

Don Atkinson  
A. RANGNO

# METEOROLOGICAL CLASSIFICATION OF NATURAL SNOW CRYSTALS



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## Meteorological Classification of Natural Snow Crystals

Choji MAGONO and Chung Woo LEE

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### Abstract

From a meteorological point of view, Nakaya's classification of natural snow crystals was modified and supplemented. By this improvement of the classification, the certain inconveniences in the description of crystal shapes of natural snow crystals were removed, particularly in unsymmetrical or irregular shapes.

By the use of this improved classification, the temperature and vapor supply conditions for the growth of various kinds of natural snow crystals were described. The conditions were determined by meteorological observation methods. It may be seen that the conditions are very similar to Nakaya's  $T_a-s$  diagram. This means that the Nakaya's diagram is applicable to the formation of natural snow crystals.

### 1. Introduction

Nakaya's<sup>1)</sup> general classification of snow crystals was a most perfect classification for natural snow crystals from a physical point of view, and the result of his investigation of the artificial snow crystals, namely, the  $T_a-s$  diagram was described by the classification method. Gold and Power<sup>2)</sup>, Murai<sup>3)</sup> and Grunow<sup>4)</sup>,<sup>5)</sup> reported that Nakaya's diagram was roughly applicable to the formation of natural snow crystals.

The diagram was further studied and improved by Nakaya, Hanajima and Muguruma<sup>6)</sup>, Hallett and Mason<sup>7)</sup> and Kobayashi<sup>8)</sup>,<sup>9)</sup>,<sup>10)</sup>. With these improvements, it may be expected that there is a possibility that the present improved diagram will be useful as a more exact and detailed indicator of temperature and humidity of a cloud in which snow crystals are formed.

In the recent ten years, Magono and his colleagues<sup>11)</sup>,<sup>12)</sup>,<sup>13)</sup> continued their observation of natural snow crystals in Hokkaido from a meteorological point of view. At first Nakaya's classification method to describe the shape of snow crystals was used, but they found that his classification was insufficient to describe the meteorological difference in the type of snow crystals, because the classification was too simple in the group of unsymmetric or modified types, although it is in good detail in the group of regular types. In actual cases, most of snow crystals are irregular, unsymmetric, modified or rimed.

