

PRELIMINARY SURVEYS OF THE ANTARCTIC CONTINENTAL SHELF BY A SEISMIC PROFILER IN AMUNDSEN BAY AND LÜTZOW-HOLM BAY

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Abstract: A preliminary sonic prospecting by a sparker system was carried out on the Antarctic continental shelf on board the icebreaker FUJI. The results are as follows: 1) A ridge which seems to be a drowned lateral moraine was found in Amundsen Bay, 2) the broad rise north-northwest of the Ongul Islands is an erosional surface, at least its northern part.

1. Introduction

Sonic prospecting of the Antarctic continental shelf is one of the important methods for the studies of submarine geomorphology and geology. But it has been hardly carried out by the Japanese Antarctic Research Expedition (JARE), because

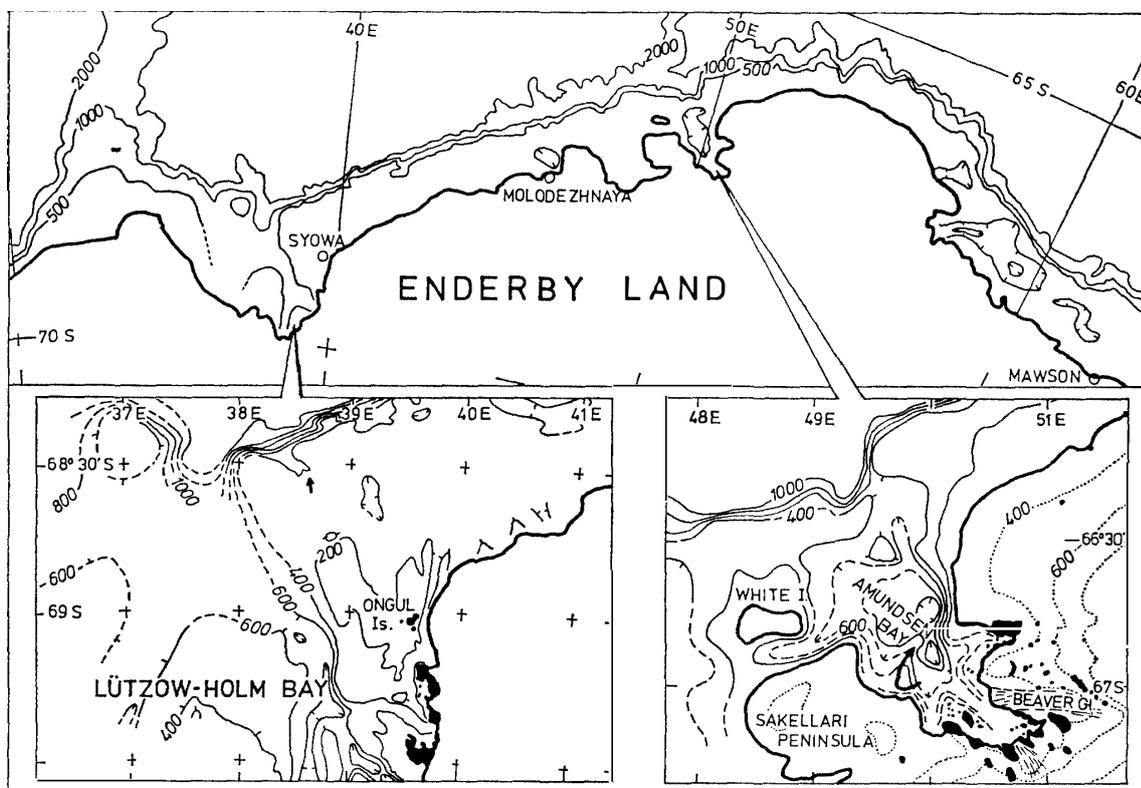


Fig. 1. Location maps and submarine topography of surveyed areas. Tracks of seismic profiling are shown by arrows.

the sea ice covers most part of the continental shelf off Enderby Land even in summer, and obstructs such survey as sonic prospecting by towing sensors. The author carried out preliminary surveys of sonic prospecting with the EG & G sparker system in a polynya of Lützow-Holm Bay and in the open water of Amundsen Bay on the continental shelf off Enderby Land (Fig. 1) from the icebreaker FUJI in JARE-22 (1981) and JARE-23 (1982).

