Oral | Symbol A (Atmospheric, Ocean, and Environmental Sciences) | A-AS Atmospheric Sciences, Meteorology & Atmospheric Environment

[A-AS22_1PM2]Atmospheric Chemistry

Convener:*Nobuyuki Takegawa(Research Center for Advanced Science and Technology, University of Tokyo), Yousuke Sawa(Geochemical Research Department, Meteorological Research Institute), Yugo Kanaya(Research Institute for Global Change, Japan Agency for Marine-Earth Science and Technology), Kenshi Takahashi(Research Institute for Sustainable Humanosphere, Kyoto University), Hiroshi Tanimoto(National Institute for Environmental Studies), Chair:Nobuyuki Takegawa(Research Center for Advanced Science and Technology, University of Tokyo)

Thu. May 1, 2014 4:15 PM - 6:00 PM 511 (5F)

This session provides a forum for the presentation of the broad spectrum of tropospheric and stratospheric chemistry, including various research topics (air quality and climate), approaches (modeling, field measurements, satellite data analysis, and laboratory studies), and species (gas and aerosol). This session also provides an opportunity for discussing possible future collaboration with other research fields relevant to atmospheric chemistry.

4:15 PM - 4:30 PM

[AAS22-P29_PG]Variations of tropospheric methane over Japan during 1988-2010

3-min talk in an oral session

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Keywords:aircraft observation, methane, troposphere, over Japan

Mixing ratios of greenhouse gases and related trace gases have been measured using chartered and commercial aircraft in the lower to upper troposphere (LT and UT) over Japan by Tohoku University. We present variations of CH_4 during 1988-2010. The analysis is aided by simulation results using an atmospheric chemistry transport model (i.e. ACTM). Tropospheric CH_4 over Japan shows altitude-dependent interannual and seasonal variations, reflecting differences in air mass origins at different altitudes. The long-term trend and interannual variation of CH_4 in the LT are consistent with previous reports of measurements at surface baseline stations in the northern hemisphere. However, those in the UT show excursions from those in the LT. In the UT, CH_4 mixing ratios show seasonal maximum in August due to efficient transport of air masses influenced by continental CH_4 sources, while LT CH_4 reaches its seasonal minimum during summer due to seasonally maximum chemical loss. Vertical profiles of the CH_4 mixing ratios also vary with season, reflecting the altitude-dependent seasonal cycles. In summer, transport of CH_4-rich air from Asian regions elevates UT CH_4 levels, forming the uniform vertical profile above the mid troposphere. On the other hand, CH_4 decreases nearly monotonically with altitude in winter-spring. The ACTM simulations with different emission scenarios reproduce general features of the tropospheric CH_4 variations over Japan. Tagged tracer simulations using the ACTM indicate substantial contributions of CH_4 sources in South Asia and East Asia to the summertime high CH_4 values observed in the UT. This suggests that our observation data over Japan are highly valuable for capturing CH_4 emission signals, particularly from the Asian continent.