Proc. NIPR Symp. Polar Meteorol. Glaciol., **11**, 247, 1997

MORPHOLOGY OF CRYSTALS IN FREE FALL AT TEMPERATURES BETWEEN 0 AND −4°C (ABSTRACT)

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Ice crystals were grown in free fall by using a large cloud chamber of height 6.5 m. Nucleation was carried out by introducing a piece of dry ice in a supercooled cloud produced in the chamber. Ice crystals fell in a supercooled cloud and were collected at the bottom of the chamber.

Circular disc crystals grew at temperatures above −1°C. Their size was about 50 μm in diameter and about 5 μm in thickness. At temperatures about −2°C, hexagonal plates with a lunar pattern grew. It was observed that these patterns were formed by the step growth on basal faces.

Circular disc crystals with $\{11\bar{2}0\}$ crystal faces were observed. It was estimated that these $\{11\bar{2}0\}$ crystal faces appeared during the growth process from circular discs to hexagonal plates. They disappeared because of their slow growth rate, after forming small hollows on their faces.

(Received January 9, 1997; Revised manuscript accepted March 19, 1997)

Proc. NIPR Symp. Polar Meteorol. Glaciol., **11**, 247, 1997

DIELECTRIC PROPERTIES OF ICE CONTAINING ACID AND SALT IMPURITIES AT MICROWAVE FREQUENCIES (ABSTRACT)

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To clarify the effects of ionic impurities on the dielectric properties of ice, the relative complex dielectric permittivities ($\varepsilon^* = \varepsilon' - i\varepsilon''$) of ice containing acid and salt impurities were measured in a wide temperature range from −80 to −2°C using the cavity resonator method at 5 GHz. The dielectric properties of ice at microwave frequencies are necessary for understanding remote sensing signatures in polar regions, obtained by ice-radar and satellite-borne microwave radar and radiometer. Especially, the dielectric loss, ε'', of ice is an important parameter to understand the attenuation of electromagnetic waves in ice sheets. In the measurements, the ice samples contained the acids H_2SO_4 and HNO_3, and the salt NaCl. The impurity concentration was between 10^{-5} and 10^{-3} M (molarity).

The results are as follows: The dielectric loss, ε'', of ice increased with the increases in temperature and contained impurity concentration. A sharp increase in ε'' of ice containing 10^{-4} M H_2SO_4, HNO_3 and NaCl was observed immediately above the eutectic points −73°C, −43°C and −21°C, respectively. The sharp change shows that the aqueous solution of the contained impurity is formed in grain boundaries and triple junctions of the polycrystalline ice above the eutectic point. The penetration depths of microwaves at 5 GHz into ice containing H_2SO_4, HNO_3 and NaCl were estimated from the temperature and concentration dependence of the dielectric permittivities.

(Received November 28, 1996; Revised manuscript accepted January 20, 1997)