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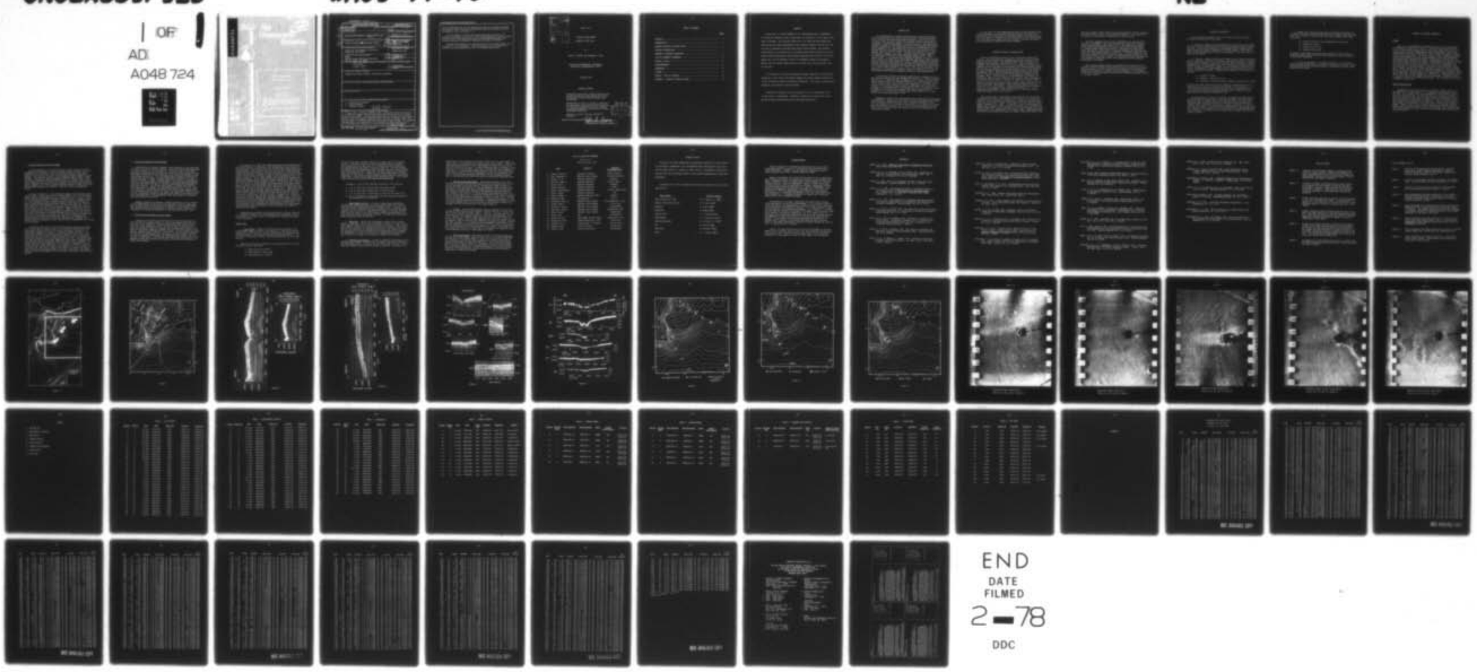

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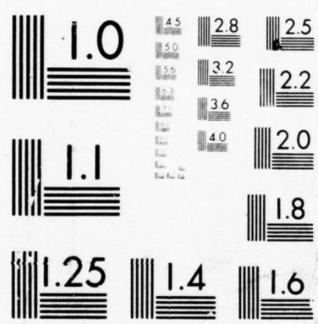


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# Woods Hole Oceanographic Institution

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During Leg 1 of cruise ATLANTIS II-94, a multidisciplinary investigation of present-day sediment-current interactions was carried out on the insular rise south of Iceland. The principal objective was to study the relationships between relatively steady thermohaline flow, episodic turbidity current flow, and the types of sediments associated with these current systems. The northern Iceland Basin is an optimal site for studying these effects because of the well-developed deep thermohaline current system resulting from overflow →

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from the Norwegian Sea, and the substantial input of terrigenous (largely volcanogenic) debris from the Iceland margin which has occurred since the post-glacial rise in sea level.

In this report, we outline the regional setting, objectives, and scientific operations of the cruise, and present examples of typical seismic profiles and 3.5 kHz records from areas of particular importance. All station locations are tabulated, and satellite fixes are listed.

Detailed data analysis will form the basis of Ph.D. dissertations (for A. Shor and M. J. Richardson). Scientific results of the cruise will be presented in these dissertations and in associated publications.

WHOI-77-70

# INITIAL CRUISE REPORT
# ATLANTIS II-94, LEG 1

by

David A. Johnson and Alexander N. Shor

WOODS HOLE OCEANOGRAPHIC INSTITUTION
Woods Hole, Massachusetts 02543

December 1977

TECHNICAL REPORT

*Prepared for the Office of Naval Research under Contract N00014-74-C-0262; NR 083-004 and for the National Science Foundation under Grant OCE76-81491.*



Approved for Distribution John I. Ewing
John I. Ewing, Chairman
Department of Geology & Geophysics

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## ABSTRACT

During Leg 1 of cruise ATLANTIS II-94, a multidisciplinary investigation of present-day sediment-current interactions was carried out on the insular rise south of Iceland. The principal objective was to study the relationships between relatively steady thermohaline flow, episodic turbidity current flow, and the types of sediments associated with these current systems. The northern Iceland Basin is an optimal site for studying these effects because of the well-developed deep thermohaline current system resulting from overflow from the Norwegian Sea, and the substantial input of terrigenous (largely volcanogenic) debris from the Iceland margin which has occurred since the post-glacial rise in sea level.

In this report we outline the regional setting, objectives, and scientific operations of the cruise, and present examples of typical seismic profiles and 3.5 kHz records from areas of particular importance. All station locations are tabulated, and satellite fixes are listed.

Detailed data analysis will form the basis of Ph.D. dissertations (for A. Shor and M. J. Richardson). Scientific results of the cruise will be presented in these dissertations and in associated publications.

## INTRODUCTION

Our understanding of geologic processes along continental margins has advanced significantly during the past decade. Oceanographers have come to realize that downslope-flowing turbidity currents (e.g. Heezen and Ewing, 1952; and many others) are processes of major geological significance in transporting sediment along the sea floor. The deposits of turbidity currents are represented as units of coarse-grained and graded detrital sediments in flat-lying abyssal plains; as wedge-shaped fan deposits seaward of the continental rise; and as coarse channel deposits incised into the continental slope and rise (e.g. Ericson et al., 1952; Normark, 1970; Horn et al., 1971). Turbidity currents are infrequent and episodic phenomena resulting from either excess sediment input at the shelf edge or failure of slope sediments (Ericson et al., 1952; Kuenen, 1952). It is expected that widespread turbidity current activity occurs during low stands of sea level when the high energy coastal environment coincides with the shelf-slope contact, thereby allowing cross-shelf sediment transport under subaerial conditions and significant dissipation of wave energy where submarine canyons intersect the shelf and upper slope (e.g. Curray, 1965; Milliman et al., 1975). This may in part explain the apparently low frequency of turbidity currents at present as well as the thick Pleistocene turbidite sequences observed on many abyssal plains.

A second major process of geologic significance is sediment entrainment and redistribution by deep thermohaline currents, or "contour currents" (Heezen et al., 1966; Hollister and Heezen, 1972). Effects of these relatively steady currents are commonly observed in bottom photographs in the form of ripples, scour moats, and current lineations; on side-scan sonar records in the form of abyssal furrows, barchan dunes, and scour around boulders; or as sediment drifts, mud waves, and fields of hyperbolic echoes recorded on surface ship echo sounders (Hollister and Heezen, 1972; Hollister et al., 1974; Flood and Hollister, 1974; Jacobi et al., 1975; Damuth, 1975; Damuth and Hayes, 1977).

Sedimentary criteria have been proposed for distinguishing "contourites" from turbidites, primarily on the basis of studies along the eastern margin of North America (Field and Pilkey, 1971; Hollister and Heezen, 1972; Fritz and Pilkey, 1975). Studies of the interaction of these two processes have been difficult, however, due in part to the marked reduction in turbidity current activity since the rise in sea level associated with the last glacial retreat.

In this report we have summarized the types of data obtained during a recent experiment to investigate sediment-current interactions in a region where both thermohaline currents and turbidity currents appear to be active agents of sedimentation and redeposition. The principal objective is to establish criteria that can be used to identify the effects of both processes in modern and ancient sediments.

## REGIONAL SETTING OF ICELAND BASIN

Previous hydrographic studies in the Iceland Basin region have revealed a well-developed deep thermohaline current flowing southward along the eastern flank of the Reykjanes Ridge from its origin in the Norwegian Sea (Fuglister, 1960; Steele et al., 1962; Worthington and Volkmann, 1965; Worthington, 1970). The flow originates through several channels and sills across the Iceland-Faeroe and Scotland-Faeroe ridges, and is driven by downslope flow of high density (cold, fresh) Norwegian Sea water brought to shallow depths by convective winter overturning Worthington, 1970). The flow subsequently mixes with warmer, saline water of the main thermocline as it flows downslope (Worthington and Volkmann, 1965). At least some of the overflow may be episodic (Lee and Ellett, 1965; Ellett and Roberts, 1973; Crease, 1965), although the Faeroe Bank Channel appears to maintain a steady flow (Crease, 1965). Episodic overflow may account for the variable volume transport calculated by Worthington and Volkmann (1965) along the length of the flow (from 2.0 to 7.6 x $10^6$ $m^3$/sec). Velocities measured within the overflow current along the margin of the Iceland Basin (Steele et al., 1962; Worthington and Volkmann, 1965; Hollister et al., 1976) are typically within the range of 10 to 30 cm $sec^{-1}$.

The Iceland Basin is perhaps one of the few areas in which turbidity currents may be active. The Iceland insular slope is cut by numerous turbidity current channels (see Figure 1), at least one of which originates near the active off-shore volcano Surtsey and may empty into Maury Channel (Cherkis et al., 1973). In addition, there is some evidence to suggest that turbidity current activity may be reduced on Iceland during glacial maxima due to nearly complete ice cover and entrapment in fjords (Thorarinsson, 1937; Schwarzbach, 1955; Hoppe, 1968). High sedimentation rates (up to 100 cm/1000 yrs) along the flanks of Reykjanes Ridge to the south are suggested during deglaciation and interglacial periods (Ruddiman and Bowles, 1976). Hence, recent turbidite deposits in this region may be relatively undisturbed by thermohaline current activity.

Two major sediment drifts are well developed in the Iceland Basin, and both are presumed to have been developed by steady bottom currents (Johnson and Schneider, 1969; Jones et al., 1970; Davies and Laughton, 1972) transporting sediments down-current from Iceland (Gardar Ridge) or southern Rockall Bank (Hatton Drift). Morphologically these drifts range from smooth, convex piles to irregular deposits with mud waves and scour, and from sharply peaked to nearly flat. The Katla Ridges may also owe their formation to bottom currents acting on glacial outwash and volcanic debris from Iceland. However, the underlying basement structure may at least partly control both their early genesis and their subsequent morphological development.

The transition region between the sediment drift deposits and the turbidity current channel and fan deposits on and around the Katla Ridges displays evidence for both turbidite and thermohaline current sediment deposition, and appears to provide an ideal setting for an investigation of the interaction of turbidity currents with thermohaline bottom currents, or "contour currents".

## OUTLINE OF OBJECTIVES

The observations obtained on Leg 1 of cruise AII-94 were centered around the following major objectives:

1) Define the present-day deep thermohaline circulation in and around the Iceland Basin, emphasizing the location and strength of bottom boundary currents. Of particular importance is describing how the boundary current flows around the irregular bathymetry of the Katla Ridges. CTD profiles, direct current measurements, and bottom photographs are the main sources of data for this effort.

2) Interpret sediment properties in terms of source areas and probable modes of deposition, in order to determine appropriate criteria for discriminating between turbidity current and "contour current" deposits. Sediment properties to be investigated include those compositional variations which reflect changes in depositional regime, as well as physical characteristics such as cross-bedding, graded bedding, particle size distribution, matrix content and surface bed forms. Compositional parameters to be investigated include:

a) carbonate content;

b) feldspar: quartz ratio; and

c) variations in smectite and/or palagonite (altered ash) content.

We expect that the latter two may prove useful in estimating rates of terrigenous input of the fine fraction from Iceland. The orientation of the cores using paleomagnetic declinations should allow a discrimination between structures and fabrics produced by down-slope transport and those produced by the transverse thermohaline flow.

We are devoting a portion of our effort to establishing relationships between sediment properties and 3.5 kHz echo character. We expect that intensive study of closely spaced box cores and piston cores from within a relatively small region may allow us to interpret lateral continuity of sediment layers and their correlation to acoustic reflectors. We anticipate that this study of acoustic layering and sediment properties may allow us to extrapolate the physical nature of sediments beyond the maximum penetration depth of our piston corer (13 meters) and in regions which we were unable to sample.

3) Observe the thickness, areal extent and spatial variability of the near-bottom mixed layer and nepheloid layer throughout the Katla Ridge study area. We hope to establish how this bottom boundary layer (BBL) varies with

a) position relative to the thermohaline current axis;

b) bathymetric relief;

c) current velocity; and

d) sediment microrelief.

We intend to investigate the relationships between the BBL thickness, suspended sediment size distribution and composition, and the properties of the surface sediments.

4) If we are successful in achieving objectives 1-3, we intend to analyze sediments down-core in an attempt to interpret the effects of Late Pleistocene glaciation and deglaciation on Iceland Basin and Katla Ridge depositional processes.

# SUMMARY OF SHIPBOARD OPERATIONS

## Resumé

Leg 1 of cruise ATLANTIS II-94 departed the fuel dock in New Bedford at approximately 2200Z on 14 June 1977. The ship set an easterly course for the first several hundred miles to avoid early summer fog and ice conditions in the vicinity of Newfoundland and the Grand Banks, then turned northeastward (near 42°N, 45°W) and set course toward the region of detailed study in the Iceland Basin. During the transit to the Iceland Basin, which required approximately 11½ days, echo-sounding (3.5 kHz) and magnetometer observations were obtained continuously. Approximately 22 hours en route were spent seismic profiling at slightly reduced speeds (∼ 8 knots) in order to test the various parts of the system. In addition, approximately 16 hours were devoted to station work at two sites on the continental rise south and east of the Grand Banks for purposes of testing the CTD, nephelometer, camera, and box core. After deploying a packet of letters and other parcels at Grand Banks Mail Buoy #2, the ship proceeded at full speed toward the Iceland Basin. Detailed work in the Iceland Basin region began at approximately 2000/June 25, and terminated at 1200/July 11. Following completion of all work, near 62°45'N, 20°00'W, the ship proceeded to Reykjavik by way of Surtsey volcano and the Reykjanes peninsula. Leg 1 terminated in Reykjavik at 0930Z on 12 July 1977.

## Underway Observations

Approximately 5 days were devoted to continuous seismic profiling in the Iceland Basin region (Figure 2) to supplement the previously existing coverage. Four recorders were used continuously, using different sweep rates and filter settings. We found that the use of multiple recording options was important in allowing the identification and resolution of subbottom features of various scales. Figure 3, 4, and 5 illustrate some of the seismic profiles obtained on cruise AII-94. Figures 3 and 4 show profiles normal to and parallel to the major axes of the East and West Katla Ridges. Figure 5 shows several profiles crossing the turbidity current channel which separates the East and West Katla Ridges, near the point where the channel widens and crosses the path of the southwestward-flowing Norwegian Sea overflow.

1. Profiles Transverse to Katla Ridges.

Acoustic basement is very poorly defined on most reflection profiles crossing the Katla Ridges. A near-horizontal coherent reflector can be identified at a total depth of ~3.3 sec beneath the West Katla Ridge (Figure 3, Profile P'P), and this reflector may represent original volcanic basement. The basement reflector would presumably deepen slightly toward the east, following the normal subsidence curve for oceanic crust. Since this deepest reflector is neither well defined nor traceable over great distances, isopach maps relative to this reflector cannot be constructed with great confidence. The total sediment thickness beneath the axes of the East and West Katla Ridges is at least ~1.5 sec, but could be considerably greater.

The general character of the reflectors suggests two principal depositional phases. Beneath the West Katla Ridge (Profile P'P), and presumably beneath the East Katla Ridge as well, approximately 0.5 to 1.0 sec of relatively transparent sediment conformably overlies acoustic basement (Figure 3). This transparent unit is overlain by the acoustically stratified sequences representing the Katla Ridge sediments, which range in thickness from near-zero in the channels to ~0.7 sec near the ridge axes. The evidence suggests that normal pelagic deposition characterized this portion of oceanic crust for much of its early history. Onset of deposition of the more stratified drift deposits presumably corresponds to the time when normal crustal spreading and subsidence brought this portion of crust sufficiently far to the east to be under the influence of turbidity current flow from the Iceland margin and thermohaline flow from the Norwegian Sea. Alternatively the initiation of the ridge deposits may correspond with a marked increase in turbidity current activity and/or thermohaline flow during the late Neogene.

Although the east flank of the East Katla Ridge generally has smooth relief, the otherwise smooth surface is occasionally interrupted by small distributary channels (Profile E'E at 0515) and slumps (Profile P'P at 0515) which document the presence of downslope sediment reworking. Post-depositional faulting of the drift deposits appears to occur on a local scale (Profile P'P at 0400 and 0700), perhaps in response to differential cooling and subsidence of the underlying volcanic crust. The profiles suggest that the East and West Katla Ridges have been distinct features with a well-defined channel separating them since their initial formation. Although relatively recent deepening of the channel is suggested by the apparent outcrops of deep reflectors on the flanks (Profile E'E at 0845), it is evident that some form of channel has served as a turbidite pathway between the East and West Katla Ridges since their initiation. Thus ridge growth and channel development have co-occurred, and perhaps are genetically related.

2. Profiles Along Axes of Katla Ridges.

Identification of acoustic basement is as uncertain for the along-axis profiles as for the transverse profiles. Beneath the West Katla Ridge there is a weak reflector at a total depth of 3.0-3.5 sec (Profile C'C) which apparently corresponds with the reflector observed on the transverse crossing (Profile P'P), but no such reflector can be identified beneath the East Katla Ridge (Profile GG'). On both ridges there is dramatic evidence for current scouring at a depth of around 1500 meters (Profile C'C at 1200 to 1300; Profile GG' at 2000). Although some of the irregular topography may be due to localized slumping, the continuity of deeper reflectors suggests deep scour and erosion of some of the most recently deposited sediment at this depth interval. On the West Katla Ridge, a 50-meter near-vertical scarp is present at a depth of ~2150 meters (Profile C'C at 1715). Again the continuity of sub-bottom reflectors across this feature suggests that it is erosional and not tectonic in origin. An explanation for the presence of such a pronounced feature at this particular depth on the ridge will require interpretation of the hydrographic data and available core material from above and below the scarp.

Dramatic evidence for faulting of deeper reflectors is not as evident on the ridge-parallel profiles as on the transverse profiles, suggesting that the fault planes may be oriented sub-parallel to the sediment ridges. This interpretation is consistent with a pattern of normal faulting as a consequence of cooling and subsidence of the underlying volcanic crust.

3. Profiles Across Turbidity Current Channel.

A sequence of reflection profiles across the channel separating the East and West Katla Ridges (Figure 5) reveals the changing morphology and structure of the channel as it emerges from between the ridges and intersects the steady thermohaline flow. Toward the head of the channel the walls are relatively steep, the channel floor is imperceptibly narrow, and smaller distributary channels apparently feed into the main channel from the adjacent sediment drifts (Figure 5, Profile FF'). As the channel approaches the axis of the thermohaline flow, the channel becomes broader, its walls are less precipitous, and meanders and abandoned channels appear (e.g. Profile AA' at 1600-1700). It is evident that significant modification of the sediments within and bordering the channels is occurring in the depth interval below ~2000 m.

