

## An evaluation of the CMAQ reproducibility of satellite tropospheric NO<sub>2</sub> data at different local times over East Asia

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Despite the importance of the role of nitrogen dioxide (NO<sub>2</sub>) in the troposphere, causes leading to a discrepancy between satellite-derived and modeled tropospheric NO<sub>2</sub> vertical column densities (VCDs) over East Asia remain unclear. Here the reproducibility of satellite tropospheric NO<sub>2</sub> VCD data by a regional atmospheric chemistry model (CMAQ) with the Regional Emission inventory in ASia (REAS) Version 2 is evaluated from the viewpoint of the diurnal variation of tropospheric NO<sub>2</sub> VCDs, where satellite observations at different local times (SCIAMACHY/ENVISAT, OMI/Aura, and GOME-2/Metop-A) are utilized considering literature validation results. As a case study, we concentrate on June and December 2007 for a detailed evaluation based on various sensitivity runs, for example with different spatial resolutions (80, 40, 20, and 10 km) for CMAQ. For June, CMAQ generally reproduces absolute values of satellite NO<sub>2</sub> VCDs and their diurnal variations over all selected 12 diagnostic regions in East Asia. In contrast, a difficulty arises in interpreting a significant disagreement between satellite and CMAQ values over most of the diagnostic regions in December. The disagreement cannot be explained by any sensitivity runs performed in this study. To address this, more investigations, including further efforts for satellite validations in wintertime, are needed.

Keywords: NO<sub>2</sub>, CMAQ, satellite data, diurnal variation