Japan Geoscience Union Meeting 2014
(28 April - 02 May 2014 at Pacifico YOKOHAMA, Kanagawa, Japan)

U04-03 Room:211 Time:April 29 09:30-09:45

Elucidation of atmospheric chemistry of reactive gases from airborne observations

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Knowledge on spatio-temporal variations in the concentrations of tropospheric NOx, CO, and VOC is critical for closing the budget of OH radical, controlling oxidative capacity, and of O3, as a pollutant and a warming substance. Although recent satellite observations of tropospheric NO2, for example, have revealed regional/global distribution and seasonal features, they are based on column concentrations and thus limitation is present regarding information on vertical profiles and also on the spatial resolution.

In-situ airborne observations could provide complementary information with improved resolution in space, critical for validation of chemical transport model simulations. Validation of future satellite observations based on multi-spectral approach (e.g., O3 and CO), which could provide a piece of vertical profile information, is also important. Successful retrieval of near-surface concentrations, having impact on health and ecosystems, should be targeted.

Remote sensing from aircraft could enhance spatial (horizontal and vertical) coverage and resolution. For example, an airborne multi-channel imaging spectrometer in a nadir view could detect detailed inhomogeneity of NO2 and other gases present within cities at a 100-m resolution, contributing to studies on meso-scale atmospheric chemistry and physics. Limb observations in multiple angles could provide detailed vertical profile information.

In the presentation, observations of halogen and other unprecedented species, and observations to reveal air-sea or air-land interactions are also highlighted.

Keywords: vertical profile, nitrogen oxides, carbon monoxide, ozone, remote sensing from aircraft, spatial resolution