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Atmospheric Measurement Techniques Discussions

Interactive comment on "Retrievals from GOMOS stellar occultation measurements using characterization of modeling errors" *by* V. F. Sofieva et al.

Anonymous Referee #1

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As a preface to my comments, I must admit that I am not terribly familiar with stellar occultation and scintillation effects in particular. Perhaps I was not a good choice for a review but I have made my way through the manuscript and my comments could be emblematic of the broader community of potential readers.

The main point of the paper boils down to the idea that the optimal estimation (OE) retrieval of GOMOS species is dependent on an accurate covariance matrix of measurement uncertainties. The past method that excluded scintillation produced uncertainties that were much too low that ultimately required the retrieved profiles to oscillate wildly in an attempt to fit the data. By increasing the size of the covariance components

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(particularly in the off diagonal elements), a smoother profile is possible while producing larger uncertainties to cover the measurement noise. As usual, I don't care for OE retrievals (although they are ubiquitous) since I often ended up wondering what was measured and what comes from the a priori. The authors, as many do, seem to assume profiles should be smooth (maybe that's true) but it would be nice to see a discussion of how the new elements in the covariance matrix impact the source of the values produced? The only thing I have major heartburn over is contained in Figure 4 where I think this problem is very evident. As an example, at 55 km , the error bars for line-of-sight aerosol is about 20%. However, aerosol at these altitudes are for all intents and purposes 0 (or exceedingly close to it) and it is impossible to measure '0' to 20%. The error should be 100% or more since there's is no way GOMOS can measure aerosol at these altitudes. It is clear that the a priori is defected in this case and producing nonsensical results. The corollary to this defect is that I find myself wondering about the extent that the a priori is driving the profile shape and the reported uncertainties in the measurements even though they have obviously improved the functionality of the retrieval with some solid scintillation modelling. I suspect this problem is not limited to aerosol but is rattling around all the species (e.g., 0.1% ozone accuracy from 15 to 70 km?).

The other issue which would have made my read of this manuscript more readable is the number of terms that the authors introduce but do not explain. A partial list includes:

isotropic turbulence dilution effects Fresnel scale What is the (cap) delta function? full ray velocity

and so forth. I know some of these terms and found others in other papers but the thickness of the terminology made this paper a fairly dense read and including some simple explanation of what these terms mean physically would be greatly appreciated and make the paper more accessible to the broader community.

There is a minor typographical error on page 2, paragraph 2, line 4 where it looks like

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2 divided by 3 rather than 2-3.

Interactive comment on Atmos. Meas. Tech. Discuss., 3, 579, 2010.