Response to Short Comment 2

We would like to thank Robert Spurr for his helpful comments and remarks. We expect the revised version to address all comments.

We reproduce comments from R. Spurr in "script" font followed by our answer. A document listing the revisions to the manuscript is also provided.

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.

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.

We have added this point in the manuscript.

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.

Indeed we used VLIDORT to solve for the 3-vector components (I, Q, U) and therefore we effectively neglected the circular polarization in the Earth's atmosphere. We have added a note to this effect in the revised manuscript.

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).

We have added this information to the revised manuscript.

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.

We have added the following text to the revised manuscript: "The TMS correction removes the single scattering feature computed with a few streams and replaces it by the exact single scattering contribution. This correction helps to remove non-physical features due to the use of a low number of Legendre coefficients in the computation."

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.

Added.

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.

Indeed, the BRDF contribution is computed separately before the call to the main VLIDORT program. This information has been added to the revised manuscript.

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.

Indeed we have used version 2.7 in our study. This is now mentioned in the revised manuscript.

In Section 1.

There are a number of fast RT models out there in the literature, and in this paper only the 2-stream model by Toon et al. (1989) is referenced. There are several 2-stream 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.

We have added a number of references in the introduction of the revised manuscript.