3. UNDERWAY GEOPHYSICS[1]

Shipboard Scientific Party[2]

INTRODUCTION

Drilling sites for Leg 152 were selected on the basis of deep (7 s) multichannel seismic-reflection profiles and nonreversed, sonobuoy refraction profiles (Larsen, 1983). Additional high-resolution seismic profiles were acquired in 1992 (Larsen, 1993, and "Pre-cruise Site Survey" chapter, this volume). These profiles cover an area that extends from the shelf to the deep sea, with the sites located approximately along a central line.

Underway geophysical data comprising navigation, bathymetry, 3.5-kHz sub-bottom profiling, and magnetics were acquired during Leg 152 en route to and from the drilling sites along tracks shown in Figure 1. Furthermore, a seismic-reflection profile approximately 20 km long was acquired along a track that passed Site 914 (Fig. 2). The primary purpose of this site-survey line was to verify the identification of the drilling site by comparing these data with previously acquired seismic data (Fig. 3).

SHIPBOARD UNDERWAY GEOPHYSICAL DATA

The *JOIDES Resolution* is equipped to acquire, display, and process single-channel, seismic-reflection, and sonobuoy refraction seismic data, as well as sub-bottom profiling, bathymetric, magnetic, and navigation data. Digital logging makes these data available for real-time and post-cruise processing. Navigation, bathymetric, sub-bottom profiling, and magnetic data are routinely edited and corrected by the Geological Data Center (GDC) at the Scripps Institution of Oceanography under contract to the Ocean Drilling Program. Merged digital data are produced in MGD77 exchange format and made available, together with microfilm copies of all original analog records, to the ODP Data Bank at Lamont-Doherty Earth Observatory, Palisades, New York, and to the National Geophysical Data Center, Boulder, Colorado.

NAVIGATION

Navigation data were acquired using a Magnavox Transit/GPS satellite navigator, Model MX1107GPS, located in the Underway Geophysics Laboratory (Fig. 4). Additional satellite-based navigation systems and a Loran-C system were installed on the bridge. Position coordinates were logged on the Masscomp 561 computer system on disk every 10 min en route and every 1 min during the profiling over the drill sites. Normally, the ship's cruising speed was 9 to 10 kt. During acquisition of the seismic-reflection profile, the ship's speed was kept at about 6 kt.

MAGNETISM

The total intensity of Earth's magnetic field was measured by a Geometrics 801 proton magnetometer. The sonde was towed approximately 490 m astern. En route, data were digitally recorded every minute and continuously displayed on a graphic recorder. During acquisition of the seismic-reflection profile, data were recorded every 10 s; furthermore, the readings at the shotpoints were stored in the seismic header records.

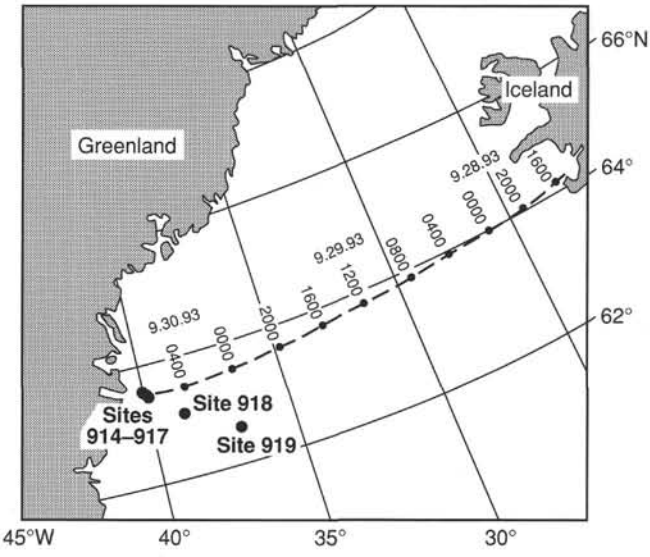

Figure 1. Leg 152 track lines with acquisition of 12-kHz bathymetric, 3.5-kHz sub-bottom profiling, and proton magnetometer data.

BATHYMETRY AND SUB-BOTTOM PROFILING

Sub-bottom profile and bathymetric data were acquired with 3.5- and 12-kHz Raytheon PTR 105B systems. Data from both systems were displayed on line-scanning recorders (Raytheon Model 1807 M) having a sweep rate of 1 s. Both systems were operated with a Cesp-III correlator. Transducers for these systems are mounted in a sonar dome, which reduces noise from turbulent and bubble-filled water at high ship's speed and in rough weather conditions. This sonar dome is mounted under the bottom of the ship, below the bridge (Fig. 4).

Because the seabed was a strong reflector at Site 914, the sub-bottom profile on the site-survey line was acquired with an EDO248C system, operated with a source booster to improve depth penetration.