Low-frequency (3.5 kHz) echo sounding profiles were obtained during the entire 15½ days of operation in the Iceland Basin, and allowed detailed resolution of the sea floor echo character and shallow sub-bottom stratification. These profiles proved to be crucial in identifying and tracing sub-bottom reflectors, and selecting sites for coring and hydrographic observations. Examples of some of these profiles, near the intersection of the turbidity current channel and the thermohaline flow, are shown in Figure 6. The 3.5 kHz profiles reveal details of sedimentation within and adjacent to the turbidity current channel which cannot be resolved with lower-frequency seismic profiles. Farther up-canyon (Profiles FF', GG') the walls of the channel are precipitously steep with 50-100 meters of relief, and shallow sub-bottom reflectors from beneath the East Katla Ridge outcrop on the channel walls (Profile GG'). Down-canyon from Profile GG' the channel changes character dramatically. Relatively transparent sediments now flank the channel (Profiles DD' add MM'), and the channel floor consists of highly stratified sub-horizontal reflectors. In one profile (Profile DD' form 2200 to 2220) it appears that 3 distinct acoustic units grade imperceptably together; elsewhere (e.g. Profile K'K from 0400 to 0425) it appears that stratified channel deposits unconformably overlie relatively transparent sediments of the former channel wall. Interpretation of the lithologic and stratigraphic relationships of the various acoustic units represented in these profiles will require extensive analyses of the closely-spaced cores from within and around the channel in this region.

Passing ships and marine life were very scarce, with the exception of an abundant standing crop of phytoplankton and zooplankton, and an ever-present but elusive cloud of sea birds which increased the hazard of deck operations.

## Station Data

1. CTD Profiles. Twenty-six CTD profiles were obtained in the Iceland Basin region (see Table 1 and Figure 7), using the CTD system developed by R. Millard and L. Armi at Woods Hole. Six additional lowerings were made at test stations near the Grand Banks (Table 1). Of the total of thirty-two stations, the CTD functioned well on only eight of them.

There were three main problems that were encountered with the CTD during the cruise. They were:

1) Dead batteries in CTD #3;

2) Noisy signal in CTD #1; and

3) Digitizing error in CTD #3.

Five of 17 batteries (lifetime should be 1-2 years) had to be replaced in CTD #3. We then decided to use this instrument only as a backup. CTD #1 worked well for some time, but the noise increased dramatically and despite washing the sensor it was not cleared up. We then returned to using CTD #3, but immediately discovered that the conductivity measurements were being incorrectly digitized. We were unable to satisfactorily solve this problem at sea. During the four months immediately following completion of the cruise, we have succeeded in retrieving the conductivity signal with a program that eliminates the digitizing error. In all these casts there were no problems with temperature measurements.

In summary, of the 32 CTD lowerings (including 5 test stations):

a) 8 of 32 casts were satisfactorily processed at sea;

b) 5 of 32 casts were discarded due to bad batteries:

c) 3 of 32 casts have a large amount of noise in the signal; and

d) 16 of 32 produced a strong signal but have required considerable post-cruise effort for editing.

2. Nephelometer profiles. A total of twenty-seven nephelometer profiles were obtained in the Iceland Basin region (Table 2), using the system developed at Lamont-Doherty by Thorndike (1975). In general the locations of the nephelometer stations correspond with the CTD lowerings (Figures 7 and 8), with the nephelometer attached to the wire 10 meters above the CTD. However, in a few instances additional nephelometer profiles were obtained on hydrographic stations. All aspects of the nephelometer system functioned as required.

3. Hydrocasts. Twenty four hydrographic stations were occupied (Table 3, Figure 8), each of which consisted of between five and fifteen water samples (using 5-liter bottles and 30-liter bottles). Water samples were filtered through 0.6 $\mu$ Nuclepore filters for analysis of the concentration and composition of suspended particulates, and comparison between the composition of the particulates and the underlying surface sediments. The measurements of total concentration of suspended particulates will also be used in an attempt to calibrate the nephelometer profiles.

4. Sediment trap moorings. In order to estimate the vertical flux of suspended particulates, three moorings of sediment traps were deployed in the Katla Ridge region: two along the East Katla Ridge transect, and one near the turbidity current channel (Figure 8, Table 6). The traps are a

modification of the type used by Gardner (1977); each is a PVC cylinder 10 inches (25.4 cm) in diameter and 25 inches (62.5 cm) in height. Each of the three moorings consisted of three traps placed at levels of 10 m, 100 m, and 500 m above the sea floor. A timed release was used at the base of each mooring to close the lowermost trap, and to release the anchor weights 2.4 hours later. A second timed release was used at the top of each mooring to close the top trap and to drop a messenger to close the intermediate trap below. The traps were positioned vertically so as to estimate vertical flux of particulates both within and above the near-bottom nepheloid layer.

5. Bottom current measurement. Three current meters, of the type developed by Scripps' Marine Life Research Group, were deployed at a total of six locations on the east flank of the East Katla Ridge in order to measure the speed and direction of the thermohaline current flowing along the ridge. Each instrument was positioned 10 meters above the sea floor, and recorded currents over a period of approximately one week (Table 5). The location of the transect of current meters corresponds with the transect of CTD stations, so as to allow the estimation of the absolute velocity field from the computations of geostrophic current velocity (i.e., vertical velocity gradients) along the same profile. The mean flow observed at each of the six stations was generally westward to southwestward (Figure 7), with velocities ranging from 5.8 to 20.8 cm/sec in the direction of mean flow, averaged over the total duration of the record (Table 5).

6. Coring. Twelve standard piston cores and fourteen box cores were obtained in the Katla Ridge area (Tables 7 and 8; Figure 8). The box core used is that described by Bouma (1969, p. 339-342). Generally the box core functioned well with excellent recovery of near-surface sedimentary structures. However, the locking compass used for core orientation failed in all but one attempt. Tests on deck suggested that the corer is not strictly non-magnetic, and further work will therefore be required to obtain oriented box cores routinely. It is possible that paleomagnetic declination can be used for azimuthal orientation of the cores, but the validity of the method for the Iceland Basin core material remains to be tested. All piston cores were rigged with 40 feet (~ 13 meters) of core barrel, and generally penetrated completely with only a minor amount of flow-in.

7. Bottom photography. Nine camera stations in the Katla Ridge area yielded one or more useable exposures, and a total of 42 useable exposures were obtained in the region (Table 4; Figure 9). Examples of several of the photographs from the East Katla Ridge and from the turbidity current channel are presented in Figures 10 through 14. The camera used (Benthos Model 371 Utility Camera System) was extensively tested in shallow water and consistently performed in a satisfactory manner, but failed repeatedly during the Iceland Basin work, despite extensive efforts by electronics technicians to remedy the problems.

# LIST OF SCIENTIFIC PERSONNEL

AII-94, Leg 1

June 14-July 12, 1977

| | Name | Position | Shipboard Responsibilities |
|---|---|---|---|
| 1. | Johnson, David A. | Associate Scientist | Chief Scientist |
| 2. | Shor, Alexander N. | WHOI-MIT Joint Program | Co-Chief Scientist |
| 3. | Witzell, W. E. | Research Specialist | seismics |
| 4. | Driscoll, Alan H. | Research Associate | coring, camera |
| 5. | Davies, Rod F. | Research Assistant | seismics |
| 6. | Farmer, Harlow G. | Research Assistant | coring |
| 7. | Peters, Christopher S. | Research Assistant | coring, digital data |
| 8. | Porter, David | Research Assistant | CTD |
| 9. | Thayer, Robert J. | Research Assistant (IPC) | computer |
| 10. | Chandler, Rick | Lab Assistant | coring |
| 11. | Richardson, Mary Jo | WHOI-MIT Joint Program | hydrography/sed. traps |
| 12. | Bremer, Mary L. | WHOI-MIT Joint Program | watchstander |
| 13. | Zlotnicki, Victor | WHOI-MIT Joint Program | watchstander |
| 14. | Duschenes, Jeremy | WHOI-MIT Joint Program | watchstander; CTD |
| 15. | Rohr, Kristin | WHOI-MIT Joint Program | watchstander |
| 16. | Galson, Dan | MIT | watchstander |
| 17. | Muller, David S. | WHOI Summer Student Fellow | watchstander; CTD |
| 18. | Markwalter, Bruce | Lamont-Doherty Geol. Obs. | nephelometer |
| 19. | Graham, Jery B. | Scripps Inst. of Oceanogr. | current meters |
| 20. | Belanger, Paul | Brown University | paleontology |
| 21. | McNutt, Steve | Wesleyan Univeristy | watchstander |

## SOURCES OF DATA

During the two years immediately following the completion of cruise AII-94, all geological, geophysical, and oceanographic data resulting from the cruise will be under study by D. Johnson, A. Shor, and M. J. Richardson of Woods Hole; the data will be the principal basis for the doctoral dissertations of Shor and Richardson.

Following July of 1979, original records will be available from the following sources;

| Type of Data | Person to Contact |
|---|---|
| Echo sounding (3.5 kHz) | W. M. Dunkle, Jr. (WHOI) |
| Seismic reflection profiles | E. T. Bunce (WHOI) |
| Magnetics | R. Groman (WHOI) |
| Navigation | R. Groman (WHOI) |
| Current meter | J. L. Reid (Scripps) |
| Nephelometer | L. G. Sullivan (Lamont) |
| Bottom photographs | W. M. Dunkle, Jr. (WHOI) |
| CTD | R. Millard (WHOI) |
| Hydrocasts | E. Schroeder (WHOI) |
| Cores | D. A. Johnson (WHOI) |

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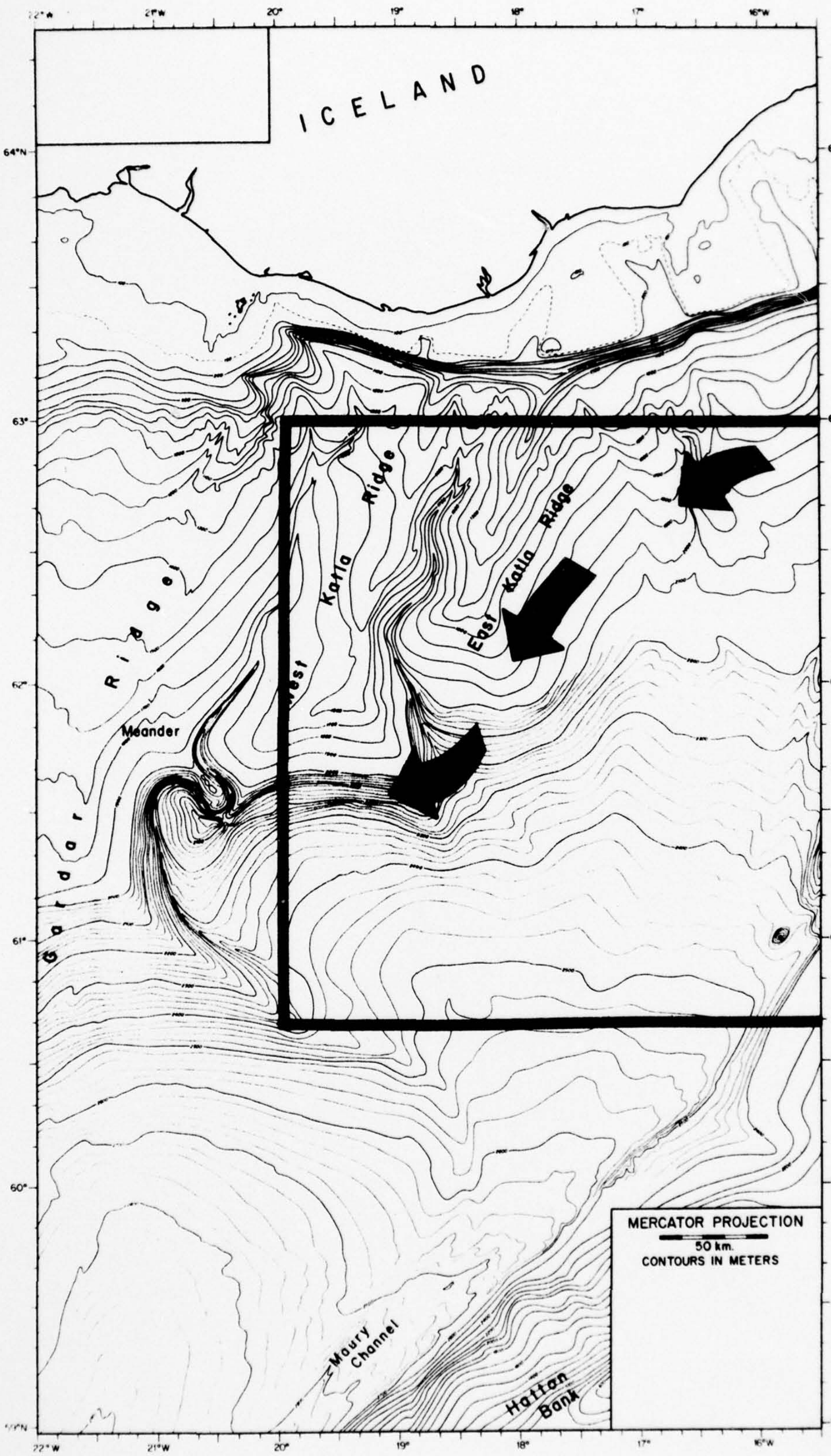

ICELAND
Gardar Ridge
Meander
West Katla Ridge
East Katla Ridge
Maury Channel
Hatton Bank
MERCATOR PROJECTION
50 km.
CONTOURS IN METERS

Figure 1.

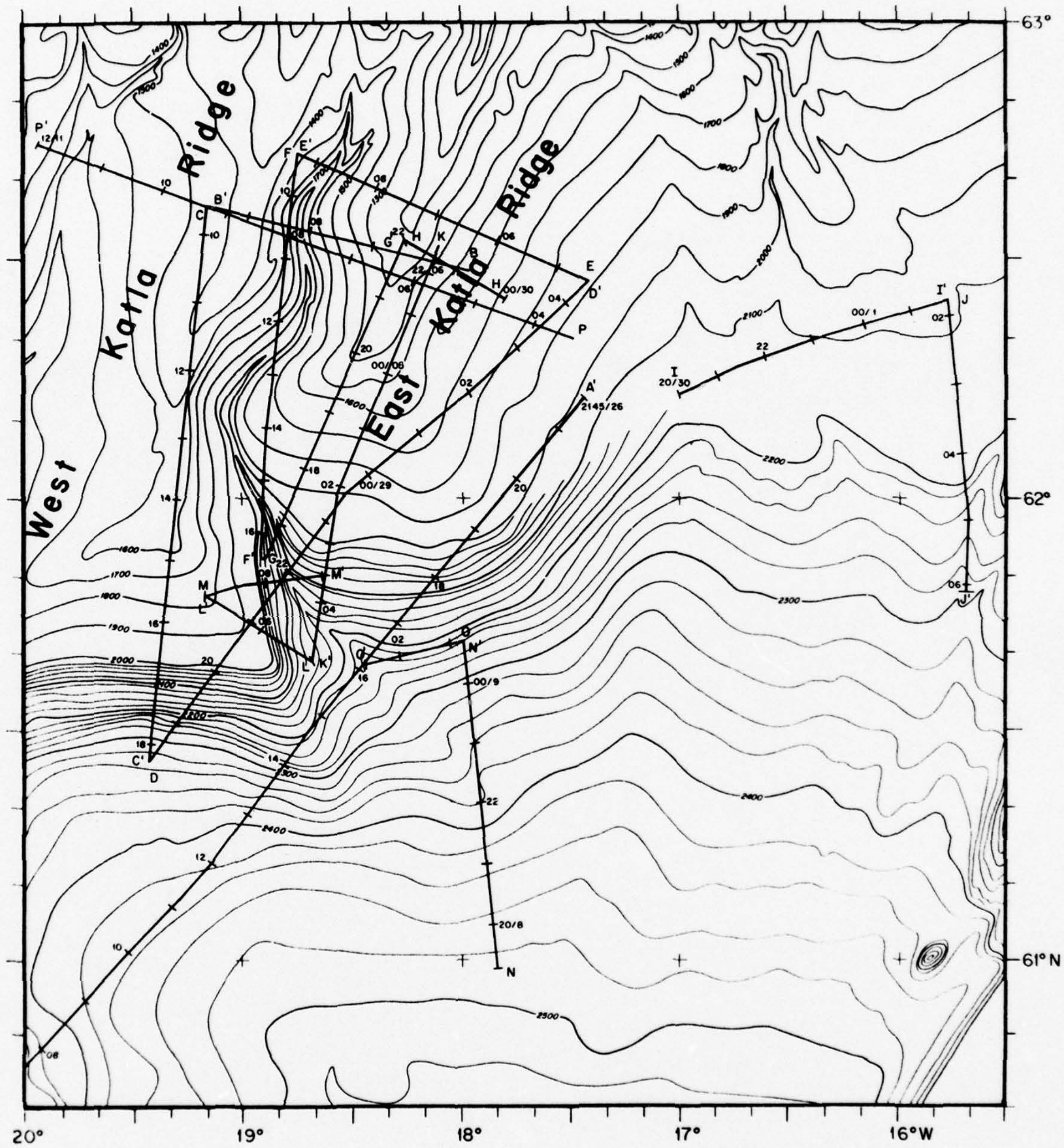



Figure 2.

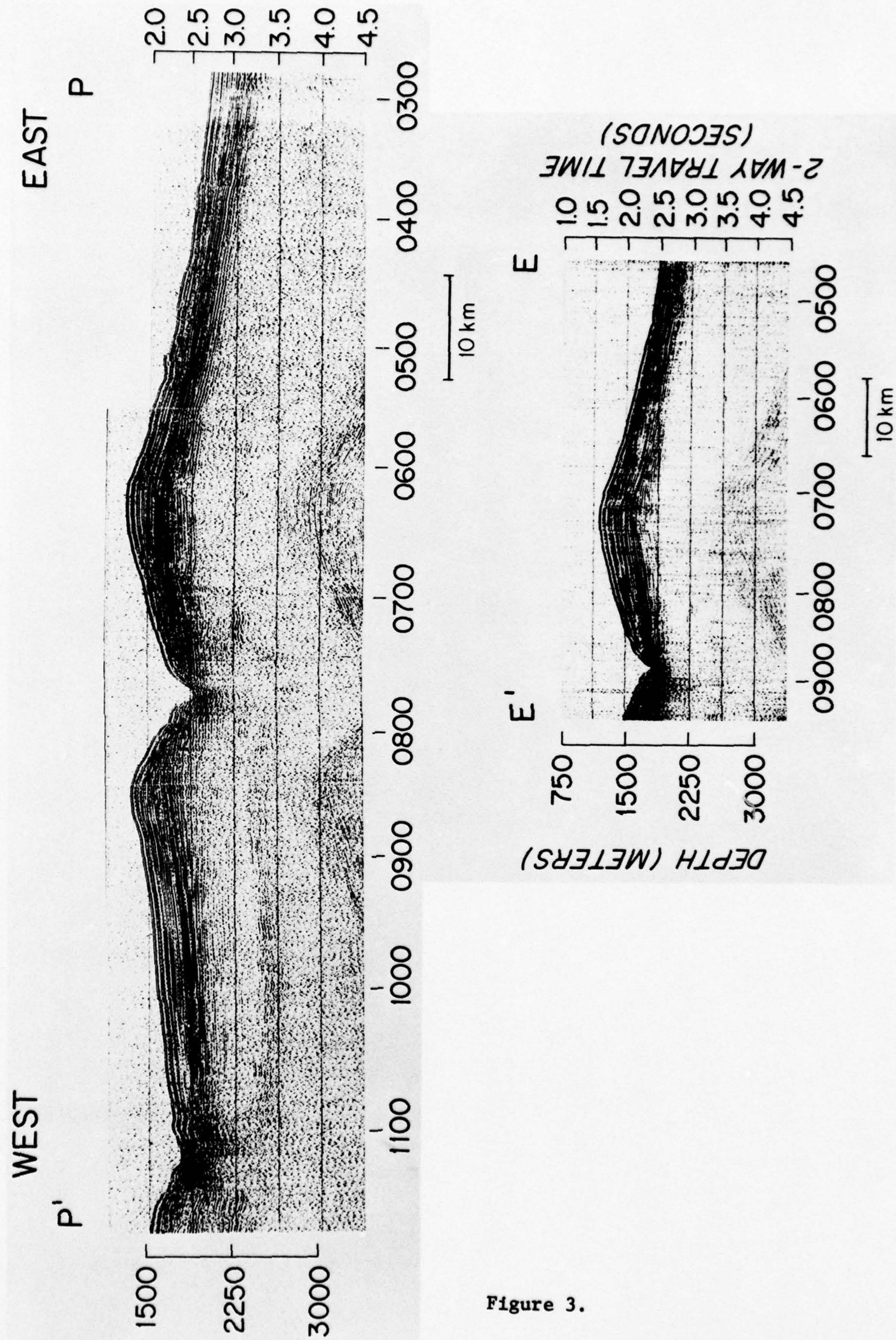

EAST
WEST
P
P'
2.0
2.5
3.0
3.5
4.0
4.5
1500
2250
3000
0300
0400
0500
0600
0700
0800
0900
1000
1100
10 km
E
E'
1.0
1.5
2.0
2.5
3.0
3.5
4.0
4.5
750
1500
2250
3000
0500
0600
0700
0800
0900
10 km
2-WAY TRAVEL TIME
(SECONDS)
DEPTH (METERS)

Figure 3.

