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WIND STRESS AND WIND STRESS CURL OVER THE CALIFORNIA CURRENT

Craig Scott Nelson

# NAVAL POSTGRADUATE SCHOOL Monterey, California



# THESIS

WIND STRESS AND WIND STRESS CURL OVER THE CALIFORNIA CURRENT

by

Craig Scott Nelson

June 1976

Thesis Advisors:

R.L. Haney J.B. Wickham

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by

Craig Scott Nelson Lieutenant, National Oceanic and Atmospheric Administration B.S., Yale University, 1971

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#### ABSTRACT

Historical surface marine observations are summarized by 1-degree square area and long term month to describe the seasonal distribution of wind stress over the California Current. Off the coasts of southern California and Baja California, an alongshore equatorward component is present throughout the year. The distributions north of Cape Mendocino are characterized by marked changes in direction and magnitude between summer and winter. The predominant wind stress maximum shifts northward coherently from off Point Conception in March to south of Cape Blanco in September, and extends approximately 500 km in the offshore direction and 1000 km in the alongshore direction. Maximum values of surface wind stress occur during July near Cape Mendocino.

The wind stress curl is positive near the coast and negative in the region offshore. A line of zero wind stress curl parallels the coast 200 km to 300 km offshore, except off central Baja California. The patterns of wind stress curl are consistent with the existence of a southward Sverdrup transport offshore and a poleward transport near the coast.

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#### I. INTRODUCTION

Spatial variation in the distributions of surface wind stress has long been recognized as a fundamental quantity in discussions of the wind-driven ocean circulation. Sverdrup's (1947) transport balance relates the vertically integrated meridional mass transport in the interior ocean to the open ocean wind stress curl. Munk (1950) extended the theory to a closed basin and estimated the mass transports for several oceanic circulations from a knowledge of the wind stress alone. Recent theoretical developments have attempted to explain the well-known westward intensification, but have largely ignored the wind-driven circulation in eastern boundary currents, such as the California Current.

The California Current flows southeastward along the west coast of the United States as one branch of the large anticyclonic gyre in the North Pacific Ocean. The predominant surface flow occurs between a cell of high atmospheric pressure to the west and a continental thermal low situated over California. Seasonal variations in the direction and strength of the surface wind are related to shifts in location of the high pressure system and intensification of the semi-permanent thermal low.

The basic features of the California Current system may be described in terms of the local wind stress (Reid et al. 1958). The equatorward surface current and poleward undercurrent are typical of eastern boundary currents (Wooster and Reid 1963). Munk (1950) has suggested that the average wind distribution off California is consistent with the existence of an equatorward surface flow offshore and

a poleward flow inshore. However, lack of an adequate data base has precluded a detailed analysis of the relationships among the distributions of surface wind stress, the southward flowing California Current, and the northward flowing countercurrent which appears seasonally off the coasts of California, Oregon, and Washington.

A related phenomenon in eastern boundary currents is the process of coastal upwelling. The role of upwelling in bringing nutrients into the surface layers where they are available for organic production is widely recognized. According to the simplified model (Sverdrup 1938), equatorward wind stress parallel to the coast induces flow in the surface Ekman layer of the ocean which is deflected offshore by the earth's rotation (Ekman 1905). When this occurs over an expanse of coast where horizontal surface flow cannot compensate for that driven offshore, the balance is maintained by upwelling of subsurface water. Smith (1968) suggests that wind stress, being the driving force in this mechanism, may be the most important single parameter in coastal upwelling.

Previous estimates of the surface wind stress over the oceans have been based primarily on wind data taken from the U.S. Hydrographic Office Pilot Chart wind roses (Hidaka 1958, Hellerman 1967). The large scale features evident in these distributions are consistent with the occurrence of the major cyclonic and anticyclonic circulations in the oceans. However, the coarse spatial and temporal resolution of these data (5-degree quadrilateral space average and 3 month time average) are not adequate to describe the locally driven processes evident in the California Current system.

Wooster and Reid (1963) used Hidaka's estimates of surface wind stress to calculate the offshore Ekman transport and described the locations and seasonal timing of the major coastal upwelling regimes in terms of these "upwelling indices." Bakun (1973) extended the concept of the upwelling index by computing estimates of Ekman transport from routinely available analyzed surface atmospheric pressure fields. Temporal fluctuations are well described by these data. However, both the derived quantities based on Hidaka's wind stress data, and Bakun's upwelling indices suffer from an inability to characterize small scale features of the Ekman transport field, particularly near the coast. For example, where these data may indicate surface divergence on the large scale, smaller scale surface convergence might exist, with associated effects on the distributions of organisms within the coastal upwelling zone.

This report is an attempt to provide more detailed descriptions of the surface wind stress distributions over the California Current. The study differs from previous work by calculating the monthly mean values on a 1-degree square area basis. Surface marine wind observations have been utilized in the computations. Roden (1974) evaluated the surface wind stress on a 1-degree latitude-longitude grid. However, Roden's distributions have been derived from monthly mean surface atmospheric pressure analyses based on a 5-degree latitudelongitude grid. Thus, any information concerning space scales smaller than 5 degrees is due to the particular interpolation scheme used to refine the data to a 1-degree grid, rather than due to observed data.

The monthly mean data described in this report adequately resolve the seasonal cycle, which is the dominant time scale for coastal

upwelling (Mooers et al. 1976). The high resolution in space and time may provide the observational background for more detailed investigations of the relationships among the local wind stress distributions, the equatorward surface current offshore, the poleward surface and subsurface flow inshore, and the distributions of certain species of fish, such as the northern anchovy (<u>Engraulis mordax</u>), and the Pacific mackerel (Scomber japonicus).

#### II. DATA REDUCTION

The monthly mean distributions of surface wind stress presented in Appendix A are based on summaries of data contained in the National Climatic Center's file of surface marine observations (Tape Data Family - 11). The total file contains approximately 40 million individual ship reports dating from the mid-nineteenth century. Over 1 million of the reports are within the area of the California Current system.

Long term composite monthly fields of surface wind stress have been compiled on a 1-degree square area basis within the geographical area outlined in Figure 1. The data grid extends from 20° N latitude to 50° N latitude and parallels the coastline configuration, extending 10° of longitude in the offshore direction. Each 1-degree quadrilateral is centered on a whole degree of latitude and longitude. Approximately 25% of the total available reports contain positions recorded to the nearest whole degree of latitude and longitude. The grid orientation used in this study thus minimizes spatial bias which might be introduced by summarizing the data according to the Marsden square numbering system.

The historical data contain errors in position, measurement, and processing. A single pass editor was used to remove gross errors in the data, including duplicate reports (0.5%), position errors (0.1%), and measurement errors (0.5%). Erroneous wind directions and wind speeds greater than 100 m sec<sup>-1</sup> were removed. Reports of variable winds were treated as calms.



FIGURE 1. Chart of the west coast of the United States showing the grid of 1-degree squares used for summaries of wind observations. Large dots indicate squares for which frequency diagrams are displayed in Figures 9-12.

An estimate of the surface wind stress was calculated for each wind velocity report according to the bulk formula:

$$(\mathcal{T}_{x},\mathcal{T}_{y}) = \rho_{a} c_{o} (|\vec{W}_{10}|U_{10},|\vec{W}_{10}|V_{10}) \quad (1)$$

where  $\mathcal{T}_{x}$  and  $\mathcal{T}_{y}$  denote the eastward and northward components of stress,  $\rho_{a}$  is the density of air which was considered to have a constant value of 0.00122 g cm<sup>-3</sup>,  $|\mathcal{W}_{io}|$  is the observed wind speed, and  $\mathcal{U}_{io}$  and  $\mathcal{V}_{io}$  are the eastward and northward components of the wind velocity measured at a height of 10 m. The empirical drag coefficient  $C_{o}$  is referred to the 10 m level. A constant value of 0.0013 (Kraus 1972) was used in the calculations.

The resultant long term monthly mean vectors were computed as the arithmetic means by east and north components of all available reports from 1850 to 1972 within a 1-degree square area. The appropriate average is defined in Equation 2:

$$(\overline{\tau}_{x},\overline{\tau}_{y}) = \frac{1}{N} \sum_{i=1}^{N} (\tau_{x},\tau_{y})_{i}$$
 (2)

where N is the total number of reports within a 1-degree square area and month. The values  $(\mathcal{T}_x, \mathcal{T}_y)_i$  were evaluated according to Equation 1. A mean value for each long term month and square is therefore formed from a data set which is independent of all other months and squares. The monthly fields of surface wind stress are displayed in Appendix A as vector quantities and as east and north components. No attempt has been made to smooth the fields, either by removing data which do not appear to fit the distributions or by

applying objective smoothing procedures. The mean values were contoured by machine and "bull's-eyes" in the contours, even where they possibly reflect erroneous data, were left in the figures as indications of the general degree of consistency in the composite distributions. The "bull's-eyes" may reflect either a paucity of ship observations, or extreme variability associated with inadequate sampling of strong winds.

The spatial distribution of observations is biased in that "ship of opportunity" reports are generally confined to the coastwise shipping lanes. The total numbers of observations per l-degree square area are shown in Figure 2. The highest density of reports is found within 300 km of the coast, exceeding 40,000 observations per 1-degree square in the area south of Point Conception. The number of reports per l-degree square per month varies from less than 20 (in January off Vancouver Island) to more than 3800 (in May off Los Angeles). A significant increase in the number of observations is evident along the shipping route between San Francisco and Hawaii. Less than 20% of the vector means are based on fewer than 50 observations per 1-degree square per month. Some temporal bias may also exist, since approximately 50% of the total reports have been taken since 1945. However, the general coherence of the resulting vector fields indicates that the composite wind stress distributions can be used to describe the dominant seasonal cycle in the California Current system.

#### A. QUALITY OF INPUT DATA

The historical surface marine observations used in this study have been obtained primarily from ship logs, ship weather reporting forms,



FIGURE 2. Distribution of observations per 1-degree square. The contour interval is 2500 observations. Values greater than 5000 are shaded. and published ship observations. The reports differ markedly in method and precision of measurement, ranging from observations made aboard 19th century vessels, to those taken aboard modern oceanographic research ships. Possible errors in wind measurement have been summarized by Hantel (1970). These include influences of anemometer height, atmospheric stability, wind gusts, and duration of the observation. Sources of error in wind estimates include the wind effects observed, error in determining the true wind from the observed apparent wind, and the unavoidable subjectivity of the observer.

A substantial portion of the historical data consists of wind reports based on the antiquated Beaufort wind force scale (Kinsman 1968). Table 1 lists the conversion scale between the Beaufort number and the equivalent wind speed in knots and meters per second. These estimates are equivalent to a wind speed measurement at a height of 10 m.<sup>1</sup>

TABLE 1. Wind speed equivalents of Beaufort force estimates in knots and meters per second

Beaufort	0	1	2	3	4	5	6	7	8	9	10	11	12
Knots	0	2	5	9	13	18	24	30	37	44	52	60	68
M sec <sup>-1</sup>	0.0	0.9	2.4	4.4	6.7	9.3	12.3	15.5	18.9	22.6	26.4	30.5	34.8

Based on the documentation for the National Climatic Center's data file  $(TDF-11)^2$ , a determination was made of the number of wind

<sup>1</sup>Resolution 9, International Meteorological Committee, Paris, 1946.
<sup>2</sup>National Climatic Center, Tape Data Family 11, NOAA/EDS/NCC, Asheville, N.C.

observations estimated and those actually measured by an anemometer. Approximately 35% of the reports in this study consisted of Beaufort wind force estimates. An additional 53% of the reports were estimated wind speeds which did not correspond to the Beaufort wind force scale. Less than 12% of the total reports consisted of measured quantities.

In addition to the errors introduced by the necessary calculation of true wind from the measured apparent wind, the reported directions vary in precision. Resolution varies from  $\pm$  11.25° to  $\pm$  5° corresponding to observations based on 16 points of a 32 point compass and a 36 point compass respectively.

The above considerations lead to the conclusion that random observational errors may be as large as real non-seasonal fluctuations in the distributions of surface wind stress. The problem may be formalized by expressing the individual stress estimates  $\mathcal{T}_{\chi}$ ,  $\mathcal{T}_{\gamma}$  as the sums of monthly mean values  $\overline{\mathcal{T}}_{\chi}$ ,  $\overline{\mathcal{T}}_{\gamma}$ , deviations from the monthly means  $\mathcal{T}'_{\chi}$ ,  $\mathcal{T}'_{\gamma}$ , and error terms  $\mathcal{T}^{\epsilon}_{\chi}$ ,  $\mathcal{T}^{\epsilon}_{\gamma}$ . The second and higher moment statistics would consist of the non-zero correlations between the deviations from the monthly means and the error terms. If the observational errors are greater than the real fluctuations, then the standard deviations of the monthly means would reflect observational noise rather than actual non-seasonal variability. However, provided that these errors are not systematic, the resultant first moment statistics will be the appropriate estimates of the monthly mean wind stress.

The standard error of the mean provides a more appropriate quantitative measure of the relation between the standard deviation of a set of measurements and the precision of the mean value of the data

set (Young 1962). The standard errors of the means are defined by:

$$(S_{\overline{\tau}_{x}}, S_{\overline{\tau}_{y}}) = (S_{\tau_{x}}/\sqrt{N}, S_{\tau_{y}}/\sqrt{N})$$
 (3)

where  $S_{\overline{\tau}_x}$ ,  $S_{\overline{\tau}_y}$  are the standard errors of the means of the eastward and northward components respectively,  $S_{\tau_x}$ ,  $S_{\tau_y}$  are the standard deviations, and N is the number of observations. Large values of N and small values of  $S_{\tau_x}$ ,  $S_{\tau_y}$  correspond to mean values  $\overline{\tau}_x$ ,  $\overline{\tau}_y$  which closely approximate the population means.

The computed standard errors of the means and numbers of observations for each 1-degree square area and long term month are tabulated in Appendix B. Values less than 0.1 dyne cm<sup>-2</sup> occur throughout a large portion of the summary area, although spatial and seasonal dependence is evident. Standard errors greater than 0.1 dyne cm<sup>-2</sup> occur over large areas north of Cape Mendocino and between 500 km and 1000 km off the coast of Baja California. High values are generally associated with regions of sparse data, although inadequate sampling of intense storms may also lead to large values. Typical ratios of the standard error to the mean stress ( $S_{\overline{\tau}_x}/\overline{\tau}_x$ ) range from 0.01 off southern California to 1.0 offshore from Cape Blanco. Near Cape Mendocino, this ratio varies between 0.02 and 0.10. Minimum values adjacent to the coast south of 40° N latitude and along the shipping lane between San Francisco and Hawaii are well correlated with the distribution of observations shown in Figure 2.

### III. DEPENDENCE OF STRESS ESTIMATES ON CD

A constant drag coefficient was used to compute the surface wind stress data displayed in Appendix A. Stress calculations were made for each wind report and then averaged to form the resultant monthly mean vectors. Different results might have been obtained if the stress were calculated from monthly mean wind data, or if effects of atmospheric stability were considered. These aspects are discussed below.

The errors associated with the observational data used in this study place certain limitations on the form of the bulk exchange formula expressed in Equation 1. If measurement errors are large, there may be little value in refining the parameterization by replacing  $C_D$  by a variable drag coefficient which is a function of stability or wind speed. Even with a constant  $C_D$ , the bulk formula contains nonlinearities. Therefore, the drag coefficient must be appropriate for the particular time averaged winds used in the calculations.

#### A. EFFECT OF AVERAGING

The empirically derived transfer coefficient  $C_D$ , determined by eddy correlation and profile methods, is based on wind measurements averaged over periods of 30 to 60 minutes. Pond (1975) indicates that the appropriate values of  $|\overrightarrow{W_{10}}|$ ,  $U_{10}$ , and  $\bigvee_{10}$  should be obtained over a period of a few minutes to a few hours at most. If the surface stress were calculated using winds averaged over much longer periods, a higher drag coefficient would be required. The surface stress calculated from a monthly mean surface wind field would

be significantly less than the surface stress field calculated as the mean of the individual stress estimates, if the same drag coefficient is used and all other parameters are held constant.

The difference described above has been determined for the data used in this study. For each 1-degree square area and long term month the following ratio has been calculated:

$$(C_{D})_{equ} = \frac{1\overline{\tau}}{\rho_{a}(\overline{|W_{a}|})^{a}}$$
 (4)

where  $\overrightarrow{|\mathcal{T}|}$  is the magnitude of the monthly mean surface stress,  $|\overrightarrow{w}_{io}|$  is the magnitude of the monthly mean surface wind, and  $(C_D)_{equ}$  is an equivalent drag coefficient. This is the value which would be necessary to make the stress values calculated from the monthly mean wind data agree with the values calculated as the means of individual stress estimates.

The values of  $(C_D)_{equ}$  for the months of June and December are shown in Figures 3 and 4. The values are significantly different from the constant value of  $C_D = 0.0013$  employed in this study. In all cases,  $(C_D)_{equ}$  is greater than  $C_D$ . Spatial and seasonal variability is marked. There is a tendency for much higher values in the northern section of the grid than in the southern area. Large values of  $(C_D)_{equ}$  are more evident in December than in June. The geographical and seasonal variations in the quantity  $(C_D)_{equ}$  agree with the general geographical and seasonal fluctuations in meteorological conditions over the Northeast Pacific Ocean. This would indicate that a large part of the monthly variance of the wind stress data is due to actual intra-month fluctuations and not due to observational errors.



FIGURE 3. Equivalent neutral drag coefficient for JUNE. The plotted value is the drag coefficient appropriate for wind observations averaged over a month. The contour interval is 2.5.



FIGURE 4. Equivalent neutral drag coefficient for DECEMBER. The plotted value is the drag coefficient appropriate for wind observations averaged over a month. The contour interval is 2.5.

If a resultant surface wind stress were calculated from the monthly mean wind field, these calculations imply that the wind stress estimates would be underestimated, on average, by as much as 50% to 100%. The departures would be even larger off Oregon and Washington.

#### B. EFFECT OF ATMOSPHERIC STABILITY

Investigations on the functional form of the drag coefficient have alternately suggested constant values, or a dependence on wind speed. Wilson (1960) gave a detailed review of the available data and adopted values of  $C_D = 0.0024 \pm .005$  for strong winds and  $C_D = 0.0015 \pm .0008$  for light winds. Smith (1970) proposed a constant value of  $C_D = (1.35 \pm 0.34) \times 10^{-3}$ . Wu (1969) adopted the form  $C_D = (0.5 \times U_{10}^{1/2}) \times 10^{-3}$ . Considering the large scatter in the open ocean determinations of  $C_D$ , the lack of conclusive data at wind speeds greater than 15 m sec<sup>-1</sup>, and the lack of agreement among individual observers, a constant value for the neutral drag coefficient was used in this study.

Recent investigations by Davidson (1974) and Denman and Miyake (1973) have demonstrated the dependence of the drag coefficient on atmospheric stability and the spectral shape of the ocean wave field. A generally accepted formulation of the dependence of  $C_D$  on wave properties does not seem well enough established to be incorporated in the calculations of surface wind stress based on historical ship observations. However, effects of atmospheric stability on the momentum exchange may be significant in the regions where seasonal upwelling typically produces a stable boundary layer.

The specific effects of atmospheric stability on the exchange of

2.9

momentum have not been completely determined and are still under investigation. However, for a given wind speed, the effect of stable (unstable) stratification is to decrease (increase) the magnitude of the momentum exchange (surface wind stress) across the atmosphereocean interface.

Deardorff (1968) defined the bulk Richardson number as an appropriate dimensionless measure of atmospheric stability. The monthly mean fields of surface wind stress were recomputed, replacing the constant value  $C_D$  in Equation 1 by a coefficient varying with atmospheric stability. The method of Deardorff was adopted to parameterize the dependence of the drag coefficient on stability, while neutral stability was assumed when the absolute value of the air-sea temperature difference was less than 1° C. Details of the calculations will be reported elsewhere.

The effect of atmospheric stability was computed as a percentage increase (decrease) in the magnitude of the monthly mean surface wind stress above (below) the appropriate neutral values. The following ratio was calculated:

$$R = \left(\frac{1\overline{7}}{|\overline{7}|_{var}} - 1\right) \times 100$$
 (5)

where  $|\vec{\tau}|_{var}$  is the magnitude of the surface wind stress calculated using a drag coefficient which varies with stability, and  $|\vec{\tau}|_{neu}$  is the magnitude of the surface wind stress computed with a constant (neutral) coefficient. A value of R = 0.0 corresponds to neutrally stable conditions.

The ratio defined by Equation 5 is displayed in Figures 5 and 6 for the months of June and December respectively. The average percentage difference is between 2% and 5%. Values greater than 10% are rare. In December, the values are positive, indicating unstable conditions. Negative values occur in June. These are related to the stable stratification induced by positive air-sea temperature differences within the coastal upwelling zone. The effects of atmospheric stability determined in this study are less than the values of 6% to 15% reported by Husby and Seckel (1975) for Ocean Weather Station "Victor", but consistent with the values of less than 5% reported by Dorman et al. (1974) for Ocean Weather Station "November." NCC - TDF-11 - ONE DEGREE SUMMARIZATION

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						-				9		3								110 110 111	<u>+ 115 112</u>	
56		-1.82	8.9	-2.5	-2.4	6-3.2	0.0	3.8	-3.77	-2.5	5.26	VRI	NCOUVE									50
49			-4.B	-2.3	2.5	-2.5	-3.5	7-2.94	-2.24	4.98	-3.51	-2.3	22		رحر	7		Γ	NATION		SERVICE	49
48				-4.58	-4.4	9.6	0.9	<b>D</b> . 98	-1.96	0.03	-2.13	-1.96	6.6		2	2			PAC	IFIC ENVIRONMENTAL	GROUP	48
47					-3.Z	-4.6	6.2	5-5.41	-7.69	-1.72	0.00	-4.99	0,00	0.00					BUI	K RI STARI		47
46					-5.20	6.67	-3.0	2.13	8.00	1.75	2.13	8.8	0.00	-4.0	COL	UMBIA	RIVER	2	EFI	ECT ON STR	RESS	46
45					-5.86	-2.83	8.8	-3,33	0.20	-2.17	0.00	0.90	e 20	6.25						( PERCENT )		45
44					8.0	8 8	-4.5	-4.25	6.67	0.00	8.00	-5.45	-7.27	-6.45								44
43					8.34	8.00	-2.1	0,00	-2.28	-4.48	-1.82	-5.00	6.17	0.00	CRP	e Blai	NCO			Lung Terri Mern For		43
42					2.4	0.00	0.1	0.00	1.41	1.92	-5.21	-5, 95	-3.91	-4,35						JUNE		42
41					3.0	-3. 13	-2.1	1.89	-3, 13	-4.41	-4.37	-4,63	-5. Ø	6.76	508	E MENI						41
40					8.0	3.8	2.0	1.15	8.08	-1.64	-1.20	-2.38	3.69	6.8	CHI							40
39					-8.0	0,00	-1.7	-1.69	-1.14	0.00	6.83	-1.43	-2.40	-4.38								39
38						-9. 29	-1.3	8.26	-1.82	-1.98	-1.54	-1.41	-1.95	-3.33	-3.71	2	1					38
37							-1.47	-2.5	-1.12	-1.82	-1.69	-1.55	-1.43	2.21	-2.58	-3,95						37
36							9.8	<b>9.9</b>	9.00	8.98	0.86	-0.79	-1.64	-1.67	-0.79	-3. 11	1	7				36
35								9.99	3.20	-8.83	0.00	-2.23	-2.70	-1.54	-1.65	-1,84	-2.91	POIN		'DN		35
34										-8.98	-9.97	-9.89	-9.85	-3.36	-2.36	-1.55	-3.48	5-1.23-	1.23	<b>`</b>		34
33					; {						-2.17	-1.05	-2.98	9.99	-1.75	-1.55	-1.74	9.93	3.26 3.4	5		33
32							; 					-1.99	-8.92	0.99	0.89	2.20	8,09	-1.10	2.30 2.5	3-4.55 N	2	32
31												1.28	8798	-8,92	0.00	1.99	-0.93	3-1.06	1.18-3.8	3 0.00	Z	31
310													10.00	1.35	9,28	-1.32	-2.78	3 0.998	3.09-2.5	-1.54-1.56	1 ac	30
29							 							-1.59	-1.23	-3.23	-1.57	-2.85-	1.47-1.4	-1.37-2.82-2.58	1 al	29
20														[1.79	1.52	1.49	0.00	0.00		-1.52-4.35-4.23		
20															1.49	3.23	2 20	2 2 60	2.00 3.7		y h	
20																4.00	9.39	-9.00-	.82-1.9	2 0 00-1 70-1 72-2	4-3.23	
20																Di	0.00	4.00		70.00-1.82 0-00-1.9	S-1.54-5.00	3.2824
23																		2,63	5.25 1.5	1.75 8.20 2.17-1.8	5-3.17-3.08-	-3.3323
22								4										3.51	2.30 2.6	3 8.80 4.80-1.54 1.6	2 2.38-1.78-	-1.4922
21																		-2.22	.92 6.6	3.39 4.26 5.13 4.2	0.20 0.20	2.2821
	137	136	135	134	133	132	131	130	129	128	127	126	125	124	123	122	121	120 1	19 118	117 116 115 114	1 113 112	111

FIGURE 5. The effect of atmospheric stability on surface wind stress for JUNE. Plotted values are the percentage increase (decrease) in the surface wind stress above (below) neutrally stable conditions. The contour interval is 10.0. Positive values correspond to unstable conditions. Negative values are shaded.

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	137	136	135	134	133	132	131	130	129	128	127	126	125	124	123	122	121	120	119	118	117	116	115	114	113	112	111
			4	•	*	-				9	1	2	<u> </u>														
58		8.93	1.29	1.85	-1.27	8.00	-3.1	3 1.5	-1.84	-1.45	Ö.00	VR	NCOUVE	R ISLA	40												50
49			8.0		1.45	8.80	-1.3	-2.7	5.86	-2.20	0.99	8.0	2	1	~	-			NOT	TOUR	MOR	NO	AA				49
48				8,92	8.83	2.17	-0.9	1.7	¢-1.96	-3.98	8.88	-3.64	2.8	~	5	5				PACI	FICE	NVIR	DNHEN	TAL C	ROUP	UE	48
47	•••••				8.53	8.00	BAB	-2.9	0.00	-2.67	(1.89	-2,94	-1-14	F 0.00	6					ז אינס		ÆY,	CALIF	ORNI	A 		47
46					1.55	8.99	0.8	11.8	-2.22	-3.28	-1.56	-1.56	-2.91		COL	UMBIA	RIVER			BUL	K I	11	SIF	IRTI	-11	Υ	ļ,
15					-9-00		2	- adas	-2 63	-2 00	a /aa		-2 01							EFF	EC	ГО	NS	TR	ESS		40
						1		1			-/										1	PER	CENT	3			45
44					8.05	10.5400	-1-1	9 1.52	1.96	8.90	0.90	-0.20	-2.86	-1.92							LOI	NG TE	RM HE	AN			44
43					1.91	3,16	2.3	5 8.8	1.59	2.73	-3.85	-2.56	-2.22	-3.98	CAP	E BLAN	00					FC	R				43
42					9.98	8.97	1.8	+1.27	1.59	3.85	1.82	0.00	-9.00	-5.45							L	JECE	MBE	R			42
41					-9. 80	8.96	1.45	2.7	8.20	-3.83	0.00	0.00	-3.92	0.28													41
40					1.37	2.63	3.3	3.7	8.90	0.00	0.00	0.00	6.25	0.20	CAP	e menio	DEIND										43
39					8.00	1.19	1.75	-3.83	2.08	2.86	0,00	4.00	8.28	6.29													39
38						0.00	-1.64	-3.33	8.89	8.88	3.99	0.00	0.00	5.26	9.89	2											38
37							1.80	8 4.26	2.33	8.80	4.00	2.86	2.27	2.38	6.90	8.88											37
36							1.79	2.44	8.86	3.83	2.56	2.44	4.29	-19.1	1.56	2.4											36
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34										2.94	2.50	10.100	1.89	9.00	7.14	Z. 17	8.00	0.00	5.29	2							34
33	¦			÷				;			7.69	2,38	1.92	2.17	1.27	2,94	2,55	0.08	2.63	0.96	- J						33
32												4.44	4.55	8.09	2.58	1.25	2.98	4.92	3.51	3.57	8.84		7	~			32
31	;											1.75	3.64	3.51	3.45	5.41	2.38	3.45	1.79	1.92	0.98	-	۲.		7		31
зø													5.00	4.23	5.26	1.69	3.49	9.00	9.52	1.75	3.92	2.3		7	1	1	30
29														3.64	2.63	4.26	8.88	3.79	3.39	4.25	8.00	78. 00	1.43		6	à	29
28														2.86	4.44	1.85	0.00	4.85	2.84	3.23	1.29	1.96	2.08	PU			. 28
27			بہ ـ ـ ـ ـ ـ	بہ ۔۔۔۔ ڈ											1.82	2.44	3.85	2.55	3.66	0.00	1.72	3.29	3.85	4.75		Z	27
26	 		 	بــــ												4.26	3.85	2.38	2.17	8.28	3.92	0.52	3.77	4.75	4.55	7	1 26
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24			 ,	+4														4.17	/.14	1.21	5.41	5.45	e. 64	01.000	5.50	0.25	0.0/24
ZB				- <b>-</b> +														5.26	3.08	5.13	4,17	6.52	5.13	6.98	4.76	6,98	8.1123
22																		3.77	2.99	7.14	7.32	18,53	6.98	9.29	5.71	3.78	5.2522
21								-					8 8 4					3.98	8.86	3.51	3.85	4.55	5.65	5.86	8.11	5.26	6.9821
	137	136	135	134	133	132	131	130	129	128	127	126	125	124	123	122	121	120	119	118	117	116	115	114	113	112	111

FIGURE 6. The effect of atmospheric stability on surface wind stress for DECEMBER. Plotted values are the percentage increase (decrease) in the surface wind stress above (below) neutrally stable conditions. The contour interval is 10.0. Positive values correspond to unstable conditions. Negative values are shaded.
#### IV. THE WIND STRESS DISTRIBUTIONS

The long term composite monthly mean fields of surface wind stress are displayed in Appendix A as resultant vectors (Charts 1 to 12), east components (Charts 13 to 24), and north components (Charts 25 to 36). These data indicate two characteristic features. The mean stress tends to be directed equatorward along the coast from Cape Mendocino to Baja California throughout the year. Off the coasts of Oregon and Washington, the wind stress exhibits marked seasonal variability in both magnitude and direction.

The distributions of surface wind stress off Baja California have been previously discussed by Bakun and Nelson (1975). They concluded that most of the seasonal variability is in magnitude rather than direction. The mean surface wind stress tends to have an alongshore, equatorward component during all months, implying conditions generally favorable for coastal upwelling throughout the year. This is contrasted with the situation to the north. Off the coasts of Oregon and Washington, the patterns of surface wind stress change seasonally. From December to February, the stress impinges on the coast at Cape Blanco, forming the southern boundary of the low pressure system which develops in the Gulf of Alaska during the winter. From May through September, the surface wind stress veers toward the south. The components are directed onshore and equatorward. The months of March and April, and October and November appear as transition periods. The surface wind stress is directed primarily onshore during these months.

The most evident feature in these distributions is the position

and extent of the predominant wind stress maximum. For purposes of discussion, this maximum is defined by the 1.0 dyne cm<sup>-2</sup> contour and is highlighted by light shading in Charts 1 to 12. Large values of stress occurring between 45°N and 50°N latitude during winter are probably associated with either high winds or sparse data, and will be ignored in this discussion.

The maximum is first evident in March, south of Point Conception. During succeeding months, the maximum strengthens, increases in size, and shifts northward. In April, values exceeding 1.0 dyne  $cm^{-2}$  cover an area from Point Conception to San Francisco. Winds off Oregon have veered, suggesting an alongshore component and implying conditions generally favorable for coastal upwelling. The pattern of surface wind stress is repeated in May. The northern boundary of the central maximum reaches the coast south of Cape Blanco.

The mean wind stress reaches maximum intensity during June and July off Cape Mendocino, where characteristic values exceed 1.5 dynes cm<sup>-2</sup>. The large scale maximum extends approximately 500 km in the offshore direction and 1000 km in the longshore direction. A more intense coastal maximum ( $|\overline{\mathcal{T}}|>1.5$  dynes cm<sup>-2</sup>) is coherent over an area approximately one-fifth this size. Maximum values of mean surface wind stress typically occur 200 km to 300 km off the coast, rather than adjacent to the coast. This feature was previously observed by Munk (1950) and Reid et al. (1958). The mean distributions for August and September suggest relaxing conditions. The maximum is reduced in extent and intensity. These months still exhibit a degree of equatorward stress along the coasts of Oregon and Washington, but in October, the direction backs to the north. The poleward components correspond to

onshore Ekman transport and subsequent downwelling at the coast. The distributions for November, December, January, and February indicate characteristic winter conditions. Mean values are typically less than 0.5 dyne cm<sup>-2</sup>. High winds associated with intense storm activity in the North Pacific Ocean result in regions of mean surface wind stress exceeding 1.0 dyne cm<sup>-2</sup> off the coasts of Oregon and Washington.

The seasonality of the surface wind stress and its association with coastal upwelling is easily observed along the northern section of the grid. Large changes in mean direction are apparent. Maximum magnitudes occur during the winter. Winds favorable for coastal upwelling occur from April to September. During the remaining months, the direction of the mean surface wind stress corresponds to downwelling at the coast.

The coast along southern California and Baja California is characterized by winds favorable for upwelling throughout the year. Peak values of surface wind stress occur in April and May. Values exceeding 0.5 dyne  $cm^{-2}$  are evident from February to July. A local maximum immediately north of Punta Eugenia is easily observed in May. This feature is consistent throughout the year. A region of local wind stress minima is indicated along the coast south of Point Conception. This feature corresponds in location to the semipermanent cyclonic eddy which dominates the ocean surface circulation in the Southern California Bight (Reid et al. 1958).

