

Oceanographic and geophysical observation campaign off Sabrina Coast, East Antarctica, in 2019/2020

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Totten Glacier is one of the fastest-flowing glaciers in East Antarctica. The glacier's drainage system as a whole has a potential of 3.5m rise of global sea level. Recent various researches have revealed Totten Glacier and nearby glaciers are changing, which has some similarity with the situation in West Antarctica. Totten Glacier is now losing its ice mass and has a potential of contributing to a significant sea level rise in the future. Warm water of the ocean off Sabrina Coast, flowing through a deep channel under the glacier, is considered as the major driver of the rapid ice melting, but yet little is known about the oceanic role in melting the ice. Although this region has been attracting growing attention, in-situ observational understandings are still inadequate because of its heavy sea ice cover.

Based on Icebreaker Shirase, we conducted oceanographic and geophysical observations off Sabrina Coast, East Antarctica, during Dec. 2019 and Feb.-Mar. 2020 as a program of 61st Japanese Antarctic Research Expedition (JARE61). Hydrographic measurements, including CTD (Conductivity-Temperature Depth profiler)/MS (Multi-water Sampler) and XCTD (eXpendable CTD), revealed the ubiquitous presence of deep warm water in this region, which is the source of the large thermal forcing. Air-borne XCTD and XBT(eXpendable BathyThermograph) helped enhance the spatial sampling in difficult access area, and largely expand the distribution of water mass property. At the same time, sediments and their cores were taken for the first time in this region. Bathymetric survey with multi-narrow beam was effective and describes new and detailed topographic features in the least explored area. Sea ice research including wave motion measurements were conducted at the marginal ice zone off Dolton Polynya. International cooperation was effective in filling gaps of our observational systems. Further analysis of these data enables us to decipher a detailed pathway of warm water and meltwater discharge to and from the Totten Glacier Ice Shelf and its historical evolution.

Keywords: Totten Glacier, Japanese Antarctic Research Expedition, Modified Circumpolar Deep Water, Sealevel rise