

Spatial and temporal variability of surface snow accumulation along the JARE traverse route for 1992–2013

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Satellite-based observations revealed the recent mass loss of the Antarctic ice sheet, and there is concern about its influence on sea level rise. Although significant mass loss has been reported in West Antarctica, spatial and temporal variability of surface mass balance is poorly understood in East Antarctica where the ice volume is more than 10 times, due to complexity in snow accumulation in space and time, resulting in relatively large uncertainty to quantify ongoing and future mass loss from the Antarctic ice sheet.

Therefore, it is important to accurately quantify surface snow accumulation in East Antarctica. Surface snow accumulation has been measured along the traverse route between coastal point (S16) and the inland Dome Fuji region as a part of the Japanese Antarctic Research Expedition (JARE) since 1992. Net snow accumulation was measured by the stake method at approximately 500 points every 2 km. In this study, we re-evaluate spatial and temporal variability of surface snow accumulation between S16 and Dome Fuji region during the period of 1992–2013. Uncertainty of the snow accumulation measurements is discussed by the accumulation data obtained from 6 stake farms and 2 stake rows along the survey route. Spatiotemporal variability of snow accumulation is discussed with surface slope of the ice sheet derived from a satellite-based digital elevation model (DEM) with 10 km resolution in order to evaluate the influence of surface topography on snow accumulation. In addition, we compare the in-situ accumulation data with mean annual precipitation used in numerical modelling and discuss the characteristics of accumulation in the region.

Keywords: Antarctica, Ice sheet, mass balance