

[EJ] Evening Poster | A (Atmospheric and Hydrospheric Sciences) | A-AS Atmospheric Sciences, Meteorology & Atmospheric Environment

[A-AS06] Atmospheric Chemistry

convener: Yoko Iwamoto (Graduate School of Biosphere Science, Hiroshima University), Tomoki Nakayama (Graduate School of Fisheries and Environmental Sciences, Nagasaki University), Sakae Toyoda (東京工業大学物質理工学院, 共同), Nawo Eguchi (Kyushu University)

Wed. May 23, 2018 5:15 PM - 6:30 PM Poster Hall (International Exhibition Hall7, Makuhari Messe)

This session provides a forum for the presentation of the broad spectrum of tropospheric and stratospheric chemistry, including various research topics (e.g., dynamical processes, air quality and climate), approaches (modeling, field measurements, remote sensing, 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.

[AAS06-P05] Continuous measurements of atmospheric O₂ and CO₂ at Tokyo

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High-precision measurements of atmospheric carbon dioxide (CO₂) in megacities are useful to validate the inventories of the fossil fuel-derived CO₂ emissions. In addition, recent studies suggest that combination of the atmospheric oxygen (O₂) and CO₂ measurements have potential for disaggregate the emissions of CO₂ into biosphere and fossil fuel combustions, which are coal, liquid fuel and natural gas. Since the exchange ratios between O₂ and CO₂ ($\delta O_2/CO_2$) are difference values for fossil fuel burning (1.17 for coal, 1.44 for liquid fuel and 1.95 for natural gas) and biotic process (1.0) due to depending on the elemental compositions. For a better understanding of the seasonal and long-term changes in CO₂ emission and contribution from fuels in the megacity, we started a continuous observation of atmospheric O₂ and CO₂ concentration at Tokyo Skytree in February 2017.

The observed CO₂ showed not only a seasonal variation but also short-term variations with amplitudes of more than several tens ppm, which were mirrored by the O₂ variations. The monthly averages of the $\delta O_2/CO_2$ ratios for the short-term variations, ranging from 1.35 to 1.63, were low in summer–autumn and high in winter. Since the short-term variations unclear correspond to the diurnal cycles, these variations may be attributed to the synoptic scale mixing of air. Examining the relation between CO₂ concentration and wind direction, we found that the high CO₂ concentration events with durations of several hours to few days were often observed when southwest wind blew. It should be noted that the $\delta O_2/CO_2$ ratio of such high CO₂ event tended to be high. This result seems to suggest that there are strong CO₂ sources with relatively high $\delta O_2/CO_2$ ratio, for example natural gas-fired plants, to the southwest of Tokyo Skytree.