

1.165 An estimation of NO_x emissions from OMI-observed NO₂ columns over East Asia.

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Abstract:

For the high-resolved (i.e., 30km x 30km) top-down NO_x emissions, an algorithm was developed based on the mass balance equation. Two main parameters were incorporated in the algorithm. For the first, atmospheric NO_x molecules transported from/to the adjacent cells for the considering the non-local sources were sophisticatedly calculated. For the second, effective NO_x lifetime for the nonlinearity between NO₂ columns and NO_x emissions was estimated. In our analysis, the NO_x transports from/to the neighborhood cells had significant impacts on the effective NO_x lifetime in both cold and warm seasons. Also, in our sensitivity test, we showed that the errors in the top-down NO_x estimations can be reduced by filtering the data whose NO_x lifetimes are smaller than 5 hours. The relative errors caused by the uncertain issues of NO_x lifetimes with interpolation of satellite data were ~13% and ~5% in January and July, 2014. Using the algorithm, the top-down NO_x emissions were estimated to be 1.04 and 1.18 Tg N /month over our entire domain for January and July, respectively. The values corresponded to decreases by ~15% and ~2%, compared with the bottom-up NO_x emissions in January and July, respectively. We also compared the CMAQ-estimated NO₂ columns with OMI-retrieved NO₂ columns to evaluate the bottom-up NO_x emission (i.e., MICS-Asia III) and investigate how much the top-down NO_x emissions estimated from our algorithm were improved.