

NO₂ observed by MAX-DOAS at Fukue Island: Comparison to ground-based observations and long-term variations

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Since spring 2009, we conduct observations of NO₂ and aerosols at Fukue Island (32.75N, 128.68E) using MAX-DOAS (Multi-Axis Differential Optical Absorption Spectroscopy), in addition to surface monitoring of O₃, PM_{2.5} and black carbon, to elucidate regional air pollution over East Asia. Differential slant column densities (DSCDs) of NO₂ and O₄ are first determined for the UV/vis spectra observed at low elevation angles (3, 5, 10, 20, and 30 degrees) with respect to the zenith observations used as reference. Aerosol profile is first retrieved such that the O₄ DSCDs are consistent with radiative transfer and then the tropospheric column density of NO₂ and its vertical profile are optimally estimated. At Fukue Island, in-situ NO₂ observations were made using a chemiluminescence instrument equipped with a photolytic converter in May-June 2009 and a laser-induced fluorescence instrument in March-June 2010, respectively. These data were successfully used to evaluate the NO₂ quantities derived from MAX-DOAS observations. We analyzed diurnal to seasonal variations of NO₂ in 2009-2012, derived from MAX-DOAS. Wintertime maxima were regularly observed during this period. High NO₂ concentrations were recorded when air mass was rapidly transported from Korean Peninsula. Such transport was sometimes evident in spring period, affecting the ozone production regime there.

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