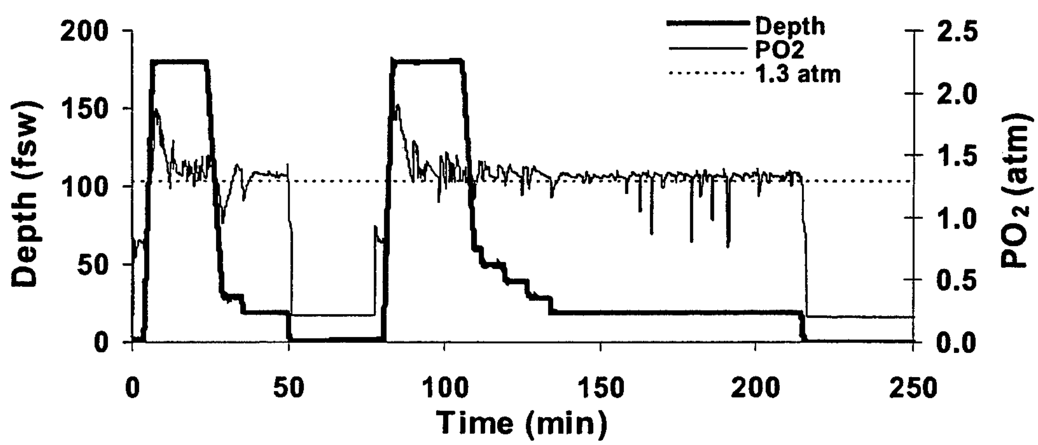

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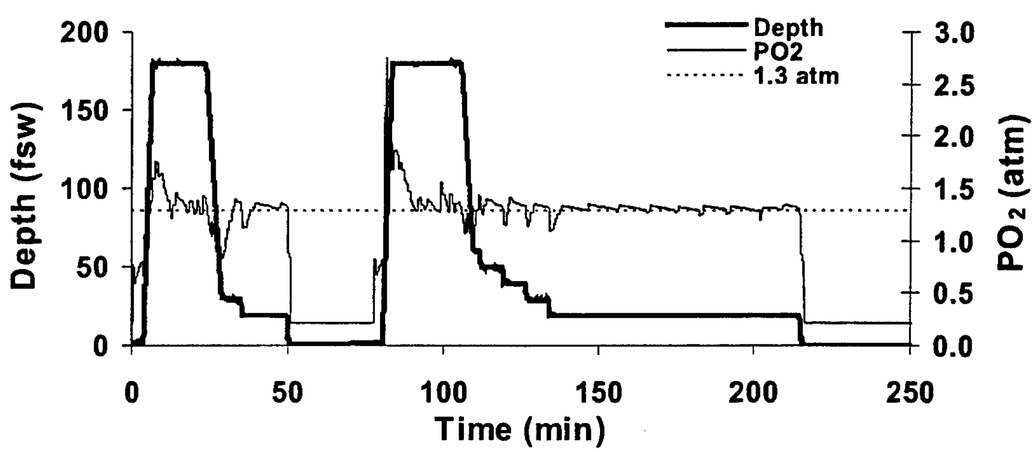

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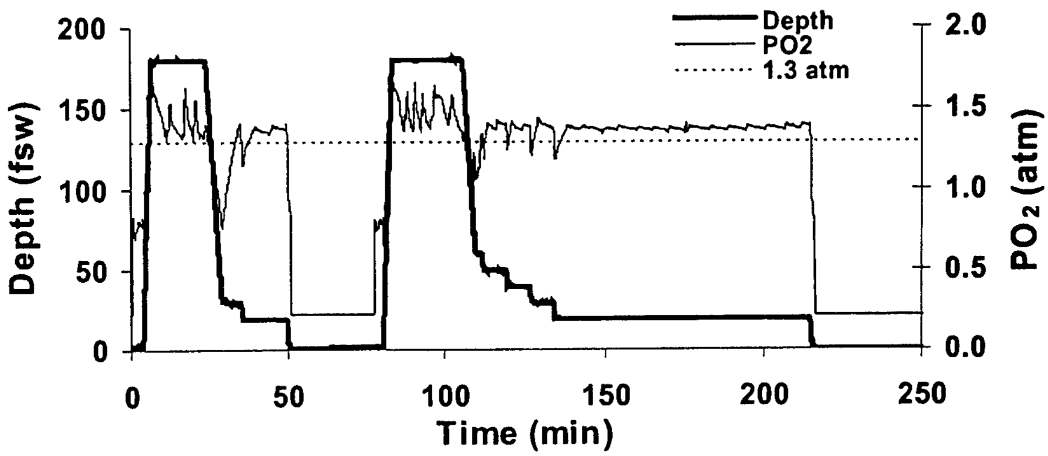

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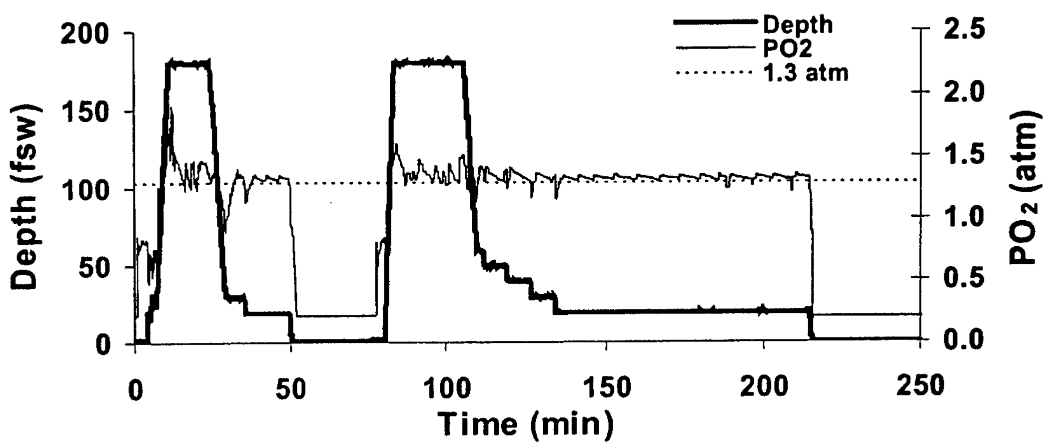

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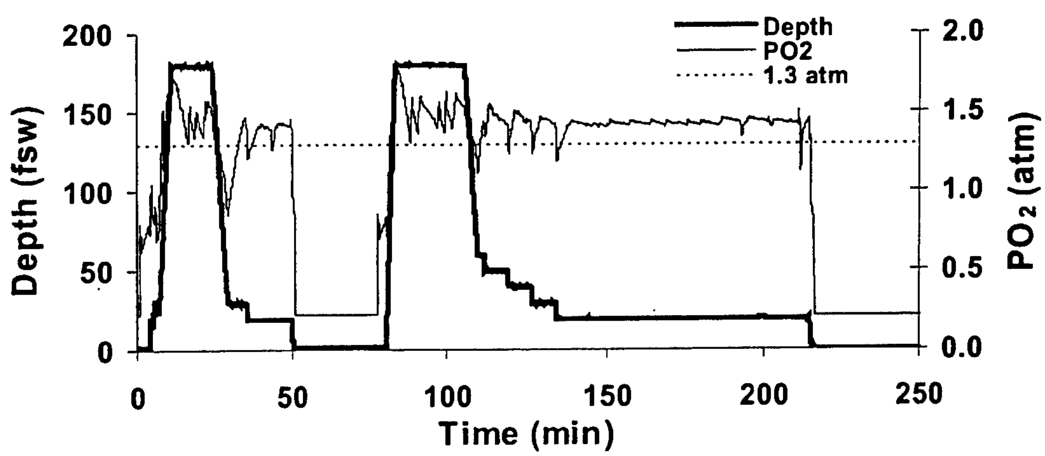

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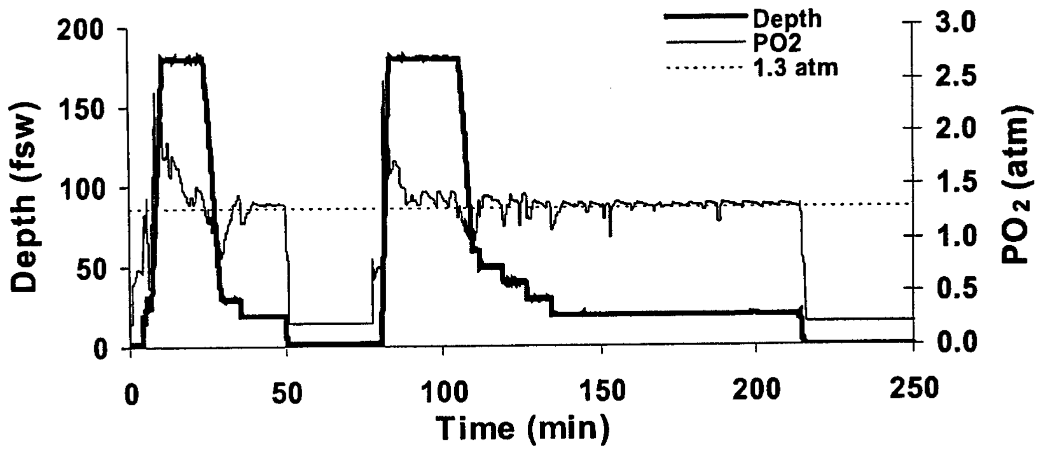

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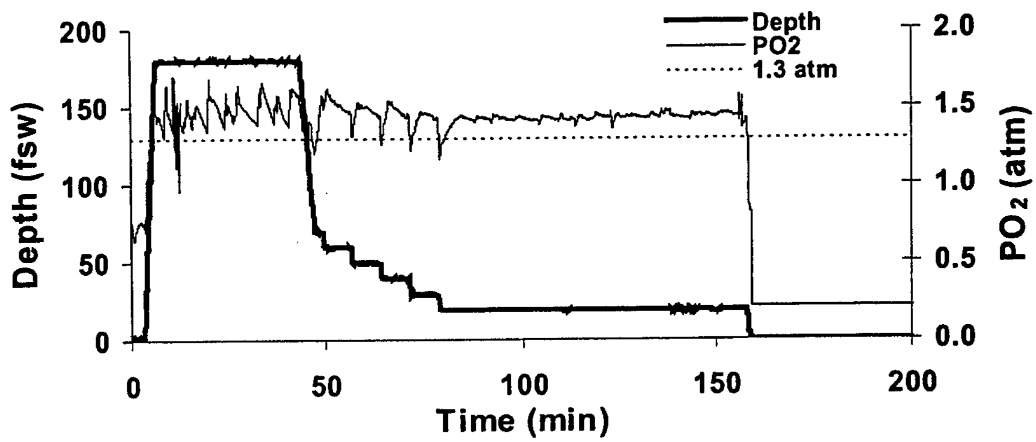

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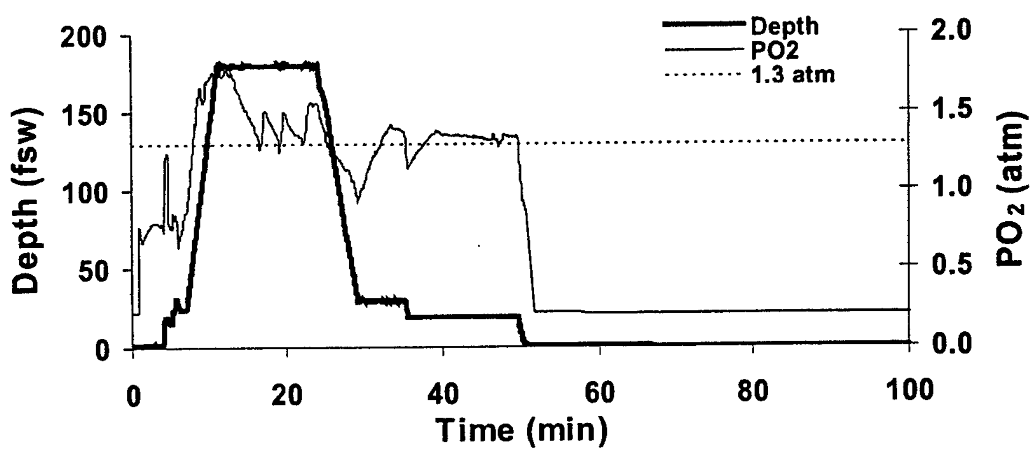

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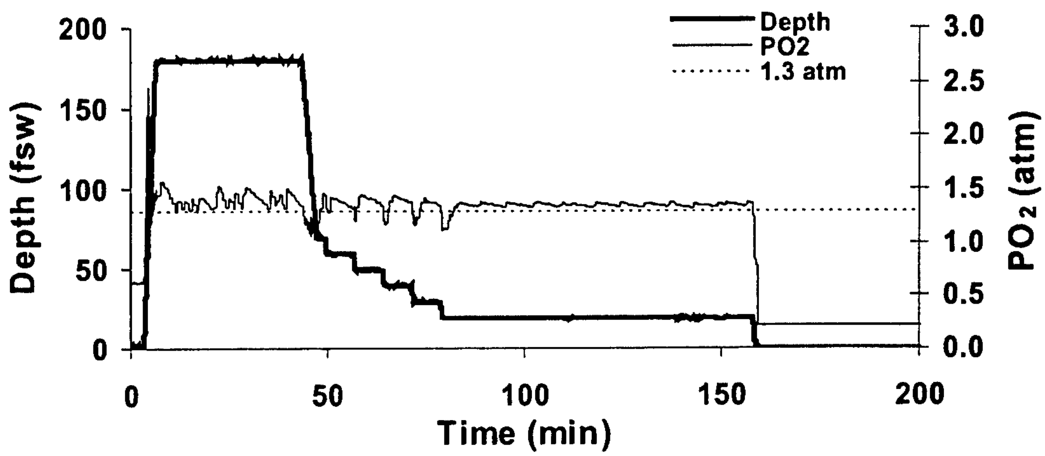

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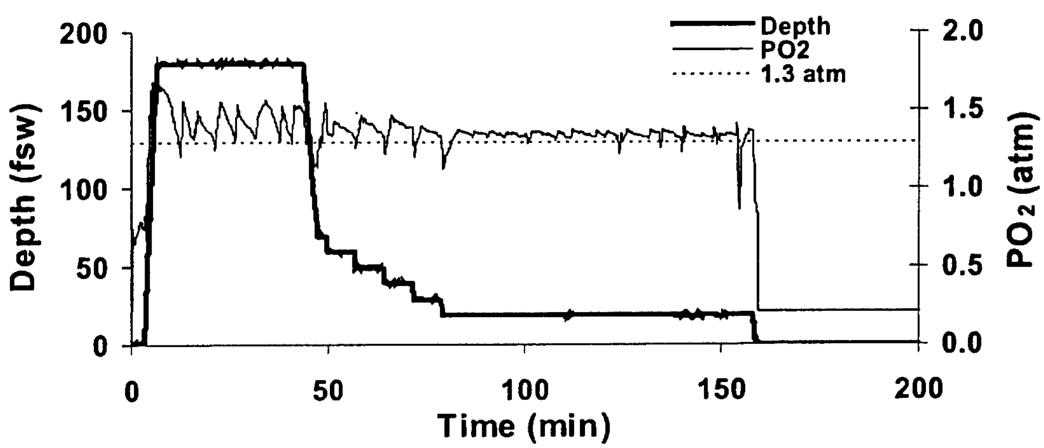

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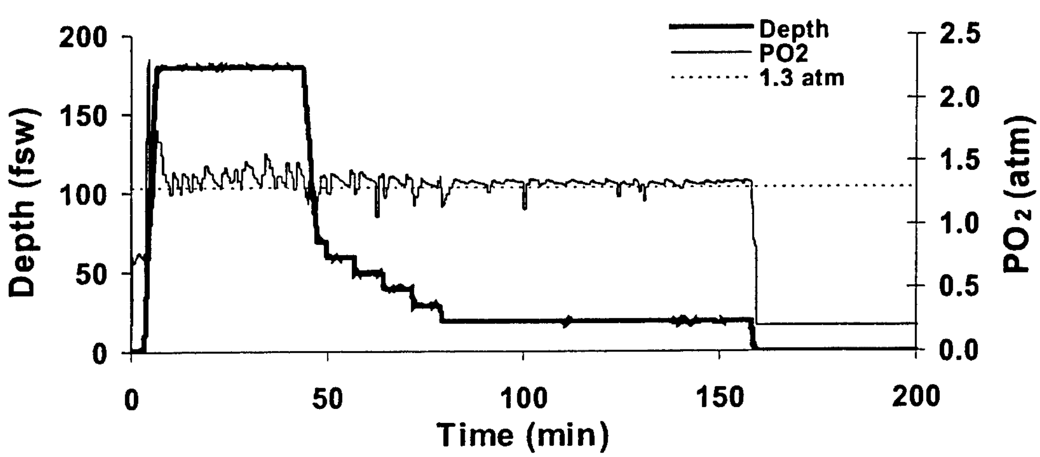

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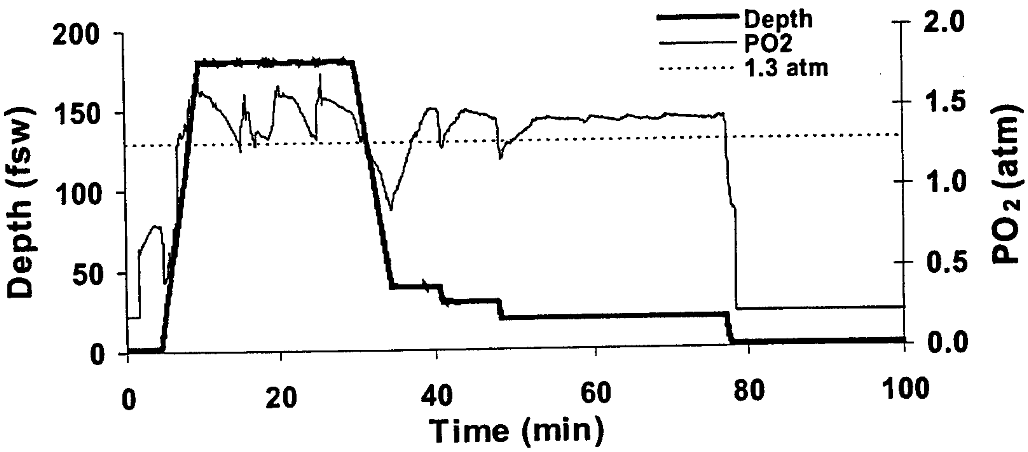

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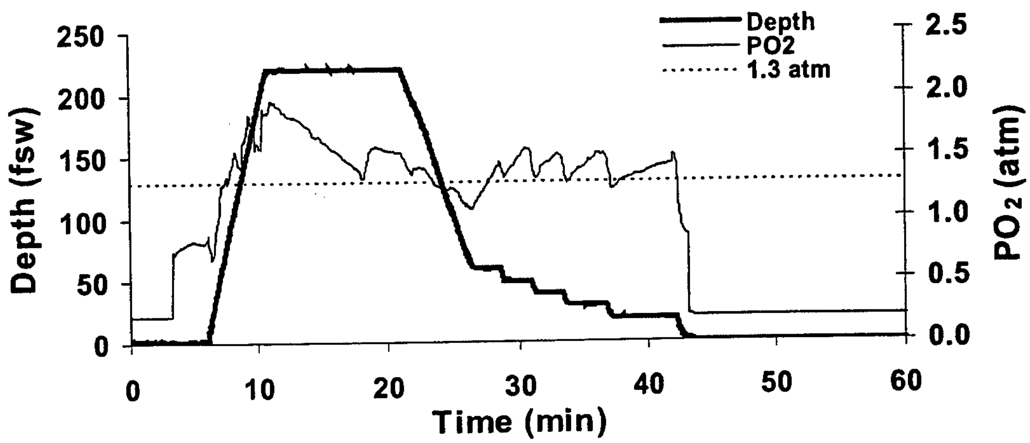

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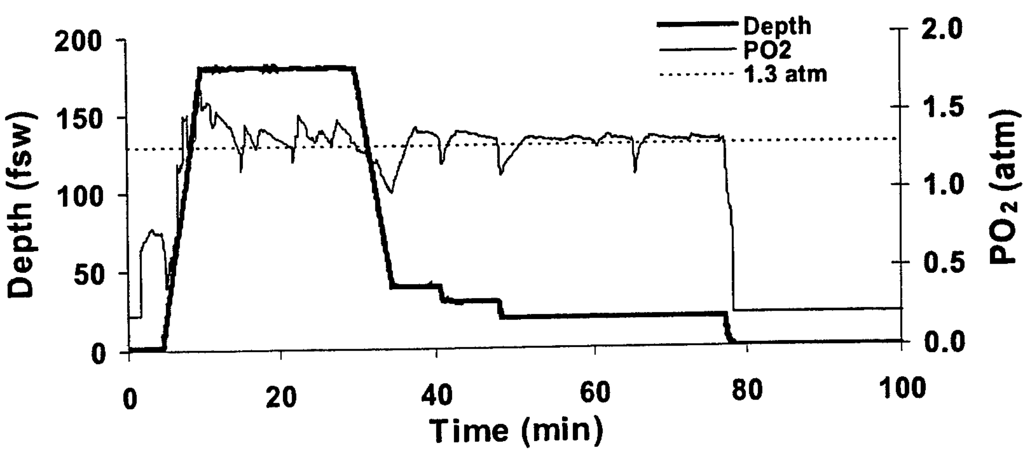

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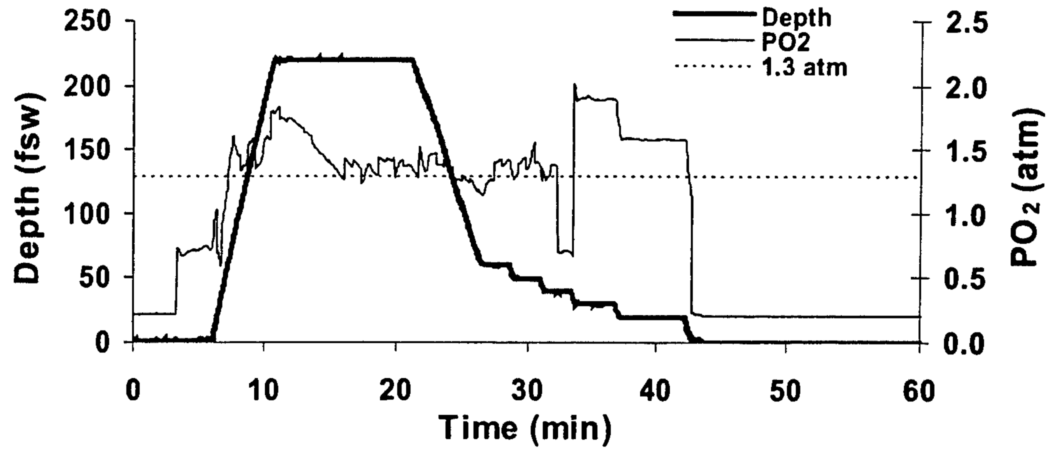

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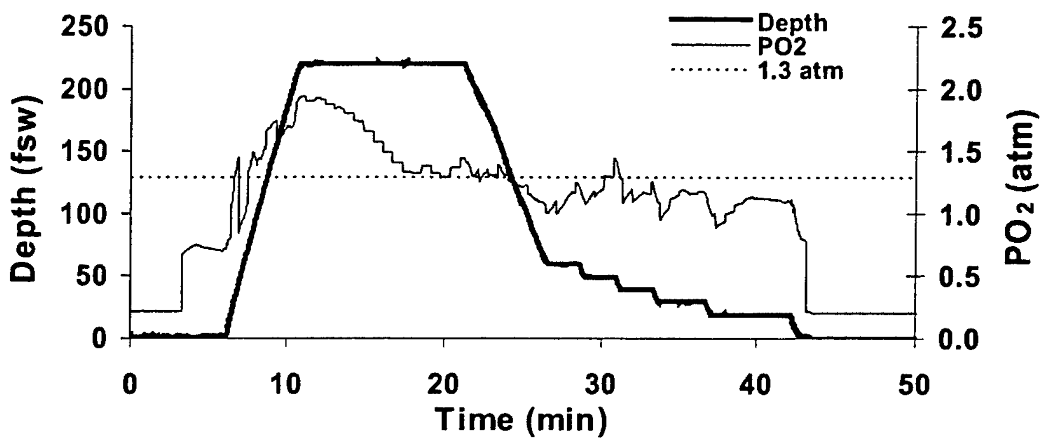

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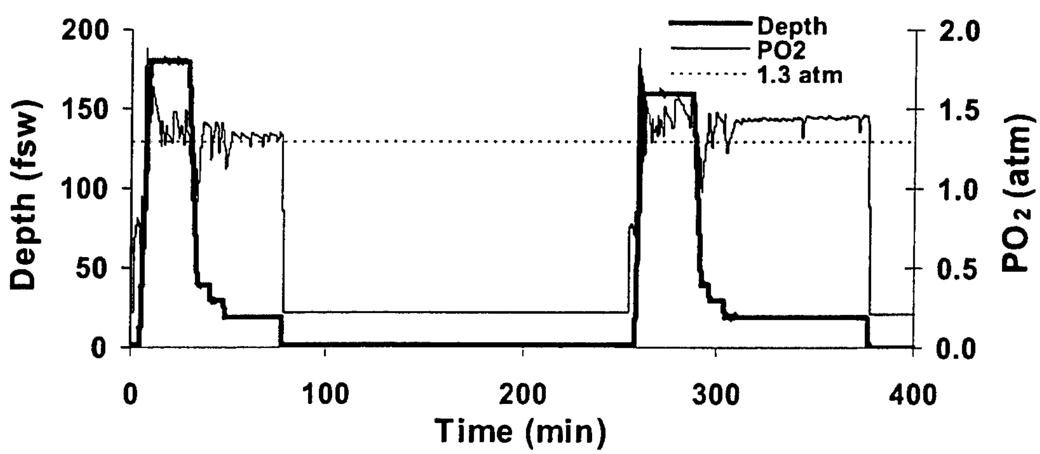

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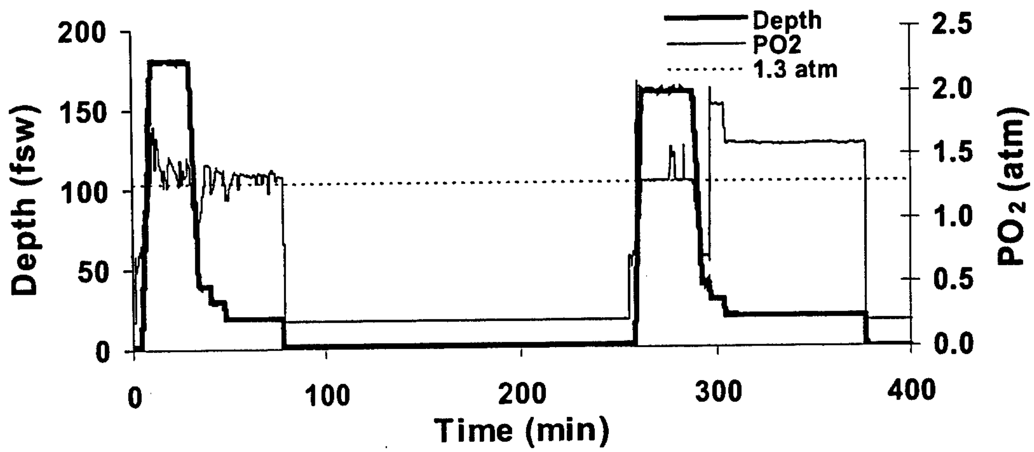

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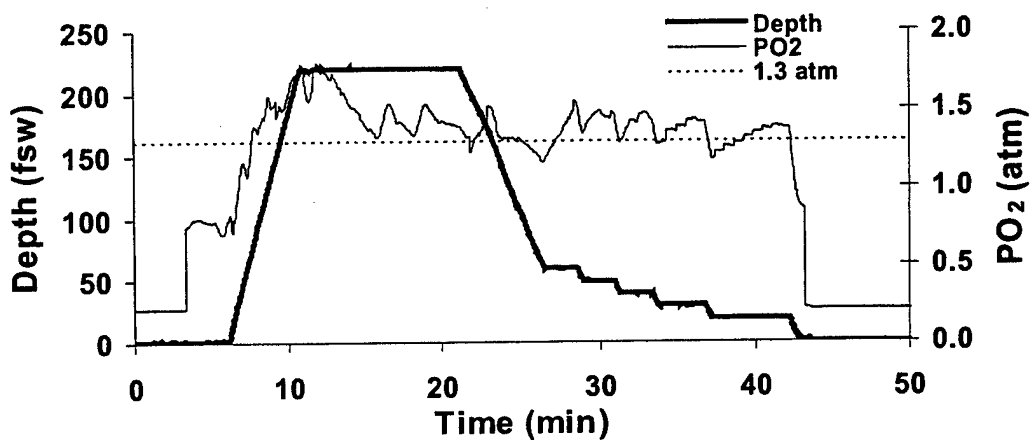

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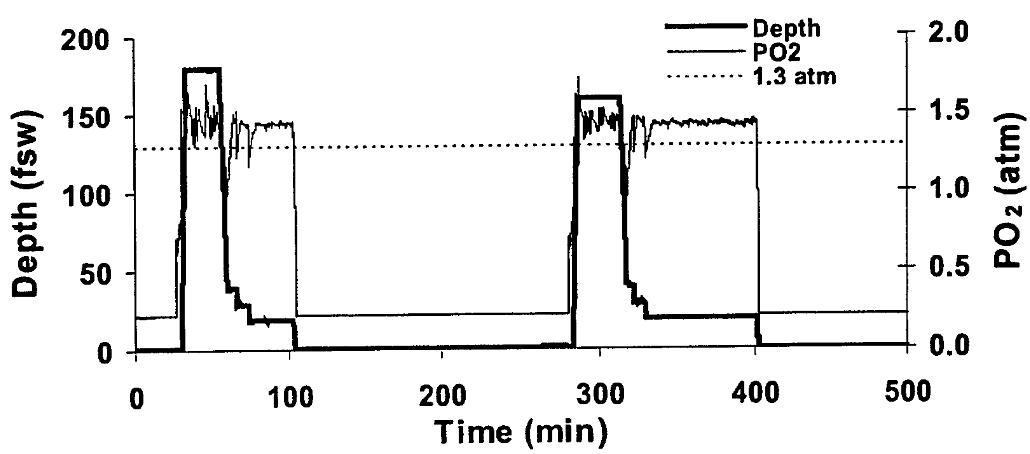

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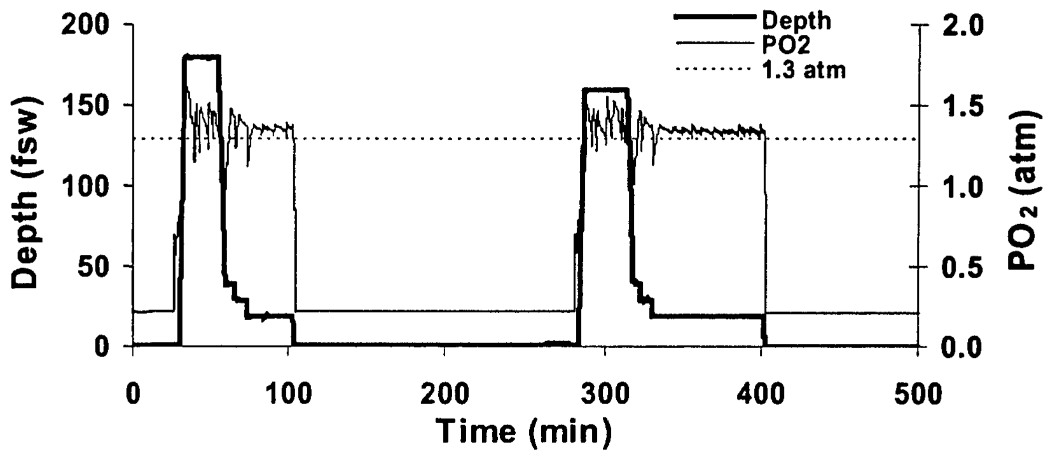

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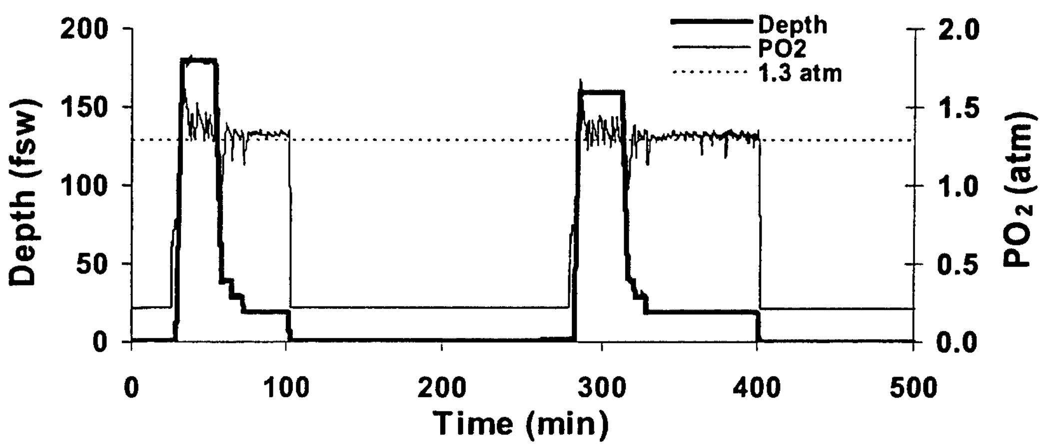

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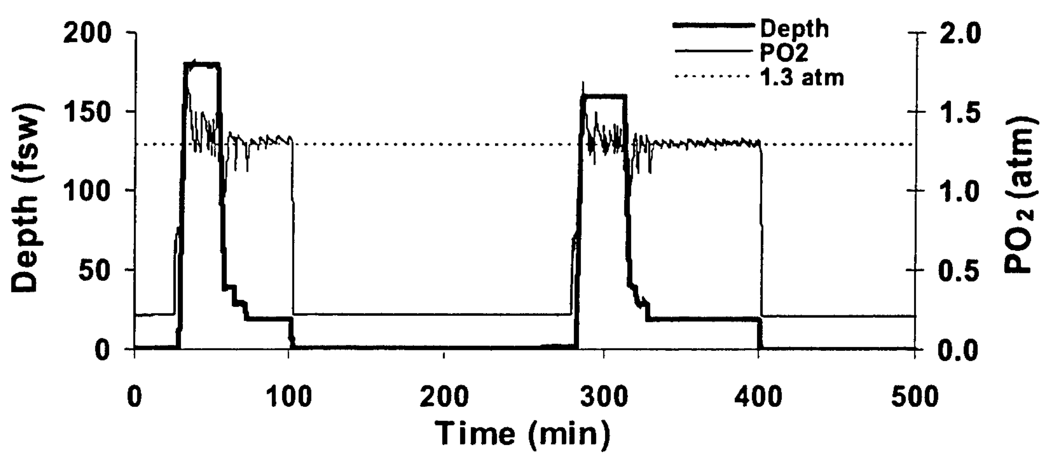

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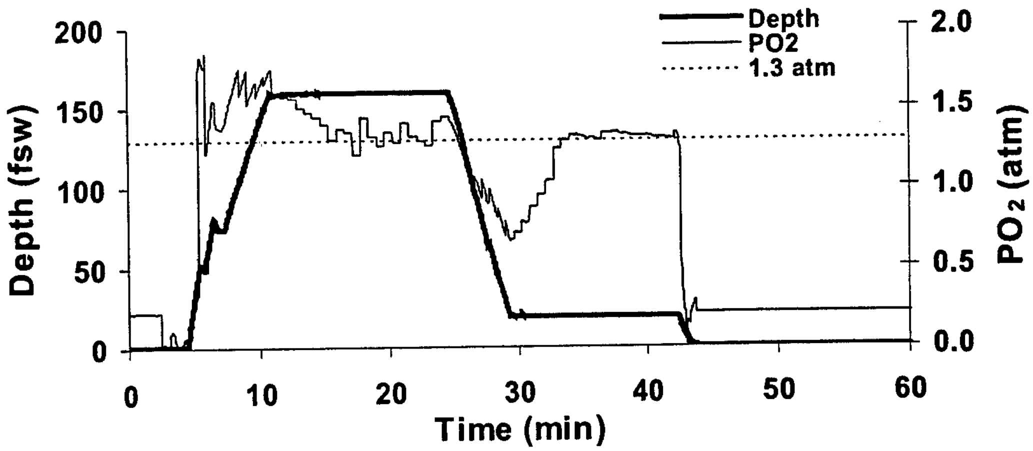

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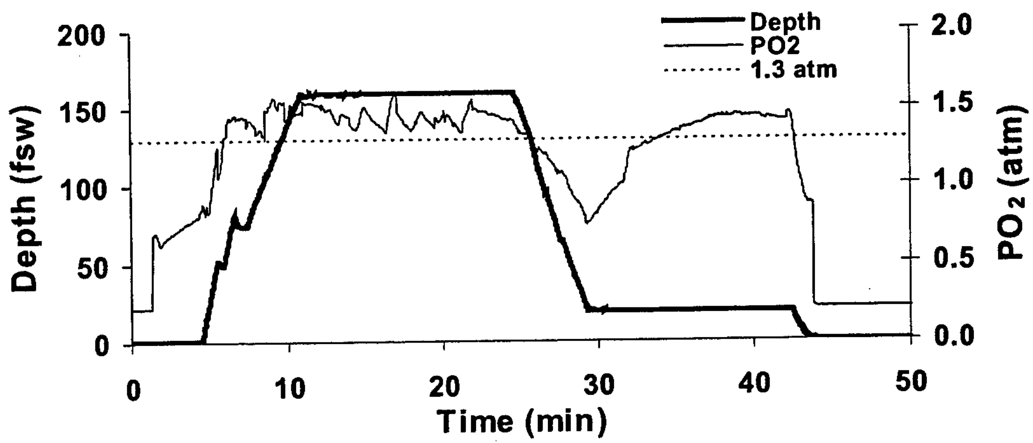

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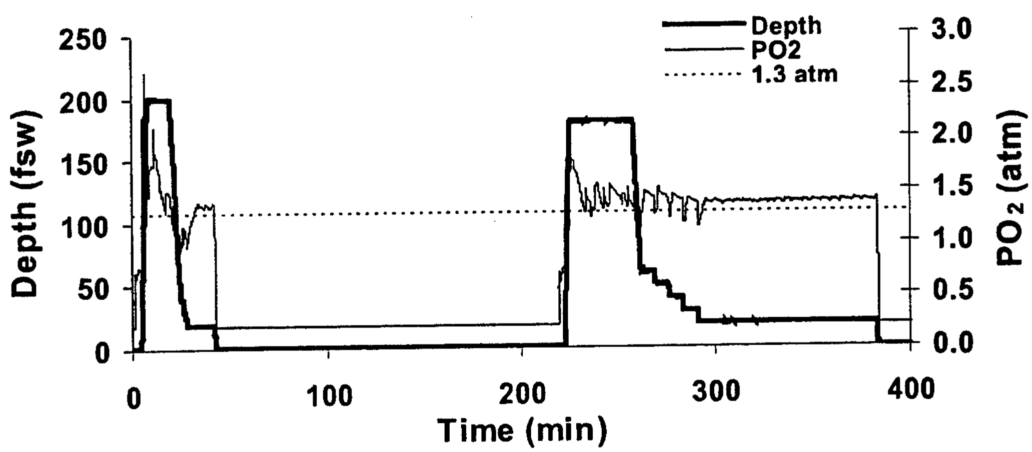

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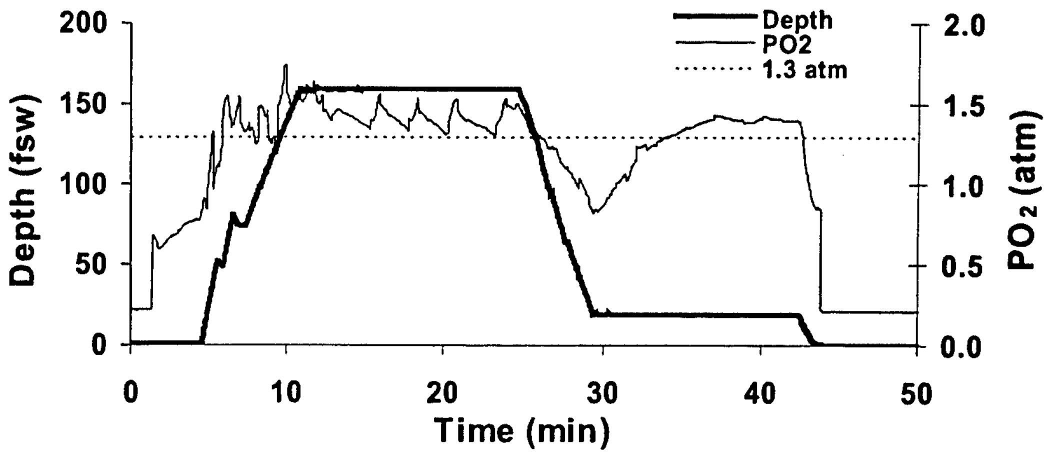

