

Spatiotemporal variability of surface mass balance along the JARE traverse route for 1991–2019

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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 the West Antarctica, spatial and temporal variability of surface mass balance (SMB) is poorly understood in the 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 crucial to accurately quantify SMB in East Antarctica. SMB has been measured along the traverse route between coastal area (S16) and the inland Dome Fuji region as a part of the Japanese Antarctic Research Expedition (JARE) since 1991. 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 SMB between S16 and Dome Fuji region during the period of 1991–2019. Uncertainty of the SMB measurements is discussed by the data obtained from stake farms and stake rows along the survey route. Spatiotemporal variability of SMB is discussed with surface slope of the ice sheet as well as wind speed and direction in order to evaluate the influence of surface topography and katabatic wind blowing on the ice sheet surface on snow accumulation.

Keywords: Antarctic ice sheet, Surface mass balance