# A. SPATIAL AND TEMPORAL VARIABILITY

Spatial and seasonal variability of the monthly distributions will be described in terms of standard errors of the means (Equation 3),

constancy of the wind stress, and frequency diagrams for selected 1-degree square areas and months. In general, these data indicate greater variability in magnitude and direction within the region north of Cape Mendocino than in the area to the south. Summer distributions are characterized by well defined mean directions and magnitudes. Broad-banded frequency histograms are typical of the winter months.

Within the regions outside of the primary shipping lanes (see Figure 2), the monthly mean distributions are based on fewer than 2500 observations per 1-degree square area. Intercomparisons of the magnitudes of the computed standard errors of the means should be a function of the measured wind stress variability. Accordingly, standard errors to the north of Cape Mendocino are larger by a factor of 2 to 3 than those to the south. Thus, the data imply a greater degree of variation in the direction and magnitude of the surface wind stress off Oregon and Washington than off California.

A contrast between winter and summer conditions is also evident. South of Cape Mendocino, the magnitudes of the standard errors of the means remain nearly constant throughout the year. Off Oregon and Washington, the computed values decrease to a minimum during the summer. Typical values range from 0.10 dyne  $\rm cm^{-2}$  in June to 0.30 dyne  $\rm cm^{-2}$  in December.

Similar features of the large scale temporal and spatial variations are evident in the monthly distributions of constancy of the wind stress as defined by the ratio of the magnitude of the average stress to the average magnitude of the stress. Figures 7 and 8 show the patterns for June and December. During December, values greater than 0.5 occur south of Point Conception. To the north, the wind stress



50 8.45 8.41 8.42 8.33 8.45 8.37 8.25 8.47 8.51 8.33 VANCOLVER ISLAND 49 8.25 8.44 8.41 8.35 8.35 8.43 8.55 8.55 8.55 8.56	NDPR
50 8.45 8.41 8.42 8.35 8.45 8.37 8.25 8.47 8.55 8.33 VANCOLVER ISLAND 49 8.25 8.44 8.41 8.35 8.35 8.35 8.55 8.55 8.55 8.56	NDAR
49 0.28 0.44 0.41 0.39 0.39 0.43 0.55 0.55 0.56 0.68 2	NDAR
48 0.45 0.55 0.36 0.44 0.65 0.59 0.55 0.65 0.55 0.39	MARINE FISHERIES SERVICE
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W	IND STRESS
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45 8.43 8.49 8.49 8.41 8.55 8.55 8.38 8.55 8.54	45
44 8.43 8.49 8.49 8.54 8.35 8.55 8.56 8.54 8.48	44
43 8.51 8.55 8.57 8.45 8.52 8.51 8.79 8.59 8.71 8.53 CRPE BLANCO	LONG TERM MEAN 43
42 8.43 8.51 8.59 8.77 8.73 8.51 8.84 8.73 8.87 8.55	JUNE 42
41 8.51 8.44 8.66 8.52 8.62 8.63 8.63 8.83 8.85 8.85	1858 - 1972
40 9.55 0.55 0.53 0.73 0.73 0.83 0.85 0.91 0.95 0.79	
	39
	38
	37
36 8.77 8.82 8.83 8.89 8.89 8.99 8.91 8.93 8.93 8.93	36
35 2.81 2.84 2.99 2.86 2.94 2.99 2.93 2.94 2.91 2.33 PDINT CONCEPTION	35
34 0.85 0.89 0.99 0.92 0.93 0.93 0.99 0.89	34
33	33
32 0.53 0.53 0.52 0.94 0.94 0.52 0.91 0.81	3.77 32
31 0.87 0.86 0.93 0.91 0.95 0.96 0.94 0.94 0.93	31
32 8.95 8.95 8.92 8.33 8.95 8.95 8.94	1.93 8.96
	PUNTA EUGENIA
8.59 8.63 8.52 8.59 8.52 8.55	1.92 0.32 0.95 0.95 x 27
26	<b>8.35 0.34 0.35 0.35 0.36</b> 26
25 0.87 0.84 0.91 0.82 0.89	<b>8.92 0.86 0.96 0.95 0.95</b>
24 0.89 0.39 0.85	0.93 0.86 0.84 0.94 0.94 0.93 0.9224
23 25,74 8.87 8.85	8.90 0.75 0.96 0.89 0.96 0.94 0.9223
22 0.82 0.57 0.79	<b>.86 0.79 0.89 0.93 0.83 0.92 0.9</b> 122
21 0.86 0.89 0.31	
137 136 135 134 133 132 131 130 129 128 127 126 125 124 123 122 121 120 119 118	17 116 115 114 113 112 111

FIGURE 7. Wind stress constancy for JUNE. The plotted values are defined as the ratios of the vector means to the scalar means. The contour interval is 0.25.

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	137	136	135	134	133	132	131	130	129	128	127	126	125	124	123	122	121	120	119	118	117	116	115	114	113	112	111	,
										S	7	2	<u> </u>															
5Ø		8.43	8.38	0.50	0.33	0.35	0.36	0.43	Ø. 46	0.56	0.73	VAN																50
49			8.42	0.35	0.32	0.41	0.38	Ø. 36	0.35	0.41	0.35	0.40	è-c		14	-				1000	MO	NC	AA					49
48				8.33	8.62	8023	0.44	0.25	0.32	0.34	0.36	0.27	0.4	$\sim$	2	5			NHI	PACI	FICE	ENVIR	- ISHE	TAL.	GROUP	/ICE		18
47					0.58	8.58	0.49	0.36	0.41	0.44	0.33	0.45	0.5	Q.59	6					1	IONTE	REY,	CALI	FORN	IA			
10				• • • • •					$\wedge$			{		L	- cai		RIVER			h	IN	כ	STF	RES	SS			4/
40					0.30	0.00			10.00	0.33	0.49	0.45	0.5	0.54	COL	UNIGEN	NI VON				C	DNS	TAN	NCY	1			46
45					-8.58	0.52	B. 47	0.49	0.42	0,50	0.41	8.34	0.47	0.48														45
44					8.57	8.56	8.44	0.29	8.44	8.48	8.45	0.42	8.52	0.63														44
43					0.45	0.44	8.47	0.20	0.32	0.47	0.32	-8.25	0.5	0.49	CRP	E BLAN	4C0					NG TE	rrini Dr	EAN				43
42					8.53	8.53	0.52	0.41	0,48	0.29	0.31	Ø.39	0.39	0.51							(	DECE	MBE	R				42
41		 ,			8.54	8.51	8.49	0.30	8.63	8.39	0.29	0.26	0.24	0.48							1	186Ø ·	- 197	2				41
49					Ø. 37	1.42	0.41	9124	8.21	0.31	9.24	0.23	8.2	6.34	CRP	E MENO	DOCINO		L								l	
20	}											$\int$		1-3														40
39					8.41	0.43	8.34		0.33		0.46	0.33	10.100	0.23														39
38						0.35	0.37	0.22	8.36	0.13	0.17	0.13	0.14	0.18	0.09	2	;											38
37		, , ,	, , ,				0.45	0.34	8.29	0.36	8.25	0.36	0.38	0.33	8.23	0.13												37
36							0.44	0.35	8.31	0.30	0.35	0.33	0.28	0.12	0,50	0.46												36
35			Ĩ					8.23	8.24	0.34	0.42	0.44	0.33	0.40	8.51	1.48	0.42	POI	INT CON	CEPTIC	N							35
34			 י י							0.36	0.41	0.38	0.48	0.47	0.37	0.54	0.65	0.61	0.29									34
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34												0.41	0.44	10.08	0.69	0.71	6.70	0.76	. n.v.	0.52	0.54		7	~	2			32
31												0.46	0.55	0.6	0.66	0949	0.67	0.67	0.50	0.75	0.71	7	; (	١	٦			31
30													0.56	9.87	0.66	8.88	0.79	0.68	0.62	0.60	0.7	0.7	5	Ϊ.		ς		30
29													1	8.75	0.57	0.67	0.78	0.85	0.84	0.75	-0.76	0.77	0.60		6	2		29
28														0.55	0.68	0.85	8.75	0.76	0.57	0.87	0.81	9.72	0.71		UNTA E	UGENTA	$\sim$	28
27		 !													0.72	0.63	8, 79	0.98	0.98	8.72	0.89	0.84	0.7	8.7	2	Y		27
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L	137	136	135	134	133	132	131	130	129	128	127	126	125	124	123	122	121	120	119	118	117	116	115	114	4 113	112	111	

FIGURE 8. Wind stress constancy for DECEMBER. The plotted values are defined as the ratios of the vector means to the scalar means. The contour interval is 0.25.

constancy decreases to relatively small values, implying a high degree of directional variability. An increase in directional stability is indicated during June. Values greater than 0.50 extend from Baja California to Vancouver Island. Values less than 0.50 occur only in the northwest section of the grid. South of Cape Mendocino, the ratios approach a value of 1.0, implying very little variation in wind stress direction.

The patterns of wind stress constancy indicate possible error in estimates of the total mechanical energy transfer at the air-sea interface. In the region off California, the magnitude of the mean vector wind stress appears to be a good estimator of the total stress acting on the sea surface. However, in the northern regions of the data grid, these data show that the magnitude of the mean vector wind stress underestimates the total stress acting on the sea surface. This has important implications for mixed-layer modelling, in which the input of turbulent energy depends on the total stress acting on the sea surface regardless of direction (Denman 1973).

The large scale spatial and temporal variations in the surface wind stress distributions are finally described in terms of selected frequency diagrams. Data for the 10 squares indicated in Figure 1 are displayed in Figures 9, 10, 11, and 12. Figures 9 and 10 show data for June and December taken from the 5 squares indicated in the inset. Similar data at 5 different locations are presented for July and January in Figures 11 and 12.<sup>3</sup>

<sup>&</sup>lt;sup>3</sup>Wind roses for all 1-degree squares within the area north of 34° N latitude may be found in, <u>Climatic study of the near coastal zone; West</u> <u>Coast of the United States</u>, published by the Director, Naval Oceanography and Meteorology, June, 1976, 133 p.

The available wind stress data have been classed by direction and magnitude for each 1-degree square area and month. Relative frequencies have been determined for 16 direction bands and for 11 magnitude bands. A category for calm winds also includes variable winds. The direction bands are 22.5° wide and the magnitude bands correspond to equivalent wind speed intervals of 2.0 m sec<sup>-1</sup>.

The relative frequency surfaces shown in these figures display contours of percentage of total reports falling within a given direction and magnitude band. The contours were drawn by hand. A contour interval of 2.5% was used. The 2.5% contour is labelled and is indicated by a solid line. Alternating dashed and solid contours indicate larger relative frequencies. The mean vector magnitude and direction is indicated by an arrow. Note that directions are defined with the oceanographic convention (i.e. the direction toward which the wind blows).

The histograms shown to the right of each frequency surface display relative frequencies for magnitude at the top, and direction at the bottom. Relative percent is labelled along the ordinate. Midpoints of the magnitude and direction class intervals are labelled on the abscissa.

If Figures 9 and 10 are compared, the contrast between winter and summer distributions appears as a change in the character of the frequency surfaces. In general, the number of contours indicated for June is greater than the number of contours appearing in December. Evidently, the wind stress is relatively constant in magnitude and direction during the summer months. A slight shift in the direction and magnitude of the wind stress is indicated between summer and



FIGURE 9. Relative frequency surfaces and frequency histograms for JUNE. Data are shown for the 1-degree squares labelled 1 through 5 in the upper left inset. Contours of relative frequency are drawn at intervals of 2.5%. Mean vector wind stress is indicated by an arrow.



FIGURE 10. Relative frequency surfaces and frequency histograms for DECEMBER. Data are shown for the 1-degree squares labelled 1 through 5 in the upper left inset. Contours of relative frequency are drawn at intervals of 2.5%. Mean vector wind stress is indicated by an arrow.

winter. The mean stress in December is directed more toward the south, and the magnitude has decreased.

The frequency histograms also show these features. During June, the direction histogram is characteristically narrow-banded. Over 70% of the observations may be concentrated within 3 direction intervals. In December, the observations tend to be spread over a wider range of directions. The histograms are broader and the peaks in direction are less well defined. The peak magnitudes in June are generally one class interval larger than the peak magnitudes in December. However, the winter distributions are characterized by an increase in relative frequency at high values of wind stress magnitude.

A similar pattern of contrasts between the summer and winter distributions is apparent in the northern section of the grid. As shown in Figures 11 and 12, the direction histograms are generally well defined during the summer, although bimodal distributions are evident. During the winter, the observations are nearly uniformly spread among all directions. There is a lack of consistency in the frequency surfaces in Figure 12. The direction histograms for January are broad and flat. The peaks which characterize the summer distributions are missing. The mean directions shift from equatorward to poleward between summer and winter. A complete reversal in the mean direction occurs at point 7 (Figures 11 and 12). A shift in magnitude is equally pronounced. Peak magnitudes are higher in January than in July. There is a greater contribution of high wind speeds in January.

The above discussion adds a new dimension to the seasonal descriptions of the surface wind stress distributions over the California



FIGURE 11. Relative frequency surfaces and frequency histograms for JULY. Data are shown for the 1-degree squares labelled 6 through 10 in the upper left inset. Contours of relative frequency are drawn at intervals of 2.5%. Mean vector wind stress is indicated by an arrow.



FIGURE 12. Relative frequency surfaces and frequency histograms for JANUARY. Data are shown for the 1-degree squares labelled 6 through 10 in the upper left inset. Contours of relative frequency are drawn at intervals of 2.5%. Mean vector wind stress is indicated by an arrow.

Current. Pronounced seasonal variations in the magnitude and direction of the monthly mean wind stress are indicated along the entire west coast of the United States. These changes are most evident off the coasts of Oregon and Washington. In addition, these data suggest month to month changes in the large scale spatial variability. The magnitudes and directions are broad-banded during the winter months, and along the northern coast. Well defined peaks in magnitude and direction characterize the distributions during the summer and along the southern coast. One may conclude that marine biological communities inhabiting the coastal zones off Oregon and Washington must respond to a wider range of environmental fluctuations than those organisms which exist in the waters off southern California.

### B. THE SEASONAL CYCLE AT THE COAST

Time series of the surface wind stress within the 1-degree square areas immediately adjacent to the coast are displayed in Figure 13 as the alongshore component, and in Figure 14 as the onshore component. For these displays, the vector means have been resolved into components parallel and perpendicular to the coast. The coastline angles were determined by visually fitting a line to the dominant trend of the coast within each 1-degree square. The months are indicated along the top of the figures. The latitudes of the 1-degree squares are indicated on the right and left sides of the figures. Negative values are shaded and indicate equatorward stress in Figure 13 and offshore stress in Figure 14.

Several characteristic features are apparent in these figures. South of 40° N latitude, there is an equatorward component throughout

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FIGURE 13. Seasonal cycle of alongshore surface wind stress near the coast. Means of alongshore components of wind stress were computed by month for the 1-degree squares immediately adjacent to the coast. Units are dyne cm<sup>-2</sup>. Equatorward alongshore stress is shaded. the year, implying conditions favorable for coastal upwelling in all months. Off the coasts of Oregon and Washington, the data suggest that upwelling occurs seasonally between the months of April and September.

Two relative maxima occur in the time/space domain. Off the coast of Baja California, maximum values of wind stress are evident near Punta Eugenia in May. A large maximum occurs just south of Cape Mendocino between May and August. A smaller, local maximum occurs in May and June at 36° N latitude.

The timing of the central maximum off the coast from Cape Mendocino agrees with the description of the mean yearly cycle of indicated upwelling given by Bakun (1973). However, Bakun's data are spatially distorted, and indicate maximum values at 33° N latitude, 119° W longitude in the middle of the Southern California Bight. The gross spatial distortion is primarily caused by the development of an intense thermal low over southern California during the summer. The influence of this low pressure system, and the effects of coastal mountain ranges distort the analyzed pressure fields used in Bakun's computations.

Figure 13 is similar in appearance to a time series of offshore Ekman transport shown by Bakun et al. (1974). They showed a good correlation between the occurrence of maximum offshore transport at 39° N latitude and a suppression of seasonal warming in the adjacent coastal waters during early summer.

The time series of alongshore surface wind stress (Figure 13) suggests a slight tilt, with time and space, to the region of maximum values. This corresponds to a northward shift in the intensity of

	1	NORA - NATIONAL MARINE FISHERIES SERVICE PACIFIC ENVIRONMENTAL GROUP MONTEREY, DELIFORNIA
		ONSHORE SURFACE STRESS
		(DYNE CH-2)
	1	LONGSHORE TIMESERIES GRID SECTION (1) LONG TERM MERN 1857 - 1972
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4	9	8.22 8.25 8.15 8.95 8.11 8.14 8.87 8.83 8.81 8.85 8.25 8.4749
4	8	8.41 8.13 8.23 8.31 8.17 8.15 8.22 8.11 8.15 8.26 8.36 8.3148
4	7	17 19 8. 14 8. 27 8. 15 8. 18 8. 11 8. 85 8. 87 8. 30 8. 21 8. 22 47
4	6	8. 1 8. 87 8. 15 8. 34 8. 35 8. 22 8. 27 8. 15 8. 85 8. 89 8. 15 9. 23 46
4	5	8. 84 8. 23 8. 33 8. 24 8. 14 8. 15 8. 18 8. 87 8. 18 8. 85 8. 81 8. 9145
4	4	
4	2	B. 19 B. 63 B. 33 B. 85 B. 15 B. 80 B. 13 B. 15 B. 16
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4	ø	8. 30 8. 30 8. 21 8. 32 8. 51 8. 29 8. 51 9. 45 8. 31 8. 36 8. 87 8. 1140
3	9	8.15 8.25 8.16 8.19 9.34 8.29 8.24 8.22 8.13 9.15 8.91 8.1139
3	8	8 88 8.12 8.25 8.38 8.33 8.33 8.23 8.27 8.15 8.88 8.89 8.85
3	7	8.85 8.83 8.12 8.14 8.14 8.15 8.15 8.11 8.89 8.84 8.85 8.3937
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3	3	8.88 8.15 8.22 8.27 8.24 8.28 8.19 8.19 8.17 8.12 8.19 8.9433
3	2	9.96 9.96 9.15 9.15 9.29 9.16 9.15 9.15 9.11 9.14 9.95 9.9632
3	1	8.85 8.89 8.17 8.18 8.21 8.16 9.15 8.15 8.12 8.18 8.86 8.8131
3	a	8.05 8.11 8.16 8.19 8.25 8.17 8.13 8.11 8.11 8.88 8.87 8.8530
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2	3	8.19 8.12 8.82 8.95 8.95 8.95 8.85 8.81 8.85 8.83 9.15 8.19 23
2	2	8.18-8.11-8.99 8.09 8.03 8.07-9.81 8.91-8.82-8.81-8.15-8.2422
2	1	8.21-8.19 8.12 8.16 8.86 8.86 8.13 8.83 8.85 8.24 8.25 8.2121
	Ł	JAN FEB MAR APR MAY JUN JUL AUG SEP OCT NOV DEC

FIGURE 14. Seasonal cycle of onshore surface wind stress near the coast. Means of the onshore components of wind stress were computed by month for the 1-degree squares immediately adjacent to the coast. Units are dyne cm<sup>-2</sup>. Offshore stress is shaded. the surface wind stress from April and May off the coast of Baja California, to June, July, and August off Cape Mendocino and Cape Blanco.

Figure 14 indicates a tendency for the surface wind stress to be directed onshore throughout the year. Off the coast of Baja California, the surface stress is characterized by offshore components, except between the months of April and October. Offshore components are also apparent in the vicinity of Cape Mendocino and Point Conception. Near these points, abrupt changes in coastline orientation may influence the direction and magnitude of the surface wind stress.

### V. WIND STRESS CURL

The surface wind stress curl is the forcing function for the vertically integrated mass transport of the wind-driven ocean circulation. Under linear, steady-state conditions on the " $\beta$  -plane", in the absence of friction, the meridional component of mass transport  $(M_{\gamma})$  is directly proportional to the vertical component of the curl of the wind stress as expressed in Equation 6:

$$M_{\gamma} = \frac{\vec{k} \cdot (\nabla x \vec{\tau})}{\beta}$$
(6)

where  $M_{\gamma}$  is the meridional component of the vertically integrated mass transport,  $\beta$  is the meridional derivative of the Coriolis parameter f, and  $\vec{k} \cdot (\nabla x \vec{\tau})$  is the vertical component of the wind stress curl. According to the simplified model, positive (negative) wind stress curl is associated with northward (southward) meridional transport. Surface Ekman divergence (convergence) corresponding to positive (negative) wind stress curl is balanced by geostrophic convergence (divergence) in the northward (southward) meridional flow.

Coastal upwelling occurs only at the ocean boundary. However, wind induced upwelling will occur whenever divergence in the surface wind drift is not balanced by other modes of horizontal surface flow. Figure 15 shows a mechanism by which the wind stress curl determines the divergent or convergent nature of the surface wind drift offshore of the primary coastal upwelling zone. An increase in the equatorward



wind stress parallel to the coast (Figure 15A) is characterized by positive wind stress curl. In this situation, the offshore component of Ekman transport increases in the offshore direction, resulting in continued surface divergence. Upwelling is required to maintain the mass balance. If the equatorward longshore surface wind stress decreases in the offshore direction (Figure 15B), the wind stress curl is negative. Convergence in the surface wind drift will result. Frontal formation and downwelling may occur just offshore of the primary coastal upwelling zone.

Direct measurements of wind stress curl are not available. Since the curl is a linear operator, the curl of the monthly mean surface wind stress fields has been computed. The vertical component of the curl of the wind stress in spherical coordinates is defined by:

$$\vec{k} \cdot (\nabla x \vec{t}) = \frac{1}{R \cos \varphi} \left[ \frac{\partial \vec{t}_y}{\partial \lambda} - \frac{\partial}{\partial \varphi} (\vec{t}_x \cos \varphi) \right]$$
(7)

where R is the radius of the earth,  $\varphi$  and  $\lambda$  denote geographic latitude and longitude respectively, and  $\overline{\mathcal{T}}_{x}$  and  $\overline{\mathcal{T}}_{y}$  denote the eastward and northward components of the mean surface wind stress. A finite difference equation approximating the curl at the grid point (i,j) in Figure 16 is given by:

$$\vec{z} \cdot (\nabla \times \vec{\mathcal{T}}_{i,j}) = \frac{1}{R \cos \varphi_{i,j}} \left[ \frac{\vec{z}_{y_{i+1,j}} - \vec{\mathcal{T}}_{y_{i-1,j}}}{2\Delta \lambda} \right]$$
(8)

$$= \left( \frac{\left( \overline{T}_{x} \cos \varphi \right)_{i,j+1} - \left( \overline{T}_{x} \cos \varphi \right)_{i,j-1} \right)}{2 \Delta \varphi} \right)$$
  
File discretation and  $54$   $\Delta \lambda = \lambda \varphi = 1^{\circ}$ 
  
File discretation and centered differential except  $\mathcal{C}$  sourcement



FIGURE 16. Discretization grid used in calculating the wind stress curl.

where  $\Delta \varphi = \Delta \lambda = 1^{\circ}$ . The method is similar to calculations described by Hantel (1970). Centered differences were utilized throughout the interior of the data grid. Forward and backward differences were required along the boundaries. As a result, certain artificial features may have been introduced at these boundaries.

# A. THE MONTHLY CURL DISTRIBUTIONS

Monthly fields of surface wind stress curl are displayed in Appendix C (Charts 37 to 48). These distributions correspond to the monthly mean wind stress distributions shown in Appendix A. The values are plotted in units of dyne  $cm^{-2}$  per 100 km. A value of 1 dyne  $cm^{-2}$  per 100 km is equivalent to 1 X 10<sup>-7</sup> dyne  $cm^{-3}$ . Negative values of wind stress curl are shaded.

The small scale features evident in these distributions should be viewed with caution. Detail within a single 1-degree square area which is not supported by similar values in surrounding squares probably reflects "noise" in the monthly means of surface wind stress. Objective smoothing procedures applied to the monthly mean wind stress fields would result in more homogeneous distributions of wind stress curl. A particular method has been described by Evenson and Veronis (1975).

Characteristic absolute magnitudes of the spatially averaged wind stress curl are 1 X  $10^{-8}$  dyne cm<sup>-3</sup>. This value is approximately an order of magnitude less than the summertime mean reported by Halpern (1976) for an upwelling region near the Oregon coast. Considering the time and space averages used in the present study, this difference appears to be reasonable. The probable errors associated with these

estimates of wind stress curl may be calculated from a knowledge of the spatial distributions of standard errors of the (wind stress) component means (see Appendix B). On average , the expected error is  $1 \times 10^{-8}$  dyne cm<sup>-3</sup>, with maximum and minimum errors of  $4 \times 10^{-8}$ dyne cm<sup>-3</sup> and  $1 \times 10^{-10}$  dyne cm<sup>-3</sup> respectively. Of course, these values apply to particular individual 1-degree squares. Large values generally correspond to "holes" in the distributions, which are easily seen in the monthly charts. For larger space scales, the errors associated with the gradients of the mean wind stress components would tend to cancel. Thus, greater confidence may be expected for the patterns of wind stress curl which are consistent over several degrees of latitude and longitude.

The large scale features of positive and negative curl along the coast are significant. The important details to note are the sign of the wind stress curl at the coast, and the position of the line of zero wind stress curl. A general feature common to all months, is the occurrence, on average, of positive wind stress curl near the coast, and negative curl at some distance offshore. This feature is well developed from May to September. Greater spatial variability is evident in the winter distributions.

The existence of an offshore wind stress maximum results in a line of zero wind stress curl approximately parallel to the coast. Positive curl occurs inshore of the maximum wind stress. Negative curl in the offshore region is associated with the anticyclonic atmospheric circulation over the interior ocean. The positive curl near the coast is related to topography and to local features in the surface wind stress distributions.

The distributions from December to March are characterized by positive wind stress curl near the coast from San Francisco to northern Baja California, and south of Punta Eugenia. Large areas of associated Ekman divergence extend several hundred kilometers off the coast. The patterns of wind stress curl are less well behaved near the coasts of Oregon and Washington. However, negative wind stress curl near this coastal region appears to be typical of the distributions during the winter.

During the spring and summer upwelling, the dominant patterns of surface wind stress curl are easily recognized. The line of zero wind stress curl parallels the coast approximately 200 km to 300 km offshore, along the entire boundary from northern Baja California to Vancouver Island. This is a consistent feature from June through September. Yoshida and Mao (1957) placed this boundary at approximately 500 km from the coast. Considering the coarse resolution (5-degree squares of latitude and longitude) of their data, the disparity is not surprising.

The months of April and May, and October and November appear as transitional periods. During the transition from spring to summer, the negative curl along the coasts of Oregon and Washington shifts to positive curl. The offshore distribution takes on a more uniform character. Scattered regions of positive and negative curl are replaced by a large area of negative curl. The late fall transition is marked by a total breakdown in the curl distributions within the northern sector of the grid.

Several local (positive) curl maxima are associated with major topographic changes in the coastline configuration. Large values

of positive wind stress curl are found near Cape Blanco, Cape Mendocino, San Francisco, and Point Conception. These features may be real, or they may be artifacts of the finite difference calculations or the data distributions. However, one does note that near Point Conception, the values of positive wind stress curl are consistent with a decrease in the magnitude of the surface wind stress in the lee of the point. Where areas of positive wind stress curl extend offshore of capes, there would tend to be a continued, although much reduced level of upwelling outside of the primary coastal upwelling regime.

A region of negative wind stress curl (Ekman convergence) reaches the coast of Baja California between Punta Eugenia and Punta Baja to the north. This feature appears consistently throughout the year. A partial breakdown in this system occurs in August, October, and November. However, considering the probable uncertainties in these derived data, one might reasonably conclude that the coastal region near Punta Eugenia can be characterized in the mean by convergence in the surface wind drift. The distributions of wind stress curl in this area imply favorable conditions for formation of fronts and convergent patches of recently upwelled water.

# B. COASTAL TIME SERIES

The mean annual cycle of wind stress curl near the coast is shown in Figure 17. Positive wind stress curl occurs along most of the coast throughout the year. Exceptions to this generalization are found in the region south of 30°N latitude and between 40°N and 47°N latitude. The temporal persistence of the negative wind stress curl

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FIGURE 17. Seasonal cycle of wind stress curl near the coast. The wind stress curl is shown by month for the l-degree squares immediately adjacent to the coast. The calculations were based on the monthly mean surface wind stress distributions. Units are dyne cm<sup>-2</sup> per 100 km. The contour interval is 0.25 dyne cm<sup>-2</sup> per 100 km. Negative values are shaded. near Punta Eugenia (29°N latitude) is clearly seen in this time series. A similar feature occurs near the tip of Baja California. A seasonal variation between positive and negative curl is apparent from Cape Mendocino to the Columbia River.

Yoshida and Mao (1957) presented evidence indicating that openocean upwelling is related to the wind stress curl. This process is distinct from coastal upwelling which is primarily a boundary phenomenon. However, the two mechanisms are not totally independent. In regions where positive wind stress curl occurs, such as between 30°N and 40°N latitude throughout the year, and near the coasts of Oregon and Washington during the summer, the ascending motion related to the wind-induced divergence offshore, enhances the upwelling associated with the more dominant coastal divergence.

### VI. DISCUSSION

The monthly distributions of surface wind stress show an offshore maximum which progressively develops over a large extent of the California Current and shifts northward and intensifies on the seasonal time scale. This process is a primary forcing function for coastal upwelling. Off Baja California, wind-induced surface divergence occurs on average throughout the year. Downwelling occurs near the coast of Vancouver Island, except during the restricted period between May and August when a small equatorward component is observed.

The major seasonal variations in the magnitude and direction of the surface wind stress can be described simply in terms of the general atmospheric circulation over the Northeast Pacific Ocean. Monthly mean surface pressure charts typically show two well developed pressure cells. A high pressure system over the ocean shifts northward and increases in strength from spring to summer. The center of the cell moves in a northwestward direction. The seasonal variation of the high pressure system is small. This shift in the large scale anticyclonic circulation results in the observed winter to summer reversal in the alongshore wind component off the coasts of Oregon and Washington. A low pressure system is situated over the southwestern United States throughout the year. This semi-permanent thermal low is fully developed over the Central Valley in California during the summer. Cyclonic circulation associated with the low leads to equatorward surface wind stress parallel to the coast. The amplitude of the annual cycle is large. During the winter, both of these pressure cells weaken. The high

pressure system moves southward and the coasts of Oregon and Washington come under the influence of the intense low pressure system in the Gulf of Alaska.

The primary mechanism controlling the location and strength of the wind stress maximum and the associated coastal upwelling is described by seasonal variations in the gradient between the two pressure cells. During the winter, this gradient is weak. Strong heating over the continent during the summer deepens the low and increases the amplitude of the onshore-offshore pressure gradient. As a result of the northward shift and slight strengthening of the high, and deepening of the low, the region of maximum wind stress moves from the area south of Point Conception to the vicinity of Cape Mendocino. These variations are, of course, a function of differential ocean-continent heating related to the annual cycle of solar radiation.

### A. PHYSICAL IMPLICATIONS

The climate of the adjacent coastal regions is influenced by upwelling. During the summer, the dome of high pressure which develops over the North Pacific Ocean, favors large scale subsidence and a strong temperature inversion over the west coast of the United States. This suppresses deep cloud formation and greatly inhibits precipitation. Unpublished distributions of cloud cover, summarized from ship observations, show a large onshore-offshore gradient in the total cloud amount. Minima occur at the coast. The effect of the large scale subsidence is noted in the true desert climate of Baja California, and in the almost complete lack of rainfall along the coasts of California, Oregon, and Washington during the summer. Coastal upwelling primarily

influences the local climate of the nearshore zone within 10 km to 20 km of the coast and contributes to the formation of low stratus clouds and fog typical of much of the coast along California and Oregon.

A secondary mechanism may account for local intensification of the surface wind stress and persistence of coastal upwelling over periods ranging from several weeks to a few months (Bakun 1974). In a simplified positive feedback model, wind stress parallel to the coast brings cold water to the surface and cools the adjacent air. The resulting temperature contrast between the continent and the ocean increases the local pressure gradient. The alongshore surface winds are increased and upwelling is enhanced (Ramage 1971). This mechanism may be slightly modified by the effect of atmospheric stability. Within the summertime coastal upwelling zone, the air-sea temperature difference is usually positive. This stable stratification decreases the magnitude of the surface wind stress. The resulting negative feedback may partially offset the increase in surface winds associated with the described changes in the local pressure gradient.

The existence of maximum wind stress some 200 km to 300 km from the coast is an interesting feature. Of course, a maximum in the onshore-offshore pressure gradient offshore may explain this phenomenon. The positive feedback associated with wind-induced upwelling extending hundreds of kilometers off the coast may act to intensify the alongshore winds. However, this feature also suggests a coastal boundary layer which acts to frictionally retard the winds near the coast, leading to a positive wind stress curl in the nearshore region.

A characteristic feature of the wind stress curl distributions is the occurrence of a line of zero curl at some distance from the coast. Observations show positive curl inshore of this line and negative curl in the offshore region. A theoretical analysis suggests that a poleward undercurrent along an eastern boundary is favored by positive wind stress curl along the coast and a poleward decrease in surface heating (Pedlosky 1974). The monthly distributions of wind stress curl presented in this study are generally consistent with an equatorward Sverdrup flow offshore and a poleward Sverdrup flow near the coast, except in the region from Punta Eugenia to Punta Baja, where the wind stress curl is negative. The general pattern of positive wind stress curl along the coast and observations of the California Countercurrent (Wooster and Jones 1970, Wickham 1975), are consistent with Pedlosky's theory.