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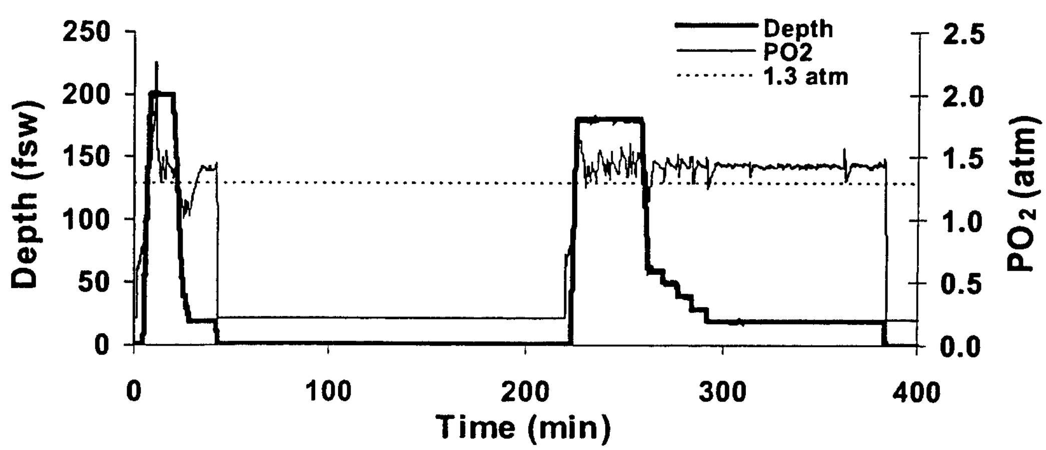

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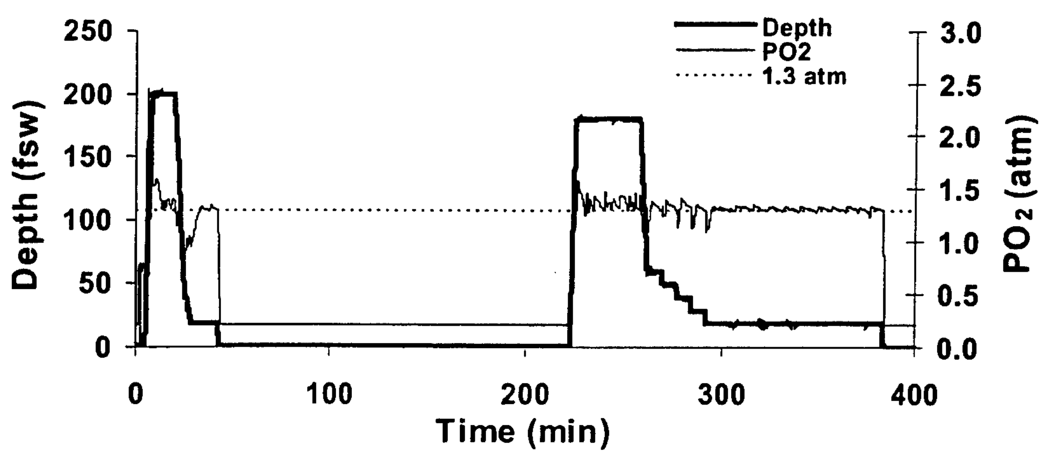

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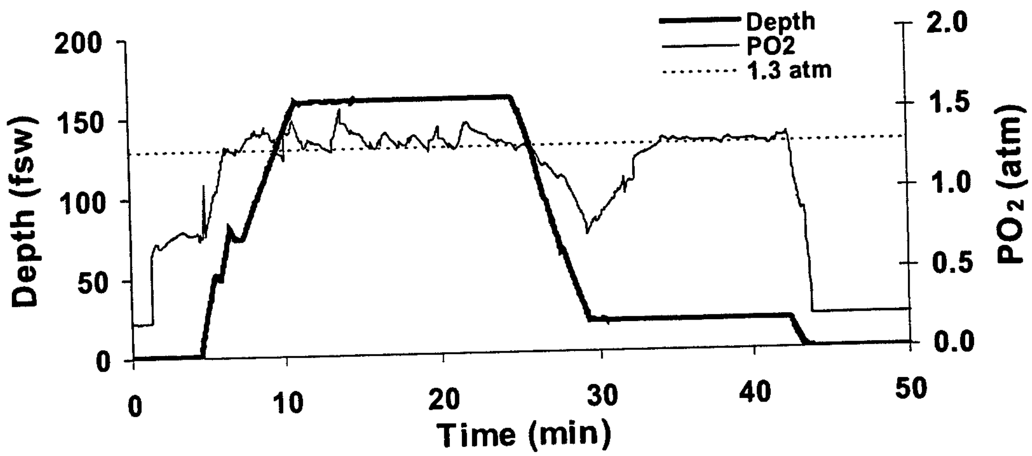

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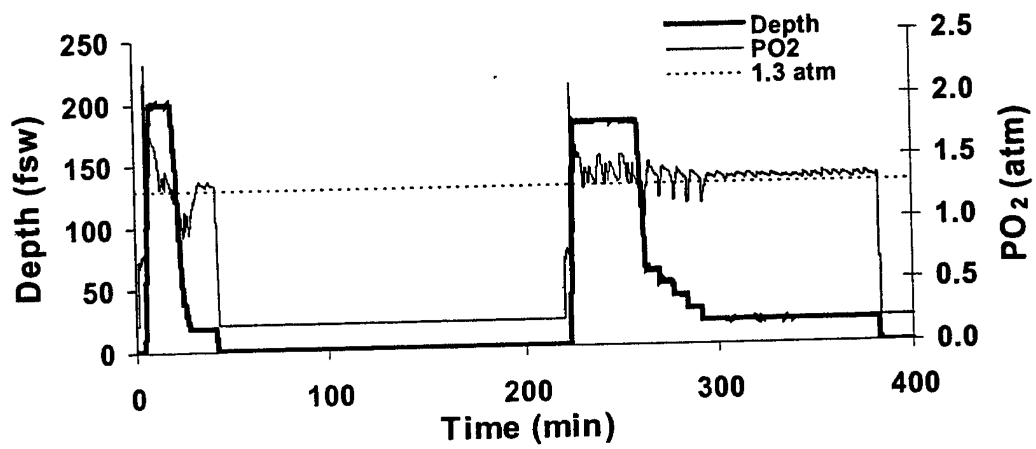

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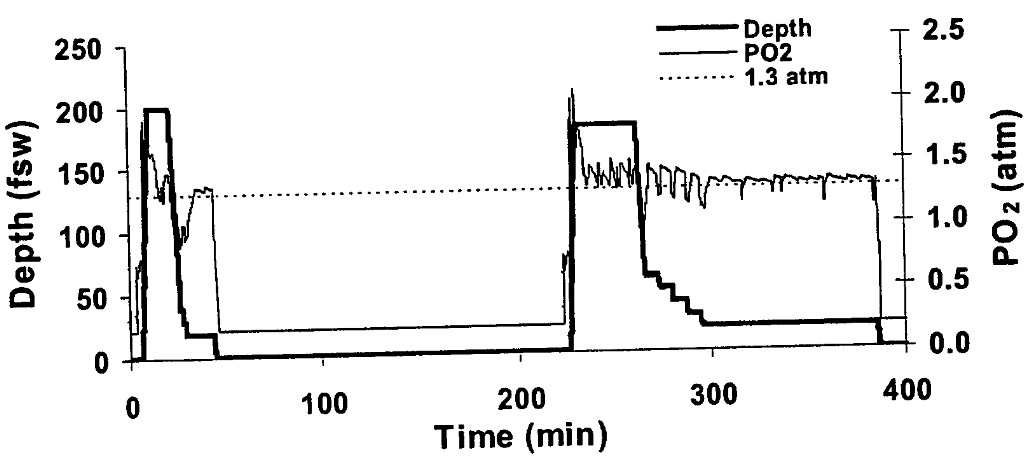

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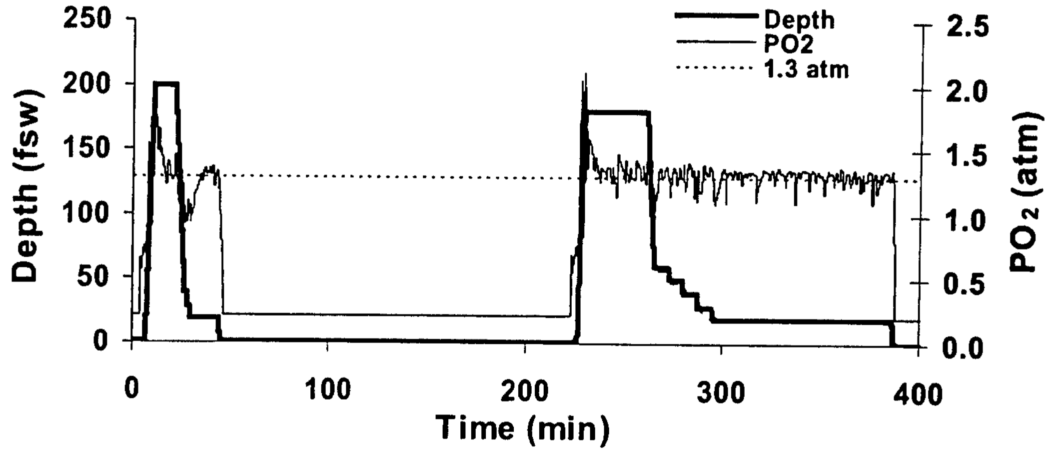

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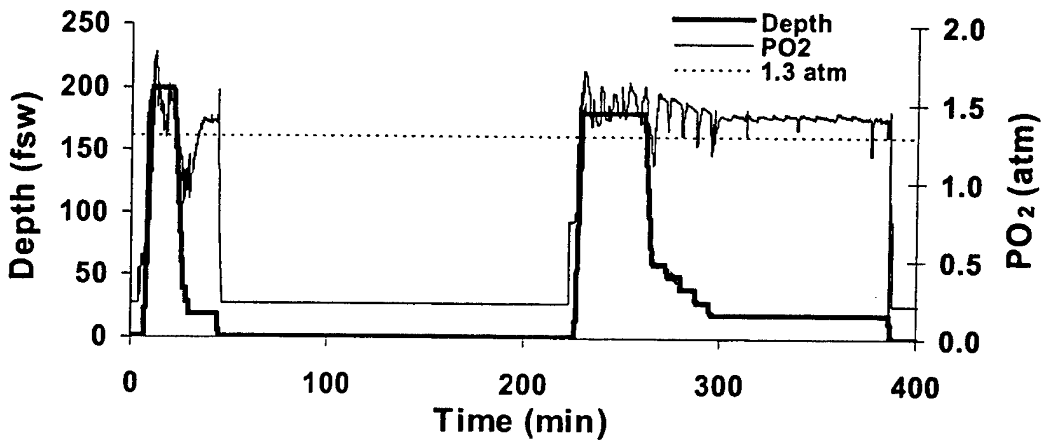

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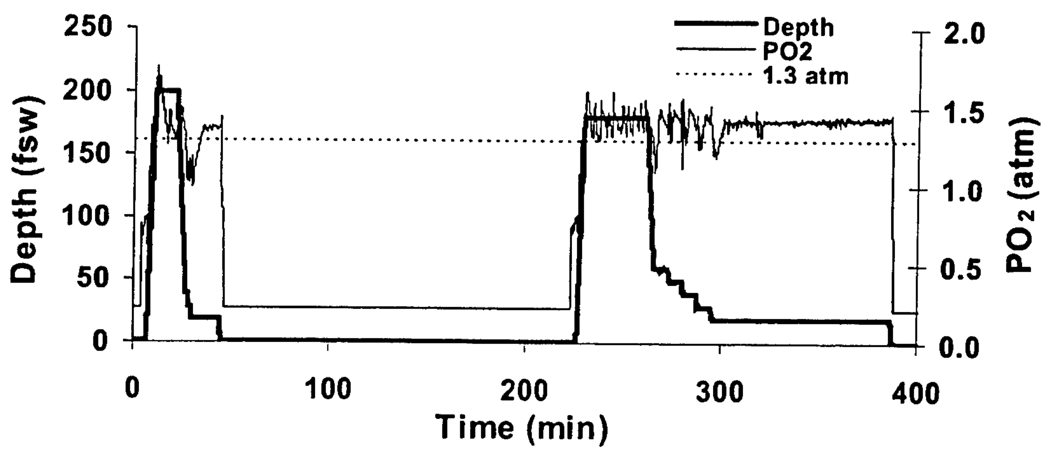

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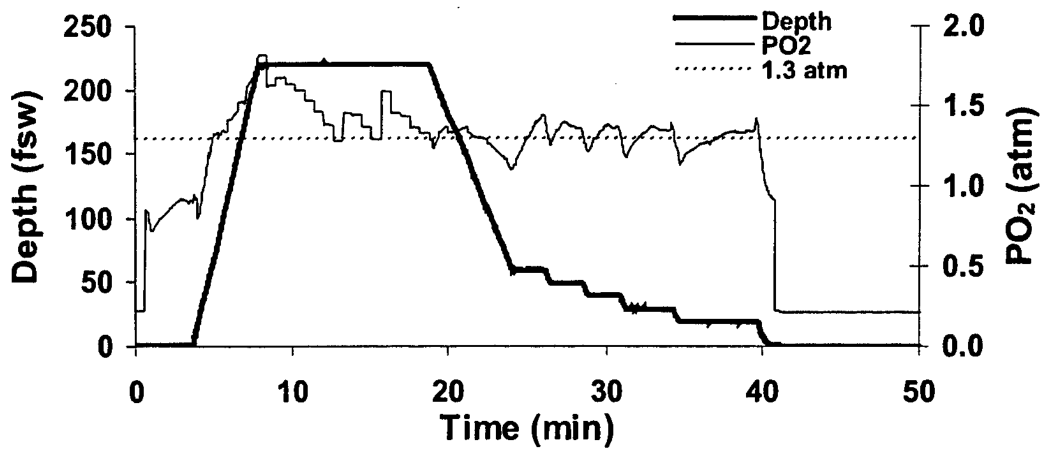

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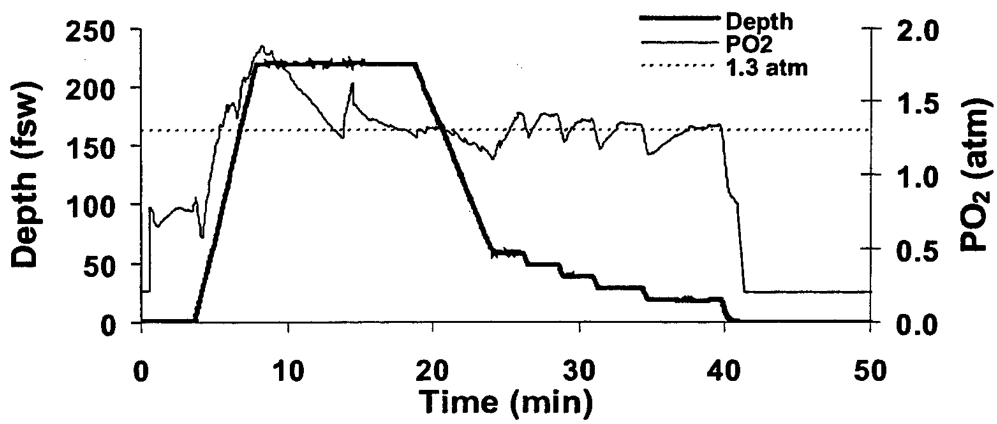

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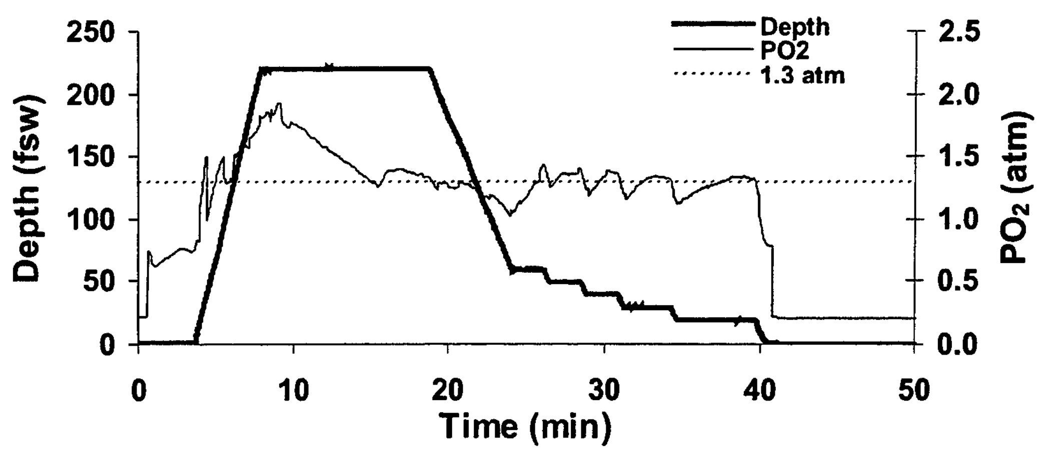

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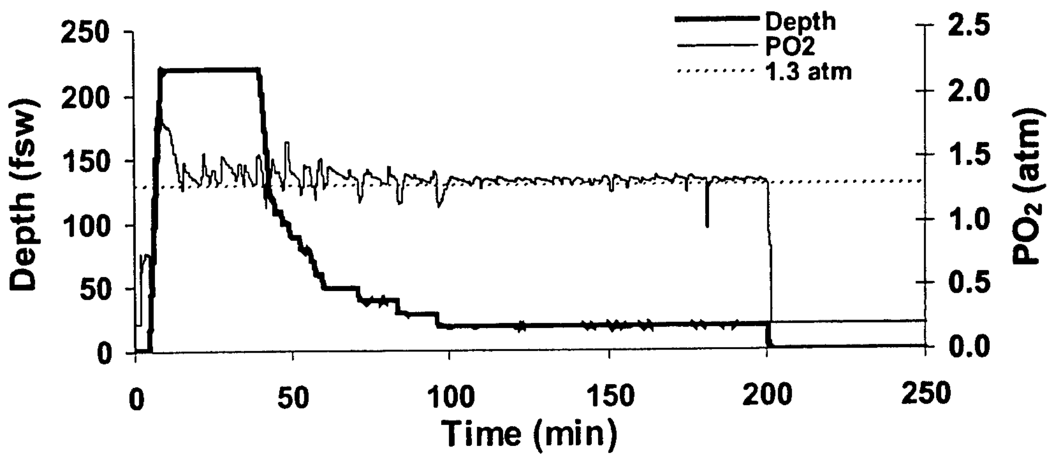

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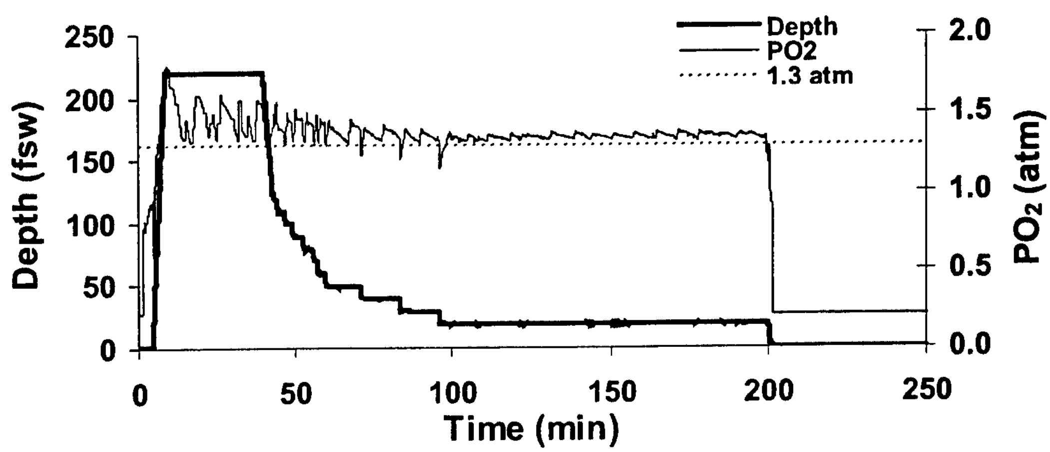

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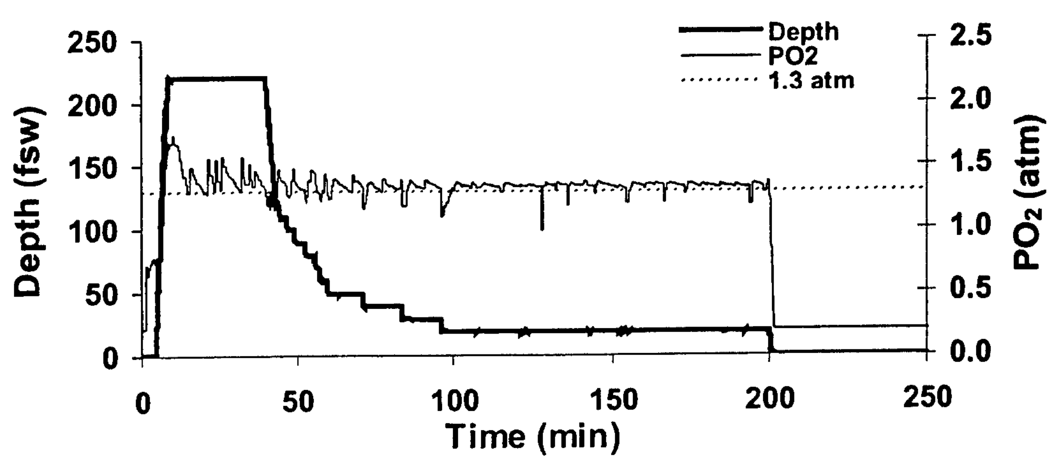

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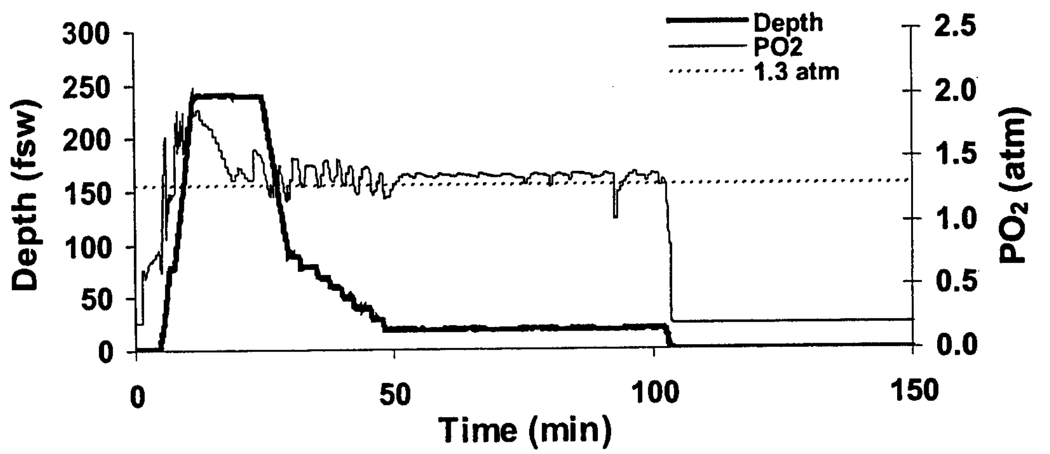

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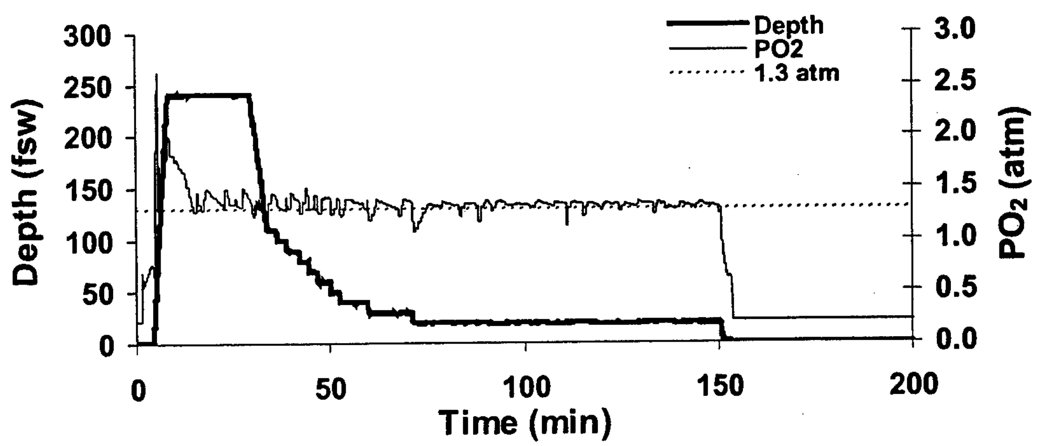

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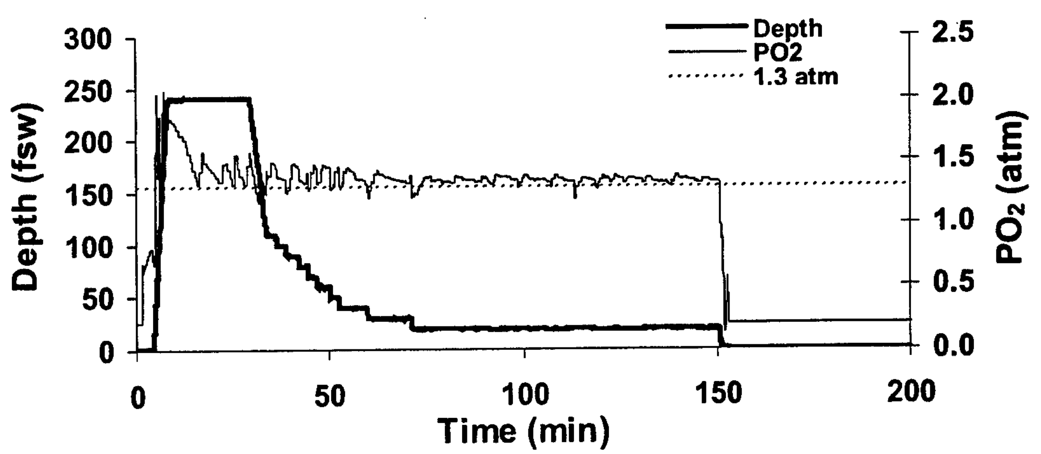

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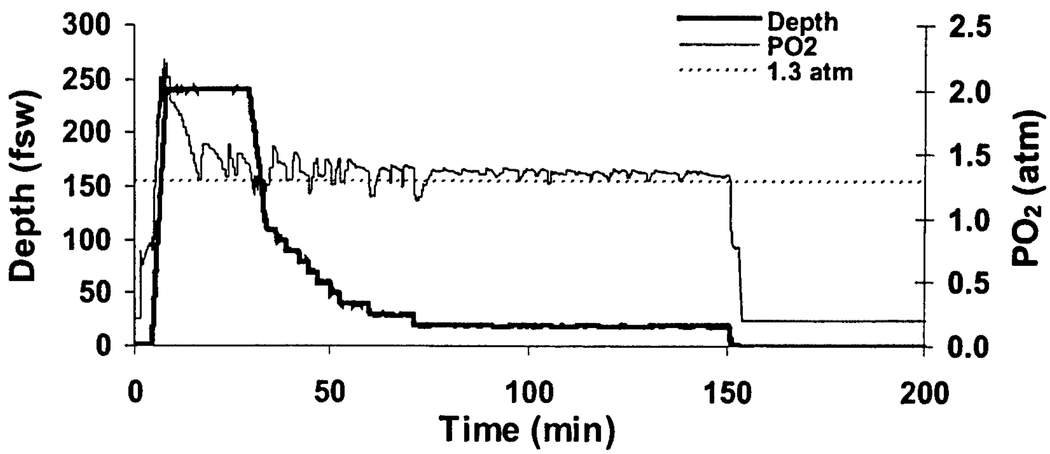

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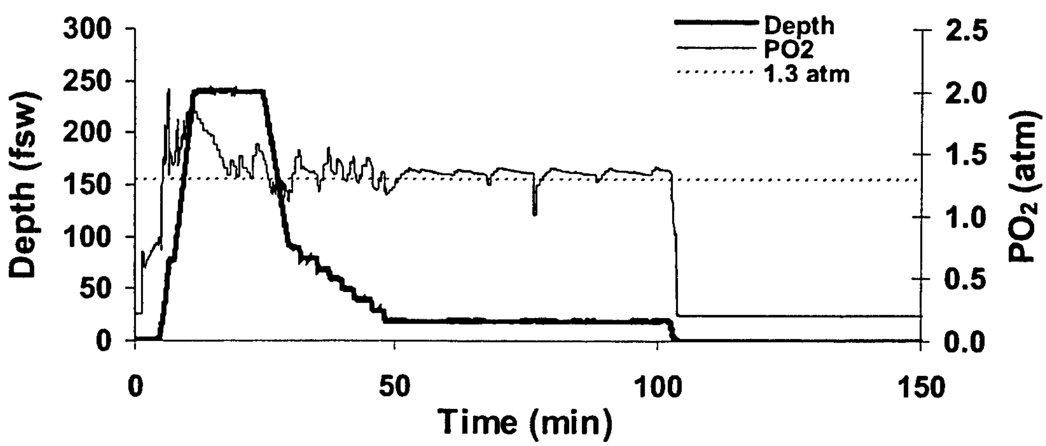

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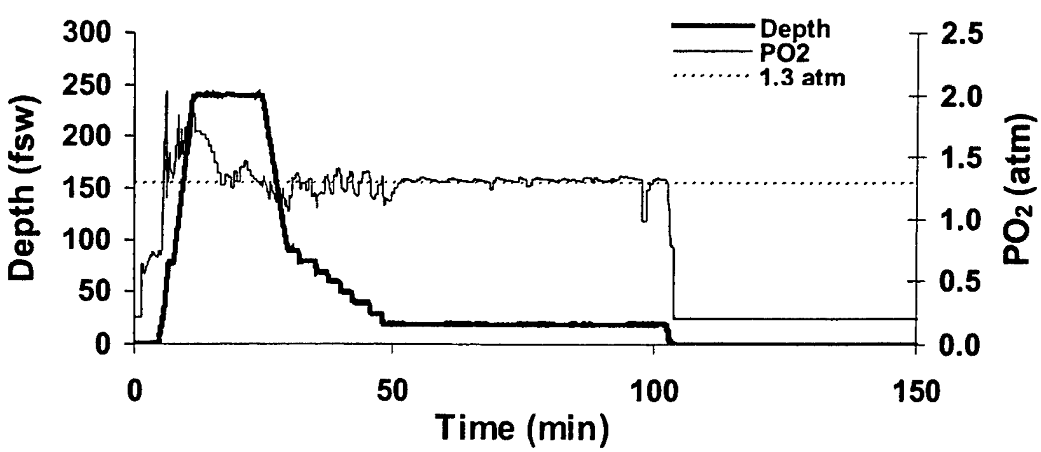

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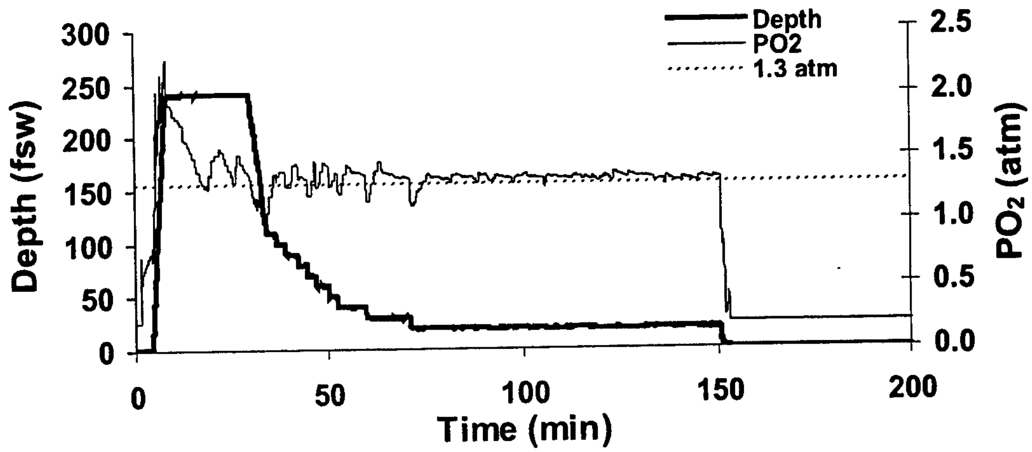

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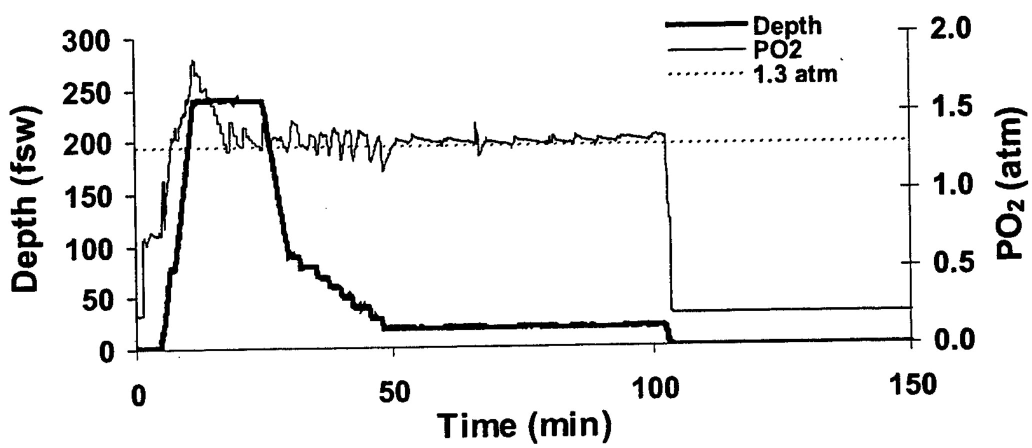

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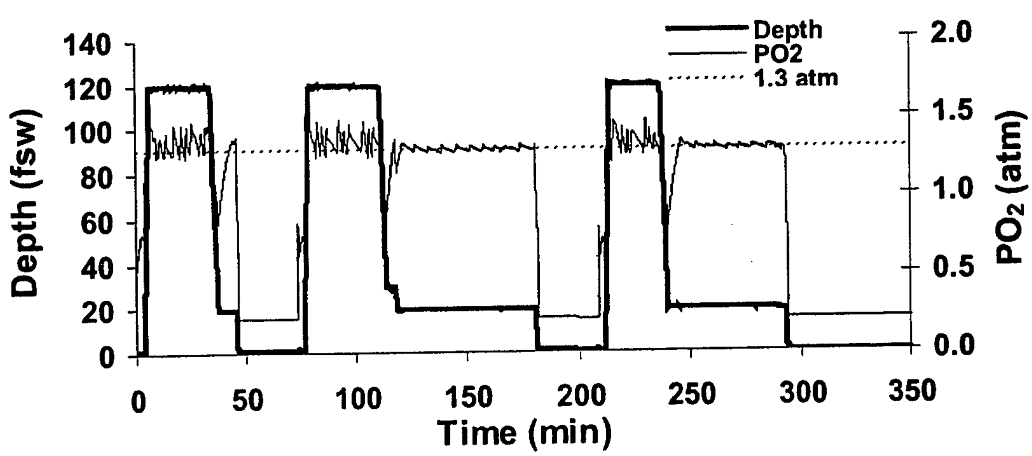

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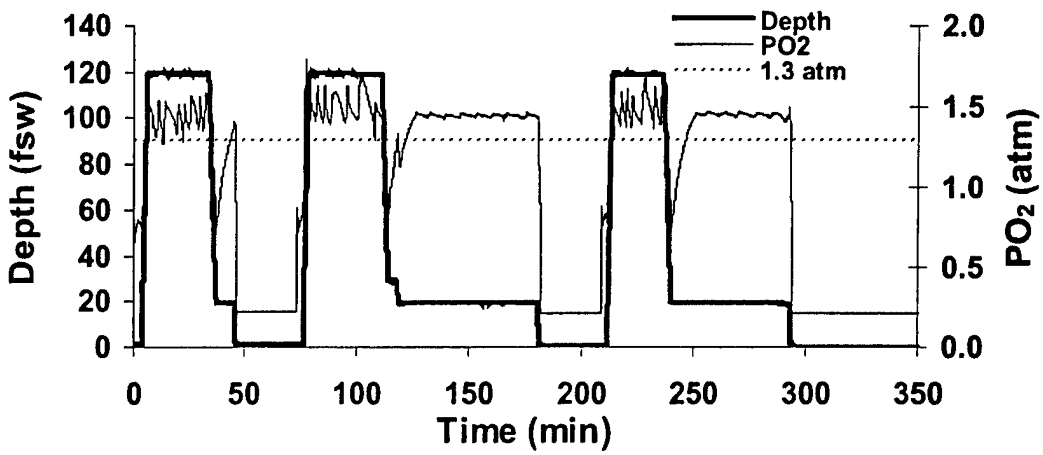

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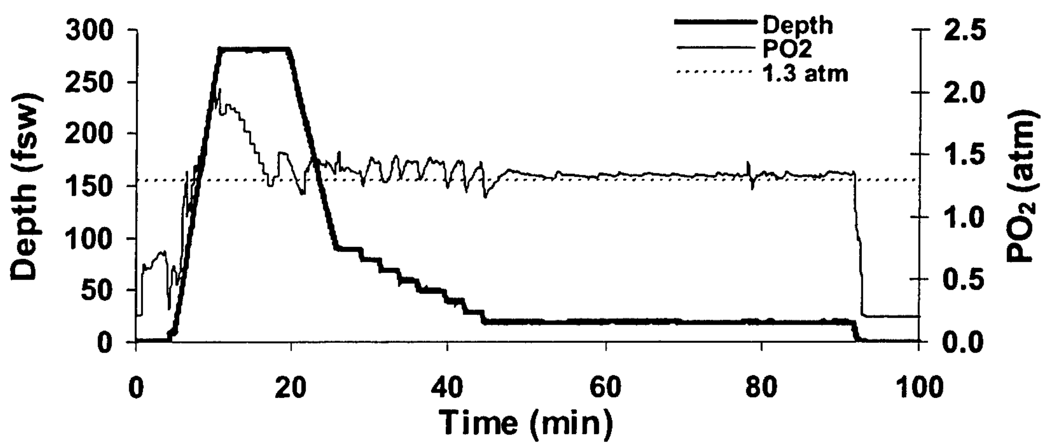

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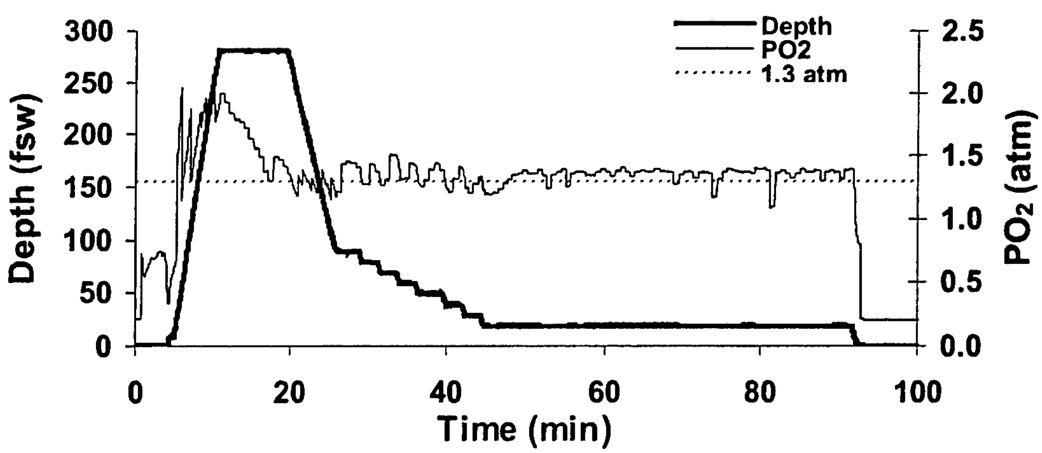

