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Atmospheric Chemistry and Physics Discussions

ACPD
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Interactive Comment

Interactive comment on "Global distributions of nitric acid from IASI/MetOP measurements" *by* C. Wespes et al.

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We would like to thank S. Kulawik for her enthusiastic comments about the results presented in the paper. We acknowledge her useful correction and suggestions. Below are our point-by-point responses to her comments which have been quoted between [...] before each response.

Response to S. Kulawik:

Comments:

[On page 8038, it is stated "The Tropospheric Emission Spectrometer (TES)/Aura (Beer et al., 2006) does indeed not routinely probe the nitric acid absorption spectral range around 900 cm-1" This is not accurate. TES routinely takes nadir measurements be-

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tween 660 and 910 cm-1 which includes all the selected IASI windows. Perhaps the confusion is regarding the limb HNO3 measurements which we no longer take? Our project has done some preliminary analysis on nadir HNO3 but we have not developed it into a product.]

Thank you for pointing this error. The paper has been revised to include the fact that TES takes such nadir measurements but does not develop it into an operational product.

[I also wondered why only scenes with cloud cover below 25% are analyzed since the IASI HNO3 sensitivity is in the stratosphere?]

The sensitivity is maximum in the middle stratosphere but it covers the entire altitude range from the troposphere to the stratosphere. At present, we do not include parameterization of clouds in our radiative transfer. The threshold of 25 % cloud cover was chosen after a series of tests, which have shown that these scenes could be treated as cloud free without significant impact on the column retrievals. Above this value, a more specific treatment of clouds would be needed.

[A comment on section 2.4: TES has had issues with retrievals over dessert and found the best emissivity match is ASTER's alluvial sand. You might try alluvial sand emissivity from ASTER (go to http://speclib.jpl.nasa.gov/search-1/soil and search for "alluvial".)]

We currently use surface emissivity taken from climatology based on MODIS/Terra satellite observations at 908 cm-1, which is close to the absorption bands of HNO3 used for the retrievals (860 to 900 cm-1). Despite it, over deserts, some sharp emissivity features are found in the retrieval spectral range (not captured by MODIS imagery), causing an overestimation of the HNO3 total columns. Filters based on brightness temperature calculations in specific channels related to these emissivity features have been applied to remove the overestimated columns. In the future, we could indeed use more adapted emissivity databases. We thank you for suggesting the ASTER one.

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[Figure 4 is hard to see. Can it be enlarged?]

This Figure have been enlarged in the revised version of the paper

[Figure 6: does the grey represent error or real variability? How does this compare to the predicted error? Where is the NDACC data on these plots? Congratulations again on your new product.]

The grey areas (3sigma around the daily mean values) have been drawn to represent the daily variability of the total columns observed for the different selected boxes. The total errors are lower than the observed daily variability. For instance, retrieval errors (error bars) associated to the total columns are shown for one of the six selected regions in the Figure 1 attached. We are very confident that we capture real daily variabilities in mid and high latitudes (mostly related to the zonal transport around the poles), while at the Equator, the variations should be looked at more critically. We have selected six NDACC stations in preparation for the future validation with the NDACC data. At the time of writing the paper, there were unfortunately no HNO3 archived data on the NDACC website.

Interactive comment on Atmos. Chem. Phys. Discuss., 9, 8035, 2009.

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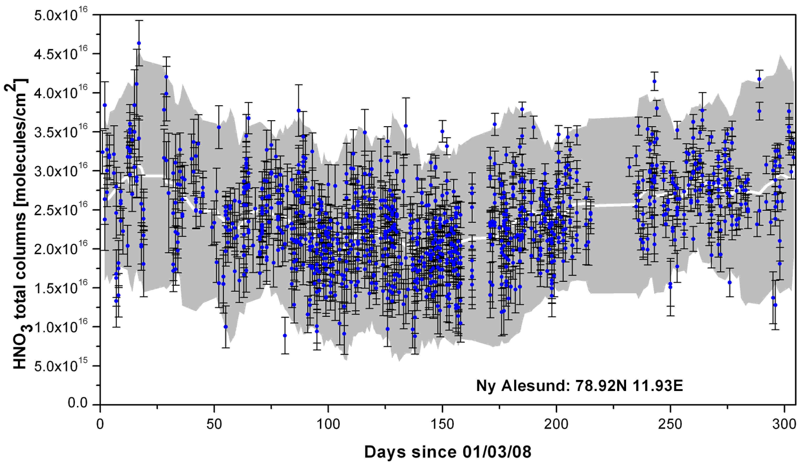

Fig. 1.

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