

Atmos. Meas. Tech. Discuss., referee comment RC2
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Comment on amt-2021-328

Anonymous Referee #2

Referee comment on "Bayesian uncertainty quantification in aerosol optical depth retrieval applied to TROPOMI measurements" by Anu Kauppi et al., Atmos. Meas. Tech. Discuss., <https://doi.org/10.5194/amt-2021-328-RC2>, 2021

General comments

The manuscript is devoted to a very important problem: correct model selection taken into accounting the uncertainties due to forward model approximations. The results are demonstrated and analyzed on several cases. The application of the developed method to different satellite remote sensing applications is described in the manuscript.

Overall, the manuscript is well written. Presented method and results can be interesting for broad remote sensing scientific community.

Specific comments

The manuscript presents the method accounting for uncertainties due to forward model approximations. To model top of atmosphere measurements the approximation of RT based on assumption of Lambertian surface reflectance is used. This RT-approximation may introduce additional uncertainties in comparison to the case when full surface BRDF is taken into account together with correct accounting for surface and atmosphere coupling. These uncertainties depend on the observation geometry, in particular, on the solar and observation zenith angles. What is important for these studies, they also depend on different combination of surface and aerosol properties as well as on aerosol optical depth and may affect the selection of best model. Some discussion of this problem would be interesting to see in this manuscript.