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Interactive comment on "OMI/Aura Nitrogen Dioxide Standard Product with Improved Surface and Cloud Treatments" *by* Lok N. Lamsal et al.

Anonymous Referee #2

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General comments

The authors present a new version of NASA's standard OMI NO2 algorithm, which includes several improvements: better surface reflectance treatment, new cloud product based on the updated surface reflectance, and several other improvements. The effects on AMFs are shown for global maps for specific days. The effects on VCDs are shown for specific days and long-term average. The new product has been evaluated with ground-based and airborne observations. The manuscript is generally well written and the new product version fits well within the scope of the AMT. I recommend publication of the manuscript after considering the comments below:

(1) The analysis of the AMFs focus on some daily global maps. The largest difference

between V3.1 and V4.0 should be actually noticeable at the regional and local scale as also discussed in the manuscript. I suggest to add some example figures that show the improvement at that scale, for example, along polluted coastlines, in the presence of snow, or in mountainous terrain. These figures would also be important to demonstrate the new version is actually superior to the previous version.

(2) The evaluation of the new product is quite short and could be extended with some additional analysis. In particular, it is currently difficult to judge if the new version significantly improves the product, because the authors do not evaluate both V3.1 and V4.0 for all data. It would also be helpful to have table with correlation coefficient, bias and other parameters to give an overview over these numbers currently spread throughout the manuscript.

Specific comments and technical corrections

L55ff: The row anomaly is only mentioned in Section 2.4 but I would consider already briefly mention it at the beginning of Section 2 because the impact on data availability is unfortunately quite severe.

L99: MODIS surface reflectance has also been used in the HKOMI product (Kuhlmann et al. 2015, https://doi.org/10.5194/acp-15-5627-2015).

L435: Please mention somewhere that "coastal areas" refers to the high NO2 values labelled with "ocean" in Figure 6.

L441ff: The term "lower troposphere" is somewhat confusing here, because it should be the additional layers between the new and old cloud pressure and not the full lower troposphere.

L444f: ". . .in the calculation of tropospheric AMF." -> ". . .in the calculation of tropospheric AMF increasing the AMF."

L459ff: What is the reason for the increase of AMFs over ocean in Fig. 5c?

L528: Please add a sentence that explains what kind of improvement is expected when improved NO2 profiles become available.

L532f: The effect of the a priori is not really removed "altogether" when NO2 profiles are used for model comparison but remains as part of the model error.

L676: What do you mean by the "alternating nature of the variation"? Please provide more details.

L684: Please specify how the "agreement" was computed here and which parameter has improved by 20-35

L725ff: The sentence is a bit confusing. Does the 0.3 refers to the GLER or to the difference between GLER and LER?

L726 L732: The formulation "lower by <0.05" and "lower by <0.30" is a bit vague. Maybe some more details can be given here like average and maximum difference.

L736: "an optimized" -> "the optimized"?

L742: "may" -> "can"

Figure 1 lists many abbreviations used in the paper. It would be better to list them in a table instead of the caption of a figure.

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