**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 #2

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This paper discusses an additional error term that may be used within the current retrieval of atmospheric constituent vertical profiles from GOMOS stellar occultation measurements. This error arises from an inability to properly handle scintillations that arise in oblique measurements as a result of isotropic turbulence. This error was discussed in previous publications and was not covered in detail within this work. Instead this work focused on the impact of including this error within the retrieval scheme. Inclusion of this error has two difficulties that were adequately addressed by the authors. These are both related to computational efficiency. The first is the calculation of the off diagonal elements in the covariance matrix and the second was the inversion of the matrix. As mentioned both of these issues were addresses adequately within the

paper an need no further comment.

I feel the paper is almost suitable for publication but I would like to see another line of discussion included within this work. The GOMOS retrieval process appears to be separated into two distinct sections. The first retrieves line of sight column densities from and the second uses these retrieved column densities to retrieve vertical profiles. It is the first step that is modified within this paper but I feel that the results from the second step are the most important and have not been sufficiently addressed. The authors address the impact on error in the final vertical profiles but they never relate how the vertical profiles themselves are changed as a result of including the new error term. More Serious Issue 1) I feel that the paper needs two or three paragraphs and a figure that address the impact on the final results not just their errors. This is not expected to be a major issue.

Minor Issues

1) I needed to read the paper a few times to fully appreciate the two stage retrieval process and exactly where the modification fit in. This needs to be made more clear with a sentence or two within the text. 2) I assume that in the retrieval of column densities the density for each tangent altitude is retrieved independent of the other tangent altitudes. If this is the case it was not clear. If this isn't the case then it really wasn't clear. A sentence or two should fix this. You also might want to reformulate how you define the vectors T as they are defined to be functions of two variables, wavelength and tangent altitude, but in practice within the retrieval they are only one dimensional, that being wavelength. 3) The authors have left out many variable definitions within equations. For example what is N in equation 1). I assume it is iteration number. 4) The authors need to better define their four sets of measurements that they use as a test. How many, where etc. were never mentioned. 5) What species do the results in Figure 2 refer to? 6) If I look at the "red" dots in the plots of Figure 2 I see a bunch of them that are greater than the solid line mean value and none that are less than the solid line mean value. How is this possible? 7) I feel that Figure 3 is not adequately discussed

within the text. Why were the operational results included and more importantly why do I care if the results are smoother. This issue ties in with the more serious issue I raised about the quality of the final retrieved product not just the quality of the error bar.

Overall I feel that this work is worthy of publication in AMT. I would like to see the minor issues addressed and I would really like to see further discussion with respect to the final retrieved data products.

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