

1.156 Regional air pollution reaching Fukue Island, western Japan: Highlights during EMeRGe-Asia/ KORUS-AQ and long-term variations during 2009-2018.

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Abstract:

At Fukue Island (32.75°N, 128.68°E), western Japan, we have been conducting long-term observations of NO₂ vertical profiles using MAX-DOAS (Multi-Axis Differential Optical Absorption Spectroscopy), other gases (e.g., O₃ and CO), and aerosols (BC and PM_{2.5}) since 2009. While long-term trends are all negative for PM_{2.5}, black carbon and CO, severe pollution episodes are occasionally encountered even in recent years, particularly for ozone. The observational data during KORUS-AQ period (April-June 2016) and EMeRGe-Asia (March-April 2018) were intensively analyzed. Tropospheric NO₂ vertical column density (TropoNO₂VCD) as measured with a MAX-DOAS instrument exceeded 10×10^{15} molecules cm⁻² when air mass traveled quickly from Japan and Korea, while O₃ and PM_{2.5} peaked at different timings when air mass originated from China. During KORUS-AQ, we found close match between the NO₂ mixing ratio (~270 pptv) at ~300 m altitude derived from MAX-DOAS and that of airborne observations from NASA DC-8 which flew just over the site on 10 June 2016. During EMeRGe-Asia, a heavy pollution episode occurred during 24-28 March 2018 covering wide region over Japan; maximum hourly ozone, CO, BC, and PM_{2.5} levels at Fukue were 97 ppb, 563 ppb, 1.39 μg m⁻³, and 79 μg

m^{-3} , respectively, on 24 March. The ozone level was highest in the recent 10 years for March, but for 6 hours in 2013. We will include observations at other locations, aircraft measurements, and model simulations, to discuss three-dimensional features of such pollution episodes and modeling capabilities.