

Interactive comment on “Comparative analysis of atmospheric radiative transfer models using the Atmospheric Look-up table Generator (ALG) toolbox (version 2.0)” by Jorge Vicent et al.

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Dear anonymous referee First, thank you for your interest in our publication and in the ALG software tool. We also believe that a broader scientific community might be interested in using the provided tool. We kindly appreciate your comments and advices, which have served us to improve the quality of the manuscript. Regarding your comments, we have been taken them carefully into consideration. Specifically, we have reviewed our paper, trying to improve the description of the functionality of the model. Please find below our response to all points (reviewer comments in blue and italics). We trust that the comments raised through the revision process have been duly

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addressed to your satisfaction. Kind regards, The Authors

N.B.: Lines numbering refer to interactive discussion paper and not to the final version of the paper.

1) OVERVIEW: *...As an example, consider Figure 2 ("LUT Configuration"). I presume this is the same as the "LUT config." box referenced in the GUI box of figure 1, but it's never explicitly stated.*

We acknowledge that the old Figure 1 might be confusing on the logic and purpose of the Section 3.2 (i.e. to describe ALG's graphical user interface). We have now modified Figure 1 to focus only on the graphical user interface. We also modified the caption in Figure 2 caption to explicitly point the this with the "LUT configuration" box in Figure 1.

2) OVERVIEW: *Within Figure 2 itself, there are numbered boxes, but those numbers are never explicitly made use of in the prose: either omit the numbers because they don't add value to your discussion, or mention them in the text because they do.*

We understand the comment from the Referee. However, the numbers are already used explicitly in the prose and each box has a dedicated paragraph. See "Firstly" (line 154 using previous version numbering), "Secondly" (line 162), "Thirdly" (line 169), "Fourthly" (line 172) and "Finally" (for the 5th step; line 175). In order to improve readability and link with the numbers in Figure 2, we have now changed those ordinal numbers (i.e., firstly, secondly. . .) by expressions such as "In step 1 (Generic configuration), . . .". We believe that, with this change, it is more explicit and clear the link between the steps in Figure 2 and the paragraphs below.

3) SECTION 3 PROPOSAL: *Consider turning Figure 1 into a high-level architecture diagram with just a few boxes (the three boxes currently in GUI, the mention of an output config file, and a single box representing "Internal Functions"). I count five potential boxes: mention each of the functions of these five boxes in a logical sequence. For two of those boxes (LUT config and Internal Functions), you can be very brief and*

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conclude with "We will discuss LUT Configuration in greater detail in section 3.x"

We appreciate the recommendation given by the Referee. We realize that the key problem in understanding and following the logic of ALG is on the position of the original Figure 1 within Section 3.2 (ALG graphical interface). We have decided to update Figure 1, only including the three blocks of the graphical user interface: Software configuration, LUT configuration and Help system. These three blocks are then further described in Section 3.2 in lines 150-153 (Software configuration), lines 154-188 (LUT configuration) and lines 190-193 (Help system).

4) SECTION 3 PROPOSAL: *Then, take your existing Figure 2 ("LUT Configuration") and give a brief, sequential discussion of the purpose of each of the five boxes. The text is mostly already in the manuscript, but should be organized around the figure itself. The figure has five boxes: I should see five paragraphs - or, more generally, five logical groupings of information.*

Please notice our reply to comment 2 above. We have explicitly numbered the paragraphs that describe each step within the LUT configuration GUI (Figure 2). We believe that this clarifies the point raised by the referee.

5) SECTION 3 PROPOSAL: *Finally, the bottom half of your Figure 1 ("ALG - Internal-Functions") can be turned into it's own Figure 3. It should follow Figure 2 in the sense that you have to configure before you can run. Once again, five boxes means five paragraphs. Some of this text will be new and some can be derived from the existing section 3.*

We have followed your recommendation and included a Figure 4 (page 8) with focus on the ALG's internal functions for RTM model execution and LUT generation. The new figure includes numbered boxes whose content is further described in the paragraphs below. In order to facilitate readiness, we have added expressions such as "In step 1...", which serve to identify the paragraph with respect to the boxes in Figures 4.

