

Authors' response to Topical Editor

Response from the Authors to the comments from the Topical Editor:

Dear Dr. van Chiel

First, thank you for your support reviewing our manuscript. We have taken your valuable comments into account and updated the manuscript accordingly. In particular, we have followed your advice on adding new plots with more measurable quantities. We have decided to plot the total solar irradiance directly and diffusely transmitted in the path Sun-target-sensor as well as the path radiance in order to better visualize the main radiative processes of absorption and scattering in the atmosphere for the different models. We believe that this has served us to improve the quality of the manuscript.

*Regarding the additional minor comments, we have been taken them carefully into consideration. Please find in the text below the main changes of our paper, which are also highlighted in **red** in the updated manuscript to facilitate the revision process.*

We trust that the comments raised through the revision process have been duly addressed to your satisfaction.

Kind regards,

The Authors

Comment #1: Line 11. Intercomparison studies of what exactly?

The utility of ALG is demonstrated in this manuscript through the comparison of top-of-atmosphere radiance simulations made with 3 broadly used radiative transfer models. The comparison is in particular carried out through global sensitivity analysis. We have rephrased this sentence in the Abstract for clarification.

#2: Section 2.3. The description of LibRadtran is a little minimal compared to the two above.

We acknowledge your observation that this section is shorter when compared to the two previous sections (i.e., for MODTRAN and 6SV). We have added further description of the software package.

#3: Figure 1 I do not fully understand why this figure is in the paper, since its content is literally in the text.

We understand your comment and agree that the figure is of little use since its content is fully described in the text. Following the Editor recommendation, we have proceed to remove the figure from the manuscript.

#4: Section 4: In order to demonstrate your tool, in my view a demonstration of output in measurable quantities is indispensable. This also permits the user to validate the output of your tool against observations. A GSA is a complex and very useful quantity, but I cannot infer whether your tool produces the correct output based on its outcome. Please add some more simple plots to the paper in which for instance radiative fluxes are plotted against each other for some representative cases.

That being said, you do not have to solve the differences, but you should at least show that the developers of the respective RTMs have the opportunity to check the implementation in ALG.

We appreciate the recommendation given by the Editor. We realize that indeed showing the spectral outputs generated by the execution of the different RTMs can be more illustrative to readers than the complex, though useful, GSA results. In the updated manuscript we have included the new Figure 4, which shows the path radiance, spherical albedo and total irradiance at TOA of MODTRAN, libRadtran and 6SV for a subset of the simulations carried out for GSA (see Table 1). Notice also the descriptive text around Figure 4 (in red), which gives further details about the observed differences between the analyzed models.

#5: (Line 327) Your paper contains only two plots. In my view, you can do better with your tool. Please show more plots that can be produced with your tool that can provide guidance on how to explain the differences.

In response to the previous comment, we have added the new Figure 4, which shows the spectral output of the atmospheric LUTs as generated by ALG. This illustrative figure (three in fact) gives an idea of the harmonization of the various RTMs done automatically by the ALG tool. The figure is also giving further insight of some differences between the models. Other figures are possible with ALG (just to cite a few: spectral aerosol optical properties, vertical profiles of gas concentration and temperature, global maps of ECMWF variables), however these functionalities are not used for the global sensitivity analysis carried out here. Therefore, we prefer to limit the number of figures only to those that are relevant for the scientific content of the manuscript.

#6 (Line 334) Is it possible to include Mystic solver (libRadtran) in ALG given the user license.

The solver Mystic is implemented and freely distributed with the rest of the libRadtran package. We have already implemented the compatibility of ALG (v2.1) with Mystic and we are currently running simulations for several projects.

#7 (Line 343) What are the licenses of the underlying RTMs? Can you provide those freely with your tool? I am no expert in those things, but have you checked this thoroughly?

We appreciate your remark. ALG does not re-distribute any third-party software (i.e. the atmospheric RTMs) to avoid problems with licenses. In fact, many licenses explicitly forbid the re-distribution (e.g. libRadtran or MODTRAN). ALG however provides guidelines (within its Help system) with instructions to download, compile and integrate these RTMs within ALG. We have added a short sentence in Line 375 describing this license aspects.