

Geosci. Model Dev. Discuss., referee comment RC2  
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## **Comment on gmd-2022-153**

Anonymous Referee #2

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Referee comment on "SCIATRAN software package (V4.6): update and further development of aerosol, clouds, surface reflectance databases and models" by Linlu Mei et al., Geosci. Model Dev. Discuss., <https://doi.org/10.5194/gmd-2022-153-RC2>, 2022

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The paper describes the latest updates and additions to the already extensive suite of aerosol, cloud and surface reflectance databases implemented in SCIATRAN. The new databases are adopted from mostly recent work of, and published in the peer-reviewed literature by, a number of researchers. The paper is fairly well written and accessible. It should provide a useful reference to current and future users of SCIATRAN.

I understand the goal is to describe the updated databases, but I think a high-level description of the state of SCIATRAN would be useful in addition to the references that are already provided. This should include the radiative transfer solver(s) implemented, databases that existed before the recent update, as well as a reasoning for replacing them, if any. It isn't entirely clear to me whether the new aerosol databases are in addition to the "old" aerosol types or the they replace the "old" ones.

The databases implemented in SCITRAN is now quite extensive. While reading the manuscript I was hoping to find some sort of guidance or recommendation as to which database should be used under various situations. I don't mean the trivial scenarios like land aerosol models over land and oceanic aerosol models over ocean, or water and ice clouds depending on what the user want to simulate. I am thinking of especially of the bidirectional surface reflectance databases. Which one would be the most appropriate to use when all inputs required for the models are available?

SPECIFIC COMMENTS:

Lines 113-14: Are the fluxes only for selected wavelengths, can the user request spectrally integrated quantities too?

Lines: 126-128: I assume this means the gas absorption calculations use the HITRAN 2020 database. I understand the discussion of it is out of scope, but please at least provide a reference.

Lines 259-262: It is said that the continental aerosol type is not included in the SCIATRAN database because according to the authors' investigation it is not used in the XBAER algorithm for MERIS. It may be fine since the continental aerosol type is generally regarded "old" by some researchers but I'd think there should be a more substantial justification for excluding it beyond the fact that the XBAER algorithm does not use it for a specific instrument.

Lines: 445-449: In the previous version, the effective radius of water droplets was between 4 and 20 microns. So, do you mean the database was extended to include the range 2 - 4 microns, or that the "old" database was replaced with a new one having effective radius between 2 and 40 microns?

Table 3 caption: I think the correct URL is <https://darktarget.gsfc.nasa.gov/atbd/ocean-algorithm>

Line 459: Is there a reference for the relationship between mode radius and effective radius?

At places where implementation of databases is discussed the choice of the specific way a particular database was implemented could be discussed. For example, re the ice particle habit (lines 520-525), has the linear interpolation been suggested by the database developer? I am not saying that a linear interpolation is not adequate; I am only suggesting that when it is appropriate the choice should be justified as much as possible, especially in those cases when multiple choices are possible.

Line 577: Are "typical values" of the mean chord length and optical thickness of snow provided in the code or database for a broad category of snow, say fresh and old snow? I assume users could read the Malinka (2014) paper, but still, having such values listed in the paper would be useful for casual users who just want to see the sensitivity to these parameters without prescribing unrealistic values.

Line 808: The Dubovik and OPAC 4.0 dust models also have relatively large differences in the backward scattering direction (scattering angle 150-180 degrees).

Lines 903-911: I am not sure I understand this part. What is being shown on the vertical axis in the lower panel of Fig. 5? Is it the reflectance from a single aerosol component

divided by the reflectance from all 5 components, or the reflectance of 4 components (excluding one aerosol type) divided by the reflectance from all 5 aerosol types?

Line 2021: I assume the authors mean user-friendly interfaces. Is it really necessary to say it since it has not been shown in the paper?

TECHNICAL CORRECTIONS (could be more):

Line 145: "the explore of" should read " the exploration of".

Line 152: "of Young database" should read "**the** Young database".

Lines 191-192: "... optical properties those six components" should read "... optical properties **of** those six components".

Line 249: "Virible" should read "Visible".

Line 311: "wavelegths" should read "wavelengths".

Line 351: "Many investigations has ..." should read "Many investigations have ..."

Line 548: "Combing" should read "Combining".

Line 588: Perhaps "build-in" should read "built-in"?

Lines 773-774: Would read better "... the new aerosol types implemented in SCIATRAN" or "... the aerosol types newly implemented in SCIATRAN".

Line 807: "paramterization" should read "parameterization".

Figure 3 caption: See comment above for lines 773-774.

Line 824: "show layer" should read "snow layer".

Lines 828-829: Instead of "the scattering processes plays very important role" the authors could write "the scattering process plays a very important role" or "scattering processes play a very important role".

Lines 855-856: "response" should read "response"; "instrument" should read "instrument".

Line 859-860: "to the time of writing" should read "at the time of writing".

Line 927: "channels" should read "channels".

Lines 983-984: "with the optical thickness of 20" should read "with an optical thickness of 20"; "the geometrical thickness" should read "a geometrical thickness"; "and the top height" should read "and a top height".