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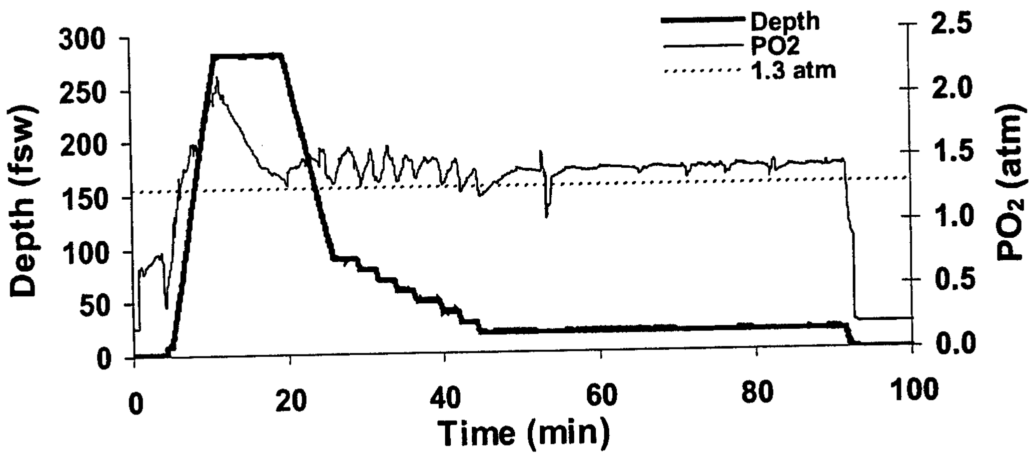

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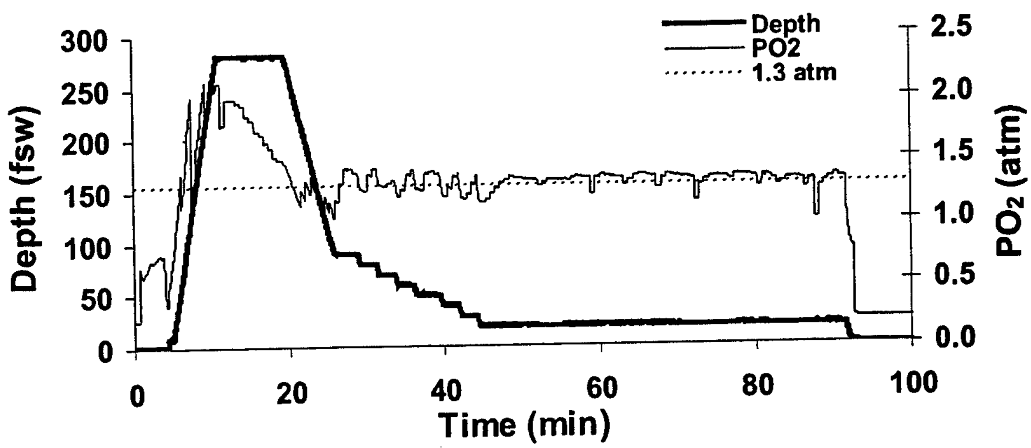

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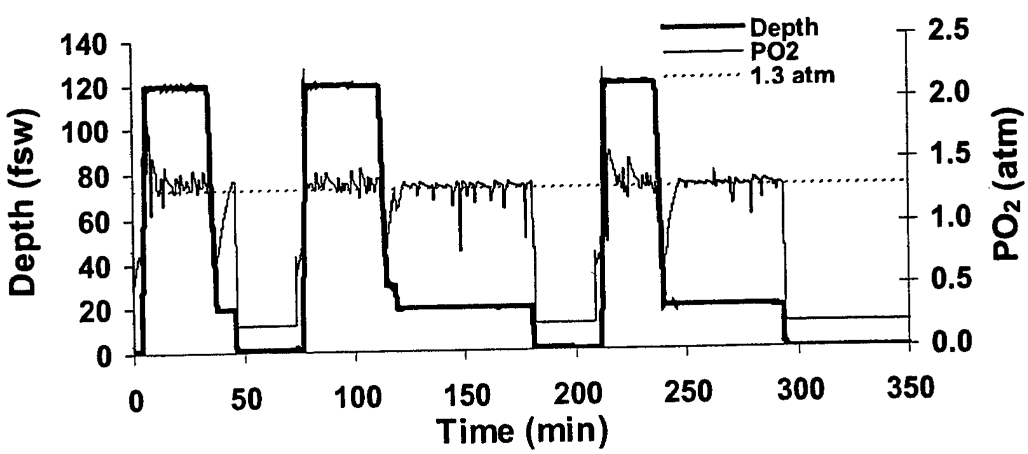

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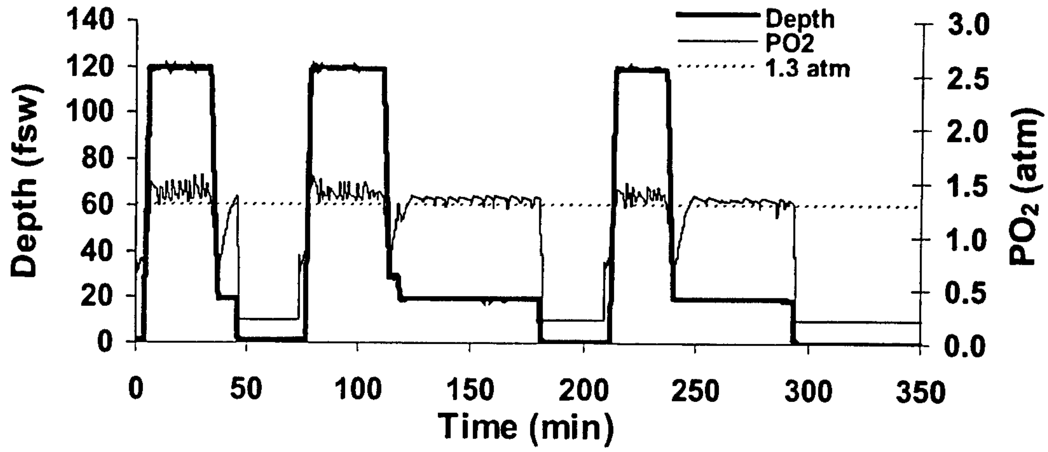

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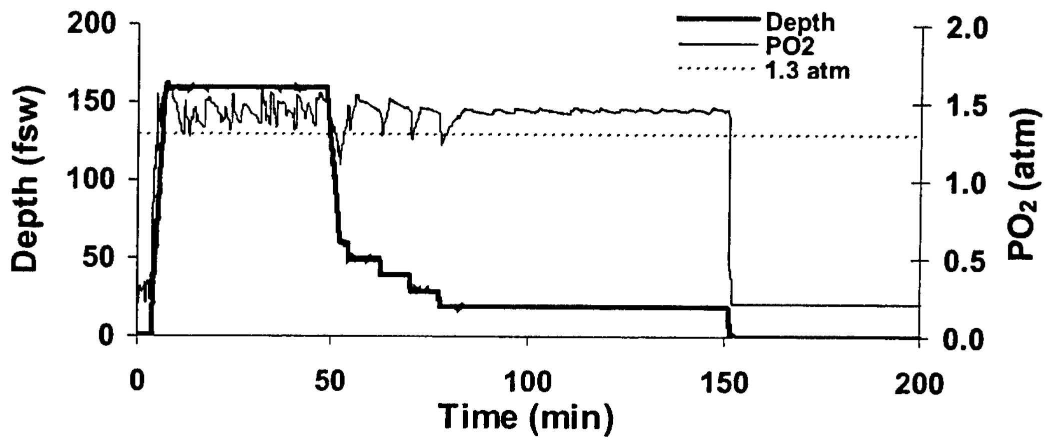

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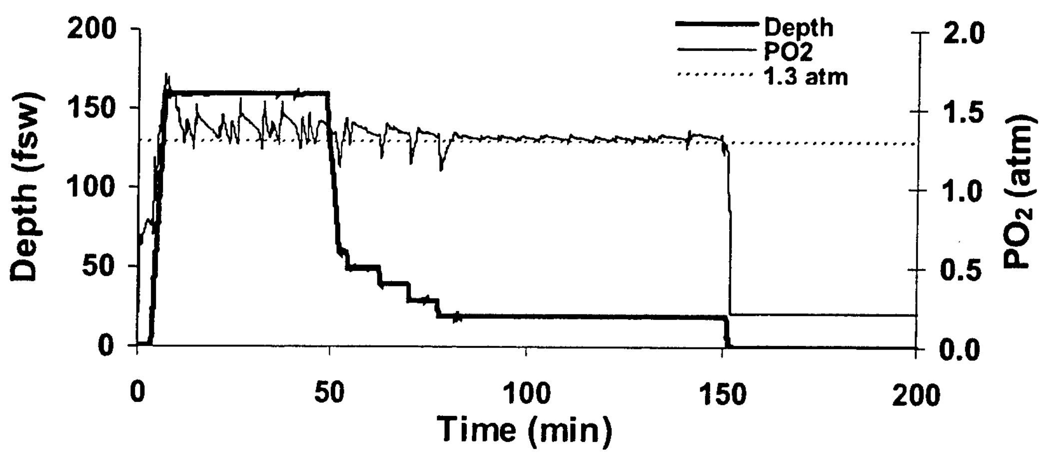

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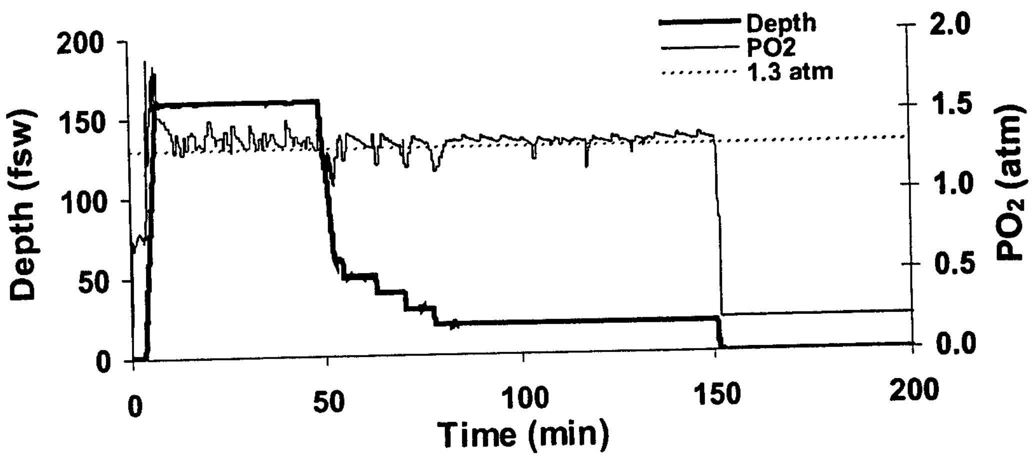

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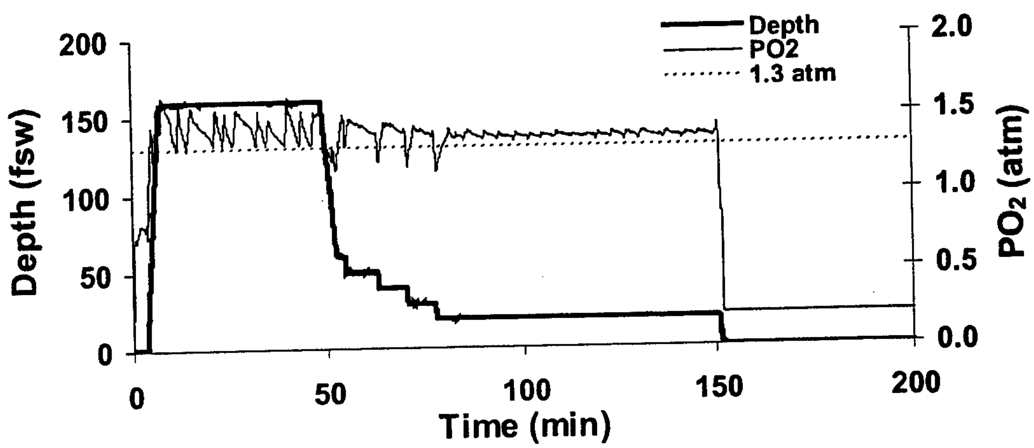

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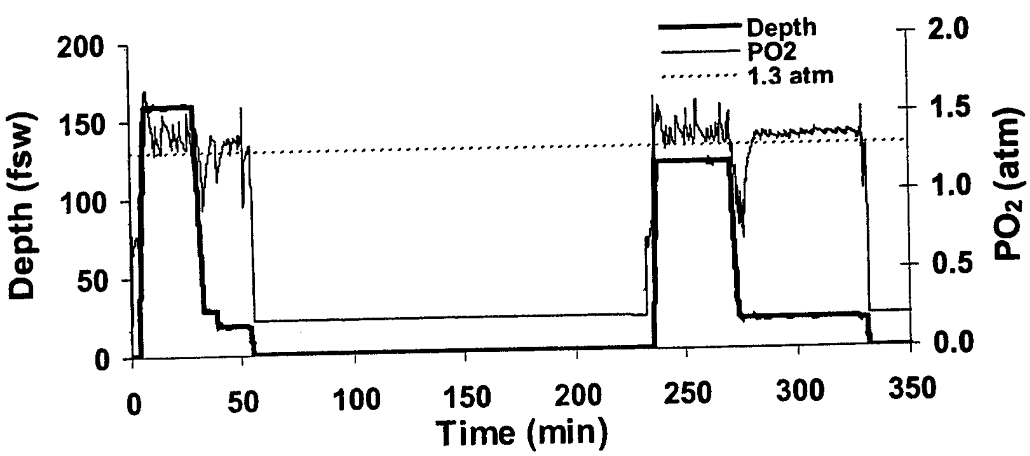

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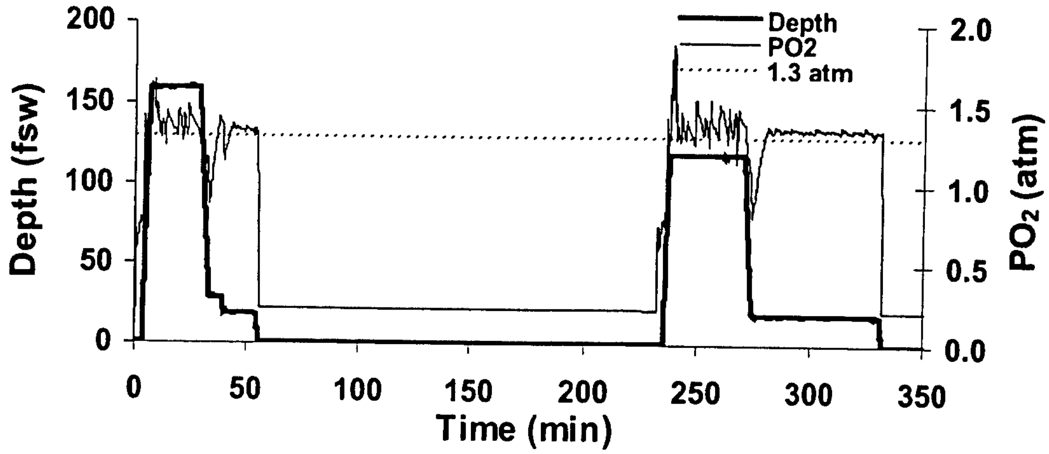

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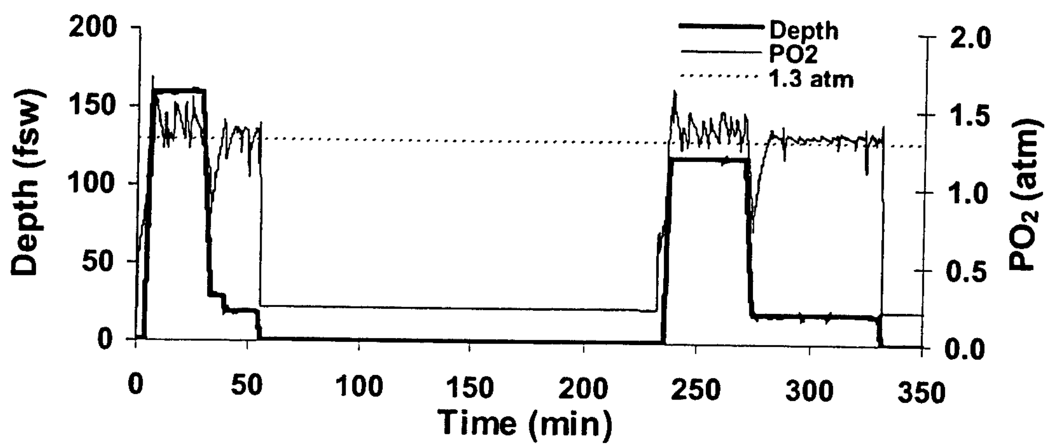

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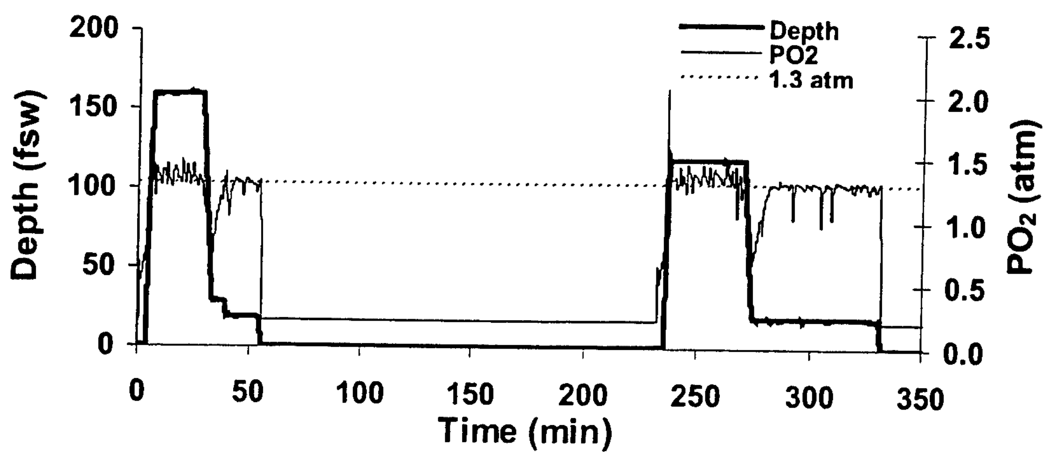

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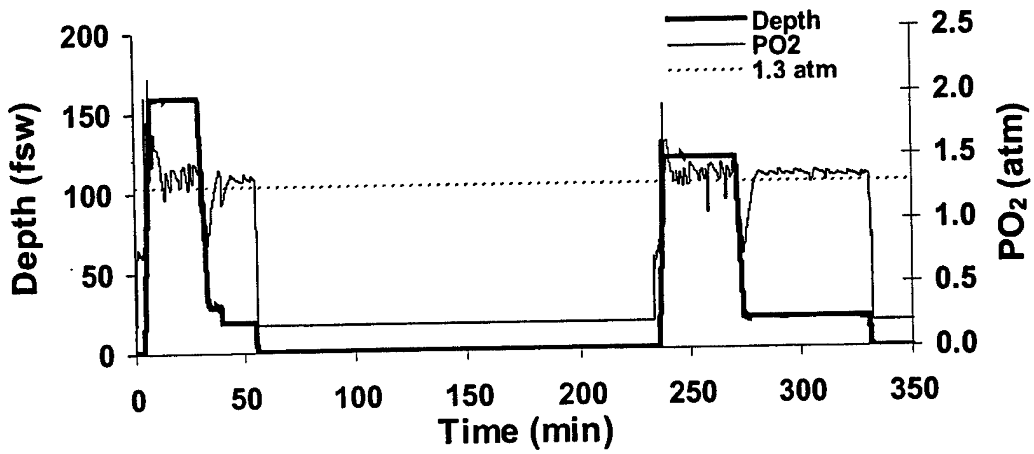

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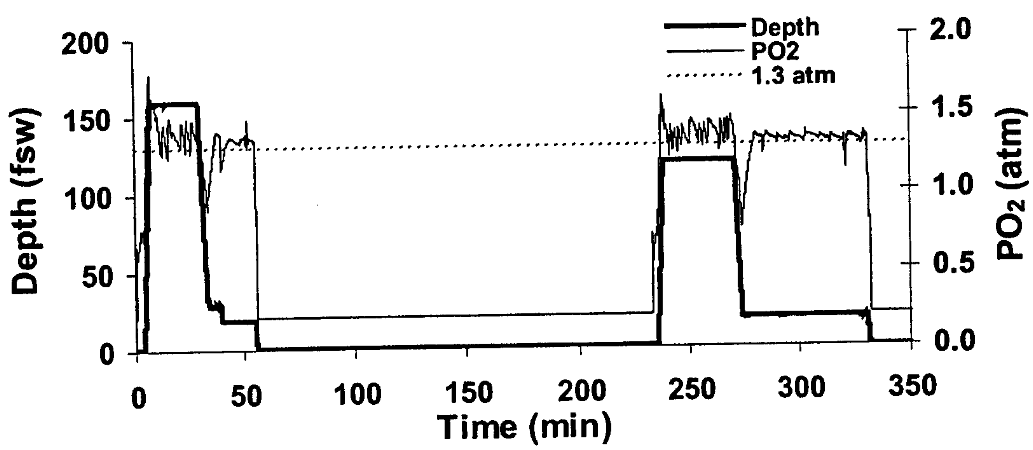
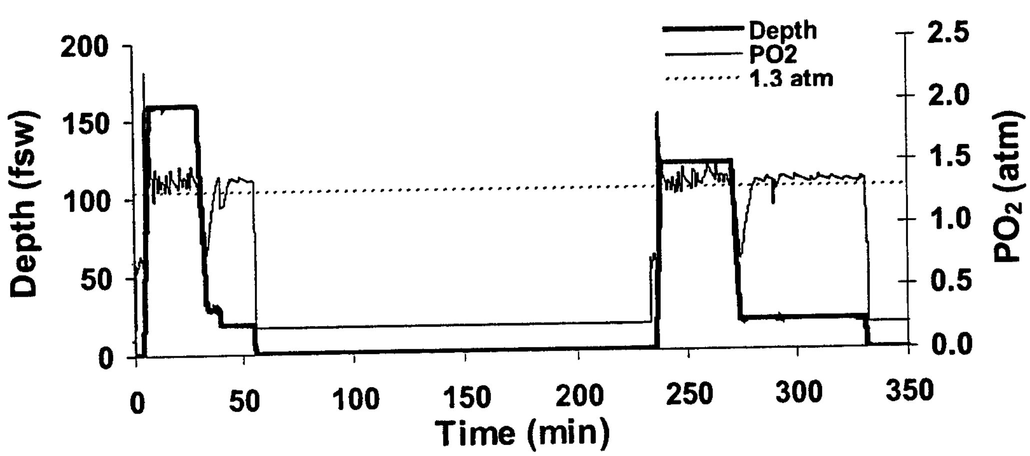
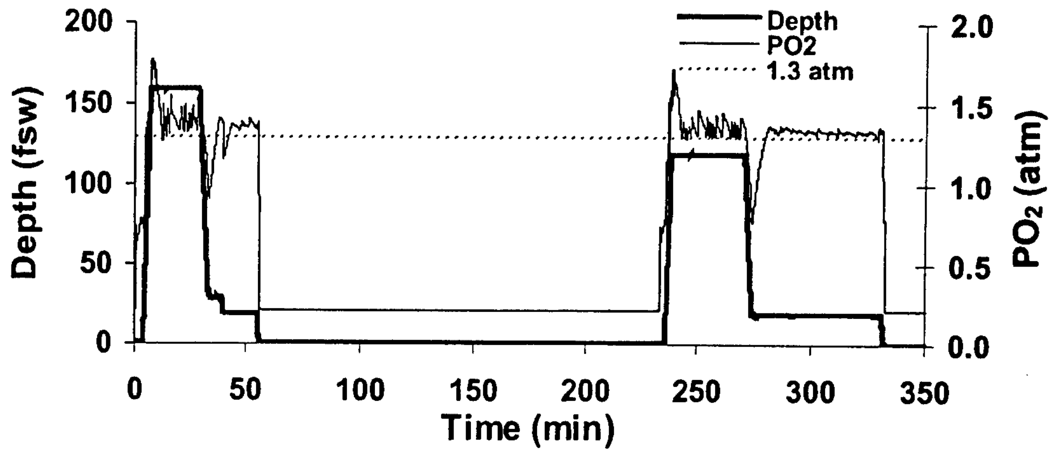


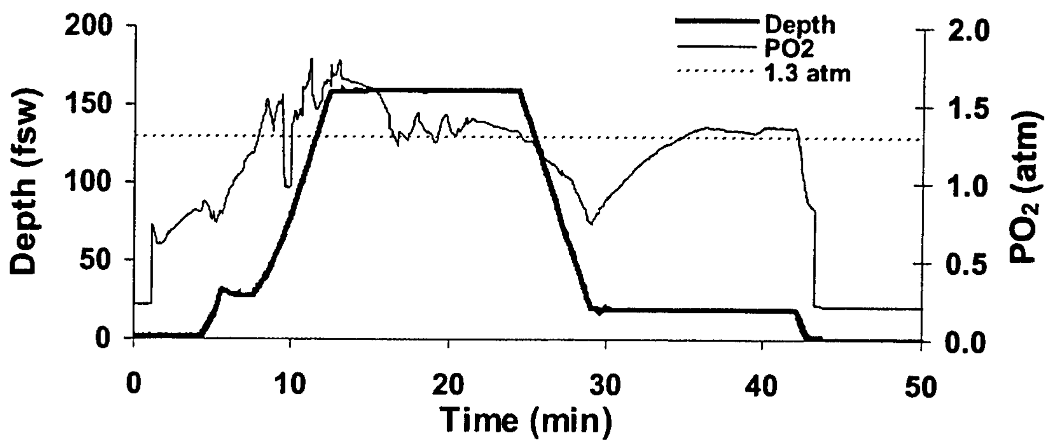
Profile 07122001N59A



Profile 07122001N09A



Profile 07122001N24A



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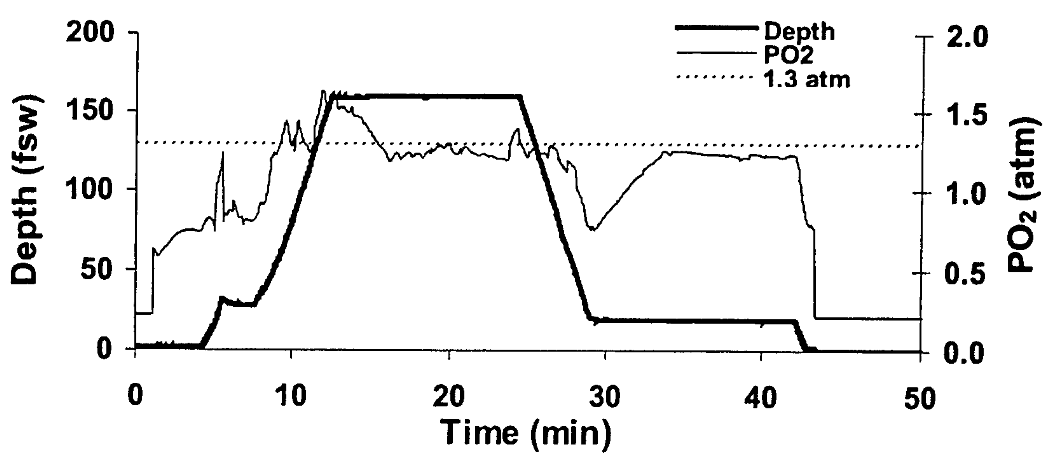
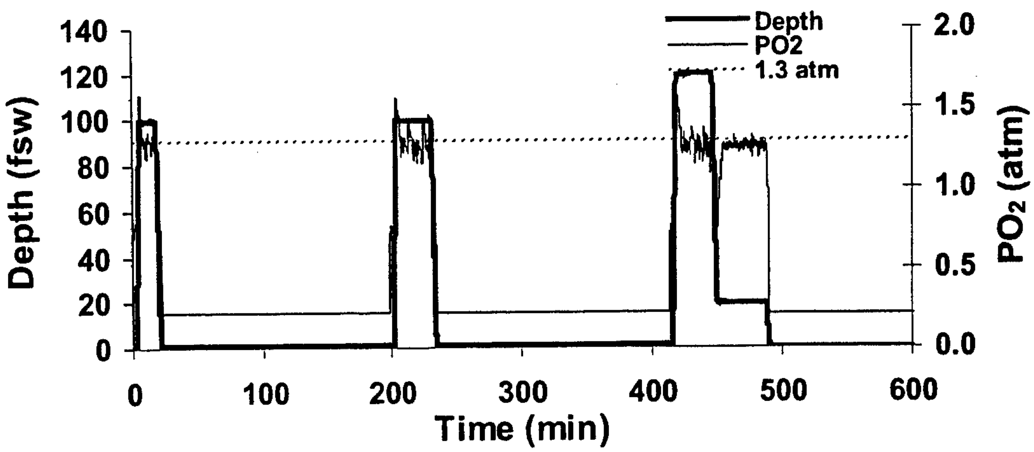
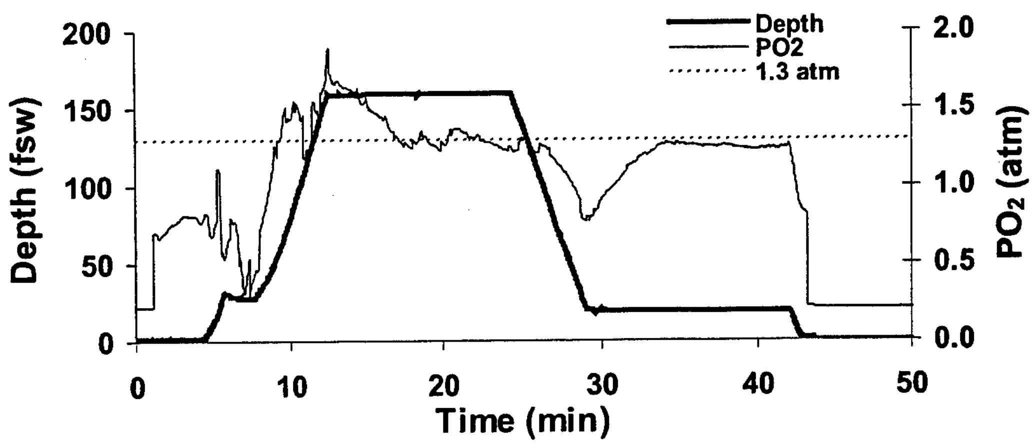


Profile 07162001N56B



Profile 07162001N10A



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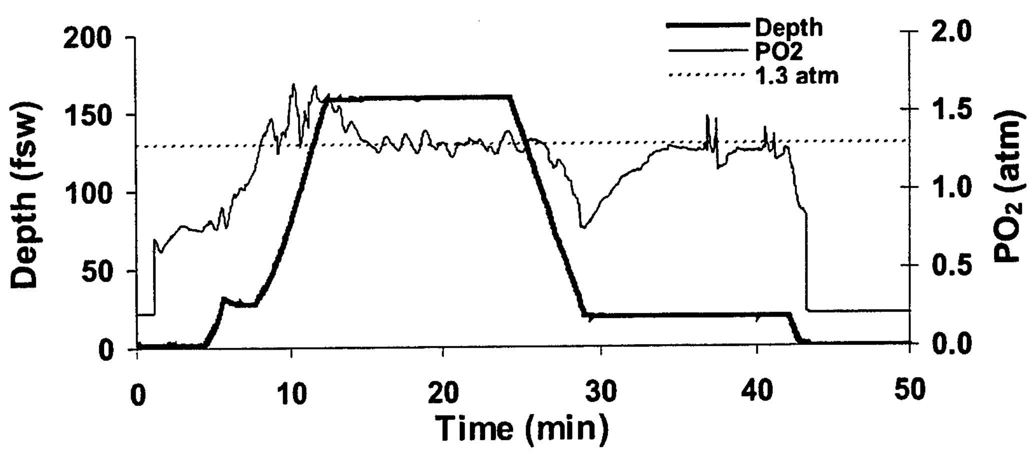
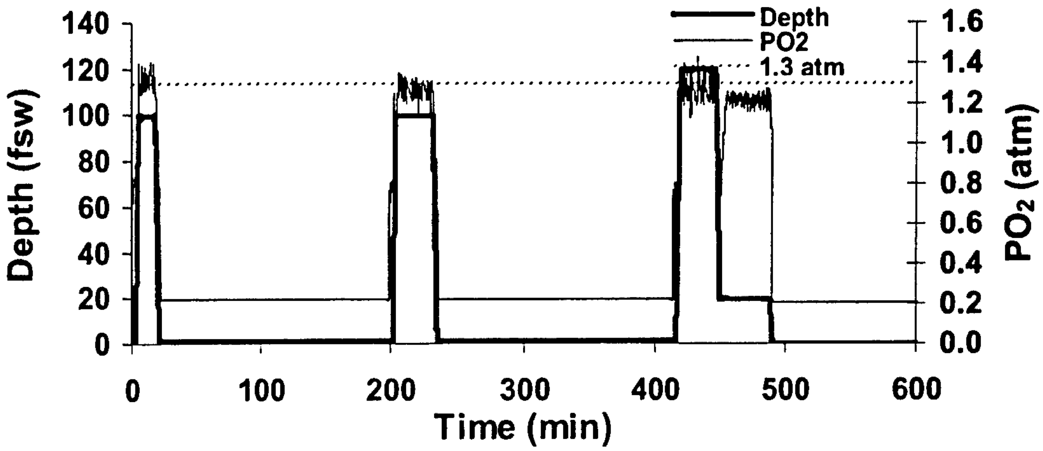


Profile 07162001N29



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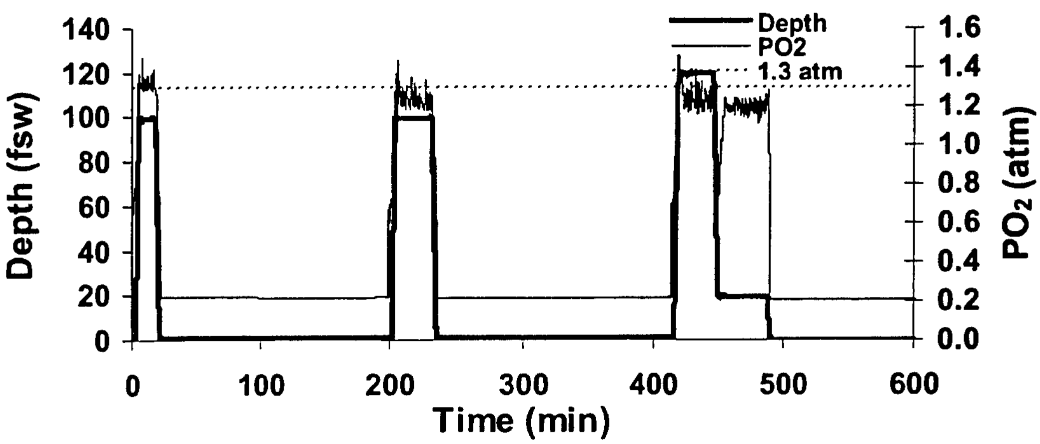

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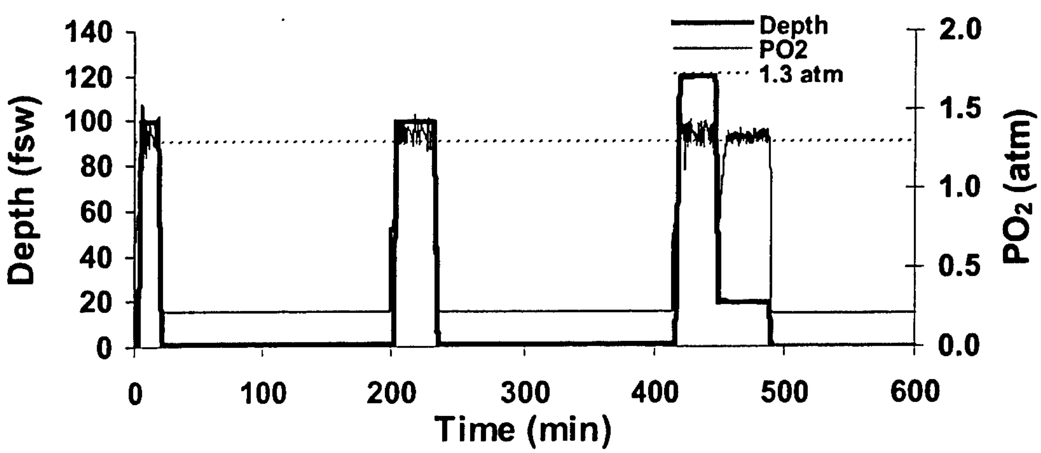

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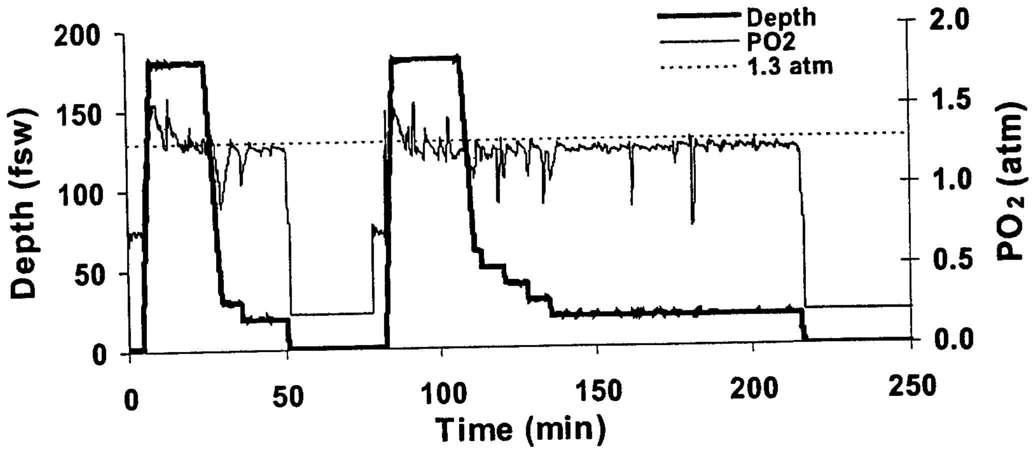

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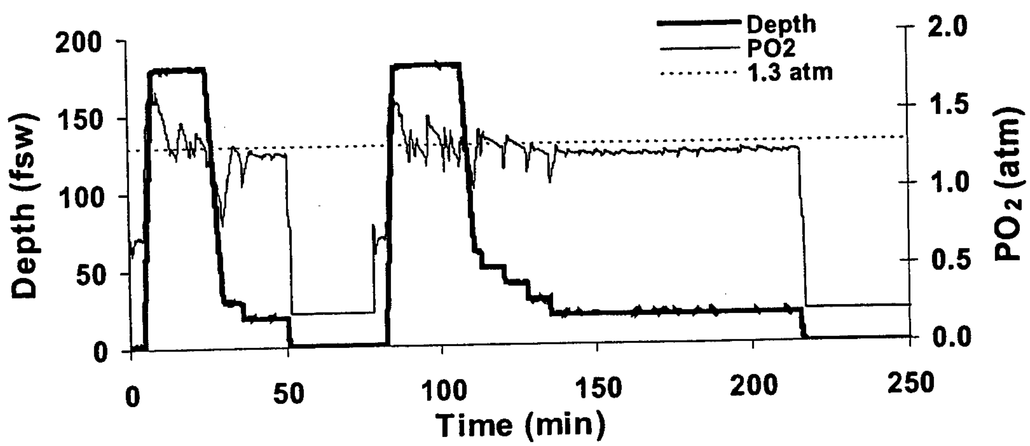
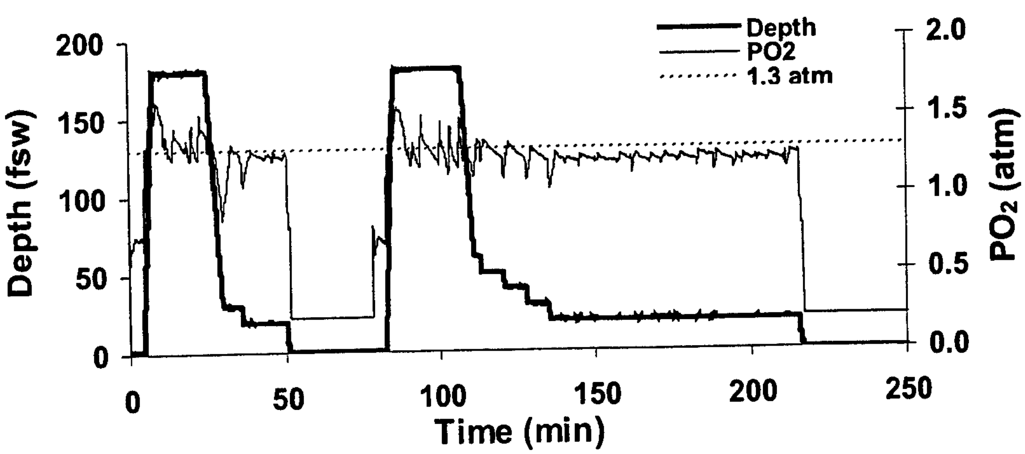
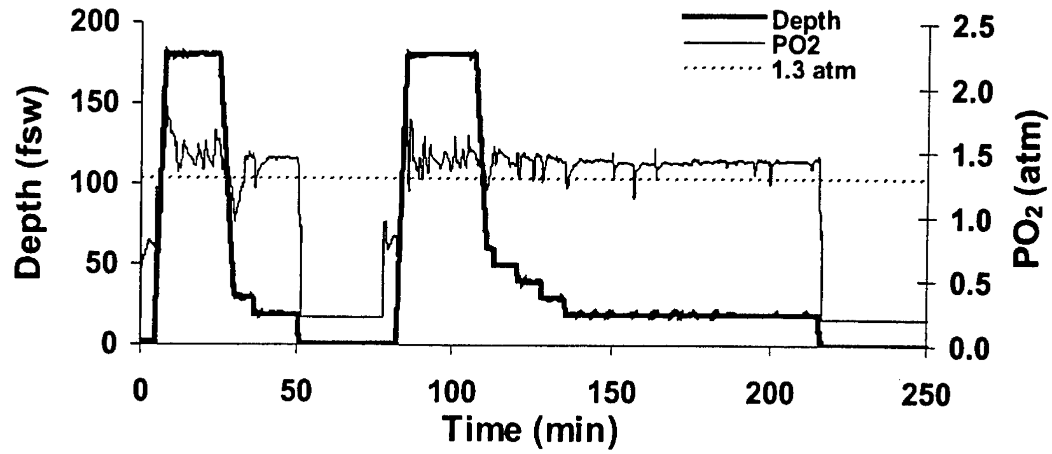


