

Determination of the ice drilling site in the next deep ice coring project of the "oldest ice" at Dome Fuji

*Shuji Fujita^{1,2}, Kenji Kawamura^{1,2}, Kumiko Goto-Azuma^{1,2}, Hideaki Motoyama^{1,2}, . Dome Fuji Ice Core Consortium³

1.National Institute of Polar Research, Research Organization of Information and Systems(ROIS),
2.The Graduate University for Advanced Studies (SOKENDAI) , 3.Dome Fuji Ice Core Consortium

In the next phase of the Antarctic research activities of Japan, National Institute of Polar Research along with Dome Fuji Ice Core Consortium (ICC) in Japan plan to perform various activities related to drilling of the "oldest ice" with ages much older than 800 kyr ago, in the vicinity of Dome Fuji. We call the planned ice core as "the 3rd DF deep core". In the near future, we aim to: (i) investigate glaciological conditions (ice sheet surface conditions, englacial conditions and subglacial conditions) of the candidate site area; (ii) determine the exact location of the drilling site and (iii) start to perform pilot hole drilling, casing and shallow/middle range deep drilling. Prerequisites of presence of the very old ice are as follows. (i) The ice/bed boundaries must be frozen. (ii) The ice layers near the bed must be maintained as undisturbed by the ice sheet flow. (iii) During glacial/interglacial cycles, surface mass balance must be generally positive. To satisfy the prerequisite (i), presence of subglacial highland is necessary in the glaciological condition of the inland of Antarctica. We have shown in our earlier observational studies that in the vicinity of Dome Fuji ice sheet bed is frozen when ice thickness is less than ~2850 m. We have confirmed, at area ~50 km of the Dome Fuji summit, there is a wide area with ice thickness of ~2200 m, where the ice sheet bed is frozen. To satisfy the condition (ii), the site must be close to the present summit of Dome Fuji. The area ~50 km of the Dome Fuji summit satisfy this condition. It has been estimated that ice layers with ages older than ~800 kyrs ago are highly compressed within the deepest 5 % of the ice sheet thickness. Thus conditions for presence of such compressed ice and rheology is also a major subject of the ice coring project. As for the condition (iii), we have confirmed the condition is satisfied based on the internal layering observations with ice sounding radars. We already started the preliminary investigation of the radar sounding in 1997, and accumulated data since then. We have identified area for the site, and performed shallow drilling at the base camp of the area. In the near future, we will carry out radar surveys spatially in more detail, to determine the exact location of the deep ice coring.

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