Geoscientific Model Development Discussions

Geosci. Model Dev. Discuss., referee comment RC1
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Comment on gmd-2020-442

Joseph Cook (Referee)

Referee comment on "A versatile method for computing optimized snow albedo from spectrally fixed radiative variables: VALHALLA v1.0" by Florent Veillon et al., Geosci. Model Dev. Discuss., https://doi.org/10.5194/gmd-2020-442-RC1, 2021

This paper aimed to describe a new method for estimating full-resolution spectral albedo from calculation at a subset of reference wavelengths. The rationale for this is that models with lower numerical load than full RTMs are required for regional climate models. Current models that do this are subject to biases because the regimes used to interpolate between reference wavelengths lead to biases.

In my estimation, the paper succeeds in demonstrating the new algorithm and the subject matter is well within the scope of GMD. Overall, they have clearly described their method, provided a transparent report of its performance relative to TARTES and identified an optimal configuration that balances computation time and accuracy. Therefore, I support this manuscript being published in GMD.

The areas that I think could be improved are:

a) it took me a few reads to really understand what benefit the new model provides to the community – I think just reworking the introduction slightly to make it crystal clear why this is useful might be helpful.

b) the comparison with the 14 tps model used by van Dalum et al. (2019) was very informative. Given that the 15 tps version of VALHALLA failed to give a good representation of the albedo, and presumably there is a computational cost associated with adding tps, can you clarify the argument for using VALHALLA in its 30 tps form in a regional climate model in preference to SNOWBAL?

c) Is there a physical explanation for the relationship between model bias and SZA/SSA?

d) Can you give any more detail about the “systematic error” at 400 nm? This seems like it could be a significant issue, but is not explained in much detail in the manuscript. Is this the same as what is referred to in the discussion lines 283-285?

e) The zenodo archive really doesn’t contain much helpful documentation. A quick review of the code indicates there are significant dependencies including a development environment that includes both tartes and sbdart with specific configurations – it also seems to be OS specific judging by calls out to the sbdart command line tool. I think these and related issues need to be explained in the model documentation in the form of some basic user instructions.

Kind regards

Joseph Cook