Atmos. Chem. Phys. Discuss., 14, C7775–C7777, 2014
www.atmos-chem-phys-discuss.net/14/C7775/2014/

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 #2

Received and published: 7 October 2014

Authors present some recent updates in the GSLS RT code to improve performance of the retrieval algorithm used to process OMPS limb data. In particular, the linear treatment of extinction coefficient within each layer and the multiple scattering function calculations are important results. Additionally, some already published features are re-implemented and some rather technical improvements are discussed, providing so a more complete evaluation of model's performance. However the paper should be improved in particular regarding algorithm description and re-structured. Theoretical description of the new multi zenith multiple scattering radiance calculations must be

given. Also the improvements in the RT code should be discussed in the context of the OMPS retrieval to justify the title: i.e. how the total error budget of OMPS is improved? I would agree with the concerns of Referee #1 that Limb Special Issue in AMT would be much better place.

Some more comments:

- To my opinion, a general overview of the RT model is needed where the technical terms (SS, MS, TS radiance, zenith ...) are introduced. To eliminate the fragmentary description of the basic model concept and its distribution through different sections, a suggestion is to add an additional section (before starting to discuss the specific improvements) where introduce the basic principle of the RT code with the terms discussed in the text, move there Fig. 6.

- OMPS instrument should be introduced also in the main text (currently just in abstract).

- Introduction, 2nd paragraph: The example RTM model list looks somehow outdated. Cite also more recent limb capable models/their recent versions), e.g. McArtim (Deutschman et al., JQSRT, 2011), MOCRA (Premuda et al., Optics express, 2012), SCIATRAN (Rozanov et al., JQSRT, 2014).

- Sect.2, 1st sentence. Say that Siro is a Monte Carlo model and "accounts for all of the complications associated with RT in the limb of a spherical atmosphere" (Loughman et al., 2004) so it is best aimed as a reference model.

- Sect.2, last paragraph: How the cone boundaries are selected in the current multi zenith model? Is there an overlap of the cones for different zeniths appearing? Is the whole horizon considered at the end that is visible from LOS?

- P. 19329, L. 9 and elsewhere: "the zenith" – perhaps "the local zenith" would be a better term?

- Sect 3, 2nd paragraph: The details of the modification are not described at all (add

an Appendix (B) with the algorithm as you did for the linear extinction treatment). How the total MS radiance is now setup from the individual source functions at different zeniths. How light paths crossing multiple cones of different zeniths at the same time are considered? I.e. how the part of radiation is considered traversing the atmosphere under a high zenith angle when being scattered into a slant path so that it crosses areas of several local zeniths?

- Fig. 6: Explain or remove variables in this figure that are not yet explained neither in caption nor in text θ_p, θ_Q, P' etc.). Please indicate the cone boundaries for each of the zeniths?

- What the zenith selection for Fig. 11 is? From Fig. 6 it looks like TP + crossings at top of the layer containing TP + crossings at TOA. Please clarify?

- Fig. 12: nzenN with N=1 to 6 means N zeniths included in the sequence listed in Sect. 3, doesn't it? What is "nzen_gt_6"?

- Sect. 6, Fig. 16. Result for an additional wavelength (in UV) would be nice to see.

- Conclusions, L. 7 in that page: According to Fig. 11 it would be more appropriate to say that "total radiance error has been reduced to the 1–3 % level "

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