Atmos. Meas. Tech. Discuss., 3, C2464–C2467, 2011
www.atmos-meas-tech-discuss.net/3/C2464/2011/

Atmospheric Measurement Techniques Discussions

Interactive comment on "Fast NO_2 retrievals from Odin-OSIRIS limb scatter measurements" *by* A. E. Bourassa et al.

Anonymous Referee #1

Received and published: 13 January 2011

General comments:

In this paper the authors apply a variant of the so-called triplet method and use the MART retrieval scheme to retrieve OSIRIS NO2 profiles using only four wavelengths. I think that this new method is sound and quite interesting addition to the other NO2 retrievals around. This paper is suitable for the AMT special issue and can be published after responding to the concerns mentioned below.

I only find the comparison section of the paper insufficient

1. There is no discussion whatsoever about the error estimates of the new nor the official NO2 product.

2. Fig 5. Instead (or additionally) of the zonal means, the authors should compare individual profiles and plot the mean/median (and deviation) of the individual relative differences for different latitudes/nodes.

3. Only one day of measurements is used for the comparisons. I would really like to see more data to be compared before drawing conclusions. I realize that this is more like a proof of the concept, but a little more thorough comparison would improve the paper.

4. The processing time of the old and the new products (with a typical modern hardware) should be mentioned somewhere. I am also missing some analysis or at least discussion about the optimal number of wavelengths. The authors use here four wavelengths but would you get better results if you had eight? Would the processing time be twice as long then? Some kind of sensitivity analysis would be required to fully understand this.

Specific comments:

1. Abstract "..boosting signal to noise by reducing spectral resolution requirements." Are you saying that the spectral resolution is not so important for future instruments? Are you sure you don't mean the spectral range of the instrument?

2. Sect. 1. "Radiance were measured at two wavelengths..or two wavelengths.." Sounds like you don't know which wavelength pair they used. Say "..depending on the orbit", or so.

3. Sect. 1. "The large number of wavelengths measured by current instruments..." I'm not sure if the number of wavelengths is really the crucial issue here. I would think that more important is the spectral resolution and the signal to noise ratio of the instrument. These are determined by the instrument design (slit, integration time etc.). Of course it makes a difference if you measure at 50 wavelengths instead of 2, but if you have noisy spectra with poor spectral resolution, it won't help if you have 500.

4. Sect. 1. "The addition of a..." This sentence is slack.

5. Sect. 2. "The retrieval technique we have employed..." I find this paragraph a little confusing. You first say that your retrieval is based on the triplet technique explained in the references. Then you say that you generalize this technique. What do you mean by that? The only difference you mention here is that you use 4 wavelengths instead of "small number of wavelengths". This is hardly a generalization. However, in the end you say that you use Multiplicative Algebraic Reconstruction Technique? Do you use triplet or MART or both together?

6. Sect. 2.1. "In this work, we have strategically chosen 4 OSIRIS.." You should give some reasons why you selected these 4 specific wavelengths. In Fig. 1. the two wavelengths at 450nm are almost the same. I guess you have some good reason for this?

7. Sect. 2.1. "..the effective depth of the absorption feature is decreased through the averaging." What is the advantage of striving for the maximum effective depth? I mean are your results really worse if you cover the whole absorption peak with pixels? Or doesn't it make any difference?

8. Sect. 2.1. "...we can add an additional reference wavelength without decreasing the effective depth." Did you try to add a second wavelength to the short wavelength side too? And maybe on the top of the peak, too? I don't see much difference (in the cross section level) in these cases either, so the effective depth wouldn't decrease.

9. Sect. 2.1.1. "...we calculate the average value of the measurement vector over a range.." Say the range (it looks like 45-55km in Fig 1.?). OSIRIS scans go much higher, did you try some different altitude ranges? And do you know how much there is deviation (or noise) in the radiance at these tangent heights and wavelengths?

10. Sect. 3. "..with vastly different techniques." "Vastly" is an exaggeration.

11. Sect. 3. "difference between our results minus the official version divided by the

average..". You are comparing your results with the validated official product. Then your relative difference should be (new-official)/official*100%.

13. Sect. 4. This is the shortest conclusions I have ever seen.. Don't you have anything to speculate? Future plans or work? Are you planning to compile the whole OSIRIS dataset with this new method?

Interactive comment on Atmos. Meas. Tech. Discuss., 3, 5499, 2010.