

Interactive comment on “Retrieval of ozone profiles from GOMOS limb scattered measurements” by S. Tukiainen et al.

Anonymous Referee #2

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This paper describe the ozone profile retrieval from GOMOS limb scattering measurements This is an important study given the length and coverage of GOMOS bright limb measurements, which can complement GOMOS long term night-time occultation measurements. This paper is suited for AMT special issue and should be published after addressing the concerns mentioned below.

1- I think the main strength of the paper is the association of this team with ESA, and the potential implementation of this retrieval to process all GOMOS bright limb measurements and subsequent release of this data set to the scientific community. If this is the case, the authors should highlight it and inform the reader if there is there is such a plan to process all the bright limb measurements by ESA.

2-The paper could benefit from an error characterization of the retrieval so that the reader can understand the potential accuracy and precision of the measurement.

3- Section 5, I think the authors should rename it data comparison rather than validation, because of the limited number of profiles and instruments used.

4- As stated in section 2, GOMOS measures the bright limb above and below the star. Which one did you use? Did you perform separate retrievals or only retrievals using either the upper or lower band? How do the separate retrievals compare? Please discuss further the merits of the approach you used in this study.

Other comments:

1-Page 4356 line 6: 'We introduce an alternative technique' should be ' We introduce a retrieval that supplement GOMOS night-time measurements' or something similar.

2-Page 4356 line 24: 'the limb-viewing technique can not achieve as good global coverage, but it yields superior vertical resolution', this is not exactly accurate, since the main advantage of the limb-viewing technique is that it can achieve similar good global coverage as well as superior vertical resolution.

3-Page 4357 the paragraph starting at line 4, can you establish relevance of this paragraph to the current study?

4- Page 4357 line 17; can you specify the number of bright limb measurements?

5- Page 4357 line 23; replace 'in similar way than' to 'in similar way to'

6- Page 4357 line 28: 'we present a new method to retrieve ozone' the retrieval is not a new method, rather than a new study. The technique is already used for OSIRS measurements in Takiainen et al, 2008..

7- Page 4378 line 18; the sentence 'the flags are claiming the data to be good' is confusing, since the authors said earlier that 'the flag are not correctly implemented', can you please clarify the use of the flags in this data set?

8- Page 4358 line 22 replace 'the whole UV optical region' with 'the whole UV-Visible optical region'

9- Section 2.2 stray light: the authors need to elaborate more on the source of stray light.

Page 4359 Line 6; the authors need to reference Rault, 2005 and Taha et al, 2008 for introducing similar empirical corrections model of the stray light. The scheme for straylight in this paper is rather similar to both papers, although not identical.

Figure 2: The figure would benefit from adding longer wavelength, the 500 and 600 nm which are used for the ozone retrieval. Also by showing the radiance before and after the corrections applied using log scale if needed.

The authors need to explain in the text the use of 20 km constraint value?

10-Page 4360 Line 9: 'OSIRIS radiances are relatively clean of stray light below 70 km' is not exactly accurate, since OSIRS still exhibit straylight contamination depending on altitude and wavelength. Please add more information about the OSIRIS straylight using proper references.

11- Page 4380 Line 15: 'These observations are from a narrow narrow latitude band', use very narrow instead.

12- Page 4361 line 7: 'First, we analyze differences in the GOMOS and OSIRIS absolute radiances' replace it with 'the differences between GOMOS and'

13-Page 4361 line 20: Can you elaborate more about any possible reasons for the observed increase in the bias?

14- Section 3.3: the authors use fixed altitude normalization at 50 then 47, however, the conclusion of which normalization height to use is not clear. I think they end up using the 47 km for normalization, but you can only read it in Fig 8 not in the text. Did you investigate the use of different normalization height for the UV than the VIS?

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15- Page 4362, line 13: Did you use the reported error values of the GOMOS bright limb? Can you add more about accuracy of the error estimate?

16- Page 4362, line 16: The reference altitude used in the retrieval is at ~ 50 km, why not 47 km? It clearly shows better agreement with OSIRIS than 50 km. Again, did you try using different reference heights for UV and VIS? What is the advantage of using same reference altitude for all wavelengths?

17- Page 4363 line 7: 'while NO₂ is taken from a climatology and kept fixed,' is it one fixed profile or a location and time dependent profile? Depending on which climatology you use there might be an added error that needed to be discussed in section 6.

18- Page 4363 line 5: 'Typically O₃, aerosols and neutral air are inverted together', did you really invert aerosol and neutral air? If so you need to discuss the accuracy of the retrieval and the error associated with such retrieval on the ozone profile. How does you retrieval compare to using a climatology of aerosol and air density?

19- Section 5 page 4364: Which version of OSIRIS ozone profile did you use? Can you add a comment about the quality of OSIRIS ozone?

Fig 9, can you add the 50% percentile to the right panel, similar to Fig 10. Also comment further on the 50% percentile in the text.

20- Can you expand your comparison for the GOMOS bright vs. night measurements? Why only showing 30S-30N? Looking at Fig 11, there are far more coincidence between the two measurements outside the selected latitudinal band. I think the paper could benefit from expanding the comparison in this section and further discussion of the sources of random and systematic biases seen in comparison.

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