Considering aerosol effects for better accuracy of tropospheric NO2 retrieval from GOSAT-GW

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Vertical column densities (VCD) of tropospheric nitrogen dioxide (NO_2) retrieved from earth-observing satellites have been extensively used to analyze emissions of nitrogen oxides (NOx) from anthropogenic and natural sources, including the magnitude, trends, and variability. In general, the retrieval of the tropospheric NO_2 VCD is made by dividing the tropospheric slant column density (SCD) by the tropospheric air mass factor (AMF), which is derived by the radiative transfer modeling (RTM). The AMF calculation provides the dominant source of errors in the retrieved NO_2 VCD, in particular, over polluted areas, with important consequences on the emission constraints. Hence, it is necessary to accurately consider the aerosol information, surface reflectance, and cloud fraction along with the NO_2 vertical profile, all of which are used in the RTM. In order to achieve the better accuracy of the NO_2 VCD from the observations by the Global Observing SATellite for Greenhouse gases and Water cycle (GOSAT-GW) satellite to be launched in 2024, we aim to better estimate the tropospheric AMF. In this work, we used the TROPOMI dataset as proxy data and calculated the AMF considering aerosol-related variables using a linearized pseudo-spherical vector discrete ordinate radiative transfer code (VLIDORT) version 2.7. Our AMFs and tropospheric NO_2 VCDs were evaluated with the TROPOMI operational products and the ground-based Multi-Axis Differential Optical Absorption Spectroscopy (MAX-DOAS) observations.

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