Towards the understanding of mass balance variation of Arctic and Antarctic ice sheets

Teruo Aoki[1,2,4], Masashi Niwano[4], *Tetsuo Sueyoshi[2,3]

1. Okayama Univ., 2. National Institute of Polar Research, 3. Japan Agency for Marine-Earth Science and Technology, 4. Meteorological Research Institute

Greenland and East- and West- Antarctic ice sheets are the largest storage of fresh water on earth. The variation of these ice sheets can effect not only the sea level, but also on global climate through the modulation of the deep water formation in the ocean. The study on ice sheets have therefore a significant importance on studies and projections of global environental change.

In the Arctic, most significant signal of global warming appears by polar amplification, which results in the rapid mass loss of the Greenland ice sheet. The extreme melt event across the entire ice sheet was also observed first time ever in 2012. The cause of mass loss can be attributed to the temperature increase, albedo decrease by snow impurities, and also to the ocean wariming which induces the enhanced melt at the marginal glaciers (Box, 2013; Fettweis et al., 2013). In the Antarctic, while the West Antarctic Ice Sheet is losing its mass rapidly, the signal in the East Antarctic Ice Sheet is not yet clear (Steig et al., 2009, etc.) .

Considering such backgrounds, the following studies are needed to make a breakthrough on our understanding of the surface process of the ice sheets (Aoki, 2015): Expanding and maintenance of the AWS network, Process study by in-situ observations, Modelling efforts of physical processes such as near-surface radiation or snow metamorphose, and Development of the regional polar system model including these processes. Validation of the model performance using satellite observation is further needed. As Japanese research community already has activities on these topics, such studies on snow and ice sheets should be an effective orientation taking an advantage of ongoing research.

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