

# Investigation of micro-physical and chemical processes in polar ice sheet using high-resolution laser techniques

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## **【 Outline of survey 】**

In order to reconstruct paleoclimate from ice core analysis or to model ice sheet behavior, it is necessary to know deformation mechanisms of ice, evolution of ice crystal microstructure, and temporal and spatial changes of impurity distribution in ice sheet due to deformation. Thus far there have been few studies on these subjects because of difficulties of laboratory reproduction of the phenomena occurring in ice sheet due to very slow processes that take hundreds or thousands of years to reach detection limits of usual measurement methods. The purpose of the research proposed here is to apply our newly developed laser technology to investigate deformation mechanisms and thermo dynamical behaviors of impurities in ice during deformation. The research project consists of the following three subjects.

- (1) Establishment of a technique to detect very small displacement of the order of nm in the diffusion creep regime of ice with a newly developed technique using laser interferometry.
- (2) Investigation of spatial distribution of chemical constituents in ice crystals by a laser ablation method.
- (3) Investigation of interactions between evolution of ice crystal texture/microstructure and redistribution of chemical constituents in ice sheet and the construction of deformation mechanism map of ice sheets.

## **【 Expected results 】**

Understanding of deformation mechanisms and thermo dynamical behavior of chemical constituents in ice sheet contributes not only to the ice sheet modeling but also to the interpretation of ice core data for the reconstruction of paleoclimate.

## **【 References by the principal researcher 】**

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- N. Azuma, Y. Wang, Y. Yoshida, H. Narita, T. Hondoh, H. Shoji and O. Watanabe, Crystallographic analysis of the Dome Fuji ice core, *Physics of Ice Core Records*, edited by T. Hondoh, Hokkaido University Press, Sapporo, 45-61, (2000).

**【 Term of project 】** F Y 2004 - 2008

**【 Budget allocation 】** 83,100,000 yen

**【 Homepage address 】** None