Japanese observation programs of atmospheric greenhouse gases in polar regions

Daisuke Goto[1]*, Shinji Morimoto[2], Shuji Aoki[2], Takakiyo Nakazawa[2], Shigeyuki Ishidoya[3], Shohei Murayama[3], Gen Hashida[1], Takashi Yamanouchi[1]

[1] National Institute of Polar Research, Japan

[2] Center for Atmospheric and Oceanic Studies, Graduate School of Science, Tohoku University, Japan

[3] National Institute of Advanced Industrial Science and Technology, Japan

* Corresponding author, email: goto.daisuke@nipr.ac.jp

The National Institute of Polar Research (NIPR) and Tohoku University (TU) have maintained systematic observation programs of atmospheric greenhouse gases at Syowa station, Antarctica (69.00°S, 39.58°E; Morimoto et al., 2003) and Ny-Ålesund, Svalbard (78.92°N, 11.93°E; Yamanouchi et al., 1996) since 1984 and 1991, respectively. The National Institute of Advanced Industrial Science and Technology (AIST) also joined the programs at Ny-Ålesund and Syowa station in 2013 and 2016, respectively.

At Syowa station, we initiated continuous measurements of the atmospheric CO_2 concentration in 1984, and then expanded in-situ continuous measurements to CH_4, CO and O_2 concentrations in the framework of the Japanese Antarctic Research Program. In addition to these measurements, systematic air sampling with subsequent laboratory analysis has been carried out for the CO_2, CH_4, CO, N_2O, SF_6, O_2 and Ar concentrations and the isotopic ratios of CO_2 and CH_4. We also have cooperated with the air sampling program of the National Oceanic and Atmospheric Administration (NOAA) at the station.

At Ny-Ålesund, we have maintained weekly air sampling since 1991 with aid of the Norwegian Polar Institute to measure the atmospheric CO_2 and CH_4 concentrations and carbon isotopic ratio of CO_2. Currently, the concentrations of CH_4, CO, N_2O, SF_6 and O_2 and the isotopic ratios of CH_4 are also measured. In addition, we started in-situ continuous measurements of the atmospheric CO_2 and O_2 concentrations using a NDIR/fuel-cell oxygen analyzer system in 2012 (Goto et al., 2017), as well as of the atmospheric CO_2, CH_4 and CO concentrations using a cavity ring-down spectrometer system in 2013.

In this presentation, we report our observation activities of atmospheric greenhouse gases at Syowa station and Ny-Ålesund, including observational results.

References

Goto et al., Seasonal and short-term variations in atmospheric potential oxygen at Ny-Ålesund, Svalbard, Tellus B, 69, doi: 10.1080/16000889.2017.1311767, 2017.

Morimoto et al., Concentration variations of atmospheric CO_2 observed at Syowa Station, Antarctica from 1984 to 2000, Tellus, 55B, 170–177, 2003.

Yamanouchi et al., Report on atmospheric science observations at Ny-Ålesund, Svalbard, Mem. Natl Inst. Polar Res., Spec. Issue, 51, 153–164, 1996.