Atmospheric Measurement Techniques Discussions

Atmos. Meas. Tech. Discuss., author comment AC2
https://doi.org/10.5194/amt-2021-322-AC2, 2022

Reply on RC1

Jean-Claude Roger et al.

Author 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-AC2, 2022

Thank you very much for all your constructive comments. We mostly agree with all of them. Below is the detail of each answer.

Page 1:

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

Thank you, modified.

Line 22: "…from 3.5X10^-5 to 10^-3 in reflectance units."

Thank you, modified.

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

OK.

Page 2:

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

Thank you, modified.

Line 51-53: But this is what is being performed for operational surface reflectance products from MODIS & VIIRS. Isn't it?

Yes, it does, but the aerosol model we use is simpler.

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.

Thank you, modified.

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

You're right, it's a typo mistake, I corrected it.

Page 3:

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

Yes, and if you do not use polarization, then using assumption of spherical particles is ok for most applications. Even with polarization the difference of scattering between spherical and non-spherical particles for small sizes is not really significant. So, we defined this parameter in case users will need it.

Line 88: "AERONET measurements".

Thank you, modified.

Page 4:

Line 92: "aerosol optical depths"

Thank you, modified with thickness.

Line 93: "860 nm"

Yes, there is a typo mistake. In reality, it's 675 and 870 nm

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

Inversion, I rewrote the sentence.

Page 5:

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

Yes, that's a good idea. Nevertheless, the length of measurement is not totally indicative as we can have several months without data (it happens when there is maintenance or for re-calibration). We decided de re-do Figures 1 and 11 with the number of data rather than elevation.

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

Please, see the comment about Figure 1.

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

Thank you, we re-wrote the methodology and the text describing Table 2. To explain: We derive 1 median value (for each microphysical parameter) for each site, and then we do the median of the 851 sites (for each microphysical parameter). It avoids the too important weight of sites with numerous data (some sites provide 100 data when others provide 10,000).

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

I understand you comment, but I do not know what to say exactly. The APU are more and more used in our AC community (it has been adopted by the CEOS ESA-NASA ACIX exercise), and there are now many papers with APU. So, I tried to rewrite the first sentence of chapter 2.3. I hope the text is clearer.

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.

Yes, you're right. I added the origin of data in both Figures 9 and 10 caption.

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

I rewrote the sentence by more precise (and trying to remain simple).

Line 213: "hydrophilic".

Thank you, modified.

Page 12:

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

I'm sorry, I don't see what you are talking about, your lines do not correspond to the initial version. Could you precise please?

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

I'm sorry, I don't see what you are talking about, your lines do not correspond to the initial version. Could you precise please?

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?

I think there is a misunderstand, there are 6 regression parameters a, b, c, d, e, f and c and f don't stand for coarse and fine.

Page 20:

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

Yes, we can say that.

Page 21:

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

This is the uncertainty generated at the end on the surface reflectance product once we apply the uncertainty on the microphysical parameter. For example, % Cvf is generated with an uncertainty of 22.0%. This uncertainty generates, once we proceed an atmospheric correction scheme, an uncertainty of 0.00014 on the surface reflectance (in

reflectance unit). I add explanation in the text.

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

I don't understand. Most of the atmospheric correction procedures over land (I added this point in the whole paper – "over land") use blue channels to retrieve the aerosol information as the surface reflectance is very low over most of lands in the blue. For that purpose, the atmospheric reflectance is usually uses. So, Figure 15 shows how uncertainties due to the use of our aerosol models is reported on the surface reflectance in the red channel (which is the most used).

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.

Figure 16 includes all uncertainties (derived from each microphysical parameter) while Table 6 reports individual uncertainties. I explained in detail the figure in the caption.

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.

AOT and AE are used to generate the microphysical parameters. Once we get these parameters, we recompute the optical properties. I collaborate regularly with people working on the aerosol chemistry. For them, an aerosol model is defined by their microphysical parameters. I agree with that view as optical properties are derived from microphysical properties.

Line 391: "...many other applications."

Thank you, modified.

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

We expanded the conclusion adding details about the adopted method and results.