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6) SECTION 3 PROPOSAL: *Lines 161-168 ...: This discussion belongs somewhere else. You're telling the user that once you've built the LUT on a discrete grid, you can interpolate to any continuous value within that grid without losing much accuracy. That information should appear in the paper, but Section 3 really focuses how the model gets constructed (not used). I'd propose deferring this paragraph until you've completed your description of how the LUT was created in the first place.*

We thanks the suggestion but we don't fully agree on moving the Lines 161-168 in Section 3.2. In our opinion, these lines are not (in principle) related to the interpolation and how the LUT is used. In fact, we find that it is important to describe here the difference between "discrete" and "continuous" variables. Each of them has a slightly different interface to configure the variable values in the LUT, and so they are important to mention here as they are related with how to use ALG. Notice that the name "discrete" refers to variables that can only take specific (integer) values (e.g. an aerosol model can only be rural, maritime or urban). The name "continuous" indicates that a variable can take any value (real numbers) (e.g., the solar zenith angle can be any value between 0° and 90°).

7) ADDITIONAL COMMENTS: *Lines 198-200 ...: This discussion belongs somewhere else. The second set of lines discusses details of how the interpolation occurs. If you aggregate these two blocks, you end up with a useful description of how ALG gets used in real-world situations*

Thanks for the suggestion. However, we consider that the description of the interpolation functions fit well within the description of the LUT node distribution. Moving this text somewhere else would imply having a new section (3.4) with only a few lines explaining the interpolation methods provided to users of ALG.

8) ADDITIONAL COMMENTS: *Lines 207-218 + Lines 230-232: This is an important paragraph that tells the user exactly what you store in your LUT. Give motivation as to why these particular quantities.*

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This is indeed a good observation. We have rephrased the introductory sentence to give further motivation on the interest of having the LUT defined as atmospheric transfer functions.

9) ADDITIONAL COMMENTS: *Also, you list several quantities in the LUT as bullet points, then switch gears to discuss a technical issue that differs between codes, and then back to completing LUT quantities, this time as numbered items. Why not complete the bulleted list first and then follow up with the difficult LUT entry.*

We have followed the suggestion by the reviewer and moved the lines 230-232 (in the original paper line numbering) right after the list of atmospheric transfer functions in order to complete the description of the LUT content.

10) ADDITIONAL COMMENTS: *Finally, this is the spot where the authors have the opportunity to tell the reader the hard work that has clearly been done to make different radiative transfer codes, with different types of outputs, fill the exact same LUT.*

We have added a sentence to stress that the harmonization of RTM outputs is one of the key aspects of the constructions of LUTs in ALG.

11) ADDITIONAL COMMENTS: *Lines 219-230: The text is fine, but please lead in with a motivating sentence. Something like "Most values stored in the ALG LUT can be obtained directly from standard RTM outputs. The exception is TOA radiance: obtaining this value differs depending on the RTM being used."*

In fact, most RTM provide the TOA radiance spectrum as an output. The lines here were meant to support the idea that the atmospheric transfer functions can be used in forward and backward (atmospheric correction) simulations. Once said that, we agree that these lines should be reorganized in the text. We have decided to introduce equation 1 before listing the content of the LUT in order to motivate why the atmospheric transfer functions are used to create the LUT. Equation 2 must come after the explanation on the complexity to harmonize the different RTM outputs, since in 6SV the

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atmospheric transfer functions have slightly a different meaning (due to the uncoupling of absorption and scattering in 6SV). We believe that the reorganization of the text results in a more clear structure to follow the understanding of ALG.

12) ADDITIONAL COMMENTS: *Figure 4: Please define "SI" somewhere (in the figure or in the text).*

Thanks for pointing to this missing acronym. SI (Sensitivity Index) is now explicitly mentioned in the text.

Please also note the supplement to this comment:

<https://www.geosci-model-dev-discuss.net/gmd-2019-188/gmd-2019-188-AC2-supplement.pdf>

Interactive comment on Geosci. Model Dev. Discuss., <https://doi.org/10.5194/gmd-2019-188>, 2019.

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