Comment on amt-2021-322

Anonymous Referee #2

Referee comment on "Aerosol models from the AERONET database: application to surface reflectance validation" by Jean-Claude Roger et al., Atmos. Meas. Tech. Discuss., https://doi.org/10.5194/amt-2021-322-RC1, 2021

Title: Aerosol models from AERONET data base: Application to surface reflectance validation

Page 1:

Line 19: "evaluate our own empirically retrieved microphysical properties".

Line 22: "…from 3.5×10^{-5} to 10^{-3} in reflectance units."

Line 28-30: There are too many citations here. Include only important ones.

Page 2:

Line 33-35: put this sentence outside the bracket.

Line 51-53: But this is what is being performed for operational surface reflectance

products from MODIS & VIIRS. Isn't it?

Line 54: "Numerous studies have shown the validation of aerosol optical depth products derived from various sensors, i.e., MODIS, MISR, OMI, POLDER, and Landsat.

Line 60: These are aerosol models describing their optical-microphysical properties (not just optical or microphysical)

Page 3:

Line 85: Non-sphericity mostly applies to coarse mode dust particles; fine mode aerosols are adequately modeled as spherical particles.

Line 88: "AERONET measurements".

Page 4:

Line 92: "aerosol optical depths"

Line 93: "860 nm"

Line 95: 50 measurements in direct product or inversion product?

Page 5:

Figure 1: It would be more informative to color-code each site with its corresponding length of measurements (in years).

Figure 1 and Figure 3 can be combined in one plot shown panels side-by-side.

Page 7: It is not understood how Table 2 was derived. Please explain the methodology clearly.

Page 8: Section 2.3 Metrics used: This section is not adequately described.

Page 9:

Line 185: From which AERONET site this data comes from? What is the time of the year? It also applies to Figure 10.

Line 190: A brief description of how such regression was derived is required here.

Line 213: "hydrophilic".

Page 12:

Line 234-235: This isn't completely true as total AOT is comprised of scattering and absorption AOTs.

Line 236-238: This isn't understood. Please clarify.

Eq. 7: Why AOT of coarse mode and AE of fine mode are used here? Can author use total AOT & AE instead? How do numbers in Table 4 (last row) change If total quantities in both parameters used?

Page 20:

Section 3.4, line 350-355: This is essentially a look-up table of TOA reflectance under varying atmospheric and surface conditions.

Page 21:

Table 6: What is "In-fine uncertainties"? Also, uncertainties in MODIS blue channel (band 3) should be included in Table 6.

Figure 15 should be plotted as uncertainties in surface reflectance in blue channel (y-axis) versus that in red channel (x-axis).

Page 22:

What is difference between results shown in Figure 16 and tabulated in Table 6? The figure caption is written poorly. Please explain in the caption what each line and dots represent.

Line 389: The aerosol model is developed using optical properties (AOT and AE), not microphysical properties, where the latter is actually derived from the former two, as stated on line 391-392.

Line 391: "…many other applications."

Conclusion should be expanded and adequately discuss the methods adopted and results obtained in this work.