The Sverdrup transport balance expressed in Equation 6 may provide a simple and reasonable explanation for the existence of the currentcountercurrent system observed along the west coast of the United States. Transport calculations based on the July wind stress curl data for the line of 1-degree squares extending offshore of Cape Blanco (43° N latitude), show a net southward transport of 3.53 X  $10^{12}$  g sec<sup>-1</sup>. Within 300 km of the coast, an integrated northward transport of 2.20 X  $10^{12}$  g sec<sup>-1</sup> is required. Negative wind stress curl between 127° W and 133° W longitude is associated with a southward vertically integrated mass transport of 5.73 X  $10^{12}$  g sec<sup>-1</sup>. These values somewhat underestimate the total volume transport of the California Current (10 sv) suggested by Sverdrup et al. (1942, p. 724).

#### B. BIOLOGICAL IMPLICATIONS

Relationships among patterns of coastal and equatorial upwelling and the distributions of primary production have been discussed by Cushing (1969). Favorable conditions for phytoplankton growth are maintained within the surface photic layers by upwelling of nutrient rich subsurface water. Offshore divergence related to the vorticity of the wind stress effectively extends the width of the biological upwelling zone. Fronts may form in areas of negative wind stress curl just offshore of the primary coastal convergence, such as near Punta Eugenia. These fronts would tend to concentrate both the available food and the grazers within the same areas. This process may be important to the survival of fish stocks which spawn in this coastal region.

Seasonal changes in the surface circulation may also provide mechanisms for survival and possible separation of stocks along the coast. The current-countercurrent system characteristic of southern California suggests a mechanism whereby fish stocks could migrate seasonally from primary feeding grounds within the coastal upwelling regime off northern California to spawning grounds off Baja California.

A relationship between wind stress curl and the California Current system has been suggested. The data indicate that the poleward undercurrent observed along the west coast of North America may be driven locally by positive wind stress curl. However, a possibility does exist that the boundary current is not entirely the result of local forcing. Coastal areas may respond to wave-like disturbances propagating from other regions of the ocean, as in the case of El Niño (Wyrtki 1975).

A general requirement for vertically integrated northward Sverdrup transport along the coast apparently breaks down near Punta Eugenia where negative wind stress curl is observed (Figure 18A). Within this region, there must be southward vertically integrated Sverdrup transport.

With this consideration in mind, it is interesting to note the winter distribution of surface currents depicted in Figure 18B. The large scale pattern suggests two separate cyclonic gyres associated with positive wind stress curl within the Southern California Bight, and south of Punta Eugenia. In the region of negative wind stress curl, the indicated surface flow is toward the south.

Correspondences of features in the patterns of wind stress curl, surface currents, and winter distributions of the northern anchovy (<u>Engraulis mordax</u>) (Vrooman and Smith 1971) are highly suggestive (Figure 18C). A mechanism which could lead to formation of subpopulations of pelagic fishes in the California Current is described by Parrish (MS)<sup>4</sup>. Distributions of Pacific mackerel (<u>Scomber japonicus</u>) are similar to those for the Central and Southern subpopulations of northern anchovy shown in Figure 18C.

This study has demonstrated the utility of historical marine observations in describing details of surface properties over an area of the North Pacific Ocean. Resolution by 1- degree square and long term month is feasible when the seasonal cycle is large. This method

<sup>&</sup>lt;sup>4</sup> PARRISH, R.H. (MS) Environmental-dependent recruitment models and exploitation simulations of the California Current stock of Pacific mackerel (<u>Scomber japonicus</u>) Ph.D. Thesis, Oregon State University (in preparation).





FIGURE 18. Distributions of A. Wind stress curl, B. Surface currents, and C. Anchovy subpopulations. Wind stress curl is shown for September. Units are dyne cm<sup>-2</sup> per 100 km. The contour interval is 0.25 dyne cm<sup>-2</sup> per 100 km. Negative values are shaded. The winter distribution of surface currents is depicted in terms of 2-degree summarizations of ship drift data. Vector symbols are scaled according to the key on the chart. Units are cm sec<sup>-1</sup>. Large arrows suggest the split cyclonic circulations which develops off southern California and Baja California. The winter distribution of the three subpopulations of northern anchovy are shown in the bottom figure. Figures A and B are after Bakun and Nelson (1975). Figure C is after Vrooman and Smith (1971).

of summarization may fail in regions of sparse data, or in the tropics where long term fluctuations frequently obscure the seasonal cycle.

Summarization of these data by 1-degree square, month, and year often fails to produce consistent time series. The resulting fields may not be statistically significant if the mean values are based on too few observations. Objective analysis provides a method to obtain consistency in time and space. However, with these methods, continuity in time is gained at the expense of spatial resolution. An engineering approach might be used to calibrate the large scale analyzed fields in terms of the features evident in higher resolution distributions as presented in this report. The resulting time series could be related to fluctuations of marine biological communities which must respond to wide variations in environmental conditions on time scales ranging from a few days to several years.
## APPENDIX A

## MONTHLY SURFACE WIND STRESS DISTRIBUTIONS

The long term composite monthly mean surface wind stress distributions are displayed in Charts 1 to 12 as resultant vectors, in Charts 13 to 24 as the eastward components, and in Charts 25 to 36 as the northward components. The values are plotted in units of dyne  $\rm cm^{-2}$ . The month is indicated in the figure legend in the upper right corner of the charts. The two years displayed below the month, for example 1858-1972, correspond to the year of the earliest report and the year of the most recent report respectively. The coastline configuration is superimposed on the grid as a visual aid and does not represent a conformal mapping.

In Charts 1 to 12, the vectors are plotted according to the scale shown below the figure legend. The mean vector magnitudes are contoured at intervals of 0.5 dyne  $cm^{-2}$ . Contour labels have been omitted for clarity. Magnitudes greater than 1.0 dyne  $cm^{-2}$  are shaded.

Charts 13 to 24 display contoured values of the eastward component of the resultant surface wind stress. The contour interval is 0.5 dyne cm<sup>-2</sup>. Positive values correspond to eastward components. Negative values are shaded.

The northward component of the resultant stress is plotted in Charts 25 to 36. The contour interval is 0.5 dyne  $cm^{-2}$ . Positive values correspond to northward components. Negative values are shaded.

70



CHART 1. Resultant surface wind stress vectors for JANUARY.



CHART 2. Resultant surface wind stress vectors for FEBRUARY.



CHART 3. Resultant surface wind stress vectors for MARCH.



CHART 4. Resultant surface wind stress vectors for APRIL.



CHART 5. Resultant surface wind stress vectors for MAY.

Shaded areas > 1.0 dyne/cm<sup>-2</sup>



CHART 6. Resultant surface wind stress vectors for JUNE.



CHART 7. Resultant surface wind stress vectors for JULY.



CHART 8. Resultant surface wind stress vectors for AUGUST.



CHART 9. Resultant surface wind stress vectors for SEPTEMBER.



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CHART 11. Resultant surface wind stress vectors for NOVEMBER.



CHART 12. Resultant surface wind stress vectors for DECEMBER.





CHART 13. East component surface wind stress for JANUARY.



	137	136	135	134	133	132	131	130	129	128	127	126	125	124	123	122	121	121	0 119	118	117	116	115	114	113	112	111	
										5	X	3	_															
5		8.47	0.58	0.13	8.49	Ø.36	0.00	3.25	9.01	0.0	-Ø. 38	VA	NCOUVE	8 ISP														50
4			8.45	8.34	0.17	8.15	0.Z	0.15	Ø. 15	0.14	0.13	Ø.1	22	_	رح	-				TIONO		NDE	AA					49
48				8.68	9.36	Q.59	2.2	9.17	Ø:52	0.31	9.96	-0.2		~	2_	5			NH	PACIF	IC E	INE F	ISHE	RIES	GROUP	ICE		48
4				Ť	0.38	0.20	0.35	8.68	-6.39	-0.25	8.28	-0.1	0.1		6					М	ONTER	ΈY, Ι	CALI	FORNI	(A			
46					3 19					1.				2.1	, <b>~</b> co	UMRIG	RIVER			EA	ST	CO	MP(	DNE	NT			ľ1
	]				8010	2.30			0.20		0.43			}		LUNDIN	1170	•		SU	RFF	ACE	S	IRE	SS			46
4:					8.83	9.32	8.48	9.28	0.36	0.51	0.33	0.Z	9.2	2 8.24							( (	IYNE	CH-:	2 3		1		45
44					0.58	8-48	8.3	0.41	8.29	0.12	8.15	0.27	0.2	3.03	5													44
43					8.49	0.83	8.35	8051	0.45	0.89	8.58	0.44	0.19	ac	CA	PE BLA	NC D				LUN	IG TEI FO	ren m R	ERIN				43
42					8.36	0.74	1.36	9.33	8,49	0.37	8.29	0.28	0.1	0.26							F	EBR	UAR	Y				42
41					8.36	848	0.97	2.49	2.55	0.25	0.48	0.25	0.0	0.27	1						1	858 -	197	2				41
48			بـــــ ;	•••••	0.24	8.39	0.68	9.34	0.34	0.54	9.32	9.25	. и. 16	- (	CA	PE MENI	DOCING		L							;	1	47
120			?		0 70					a 73				}														
					0.23		0.30		0.33	0.32	3.32			8.10	4													39
38						-8.49	0.17	0.24	8, 20	0.30	0.27	0.29	9.21	0.38	0.2	3												38
37	j						0.16	0.26	0.26	0.33	8.22	0.24	0.3	9.41	2.3	) Ø.21												37
36							9.34	0.33	Ø. 15	9.28	8.33	Ø.25	0.22	8.17	3.2	2 0.33												36
35								8.36	8.38	0.37	0.26	Ø. 25	C. 19	0.29	0.3	0.27	0.2	•	GINT CO									35
34			;							0.27	0.29	1.26	Ø.34	0.37	0.4	2 2.41	0.3	8.4	4 8.1	2								34
33											8.24	0.19	0.20	0.31	9.3	5 0.48	0.4	7 0.5	59 Ø. 4	3.28								33
32	i		i		· :							Ø. 19		a. 23	3.3													32
21	····								3												1		1	~				
31												10. 104			0.2	2.30	· 0.3	> 0. 3	se <i>a</i> .s	. 40	0.20			1				31
39					: بـــــ								0.28	2.25	0.4	F-Øv52	0.3	3 0.2	24 Ø.1:	0.27	0.27	0.32		5	i.	1		30
29					::						: :			9.19	8.9	0.18	0.25	6.1	11 0.2	0.22	0.30	2.38	0.49	5	g	à		29
28														0.09	0.Z	0.04	0.0	Ø.6	2 0.1	0.26	ø <b>.</b> 13	0.29	0.29	PL	INTA EL	AINGO	1	28
27															Ø. 1	9.15	-2.1	0.3	91 0.2	0.23	Ø. 11	0.23	0.30	8.20	e.	Z		27
26									 ,							-0.88	9.2	20.0	14 8.1	6 0.03	Ø. 11 <sup>:</sup>	Ø. 11	0.21	0.2	0.24	5	}	26
25			:													-9.89	-0.18		9-0.0	0.23	8.25	0.14	3.11	0.2	0.25		2	25
24	;	· · · · · · · · · · · · · · · · · · ·			·													1.		-0.17		a. 20	a ao	a				DA
24				·					: j											-0.13	0.00		0.09	0.0	0.21	. 21	0.20	44
23		; 								بـــــ	;							-0.1	7~0.1	-8.24-	0.08	3.24	8.01	0.00	8 0.04	0.17	0.18	23
22																		-8.3	8-3.Z	-0.33-	8.24	8.85	-20.202	-0.01	0.64	8.86	0.11	22
21		1		:														8.3	9-0.3	-0.26-	9.19	8.26	2.28	-0.20	9.28	-0.01	8.92	zi
	137	136	135	134	133	132	131	130	129	128	127	125	125	124	123	122	121	120	119	118	117	116	115	114	113	112	111	

CHART 14. East component surface wind stress for FEBRUARY.







	137	136	135	134	133	132	131	130	129	128	127	126	125	124	123	122	121	120	119	118	117	116	115	114	113	112	111	1
		-								G	1	3	_	_														
50		8.78	8.59	8.43	8.44	0.27	0.3	0.42	0.41	0.12	9.53	VRJ	NCOUVE	R 151.R	NO												5	2
49			8.62	8.63	0.39	Ø. 37	0.17	8.43	9.20	Ø.29	0.14	0.3	22		ل م	-			10	TION		NC	AA				4	9
48				0.51	3.68	9.3	9.46	0.43	Ø.38	Ø.28	0.33	0.16	5 0.2	$\sim$	ير خ	5			MH	PACI	FICE	ENVIR	ONMEN	TAL (	GROUP	ICE	Ar	8
47					0.56	8.45	8.45	0.45	0.15	0.50	2.26	0.2	, ø.э	0.2	- 18						IDNTE	REY.	CALIF	DRNI	R			1
46					0.53	9.48	0.45			0 74				ě	; <b>~</b> ca	UMBTR	RIVER			EF	IST	CO	MPC	INE	NT		4	P
										0.34	0.20			}						SL	IRFI	ACE	SI	RE	SS		40	10
40	•-•-				0.43	0.94	0.55	8.57	0.50	0.51	0.51	2.48	• Ø. 19	9 8.2	5						C	DYNE	CM-2	2.)			4	10
44					0.59	8.36	0.33	0.42	8.52	2.58	0.58	-Ø.21	) 8.Z	3 0.00	5								-				4	4
43					0.39	0.21	8.71	0.28	0.24	0.53	0.42	0.21	0.1	0.05	CRF	e Blai	NC0				u	F	DR PR	HN			4	3
42					0.36	8.48	8.41	0.25	8.52	0.46	0.26	Ø. 38	Ø.2	0.13	3							APF	IL				4	2
41					0.28	8.37	0.43	0.21	Ø.33	0.32	8.58	0.46	0.1	) 9 Ø,13	÷.						:	1858	- 1973	2			4	1
40					0.34	0.22	0.29	0.30	8.43	0.28	0.21	0.35	0.2	0.13	CAP	'E MENE	001300		L			·					4	
39			 	• • • • •	9.38	0.30	0.23	0.21	0.38	0.36	Ø. 32	2.31	0.36															
38						0 29	a 36	<i>a</i> 26	3 20	7 79		a 47		1		0											2	3
						0.20	0.35	0.30	0.35	0.20	9. 34	101 4-3	<b>9.9.</b> 4			p.											3	5
3/			 				Ø. 16	0.29	0.28	0.32	0.48	0.47	0.5	0.72	0.50	0.43											3	7
36				•			0.31	0.37	0.32	Ø. 35	0.42	9.44	· 8	0.43	0.53	Ø.55	<u> </u>										31	0)
35								0.29	8.39	0.37	Ø. 37	2.33	0.42	0.33	0.46	0.54	ø.cd	P01	NT LON	CEPTI	Эн						3	5
34										0.25	0.34	0.24	Ø. 46	0. 14	B. 51	Ø. 56	0.72	0.75	0.28	2							3.	4
33											0.27	0.25	Ø. 35	0.49	2.57	0.57	0.74	Ø.83	Ø.66	0.48	1						3	3
32												2, 25	0.3	0.33	8.42	0.56	8.68	0.76	Ø.59	0.42	0.28		L				3	2
31			·	<i>د</i>								0.64	0.21	9.27	0.30	0.56	Ø.51	0.65	Ø.57	0,50	0.39	1	{	~	5		3	1
30		<u>ب</u> ــــ			; ;							L	9.12		9.22	A. 49	a 42		A 19									5
20	· ;			;		į	<i>ئ</i> ــــ																	1		7		
23			{	·····										0.00	0.19	0.29	0.23		0.30	10.35	0.43	0.49	0.50	2	Ľ	3		3
29										;				-0.03	8.04	0.20	2.22	0.19	0.37	0.42	0.33	0.45	9.48 5	PU	NTA EU	GENIA	P	3
27			; ;										: {		-0.26	0.04	0.08	0.07	Ø.32	0.25	0.38	0.37	2.49	0.49	~	r	27	7
26						;		:								8.09	-3.91	0.27	0.07	0.26	0.29	0.44	0.37	8.49	0.52	7	1 20	5
25																-0.15	0.00	-0.93	Ø. 11	Ø. 18	0.00	Ø.14	0.27	Ø. 39	0.47	4	29	2
24			:	;														2.61	-0.04	0.00	Ø. 17	0.07	Ø.25	Ø.33	0.42	0.43	8.482	44
23			ب	بـــــ :	 		   											-8.14	-0.10	-0.04	0.00	0.05	0.09	0.26	Ø. 19	9.48	8.432	3
22	• • •		·	i ,										; !				-9.22	-0.03	-0.18	-0.11	Ø. 18	0.04	Ø. 12	8.25	2.18	0.352	X
21			نـــــ :				 ,											-18.25	-9, 34	-8.18	-0.13	-8.77	-8.02	2, 22	0.02	8,23	1.250	
	137	136	135	134	153	132	131	130	129	128	127	126	125	124	123	122	121	120	119	118	117	116	115	114	113	112	111	

CHART 16. East component surface wind stress for APRIL.





CHART 17. East component surface wind stress for MAY.



CHART 18. East component surface wind stress for JUNE.









CHART 20. East component surface wind stress for AUGUST.









CHART 22. East component surface wind stress for OCTOBER.



	13/	130 135	134	133	132	131	130	129	128	127	126	125	124	123	122	121	120	119	118	117	116	115	114	4 11	3 112	211	
					1	8			8	-	3																ר
58		9.73 8.5	6 8.71	3.72	9.6	8.37	0.21	8.28	-0.00	3.00	VA	NCOUVE	R JSLA	NC.													56
49		8.8	1 8.73	0.57	1.48	8.48	0.34	0.28	9.91	0.00	-2.0	2-c	~	1 th	-						N	DAA				7	49
48			2.8	0.75	0.5	5 8.73	8.43	0.25	0.29	0.43	8.0	5-0.1	$\sim$	2	5			I NE	PRCI	FIC	RINE	FISHE	RIE	GROU	VICE P		48
47				0.96	0.52	9.78	0.95	0.41	0.63	0.23	8.3	5 8.1	3-8.21	6					EC		BEY.		FORN				47
48				10.98	8,45	0.89	Ø. 48	8.32	8.73	8.49	i)I	0.1	7-0.15	Ca	UMBIA	RIVER				131							46
45				0.79	0.56	0.38	1.54	8.55	0.55	3.64	8.3		2 8.05						31	יאר		С : -КО	1 ME 2 1	:55			4
44			 !	3.65	0.76	a. /1	0.92	0.52	0.54	8.45	0.2	3 9.1	0.01	:						•		G11	. ,				4
43				0.63	0.59	0.57	0.67	0.57	8.65	9.91	Ø. 23	9.13	0.05	Car	e a c	NC0				10	NG TE	ern M Ne	EAN				4
42				0.55	0.67	9.58	0.73	2. 48	8.27	Ø. 35	9.2	-8.8	1-8,18							i	NOVE	EMBE	R				4
41			 1	8.72	0.73	0.65	0.57	2.50	0.14	ø. <sup>3</sup> 51	Ø. 22	8									1854	- 197	2				4
40				0.58	0.58	8.36	8.48	0.59	8.21	9.05	8.2	. 0.0	-0.15	CRE	PE MENO	DOCINO		L								_	48
39				8.74	8,51	-1.51	8.41	9.25	8.25	0.42	9.14	()  -  0. 15	5 8.63														39
38					8.39	0.48	0.39	8.31	0.34	0.33	Ø. 36	0.18	9.13	8.11	2												38
37			4 4			0.28	8.39	8.29	0.28	2.25	8.32	9.26	8.27	9.20	3.12												37
36						2.53	0.32	8.29	8.25	8.25	9.21	<b>8.</b> 23	9.15	8.25	8.2	-											36
35							8.22	0.25	0.21	8.23	<b>ð.</b> 19	8.27	9.18	8.28	9.27	8.19	POI	INT CO	NCEPTI	DN							35
34									8.14	0.27	0.19	9.28	0.25	0.30	0.30	ø. 39	8.33	0.0	2								34
33										3.14	0.13	0.14	9.22	0.31	ø. 32	8.47	0.45	0.3	2 0.21	5							33
32							;				2.09	8.17	0.18	0.32	9.28	9.26	9.34	Ø.3	5 0.25	8.11		Ļ					32
31											0.08	0.09	0.25	3.13	9.33	9.21	0.33	9.3	9 0.30	0.21		(	$\sim$	$\sim$			31
3Ø												Ø. 16	9.02	2.26	9.20	9.19	0.34	9.2	<b>Ø.</b> 26	9.27	8.2		7	)			30
29													-8.94	9.02	0.83	0:52	9.97	Ø. 13	9.21	Ø. 22	9.25	9.18		2	2		29
28													-8.87	8.85	-8. R3	8.00	0.05	9.0	9.17	Ø. 19	8.24	8.25	2		UCENTR	1	28
27														-8. 87	8.11	-8.29	8.03	8.8	9.22	-8.22	Ø. 15	8.23	8.1	2	4	0	27
26															-8. 28	-0.18	8.23	-0.0	8.84	9.13	8.91	8.14	9.2	B 8.2	10	1	26
25															-8.13	-0.15	-9.99	-9.28	8.82	-9.04	0.09	0,00	0.1	8 Ø.Z	1	1	25
24								:									-8.12	-9.17	-2.15	0.81	9.20	10.00	28.9	1 9.1	6 9.1	8 8.1	924
23																	-8.39	0.2	0.28	-8.22	-8.85	-8.03	8.2	5 9.9	3 8.1	3 0.1	523
22																	-8.33	-0.41	-3. 37	-0.20	-9.13	-0.29	9.8	4 8.8	5 8.0	8.8	722
21	0					-		1		-							-8.42	-9.23	-8.28	-0.09	-0.12	-8.82	-8.8	6-8.8	5-8.8	5-8.8	921
	137	136 135	134	133	132	131	130	129	128	127	126	125	124	123	122	121	120	119	118	117	116	_115	114	113	112	111	_

CHART 23. East component surface wind stress for NOVEMBER.

NCC	- TDF	-11 -	ONE	DEGR	EE SL	IMMARI	ZATIO	DN									
13	7 136	135	134	133	132	131	130	129	128	127	126	125	124	123	122 12	1 120	119 118 117 116 115 114 113 112 111
	1	-	:	1		2 9 9			6		3						
50	8.3	5 8.75	1.01	0.57	8.48	Ø. 14	0,53	.21	0.75	-i.18	VA	COINE	ISLAN	a			
49		8.65	9.63	0.53	8.5	9.35	0.49	8.85	-10	-G. 10	2 01	i z	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	2		F	NOR
	·	-	1	-		-	\		arer.			~	-	2	ζ		NATIONAL MARINE FISHERIES SERVICE
••		<u>.</u>	8.00	(	I ICAAS	8.75	6.41	0.25	0.21	0.28	8.12		<b>\</b>	Z	4		MONTEREY, CALIFORNIA
47			; ;	1.12	8.90	8.83	0.28	0.58	9.68	0.55	8.3	6 8.83	-8.37				EAST COMPONENT
46		ļ		<b>7</b> 751	1.18	1.84	8.86	9.79	8.58	0.69	0.52	0.36	8.03	- COL	UMBIA RIVE	R	SURFACE STRESS
15				1.16	1.0	9.84	8.75	0.60	8.93	9.59	8.42	0.4	8.134				( DYNE CH-2 )
14	-	-		0.90	1.18	0.79	Ø.59	1.11	1.16	Ø.71	8 51	0.32	0.28				
13 13		1		1.20	0.88	-D 02	8.34	0.52	9.92	0.31	8.39	8.17	8.18	CAP	é blanco		" LONG TERM MEAN FOR
12				0.94	6.78	0.81	0.61	0.78	8.19	0.47	18:51	0.15	2.18				DECEMBER
±1				9.84	0.88	8.71	8.34	0.91	0.16	0.31	8.79	9.25	8.85				1862 - 1972
				3.57			9.72	8.20	g 20		a 25	- a a	6	CRP	E MENCOCIN	o L	
									0.00	0.27	0.20						
		¦		0,53	9.78	3.45	Ø.19	0.39	8.21	0.25	0.39	0.28	0.20				
38		; ;			0.53	9.33	8.28	8.45	0.17	9.11	9.19	0.15	0.13	-E.02	2		
37	ļ	ļ				8.55	8.37	Ø. 36	0.32	0.23	0.29	0.29	0.26	0.98	8.25		
36						8.50	9.42	0.37	9.22	Ø.25	0.25	8.22	0.09	ø. 16	8.19		
35					1		8.24	Ø. 16	9.14	0.32	0.28	9.14	0.23	Ø. 25	9.14 0.1	POTH	NT CONCEPTION
34									0.12	8.23	Ø. 16	Ø.22	ø. 18	0.14	0.21 0.3	12 8.ZZ	8.24
33										Ø.14	8.00	2.18	8.28	2.31	0.29 0.4	18 0.39	8.28 8.15
32										-	0.05	9.12	0.10	0.22	2.36 8.3	9 2.43	0.39 0.21 0.13 L
						·					9.91	0.29	0.18	9.18	0.16 0.2	28 0.14	8.33 8.31 8.17
													40.00	0 0C	3 10 9.5		
												0.05			0.15 813		D. 14 D. 20 D. 20 D. 20
	¦					·							-2.29	-9.19	8.85 8.2	25 Ø. 19	0.11 0.20 0.21 0.22 0.42
													0.14	-0.05	-0.83-0.1	3 8.18	0.31 0.02 0.26 0.17 0.18 PUNTA EUGENIA
27	<u>.</u>													8.21	-8.22 8.4	8 9.32	-27.02 0.34 0.20 0.16 0.18 0.19
26		1													8.22-8.1	15-9.53	-9.13-9.06-9.29 0.11 0.17 0.12 0.19
25					,										-8.32-8.2	26-0.15	0.00-0.05-0.16-0.05 0.03 0.09 0.16
24																-0.21-	-0.14-0.18-0.09-0.07 0.00-0.06 0.07 0.12 0.1
23		·														-0.35	-8. 18-9. 13-8. 16-9. 11-9. 25 0. 25 0. 11 0. 25 0. 3
																-9.37-	-2. 25-9. 14-2. 17-3. 23-9. 18 2. 82-5. 14-3. 25 2. 24
																-9.18	a 34-a 25-a 15-a 18-a 17-a a0-a 07-a 12-a a0
137	136	125	134	133	132	131	130	129	128	127	126	125	124	123	122 121	1 120	119 118 117 116 115 114 113 <u>1</u> 12 111

CHART 24. East component surface wind stress for DECEMBER.

137	136 135 134 133 132 1	31 130 129 126 127 126 125 124 12	23 122 121 120 119 118 117 116 115 114 113 112 111
		-Stop	
50	8.25-8.17 8.34 8.26 8.28	6.15 8.29 8.76 8. 5 8.52 VANCELVER ISLAND	
49	- 19 8.01-9.07 8.29 ( 3e 8.22 8.39 (	1.22 6/53 8.16 8.33 8.39 8.29 8.59 8.11 8.67 8.29 6.31 8.84 9.76	NOPA NATIONAL MARINE FISHERIES SERVICE PACIFIC ENVIRONMENTAL GROUP MONTEREY, CONTENDATED
47	2.18 2.15	1.25 8.98 8.19 8.28 8.48 8.82 8.65 8.43	
46		1.47 8.29 8.20 8.70 8.57 8.55 6.72 8.45	
45	8.31 8.35	1.39 8.22 8.28 8.38 8.67 8.36 8.57 8.15	
44	0.07 0.14 0	1.38 8.03 8.39 8.38 8.51 8.72 6.97 0.64	
13	9.09 9.22	1.62 (010-0.10 0.31 0.70 0.37 0.75 E.49	LONG TERM MEAN
42	8.28 3.45	1,55-9.35-9.56 8.15-0.11-3.48 0.58 8.23	JANUARY
41	0.11 3.99 2	1.25-0.11 8.27-0.37-4.21 6.08 0.06 8.54	1857 - 1972
40	-2.18 8:28-2	0.02 0.36-0.08-0.82 0.03 0.49 0.20 0.62	CAPE MENDOCINO
39	e. 37-9.05 2	1.13 0.51 0.31 0.03 0.37-0.09-0.01-0.10	
38	8.83-8	01-0.14-0.10-0.28 0.13-0.13-0.20-0.24-0.	
37		<b>1.26</b> 0.22-0.12-0.21-0.29-0.21-0.27-0.13-0.	20. 2. 02
36		21-9.09-0.14-9.03-9.72-3.14-9.96-0.77-9	30-2 23
			21-0 25-0 20
		6 10-6 10-6 21-6 20-6 17-6	POINT CONCEPTION
		6.13 0.13 0.31 0.22 9.3/ b.	35-8.35-6.45-6.15-6.11
		0.35-0.27-0.36-0.46-0.	59-0.57-0.55-0.45-0.25-0.11
		-6.35-9.34-6.42-9.	3
		-9.22-9.32-8.39-8.	22-2.31-8.23-9.53-9.41-8.28-9.26
		-0. 18-9. 47-9.	33-0, 38-6, 53-0, 56-0, 40-0, 42-0, 34-0, 38
		-9.25-9.	53-0.43-0.39-0.21-0.15-0.29-0.38-0.40-0.40
28		12. 53-2.	86-0.47-0.30-0.45-0.21-0.23-0.33-0.45-0.41 PUNTA EUGENIA
27			31-8.29-9.21-9.45-9.44-9.47-9.53-9.51-9.43-9.41
26			-2.32-2.33-2.45-0.49-2.51-2.52-2.58-2.52-2.38-2.49
25			8.55-0.48-0.59-0.28-0.45-0.44-0.71-(.13-0.41-0.33
24			-8.55-8.41-8.47-8.49-8.37-8.55-8.41-8.35-8.38-8.28
23			9.82-9.51-9.37-9.61-9.45-9.34-9.22-9.47-9.38-9.37
2			-0.55-0.94-0.44-0.53-3.59-0.50-0.37-0.27-0.38-0.35
21			-9.33-9.58-9.53-9.35-9.58-9.48-9.47-9.42-9.36-8.38
137	136 135 134 133 132 1	31 130 129 128 127 126 125 124 12	3 122 121 120 119 118 117 116 115 114 113 112 111

CHART 25. North component surface wind stress for JANUARY.

	137	136	135	134	133	132	131	130	129	128	127	126	125	124	123	122	121	120 119 118 117 116 115 114 113 112 111	_
					•			1		2		3							
50		8,76	8.50	0.05	0.18	0.35	Ø.2	3 3.2	5 8.25	8.7	0.55	VA	NCOUVE	R ISLA	0410				50
49			8.19	8.17	8.42	8.42	8.1	8 0.3	1 0.3	8.3	5 8.48	8.3	à.	-	X	•		NDAA	10
48				8, 17	0.37	0.19	0.6	3. 8.2	6 2.47	8.2	3 8.23	9.4	1 0.4	~	2	5		NATIONAL MARINE FISHERIES SERVICE PACIFIC ENVIRONMENTAL GROUP	
47					a 15				-					<u>}-</u>	- G	~		MONTEREY, CALIFORNIA	48
					0.13	D. 14			0.50	0.34	0.33		6 Ø. <3	1	1	-		NORTH COMPONENT	47
46	İ				P.26	Ø.22	2,5	6 8.1	8.26	0.5	3.42	3.6	5 Ø.27	8.6	3 COI	UMBIA i	RIVER	SURFACE STRESS	46
45					3,25	8,23	0.3	8.2	0.65	8.8	8.56	0.4	7 0.23	0.3	3			( DYNE CH-2 )	45
44					0.33	8.12	8.1	8.2	8.46	1984	8.37	0.8	1 6.4	8.3	3				44
43					8.36	8.95	8.4	5 10.95	8.48	0.33	8.51	8.4	1 0.7	8.2	CRF	E GLAN	C)	LONG TERM MEAN FOR	43
42					8.28	10.65	8.4	1-12. Z	-9.19	9.32	0.39	2.3	7 9.37	8.0	5			FEBRUARY	42
41					8.72	8.12	8.9	5) 2. IT	-0.11	0.15	2.54	8.2	3 8.33	-7)-	2			1858 - 1972	
12	· '	i			a. 15	8.94	0.9		10.03	9 27	0 20	 a w		1.6		E MENDO	GCINO	L]	
20	···;		<del>;</del>			~													40
23					12.23	0.00	10.22		-10.100		-0.20	12.10	L-D-11	-0.2	·	;			39
38		{				0. 17	0.12	-9.0	-9.13	3.98	-8.2:	-0.4	-0.46	2.4	3-0.25	8			38
37							8.01	-66, 16	-0.22	-0.12	-0.12	-8.3	0.35	-0.3	-0.37	-9.30			37
36							-8.00	-8.21	-0.25	-0.35	-0.23	-3.0	-0.27	-0.1	-3.42	-8.45			36
35								-0.15	-0.17	-0.29	-0.18	-2. 18	-0.24	-8.2	- 2651	-8.39	0.30	POINT CONCEPTION	35
34			!							9.26	-0.28	-0.32		-0.4	3-0.52	-0.71-	-1.53-	0.49-0.05	34
33						 , ,					-0.17	-0.30	-P. 47	9.0	-0.49	-0.65-	9.78-	8.54-8.28-8.18	33
32			i		·i			:				0.50		-0.5		-0.8%		a sana yana zana 12	37
21	····- :	: ;		4	{														
.51												-11. 61	1-10-50	-12-51		-0.59-		0.42 0.55 0.41 0.33	31
30					:						,		-1.63	-8.5	-0.80	-8.55-	-5.42-	-9.35-9.37-9.41-9.33-9.41	30
29								{					ļ	-0.2	-0.25	-2.49-	0.33	-8.33-9.39-2.38-2.47-9.47-9.49	29
28		j.		]		j								-12. 48	<b>Ø.</b> 26	-0.38-	9.56	8. 45-8.48-8.42-9. 48-9.59-9.54 PUNTA EUGENTA	28
27			;												-8.36	0.56	8.28	-8.48 8.00 0.51-9.50-0.70-0.52-0.47	27
26																-0.41-	Ø.33-	8.28-0.70-0.62-0.76-0.61-9.50-0.45-0.46	26
25													·			-8.45-	8.44	8.46-9.69 0.48 9.52 9.45 9.37 9.48 9.42	25
24	·				 !												-	9.57-8.65-9.55-9.55-9.47-9.45-9.55-9.44-9.34-9.34	b.
																			5
23		;																8. 30 B. 34 W. D. W. at W. DE W. 55 B. 32 W. 21 W. 38 8. 39	23
22																		2.31-2.09-8.58-2.25-6.15-2.54-2.45-3.50-8.38-2.31	22
21												1.0.0	105		1.0.0		F	<b>8</b> . 43 <b>8</b> . 48 <b>8</b> . 34 <b>9</b> . 32 <b>8</b> . 39 <b>8</b> . 39 <b>9</b> . 56 <b>9</b> . 23 <b>8</b> . 35 <b>9</b> . 33	21
	137	136	135	134	133	132	131	130	129	128	121	126	125	124	123	122	121	120 119 118 117 116 115 114 113 112 111	

CHART 26. North component surface wind stress for FEBRUARY.

