A new aspect of the polar science: integrated observations of the ice sheet mass loss for better prediction of the sea level rise

*Takuji Nakamura[1], Shin Sugiyama[2], Ayako Abe-Ouchi[3], Teruo Aoki[4], Yoshifumi Nogi[1], Takeshi Tamura[1]

1. National Institute of Polar Research, 2. Institute of Low Temperature Science, Hokkaido Univ., 3. Atmosphere and Ocean Research Institute, the University of Tokyo, 4. The Graduate School of Natural Science and Technology, Okayama University

Recently the global environmental change is of great interest for the governments and general public, as well as scientists on the earth and planets. The Arctic and the Antarctic regions significantly affect global environment and also provide invaluable information on its variation. In the Arctic region, for example, temperature increase due to the global warming is the largest on the globe. The climate change is most significantly emerging which causes change of ecology, human economic activity and life. On the other hand, very little is known on the response of the huge Antarctic ice sheet to the global warming, and hence a possible change in Antarctic region on a global scale and its prediction are of greatest interest. Variations in both polar regions are not independent but connected through the ocean and atmosphere circulations, and therefore it is necessary to consider them to be one unified system. Moreover, the Arctic and Antarctic regions are the best observation and/or investigation field for space/planetary sciences, atmospheric/hydrospheric sciences, and solid earth sciences, indicating that the polar regions are important windows for earth and planetary sciences.

Greenland Ice Sheet amounts about 9 % of total ice mass on the glove, and its mass loss is becoming faster due to the rapid warming in the Arctic region. This causes acceleration of the global sea level rise. On the other hand, the Antarctic Ice Sheet, which as about an order larger mass, also indicating a significant mass loss in the western part. Once the East Antarctic Ice Sheet also started to melt quickly, which has much larger mass than the West Antarctic Ice Sheet, the sea level rise would become fatal. Thus, it is very important to understand the current variation of the ice sheets, which could cause more than 60 m of sea level rise as a total amount, and monitor its trend.

This proposal focuses on the sea level rise due to the ice sheet mass loss. We propose to carry out integrated observations at remote sites in the Antarctica and Greenland, by deploying new technical challenge with un-manned and remote controlled system. Then, by unifying in-situ observations, detailed analyses, satellite observations and numerical modelings, we plan to clarity variations of the ice sheet and ocean in the past and at present, then improve the forecast of future sea level rise, which might rapidly proceed even within this century.

Keywords: Polar Science, Arctic, Antarctic, Sea level rise, Ice sheet

