MORPHOLOGY OF SNOW CRYSTALS AND ICE NUCLEI AT LOW TEMPERATURES (Abstract)

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The effect of ice nuclei mainly on the formation of snow crystals of cold temperature types (peculiar shapes) was examined experimentally. Ice nuclei (rock-forming minerals, clay minerals and silver iodide) were adhered on a fine fiber and snow crystals were formed on them in the cold chamber. Experimental results are as follows: 1) Several rock-forming minerals and clay minerals were not easy to nucleate even at −30°C. 2) Peculiar shapes of snow crystals were formed easily on the mineral particles whose symmetry was not fitted crystallographically. 3) The larger the size of ice nuclei the higher was the production rate of peculiar shapes of snow crystals. 4) Peculiar shapes of snow crystals were formed more on initial nucleation than on secondary nucleation (memory effect). Some considerations were made on these results.

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PRECIPITATION FLUCTUATION IN PATAGONIA AND THE ATMOSPHERIC CIRCULATIONS OF THE MIDDLE-HIGH LATITUDES IN THE SOUTHERN HEMISPHERE (Abstract)

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Correlative analysis of this study reveals the relationship between the precipitation fluctuations of the Patagonia Icefield and the atmospheric circulations of the middle-high latitudes of the Southern Hemisphere. The atmospheric circulations of 3 and 2 wave-number patterns at the 500 mb level strongly influence precipitation in Patagonia during the winter season. Heavy winter precipitation is often associated with the extended upper air trough from the Antarctic Peninsula. The composite map of sea level pressure also shows that an upper air trough over Tasmania causes to form depressions in the southern part of the South Pacific. These depressions bring heavy precipitation to Patagonia. The above-mentioned 2 wave-number pattern influences the summer precipitation in Patagonia. The synoptic correlation maps also indicate the strengthened jet stream existing over Patagonia in the case of heavy precipitation. The atmospheric circulations of middle-high latitudes caused by geographical conditions of the Antarctic Continent are evident in the precipitation fluctuations of Patagonia.

The long-term fluctuation of winter sea level pressure in the middle latitude zone of the Southern Hemisphere shows high zonality and agrees well with the long-term fluctuation of accumulated snow at the South Pole and the sea-ice area (J. O. FLETCHER: Memorandum RM-5793-NSF, RAND Corporation, 39, 1969). The increase in accumulation of snow at the South Pole and the spread of sea-ice around Antarctica are associated with the sea level pressure decrease

zonaly in the middle latitude (40–50°S). Therefore, the climate of middle-high latitudes in the Southern Hemisphere is strongly influenced by interaction of air and sea-ice. (*Present address: Geographisches Institut, ETH Zürich, Winterthurstrasse 190, CH-8057 Zürich, Switzerland)

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INTERMEDIATE-DEPTH AND SHALLOW CORE DRILLING OPERATIONS IN MIZUHO PLATEAU, ANTARCTICA, IN 1983–84 FIELD SEASON (Abstract)

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The 24th Japanese Antarctic Research Expedition (JARE-24) drilled a 413-m hole at Mizuho Station (70°41′53″ S, 44°19′54″ E) with a thermal drill, and a 101.5-m hole at Minami-Yamato Mts. (72°05′13″ S, 35°11′00″ E) and a 100.4-m hole at G15 (71°11′40″ S, 54°58′45″ E) with an electro-mechanical drill.

The thermal drill, made by Chikyu Kogaku Kenkyusho K. K., 3.9 m long and capable of taking a core 1.5 m long and 130 mm in diameter, is an improved version of the drill used by JARE-15 in 1975. The most important improvement was the increase in the amount of data sent to the surface. Besides the previous two bits of the cable tension at the drill head and one bit of the core length, the drill could send, with an aid of a micro-computer, analogue data (each converted to 8 bit) of the main heater temperature, the water temperature and level in the tank, the input voltage to the main heater and that to the pump, so that such accidents as the heater burn-out, the tank overflow, and the failure of water suction could be immediately alarmed. Other improvements were the reinforced mechanical strength and the addition of heaters on every necessary part. (Previously, only the suction pipes and the pump were heated.) The allowable output of the main heater, 168 and 134 mm in outer and inner diameters (same as the previous one), was increased from 3 to 6 kW. However, the field experience showed that the optimum output was 3.6 kW, which gave a drilling speed of about 1.6 m/h.

The winch with 700-m armored cable, whose specifications were the same as those of the cable used in 1975 and 1976, was driven by a 3.7-kW motor, which gave a hoisting speed ranging from 0.1 to 1 m/s with an aid of a frequency inverter. The winch had also an auxiliary motor for slow lowering of less than 0.001 m/s during drilling. This motor and the brake were alternatively activated by the two-bit data of the tension to keep it in the pre-assigned range and to give an average lowering speed matched to the output of the main heater.

The drilling at Mizuho Station began on April 22, 1983 and terminated on July 22 at 413 m, where the hole closure became dangerous for further drilling. It took 499 working hours by a four-man team. Physical properties of the cores were measured simultaneously.