Profile 07172001N39A



Profile 07172001N42A



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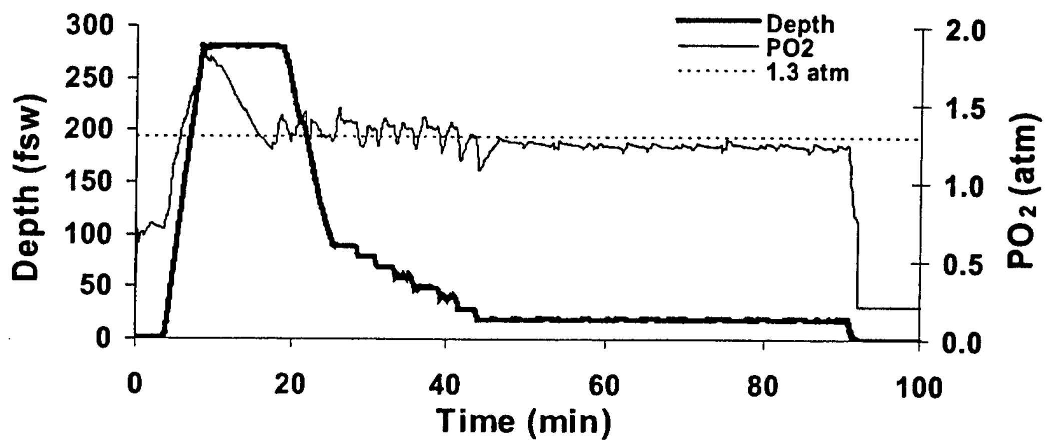
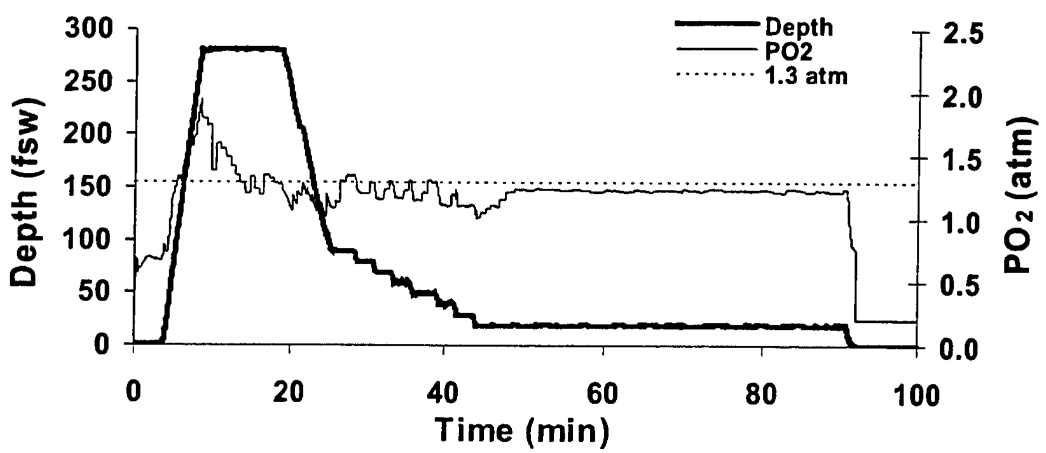


Profile 07172001N11B



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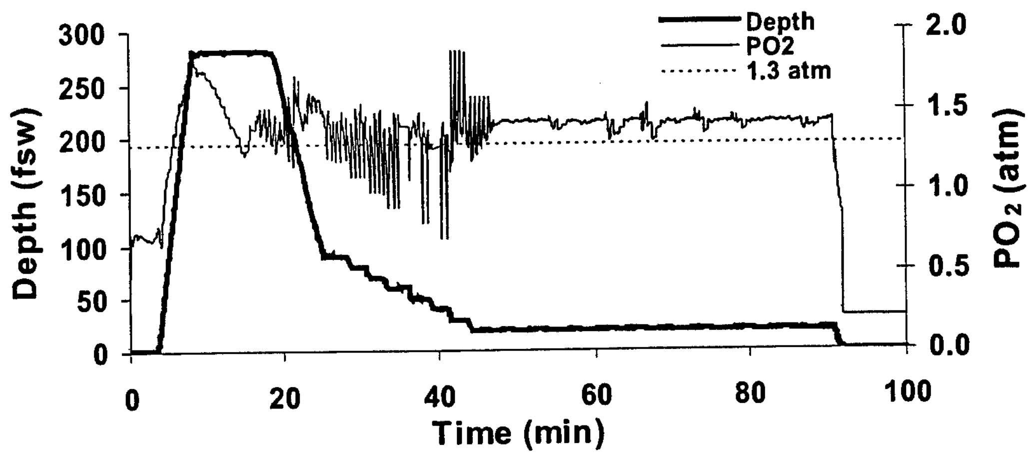

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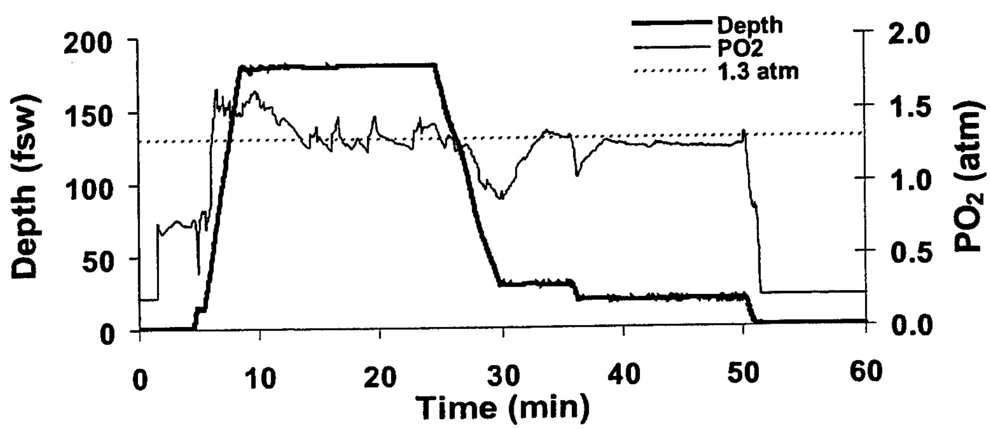
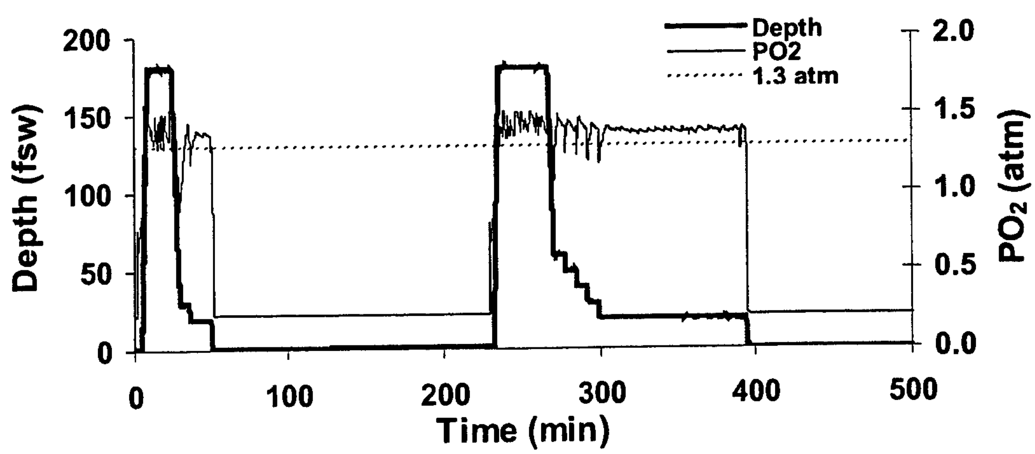
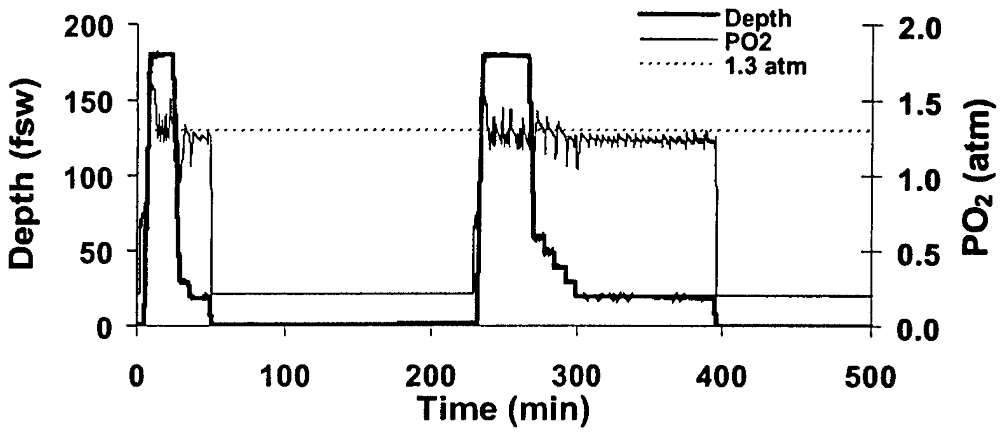


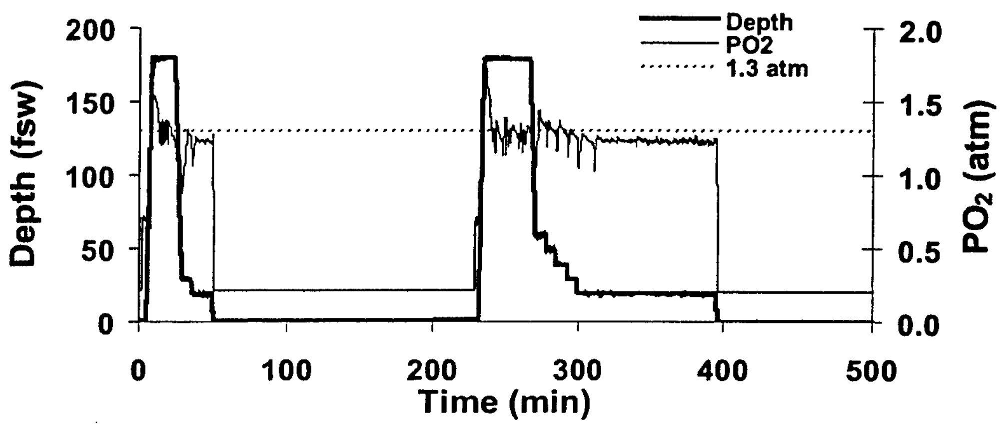
Profile 07182001N17



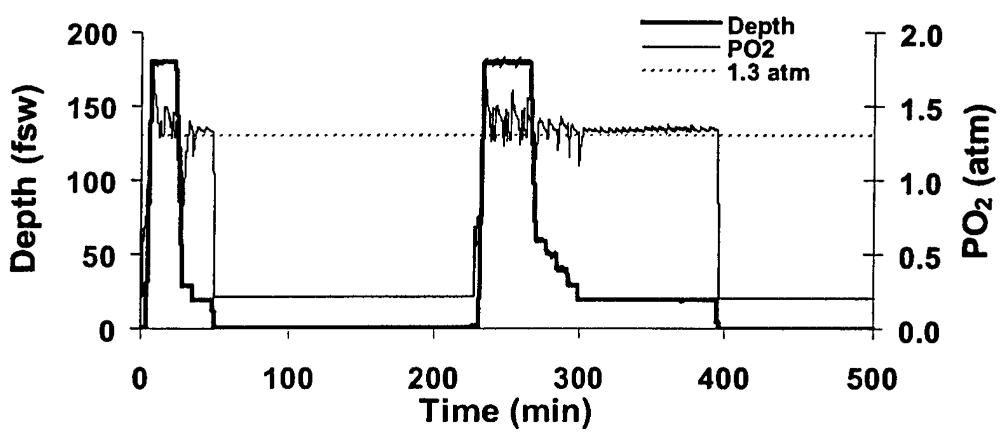
Profile 07182001N22A



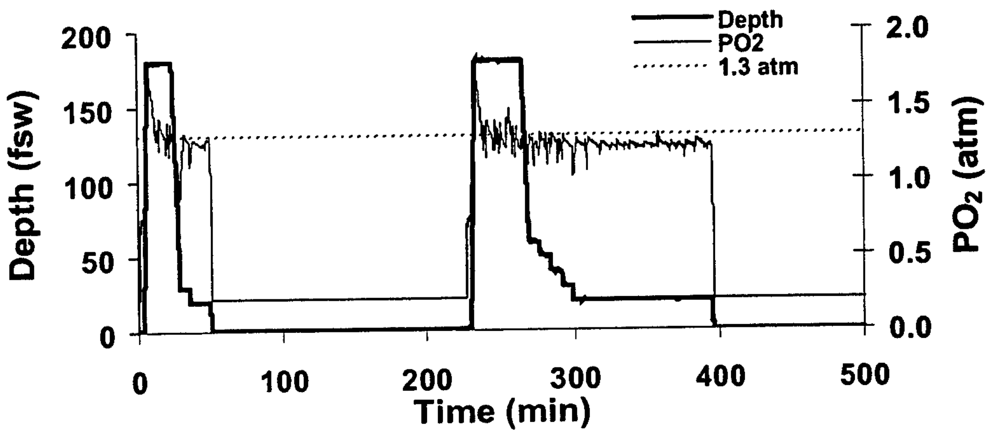
Profile 07182001N07A



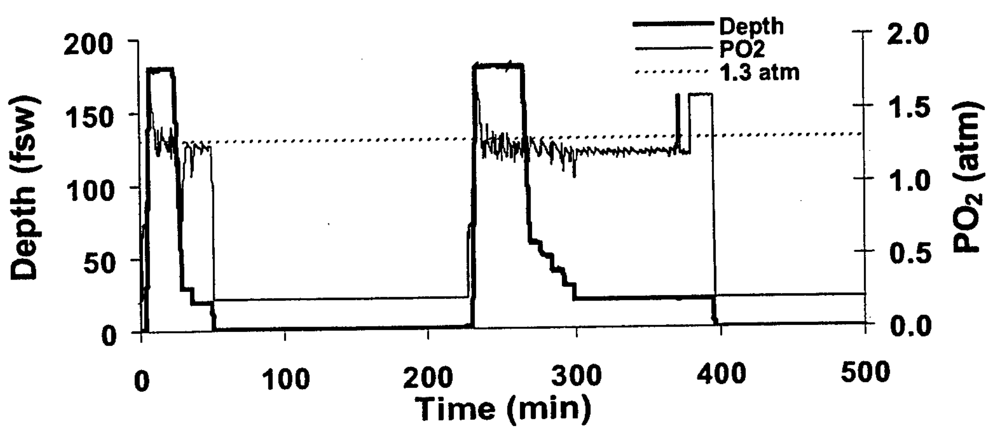
Profile 07182001N69A



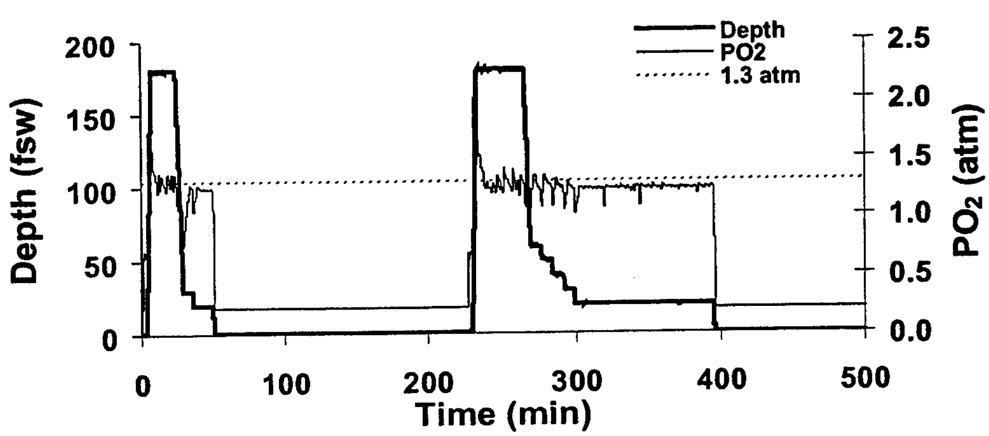
Profile 07192001N56A



Profile 07192001N10A



Profile 07192001N24A



Profile 07192001N35A

APPENDIX J.

1.3 ATA PO_2-in-He DECOMPRESSION TABLES FOR MK 16 MOD 1 DIVING

Note: Operational guidance for use of the tables and for the rationale of limit line placement in the tables was given with their original issue in NEDU TR 14-01.[1]

Reference

1 Johnson, T. M., Gerth, W. A. *1.3 ATA PO_2-in-He Decompression Tables for MK 16 MOD 1 Diving: Summary Report and Operational Guidance*. NEDU TR 14-01, Navy Experimental Diving Unit, Panama City, FL, 2001.

Table 1. No-Decompression Limits and Repetitive Group Designators for MK 16 MOD 1 HeO_2 No-Decompression Dives

1.30 ATA FIXED PO2 IN HELIUM   RATES: DESCENT 60 FPM; ASCENT 30 FPM

NO-DECOMPRESSION DIVES

REPETITIVE GROUP DESIGNATOR
BOTTOM TIME (MIN)

DEPTH (FSW)	NO-STOP LIMIT	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	Z
20	720	129	269	720													
30	332	27	43	60	78	100	124	152	185	227	281	332					
40	720	122	246	720													
50	325	27	43	59	78	99	123	150	183	223	276	325					
60	134	15	23	32	41	51	61	71	83	95	108	123	134				
70	86	11	16	22	28	34	41	47	54	61	69	77	85	86			
80	63	8	12	17	21	26	30	35	40	45	51	56	62	63			
90	44	6	10	13	17	20	24	28	32	36	40	44					
100	31	5	8	11	14	17	20	23	26	30	31						
110	24	4	7	9	12	14	17	20	22	24							
120	20	4	6	8	10	13	15	17	19	20							
130	17	3	5	7	9	11	13	15	17								
140	15	3	4	6	8	10	12	13	15								
150	13	3	4	6	7	9	10	12	13								
160	12		3	5	6	8	9	11	12								
170	11		3	4	6	7	9	10	11								
180	10		3	4	5	6	8	9	10								
190	9		3	4	5	6	7	8	9								
200	8			3	4	5	7	8									

Table 2. Schedules and Repetitive Group Designators for MK 16 MOD 1 HeO_2 Decompression Dives

1.30 ATA FIXED PO2 IN HELIUM RATES: DESCENT 60 FPM; ASCENT 30 FPM

DEPTH (FSW)	BTM TIM (M)	TM TO FIRST STOP (M:S)	DECOMPRESSION STOPS (FSW) STOP TIMES (MIN) 150	140	130	120	110	100	90	80	70	60	50	40	30	20	10	TOTAL ASCNT TIME (M:S)	RPT GRP DES
40	238	1:20														0	0	1:20	B
limit line																			
40	720	1:20														0	0	1:20	C
50	238	1:40														0	0	1:40	J
limit line																			
50	325	1:40														0	0	1:40	K
50	330	1:00														1	0	2:40	K
50	340	1:00														2	0	3:40	K
50	350	1:00														3	0	4:40	K
50	360	1:00														4	0	5:40	K
60	134	2:00														0	0	2:00	L
60	140	1:20														3	0	5:00	L
60	150	1:20														8	0	10:00	L
60	160	1:20														12	0	14:00	L
60	170	1:20														16	0	18:00	L
60	180	1:20														20	0	22:00	K
60	190	1:20														24	0	26:00	K
60	200	1:20														27	0	29:00	K
limit line																			
60	210	1:20														31	0	33:00	K
60	220	1:20														34	0	36:00	K
60	230	1:20														37	0	39:00	J
60	240	1:20														39	0	41:00	J
60	250	1:20														42	0	44:00	J
60	260	1:20														45	0	47:00	J
60	270	1:20														47	0	49:00	J
60	280	1:20														49	0	51:00	J

DEPTH (FSW)	BTM TIM (M)	TM TO FIRST STOP (M:S)	DECOMPRESSION STOPS (FSW) STOP TIMES (MIN)															TOTAL ASCNT TIME (M:S)	RPT GRP DES
			150	140	130	120	110	100	90	80	70	60	50	40	30	20	10		
60	290	1:20														51	0	53:00	J
60	300	1:20														53	0	55:00	J
60	310	1:20														55	0	57:00	J
60	320	1:20														57	0	59:00	I
60	330	1:20														59	0	61:00	I
60	340	1:20														61	0	63:00	I
60	350	1:20														64	0	66:00	I
60	360	1:20														66	0	68:00	I
70	86	2:20														0	0	2:20	M
70	90	1:40														3	0	5:20	M
70	95	1:40														7	0	9:20	L
70	100	1:40														12	0	14:20	L
70	110	1:40														19	0	21:20	L
70	120	1:40														26	0	28:20	L
70	130	1:40														33	0	35:20	K
70	140	1:40														39	0	41:20	K
70	150	1:40														45	0	47:20	K
70	160	1:40														50	0	52:20	K
70	170	1:40														55	0	57:20	J
limit line																			
70	180	1:40														60	0	62:20	J
70	190	1:40														64	0	66:20	J
70	200	1:40														68	0	70:20	J
70	210	1:40														72	0	74:20	J
70	220	1:40														76	0	78:20	I
80	63	2:40														0	0	2:40	M
80	65	2:00														2	0	4:40	M
80	70	2:00														8	0	10:40	L
80	75	2:00														13	0	15:40	L
80	80	2:00														19	0	21:40	L
80	85	2:00														24	0	26:40	L

DEPTH (FSW)	BTM TIM (M)	TM TO FIRST STOP (M:S)	DECOMPRESSION STOPS (FSW) STOP TIMES (MIN) 150	140	130	120	110	100	90	80	70	60	50	40	30	20	10	TOTAL ASCNT TIME (M:S)	RPT GRP DES
80	90	2:00														29	0	31:40	L
80	95	2:00														34	0	36:40	L
80	100	2:00														39	0	41:40	K
80	110	2:00														47	0	49:40	K
80	120	2:00														56	0	58:40	K
80	130	2:00														63	0	65:40	K
80	140	2:00														70	0	72:40	J
80	150	2:00														76	0	78:40	J
limit line																			
80	160	2:00														82	0	84:40	J
80	170	2:00														88	0	90:40	J
80	180	2:00														93	0	95:40	I
80	190	2:00														98	0	100:40	I
90	44	3:00														0	0	3:00	K
90	45	2:20														1	0	4:00	K
90	50	2:20														2	0	5:00	L
90	55	2:20														7	0	10:00	M
90	60	2:20														15	0	18:00	L
90	65	2:20														22	0	25:00	L
90	70	2:20														29	0	32:00	L
90	75	2:20														35	0	38:00	L
90	80	2:20														41	0	44:00	L
90	85	2:20														47	0	50:00	K
90	90	2:20														53	0	56:00	K
90	95	2:20														58	0	61:00	K
90	100	2:20														63	0	66:00	K
90	110	2:20														73	0	76:00	J
90	120	2:20														82	0	85:00	J
90	130	2:20														90	0	93:00	J
limit line																			

DEPTH (FSW)	BTM TIM (M)	TM TO FIRST STOP (M:S)	150	140	130	120	110	100	90	80	70	60	50	40	30	20	10	TOTAL ASCNT TIME (M:S)	RPT GRP DES
			DECOMPRESSION STOPS (FSW) STOP TIMES (MIN)																
90	140	2:20														97	0	100:00	J
90	150	2:20														104	0	107:00	J
90	160	2:20														112	0	115:00	I
100	31	3:20														0	0	3:20	J
100	35	2:40														2	0	5:20	K
100	40	2:40														4	0	7:20	L
100	45	2:40														6	0	9:20	M
100	50	2:40														16	0	19:20	L
100	55	2:40														24	0	27:20	L
100	60	2:40														33	0	36:20	L
100	65	2:40														40	0	43:20	L
100	70	2:40														48	0	51:20	K
100	75	2:40														55	0	58:20	K
100	80	2:40														62	0	65:20	K
100	85	2:40														68	0	71:20	K
100	90	2:40														74	0	77:20	K
100	95	2:40														80	0	83:20	J
100	100	2:40														85	0	88:20	J
100	110	2:40														96	0	99:20	J
100	120	2:40														105	0	108:20	J
limit line																			
100	130	2:20													1	114	0	118:36	I
100	140	2:20													1	123	0	127:36	I
110	24	3:40														0	0	3:40	I
110	25	3:00														1	0	4:40	I
110	30	3:00														4	0	7:40	J
110	35	3:00														7	0	10:40	L
110	40	3:00														10	0	13:40	M
110	45	3:00														21	0	24:40	L
110	50	3:00														31	0	34:40	L
110	55	3:00														40	0	43:40	L

DEPTH (FSW)	BTM TIM (M)	TM TO FIRST STOP (M:S)	150	140	130	120	110	100	90	80	70	60	50	40	30	20	10	TOTAL ASCNT TIME (M:S)	RPT GRP DES
			DECOMPRESSION STOPS (FSW) STOP TIMES (MIN)																
110	60	2:40													1	49	0	53:40	K
110	65	2:40													2	56	0	61:40	K
110	70	2:40													3	63	0	69:40	K
110	75	2:40													4	70	0	77:40	K
110	80	2:40													5	77	0	85:40	J
110	85	2:40													5	83	0	91:40	J
110	90	2:40													6	89	0	98:40	J
110	95	2:40													6	95	0	104:40	J
110	100	2:40													6	101	0	110:40	J
110	110	2:40													7	111	0	121:40	J
limit line																			
110	120	2:40													7	123	0	133:40	
110	130	2:40													7	136	0	146:56	
110	140	2:20												1	7	148	0	159:56	
120	20	4:00														0	0	4:00	I
120	25	3:20														4	0	8:00	J
120	30	3:20														8	0	12:00	K
120	35	3:20														12	0	16:00	M
120	40	3:20														23	0	27:00	L
120	45	3:00													2	33	0	39:00	L
120	50	3:00													4	43	0	51:00	L
120	55	3:00													6	51	0	61:00	K
120	60	3:00													7	60	0	71:00	K
120	65	2:40												1	7	68	0	80:00	K
120	70	2:40												2	7	76	0	89:00	K
120	75	2:40												3	7	83	0	97:00	J
120	80	2:40												4	7	90	0	105:00	J
120	85	2:40												5	7	97	0	113:00	J
120	90	2:40												5	7	103	0	119:00	J
120	95	2:40												6	7	109	0	126:00	J
120	100	2:40												6	7	116	0	133:00	
limit line																			

DEPTH (FSW)	BTM TIM (M)	TM TO FIRST STOP (M:S)	DECOMPRESSION STOPS (FSW) STOP TIMES (MIN)															TOTAL ASCNT TIME (M:S)	RPT GRP DES
			150	140	130	120	110	100	90	80	70	60	50	40	30	20	10		
120	110	2:40												6	7	130	0	147:00	
120	120	2:40												7	7	145	0	163:00	
130	17	4:20														0	0	4:20	H
130	20	3:40														3	0	7:20	I
130	25	3:40														8	0	12:20	K
130	30	3:40														13	0	17:20	L
130	35	3:20													2	21	0	27:20	L
130	40	3:20													5	32	0	41:20	L
130	45	3:00												1	7	42	0	54:20	L
130	50	3:00												3	7	53	0	67:20	K
130	55	3:00												5	7	62	0	78:20	K
130	60	3:00												6	7	71	0	88:20	K
130	65	2:40											1	7	7	80	0	99:20	J
130	70	2:40											2	7	7	88	0	108:20	J
130	75	2:40											3	7	7	96	0	117:20	J
130	80	2:40											3	7	7	104	0	125:20	J
130	85	2:40											4	7	7	111	0	133:20	J
130	90	2:40											5	7	7	118	0	141:20	
limit line ----------																			
130	95	2:40											5	7	7	126	0	149:20	
130	100	2:40											5	8	7	135	0	159:20	
130	110	2:40											6	7	7	151	0	175:20	
130	120	2:40											7	7	18	158	0	194:20	
140	15	4:40														0	0	4:40	H
140	20	4:00														7	0	11:40	J
140	25	4:00														12	0	16:40	K
140	30	3:40													2	16	0	22:40	M
140	35	3:40													7	28	0	39:40	L
140	40	3:20												3	7	41	0	55:40	L
140	45	3:20												6	7	52	0	69:40	K
140	50	3:00											1	7	7	63	0	82:40	K

DEPTH (FSW)	BTM TIM (M)	TM TO FIRST STOP (M:S)	150	140	130	120	110	100	90	80	70	60	50	40	30	20	10	TOTAL ASCNT TIME (M:S)	RPT GRP DES
			DECOMPRESSION STOPS (FSW) STOP TIMES (MIN)																
140	55	3:00											3	7	7	74	0	95:40	K
140	60	3:00											5	7	7	83	0	106:40	J
140	65	3:00											7	7	7	92	0	117:40	J
140	70	2:40										1	7	7	7	101	0	127:40	J
140	75	2:40										2	7	7	7	109	0	136:40	J
140	80	2:40										3	7	7	7	117	0	145:40	
limit line																			
140	85	2:40										3	8	7	7	126	0	155:40	
140	90	2:40										4	7	7	7	137	0	166:40	
140	95	2:40										5	7	7	7	146	0	176:40	
140	100	2:40										5	7	7	8	154	0	185:40	

150	13	5:00														0	0	5:00	H
150	15	4:20														3	0	8:00	H
150	20	4:20														10	0	15:00	J
150	25	4:00													2	14	0	21:00	L
150	30	4:00													7	23	0	35:00	L
150	35	3:40												4	7	37	0	53:00	L
150	40	3:20											1	7	7	50	0	70:00	K
150	45	3:20											4	7	7	63	0	86:00	K
150	50	3:20											7	7	7	74	0	100:00	K
150	55	3:00										2	7	7	7	85	0	113:00	J
150	60	3:00										4	7	7	7	95	0	125:00	J
150	65	3:00										6	7	7	7	104	0	136:16	J
150	70	3:00										7	7	7	7	114	0	147:00	I
150	75	2:40									1	7	7	7	7	124	0	158:16	
limit line																			
150	80	2:40									2	7	7	7	7	135	0	170:16	
150	85	2:40									3	7	7	7	7	146	0	182:16	
150	90	2:40									4	7	7	7	8	155	0	193:00	

DEPTH (FSW)	BTM TIM (M)	TM TO FIRST STOP (M:S)	DECOMPRESSION STOPS (FSW) STOP TIMES (MIN) 150	140	130	120	110	100	90	80	70	60	50	40	30	20	10	TOTAL ASCNT TIME (M:S)	RPT GRP DES
160	12	5:20														0	0	5:20	H
160	15	4:40														5	0	10:20	I
160	20	4:40														13	0	18:20	K
160	25	4:20													6	15	0	26:20	M
160	30	4:00												4	7	31	0	47:20	L
160	35	3:40											2	7	7	46	0	67:20	L
160	40	3:40											6	7	7	60	0	85:20	K
160	45	3:20										2	8	7	7	73	0	102:20	J
160	50	3:20										5	7	7	8	84	0	116:20	J
160	55	3:00									1	7	7	7	7	96	0	130:20	J
160	60	3:00									3	7	7	7	7	107	0	143:20	J
160	65	3:00									5	7	7	7	7	117	0	155:36	
160	70	3:00									6	7	7	7	7	129	0	168:36	
limit line																			
160	75	3:00									7	7	8	7	7	141	0	182:36	
160	80	2:40								1	7	8	7	7	7	153	0	195:20	
160	85	2:40								2	7	7	7	7	16	157	0	208:36	
160	90	2:40								3	7	7	7	7	25	161	0	222:36	
170	11	5:40														0	0	5:40	H
170	15	5:00														8	0	13:40	I
170	20	4:40													2	15	0	22:40	K
170	25	4:20												2	7	22	0	36:40	L
170	30	4:00											1	8	7	38	0	59:40	L
170	35	4:00											7	7	7	55	0	81:40	K
170	40	3:40										4	7	7	7	70	0	100:40	K
170	45	3:20									1	7	7	7	7	83	0	117:40	J
170	50	3:20									4	7	7	7	7	96	0	133:40	J
170	55	3:20									7	7	7	7	7	108	0	148:40	J
170	60	3:00								2	7	7	7	7	7	119	0	161:40	
limit line																			
170	65	3:00								4	7	7	7	7	7	134	0	178:56	
170	70	3:00								5	7	7	7	7	8	146	0	192:40	

DEPTH (FSW)	BTM TIM (M)	TM TO FIRST STOP (M:S)	150	140	130	120	110	100	90	80	70	60	50	40	30	20	10	TOTAL ASCNT TIME (M:S)	RPT GRP DES
			DECOMPRESSION STOPS (FSW) STOP TIMES (MIN)																
170	75	3:00								7	7	7	7	7	11	156	0	207:56	
170	80	2:40							1	7	7	7	7	7	22	160	0	223:40	
180	10	6:00														0	0	6:00	H
180	15	5:20														11	0	17:00	J
180	20	5:00													6	14	0	26:00	L
180	25	4:40												6	7	29	0	48:00	L
180	30	4:20											6	7	7	47	0	73:00	K
180	35	4:00										4	7	7	7	64	0	95:00	K
180	40	3:40									2	7	7	7	7	79	0	115:00	J
180	45	3:40									6	7	7	7	7	94	0	134:00	J
180	50	3:20								2	7	8	7	7	7	107	0	151:00	J
180	55	3:20								5	7	7	7	7	8	119	0	166:00	
limit line																			
180	60	3:00							1	7	7	7	7	7	7	136	0	185:00	
180	65	3:00							3	7	7	7	7	7	7	151	0	202:16	
180	70	3:00							5	7	7	7	7	7	16	158	0	220:00	

RPT GRP DES	DEPTH (FSW)	BTM TIM (M)	TM TO FIRST STOP (M:S)	170	160	150	140	130	120	110	100	90	80	70	60	50	40	30	20	10	TOTAL ASCNT TIME (M:S)
				DECOMPRESSION STOPS (FSW) STOP TIMES (MIN)																	
H	190	9	6:20																0	0	6:20
H	190	10	5:40																2	0	8:20
J	190	15	5:40																14	0	20:20
M	190	20	4:40													1	1	7	16	0	31:20
L	190	25	3:20									1	0	0	0	2	7	7	37	0	60:20
K	190	30	3:00								1	0	0	1	1	7	7	7	56	0	86:20
J	190	35	2:40							1	0	0	1	0	7	7	7	7	74	0	110:20
J	190	40	2:20						1	0	0	0	1	5	7	7	8	7	90	0	132:20
J	190	45	2:20						1	0	0	0	4	7	7	7	7	7	105	0	151:20
I	190	50	2:20						1	0	0	0	7	7	7	7	7	7	119	0	168:20
limit line ----																					
	190	55	2:20						1	0	0	3	7	7	7	7	7	7	137	0	189:20
	190	60	2:20						1	0	0	6	7	7	7	7	7	7	153	0	208:20
	190	65	2:20						1	0	1	7	7	7	7	7	7	19	159	0	228:36
	190	70	2:20						1	0	3	7	7	7	7	7	7	31	164	0	247:20
G	200	8	6:40																	0	6:40
I	200	10	6:00																4	0	10:40
K	200	15	5:20														1	1	14	0	22:40
L	200	20	3:20								1	0	0	1	0	0	4	7	24	0	43:40
K	200	25	2:00				1	0	0	0	1	0	0	0	1	6	7	7	47	0	76:40
K	200	30	1:20		1	0	0	1	0	0	0	1	0	0	7	7	7	7	68	0	105:40

200	35	1:20		1	0	1	0	0	0	1	0	0	6	7	7	7	7	87	0	130:40	J
200	40	1:00	1	0	1	0	0	0	1	0	0	4	7	7	7	7	7	104	0	152:40	J
200	45	1:00	1	0	1	0	0	1	0	0	1	7	8	7	7	7	7	120	0	173:40	I
limit line --																					
200	50	1:00	1	0	1	0	0	1	0	0	5	7	7	7	7	7	7	139	0	195:40	
200	55	1:00	1	0	1	0	0	1	0	1	7	7	7	7	7	7	8	155	0	215:40	
200	60	1:00	1	0	1	0	0	1	0	4	7	7	7	7	7	7	23	160	0	238:40	

DEPTH (FSW)	BTM TIM (M)	TM TO FIRST STOP (M:S)	DECOMPRESSION STOPS STOP TIMES (MIN) 140	130	120	110	100	90	80	70	60	50	40	30	20	10	TOTAL ASCNT TIME (M:S)
210	5	7:00															7:00
210	10	6:00												2	2	0	11:00
210	15	5:00									1	1	3	2	5	0	19:00
210	20	4:40								2	3	2	2	2	28	0	46:00
210	25	4:00						1	3	2	2	3	1	3	57	0	79:00
210	30	3:40					1	3	2	2	2	3	4	12	76	0	112:00
210	35	3:20				1	2	3	2	2	2	6	11	12	95	0	143:00
210	40	3:20				3	2	2	2	2	5	12	11	11	113	0	170:00
limit line ----------																	
210	45	3:00			1	3	2	2	3	2	12	11	12	11	130	0	196:00
210	50	3:00			2	2	2	3	2	9	12	11	11	11	148	0	220:00
210	55	3:00			3	2	2	2	6	11	11	11	11	12	165	0	243:00
210	60	2:40		1	2	3	1	3	10	11	11	11	11	20	173	0	264:00
220	5	7:20														0	7:20
220	10	6:00											1	2	2	0	12:20
220	15	5:20									2	2	2	3	5	0	21:20
220	20	4:40							2	2	2	3	2	2	36	0	56:20
220	25	4:00					1	2	2	2	3	2	2	8	64	0	93:20
220	30	3:40				1	3	2	2	2	3	2	10	11	85	0	128:20
220	35	3:20			1	2	2	3	3	1	2	11	12	12	104	0	160:20
220	40	3:20			2	3	2	2	2	3	11	11	11	11	124	0	189:20
limit line ----------																	
220	45	3:00		1	2	3	2	2	2	10	11	11	11	12	143	0	217:20
220	50	3:00		2	2	2	3	2	7	11	11	11	11	12	162	0	243:20
220	55	3:00		2	3	2	2	4	11	11	11	11	11	19	174	0	268:20

DEPTH (FSW)	BTM TIM (M)	TM TO FIRST STOP (M:S)	DECOMPRESSION STOPS STOP TIMES (MIN) 140	130	120	110	100	90	80	70	60	50	40	30	20	10	TOTAL ASCNT TIME (M:S)
230	5	7:40														0	7:40
230	10	6:20											1	3	2	0	13:40
230	15	5:20								1	2	2	2	3	8	0	25:40
230	20	4:40						1	2	2	3	2	2	2	46	0	67:40
230	25	4:20					2	3	2	3	2	2	2	12	71	0	106:40
230	30	3:40			1	2	2	2	3	2	2	6	12	11	93	0	143:40
230	35	3:20		1	2	2	2	3	2	2	7	12	12	12	114	0	178:40
limit line --																	
230	40	3:20		2	2	3	2	2	2	8	11	12	11	11	136	0	209:40
230	45	3:00	1	2	2	3	2	2	7	12	10	11	11	12	157	0	239:40
230	50	3:00	2	2	2	2	3	4	12	11	11	11	11	16	173	0	267:40
230	55	3:00	2	3	2	3	2	10	11	11	11	11	11	37	172	0	293:40
240	5	8:00														0	8:00
240	10	6:40											2	3	3	0	16:00
240	15	5:40								2	2	2	3	2	16	0	35:00
240	20	5:00						2	3	2	2	2	3	2	54	0	78:00
240	25	4:20				2	2	3	2	2	3	2	7	11	79	0	121:00
240	30	4:00			3	2	2	2	2	3	2	11	12	11	103	0	161:00
240	35	3:40		3	2	2	3	1	3	3	12	11	12	11	126	0	197:00
limit line --																	
240	40	3:20	2	2	3	2	2	2	4	12	11	11	11	12	149	0	231:00
240	45	3:20	3	3	1	3	2	4	11	11	12	11	11	12	171	0	263:00
240	50	3:20	4	2	2	2	3	11	11	11	11	11	11	33	173	0	293:00

