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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Gauss-Seidel Limb Scattering (GSLS) radiative transfer model development in support of the Ozone Mapping and Profiler Suite (OMPS) Limb Profiler mission" *by* R. Loughman et al.

Anonymous Referee #1

Received and published: 4 September 2014

Review of Loughman et al., 2014 This paper presents the results from several recent updates and improvements to the GSLS radiative transfer code, which is used to simulate limb scatter radiances for the OMPS Limb Profiler retrievals. The updates are, for the most part, important, and this work should be published in order to inform the community of the modern and up-to-date capability of the RT code used for OMPS-LP. Additionally, the convergence of the multiple scattering source term for various number of solar zenith angles is a nice result. My concern is that this is not really suitable for publication in ACP. However, I believe that it is suitable for the Limb Special Issue and

that AMT would make a much better place for publication of this work. I would ask that the authors and editor discuss this change of journal and pursue it if possible.

The following points should also be addressed:

- The "re-introduction" of the ability to simulate vector radiances is not really an important point to include in the paper, as this essentially results in the ability to get the same answer as the model did in 2004. However, the comparison of the result to Natraj et al., 2009, and the variation of the error in the scalar approximation over the OMPS orbit (Fig. 13) are noteworthy. I would suggest removing the first paragraph of Section 4 and focusing this section on these comparisons.

- Are the computations of the multiple scatter source terms at various solar zenith angles uncoupled? i.e. does a large signal from one term (maybe due to high associated surface reflection) affect the calculation of a neighboring term at a different solar zenith angle? Of course it should in reality. Also, 143 source term calculations seems like a lot of computational memory. How is this handled?

- What interpolation method is used when performing the final line integral of the LOS through the source terms at multiple solar zenith angles? Are the radiances sensitive to this choice?

- How many source term calculations are used to get the level of agreement presented in Fig. 11?

- The "Chapman Layer improvement" seems like an extremely minor point and is not necessary for publication. I would recommend removing this section and the associated figure.

- Can the authors speculate on the cause of the problem with the 600 nm radiance calculation that is the outlier in Figures 4 and 5? Is it related to the forward scattering geometry, possibly an aerosol effect? - It would be very helpful if Figs 2 and 4 could be combined into a 2 panel side-by-side figure with a legend (rather than an explanation

of the lines and colors in the caption).

- Same for Figs 3 and 5.

- Same for Figs 7 and 11.

- Similarly Figures 8, 9, and 10 would be easier to interpret and more effective if combined into a single 3 panel figure with a legend. (Then the common axis ranges make more sense too).

- Use words rather than what appears to be code variable names in the legend of Fig. 12.

- Include a legend in Fig. 13.

Minor points:

- I believe that CDIPI is now called SCIATRAN, correct?

- Remove point 3 in the abstract.

- The term “multiple zeniths” is used throughout the paper. I find this confusing. Using the term “multiple solar zenith angles” would be much clearer.

- On page 19318 line 4, Loughman et al., 2004 is abbreviated as L04; this is a duplication and is already noted on the previous page.

- State why SIRO was used as the radiance benchmark

- It would be helpful to briefly mention the atmospheric state used for the radiance comparisons, i.e. was it only Rayleigh scattering, or were ozone and aerosol included?

Interactive comment on Atmos. Chem. Phys. Discuss., 14, 19315, 2014.