Observation of atmospheric CH4 using aircraft platform.

T. Machida1, M. Sasakawa1, T. Umezawa1, Y. Sawa2, H. Matsueda2, Y. Niwa2, K. Tsuboi2, S. Murayama3, S. Morimoto4 and S. Aoki4

1. National Institute for Environmental Studies

2. Meteorological Research Institute

3. National Institute of Advanced Industrial Science and Technology

4. Tohoku University

Atmospheric inversion model is one of the most promising methods to understand the sources and sinks of CH4 as well as CO2. There are a lot of surface observations for inverse calculation, but the CH4 data in the upper troposphere are quite limited. Chartered and commercially operated aircraft are most efficient platform to investigate the vertical profiles of atmospheric trace gases.

We have performed regular air samplings using chartered aircraft over the three sites in Siberia since 1993. Sample air is compressed in a glass flask at each assigned altitude and is transported to Japan. The mixing ratios of CH4, CO2, N2O, SF6, CO and H2 are analyzed in the National Institute for Environmental Studies (NIES). The CH4 mixing ratios over Siberia are apparently higher than those observed in coastal area. We found seasonal double peaks occurring in summer and winter. CH4 isotope analyses suggested that summer peaks are due to CH4 emission from wetlands, while winter maximums are attributed to fossil CH4 such as leaks of natural gas. Vertical profiles of CH4 show higher mixing ratios at lower altitudes throughout the year. The vertical gradient observed over wetland region gradually decreased during 20 years, suggesting the long-term changes of CH4 emission in Siberia.

We have also conducted CH4 observations by Automatic air Sampling Equipment (ASE) onboard the commercial airliner in the project of Comprehensive Observation Network for Trace gases by Airliner (CONTRAIL). The ASE observation covers latitude ranges from 30˚S to 70˚N during flights between Japan and Australia, and Japan and Europe. Since the aircraft cruises near the tropopause, we revealed the seasonal variations of CH4 both in the upper troposphere and lower stratosphere.