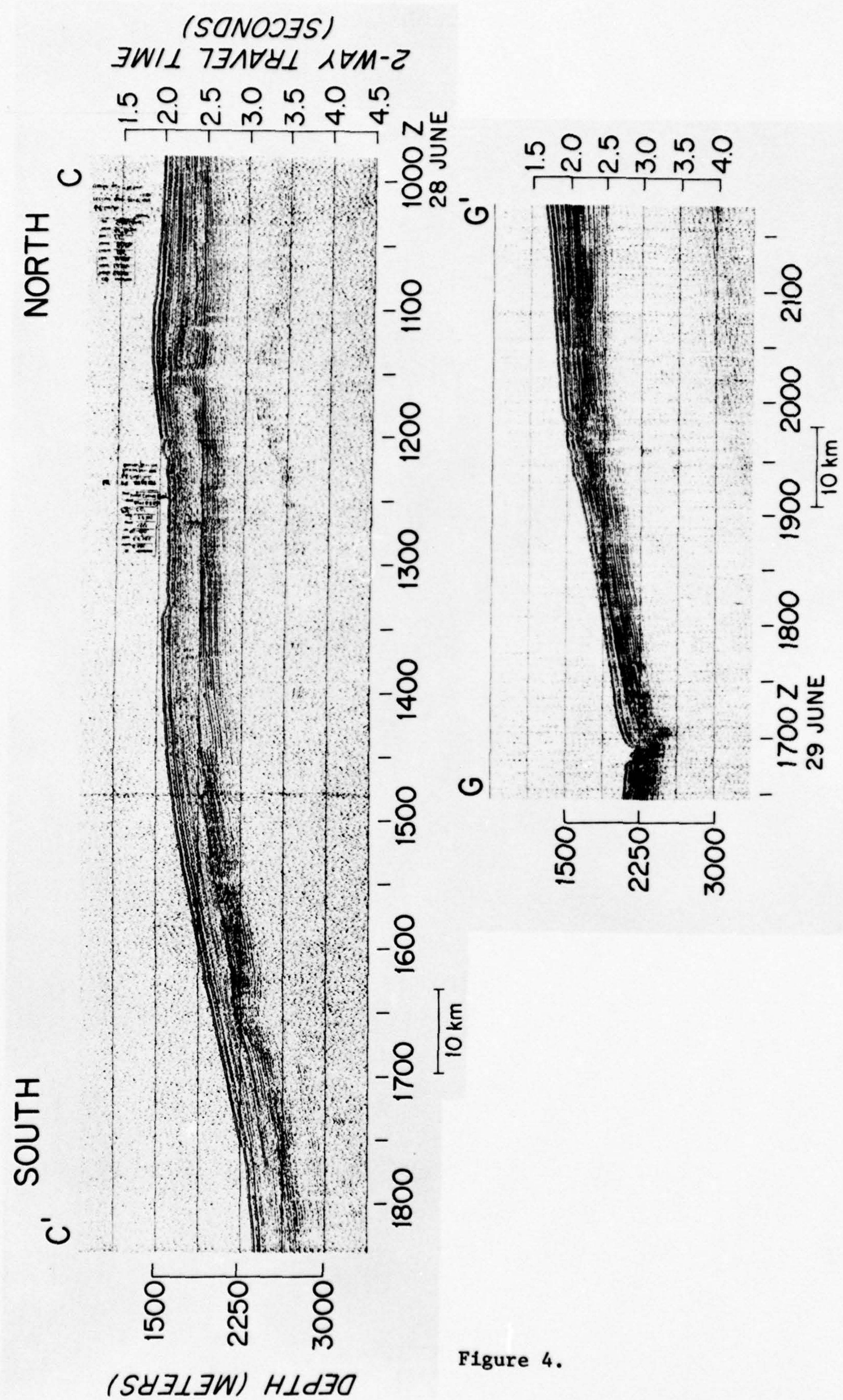

2-WAY TRAVEL TIME (SECONDS)
DEPTH (METERS)
NORTH
SOUTH
C
C'
G
G'
1000 Z 28 JUNE
1700 Z 29 JUNE
10 km

Figure 4.

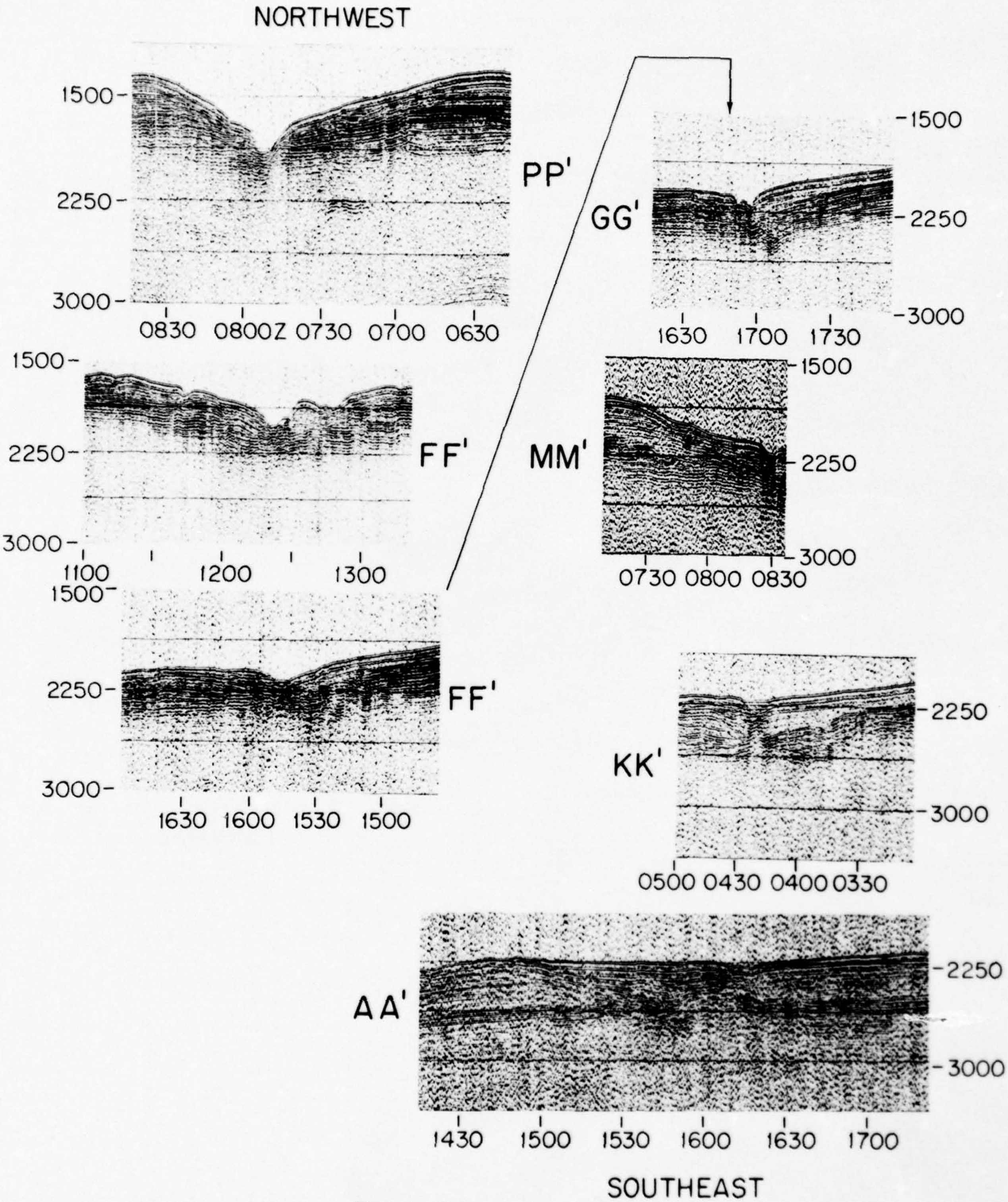

NORTHWEST
1500
2250
3000
0830
0800Z
0730
0700
0630
PP'
GG'
1500
2250
3000
1630
1700
1730
1500
2250
3000
1100
1200
1300
FF'
MM'
1500
2250
3000
0730
0800
0830
1500
2250
3000
1630
1600
1530
1500
FF'
KK'
2250
3000
0500
0430
0400
0330
AA'
2250
3000
1430
1500
1530
1600
1630
1700
SOUTHEAST

**Figure 5.**

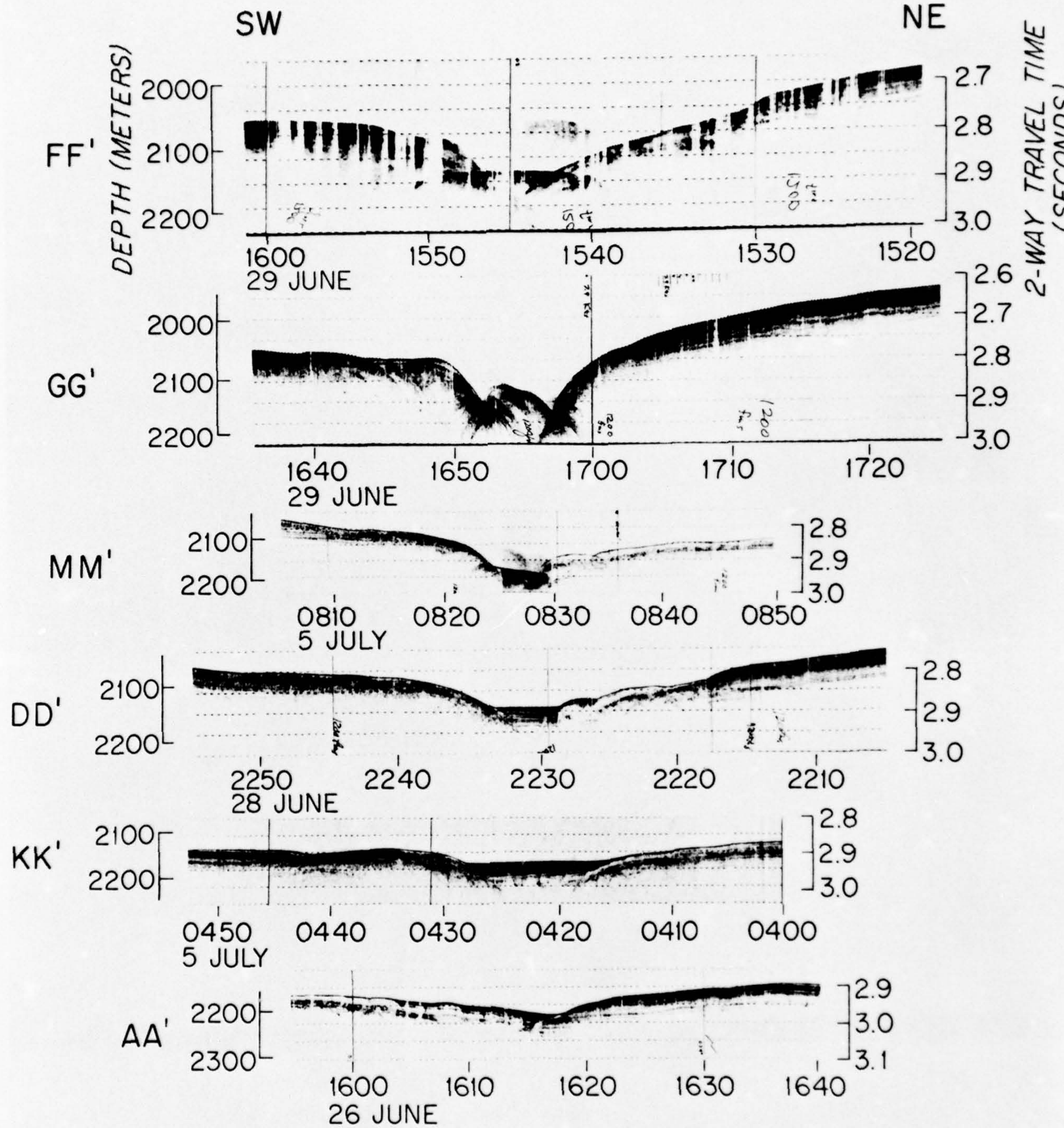
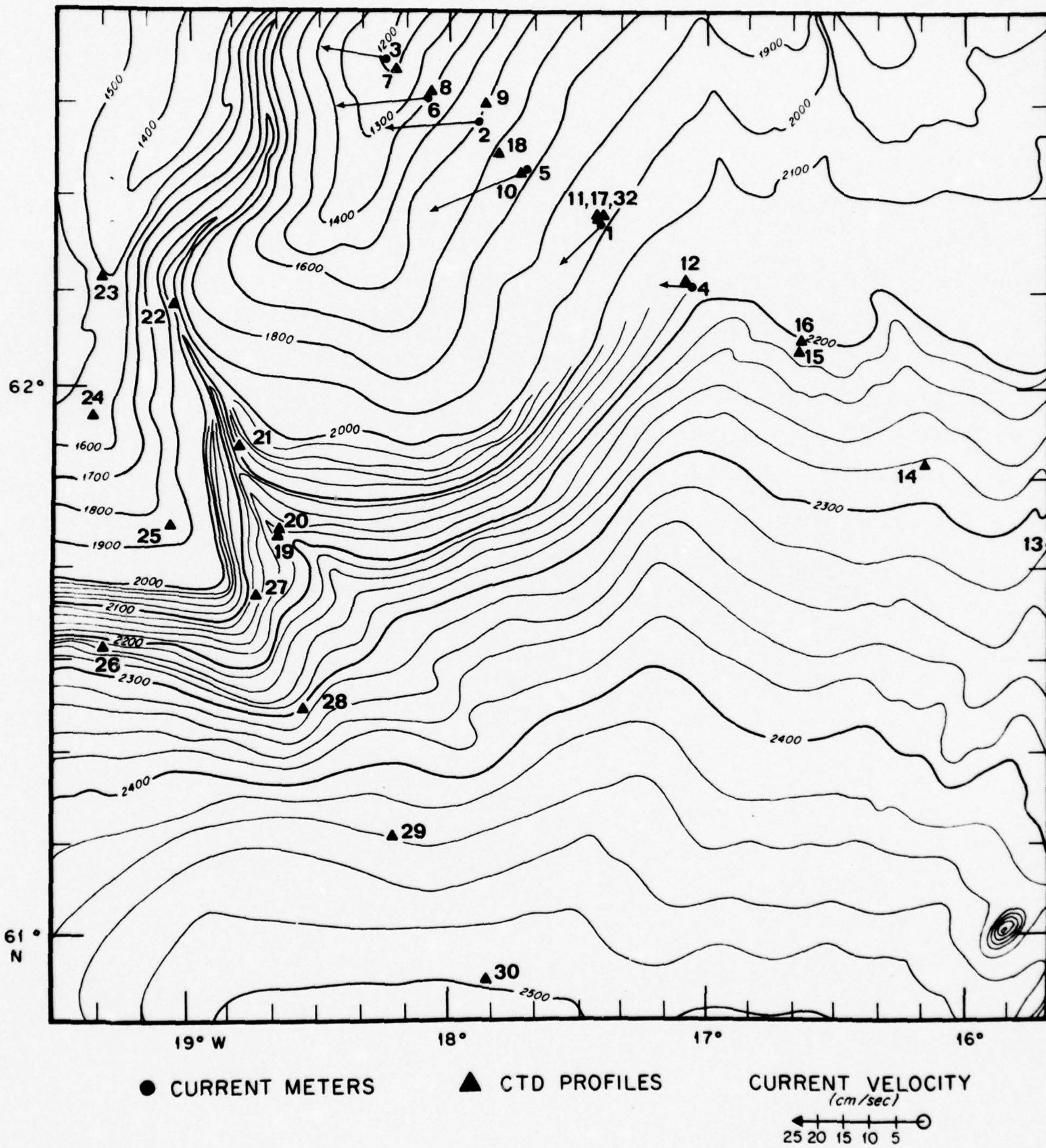

SW
NE
DEPTH (METERS)
2-WAY TRAVEL TIME (SECONDS)
FF'
2000
2100
2200
2.7
2.8
2.9
3.0
1600
1550
1540
1530
1520
29 JUNE
GG'
2000
2100
2200
2.6
2.7
2.8
2.9
3.0
1640
1650
1700
1710
1720
29 JUNE
MM'
2100
2200
2.8
2.9
3.0
0810
0820
0830
0840
0850
5 JULY
DD'
2100
2200
2.8
2.9
3.0
2250
2240
2230
2220
2210
28 JUNE
KK'
2100
2200
2.8
2.9
3.0
0450
0440
0430
0420
0410
0400
5 JULY
AA'
2200
2300
2.9
3.0
3.1
1600
1610
1620
1630
1640
26 JUNE

**Figure 6.**



62°
61°
N
19° W
18°
17°
16°
1200
1300
1400
1500
1600
1700
1800
1900
2000
2100
2200
2300
2400
2500
3
7
8
6
9
2
18
10
5
11,17,32
1
12
4
16
15
23
22
24
21
14
20
19
25
13
27
26
28
29
30
● CURRENT METERS
▲ CTD PROFILES
CURRENT VELOCITY
(cm/sec)
25 20 15 10 5


Figure 7.

