Atmos. Chem. Phys. Discuss., 15, C5596–C5600, 2015
www.atmos-chem-phys-discuss.net/15/C5596/2015/

Atmospheric Chemistry and Physics Discussions

Interactive comment on "Influence of aerosols and surface reflectance on satellite NO_2 retrieval: seasonal and spatial characteristics and implications for NO_x emission constraints" *by* J.-T. Lin et al.

J.-T. Lin et al.

linjt@pku.edu.cn

Received and published: 4 August 2015

I found this to be a very important and mostly clear paper that is a wonderfully complete case study on tropospheric NO2 retrieval. It should be accepted with only a few minor changes in grammar and bookkeeping, none of particular substance. They are:

Read carefully to define abbreviations and acronyms on first use (AMFv6, OMLER, Case S_A, CRF, : : :.)

Response: AMFv6 is short for our Fortran package 'Air Mass Factor version 6'. We have decided to always just use the short name, in order not to confuse it with the actual 'air mass factor' quantity. OMLER is a widely-used satellite albedo product best understood with its short name. Case S_A etc. represent individual sensitivity cases with no full names.

12656.1 – Excluding days with high pollution is not clarified until Section 3.5. Please add a sentence to clarify here.

Response: We have updated the sentence as follows:

"The implicit aerosol treatment also tends to exclude days with high pollution, since aerosols are interpreted as effective clouds and the respective OMI pixels are often excluded by cloud screening; this is a potentially important sampling bias."

12657.5-6 Please discuss in terms of moving from implicit to explicit, since this is the direction of improvement.

Response: Updated:

"Our previous study (Lin et al., 2014b) for several locations in the North China Plain (NCP) has shown large changes in retrieved NO2 VCDs when moving from an implicit to an explicit treatment of aerosols. In particular, NO2 VCDs are reduced by 14% on average but are changed by (-90)–(+70)% for individual pixels when aerosol optical depth (AOD) exceeds 0.8."

12659.25 I found Figure 2 to be unnecessary. It did not clarify the retrieval procedure.

Response: Although the retrieval procedure is easily understood for advanced users, we have elected to use Fig. 2 to help other users' understanding. In particular, we clearly show in Fig. 2 that we always retrieve cloud parameters prior to the NO2 retrieval using consistent ancillary parameters. The decision is in part based on some reader feedbacks for our previous paper (Lin et al., 2014b).

ACPD
15, C5596–C5600, 2015

12666.4-8 The wrong conclusion seems to be drawn here. If the heights are correlated would that more likely reduce errors than if they were not?

Response: The writing is indeed misleading here. We have updated the sentences to: "Note that since the same vertical mixing and convection schemes were used to simulate aerosols and NO2, the height of aerosols relative to NO2 (above or below or mixed with NO2, relevant to our study) may be subject to smaller errors than the absolute height of aerosols. Future work is needed to better understand and constrain aerosol properties and evaluate how they affect the NO2 retrieval."

12667.20 and later discussion – The order of rows in Figure 5 and the order of subsequent discussion in the text should be made consistent.

Response: Although we discussed the fifth row prior to the second-fourth rows, we have elected not to adjust the order of these rows, in order to be consistent with other figures, e.g., in the supplementary material.

12671.23 – "to space"

Response: Changed.

12672.7 What is the correlation for Castellanos et al?

Response: They show correlation of 0.87-0.93 for each bin of SSA. The overall correlation is reduced if all cases of SSA are considered together. The paper does not specify the overall correlation. See their Fig. 14:

12672.26 "Several representative regions of China are considered, including: : :."

Response: Changed.

12675.15 ": : :REF from DOM. These include: : :."

Response: Changed.

12676.12 ": : :TOA radiance is from the combination: : :."

ACPD

15, C5596–C5600, 2015

Response: Changed.

12676.26 “situations”

Response: Changed.

12681.10 “: : :DOMINO v2. Our cloud: : :.”

Response: Changed.

12684 – The conclusions here should certainly mention the upcoming GEMS mission and its hourly high spatial resolution measurements of China.

Response: The last sentence has been updated:

“Such retrieval efficiency enables a fast global retrieval that will be particularly important for future fine-resolution satellite instruments such as TropOMI (which is expected to have a data rate ∼8 times that of OMI) and GEMS (which will be onboard a geostationary satellite with hourly measurements at a horizontal resolution of 5 x 15 km2).”

Interactive comment on Atmos. Chem. Phys. Discuss., 15, 12653, 2015.

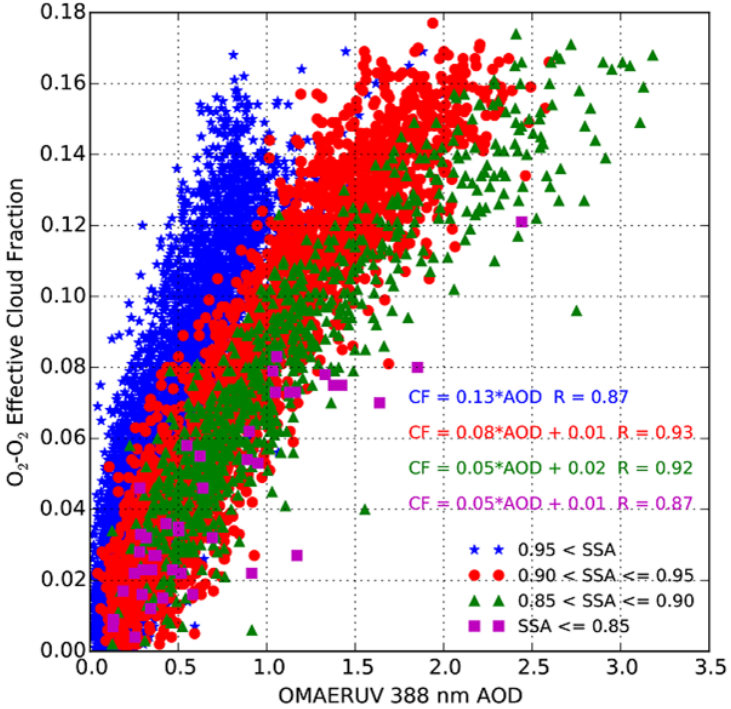

Figure 14. Comparison of the OMAERUV retrieved 388 nm AOD and observed effective cloud fraction binned by the OMAERUV retrieved SSA.

Fig. 1.

ACPD
15, C5596–C5600, 2015