FUTURE PLANS FOR OCEANOGRAPHIC AND GLACIOLOGICAL STUDIES ON T-3*

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Oceanographic Studies

T-3 started to rotate with a fairly high angular speed in late summer and early fall of 1959 when it became free of attached sea ice. In August and September 1959, three complete rotations were observed; the maximum angular velocity was nearly 30^{o} per day and the direction generally clockwise. Mr. Muguruma, however, made a continuous observation of the rotation over a period of a few days and found that the rotation speed sometimes decreases and the rotation stops; then the island makes a counter-clockwise rotation for a few degrees and comes back to the clockwise rotation again. Considering the enormous inertia of a body as large as T-3, this force must be tremendous. Its nature must be studied in detail.

Past observations show that the track of T-3 often makes a loop in a counter-clockwise direction. More than five loops of this nature are seen in the former track of T-3. This is contradictory to common sense; that is, when a body is subjected to a displacement with rotation, the path is expected to make a loop in the same direction as the rotation of the body. If past observations are correct, there must be some unknown force acting on T-3. This phenomenon should be investigated. Continuous observation of the position and rotation of T-3 must be carried out with sufficient accuracy, as frequently as possible (whenever a sun shot or star shot can be made), for about a month.

Glaciological Studies

The geomorphology of the ice of T-3 is an interesting problem from the purely scientific point of view. All features of geomorphological phenomena are observed: The Grand Canyon on a miniature scale, V-shaped or U-shaped valleys, a peculiar type of fold that is known in the case of rocks -- all can be seen on the surface of T-3.

The point of interest is that these phenomena take place in millions of years in the case of rocks but in only one year or so in the case of ice. Two main elements which determine the geomorphological change are the viscosity of the material and the rate of erosion. The viscosity of rocks is of the order of 10^{22}, while that of ice is about 10^{9} or 10^{10}. The time needed for erosion of 1 mm of rock may be 1 year; the same amount of erosion of ice may take place in one minute when the ice is washed with thaw water. The time is, so to speak, contracted to 10^{-6}. Thus, the geomorphological study of ice will contribute to the rheology of ice.

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Crystallographic Studies

Up to this time, the term "crystallographic study of ice" has usually been used to mean the determination of the distribution of crystallographic axis of each of the grains in a block of ice. Polarizing light is used for this purpose, and only the orientation of the c-axis is determined.

Crystallographic study, however, can cover a wider field than this kind of measurement. An aggregate of component single crystals makes a block of ice, and the aggregate of these blocks makes a bulk mass of ice. For example, a piece of candle ice is a block made of several component crystals, and the aggregate of these candle ices makes lake ice.

The boundary between component crystals is the so-called grain boundary. The boundary between candles is also a grain boundary, but its nature must be quite different, because this latter boundary melts faster than the former. The nature of these boundaries must be studied from the crystallographic point of view. Therefore, both the orientation of the c-axis and that of the a-axis should be studied.

Recently a simple new method was found by Dr. Higuchi for determining the orientation of both a and c-axes. This is an etching method and can be applied in the field. Comprehensive studies using the etching method should be carried out with respect to samples obtained from various levels of T-3.