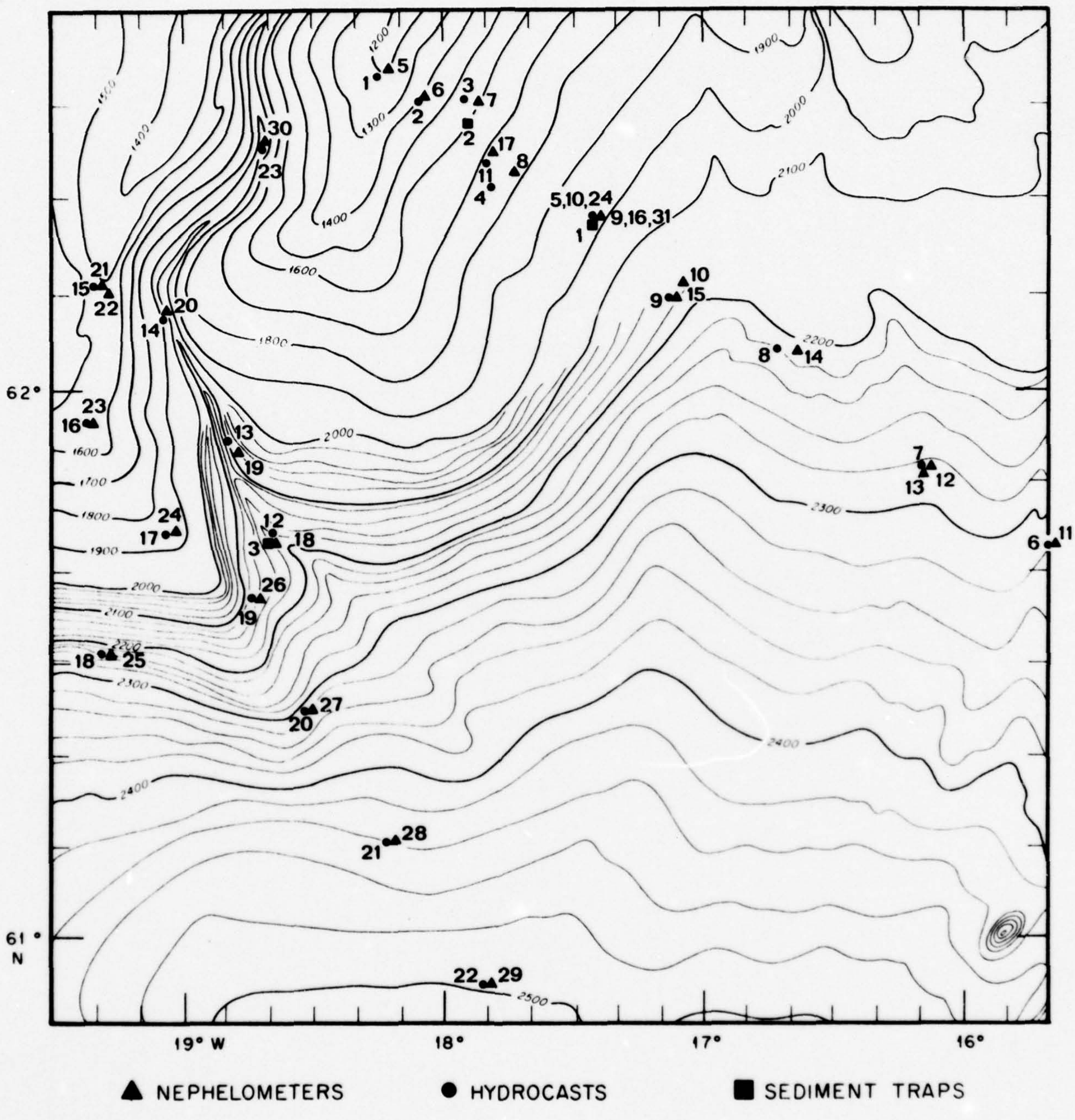
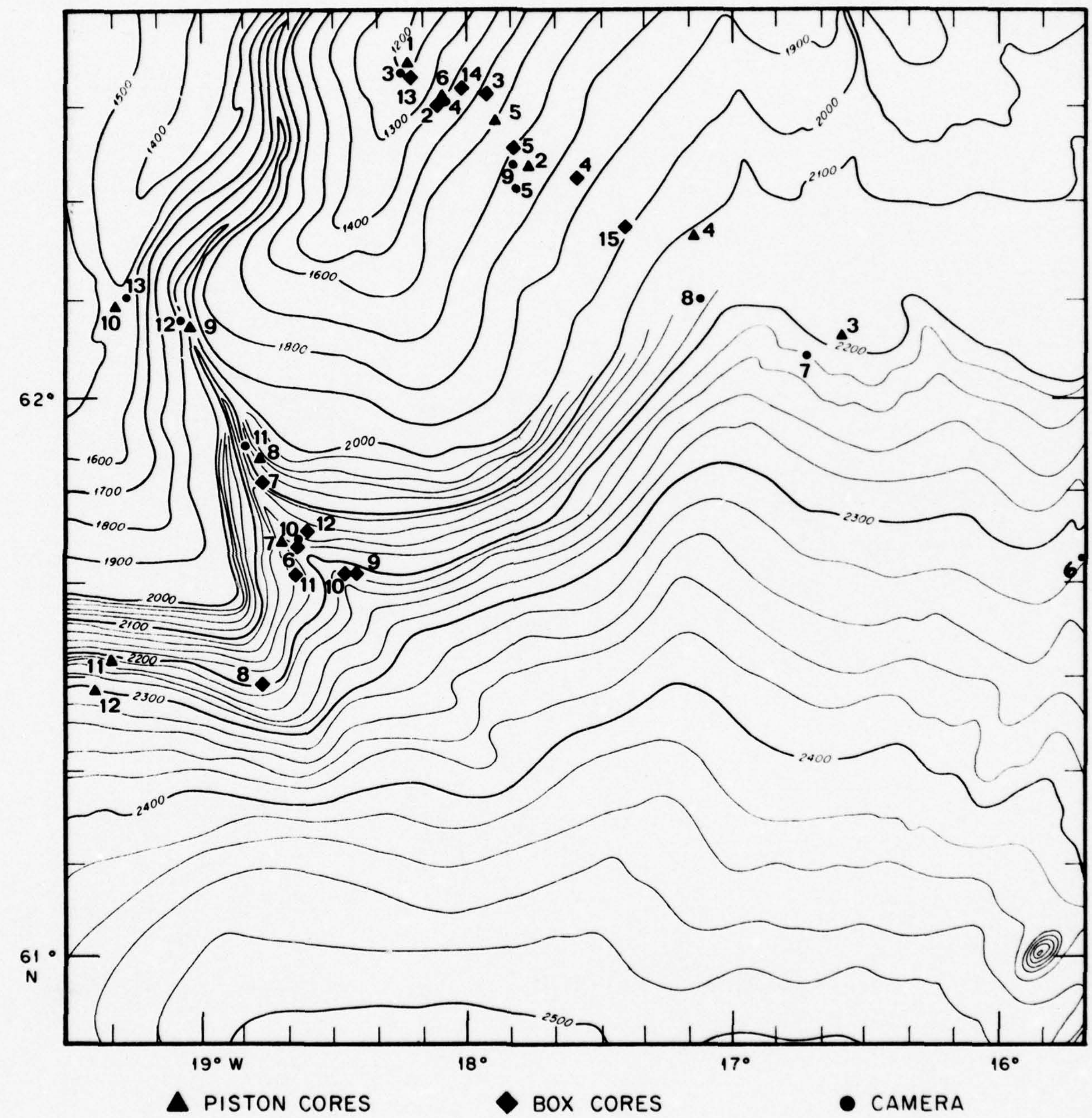

19° W
18°
17°
16°
62°
61° N
NEPHELOMETERS
HYDROCASTS
SEDIMENT TRAPS

Figure 8.



62°
61°
N
19° W
18°
17°
16°
1200
1300
1400
1500
1600
1700
1800
1900
2000
2100
2200
2300
2400
2500
PISTON CORES
BOX CORES
CAMERA


Figure 9.

Figure 10.

East Katla Ridge, depth 1194 m

AII-94, Stn. 18, Cam. #3, Frame 39

Figure 11.

East Katla Ridge, depth 1732 m
AII-94, Stn. 47, Cam. #9, Frame 10

Figure 12.

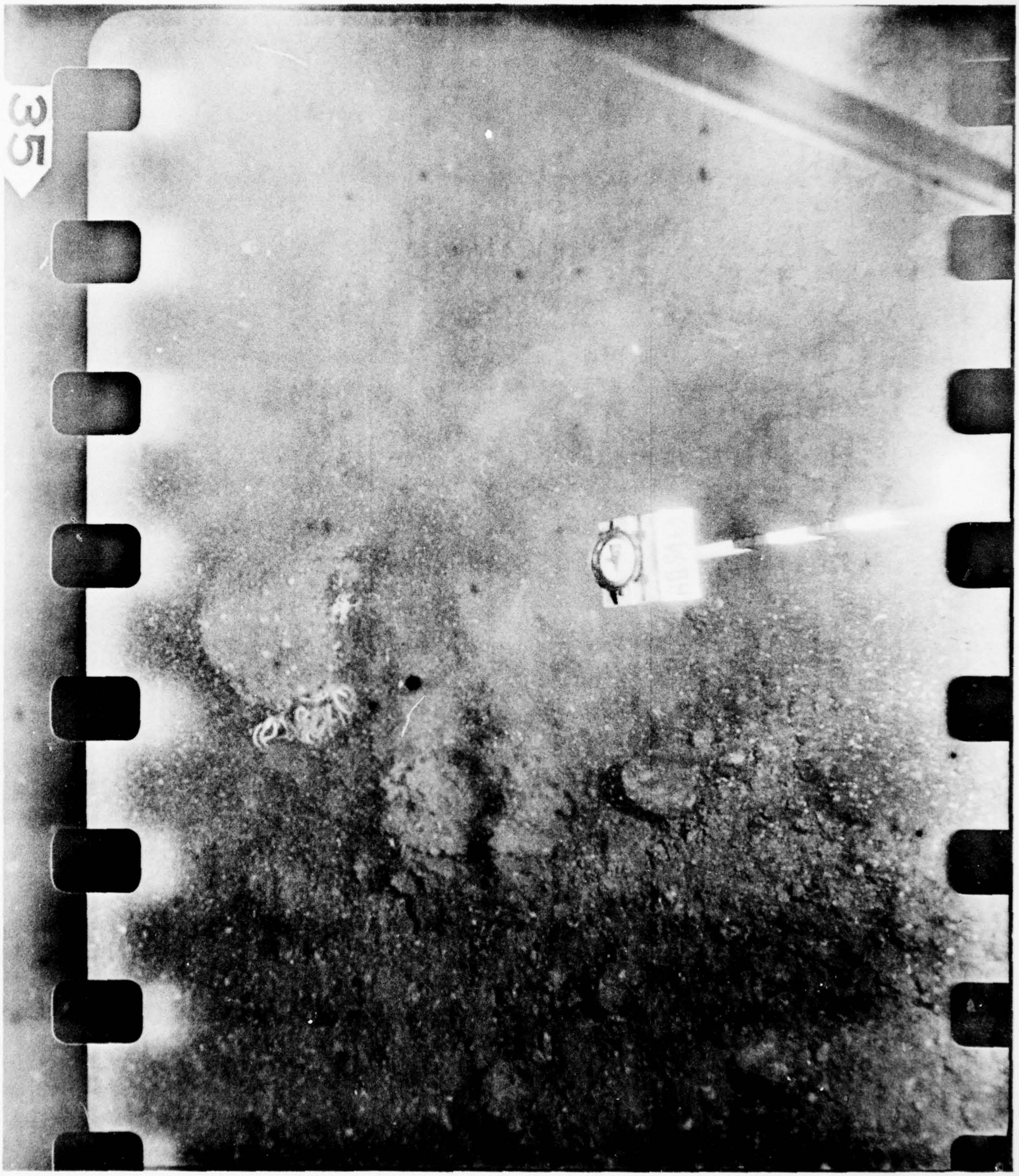
East Katla Ridge, depth 2211 m

AII-94, Stn. 36, Cam. #7, Frame 29

Figure 13.


Turbidity current channel, depth 2145 m
AII-94, Stn. 59, Cam. #11, Frame 18

Figure 14.




Turbidity current channel, depth 2082 m
AII-94, Stn. 63, Cam. #12, Frame 35

# TABLES

TABLE 1. CTD STATIONS

| Station | CTD No. | Date | Time | Depth (m) | Latitude | Longitude |
|---|---|---|---|---|---|---|
| 2 | 1 | 16 June | 1555-1703 | 4554 | 40°35.1'N | 64°04.4'W |
| 4 | 2 | 16 June | 2134-2140 | 4543 | 40°37.4'N | 62°58.6'W |
| 5 | 3 | 16 June | 2152-2313 | 4543 | 40°38.0'N | 62°58.0'W |
| 6 | 4 | 16 June | 2322-2331 | 4546 | 40°38.0'N | 62°58.0'W |
| 7 | 5 | 19 June | 1156-1205 | 3816 | 41°39.7'N | 47°55.7'W |
| 9 | 6 | 19 June | 1502-1734 | 3947 | 41°40.0'N | 47°54.2'W |
| 17 | 7 | 27 June | 1016-1151 | 1183 | 62°34.0'N | 18°13.0'W |
| 19 | 8 | 27 June | 1633-1800 | 1395 | 62°31.4'N | 18°04.4'W |
| 22 | 9 | 27 June | 2323-0130 | 1598 | 62°28.7'N | 17°53.1'W |
| 25 | 10 | 30 June | 0055-0244 | 1796 | 62°23.1'N | 17°44.1'W |
| 28 | 11 | 30 June | 0912-1125 | 1989 | 62°18.3'N | 17°24.8'W |
| 30 | 12 | 30 June | 1554-2035 | 2167 | 62°11.7'N | 17°04.5'W |
| 32 | 13 | 1 July | 0935-1200 | 2310 | 61°43.4'N | 15°40.2'W |
| 34 | 14 | 1 July | 1843-2115 | 2276 | 61°51.1'N | 16°09.8'W |
| 37 | 15 | 2 July | 2105-2306 | 2207 | 62°04.0'N | 16°38.7'W |
| 38 | 16 | 2 July | 2315-0018 | 2199 | 62°05.2'N | 16°38.5'W |
| 40 | 17 | 3 July | 2028-2137 | 1984 | 62°18.6'N | 17°21.6'W |
| 46 | 18 | 4 July | 1145-1248 | 1696 | 62°25.5'N | 17°45.7'W |
| 53 | 19 | 5 July | 1523-1644 | 2175 | 61°43.5'N | 18°39.9'W |
| 54 | 20 | 5 July | 1647-1704 | 2173 | 61°43.8'N | 18°39.4'W |
| 58 | 21 | 6 July | 0145-0321 | 2165 | 61°53.1'N | 18°48.6'W |
| 62 | 22 | 6 July | 1539-1705 | 2082 | 62°08.8'N | 19°05.0'W |
| 65 | 23 | 6 July | 2315-0149 | 1561 | 62°11.7'N | 19°21.3'W |
| 67 | 24 | 7 July | 0643-0827 | 1522 | 61°57.0'N | 19°26.7'W |
| 68 | 25 | 7 July | 1040-1235 | 1841 | 61°44.7'N | 19°04.3'W |
| 70 | 26 | 7 July | 1707-1932 | 2237 | 61°31.5'N | 19°19.9'W |
| 72 | 27 | 8 July | 0057-0305 | 2096 | 61°33.8'N | 18°47.9'W |
| 74 | 28 | 8 July | 0653-0937 | 2300 | 61°25.0'N | 18°31.8'W |
| 75 | 29 | 8 July | 1130-1333 | 2433 | 61°10.8'N | 18°14.0'W |
| 76 | 30 | 8 July | 1530-1735 | 2501 | 60°54.3'N | 17°51.1'W |
| 81 | 31 | 10 July | 0030-0230 | 1851 | 62°25.8'N | 18°41.6'W |
| 84 | 32 | 10 July | 2020-2130 | 1991 | 62°18.4'N | 17°25.3'W |

TABLE 2. NEPHELOMETER STATIONS

| Station | Neph. No. | Date | Time | Depth (m) | Latitude | Longitude |
|---|---|---|---|---|---|---|
| 2 | 1 | 16 June | 1636-1724 | 4554 | 40°35.1'N | 63°04.4'W |
| 5 | 2 | 16 June | 2152-2313 | 4543 | 40°38.0'N | 62°58.0'W |
| 8 | 3 | 19 June | 1234-1450 | 3913 | 41°36.8'N | 47°57.6'W |
| 10 | 4 | 19 June | 1747-1947 | 3972 | 41°40.6'N | 47°53.8'W |
| 17 | 5 | 27 June | 1016-1151 | 1183 | 62°34.0'N | 18°13.0'W |
| 19 | 6 | 27 June | 1620-1839 | 1395 | 62°31.4'N | 18°04.4'W |
| 22 | 7 | 27 June | 2326-0130 | 1598 | 62°28.2'N | 17°54.0'W |
| 25 | 8 | 30 June | 0057-0244 | 1796 | 62°23.8'N | 17°42.9'W |
| 28 | 9 | 30 June | 0912-1130 | 1989 | 62°18.3'N | 17°24.8'W |
| 30 | 10 | 30 June | 1544-2030 | 2169 | 62°11.7'N | 17°04.5'W |
| 32 | 11 | 1 July | 0935-1200 | 2310 | 61°42.9'N | 15°40.1'W |
| 33 | 12 | 1 July | 1454-1810 | 2274 | 61°51.6'N | 16°10.6'W |
| 34 | 13 | 1 July | 1852-2115 | 2276 | 61°51.1'N | 16°09.8'W |
| 37 | 14 | 2 July | 2105-2306 | 2207 | 62°04.3'N | 16°38.4'W |
| 39 | 15 | 3 July | 0200-0451 | 2165 | 62°10.5'N | 17°06.6'W |
| 40 | 16 | 3 July | 2028-2137 | 1984 | 62°18.6'N | 17°21.6'W |
| 53 | 18 | 5 July | 1523-1644 | 2175 | 61°43.5'N | 18°39.9'W |
| 58 | 19 | 6 July | 0145-0321 | 2165 | 61°53.1'N | 18°48.2'W |
| 62 | 20 | 6 July | 1539-1705 | 2082 | 62°08.8'N | 19°05.0'W |
| 65 | 21 | 6/7 July | 2315-0149 | 1561 | 62°11.7'N | 19°21.3'W |
| 66 | 22 | 7 July | 0250-0429 | 1535 | 62°10.3'N | 19°16.3'W |
| 67 | 23 | 7 July | 0643-0827 | 1522 | 61°57.0'N | 19°26.7'W |
| 68 | 24 | 7 July | 1040-1235 | 1841 | 61°44.7'N | 19°04.3'W |
| 70 | 25 | 7 July | 1707-1932 | 2237 | 61°31.5'N | 19°19.9'W |
| 72 | 26 | 8 July | 0057-0305 | 2096 | 61°33.8'N | 18°47.9'W |
| 74 | 27 | 8 July | 0653-0937 | 2300 | 61°25.0'N | 18°31.8'W |
| 75 | 28 | 8 July | 1130-1333 | 2433 | 61°10.8'N | 18°14.0'W |
| 76 | 29 | 8 July | 1530-1735 | 2501 | 60°54.3'N | 17°51.1'W |
| 81 | 30 | 10 July | 0030-0230 | 1851 | 62°25.8'N | 18°41.6'W |
| 84 | 31 | 10 July | 2020-2130 | 1991 | 62°18.4'N | 17°25.3'W |

TABLE 3. HYDROCASTS

| Station | Hydro-cast | Date | Time | Depth (m) | Latitude | Longitude |
|---|---|---|---|---|---|---|
| 18 | 1 | 27 June | 1200-1538 | 118 | 62°33.6'N | 18°13.9'W |
| 20 | 2 | 27 June | 1813-2016 | 1387 | 62°30.7'N | 18°05.0'W |
| 23 | 3 | 28 June | 0154-0340 | 1544 | 62°29.0'N | 17°57.5'W |
| 26 | 4 | 30 June | 0252-0443 | 1798 | 62°21.9'N | 17°48.8'W |
| 29 | 5 | 30 June | 1213-1418 | 1993 | 62°18.0'N | 17°23.9'W |
| 31 | 6 | 1 July | 0654-0931 | 2310 | 61°42.9'N | 15°40.7'W |
| 33 | 7 | 1 July | 1504-1810 | 2276 | 61°52.0'N | 16°10.1'W |
| 36 | 8 | 2 July | 1720-2041 | 2214 | 62°04.3'N | 16°43.4'W |
| 39 | 9 | 3 July | 0200-0451 | 2165 | 62°10.5'N | 17°06.6'W |
| 40 | 10 | 3 July | 2033-2230 | 1984 | 62°18.6'N | 17°21.6'W |
| 47 | 11 | 4 July | 1330-1610 | 1700 | 62°23.9'N | 17°50.2'W |
| 55 | 12 | 5 July | 1724-1950 | 2171 | 61°43.8'N | 18°39.5'W |
| 59 | 13 | 6 July | 0321-0555 | 2119 | 61°54.0'N | 18°49.5'W |
| 63 | 14 | 6 July | 1800-2020 | 2082 | 62°08.0'N | 19°03.6'W |
| 65 | 15 | 6/7 July | 2315-0149 | 1561 | 62°11.7'N | 19°21.3'W |
| 67 | 16 | 7 July | 0643-0827 | 1522 | 61°57.0'N | 19°26.7'W |
| 68 | 17 | 7 July | 1040-1235 | 1841 | 61°44.7'N | 19°04.3'W |
| 70 | 18 | 7 July | 1707-1932 | 2237 | 61°31.5'N | 19°19.9'W |
| 72 | 19 | 8 July | 0057-0305 | 2096 | 61°33.8'N | 18°47.9'W |
| 74 | 20 | 8 July | 0653-0937 | 2300 | 61°25.0'N | 18°31.8'W |
| 75 | 21 | 8 July | 1130-1333 | 2433 | 61°10.8'N | 18°14.0'W |
| 76 | 22 | 8 July | 1530-1735 | 2501 | 60°54.3'N | 17°51.1'W |
| 81 | 23 | 10 July | 0030-0230 | 1851 | 62°25.8'N | 18°41.6'W |
| 85 | 24 | 10 July | 2130-0046 | 1993 | 62°17.5'N | 17°25.6'W |

