

Observations of horizontal distributions of air pollutants by MAX-DOAS

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In June 2012 we set up a MAX-DOAS device in Chiba University and continuous observations have been conducted since then. The MAX-DOAS method measures the spectra of scattered sunlight in ultraviolet and visible regions at various elevation angles. By analyzing the measured spectra with a radiative transfer model and an inversion method, vertical distributions of aerosol and gas and their column amounts can be retrieved (Irie et al., 2008,2009, Vlemmix, 2010). In this study, firstly, we compared the aerosol optical depth measured by the MAX-DOAS to that measured by the sky radiometer. We found the consistency of differences between MAX-DOAS and sky radiometer AOD values are within 30%. Secondly, we set up two MAX-DOAS devices (machine No.1 and No.2) for simultaneous observations at the same place. For both devices, the wavelength regions of 460-490nm and 338-370nm were analyzed with the DOAS method to derive the differential slant column densities (DSCDs) of O₄. In order to quantify the effect of the systematic offset of the elevation angle in O₄ DSCDs, we have biased the offset of elevation angles by $\pm 0.5, \pm 1.0$ degrees. Comparisons such as correlation analysis etc. show that the effect is insignificant as there is only 20% differences found in the O₄ DSCD comparisons between two devices. Based on such a detailed error evaluation, since December 2013, we have directed the machine No.1 to north and No.2 to west to perform quantitative observations of horizontal-distribution of aerosols. Results will be discussed in this work.

Keywords: MAX-DOAS, Elevation angle offset, vertical profile, tropospheric column amount, differential slant column density