SEISMIC-REFLECTION PROFILING

The acoustic source for the seismic profile at Site 914 was a 200-in.^{3} water gun (Seismic Systems Inc.), operated at a pressure of ≈2000 psi. The gun was towed ≈24 m behind the vessel at a depth of ≈10 m (Fig. 4). Firing rate was 10 s, which produced shotpoints at 25- to 30-m intervals. The seismic signals were received with a series-coupled, 60 hydrophone, 100-m-long streamer (Teledyne Model 178). Because of the shallow water at Site 914, the center of the active section of the streamer was towed 115 m behind the vessel. The depth of the streamer was not recorded because of failure in the electronic system, but we estimated it to be 15 m (Fig. 4).

[1] Larsen, H.C., Saunders, A.D., Clift, P.D., et al., 1994. *Proc. ODP, Init. Repts.,* 152: College Station, TX (Ocean Drilling Program).

[2] Shipboard Scientific Party is as given in list of participants preceding the contents.

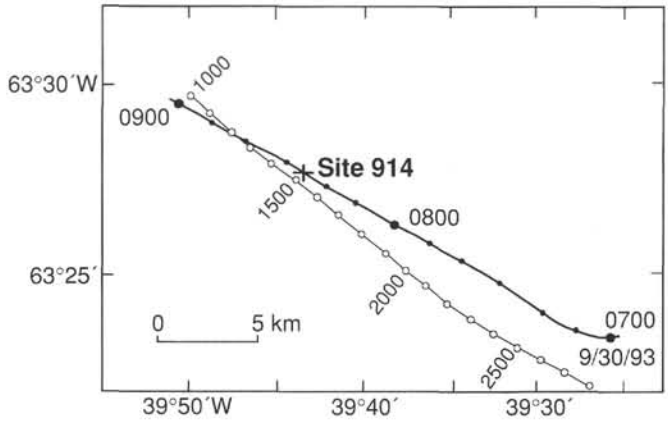

Figure 2. Location of seismic-reflection profile acquired during Leg 152 at Site 914 (heavy line). Also shown are the locations of the pre-cruise profiles (thin line).

After electronic amplification and bandpass filtering (30–150 Hz), the seismic data were displayed in real time on Raytheon Model 1807M LSR recorders. Digital data were recorded at a 1-ms sampling rate using a Masscomp 561-based acquisition system. A digital bandpass filter (25–250 Hz) was applied to the data before storage. Data were stored in SEG-Y format on nine-track tape having a packing density of 1600 bpi. The data were processed on board the ship and are displayed in scales comparable to the scales of the pre-cruise site survey profiles (Fig. 3).

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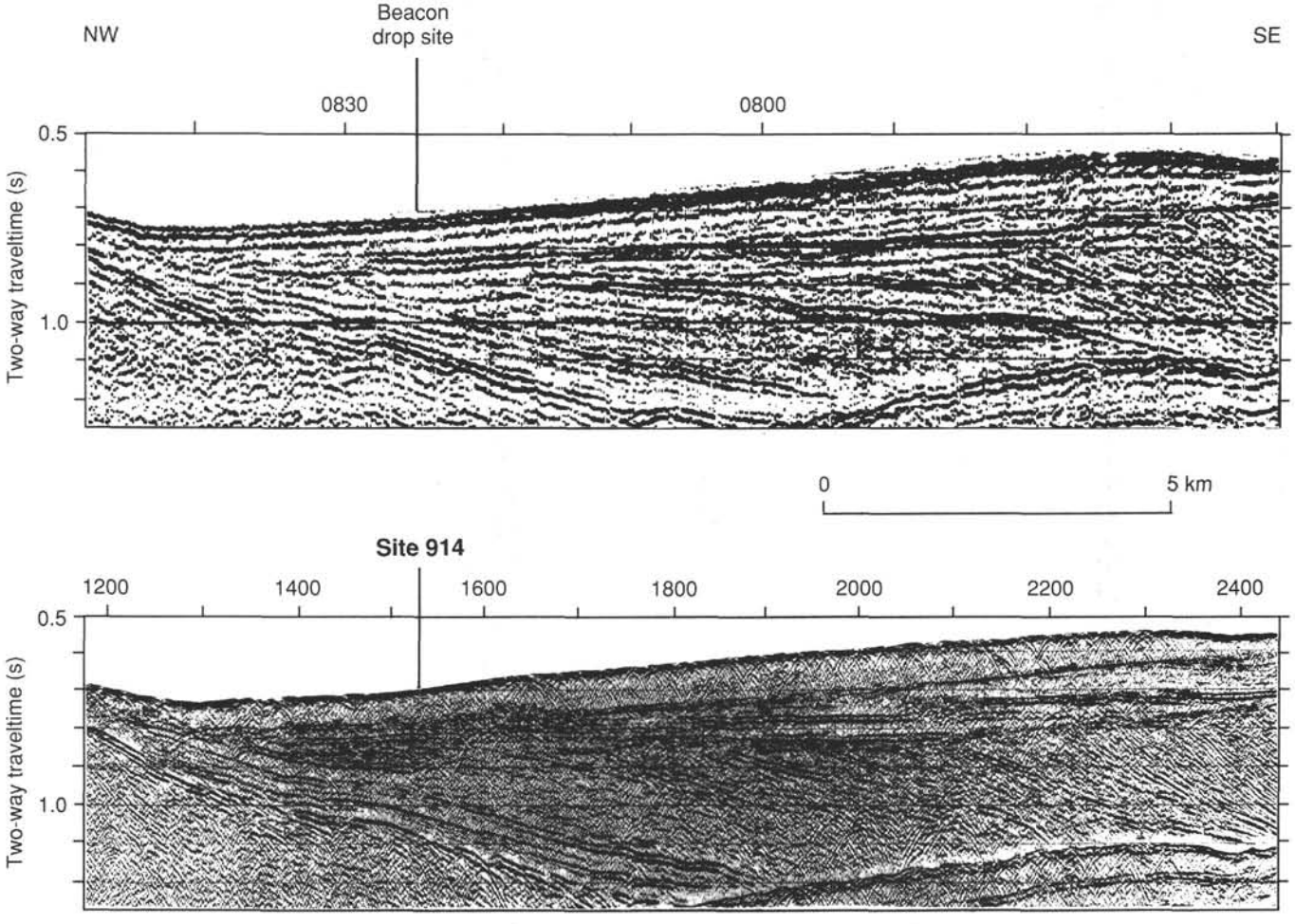

