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General Report on the Japanese Antarctic Research Expedition II, 1957–58.

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Following the Japanese Antarctic Research Expedition I, 1956–57, and acting on the resolution of the SCAR in Paris, 1956, a second expedition was planned for the purpose of scientific research in the following fields: cosmic-rays, aurora, night airglow, ionosphere, geomagnetism, meteorology, oceanography, glaciology, geology, geography, gravity and biology.

At the end of the first expedition in 1956–57 a wintering party of eleven members remained in Antarctica from February 1957 to February 1958, and accomplished preliminary research in cosmic-rays and auroral phenomena at the Japanese Base ($69^{\circ}0'22''$ S, $39^{\circ}35'24''$ E), and in geology and glaciology along the Prince Harald Coast. In the second expedition of 1957–58 it was planned to replace these eleven by another team of twenty men who would carry out the full IGY program from February 1958 to February 1959.

A total of 647 tons, 1643 m^3 , of supplies were prepared for this project, including 62 tons, 213 m^3 , of scientific instruments, 131 tons, 520 m^3 , of logistic equipment, 65 tons, 287 m^3 , of housing materials, 174 tons, 290 m^3 , of food, and 215 tons, 333 m^3 , of fuel. The expedition ship "Soya" was also strengthened to increase her ice-breaking power up to pack ice of 1.2 m in thickness.

From the experience of the first expedition it was felt that in spite of the Soya's small ice-breaking capacity the summer condition of the pack ice in Lützow-Holm Bay would be suitable for her attempt if the date of arrival was about twenty days earlier than that of the first expedition on January 24 th, 1957.

"Soya" left Tokyo on October 21 st, 1957, and after calling at Singapore from November 3 rd to 8 th and Cape Town from December 2 nd to 9 th, passed through the Antarctic convergency on December 17 th following a SSE course linking the points $44^{\circ}09'$ S, $28^{\circ}16'$ E and $54^{\circ}13'$ S, $39^{\circ}40'$ E. She arrived at the edge of the pack ice off Enderby Land, $64^{\circ}11'$ S, $53^{\circ}48'$ E, on December 20 th.

It was discovered by helicopter reconnaissance on December 22 nd that the width of the pack ice along Prince Olav Coast near the 45° E meridian was about 250 km, compared with only about 160 km on January 8 th of the previous year. It was also found from meteorological observations carried out throughout the expedition that, as the Antarctic convergency spread as far southward as 60° S because of the weakness of the high pressure of the polar cap covering Enderby Land, atmospheric low pressure areas frequently penetrated the pack ice zone.

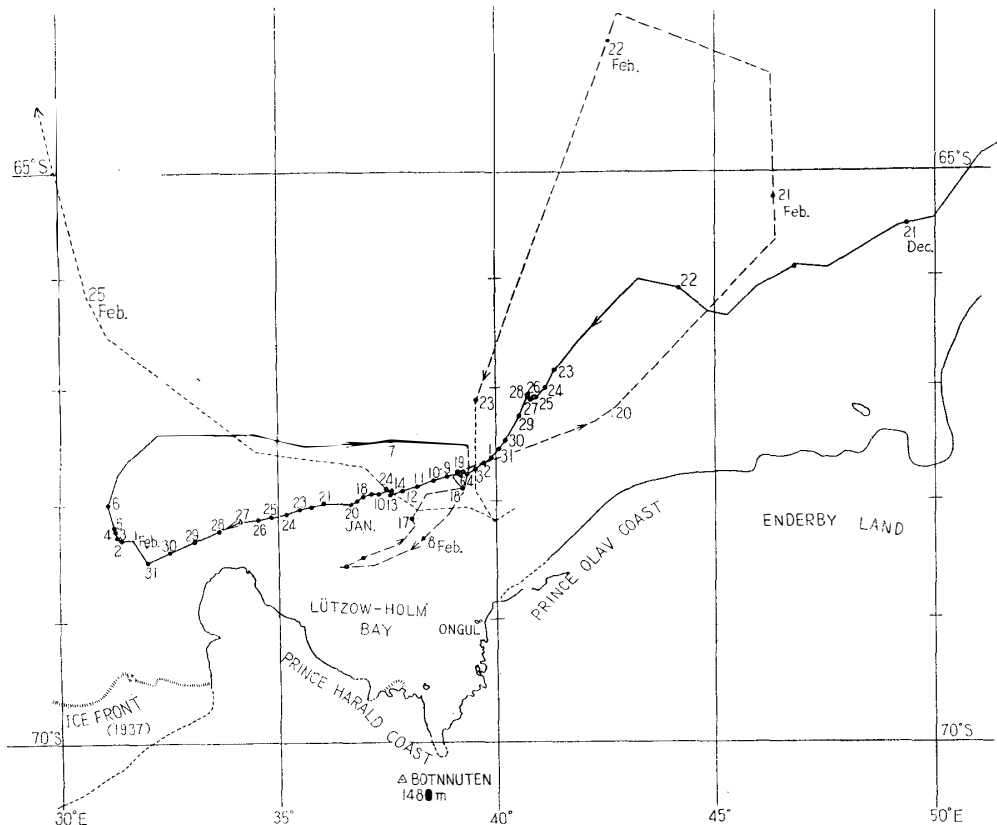
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Weather conditions from December 20 th to 30 th were fairly mild: mean temperature was -1.5°C , mean water temperature was -1.5°C , and mean wind velocity was 3.5 m/s. The main wind direction was NE, however, which caused the pack ice to close up until the end of the month.

