

## ***Interactive comment on “A new TROPOMI product for tropospheric NO<sub>2</sub> columns over East Asia with explicit aerosol corrections” by Mengyao Liu et al.***

### **Anonymous Referee #1**

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#### General comments:

This manuscript describes a tropospheric NO<sub>2</sub> column retrieval algorithm applied to the new sensor TROPOMI. Results are validated using ground-based measurements, and the impact of introducing an explicit aerosol correction and improving the horizontal resolution of a priori NO<sub>2</sub> profile shapes used in the retrieval are discussed.

This study is based on the author's previous work on OMI tropospheric NO<sub>2</sub> retrievals using the POMINO algorithm. A simplified version of this algorithm is developed here and applied to the new TROPOMI sensor. The main simplification concerns the cloud pressure retrieval, which no longer accounts for aerosols, while an explicit aerosol correction is maintained for the NO<sub>2</sub> retrieval itself. The impact of this simplification should be more extensively discussed and accounted for in the error analysis. In addition, the

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aerosol correction is treated twice in the product (explicit correction for the NO<sub>2</sub> retrieval, and implicit correction for the cloud pressure retrieval), which may lead to larger retrieval errors than more simple treatments (e.g. only explicit aerosol correction without cloud, or simple cloud correction including implicit aerosol correction). Therefore, I strongly encourage the authors to expand their discussion and provide more robust and convincing arguments in support of their approach. I recommend publication of this manuscript only after major revision addressing the aforementioned comments.

Specific comments:

Figure 1: Reflectance at 758nm -> 437.5nm.

Figures 6-7: these figures can be merged. I suggest to add similar figures where the y-axis use retrieved MAX-DOAS profiles smoothed by satellite averaging kernels. This will remove the error on the satellite retrieval coming from the profile shape uncertainty.

Page 17 line 9: more much -> much more

SI Table S2: Number of measurements within +/- 0.5h -> Number of measurements within +/- 1h, why?

SI reference is missing.

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