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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Systematic analysis of interannual and seasonal variations of model-simulated tropospheric NO_2 in Asia and comparison with GOME-satellite data" *by* I. Uno et al.

Anonymous Referee #1

Received and published: 24 November 2006

The paper compares NO2 vertical column densities based on GOME satellite data with those simulated with the CMAQ regional scale chemical transport model. Such a comparison is interesting and can be used to better understand the interannual and seasonal variations of tropospheric NO2 in Asia. Concerns are that there are some major unresolved issues with this manuscript, and that the manuscript overlaps with another manuscript by the same authors that was submitted to Atmospheric Environment, "Variations of the increasing trend of tropospheric NO2 over Central East China during the past decade". Both manuscripts indicate a large difference between

CMAQ and NO2 VCDs. Both manuscripts indicate larger differences in winter. Both manuscripts neglect important NOx emission processes. I would encourage the authors to either 1) combine both manuscripts into a single manuscript, and/or 2) extend the analysis of this manuscript by correcting the major issues described here and by the other Anonymous Referee. Either approach could produce a valuable publication.

The omission of soil NOx emission in the simulation is a potentially serious omission. Lightning also appears to be omitted in the simulation. These sources should be included for a comprehensive analysis. Since both sources have larger emissions in summer, omission of these sources would affect the conclusions about seasonal variation.

The GOME NO2 retrieval uses NO2 profiles from the global model MOZART-2 for 1997. How do the profiles in MOZART-2 compare with those in CMAQ? Differences could arise from spatial resolution, chemistry, meteorology, emissions, and interannual variability. Differences would introduce a bias in the comparison of GOME and CMAQ NO2 VCDs. It would be preferable to use NO2 profiles from CMAQ in the retrieval.

I agree with the other Anonymous Referee that the analysis of wind direction, wind speed, and water vapor are peripheral issues that could be omitted to save space. Figures 5 and 6 could probably be cut.

The top of page 11195 includes speculation about the nonlinear relationship in Figure 7. One option is to eliminate this speculation as suggested by the first reviewer. Another option is to test the hypothesized explanations in the model or in the retrieval and assess whether they could explain the nonlinear relationship.

Page 11187: Please give additional information on the surface reflectivity climatology. It could affect the seasonal variation of the GOME VCDs.

Page 11188, the statement that 95% of NO2 resides at heights below 3km in the CMAQ simulation would be biased by the neglect of NOx from lightning. It would be preferable

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to either use observations to assess the relative values, or to use a simulation that accounts for lightning.

At the top of page 11183 (and elsewhere in the manuscript) it is stated that the lifetime of NO2 is short. Do the author's mean lifetime of NOx? The latter is more relevant for the relationship with NOx emissions.

Please be more specific when discussing lifetimes. Does a short lifetime imply seconds, minutes, hours, or days?

Interactive comment on Atmos. Chem. Phys. Discuss., 6, 11181, 2006.

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Interactive Comment