	137	136	135	134	133	132	131	130	129	128	127	126	125	124	123	122 12	1 120	119 118 117 116 116 114 112 112 111
				1			1	-		-		-	120	164	_120	166 16	1 120	
50		-8.20	0.85	8.8	Ø. 19	5 8.85		1 0.2	8.5	0.0	0.35	VRJ	NEOUVE	P ISLA	CN			5
49			8.85	9.1	0.19	5 0.07	9.3	5 9.4	0.14	0.2	0.33	9.4	لجمح	-	SA		[	NOR
48				8. 12	-0.04	9.15	9.Z	2 0.19	9.19	Ø. 16	6.19	0.26	5 0.55	$\sim$	2	5		NATIONAL MARINE FISHERIES SERVICE
47					0.8	Ø.11	3.0	5 8.4	7. 91. 19	9.26	9.38	a. 54	0.2	1.	- 6	~		MONTEREY. CALIFORNIA
46	• • • • •				a 10		1	-	-	<u> </u>				ł	j Rođeni se		FR	NORTH COMPONENT
	• • • • •										0.13			1				SURFACE STRESS
4.					0.0					0.35	0.30	9.4	. 18.71	/	-			( DYNE CM-2 ) 45
44						-9.39	-8.2	0.85	0.19	0.16	-2.27	0,02	2 10.36	6.1	<b>;</b>			LONG TERM MEON
43					-0.10	-8.35	-0.20	8.2	0.31	0.17	8.85	0.14	i 0.35	3.0	CA	E BLANCO		FOR 4
42					8.17	-8.28	-6.0	-0.00	-0.41	-8.32	0.32	J. 44	-0.10	-9.9				MARCH
41					2.17	-0.14	-8.12	2-0.14	-01.53	-8.71	0.01	19.20	9.02	-0.1	į.			1857 - 1972 4
40					-0.37	-0.20	-0.3	8.21	<b>}0.1</b> 4	-9.48	-8.25	8.55	<b>e</b> .19	-0.2	E CAR	E MENOOCIN	NO	41
39					-0.41	-9.38	-0.24	-0.26	-0.33	-0-51	-0.56	0.55		-8.4	È			3
38						-8.13	-0.45	. 15	-2.18	-9.27	-8.46	-8.39	1.62	-0.67	-0.3	5		3
37		·				L	-8.43	-0.33	-0.27	-0.51	0.55	-0.53		-9.5	A. 44	-0.32		3
36			- <b></b> ,					-0.4	-0.44	-8.48	-0.53	48.47	-0.58	-8.3	-0.5	-1.55		
35		 }	· י		• • • - •	·		-9.39	-9.34		-0. 36-	-	-0.41	-15	And the	-7 69-7		
34	لاست									L							POIN	
22										Be OC				-	0.01	-0.74-9.0	01-19,40	
33											-10.64	-10, 62	-8.69	-10.76	-1-101	-9.69-9.	34-0.76	3
32												-8.50	-0.62	-0.78	-0.86	-0.36-0.	97-0.70-	-0.54-0.25-0.19
31												8.51	-E. 48	-2.50	-3-49	-2.63-9.	75-0.60-	-0.57-0.53-0.44 3
30								; ;					-0.56	8.55	-0.87	-0.84-0.	52-8.53-	-0.52-0.55-0.53
29			!						, , ,					-2.61	10.45	-2.55-2.	13-18.77-	8.53 8.55 8.59 8.59 8.59 2 2
28							•							-8.71	-0.61	8.69-8.8	63-9.61-	-0.57-0.53-0.51-0.58-0.60 PUNTA EUGENIA
27															-0.63	-2.52-0.	75-0.55-	-0.50-0.92-0.58-0.63-0.59-0.49 x 21
26								, , , ,								8.19-2.1	58-9.49	2.55-0.64-0.79-0.81-0.62-8.55-0.50
25								:								-2.35-2.	41-8.41-	-0.49-0.79-0.66-0.76-0.58-0.64-0.49
24			• • • • • • • •	4			•			 1							-8.48-	-0.46-0.53-0.53-0.70-0.51-0.55-0.40-0.43-0.4924
23		;	·														-8.31-	-0, 49-0. 48-0. 18-0. 55-0. 55-0. 58-0. 52-0. 48-0. 4423
22			·														-9.55	9.55-0.31-0.58-0.51-0.55-0.54-0.53-0.44-0.302
21	;																-	
~ 1	137	136	135	134	133	132	131	130	129	128	127	126	125	124	123	122 12	1 120	

CHART 27. North component surface wind stress for MARCH.





CHART 28. North component súrface wind stress for APRIL.

NCC -	TOF-11 -	ONE	DEGREE	SUMMARIZATION
				CONTRACT CONTRACTOR

<u>137 136 135 134 133 132 131 130 129 128 127 126 125 124 123 122 121 120</u>	119 118 117 116 115 114 113 112 111
2.68 8.23 8.82 8.17 8.88-9.81-6.82-8.89-8. 8 - 0.82 VANCOUVER 15. 340	
B. 16 8. 13 8. 43 8. 82 8. 82 8. 12 8. 85 8. 17-6. 18-8. 80 B. 87 8. 85 8. 83 8. 89 6. 12-8. 08 8. 84-8. 49-8. 84 8. 84	NDAA NATIONAL MARINE FISHERIES SERVICE PACIFIC ENVIRONMENTAL GROUP
0.60-0.10 0.01 - 0.01-0.11-0.11 0.00 A.03-0.22-0.03	
6 -8.16-8.18 8.89-8.84 0.06 8.81-0.11-8.32-9.17 COLUMBIN RIVER	
5 8.88 0.83 4.60-0.12-0.14 0.16-0.10-0.21-0.38-0.20	LOYNE CM-2 1
4 0.04 0.00-0.11-0.13-0.12-0.27-0.22-0.27+0.00-0.15	
3 0.03-0.25-0.39-0.24-0.23-0.42-0.25-0.14-0.07-0.23 CAPE BLANCD	LONG TERM MERN
2 -8.12-8.24-0.22-8.50-8.82-8.28-0.45-8.64-1.31-8.73	MAY
1 -0.21-0.22-0.26-0.24-0.54-0.82-0.79-3.74-0.92-0.04	1857 - 1972
CAPE MENOCINO	
-8.26-8.36-0.22-9.28-9.49-0.78-0.30-1.19-1.19-1.20	
3 -8.43-8.37-8.48-0.56-0.61-8.85-1.85-1.96-1.11-2.57	
9.42-9.51-9.73-9.89-9.52-9.38-1.25-1.13-0.88-9.59	
-0.57-0.61-0.69-0.68-0.35-0.86-1.81-0.75-0.86-0.90	
- 0.55-0.54-0.78-0.91-0.99-0.02-0.89-9.30-0.77 POI	NT CONCEPTION
4 - <b>8.7</b> 9- <b>8.6</b> 3- <b>8.</b> 94- <b>5.</b> 31- <b>8.</b> 97- <b>4</b> .54- <b>8.</b> 85- <b>5</b> .83- <b>8</b> .56	-0.01
- <b>0.</b> 59-0.71-0.83-0.55-0.95-0.55-0.77	-2.34-0.10
-2.86-9.35-0.93-1.24-1:28-0.77-0.71	-8,49-6.24-8.15
- <b>8.78-8.75</b> -3.64-8.55-8.75-0.83-2.59	-0.58-0.45-0.48
-0.81-0.96-0.82-0.70-0.74-0.76	-0.70-0.58-0.57-0.55
-7.72-2.73-8.62-6.51-8.68	-0.73-0.58-0.62-0.63-0.55
-0.52-3.57-8.83-8.54-8.74	-0.55-0.58-0.58-0.57-0.50 PUNTA EUGENIA
-0.50-0.66-0.59-0.72	-0.56-0)49-0.78-0.77-0.51-0.59
-8.76-8.53-8.79	-0. 59-0. 50-0743-8. 78-0. 30-0. 58-0. 51
-0.14-0.58-0.58	-0.72-0.78-0.57-0.67-0.30-0.68-0.51
₹.5a	-0.71-0.63-0.58-0.89-0.65-0.51-0.56-0.49-0.44
-8.45	9.51-9.52-0.77-9.63-9.82-9.63-9.53-9.58-9.47
-8.46	-0.72-0.)17-0.69-0.69-0.71-0.74-0.61-0.68-0.50
-2.48	-0.49-0.50-0.39-0.92-0.43-0.70-0.50-0.47-0.45
137 136 135 134 135 132 131 130 129 128 127 126 125 124 123 122 121 120	119 118 117 116 115 114 113 112 111

CHART 29. North component surface wind stress for MAY.

NEC	-	TDF-11	-	ONE	DEGREE	SUMMORIZATION
		101 11				JOINEGITTUN

	137	136	135	134	133	132	131	130	129	128	127	126	125	124	123	122	121	120	119 118 117 116 115 114 113 112 11	1
					-					6	Ľ.	2								
52		0.08	0.03	0.19	3. 2		. ø.ø	5 8.0	0.2	-0.4	5 0.09	V9	NEQUVE	P 15LA	ND DAN					50
49			a. 13	a.a	. 01.04		i ana		-0 22			2	5	-	v,			1	NDGO	ľ
	]							June .				-2-1:	~~~		5~	2			NATIONAL MARINE FISHERIES SERVICE	49
48				0.8	0.2	3-18.11	9.0	2 0.0	-0.29	-0.1	-0.25	-Ø.23	0.8	5	7	5		ĺ	PACIFIC ENVIRONMENTAL GROUP	48
47					0.3	1.0	0.0	8 8.8	-0.20	-8.3	1.54	-9.21		-0.0	6				NORTH COMPONENT	47
46					8.2	5-8.14	-0.0	5-0.2	-Ø. 13	i-9.3	3-9.36	-	i-9. 23	2-0 0	÷ co.	.UM8[A	RIVER	,	NUNTH CUMPUNENT	
	•••••					<u>.</u>		4						}	-				SURFACE STRESS	4
45					-18. 84	<b>-8.1</b> 7	-Ø.2	7 0.00	0.38	-8.43	9-0.29	-8.23	9.37	-0.2	4				( DYNE CH-2 )	4
44					<b>-0.</b> 17	-8.31	-0.2	50.7	0.19	0.1	-0.33	2.45	-0.50	-0.2	i i					4
43					-0.19		-8.3	1-0.2	-8.81	-8.61	-0.63	-0.76	-0.73	-0.Z	7 7: nee	-	NCB		LONG TERN MERN	4
12													5	·+			neu		IIINE	ſ
					10 a 2 a			4			1.02	-9.79	-1.eZ)	-0.5	2				1858 - 1972	4
41					-0.24	-8.26	-0.4	3-05-45	-0.61	-0.71	41.17	-1.07	-1.18	-8.7	4					4
40					<b>Ø.</b> 31	-0.32	-0.4	3-3.83	-0.52	-1.00	-a. 96	-(.52	41.34	1.9	CRE	'E MEN	UOCINO	]		46
39					-9.41	-0.51	-8.5	0.53	-0.79	-8.91	-1-19	-1.3		() (	Š.					
				••••	-	Ý									-					
38						-9.54	-9.7	-8.7	-9.88	-0.94	k-1.13	-1.23	-1.37	-1.2	9.67	R.				38
37		]					9.6	-0.71	-0.30	-1.83	-1.03	-1.15	-1.23	-1.39	9.97	-0.5				3
36							-9.6	9.84	-8.87	-1.18	-1.11	-1.15	-1.18	-000	3-1.26	-1.2				38
35	د :	;						-8.74	-0.69	1. 25	-Ø.98	-1.17	-1.03	(-1. 1/	i-1.92	-8.8	-0.7			30
3.4																		For		
										8.00				- 1.0 64			-0.0			34
33				;							-0.87	-Ø. 91	-1.05	-1.0	-1.01	-1.5	-0.85	5-8.54	-0. 273. 05	33
32							•					-0.87	-1.32	-0.94	-1.20	-3.3	-3.82	3-0.62-	8.48-0.15-0.28	32
31												-9.81	-9.55	-6.0	-0.53	-9.8	-0.82	2-2.71	-0.61-2.45-0.35	31
30			¦					3 1					La 70							L
	{												2.75					- <b>8.03</b>	D. DO . D. D	134
29			; ;;											-0.60	-9.81	-2.55	9.61	-0.62-	-9.52-9.52-9.53-9.53	29
28														-0.53	-8.57	-0.66	-0.59	0.51	-0.58-8.53-0.44-0.54-0.53 PUNTA EUGENTA	48
27			· · · · · ·												9.65	-8.58	10.45	0.37-	-9.53-0.58-0.55-0.58-0.30-0.56	27
26	ہــــ		<i>ب</i> ــــ					 							-	9.47	-2.5	-0.43	-7.51-9.58-9.55-9.67-9.69-9.50-0.46	PF
25	· • • • • •		;														1.00			٢
25	÷															-8.41	-9.47		-9.54-0.45-0.56-0.52-0.54-0.68-0.43	
24			j															8.48	-0.25-2.39-0.51-3.53-0.53-0.53-0.47-2.38-0.	3324
23																		-0.34-	-2.54-0.52-0.55-0.42-0.44-0.48-0.50-0.	3523
22	;											J						-0.39-	-0.49-0.44-0.11-0.45-0.58-0.52-0.37-0.44-0.	4422
75	i	·;										,							A 44 0 41 A CZ A 72 A 20 A 40 A CL 2 44 A	300
- 1	197	136	135	134	199	132	131	130	120	178	127	126	125	1.24	123	100	121	120	110 118 117 16 115 114 13 12 2	-
-	1.0	100	100	104	175	192	121	100	143	120	161	120	163	164	163	166	161	120	TTO TTO TTV 'tO TTO TTO TTO TTO TTO TTO	*

CHART 30. North component surface wind stress for JUNE.

	137	136	135	134	133	132	131	130	129	128	127	126	125	124	123	122	121	120	119 118 117 116 115 114 112 112 11	
					-					-	-	2				166	1-1	10	<u>113 110 117 116 115 114 113 112 11</u>	
50		-	8.00	8.84	-0.2	5-0.84	-Ø. 2	2-0.2	9.30	0.4	-0.14	VA	NEOUVE	R ISLA	ND					50
49			0.81	-8.85	3.0	0.13	-0.0	1-0.19	Ø.25	-0.35	-0.25	0.2	j.		X	•			NDAR	10
48			-	-0.94	-9.85	3-0.17	-0.2	4-2.17	-2.30	-6.51	A. 15	·····	7-0.0	$\approx$	5	3			NATIONAL MARINE FISHERIES SERVICE PACIFIC ENVIRONMENTAL GROUP	43
17					L		-0.7							<u>}-</u>	6	~			MONTEREY, CALIFORNIA	48
								2-2.40		-18.3/	-10.30	-10. dt	s−8.24	-9.5	-				NORTH COMPONENT	47
40		ļ				L-9.48	-0.1	8-0.3	2-18.34	-9.38	-2.47	-0.5	2 <b>63.</b> 41 	1-0.7		.09819	RIVER	4	SURFACE STRESS	46
45					-9.26	-8.26	-3.4	8-8.44	-0651	9.5	-0.54	-6.6	7-10-55	3-8.2					COTNE CH-2 1	45
44					-0.21	-0.37	0.4	4-8.55	-0.4	-0.58	-0.81	-9.7	2-0.3	0.3						44
43					-0.18	-8.23	-8.4	7-0.81	-8.69	-9.89	-2.94	-1.11	0.8	-9.5	CRI	PE BLA	NCD		LONG TERM MEAN FOR	43
42					-0.3	9.51	-0.5	7-0.51	-0.96	-1.99	-0.95	-1.10	-1~5¢	3-1,19					JULY	42
41					9.0	-0.58	-18.6	8-8.74	-0.74	+1.22	-1.31	-1.39	2:3,0 ≹~1.42	2-1.28	≱				1858 - 1972	41
40					-8.44	-0.19	-0.6	3+1.22	40.85	-1.01	-1.29	-1.2	-1.49	- (	CAI	PE MEN	DOC INC	- I		47
30					-	1	-0 5	7-0 0		- f	-1 31									
20									1		1.01				1	-				39
30						-6.00	-10. /	919, 05	1.03	-1.89	-1.24	-1.34	-1.47	-1.2		7	-			38
37							-0.6	5-9.83	-1.87	-1.12	-1.19	-1.18	8-1-13	-1.2	0.7	-0.34 	i i			37
36							0.6	5-8.84	-9.95	-1.15	-1.14	-1.14	-1.15	2-9.30	×1.pt	-2.65	~	-		36
35								-9.85	-0.90	1.84	-1.03	-1.18	-1.14	-8.8	-9.90	-0.86	-0.5	P01	NT CUNCEPTION	35
34										-9.85	-0.97	-1.31	-1.11	-1.5	1.0	-0.95	3.8	5-0.34	-0.04	34
33											-0.50	-1,62	-0.8	-0.9	-0.7	-6.96	-0.7	8-0.51	-0.22-0.07	33
32			:						1			-0.93	-0.58	-Ø. 81	-0.78	- 2.86	-0.7	3-8.63	-0.42-0.22-8.10	32
31	     											-0. 87	-8.76	-2.5	-0.7	-8.78	-0.7	3-12.69	-F. 49-0.36-0.33	31
32												·	-1.64	-0.75	 	-0.66	-9.5	9-0.58	-0.12-0.45-0.42-0.39	30
29	· ;												<u> </u>	-9.65	-0.75	-8.71	-9.5	2-7.55	-9. 42-9. 45-9. 47-9. 43-9. 5N	20
28			ئــــ. :																	20
20				 										0.00	0.00	0.30	2.3		PUNTA EUGENIA	
27			·											( 	-9, 56	-0.5	-0.5	2-8.44	-0.45-0.45-0.44-0.44-0.43-0.34	27
25																-8.43	-0.5	7-0.52	B 50-0.36-0.42-0.37-0.46-0.34-0.29	26
25																-9. 19	-0.49	9-0.39	-2.46-0.35-2.47-3.39-8.41-3.37-9.25	25
24		j.		:														10.50	-0.44-0.41-0.43-0.37-0.59-0.36-0.38-0.19-0.1	724
23																		8.58	-8.42-2.32-3.39-8.36-8.33-8.33-2.27-8.28-8.1	923
22			;											;				-0.32-	-0.45-2.47-0.39-0.41-0.45-3.27-0.26-0.21-0.1	722
21								4										-0. 28	-0.54-0.33-2.38-9.19-0.28-0.58-0.31-0.17-0.1	92:
-	137	136	135	134	133	132	131	130	129	128	127	126	125	124	123	122	121	120	119 113 117 115 115 114 1 3 . 2 .11	

CHART 31. North component surface wind stress for JULY.

	37 1	36 1	135	134	133	132	131	130	129	128	127 1	26 12	5 12	4 123	122 121	120	119 118 117 116 115 114 113 112 111
									-	6		-					
50	8	. 87	1. 06	-0.03	-9.1	5 0.1	.1	9.2	1-0.1	-8. J	-0.01	VHNCOUN		LAND			
49		F	8. 23	0.00	-8.2	5-9.1	5-3.1	-0.2	<b>9-9.</b> 3	3-6.41	-0.15-0	.03-2	-	V	•		NDPA
48				-8.13	8.0	-3.0	-2.0	-0.2	8-0.2	-8.35	-0.39-0		~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	2	3		NATIONAL MARINE FISHERIES SERVICE PACIFIC ENVIRONMENTAL GROUP
47					-a 1								7	6			MONTEREY, CALIFORNIA
			· ;				Bre Br	Dec				. 30-10:					NORTH COMPONENT
40						-8.2		-9.3	1-0.3	-9.36		.52-0.	37-8.	25 ***	TOURIN KIAFH	(	SURFACE STRESS
45					-0.0	-0.2	-9.2	-B.4	ð-0.20	3.64	-8.45-3	.39-0.	41-8.	49			( DYNE CM-2 )
44				*	-0.34	9.3	-6.15	-0.3	0.4	3-10.58	8.53-8	GB-8.	3-0.	17			
43					8.3	-0.2	9.37	-8.4	60.62	-2/47	-0.83-0	.91-0.	59-0.	49 CA	PE BLANCO		LONG TERM MERN
42					-0.26	8.3	-8.41	-8.Z	-0.37	-0.77	-0.63-0	.87-1.	0.	63			AUGUST
41					9.23	-0651	-0.4	-8.7	-8.67	-8.89	2.99-1	.07-0	19 0.	36			1857 - 1972
40					-0.41	-0.51	-0.48	1.2	8.9	-0.96	-1.17-1	.Ø1-1	12-1.	CR	E MENODEIND		
39				•••••	0.19	8.57	-0.52	-0.7	-0.90		-1.03-1	. 19-1.					
38					2	-1.51	-20.54	-0.6	- <b>6</b> .91	-9.84	-1-05-1		2-1	A			
37					• • • • •		1	-0 7			finif.	art.			4		
													2-10.	3/-0.7	10.40		
							-0.01	-0.64	-18.74		-0.93-0	.92~10	57-10.	59-9.8	-8.74	1	
35 								-8.5	-0.59	-9.92	-0.95-0	78-0.	8-0.	36-9.9	-0.77-0.5	P01	NT CONCEPTION
34				: • • • • •		; ;				-8.72	-0.88-0	77-1.	40.	95-0.8	-0.73-0.75	9-0.48	-8.84
33				:							2.74-0.	92-0.8	5-0.	84-8.7	-6.78-3.78	3-0.81	-8.21-3.08
32			j.			, 					-7.	78-0.	ō-0.	76-Ø.9	-0.97-0.76	9.63	48.12-8.21-8.12
31											-8.	69-0.6	7-9.	75-0.7	-8.75-0.55	-0.53	-0.49-2.36-0.33
32				1								-0.1	1-8.	54-10.74	-0.69-0.63	3-11.59	-0.40-0.37-0.36-0.34
29						/							-8.	51-3.6	-0.46-0.52	-8 49	-9.43-9.31-9.43-9.42-9.41 2 A
28				·;				*					-a.	8-9.5	-9.57-9.45	-8.52	-0.57-0.39-8051-0.48-0.48
27				 									-	-9.5	-8.68-0.43	.32	-0.23-0.47-0.41-0.36-0.41-0.34
26				·										-	2.51-0.5	-9.45	- 44-9, 43-9, 29-9, 37-9, 41-2, 31-9, 78
															0. 40.00.50	2.43	D. R. D. RO D. 35 D. 51 D. 53 D. 53 D. 20 (
		- <u>.</u>		·												0.60	-0.30-0.31-0.39-6.40-0.25-0.26-0.26-4.23-0.16
23																-8.34	-0.50-2.31-0.17-0.28-0.36-0.29-0.26-0.21-0.17
22													ļ			-8.41-	-0.34-0.39-0.43 0.06 0.00-0.34-0.20-0.25-0.13
21		1	ł	:								1				8.39	-0.34-0.23-0.15 0.02-0.23-0.23 0.36-0.22-0.19
13	57 i3	6 1	35	134	133	132	131	132	129	128	127 12	6 125	12	4 123	122 121	120	119 118 117 116 115 114 113 112 111

CHART 32. North component surface wind stress for AUGUST.

