

## ***Interactive comment on “Cloud sensitivity studies for stratospheric and lower mesospheric ozone profile retrievals from measurements of limb scattered solar radiation” by T. Sonkaew et al.***

**Anonymous Referee #4**

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### **General comments on Sonkaew et al. [2009]:**

This paper addresses an area of research relevant to Atmospheric Chemistry and Physics Discussions, namely the ozone retrieval error caused by failure to include radiative transfer in cloudy atmospheres realistically in limb scattering retrievals. This topic has not been explored in depth, so the work described is timely. Useful suggestions for a simple correction that does not require full modeling of the cloudy atmosphere are also included. The set of simulations is sufficient to draw meaningful conclusions, and is described carefully to permit the reader to understand the results. The paper is structured well and clearly written. References, figures and tables are

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sufficient to support the text.

### **Specific comments:**

#### *Abstract:*

It would be helpful to mention here that the clouds in this study are spherical shell clouds that vary only with height. The lack of horizontal variations may be an important limitation on the applicability of the conclusions to real limb scattered data.

#### *Sect. 2, last paragraph:*

How has the performance of the SCIATRAN model in simulating in-cloud radiative transfer been tested? Several references are given to cite various tests of the SCIATRAN package, but all of them appear to be “clear-sky” comparisons. I can find no evidence of any comparison that includes radiances within a cloudy atmosphere. The usefulness of this study rests entirely upon the assumption that SCIATRAN accurately computes the radiance in the model atmosphere for both clear and cloudy conditions, so I am uncomfortable with the lack of documentation presented in the literature for the latter case. I doubt that simulating the radiance for each direction as it leaves the cloud with high accuracy is crucial for this study, but a numerical estimate of the SCIATRAN accuracy in simulating the radiation field at the cloud/atmosphere boundary would be useful.

#### *Sect. 8.4, first paragraph:*

The analysis in this section is incomplete. It seems unreasonable that a perfect estimate of the ground albedo could be obtained for a limb scattering retrieval despite the presence of a cloud layer. A few calculations to quantify the impact of an imperfect estimate of the ground albedo under various conditions would complete this section nicely.

#### *Appendix A:*

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The Chappuis triplet (as it's usually formulated, including in this manuscript) uses two kinds of "normalization" to limit sensitivity of the measurement vector to factors other than ozone: Tangent height normalization for measurements at each wavelength, followed by grouping the wavelengths into the "triplet." In the analysis presented (see Figs. 1-3), the sensitivity of the absolute radiance to clouds is compared to the sensitivity of the Chappuis triplet. A reader who is pondering alternative approaches might be interested to see how much of the reduced sensitivity of the Chappuis triplet arises from the tangent height normalization and how much arises from the wavelength grouping. That analysis might fit comfortably into the Appendix.

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Interactive comment on Atmos. Meas. Tech. Discuss., 2, 379, 2009.