3. UNDERWAY GEOPHYSICS[1]

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NAVIGATION

Primary navigation data were acquired on the *JOIDES Resolution* during Leg 161 using a Magnavox Global Positioning System (GPS) Model MX 1107 GPS receiver and a Lehmkuhl Gyrocompass to provide the ship's heading. The GPS antenna is located 28.65 m forward of the stern, 46.33 m aft of the drill floor, and 3.05 m starboard of the ship's centerline. GPS navigation and gyrocompass data were acquired, displayed, and archived using WinFrog™ software (Pelagos Co.) operating on a Pentium computer in the underway geophysics laboratory. The navigation data are available in real-time over the shipboard computer network, allowing the navigation data to be displayed on any IBM-compatible PC on the ship. The primary navigation computers outside the underway geophysics laboratory were located on the bridge, in the dynamic positioning control room, and in the co-chief scientists' office.

The GPS data are archived in two formats raw ("raw") and decimated ("dat") files. Raw navigation files are collected every second throughout the entire cruise. After the cruise, the "raw" files are combined with magnetic field data and seafloor depths (from the 12-kHz echosounder) to produce an "MGD77" format file that is available from the Data Librarian at ODP. The "dat" files were recorded at various intervals depending on whether we were acquiring seismic data, transitting between sites, or performing coring operations. These files contain much the same data as the "raw" data files, but are in a different format, much smaller in size, and more easily converted for making ship's track plots.

Final hole positions were calculated using GPS position and gyro data combined with the offset of the GPS antenna to the moonpool. Only navigation data covering the interval of time while the drill pipe was in the hole were used. At least three hours of data that were used as tests have shown that several hours of data provide an accurate site location. When the ship occupied holes for shorter times, such as when only a single mudline core was taken, the GPS position for the exact time that the core was shot was used.

BATHYMETRY

Bathymetric data were acquired using both 3.5- and 12-kHz systems. Data for both systems were displayed using Raytheon Model 1807M line scanning recorders (LSR). The 3.5-kHz system used an EDO 248C transceiver, while the 12-kHz system used a Raytheon PTR105B transceiver to drive an EDO 323B transducer. Transducers for both systems are mounted in a sonar dome for improved noise conditions at high ship's speed and in rough weather conditions. Depth readings were recorded manually every 5 min for post-cruise merging with navigation. Preliminary onsite water depths were estimated using data from the 12-kHz system.

After positioning the ship over a site and deploying the beacons, initial seafloor depths and the depth at which the bit should be placed to take the first (mudline) core were calculated using the 12-kHz echosounder data. This information is calculated using the initial 12-kHz depth reading, corrections for velocity of sound in water (Carter, 1980), the distance of the transducer from the dual elevator stool (DES) on the rig floor, and the ship's draft.

MAGNETIC FIELD INTENSITY

Measurements of total magnetic field intensity were collected along the ship's track using a Geometrics 801 proton-precession magnetometer. The sensor was towed approximately 400 m behind the ship and the data were recorded on a Sun workstation at 3-s intervals with a sensitivity of about 1 nT.

SEISMIC REFLECTION PROFILING

We used an 80-in^3 water gun as a seismic source for all three seismic surveys, except for a portion of the seismic survey over Site 976 where we used a 200-in^3 water gun (see "Site Geophysics" section, "Site 976" chapter, this volume). The seismic sources were towed approximately 20 m behind the stern at a depth of about 13 m. They were fired every 10 s at approximately 2000 psi (13.8 MPa). During the surveys the ship's speed was about 5 to 6 nmi/hr but fluctuated depending on the local direction and strength of the surface currents. A 100-m Teledyne Model 178 hydrophone streamer, containing 60 active hydrophones, was towed at a depth of 15–20 m. The midpoint of the active portion of the streamer lay 250 m astern. Analog seismic reflection data were displayed on two Raytheon Model 1807M LSR recorders. In real time, the signal from the streamer was digitized, displayed, and archived using "a2d" software running on a Sun workstation. The data were written to DAT (4 mm) and Exabyte (8 mm) tapes in SEGY format. Shipboard processing was performed using SIOSEIS seismic processing software.