1	37 136 135 134 133 132 13	31 130 129 128 127 176 1	25 124 123 122 121 128 119 118 117 116 115 114 113 112 114
		and a	
50	8.29 9.45 0.00 0.45-6.13 8.	. 22-0. 28-0. 14 0. 12- 0. 03 VHICO	LAVER IS, MD
49	8.24 8.85-8.06-3.87-8.	. 34-8.82-8. 88-8. 15-8. 14-8.82	PAGN NORA
48			NATIONAL MARINE FISHERIES SERVICE
	10.31 0.05 0.01 0.	18 0.103-0.32-8.44-0.13-9.04 U	MONTEREY, CALIFORNIA
47	FB. 84-8. 33-8.	.25-2,55-0.32-0.48-0.25-0.03-0	NORTH COMPONENT
46	0.84-0.25-0.	. 19-0. 19-0. 44-0. 39-0. 48-0. 42-0	A 25 0.00 COLUMBIA RIVER
45	-0.13-0.49-2.	37-0.29-0.32-0.63-0.22-0.74-0	
		. 30-6. 52-10. 50-6.48-10. 41-8. 17-0.	
43	8.28-9,55-0.	. 39-0.91-0.61-0.76-0.85-0.47-0.	1.55-0.26 CRPE BLANCO FOR
42	-0.28-0.35-8.	52-8-17-8.49-8.63-8.99-1.20-0.	SEPTEMBER
41	8.55-8.55-8.	43-8.78-8.49-9.51-1.23-1.48-6	1854 - 1972
	La racia		CAPE MENDOCING
		.54-9.75-9.76-9.53-9.74-9.34-2.	
39	-0.54-0.53-0.	.65-0.73-0.78-(.05-0.92-0.57-1.	,03-0.7
38	8.40-0.	57-8.65-8.73-8.99-8.89-9.87-8	. 89-0. 81-0. 3412
37	-0.	.55-8.79-8.88-9.95-8.84-2.87-9.	0.929.85-8.52-8.38
			. 74-6. 65-8. 75-6. 65
35		-8.75-8.89-8.87-3.75-9.73-6.	.72-3.71-0.59-0.63-0.51 PGINT CONCEPTION
34		-2.67-3.88-3.08-4.	.71-9.86-9.72-3.73-3.77-0.35-9.09
33		-8.77-6.73-6.	1.72-0.78-3.59-3.56-0.83-0.62-0.23-3.11
32		-0.63-4	
			. 50-0. / 0. 54-0. 91-0. 55-0. 55-0. 47-0. 39
3Ø		-9.	1. 58-2. 57-3. 52-0. 72-0. 61-8. 48-2. 59-2. 47-9. 46-6. 44
29			-0.53-0.55-0.57-2.52-0.44-0.53-0.37-0.49-0.52-0.53 V D
28			-0.66 -0.45-9.39 9.51-0.15-9.53-0.49-0.24-0.43-0.47
~~~~			- A 13-12 SL-2 33-2 SZ-2 SZ-2 17-2 JOHD SL-2 46-2 72
	· · · · · · · · · · · · · · · · · · ·		
20	·····		-0.62-0.72-0.64-0.41-0.67-0.56-0.68-0.42-0.38-0.23
25			-0.69-0.64-0.49-0.65-0.58-0.54-0.43-9.56-0.42-0.29
24			-0.63-0.56-0.68-0.44-0.53-0.52-0.39-0.31-0.22-0.13
23			-2.75-0.78-2.62-0.61-0.48-0.51-0.34-0.48-0.27-0.14
22			-2. 14-9. 45-0. 23-0. 33-0. 30-0. 30-0. 30-0. 23-8. 28
-'L_		21 120 120 120 127 126 11	
12	1 1 1 1 2 1 2 1 2 1 2 1 2 1 3 1 3 2 1 3	11 130 123 140 14/ 140 14	CD 164 163 166 161 167 119 110 11 110 11

CHART 33. North component surface wind stress for SEPTEMBER.

						1		1	4		-			_	-	-	_			1
1 1-							1			3	2	3								
۶Ø		8.77	8.66	8.51	0.22	0.52	0.31	0.15	0.32	0.21	0.2	VA	NEQUVE	A 150	IND					52
49			8.67	0.51	2.33	0.5	0.32	0.39	0.39	0.31	0.27	0.3	2-	-	12	•		Γ	NDAR	AC
48				8,56	0.26	0.2	2.14	0.55	2.5	0.28	0.29		1 1.5	$\sim$	5	3			NATIONAL MARINE FISHERIES SERVICE	
-		·		-		1								<del>]</del>	6	~			MONTEREY, CALIFORNIA	48
-								0.24	10.20	0.31	0.29	9.41	5 6.4t						NORTH COMPONENT	47
46	;		ļ		0.15	8.12	-9.22	-0.09	0.07	0.05	0.26	0.0	0.3	3 Ø. 1	5 COL	.un8[A	RIVER	R	SURFACE STRESS	48
45 -			;		0.24	-0.05	8.83	0.13	-0.07	0.39	0.64	<b>ə.</b> 2	0.2	2 2.2	i.				DYNE CH-2 1	45
44					0.17	-0.02	-0.15	-8.67	-0.15	9.28	-0.02	-8.11	0.12	0.2	7					44
43					8.21	0.09	2. 38	9.33	-0.09	8.86	<b>-Ø.</b> 21	-3.19	-0.20	0.0	CAF	E 6LAN	100		LONG TERM HERN	43
42					Ø. 12	-9.06	-0.11	-9.83	-0.46	-0.21	-0.22	-18.45	-0.3	-0.2					OCTOBER	47
41		i. 	i		-91.96	-9.00	-0.02	-9.16	-0.16	-a. 20				····)-	-				1854 - 1972	
-														(	CRE	E MENO	00 I N0	o L		41
41				[	10-14	9.42		-10.31	-10- 38	-9.29	-0.38	-0.55	-0.7	-8.19	•					42
39 -					0.35	-0.21	-0.15	-9.29	-0.33	8.37	-0.65	-1:91	-0.67	-9.6	<u>L</u> .					39
38	<u>;</u>					-9.15	-8.29	-8.48	-3.45	-0.54	-0.53	-g.62	-Ø.CE	- <b>0.</b> 5	-3.28	8				38
37							-2.27	8.45	-0.51	-0.61	-2.54	-2.67	-2.70	-0.05	-3.73	-1.29				37
36				1			-0.37	-8.46	.51	-0.54	-2.69	-3.74	-6.54	-0.46	-0.72	-0.51				38
35								-8.47	1.53	-8.59	-10.56	-13.68	-C.57	-0-50	-0.50	-0.57	-2.44	5 NOT	CONCERTION	35
34										4 52	-0 55					-0.04	····			
		·		·	4					0.00	0.00							1	- Carl	34
33	į.										-12.51	-0.55	-0.72	-0.68	-9.65	-0.72	-2.60	0-0.44-0	.22-9.11	33
32				j								-9.54	-9.58	-6.84	-Ø.76	-id. 59	0.58	8-0.50-0	.41-9.25-9.17	32
31				;	، نہ ـ ـ ـ ـ ـ							-9.59	-0.58	-0.53	-0.63	-0.68	-9.47	7-9.39-0	46-2.41-0.32	31
30							1		:				9.54	-9.52	-9.54	-0.17	-3.54	1-9.44-9	.45-8.35-8.42-8.42	30
29	1													-0.47	-2.44	-9.52	-10.41	1-8,52-8	53-3.45-0.48-0.54-0.48 28 2	29
28					·	نى ـ ـ ـ ـ ـ ـ ;		 ;	· • •	· · · · · · · · · · · · · · · · · · ·				-18.37	-0.41	-0.58	-0.43	3-0.45-0	.38-3.35-3-58-3.45-9.46	28
27			-ئــــ :	· · · · · · · · ·	 !	 :					4				La 24	-0.20			12-10 JE-1 JE-10 J	27
															0.34	0.32	1.45			C
20						;		i								-2.45	12.53	3-2.57-0	.49-0.52-0.11-0.44-5.46-0.45-0.39	26
25						:										-0.43	0.49	9-0.47-8	.52-0.46-0.5-0.46-0.46-0.49-0.35	125
24																		-7.51-0	.58-0.49-0.39-0.54-0.36-0.34-0.37-0.33-0.	2824
23	1						1											-0.58-0	.50-0.52-0.52-0.42-0.43-0.43-0.30-0.31-0.	3123
22						لہ ہے ۔ = = ۱ ۱	 1 1 1	i										-3.45-8	.56-0.48-0. 37-0.31-0.32-0.32-0.34-0.48-0.	2422
21								· i	4									-0.35-0	36-0.26-0.58-0.36-0.40-0.25-0.41-0.33-0.	342:
	37	136_	135	134	133	132	131	130	129	128	127	126	125	124	123	122	121	120 1	9 118 117 116 115 114 113 112 11	

CHART 34. North component surface wind stress for OCTOBER.



1	37 136	135	134	133	132	131	130	129	128	127	126	125	124	123	122	121	120	119 118 117 116 115 114 112 112 1
	1						1		6		Z.				I to to			115 116 117 116 115 114 115 112 1
50	0.65	0.65	0.25	9.55	0.69	0.3	0.90	0.7	0.12	E-0.17	UN VA	INCOUVE	2 ISU	1N8				
49		B. 47	0.39	0.52	0.51	-0.5	0.41	Ø. 1	9 85.58	0.23	0.4	à	~	NY Y			[	NDRA
48			0.16	E. 02	0.36	Ø. 31	0.45	B.2	1 AU53	-0.05	20.1	3 8 5	$\sim$	5	3			NATIONAL MARINE FISHERIES SERVICE
													)	6	~			MONTEREY. CALIFORNIA
				80.04	0.09	0.3	. 6.23		\$ 0.31	2.72	0.5	20.3	s 2.3	3				NORTH COMPONENT
40		¦		0.22	0.44	0.24	10.20	0.4	3 0.38	0.71	0.7	7 0.6	2 0.6	Ca	LUMBIA	RIVER		SURFACE STRESS
45				Ø.21	0.59	8.47	0.40	0.2	5 Ø.28	0.39	DAF	8 8.5	2 0.8	ġ				( DYNE CM-2 )
44				2.15	Ø. 38	9.25	8.23	0.1	3-0301	0.38	0.1	1 0.2	0.5	Ę.				
43				0.05	Ø. 18	-(0.1)	0.15	0.3	0.15	0.24	0.3	5 65	2 0.5	, CA	PE BLAK	NCO		LONG TERM MEAN
42		 		0.42	Ø. 12	0.25	-0.92	Ø. 16	8.60	0.27	-3.1	6 0.19	9 0.2	-				NOVEMBER
41		·		2.26	Ø. 15	0.21	2.25	8.2	=0:02	0.24	-0.1	 8 0		j zi				1854 - 1972
10		·						- 1-		/		/		CA	PE MEN	00C [ NO	l	
							-0.22	0-00					2.0.4					
		····	<u> </u>	B. 13/	-10.08	8.87	0.03	-18. 1.	0.47	0,04		5-0.19	-0.0	5	-			
38					2. 29	-0.24	-0.15	-0.22	-0.29	-0.09	-0.0	9-2.18	9-8.10	-2.0	R.			
37						9.24	-2.16	-0.14	-9.27	-0.24	-0.3	7-0.31	-2.35	-0.2	8-3.19			
66			1.1	į		-0.11	-8.24	-Ø. 31	-0.34	-0.33	-0.3	1-0.27	-9.35	4.5	2-0.37			
35							-0.34	-0.25	-0.34	-Ø.33	-9.5	8-0.28	1-04.52	-6.5	7-0-49	-0.27	P011	NT CONCEPTION
34		;							8.42	-2.23	-0.3	3-10.41	170.58	-0.6	3-0.74	-0.57	-0.7.9	-8.00
										-0.26	-0.54	0.42	-3.57	-0.5	1-12.68	-Ø.SC	-8.51-	-8.24-8.12
				·	· · · · · · · · · · · · · · · · · · ·						La. 4		Le cu		2-01.53	-0 18	-1.1.3	-0.37-0.25-0.14
			;															
	·		· • • • • •								-9.5	1	19.51 19.51	70.40			-0.74-	
52 									 			-0.37	-0.43	-0.4	1-0.37	-2.33	-8.11-	-0.45-0.33-0.37-0.35
29												ļ	-0.48	-0.47	79.41	2.94	8.36	-0.58-0.45-0.41-0.43-0.44
8												: 	-0.53	-0.48	-3.48	-0.43	9.25	-0. 26-0. 59-0. 30-0. 45-0. 45 PUNTA EUGENIA
27	Ξ		1											-0.45	-0.19	-8.27	0.24	-0.32-0.55-0.45-0.42-0.44-0.32
26															-0.38	-0.63	-2.28-	-0.35-8.34-0.41-0.53-0.41-0.40-8.39
25	دد								<i>د</i>				·		-8.38	-8.54	-0. 47-	(0.53-0.43-0.41-0.31-0.33-0.43-0.33 )
24																	-3.32-	-0.47-0.45-0.45-0.48-0.48-0.30-0.30-0.
											• = -							A
					:-									{	į			
2												, 					-9.33-	-0.26-0.50-0.33-0.46-0.36-0.33-0.42-2.29-0.
	7						1.6.5			1	1.00	1		1.20			0.47	-0.39-0.37-0.28-0.31-0.33-0.38-0.47-0.28-0.
	1.16	.35	134	131	32	1.21	1.314	1.9	128	127	126	125	124	123	142	121	141	119 110 11/ 110 115 114 1.1 11 1

CHART 35. North component surface wind stress for NOVEMBER.
13	7 136	135	134	133	132	131	130	129	128	127	126	125	124	123	122	121	1 120 119 118 117 116 115 114 113 112 111
					3		÷		6	5	3						
50	-0.97	2.32	8.44	8.4	3 2.40	÷ Ø.6	5 0.3	0.9	1.7	1.00	VR	NCOUVE	R 151	OMP			
49		8.36	8.30	0.3	1	5 0.6	5 8.6	3 0.67	0.7	3 8.55	Ø.5	2 m	-	X			NDRA
48			a ara				1 4 7				0		~	2	3		NATIONAL MARINE FISHERIES SERVICE
			0.00				- 0.6			0.6	≥ 244 ;- <i>{</i>	7. 10.9	7.	- 6	<b>ل</b> رز		MUNTEREY, CALIFORNIA
47				0.3	8753	0.1	6 8:51	B.4	0.5	5.26	0.6	3 6.9	5 0.7	8			NORTH COMPONENT
46				-8x 81	0.3	8.4	8 8.2:	0.54	0.2	0.34	8.7	9 Ø.Š	2 1.1	CO	Lunati	RIVE	
45				0.5	8.42	8.4	6 8.45	8.3	1.00	0.74	0.5	5 0.7	3 0.5	8			
44	·	لہ ــــــــــــــــــــــــــــــــــــ		0.55	0.58	0.3	5 Ø. 14	-0.1	-a.1	1 9.59	9.7	1.7					
		·;							1-1-	+7	2		-J-	-			LONG TERM MERN
•••]		÷		0.23		-0.1			-0.13	9,51	8.01	0.9	0.5	Z: CRI	PE BLP	NCD	FOR
42				8.3	8.58	Ø.2	2 0.3	8.00	8.24	0.10	0.3	8.5	. 0. 4	4			ULCEMBER
41				8.12	8.58	0.1	7 8.28	9.15	0.33	0.34	6.72	¢ 0.3	0.3	1			1862 - 1972
1Ø				8.19	0.18	0,0	-8.05	8.26	0.84	-0.07	0.2	9.2	0.4	CRi Z	PEMEN	OGL IN	0
39	· · · · · · · · · · · · · · · · · · ·			8-17	-2.24	12.05	5 0.22	0.01	Ø. 12	Ø. 13	-9.17	·	-7.2	Š			
											J	1-7-		1	-		
	÷;				8-16	0.3	5 8.24	0.03	0.00	8.22	0.2	- <b>0</b> .0	-0.1	7-9.3	jZ.		
87	<u>.</u>					9.0	7-8.23	-0.12	-3.31	-Ø.17	-0.3	- 3.3	-0.2	3-0.23	-0.0	B	
36		÷		_		-9.17	-9.98	-0.10	-8.23	-8.27	-3.2	-0.13	12.5	1-2:51	-9.3	A.	
5							-8.07	-0.19	-0.32	-8.36	-3.36	-9.3E	-0.36	-0.45	-8.3	0.Z	23 POINT CONCEPTION
34	4						-		-8.30	-2.28	-3.3	-8.48	-9.4	3-0.29	-0.4	¢-0.4	42-9.21-3.50
			·;							La pe	-0.4						
										Dico	- 0. 44	1	- <b></b>				
2 			·								-17.44	-8.41	-20.5	6-0.55	-0.7	3-0.6 ,∕	55-4.52-0.43-0.13-0.17
1	;;						<u>.</u>				-0.44	42.54	-0.5	-3.45	-3.3	2-0.4	41-0.29-0.44-2.40-0.32
ø												-0.3	-9.5	2-0.37	-0.4	-1.7	78-0.43-0.40-7.58-0.48-0.32
9			·: ;										-2.5	-0.42	9.4	-0.3	34-9.52-8-32-0.47-9.42-8.44-8.49 & A
															6		
	į	·												0.40			PUNTA EUGENTA
	įį.													-0.49	1	-8.4	45-0.38-0.88-8.48-9.62-0.55-0.47-0.35
6	j		;												-8.3	-8.4	45-8.41-3.48-8.45-8.36-1.34-9.43-8.39-8.40
5															0.5	8.4	11-2.45-2.49-2.51-2.35-0.58-9.33-0.39-0.32
4																	0.44-8.38-9.45-0.36-0.55-8.43-0.55-0.33-8.28-0.27
	·		·	·	بــــــــــــــــــــــــــــــــــــ	• •	·					·			!		-0 51-0 54-0 35-0 44-0 41-0 20-0 20-0 20-0 20-0 20-0 20-0 20-0 2
	ì-						*****										2 01 0.14 0.03 0.04 0.01 D. 0.00 0.00 0.00 0.00 0.00
										4						: 	-9. 15-0. 59-0. 53-0. 39-0. 35-0. 34-0. 34-0. 30-0. 25-0. 35
1	1																-0.45-0.52-0.48-0.42-0.36-0.44-0.39-0.36-0.28-0.25
_137	:36	135	134	:33	132	131	150	129	128	127	125	125	124	123	122	121	1 120 19 118 117 116 115 114 1.3 .12 1

CHART 36. North component surface wind stress for DECEMBER.

# APPENDIX B STANDARD ERRORS OF THE MEANS

The following tables list the computed standard errors of the monthly means by 1-degree square area for the eastward and northward components of the resultant surface wind stress. The standard errors of the means are defined by Equation 3. Each page contains values for 30 one-degree squares blocked in groups of 10. Within each group of 10, all 1-degree squares are defined by a common latitude. The first set of values corresponds to the 1-degree square immediately adjacent to the coast. The final tabulations refer to the 1-degree square farthest from the coast.

The standard error of the mean is tabulated for each month and square. The latitude and longitude of the center of the l-degree square is listed at the left. The first two numbers below each month are the standard errors of the means for the eastward and northward components respectively. The units are dyne  $cm^{-2}$ . The last value is the number of observations.

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LATION	JAN	FEB	MAR	AP₹	4 A P	JUN	JUL	AUG	SEP	OCT	NO¥	DEC
21 N 111 W	•_4 •J5 74	• 3 • 03 71	• 3 • 4 95	•13 •05 75	- €3 - 04 - 38	• 04 • 04 87	. L6 . 04 101	្សីង ភ្លេង ភូច	•03 •06 107	.16 .04 95	• 08 • 05	• 02 • 03
21 N 112 W	.03 .05 51	• 02 • 03 68	.02 .07 52	.C3 .07 48	•04 •36	• 0 3 • 05 66	• C 8 • 06 57	•11 •07	. G d . 0 8 5 7	• 4 • 46	.04 .04	•04 •04
21 N 113 W	•04 •06 35	•11 •J8 50	• 3 4 • 10 3 8	•04 •09 39	• 05 • 08 39	• 04 • 07 3 3	• 05 • 06	•15 •16	• 08 • 15	•04 •10 38	• 0 8 • <u>1</u> ° • <u>3</u> 7	• 05
21 N 114 W	· 04 • 8 41	•10 •7 39	• ] 4 • _ 8 3 3	.07 .17 22	.05 .11 24	.08 .1. 21	• 0 8 • 24 32	•15 •16 18	• 35 • 28 • 23	.07 .04 28	• 0 3 • 07 32	.05
21 N 115 W	• 16 • J9 29	• J9 • 10 26	•08 •17 35	•C8 •13 18	5	• 66 • 08 23	.03 .62 31	• 5 • 8 17	•58 •11 19	• J7 • 11 20	• 0 3 • 0 8 27	•04 •36
21 N 116 W	•15 •12 26	• ↓ • ↓6 28	• 17 • 19 32	.09 .14 15	•10 •14 13	• 07 • 07 14	.08 .12 26	•14 •16 15	.20 .15 18	.08 .06 18	• 04 • 09 18	•03
21 N 117 W	.06 .09 38	• 36 26	7 .09 25	.11 .09 19	.05 .19 .12	• 05 • 09 22	• 16 • 08 15	•13 •19 21	•14 •10 23	• J 9 • J 9 • J 9 • 22	• 02 • 06 24	• 04 • 07 26
21 N 118 W	• 0 9 • 0 8 34	• 10 • 35 21	.06 .07 24	.1% •14 18	• 08 • 12 19	.08 .05 19	• 12 • 09 • 22	•19 •24 •8	•11 •15 21	. J 3 .L 3 38	• 05 • 08 2 3	.05 .08 34
21 N 119 W	.09 .08 24	. J7 . J8 26	•06 •39 30	•11 •11 27	.04 .13 19	• 09 • 06 27	• 16 • 13 21	•11 • 16	• 08 • 18 - 30	• 05	• 04 • 06	• 07 • 07 • 37
21 N 120 W	• 59 • 10 24	• 5 • 56 34	• . 6 • . 5 30	•03 •09 28	• . 6 • C 7 38	• 30 • 35 • 31	• 12 • 07 • 39	•05 •09 34	• 07 • 07 • 07 • 37	•69 •13 40	• 05 • 05 • 4 6	.18 .06 27
22 N 111 W	.02 .04 128	•03 •03 101	• 32 • 33 164	-017 122	•02 •03 169	• 03 • 03 15:	• 0 3 • 0 2 1 4 3	•03 150	• [7 • 27 161	· 43 165	• 92 • 02 150	.035
22 N 112 W	• 7 2 • 6 4 7 3	• . 2 • 4 6 0	• .3 • .5 78	.05 .05 08	• 6 3 • 05 99	.03 .04 117	.02 .03 105	•15 •08 116	.04 .04 110	.04 .04 106	.02 .03 90	.03 .05 69
22 N 113 W	.03 .04 51	• 34 • 1 <u>1</u> • 47	• 03 • 06 67	• 12 • 127	• ú 3 • 07 67	• 03 • 05 75	.03 .03 84	.05 68	• 6 9 • 11 7	•03 •04 73	.03 .05 77	.06 .04 57
22 N 114 W	. 03 . 06 34	. 04 . 09 42	.)4 .99 45	•02 •07 52	• 05 • 08 53	• 03 • 07 50	.04 .04 61	• 29 • 7 35	•11 •1 53	• Ú 3 • J 3 4 5	.04 .05 38	.03 .04 66
22 N 115 W	• 0 <b>7</b> • 37	• 10 • 10 30	. J 6 . 9 . 54	•0+ •1: 38	•05 •39 36	• 03 • 09 37	• 05 • 07 32	•19 •18 34	.09 .07 31	•07 •67 34	• 04 • 07 22	.07 .06 30
22 N 116 W	• 06 • 10 24	• 5 • 10 30	• 122	•11 •19 15	- 15	• 59 • 59 35	• 33 • 97 26	• 32 • 29 17	•26 •29 24	.[3 .[6 21	• 04 • 07 32	.07 .06 .33
22 N 117 W	.05 .11 .33	• 5599 • 2999	.08 .10 .34	.05 .11 23	.07 .14 19	.08 .12 15	. 67 . 10 21	•13 •27 17	•12 •10 17	.05 .06 25	• 06 • 07 26	• 05 • 05 27
22 N 118 W	• 36 • 39 • 28	• 12 • 11 27	• 0 6 33	•13 •13 21	.03 .11 17	• 05 • 12 13	.15 .14 15	.05 .12 17	•21 •17 17	.35 .07 19	• 05 • 09 23	.05 .07 .34
22 N 119 W	.07 • 8 31	• 17 • 27	• ]8 • 3 24	.07 .(5 25	•1) •1 19	• 04 • 36 24	.06 .12 19	•12 •11 26	.19 .18 21	• 10 • 67 21	• 12 • 07 26	• 05 • 09 32
22 N 120 W	• 07 • 08 33	• 38 • 10 26	• 37 • 36 31	•09 •08 23	• 64 • 67 • 38	• 17 • 14 17	.08 .10 20	•14 •13 19	• 11 • 22	• 47 • 47 23	.06 .06 34	• 07 • 08 20
23 N 111 H	.01 1359	- J 1 10 30	•31 1125	.01 .01 1159	• 01 1241	.01 .01 1125	.01 J.O. 1178	• 92 • 93 1152	•01 •01 1132	•31 •51 1199	- 01 - 01 1083	•03 •01 986
23 N 112 W	.02	• 32 • 33 124	.32 .33 146	•03 •04 139	• 5 3 • 5 3 192	• 02 • 03 245	• 62 • 61 203	181	· 536	· 52	.02 .03 154	.03 .05 140
23 N 113 W	• 03 • 09 47	.03 .04 48	. J6 . J6 47	•03 •06 5*	• 03 • 05 78	• 05 • 05 73	.02 .03 76	.04 .05 72	•04 •10 79	. C 3 . ù 4 75	. 62 . 04 70	.06 .11 47
23 N 114 W	.34 .04 45	• 32 • 35 44	.34 .38 49	.65 .13 59	• 13 • 36 79	.03 .05 71	. 62 . 03 84	.04 .04 96	•05 •06 74	• 64 • 66 7 3	•03 •05 59	• 0 6 • 0 9 4 7
23 N 115 W	· 11 · 34 · 42	• ] 3 • ; 7 4 5	.J4 .J6 55	.13 .05 67	.03 .55	• 02 • 05 7:	• 03 • 64 62	•15 •52	• 04 • 17 • 1	• 🛛 4 • ½ 4 • ½ 4	• 05 • 05	.05 .57 .57
23 N 116.W	.04 .07 42	. 37 . 39 . 37	.]4 .]6 48	.65 .07 45	. J3 . J7 63	.15 .16 46	• 03 • 05 62	•97 •64 50	.05 .08 51	• • • • • • • • • • • • • • • • • • •	.05 .06 45	.06 .05 54
23 N 117 W	.:9 .10 30	• <u>1</u> • <u>1</u> <u>1</u> <u>1</u> <u>4</u>	• 6 • 7 • 50	.65 .12 38		• 0 + • 07 +9	• 04 • 05 43	•16 •19 28	•09 •09 40	.06 .08 38	.09 .10 .33	• 0 5 • 0 4 • 5 2
23 N 118 H	.05 .08 34	. 10 . 10 29	• 53 • 587	.05 .1] 33	900 900 900	• 06 • 13 27	. CS . GS2	-16	•11 •11 29	• • • • • • • • • • • • • • • • • • •	• 06 • 06 26	• 0 4 • 0 5 3 8
23 N 119 W	• 66 • 08 • 35	. 15 . 09 38	• ] 3 • ] 9 38	• 0 5 • 3 9 • 3 3	.05 .07 38	• 00 • 03 39	• 06 • 08 30	.07 .12 15	• 10 • 11 24	•07 •09 26	• 17 • 10 24	•10 •38 37
23 N 120 W	-10 -13	. 05	• 36 • 13 21	•11 •14 17	• 0 4 • 6 22	. 05 . 09 23	• 08 • 17 17	• 18 • 09 22	.07 .1. 24		• 14 • 38 32	• 06 • 08 4 2

LATION	JAN	FEB	MAR	APR	MAY	NUL	JUL	AUG	SEP	100	NOV	DEC
24 N 111 H	.01 .01 572	• 01 • 01 494	• 11 • 01 590	.01 .01 587	.02 .01 291	• 01 • 01 • 03	.01 .01 596	.01 .01 602	.03 .06 565	• u 1 • ù 1 535	.01 .01 594	•01 •01 504
24 N 112 W	0.00 01 1226	•01 •J1 12:9	.02 .11 1375	.01 .01 1380	.01 .01 1458	01 01 1398	01 000 1453	01 01 1324	•01 •01 1382	0.00	0.00 .01 1336	.01 .01 1208
24 N 113 W	.02 .04 143	.03 142	· 23	•03 •25 15]	.02 176	.02 .03 21.	.02 .u2 193	• 0 2 • . 2 22 3	•03 •03 214	• 0 3 • 6 3 1 7 7	• 02 • 02 172	• 02 • 03 141
24 N 114 W	• 07 • 06 42	•06 •39	• 05 • 18 • 5	•05 •07 38	ູປິ4 - ບໍ5 - 58	• 04 • 05 54	.03 .05 54	. 4 . 6 7 0	.15 .06 78	.:52	• 05 • 08 • 44	•14 •18 25
24 N 115 W	. 7 . 0 9 . 2 9	• 5 • 8 31	• 5 • 39	.67 .15 45	• : 4 • : 7 • 5 9	. 97 . 1u 49	• 0 3 • 0 5 87	.04 .05 51	.05 .06 68	.05 .05 56	• 0 3 • 0 7 • 44	.07 .10 22
24 N 116 W	. C5 . 07 35	. J3 . J6 . J6	• 18 • 09	.C.4 .08 55	. č 8 67	• 05 • 06 63	• C2 • 04 75	• 46 • 45 • 73	.U+ .L3 50	• L 3 • L 5 • 5 9	• 02 • 06 56	.04 •10 39
24 N 117 W	.05 .07 43	.05 .15 29	• 14 • 19 33	.05 .18 44	• 0 4 • 0 8 6 2	• 03 • 07 71	03 06 71	• 14 • 15 • 62	•0→ •06	• û 3 • 1 5 5 6	.04 .05 51	.04
24 N 118 W	. 05 . 6 35	• 36 • 8 • 47	• ù4 • 6 4 9	.03 .19 45	• C 5 • .8 • 52	• 03 • 36 52	• 02 • 06 47	• ບ່9 • ບ6 - 44	•05 •08 51	•04 •05 57	.04 .06 48	.07
24 N 119 W	•03 •05 40	• 11 • 13 • 1	•08 •17 56	.[5 .10 44	• 4 • 57 57	• 1 × • 09 39	.06 .08 53	.13 .8 38	•09 •09	• 44 • 67	• 08 • 08 36	• 0 4 • 0 4 5 0
24 N 120 W	.07 .08 47	• ]4 • 07 55	• 13 • 18 57	•05 •08 •5	.[5 .06 41	.03 .03 31	• 08 • 05 38	•15 •10 29	.08 .11 .35	• i 7 • i 5 38	• 05 • 06 46	• 95 • 06 48
25 N 1 <b>13</b> W	G.51	: 1	• <u>1</u> •71	•61 •61	• 1 • 1	•01 •91	.81 6.00	9.0 .01	.01 .01	0.Cî •01	0.00	•01 •01
25 N 114 W	1297 .02 .04	1257 .02 .04	1441 .04 .15	1409 •03 •05	1509 .03 .04	1467 • 03 • 03	1508 • C4 • 04	1431 • 02 • 32	1431 	1426 •13 •05	1408 .03 .04	1269 .03
25 N 115 W	147 .56 .65	128 .04 .09	139 . 35 . 38	150 •C3 •08	176 .ŭ3 .07	206 • 05 • 03	177 .03 .04	225 .04 .04	20 .03 .05	185 .02 .04	149 .05 .05	125 .08 .09
25 N 116 W	31 • 10 • 17	32 • 18 • 16	42 •12	59 •05 •12	86 . 18 8	65 • 05 • 09	81 • 03 • 65	73 .02	67 .14 .08	66 .04 .11	46 .05 .06	30 •10 •16
25 N 117 W	15 .04 .07	22 • 11 • 10	27 •10 •12	23 .04 .09	35 •04 •05	31 • 05 • 05	46 .03 .05	53 • 6 • 6	44 • 96 • 98	25 • 25 • 37	37 • 115 • 118	14 •11 •16
25 N 118 W	23 .36	27 :10	30 • 10	35 :25	52 • 4 • 4	4ŭ • 04 • 06	51 .02 .05	59 •05 •07	38 •05 •10	45 •02 •05	34 • 05 • 08	22 •03 •08
25 N 119 W	33 .06 .08	29 •06 •10	34 • 35 • 37	41 .35 .14	61 .05 .03	58 .04 .07	67 • C 3 • 07	57 .03 .05	48 .04 .19	61 - C3 • Q5	42 .05 .11	50 .05 .06
25 N 120 W	52 .07 .09	34 .07 .12	5 u • มี4 • มีอู้	42 •08 •08	54 • 37	7. .03 .05	58 .02 .04	59 •04 •06	56 .07	58 •04 •56	49 .04 .09	48 • 07 • 38
25 N 121 W	37 .07 .^6	36 .15 .14	49 • ] 3 • _ 6	-03 -07	61 .34 .0	4+ • 04 • 90	.03 .06	51 •08 •08	41 .08 .03	45 •05 •05	54 • 09 • 15	36 .07 .07
25 N 122 W	46 •05 •08	42 .07 .08	53 .04 .36	38 -05 -08	49 • 12 • 15	41 • 04 • 05	.04 .06	46 •26 •26	41 .05 .09	60 • 15 • 46	33 • 10 • 06	37 • 0 9 • 0 6
	50	52	56	59	63	36	la la	45	48	54	49	56
26 N 113 W	.0 <u>1</u> 372	. J1 399	• 3 2 • 2 • 2	•02 •02 397	• 02 444	• 01 • 52	• 01 • 06 3 98	•01 •01 408	• 02 • 02 428	•01 •02 427	• 01 • 02 4 3 9	•02 •02 389
26 N 114 W	.J1 .01 1199	• J1 • 01 1201	.1 .31 1438	•01 •01 1327	• • 1 • • 1 1 3 6 7	01 01 1334	• 41 • 61 1360	• 1 • 1 • 1	1331	· 62 1333	.01 .01 1253	.01 .01 1165
26 N 115 W	.04 .04 120	.]3 .]4 115	. 14 . 15 126	.03 .05 117	•04 •04 135	.02 .04 158	• 02 • 03 149	.[2 .]3 15.	•03 •05 147	• 43 • 94 • 14	.02 .04 129	. U 3 . U 5 . 96
26 N 116 W	•08 •09 35	• 37 • 14 24	. 08 .10 34	.65 •10 46	• 04 • 07 65	• 04 • 07 68	•03 •04 68	•63 •65 59	•04 •07 60	•03 •05 55	• 05 • 08 6 0	•15 •80 30
26 N 117 W	.07 .16 16	•12 •18 15	•24 •28 16	•04 •9 33	• C 3 • 7 3 J	•03 •5 <del>)</del> 37	• 04 • 65 59	•ບໍ5 • ປີ 48	•04 •09 42	- 6 3 - 6 35	• 0 4 • 05 3 0	•20 •19 16
26 N 118 W	.04 .09 32	• 36 • 39 24	•12 •12 32	•15 26	• - * 8	• 04 • 07 34	• 04 • 05 35	• 5 • 5 • 5	• 34 • 97 • 52	• 5 % • 5 7 39	• 05 • 10 25	.10 .14 13
26 N 119 W	. 09 33	.10 .11 29	• 39 • 39 26	•05 •1'+ 33	•04 •08 41	• 04 • 08 35	.03 .06 .43	.ជ2 .ជ៥ 38	•06 •10 24	•05 •07 3-	• 04 • 07 37	. C 4 . 0 9 . 27
26 N 120 W	• 10 • J7 30	• 10 • 15 24	• , ) • 15 54	•11 •69 38	• 63 • 68 57	• 02 • 05 5 9	•05 •08 50	•03 •06	•00 •09 48	.03 .05 57	• 06 • 06 43	• 05 • 09 38
26 N 121 W	.05 .07 59	• 10 • 12 26	.04 .1J 40	•04 •09 5+	• 0 4 • 9 55	• 83 • 86 69	.08 .08 43	• 3 3 • 5 6 6	•04 •09 47	• 0 4	• 05 • 14 42	.07 .08 46
26 N 122 W	.05 .06 37	.04 .36 52	.06 .06	•03 •09 5'+	• 0 3 • 0 7 • 55	• 02 • 04 57	• 03 • 05 60	.03 .55 57	•03 •06 60	• 4 3 • 2 4 6 3	• 0 3 • 05 7 0	.08 .07 50