For these reasons, even though the construction of the Beaver airplane was completed between December 21 st and 24 th, hardly any calm open water or large leads into the pack ice could be found from which it might take off for long distance reconnaissance. However, as it was thought that there would be some open lead or crack linking the weak points in the pack ice along the 40°E meridian on the east side of Lützow-Holm Bay by which the ship might reach the vicinity of Ongul Island where the Japanese Base had been established, it was felt that some southward progress along the 40°E line would be possible when the wind changed from E to S.

On December 26 th, at the position $67^{\circ}04' \text{S}$, $40^{\circ}50' \text{E}$, wireless communication was first established between the ship and the Japanese Antarctic Base, and from that time onwards meteorological data from the Syowa Base and from a few foreign bases such as Mawson and Mirny were used for weather forecasting.

Two great storms were experienced on December 31 st, 1957, at $67^{\circ}27' \text{S}$, $40^{\circ}14' \text{E}$, and on January 9 th, 1958, at $67^{\circ}46' \text{S}$, $38^{\circ}54' \text{E}$, lasting about three days.



Map showing the field of the operation of the Japanese Antarctic Research Expedition II, 1957-58.

Maximum wind velocities were 14.7 m/s and 18.0 m/s, respectively, and the wind was ENE in both cases. As a result of these two storms the pack ice was heaped up to a height of 3 m above sea level, and "Soya" was completely locked in.

By the middle of January the pack ice surrounding the ship which had drifted westward with an average velocity of 0.1–0.2 knots due to the bay current and the surface wind force of the east component, was estimated to be 100 sq km in area. Fig. 1 shows the drift course of the ship. While drifting observations were made of the geomagnetic field by means of an earth-inductor and a proton-magnetometer, of the gravity by means of a Worden gravimeter, of the sea-water temperature and of the depth of the sea-bottom, and analyses were carried out of the chemical content and the radio-activity of sea-water, ice and air. The results will be reported elsewhere in this series of publications.

The original plan of the second expedition called for the ship to arrive at the fast ice on the west side of Ongul Island, 69°00' S, 39°35' E, on January 8th, 1958, and begin to transport the 20 members of the wintering party and 433 tons of cargo. By the end of January a reduced plan had to be decided upon, so three tentative plans were drawn up according to the possible time of landing and period of stay at the fast ice. These plans called for transportation of 422 tons of supplies and 20 new members in case of 11 days stay, 344 tons and 19 members in case of 10 days, 288 tons and 16 members in case of 9 days, and 107 tons and 11 members in case of only 5 days.

In February the weather was like the beginning of the Antarctic winter season. The mean temperature fell to -5°C , and the mean wind velocity was 4 m/s. Fortunately, however, the wind direction had changed to SW or WSW, which often released the heaped ice and caused many cracks and open stretches of water. Also, passing off Riiser-Larsen Peninsula, 35°E, the bay current with its west component gradually changed its direction to the south-west and the pack ice began to diffuse out of the bay. On February 6th, "Soya" succeeded in getting free of the pack ice at 67°53' S, 31°02' E.

At the end of January, the Japanese Antarctic Committee had requested the help of the U. S. Navy in getting "Soya" free of the ice, rescuing the wintering team from the Syowa Base, and completing the mission of the second expedition. The U. S. Navy had dispatched the ice-breaker "Burton Island" to Lützow-Holm Bay for this purpose from Knox Coast, 107°E. On the evening of February 7th, the two ships met at 67°57' S, 39°19' E, and a meeting attended by Cmdr BRANTINGHAM of "Burton Island", Capt. M. MATSUMOTO of "Soya", and Prof. T. NAGATA, Expedition Leader, was held to replan the operation. It was decided to first rescue the wintering team at the Syowa Base, and then transport personnel and supplies necessary for the second wintering program.