TABLE 4. CAMERA STATIONS

| Station | Camera No. | Date | Time | Depth (m) | Latitude | Longitude | Remarks |
|---|---|---|---|---|---|---|---|
| 3 | 1 | 16 June | 1756-2120 | 4531 | $40^{o}36.4$'N | $63^{o}01.5$'W | Test station |
| 10 | 2 | 19 June | 1747-1947 | 3970 | $40^{o}40.7$'N | $47^{o}53.8$'W | 1 Exposure |
| 18 | 3 | 27 June | 1200-1537 | 1194 | $62^{o}33.6$'N | $18^{o}13.8$'W | 3 Exposures |
| 20 | 4 | 27 June | 1810-2016 | 1387 | $62^{o}31.0$'N | $18^{o}04.3$'W | Camera failed |
| 26 | 5 | 30 June | 0251-0443 | 1798 | $62^{o}22.1$'N | $17^{o}47.6$'W | Camera failed |
| 31 | 6 | 1 July | 0654-0931 | 2311 | $61^{o}42.9$'N | $15^{o}40.7$'W | 4 Exposures |
| 36 | 7 | 2 July | 1720-2041 | 2211 | $62^{o}04.3$'N | $16^{o}43.4$'W | 7 Exposures |
| 39 | 8 | 3 July | 0200-0451 | 2162 | $62^{o}10.5$'N | $17^{o}06.6$'W | 13 Exposures |
| 47 | 9 | 4 July | 1310-1610 | 1732 | $62^{o}23.9$'N | $17^{o}50.2$'W | 3 Exposures |
| 55 | 10 | 5 July | 1724-1950 | 2173 | $61^{o}43.8$'N | $18^{o}39.5$'W | 5 Exposures |
| 59 | 11 | 6 July | 0321-0555 | 2145 | $61^{o}54.0$'N | $18^{o}49.5$'W | 2 Exposures |
| 63 | 12 | 6 July | 1800-2020 | 2082 | $62^{o}08.0$'N | $19^{o}03.6$'W | 1 Exposure |
| 66 | 13 | 7 July | 0250-0429 | 1535 | $62^{o}10.3$'N | $19^{o}16.4$'W | 4 Exposures |

TABLE 5. CURRENT METERS

| Station | Current Meter | Time Deployed | Time Recovered | Depth | Height above Bottom | Location |
|---|---|---|---|---|---|---|
| 11 | 1 | 2300/June 26 | 1900/July 3 | 2000m | 10m | 62°17.6'N 17°24.6'W |
| 13 | 2 | 0400/June 27 | 1330/July 3 | 1600m | 10m | 62°28.3'N 17°52.0'W |
| 15 | 3 | 0820/June 27 | 1000/July 3 | 1177m | 10m | 62°34.9'N 18°14.7'W |
| 42 | 4 | 0300/July 4 | 1800/July 10 | 2171m | 10m | 62°11.0'N 17°04.0'W |
| 44 | 5 | 0825/July 4 | 1200/July 10 | 1796m | 10m | 62°23.2'N 17°42.0'W |
| 49 | 6 | 1930/July 4 | 0800/July 10 | 1393m | 10m | 62°30.9'N 18°05.4'W |

TABLE 5. CURRENT METERS

| Station | Current Meter | Time Deployed | Time Recovered | Depth | Height above Bottom | Location |
|---|---|---|---|---|---|---|
| 11 | 1 | 2300/June 26 | 1900/July 3 | 2000m | 10m | 62°17.6'N 17°24.6'W |
| 13 | 2 | 0400/June 27 | 1330/July 3 | 1600m | 10m | 62°28.3'N 17°52.0'W |
| 15 | 3 | 0820/June 27 | 1000/July 3 | 1177m | 10m | 62°34.9'N 18°14.7'W |
| 42 | 4 | 0300/July 4 | 1800/July 10 | 2171m | 10m | 62°11.0'N 17°04.0'W |
| 44 | 5 | 0825/July 4 | 1200/July 10 | 1796m | 10m | 62°23.2'N 17°42.0'W |
| 49 | 6 | 1930/July 4 | 0800/July 10 | 1393m | 10m | 62°30.9'N 18°05.4'W |

TABLE 6. SEDIMENT TRAP MOORINGS

| Station | Mooring No. | Time Deployed | Time Recovered | Depth (m) | Location | Height of Traps Above Bottom(m) |
|---|---|---|---|---|---|---|
| 12 | 1 | 0200/June 27 | 1500/July 10 | 1971 | $62^{o}18.6'$N<br>$17^{o}26.2'$W | 13,103,503 |
| 14 | 2 | 0630/June 27 | 1500/July 3 | 1596 | $62^{o}28.5'$N<br>$17^{o}53.8'$W | 13,103,493 |
| 51 | 3 | 1153/July 5 | 1200/July 9 | 2146 | $61^{o}45.4'$N<br>$18^{o}39.2'$W | 13,14,54,104,<br>494 |

TABLE 7. PISTON CORES

| Station | Core No. | Depth (m) | Latitude | Longitude | Piston Sample(cm) | Pilot Sample(cm) |
|---|---|---|---|---|---|---|
| 16 | 1-PC | 1177 | 62°34.6'N | 18°14.0'W | 845 | 18 |
| 27 | 2-PC | 1764 | 62°24.0'N | 17°46.7'W | 970 | 12 |
| 35 | 3-PC | 2199 | 62°05.9'N | 16°37.3'W | 1010 | 67 |
| 41 | 4-PC | 2114 | 62°18.4'N | 17°08.6'W | 1170 | 136 |
| 45 | 5-PC | 1596 | 62°28.5'N | 17°54.1'W | 1132 | 155 |
| 50 | 6-PC | 1369 | 62°31.2'N | 18°05.5'W | 1138 | 0 |
| 52 | 7-PC | 2173 | 61°44.2'N | 18°40.9'W | 814 | 148 |
| 57 | 8-PC | 2088 | 61°53.2'N | 18°48.1'W | 481 | 0 |
| 61 | 9-PC | 2082 | 62°07.6'N | 19°02.5'W | 721 | 0 |
| 64 | 10-PC | 1555 | 62°09.9'N | 19°19.8'W | 1128 | 9 |
| 69 | 11-PC | 2205 | 61°32.0'N | 19°21.9'W | 1084 | 49 |
| 71 | 12-PC | 2295 | 61°28.7'N | 19°24.4'W | 1147 | 141 |

TABLE 8. BOX CORES

| Station | Core No. | Depth (m) | Latitude | Longitude | Remarks |
|---|---|---|---|---|---|
| 1 | 1-BC | 4539 | 40°35.1'N | 63°04.4'W | 72 cm sample |
| 21 | 2-BC | 1391 | 62°30.4'N | 18°06.4'W | 1 kg sample |
| 24 | 3-BC | 1509 | 62°29.6'N | 17°59.3'W | 26 cm sample |
| 43 | 4-BC | 1839 | 62°22.5'N | 17°35.8'W | |
| 48 | 5-BC | 1687 | 62°26.3'N | 17°50.3'W | 10 cm sample |
| 56 | 6-BC | 2175 | 61°44.0'N | 18°39.0'W | |
| 60 | 7-BC | 2128 | 61°50.3'N | 18°47.9'W | |
| 73 | 8-BC | 2203 | 61°31.0'N | 18°46.5'W | |
| 77 | 9-BC | 2205 | 61°41.0'N | 18°25.1'W | |
| 78 | 10-BC | 2248 | 61°40.5'N | 18°27.2'W | |
| 79 | 11-BC | 2154 | 61°41.2'N | 18°39.0'W | |
| 80 | 12-BC | 2133 | 61°45.6'N | 18°37.0'W | |
| 82 | 13-BC | 1198 | 62°33.2'N | 18°14.3'W | ½ kg sample |
| 83 | 14-BC | 1409 | 62°31.8'N | 18°02.0'W | 1 kg sample |
| 86 | 15-BC | 1998 | 62°17.6'N | 17°25.1'W | |

# APPENDIX

# LISTING OF SATELLITE FIXES

## ATLANTIS II - 94, Leg 1

## 14 June - 12 July, 1977

| REC# | | SPEED | HEADING | DATE,TIME | | | LATITUDE | | LONGITUDE | | FIX QUALITY |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | .00 | .00 | .0 | *14 | 67712360 | 4 | 41 | 31.405 | -70 | -39.95000 | 902 |
| 2 | 8.10 | 1.61 | 299.6 | *14 | 67720420 | 4 | 41 | 37.847 | -70 | -55.12800 | 902 |
| 3 | 3.03 | 2.04 | 163.2 | *14 | 67723440 | 4 | 41 | 31.920 | -70 | -52.72800 | 902 |
| 4 | 2.83 | 7.74 | 167.4 | *15 | 677 2340 | 4 | 41 | 10.528 | -70 | -46.34800 | 902 |
| 5 | .73 | 10.00 | 129.2 | *15 | 677 3180 | 4 | 41 | 5.892 | -70 | -38.81100 | 902 |
| 6 | .33 | 12.07 | 122.2 | *15 | 677 3380 | 4 | 41 | 3.749 | -70 | -34.29800 | 902 |
| 7 | .67 | 10.31 | 147.1 | *15 | 677 4180 | 4 | 40 | 57.985 | -70 | -29.34900 | 902 |
| 8 | .50 | 12.70 | 123.4 | *15 | 677 4480 | 4 | 40 | 54.486 | -70 | -22.33500 | 902 |
| 9 | .53 | 11.10 | 133.2 | *15 | 677 5200 | 4 | 40 | 50.433 | -70 | -16.63400 | 902 |
| 10 | 2.37 | 8.65 | 127.5 | *15 | 677 7420 | 4 | 40 | 37.981 | -69 | -55.18400 | 902 |
| 11 | 1.77 | 11.21 | 116.4 | *15 | 677 9280 | 4 | 40 | 29.185 | -69 | -31.84300 | 902 |
| 12 | 2.27 | 9.64 | 91.5 | *15 | 67711440 | 4 | 40 | 28.630 | -69 | -3.14200 | 902 |
| 13 | 3.83 | 10.33 | 86.0 | *15 | 67715340 | 4 | 40 | 31.365 | -68 | -11.21400 | 902 |
| 14 | 2.17 | 10.71 | 91.8 | *15 | 67717440 | 4 | 40 | 30.648 | -67 | -40.71900 | 902 |
| 15 | 3.63 | 10.19 | 95.8 | *15 | 67721220 | 4 | 40 | 26.915 | -66 | -52.29700 | 902 |
| 16 | 3.23 | 10.61 | 87.1 | *16 | 677 360 | 4 | 40 | 28.668 | -66 | -7.27700 | 902 |
| 17 | 2.90 | 12.04 | 84.3 | *16 | 677 3300 | 4 | 40 | 32.161 | -65 | -21.59500 | 902 |
| 18 | 4.03 | 10.71 | 94.4 | *16 | 677 7320 | 4 | 40 | 28.876 | -64 | -24.94800 | 902 |
| 19 | 10.73 | 5.95 | 83.3 | *16 | 67718160 | 4 | 40 | 36.362 | -63 | -1.50500 | 902 |
| 20 | 1.93 | 1.28 | 64.9 | *16 | 67720120 | 4 | 40 | 37.412 | -62 | -58.55800 | 902 |
| 21 | 6.53 | 5.41 | 80.6 | *17 | 677 2440 | 4 | 40 | 43.173 | -62 | -12.59200 | 902 |
| 22 | 6.27 | 12.34 | 86.4 | *17 | 677 9000 | 4 | 40 | 48.060 | -60 | -30.72800 | 902 |
| 23 | 4.90 | 10.13 | 79.4 | *17 | 67713540 | 4 | 40 | 57.225 | -59 | -26.25700 | 902 |
| 24 | 3.47 | 10.40 | 77.3 | *17 | 67717220 | 4 | 41 | 5.163 | -58 | -39.65400 | 902 |
| 25 | 5.40 | 10.77 | 83.5 | *17 | 67722460 | 4 | 41 | 11.759 | -57 | -22.92600 | 902 |
| 26 | 3.13 | 10.75 | 81.1 | *18 | 677 1540 | 4 | 41 | 16.945 | -56 | -38.67500 | 902 |
| 27 | 3.97 | 11.04 | 81.0 | *18 | 677 5520 | -4 | 41 | 23.833 | -55 | -41.07200 | 902 |
| 28 | 4.87 | 11.02 | 80.7 | *18 | 67710440 | -4 | 41 | 32.516 | -54 | -30.48900 | 902 |
| 29 | 5.57 | 10.94 | 84.4 | *18 | 67716180 | -4 | 41 | 38.483 | -53 | -9.45000 | 902 |
| 30 | 3.47 | 11.83 | 88.1 | *18 | 67719460 | -4 | 41 | 39.839 | -52 | -14.61800 | 902 |
| 31 | 5.40 | 12.12 | 91.2 | *19 | 677 1100 | -4 | 41 | 38.443 | -50 | -47.10700 | 902 |
| 32 | 3.87 | 12.72 | 88.8 | *19 | 677 5020 | -4 | 41 | 39.430 | -49 | -41.32400 | 902 |
| 33 | 3.50 | 12.49 | 93.8 | *19 | 677 8320 | -4 | 41 | 36.540 | -48 | -43.00000 | 902 |
| 34 | 3.73 | 9.51 | 84.8 | *19 | 67712160 | -4 | 41 | 39.779 | -47 | -55.70300 | 902 |
| 35 | 2.57 | .36 | 75.6 | *19 | 67714500 | -4 | 41 | 40.007 | -47 | -54.51500 | 902 |
| 36 | 2.07 | .34 | 46.4 | *19 | 67716540 | -4 | 41 | 40.489 | -47 | -53.83800 | 902 |
| 37 | 1.73 | .13 | 1.0 | *19 | 67718380 | -4 | 41 | 40.707 | -47 | -53.83300 | 902 |
| 38 | 3.93 | 3.84 | 82.7 | *19 | 67722340 | -4 | 41 | 42.611 | -47 | -33.79700 | 902 |
| 39 | 3.47 | 7.69 | 86.0 | *20 | 677 2020 | -4 | 41 | 44.479 | -46 | -58.17000 | 902 |
| 40 | 2.20 | 7.98 | 82.5 | *20 | 677 4140 | -4 | 41 | 46.770 | -46 | -34.85500 | 902 |
| 41 | 3.17 | 8.30 | 77.6 | *20 | 677 7240 | -4 | 41 | 52.411 | -46 | -.43700 | 902 |
| 42 | 5.83 | 8.25 | 86.7 | *20 | 67713140 | -4 | 41 | 55.165 | -44 | -55.93000 | 902 |
| 43 | 2.17 | 7.59 | 56.5 | *20 | 67715240 | -4 | 42 | 4.238 | -44 | -37.48900 | 902 |
| 44 | 3.90 | 7.35 | 43.2 | *20 | 67719180 | -4 | 42 | 25.133 | -44 | -11.02700 | 902 |

| REC# | | SPEED | HEADING | DATE,TIME | | | LATITUDE | | LONGITUDE | | FIX QUALITY |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 45 | 4.23 | 10.93 | 36.9 | *20 | 67723320 | -4 | 43 | 2.132 | -43 | -33.18900 | 902 |
| 46 | 2.47 | 10.61 | 38.8 | *21 | 677 2000 | -4 | 43 | 22.519 | -43 | -10.66300 | 902 |
| 47 | 3.20 | 10.81 | 36.5 | *21 | 677 5120 | -4 | 43 | 50.324 | -42 | -42.24300 | 902 |
| 48 | 6.40 | 10.93 | 40.2 | *21 | 67711360 | -2 | 44 | 43.696 | -41 | -39.17400 | 902 |
| 49 | 3.07 | 10.27 | 35.5 | *21 | 67714400 | -2 | 45 | 9.325 | -41 | -13.33200 | 902 |
| 50 | 1.67 | 10.24 | 35.8 | *21 | 67716200 | -2 | 45 | 23.164 | -40 | -59.12700 | 902 |
| 51 | 6.30 | 10.57 | 38.7 | *21 | 67722380 | -2 | 46 | 15.101 | -39 | -59.32500 | 902 |
| 52 | 2.53 | 10.83 | 37.0 | *22 | 677 1100 | -2 | 46 | 37.004 | -39 | -35.38300 | 902 |
| 53 | 3.53 | 11.16 | 39.7 | *22 | 677 4420 | -2 | 47 | 7.349 | -38 | -58.54200 | 902 |
| 54 | 2.20 | 11.71 | 40.2 | *22 | 677 6540 | -2 | 47 | 27.006 | -38 | -34.01100 | 902 |
| 55 | 3.70 | 12.04 | 37.2 | *22 | 67710360 | -2 | 48 | 2.494 | -37 | -53.98000 | 902 |
| 56 | 3.20 | 10.80 | 40.0 | *22 | 67713480 | -2 | 48 | 28.961 | -37 | -20.57200 | 902 |
| 57 | 2.07 | 10.45 | 37.3 | *22 | 67715520 | -2 | 48 | 46.138 | -37 | -.74200 | 902 |
| 58 | 3.00 | 10.11 | 37.3 | *22 | 67718520 | -2 | 49 | 10.268 | -36 | -32.71800 | 902 |
| 59 | 4.57 | 9.99 | 39.5 | *22 | 67723260 | -2 | 49 | 45.473 | -35 | -48.04600 | 902 |
| 60 | 2.50 | 10.38 | 40.0 | *23 | 677 1560 | -2 | 50 | 5.359 | -35 | -22.15000 | 902 |
| 61 | 3.50 | 10.98 | 40.0 | *23 | 677 5260 | -2 | 50 | 34.827 | -34 | -43.45100 | 902 |
| 62 | 2.57 | 11.04 | 39.8 | *23 | 677 8000 | -2 | 50 | 56.602 | -34 | -14.78400 | 902 |
| 63 | 3.47 | 11.04 | 41.6 | *23 | 67711280 | -2 | 51 | 25.245 | -33 | -34.25500 | 902 |
| 64 | 3.23 | 10.90 | 40.3 | *23 | 67714420 | -2 | 51 | 52.141 | -32 | -57.54200 | 902 |
| 65 | 3.03 | 11.72 | 38.0 | *23 | 67717440 | -2 | 52 | 20.170 | -32 | -21.92000 | 902 |
| 66 | 5.17 | 10.97 | 41.8 | *23 | 67722540 | -2 | 53 | 2.444 | -31 | -19.65500 | 902 |
| 67 | 2.17 | 10.18 | 37.0 | *24 | 677 1040 | -2 | 53 | 20.051 | -30 | -57.49000 | 902 |
| 68 | 3.23 | 10.81 | 35.4 | *24 | 677 4180 | -2 | 53 | 48.570 | -30 | -23.38500 | 902 |
| 69 | 2.80 | 10.69 | 35.7 | *24 | 677 7060 | -2 | 54 | 12.871 | -29 | -53.64000 | 902 |
| 70 | 4.60 | 11.40 | 40.2 | *24 | 67711420 | -2 | 54 | 52.941 | -28 | -55.29800 | 902 |
| 71 | 3.23 | 10.79 | 36.4 | *24 | 67714560 | -2 | 55 | 21.007 | -28 | -19.05200 | 902 |
| 72 | 3.47 | 10.90 | 40.2 | *24 | 67718240 | -2 | 55 | 49.857 | -27 | -35.85500 | 902 |
| 73 | 4.93 | 10.96 | 39.0 | *24 | 67723200 | -2 | 56 | 31.865 | -26 | -34.63600 | 902 |
| 74 | 2.70 | 10.81 | 39.9 | *25 | 677 2020 | -2 | 56 | 54.280 | -26 | -.52500 | 902 |
| 75 | 3.30 | 11.06 | 38.2 | *25 | 677 5200 | -2 | 57 | 22.980 | -25 | -18.86800 | 902 |
| 76 | 2.60 | 11.00 | 37.0 | *25 | 677 7560 | -2 | 57 | 45.829 | -24 | -46.76100 | 902 |
| 77 | 2.97 | 11.66 | 38.3 | *25 | 67710540 | -2 | 58 | 12.978 | -24 | -6.24000 | 902 |
| 78 | 3.53 | 11.31 | 39.0 | *25 | 67714260 | -2 | 58 | 44.066 | -23 | -18.14400 | 902 |
| 79 | 2.30 | 11.15 | 39.3 | *25 | 67716440 | -2 | 59 | 3.937 | -22 | -46.69900 | 902 |
| 80 | 3.87 | 10.54 | 39.1 | *25 | 67720360 | -2 | 59 | 35.586 | -21 | -56.28700 | 902 |
| 81 | 2.47 | 8.08 | 36.1 | *25 | 67723040 | -2 | 59 | 51.693 | -21 | -32.96000 | 902 |
| 82 | 1.83 | 8.42 | 36.0 | *26 | 677 540 | -2 | 60 | 4.180 | -21 | -14.80200 | 902 |
| 83 | 2.10 | 8.07 | 40.5 | *26 | 677 3000 | -2 | 60 | 17.072 | -20 | -52.63600 | 902 |
| 84 | 4.03 | 8.38 | 41.3 | *26 | 677 7020 | -2 | 60 | 42.482 | -20 | -7.24800 | 902 |
| 85 | 4.77 | 8.47 | 42.6 | *26 | 67711480 | -2 | 61 | 12.190 | -19 | -10.90600 | 902 |
| 86 | 2.60 | 7.89 | 37.0 | *26 | 67714240 | -2 | 61 | 28.603 | -18 | -45.15600 | 902 |
| 87 | 3.13 | 8.05 | 39.5 | *26 | 67717320 | -2 | 61 | 48.097 | -18 | -11.37400 | 902 |
| 88 | 5.17 | 7.24 | 39.3 | *26 | 67722420 | -2 | 62 | 17.032 | -17 | -20.78300 | 902 |
| 89 | 2.53 | 1.41 | 293.1 | *27 | 677 1140 | -2 | 62 | 18.431 | -17 | -27.84600 | 902 |
| 90 | 1.77 | 4.20 | 317.7 | *27 | 677 3000 | -2 | 62 | 23.916 | -17 | -38.61500 | 902 |
| 91 | 3.13 | 2.78 | 304.2 | *27 | 677 6080 | -2 | 62 | 28.821 | -17 | -54.20100 | 902 |
| 92 | 10.20 | .50 | 299.9 | *27 | 67716200 | -2 | 62 | 31.369 | -18 | -3.80800 | 902 |
| 93 | 5.97 | .27 | 233.9 | *27 | 67722180 | -2 | 62 | 30.430 | -18 | -6.60100 | 902 |
| 94 | 1.83 | 3.40 | 111.0 | *28 | 677 80 | -2 | 62 | 28.197 | -17 | -53.97500 | 902 |

