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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Evaluating the accuracy of NO_x emission fluxes over East Asia by comparison between CMAQ-simulated and OMI-retrieved NO_2 columns with the application of averaging kernels from the KNMI algorithm" *by* K. M. Han et al.

Anonymous Referee #2

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The manuscript appears to suggest that applying averaging kernel in the application of satellite observed NO2 columns is so new that it warrants a journal publication (with which I cannot agree). It seems that a main justification is in line 10-14 on P. 17596, "However, such a comparison without applying the AKs is like comparing apples and oranges, and is not reasonable. Such studies have been conducted over East Asia, with misleading conclusions (e.g. Ma et al., 2006; He et al., 2007; Uno et al., 2007;

Shi et al., 2008; Han et al., 2009, 2011)." I strongly suggest that the authors read the papers from the other groups carefully before stating that those papers erred. Among the cited papers, Uno et al. (2007), for example, compared the retrieved tropospheric vertical columns with the model simulations, which is very appropriate. The authors did not seem to know that AK has already been used in the retrieval of the vertical columns.

In line 6-10 on P. 17596, the authors stated "Previously, Han et al. (2009, 2011) also compared the CMAQ-calculated NO2 columns with satellite-retrieved NO2 columns, without using the AKs, to investigate the accuracy of bottom-up NOx emissions over East Asia. Based on this comparison, Han et al. (2011) concluded that the bottom-up NOx emissions used in the CTM simulation over East Asia could be overestimated." While it is common knowledge that the AK-type observation sensitivity corrections on satellite data are absolutely needed, if the authors were using retrieved tropospheric NO2 vertical columns to compare to model simulated columns, it is OK. (The profile error is another matter.)

I strongly suggest that the authors read carefully the early papers by Martin and coauthors to understand the difference between slant and vertical tropospheric NO2 columns and where AK was used in the retrieval. It seems that the concept of tropospheric NO2 vertical column retrieval was misunderstood. Another possibility is that the paper suggests that AK should be used when comparing to satellite-derived tropospheric slant columns, which seems rather obvious and there is no need to write a journal paper for that.

As a side note, the usage of English can be improved in this manuscript. "Accuracy" has a well-defined meaning in science. I don't think that a comparison between satellite and model columns can be used to evaluate the accuracy of NOx emissions (as stated in the title). In the abstract, AKs cannot be retrieved from a retrieval algorithm. On P. 17594, the wording of "under-sensitive" and "over-sensitive" should be changed.

In addition, the statement on P. 17595 “In the same context, more attention was paid to winter (spring and fall) in this study, because there are fewer uncertainties and unknowns related to the chemical NOx loss rates during these seasons.” is incorrect. Although the chemical effect is less in winter (one can even argue that the uncertainty of NOx chemistry in winter is larger), the transport uncertainty is much larger in winter than summer. To understand emissions, winter is not a better season to use satellite measurements than summer. The MM5-CMAQ (4.7.1) modeling system is getting long in the tooth. The authors should consider updating the modeling system.

Interactive comment on Atmos. Chem. Phys. Discuss., 14, 17585, 2014.