LATILON	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	100	NOV	DEC
27 N 114 W	• C 2 • 0 2 468	.;2 .j2 458	. 12 542	.C2 .02 517	• 6 2 • 0 2 5 4 8	• 02 • 02 4 83	•01 •01 527	.01 .J1 452	•02 •02 549	•01 •01 524	.02 .02 511	.02 .02 521
27 N 115 W	.01 .01 1113	• 01 • 31 1035	.01 .01 1245	.01 .01 1204	• 91 • 01 1253	.01 .01 1194	.01 .01 1209	.01 .1 1188	.01 .11 1169	.01 1 1183	01 01 1122	•01 •02 973
27 N 116 W	• ° 6 • . 7 76	.04 .6 102	•52 •13	.03 .C+ 103	•04 •05 101	•04 •05 110	• 02 • 04 99	•02 •03 120	•03 •06 133	•03 •06 84	•03 •05 86	•04 •07 52
27 N 117 W	• 18 • 12 29	• 17 - 34	•ð •10 43	•05 •11 48	• 51	• 03 • 06 • •	.03 .06 71	- 3 - 6 71	• 1 3 • 05 75	• 4 3 • 7 3 55	•06 •07 51	.06 .10 25
27 N 118 W	.06 .10 28	. 37 . 16 20	•10 •14 23	.05 .11 32	. 64 . 68 36	• 03 • 05 48	• 02 • 05 7	• • 3 • 0 4 • 5 3	• 6 4 • 0 8 4 9	• 6 3 • 04 31	• 65 • 09 37	.24 .10 19
27 N 119 W	.13 .19 19	• 10 • 32 12	.11 .J8 16	•05 •09 34	. û 4 . 1 Ŭ 32	• 05 • 1 ] 32	• 03 • 10 29	• 35 32	•04 •07 37	• 0 3 • 06 37	• 04 • 05 26	• 04 • 22 20
27 N 120 W	. 37 •11 34	• <u>11</u> • 27 19	• 18 • 11 23	•05 •11 20	.03 .14 35	•03 •68 33	• 04 • 27 29	• 34 • 7 38	•08 •09 36	• 0 4 • 0 9 26	•09 •14 17	.06 .08 15
27 N 121 W	•13 •09 •0	• 06 • 05 25	• 11 • 12 2 9	• C 5 • 12 • 42	.(4 .28 46	. 05 . 1: 10	• 14 • 12 • 31	• 35 • 49	• 6 9 • 1 3 2 4	• 6 4 • 6 7 • 6 9	• 07 • 07 33	•08 •14 17
27 N 122 W	• 37 • 36 36	• û 9 • 12 33	• 36 • 11 51	•03 •10 53	.15 .08 58	.05 .06 6+	.05 .09 54	.04 .08 62	.05 .09 48	. 25	.07 .08 53	.07 .05 62
27 N 123 W	.04 .17 69	• 38 • 39 52	• 36 • 39 6 3	• C 3 • 0 7 7 5	• C 2 • 05 93	• 03 • 05 9.	.05 .08 60	.03 .05 80	.03 .04 91	.02 .04 105	•06 •08 77	.06 .09 61
28 N 115 W	• û 3 • 06 688	.)2 .02 617	• ] 1 • J 2 7 4 2	.02 .03 720	• u 1 • J 2 72 3	.01 .01 568	.01 .01 632	•1 •11 685	•01 •02 709	• 1 • 1 695	•01 •02 676	• 82 • 02 524
28 N 116 W	· 01 .02 81.	• 31 • 32 7 4 7	• 12 866	•01 •02 843	•01 •01 874	• 01 • 01 9 03	.01 .01 831	.01 .01 840	01 01 835	.01 .01 875	•01 •01 821	•02 •02 735
28 N 117 W	.06 .05 75	• 05 • 7 72	. 15 •.6 55	•03 •05	.04 .6 53	.03 .04 69	• 04 • 55 53	.03 .7 66	.04 .15 75	•04 •5 71	.04 .08 55	•09 •12 •56
28 N 118 W	• 25 • 36 34	.07 .11 24	.05 .09 25	•07 •15 30	.05 .06 41	• 03 • 07 47	• 02 • 06 56	• 4 • 14 • 53	.04 .07 54	• • 2 • • 6 • 4 3	.05 .10 33	.05 .14 22
28 N 119 W	•6 •6 38	• 14 • 11 30	•.5 •38 •33	• 6 5 • 6 9 • 6 3	.04 .15 53	• 0+ • 07 72	• 0 3 • 07 67	• 3 3 • 07 5 5	04 11 39	• 03 • 06 39	.06 .10 33	.13 .14 19
28 N 120 W	.20 .16 17	.29 .36 18	.18 .19 36	•65 •11 43	• 66 • <u>11</u> 33	• 63 • 08 39	.06 .06 .36	· 14 • 37 • 41	• 3 3 • 0 6 4 5	. 15 .08 22	•05 •12 31	•10 •20 20
28 N 121 W	•06 •09 35	. 38 . 25 14	.18 .11 28	.05 .10 41	.04 .09 31	.05 .10 41	.05 .09 29	.J2 .05 48	.04 .09 32	• û 4 • L 7 3 9	.03 .08 31	.06 .1: 23
28 N 122 W	. 16 . 11 . 56	• û4 • 1( 34	• J7 • 2 • 5	.05 .10 .32	• 65 • 1 3 4 4	• 05 • 08 • 4+	.03 .08 55	.05 .08 58	.03 .05 43	.03 .08 54	.08 .16 27	.05 .11 35
28 N 123 W	•10 •12 47	.38 .10 50	.16 .12 44	.[3 •1: 68	• 5 • 56 • 70	. J5 . <u>11</u> . <u>3</u> 7	• C 3 • 13 • 41	• .7 • 37 • 65	• 3 4 • 05	• 13 • 14 80	.07 .09 75	.06 .06 58
28 N 124 W	• 16 • 08 48	• 55 • 7 • 46	• ù 9 • 12 4 3	.05 .09 44	•03 •07 65	• 05 • 00 5•	• 06 • 09 46	.08 .07 47	•09 •08 38	.02 .04 88	• 06 • 07 67	.06 .09 51
29 N 115 W	۲ 90 •	• 7 • 38	• 1 4 • 1 9 • 9 0	.07 .j9 80	•19 •171	• 0.5 • 0.5 60	.ü7 .07 61	• 7 • 04 • 63	•05 •07 •59	• 0.5 • 55 • 58	• 12 • 07 • 7 र	.08 .09 .57
29 N 116 W	.02 .01 1030	.01 .31 1049	.01 1239	.01 1155	.01 1246	.01 1.8 1.8	.01 .01 1381	.J1 1115	.01 .01 1139	.01 1112	.01 .01 1051	•01 •01 983
29 N 117 W	• 13 • 03 252	• 22 • 23 249	• ] 2 • ] 3 336	•02 •03 308	• 02 • 03 253	• 02 • 02 2 94	•02 •02 267	•ú1 •C2 280	• 0 2 • 0 2 2 7 3	•02 •02 265	.02 .03 261	.03 .03 229
29 N 118 W	.J3 .^6 108	. J8 .19 58	.]7 .8 71	.07 .37 65	• 65 • 7 • 59	• 04 • 07 64	• 05 • 66 49	. C 3 . 5 56	. 38 . 65 54	. 14 . 15 .55	•05 •05 56	• 0 6 • 0 9 37
29 N 119 W	•07 •09 •27	. J <b>7</b> . J9 21	• 10 • 22 • 34	•05 •08 35	.05 .103	• 004 • 495	. ±3 . \$7 43	• <u>1</u> 6 • <u>1</u> 6	• L 4 • 0 9 4 2	• • • • • • • • • • • • • • • • • • •	• 10 • 09 • 33	• 0 5 • 0 7 3 5
29 N 120 W	• 6 • 11 • 29	• 7 • 9 • 28	•15	•05 •09 55	• 04 • 07 48	•04 •J8 44	• 05 • 07 52	• 0 3 • 0 5 6 8	• 0 4 • 0 8 55	•06 •09 36	• 06 • 09 27	•06 •11 36
29 N 121 W	.ŭ5 .C8 59	• 11 • 12 29	• 19 • 12 42	.05 .05 51	• 45 • 48	• 03 • 07 69	. C4 . 08 59	• 37 • 37 54	• 0 7 • 0 7 4 5	• 6 4 • 6 8 4 4	1 • 27 42	• 0 8 • 0 9 3 4
29 N 122 W	.05 .10 73	• 39 • 13 • 48	•;7 •13 51	.0% .10 55	• 05 • 06 81	•03 •05 84	• 04 • 99 52	• J 3 • 6 86		• ú 3 • "6 82	• 07 • 07 62	• 0 8 • 0 8 3 9
29 N 123 W	.08 .12 .53	. 15 .13 39	• 0 9 • 1 1 3 9	•05 •12 46	• 0 4 • 0 7 6 5	•03 •J8 61	• 0 3 • 06 65	•16 •07	• 0 2 • 95 73	•03 •06 68	.07 .09 54	•06 •09 58
29 N 124 W	• 06 • 11 • 51	. 7 . 17 50	• 7 • 14 36	.05 .08 50	•: 3 • 37 • 76	. 34 . 07 54	. û 4 . 1( 54	• 2 • 57	• 65 • 65 53	•	.07 .08 89	• 0 8 • 1 1 3 1

LAT/L	ON	JAN	FEB	MAR	APł	MAY	100	JUL	AUG	SEP	001	NOV	DEC
30 116	N W	• 92 • 02 571	• 32 5 6	• 57	•01 •02 581	•î1 •02 624	• 01 • 02 5 93	•01 •01 547	•01 •31 537	.01 .02 553	•01 •02 557	•01 •02 545	•01 •02 481
30 117	N	•01 •02 604	•01 •32 630	•01 •02 698	•01 •12 653	.05 .4 653	• 01 • 61 354	.01 .(1 666	•J1 693	.01 .02 651	• 61 • 1 672	•03 •04 645	•02 •32 591
30 118	N	.04 .35 194	• J2 • J3 239	.03 .54 187	.04 .04 201	.33 .64 193	•03 •04 195	.02 .03 195	• - 2 • - 2 183	• 32 • 63 185	· · 2 · · 2 203	.03 .03 182	•04 •05 165
119 119	N	• 18 • 18 76	• 6 • 19 65	. 7 . 18 60	•05 •05	•10 -38	• 04 • 06 73	02 03 139	5 	.05 .08 .60	.05 91	•06 •10 48	.08 .10 42
30 120	N W	.05 .09 63	5 8 113	• 18 • 13 58	. 6 5 . 0 7 . 99	• 03 • 05 86	. 05 . 05 . 91	.04 .06 67	•15 •16 70	• 34 • 35 56		• 07 • 07 • 37	•06 •10 52
30 121	N H	.07 .08 71	. J6 . 07 81	.37 .11 58	-04 -08 107	• 0 3 • 0 7 9 1	•04 •05 86	.03 .05 84	.03 .05 102	• 0 4 • 2 7	. Ц З - Ј Б 89	•04 •08 35	•10 •11 53
30 122	N W	• 5 • 7 92	.12 .16	• 19 • 12 • 47	•03 •11 51	•04 •8 103	.03 .03 194	• 03 • 06 77	. 04 . 06 88	•04 •07 73	• 05 • 56 • 74	•05 •08 51	• 0 5 • 0 9 • 4 9
30 123	N H	• 35 • 08 7 8	•13 •13 50	•12 •15 48	•14 54	• . 4 • . 6 87	• 33 • 37 8 3	• 13 • 06 • 72	• 12 • 12 7 3		• 43 • 49 82	.04 .10 69	.03 .05 96
35 124	N H	• 11 • 11 66	.]9 .11 80	•04 •07 55	•03 •07 76	•ŭ4 •07 110	• 02 • 05 1 09	. 64 . 08 66	.:5 .J7 83	.13 .07 66	• 03 • 07 113	•04 •09 87	.05 .09 63
30 125	ЯZ	.08 .12 78	.1L .15 66	• 56 • 10 57	•05 •10 65	. L7 • 08 55	.04 .08 78	.04 .08 64	-04 -08 78	.04 .05 70	.03 .07 86	•06 •09 72	•06 •08 65
31 117	E Z	•01 •01 776	• 01 • 02 7 93	• 31 • 31 922	1  880	.01 .01 916	• 01 • 01 865	• 01 • 01 926	•01 •01 837	.01 .01 861	•01 •01 821	•01 •02 793	•01 •02 706
31 118	N	• 0 2 • 0 3 3 94	• 13 • 13 4 12	• J 2 • U 3 446	•02 •02 442	•02 •33 441	• 02 • 02 3 84	.01 .02 36ŭ	•01 •01 443	•02 •02 499	•02 •02 441	•02 •92 459	.03 .03 372
31 119	N	•12 •3 294	•32 294	•04 •6 236	.04 .(4 286	• 03 253	• 02 • 03 • 06	• 02 • 63 255	• 02 • 03 214	•02 •03 267	•02 •02 345	• 04 • 04 222	.04 .05 154
31 120	N	•05 •07 169	• 14 • 36 143	• 35 • 37 131	.05 .05 149	• • • • • • • • • • • • • • • • • • •	• 03 • 05 124	. 13 . 05 158	. 3 .04 126	• 6 4 • 5 6 98	• J 3 • J 3 21 2	.04 .07 122	•03 •06 84
31 121	N X	· 58 103	• 4 • 38 145	.10 101	.03 .05 131	.06 .06 119	• 05 • 07 1 05	• 03 • 04 132	• 45	•04 •08 78	.04 .05 131	.04 .06 101	.06 .08 78
31 122	N	.04 .06 115	• 15 • 10 98	• 15 • 10 97	•03 •11 73	.06 .07 1.4	• 63 • 07 104	.C3 .05 106	. 4 . 06 87	•04 •09 79	• C 3 • 0 8 127	•05 •10 107	•05 •08 87
31 123	N N	• 03 • 36 171	.06 .10 110	•16 •18 84	.04 •13 91	.34 .06 169	• 43 • 07 123	•02 •65 170	•03 •5 142	.03 .06 133	• 4 3 • 4 7 15 3	.04 .06 111	.05 .10 79
31 124	NW	.07 9 112	•17 •12 36	• 36 • 13 105	•04 •(7 173	• 02 • 04 237	• 03 • 06 1 69	• 02 • 05 166	.J2 .06 102	•03 •05 133	•03 •05 146	•05 •08 119	•06 •10 107
31 125	N M	• 36 • 38 134	• 5 • 9 121	139	.05 .08 144	26 126	•03 •00 150	•54 160	125	-0554 -1254	.03 .18 166	.05 .09 122	.05 .11 92
31 126	ΣX	• 15 • 08 157	• 16 • 10 1 37	•06 •17 152	.04 .07 145	•03 •05 149	• 03 • 05 155	•03 •06 158	.:2 .:15 145	• C 2 • 0 4 1 4 4	.:3 .06 18⊾	.05 .06 148	.05 .09 131
32 117	Z X	• 1 1346	• 1 912	1055	•(1 •01 967	• • 1 • € 1 1995	0.0, 0.0, 1059	0.00 0.00 931	0.00 0.00 1097	.01 .01 1041	•01 •01 1062	•01 •01 887	•01 •01 714
32 118	NW	.01 2163	• ]1 • ]1 1933	2268	.01 2283	0.01 2375	0.00 0.00 2221	.01 0.00 1934	3.30 0.30 2512	.01 0.00 2363	• 01 • 01 2284	•01 •01 1882	01 01 1133
32 119	N	.01 .02 11.8	.]2 .]2 981	•02 •32 1244	01 02 1106	• 51 • 81 1140	.01 .01 1300	01 01 1054	01 1128	01. 01 1220	.01 01 1399	02 02 1017	•02 •02 768
. <u>32</u> 120	N	•02 •13 451	•03 354	.03 .J3 491	•03 •04 479	•03 •03 •65	•03 •14 354	• 02 500	• 62 • 62 • 33	•02 •02 573	• 02 • 03 492	•02 •03 419	• 04 • 05 262
32 121	N	•03 •96 241	- 102 2552	.94 235	20 -20 -20 -20 -20 -20 -20 -20 -20 -20	+ . 3 254	.04 .05 190	• 62 972 272	· 3	· ·245	293	• 05 • 06 233	•05 •07 189
32 122	X X	.24 .37 198	• • 5 • 58 214	.04 .38 212	.05 .08 214	.04 .06 183	.03 .06 19	• 63 • 05 229	.04 .06 171	.03 .05 191	ن ن ن د ن ن د ن د د ن	• 03 • 05 208	•05 •08 176
32 123	N	• 33 •06 287	• 35 • 08 197	.07 218	.C5 .O5 198	•04 •07 190	•03 •07 172	.02 .04 203	.03 .05 188	.03 .05 181	•03 •06 253	•03 •06 232	.04 .08 184
32 124	NW	• ]1 771	• 02 531	• J 2 • 3 6 3 5	•03 432	• 91 569	• 01 • 03 551	.01 .02 662	.01 711	•01 •02 662	•01 •04 824	• 02 • 03 623	• 0 1 • 0 3 6 3 7
32 125	N W	• 0 3 • 3 5 3 5 2	•03 •36 273	• 05 289	•04 267	• 04 273	• 02 • 05 263	• (2 • 65 268	284	• 0247 237	• 3 2 5 3 3 5 3	.02 .04 323	•03 •36 363
32 126	NW	•13 •15 289	. 07 252		• 2 3 • 0 5 30 0	• 0 3 • 05 278	• 02 • 04 257	• 0 2 • 05 2 67	• U 2 • C 4 28 0	•01 •04 247	•02 •05 320	• 03 • 04 352	•03 •06 311

LAT/LON	JAN	FEB	MAR	APR	MAY	лин	JUL	AUG	SEP	100	NOV	080
33 N 118 H	0.00 0.00 3638	.J1 .J1 3329	•31 3•30 3831	0.00 0.00 3775	0.00 0.03 3805	0.0J 0.00 3305	0.00 0.00 3107	0.00 J.J.J 3712	0 • 0 0 3 • ú 3 48 3	0.00 3798	0.00 0.00 3536	.01 .01 2251
33 N 119 W	.01 .1 1351	• 02 • 2 1121	.J2 1557	02 02 1412	•02 •J1 1492	• 01 • 01 1320	.01 .01 1079	.01 J.10 1595	•01 •61 1476	.01 .01 1686	.01 .01 1461	.02 .01 1023
33 N 120 W	• U 2 • J 2 966	.33 .34 610	• 2 • 2 9 3 J	•63 •02 935	• 52 • 62 106→	• JJ • 92 1124	• 62 • 62 8 23	• 1 967	1000	.12 975	•02 •02 934	•03 •03 699
33 N 121 W	• 02 • 54 473	• 13 • 16 289	• ] 4 • 36 392	•û4 •3∋ 333	.05 .06 41J	.03 .04 415	.03 .05 303	. <u>C2</u> .J3 341	• 0 3 • 0 4 384	• 63 • 34 31	.03 .05 341	• 03- • 05- 293
33 N 122 W	·:3 ·06 3+5	• • 4 • • 7 3 5	• 25 372	.04 .06 350	• 6 3 • 6 4 3 3 2	• 0'+ • 06 2 7 5	•04 •05 306	• 0 2 • 6 4 26 9	•02 •04 298	•03 •06 297	03 05 347	•03 •05 332
33 N 123 W	. ù 3 363	. J3 • 6 313	.04 .0 336	•02 •04 575	• 6252	• 03 • 05 324	• 02 • ũ3 411	2 286	•02 •64 308	•02 •04 31J	•03 •05 345	03 05 362
33 N 124 W	• C2 • 55 400	• 33 • 96 236	• 33 • 65 395	.64 .05 313	•02 •05 389	• 63 • 05 313	•62 •35 314	• 1 • 3 378	• 0 2 • 0 4 287	• 25 406	03 05 377	03 05 377
33 N 125 W	• 3 • č5 356	• .3 • 36 318	• 03 • 05 • 05	•03 •05 272	. 02 .05 324	•03 •05 285	• 02 • 04 273	• 1 316	•02 •05 238	• 02 • 05 329	•03 •04 339	•03 •06 356
33 N 126 W	.36 .07 244	• 34 • 68 1 87	.04 .08 217	.08 180	.62 .35 _17	•03 •06 164	.02 .06 204	.03 .06 137	.02 .05 182	.02 .06 216	•03 •06 221	• 03 • 06 256
33 N 127 W	.ú5 .08 196	• 05 • 09 178	.34 .07 199	.07 .08 154	.03 .07 164	.04 .96 152	.03 .06 178	•ŭ3 •:6 137	•03 •07 143	.03 6 182	.05 .06 183	.06 .11 199
34 N 119 W	• 01 • 01	.J1 1637		.01 0.00 1990	• U 1 • U 1 1 9 2 4	C.O. 0.03 1615	J.00 0.00 1623	0.00 0.00 1420	•01 0•00 1448	.01 0.00 1472	•01 •01 1261	.02 .01 995
34 N 120 W	· J2 · 02	• 03 • 03 588	•03 •32 743	.03 .03 745	• 64 • 13 643	• 02 • 02 7 21	• 02 • 02 775	• 3 3 • 2 650	• 0 2 656	•02 •62	• 02 • 02 652	•02 •02 769
34 N 121 W	• J 2 • 93 576	• 33 • 34 5 3 6	•03 •94 594	•03 •04 535	•03 •04 543	• 02 • 03 • 70	.02 .03 .03	• J2 • J2 65J	• 0 2 • 0 3 577	• 02 • 3 567	• 0 2 • 0 3 5 5 8	• 3 3 • 04 495
34 N 122 W	• 3 • 5 276	261	274	·[4 ·27 239	• 36	.07 .0) 265	• 03 • 04 284	- J 3 - J 4 232	• 03 • 05 246	• 04 • 07 228	.04 .08 272	• 3 3 • 0 5 2 5 6
34 N 123 W	• 04 • 07 230	• 35 • 38 228	+ 53 + 59 258	.07 185	.15 .03 189	. 65 . 08 19	• 64 • 06 1 97	.36 156	.04 .05 172	•03 •07 263	• 04 • 06 2 07	•03 •07 212
34 N 124 W	.]3 .]5 265	. 35 37 204	• ]4 • ]7 229	.03 .07 219	.08 147	.04 .07 166	.04 .08 152	.ų4 .6 146	.03 .13 188	•03 •26 273	•04 •37 206	•04 •07 241
34 N 125 W	•04 • 6 229	.35 .8 199	• ]4 • 7 24]	.05 .07 204	.05 .08	• 04 • 07 143	.04 .07 149	•07 •37 137	•03 •06 175	• ŭ 2 • J 7 234	• 03 • 05 217	•06 •09 234
34 N 126 W	.07 .08 206	• 05 •09 200	204	•05 •09 196	• 25 • 29 149	.04 .08 132	• 23 • 07 141		.05 142	• 33 • 86 189	.05 .08 184	•04 •07 232
34 N 127 W	• 05 • 08 238	•06 •07 192	• J6 • J7 212	.65 .08 185	. 35 . 98 . 38	• 84 • 07 134	.04 .68 122	• ມູ 3 • ມູ 8 ອິອິ	• û 3 • 0 8 1 45	• 43 • 46 164	• 05 • 08 187	.05 .06 218
34 N 128 W	• 15 • 08 2 3	• 16 • 38 184	• 167	•65 •09 182	.04 .07 179	.04 .07 143	.03 .06 127	.04 .06 129	.63 .07 130	.05 .16 169	.05 .08 186	•05 •07 215
35 N 121 W	• 02 • 03 5 25	• 53 • 54 477	.:3 .:4 613	•03 •04 572	•03 •03 586	• 03 • 04 551	• 02 • 02 • 31	• 4 2 • 4 3 56 4	• 0 2 • 0 2 5 3 6	• û 2 • 03 65 8	• 12 • 03 559	•03 •04 447
35 N 122 W	• 43 • 15 296	• J 3 • J 5 310	• 34 • 35 376	.03 .05 388	• 03 • 04 432	• 02 • 04 • 8	•03 •04 441	• 62 • 33 445	•02 •63 418	•03 •04 422	• 02 • 04 423	• 0 2 • 05 274
35 N 123 W	.04 .07 243	.J4 .J8 218	.14 .07 224	•03 •66 284	• û 3 276	•04 •06 296	•03 •64 293	• û 2 325	•02 •94 306	• 02 262	•03 •06 283	•04 •08 211
35 N 124 W	• 34 222	• •59 • •59 • •20	• J 4 • J 8 186	•05 •08 189	• 03 • 05 243	• 04 • 06 229	• 0 3 • 06 2 25	• 33 • 35 243	• 0 2 • 0 4 20 4	•15 279	• 0 3 • 06 2 37	•05 •09 202
35 N 125 W	· . 7 207	178	• 5 171	•05 •05	• 25 • 39 161	• 04 • 07 2 0u	.03 .06 177	.03 .06 174	•04 •07 174	•03 •07 187	• 03 • 06 2 07	.06 .10 169
35 N 126 W	.06 .12 189	.07 .10 147	.35 .12 157	.04 .10 183	.26 .38 141	•04 •08 134	.04 .08 139	.04 .06 147	•34 •07 139	.24 .08 174	.04 .08 179	.06 .08 184
35 N 127 W	• 55 • 19 193	.05 .J8 181	• 06 • 08 198	.05 .08 171	•04 •09 153	• 05 • 07 154	•04 •08 129	• ú 3 • 36 150	•03 •07 111	• 05 • 08 206	.05 .09 191	•05 •09 201
35 N 128 W	. 04 366	· 35 7 317	. 34 373	-05	• 0 3 271	• 02 • 36 2 43	• 02 • 05 313	.J2 316	• 0 3 • 0 6 2 7 3	• 02 • 05 356	• 03 • 05 370	• 05 • 06 368
35 N 129 W	.04 .36 400	• 35 • 36 394	• 33 • 35 479	• 0 4 0 5 37 9	• 02 • 04 352	• 02 • 04 3 37	• 02 • 04 312	• : 2 • 326	• • 2 • 05 324	• 43 • 5 • 6 • 6	• 0 3 • 05 373	•04 •05 •11
35 N 130 W	• 05 568	.J5 523	• 15	.04 487	. 24	• 02 • 03 • 42	• 02 • 04 464	•01 •33 446	•02 •04 476	•02 •04 592	• 0 3 • 0 4 5 5 4	•03 •05 562

LATILON	JAN	FEB	MAR	AP R	YAP	JUN	JUL	AUG	SEP	OCT	NOV	DEC
36 N 122 W	•02 •04 552	•ປີ3 •ປີ5 465	•:3 •]4 592	.02 .04 621	• ĉ3 • 04 631	• 02 • 03 7 5 9	.02 .03 767	.02 .03 561	.02 .03 604	•02 553	.02 .03 561	•03 •04 411
36 N 123 W	.03 286	. ]4 . 6 342	•03 •-5 298	•03 •07 364	• U 2 • U 4 +6 8	• 02 • 04 291	.02 .04 577	• U 2 • J 3 525	•02 •03 478	.02 .05 418	• 03 • 05 380	•04 •09 247
36 N 124 W	.05 .J8 240	• 3 • 8 228	215	.07 279	• 23 • 25 360	• 03 • 05 351	· 15 339	- 2 360	•35 286	• • ° 6 269	•03 •06 257	•04 •06 246
36 N 125 ₩	• 15 • 18 296	· 54 · 59 206	- 34 - 07 225	.04 .08 271	•04 •06 281	• 03 • 05 2 98	• L 3 • 06 2 97	• 3 • 0 5 291	•07 258	. Ĉ 3 . Ŭ 7 25 .	.03 .06 270	.04 .07 255
36 N 126 W	• 34 • 98 446	• 5 3 • 96 4 1 4	•±3 •⊒6 449	.03 .06 368	.03 .05 371	.03 .05 357	• 02 • 05 358	• ]2 • 34 382	.02 .05 352	.03 .06 398	• 02 • 05 5 3 0	.04 .07 397
36 N 127 W	• 62 899	•03 748	• 13 • 14 694	• 0 2 • 2 4 62 *	.02 651	• 02 • 04 • 55	• 02 • 24 584	•01 •03 714	.02 .04 645	.J2 .J4 699	•02 •04 660	•02 •05 734
36 N 128 W	.02 .04 1060	. 13 . 04 875	• j2 • j3 963	•02 •03 857	• 1 • 3 769	• 01 • 03 969	• • 1 • 0 3 861	• 1 952	.01 .04 929	• 12 • 13 913	.02 .03 1168	.02 .03 997
36 N 129 W	•.;5 519	• 34 • 45 511	• 03 • 04 682	.03 .04 615	.[2 .04 566	• 02 • 04 • 81	• 01 • 03 552	•01 •03 585	•01 •03 637	.03 .04 612	•03 •04 598	• 06 520
36 N 130 W	• 06 • 08	• 06 315	• 24 • 36 382	•65 •06 331	•C3 •06 274	• 02 • 05 2 98	• 02 • 05 249	•02 •04 259	•04 •05 299	• 0 3 • 0 4 37 3	.04 .05 404	•06 •07 322
36 N 131 W	• J8 • U9 235	•08 •08 266	•06 •)8 272	.03 .07 238	.04 .05 212	• 04 • 35 2 0 9	.03 .05 138	.03 .5 185	.04 .26 191	•04 •06 25-	.06 .08 251	•07 •08 234
37 N	• 0 <u>3</u>	• 03	.03	.03	.Ç3	• Q 3	.01	•02	• 0 2	۰ų۲	- 02	• 0 3
122 W 37 N	.05 412 .03	337 . 13	343 . 34	378 .03	.04 432 .03	391 • 02	-02 -02	354. • U 1	•03 400	433 • 02	376 • 0 3	325 • 04
123 W	688 . 04	\$91	688	672	738	• 03 995	.02 381	•03 836	882 882	797 -53	.04 687	.06 637
124 W	578	572	605	.06 514	504	• 05 5 7 0	523	537	533	602	.04 645	.05 534
37 N 125 W	.02 .05 731	•03 •05 686	.U2 .J4 789	.02 .05 719	. U 2 . U 4 7 4 8	• 02 • 04 5 95	.02 .03 766	.02 .03 681	.04 664	•02 •04 755	•02 •04 883	•02 •05 588
37 N 126 W	. C 3 . 05 6 3 3	.02 .05 545	• 05 696	.02 .07 703	• 02 • 05 • 85	.02 .04 72:	• 02* • 04 6 84	•01 •03 603	•02 •04 602	.01 .04 651	•02 •04 722	.02 .05 617
37 N 127 W	.04 .26 435	.34 391	• 03 • 16 424	•03 •05 473	• 025 5 32	• 02 • 60 447	• 02 • 05 4 3 8	• J 2 • J 5 4 0 6	•02 •05 453	•02 •05 528	•04 •05 489	•03 •07 430
37 N 128 W	• 0 6 • 0 8 3 1 3	•06 •J8 299	•04 352	•03 •05 343	.02 .05 369	.02 .05 361	• û 3 • 0 6 2 8 6	• • 2 • 36 274	.02 .06 405	• 12 • 15 410	•04 •06 357	•06 •07 337
37 N 129 W	• j8 263	236	•.6• 279	•04 •05 322	•04 •06 306	•03 •06 331	.02 .06 253	•02 •05 283	•02 •05 333	•03 •05 387	•04 •06 351	.06 .09 271
37 N 130 W	.06 233	• 16 230		.04 .07 312	- 05 281	• 02 • 05 306	• 02 • 05 271	•03 •05 261	• 03 • 05 345	• 4 3 • 0 5 3 3 8	• 05 • 06 2 98	.06 .10 267
37 N 131 W	. 37 . 09 223	.37 .10 291	- 08 2.9	•05 •05 266	• 04 • 5 229	- 04 - 06 239	• 02 • 05 234	•02 242	•03 •05 262	•04 •05 291	•05 •07 266	.07 .08 254
38 N	.12		• û 3	.03	• 42	. 03	.01	.02	.01	.01	• 0 2	.03
123 W	956	919	937	.03 1139	1121 14	103 1034	• 02 11 32	•02 931	1025	•03 986	827 03	,03 791
124 W	- 9 319	3352	. 54 351	•U3 •Cô 464	459	268	• 03 • 65 5 60	563	• 02 • 04 • 533	• 0 4 • 2 3	• 05 • 05 • 30	.07 453
38 N 125 W	.05 .09 208	• 15 • 10 222	• 06 • 12 216	•0% •08 295	•04 •09 274	• 07 315	• (3 • 06 3 38	• 3 • 5 370	• 63 • 67 327	• £ 3 • 07 287	•03 •06 289	• 0 5 • 0 9 2 2 2
38 N 126 W	8 . 14 162	229	. 15 . 19 191	.04 .10 215	•03 •08 259	.03 .08 248	.04 .06 292	•03 •05 340	•03 •06 300	•03 •09 272	• 06 • 08 239	.07 .12 211
38 N 127 W	+07 17 175	. 7 . 11 176	• 05 • 03 233	• C 4 • O 8 243	. L 2 . U 7 318	• 03 • 06 334	. 03 .06 384	.13 .16 349	.03 .06 318	•03 •08 285	.04 .06 266	.08 .11 214
38 N 128 H	.06 .13 206	. 39 .12 193	•04 •7 261	277	•03 383	.02 .00 381	.02 .05 449	• 22 • 4 435	•02 •05 416	- 134 - 27 34 -	• 05 • 07 282	•07 •09 239
38 N 129 W	•08 •13 177	.06 .10 206	• J6 • J9 214	•05 •05 247	• 03 • 05 3 0 7	• 02 • 09 3 3 û	• 02 • 05 3 55	• 25 337	•03 •05 320	• 137 249	• 05 • 06 253	.08 .09 217
38 N 130 H	• * 9 • 15 140	• 12 • 11 172	•.7 •10 170	.05 .08 180	• 03 • 06 247	• 03 • 05 258	03 05 273	.02 .54 281	• 0 3 • 0 5 272	.05 .03 192	•08 •09 206	.10 .10 196
38 N 131 W	.09 .13 160	• 08 • 12 146	. 97 . 12 191	.07 .09 151	• 13 • 15 24 8	• 04 • 08 201	• 0 3 • 05 2 3 2	.02 .04 291	.04 .06 221	.06 .08 198	•07 •08 174	.08 .12 190
38 N 132 ₩	•11 •17 126	•13 •12 139	• 38 • 38 166	.07 .19 146	.05 .7 189	.04 .06 181	.03 .05 208	• 06 225	• 0 4 • 3 4 2 3 8	• U 8 • 0 8 1 9 3	.07 .08 178	• 11 • 12 157

LATILON	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	0C T	NOV	DEC
39 N 124 W	• 04 • 08 337	• 4 • 37 393	.ŭ3 .j6 392	.04 .05 437	• ນີ 5 • ນີ 8 +23	•04 •06 496	03 07 465	.33 .05 415	• 33 • 05 420	. ( 2 . ( 5 4 ( 6	.03 .05 422	.09 .12 344
39 N 125 W	•10 •12 181	.06 .16 171	.38 .15 162	•03 •10 202	• 05 • 10 229	• 05 • 13 273	.04 .08 311	- U 4 - J 8 267	• 0 4 • 0 9 242	.04 .08 218	• 05 • 12 157	.05 .12 158
39 N 126 W	• 77 • 17 172	• 19 • 11 100	. 7 .11 165	.64 .09 231	• 69 232	. 03 . 07 301	. [ 3 . [6 331	· 3 · 7 318	•03 •07 269	• 07 • 17 22 u	•06 •09 206	.08 .13 155
39 N 127 W	.09 .17 134	• 96 • 99 173	•17 •13 167	.05 .10 213	.05 .1] 173	• 05 • 15 1 82	• 04 • 08 2 22	· 37 · 244	.64 .09 195	• 45 • 12 197	.08 .10 174	.08 .13 141,
39 N 125 W	. j7 . 14 138	•10 •11 135	•13 169	.05 .11 164	.04 .13 161	•04 •09 167	• 03 • 07 233	• 03 • 07 219	•03 •07 227	.05 .10 171	.07 .20 163	.08 .11 136
39 N 129 W	.07 .11 133	.10 .10 162	• 47 2 2	.05 .09 229	• C 4 • 5 2 4 9	•03 •00 254	.02 .06 288	ະນີ 3 - 6 248	.03 7 238	•06 •49 178	.06 .09 184	.07 .09 172
39 N 130 W	.07 .08 304	• 07 • 07 337	• J5 • J7 248	•03 •07 349	• 03 • 04 451	• 02 • 04 3 3 3	.02 .05 356	• 2 • 5 324	.C? .CE 251	•••6 •10 239	.07 .09 187	.35 .07 335
39 N 131 W	•13 •13 138	•11 •13 149	• 6 192	.04 .05 216	• 4 • 64 347	.03 .05 264	.02 .04 400	• ŭ 2 • 3 3 357	.07 284	.06 .08 187	.09 .09 198	.08 .10 174
39 N 132 W	• 10 • 12 135	.13 .15 101	.10 .12 157	•06 •05 163	.:5 .07 185	.04 .05 251	. C2 . 04 269	• 53 • 06 219	• 06 235	· 64 • 67 159	.09 .10 172	.13 .14 148
4 39 N 133 W	•12 •18 132	• 10 •21 112	•03 •11 145	.C5 .11 149	. ú5 . 08 162	.03 .05 206	.03 .04 240	.:3 .:5 186	. J. . 0.4 246	.05 .06 316	• 09 • 08 220	.08 .11 150