| REC# | | SPEED | HEADING | DATE,TIME | | | LATITUDE | | LONGITUDE | | FIX QUALITY |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 95 | 5.13 | .58 | 306.2 | *28 | 677 5160 | -2 | 62 | 29.955 | -17 | -59.18100 | 902 |
| 96 | 3.13 | 7.41 | 280.5 | *28 | 677 8240 | -2 | 62 | 34.176 | -18 | -48.75100 | 902 |
| 97 | 5.37 | 6.60 | 202.5 | *28 | 67713460 | -1 | 62 | 1.443 | -19 | -17.93300 | 902 |
| 98 | 2.10 | 8.08 | 186.3 | *28 | 67715520 | -1 | 61 | 44.557 | -19 | -21.86300 | 902 |
| 99 | 3.77 | 2.87 | 155.6 | *28 | 67719380 | -1 | 61 | 34.717 | -19 | -12.46600 | 902 |
| 100 | 3.53 | 8.10 | 37.8 | *28 | 67723100 | -1 | 61 | 57.374 | -18 | -35.37000 | 902 |
| 101 | 1.67 | 8.33 | 48.3 | *29 | 677 500 | -1 | 62 | 6.618 | -18 | -13.24600 | 902 |
| 102 | 3.27 | 8.16 | 47.9 | *29 | 677 4060 | -1 | 62 | 24.488 | -17 | -30.68500 | 902 |
| 103 | 5.57 | 6.89 | 295.1 | *29 | 677 9400 | -1 | 62 | 40.805 | -18 | -46.06800 | 902 |
| 104 | 3.20 | 7.64 | 187.8 | *29 | 67712520 | -1 | 62 | 16.572 | -18 | -53.29000 | 902 |
| 105 | 3.47 | 6.71 | 181.4 | *29 | 67716200 | -1 | 61 | 53.305 | -18 | -54.50700 | 902 |
| 106 | 4.13 | 7.48 | 25.6 | *29 | 67720280 | -1 | 62 | 21.193 | -18 | -25.90500 | 902 |
| 107 | 3.57 | 5.05 | 79.0 | *30 | 677 20 | -1 | 62 | 24.641 | -17 | -47.74300 | 902 |
| 108 | 3.27 | .71 | 182.5 | *30 | 677 3180 | -1 | 62 | 22.326 | -17 | -47.95700 | 902 |
| 109 | 3.73 | .77 | 22.8 | *30 | 677 7020 | 0 | 62 | 24.976 | -17 | -45.55800 | 902 |
| 110 | 1.63 | 6.91 | 125.8 | *30 | 677 8400 | 0 | 62 | 18.368 | -17 | -25.79000 | 902 |
| 111 | 1.70 | .39 | 112.9 | *30 | 67710220 | 0 | 62 | 18.113 | -17 | -24.48500 | 902 |
| 112 | 2.13 | .29 | 23.7 | *30 | 67712300 | 0 | 62 | 18.671 | -17 | -23.95700 | 902 |
| 113 | 1.77 | .39 | 210.3 | *30 | 67714160 | 0 | 62 | 18.080 | -17 | -24.70000 | 902 |
| 114 | 1.63 | 7.20 | 127.8 | *30 | 67715540 | 0 | 62 | 10.867 | -17 | -4.74300 | 902 |
| 115 | 1.80 | 1.24 | 27.8 | *30 | 67717420 | 0 | 62 | 12.841 | -17 | -2.51000 | 902 |
| 116 | 1.93 | .33 | 219.5 | *30 | 67719380 | 0 | 62 | 12.343 | -17 | -3.39000 | 902 |
| 117 | 1.80 | 5.38 | 66.7 | *30 | 67721260 | 0 | 62 | 16.178 | -16 | -44.28600 | 902 |
| 118 | 1.70 | 6.55 | 70.2 | *30 | 67723080 | 0 | 62 | 19.957 | -16 | -21.71500 | 902 |
| 119 | 1.43 | 6.72 | 73.8 | * 1 | 777 340 | 0 | 62 | 22.645 | -16 | -1.77200 | 902 |
| 120 | 1.60 | 4.87 | 99.5 | * 1 | 777 2100 | 0 | 62 | 21.357 | -15 | -45.20500 | 902 |
| 121 | 2.00 | 8.58 | 174.6 | * 1 | 777 4100 | 0 | 62 | 4.264 | -15 | -41.74000 | 902 |
| 122 | 1.83 | 8.77 | 178.6 | * 1 | 777 6000 | 0 | 61 | 48.180 | -15 | -40.89800 | 902 |
| 123 | 3.70 | 1.49 | 171.2 | * 1 | 777 9420 | 0 | 61 | 42.726 | -15 | -39.11000 | 902 |
| 124 | 1.67 | .46 | 319.0 | * 1 | 77711220 | 0 | 61 | 43.310 | -15 | -40.18300 | 902 |
| 125 | 1.03 | 4.70 | 283.5 | * 1 | 77712240 | 0 | 61 | 44.442 | -15 | -50.17400 | 902 |
| 126 | .70 | 8.29 | 325.6 | * 1 | 77713060 | 0 | 61 | 49.234 | -15 | -57.10400 | 902 |
| 127 | .30 | 8.71 | 303.7 | * 1 | 77713240 | 0 | 61 | 50.684 | -16 | -1.71100 | 905 |
| 128 | .70 | 4.87 | 298.2 | * 1 | 77714060 | 0 | 61 | 52.294 | -16 | -8.08200 | 902 |
| 129 | .97 | .34 | 146.1 | * 1 | 77715040 | 0 | 61 | 52.023 | -16 | -7.69700 | 902 |
| 130 | .30 | 1.11 | 287.8 | * 1 | 77715220 | 0 | 61 | 52.126 | -16 | -8.37200 | 902 |
| 131 | .57 | 1.02 | 255.3 | * 1 | 77715560 | 0 | 61 | 51.979 | -16 | -9.56200 | 903 |
| 132 | .70 | .89 | 229.5 | * 1 | 77716380 | 0 | 61 | 51.572 | -16 | -10.57200 | 905 |
| 133 | 2.00 | .50 | 73.7 | * 1 | 77718380 | 0 | 61 | 51.852 | -16 | -8.54600 | 903 |
| 134 | 1.43 | .64 | 219.9 | * 1 | 77720040 | 0 | 61 | 51.147 | -16 | -9.79500 | 902 |
| 135 | .33 | 1.21 | 340.6 | * 1 | 77720240 | 0 | 61 | 51.527 | -16 | -10.07800 | 903 |
| 136 | 1.60 | 4.44 | 303.8 | * 1 | 77722000 | 0 | 61 | 55.481 | -16 | -22.61600 | 904 |
| 137 | .30 | 9.40 | 309.8 | * 1 | 77722180 | 0 | 61 | 57.288 | -16 | -27.22000 | 902 |
| 138 | 1.47 | 5.42 | 318.4 | * 1 | 77723460 | 0 | 62 | 3.236 | -16 | -38.48600 | 904 |
| 139 | 1.17 | 2.39 | 11.2 | * 2 | 777 560 | 0 | 62 | 5.968 | -16 | -37.32900 | 902 |
| 140 | .40 | 2.01 | 350.7 | * 2 | 777 1200 | 0 | 62 | 6.760 | -16 | -37.60800 | 903 |
| 141 | 1.33 | 2.38 | 30.6 | * 2 | 777 2400 | 0 | 62 | 9.494 | -16 | -34.15100 | 903 |
| 142 | .53 | 3.51 | 341.4 | * 2 | 777 3120 | 0 | 62 | 11.272 | -16 | -35.43100 | 904 |
| 143 | .37 | 2.51 | 8.5 | * 2 | 777 3340 | 0 | 62 | 12.184 | -16 | -35.13900 | 903 |
| 144 | .87 | 2.60 | 347.1 | * 2 | 777 4260 | 0 | 62 | 14.382 | -16 | -36.21500 | 902 |

| REC# | | SPEED. | HEADING | | | DATE,TIME | | | LATITUDE | | LONGITUDE | FIX QUALITY |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 145 | .87 | 2.47 | 13.2 | * | 2 | 777 5180 | 0 | 62 | 16.465 | -16 | -35.16400 | 902 |
| 146 | .90 | 2.83 | 35.2 | * | 2 | 777 6120 | 0 | 62 | 18.546 | -16 | -32.00500 | 904 |
| 147 | .63 | 3.15 | 32.1 | * | 2 | 777 6500 | 0 | 62 | 20.235 | -16 | -29.72500 | 903 |
| 148 | .37 | 2.50 | 7.9 | * | 2 | 777 7120 | 0 | 62 | 21.142 | -16 | -29.45500 | 905 |
| 149 | .73 | 6.05 | 267.4 | * | 2 | 777 7560 | 0 | 62 | 20.940 | -16 | -39.01700 | 905 |
| 150 | .63 | 5.89 | 260.7 | * | 2 | 777 8340 | 0 | 62 | 20.337 | -16 | -46.95400 | 904 |
| 151 | .47 | 4.15 | 261.1 | * | 2 | 777 9020 | 0 | 62 | 20.038 | -16 | -51.07800 | 904 |
| 152 | .60 | 4.86 | 265.3 | * | 2 | 777 9380 | 0 | 62 | 19.797 | -16 | -57.34300 | 903 |
| 153 | 1.00 | 4.31 | 258.8 | * | 2 | 77710380 | 0 | 62 | 18.956 | -17 | -6.45200 | 903 |
| 154 | .67 | 4.21 | 263.3 | * | 2 | 77711180 | 0 | 62 | 18.631 | -17 | -12.45400 | 902 |
| 155 | 1.20 | 4.16 | 263.7 | * | 2 | 77712300 | 0 | 62 | 18.084 | -17 | -23.14800 | 902 |
| 156 | .50 | 4.28 | 124.3 | * | 2 | 77713000 | 0 | 62 | 16.878 | -17 | -19.34200 | 902 |
| 157 | 1.07 | 5.64 | 120.9 | * | 2 | 77714040 | 0 | 62 | 13.785 | -17 | -8.24000 | 905 |
| 158 | .23 | 6.56 | 128.9 | * | 2 | 77714180 | 0 | 62 | 12.823 | -17 | -5.68300 | 902 |
| 159 | .23 | 5.74 | 121.5 | * | 2 | 77714320 | 0 | 62 | 12.123 | -17 | -3.22900 | 902 |
| 160 | .23 | 6.58 | 119.0 | * | 2 | 77714460 | 0 | 62 | 11.377 | -17 | -.35000 | 904 |
| 161 | 1.07 | 5.07 | 126.2 | * | 2 | 77715500 | 0 | 62 | 8.184 | -16 | -51.00500 | 905 |
| 162 | .37 | 5.17 | 120.8 | * | 2 | 77716120 | 0 | 62 | 7.210 | -16 | -47.51800 | 902 |
| 163 | 1.37 | 3.97 | 140.7 | * | 2 | 77717340 | 0 | 62 | 3.009 | -16 | -40.16600 | 903 |
| 164 | .40 | 2.78 | 298.7 | * | 2 | 77717580 | 0 | 62 | 3.543 | -16 | -42.25000 | 904 |
| 165 | .37 | .76 | 54.4 | * | 2 | 77718200 | 0 | 62 | 3.706 | -16 | -41.76300 | 902 |
| 166 | 1.23 | .80 | 310.4 | * | 2 | 77719340 | 0 | 62 | 4.349 | -16 | -43.37400 | 902 |
| 167 | 1.70 | 1.03 | 103.1 | * | 2 | 77721160 | 0 | 62 | 3.951 | -16 | -39.72900 | 902 |
| 168 | .73 | .66 | 81.0 | * | 2 | 77722000 | 0 | 62 | 4.027 | -16 | -38.71000 | 905 |
| 169 | 2.70 | 1.53 | 315.6 | * | 3 | 777 420 | 0 | 62 | 6.979 | -16 | -44.88000 | 903 |
| 170 | .27 | 8.98 | 298.1 | * | 3 | 777 580 | 0 | 62 | 8.110 | -16 | -49.40200 | 902 |
| 171 | .60 | 9.29 | 294.4 | * | 3 | 777 1340 | 0 | 62 | 10.420 | -17 | -.27800 | 902 |
| 172 | .77 | 4.37 | 287.2 | * | 3 | 777 2200 | 0 | 62 | 11.407 | -17 | -7.13600 | 903 |
| 173 | .30 | 1.38 | 202.8 | * | 3 | 777 2380 | 0 | 62 | 11.026 | -17 | -7.48000 | 902 |
| 174 | .70 | .96 | 142.5 | * | 3 | 777 3200 | 0 | 62 | 10.492 | -17 | -6.60200 | 903 |
| 175 | 1.13 | 1.27 | 249.3 | * | 3 | 777 4280 | 0 | 62 | 9.984 | -17 | -9.48700 | 902 |
| 176 | .60 | 2.85 | 300.7 | * | 3 | 777 5040 | 0 | 62 | 10.859 | -17 | -12.63900 | 902 |
| 177 | .87 | 11.25 | 306.6 | * | 3 | 777 5560 | 0 | 62 | 16.669 | -17 | -29.45300 | 902 |
| 178 | .40 | 12.16 | 311.2 | * | 3 | 777 6200 | 0 | 62 | 19.875 | -17 | -37.33400 | 905 |
| 179 | 1.33 | 10.41 | 313.7 | * | 3 | 777 7400 | 0 | 62 | 29.465 | -17 | -59.02900 | 902 |
| 180 | 2.60 | 3.76 | 314.7 | * | 3 | 77710160 | 0 | 62 | 36.338 | -18 | -14.09800 | 905 |
| 181 | .97 | 2.66 | 236.9 | * | 3 | 77711140 | 0 | 62 | 34.929 | -18 | -18.78600 | 902 |
| 182 | .63 | 5.93 | 111.5 | * | 3 | 77711520 | 0 | 62 | 33.553 | -18 | -11.19300 | 902 |
| 183 | 1.23 | 7.04 | 109.5 | * | 3 | 77713060 | 0 | 62 | 30.652 | -17 | -53.44200 | 905 |
| 184 | .33 | 1.73 | 188.3 | * | 3 | 77713260 | 0 | 62 | 30.082 | -17 | -53.62300 | 903 |
| 185 | .27 | 3.18 | 204.7 | * | 3 | 77713420 | 0 | 62 | 29.310 | -17 | -54.39100 | 905 |
| 186 | 1.27 | .72 | 200.6 | * | 3 | 77714580 | 0 | 62 | 28.452 | -17 | -55.09000 | 903 |
| 187 | .23 | 2.93 | 180.3 | * | 3 | 77715120 | 0 | 62 | 27.767 | -17 | -55.09800 | 902 |
| 188 | .23 | 1.53 | 268.9 | * | 3 | 77715260 | 0 | 62 | 27.760 | -17 | -55.87100 | 902 |
| 189 | 1.37 | .87 | 295.4 | * | 3 | 77716480 | 0 | 62 | 28.273 | -17 | -58.20400 | 903 |
| 190 | .37 | 2.50 | 259.4 | * | 3 | 77717100 | 0 | 62 | 28.105 | -18 | -.15300 | 903 |
| 191 | 1.40 | 6.89 | 134.0 | * | 3 | 77718340 | 0 | 62 | 21.392 | -17 | -45.15800 | 902 |
| 192 | 1.63 | 5.39 | 97.9 | * | 3 | 77720120 | 0 | 62 | 20.182 | -17 | -26.35700 | 902 |
| 193 | .47 | 2.63 | 67.7 | * | 3 | 77720400 | 0 | 62 | 20.649 | -17 | -23.90900 | 904 |
| 194 | 1.27 | .18 | 323.1 | * | 3 | 77721560 | 0 | 62 | 20.832 | -17 | -24.20600 | 902 |

