

4. UNDERWAY GEOPHYSICS¹

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EQUIPMENT AND METHODS

Navigation

Primary navigation data were acquired during Leg 159 using a Magnavox Transit/Global Positioning System (GPS) Satellite Navigator, Model MX1107 GPS, which is located in the Underway Geophysics Laboratory. The receiving aerial is located 28 m forward of the stern, 45 m aft of the drill floor, and 89 m aft of the ship's bridge. GPS fixes were available on an essentially continuous basis. All fixes, together with course and speed information, were recorded digitally using a Pentium PC computer system. A real-time navigation system, WINFROG, proved extremely useful while re-occupying existing seismic track lines and for deploying acoustic beacons.

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 a Raytheon correlator, while the 12-kHz system used a Raytheon PTR105B transceiver to drive an EDO323B transducer. Transducers for both systems were mounted in a sonar dome to reduce noise at high ship speed. Depth readings were recorded manually from the 12-kHz data every 5 min for post-cruise merging with navigational data.

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. Observations were made at 6-s intervals with a sensitivity of about 1 nT. Values were digitally recorded on a Sun SPARCstation computer. Manual log entries of magnetic field intensity were made every 30 min.

Seismic Reflection Profiling

Two Seismic Systems Inc. 200-in³ water guns were towed approximately 14 m apart and 46 m behind the stern. The guns were towed at a depth of about 13 m. They were fired simultaneously at approximately 2000 psi (13.8 MPa) at a uniform time interval of 12 s. The ship's speed was about 5–6 kt. 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 streamer lay 430 m astern. During the acquisition of the seismic data, the ship's origin in the WINFROG navigation system was switched from the ship's moon-

pool to the midpoint between the water guns and the center of the streamer (i.e., an offset of 311 m astern) so that the precise position of the seismic data being collected at any one time could be seen in real time.

Analog seismic reflection data were displayed on two Raytheon Model 180M LSR recorders. Recorder 1 displayed a 2-s sweep and was bandpass filtered from 30 to 150 Hz, and Recorder 2 displayed a 4-s sweep and also was bandpass filtered from 30 to 150 Hz. The seismic reflection data also were recorded digitally on a Sun SPARCstation computer using the a2d software package. The data were recorded in SEG Y format.

Seismic reflection data were recorded over the three principal proposed sites (IG1, IG2, and IG3) in a continuous survey (Table 1). The survey lines were designed to provide two passes across each site in a figure-eight layout (Fig. 1), and so that one pass coincided with a previously recorded multichannel seismic line. This provided greater accuracy in the sites' locations. This was necessary because the previous seismic surveys had been conducted prior to complete GPS coverage in the area, and accurate positioning was needed to satisfy hydrocarbon concerns raised by the JOIDES Pollution Prevention and Safety Panel. On the last pass across each site, the acoustic beacon for that site was deployed.

Details of the seismic data recorded at each site are given in the "Site Geophysics" sections of the site chapters in this volume.

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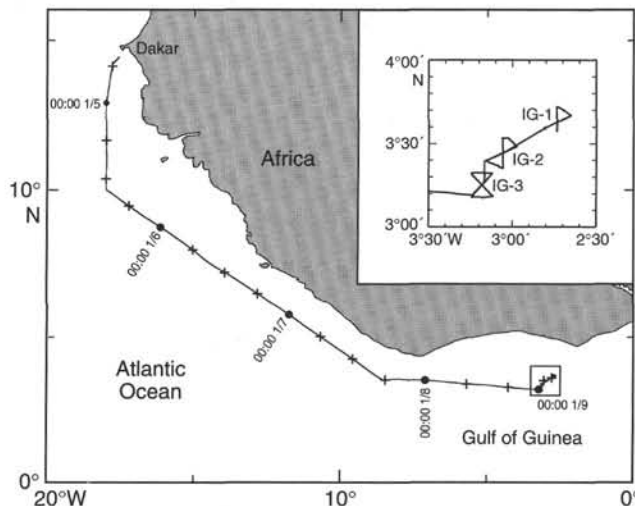


Figure 1. Leg 159 track chart showing the transit from Dakar and the seismic survey over the three proposed sites. The small box defines the area shown in greater detail in the inset, where single-channel data were acquired.

¹Mascle, J., Lohmann, G.P., Clift, P.D., et al., 1996. *Proc. ODP, Init. Repts.*, 159: College Station, TX (Ocean Drilling Program).

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Table 1. Leg 159 seismic survey log.

Date (1995)	Time (UTC)	Latitude (N)	Longitude (W)	PDR	Magnetics	Seismics	Comments
4 Jan	1530	14°33.64'	17°27.15'	On	Off	Off	3.5- and 12-kHz PDRs turned on
4 Jan	1700	4°19.59'	17°41.67'	On	On	Off	Magnetometer deployed
8 Jan	1600	3°12.25'	3°22.46'	On	Off	Off	Magnetometer recovered
8 Jan	1640	3°11.72'	3°18.19'	On	Off	On	Seismic gear deployed
8 Jan	1723	3°11.44'	3°14.05'	On	Off	On	Start of line IG3-1
8 Jan	1910	3°18.86'	3°07.60'	On	Off	On	End of line IG3-1
8 Jan	2038	3°18.78'	3°14.37'	On	Off	On	Start of line IG3-2
8 Jan	2219	3°11.52'	3°07.52'	On	Off	On	End of line IG3-2
9 Jan	0039	3°15.14'	3°10.92'	On	Off	On	Beacon deployed at site IG3
9 Jan	0242	3°24.45'	3°08.06'	On	Off	On	Start of line IG2-1
9 Jan	0427	3°28.69'	2°59.00'	On	Off	On	End of line IG2-1
9 Jan	0549	3°31.51'	3°03.46'	On	Off	On	Start of line IG2-2
9 Jan	0732	3°21.64'	3°00.00'	On	Off	On	End of line IG2-2
9 Jan	0944	3°26.59'	3°03.52'	On	Off	On	Beacon deployed at site IG2
9 Jan	1148	3°35.70'	2°48.65'	On	Off	On	Start of line IG1-1
9 Jan	1326	3°39.80'	2°39.58'	On	Off	On	End of line IG1-1
9 Jan	1547	3°36.63'	2°44.05'	On	Off	Off	End of line IG1-2; seismic gear recovered
9 Jan	1634	3°37.72'	2°44.08'	On	Off	Off	Beacon deployed at site IG1
9 Jan	2040	3°37.72'	2°44.08'	Off	Off	Off	PDRs turned off