

Shallow ice core drillings at three sites near the Dome Fuji station, Antarctica, during the summer season of JARE-59 (2017–2018)

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As a glaciological survey for identifying the optimum site for the next deep drilling in the vicinity of the Dome Fuji station, we drilled three shallow ice cores during the Antarctic summer season of 2017–2018 (JARE59). The purpose of this drilling was to investigate the spatial difference in accumulation rate during the past several hundred to several thousand years in the candidate area and the processes of preservations of original chemical and gas compositions in the ice sheet. The first core was drilled at 54 km south of the Dome Fuji station (New Dome Fuji; NDF) to the depth of 151.9 m. The second one was drilled at 44 km southeast of the station (BC 2) to 41 m, and the third one was drilled at 28 km northwest of the station (BC 3) to 41 m. The diameter, length and weight of each ice-core segment were measured on site to calculate its density. The density profile at NDF indicated that the close-off density of 830 kg m⁻³ occurred at approximately 84–87 m depth. A precise measurement of density by gamma ray transmission method will be carried out in the future. A 20-mm-thick volcanic ash layer was found at 118.9 m depth in the NDF core, indicating a lower accumulation rate at the NDF site than at Dome Fuji over the recent millennia. A volcanic ash layer sharing the same volcanic origin has been found at 132.5 m deep in the second Dome Fuji deep ice core. Similarly, volcanic ash layers with the thicknesses of ~30 mm and less than 1 mm have been found at 103.04 m in the Vostok core (Basile et al., 2001) and at 132.6 m in the Dome C core (Narcisi et al., 2005), respectively. These sites are about 1500 km and about 2000 km away from the Dome Fuji station, respectively. This eruption is thought to have occurred in the South Sandwich Islands (Narcisi et al., 2005) in about 3733 yr BP (Dome Fuji Ice Core Project Members, 2017) and seems to have dispersed a large amount of volcanic ash through a wide area. We also measured borehole temperature at the three sites. The temperatures at 10 m depth were -56.4°C, -58.1°C and -56.2°C at NDF, BC2 and BC3, respectively.

References

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