60 N	. 03	. 3	. 3	.52		- 62	. 63	. 5	- 6.2		. 0.2	. 11 4
124 W	*09 727	- )6 710	37 747	735	453	605	05 658	- J6 517	478	49	525	.08 454
125 ₩	•16 178	.14 158	• 11 184	.11 21J	.12 167	• 09 2 2 3	•09 212	233	.11 193	•12 191	•11 213	.15 151
40 N 126 W	.09 .18 111	• 16 • 28 • 75	•11 •19 8J	•02 •13 102	•1J •14 124	.06 .17 105	• 05 • 12 1 27	.04 .11 127	•05 •13 95	•06 •13 114	•07 •17 128	.09 .23 101
40 N 127 W	.09 .14 127	• • • • • • • • • • • • • • • • • • •	•13 •16 115	.[5 .11 169	• • • 9 • • 9 167	• 03 • 08 196	• 54 • 59 2 0 4	270	.04 .09 162	•12 169	.07 .16 122	.08 .13 123
40 N 128 W	.06 .12 257	• . 9 • 14 162	.10 .11 153	.03 212	•03 •08 2.1	.03 .21 248	.02 .07 301	• 36 247	•04 •08 215	• 65 • 69 19	.08 .12 136	•08 •09 225
40 N 129 W	.:7 .10 167	.06 .11 189	•05 •07 276	•05 •07 305	• 04 • 05 279	• 03 • 06 230	•03 •05 268	.04 .06 249	•05 •08 243	•04 •08 253	.08 .09 218	.07 .11 158
40 N 130 W	.07 209	.06 295	. 15 568	.04 .15 479	.ū3 519	.02 .04 717	• 02 • 115 4 99	• ú 2 393	•04 •06 359	•04 •05 472	.05 .06 396	.05 .08 197
40 N 131 W	- 10 - 15 108	•11 •12 176	.38 .13 145	.07 .03 168	.05 .15 191	• 33 • 05 185	.05 216		•15 •25 170	•û7 •ù7 147	. 38 . 10 153	•11 •12 129
40 N 132 W	•11 •1- 165	• 1.9 162	182	.05 .07 183	- 45 - 96 232	.02 .04 261	• 02 • 04 3 04	.02 .03 271	•04 •05 233	•13 •08 213	.08 .09 177	•10 •13 173
60 N 133 W	.09 .11 172	.17 .J9 166	•18 •18 226	-04 -06 291	• 64 • 05 268	.02 .03 38+	• 02 • 03 375	• • 2 • 0 4 341	.03 .04 429	•11 •06 362	•08 •07 235	•09 •11 203
41 N	. 18	. 04	. 35	.05	.05	. 04	. 08	. 12	. 0.2	a ii 3	. 14	. 07
124 W	17 102	10 112	121	.21 114	125	11 120	14	.05 180	208	212	209	178
125 W	16 234	227	256	226	243	258	271	236	13 236	271	11 246	17
126 W	•17 •16 77	•19 •19 77	•12 •29 •82	•15 93	.16 102	• 15 • 14 87	• 12 • 29 • 84	-14	•04 •18 91	.27 118	• 05 • 15 101	•10 •19 98
41 N 127 W	• 12 • 22 • 88	•16 •17 •14	•16 •26 73	•12 •17 •17	.04 10 105	• 08 • 18 60	• 14 • 64	• 12 • 12 • 85	• 0 9 • 2 0 • 6 0	• 15 82	• 11 • 19 • 94	•14 •21 84
41 N 128 W	• 29 • 25 • 77	•13 •14 50	.236	.19 101	• 13 • 13	• 10 • 13 76	• 64 • 13 83	• 64 • 14 • 77	•05 •12 65	•08 •12 89	• 16 • 24 8 3	•14 •14 86
41 N 129 W	.13 .18 103	• 12 • 18 97	.50 .43 1u8	.05 .08 120	• 46 • 49 119	.03 .05 154	• 03 • 07 1 37	.05 .07 122	.04 .09 115	•63 •11 111	•10 •12 107	.20 .14 113
41 N 130 W	•18 •14 113	•11 •16 156	•11 •39 164	.04 .06 219	.04 .06 218	• 0 3 • 05 2 7 4	.02 .05 253	.02 .05 295	.05 .06 199	•08 •08 206	.08 .10 154	•10 •15 122
41 N 131 W	• 09 • 12 175	•12 •16 2,2	• 39 221	283	•04 268	• 02 • 34 27	05 11 344	• 03 341	•04 35 247	•05 •08 227	•08 •12 195	•09 •11 161
41 N 132 W	•10 •12 116	•14 •18 113	•10 •12 115	.08 .09 155	•08 •09 161	.05 .05 161	•03 •05 171	152	•05 •07 148	•••9 ••55 162	•12 •11 139	•12 •17 131
41 N 133 W	•12 •16 117	• 12 • 18	•13 •16 115	.07 133	.08 .08 118	• 04 05 157	• 04 • 26 1 52	•03 •05 168	• 05 • 07 141	• 48 • 11 137	• 15 • 12 113	·10 123

LAT/LON	I JAN	FEB	MAR	AP R	YAM	JUN	JUL	AUG	SEP	007	NOV	080
42 N 124 W	•08 •15 103	.36 .14 137	. J6 .12 74	.05 .15 92	.05 •13 96	.05 .09 112	.05 .13 128	.05 •13 90	.03 .1 112	•02 •-9	.07 .17	.06 .12 76
42 N 125 W	• 36 • 12 221	· 16 • 11 241	• J 4 • J 8 27 3	.03 .11 258	• ]4 • 14 214	• 0 3 • 1 3 0 3	+03 +09 296	.03 .09 238	.03 .1. 243	• . 3 • 38 268	. n 3 272	• 36 • 15 196
42 N 126 W	•17 •28 73	.15 .25 60	•15 •21 77	.28 .14 85	- 18 - 15 75	• 5 • 13 61	.07 .17 63	.12	• Ü ð • 21 • 50	.13 .23 73	.09 .15 77	• 17 • 23 58
42 N 127 W	•18 •21 86	• 09 • 17 • 32	• 1 d • 2 3 95	.10 .21 89	. 05 . 09 . 83	• 67 • 11 7 3	• 58 • 12 72	•11 •11	.05 .18 69	•11 •15 94	• 12 • 15 114	.14 .16 102
42 N 128 W	• 2 4 • 2 0 9 4	•10 •18 54	• 2 3 • 2 4 3 7	.10 .13 68	û7 .14 75	• 10 • 25 67	.06 .15 67	.37 -18 51	.09 .11 53	.08 .13 82	• 14 • 25 86	•16 •20 110
42 N 129 W	.12 .16 212	.10 .13 166	• 16 • 19 250	.05 .:7 24+	. 06 . 7 241	. 04 . 17 157	.64 .66 143	•52 •55 264	•11 •13 48	•14 •13 61	-11 -13 152	•10 •11 257
42 N 130 W	- 10 - 14 146	•14 •17 142	•12 •12 124	.07 .03 93	.05 .09 100	. L'+ . 07 1 39	.04 .09 128	- 32 - 39 100	•21 •02	•12 •12 76	• 12 • 11 137	•14 •19 114
42 N 131 W	•17 •19 187	·14 •13 158	•,7 •13 199	.07 .06 216	.05 .07 160	.64 .05 183	.03 .04 280	- C 2 - C 4 2 9 8	•07 206	•1: •09 160	.1C .13 158	•13 •12 138
42 N 132 W	•13 •17 121	*11 *18 120	•15 •13 123	83. 60. 68.	.25 .05 194	• 04 • 05 2 28	• 03 • 05 2 4 9	· 354 · 354	.04 .06 190	.08 .09 159	.12 .19 116	•12 •21 126
42 N 133 W	•15 •15 144	.16 .18 110	•13 •10 167	.07 .[9 181	• 46 • 7 256	- 05 - 119 257	. 03 . 04 2 3 3	•33 •.3 259	.04 .05 21∋	.58 .7 20-	•15 •17 119	•12 •15 139
43 N 124 W	•11 •14 •5	• 19 • 11 1 6	• .6 • 12	•03 •12	•56 •10 87	• 03 • 07	.03 •10	• 03 • 09 76	• 02	.02 .08	• 08 • 21 • 72	.07
43 N 125 W	• 56	• 34 • 33 272	. J6 .1) 255	•03 •19 241	• 0 3 • 9 241	• 02 • 07 2 8	• 02 • 65 304	• 52	.02 .09 281	•10 •07 456	•04 •09 423	•06 •15 224
43 N 126 W	• 13 • 19 • 71	•13 •22 58	•15 •14 61	•13 •12 59	• û ô • 14 5 9	• 06 • 17 • 17	• 07 • 16 42	• 3 • 17 5 2	• 21 • 21 • 47	•L7 •12 87	• 13 • 15 • 77	• 12 • 23 68
43 N 127 W	.24 .33 71	· 13 • 22 • 64	• 12g • 2g	•1; •15 64	- 64	• 06 • 13 48	- 04 - 10 - 58	.11 .17 .54	•07 •14 53	.09 .13 105	• 11 • 15 116	• 20 • 25 • 33
43 N 128 W	• 18 • 21 85	.23 .31 78	• 325	•11 •1* 68	*.C6 .11 69	. 03 6+	.09 .11 64	• 58 • 58	.07 .12 71	.09 .17 83	.14 .15 104	•16 •22 105
43 N 129 W	•14 •17 136	.16 .21 .78	•14 •15 123	.03 .13 93	•12 •13 97	• 09 • 23 87	•05 •05 76	.35 .10 86	•07 •08 77	•12 •17 •82	.15 .18 195	•13 •23 107
43 N 130 W	- 0 8 - 1/ 330	.13 156	• 18 • 1 J 3 2 6	.06 .5 317	• 0 3 3 4 6	- 02 - 05 369	• 02 • 05 3 20	• 02 330	•03 •05 288	•09 •10 173	•12 •12 118	.07 .10 332
43 N 131 W	••12 •15 119	• 10 • 14 149	•11 •11 139	·11 ·14 117	• 5 • 15 133	. 45 . 45 150	.04 .06 150	2 .05 169	•09 •126	•1 •09 130	.11 .12 116	-19 -22 103
43 N 132 W	•15 •19 99	12 26 101	•13 •15 114	•11 •15 95	•10 •03 85	.07 .03 83	. 05 . 07 . 94	•û5 •08 84	.08 .10 75	:14 :12 81	• 19 • 20 • 78	• 17 • 22 7 9
43 N 133 W	• 14 • 13 127	•12 •17 112	· 10 1_7	.03 147	80. 09 122	• 0 + • 0 6 1 28	.04 .05 115	-16 -05 129	•07 •07 19.	.09 .12 149	•13 •12 143	.20 .47 121
44 N 124 W	• - 9 • 17 126	• 08 • 10 1 33	.09 .16 118	-04 -08 136	.03 .06 162	-01 .07 133	.02 .05 161	• J 1 • 05 • 95	• Ĵ 3 • 05 138	. 63 .03 156	.04 .09 174	•11 •16 94
44 N 125 W	.07 .14 229	• 10 252	- 15 15 15 15	.03 237	.16 .07 259	• 02 • 06 27:	• Ú1 • 05 341	• 11 • 15 286	•01 •04 543	•02 •07 492	•03 •06 437	•08 •18 221
44 N 126 H	• 17 • 23 84	•14 •25 45	.19 .16 .58	•18 •652	.06 .10 73	• 05 • 12 6 3	• 35 • 17 • 61	• 32 • 76	•10 •24 39	•16 •19 •3	• 09 • 17 76	• 17 • 32 65
44 N 127 W	• 20 • 28 75	• 20 • 23 • 52	• 13 • 21 • 77	•14 •17 55	• 28 • 12 77	.08 .11 55	• 05 • 15 42	.ú4 .09 54	•10 •12 51	•13 •10 77	•09 •14 103	•17 •30 81
44 N 128 W	•19 •22 99	• 16 • 23 124	.17	•1) •13	• 10 • 11 109	• 27 • 47 83	. 65 • 11 • 79	•35 •28 74	• 05 • 13 124	.05 .288	•07 •12 270	•25 •22 103
44 N 129 W	•15 •18 99	•14 •17 94	•16 •17 115	•10 •13 126	•07 •06 102	.05 .11 107	- 64 - 07 104	.:4 .ū8 94	.05 .08 119	.11 .68	· 16 • 12 145	•18 •22 139
44 N 130 W	•10 •14 134	•11 •15 116	•16 •16 126	.10 .16 102	.09 .14 110	• 07 • 25 1 1 0	.04 .09 110	.06 .j9 .91	•05 •09 113	.09 .14 125	• 13 • 20 117	• 16 • 19 117
44 N 131 W	• 10 • 12 231	. 19 11 194	.]7 .7 318	.05 255	- 64 283	.02 .04 417	• 02 • 34 384	.05 .03 385	• 0 3 • 0 5 38 ±	•04 •07 372	• 06 • 08 273	• 13 • 14 238
44 N 132 W	- 12 - 14 17 0	•11 •17 150	•11 •11 157	.07 .07 181	•06 •68 177	. 15 . 05 169	- 63 - 65 175	• 3 • 5 149	• 25 143	173	-13 -12 151	•11 •17 177
44 N 133 W	•14 •16 137	-15 -16 133	·13 ·12 118	.12 .11 101	. 67 . 67 165	.08 .07 115	.06 .06 108	· 4 . 57 109	.07 .10 100	•11 •10 137	•13 •14 116	• 11 • 15 135

LATILON	NAL	FE8	MAR	465	HAY	ЧÜГ	JUL	AUG	SEP	oct	NOV	25C
45 N 124 N	•11 •12 175	- 36 - 38 188	.36 .39 164	.0% .09 150	.04 .ū6 219	• 01 • 04 230	.01 .05 204	.31	.02 .07 161	.04 7 211	.10 .12 175	•11 •14 141
45 N 125 W	· 36 • 1 277	• 04 • 8 338	• J6 • 1_ 329	- 04 - 45 277	• J 3 • • 5 344	• 01 • 05 344	.01 .04 368	.01 .04 238	•01 •03 422	• 03 • 06 458	• 05 • 10 355	•10 •14 233
45 N 126 W	·13 ·24 109	• ]8 • 12 116	•14 •18 33	•£7 •15 87	• 5 • 8 103	• 63 • 08 129	. (5 . 13 87	• 5 • 38 96	• J 9 • 12 • 99	•14 •10 115	•11 •16 113	•18 •27 101
45 N 127 W	• 19 • 26 98	.14 .17 1J1	•12 •17 116	.09 .18 82	.06 .11 104	.05 .08 75	.06 .11 81	.24 .37 31	• 0 5 • 1 2 7 2	•12 •12 11-	• 11 • 15 1 32	·20 •29
45 N 128 W	· 11 · 20 1 · 2	.13 .14 99	•10 •15 1•3	•09 •21 105	. : 4 . 04 297	.05 .07 10	• 65 • 08 79	. J 3 . J 7 147	.07 .11 71	•17 •15 113	· 14 · 13 121	•29 •27 85
45 N 129 W	•14 •19 119	•13 •13 ∋7	• 11 • 16 144	•08 •10 10∋	.05 .09 103	• 05 • 07 1 15	. 65 . 68 97	. 34 . 7 95	.08 .28 123	.19 .14 117	. 12 . 18 1 31	•11 •16 109
45 N 130 N	.06 507	• 06 • 8 6 5 6	• 35 • 5 539	•04 •55 554	.03 .05 386	• 03 • 03 • 23	• 01 • 04 559	. 3 3 . 3 3 3 6 7	• 0 3 • 0 3 471	•06 •06 379	• 07 • 09 482	•08 •10 425
45 N 131 W	.08 .10 257	• ]9 • 1( 273	• 7 • 7 234	•L5 •C7 223	• 5 260	• 6 3 • 04 251	· 69 - 64 274	•	.05 .07 209	7 . 38 216	.10 .12 199	•11 •12 255
45 N 132 M	•12 •17 156	• 12 • 12 143	•11 •1] 163	.08 .08 192	. C7 . D7 173	.04 .06 167	.05 .06 129	.05 .06 141	.06 .08 145	• 1 • 11 16	.09 .13 132	.18 .16 127
45 N 133 W	.23 .29 61	• 29 • 25 5 3	•23	•15 •16 59	• 15 • 12 55	. 07 . 09 68	.08 .08 56	. J 9 . 12 45	.07 .09 55	.13 .15 .93	• 16 • 18 79	• 25 • 34 75
46 N 1 <b>24</b> W	.04 .u4 967	• .4 • .36 660	• 33 • 37 692	• 6 3 • 05 694	.ŭ3 .04 7⊑9	• 02 • 03 712	• 61 • 02 771	• 1 • 02 696	• 62 • 03 724	. 63 .05 818	.04 .06 719	•06 •08 675
46 N 125 W	· 10	• 10 222	.]3 .03 269	•03 •09 204	• 03 • 05 246	.02 .04 291	. 02 . 04 314	.01 .J4 255	•04 •06 269	.07 .09 285	.07 .12 258	.13 .14 154
46 N 126 W	.13 .19 100	•13 •19 •3	•13 •17 34	•09 •13 7.4	.06 •1 82	. 07 . 13 78	• 64 • 68 95	• û 4 • 8 87	•19 •16 88	• 11 • 27 89	.24 .27 115	•27 •21 76
46 N 127 W	•14 •16 126	• 11 • 13 120	• 11 • 14 140	.08 .11 103	•05 •05 100	.07 .1. 96	• 55 • 59 1 02	• 56 • 56 • 98	.06 .11 95	•15 •15 105	.12 .14 181	•18 •15 114
46 N 128 W	•12 •17 139	•16 •15 148	11	.08 .10 113	• 0 3 • 0 3 1 0 9	.05 .08 105	.04 .08 113	.35 .06 110	.05 .07 118	.11 .12 139	.14 .17 145	•12 •13 145
46 N 129 W	.16 .17 145	•13 •16 136	.12 .11 154	•15 •11 129	.09	.05 .06 115	.05 .06 1:7	.04 .05 120	.05 .09 113	•1: •14 133	• 10 • 12 1 36	•13 •18 145
46 N 130 W	.11 .14 131	•14 •16 130	•11 •12 152	•15 •12 123	•06 •06 125	•06 •08 140	.05 .07 114	.25 •38 98	•09 •12 102	.14 .11 123	• 12 • 12 1 37	•13 •16 130
46 N 131 W	.14 .15 141	•12 •16 1.7	•11 •15 112	.07 .13 159	.05 157	.04 .05 142	.04 .07 123	.35 144	.08 .08 141	•13 •13 125	.15 .17 154	•12 •12 148
46 N 132 W	•10 •10 240	. J9 . J9 182	. J9 . J8 254	•08 •03 296	• • \$ • • 5 2 2 9	• 100 • 100 145	• 14 • 12 1 38	•_6 •_8 121	. 37 . 38 151	• 19 • 12 121	-13 -14 114	•16 •17 134
46 N 133 W	.15 .14 106	• 17 • 20 92	• 15 • 15 8 3	•12 •12 95	• 14 • 14 92	• 07 • 08 • 77	.06 .09 74	.35 .36 36	•10 •13 90	.13 .12 105	•17 •18 91	.24 .23 108
47 N 124 W	• 18 • 15 80	•10 •11 96	.07 .10 31	.C8 .1J 83	• ຼ 4 • ີ ງ 84	• 02 • 03 1 17	.02 .03 119	. 2	.03 .04 101	•106 •06	.07 .09 173	•18 •19 74
47 N 125 W	•1. •12 228	.08 .10 198	.06 .08 252	.67 .09 195	• 04 • 05 197	. 62 . 03 356	.01 .02 450	.01 .02 436	.03 .03 274	.04 .17 357	.07 .09 304	•11 •15 155
47 N 126 W	•14 •16 196	·:2 •13 158	•15 •11 177	.09 .10 185	. 35 . 08 174	• 65 • 68 152	.03 .06 143	•03 •06 174	.09 .10 157	.09 .11 192	.10 .11 223	•12 •14 138
47 N 127 W	•15 •13 171	.10 .12 177	.11 .09 215	.08 .12 171	• 05 • 08 177	•08 •11 175	. 03 . 06 149	•35 •6 151	.08 .1. 181	.07 .1., 17.	• 11 • 13 186	•14 •13 159
47 N 125 W	• 15 • 12 151	• 16 • 19 127	.09 .12 156	•10 •13 13]	• 05 • 06 128	•09 •12 11)	.08 .06 108	.04 .08 116	.06 .10 183	•88 •69 293	• 10 • 19 154	•15 •17 125
47 N 129 W	•19 •18 88	·21 ·20 100	.13 .16 .33	.39 .13 94	• 16 • 16 99	• 05 • 05 95	• 64 • 07 94	• 5 • 58 86	.08 .09 107	••9 •10 198	•11 •16 115	• 16 • 18 • 38
47 N 130 W	•10 •12 262	• 10 • 12 2 33	•10 •19 299	• 0 5 • 0 5 276	.05 213	• 03 • 06 247	.02 .03 270	· 0252	.07 257	•13 •14 148	• 19 • 21 78	.09 .08 282
47 N 131 W	•08 237	• 12 • 16 120	.09 18	.06 200	.04 .07 198	• 03 • 04 267	• 03 • 04 237	.03 .J5 316	•04 •06 326	• 11 • 11 202	.10 .14 185	•10 •12 262
47 N 132 W	•11 •16 159	• 98 • 11 206	•09 171	•13 •69 157	• 04 265	· 03 • 03 • 74	.03 292	• 04 259	• 0 4 • 0 6 2 3 2	• ú 8 257	• 08 • 10 2 48	•11 17 196
47 N 133 H	• 16	· 18 • 19 84	•19 •15	•11 •17 83	• 1ŭ • 14 76	• 08 • 11 75	• 07 • 08 61	•06 •10 85	• 1 8 • 100	·1: 12 114	• 25 • 22 • 90	-18 -17 -91

LAT/LON	JAN	FEB	MAR	AP₹	HAY	JUN	JUL	AUG	SEP	OC T	NOV	020
48 N 125 W	•36 •65 930	•06 •06 739	. 44 . 36 848	-03 -0'+ 771	.02 .02 767	• 01 • 01 763	01 01 1213	1 	.C2 .03 754	. 63 .05 795	• 05 • 05 8 2 3	.07 .08 529
48 N 126 W	•12 •12 304	•11 •39 239	.10 .08 252	.07 .07 193	.00 .09 185	• 05 • 05 197	• 02 • 03 324	.02 .02 327	.03 .04 298	.07 .15 431	.09 .09 331	•12 •12 201
48 N 127 W	.12 .12 143	•12 •13 131	• 10 • 12 130	•09 •14 191	.08 .1 151	• 06 • 07 14	.06 7 137	.04 .06 134	•04 •05 206	.09 .11 136	• 09 • 11 247	•17 •15 137
48 N 128 W	•12 •14 114	•11 •16 131	•09 •09 139	.05 .08 147	• • 6 • • 8 145	• 05 • 05 1 33	. 35 . 88 1 1 8	• 5 • 7 115	.18 .14 130	•13 •14 134	•14 •16 142	•15 •16 136
48 N 129 W	•12 •17 111	•14 •12 125	•10 •11 126	.07 .13 110	• 36 • 53 147	.05 .08 113	.05 .08 135	.C4 .G8 131	.08 .14 141	•11 •15 117	• 13 • 16 114	•13 •15 122
48 N 130 W	•14 •15 132	•11 •17 1.8	• . 9 • 10 136	.13 .11 123	.07 .09 131	.45 .13 133	.06 .09 120		.38 .09 179	•10 •15 131	• 14 • 16 134	•15 •16 141
48 N 131 W	•19 •18 143	•11 •13 126	•11 •12 134	.05 .07 167	• 05 • 06 207	.04 .05 168	• 03 • 04 173	.04 .6 161	.07 .09 178	•10 •14 169	•11 •16 162	.10 .15 184
48 N 132 W	• 0 8 • 8 322	. 07 322	• 06 335	.05 .07 321	. 33 . 64 380	• 03 • 05 205	•04 •06 192	•34 •05 192	•07 •08 209	•13 •13 161	•11 •12 197	•08 •10 295
48 N 133 W	•12 •13 124	.14 .16 .95	•13 •15 116	•[8 •12 134	• 28 • 28 136	. 17 . 07 1 33	• 04 • 05 1 37	• 0 • 107	•1 •19 147	•13 •12 143	•12 •16 147	•15 •15 153
48 N 134 W	• 16 • 17 \$2	•18 •26 107	•15 •14 97	•13 •13 10+	.28 .07 113	.00 .08 113	• 05 • 05 94	-L8 -37 91	•1_ •13 96	.22 .34 114	•13 •14 132	.28 .25 114
49 N 126 W	• 2° • 13 98	• 9 • 9 146	•24 •13 124	•28 •58 141	• 65 • 65 149		- LS26	• 2 • 4 378	•35 •04 235	• 0 7 • 0 6 20 7	•09 •12 122	•15 •16 106
49 N 127 W	• 12 • 12 15 2	.j9 .10 159	•13 •12 170	.08 .10 193	.06 .05 213	• 05 • 06 2 09	.04 .03 331	.23 .03 283	•05 •06 268	•08 •08 223	• 26 • 16 212	.12 .11 169
49 N 128 W	•13 •13 185	• 98 • 12 175	•1] •]9 234	•05 •09 197	. C 4 . D 5 4 5 3	• 04 • 05 273	.04 .05 325	.04 .04 322	•05 •07 272	•10 •11 207	•10 •10 267	•14 •13 184
49 N 129 W	•11 •14 184	•10 •9 196	•09 212	· • • • • •	. 05 289	• 04 • 05 24	• 04 • 65 272	•03 251	•15 •18 249	•09 •11 233	•09 •11 246	•13 •14 194
49 N 130 W	•13 •12 308	•09 •11 316	• 36 • 37 314	•05 •07 315	. ເອ ເງິງ 298	• 03 • 04 2 93	• 03 • 05 303	• 3 5 325	• 35 • 06 346	• • 7 • 0 9 280	• 07 • 08 332	•11 •12 304
49 N 131 W	• <u>9</u> • 30	• 9 • 79 388	• • • 6 • • 8 411	•08 •08 452	.34 .05 \$30	• 02 • 03 525	.04 .05 +58	. ŭ 3 . 04 330	.05 .06 420	.05 .16 362	.07 .08 368	.07 .11 406
49 N 132 W	•15 •14 182	.10 .11 197	.13 .11 189	.09 .09 191	• 65 • 35 24	.35 .05 ?1:	• 03 • 04 235	.:4 .05 221	•06 •03 225	•£9 •10 227	• 11 • 10 235	•12 •11 217
49 N 1 <b>33</b> W	•11 •14 196	•10 •12 185	•11 •J8 225	•07 •09 250	• 36 • 36 235	• 04 • 05 244	.03 .04 220	•04 •05 272	.06 .07 251	•11 •1- 233	•13 •13 238	•11 •13 190
69 N 134 H	•14 •13 230	•12 •11 •79	•10 251	.09 .12 210	. U 5 . L 6 2 4 9	.05 .05 24.	• 04 • 04 2 27	•04 252	•07 •07 277	•11 •12 257	• 11 262	•11 •12 211
49 N 135 H	•12 •11 183	•11 •11 165	•13 •11 199	.09 .12 217	8 7 213	• 08 • 05 200	.û5 .C5 184	• 5 • 5 211	•07 263	.13 243	.09 .11 306	•11 •10 241
50 N 127 W	• 38 • 26 • 19	• 17 • 16 36	• 28 • 33 • 25	•5325 •525	• 0 19 • 0 19	.09 .10 27	• 05 • 05 86	.04 .01 88	•03 •02 160	•10 •07 112	2.75 .51 .53	• 54 • 55 17
50 N 128 W	•18 •17 68	•33 •35 •48	•19 •13 68	•11 •17 69	•13 •13 62	• 0 8 • 15 95	•09 •08 102	• .6 • 29 69	• ¢ 9 • 12 77	•1 •1ū 81	• 12 • 17 84	• 32 • 27 • 61
50 N 129 W	•17 •20 93	•18 •16 78	•13 •17 89	•11 •15 110	• 66 • 37 136	•08 •09 115	.05 .06 171	•05 •07 148	.07 .11 129	•13 •14 98	•20 •18 106	• 22 • 24 • 82
50 N 130 W	• 19 • 14 • 124	•13 •13 1:3	•15 •14 121	.C7 .10 143	•35 •06 189	• 06 • 06	.04 .07 216	.05 .07 183	•05 •09 187	•11 •11 152	•13 •20 139	$ \begin{array}{r}                                 $
50 N 131 W	• 13 • 17 163	•12 •13 149	.10 .11 160	.07 .10 217	• 05 253	• 07 • 06 • 06 • 06	• 04 • 05 273	• 0 4 2 4 0	•07 •09 248	•10 •10 180	.11 .12 187	•12 •15 154
50 N 132 W	• 12 • 16 1 3 3	•12 •13 129	•12 •10 160	• 0 5 • 0 8 17 3	• 05 • 06 223	• 04 • 06 2 13	• 04 • 05 2 54	• 09 • 23 234	•05 •38 228	•12 •16 148	•13 •12 170	•14 •23 125
50 N 133 H	•14 •16 125	•14 •14 129	•15 •13 137	•05 •08 13€	• -6 • 06 212	• 06 • 07 1 85	•04 •05 214	.34 .05 230	•07 •08 203	•14 •12 160	• 16 • 15 147	•16 •17 144
50 N 134 W	• 12 • 11 327	•08 •10 261	. 17 . 66 331	•06 •08 309	• 05 328	• 03 • 04 • 09	• 03 04 335	. : 4 . : 4 31 3	•07 •08 213	•11 •11 163	•11 •10 284	•10 •12 289
50 N 135 W	•14 •15 161	•13 •11 162	•11 •11 197	.08 .08 212	• 05 255	• 0 + • 0 + 2 6 3	• 03 2 37	• 0 5 23 7	• 05 • 06 484	•13 •11 228	•11 •13 222	•15 •15 188
50 N 136 W	. 68 . 08 485	• 09 • - 8 463	• 35 • 5 64 9	.04 .05 681	• 04 \$ 95	• 04 • 04 537	• 03 • 13 384	• 04 • 4 406	• [] 4 • [] 6 4 4 6	• li 7 • u 8 499	.08 .07 536	•09 •09 566

### APPENDIX C

## MONTHLY WIND STRESS CURL DISTRIBUTIONS

The monthly mean wind stress curl distributions are displayed in Charts 37 to 48. The plotted values are estimates of the vertical component of the wind stress curl, calculated by applying a finite difference, spherical coordinate curl operator to the fields of monthly mean surface wind stress. The contoured values are plotted in units of dyne cm<sup>-2</sup> per 100 km. A value of 1 dyne cm<sup>-2</sup> per 100 km is equivalent to 1 X 10<sup>-7</sup> dyne cm<sup>-3</sup>. The contour interval is 0.25 dyne cm<sup>-2</sup> per 100 km. Positive wind stress curl is associated with surface Ekman divergence (upwelling). Negative values are shaded. These correspond to surface Ekman convergence (downwelling).

In the following charts, the month is indicated in the figure legend in the upper right corner of the charts. The coastline configuration is superimposed on the grid as a visual aid and does not represent a conformal mapping.

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NCC - 1	TDF-11 - ONE DEGR	EE SUMMARIZATION	
137 1	36 135 134 133	132 131 130 129 128 127 126 125 124 123 122 121 120 1	19 118 117 116 115 114 113 112 111
		and the second s	
50 -9	.50 0.93 8.11-8.8	0.24-0.11-0.12 0.19 0.81 0.60 RNCOUVER ISIAND	5
49	8.12-8.06 8.2	8.09 8.15-8.16 9.06 8.48 0.34 3.32 2	NDAR 4
48	8.73 8.4	0.20 - a. 14 - 0. 14 0.20 0.22 0.53 0.55 - 0.24	PACIFIC ENVIRONMENTAL GROUP
47	8.9	0.35 0.73 8.09 0.45 0.01 0.44 0.35 8.17 0.02	HUNDERET, CHEIFDHNIR
46	8.71	8.44 8.22-8.15 8.25 8.35 8.84 8.11-8.02-8.19 COLUISIA RIVER	WIND STRESS
45	8.36	0.31-2.08-0.16 0.04 0.45-0.21-5.04 0.12-0.13	
44	8.18	8. 17 - 8. 36 - 9. 33 8. 32 9. 07 - 9. 43 8. 31 - 9. 94 - 9. 37	
43	8.38	0.45° 0.40°-0.57-0.55 8.59 0.38°-8.07=0.81-0.75	LONG TERM MEAN
42	0,11	0.04-0.3-0.33 0.71 0.33-0.75 0.47 0.30-0.35	JANUARY
41			
49	g 21	a al a 10-a 12-a 28-a that a that a 2 a a a	
30			4
20			3
		2. 21 - 10	3
		0.12 0.00 0.13 0.00 0.00 0.00 0.10 0.22 0.14 0.25	9
36		1 8.14 8.83 9.82-9.35 6.99 8.87 9.85-8.15-3.57 2.14	6
35		0.01-0.11-0.04 0.09 0.09-0.13-0.75-0.07 0.08 8.23 POINT	CONCEPTION 3
34		<b>4.</b> 92-6.11-6.05-C.11-6.07 6.92-6.82 0.15 0.34 0	
33		0.13-0.07-0.12-0.29-0.19-0.81 0.07 0.24 0	34 0.24
32		-0.07 -1.04 -2.07 -0.12 - 9.02 _ 0.23 - 0.05 0.	Ø1 0.17 0.16
31		-0.11-2.10/0.25 0.03-0.29-0.13-2.15 2	.03 0.09 2.19
30	· · · · · · · · · · · · · · · · · · ·	-8.24-0.33 0.18-9.16-0.22 9.02 0.	25-2.02 2.01-0.07
29		-2.45-3.23 0.00-8.61 0.17-3	18-8.19-0.23-0.07-0.00 2 2
28		<b>-8.</b> -23-0.14/0.07-0.05-0.02-0	01-8. 06-0.12-0.03 0.02 PHINTA EUCENTA
27		a. 05 a. 08-9. 15-8. 26-9.	09-0.04-0.15 9.03 0.07 0.00 h
26		-0.85-3.15-0.14-9.	125-0.14-0.12 0.03 0.38 0.03-0.07
25		0.13-2.11-9.03 0	85-8.12-8.12-8.42 0.03 0.39 0.03
24		0.15 0.	28-0.34 0.22-0.03-2.31 0.82-0.23-0.84 0.012
23		2, 28 9.	12-0.04-9.06 6. 13 0.06-0. 13-0. 14-0.01-0.002
22		-9.130.	05-0.09-0.14-0.09 0.08 0.13 3.01-0.07-0.072
21	••••••••••••••••••••••••••••••••••••••	-0.35-0.	17-0.13-0.07-0.31-0.16 0.02 0.07 0.01-0.032
137 13	36 135 134 133	132 131 130 120 126 127 126 125 124 123 122 1.31 1.20 11	9 118 117 116 115 114 115 112 111

CHART 37. Wind stress curl for JANUARY.

NCC	- TDF-	-11 -	ONE	DEGRE	ESU	IMARI	ZATIO	N									
13	7 136	135	134	133	132	131	130	129	128	127	126	125	124	123	122	121	120 119 118 117 116 115 114 113 112 111
			:						A	5	2	~					
50	-8.36	1.66	0.82	0.18	-0.11	8.06	9.28	8.51	0,25	Ø. 16	VRN	COUVER	ISLAN				50
49		8.2	8.41	8.12	8.05	2.01	0.06	0.26	8.14	0.28	8.27	2	~	5			
43			8.58	0.05	Ø. 18	0.17	Ø. 18	8.26	8.33	Ø. 19	Ø. 18	C. 18	-	j	5		PACIFIC ENVIRONMENTAL CROUP 48
