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Seismic Refraction Survey in the Ross Sea Ross-Victoria Land Area,
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The U.S. Geological Survey carried out a marine seismic refraction experiment in cooperation with marine and land seismic refraction work in North Victoria Land and the Ross Sea with Ohio State University, University of Hamburg, and the German Federal Institute for Geosciences and Resources (BGR). The work was done from the R/V Polar Queen, an ice strengthened ship operating in the area and supporting GANOVEX XV field work in North Victoria Land for BGR and other US-NSF supported projects. Figure 1 shows the area of the survey and the locations of the seismic refraction lines obtained. USGS operated four ocean bottom seismometers (OBS) along the marine portions of the lines. These instruments were deployed and recovered using acoustic transponder release mechanisms in combination with ocean bottom hydrophones deployed by University of Hamburg researchers. BGR supplied navigation and airgun systems to fire at approximately 250 meter intervals along the indicated lines. Preliminary playback of the marine data on our instruments and the Hamburg instruments indicated that energy was received on the marine lines shown. We know from results recorded by Dr. D. O'Connell, (Ohio State University) (Project S065) that energy was recorded at least as far as 170 kilometers from shot points.

Sonobuoy data were collected by USGS continually on all of the lines shown. Gravity profiles, as well as 3.5 kHz profiles and single channel seismic reflection profiles were obtained throughout the area by the BGR geophysics program.

The marine results obtained by our group and the Hamburg group should allow us to determine crustal thickness in the Victoria Land basin and the Central basin in the Ross Sea part of the West Antarctic rift system. We hope also that marine shots fired as part of our cruise will enable the Ohio State group and the Hamburg group, using data recorded on the land portions in Figure 1, to obtain crustal thickness crossing the transition from West to East Antarctica as well. Locations of the lines shown in Figure 1 were determined from results from the US Geological Survey cruise of the S.P. Lee in 1984 (Cooper et al., 1986) and BGR multichannel seismic reflection lines in the

area of the lines 2, 3, 4S and 6. The 1984-85 aeromagnetic survey was also used extensively in planning the locations of the lines.

Sea ice difficulties prevented the locations of the original lines as originally proposed by BGR, USGS and Ohio State University researchers. The Victoria land basin (Cooper et al., 1986) was ice covered with the exception of the polyna near Gondwana station (Figure 1). The open sea area covered essentially line 5 and the seaward portion of line 1. The area of the central Ross Sea however, was ice free and that allowed the planning and carrying out of the marine survey of lines 2,3,4S and 6. Subsequent to the completion of these lines in the central Ross Sea, positions were communicated to the Italian geophysical survey ship operating in late January and February so that they were able to obtain multichannel seismic reflection profiles along some of these.

The most severe difficulties encountered were related to failure on a number of occasions of the release mechanisms on the instruments of both University of Hamburg and USGS. Ultimately USGS failed to retrieve three of our four instruments and the University of Hamburg lost eleven of their ocean bottom hydrophones. The reasons for failure to release were not in the acoustic transponder system, clocks or navigation. Before future work of this sort is planned in the Ross sea or other Antarctic marine areas the difficulties we encountered should be studied carefully in an attempt to prevent future loss of instruments.

The USGS party consisted of Dr. Anne Trehu on detail to the USGS from Oregon State University, Martin Uyesugi, of Seakem Ltd, Patrick Hart USGS, and John Behrendt USGS Party Chief and Co-Chief Scientist of the marine survey. Arrangements were made with the University of Hamburg geophysicists and the land geophysicists to exchange all of the digital data after this portion of the data reduction is accomplished, and to work on joint interpretations.

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