

Interactive comment on “A benchmark for testing the accuracy and computational cost of shortwave top-of-atmosphere reflectance calculations in clear-sky aerosol-laden atmospheres” by Jeronimo Escribano et al.

R. Spurr

rtsolutions@verizon.net

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This is an interesting work on short-wave reflectance comparisons.

As the author of the VLIDORT model, I have some points I would like to bring to the attention of the authors. Most of my comments concern section 3.1.

Since VLIDORT is being used as the benchmark reference model in this study, it is useful to give a proper description of the model. Here, the summary is very short, and there are a few omissions.

C1

1. Although VLIDORT and LIDORT are independent implementations of the discrete ordinate method, they are based only in part on Siewert's work. Several other sources (including the original work of Chandrasekhar) were consulted in the LIDORT/VLIDORT development. In particular, the Green's function methodology used in the Siewert work is not used in VLIDORT, but it is used in LIDORT.
2. VLIDORT actually solves the RTE for the full Stokes 4-vector, but it is possible to use VLIDORT to solve for the (I,Q,U) 3-vector when neglecting circular polarization. You should add that you are neglecting circular polarization in the Earth's atmosphere.
3. It should be stated that VLIDORT is in double precision throughout. It should be noted that VLIDORT is also flexible (actually more so than DISORT, given the linearization capability for the VLIDORT code, and the multiple-SZA facility - see 5 below).
4. The TMS correction is mentioned in both section 3.1 and 3.2. Please add a sentence explaining this correction. The implementation of the TMS single-scatter correction is done differently in DISORT compared with the treatment in VLIDORT – this can affect computational speed.
5. You mention that “Given a solar zenith angle, the DISORT model can provide outputs for multiple viewing geometries”. VLIDORT has the same capability (and more); indeed VLIDORT can generate output in a single call for any number of solar angles and for any combination of viewing geometries.
6. The use of BRDF models in VLIDORT should be made more explicit, as was done for DISORT in the section following. It should be mentioned that the VLIDORT BRDF supplement is called separately before the main VLIDORT code.
7. You should state in the text the actual version of VLIDORT that you are using (Version 2.7). This is important as the BRDF supplement was not present in earlier versions.

In Section 1.

C2

There are a number of fast RT models out there in the literature, and in this paper only the 2stream model by Toon et al. (1989) is referenced. There are several 2stream models, and I think it would be good at least to draw attention to the review by Natraj (2013), and a discussion of recent fast PCA approaches would not go amiss here,

Natraj, V. A review of fast radiative transfer techniques, *Light Scattering Reviews* 8 pp 475-504, 2013.

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