PRECIPITATION AT SYOWA STATION (ABSTRACT)

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A 5-year project of "Antarctic Climate Research (ACR)" has been started from JARE-28 in 1987. Observations of clouds and precipitation were carried out using vertical pointing radar and two microwave radiometers in 1988 (JARE-29), the second year of this project. The observations of vertical pointing radar were begun on February 24, 1988, and the microwave radiometers observations were handed over to JARE-29 by JARE-28 on February 1, 1988.

The characteristics of the precipitation in 1988 at Syowa Station, on the coast of Antarctica, are described in this paper. Ten days variation of precipitation are calculated using radar echo intensity at 300 m altitude and the relation between radar reflectivity factor (Z) and rainfall rate (R), the so-called Z-R relation. The values obtained from this method are free from the contamination of drifting snow which affects precipitation obtained by rain gauge. The result shows the maximum precipitation in autumn (February and March) and the minimum precipitation in spring (September and October). Low precipitation in spring seems to be characteristic of 1988 at Syowa Station. Snow crystals of precipitation there can be classified into three types: graupel or a heavily rimed crystals, grathering bullets, and other types of crystals such as snowflakes, dendrites and plates. The first and second types of crystals were mainly observed throughout 1988. The height of the radar echo was relatively low; namely, the echo top was under 2 km in altitude, in the period when the first type of crystals mainly fell. On the other hand, in the period when the second type of crystals mainly fell, the echo top was often over 4 km altitude.

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ACCUMULATION RATE ON THE ICE SHEET SURFACE IN EAST QUEEN MAUD LAND, EAST ANTARCTICA (ABSTRACT)

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In the East Queen Maud Project from 1981 to 1987, accumulation rate on the ice sheet surface was observed in an extensive inland area by the stake-method. Along a traverse route from Syowa Station (69°00′S, 39°35′E, 21 m a.s.l.) to Dome Camp (77°00′S, 35°00′E, 3761 m a.s.l.), variation of accumulation rate with elevation was obtained. The accumulation rate was large (about 50 cm/a snow depth) in the lower part of ice sheet between 800 m and 1500 m a.s.l., small (about 15 cm/a) in the middle part between 2000 m and 2400 m, and intermediate (about 30 cm/a to 20 cm/a) in the higher part above 2400 m.

Redistribution of drifting snow was estimated by a calculation of drifting snow convergence, based on the dependence of katabatic wind speed on topography and the relation between drifting snow and wind speed. The calculated convergence was large positive at around 800 m a.s.l., negative between 2000 m and 2400 m a.s.l., and negligibly small above 2400 m a.s.l. Taking account of this drifting snow convergence into the accumulation rate, the observed variation of accumulation rate with elevation was well explained.

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SNOW OBSERVATIONS BY MSR (ABSTRACT)

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The Marine Observation Satellite (MOS)-1 is the first Japanese earth observation satellite, launched in February 1987. It has a Microwave Scanning Radiometer (MSR) with the frequencies of 23.8 GHz and 31.4 GHz.

On February 9 and 10, 1988, an MOS-1 airborne verification program for snowpack was carried out by the National Space Development Agency (NASDA), in the central part of Hokkaido, Japan. Several flights were carried out by an aircraft-mounted MSR, synchronized with MOS-1, together with field experiments for obtaining ground truth data of the snowpack in the same area.

Seven test sites were set up along the flight route from Iwamizawa to Sapporo at appropriate intervals. Snowpack parameters such as density, temperature profiles, snow depth, stratigraphy and so forth were measured at each site using pits digged in the snowpack. Continuous observations of the microwave properties and stratigraphic features of the snowpack were also carried out at the site in Sapporo using an FM-CW radar with frequency 6–12 GHz.

A comparison between ground truth data and data obtained by MSR for snowpack was made and the following are concluded:

1) The brightness temperature obtained by the MSR exhibits a remarkable sensitivity to snow depth and water equivalent of snowpack.

2) Snow depth/water equivalent and the brightness temperature obtained by MSR are correlated with a regression line having a negative slope. However, when the snowpack is covered with a new snow layer, the regression line slope is inverted.

3) The seasonal variations in the brightness temperature obtained by MSR on MOS-1 are correlated with those of snow depth and snow extent in the area.

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