

Zawada et al. (submitted to AMTD)

Even though this is a difficult topic, the paper is very well written and understandable. I recommend it for publication after the following minor corrections. This long paper could be made shorter by dropping the timing section. I didn't find it that interesting, particularly since apples-to-apples comparisons were difficult, particularly for the Monte Carlo models. Perhaps that section could be condensed, if it is not eliminated.

L36: BrO reference should not be McLinden and Bourassa, 2010. It should be McLinden et al., 2010:

C. A. McLinden, C. S. Haley, N. D. Lloyd, F. Hendrick, A. Rozanov, B.-M. Sinnhuber, F. Goutail, D. A. Degenstein, E. J. Llewellyn, C. E. Sioris, M. Van Roozendaal, J. P. Pommereau, W. Lotz, J. P. Burrows, Odin/OSIRIS observations of stratospheric BrO: Retrieval methodology, climatology, and inferred Br_y, *J. Geophys. Res.*, **115**, D15308, doi:10.1029/2009JD012488 (2010).

L48: "at most" -> ", at most,"

L75: "built-in" -> "a built-in"

L79: With the previous sentence mentioning polarization, it should be clear here whether Sasktran HR is a vector model or not.

L105: "the multiple scatter source function is calculated at" -> "at which the multiple scatter source function is calculated"

L106: In what sense are the weighting functions "approximate"? Is this related to the pseudo-spherical multiple scattering?

L140 (and elsewhere): approximate -> approximately

L146: SCIATRANs -> SCIATRAN's

L172: The last part of this sentence is repetitive: "and is capable of simulating the effects of a fully three-dimensional atmosphere".

L180 (and elsewhere): A comma should follow a leading prepositional phrase. See L76, L77 for good examples.

L186: Was the surface 3-d (i.e. varying terrain elevation) or is 2-d meant?

L206: The two sentences starting here are irrelevant to this paper. Maybe they should be deleted.

L207: "higher wavelengths" -> "longer wavelengths" ?

L214: "force-scatter" What is this? Never heard of such a term. It becomes clear later (L432), but I suggest a rewording here.

L237 Reword or remove "when the incident source is unpolarized". This is not correct. The incident source could be, for example, partially polarized and the statement would be true.

L245: Begin sentence with "The ozone..."

L247: "simple Rayleigh scattering without" -> "elastic and without"

L279: Remove comma after "attributing"

L288 (Figure 2 caption): State the wavelength. Presumably there is a single wavelength used to generate the figure.

L299: "(MMM)." -> "(MMM) for this case." [see L284]

L304: in -> with (?)

L306: "simulation" might be preferable over "calculation"

L329: What kind of approximations are made in the ground-to-LOS scatter? How might GSLS be approximating this differently? Since the surface is Lambertian for all models, it does not seem that this should be a source of bias.

L369: identically -> exactly

L384: "differences" -> "differences relative to SMART-G" (?)

L388: "The refraction ratio is larger at longer wavelengths due to the atmosphere being more optically thin". This explanation is insufficient for me. Is it that refraction is of greater relative importance when scattering is diminished? If so, I think my wording is more to the point.

L397: Odd construction with this sentence (suggested change is optional): "There exist various methods" -> "Various methods exist"

L400: The meaning of "this" is ambiguous. Can you not narrow it down with some single scattering comparisons?

L402 (and L471): higher -> larger (see L470)

L415: Delete ", solar geometry, and atmospheric composition"

L423: The -> the

L441: Search the document for polaris* and replace the 8 occurrences with polariz*

L448: low -> small

L455: Is refraction considered at all altitudes for SMART-G or does it "turn on" when the altitude is low enough (e.g. 11.5 km)?

L477: university -> University

L720: No need to provide second website and publisher in this reference and many others, or is this a new convention?