ECHO SOUNDING AND BATHYMETRIC CHART IN THE ANTARCTIC OCEAN*

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南極洋における Bathymetric Chart について*

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Introduction The depth in the Antarctic ocean is generally from 3,000 to 4,000 meters except near Antarctica. But there are three sea basins that are known by the name of the Pacific Antarctic Basin, Indian Ocean Antarctic Basin and Atlantic Antarctic Basin, in the bottom of attains a depth of about 5,000 meters. The deepest part of the Antactic ocean is the "Meteor abyss," 8,200 meters deep, which is situated in the north east side of South Sandwitch Islands.

Though in the continental shelf there are comparably shallower banks, the survey ship cannot easily approach there, being obstructed her way by the pack ice.

In 1951, from Aug. 21 to Sept. 1, the ninth general assembly of the land survey and geophysics was in session, when the committee of ocean topographical chart adopted a resolusion concerning the ocean topography. On Mar. 1, 1951, as the first work of its resolution, the Antarctic bathymetric chart(Lat. 64°–69°S.,Long. 0°–90°E.) was produced by the International Hydrographic Bureau (Monaco) after analysing 7023 points which were served by H. M. S. Challenger (1873–1894) and other eleven Antarctic research vessels as Table 1. This chart was based upon the 117 measured points: the chart in 1903 was only 9 measured points recorded. The bathymetric chart produce in Mar. of 1954 is projected by Mercator's method with 1:5,109,400 in scale on the parallel of Lat. 59°20′S. and it covers the area of Lat. 46°40′S.–72°00′S., Long. 0°–90°E.

Table 1. Ships engaged in the bathymetric survey in the Antarctic ocean.

Ship's name	Year	Nationality
H. M. S. Challenger	1873–1874	Britain
Valdivia	1899	Germany
Gauss	1901–1903	〃
Planet	1906	〃
R. R. S. Discovery	1926	Britain
Meteor	1926	Germany
Norvegia	1930–1931	Norway
S.Y. Discovery	1929–1931	Britain
R. R. S. Discovery	1930, 1931 1939, 1951	〃
S. S. Thorshavn	1933–1935	Norway
M. S. Schwabenland	1939	Germany
Commandant-Charcot	1950	France

As this chart is wanting in measured points in the vicinity of Gunnerus Bank, we surveyed again in order to clear the uncertainty of topography there.

Description Our research ship "Umitakamaru" belonging to the Tokyo University of Fisheries had been engaged in sounding at the area of Lat. 64°–69°S., Long. 20°–55°E. and on the way from Cape of Good Hope to Enderby

land and on the way back from Cook Peninsular to Cape of Good Hope. Then the newly sounding points were added to the bathymetric chart described above as the plate followed.

The echo sounding machine was newly designed by Kaijo electric Co. Ltd. for this purpose using 20 kc frequency supersonic wave. This machine used the assumed sound velocity through the water as 1,500 m/s.

The transducer of this machine is in the use of magnetostriction method. The recording atlas is moved in uniform speed upon the recording roller by making use of A. C. uniform velocity motor. And the fluctuation of the voltage of this machine is controlled lower than 0.4% of the voltage.

The depth correction must be done concerning with mechanical error, tide and the variation of sound velocity with temperature and density of each layer along the sound path.

Mechanical error was adjusted, but the correction of range of tides could not be adapted, because it had not been known in these area. Only the error caused by the variation of sound velocity was corrected by computation. Sound velocity was calculated by density, compressibility, and Cp/Cv.

Compressibility and density were given by the result of the oceanographic observation. In the Antarctic ocean, variety of the sound velocity was not so large that the corrections were computed is as follows:

$$C = D\left(1 - \frac{1500\,dz/v}{D}\right).$$

where, C is correction, D true depth, v sound velocity at that layer whose depth is z. The accuracy was confirmed on Gunnerus Bank (872 m) by comparing the depths obtained by echo sounding and sounding wire. Indicated depths, corrections and depths corrected were presented on appendix. Especially in order to confirm the topography near Gunnerus Bank, many soundings were performed, the results is on Fig. 1. (Mercator's project 1:5,109,400 at Lat. 59°20′S). The plate has been added to the depth sounding results on the chart published on Mar. 1, 1954 at I. H. B. If the more sufficient survey should be done, the bathymetric chart in the Antarctic ocean between Long. 20° and 55°E would be complished.
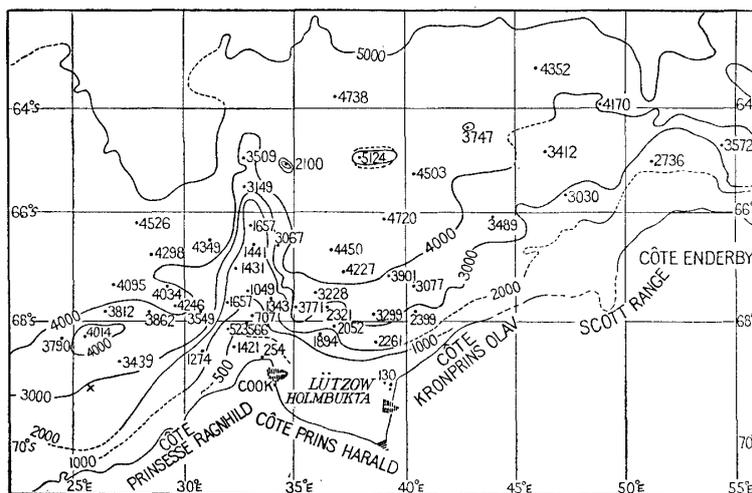

Fig. 1. Bathymetric chart in the vicinity of Gunnerus Bank. (Mercator projection of 1:5,109,400 in scale which is based on the parallel of Lat. 59°-20′S.) Sounded by Umitaka-maru (1957).