DEPTH (FSW)	BTM TIM (M)	TM TO FIRST STOP (M:S)	140	130	120	110	100	90	80	70	60	50	40	30	20	10	TOTAL ASCNT TIME (M:S)
			DECOMPRESSION STOPS STOP TIMES (MIN)														
250	5	8:20														0	8:20
250	10	6:40										1	2	2	4	0	17:20
250	15	5:40							1	2	2	3	3	1	24	0	44:20
250	20	5:00					2	2	2	2	3	2	3	5	61	0	90:20
250	25	4:20			1	3	2	2	2	2	3	2	12	12	86	0	135:20
250	30	4:00		2	3	2	2	2	2	3	6	12	12	12	111	0	177:20
limit line																	
250	35	3:40	2	2	3	2	2	2	2	10	11	12	11	11	137	0	215:20
250	40	3:40	4	2	3	2	2	2	11	11	11	11	11	11	163	0	252:20
250	45	3:40	5	3	2	2	2	10	12	11	11	11	11	25	173	0	286:20
250	50	3:40	6	2	2	3	9	11	11	12	10	12	11	47	174	0	318:20
260	5	8:40														0	8:40
260	10	7:00										2	2	2	4	0	18:40
260	15	6:00							2	2	3	2	2	3	31	0	53:40
260	20	5:00				1	2	2	3	2	3	2	2	10	67	0	102:40
260	25	4:40			3	3	2	2	2	2	2	7	12	12	95	0	150:40
260	30	4:00	2	2	3	2	2	2	2	3	11	12	12	10	123	0	194:40
limit line																	
260	35	4:00	4	2	2	3	2	2	6	11	12	11	11	11	150	0	235:40
260	40	4:00	6	2	2	2	3	7	11	12	11	11	11	13	175	0	274:40
260	45	4:00	7	2	3	2	7	12	11	11	11	11	11	42	172	0	310:40

DEPTH (FSW)	BTM TIM (M)	TM TO FIRST STOP (M:S)	140	130	120	110	100	90	80	70	60	50	40	30	20	10	TOTAL ASCNT TIME (M:S)
			DECOMPRESSION STOPS STOP TIMES (MIN)														
270	5	8:20													1	0	10:00
270	10	7:00									1	2	2	3	4	0	21:00
270	15	6:00						1	2	3	2	3	2	2	39	0	63:00
270	20	5:20				3	2	2	3	2	2	2	4	12	74	0	115:00
270	25	4:40	0	3	2	2	2	2	3	2	3	11	11	12	103	0	165:00
270	30	4:20	4	2	2	2	2	3	3	7	11	11	12	11	133	0	212:00
limit line	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
270	35	4:20	6	2	2	3	2	3	10	12	11	11	11	11	163	0	256:00
270	40	4:20	8	2	2	2	5	11	11	12	10	11	11	29	175	0	298:00
270	45	4:20	9	3	2	4	12	11	11	11	11	11	11	56	175	0	336:00

280	5	8:40													1	0	10:20
280	10	7:40										4	2	3	5	0	23:20
280	15	6:20						3	2	2	2	3	2	2	47	0	72:20
280	20	5:20			1	3	3	2	2	3	1	2	9	12	80	0	127:20
280	25	4:40	1	3	2	3	2	2	3	2	7	11	12	11	113	0	181:20
limit line	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
280	30	4:40	5	3	2	2	3	2	3	12	11	11	11	12	144	0	230:20
280	35	4:40	8	2	2	2	3	7	12	12	10	11	11	12	176	0	277:20
280	40	4:40	10	2	2	3	10	11	11	11	11	11	11	44	175	0	321:20
280	45	4:40	11	2	3	11	11	11	11	11	11	11	11	71	178	0	362:20

290	5	8:40												1	1	0	11:40
290	10	8:00										4	3	3	5	0	24:40
290	15	6:20					2	2	2	3	2	2	2	3	54	0	81:40
290	20	5:40			3	3	2	2	2	3	2	3	12	11	88	0	140:40
290	25	5:00	4	2	2	2	3	3	1	2	12	11	12	11	121	0	195:40
limit line	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----

DEPTH (FSW)	BTM TIM (M)	TM TO FIRST STOP (M:S)	140	130	120	110	100	90	80	70	60	50	40	30	20	10	TOTAL ASCNT TIME (M:S)
			DECOMPRESSION STOPS STOP TIMES (MIN)														
290	30	5:00	7	2	3	2	2	3	8	11	12	11	11	11	156	0	248:40
290	35	5:00	10	2	2	2	4	12	11	11	11	11	11	27	175	0	298:40
290	40	5:00	12	2	2	7	12	11	11	11	11	10	11	58	178	0	345:40
290	45	5:00	13	3	8	11	11	11	12	12	9	10	19	82	179	0	389:40
300	5	9:00												1	2	0	13:00
300	10	7:40								1	3	2	2	3	7	0	28:00
300	15	6:40					3	2	2	3	2	2	2	5	60	0	91:00
300	20	5:40		1	4	2	2	3	2	2	2	7	12	12	95	0	154:00
300	25	5:20	5	3	2	2	2	2	3	6	12	11	12	11	131	0	212:00
limit line																	
300	30	5:20	9	2	2	3	2	4	12	11	11	11	11	12	168	0	268:00
300	35	5:20	12	2	2	2	10	11	12	11	10	11	11	41	177	0	322:00
300	40	5:20	14	2	4	11	11	11	11	11	11	11	11	73	180	0	371:00
limit line																	
310	6	9:00											1	3	2	0	16:20
310	10	8:00								3	2	2	2	3	14	0	36:20
310	15	6:40				1	3	2	3	2	3	1	3	8	65	0	101:20
310	20	6:00		4	3	2	2	2	3	2	2	11	12	11	103	0	167:20
310	25	5:40	7	3	1	3	2	2	3	11	11	11	11	12	141	0	228:20
310	30	5:40	11	2	2	2	3	9	11	12	11	11	11	16	177	0	288:20
310	35	5:40	14	2	2	6	11	12	11	11	11	10	11	54	179	0	344:20
310	40	5:40	16	2	10	11	11	11	12	11	9	11	19	82	182	0	397:20
limit line																	
320	6	9:00										1	1	2	3	0	17:40
320	10	8:00							1	3	2	2	3	2	20	0	43:40

DEPTH (FSW)	BTM TIM (M)	TM TO FIRST STOP (M:S)	DECOMPRESSION STOPS STOP TIMES (MIN) 140	130	120	110	100	90	80	70	60	50	40	30	20	10	TOTAL ASCNT TIME (M:S)
320	15	7:00				3	3	2	2	2	2	3	2	12	70	0	111:40
320	20	6:00	1	5	2	3	1	3	3	1	6	11	12	12	110	0	180:40
320	25	6:00	9	2	2	3	2	2	6	12	11	11	11	12	152	0	245:40
320	30	6:00	13	2	2	2	6	11	11	11	11	11	11	29	178	0	308:40
320	35	6:00	15	3	2	11	12	11	11	11	10	11	11	68	182	0	368:40
320	40	6:00	18	7	11	11	11	11	10	11	11	12	36	83	182	0	424:40

Table 3. MK 16 MOD 1 HeO_2 Surface Interval Credit and Residual Gas Time Table

START																
A																0:30 2:01
B															0:30 1:10	1:11 3:11
C														0:30 0:50	0:51 2:00	2:01 4:01
D													0:30 0:42	0:43 1:32	1:33 2:43	2:44 4:44
E												0:30 0:42	0:43 1:25	1:26 2:15	2:16 3:25	3:26 5:26
F											0:30 0:42	0:43 1:25	1:26 2:07	2:08 2:57	2:58 4:08	4:09 6:08
G										0:30 0:42	0:43 1:25	1:26 2:07	2:08 2:49	2:50 3:39	3:40 4:50	4:51 6:51
H									0:30 0:42	0:43 1:25	1:26 2:07	2:08 2:49	2:50 3:32	3:33 4:22	4:23 5:32	5:33 7:33
I								0:30 0:42	0:43 1:25	1:26 2:07	2:08 2:49	2:50 3:32	3:33 4:14	4:15 5:04	5:05 6:15	6:16 8:15
J							0:30 0:42	0:43 1:25	1:26 2:07	2:08 2:49	2:50 3:32	3:33 4:14	4:15 4:56	4:57 5:46	5:47 6:57	6:58 8:58
K						0:30 0:42	0:43 1:25	1:26 2:07	2:08 2:49	2:50 3:32	3:33 4:14	4:15 4:56	4:57 5:39	5:40 6:29	6:30 7:39	7:40 9:40
L					0:30 0:42	0:43 1:25	1:26 2:07	2:08 2:49	2:50 3:32	3:33 4:14	4:15 4:56	4:57 5:39	5:40 6:21	6:22 7:11	7:12 8:22	8:23 10:22
M				0:30 0:42	0:43 1:25	1:26 2:07	2:08 2:49	2:50 3:32	3:33 4:14	4:15 4:56	4:57 5:39	5:40 6:21	6:22 7:03	7:04 7:53	7:54 9:04	9:05 11:05
N			0:30 0:42	0:43 1:25	1:26 2:07	2:08 2:49	2:50 3:32	3:33 4:14	4:15 4:56	4:57 5:39	5:40 6:21	6:22 7:03	7:04 7:46	7:47 8:36	8:37 9:46	9:47 11:47
O		0:30 0:42	0:43 1:25	1:26 2:07	2:08 2:49	2:50 3:32	3:33 4:14	4:15 4:56	4:57 5:39	5:40 6:21	6:22 7:03	7:04 7:46	7:47 8:28	8:29 9:18	9:19 10:29	10:30 12:29
Z	0:30 0:42	0:43 1:25	1:26 2:07	2:08 2:49	2:50 3:32	3:33 4:14	4:15 4:56	4:57 5:39	5:40 6:21	6:22 7:03	7:04 7:46	7:47 8:28	8:29 9:10	9:11 10:00	10:01 11:11	11:12 13:12
FINAL	Z	O	N	M	L	K	J	I	H	G	F	E	D	C	B	A

REPETS BREATHING 1.30 ATA FIXED PO2 IN HELIUM

DEPTH	Z	O	N	M	L	K	J	I	H	G	F	E	D	C	B	A
10																720
20														720	269	129
30				720	516	362	281	227	185	152	124	100	78	60	43	27
40														720	246	122
50				720	490	352	276	223	183	150	123	99	78	59	43	27
60	220	195	174	155	138	123	108	95	83	71	61	51	41	32	23	15
70	123	112	103	94	85	77	69	61	54	47	41	34	28	22	16	11
80	86	80	74	67	62	56	51	45	40	35	30	26	21	17	12	8
90	67	62	57	53	48	44	40	36	32	28	24	20	17	13	10	6
100	54	51	47	43	40	36	33	30	26	23	20	17	14	11	8	5
110	46	43	40	37	34	31	28	25	22	20	17	14	12	9	7	4
120	40	37	34	32	29	27	24	22	19	17	15	13	10	8	6	4
130	35	32	30	28	26	24	21	19	17	15	13	11	9	7	5	3
140	31	29	27	25	23	21	19	17	15	13	12	10	8	6	4	3
150	28	26	24	22	21	19	17	15	14	12	10	9	7	6	4	3
160	25	24	22	20	19	17	16	14	12	11	9	8	6	5	3	3
170	23	22	20	19	17	16	14	13	11	10	9	7	6	4	3	3
180	21	20	19	17	16	14	13	12	10	9	8	6	5	4	3	3
190	20	18	17	16	15	13	12	11	10	8	7	6	5	4	3	3
200	18	17	16	15	13	12	11	10	9	8	7	5	4	3	3	3

Appendix K.

Comparison of Repetitive Dive Schedules as Planned for Test to Corresponding Schedules Prescribed by the MK 16 MOD 1 Heliox Decompression Tables

NOTE: The tabulated estimated DCS risk for each schedule was computed assuming ideal MK 16 MOD 1 PO_2 control.

Phase I.

	Tested Schedule (Computed using Probabilistic LEM algorithm)							Corresponding Schedule as Prescribed by MK 16 MOD 1 He-O_2 Decompression Tables						
Profile #	Dive 1		Dive 2		Dive 3	Estimated Cumulative P_{DCS}, %		Dive 1		Dive 2		Dive 3	Estimated Cumulative P_{DCS}, %	
1-A	160/ 25 50/ 2 40/ 2 30/ 3 20/ 6	- SI30 -	160/ 25 50/ 2 40/ 3 30/ 4 20/ 79			2.697	2.344 - 3.086	160/ 25 30/ 6 20/ 15	- SI30 -	160/ 25 60/ 2 50/ 8 40/ 7 30/ 7 20/ 73			2.633	2.299 - 3.001
2-A	120/ 20	- SI30 -	160/ 15 30/ 2 20/ 14	- SI30 -	160/ 20 40/ 2 30/ 3 20/ 65	4.072	3.278 - 4.989	120/ 20	- SI30 -	160/ 15 40/ 4 30/ 7 20/ 31	- SI30 -	160/ 20 50/ 6 40/ 7 30/ 7 20/ 60	3.616	2.875 - 4.481
3-A	200/ 15 50/ 1 40/ 2 30/ 3 20/ 4	- SI30 -	160/ 15 30/ 2 20/ 36	- SI30 -	160/ 15 30/ 1 20/ 49	3.442	2.698 - 4.319	200/ 15 40/ 1 30/ 1 20/ 14	- SI30 -	160/ 15 50/ 2 40/ 7 30/ 7 20/ 46	- SI30 -	160/ 15 50/ 2 40/ 7 30/ 7 20/ 46	2.489	2.131 - 2.889

Profile #	Tested Schedule (Computed using Probabilistic LEM algorithm): Dive 1		Dive 2	Dive 3	Estimated Cumulative P_{DCS}, %		Corresponding Schedule as Prescribed by MK 16 MOD 1 He-O_2 Decompression Tables: Dive 1		Dive 2	Dive 3		
4-A	200/ 15 50/ 1 40/ 2 30/ 3 20/ 4	- SI30 -	200/ 20 70/ 2 60/ 2 50/ 2 40/ 3 30/ 12 20/ 73		3.052	2.312 - 3.947	200/ 15 40/ 1 30/ 1 20/ 14	- SI30 -	200/ 20 160/ 1 140/ 1 100/ 1 70/ 6 60/ 7 50/ 7 40/ 7 30/ 7 20/ 87		2.464	2.115 - 2.853
5-B	200/ 22 80/ 2 70/ 2 60/ 3 50/ 2 40/ 2 30/ 2 20/ 47	- SI30 -	160/ 15 30/ 1 20/ 49		2.268	1.967 - 2.600	200/ 22 140/ 1 100/ 1 60/ 1 50/ 6 40/ 7 30/ 7 20/ 47	- SI30 -	160/ 15 50/ 2 40/ 7 30/ 7 20/ 46		2.586	2.265 - 2.939
6-B	120/ 15	- SI30 -	200/ 23 80/ 2 70/ 3 60/ 2 50/ 2 40/ 2 30/ 12 20/ 71		2.410	1.829 - 3.115	120/ 15	- SI30 -	200/ 23 160/ 1 130/ 1 90/ 1 60/ 7 50/ 7 40/ 7 30/ 7 20/ 68		2.768	2.147 - 3.509

Tested Schedule (Computed using Probabilistic LEM algorithm)							Corresponding Schedule as Prescribed by MK 16 MOD 1 He-O_2 Decompression Tables					
Profile #	Dive 1		Dive 2		Dive 3	Estimated Cumulative P_{DCS}, %	Dive 1		Dive 2		Dive 3	Estimated Cumulative P_{DCS}, %
7-B	160/ 15 30/ 1 20/ 2	- SI30 -	200/ 23 80/ 2 70/ 3 60/ 2 50/ 3 40/ 7 30/ 12 20/ 81			3.342 2.513 - 4.348	160/ 15 20/ 5	- SI30 -	200/ 23 160/ 1 140/ 1 100/ 1 70/ 6 60/ 7 50/ 7 40/ 7 30/ 7 20/ 87			2.755 2.182 - 3.429
8-B	120/ 15	- SI30 -	160/ 20 40/ 2 30/ 2 20/ 23	- SI30 -	120/ 21 20/ 52	2.842 2.204 - 3.603	120/ 15	- SI30 -	160/ 20 40/ 4 30/ 7 20/ 31	- SI30 -	120/ 21 30/ 4 20/ 43	2.756 2.131 - 3.503
9-B	120/ 19 20/ 2	- SI30 -	120/ 15 20/ 2	- SI30 -	200/ 15 50/ 2 40/ 2 30/ 3 20/ 68	2.875 2.194 - 3.695	120/ 19	- SI30 -	120/ 15 20/ 23	- SI30 -	200/ 15 160/ 1 130/ 1 90/ 1 60/ 7 50/ 7 40/ 7 30/ 7 20/ 68	3.496 2.760 - 4.359
10-B	160/ 20 40/ 2 30/ 2 20/ 4	- SI30 -	120/ 15 20/ 13	- SI30 -	160/ 17 40/ 2 30/ 3 20/ 65	3.104 2.453 - 3.869	160/ 20 20/ 13	- SI30 -	120/ 15 30/ 2 20/ 33	- SI30 -	160/ 17 50/ 6 40/ 7 30/ 7 20/ 60	2.144 1.841 - 2.483

Profile #	Tested Schedule (Computed using Probabilistic LEM algorithm)				Corresponding Schedule as Prescribed by MK 16 MOD 1 He-O_2 Decompression Tables			
	Dive 1	Dive 2	Dive 3	Estimated Cumulative P_{DCS}, %	Dive 1	Dive 2	Dive 3	Estimated Cumulative P_{DCS}, %
11-B	200/ 22 - SI30 - 80/ 2 70/ 2 60/ 3 50/ 2 40/ 2 30/ 2 20/ 47	120/ 20 20/ 40		2.292 1.987 - 2.629	200/ 22 - SI30 - 140/ 1 100/ 1 60/ 1 50/ 6 40/ 7 30/ 7 20/ 47	120/ 20 30/ 4 20/ 43		2.546 2.227 - 2.897
12-B	120/ 15 - SI30 -	160/ 15 - SI30 - 30/ 2 20/ 14	200/ 15 50/ 2 40/ 2 30/ 2 20/ 69	2.781 2.122 - 3.577	120/ 15 - SI30 -	160/ 15 - SI30 - 30/ 6 20/ 15	200/ 15 160/ 1 130/ 1 90/ 1 60/ 7 50/ 7 40/ 7 30/ 7 20/ 68	2.839 2.221 - 3.572
13-B	160/ 20 - SI30 - 40/ 2 30/ 2 20/ 4	200/ 18 70/ 2 60/ 2 50/ 2 40/ 2 30/ 12 20/ 72		2.768 2.138 - 3.521	160/ 20 - SI30 - 20/ 13	200/ 18 160/ 1 130/ 1 90/ 1 60/ 7 50/ 7 40/ 7 30/ 7 20/ 68		2.657 2.308 - 3.044

	Tested Schedule (Computed using Probabilistic LEM algorithm)							Corresponding Schedule as Prescribed by MK 16 MOD 1 $He-O_2$ Decompression Tables						
Profile #	Dive 1		Dive 2		Dive 3	Estimated Cumulative P_{DCS}, %		Dive 1		Dive 2		Dive 3	Estimated Cumulative P_{DCS}, %	
14-B	200/ 15 50/ 1 40/ 2 30/ 3 20/ 4	- SI30 -	120/ 15 20/ 15	- SI30 -	200/ 13 50/ 2 40/ 2 30/ 3 20/ 68	2.710	2.316 - 3.151	200/ 15 40/ 1 30/ 1 20/ 14	- SI30 -	120/ 15 30/ 2 20/ 33	- SI30 -	200/ 13 160/ 1 130/ 1 90/ 1 60/ 7 50/ 7 40/ 7 30/ 7 20/ 68	2.350	2.006 - 2.736
15-B	120/ 20	- SI30 -	160/ 16 40/ 2 30/ 3 20/ 34	- SI30 -	160/ 15 30/ 1 20/ 48	3.671	2.923 - 4.543	120/ 20	- SI30 -	160/ 16 40/ 4 30/ 7 20/ 31	- SI30 -	160/ 15 50/ 2 40/ 7 30/ 7 20/ 46	3.606	2.864 - 4.473
16-B	160/ 20 40/ 2 30/ 2 20/ 4	- SI30 -	120/ 25 20/ 40	- SI30 -	120/ 16 20/ 40	3.143	2.489 - 3.911	160/ 20 20/ 13	- SI30 -	120/ 25 30/ 6 20/ 51	- SI30 -	120/ 16 30/ 2 20/ 33	2.428	2.098 - 2.79
17-B	200/ 20 70/ 1 60/ 2 50/ 2 40/ 3 30/ 2 20/ 18	- SI30 -	160/ 17 40/ 2 30/ 3 20/ 64			2.380	2.050 - 2.746	200/ 20 100/ 1 70/ 1 40/ 4 30/ 7 20/ 24	- SI30 -	160/ 17 50/ 6 40/ 7 30/ 7 20/ 60			2.275	1.972 - 2.610

Profile #	Tested Schedule (Computed using Probabilistic LEM algorithm)							Corresponding Schedule as Prescribed by MK 16 MOD 1 He-O_2 Decompression Tables						
	Dive 1		Dive 2		Dive 3	Estimated Cumulative P_{DCS}, %		Dive 1		Dive 2		Dive 3	Estimated Cumulative P_{DCS}, %	
18-B	120/ 20	- SI30 -	120/ 20 20/ 20	- SI30 -	160/ 15 30/ 1 20/ 49	3.721	2.969 - 4.597	120/ 20	- SI30 -	120/ 20 30/ 2 20/ 33	- SI30 -	160/ 15 50/ 2 40/ 7 30/ 7 20/ 46	3.346	2.615 - 4.212
19-B	160/ 15 30/ 1 20/ 2	- SI30 -	200/ 11 50/ 2 40/ 3 30/ 2 20/ 42	- SI30 -	120/ 15 20/ 28	3.423	2.600 - 4.413	160/ 15 20/ 5	- SI30 -	200/ 11 140/ 1 100/ 1 60/ 1 50/ 6 40/ 7 30/ 7 20/ 47	- SI30 -	120/ 15 30/ 2 20/ 33	2.431	1.877 - 3.095
20-B	200/ 17 70/ 1 60/ 2 50/ 2 40/ 3 30/ 2 20/ 18	- SI30 -	200/ 15 50/ 2 40/ 2 30/ 2 20/ 68			2.251	1.944 - 2.594	200/ 17 100/ 1 70/ 1 40/ 4 30/ 7 20/ 24	- SI30 -	200/ 15 160/ 1 130/ 1 90/ 1 60/ 7 50/ 7 40/ 7 30/ 7 20/ 68			2.669	2.331 - 3.042

	Tested Schedule (Computed using Probabilistic LEM algorithm)				Corresponding Schedule as Prescribed by MK 16 MOD 1 He-O_2 Decompression Tables			
Profile #	Dive 1	Dive 2	Dive 3	Estimated Cumulative P_{DCS}, %	Dive 1	Dive 2	Dive 3	Estimated Cumulative P_{DCS}, %
21-B	120/ 25 20/ 2	- SI30 - 120/ 20 20/ 17	- SI30 - 200/ 13 50/ 2 40/ 2 30/ 3 20/ 67	3.729 3.072 - 4.478	120/ 25 20/ 4	- SI30 - 120/ 20 30/ 2 20/ 33	- SI30 - 200/ 13 160/ 1 130/ 1 90/ 1 60/ 7 50/ 7 40/ 7 30/ 7 20/ 68	2.677 2.198 - 3.227
22-B	120/ 25 20/ 2	- SI30 - 200/ 18 70/ 2 60/ 2 50/ 3 40/ 2 30/ 7 20/ 68		3.335 2.698 - 4.071	120/ 25 20/ 4	- SI30 - 200/ 18 160/ 1 130/ 1 90/ 1 60/ 7 50/ 7 40/ 7 30/ 7 20/ 68		2.743 2.259 - 3.298
23-B	200/ 17 70/ 1 60/ 2 50/ 2 40/ 3 30/ 2 20/ 18	- SI30 - 200/ 15 50/ 2 40/ 2 30/ 2 20/ 68		2.251 1.944 - 2.594	200/ 17 100/ 1 70/ 1 40/ 4 30/ 7 20/ 24	- SI30 - 200/ 15 160/ 1 130/ 1 90/ 1 60/ 7 50/ 7 40/ 7 30/ 7 20/ 68		2.669 2.331 - 3.042

Profile #	Tested Schedule (Computed using Probabilistic LEM algorithm)				Corresponding Schedule as Prescribed by MK 16 MOD 1 He-O_2 Decompression Tables			
	Dive 1	Dive 2	Dive 3	Estimated Cumulative P_{DCS}, %	Dive 1	Dive 2	Dive 3	Estimated Cumulative P_{DCS}, %
24-B	160/ 25 - SI30 -	160/ 22		2.379 2.067 - 2.724	160/ 25 - SI30 -	160/ 22		2.344 2.039 - 2.682
	50/ 2	50/ 2			30/ 6	60/ 2		
	40/ 2	40/ 3			20/ 15	50/ 8		
	30/ 3	30/ 4				40/ 7		
	20/ 6	20/ 79				30/ 7		
						20/ 73		
25-B	120/ 25 - SI30 -	200/ 18		3.335 2.698 - 4.071	120/ 25 - SI30 -	200/ 18		2.743 2.259 - 3.298
	20/ 2	70/ 2			20/ 4	160/ 1		
		60/ 2				130/ 1		
		50/ 3				90/ 1		
		40/ 2				60/ 7		
		30/ 7				50/ 7		
		20/ 68				40/ 7		
						30/ 7		
						20/ 68		
26-B	160/ 20 - SI30 -	200/ 18		2.768 2.138 - 3.521	160/ 20 - SI30 -	200/ 18		2.657 2.308 - 3.044
	40/ 2	70/ 2			20/ 13	160/ 1		
	30/ 2	60/ 2				130/ 1		
	20/ 4	50/ 2				90/ 1		
		40/ 2				60/ 7		
		30/ 12				50/ 7		
		20/ 72				40/ 7		
						30/ 7		
						20/ 68		

Profile #	Tested Schedule (Computed using Probabilistic LEM algorithm) Dive 1	Dive 2	Dive 3	Estimated Cumulative P_{DCS}, %	Corresponding Schedule as Prescribed by MK 16 MOD 1 He-O_2 Decompression Tables Dive 1	Dive 2	Dive 3	Estimated Cumulative P_{DCS}, %
27-B	200/ 22 80/ 2 70/ 2 60/ 3 50/ 2 40/ 2 30/ 2 20/ 47	- SI30 - 120/ 20 20/ 40		2.292 1.987 - 2.629	200/ 22 140/ 1 100/ 1 60/ 1 50/ 6 40/ 7 30/ 7 20/ 47	- SI30 - 120/ 20 30/ 4 20/ 43		2.546 2.227 - 2.897
28-B	160/ 25 50/ 2 40/ 2 30/ 3 20/ 6	- SI30 - 160/ 22 50/ 2 40/ 3 30/ 4 20/ 79		2.379 2.067 - 2.724	160/ 25 30/ 6 20/ 15	- SI30 - 160/ 22 60/ 2 50/ 8 40/ 7 30/ 7 20/ 73		2.344 2.039 - 2.682
29-B	160/ 15 30/ 1 20/ 2	- SI30 - 200/ 23 80/ 2 70/ 3 60/ 2 50/ 3 40/ 7 30/ 12 20/ 81		3.342 2.513 - 4.348	160/ 15 20/ 5	- SI30 - 200/ 23 160/ 1 140/ 1 100/ 1 70/ 6 60/ 7 50/ 7 40/ 7 30/ 7 20/ 87		2.755 2.182 - 3.429
30-B	200/ 15 50/ 1 40/ 2 30/ 3 20/ 4	- SI30 - 120/ 20 20/ 28	- SI30 - 120/ 16 20/ 41	3.140 2.424 - 3.993	200/ 15 40/ 1 30/ 1 20/ 14	- SI30 - 120/ 20 30/ 4 20/ 43	- SI30 - 120/ 16 30/ 2 20/ 33	2.412 2.053 - 2.815

Profile #	Tested Schedule (Computed using Probabilistic LEM algorithm): Dive 1	Dive 2	Dive 3	Estimated Cumulative P_{DCS}, %	Corresponding Schedule as Prescribed by MK 16 MOD 1 He-O_2 Decompression Tables: Dive 1	Dive 2	Dive 3	Estimated Cumulative P_{DCS}, %
31-B	120/ 25 20/ 2	- SI30 - 120/ 15 20/ 2	- SI30 - 200/ 13 50/ 2 40/ 2 30/ 3 20/ 68	3.844 2.974 - 4.878	120/ 25 20/ 4	- SI30 - 120/ 15 20/ 23	- SI30 - 200/ 13 160/ 1 130/ 1 90/ 1 60/ 7 50/ 7 40/ 7 30/ 7 20/ 68	2.623 2.146 - 3.173
32-B	160/ 15 30/ 1 20/ 2	- SI30 - 200/ 23 80/ 2 70/ 3 60/ 2 50/ 3 40/ 7 30/ 12 20/ 81		3.342 2.513 - 4.348	160/ 15 20/ 5	- SI30 - 200/ 23 160/ 1 140/ 1 100/ 1 70/ 6 60/ 7 50/ 7 40/ 7 30/ 7 20/ 87		2.755 2.182 - 3.429
33-B	120/ 20	- SI30 - 200/ 23 80/ 2 70/ 3 60/ 2 50/ 3 40/ 4 30/ 12 20/ 79		3.394 2.661 - 4.260	120/ 20	- SI30 - 200/ 23 160/ 1 140/ 1 100/ 1 70/ 6 60/ 7 50/ 7 40/ 7 30/ 7 20/ 87		3.494 2.750 - 4.369

Profile #	Tested Schedule (Computed using Probabilistic LEM algorithm): Dive 1		Dive 2		Dive 3	Estimated Cumulative P_{DCS}, %	Corresponding Schedule as Prescribed by MK 16 MOD 1 He-O_2 Decompression Tables: Dive 1		Dive 2		Dive 3	Estimated Cumulative P_{DCS}, %
35-B	200/ 17 70/ 1 60/ 2 50/ 2 40/ 3 30/ 2 20/ 18	- SI30 -	200/ 15 50/ 2 40/ 2 30/ 2 20/ 68			2.251 1.944 - 2.594	200/ 17 100/ 1 70/ 1 40/ 4 30/ 7 20/ 24	- SI30 -	200/ 15 160/ 1 130/ 1 90/ 1 60/ 7 50/ 7 40/ 7 30/ 7 20/ 68			2.669 2.331 - 3.042
36-B	120/ 15	- SI30 -	120/ 15	- SI30 -	160/ 22 50/ 2 40/ 3 30/ 2 20/ 68	3.224 2.241 - 4.479	120/ 15	- SI30 -	120/ 15 20/ 8	- SI30 -	160/ 22 50/ 6 40/ 7 30/ 7 20/ 60	2.633 2.031 - 3.356
37-B	200/ 22 80/ 2 70/ 2 60/ 3 50/ 2 40/ 2 30/ 2 20/ 47	- SI30 -	120/ 20 20/ 40			2.426 2.108 - 2.778	200/ 22 140/ 1 100/ 1 60/ 1 50/ 6 40/ 7 30/ 7 20/ 47	- SI30 -	120/ 20 30/ 4 20/ 43			2.546 2.227 - 2.897
38-B	120/ 15	- SI30 -	160/ 21 50/ 2 40/ 3 30/ 2 20/ 42	- SI30 -	120/ 20 20/ 40	2.710 2.120 - 3.410	120/ 15	- SI30 -	160/ 21 40/ 4 30/ 7 20/ 31	- SI30 -	120/ 20 30/ 4 20/ 43	2.789 2.158 - 3.542

Profile #	Tested Schedule (Computed using Probabilistic LEM algorithm): Dive 1		Dive 2		Dive 3	Estimated Cumulative P_{DCS}, %		Corresponding Schedule as Prescribed by MK 16 MOD 1 He-O_2 Decompression Tables: Dive 1		Dive 2		Dive 3	Estimated Cumulative P_{DCS}, %	
40-B	120/ 20	- SI30 -	160/ 15 30/ 2 20/ 14	- SI30 -	120/ 21 20/ 53	3.786	3.028 - 4.666	120/ 20	- SI30 -	160/ 15 40/ 4 30/ 7 20/ 31	- SI30 -	120/ 21 30/ 4 20/ 43	3.531	2.791 - 4.398
41-B	120/ 20	- SI30 -	120/ 25 20/ 20	- SI30 -	200/ 13 50/ 2 40/ 2 30/ 3 20/ 67	3.791	3.042 - 4.659	120/ 20	- SI30 -	120/ 25 30/ 4 20/ 43	- SI30 -	200/ 13 160/ 1 130/ 1 90/ 1 60/ 7 50/ 7 40/ 7 30/ 7 20/ 68	3.350	2.623 - 4.210
42-B	160/ 20 40/ 2 30/ 2 20/ 4	- SI30 -	200/ 18 70/ 2 60/ 2 50/ 2 40/ 2 30/ 12 20/ 72			2.768	2.138 - 3.521	160/ 20 20/ 13	- SI30 -	200/ 18 160/ 1 130/ 1 90/ 1 60/ 7 50/ 7 40/ 7 30/ 7 20/ 68			2.657	2.308 - 3.044
43	120/ 25 20/ 2	- SI30 -	120/ 25 20/ 30	- SI30 -	120/ 25 20/ 53			120/ 25 20/ 4	- SI30 -	120/ 25 30/ 4 20/ 43	- SI30 -	120/ 25 30/ 6 20/ 51	2.815	2.325 - 3.376

Tested Schedule (Computed using Probabilistic LEM algorithm)						Corresponding Schedule as Prescribed by MK 16 MOD 1 He-O_2 Decompression Tables				
Profile #	Dive 1		Dive 2	Dive 3	Estimated Cumulative P_{DCS}, %	Dive 1		Dive 2	Dive 3	Estimated Cumulative P_{DCS}, %
44	160/ 25	- SI30 -	160/ 25			160/ 25	- SI30 -	160/ 25		2.633 2.299 - 3.001
	50/ 2		50/ 2			30/ 6		60/ 2		
	40/ 2		40/ 3			20/ 15		50/ 8		
	30/ 3		30/ 4					40/ 7		
	20/ 6		20/ 79					30/ 7		
								20/ 73		

Phase II.

Profile #	Tested Schedule (Computed using EL-RTA-XVAL_He_4 algorithm): Dive 1		Dive 2		Dive 3	Estimated Cumulative P_{DCS}, %		Corresponding Schedule as Prescribed by MK 16 MOD 1 He-O_2 Decompression Tables: Dive 1		Dive 2		Dive 3	Estimated Cumulative P_{DCS}, %	
II.22	120/ 30 20/ 8	- SI30 -	120/ 35 30/ 4 20/ 62	- SI30 -	120/ 25 20/ 53	2.824	2.467 - 3.217	120/ 30 20/ 8	- SI30 -	120/ 35 40/ 1 30/ 7 20/ 68	- SI30 -	120/ 25 30/ 6 20/ 51	2.529	2.209 - 2.882
II.23	100/ 15	- SI180 -	100/ 30	- SI180 -	120/ 30 20/ 39	4.110	3.470 - 4.827	100/ 15	- SI180 -	100/ 30 20/ 4	- SI180 -	120/ 30 30/ 4 20/ 43	2.818	2.384 - 3.305
II.24	120/ 35 20/ 12	- SI30 -	100/ 35 20/ 52			2.442	2.121 - 2.798	120/ 35 20/ 12	- SI30 -	100/ 35 20/ 62			2.128	1.842 - 2.446
II.25	140/ 35[1] 30/ 3 20/ 16	- SI30 -	120/ 30 30/ 1 20/ 62			2.547	2.220 - 2.908	140/ 35 30/ 3 20/ 16	- SI30 -	120/ 30 40/ 1 30/ 7 20/ 68			2.211	1.922 - 2.530

[1] Profile II.25 was computed with first dive as 140/30, but dove with first dive as shown due to typographical error.

Profile #	Tested Schedule (Computed using EL-RTA-XVAL_He_4 algorithm) Dive 1		Dive 2		Dive 3	Estimated Cumulative P_{DCS}, %	Corresponding Schedule as Prescribed by MK 16 MOD 1 He-O_2 Decompression Tables Dive 1		Dive 2		Dive 3	Estimated Cumulative P_{DCS}, %
II.26	140/ 30 30/ 3 20/ 16	- SI180 -	140/ 30 30/ 5 20/ 60			3.389 2.947 - 3.876	140/ 30 30/ 3 20/ 16	- SI180 -	140/ 30 50/ 1 40/ 7 30/ 7 20/ 63			3.129 2.719 - 3.582
II.27	140/ 20 20/ 7	- SI30 -	140/ 30 40/ 4 30/ 7 20/ 57			2.443 2.075 - 2.856	140/ 20 20/ 7	- SI30 -	140/ 30 50/ 1 40/ 7 30/ 7 20/ 63			2.223 1.864 - 2.631
II.28	160/ 30 40/ 4 30/ 7 20/ 31	- SI30 -	160/ 25 40/ 2 30/ 7 20/ 74			2.832 2.467 - 3.234	160/ 30 40/ 4 30/ 7 20/ 31	- SI30 -	160/ 25 60/ 2 50/ 8 40/ 7 30/ 7 20/ 73			2.682 2.352 - 3.044
II.29[2]	120/ 25 20/ 4	- SI180 -	160/ 20 30/ 3 20/ 32	- SI30 -	140/ 15 20/ 42	3.607 3.040 - 4.243	120/ 25 20/ 4	- SI180 -	160/ 20 40/ 4 30/ 7 20/ 31	- SI30 -	140/ 15 40/ 3 30/ 7 20/ 41	3.377 2.827 - 3.999

[2] This profile is outside the recommended limit of only one repetitive dive after a decompression stop dive (*c.f.*, item 3 in Conclusions and Recommendations).

Profile #	Tested Schedule (Computed using EL-RTA-XVAL_He_4 algorithm): Dive 1		Dive 2	Dive 3	Estimated Cumulative P_{DCS}, %		Corresponding Schedule as Prescribed by MK 16 MOD 1 He-O_2 Decompression Tables: Dive 1		Dive 2	Dive 3	Estimated Cumulative P_{DCS}, %	
II.30	160/ 25	- SI180 -	120/ 35		3.400	2.952 - 3.894	160/ 25	- SI180 -	120/ 35		3.128	2.710 - 3.590
	30/ 6		20/ 57				30/ 6		30/ 7			
	20/ 15						20/ 15		20/ 60			
II.31	140/ 20	- SI30 -	160/ 30		2.569	2.199 - 2.981	140/ 20	- SI30 -	160/ 30		2.108	1.765 - 2.497
	20/ 7		50/ 5				20/ 7		60/ 5			
			40/ 7						50/ 7			
			30/ 7						40/ 7			
			20/ 70						30/ 8			
									20/ 84			
II.32	180/ 25	- SI180 -	160/ 30		3.775	3.286 - 4.313	180/ 25	- SI180 -	160/ 30		3.560	3.108 - 4.057
	40/ 6		40/ 4				40/ 6		60/ 2			
	30/ 7		30/ 7				30/ 7		50/ 8			
	20/ 29		20/ 72				20/ 29		40/ 7			
									30/ 7			
									20/ 73			
II.33	180/ 20	- SI180 -	180/ 35		3.820	3.327 - 4.361	180/ 20	- SI180 -	180/ 35		3.842	3.346 - 4.386
	30/ 6		60/ 7				30/ 6		70/ 6			
	20/ 14		50/ 7				20/ 14		60/ 7			
			40/ 7						50/ 7			
			30/ 7						40/ 7			
			20/ 95						30/ 7			
									20/ 94			

Profile #	Tested Schedule (Computed using EL-RTA-XVAL_He_4 algorithm) Dive 1		Dive 2	Dive 3	Estimated Cumulative P_{DCS}, %	Corresponding Schedule as Prescribed by MK 16 MOD 1 He-O_2 Decompression Tables Dive 1		Dive 2	Dive 3	Estimated Cumulative P_{DCS}, %
II.34	180/ 20 30/ 6 20/ 14	- SI30 -	180/ 25 60/ 2 50/ 7 40/ 7 30/ 7 20/ 80		2.846 2.451 - 3.286	180/ 20 30/ 6 20/ 14	- SI30 -	180/ 25 70/ 6 60/ 7 50/ 7 40/ 7 30/ 7 20/ 94		2.443 2.111 - 2.812
II.35	200/ 20[3] 140/ 1 100/ 1 60/ 1 50/ 6 40/ 7 30/ 7 20/ 47	- SI30 -	180/ 25 40/ 6 30/ 6 20/ 84		3.079 2.675 - 3.525	200/ 20 140/ 1 100/ 1 60/ 1 50/ 6 40/ 7 30/ 7 20/ 47	- SI30 -	180/ 25 70/ 2 60/ 7 50/ 7 40/ 7 30/ 7 20/ 79		3.049 2.673 - 3.460
II.36	200/ 15 40/ 1 30/ 1 20/ 14	- SI180 -	180/ 35 60/ 7 50/ 7 40/ 7 30/ 7 20/ 91		3.645 3.152 - 4.189	200/ 15 40/ 1 30/ 1 20/ 14	- SI180 -	180/ 35 70/ 6 60/ 7 50/ 7 40/ 7 30/ 7 20/ 94		3.538 3.060 - 4.065
II.37	200/ 20 100/ 1 70/ 1 40/ 4 30/ 7 20/ 24	- SI30 -	180/ 15 30/ 4 20/ 57		2.640 2.270 - 3.053	200/ 20 100/ 1 70/ 1 40/ 4 30/ 7 20/ 24	- SI30 -	180/ 15 60/ 4 50/ 7 40/ 7 30/ 7 20/ 64		2.277 1.976 - 2.610

[3] Profile II.35 was computed with first dive as 200/25, but dove with first dive as shown due to typographical error.