ACQUISITION OF UNDERWAY GEOPHYSICAL DATA

Table 1 contains underway geophysical data. Detailed maps showing the location of the ship's track while collecting seismic data over Sites 975, 976, and 977 are shown in Figure 68 in the "Site 975" chapter, Figure 139 in the "Site 976" chapter, and Figure 2 in the "Site 977" chapter, this volume. Portions of the seismic data immediately over the drill sites and brief descriptions of the data can be found in the "Site Geophysics" sections in the "Site 975" and "Site 976" chapters, and in the "Background and Objectives" section in the "Site 977" chapter. The entire seismic reflection profile for each of the three seismic surveys is shown in Figure 1, back pocket.

[1]Comas, M.C., Zahn, R., Klaus, A., et al., 1996. *Proc. ODP, Init. Repts.,* 161: College Station, TX (Ocean Drilling Program).
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Table 1. Times and types of underway geophysics data collection during Leg 161.

Line Number	Start	End
Line 1T (transit)	Napoli, Italy	Site 974
PDRs (3.5 and 12 kHz)	1955, May 6	0150, May 7
Magnetics	2022, May 6	0113, May 7
Site 974*		
974A	1427, May 7	1500, May 7
974B	1530, May 7	2008, May 7
974C	2332, May 8	0915, May 9
974D	0001, May 11	0850, May 11
Line 2T (transit)	Site 974	Site 975 survey
PDRs (3.5 and 12 kHz)	1722, May 11	1630, May 13
Magnetics	1757, May 11	1514, May 13
Line 1S	Site 975 survey	Site 975 survey
PDRs (3.5 and 12 kHz)	1630, May 13	2130, May 13
Magnetics	1516, May 13	2130, May 13
Seismic reflection	1633, May 13	2132, May 13
Site 975*		
975A	0501, May 14	0541, May 14
975B	1026, May 14	1815, May 14
975C	0032, May 16	1254, May 16
975D	0957, May 18	1825, May 18
Line 3T (transit)	Site 975	Site 976 survey
PDRs (3.5 and 12 kHz)	0130, May 19	1335, May 20
Magnetics	0147, May 19	1335, May 20
Line 2S	Site 976 survey	Site 976 survey
PDRs (3.5 and 12 kHz)	1335, May 120	2130, May 20
Magnetics	1335, May 120	2156, May 20
Seismic reflection	1352, May 120	2143, May 20
Site 976*		
976A	0415, May 21	0631, May 21
976B	0801, May 21	1301, May 21
976C	2001, June 1	0850, June 2
976D	1030, June 3	1200, June 3
976E	0000, June 4	1831, June 4
Line 4T (transit)	Site 976	Site 977 survey
PDRs (3.5 and 12 kHz)	0625, June 8	1435, June 8
Magnetics	0648, June 8	1435, June 8
Line 3S	Site 977 survey	Site 977 survey
PDRs (3.5 and 12 kHz)	1435 June 8	2010, June 8
Magnetics	1435, June 8	1936, June 8
Seismic reflection	1435, June 8	1936, June 8
Site 977*		
977A	0900, June 9	1946, June 9
Line 5T (transit)	Site 977	Site 978
PDRs (3.5 and 12 kHz)	1215, June 15	1430, June 15
Site 978*		
978A	2100, June 15	0927, June 16
Line 6T (transit)	Site 978	Site 979
PDRs (3.5 and 12 kHz)	0020, June 21	0555, June 21
Magnetics	0032, June 21	0517, June 21
Site 979*		
979A	0936, June 21	2052, June 21
Line 7T (transit)	Site 979	Leith, Scotland
PDRs (3.5 and 12 kHz)	0540, June 25	1700, June 29
Magnetics	1348, June 26	2350, June 28

Note: PDR = precision depth recorder,* = times used to calculate final hole position.

REFERENCE

Carter, D.J.T., 1980. Echo-sounding correction tables (formerly Matthews' Tables): Taunton, Somerset, UK (Hydrographic Dept., Min. of Defence).

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