

A01-P16

STUDIES ON GREENHOUSE GAS CYCLES IN THE ARCTIC AND THEIR RESPONSES TO CLIMATE CHANGE

Shuji Aoki (*Tohoku University, Japan*)

GRENE #5 members

aoki@m.tohoku.ac.jp

To elucidate temporal and spatial variations of the concentrations of carbon dioxide, methane, nitrous oxide and other greenhouse gases as well as their isotopes and oxygen concentration in the higher latitudes of the Northern Hemisphere, we have established comprehensive observations by using land stations and aircraft. Although it was believed that the Arctic Ocean also plays an important role in the variations of greenhouse gases and their related constituents, it was not well known about the role of the Arctic Ocean. Therefore, we made oceanographic observations by the research vessel '*Mirai*'.

These observational data are analyzed to quantify the distributions and variations of sources and sinks of the greenhouse gases in the Arctic region using almost all of the high-resolution atmospheric chemistry transport models developed in Japan. We are trying to combine the high-resolution atmospheric chemistry transport models with a terrestrial ecosystem model. By conducting simulations to see how these combined models are able to reproduce observed annual changes in concentrations and isotopes, we will gain a clearer understanding of complicated process of the greenhouse gas cycles in the Arctic, and how the greenhouse gas cycles respond to climate change.

By analyzing ice cores and firn air sampled from Greenland and other locations, we reconstructed the changes of the concentrations and isotopes of the greenhouse gases from the past to the present. By analyzing these data, we are investigating the changes of sources and sinks of the greenhouse gases in the past, as well as how each type of the sources has responded to climate change. These works contribute to our understanding of the various processes involved in changes to the greenhouse gases in the Arctic.

In the symposium, we will present outline of our research program and several outstanding results obtained so far.