| REC# | | SPEED | HEADING | DATE,TIME | | | LATITUDE | LONGITUDE | | FIX QUALITY |
|---|---|---|---|---|---|---|---|---|---|---|
| 195 | .43 | .64 | 309.9 | * 3 77722220 | 0 | 62 | 21.009 | -17 | -24.66300 | 902 |
| 196 | 1.77 | 4.23 | 130.5 | * 4 777 80 | 0 | 62 | 16.157 | -17 | -12.44000 | 902 |
| 197 | .30 | 9.60 | 38.0 | * 4 777 260 | 0 | 62 | 18.427 | -17 | -8.62100 | 902 |
| 198 | 1.37 | .67 | 167.3 | * 4 777 1480 | 0 | 62 | 17.537 | -17 | -8.19100 | 903 |
| 199 | .40 | 2.35 | 258.6 | * 4 777 2120 | 0 | 62 | 17.351 | -17 | -10.17200 | 902 |
| 200 | 1.13 | 6.15 | 155.8 | * 4 777 3200 | 0 | 62 | 10.986 | -17 | -4.02100 | 902 |
| 201 | .33 | 5.71 | 297.9 | * 4 777 3400 | 0 | 62 | 11.878 | -17 | -7.62500 | 902 |
| 202 | .30 | 8.67 | 305.2 | * 4 777 3580 | 0 | 62 | 13.377 | -17 | -12.18900 | 902 |
| 203 | 1.10 | 9.08 | 309.1 | * 4 777 5040 | 0 | 62 | 19.680 | -17 | -28.88100 | 902 |
| 204 | .40 | 9.13 | 308.7 | * 4 777 5280 | 0 | 62 | 21.966 | -17 | -35.03000 | 902 |
| 205 | .30 | 1.30 | 338.7 | * 4 777 5460 | 0 | 62 | 22.330 | -17 | -35.33700 | 902 |
| 206 | 1.33 | .77 | 329.4 | * 4 777 7060 | 0 | 62 | 23.216 | -17 | -36.46700 | 905 |
| 207 | 1.40 | 1.70 | 274.2 | * 4 777 8300 | 0 | 62 | 23.390 | -17 | -41.58400 | 905 |
| 208 | .37 | 6.14 | 299.9 | * 4 777 8520 | 0 | 62 | 24.514 | -17 | -45.79800 | 902 |
| 209 | .33 | 9.42 | 317.1 | * 4 777 9120 | 0 | 62 | 26.814 | -17 | -50.42200 | 905 |
| 210 | 1.10 | 2.18 | 314.2 | * 4 77710180 | 0 | 62 | 28.484 | -17 | -54.13300 | 902 |
| 211 | .80 | .41 | 310.5 | * 4 77711060 | 0 | 62 | 28.697 | -17 | -54.67200 | 902 |
| 212 | 1.03 | 3.88 | 138.2 | * 4 77712080 | 0 | 62 | 25.703 | -17 | -48.89100 | 902 |
| 213 | .67 | .61 | 216.2 | * 4 77712480 | 0 | 62 | 25.374 | -17 | -49.41100 | 902 |
| 214 | 1.20 | .93 | 265.3 | * 4 77714000 | 0 | 62 | 25.282 | -17 | -51.81500 | 904 |
| 215 | .23 | 5.06 | 114.5 | * 4 77714140 | 0 | 62 | 24.793 | -17 | -49.49400 | 902 |
| 216 | .33 | .29 | 179.2 | * 4 77714340 | 0 | 62 | 24.694 | -17 | -49.49100 | 902 |
| 217 | 1.27 | .67 | 231.5 | * 4 77715500 | 0 | 62 | 24.170 | -17 | -50.91600 | 905 |
| 218 | .30 | 1.38 | 131.3 | * 4 77716080 | 0 | 62 | 23.895 | -17 | -50.24200 | 902 |
| 219 | .33 | 2.03 | 87.0 | * 4 77716280 | 0 | 62 | 23.930 | -17 | -48.78300 | 903 |
| 220 | 1.17 | 2.09 | 342.9 | * 4 77717380 | 0 | 62 | 26.260 | -17 | -50.33200 | 902 |
| 221 | 1.80 | 4.67 | 304.2 | * 4 77719260 | 0 | 62 | 30.984 | -18 | -5.40100 | 902 |
| 222 | 1.70 | .73 | 228.0 | * 4 77721080 | 0 | 62 | 30.156 | -18 | -7.39400 | 902 |
| 223 | .43 | 3.96 | 200.5 | * 4 77721340 | 0 | 62 | 28.549 | -18 | -8.69500 | 903 |
| 224 | 1.70 | 4.43 | 202.0 | * 4 77723160 | 0 | 62 | 21.563 | -18 | -14.79800 | 902 |
| 225 | 1.53 | 8.09 | 203.4 | * 5 777 480 | 0 | 62 | 10.168 | -18 | -25.39700 | 904 |
| 226 | .30 | 8.41 | 208.1 | * 5 777 1060 | 0 | 62 | 7.941 | -18 | -27.93900 | 902 |
| 227 | 1.37 | 7.67 | 196.1 | * 5 777 2280 | 0 | 61 | 57.858 | -18 | -34.14200 | 902 |
| 228 | .33 | 7.49 | 187.5 | * 5 777 2480 | 0 | 61 | 55.380 | -18 | -34.83200 | 902 |
| 229 | 1.80 | 7.77 | 190.7 | * 5 777 4360 | 0 | 61 | 41.617 | -18 | -40.31700 | 902 |
| 230 | 1.27 | 5.39 | 274.7 | * 5 777 5520 | 0 | 61 | 42.180 | -18 | -54.67000 | 902 |
| 231 | .30 | 8.35 | 303.5 | * 5 777 6100 | 0 | 61 | 43.562 | -18 | -59.08100 | 905 |
| 232 | .27 | 7.96 | 305.0 | * 5 777 6260 | 0 | 61 | 44.781 | -19 | -2.75500 | 902 |
| 233 | 1.17 | 3.06 | 14.7 | * 5 777 7360 | 0 | 61 | 48.240 | -19 | -.83300 | 902 |
| 234 | 1.73 | 6.08 | 89.8 | * 5 777 9200 | 0 | 61 | 48.277 | -18 | -38.51400 | 903 |
| 235 | .83 | 3.61 | 198.5 | * 5 77710100 | 0 | 61 | 45.422 | -18 | -40.53600 | 903 |
| 236 | 1.03 | .90 | 264.3 | * 5 77711120 | 0 | 61 | 45.330 | -18 | -42.49100 | 902 |
| 237 | .30 | 7.25 | 154.3 | * 5 77711300 | 0 | 61 | 43.369 | -18 | -40.49700 | 903 |
| 238 | 1.90 | .31 | 40.1 | * 5 77713240 | 0 | 61 | 43.817 | -18 | -39.70000 | 903 |
| 239 | .43 | 3.47 | 281.9 | * 5 77713500 | 0 | 61 | 44.129 | -18 | -42.81000 | 903 |
| 240 | 1.07 | 2.61 | 86.6 | * 5 77714540 | 0 | 61 | 44.295 | -18 | -36.94400 | 903 |
| 241 | .30 | 5.23 | 228.6 | * 5 77715120 | 0 | 61 | 43.256 | -18 | -39.43000 | 902 |
| 242 | .33 | .98 | 315.2 | * 5 77715320 | 0 | 61 | 43.488 | -18 | -39.91600 | 902 |
| 243 | 1.77 | .23 | 28.2 | * 5 77717180 | 0 | 61 | 43.840 | -18 | -39.51700 | 902 |
| 244 | 1.20 | .46 | 348.6 | * 5 77718300 | 0 | 61 | 44.378 | -18 | -39.74600 | 902 |

| REC# | | SPEED | HEADING | | | DATE,TIME | | LATITUDE | | LONGITUDE | | FIX QUALITY |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 245 | 2.30 | .09 | 125.8 | * | 5 | 77720480 | 0 | 61 | 44.259 | -18 | -39.39800 | 905 |
| 246 | 1.67 | 3.51 | 342.3 | * | 5 | 77722280 | 0 | 61 | 49.834 | -18 | -43.16400 | 903 |
| 247 | 1.43 | 2.52 | 328.4 | * | 5 | 77723540 | 0 | 61 | 52.912 | -18 | -47.18100 | 902 |
| 248 | .30 | 1.75 | 300.3 | * | 6 | 777 120 | 0 | 61 | 53.176 | -18 | -48.14100 | 902 |
| 249 | 1.43 | .32 | 198.5 | * | 6 | 777 1380 | 0 | 61 | 52.739 | -18 | -48.45200 | 903 |
| 250 | .33 | 1.62 | 80.5 | * | 6 | 777 1580 | 0 | 61 | 52.828 | -18 | -47.32200 | 904 |
| 251 | 1.33 | 1.00 | 312.7 | * | 6 | 777 3180 | 0 | 61 | 53.731 | -18 | -49.40100 | 905 |
| 252 | .23 | 1.58 | 302.4 | * | 6 | 777 3320 | 0 | 61 | 53.929 | -18 | -50.06300 | 902 |
| 253 | .30 | .89 | 65.8 | * | 6 | 777 3500 | 0 | 61 | 54.039 | -18 | -49.54500 | 902 |
| 254 | 1.13 | .46 | 319.2 | * | 6 | 777 4580 | 0 | 61 | 54.430 | -18 | -50.26200 | 902 |
| 255 | .30 | .86 | 9.0 | * | 6 | 777 5160 | 0 | 61 | 54.684 | -18 | -50.17700 | 903 |
| 256 | .43 | .76 | 24.0 | * | 6 | 777 5420 | 0 | 61 | 54.984 | -18 | -49.89300 | 904 |
| 257 | 1.00 | 4.99 | 166.2 | * | 6 | 777 6420 | 0 | 61 | 50.130 | -18 | -47.36000 | 903 |
| 258 | .33 | .93 | 306.7 | * | 6 | 777 7020 | 0 | 61 | 50.315 | -18 | -47.88700 | 903 |
| 259 | 1.70 | .82 | 8.1 | * | 6 | 777 8440 | 0 | 61 | 51.696 | -18 | -47.46900 | 905 |
| 260 | .23 | 6.94 | 340.8 | * | 6 | 777 8580 | 0 | 61 | 53.226 | -18 | -48.60000 | 905 |
| 261 | .40 | 9.75 | 329.3 | * | 6 | 777 9220 | 0 | 61 | 56.582 | -18 | -52.82600 | 905 |
| 262 | .83 | 9.06 | 331.1 | * | 6 | 77710120 | 0 | 62 | 3.194 | -19 | -.59800 | 903 |
| 263 | .53 | 7.68 | 357.3 | * | 6 | 77710440 | 0 | 62 | 7.287 | -19 | -1.00600 | 903 |
| 264 | .40 | 7.50 | 17.0 | * | 6 | 77711080 | 0 | 62 | 10.156 | -18 | -59.12400 | 904 |
| 265 | .93 | 4.04 | 327.4 | * | 6 | 77712040 | 0 | 62 | 13.337 | -19 | -3.48900 | 902 |
| 266 | .57 | 5.16 | 192.0 | * | 6 | 77712380 | 0 | 62 | 10.477 | -19 | -4.79700 | 903 |
| 267 | .30 | 5.63 | 174.1 | * | 6 | 77712560 | 0 | 62 | 8.796 | -19 | -4.42200 | 904 |
| 268 | .87 | 1.90 | 164.9 | * | 6 | 77713480 | 0 | 62 | 7.204 | -19 | -3.50400 | 902 |
| 269 | .50 | .88 | 352.6 | * | 6 | 77714180 | 0 | 62 | 7.638 | -19 | -3.62400 | 902 |
| 270 | .43 | .65 | 336.4 | * | 6 | 77714440 | 0 | 62 | 7.895 | -19 | -3.86500 | 902 |
| 271 | .87 | .74 | 36.4 | * | 6 | 77715360 | 0 | 62 | 8.414 | -19 | -3.04600 | 903 |
| 272 | .50 | 1.20 | 293.1 | * | 6 | 77716060 | 0 | 62 | 8.649 | -19 | -4.22700 | 902 |
| 273 | .40 | .96 | 286.6 | * | 6 | 77716300 | 0 | 62 | 8.759 | -19 | -5.01700 | 902 |
| 274 | 1.13 | .75 | 185.4 | * | 6 | 77717380 | 0 | 62 | 7.915 | -19 | -5.18900 | 902 |
| 275 | .63 | 1.17 | 86.3 | * | 6 | 77718160 | 0 | 62 | 7.963 | -19 | -3.61100 | 903 |
| 276 | .93 | .50 | 346.0 | * | 6 | 77719120 | 0 | 62 | 8.420 | -19 | -3.85600 | 904 |
| 277 | .40 | 3.09 | 241.4 | * | 6 | 77719360 | 0 | 62 | 7.828 | -19 | -6.18100 | 903 |
| 278 | 1.53 | 4.06 | 248.2 | * | 6 | 77721080 | 0 | 62 | 5.511 | -19 | -18.54200 | 902 |
| 279 | .57 | 5.37 | 1.8 | * | 6 | 77721420 | 0 | 62 | 8.558 | -19 | -18.34100 | 904 |
| 280 | 1.13 | 1.32 | 333.1 | * | 6 | 77722500 | 0 | 62 | 9.897 | -19 | -19.79800 | 903 |
| 281 | .33 | 2.01 | 270.8 | * | 6 | 77723100 | 0 | 62 | 9.906 | -19 | -21.23600 | 905 |
| 282 | .27 | 2.40 | 38.3 | * | 6 | 77723260 | 0 | 62 | 10.409 | -19 | -20.38600 | 903 |
| 283 | 1.17 | .99 | .7 | * | 7 | 777 360 | 0 | 62 | 11.568 | -19 | -20.35600 | 902 |
| 284 | .30 | .20 | 200.0 | * | 7 | 777 540 | 0 | 62 | 11.511 | -19 | -20.40100 | 902 |
| 285 | .33 | 1.34 | 292.4 | * | 7 | 777 1140 | 0 | 62 | 11.681 | -19 | -21.28600 | 902 |
| 286 | 1.13 | 1.66 | 96.9 | * | 7 | 777 2220 | 0 | 62 | 11.455 | -19 | -17.27800 | 903 |
| 287 | .33 | 4.60 | 155.5 | * | 7 | 777 2420 | 0 | 62 | 10.057 | -19 | -15.91500 | 902 |
| 288 | .30 | 1.13 | 314.7 | * | 7 | 777 3000 | 0 | 62 | 10.295 | -19 | -16.43000 | 902 |
| 289 | 1.10 | .58 | 308.3 | * | 7 | 777 4060 | 0 | 62 | 10.631 | -19 | -17.50500 | 903 |
| 290 | .23 | .66 | 60.5 | * | 7 | 777 4200 | 0 | 62 | 10.767 | -19 | -17.21600 | 902 |
| 291 | .43 | 1.68 | 212.9 | * | 7 | 777 4460 | 0 | 62 | 10.155 | -19 | -18.06600 | 902 |
| 292 | 1.03 | 8.75 | 191.4 | * | 7 | 777 5480 | 0 | 62 | 1.284 | -19 | -21.88400 | 902 |
| 293 | 2.43 | 1.77 | 184.9 | * | 7 | 777 8140 | 0 | 61 | 56.991 | -19 | -22.67100 | 902 |
| 294 | 1.07 | 5.70 | 149.2 | * | 7 | 777 9180 | 0 | 61 | 51.765 | -19 | -16.04300 | 902 |

| REC# | | SPEED | HEADING | | DATE,TIME | | LATITUDE | LONGITUDE | FIX QUALITY |
|---|---|---|---|---|---|---|---|---|---|
| 295 | .57 | 8.60 | 144.5 | * | 7 777 9520 | 0 | 61 47.795 | -19 -10.04700 | 902 |
| 296 | .47 | 8.16 | 144.4 | * | 7 77710200 | 0 | 61 44.695 | -19 -5.36200 | 902 |
| 297 | .70 | .52 | 71.5 | * | 7 77711020 | 0 | 61 44.811 | -19 -4.63400 | 903 |
| 298 | .63 | .27 | 111.7 | * | 7 77711400 | 0 | 61 44.747 | -19 -4.29400 | 904 |
| 299 | .47 | .35 | 260.9 | * | 7 77712080 | 0 | 61 44.721 | -19 -4.63100 | 903 |
| 300 | .57 | .27 | 190.4 | * | 7 77712420 | 0 | 61 44.569 | -19 -4.69000 | 902 |
| 301 | .77 | 8.56 | 215.4 | * | 7 77713280 | 0 | 61 39.218 | -19 -12.71300 | 902 |
| 302 | .43 | 5.80 | 212.9 | * | 7 77713540 | 0 | 61 37.106 | -19 -15.58700 | 903 |
| 303 | .53 | 5.30 | 212.0 | * | 7 77714260 | 0 | 61 34.708 | -19 -18.73400 | 903 |
| 304 | 1.30 | 2.37 | 209.8 | * | 7 77715440 | 0 | 61 32.035 | -19 -21.94200 | 902 |
| 305 | .47 | .71 | 91.8 | * | 7 77716120 | 0 | 61 32.024 | -19 -21.24600 | 902 |
| 306 | .43 | .60 | 95.0 | * | 7 77716380 | 0 | 61 32.002 | -19 -20.69900 | 905 |
| 307 | .40 | 1.91 | 180.8 | * | 7 77717020 | 0 | 61 31.237 | -19 -20.72000 | 905 |
| 308 | .43 | 1.06 | 60.5 | * | 7 77717280 | 0 | 61 31.464 | -19 -19.87900 | 903 |
| 309 | .57 | .21 | 100.7 | * | 7 77718020 | 0 | 61 31.442 | -19 -19.63300 | 902 |
| 310 | .40 | .44 | 84.7 | * | 7 77718260 | 0 | 61 31.458 | -19 -19.26600 | 903 |
| 311 | .37 | .71 | 53.6 | * | 7 77718480 | 0 | 61 31.614 | -19 -18.82300 | 905 |
| 312 | 1.40 | 2.91 | 203.4 | * | 7 77720120 | 0 | 61 27.869 | -19 -22.22300 | 903 |
| 313 | .30 | 4.99 | 294.5 | * | 7 77720300 | 0 | 61 28.490 | -19 -25.07900 | 902 |
| 314 | 1.50 | .24 | 56.7 | * | 7 77722000 | 0 | 61 28.690 | -19 -24.43800 | 902 |
| 315 | .30 | .36 | 61.1 | * | 7 77722180 | 0 | 61 28.743 | -19 -24.23900 | 902 |
| 316 | .33 | 7.25 | 59.9 | * | 7 77722380 | 0 | 61 29.954 | -19 -19.85500 | 902 |
| 317 | .87 | 9.45 | 61.1 | * | 7 77723300 | 0 | 61 33.922 | -19 -4.80400 | 902 |
| 318 | .37 | 8.86 | 69.5 | * | 7 77723520 | 0 | 61 35.062 | -18 -58.40700 | 902 |
| 319 | .47 | 8.51 | 77.3 | * | 8 777 200 | 0 | 61 35.938 | -18 -50.25400 | 903 |
| 320 | .93 | 2.54 | 160.8 | * | 8 777 1160 | 0 | 61 33.698 | -18 -48.61900 | 903 |
| 321 | .37 | .49 | 65.6 | * | 8 777 1380 | 0 | 61 33.773 | -18 -48.27400 | 902 |
| 322 | .47 | .41 | 69.6 | * | 8 777 2060 | 0 | 61 33.839 | -18 -47.89900 | 902 |
| 323 | .93 | .44 | 60.7 | * | 8 777 3020 | 0 | 61 34.042 | -18 -47.13800 | 903 |
| 324 | .43 | 5.70 | 129.0 | * | 8 777 3280 | 0 | 61 32.486 | -18 -43.10900 | 903 |
| 325 | .47 | 4.67 | 191.7 | * | 8 777 3560 | 0 | 61 30.349 | -18 -44.04000 | 902 |
| 326 | 11.13 | 3.55 | 144.6 | * | 8 77715040 | 0 | 60 58.165 | -17 -56.43200 | 902 |
| 327 | 1.10 | 4.22 | 145.9 | * | 8 77716100 | 0 | 60 54.312 | -17 -51.07000 | 903 |
| 328 | 1.33 | .75 | 155.8 | * | 8 77717300 | 0 | 60 53.405 | -17 -50.23200 | 902 |
| 329 | .53 | 2.66 | 5.4 | * | 8 77718020 | 0 | 60 54.819 | -17 -49.95800 | 905 |
| 330 | .67 | 2.74 | 349.8 | * | 8 77718420 | 0 | 60 56.620 | -17 -50.62200 | 905 |
| 331 | .60 | 5.51 | 358.0 | * | 8 77719180 | 0 | 60 59.926 | -17 -50.86200 | 902 |
| 332 | 1.77 | 7.30 | 355.8 | * | 8 77721040 | 0 | 61 12.794 | -17 -52.83200 | 902 |
| 333 | .40 | 7.80 | 354.9 | * | 8 77721280 | 0 | 61 15.904 | -17 -53.40400 | 902 |
| 334 | .40 | 7.85 | 353.1 | * | 8 77721520 | 0 | 61 19.023 | -17 -54.19000 | 905 |
| 335 | .97 | 7.71 | 353.6 | * | 8 77722500 | 0 | 61 26.435 | -17 -55.92000 | 902 |
| 336 | 1.33 | 7.72 | 354.3 | * | 9 777 100 | 0 | 61 36.684 | -17 -58.04700 | 902 |
| 337 | .43 | 8.07 | 352.5 | * | 9 777 360 | 0 | 61 40.155 | -17 -59.00500 | 905 |
| 338 | .70 | 5.13 | 274.2 | * | 9 777 1180 | 0 | 61 40.418 | -18 -6.56400 | 903 |
| 339 | .60 | 7.16 | 256.4 | * | 9 777 1540 | 0 | 61 39.406 | -18 -15.36600 | 902 |
| 340 | .67 | 7.48 | 256.2 | * | 9 777 2340 | 0 | 61 38.217 | -18 -25.57700 | 903 |
| 341 | .30 | 3.68 | 308.9 | * | 9 777 2520 | 0 | 61 38.910 | -18 -27.38400 | 902 |
| 342 | .30 | 3.43 | 344.6 | * | 9 777 3100 | 0 | 61 39.902 | -18 -27.96000 | 902 |
| 343 | .50 | 2.11 | 33.9 | * | 9 777 3400 | 0 | 61 40.776 | -18 -26.72200 | 902 |
| 344 | .37 | 1.45 | 49.9 | * | 9 777 4020 | 0 | 61 41.120 | -18 -25.86200 | 903 |