47				8.28	8,25	8.36	0.14	8.31	2.04	8.24	0.13	0.14	8.58	G.			LIND STRESS
46				0.25	0,21	9.26	8.35	8.63	0.40	8.08	2.03	0.02	B.69	COL	MBIA R	IVER	
45				8.41	10.16	0.11	8.14-	8.28	-8.19	0.12	······································	-0.18	Ø. 13				
			•••••	-11 -10	9 99	0.07	6.33	A	12.12		a ) 1	-9 32	-1.25				
									/								LONG TERM MERN
4.5				<b>0.</b> 33		-0.23	-0.00		0.24	0.11	0.0/	-0.1/	1	CAPI	E BLANC	:0	FEBRUARY
42				8.49	-84.82	-0.25	-0.35	2.38	0.87	<b>Q.</b> 83	-0.07	-0.23	-0.36				
41				-11.78	6.81	8.15	-0.52	0.07	8.46	0.35	-8.12	-0.29	-2.57	CSP	E MENOC	C I ND	41
40				-0.15	0.17	027	0.28	8.07	Ø. 18	8.98	-2.25	2.24	0.0%				49
39				0.33	e.ø2	0,28	8.98	0.28	- <b>3.</b> 17	Ø. 16	0.04	-0.15	-0.03	<b></b>			3
38					18.15	-8.24	8.28	0.01	8.25	-0.29	-0.13	ø.05	e.34	Ø. 3L	8.		31
37				:		-2. 28	8.07	8728	0.05	0.12	-0.13	8. GZ	0.66	0.00	Ø. 19		a
36						9.26	-9.89	8.05	0.03	0.20	-0.01	-0.28	-0.13	-9.19	-0.01		з
35			بر ! !				0.20	8.85	8.83	0.08	-8.08	-6.02	-3.35	2.01	0.12	0.12	POINT CONCEPTION
34									-S. 19	-0.84	-6.08	-0.05	-0.05	-0.13	1.05	9.25	8.38 8.63
33							 			<b>Ø.</b> 18	-Ø. 19	-0.24	-0.07	-2.00	-E. 23	9.09	3 8.24 3.41 5.28
32								:			-8.87	-0.14	-0.18	-0.15	-0,02	0.12	3. 30 0.13 0.24 0.21
31							 ; ;				-2.11	0.03	2.03	0.05	6.16	0.00	-3.16-0.12 3.11 8.20
3Ø							 ;	·····; ,	 !			6.18	8.49	-8.29	0.08	0.03	-0.89-0.87-2.90 0.92-0.84
29			i						·			L	0.05	-0.20	-0.25-	-1.09	8.14 8.03 3.84-9.14 8.86-3.12 C A
28													0, 19	8.00	-2.15-	-9.1	8.17 8.05 8.08-8.12-9.18-8.18
														-	2.07	0 00	2-0 15-0 11-0 35-0 05-0 85 0 08 0 04
														0.34	0.02	/.	
26 															10:100	2/03	5 10.40 10.00 0.11 10.12 0.00 0.00 0.00 0.00
25															2/01-	-0.20	2-9.11-0.15-0.13-0.03 0.07+0.15-0.16 0.04
24					{												-0.18-5.02-0.12-0.02 C. 04-0.05-0.09 0.00 C. 81-0.012
23	:																-2.28-2.15-0.12 9.23 9.03 9.08 9.07 -3.12-0.12-0.032
22																	8.11-9.22-9.38 0.88-8.14-8.14-8.87-8.85 6.81-8.892
21													•				8.81-9.83 8.89-8.15-9.84-9.28-9.89-3.18-9.11-8.862
13	7 136	: 35	134	133	132	131	130	129	128	127	126	125	124	123	:22	121	120 119 :18 117 :16 115 114 113 112 111

CHART 38. Wind stress curl for FEBRUARY.



CHART 39. Wind stress curl for MARCH.

137 136 135 134 133 132 131 130 129 128 127	126 125 124 123 122 121 120 119 118 117 116 115 114 113 112 111
	VANCELINER ISI HND
43 0.18-8,383 0.18 8.87 8.83 0.14-6,05	NATIONAL MARINE FISHERIES SERVICE PACIFIC ENVIRONMENTAL GROUP MONTEREY, CALIFORNIA
47 0.17 8.11-2,24 0.25 0.05-5,82 0.05	9 0.04 0.01 0.22 WIND STRESS 47
45 -3.45 0.02 0.15 0.01 0.15 0.14 0.13	3. 8. 30 0. 16 0. 36 COLUMDIA RIVER CURL
8.15-9.81-9.05-9.85 8.15 8.24-8.00	C. 10 0.84 3.18 ( DYNE CM-2/188KH ) 45
44 - 0. 17-0. 17 0: 25-0. 05-0. 19 0. 18 0. 75	5 01.31-22.57 0.18 44
-0. 17 0. 15-0. 28-0. 18 0. 32-0. 13-0. 19	COZT DI DE 2.03 CRPE BLANCO FOR 43
42 0.01 0.07-0.14 0.29-0.01-0.55 0.15	97. 87-9. 17. 3. 37. APRIL 42
41	<i>1</i> = <b>3</b> , 24 α. (25= <b>3</b> , 11)
40 0.67-2.02-0.16-0.18-0.07-0.16-0.06	-0.24-0.13 0.22 42
39 8.39 8.11 8.15 8.68-8.86-2.83	3-3.16 N.84 0.47
38 0.04 0.02-0.01-0.17-0.11-0.24	10.03 0.16 0.29 0.20 B
37 -0.12-0.01-0.13-0.08-0.01	-0.03-0:41 2.09 5.18 0.39
36 0.04 0.04 0.04 0.04 0.04	30-9. 24-6. 13-8. 19-8. 191 8. 25
35 <b>-8.15 8.94-9.12 6.35</b>	2.21 0.22 0.03 0.03 0.07 0.13 SUNT CONCEPTION 35
34 -0, 12-0, 12	-0.85 0.14 0.28-0.82 0.85 0.21 0.51 0.91
33 - 2.84	-9.81-8.16-9.12-8.85 2.85 0.14 8.23 0.49 0.33
32	-3. 18-0. 15-0. 14-3. 18 0.06-2.02 0. 12 0.26 0. 19 0. 16
31	
30	0. 12-0. 19-0. 16-0. 00 0. 14 0. 00-0. 12 0. 01 0. 07
29	+ 8. 24 - 8. 13 - 9. 17 - 3. 12 8. 80 8. 12 - 8. 81 - 8. 18 - 8. 87 - 9. 10 2
28	-0.17-9.19-0.28-0.27-0.19 0.01-0.01 0.25-0.25-0.05 - 0.05 - 0.05 - 0.05
27	- 22- 3. 22 - 3. 25 8. 18-2. 11-3. 83 8. 42 9. 86 - 0. 92 8. 18
26	-2.15-2.10-2.11-2.22 2.06-26-26-20.28 2.07 2.23 2.00 226
25	-0.11-0.05-0.27-0.22 0.01 0.20-0.16-0.06 0.00 0.03
24	-9. 85-9. 16-9. 22 0. 21-9. 37-9. 32 0. 30-9. 34 0. 39-9. 3124
23	- 2. 23 7. 72-7. 25-9. 39 (8. 26-8. 29-3. BE 8. 86+8. 84 8. 88 23
22	0.11/-0.12-9.14-0.23-0.11 0.15-0.16-0.09 0.04-0.0122
21	-8. 28 -9. 32 8. 19 -3. 84 -9. 48 -9. 66 -9. 84 -9. 12 8. 06 -9. 81 -2. 12 8. 06 -9. 81 -2.
157 136 .35 134 133 132 131 132 129 128 127	126 125 124 123 122 121 120 119 118 117 1.6 115 114 13 .12 111

CHART 40. Wind stress curl for APRIL.

	137	136 1	35 134	133	132	131	130	129	128	127	i 20	125	124	123	122	121	122	2 119 118 117 116 115 114 113 112 111
			-			i.			2	-	3							
50		9.28-8	. 89-8. 1	8 0.0	5-8.0	5 Øc84	8-8.8	. 15	0.05	Ø.36	VA	NCOUVE	R ISLA	NO				50
49		-8	28-8.2	9-0.1	8-8.1	1 9.0	5 0.06	0.15	8.07	1.04	0.1	ني م	~	Z				NDGA 49
48			-8.1		3-8.0	- 10. IC	6-11	8.02		-9.94	8.3	2 0.1	~	3	5			PRCIFIC ENVIRONMENTAL GROUP
47				-a. 11	5 2.20	0.90	2-9.12				-9.1	8 0. 76	1	G	~			MONTEREY, CALIFORNIA
-					1		, Jerre		Į.V.				1.E	S Cos	UMRTO	RIVER		WIND STRESS
-				8.0	0.0		0.0			-10.15	- 2. 1	10.00					•	
45				-0.2	-	2- <b>8.</b> 81	9 0.01	0,27	0.07	-0.21	-0.1	9 0 26	0.12					( DYNE CM-2/180KM ) 45
44				0.0	0.10	-2.0	2 0.02	2.05	-8.09	10.125	-0,2	4 0.0	5 0.50					LONG TERM MEON
43				-0.3	>9.2	8.05	5.0.04	-8:20	-9.84	0.23	-0.3	4-0.0	0.7	CRF	E BLA	(CO		FOR 43
42				-0.2	-0.22	-8.Z	-9.4	0.13	0.12	-0.28	-0.4	90.0	0.78					MAY 42
41				-2.15	8.07	-0.07	-9.15	-0.16	-0.18	8.84	0.0	2-0.01	0.25					41
4Ø				3.8	-2.14	9.18	0.16	6.19	-0.23	-0.17	-0.1	7 0.0	0.15	CRF	E MENO	001 1 DO	)	40
39				-9.2	0.01	0.09	8.12	-8.35	0.17	-0.12	-0.1	7-10. CE	0.22	Ĺ				39
38				-	0.00	0.84	-0.29	0:81	-0.06	-0.22	-0.0	7 0.01	2.27	0.64	5			38
37		;				-9.18	6. 18	-0.17	-8.12	-0.27	-2.0	9-0.19	-0.01	1.77	P. 45			37
-				<u>.</u>		-0.00	1-0. 19	-0.12	-0.08	-0.11	-9 1	1	-01 2-	-0 17	-			30
-							L					· · · · ·					-	
-				ļ			10.13	- 10-10	-0.10		B. B.	. 0.1	0.01	0.02	0.00		PC	DINT CONCEPTION
34				ļ					-10.11	-0.14	-9.1	5-14.97	0-40	0.07	0.05	012	- Ø.8	34
33				ļ			! 			0.23	-8.1	2-1025	-0.22	-0.93	0.11	0.0	3 8.2	33
32			; 								-0.8	2-0.11	-0.13	-0.11	0.13	0.5	4-8.2	32 0.17 0.24 0.22
31				ļ			ļ				-0.10	5-0.12	-9.08	-2.01	-0.14	-10.10	7 9.0	31
3Ø -		:		<u>.</u>				; ; /====4				10.16	-9.10	3.07	0.08	2.18	5-0.8	30
29					:								-0.07	8.84	-0.01	-3.8	9-9.1	11-0.12-0.03-0.10-0.13-0.52 2 D 29
28													-8.03	-0.22	-0.84	3.0	<b>3-9.</b> 2	18-0.01-0.09-0.05-0.02-0.16 PUNTA EUGENIA
27														-0.13	-0.12	-0.2	7-9.6	27 0.01-0.11-0.25-0.11 0.11 0.00 27
26														L	2.00	-0.05	3-8.2	88 2. 25 0. 08-2. 14-9. 24-9. 08 0. 12 0. 63 28
25	 !			 ;									·		-8.15	-Ø. 19	-8.1	14-9.16-9.97 9.05 0.15-0.16-9.28 0.11
24												·					4	5-8.22-9. 97-9. 13-9. 85 9. 14-9. 86-9. 25 8. 85 9. 80-0
23	; ;								י									15-0 14-0 15-0 10-0 15-0 ni. 0 10-0 nt. 0 00- 0 00-23
		j										j						
-				į														53 0.01 6.08 0.14 0.05 0.06 0.101 0.04 0.64 0.8722
- <sup>1</sup>	1.37	138 13	5 134	133	132	151	130	129	128	127	126	125	124	123	122	121	120	21 0.01 0.04-0.16-0.03 0.01-0.21 0.03-0.82-0.0721
			U 104	100	102	1	100	160	120	A. G. /	150	14.	164	120	166	101	126	- + + + + + + + + + + + + + + + + +

+ values clear Sfi Etma div upwellig

CHART 41. Wind stress curl for MAY.

.

- values shaded Ste Elma conv dur



50   -9.85-9.87   8.87-9.87   8.81-9.82   9.11-9.31   9.15   9.99   VALCOUVER ISLAND     49   -9.18   8.89   9.82   9.15-9.87   8.22   0.23   NATIONAL MARINE FISH     46   8.13   8.29-9.19   8.06   9.15   9.15   9.15   8.13   8.15     47   8.13   9.22-9.09   9.00   9.15   9.14   8.29   8.13   8.15     46   9.13   9.02   9.00   9.15   9.14   9.29   9.13   8.15     45   9.13   9.19   9.05   9.15   9.14   9.29   9.13   8.17     45   9.13   9.13   9.13   9.13   9.15   9.93   9.12   9.13   9.12   9.13   9.12   9.13   9.12   9.13   9.12   9.13   9.12   9.13   9.13   9.13   9.13   9.13   9.13   9.13   9.13   9.13   9.13   9.13   9.13   9.13   9.13   9.13   9.13   9.13   9.13   9.13   9.13   9.13   9.13   9.13	52
50   -2.86-8.87   8.87-8.87   8.81-8.87   8.99   ************************************	52
49   4.18   8.00   0.02   0.00   8.19   0.15   0.27   0.27   0.00   0.00   0.15   0.15   0.27   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   <	49
46   8.2178.83 - 8.87 8.20 - 8.13 - 8.07 8.19 8.85 8.19 8.36 8.19 8.36     47   8.13 8.82 8.42 - 8.30 - 8.25 - 8.15 8.14 8.25 8.13 8.15     46   9.13 - 8.44 8.26 - 8.85 - 8.25 - 8.30 - 8.22 8.25 8.30 - 8.22 8.25 8.30 - 8.22 8.25 8.30 - 8.22 8.25 8.30 - 8.22 8.25 8.30 - 8.22 8.25 8.30 - 8.22 8.25 8.30 - 8.22 8.25 8.30 - 8.22 8.25 8.30 - 8.22 8.25 8.30 - 8.22 8.25 8.30 - 8.22 8.20 - 8.30 - 8.22 8.25 8.30 - 8.22 8.25 8.30 - 8.22 8.25 8.30 - 8.22 8.25 8.30 - 8.22 8.25 8.30 - 8.22 8.25 8.30 - 8.22 8.25 8.30 - 8.22 8.25 8.30 - 8.22 8.25 8.30 - 8.22 8.25 8.30 - 8.22 8.25 8.30 - 8.22 8.25 8.30 - 8.22 8.25 8.30 - 8.22 8.25 8.30 - 8.22 8.25 8.30 - 8.22 8.25 8.30 - 8.22 8.25 8.30 - 8.22 8.25 8.30 - 8.22 8.25 8.30 - 8.22 8.25 8.30 - 8.22 8.25 8.30 - 8.22 8.25 8.30 - 8.22 8.25 8.30 - 8.22 8.25 8.30 - 8.22 8.25 8.30 - 8.22 8.25 8.30 - 8.22 8.25 8.30 - 8.22 8.25 8.30 - 8.22 8.25 8.30 - 8.22 8.25 8.30 - 8.22 8.25 8.30 - 8.22 8.25 8.30 - 8.22 8.25 8.30 - 8.22 8.25 8.30 - 8.22 8.25 8.30 - 8.22 8.25 8.30 - 8.22 8.25 8.30 - 8.22 8.25 8.30 - 8.22 8.25 8.20 - 8.25 - 8.20 - 8.25 - 8.20 - 8.25 - 8.20 - 8.25 - 8.20 - 8.20 - 8.20 - 8.20 - 8.20 - 8.20 - 8.20 - 8.20 - 8.20 - 8.20 - 8.20 - 8.20 - 8.20 - 8.20 - 8.20 - 8.20 - 8.20 - 8.20 - 8.20 - 8.20 - 8.20 - 8.20 - 8.20 - 8.20 - 8.20 - 8.20 - 8.20 - 8.20 - 8.20 - 8.20 - 8.20 - 8.20 - 8.20 - 8.20 - 8.20 - 8.20 - 8.20 - 8.20 - 8.20 - 8.20 - 8.20 - 8.20 - 8.20 - 8.20 - 8.20 - 8.20 - 8.20 - 8.20 - 8.20 - 8.20 - 8.20 - 8.20 - 8.20 - 8.20 - 8.20 - 8.20 - 8.20 - 8.20 - 8.20 - 8.20 - 8.20 - 8.20 - 8.20 - 8.20 - 8.20 - 8.20 - 8.20 - 8.20 - 8.20 - 8.20 - 8.20 - 8.20 - 8.20 - 8.20 - 8.20 - 8.20 - 8.20 - 8.20 - 8.20 - 8.20 - 8.20 - 8.20 - 8.20 - 8.20 - 8.20 - 8.20 - 8.20 - 8.20 - 8.20 - 8.20 - 8.20 - 8.20 - 8.20 - 8.20 - 8.20 - 8.20 - 8.20 - 8.20 - 8.20 - 8.20 - 8.20 - 8.20 - 8.20 - 8.20 - 8.20 - 8.20 - 8.20 - 8.20 - 8.20 - 8.20 - 8.20 - 8.20 - 8.20 - 8.20 - 8.20 - 8.20 - 8	
47   -8.13   9.62   9.02   9.14   9.13   9.12   9.14   9.13   9.15   9.14   9.13   9.15   9.14   9.13   9.15   9.14   9.13   9.15   9.15   9.14   9.13   9.15   9.14   9.15   9.15   9.14   9.15   9.15   9.15   9.15   9.15   9.15   9.15   9.15   9.15   9.15   9.15   9.15   9.15   9.15   9.15   9.15   9.15   9.15   9.15   9.15   9.15   9.15   9.15   9.15   9.15   9.15   9.15   9.15   9.15   9.15   9.15   9.15   9.15   9.15   9.15   9.15   9.15   9.15   9.15   9.15   9.15   9.15   9.15   9.15   9.15   9.15   9.15   9.15   9.15   9.15   9.15   9.15   9.15   9.15   9.15   9.15   9.15   9.15   9.15   9.15   9.15   9.15   9.15   9.15   9.15   9.15   9.15   9.15   9.15   9.15   9.15   9.15   9.15   9.15	ENTAL GROUP
46	DECC 47
45	11233
t UINC CIT2/	
44	
43 -0. 35-0 00 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	MEAN
42 De 162 De 13 De 20 De 13 De 34 De 24 De 12 E 13 De 35	
41	41
43 -0.37-0.37-0.13-0.14-0.13-0.27-0.15 (0.54 0.63	42
39	39
38 3.20-9.19-9.11-9.14-9.11-9.18 0.31 8.43 0.51	38
37 -0.12-0.15-0.22-0.16-0.08-3.16-0.07 2.11 0.29 0.55	37
36	36
35 -0.11-0.10-0.10-0.10-0.10-0.02 0.15 0.16 0.20 POINT CONCEPTION	35
34	34
33 -0.11-3.13-0.14-3.05-0.27 2.03 0.21- 0.29 0.25 0.28	33
32 -8.22-0.11-8.55-9.12-8.52 8.12 8.18 8.26 8.38 8.72	32
31 -8.15-8.17-8.12-3.91-8.85-8.89 8.05 8.07 0.28 8.21	31
30 8.05-0.13-0.25 0.04-0.15-0.19-0.28 0.04 0.11 0.02	
29	12 2 2 29
26 -0.03-5.02-0.08-0.02-9.00-0.03-0.04.0-	PUINTO FUCENZO
27	18 3.11 27
26 -8.22-9.84 8/81-9.14-8.84-8.85-8.16 8.	01 0.11 0.02 2
25 - <b>9.88-8.44-9.95-9.06-9.01-9.89-9.</b>	13 2.03 8.14
2	12-9. 88 8. 83 8. 85 8. 810
	11-0.10-0.09 0.02 0.132
	03 0 04-0 03-0 14-0 0000
	15-0 12-0 01-0 00-0 100
137 136 135 134 133 132 131 130 129 128 127 126 125 124 123 122 121 120 119 118 117 116 11	5 114 113 112 11

CHART 42. Wind stress curl for JUNE.



CHART 43. Wind stress curl for JULY.



CHART 44. Wind stress curl for AUGUST.

N	- 23	TOF-	-11 -	ONE	DEGR	EE SL	IMMAR	IZATI	ON																	
	137	136	135	134	133	132	131	130	129	128	127	126	125	124	123	122	121	120 11	9 118	117	116	115	14 1	13 112	2 111	
										G	~	2														
50		8.15	0.22	-0.15	0.00	1.00	0.0	4-8. 32	8.35	0.2	0.07	VAN	ICOUVE	LISLA	NO											50
49			8.84	-8.16	0.01	0.0	0.0	2-8-0	0.09	9.13	0.19	Ø. 31	in,	~	2			[			NDE	R.			٦	13
			-	-			<u>i</u>	÷		<u>}</u>	£		×	~	2	ζ		L L	RTION	AL MAR	INE F	ISHER	IES SE	RVICE		
40				10.31	-0.21	-021	-0.8	-8.04	-0.24	0.15	0.42	Ø.33	0.24	h	2	4			FHG:	MONTE	REY, I	CALIFO	RNIR	Ur.		48
47					-8.47	-0.14	-8.8	7-0.81	-0.05	0.05	8-29	a. 31	0.03	0.03					L	JTN	<b>ר</b>	STR	-99			47
46					-0.3	0.00	0.0	1-0.2	-0.08	8.82	-0.10	0.08	0.23	0.7	COL	UMBIA	RIVER		•		~	5	-00			46
1.5	<i>د</i> ــــ.				-		1	1						4							LU	٦L				1
	· {								<u> </u>				0.00							COYN	E CM	-2/100	KM I			40
44					-0.2	-2.26	-0.1	9.21	-8.11	0.26	0.05	-6.51	EL DE	0.17	K J					10			161			44
43					-8.46	9.15	-0.2	1-0.07	Ø. 17	-8,23	0.92	0.04	0.16	0.43	CAP	EBLA	NCO			20	FO	R	214			43
42					0.2	-0.15	-0.0	0.01	-0.12	-0.37	-0.39	3. 26	8.4	1.33						SE	EPTE	MBER				42
-		بر			- 12								1	)	4											
-									9				0.00	7	CAF	E MENI	DOC I NO									41
40-					8.75	9,92	-0.18	3-0.16	-0.09	0.82	8.82	-0.14	9.12	2.21												40
39					-0.24	-0.08	-8.05	0.15	-0.28	-0.83	8.87	-9.65	0.15	8.46												39
38					-	-9,18	-0.0	-8.82	-0.12	-8.02	0.01	0.09	0.18	0.35	0.57	2										38
- 37		بـــــ :					-9. 17		-Ø. 15	-8.82	9.05	-a.a.	-9.03	a. 79	2.27	a 34	- L									37
-		į														-7	Į									Ĩ
36 -							-0.22	213.28	0,03	-9.19	-0.11	0.03	0.11	+0.08	-0.24	Ø.11	$\sum$									36
35						:		-8.02	-8. 85	8.21	8.03	0. 02	0.20	0.12	0.02	2.98	5 2.37	POINT C	ONCEPTI	ON						35
34	ł					, , ,		1		8.15	8.22	2/01	-0.19	-0:01	0.25	0.0	9 0.33	8 0.53 0.	59							34
33	; ;					/ , ,		   			9.06	-0.07	-2.01	-0.05	-0.08	-0.12	8.05	8.34 8.	48 8.11	\$						33
- 32												-2.28	-0.13	-3.18	-9.05	-0.01	-0.03	0.24 0.	17 0.1	0.23		5				32
- 31	بـــــ ب											-9.11	-0.12	-9. 89	-0.09	-8.13	1.38	0. 16 0.1	: 83 0.91	. Ø. 15	1	(	~	١		31
- 30	4 ; ;												0.01	-0.01	-0.15	-0.36	-0.02	-0.99-0.1	23-9.2		3.06	1		$\mathbf{X}$		32
- 29			· •										<u> </u>	-0.06	-7. 29	-0.75	6 1. 00	-9.13 9.	A. 9.9	-0.15	-0. 84	9.10	10	6.		29
-			·								{						1	···· ··· ·		÷			1	Ya	5	
28														0.11	0.09	-0.19	-0.02		ap 2.1	-0.03	-10.12	10.09	PUNTA	EUGENI	A ~	78
27	; 														-8.22	0.00	6.03	8-8.15-0.	9.6 83	0.18	0.88	0.03	0.09	۰. ۲	h	27
26													1 0 1 1			-0.10	<b>.</b> 17	0. 18-0.	0 <b>8</b> - 0.1	0.03	0.13	0.05	0.04 0	. 06	l	26
25																-0.11	-0.17	-8.C3-0.	28 2.0	0.05	-1.86	0. 38	ø. 11 ø	.11	1	25
24											 ,							8.04-8.1	12-0.0	2/20	-9.17	0.29	a.25 a	.07 0.	8 8.8	024
23											d. 1						 !	0.05-0.1	36 8.20	0.00	0.18	0.12-	0.04 0	20 0.	2 0.0	723
22-			له ا															- 24 D	AL 05 00		-9.00	-0.012	1.23 3	-22 0.0	17-A.A	100
	·																						14			-
21	107		100	1.2.1	1.00	1.000	1.0.1	100	1.00	100	1.27	1.00	100	101	100	100	1.01	10.11 0.	19 3.06	9.31	-9.29	0:01/	0.37-10	.21 9.1	8 0.0	F1
	13/	136	132	134	133	132	131	130	129	128	121	120	125	124	163	122	121	120 11	<u>= 116</u>	117	116	110	4 1	13 11	< 111	

CHART 45. Wind stress curl for SEPTEMBER.

	NEC	- TDF	-11 -	ONE	DEGR	E SU	MMAR	IZATI	ON																		
Γ	137	136	135	134	133	132	131	130	129	128	127	126	125	124	123	122 12	1 120	119	11	8 11	7 116	115	<u>11</u>	4 1	3 11	2 11	1
				-				:		9	~	2															
5	3	-8.15	-0.2	-8.3	0.23	9.82	-0,Z	7 8.8	0.12	ø. i	0.28	VA	NEOLIVE	LISLA	HC .												58
49	9		-8.3	-2.01	8.18	9.98	-Ø.H	8 0.16	6 2.81	-0.0	0.25	0.1	in the second	~	2						N	OAA					ИС
	 a			í	6.0				,				×	~	2	ζ		NA	T10N POC	AL M	RINE	FISH	ERIE	S SE			
Ĩ	]							-	The 12		91.0	0.3		7	6	~			1115	MONT	EREY.	CALI	FOR	AIN			48
47	]	; 			-0.40	-0.29	8.1	1 8.4	0.48	0.105	8.30	0.19	5 0.01	-2.21						WIN	D	ST	RE	SS			47
46	\$	<u>.</u>			1.18	-8.39	-8.2	1-0.0	0.22	0.16	8 0.15	2.2	0.12	-0.19	COL	UMBIA RIVI	ER				CI	IRI					48
45				:	-9.36	8.17	-2.2	2-0.Z	8.08	0.13	-0.27	3.6	3-8.87	0.02						( 01	NE C	11-2/1	020	1 1			45
44		4 !		; ;	-0.14	-1.12	Ba	i-8.13	.0.23	-8.8	60.48	8.0	0.11	0.18	t. F												
4-						-0 12		20 1		· · · · ·					1					L	ONG T	ERM P	ERN				
	]							2	0.04			0.00		1	CAP	E BLANCO					OCT	OR NDEI					4
44	1			; 	8.48	-8.43	-0.1	1-8.23	-0.25	9.0	-0.21-	-9.00	9 0.17	0.11	ł						001	ober					4
41		i 	: 		0.15	1.09	0.0	1-0.17	-8.21	-8.86	8.86	2.0	0.00	0.25													4
48	1		:		8.18	0.05	-8.2	-9.16	Ø. 96	-8.83	-0.14	10.26	0.38	3.74	CHP	E MENDUL!	NU										44
39					-8.24	8.14	0.8	-9.95	-0.13	-8.28	-0.31-	0,01	1 8.33	0.21													39
38				:		-8.81	-Ø. 15	-0.17	-0.09	-0.07	-8.32	0.25	5 8.29	8.23	2.43	5											38
37							8.3	1-0125	-0.08	-8.11	-8.84-	3.8	0.03	10.00	0.22	0.58											37
36							8.2	-0.05	-0.12	-8.14	-8.89	8.01	0.57	-9.12	-2.08	8.38											38
35								-9.00				j	i (1.08	A	-9	A 15 A	÷										1
34										9.96	-9.96	3.03	-9.06	-9.09	-0.05	a. ag. a.	38 0.39	AL CO	NCEPT	101							2
33						 :					-0. 01-	-2.14	i-0.06	3.04	-2.02	-9. 87. 3.	18 8-26	Ø. 31	3-2	1							3
32							• • • •		·		-	8.08	9.21	-0.12	Ø. 13	0.01-8.	25 1. 02	8.17		5 0.1	2	1					3
31						; ,		·					·	-0.05	-8.13	8.85 9.	75-8.90	-9.9		13 9.1	3	Ì		~			3
30											<b>L</b>		-a. 12	-7.94	a 99		an a an					<u>,</u>					3
29														- 90	-0.08	-3 93-9	17-0-13	-0.00	-2.0	4-9.0	5 0.0		- <b>`</b>	10	2		2
28								<b>.</b>						-9.97		-0. 02 0.	a.4			4-9.7	8 2 0	G-0.0			5	$\checkmark$	
27															-9.05	-9.14-9.	14-9-92	9.17	4	3-8.1	5 8.3	. а.а			EUGENI	(8	6
26																-9.14-9.	15 0. 02	-9:01	. \- 0-0	1 9.1	B-1.1	1-9.0	5 0.	29 a	RT	2	20
25					;						;		; 				10-0 00	-0.07		4-0 0							
																Be 21 De.	10.00						4		K	2	
24								·									-9.19	0.01	0.2	5-0.2	7-8.0	5 0.0	5-0.	11-0.	26 2	96 0.1	124
23								/								:	0.26	9.70	-8.8	5 0.2	3 0.0	1-0.0	6 Ø.	84 8.	<b>08-0</b> .	88-2.1	<b>73</b> 23
22																	-0.11	-0.18	0.2	9 0.2	7 0.3	1-8.0	4-8.	86-0.	<b>86-8</b> .	81 B. 6	322
21																:	-0.98	-0.03	0.2	8-9.2	3-0.8	1 0.0	7-8.	ai-0.	26 0.	81-8.3	2
	137	136	135	134	133	132	131	130	129	128	127	126	125	124	123	122 12	1 120	119	118	3 117	116	115	11	4 11	3 11	2 11	1

CHART 46. Wind stress curl for OCTOBER.



CHART 47. Wind stress curl for NOVEMBER.

Г	137 136	135_1	34 133	3 132	131	130	129	128	127	126	125	124	123	122 12	1 120	119 118 117 116 115 114 113 112 11	1
-						<u> </u>		Ģ	~	2							
50	-0.90	0.42-0	21-8.2	0.19	9.1	1 0.05	878	ø. 61	2.89	VH	ICOUVE:		10				50
49		8.13-8	84 3.4	4 8.17	0.3	7-0.93	0,24	0.34	0.54	Ø. 12	è-ze		14	7		NORA NATIONAL MARINE FISHERIES SERVICE	49
48		8	26 8.2	5 0.48	0.4	1-0-05	0.50	20.47	1.20	0.38	0.7	-	-7	2		PRCIFIC ENVIRONMENTAL GROUP	48
47			8.4	3 0.2	8.1	3 0.37	8.25	8.03	0,23	0.64	0.27	0.13	. Gr			WIND STRESS	47
46			0.4	5 8,25	-0.2	4 8.35	0.02	-0.03	8.31	2.44	10.48	0.34	- COL	UMBIA RIVE	R	CLIRI	46
45			0.2	2-0.B	-0.0	7-0.15	6.58	0,53	-0.22	34.00	8.37	0.05				( DYNE CM-2/18/2KM )	45
44			-0.0	1-3.16	-0.1	0.47	8.08	0.45	3.28	0.38	-E. Ø8	-0.43	2 - •				44
43			-9.4	4-2.42	8.1	0.3	10.20	-8.14	-0,21	0.23	0.23	-0.71	CRP	E BLANCO		LONG TERM MEAN	43
42			3,2	8-8.85	-9.2	-0.00	0. 13	-ale	8.09	0.16	0.27	+				DECEMBER	42
41	·ii		12.2	9-0.03	-9.2	2-9.15	-0.18	0.86	-3.30	-8. N	0.17	0.01					41
40			-0.0	5-8.85	-02	5-0.02	-0.19		0.13	ROBI	u. 23	7	CRP	E MENDOCIN	0	L	42
- 39			a	9-0.10		-0.05	0.03	-9.02	-1.73	-0.12	N-28	-2.13					30
- 38				1 . 6	01.04	2 3 90	-0.14	Ø 15	0.00	-0 20	-0 21	-9.91	0 24				
27					Lan		-0 07	0.00			1	0 013	0.15	A			
-				÷				0.00	0.01	20.00	0.07	0.20	2.10				
-					0.1		0.1/		0,01	D. 18		-0.22	-0. 11	6.02	S		30
35						-0.20	-0.32	10.13	-10.02-	-10.23		0.00	3.62	N. 12 0.2	PD	INT CONCEPTION	35
34								-8.98	-0.37-	-0.13	-0.05	9.94	6.32	-9.09 9.8	23 2.3	3 0.34	34
33									-027-	-0.15	-0.03	-0.12	-10.82	0.18 0.2	35 8 2	8 0.35 0.11	33
32	; ;;									2001	-0.10	-0.19	-Ø.19	-2.25 0.2	25 8.0	8 0.20 3.28 0.65	32
31						ļ			t	8.14	-2.49	-9.23	0.06	-0.83 0.0	5%-0.1	2-8.16 8.08 0.13	31
3Ø -				: 		ļ					-6.27	-8.87	-w.a1	-Ø. 19 Ø.£	31 0.1	7-8.13-8.84 0.18 0.07	30
29						ļ						8.06	-0.02	-0.05-2.2	26-9.1	1 0. 10-0. 25 8. 82 40. 25 - 8. 20 J	29
28												-0.12	-0.13	-0.16-0.2	21-0.0	9 8.01-8.09-6.84 0.11-8.07. PUNTA EUCENTA	28
27													8.82	-0.06-0.8	<b>19-0</b> .7	5-8.24 8,85-5:28 0.84 8.89 8.85	27
26														-8.15-2.1	15-8.0	8-0.01-0.13-6:51-0.12 (0.43-0x 22-0.03	26
25			1											8.02-9.8	3-9.Ø	5-9. 23-8. 83 8. 05-3. 67-3. 82-3. 87 8.81	125
24															-2.2	1-0.29 0.08-0.04-0.69-0.25 0.06 0.15-0.03-0	<b>B3</b> 24
23															-0.1	8 0.11 0.08-0.06 8.02-0.26 0.04-0.03-0.08-0	8323
22	· · · · ·														-0.1	3-9.11 8.04 8.08 0.08 9.04-9.81-8.81-8.81-8.81-8.	1522
21	• • • • • •			:											-18. 15	5-9:26-8.85 0.05-0.10 0.80 0.88 0.15-8.82-8	<b>83</b> 21
	37 136	135 1	34 133	132	131	130	129	128	127	126	125	124	123	122 12	1 120	119 113 117 116 115 114 113 112 1	1

CHART 48. Wind stress curl for DECEMBER.

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