APPENDIX L.

Estimated DCS Risks of Dive Profiles as Actually Dived

PHASE I

Profile #	Estimated Cumulative DCS Risk, % Mean	95% Confidence Band Low - High	CUPTD[1]	Minimum VC % Normal[3]	P_{CNS}, %[2]
103100AN91	1.857	1.576 - 2.175	79.82	99.51	0.52
103100AN29	1.795	1.520 - 2.106	83.00	99.49	0.58
110100AN83	1.925	1.664 - 2.215	282.73	98.32	1.72
110100AN79	1.860	1.607 - 2.142	285.10	98.31	1.80
110100AN72	1.922	1.662 - 2.211	282.00	98.33	1.67
110100BN121	2.566	2.038 - 3.188	268.03	98.48	1.64
110100BN601	2.448	1.899 - 3.105	276.89	98.43	1.81
110100BN581	2.619	2.042 - 3.305	272.04	98.46	1.63
110100BN211	2.078	1.535 - 2.752	292.80	98.34	2.15
110200AN321	2.538	1.874 - 3.358	263.33	98.51	1.36
110200AN221	2.013	1.735 - 2.324	276.22	98.43	1.56
110200AN891	1.961	1.633 - 2.337	155.97	99.12	1.01
110200AN311	1.702	1.452 - 1.982	292.20	98.33	1.99
110200BN531	1.737	1.450 - 2.065	265.13	98.44	1.57
110200BN80	1.392	1.153 - 1.668	55.26	99.66	0.32
110200BN35	1.746	1.501 - 2.020	263.74	98.45	1.54
110600BN652	1.019	0.829 - 1.241	309.86	98.16	2.96
110600BN602	1.542	1.314 - 1.799	276.03	98.36	1.67
110600BN912	1.729	1.484 - 2.003	264.46	98.43	1.43
110600BN352	1.554	1.324 - 1.813	274.22	98.37	1.56
110700AN392	1.572	1.017 - 2.331	256.63	98.50	2.25
110700AN893	0.882	0.583 - 1.292	282.74	98.32	2.30
110700AN553	0.972	0.703 - 1.314	272.58	98.38	2.44
110700N792	1.271	0.925 - 1.708	260.66	98.46	1.72
110800AN531	2.813	2.008 - 3.829	260.39	98.45	1.33
110800AN071	1.684	1.161 - 2.368	296.12	98.24	1.99
110800AN691	1.673	1.052 - 2.538	310.68	98.15	2.33
110800AN841	1.593	1.120 - 2.204	302.65	98.20	2.38
110900AN581	1.570	1.229 - 1.978	263.10	98.52	1.70
110900AN451	2.105	1.682 - 2.602	236.17	98.68	1.12
110900AN813	1.928	1.522 - 2.409	245.61	98.62	1.27
110900AN423	1.770	1.381 - 2.237	254.57	98.57	1.46
111300AN251	1.638	1.211 - 2.170	253.52	98.60	1.90
111300AN391	5.110	4.424 - 5.865	108.84	99.50	0.66
111300AN601	1.606	1.250 - 2.033	257.20	98.58	1.98
111400AN372	1.902	1.606 - 2.238	264.69	98.50	1.50
111400AN322	1.947	1.577 - 2.378	264.54	98.50	1.46
111400AN092	1.672	1.352 - 2.046	278.59	98.42	1.67
111400AN482	2.063	1.580 - 2.649	265.27	98.50	1.58

Profile #	Estimated Cumulative DCS Risk, % Mean	95% Confidence Band Low - High	CUPTD[1]	Minimum VC % Normal[3]	P_{CNS}, %[2]
111400BN22	1.585	1.351 - 1.849	267.48	98.41	1.62
111400BN53	1.839	1.582 - 2.126	252.34	98.50	1.34
111400BN69	1.505	1.278 - 1.762	272.41	98.39	1.72
111400BN05	1.823	1.568 - 2.109	253.74	98.50	1.36
111500AN771	1.698	1.279 - 2.212	263.58	98.51	1.53
111500AN741	1.794	1.373 - 2.306	258.05	98.54	1.46
111500AN841	1.839	1.397 - 2.379	257.81	98.54	1.55
111500AN291	1.544	1.047 - 2.203	276.98	98.43	1.98
111500BN701	1.603	1.169 - 2.149	54.81	99.66	0.27
111500BN651	1.558	1.206 - 1.984	268.27	98.42	1.67
111500BN501	1.423	1.112 - 1.798	56.41	99.65	0.30
111500BN341	1.960	1.438 - 2.612	253.84	98.50	1.42
111600AN141	2.041	1.737 - 2.382	111.32	99.38	0.61
111600AN751	2.127	1.747 - 2.564	251.41	98.60	1.18
111600AN551	1.717	1.464 - 2.002	273.39	98.47	1.60
111600AN351	1.488	1.107 - 1.962	291.21	98.37	2.05
111700AN361	2.464	1.863 - 3.195	265.26	98.50	1.58
111700AN791	2.811	2.212 - 3.518	244.37	98.62	1.19
111700AN05	2.045	1.527 - 2.684	264.16	98.41	1.30
112000AN671	1.504	1.271 - 1.769	298.90	98.30	2.03
112000AN771	2.302	1.924 - 2.731	256.02	98.55	1.23
112000AN742	2.008	1.665 - 2.401	272.51	98.46	1.53
112000AN292	2.324	1.918 - 2.790	256.12	98.55	1.22
112000BN591	1.220	1.017 - 1.454	276.83	98.36	2.08
112000BN581	2.128	1.841 - 2.448	222.97	98.68	1.01
112000BN411	1.804	1.549 - 2.088	243.02	98.56	1.39
112100AN122	1.469	0.936 - 2.207	39.06	99.76	0.20
112100AN782	2.380	1.838 - 3.032	236.23	98.68	1.33
112100AN552	2.296	1.737 - 2.976	243.32	98.64	1.52
112100AN352	3.055	2.387 - 3.845	211.24	98.82	0.94
112100BN521	1.565	0.961 - 2.421	36.20	99.77	0.18
112100BN341	2.155	1.477 - 3.039	236.56	98.67	1.39
112100BN801	2.003	1.399 - 2.782	236.12	98.68	1.37
112200AN321	1.399	1.174 - 1.657	258.12	98.47	1.75
112200AN071	1.374	1.157 - 1.620	261.05	98.45	1.62
112200AN361	1.072	0.877 - 1.300	284.75	98.32	9.38
112200AN051	1.446	1.222 - 1.702	262.63	98.45	9.98
112200BN37	2.815	2.260 - 3.461	262.85	98.51	1.33
112200BN531	3.137	2.517 - 3.857	255.09	98.55	1.22
112200BN481	2.312	1.757 - 2.986	296.99	98.31	1.95
112200BN311	2.384	1.842 - 3.034	287.38	98.37	1.71
112700AN771	2.479	1.915 - 3.156	238.11	98.60	1.38
112700AN341	2.766	2.178 - 3.462	224.47	98.68	1.14
112700AN741	2.408	1.903 - 3.004	229.68	98.65	1.24
112700AN291	2.503	1.982 - 3.119	226.96	98.66	1.19
112700BN20	2.008	1.734 - 2.314	228.34	98.64	1.05

Profile #	Estimated Cumulative DCS Risk, % Mean	95% Confidence Band Low - High	CUPTD[1]	Minimum VC % Normal[3]	P_{CNS}, %[2]
112700BN45	1.502	1.275 - 1.758	260.54	98.47	1.64
112700BN30	1.752	1.502 - 2.031	243.54	98.56	1.30
112700BN02	1.594	1.359 - 1.859	254.13	98.49	1.57
112800AN091	1.945	1.683 - 2.238	252.74	98.50	1.23
112800AN181	2.033	1.761 - 2.334	249.08	98.52	1.17
112800AN791	1.312	1.107 - 1.543	289.35	98.28	2.07
112800AN551	1.884	1.627 - 2.170	258.80	98.46	1.32
112800BN381	2.537	2.003 - 3.168	226.90	98.66	1.15
112800BN581	2.307	1.808 - 2.900	233.28	98.62	1.30
112800BN211	2.585	2.032 - 3.239	228.00	98.66	1.25
112900BN221	2.239	1.760 - 2.808	229.92	98.63	1.01
112900BN331	1.568	1.166 - 2.067	53.23	99.67	0.25
112900BN361	1.131	0.842 - 1.491	288.62	98.29	2.68
112900BN051	1.360	1.136 - 1.617	272.71	98.38	1.82
113000AN491	2.000	1.727 - 2.304	241.09	98.57	1.16
113000AN671	1.954	1.686 - 2.254	244.05	98.55	1.23
113000AN341	1.358	1.144 - 1.603	278.88	98.35	1.90
113000AN741	1.811	1.557 - 2.095	250.82	98.51	1.38
113000BN621	1.888	1.631 - 2.174	257.45	98.47	1.28
113000BN801	1.831	1.580 - 2.111	261.20	98.45	1.36
113000BN201	1.559	1.332 - 1.813	277.09	98.35	1.68
113000BN351	1.700	1.461 - 1.967	268.20	98.41	1.46
120400AN791	2.201	1.669 - 2.848	268.41	98.40	1.51
120400AN781	1.650	1.206 - 2.207	295.77	98.24	2.01
120400AN751	1.749	1.288 - 2.325	290.43	98.27	1.86
120400AN211	1.988	1.496 - 2.593	278.79	98.34	1.74
120400BN551	1.828	1.563 - 2.126	249.28	98.60	1.43
120400BN451	2.250	1.917 - 2.624	225.82	98.74	1.10
120400BN801	2.155	1.812 - 2.545	232.49	98.70	1.23
120400BN721	1.912	1.639 - 2.218	245.34	98.63	1.38
120500AN691	2.868	2.232 - 3.624	233.62	98.69	1.19
120500AN361	2.636	1.944 - 3.490	251.06	98.59	1.47
120500AN481	2.641	1.980 - 3.450	246.52	98.62	1.43
120500AN051	2.977	2.277 - 3.818	229.64	98.71	1.11
120500BN501	1.478	0.941 - 2.221	36.02	99.78	0.17
120500BN071	1.983	1.376 - 2.770	283.08	98.32	1.72
120500BN381	2.292	1.635 - 3.125	268.58	98.40	1.49
120500BN021	2.143	1.609 - 2.798	257.52	98.47	1.28
120600AN671	1.588	1.063 - 2.289	41.41	99.74	0.23
120600AN621	2.888	2.292 - 3.589	247.91	98.53	1.17
120600AN741	2.032	1.559 - 2.605	284.14	98.31	1.84
120600AN301	2.307	1.741 - 2.999	280.07	98.34	1.74
120600BN391	2.632	2.083 - 3.279	95.80	99.51	0.54
120600BN641	3.229	2.598 - 3.963	81.27	99.58	0.32
120600BN341	1.171	0.689 - 1.881	93.91	99.53	0.47
120700AN791	1.291	1.081 - 1.530	267.90	98.41	1.85

Profile #	Estimated Cumulative DCS Risk, % Mean	95% Confidence Band Low - High	CUPTD[1]	Minimum VC % Normal[3]	P_{CNS}, %[2]
120700AN451	1.648	1.408 - 1.918	245.10	98.54	1.32
120700AN811	1.909	1.645 - 2.203	230.66	98.63	1.11
120700AN721	1.732	1.485 - 2.009	240.81	98.57	1.26
120700BN521	2.142	1.384 - 3.170	241.10	98.65	1.39
120700BN781	1.955	1.234 - 2.952	248.94	98.60	1.54
120700BN751	2.687	1.846 - 3.774	219.73	98.77	1.04
120700BN211	2.400	1.614 - 3.436	228.77	98.72	1.18
121100AN372	1.561	1.329 - 1.823	258.67	98.47	1.47
121100AN851	1.449	1.225 - 1.702	266.47	98.42	1.60
121100AN692	1.294	1.084 - 1.535	276.10	98.36	1.85
121100AN051	1.644	1.403 - 1.914	256.18	98.48	1.44
121200AN491	1.889	1.482 - 2.373	134.53	99.36	0.72
121200AN091	2.306	1.717 - 3.031	241.15	98.60	1.27
121200AN331	2.068	1.548 - 2.708	250.23	98.55	1.44
121200AN861	1.778	1.393 - 2.238	259.16	98.67	1.67
121300AN791	1.861	1.581 - 2.177	100.71	99.38	0.73
121300AN751	1.873	1.592 - 2.189	99.67	99.38	0.65
121300AN411	1.948	1.660 - 2.273	95.79	99.41	0.58
121300BN922	2.748	2.146 - 3.464	230.87	98.71	1.30
121300BN872	3.110	2.443 - 3.897	217.53	98.79	1.08
121300BN57	2.888	2.259 - 3.634	225.46	98.74	1.20
121400AN531-2	2.817	2.250 - 3.481	262.07	98.51	1.24
121400AN321-2	2.431	1.909 - 3.051	283.04	98.39	1.66
121400AN141-2	2.408	1.867 - 3.055	285.41	98.38	1.61
121400BN881	1.749	1.379 - 2.190	259.00	98.47	1.56
121400BN481	1.604	1.286 - 1.978	263.21	98.44	1.61
121400BN311	1.134	0.859 - 1.473	291.20	98.28	2.36
020501AN491	0.000	0.000 - 0.000	14.32	99.90	0.03
020501AN291	0.000	0.000 - 0.000	16.00	99.89	0.05
020501AN551	0.000	0.000 - 0.000	14.41	99.90	0.04
020501BN671	2.088	1.798 - 2.412	294.84	98.33	2.12
020501BN772	1.957	1.608 - 2.360	313.77	98.21	2.21
020501BN342	2.387	2.033 - 2.784	287.31	98.37	1.57
020501BN831	2.201	1.875 - 2.567	296.58	98.31	1.73
020501AN581	0.000	0.000 - 0.000	8.89	99.94	0.01
020601AN501	0.000	0.000 - 0.000	2.69	99.98	0.00
020601AN391	0.000	0.000 - 0.000	2.90	99.98	0.00
020601AN121	0.000	0.000 - 0.000	2.43	99.98	0.00
020601AN421	0.000	0.000 - 0.000	2.97	99.98	0.00
020601BN521	2.760	2.224 - 3.384	284.71	98.38	1.55
020601BN351	2.118	1.709 - 2.596	306.72	98.26	2.02
020601BN211	2.536	2.026 - 3.135	294.83	98.32	1.74
020701N531	2.023	1.752 - 2.323	271.32	98.40	1.47
020701N172	0.000	0.000 - 0.000	9.32	99.94	0.01
020701N662	0.000	0.000 - 0.000	3.28	99.98	0.00
020701N362	0.000	0.000 - 0.000	7.87	99.95	0.01

Profile #	Estimated Cumulative DCS Risk, % Mean	95% Confidence Band Low - High	CUPTD[1]	Minimum VC % Normal[3]	P_{CNS}, %[2]
020701N312	0.000	0.000 - 0.000	8.65	99.94	0.01
020701N931	1.803	1.555 - 2.080	283.87	98.32	1.71
020701N081	1.923	1.663 - 2.213	277.52	98.36	1.59
020801AN671	1.473	1.217 - 1.768	332.73	98.10	2.75
020801AN771	2.526	2.140 - 2.960	281.69	98.40	1.51
020801AN581	2.604	2.192 - 3.069	281.22	98.40	1.51
020801AN861	2.608	2.202 - 3.066	278.89	98.41	1.45
020801BN651	1.226	1.029 - 1.452	318.47	98.12	2.81
020801BN561	1.836	1.585 - 2.116	279.70	98.34	1.62
020801BN451	2.150	1.867 - 2.463	260.88	98.45	1.29
020801BN461	1.900	1.641 - 2.187	278.82	98.34	1.69
021201AN521	2.657	2.154 - 3.241	286.59	98.37	1.52
021201AN121	1.188	0.974 - 1.436	344.20	98.04	3.40
021201AN192	2.466	2.014 - 2.988	292.57	98.33	1.67
021201AN582	2.691	2.112 - 3.376	301.32	98.29	2.04
021201BN701	1.024	0.833 - 1.248	270.01	98.39	1.62
021201BN391	0.773	0.598 - 0.986	288.64	98.28	2.21
021201BN111	0.951	0.755 - 1.186	57.28	99.64	0.31
022701BN3912	5.504	4.304 - 6.904	153.04	99.38	0.26
021301AN331	2.643	2.060 - 3.336	316.13	98.22	2.29
021301AN361	2.253	1.714 - 2.907	317.74	98.20	2.18
021301N611	2.734	2.150 - 3.426	300.84	98.30	1.71
021301AN631	2.745	2.158 - 3.439	304.85	98.29	2.04
021401AN491	1.514	1.077 - 2.074	50.02	99.69	0.24
021401AN531	2.575	2.029 - 3.220	298.61	98.32	1.83
021401AN34	2.147	1.737 - 2.626	306.06	98.26	1.94
021401AN83	2.533	2.067 - 3.071	288.62	98.37	1.58
021501AN041	1.066	0.802 - 1.393	59.82	99.63	0.47
021501AN781	1.264	0.921 - 1.699	60.49	99.63	0.46
021501AN551	1.583	1.151 - 2.127	55.20	99.66	0.34
021501AN211	1.710	1.261 - 2.271	50.22	99.69	0.26
021501BN521	1.534	1.312 - 1.784	295.72	98.24	1.94
021501BN581	2.397	2.084 - 2.743	246.07	98.53	1.10
021501BN421	1.992	1.725 - 2.289	270.61	98.39	1.49
021501BN721	1.849	1.597 - 2.129	278.12	98.35	1.59
022001AN481	3.547	3.042 - 4.108	201.63	98.77	1.26
022001AN311	3.423	2.937 - 3.964	207.53	98.74	1.38
022001AN351	3.030	2.625 - 3.479	218.21	98.67	1.68
022001BN591	3.457	2.985 - 3.980	202.30	98.76	1.32
022001BN661	3.321	2.865 - 3.827	208.18	98.73	1.45
022001BN051	3.690	3.160 - 4.280	197.11	98.79	1.22
022101AN021	4.156	3.599 - 4.771	237.55	98.55	1.53
022101AN771	5.033	4.343 - 5.793	211.66	98.70	1.03
022101AN341	4.900	4.248 - 5.615	210.04	98.71	1.02
022101AN201	4.170	3.594 - 4.805	240.57	98.53	1.61
022101BN832	3.490	3.029 - 3.997	231.79	98.88	1.23

Profile #	Estimated Cumulative DCS Risk, % Mean	95% Confidence Band Low - High	CUPTD[1]	Minimum VC % Normal[3]	P_{CNS}, %[2]
022101BN102	3.293	2.855 - 3.776	240.55	98.82	1.36
022101BN291	3.488	3.027 - 3.995	229.23	98.88	1.20
022101BN411	3.380	2.933 - 3.874	235.01	98.85	1.28
022201BN371	6.109	5.225 - 7.085	188.40	98.83	0.79
022201BN041	6.432	5.508 - 7.448	171.51	98.93	0.56
022201BN211	4.187	3.633 - 4.795	236.33	98.56	1.51
022201BN081	4.178	3.620 - 4.792	243.33	98.52	1.67
022201cN5212	3.870	3.319 - 4.481	212.37	98.99	0.91
022201cN3612	3.305	2.867 - 3.788	231.17	98.86	1.19
022201cN46123	2.598	2.238 - 2.999	272.28	98.65	7.48
022201cN42123	3.341	2.846 - 3.894	242.10	98.83	1.85
022301AN591	6.959	5.978 - 8.035	152.06	99.05	0.31
022301AN221	6.960	5.979 - 8.036	152.06	99.05	0.31
022301AN071	4.753	4.117 - 5.453	222.81	98.64	1.25
022301AN751	5.493	4.703 - 6.366	227.04	98.61	1.77
022601AN671	6.757	5.797 - 7.811	158.65	99.01	0.36
022601AN341	6.785	5.823 - 7.842	156.84	99.02	0.34
022601AN101	4.385	3.805 - 5.023	227.64	98.61	1.36
022601AN201	4.234	3.657 - 4.870	239.00	98.54	1.61
022601BN091	3.175	2.752 - 3.642	248.16	98.77	1.52
022601BN561	3.422	2.969 - 3.921	234.57	98.85	1.25
022601BN831	5.033	3.992 - 6.241	166.79	99.26	0.30
022601BN741	4.945	3.968 - 6.071	168.87	99.24	0.32
022701AN251	4.358	3.763 - 5.015	236.11	98.56	1.50
022701AN581	4.412	3.804 - 5.083	233.09	98.58	1.45
022701AN551	3.879	3.374 - 4.434	248.61	98.49	1.79
022701AN861	4.663	4.025 - 5.365	224.66	98.62	1.28
022701BN3912	5.504	4.304 - 6.904	153.04	99.38	0.26
022701BN1412	3.079	2.666 - 3.537	252.60	98.75	1.56
022701BN7812	5.477	4.278 - 6.877	152.38	99.39	0.26
022701BN0812	5.460	4.267 - 6.853	152.99	99.38	0.26
022801BN321	5.888	5.024 - 6.841	202.13	98.76	1.09
022801BN812	4.447	3.855 - 5.097	224.05	98.63	1.27
022801BN631	4.156	3.593 - 4.776	237.81	98.55	1.54
022801BN352	4.263	3.688 - 4.897	235.13	98.56	1.49

PHASE II

Profile #	Estimated Cumulative DCS Risk, % Mean	95% Confidence Band Low - High	CUPTD*	Minimum VC % Normal	P_{CNS}, %
04102001N39	0.796	0.617 - 1.015	60.31	99.63	0.33
04102001N04	0.913	0.722 - 1.141	53.40	99.67	0.24
04102001N14	0.867	0.679 - 1.094	58.10	99.64	0.26
04102001N75	0.865	0.678 - 1.089	56.93	99.64	0.26
04112001N32B	1.378	1.178 - 1.604	255.73	98.41	1.57
04112001N59A	1.743	1.497 - 2.017	321.81	98.09	1.81
04112001N19A	1.682	1.445 - 1.947	325.20	98.07	1.87
04112001N66B	1.620	1.398 - 1.868	243.25	98.49	1.30
04112001N36A	2.041	1.769 - 2.343	310.78	98.15	1.56
04112001N47B	1.553	1.336 - 1.797	253.01	98.43	1.61
04112001N05A	1.452	1.232 - 1.702	343.43	97.96	2.24
04122001N56A	1.981	1.716 - 2.276	311.36	98.14	1.59
04122001N34A	1.439	1.221 - 1.685	343.81	97.95	2.30
04122001N30A	1.844	1.591 - 2.127	319.32	98.09	1.72
04122001N24A	1.583	1.355 - 1.838	335.50	98.01	2.07
04162001N522	1.541	1.326 - 1.781	260.08	98.39	1.59
04162001N782	1.763	1.528 - 2.025	247.32	98.46	1.35
04162001N751	1.650	1.405 - 1.925	231.75	98.63	1.25
04162001N551	1.727	1.476 - 2.010	228.14	98.66	1.19
04162001N412	1.719	1.488 - 1.976	249.98	98.45	1.40
04162001N211	1.675	1.427 - 1.955	231.30	98.64	1.22
04162001N721	1.676	1.429 - 1.955	231.13	98.64	1.25
04162001N082	1.750	1.516 - 2.010	248.36	98.46	1.38
04172001N321	2.021	1.742 - 2.331	227.14	98.66	1.13
04172001N591	1.957	1.686 - 2.260	230.62	98.64	1.20
04172001N22B	1.955	1.700 - 2.237	241.77	98.50	1.27
04172001N60B	1.930	1.678 - 2.210	242.93	98.49	1.30
04172001N071	1.555	1.320 - 1.820	254.24	98.50	1.66
04172001N691	1.870	1.606 - 2.166	236.26	98.61	1.29
04172001N31B	1.830	1.588 - 2.098	248.08	98.46	1.38
04172001N05B	1.637	1.413 - 1.887	260.17	98.39	1.61
04182001N491	1.643	1.426 - 1.883	273.95	98.30	2.22
04182001N67B	1.898	1.631 - 2.197	241.70	98.57	1.27
04182001N34B	1.779	1.521 - 2.068	249.03	98.52	1.44
04182001N581	1.880	1.610 - 2.183	243.53	98.56	1.34
04182001N101	1.771	1.538 - 2.030	271.13	98.32	1.70
04182001N451	1.742	1.488 - 2.026	250.72	98.51	1.42
04182001N241	1.646	1.426 - 1.892	277.45	98.28	1.79
04182001N351	1.953	1.703 - 2.230	259.00	98.39	1.42
04192001N25A	1.611	1.359 - 1.897	237.16	98.60	1.34
04192001N50B	1.218	1.031 - 1.431	248.31	98.45	1.28
04192001N40B	1.123	0.940 - 1.332	256.79	98.40	1.49
04192001N04B	0.946	0.776 - 1.144	267.84	98.34	1.76
04192001N18A	1.190	0.977 - 1.439	109.63	99.32	0.66

Profile #	Estimated Cumulative DCS Risk, % Mean	95% Confidence Band Low - High	CUPTD*	Minimum VC % Normal	P_{CNS}, %
04192001N75A	1.464	1.229 - 1.732	245.43	98.55	1.45
04192001N46B	1.060	0.882 - 1.265	260.49	98.38	1.52
04192001N02A	0.988	0.797 - 1.214	274.02	98.39	2.33
04232001N60A	1.920	1.656 - 2.214	248.65	98.54	1.38
04232001N17B	1.956	1.704 - 2.235	263.11	98.36	1.50
04232001N32B	1.830	1.593 - 2.092	265.62	98.34	1.34
04232001N60A	1.809	1.555 - 2.093	253.58	98.51	1.44
04232001N66B	1.885	1.642 - 2.153	262.99	98.36	1.28
04232001N31B	1.526	1.318 - 1.758	283.80	98.24	1.66
04232001N05A	2.113	1.830 - 2.426	237.71	98.60	1.17
04242001N09A	2.060	1.786 - 2.364	247.48	98.54	1.38
04242001N56B	1.973	1.721 - 2.251	272.52	98.30	1.48
04242001N33A	2.056	1.781 - 2.363	245.11	98.55	1.29
04242001N74B	1.495	1.293 - 1.720	295.72	98.16	2.50
04242001N38B	0.986	0.819 - 1.177	343.98	97.89	100.00
04242001N10A	1.366	1.157 - 1.603	283.36	98.32	2.07
04242001N30A	1.951	1.688 - 2.243	254.50	98.50	1.59
04252001N701	1.918	1.655 - 2.212	252.67	98.51	1.26
04252001N531	1.705	1.462 - 1.977	264.35	98.44	1.48
04252001N521	1.764	1.516 - 2.041	263.29	98.45	1.54
04252001N122	1.970	1.703 - 2.267	183.87	98.85	0.90
04252001N041	1.529	1.301 - 1.786	277.80	98.38	1.64
04252001N182	1.840	1.585 - 2.125	192.33	98.81	1.08
04252001N452	1.837	1.582 - 2.121	192.85	98.80	1.08
04252001N572	1.946	1.681 - 2.240	185.12	98.85	0.93
04262001N32A	2.281	1.982 - 2.611	242.07	98.56	1.08
04262001N25B	1.924	1.661 - 2.217	188.08	98.83	0.98
04262001N22A	2.143	1.859 - 2.458	250.25	98.51	1.23
04262001N60B	1.661	1.421 - 1.930	203.72	98.74	1.30
04262001N07A	1.931	1.667 - 2.224	263.65	98.44	1.45
04262001N66A	1.871	1.613 - 2.159	266.81	98.42	1.51
04262001N48B	1.955	1.690 - 2.251	187.20	98.84	0.99
04262001N35B	1.870	1.612 - 2.159	191.92	98.81	1.06
04302001N37A	1.980	1.702 - 2.289	218.93	98.71	1.15
04302001N77B	1.729	1.487 - 1.999	221.21	98.63	1.24
04302001N09A	1.862	1.596 - 2.159	224.51	98.68	1.19
04302001N56A	2.027	1.747 - 2.338	214.14	98.74	1.04
04302001N34A	1.892	1.627 - 2.189	221.10	98.70	1.16
04302001N71B	1.987	1.720 - 2.284	206.64	98.71	1.00
04302001N29B	1.758	1.513 - 2.033	221.12	98.63	1.24
04302001N35B	1.759	1.513 - 2.034	221.80	98.63	1.26
05012001N522	0.006	0.000 - 0.115	308.98	98.11	2.42
05012001N042	1.693	1.443 - 1.974	173.55	98.93	1.06
05012001N741	1.839	1.575 - 2.135	220.19	98.71	1.12
05012001N782	1.944	1.672 - 2.247	160.92	99.00	0.88
05012001N581	1.457	1.230 - 1.715	240.01	98.59	1.88

Profile #	Estimated Cumulative DCS Risk, % Mean	95% Confidence Band Low - High	CUPTD*	Minimum VC % Normal	P_{CNS}, %
05012001N752	1.580	1.341 - 1.849	179.25	98.89	1.12
05012001N451	1.841	1.577 - 2.137	220.15	98.71	1.12
05012001N621	1.619	1.375 - 1.895	231.33	98.65	1.31
05022001N611	2.433	2.088 - 2.818	257.65	98.90	1.39
05022001N59B	0.960	0.764 - 1.193	53.19	99.68	0.28
05022001N28A	2.188	1.869 - 2.544	266.28	98.85	1.61
05022001N60A	2.293	1.964 - 2.661	267.15	98.85	1.83
05022001N66B	1.010	0.810 - 1.247	50.44	99.69	0.23
05022001N69A	2.442	2.098 - 2.826	257.91	98.90	1.40
05022001N48A	0.924	0.732 - 1.154	54.96	99.66	0.35
05022001N31B	1.202	0.981 - 1.459	44.41	99.72	0.18
05032001N77A	2.503	2.151 - 2.894	255.93	98.91	1.38
05032001N56A	2.575	2.218 - 2.972	252.24	98.94	1.33
05032001N10B	0.849	0.664 - 1.074	56.00	99.67	0.29
05032001N20A	2.326	1.993 - 2.699	260.95	98.89	1.51
05032001N30B	0.865	0.678 - 1.092	55.14	99.67	0.29
05032001N24A	0.854	0.669 - 1.079	55.56	99.67	0.29
05032001N02A	1.737	1.471 - 2.038	90.61	99.44	0.49
05072001N17A	1.024	0.813 - 1.277	53.00	99.67	0.28
05072001N09A	2.593	2.135 - 3.118	258.78	98.43	12.99
05072001N04A	2.678	2.214 - 3.208	253.90	98.47	3.98
05072001N03A	0.993	0.786 - 1.241	54.36	99.66	0.28
05072001N14A	2.632	2.197 - 3.126	250.96	98.47	10.42
05072001N58A	0.976	0.770 - 1.222	55.24	99.65	0.31
05072001N35A	2.933	2.389 - 3.561	249.83	98.48	11.82
05072001N08A	1.148	0.923 - 1.414	49.49	99.69	0.28
05082001N61B	0.826	0.642 - 1.049	53.99	99.67	0.38
05082001N22B	0.834	0.647 - 1.060	52.29	99.67	0.36
05082001N60A	2.351	1.916 - 2.855	256.91	98.50	1.47
05082001N28B	0.821	0.637 - 1.045	52.81	99.67	0.30
05082001N07B	0.777	0.598 - 0.996	54.93	99.66	0.33
05082001N66A	2.219	1.831 - 2.666	261.21	98.47	1.55
05082001N69A	2.304	1.866 - 2.814	260.37	98.47	1.52
05082001N48A	2.663	2.174 - 3.228	245.93	98.56	1.20
05092001N67A	1.770	1.524 - 2.045	217.83	98.65	1.19
05092001N77A	1.754	1.509 - 2.028	219.21	98.64	1.23
05092001N32B	1.017	0.850 - 1.208	225.38	98.60	1.72
05092001N56B	1.604	1.374 - 1.864	192.08	98.80	0.99
05092001N34B	1.433	1.218 - 1.677	202.25	98.74	1.16
05092001N51A	1.690	1.451 - 1.957	222.16	98.62	1.27
05092001N45B	2.172	1.871 - 2.506	151.74	99.05	0.71
05092001N44A	1.799	1.549 - 2.077	216.85	98.65	1.18
05092001N24B	1.521	1.297 - 1.772	198.34	98.76	1.15
05102001N53A	1.737	1.492 - 2.011	191.25	98.81	1.03
05102001N12A	1.036	0.852 - 1.249	230.55	98.57	2.03
05102001N45A	1.709	1.467 - 1.981	192.77	98.80	1.02

Profile #	Estimated Cumulative DCS Risk, % Mean	95% Confidence Band Low - High	CUPTD*	Minimum VC % Normal	P_{CNS}, %
05102001N35A	1.650	1.414 - 1.915	195.53	98.78	1.05
05142001N59A	1.831	1.587 - 2.103	243.80	98.48	1.46
05142001N22A	2.109	1.835 - 2.413	227.58	98.58	1.08
05142001N60B	1.970	1.693 - 2.279	161.79	98.99	0.87
05142001N74A	1.793	1.553 - 2.060	245.84	98.47	1.39
05142001N48A	1.720	1.488 - 1.980	251.19	98.44	1.74
05142001N41B	1.908	1.640 - 2.207	164.81	98.97	0.91
05142001N72B	2.030	1.749 - 2.344	158.76	99.01	0.84
05152001N702	0.839	0.648 - 1.071	72.94	99.55	0.87
05152001N671	1.335	1.089 - 1.621	61.80	99.61	0.36
05152001N652	1.097	0.873 - 1.363	65.14	99.60	0.34
05152001N562	1.047	0.828 - 1.309	67.47	99.58	0.44
05152001N731	1.375	1.122 - 1.669	60.55	99.62	0.33
05152001N341	1.447	1.185 - 1.752	57.77	99.64	0.26
05152001N583	1.432	1.171 - 1.736	60.66	99.62	0.34
05152001N553	1.432	1.172 - 1.735	61.46	99.62	0.41
05152001N201	1.302	1.042 - 1.609	58.68	99.63	0.30
05152001N573	1.362	1.112 - 1.653	63.27	99.61	0.35
05152001N353	1.422	1.172 - 1.710	57.67	99.64	0.27
05162001N26A	1.908	1.655 - 2.189	376.35	97.85	1.99
05162001N15B	1.354	1.117 - 1.629	61.41	99.62	0.33
05162001N13A	2.041	1.775 - 2.336	367.06	97.90	1.85
05162001N78A	2.337	2.038 - 2.668	348.94	98.01	1.58
05162001N76B	1.440	1.192 - 1.725	57.96	99.64	0.26
05162001N24B	1.368	1.129 - 1.645	61.05	99.62	0.31
05162001N46B	1.505	1.250 - 1.797	55.10	99.65	0.22
05162001N08A	1.365	1.129 - 1.636	69.19	99.58	0.35
05172001N32A	2.071	1.797 - 2.374	363.74	97.89	1.79
05172001N23A	1.631	1.399 - 1.890	387.31	97.75	2.24
05172001N16A	0.983	0.790 - 1.211	80.56	99.51	0.98
05172001N43A	2.137	1.857 - 2.447	360.31	97.91	1.70
05232001N13A	1.745	1.475 - 2.049	93.29	99.42	0.84
05232001N60A	1.709	1.443 - 2.010	94.76	99.41	0.70
05232001N36A	1.864	1.583 - 2.181	86.72	99.46	0.53
05232001N31A	1.814	1.538 - 2.126	89.51	99.44	0.66
05242001N26A	1.717	1.458 - 2.010	125.99	99.22	0.91
05242001N25B	1.908	1.660 - 2.183	281.82	98.24	1.48
05242001N56A	1.780	1.514 - 2.081	122.66	99.24	0.82
05242001N20A	1.954	1.667 - 2.276	114.36	99.29	0.70
05242001N10B	1.558	1.347 - 1.794	304.11	98.11	2.00
05242001N45A	1.946	1.660 - 2.267	114.46	99.29	0.66
05242001N24B	1.981	1.725 - 2.264	277.45	98.27	1.42
05242001N35B	0.892	0.732 - 1.077	342.00	97.89	2.90
05292001N37A	1.850	1.588 - 2.143	163.50	98.98	0.90
05292001N39A	1.672	1.428 - 1.947	174.02	98.92	1.25
05292001N64A	1.320	1.113 - 1.556	190.46	98.82	1.77

Profile #	Estimated Cumulative DCS Risk, % Mean	95% Confidence Band Low	-	High	CUPTD*	Minimum VC % Normal	P_{CNS}, %
05292001N11A	1.683	1.437	-	1.958	172.71	98.93	1.12
05302001N32A	2.040	1.740	-	2.378	89.39	99.45	0.61
05302001N59B	1.633	1.414	-	1.877	301.24	98.13	1.83
05302001N71	2.064	1.759	-	2.405	88.22	99.45	0.59
05302001N66A	1.991	1.696	-	2.322	91.58	99.43	0.63
05302001N58B	1.616	1.399	-	1.858	301.64	98.13	1.84
05302001N48B	1.626	1.408	-	1.868	303.47	98.12	2.04
05302001N31B	1.511	1.305	-	1.742	309.31	98.08	2.10
05302001N05	2.140	1.824	-	2.496	84.86	99.47	0.52
05312001N65B	1.735	1.481	-	2.020	154.23	99.04	1.11
05312001N20A	1.706	1.474	-	1.964	251.33	98.44	1.52
05312001N10B	1.778	1.519	-	2.068	152.19	99.05	1.03
05312001N30B	1.570	1.332	-	1.839	163.12	98.99	1.37
05312001N24A	1.715	1.484	-	1.973	250.52	98.44	1.51
05312001N46A	1.574	1.356	-	1.818	259.57	98.39	1.91
05312001N41B	1.779	1.521	-	2.068	151.93	99.05	1.05
05312001N35A	1.875	1.626	-	2.151	242.26	98.49	1.51
06012001N37A	1.432	1.194	-	1.704	275.42	98.30	2.07
06012001N53B	1.989	1.708	-	2.304	147.39	99.08	0.92
06012001N25A	1.912	1.660	-	2.192	248.55	98.46	1.68
06012001N39B	1.829	1.566	-	2.124	156.05	99.03	1.17
06012001N12B	1.700	1.450	-	1.982	162.16	98.99	1.25
06012001N14B	1.964	1.687	-	2.274	149.06	99.07	0.92
06012001N78A	1.647	1.421	-	1.899	261.92	98.38	1.86
06012001N42A	1.812	1.569	-	2.082	253.21	98.43	1.72
06042001N37B	1.880	1.592	-	2.205	64.51	99.60	0.38
06042001N32B	1.822	1.541	-	2.141	67.35	99.58	0.44
06042001N59A	1.847	1.606	-	2.114	320.12	98.01	1.72
06042001N36B	1.887	1.599	-	2.213	64.17	99.60	0.38
06042001N48A	1.248	1.067	-	1.452	358.06	97.79	2.43
06042001N01B	1.833	1.552	-	2.150	65.49	99.60	0.43
06042001N57A	1.366	1.175	-	1.580	349.07	97.84	2.23
06042001N31A	1.656	1.435	-	1.900	332.11	97.94	1.93
06052001N67B	0.000	0.000	-	0.000	43.94	99.72	0.19
06052001N65B	0.000	0.000	-	0.000	41.85	99.73	0.16
06052001N56B	0.000	0.000	-	0.000	41.91	99.73	0.17
06052001N60A	1.488	1.283	-	1.717	306.23	98.10	2.56
06052001N74A	1.436	1.236	-	1.659	309.71	98.08	2.49
06052001N10A	1.768	1.535	-	2.027	287.97	98.21	1.80
06052001N24A	1.470	1.266	-	1.698	307.20	98.10	2.65
06052001N46B	0.000	0.000	-	0.000	44.67	99.72	0.21
06062001N25B	1.837	1.579	-	2.126	169.44	98.94	0.99
06062001N39B	1.445	1.224	-	1.694	191.14	98.81	1.48
06062001N12A	1.735	1.505	-	1.991	291.52	98.19	1.84
06062001N18A	1.642	1.420	-	1.889	295.05	98.17	1.73
06062001N58B	1.646	1.407	-	1.915	180.16	98.88	1.33