Figure 3. Underway single-channel reflection seismic profile (upper part of figure). Numbers on the horizontal scale indicate shooting time (UTC) on 30 September 1993. Time distance between tick marks is 10 min (cf. Fig. 2). Pre-cruise profile EG92-24 in the vicinity of Site 914 (lower part of figure). Location is shown in Figure 2.

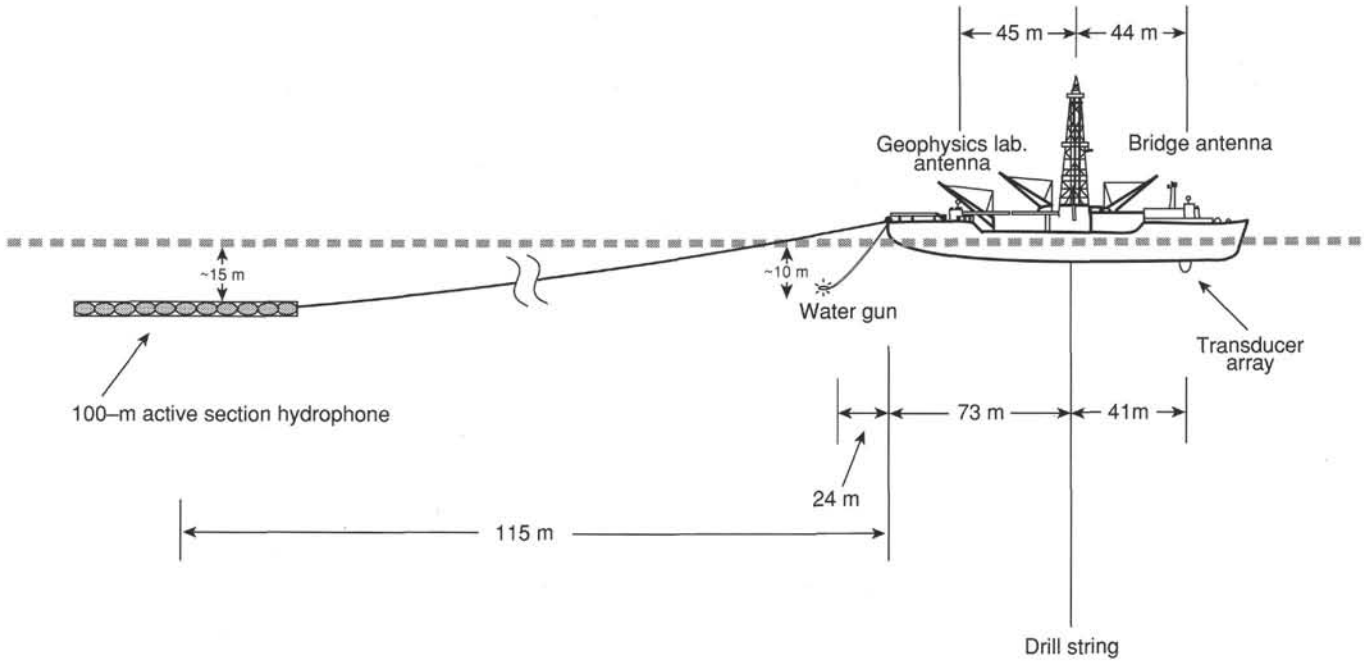

Figure 4. Positions of geophysical and navigational elements relative to drill string on board the *JOIDES Resolution*.