| REC# | | SPEED | HEADING | DATE,TIME | | | | LATITUDE | | LONGITUDE | | FIX QUALITY |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 345 | .37 | 1.31 | 98.1 | * 9 | 777 | 4240 | 0 | 61 | 41.052 | -18 | -24.85700 | 902 |
| 346 | .33 | .80 | 49.5 | * 9 | 777 | 4440 | 0 | 61 | 41.225 | -18 | -24.43000 | 903 |
| 347 | .70 | 1.70 | 241.6 | * 9 | 777 | 5260 | 0 | 61 | 40.659 | -18 | -26.63900 | 904 |
| 348 | .30 | 6.43 | 233.8 | * 9 | 777 | 5440 | 0 | 61 | 39.518 | -18 | -29.92300 | 902 |
| 349 | .57 | .89 | 83.4 | * 9 | 777 | 6180 | 0 | 61 | 39.576 | -18 | -28.86100 | 905 |
| 350 | .27 | 1.86 | 60.0 | * 9 | 777 | 6340 | 0 | 61 | 39.824 | -18 | -27.95500 | 905 |
| 351 | .60 | 1.72 | 10.1 | * 9 | 777 | 7100 | 0 | 61 | 40.844 | -18 | -27.57200 | 903 |
| 352 | .97 | 1.39 | 91.8 | * 9 | 777 | 8080 | 0 | 61 | 40.800 | -18 | -24.73500 | 903 |
| 353 | .27 | 1.67 | 322.1 | * 9 | 777 | 8240 | 0 | 61 | 41.152 | -18 | -25.31300 | 902 |
| 354 | .47 | 7.90 | 274.9 | * 9 | 777 | 8520 | 0 | 61 | 41.465 | -18 | -33.06200 | 904 |
| 355 | .37 | 4.07 | 4.3 | * 9 | 777 | 9140 | 0 | 61 | 42.955 | -18 | -32.82800 | 902 |
| 356 | .70 | 4.21 | 279.8 | * 9 | 777 | 9560 | 0 | 61 | 43.457 | -18 | -38.96900 | 902 |
| 357 | .30 | 5.81 | 234.0 | * 9 | 777 | 10140 | 0 | 61 | 42.431 | -18 | -41.94900 | 902 |
| 358 | .30 | 5.56 | 169.0 | * 9 | 777 | 10320 | 0 | 61 | 40.792 | -18 | -41.27800 | 902 |
| 359 | .53 | 1.73 | 78.6 | * 9 | 777 | 11040 | 0 | 61 | 40.975 | -18 | -39.37200 | 902 |
| 360 | .67 | 1.14 | 49.3 | * 9 | 777 | 11440 | 0 | 61 | 41.472 | -18 | -38.15200 | 902. |
| 361 | .30 | .73 | 114.3 | * 9 | 777 | 12020 | 0 | 61 | 41.382 | -18 | -37.73100 | 902 |
| 362 | .30 | 1.01 | 157.9 | * 9 | 777 | 12200 | 0 | 61 | 41.100 | -18 | -37.49000 | 902 |
| 363 | .57 | 9.01 | .9 | * 9 | 777 | 12540 | 0 | 61 | 46.209 | -18 | -37.32400 | 905 |
| 364 | 4.17 | .19 | 227.4 | * 9 | 777 | 17040 | 0 | 61 | 45.671 | -18 | -38.55900 | 902 |
| 365 | .50 | 1.66 | 98.2 | * 9 | 777 | 17340 | 0 | 61 | 45.552 | -18 | -36.82300 | 902 |
| 366 | .80 | 1.40 | 42.9 | * 9 | 777 | 18220 | 0 | 61 | 46.373 | -18 | -35.20900 | 902 |
| 367 | 1.77 | 5.24 | 322.9 | * 9 | 777 | 20080 | 0 | 61 | 53.772 | -18 | -47.04700 | 902 |
| 368 | .37 | 9.84 | 312.8 | * 9 | 777 | 20300 | 0 | 61 | 56.226 | -18 | -52.67400 | 902 |
| 369 | .57 | 8.01 | 324.6 | * 9 | 777 | 21040 | 0 | 61 | 59.932 | -18 | -58.27100 | 902 |
| 370 | .87 | 8.92 | 8.0 | * 9 | 777 | 21560 | 0 | 62 | 7.597 | -18 | -55.98200 | 902 |
| 371 | .33 | 9.11 | .9 | * 9 | 777 | 22160 | 0 | 62 | 10.636 | -18 | -55.87600 | 902 |
| 372 | .27 | 9.78 | 355.3 | * 9 | 777 | 22320 | 0 | 62 | 13.238 | -18 | -56.33200 | 902 |
| 373 | .27 | 9.97 | 4.8 | * 9 | 777 | 22480 | 0 | 62 | 15.890 | -18 | -55.85000 | 902 |
| 374 | .27 | 9.38 | .0 | * 9 | 777 | 23040 | 0 | 62 | 18.393 | -18 | -55.85000 | 902 |
| 375 | .90 | 8.46 | 51.4 | * 9 | 777 | 23580 | 0 | 62 | 23.141 | -18 | -43.01900 | 902 |
| 376 | .30 | 4.97 | 38.0 | *10 | 777 | 160 | 0 | 62 | 24.318 | -18 | -41.03600 | 902 |
| 377 | .30 | 3.61 | 337.0 | *10 | 777 | 340 | 0 | 62 | 25.316 | -18 | -41.95000 | 902 |
| 378 | .27 | 1.11 | 64.5 | *10 | 777 | 500 | 0 | 62 | 25.444 | -18 | -41.37100 | 902 |
| 379 | .60 | .90 | 308.7 | *10 | 777 | 1260 | 0 | 62 | 25.783 | -18 | -42.28500 | 902 |
| 380 | .27 | 1.12 | 81.8 | *10 | 777 | 1420 | 0 | 62 | 25.825 | -18 | -41.64700 | 902 |
| 381 | .30 | .51 | 309.2 | *10 | 777 | 2000 | 0 | 62 | 25.921 | -18 | -41.90100 | 902 |
| 382 | .30 | .37 | 16.3 | *10 | 777 | 2180 | 0 | 62 | 26.027 | -18 | -41.83400 | 902 |
| 383 | .30 | 2.09 | 62.9 | *10 | 777 | 2360 | 0 | 62 | 26.313 | -18 | -40.62600 | 904 |
| 384 | .57 | 8.68 | 53.7 | *10 | 777 | 3100 | 0 | 62 | 29.231 | -18 | -32.04400 | 905 |
| 385 | .37 | 9.33 | 62.8 | *10 | 777 | 3320 | 0 | 62 | 30.795 | -18 | -25.44500 | 902 |
| 386 | .33 | 8.36 | 57.9 | *10 | 777 | 3520 | 0 | 62 | 32.279 | -18 | -20.32600 | 905 |
| 387 | .33 | 6.35 | 63.6 | *10 | 777 | 4120 | 0 | 62 | 33.220 | -18 | -16.21100 | 902 |
| 388 | .20 | 2.45 | 94.9 | *10 | 777 | 4240 | 0 | 62 | 33.178 | -18 | -15.15000 | 902 |
| 389 | .43 | .93 | 85.0 | *10 | 777 | 4500 | 0 | 62 | 33.213 | -18 | -14.27700 | 902 |
| 390 | .53 | 4.06 | 177.6 | *10 | 777 | 5220 | 0 | 62 | 31.046 | -18 | -14.07600 | 904 |
| 391 | .60 | 7.41 | 76.9 | *10 | 777 | 5580 | 0 | 62 | 32.052 | -18 | -4.68500 | 905 |
| 392 | .63 | 2.05 | 100.9 | *10 | 777 | 6360 | 0 | 62 | 31.806 | -18 | -1.91900 | 902 |
| 393 | .67 | .81 | 91.4 | *10 | 777 | 7160 | 0 | 62 | 31.793 | -18 | -.75000 | 904 |
| 394 | 1.80 | 1.04 | 163.3 | *10 | 777 | 9040 | 0 | 62 | 29.998 | -17 | -59.58600 | 902 |

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| REC# | | SPEED | HEADING | | DATE,TIME | | | LATITUDE | | LONGITUDE | FIX QUALITY |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 395 | .30 | 5.55 | 111.5 | *10 | 777 9220 | 0 | 62 | 29.389 | -17 | -56.23100 | 902 |
| 396 | .30 | 5.28 | 115.3 | *10 | 777 9400 | 0 | 62 | 28.713 | -17 | -53.12800 | 902 |
| 397 | 1.20 | 5.17 | 119.0 | *10 | 77710520 | 0 | 62 | 25.707 | -17 | -41.39200 | 902 |
| 398 | .30 | 5.89 | 127.2 | *10 | 77711100 | 0 | 62 | 24.638 | -17 | -38.35200 | 905 |
| 399 | .30 | 4.94 | 255.9 | *10 | 77711280 | 0 | 62 | 24.276 | -17 | -41.46000 | 902 |
| 400 | .47 | 2.50 | 212.7 | *10 | 77711560 | 0 | 62 | 23.295 | -17 | -42.82100 | 902 |
| 401 | .70 | 1.75 | 263.0 | *10 | 77712380 | 0 | 62 | 23.146 | -17 | -45.44300 | 905 |
| 402 | .60 | 9.85 | 104.0 | *10 | 77713140 | 0 | 62 | 21.713 | -17 | -33.07200 | 905 |
| 403 | 1.20 | 3.55 | 128.7 | *10 | 77714260 | 0 | 62 | 19.048 | -17 | -25.90600 | 902 |
| 404 | .30 | 2.96 | 179.1 | *10 | 77714440 | 0 | 62 | 18.159 | -17 | -25.87700 | 902 |
| 405 | .37 | .85 | 339.5 | *10 | 77715060 | 0 | 62 | 18.450 | -17 | -26.11100 | 902 |
| 406 | .57 | 1.20 | 100.3 | *10 | 77715400 | 0 | 62 | 18.329 | -17 | -24.67200 | 903 |
| 407 | .53 | 6.45 | 119.8 | *10 | 77716120 | 0 | 62 | 16.615 | -17 | -18.24600 | 904 |
| 408 | .30 | 9.11 | 126.6 | *10 | 77716300 | 0 | 62 | 14.986 | -17 | -13.52500 | 902 |
| 409 | .30 | 8.43 | 123.2 | *10 | 77716480 | 0 | 62 | 13.600 | -17 | -8.97500 | 902 |
| 410 | .63 | 8.16 | 127.2 | *10 | 77717260 | 0 | 62 | 10.476 | -17 | -.14100 | 902 |
| 411 | 1.13 | 2.05 | 292.6 | *10 | 77718340 | 0 | 62 | 11.371 | -17 | -4.74000 | 905 |
| 412 | .67 | 8.00 | 307.9 | *10 | 77719140 | 0 | 62 | 14.649 | -17 | -13.78400 | 902 |
| 413 | .43 | 8.96 | 311.3 | *10 | 77719400 | 0 | 62 | 17.214 | -17 | -20.05900 | 905 |
| 414 | .40 | 7.11 | 290.9 | *10 | 77720040 | 0 | 62 | 18.231 | -17 | -25.77700 | 905 |
| 415 | .93 | .28 | 55.7 | *10 | 77721000 | 0 | 62 | 18.380 | -17 | -25.30600 | 902 |
| 416 | .60 | .95 | 91.1 | *10 | 77721360 | 0 | 62 | 18.368 | -17 | -24.07400 | 902 |
| 417 | .30 | 2.40 | 256.2 | *10 | 77721540 | 0 | 62 | 18.197 | -17 | -25.57700 | 903 |
| 418 | .87 | .82 | 180.8 | *10 | 77722460 | 0 | 62 | 17.485 | -17 | -25.59900 | 902 |
| 419 | .30 | .41 | 1.1 | *10 | 77723040 | 0 | 62 | 17.607 | -17 | -25.59400 | 902 |
| 420 | .30 | .52 | 127.9 | *10 | 77723220 | 0 | 62 | 17.510 | -17 | -25.32700 | 903 |
| 421 | .30 | .27 | 102.7 | *10 | 77723400 | 0 | 62 | 17.492 | -17 | -25.15400 | 902 |
| 422 | .87 | .58 | 355.6 | *11 | 777 320 | 0 | 62 | 17.992 | -17 | -25.23700 | 903 |
| 423 | .30 | 1.14 | 217.2 | *11 | 777 500 | 0 | 62 | 17.718 | -17 | -25.68400 | 904 |
| 424 | .33 | .90 | 111.5 | *11 | 777 1100 | 0 | 62 | 17.609 | -17 | -25.08300 | 903 |
| 425 | 1.47 | 1.16 | 70.0 | *11 | 777 2380 | 0 | 62 | 18.192 | -17 | -21.63600 | 902 |
| 426 | .40 | 4.88 | 295.8 | *11 | 777 3020 | 0 | 62 | 19.040 | -17 | -25.42000 | 904 |
| 427 | .93 | 7.57 | 292.9 | *11 | 777 3580 | 0 | 62 | 21.791 | -17 | -39.44700 | 903 |
| 428 | .53 | 7.78 | 288.0 | *11 | 777 4300 | 0 | 62 | 23.074 | -17 | -47.96100 | 902 |
| 429 | .40 | 8.21 | 293.0 | *11 | 777 4540 | 0 | 62 | 24.356 | -17 | -54.48900 | 905 |
| 430 | .77 | 7.92 | 290.8 | *11 | 777 5400 | 0 | 62 | 26.510 | -18 | -6.76100 | 902 |
| 431 | .70 | 8.57 | 288.8 | *11 | 777 6220 | 0 | 62 | 28.440 | -18 | -19.05400 | 904 |
| 432 | .33 | 8.39 | 290.4 | *11 | 777 6420 | 0 | 62 | 29.416 | -18 | -24.72800 | 904 |
| 433 | .30 | 5.30 | 312.1 | *11 | 777 7000 | 0 | 62 | 30.484 | -18 | -27.28700 | 905 |
| 434 | 1.20 | 9.54 | 286.4 | *11 | 777 8120 | 0 | 62 | 33.717 | -18 | -51.13100 | 905 |
| 435 | .37 | 8.34 | 284.7 | *11 | 777 8340 | 0 | 62 | 34.494 | -18 | -57.55500 | 902 |
| 436 | 1.47 | 8.14 | 288.7 | *11 | 77710020 | 0 | 62 | 38.326 | -19 | -22.14400 | 902 |
| 437 | .30 | 8.34 | 290.2 | *11 | 77710200 | 0 | 62 | 39.191 | -19 | -27.25900 | 902 |
| 438 | .30 | 8.42 | 291.3 | *11 | 77710380 | 0 | 62 | 40.107 | -19 | -32.38700 | 902 |
| 439 | .37 | 8.59 | 289.4 | *11 | 77711000 | 0 | 62 | 41.152 | -19 | -38.86700 | 902 |
| 440 | .77 | 8.42 | 289.7 | *11 | 77711460 | 0 | 62 | 43.330 | -19 | -52.13200 | 902 |
| 441 | .40 | 5.96 | 287.5 | *11 | 77712100 | 0 | 62 | 44.048 | -19 | -57.10000 | 902 |
| 442 | .33 | 4.30 | 287.6 | *11 | 77712300 | 0 | 62 | 44.482 | -20 | -.08300 | 902 |
| 443 | .33 | 8.68 | 330.7 | *11 | 77712500 | 0 | 62 | 47.005 | -20 | -3.18200 | 905 |
| 444 | .67 | 8.95 | 328.0 | *11 | 77713300 | 0 | 62 | 52.073 | -20 | -10.10800 | 903 |

| REC# | | SPEED | HEADING | | DATE,TIME | | LATITUDE | | | LONGITUDE | FIX QUALITY |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 445 | .40 | 8.99 | 327.9 | *11 | 77713540 | 0 | 62 | 55.122 | -20 | -14.30500 | 902 |
| 446 | .30 | 9.34 | 327.2 | *11 | 77714120 | 0 | 62 | 57.479 | -20 | -17.64100 | 902 |
| 447 | 1.07 | 8.85 | 330.0 | *11 | 77715160 | 0 | 63 | 5.659 | -20 | -28.05000 | 903 |
| 448 | .43 | 9.39 | 326.8 | *11 | 77715420 | 0 | 63 | 9.065 | -20 | -32.98500 | 904 |
| 449 | .27 | 8.78 | 334.2 | *11 | 77715580 | 0 | 63 | 11.175 | -20 | -35.24700 | 902 |
| 450 | .53 | 8.15 | 321.1 | *11 | 77716300 | 0 | 63 | 14.559 | -20 | -41.30400 | 903 |
| 451 | .57 | 8.50 | 301.1 | *11 | 77717040 | 0 | 63 | 17.051 | -20 | -50.47500 | 902 |
| 452 | .33 | 8.37 | 299.6 | *11 | 77717240 | 0 | 63 | 18.431 | -20 | -55.87500 | 905 |
| 453 | .90 | 8.76 | 299.8 | *11 | 77718180 | 0 | 63 | 22.353 | -21 | -11.13300 | 902 |
| 454 | .60 | 8.70 | 299.8 | *11 | 77718540 | 0 | 63 | 24.948 | -21 | -21.26500 | 902 |
| 455 | 1.17 | 8.53 | 301.0 | *11 | 77720040 | 0 | 63 | 30.076 | -21 | -40.37600 | 903 |
| 456 | .37 | 8.48 | 301.9 | *11 | 77720260 | 0 | 63 | 31.724 | -21 | -46.30000 | 904 |
| 457 | .43 | 8.77 | 297.5 | *11 | 77720520 | 0 | 63 | 33.480 | -21 | -53.87300 | 902 |
| 458 | .33 | 8.57 | 297.7 | *11 | 77721120 | 0 | 63 | 34.810 | -21 | -59.55500 | 905 |
| 459 | .63 | 8.77 | 297.5 | *11 | 77721500 | 0 | 63 | 37.382 | -22 | -10.64300 | 902 |
| 460 | .50 | 8.70 | 301.1 | *11 | 77722200 | 0 | 63 | 39.629 | -22 | -19.04100 | 902 |
| 461 | .23 | 9.42 | 300.6 | *11 | 77722340 | 0 | 63 | 40.748 | -22 | -23.31100 | 903 |
| 462 | .33 | 8.97 | 303.6 | *11 | 77722540 | 0 | 63 | 42.405 | -22 | -28.93500 | 902 |

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INITIAL CRUISE REPORT, ATLANTIS II-94, LEG 1 by
David A. Johnson and Alexander N. Shor. 57 pages. December 1977. Prepared for the Office of Naval Research under Contract N00014-74-C-0262; NR 083-004 and for the National Science Foundation under Grant OCE76-81491.

During Leg 1 of cruise ATLANTIS II-94, a multidisciplinary investigation of present-day sediment-current interactions was carried out on the insular rise south of Iceland. The principal objective was to study the relationships between relatively steady thermohaline flow, episodic turbidity current flow, and the types of sediments associated with these current systems. The northern Iceland Basin is an optimal site for studying these effects because of the well-developed deep thermohaline current system resulting from overflow from the Norwegian Sea, and the substantial input of terrigenous (largely volcanogenic) debris from the Iceland margin which has occurred since the post-glacial rise in sea level.

In this report, we outline the regional setting, objectives, and scientific operations of the cruise, and present examples of typical seismic profiles and 3.5 kHz records from areas of particular importance. All station locations are tabulated, and satellite fixes are listed.

Detailed data analysis will from the basis of Ph.D. dissertations (for A. Shor and M. J. Richardson). Scientific results of the cruise will be presented in these dissertations and in associated publications.

1. Norwegian Sea Overflow
2. Contour Current
3. Turbidity Current

I. Johnson, David A.
II. Shor, Alexander N.
III. N00014-74-C-0262; NR 083-004
IV. OCE76-81491

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I. Johnson, David A.
II. Shor, Alexander N.
III. N00014-74-C-0262; NR 083-004
IV. OCE76-81491

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Woods Hole Oceanographic Institution

INITIAL CRUISE REPORT, ATLANTIS II-94, LEG 1 by
David A. Johnson and Alexander N. Shor. 57 pages. December 1977. Prepared for the Office of Naval Research under Contract N00014-74-C-0262; NR 083-004 and for the National Science Foundation under Grant OCE76-81491.

During Leg 1 of cruise ATLANTIS II-94, a multidisciplinary investigation of present-day sediment-current interactions was carried out on the insular rise south of Iceland. The principal objective was to study the relationships between relatively steady thermohaline flow, episodic turbidity current flow, and the types of sediments associated with these current systems. The northern Iceland Basin is an optimal site for studying these effects because of the well-developed deep thermohaline current system resulting from overflow from the Norwegian Sea, and the substantial input of terrigenous (largely volcanogenic) debris from the Iceland margin which has occurred since the post-glacial rise in sea level.

In this report, we outline the regional setting, objectives, and scientific operations of the cruise, and present examples of typical seismic profiles and 3.5 kHz records from areas of particular importance. All station locations are tabulated, and satellite fixes are listed.

Detailed data analysis will from the basis of Ph.D. dissertations (for A. Shor and M. J. Richardson). Scientific results of the cruise will be presented in these dissertations and in associated publications.

1. Norwegian Sea Overflow
2. Contour Current
3. Turbidity Current

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