Profile #	Estimated Cumulative DCS Risk, % Mean	95% Confidence Band Low - High	CUPTD*	Minimum VC % Normal	P_{CNS}, %
06062001N45A	2.024	1.762 - 2.314	272.35	98.30	1.34
06062001N42B	1.548	1.319 - 1.807	185.09	98.85	1.26
06062001N35A	1.724	1.494 - 1.981	291.16	98.19	1.79
06072001N01A	1.718	1.473 - 1.993	186.79	98.84	1.26
06072001N57A	1.783	1.529 - 2.066	183.88	98.86	1.38
06072001N08A	1.919	1.652 - 2.217	176.05	98.90	1.10
06072001N31A	1.772	1.521 - 2.053	184.52	98.85	1.31
06082001N04A	1.704	1.435 - 2.010	68.81	99.58	0.51
06082001N65B	1.909	1.623 - 2.231	85.06	99.47	0.54
06082001N56B	1.728	1.460 - 2.030	93.80	99.42	0.67
06082001N33A	1.786	1.508 - 2.101	64.68	99.60	0.45
06082001N10B	1.780	1.508 - 2.088	91.31	99.43	0.67
06082001N20A	1.745	1.472 - 2.056	66.80	99.59	0.49
06082001N24B	1.817	1.541 - 2.129	89.65	99.44	0.67
06082001N41A	1.793	1.514 - 2.108	64.32	99.60	0.40
06182001N37B	2.168	1.888 - 2.478	373.73	97.75	1.90
06182001N25B	2.430	2.117 - 2.776	360.45	97.83	1.73
06182001N40A	1.972	1.705 - 2.269	194.76	98.79	1.05
06182001N64A	1.839	1.585 - 2.121	201.51	98.75	1.15
06182001N18B	2.233	1.942 - 2.554	372.22	97.76	2.00
06182001N74A	1.663	1.427 - 1.928	210.03	98.70	1.29
06182001N27A	1.684	1.446 - 1.950	210.24	98.69	1.31
06182001N68B	1.844	1.592 - 2.124	393.89	97.63	2.28
06192001N59A	2.793	2.445 - 3.176	355.18	97.87	1.74
06192001N60A	2.023	1.758 - 2.317	394.23	97.64	2.29
06192001N07A	1.742	1.504 - 2.007	412.88	97.53	2.54
06192001N05A	2.444	2.132 - 2.789	372.46	97.77	1.91
06202001N34A	2.210	1.914 - 2.538	294.69	98.24	1.54
06202001N10A	2.213	1.917 - 2.540	294.98	98.24	1.55
06202001N20A	2.408	2.085 - 2.766	285.23	98.30	1.42
06202001N45A	2.158	1.860 - 2.489	298.91	98.22	1.60
06212001N25A	1.880	1.619 - 2.171	285.42	98.29	1.38
06212001N62A	1.389	1.172 - 1.637	315.62	98.12	1.95
06212001N52A	1.898	1.633 - 2.194	286.37	98.29	1.53
06212001N09B	1.574	1.360 - 1.813	278.87	98.27	1.81
06212001N68A	1.056	0.847 - 1.302	75.09	99.53	0.43
06212001N01B	2.011	1.755 - 2.294	253.98	98.42	1.33
06212001N46B	1.953	1.702 - 2.231	257.95	98.40	1.41
06212001N08B	2.094	1.828 - 2.388	249.58	98.45	1.24
06252001N32	2.043	1.738 - 2.385	333.29	98.43	2.01
06252001N60B	1.718	1.447 - 2.026	68.12	99.58	0.50
06252001N66A	1.750	1.488 - 2.045	114.05	99.29	0.55
06252001N69B	1.717	1.447 - 2.024	67.90	99.58	0.48
06252001N68B	1.914	1.622 - 2.243	58.90	99.63	0.39
06252001N48A	2.211	1.891 - 2.570	326.66	98.47	1.87
06252001N57A	1.824	1.548 - 2.134	340.49	98.38	2.45

Profile #	Estimated Cumulative DCS Risk, % Mean	95% Confidence Band Low - High	CUPTD*	Minimum VC % Normal	P_{CNS}, %
06252001N05B	1.783	1.505 - 2.097	64.76	99.60	0.40
06262001N56A	2.213	1.897 - 2.566	336.81	98.41	2.03
06262001N34A	2.692	2.332 - 3.091	311.06	98.57	1.58
06262001N99A	2.850	2.474 - 3.265	302.72	98.61	1.45
06262001N24A	2.953	2.567 - 3.379	297.03	98.65	1.37
06272001N52B	1.230	1.004 - 1.493	57.56	99.64	0.30
06272001N12B	1.051	0.843 - 1.296	63.10	99.61	0.33
06272001N04A	2.401	2.062 - 2.780	341.29	97.90	2.10
06272001N19B	1.049	0.841 - 1.294	63.08	99.61	0.33
06272001N74A	2.313	1.981 - 2.684	346.26	97.87	2.11
06272001N45A	3.085	2.676 - 3.538	305.23	98.12	1.42
06272001N62B	1.167	0.947 - 1.425	57.52	99.64	0.24
06272001N08A	2.744	2.370 - 3.159	321.86	98.01	1.66
06282001N69A	2.659	2.290 - 3.068	319.91	98.05	1.67
06282001N58A	2.833	2.448 - 3.260	309.54	98.11	1.48
06282001N68A	2.190	1.865 - 2.555	348.28	97.88	2.20
06282001N48A	2.274	1.946 - 2.640	339.25	97.93	1.94
07022001N67B	1.834	1.551 - 2.154	62.94	99.61	0.35
07022001N10B	1.864	1.577 - 2.188	61.21	99.62	0.35
07022001N46B	1.860	1.575 - 2.184	61.69	99.62	0.37
07022001N35A	1.782	1.548 - 2.042	319.33	98.01	1.71
07022001N08A	1.617	1.401 - 1.857	330.51	97.95	1.87
07022001N05A	1.811	1.574 - 2.074	317.03	98.03	1.65
07032001N37B	1.445	1.220 - 1.700	167.53	98.96	1.04
07032001N53A	1.939	1.683 - 2.222	239.12	98.51	1.29
07032001N25A	1.830	1.587 - 2.101	246.90	98.46	1.43
07032001N52A	1.719	1.487 - 1.978	252.62	98.43	1.64
07032001N12B	1.473	1.246 - 1.729	165.52	98.97	0.97
07032001N40B	1.658	1.414 - 1.933	154.94	99.03	0.79
07032001N19A	1.892	1.642 - 2.171	243.34	98.48	1.46
07032001N62B	1.580	1.343 - 1.847	159.41	99.00	0.85
07092001N22A	2.379	2.074 - 2.715	348.28	97.98	1.52
07092001N60A	1.564	1.340 - 1.816	400.65	97.67	2.46
07092001N69B	1.625	1.381 - 1.901	146.19	99.09	0.89
07092001N58B	1.569	1.330 - 1.839	149.29	99.07	0.97
07092001N99B	1.354	1.135 - 1.603	160.94	99.00	1.20
07092001N57B	1.627	1.382 - 1.902	146.48	99.09	1.04
07092001N02A	2.369	2.065 - 2.704	349.63	97.97	1.57
07092001N05A	2.118	1.841 - 2.425	365.57	97.88	1.81
07102001N52B	1.514	1.302 - 1.751	263.68	98.37	1.69
07102001N41B	1.930	1.678 - 2.210	239.31	98.51	1.22
07102001N62B	1.967	1.712 - 2.250	236.91	98.52	1.17
07102001N08B	1.744	1.510 - 2.005	249.88	98.45	1.40
07112001N37A	2.584	2.224 - 2.985	237.31	99.03	1.20
07112001N39A	2.654	2.288 - 3.061	235.11	99.04	1.15
07112001N19A	2.736	2.361 - 3.152	231.83	99.05	1.11

Profile #	Estimated Cumulative DCS Risk, % 95% Confidence Band		CUPTD*	Minimum VC	P_{CNS}, %
	Mean	Low - High		% Normal	
07112001N18A	3.009	2.605 - 3.455	218.50	98.65	0.94
07122001N17A	2.589	2.226 - 2.992	238.08	99.03	1.21
07122001N59A	2.644	2.277 - 3.051	234.70	99.05	1.15
07122001N09A	2.661	2.292 - 3.072	234.10	99.05	1.14
07122001N24A	2.555	2.197 - 2.954	239.13	99.02	1.22
07162001N32B	0.732	0.558 - 0.948	58.68	99.63	0.29
07162001N56B	0.853	0.666 - 1.079	51.83	99.67	0.18
07162001N10A	3.580	3.063 - 4.155	180.95	98.90	0.70
07162001N99B	0.826	0.643 - 1.049	53.45	99.66	0.23
07162001N29	0.789	0.607 - 1.011	55.45	99.65	0.23
07162001N45A	3.725	3.2 - 4.308	174.29	98.94	0.61
07162001N46A	3.908	3.358 - 4.517	171.21	98.95	0.58
07162001N41A	3.254	2.751 - 3.818	193.45	98.82	0.87
07172001N37A	2.904	2.528 - 3.318	254.81	98.47	0.92
07172001N39A	2.778	2.416 - 3.179	261.86	98.43	1.04
07172001N11B	2.164	1.863 - 2.498	135.07	99.15	0.66
07172001N14B	2.423	2.057 - 2.834	124.18	99.22	0.49
07172001N42A	2.755	2.397 - 3.150	262.19	98.43	1.03
07172001N02A	1.695	1.454 - 1.965	322.82	98.07	1.99
07172001N63B	1.812	1.548 - 2.109	153.27	99.05	0.94
07182001N17	1.395	1.138 - 1.695	69.05	99.57	0.30
07182001N22A	2.453	2.118 - 2.826	353.65	97.81	1.95
07182001N07A	3.256	2.841 - 3.713	306.51	98.09	1.24
07182001N69A	3.372	2.941 - 3.846	302.79	98.11	1.20
07192001N56A	2.871	2.495 - 3.286	341.13	97.89	1.74
07192001N10A	3.525	3.078 - 4.016	304.72	98.10	1.21
07192001N24A	3.436	3.000 - 3.916	308.27	98.08	1.29
07192001N35A	3.701	3.232 - 4.216	296.34	98.15	1.10

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2 Harabin, A. L., Survanshi, S. S., Homer, L. D. "A Model for Predicting Central System Oxygen Toxicity from Hyperbaric Oxygen Toxicity in Humans." Toxicology and Applied Pharmacology 132, 19-26, 1995.

3 Vann, R. D. *Oxygen Toxicity Risk Assessment*. Final Report. ONR Contract N00014-87-C-0283. May 31, 1988.

APPENDIX M.

Estimated DCS Risks of Dive Profiles Randomly Constructed from MK 16 MOD 1 Decompression Tables

Table Evaluation: Depths: 40-200 Surface Intervals: 30-720

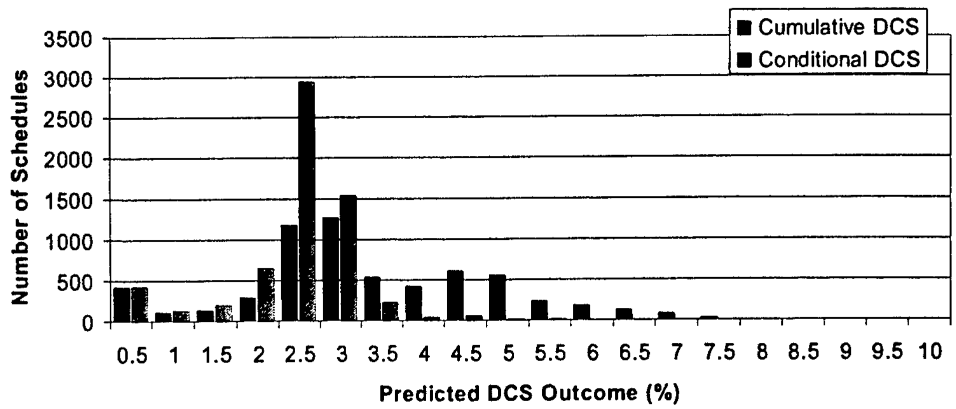


Table Evaluation: Depths: 40-80 Surface Intervals: 30-720

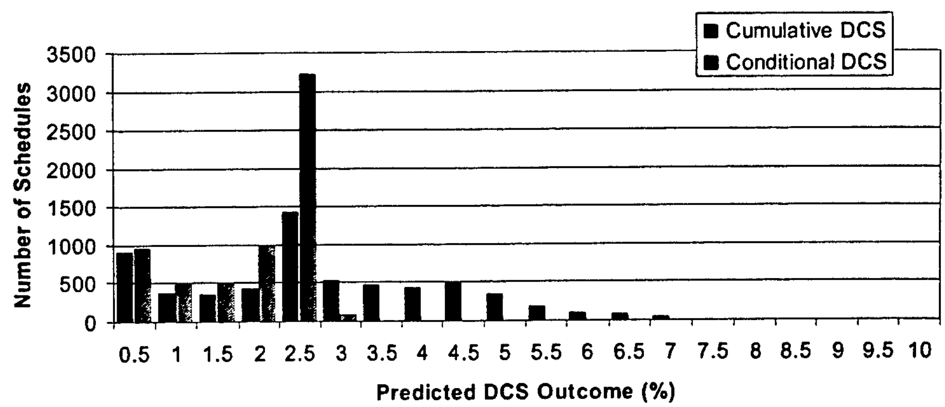


Table Evaluation: Depths: 40-80 Surface Intervals: 30-90

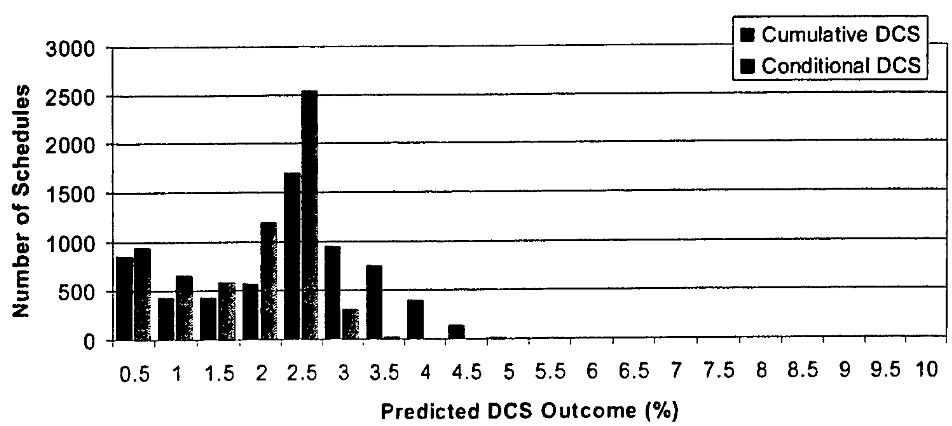


Table Evaluation: Depths: 40-80 Surface Intervals: 95-150

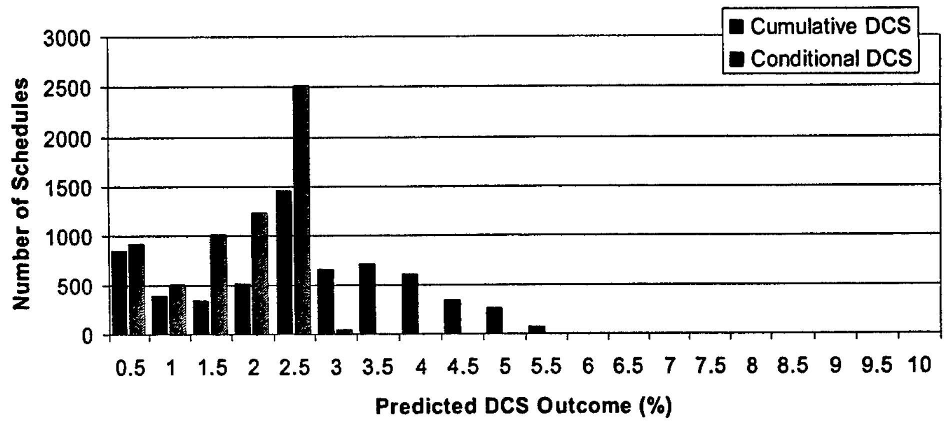


Table Evaluation: Depths: 40-80 Surface Intervals: 155-210

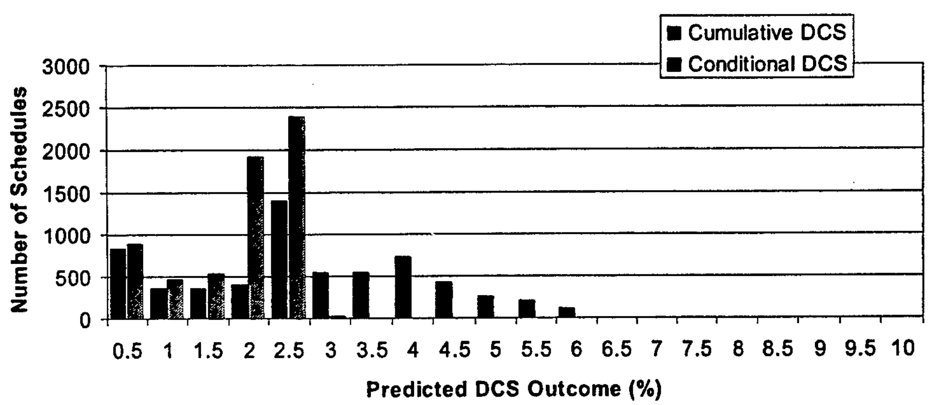
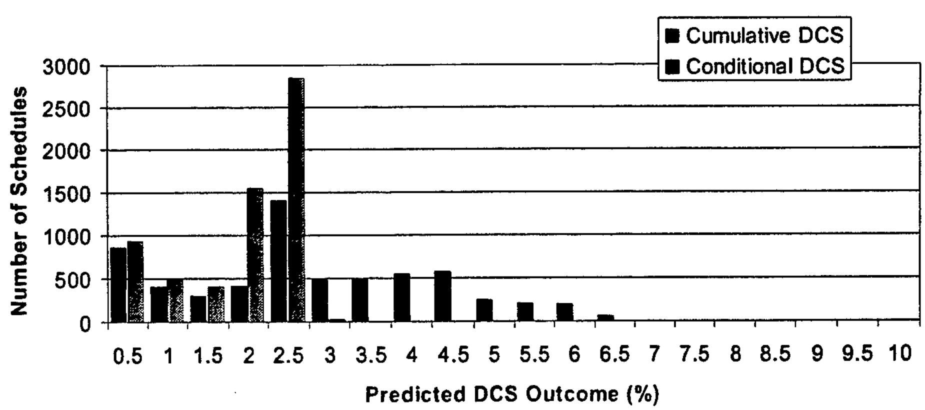


Table Evaluation: Depths: 40-80 Surface Intervals: 215-270



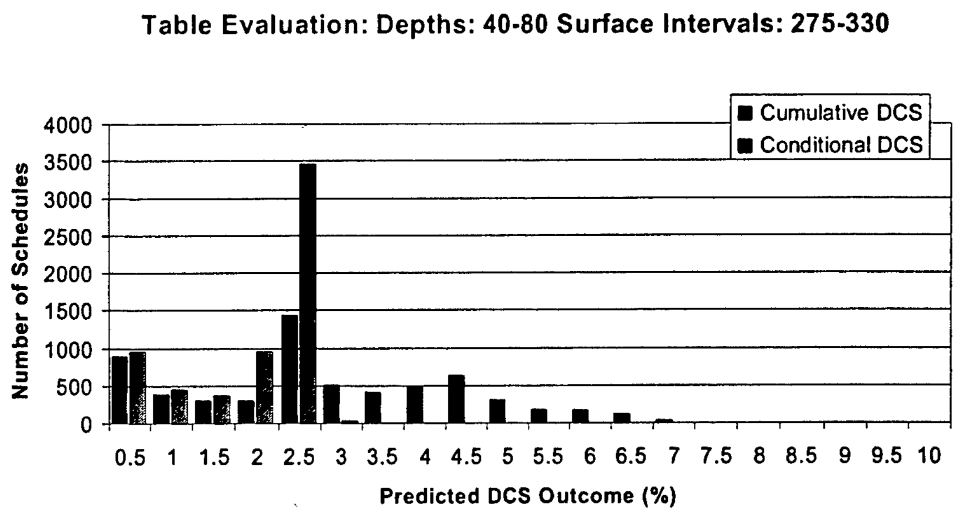


Table Evaluation: Depths: 40-80 Surface Intervals: 275-330
Cumulative DCS
Conditional DCS
Number of Schedules
0
500
1000
1500
2000
2500
3000
3500
4000
0.5 1 1.5 2 2.5 3 3.5 4 4.5 5 5.5 6 6.5 7 7.5 8 8.5 9 9.5 10
Predicted DCS Outcome (%)

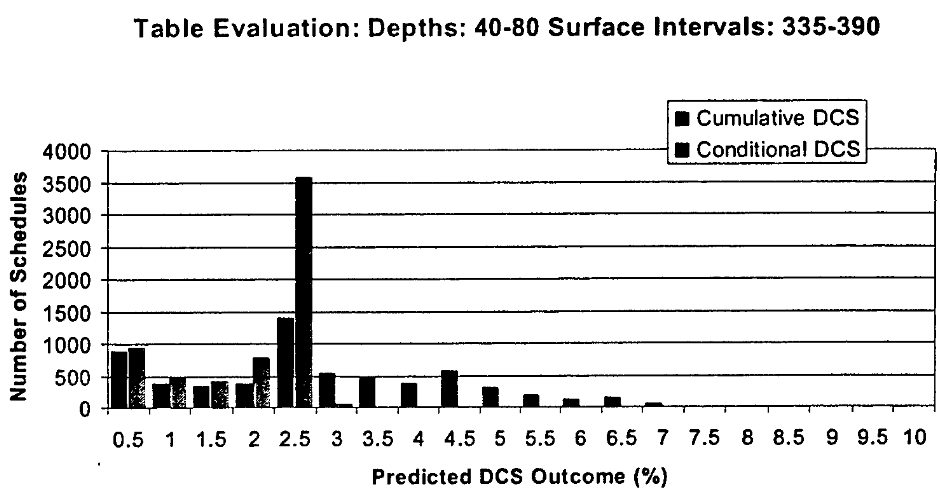


Table Evaluation: Depths: 40-80 Surface Intervals: 335-390
Cumulative DCS
Conditional DCS
Number of Schedules
0
500
1000
1500
2000
2500
3000
3500
4000
0.5 1 1.5 2 2.5 3 3.5 4 4.5 5 5.5 6 6.5 7 7.5 8 8.5 9 9.5 10
Predicted DCS Outcome (%)

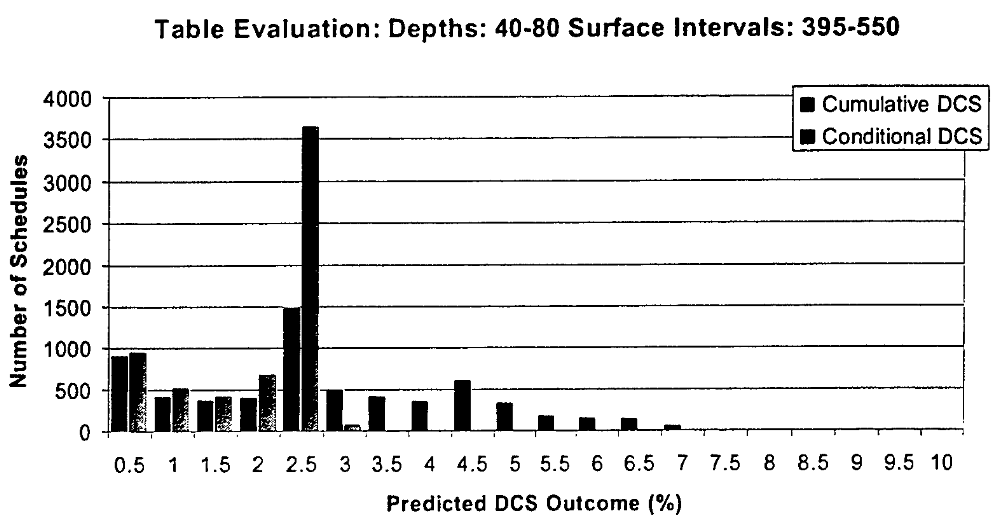


Table Evaluation: Depths: 40-80 Surface Intervals: 395-550
Cumulative DCS
Conditional DCS
Number of Schedules
0
500
1000
1500
2000
2500
3000
3500
4000
0.5 1 1.5 2 2.5 3 3.5 4 4.5 5 5.5 6 6.5 7 7.5 8 8.5 9 9.5 10
Predicted DCS Outcome (%)

Table Evaluation: Depths: 40-80 Surface Intervals: 560-720

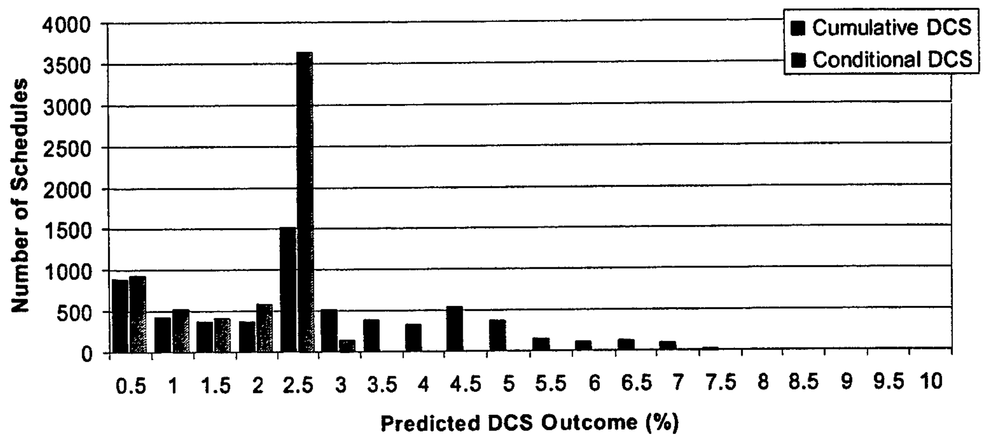


Table Evaluation: Depths: 85-120 Surface Intervals: 30-720

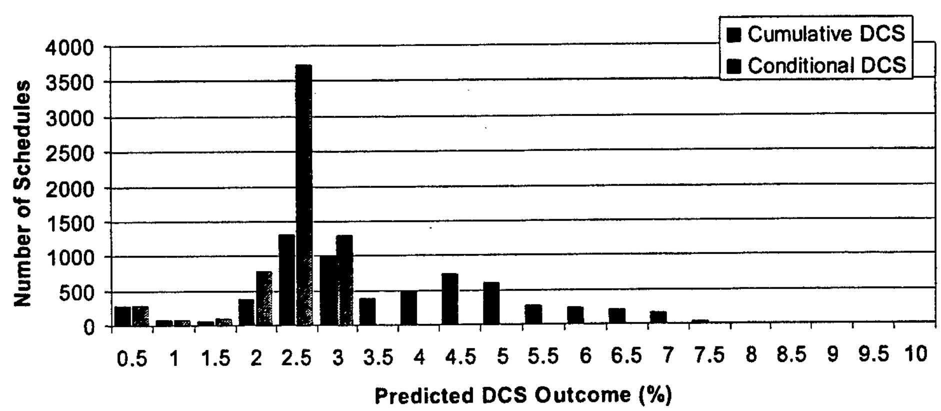


Table Evaluation: Depths: 85-120 Surface Intervals: 30-90

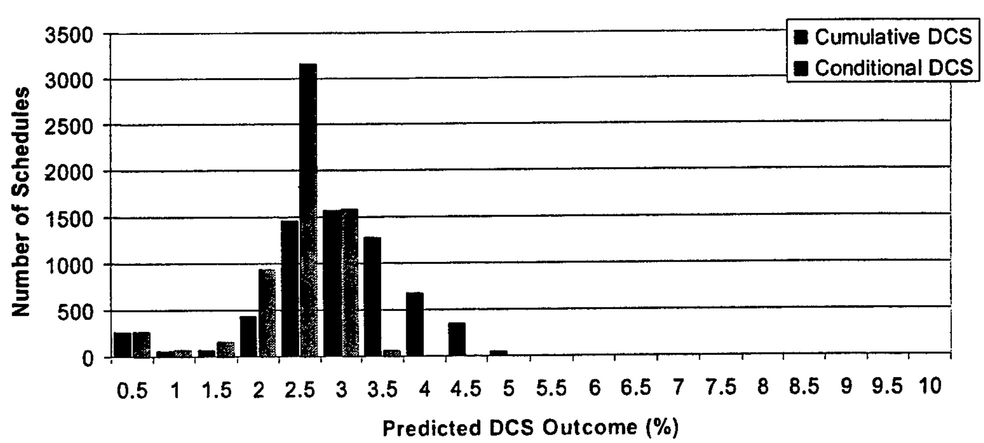


Table Evaluation: Depths: 85-120 Surface Intervals: 95-150

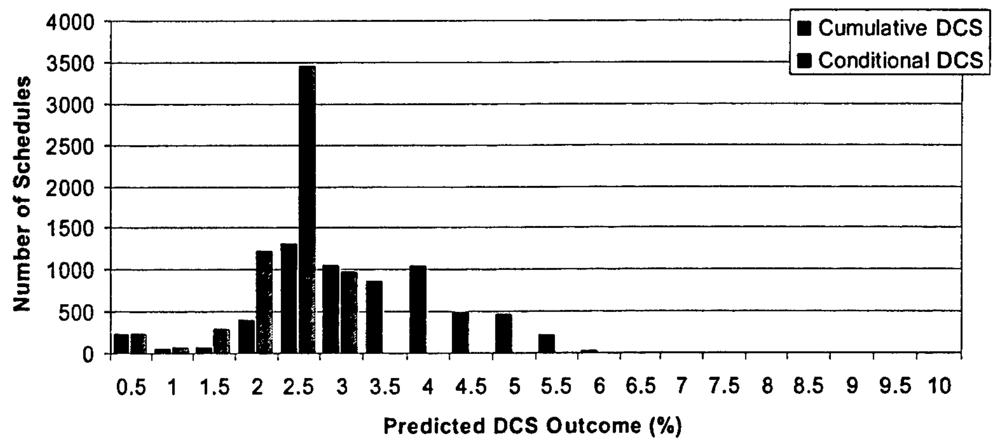


Table Evaluation: Depths: 85-120 Surface Intervals: 155-210

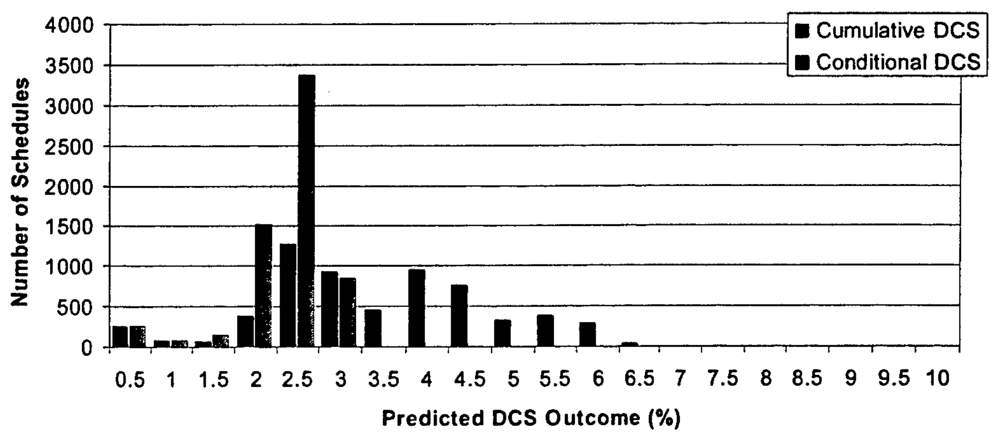


Table Evaluation: Depths: 85-120 Surface Intervals: 215-270

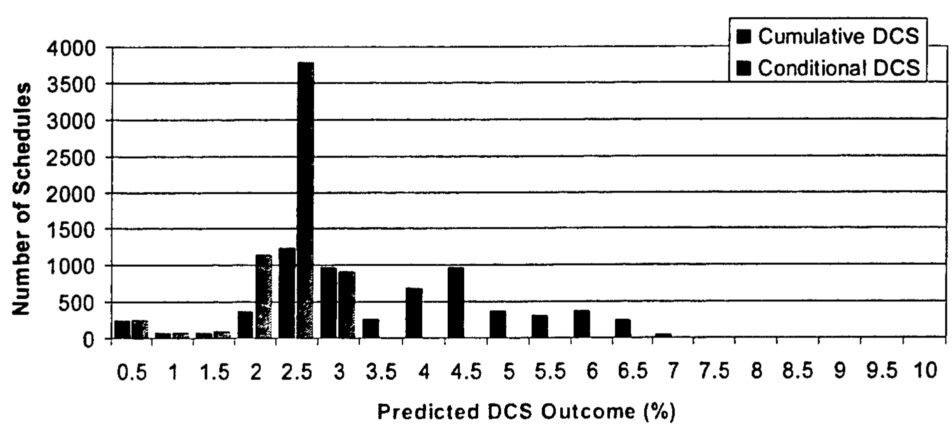


Table Evaluation: Depths: 85-120 Surface Intervals: 275-330

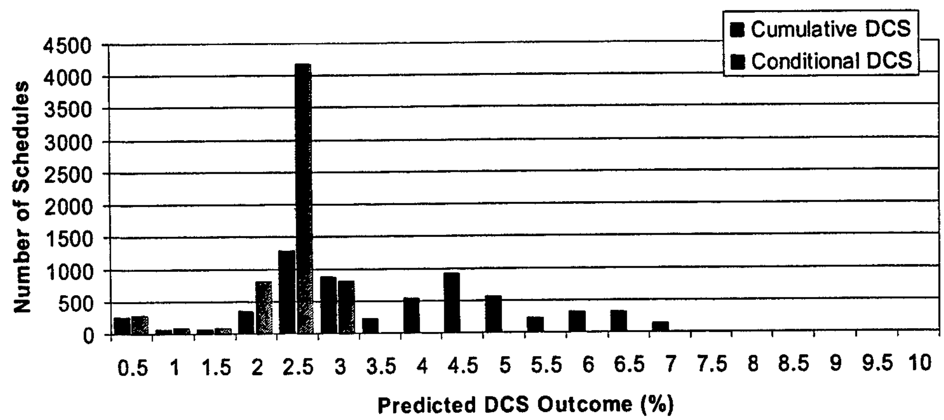


Table Evaluation: Depths: 85-120 Surface Intervals: 335-390

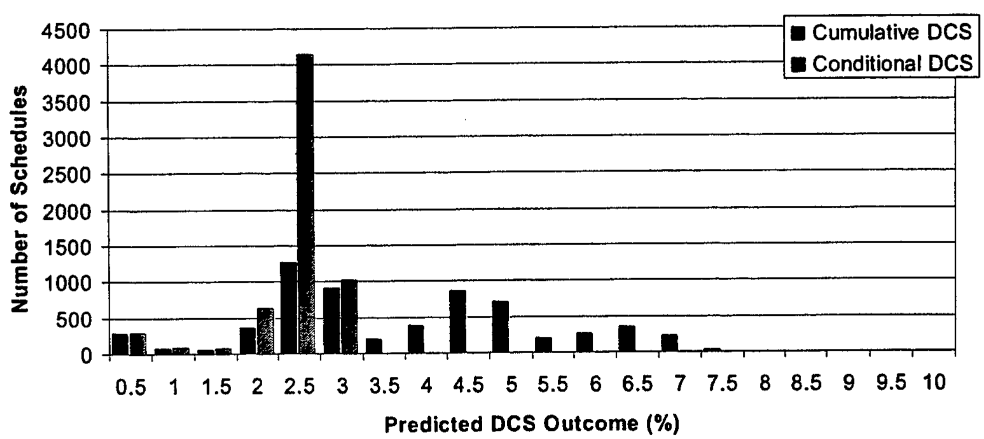


Table Evaluation: Depths: 85-120 Surface Intervals: 395-555

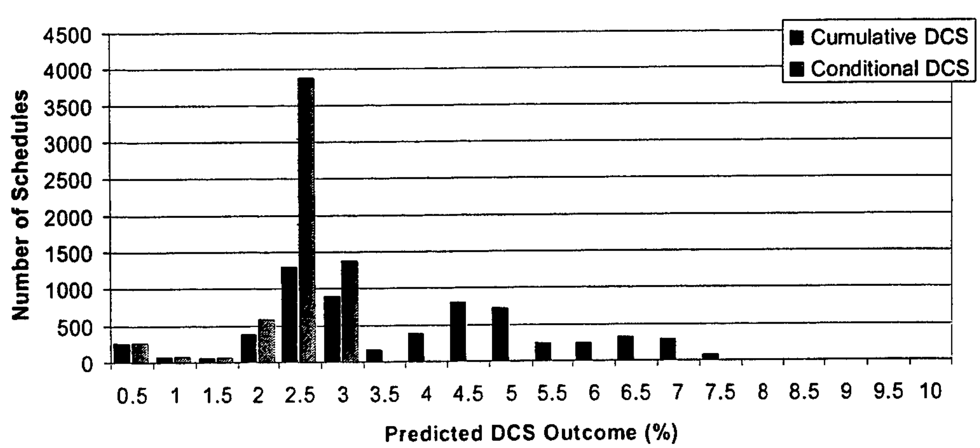


Table Evaluation: Depths: 85-120 Surface Intervals: 560-720

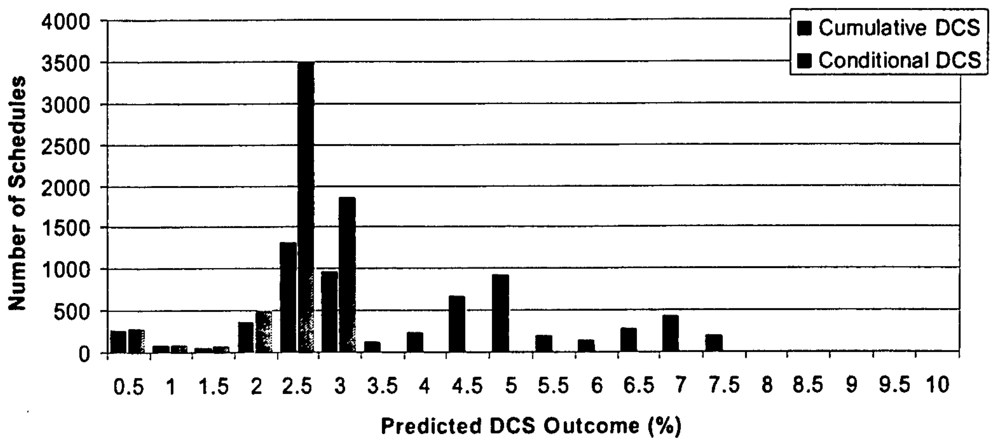


Table Evaluation: Depths: 125-160 Surface Intervals: 30-720

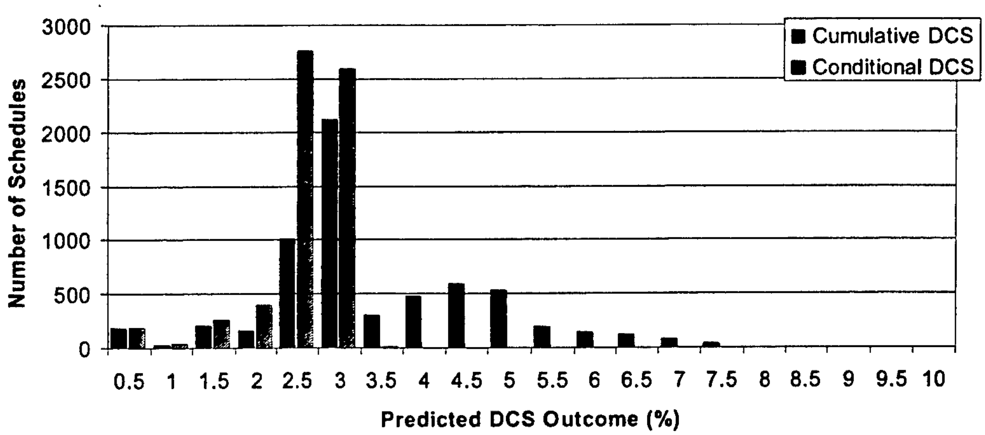
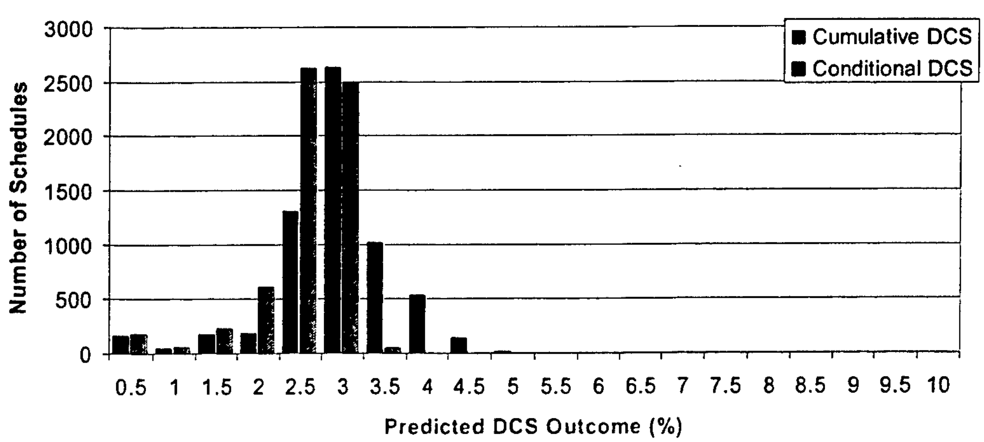


