

Atmos. Meas. Tech. Discuss., referee comment RC2
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Comment on amt-2021-322

Anonymous Referee #1

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-RC2>, 2021

General comments

The objective of the manuscript is somewhat confusing. The title suggest "the use of aerosol models for the validation of surface reflectance", the abstract suggests that the objective concerns building and identifying aerosol models. Finally, the introduction suggests that the objective is the description of these "dynamic" aerosol models definition and design.

The introduction does not reflect well enough the paper objective and structure. Please define clearly the objective within the paper title, abstract and introduction. Detail how the paper is organised to reach the proposed objective(s).

In the context of the radiative transfer theory used here to perform atmospheric correction, the authors do not justify the choice of the proposed strategy. Single scattering (or optical, ie, single scattering albedo and phase function) properties directly impact the propagation of light in the atmosphere following this theory. Different combinations of micro-physical properties might lead to similar optical properties. There is therefore no need to develop such kind of aerosol model based on micro-physical

properties. Starting from the optical properties is simpler and leads to less possible confusion. Please compare these two approaches and justify the proposed approach.

The selection of the experimental setup used in Sections 3.4 is not discussed at all. It is also not clear how τ_{440} and $\alpha_{440-870}$ can be derived to use the proposed approach. The benefit of this method is therefore not clearly demonstrated. Consequently, the approach proposed in this paper appears pretty much irrelevant as can be seen from the absence of convincing conclusions.

Detailed comments

- Abstract: Second sentence "As part of the validation of atmospheric correction of remote sensing data affected by the atmosphere, it is critical to utilize appropriate aerosol models as aerosols are a main source of error" Is the aerosol model more important to characterise than the aerosol optical thickness?
- Abstract third sentence "In this paper, we propose and demonstrate a framework for building and identifying an aerosol model". This sentence is not clear. What is the purpose?
- Abstract : last two sentences. Uncertainties are given in absolute reflectance units and relative. Please provide uncertainties in a coherent way throughout the manuscript.
- introduction, first sentence: It is written ... properties for a better evaluation of their impacts. Aerosol impact on what? Please clarify.
- Line 67: It is written: the complex refractive index (gives the path of light through the atmosphere). This statement is inaccurate. The path of light also depends on the radius. Please correct this statement.
- Line 70-71. It is written "For an optical approach, the use of the Gaussian Distribution is widely accepted". Please add a reference.
- Line 89. Are these references correct for version 3? They look a bit old for version 3.
- Line 96 and 116: Some symbols are not defined or not consistent with previous definition. Please define and use symbols consistently throughout the manuscript.
- Line 98 : It is written "As this study was focused on the validation of the atmospheric correction and in an operational context ..." Is this yet a new or different objective of this manuscript?
- Line 120 : If it not unrealistic, does that mean it is realistic?
- Line 121 : can you please elaborate this sentence: "Their integration along the vertical column generates a kind of a minimum sphericity."
- Line 124 : "this time period" do you mean the last 9 years?

- Figure 4 : The X axis title and figure legend are misleading. The axis title suggests that all data sets are considered whereas the legend suggest that only the first one is used.
- Line 166 : The definition of symbols C_i is not clear. Please specify the nature of the computed values.
- Line 207 : please clarify and justify the statement made in this sentence : "Indeed, an intensive parameter can be used for identifying a sample while an extensive parameter can be used for describing this sample".
- Line 209 : It is written "We decided to select the Ångström coefficient for the 440 and 870 nm ..." Why did you take this decision? Please clarify.
- Line 211 : "At the end, we selected t_{440} and $a_{440-870}$ as variables of the regression" You mean Equation 5? Could you please justify this choice.
- Equation 6 and 7. Please use symbols for the left side of these equations
- Lines 254, 257, 258 : please use the correct symbols for alpha and tau. Such loose usage of symbols occurs elsewhere but will not be reported in this review.
- Line 259 : Please be more rigorous in the definition of the most representative variables.
- Figure 12 : left axis is title is not readable
- Line 352 : it is not clear how this work is used in practice to support atmospheric correction validation.
- Figure 15 : which angular configuration is used? Why the magnitude of the x axis stops at 0.07? Is the surface assumed Lambertian? Please justify the experimental setup.
- Figure 15 : Please add the requirements
- Figure 16 : Please provide a reference for the requirement definition.
- Line 400 : Could you please clarify how this method can be use to define a surface reflectance reference?