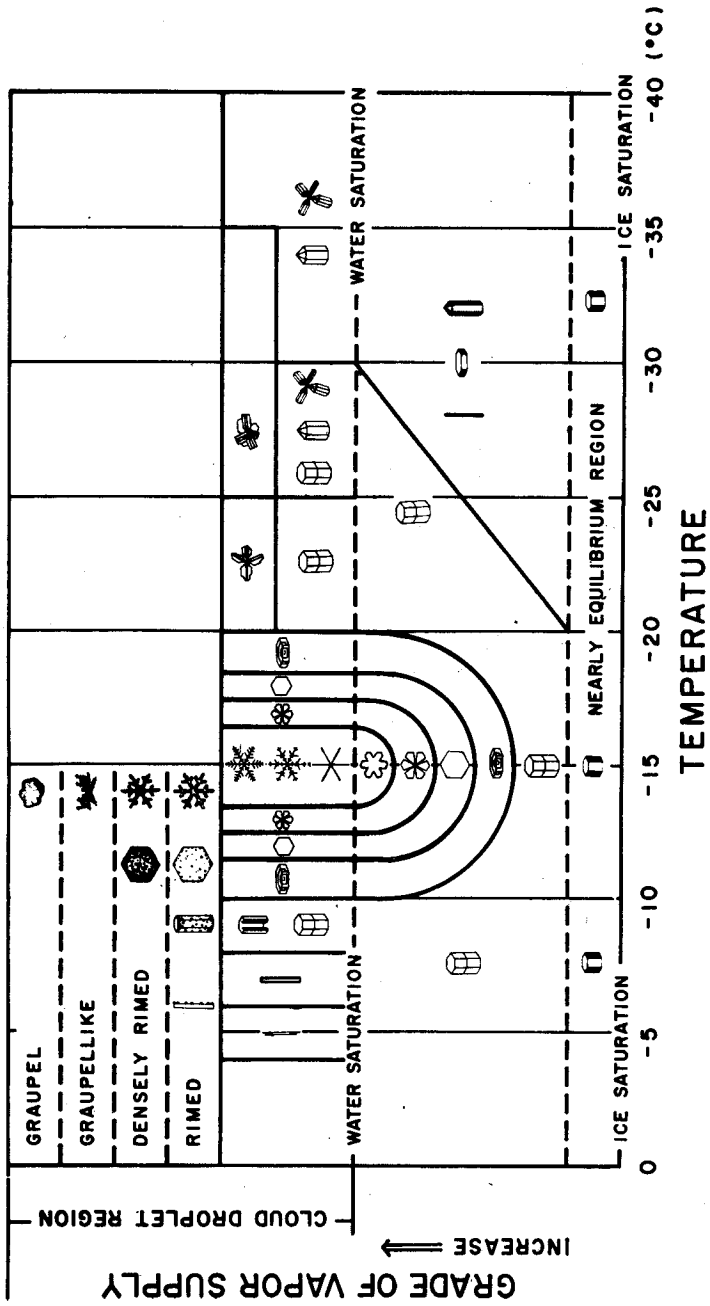


Fig. 2. Temperature and humidity conditions for the growth of natural snow crystals of various types

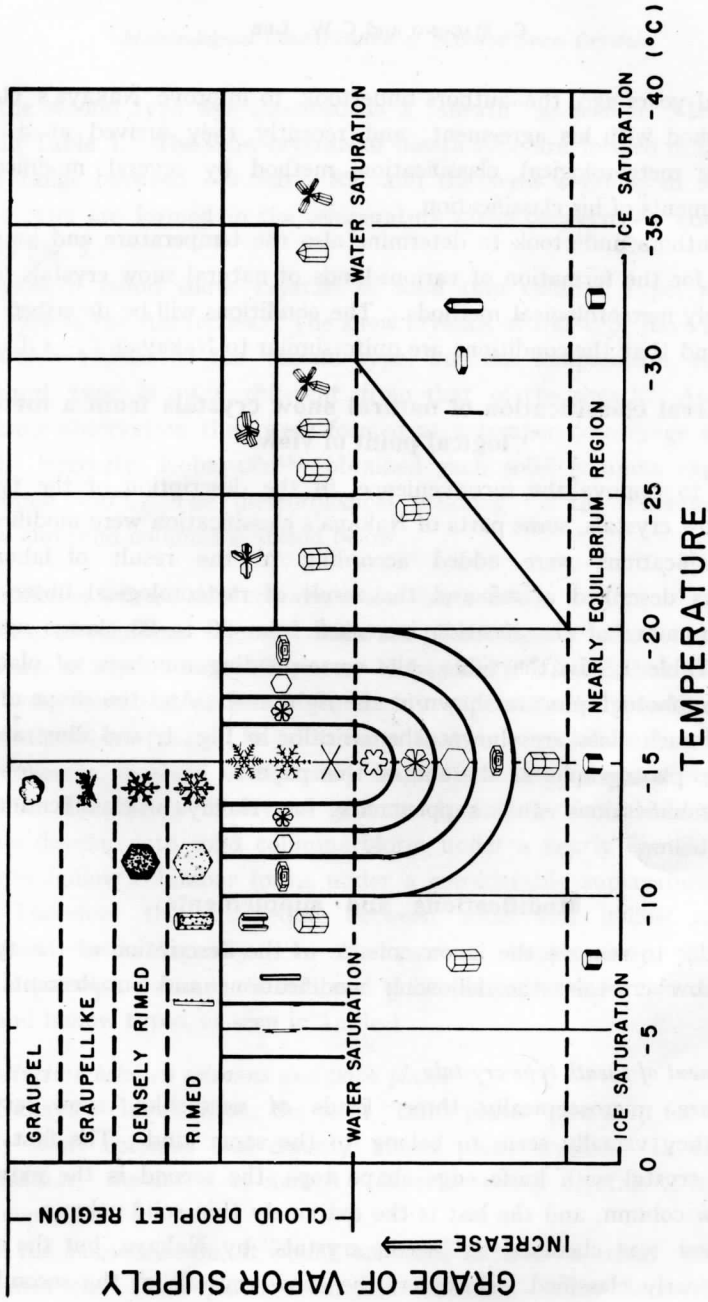


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