The two vessels then proceeded southward into the pack ice along a long open lead about 2 km in width. Unfortunately this lead closed in at 68°31' S, 37°12' E,

and in spite of reconnaissance by helicopters from "Burton Island" no alternative route was found leading to the east side of Lützow-Holm Bay. It was found possible, however, to anchor at the north side of the lead and rescue the wintering team by air because of the flat surface of the pack ice which was about 3 m thick. The distance to Ongul Island was about 60 miles, but the surface condition of the sea ice between the south side of the lead and Ongul Island was at first considered feasible for transportation by snow-cars and snow-sledges. Actual reconnaissance by snow-cars showed, however, that there were too many pressure ridges and cracks for the first twelve miles southeastward, making it difficult to cross in the snowcars, although from that point on to Ongul Island there was fast ice of 1 or 2 meters in thickness.

Ten flights were made between February 10 th and 14 th. The members of the first wintering team were rescued together with seven puppies and their mother, and the samples collected in the vicinity of the Syowa Base, rocks, ice, plants specimens and animals, were brought out.

In spite of every effort to transport the planned minimum of 7 new members and 10 tons of supplies, food, fuel and clothing, only 2.7 tons were able to be carried in.

Meanwhile the lead surrounding the two ships was gradually freezing and the east and west ends were increasing in height, so operations had to be suspended to avoid both vessels being locked in. Since February 11 th the wind had again changed from S to ENE or E, and frequently there was a mean wind velocity of over 10 meters.

After escaping from this freezing lead, one last operation was planned in an attempt to reach Ongul Island by airplane from the open sea. Thanks to strenuous ice breaking by "Burton Island", on February 17 th "Soya" was able to reach the outside of the pack ice at $67^{\circ}58' S$, $38^{\circ}16' E$. At this time, however, it was forecast that two large low pressure areas would pass through the vicinity of this point, so course was changed northwards to avoid the storms, and from February 19 th to 23 rd the two ships drifted far from the edge of the pack ice. Maximum wind velocity during these storms was 25.2 m/s from ENE, and the minimum pressure was 982.0 mb, the lowest experienced during the entire period of operations.

By this time, because of the Soya's limited water supply and fuel, it was agreed with "Burton Island" that the final operation should be continued only until February 24 th. The reduced minimum plan agreed on was to fly in the seven members of the new wintering team and an additional 1.5 tons of supplies by at least five flights from outside the pack ice zone to Ongul Island, a distance of about 100 km.

On the 24 th of February, however, due to the after effects of the storms, the surface of the sea proved to be insufficiently calm, so the last attempt to reach

the Antarctic base had to be given up at the position 68°00' S, 39°29' E. It was an occasion of deep regret to the members of the expedition that they had not been able to complete their mission successfully, but the condition of the ice in Lützow-Holm Bay was bad compared with that during the first expedition of 1956-57.

After expressing sincere thanks to "Burton Island" for her hearty co-operation during the long operation, "Soya" followed the same course homeward via Cape Town and Singapore, arriving in Tokyo on April 28 th, 1958. Prof. T. NAGATA and the eleven members of the first wintering team returned to Japan in advance on March 24 th, having flown from Cape Town via Rome.

第2次南極地域観測隊行動概要

原 田 美 道

要 旨

第2次観測隊は宇宙線, 極光・夜光, 電離層, 地磁気, 気象, 海洋, 氷河, 重力, 生物の船上及び基地観測と第1次越冬隊員にかわる 20 名の越冬隊員を残すことを目的とした。

宗谷は 1957 年 10 月 21 日東京港を出港し, 12 月 20 日 Enderby Land 沖 64°11'S, 53°48'E で浮氷縁に到達したが, 氷状及び気候条件が悪く, 1958 年 1 月初めより宗谷は流氷群に全くとじこ

められた(第1図参照)。2 月 6 日, 宗谷は浮氷域を脱し, アメリカ海軍砕氷艦 Burton Island 号の援助を受けて第1次越冬隊の救出及び第2次越冬隊をのこすための輸送に努力したが, 残念ながら第2次越冬隊の輸送には成功せず, 第1次越冬隊の救出のみに終った。2 月 24 日を以て南極地域における活動は打ち切られ, 宗谷は帰国の途についた。