2. Seismic Profile in Amundsen Bay

The investigation was done on 16 February 1982. Depressions deeper than 1000 m exist in the central part of Amundsen Bay. They seem to be parts of a drowned glacial trough (YOSHIDA *et al.*, 1964). The author tried to obtain a seismic profile crossing one of the depressions at first, but could not get it because the water was too deep for instruments. Therefore, the seismic profiling was conducted on a cruise course which was access to and away from the west coast of Amundsen Bay. Submarine topography of most part of this area was not known at that time. But, as a result, this course crossed a western wall of the drowned glacial trough and traversed longitudinally on a western rise running parallel with a glacial trough. The total length of the seismic profile is 18 km (Figs. 2, 3).

The western wall of the drowned glacial trough is steep and an angle of its upper part attains to 30°. The surface of the rise west of the trough is rather flat and deepens gradually toward north-northeast. A low and gentle ridge composed of sedi-

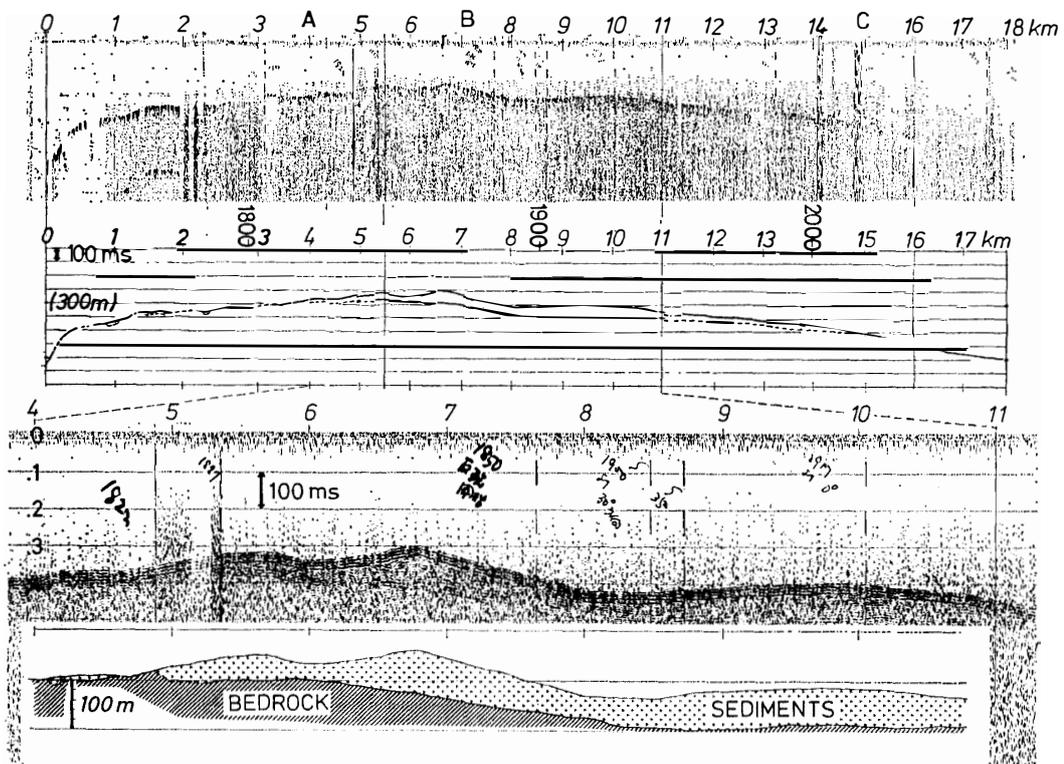


Fig. 2. Seismic profile and its interpretative section in Amundsen Bay. Its track is shown in Figs. 1 and 3.

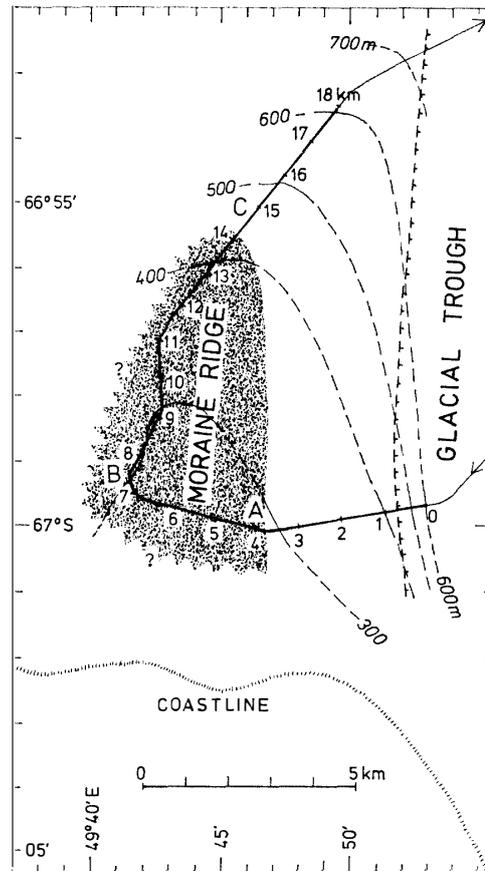


Fig. 3. Track of seismic profiling in Amundsen Bay and location of moraine ridge. The seismic profile is shown in Fig. 2.