Table Evaluation: Depths: 125-160 Surface Intervals: 30-90



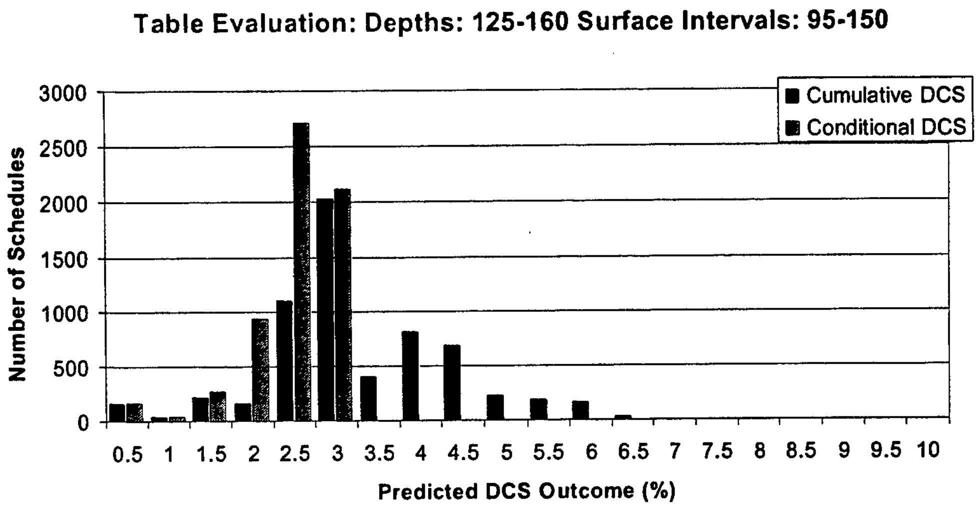


Table Evaluation: Depths: 125-160 Surface Intervals: 95-150
Cumulative DCS
Conditional DCS
Number of Schedules
3000
2500
2000
1500
1000
500
0
0.5 1 1.5 2 2.5 3 3.5 4 4.5 5 5.5 6 6.5 7 7.5 8 8.5 9 9.5 10
Predicted DCS Outcome (%)

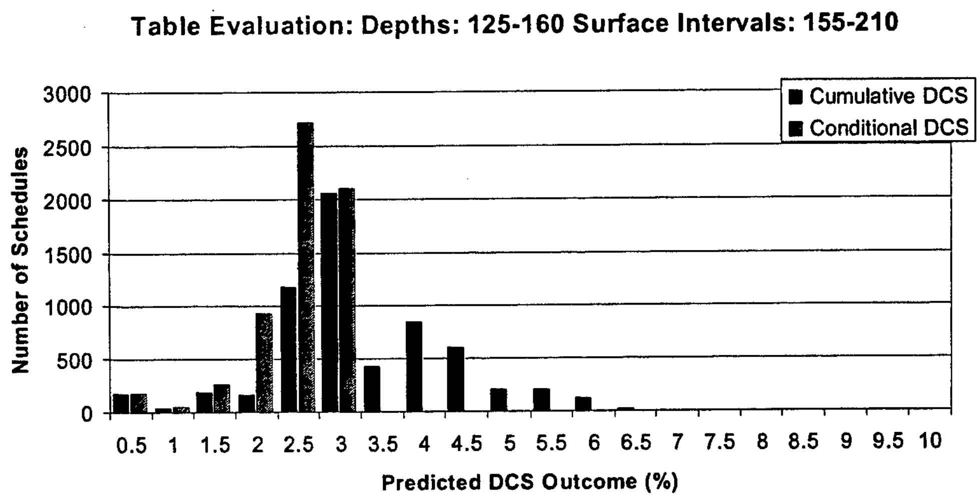


Table Evaluation: Depths: 125-160 Surface Intervals: 155-210
Cumulative DCS
Conditional DCS
Number of Schedules
3000
2500
2000
1500
1000
500
0
0.5 1 1.5 2 2.5 3 3.5 4 4.5 5 5.5 6 6.5 7 7.5 8 8.5 9 9.5 10
Predicted DCS Outcome (%)

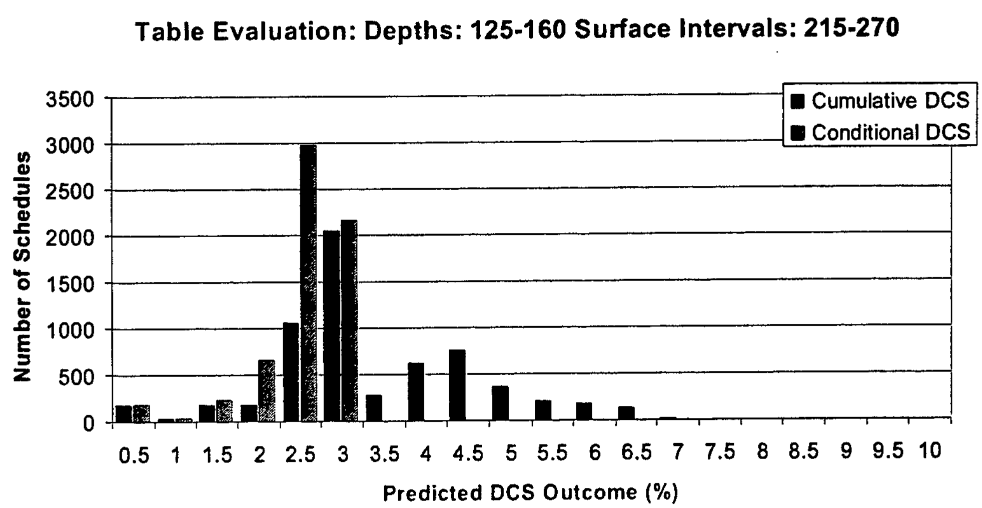


Table Evaluation: Depths: 125-160 Surface Intervals: 215-270
Cumulative DCS
Conditional DCS
Number of Schedules
3500
3000
2500
2000
1500
1000
500
0
0.5 1 1.5 2 2.5 3 3.5 4 4.5 5 5.5 6 6.5 7 7.5 8 8.5 9 9.5 10
Predicted DCS Outcome (%)

Table Evaluation: Depths: 125-160 Surface Intervals: 275-330

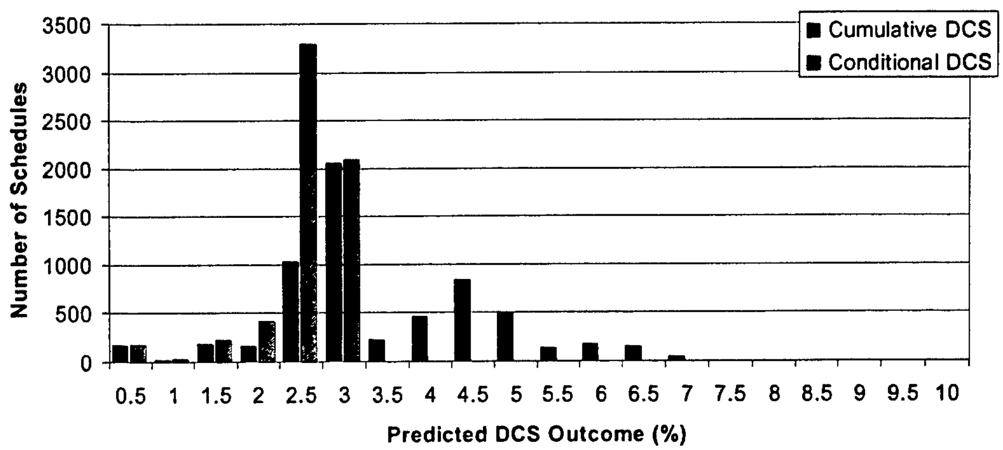


Table Evaluation: Depths: 125-160 Surface Intervals: 335-390

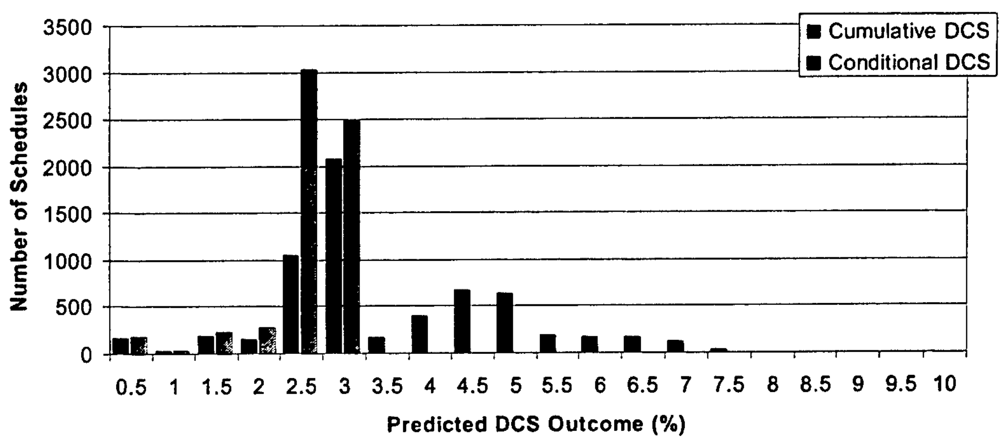


Table Evaluation: Depths: 125-160 Surface Intervals: 395-555

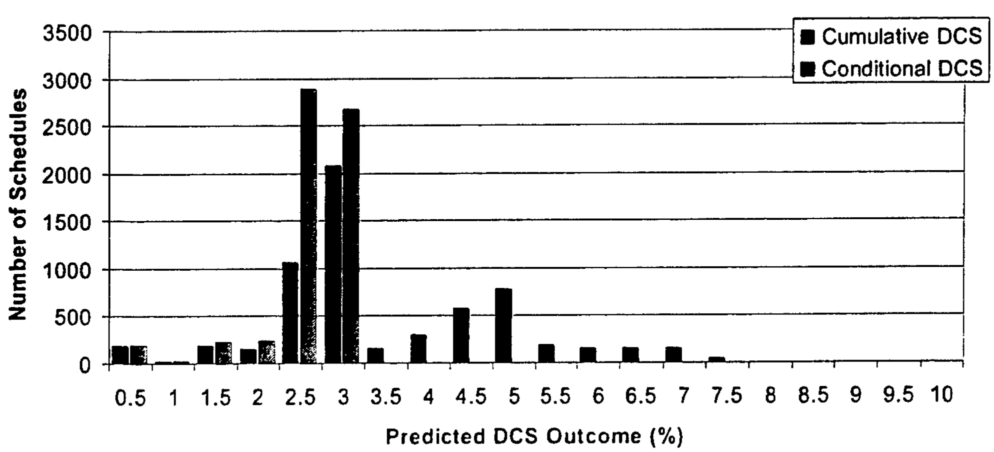


Table Evaluation: Depths: 125-160 Surface Intervals: 560-720

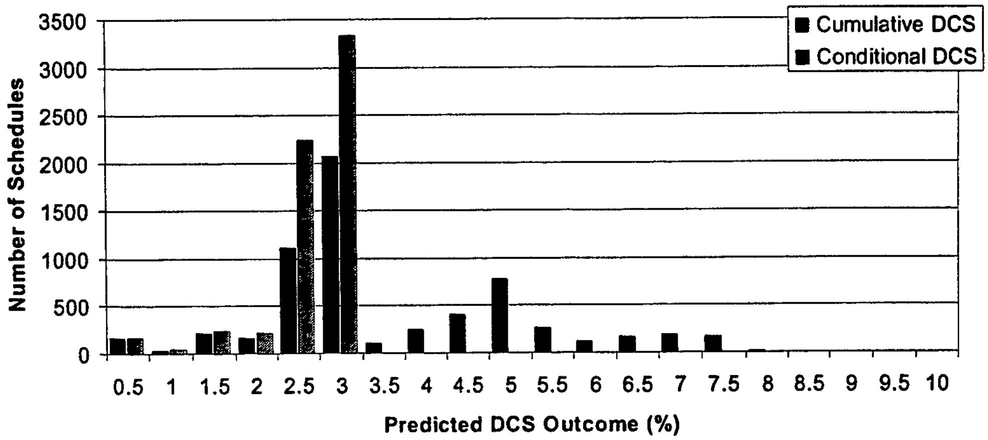


Table Evaluation: Depths: 165-200 Surface Intervals: 30-720

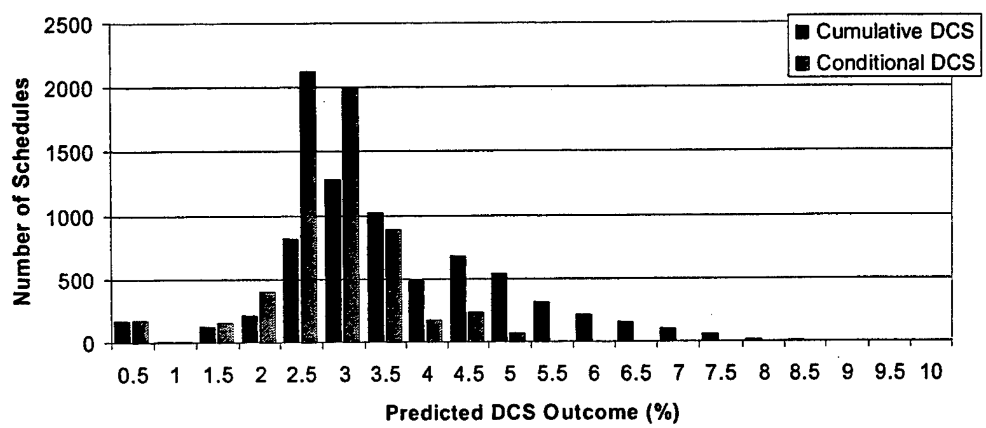


Table Evaluation: Depths: 165-200 Surface Intervals: 30-90

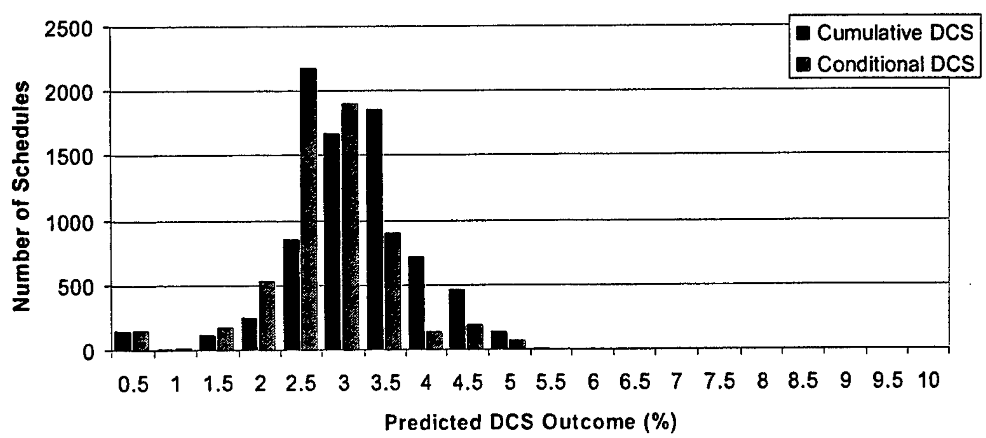


Table Evaluation: Depths: 165-200 Surface Intervals: 95-150

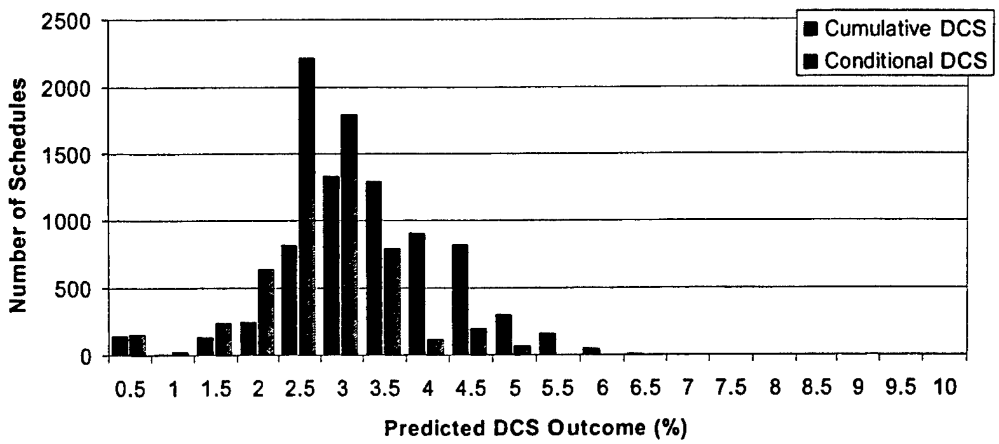


Table Evaluation: Depths: 165-200 Surface Intervals: 155-210

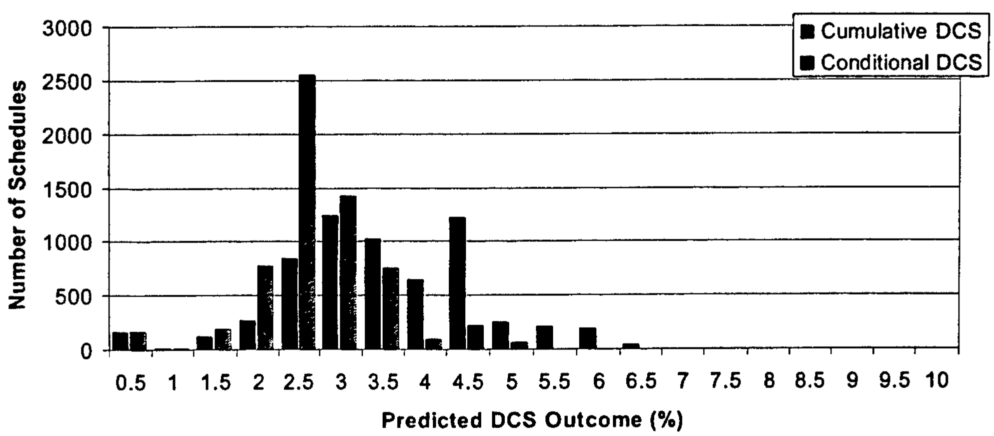


Table Evaluation: Depths: 165-200 Surface Intervals: 215-270

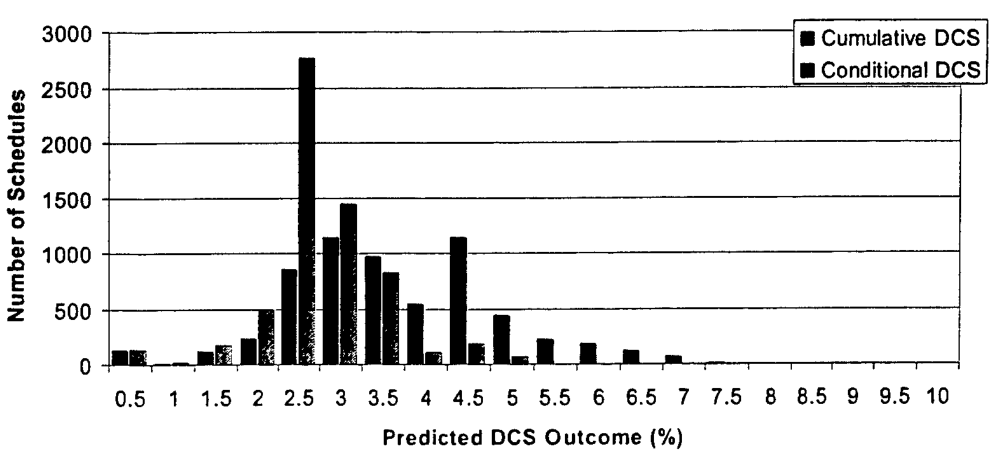


Table Evaluation: Depths: 165-200 Surface Intervals: 275-330

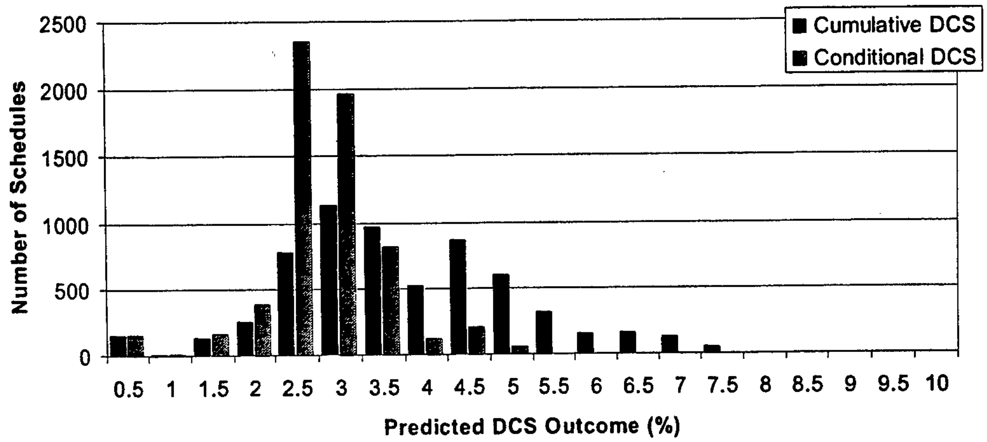


Table Evaluation: Depths: 165-200 Surface Intervals: 335-390

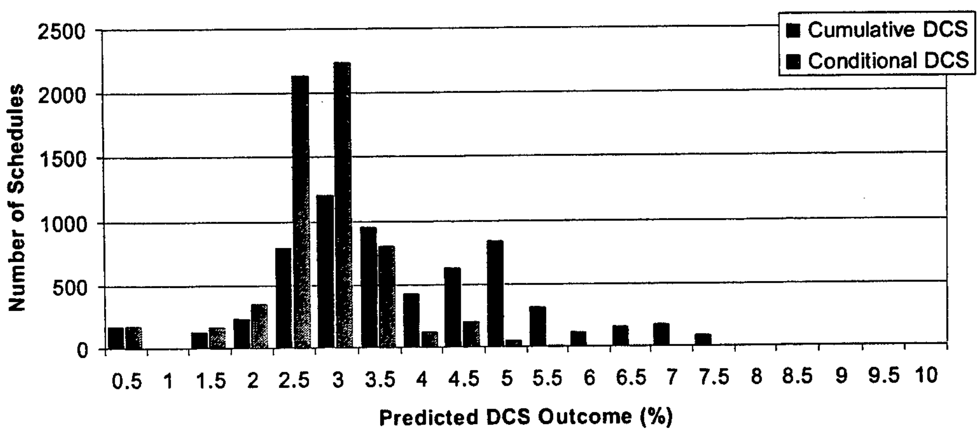


Table Evaluation: Depths: 165-200 Surface Intervals: 395-555

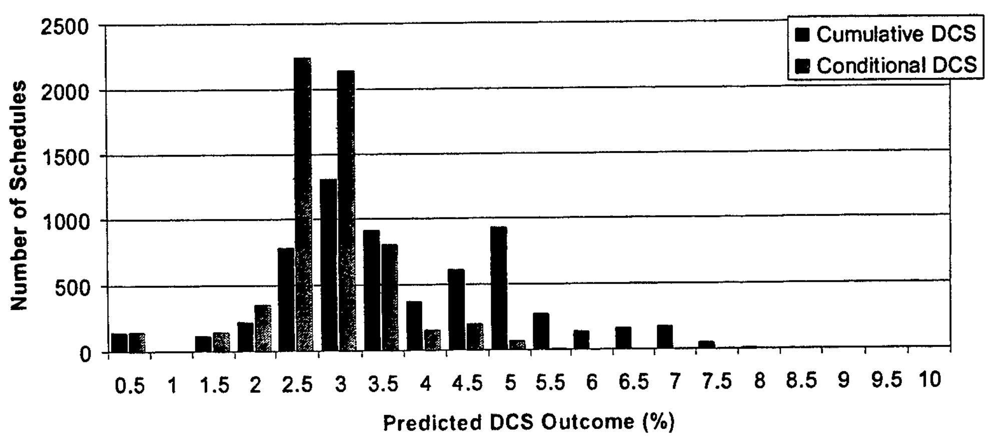
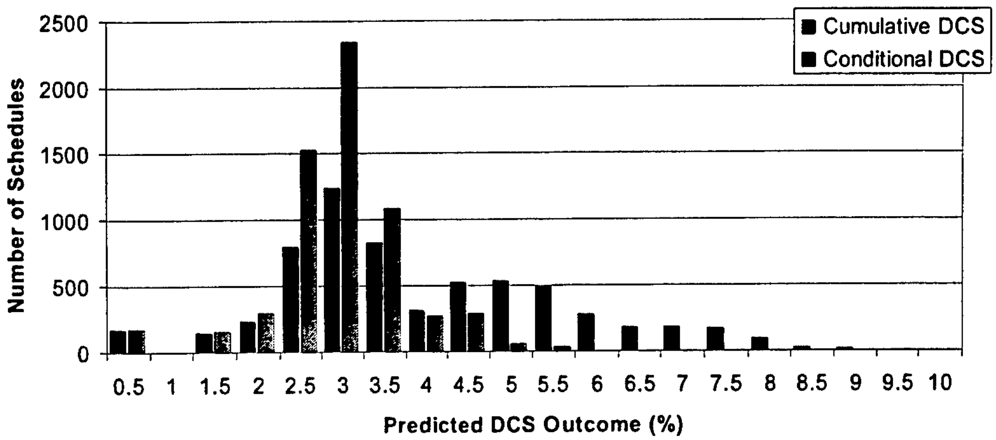


Table Evaluation: Depths: 165-200 Surface Intervals: 560-720



APPENDIX N.

Summary Features of Oxygen Partial Pressures in the
Canadian Underwater Mine Apparatus (CUMA)
and the
Royal Navy Clearance Divers Breathing Apparatus (CDBA)

CUMA

The Canadian Underwater Mine-countermeasures Apparatus, or CUMA, is a semi-closed He-O_2 mixed gas UBA designed, like the MK 16 MOD 1, to maintain high diver inspired PO_2 to minimize decompression obligations. Its operating principles, however, are different from those of the MK 16 MOD 1, and are described in the following excerpt from a DCIEM report:[1]

> "The CUMA diving equipment utilises a supply of helium (He) and oxygen (O_2) to provide the diver with a nominal constant partial pressure of O_2 (PO_2) of 1.6 atmospheres absolute (ATA) at all depths. This is achieved by the addition of a variable flow of diluent (He) gas to a constant mass flow of O_2 at 3.6 litres/min at 0°C at 1 ATA (slm). At the surface, only pure O_2 is supplied to the breathing loop; then as the depth increases past 6 msw, the diluent gas flow rate increases linearly in proportion to depth. The combined flow of O_2 and He produces a heliox (HeO_2) gas mixture entering the breathing loop with a PO_2 of 1.6 ATA, with an allowable range of 1.5 ATA to 1.7 ATA at depths of 10 msw to 81 msw. The PO_2 in the breathing loop depends on the diver's work rate but should not exceed 1.62 ATA when the diver is at rest (assuming a metabolic O_2 consumption rate (VO_2) of 0.25 slm), nor drop below a minimum of 0.29 ATA if the diver is working strenuously (assuming VO_2 of 3.0 slm) for an extended period."

Features of PO_2 control in the CUMA were compiled from detailed records of 1343 CUMA man-dives completed at the Defence and Civil Institute of Environmental Medicine (DCIEM).[2]

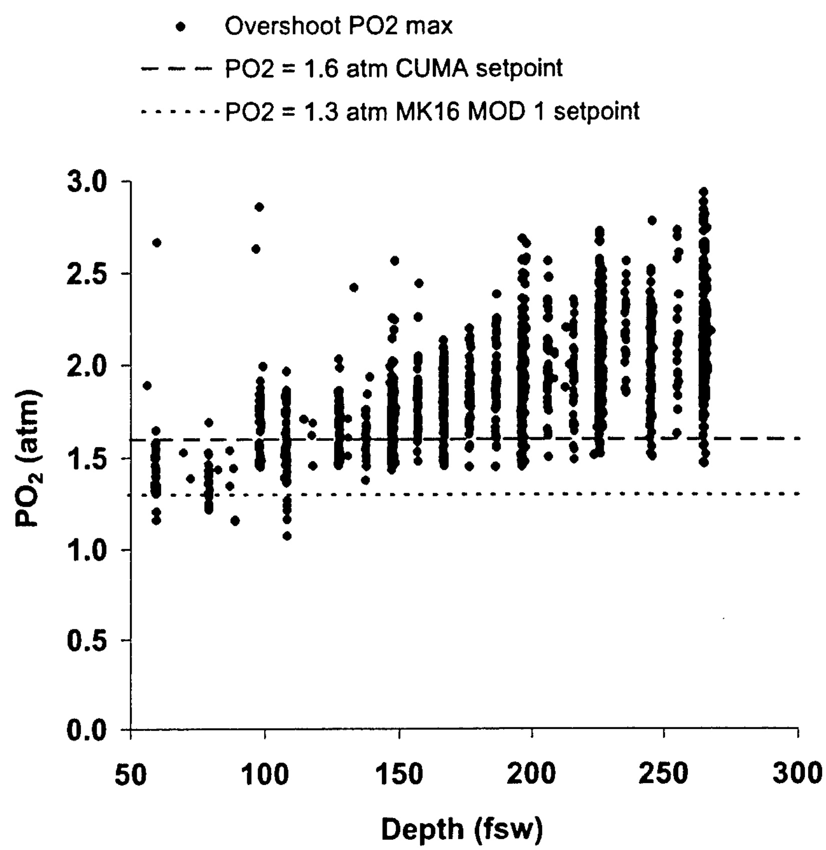


Figure N1. Peak diver inspired PO_2 in Canadian CUMA UBA. The dotted line is the nominal 1.6 ATA PO_2 set-point of the CUMA UBA. (Compiled from data provided courtesy of R.Y. Nishi, DCIEM, CA.)

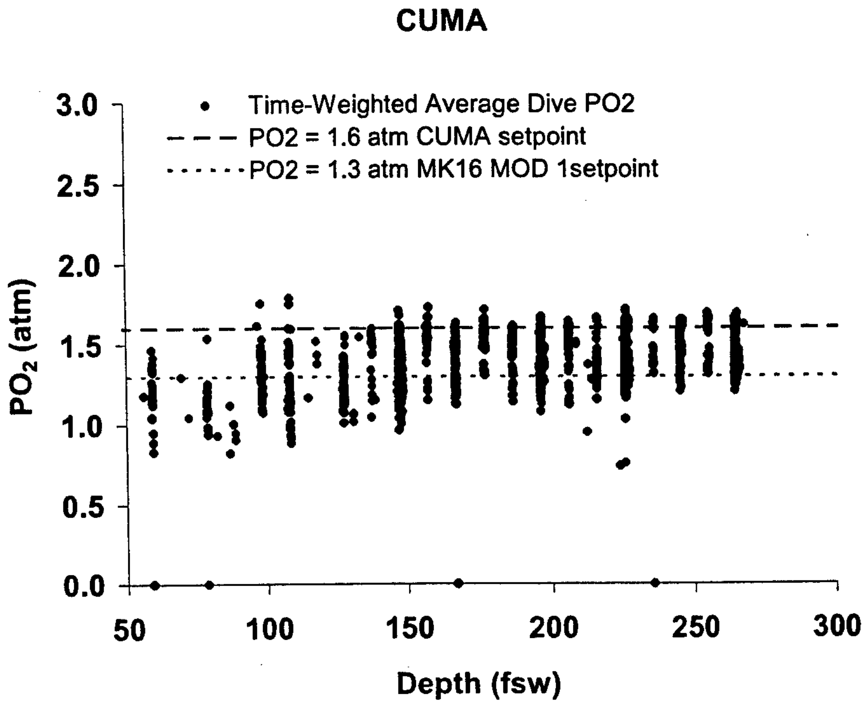


Figure N2. Time weighted average diver inspired PO_2 throughout dive times in CUMA UBA. The heavy dotted line is the nominal 1.6 ATA PO_2 set-point of the CUMA. For comparison, the light dotted line is the nominal 1.3 ATA PO_2 set-point of the MK 16 MOD 1. (Compiled from data provided courtesy of R.Y. Nishi, DCIEM, CA.)

CDBA

The Royal Navy Clearance Divers Breathing Apparatus (CDBA) is essentially the same as the U.S. Navy MK 16 MOD 1, with the same breathing loop and electronic control circuitry. Features of PO_2 control in the CDBA were compiled from detailed records of 133 CDBA man-dives completed at the Defence Evaluation and Research Agency (Alverstoke) (DERA(A)):[3]

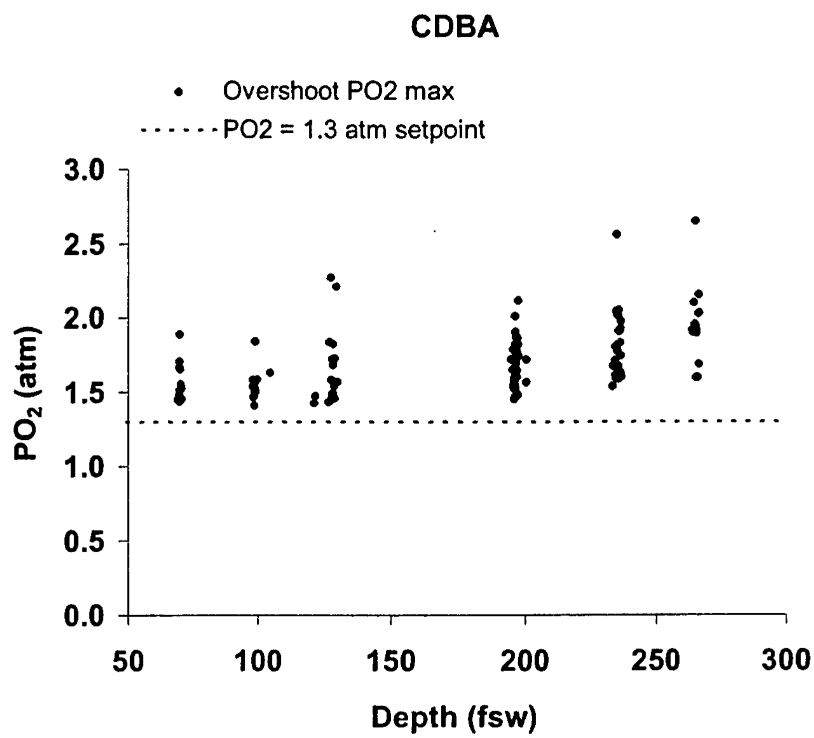


Figure N3. Peak diver inspired PO_2 in Royal Navy CDBA. The dotted line is the nominal 1.3 ATA PO_2 set-point of the CDBA. (Compiled from data provided courtesy of T.G. Anthony, DERA(A), UK.)

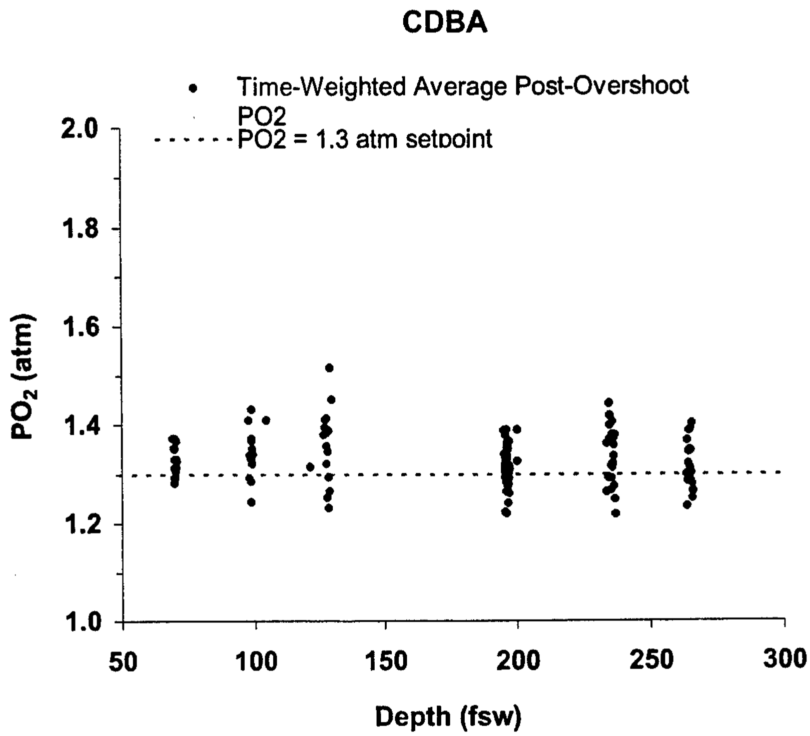


Figure N4. Time weighted average diver inspired PO_2 at bottom after PO_2 overshoots in Royal Navy CDBA. The dotted line is the nominal 1.3 ATA PO_2 set-point of the CDBA. (Compiled from data provided courtesy of T.G. Anthony, DERA(A), UK.)

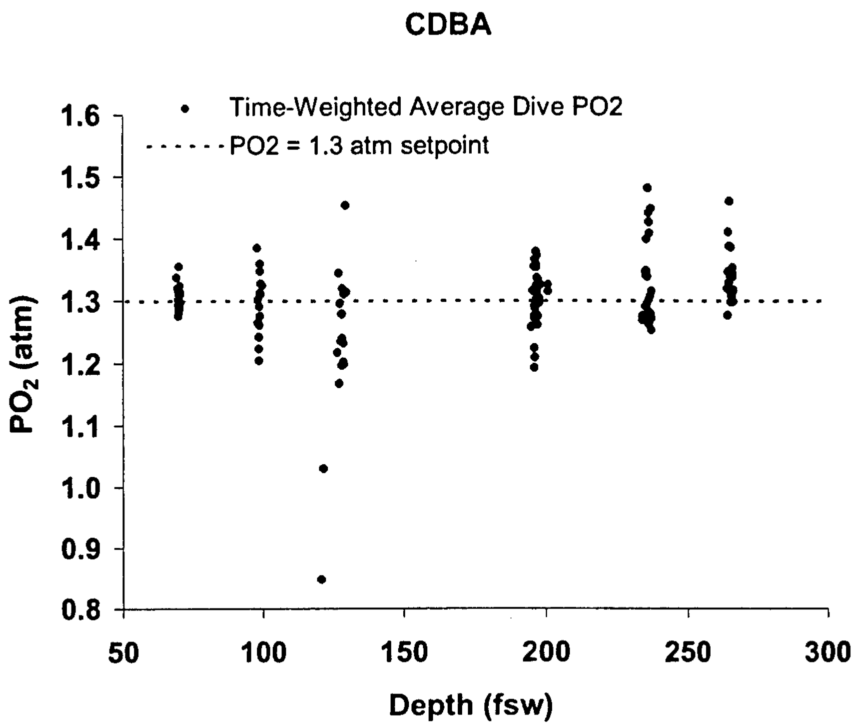


Figure N5. Time weighted average diver inspired PO_2 throughout dive times in Royal Navy CDBA. The dotted line is the nominal 1.3 ATA PO_2 set-point of the CDBA. (Compiled from data provided courtesy of T.G. Anthony, DERA(A), UK.)

References

1 Nishi, R. Y., Kessler, M. L., Eaton, D. J. *Reduced Surface Interval Between Dives for CUMA HeO_2 Decompression Tables – Final Report*. DCIEM Technical Report TR 2000-063, Defence and Civil Institute of Environmental Medicine, North York, Ontario, 2000.

2 Nishi, R. Y., Warlow, M. R. N. *Development of CUMA HeO_2 Decompression Tables: Final Report*. DCIEM Report No. 97-R-68, 1997.

3 Anthony, T. G., *et al. Evaluation of DERA Table 90 1.3 Bar Oxygen in Helium Decompression Tables for Use with the MCM/EOD LSE: Phase I – In-water Decompression (U)*. DERA/CHS/PPD/TR000518/1.0, 2001.