

Long-term field experiment for detection and study of climatological change in East Antarctica

*Naohiko Hirasawa¹, Teruo Aoki², Masahiko Hayashi³, Koji Fujita⁴, Yoshinori Iizuka⁵, Naoyuki Kurita⁴, Hideaki Motoyama¹

1.National Institute of Polar Research, 2.Meteorological Research Institute, 3.Fukuoka University, 4.Nagoya University, 5.Hokkaido University

This presentation will make a review on the Antarctic climatic change during the last decades and discuss important observation to understand the mechanism of the present situation of Antarctica and the future trajectory.

The observational results have clearly indicated that West Antarctica has been warmed up since the middle of the last century, which is one of the areas with the highest warming rate. On the other hand, clear temporal tendency in surface temperature of East Antarctica is not detected. The mechanism of the suppression of surface warming of East Antarctica has not been understood yet. If we see the tropospheric temperature for the last several decades, the scientific discussion on the temporal change has not been done sufficiently mainly due to limitation in observation. Thompson and Solomon (2002) showed stratospheric cooling tendency mainly responding to ozone hole growth for 1969 to 1998, and discussed it has induced enhancement of tropospheric polar vortex, which can suppress the Antarctic surface air temperature. However, Turner et al. (2006) showed the tropospheric warming tendency. These discussion is based upon very limited data, in particular, radiosonde observation has been operated at the coast of Antarctica, except for the South Pole station. So, at first, we should make effort to operate radiosonde with surface meteorological observation at interior station of Antarctica to confirm that the tropospheric warming tendency is robust feature above whole the Antarctic ice sheet or not.

In the last decade, some remarkable topics were observed in Droning Maud Land. One of the top issues is the extreme accumulation on the lower slope of the ice sheet at 2009 (Boening et al., 2006). The Japanese snow stakes data along the traverse route from Syowa station to Dome Fuji station also captured the same feature. Another issue is a warming event in 2012/13 summer, which would induce surface melting at higher elevated slope of the ice sheet than in normal summer. This warming event was intense one since 1970s for Syowa station, namely, which is a kind of extreme phenomenon. Increment in precipitation and extreme phenomena are the typical features emerged in the global warming, and thus, we should pay attention to the data from East Antarctica in climatological sense.

The purpose of this project are 1) detecting ongoing climatic changes in East Antarctica, 2) specifying the mechanisms together with the relevant processes, and 3) indicating possible trajectories of the detected changes from past to future, focusing on 1) transportation of heat, moisture and aerosols in atmosphere and exchange of those at the surface, paying attention to diurnal variation of boundary layer and katabatic wind circulation in summer and 2) contribution of radiative process forced by clouds, aerosols, moisture, and snow property to change in the surface heating and moisture budget.

Keywords: In-situ observation in East Antarctic interior , Global warming, Climatic system of atmosphere-icesheet-ocean