3. UNDERWAY GEOPHYSICS[1]

Annik M. Myhre,[2] Jörn Thiede,[3] and John V. Firth[4]

INTRODUCTION

Underway geophysical measurements were made during Ocean Drilling Program (ODP) Leg 151, which began in St. John's, Newfoundland, Canada, on 29 July 1993 and ended in Reykjavik, Iceland, on 24 September after operations in the Iceland Plateau, Fram Strait, and Yermak Plateau regions. Bathymetric and magnetic measurements were performed during all transits. Single seismic reflection profiles were recorded only for site surveys and not during transit. We were underway 18 days (29.5% of the time) during the 61 days of Leg 151, spent 38.4 days at site (63%) and 4.7 days in port (7.5%). Instrumentation aboard the ship included two precision echo-sounders, a magnetometer, seismic reflection profilers, and a satellite-navigation system. The instruments were maintained and operated by the ODP marine technicians in cooperation with the scientific party and the officers and crew of SEDCO-FOREX, Inc.

NAVIGATION DATA

Navigation data were collected, based on the Global Positioning System (GPS) for real time positioning using the AGCNAV program (Atlantic Geoscience Center in Canada), in the underway geophysics lab generally on a 1-min (sometimes 2-min) interval output. Slave output was available elsewhere throughout the ship on the scratch server providing a real time plot of the ship's course. The GPS was the main method used to determine the ship's position during the cruise. However, Loran C stations were available as backup coverage at all sites. A Magnavox MX 1107 satellite navigation system (SATNAV) collected the primary navigation data. During transit and site survey, navigation was logged on the computer every 1 min. During site survey a hard copy printout with 1-min intervals was made. A plot of the general navigation for Leg 151 was generated from the GPS fixes.

BATHYMETRIC DATA RECORDING

Bathymetric data were obtained with both 3.5-kHz and 12-kHz echo-sounders using a Raytheon recorder system for the 3.5-kHz and an EDO 248C recorder for the 12-kHz instruments. Depending on the bottom sediments, the quality of the 3.5-kHz data was generally good, even on high-speed transit (10–11 kt), when the weather was calm, but became poor in heavy seas. At some of the site surveys with the reduced speed between 5 and 6 kt, we obtained exceptionally good quality high-resolution data. The single seismic reflection lines shot over the site locations and 3.5-kHz recordings are compiled on the foldout in the back of the book (Fig. 1, back pocket).

MAGNETICS

A Geometrics 801 proton precession magnetometer was towed between sites and along the transits from St. John's and also during site survey. The sensor was towed approximately 300 m behind the ship. The magnetic data were recorded in analog form on a graphic recorder in the header of seismic tapes (once per seismic shot during surveying), and manually every 5 min in the geophysics log.

SEISMIC-REFLECTION PROFILES

During Leg 151 seismic lines were collected as part of the site surveying for each site. As a source either an 80- or 200-in.^{3} water gun was used, depending on sediment thickness and drilling target. Sometimes both were deployed and tested before the site survey started to see which gun gave the best resolution for the sediment sequence (Table 1).

The streamer, a 100-m-long Teledyne containing 60 active sections, was deployed from the fantail and towed 500 m behind the vessel. No external depth depressors were used. The hydrophone elements were combined to procure a single signal.

The seismic system was supported by a super-micro 561 Masscomp computer as the central unit to record, process, and display the data. The Masscomp allowed data to be processed and displayed in real time on a 15-in.-wide Printronix, a high-resolution graphic printer (160 dots per inch). The raw data were recorded on a Cither tape, using an SEG-Y format and a density of 1600 bits/in. For all the seismic surveys the digital recording applied a zero-phase band-pass filter with a high cut of 250 Hz and a low cut of 20 Hz.

The seismic lines were displayed in the Printronix printer with the following parameters:

Traces per inch = 10
Clip high = 0.10 in.
Clip low = –0.10 in.
Deflection = 0.10 in.
Positive peaks to the right

Seismic data were also displayed in real time in analog format on two EDO 550 dry-paper recorders, using only streamers, an amplifier, and two band-pass filters (Table 1).

Other key elements:
80-in.^{3} gun deployed port
200-in.^{3} gun deployed starboard

Ms 151IR-103

[1]Myhre, A.M., Thiede, J., Firth, J.V., et al., 1995. *Proc. ODP, Init. Repts.*, 151: College Station, TX (Ocean Drilling Program).
[2]Department of Geology, University of Oslo, N-0316 Oslo, Norway.
[3]GEOMAR Research Center for Marine Geosciences, Wischhofstrasse 1-3, D-24148 Kiel, Federal Republic of Germany.
[4]Ocean Drilling Program, Texas A&M University Research Park, 1000 Discovery Drive, College Station, TX 77845, U.S.A.

Table 1. Recording parameters.

	Site 907	Site 908	Site 909	Site 910	Site 911	Site 912	Site 913	YERM 1D
Source	80 in.^{3}	80 in.^{3}	200 in.^{3}	80 in.^{3}	80 in.^{3}	200 in.^{3}	200 in.^{3}	200 in.^{3}
Streamer	Port	Port	Starboard	Port	Port	Starboard	Starboard	Starboard
EDO 1								
High cut	120	120	120	120	120	120	120	120
Low cut	30	20	20	30	20	20	15	20
Time windows (s)	0–4	1–5	3–7	0–4	0–4	0–4	0–4	0–4
EDO 2								
High cut	150	150	150	150	150	150	120	150
Low cut	50	50	40	50	50	30	30	30
Time windows (s)	2–4	0–4	3–7	0–4	0–4	0–4	0–4	0–4