ments exists on that rise and extends in the NNE-SSW direction for about 10 km from the present coastline (Fig. 3). In Fig. 2, profile A-B seems to be a cross profile of this ridge and profile B-C a longitudinal one. Sound velocity of these sediments was not measured, but, assuming it being between 1.6 and 2.0 km/s (HAUGLAND, 1982), the thickness of a sediment layer is estimated to be between 75 and 90 m in the thickest part. The sediment layer becomes thinner gradually toward north-northeast. Figure 2 shows profiles of the surfaces of sediments and bedrock on the basis of the assumption that the velocity of sediments is 2.0 km/s. It shows that the surface of bedrock is extremely flat. Judging from its location and shape, the ridge seems to be a drowned lateral moraine formed by an ice stream which flowed from the south during the past ice expansion.

3. Seismic Profile in the Western Part of Lützow-Holm Bay

In Lützow-Holm Bay, the author was able to get only short and piecemeal profiles because this operation was carried out in a small polynya and minor instrumental troubles occurred at that time. The investigation was done on 15 January 1981. The total length of the profile is 3 km (Fig. 4). The resolution of the sparker seems to be 5 m in this profile.

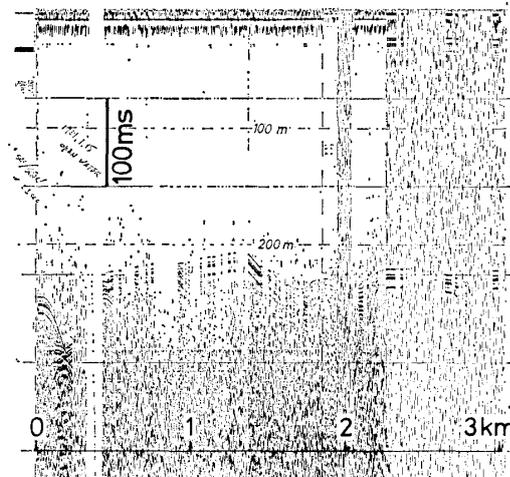


Fig. 4. Seismic profile in the northeastern part of Lützow-Holm Bay. Its track is shown in Fig. 1.

The sea floor investigated is situated on a broad rise extending in the NNW direction from the Ongul Islands and inferred to be overlain by little deposits (FUJIWARA, 1971; MORIWAKI and YOSHIDA, 1983; Fig. 1). The seismic profile shows that sediments thicker than 5 m, which is the resolution value of this sparker, do not overlie on the sea floor except in a few depressions. In other words, this sea floor was confirmed to be a surface of bedrock which might have been a remnant of a former peneplain glaciated by the past ice sheet (FUJIWARA, 1971; MORIWAKI and YOSHIDA, 1983).

4. Summary

The broad rise extending in the direction of NNW from the Ongul Islands in Lützow-Holm Bay is an erosional surface, at least its northern part. In Amundsen Bay, the low and gentle ridge which seems to be a drowned lateral moraine exists along the upper edge of the drowned glacial trough.

This preliminary survey was carried out in a very short time and in a very small area, but it could obtain some information as to glaciation on the Antarctic continental shelf. It proves that the systematic sparker profiling on the continental shelf is useful for the elucidation of the process of change of the ice sheet.

Acknowledgments

I wish to express my hearty gratitude to Mr. T. ASANUMA who suggested me how to operate and analyze for sonic prospecting. I also wish to thank Mr. T. NAGAO, a member of JARE-22, and the crew of the icebreaker FUJI commanded by captains S. NEI (JARE-22) and S. TAKEUCHI (JARE-23). They supported pleasantly this work. I thank Prof. Y. YOSHIDA of the National Institute of Polar Research who drafted the seismic prospecting on the Antarctic continental shelf in JARE and gave me the chance of its execution.

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(Received March 29, 1984; Revised manuscript received May 16, 1984)