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Atmospheric Measurement Techniques Discussions

Interactive comment on "Ground-based stratospheric O_3 and HNO_3 measurements at Thule, Greenland: an intercomparison with Aura MLS observations" *by* I. Fiorucci et al.

Anonymous Referee #1

Received and published: 16 May 2013

General comment

I'm not familiar with the term "to/by the larger of". I don't think it's a used term, please verify/correct.

Major concern

My major concern is Figure 7 (see comments below). This should be adjusted or a very convincing argument needs to be given for the choice of altitude levels.

Page 1

Line 16 : ..during the winters of..

Line 20 : 'to be the larger of' (see general comment)

Line 22 : 'to the larger of' (see general comment)

Line 25 : ..0.3 ppMv (8%) and 0.9 ppmv (18%)..

Page 2

Line 2 : 'columns interannual and seasonal variations' : see comment on Page 13, Line 27.

Line 11 : ..the main components of Polar Stratospheric..

Line 25-26 : ..that are at work in.. : strange formulation, maybe change to "that take place in.."

Line 30 : ..understanding of *the* mechanisms..

Page 3

Line 6 : '*especially while* anthropogenic' : please rephrase.

Line 23-24 : ..when well validated..

Page 4

Line 19 : ..trace gas concentrations..

Line 19-21 : add reference.

Line 27 : ..balance *between* the two beams..

Page 5

Line 1 : a compact cluster?

Line 3 : ..contributes background curvature.. : what do you mean? please rephrase.

Page 6

Line 8 : what do you mean with 'The amount of information that is added to xa from the measurement'?

Line 21-24 : After applying a smoothing or as you mention at the end of Section 3.1, by 'convolving' the high resolution MLS profile (Eq. 2). Please rephrase to make your statement complete.

Page 8

Line 4 : Please define xr and x, maybe in combination with L5-6? Be consistent with Eq. 1.

Line 23 : Reference for forward model error?

Line 23/25 : 'data scaling errors' : see comment on Section 2.

Page 10

Line 2 : 'by the larger of' (see general comment)

Page 11

Line 7-21 : Please, do add your reference here (Sect. 3.11 Livesey et al. 2011?).

Page 12

Line 29 : Quantify selection criteria of a 'poorly fitted spectrum'.

Page 13

Line 9-11 : 0.05 ppm : add the relative difference value in percentage (which is calculated how (relative to ?)? To remind the reader please add, in the figure (by a line or shading..), the vertical range (17 to 50 km) you considered the retrieval to be scientifically useful (as mentioned in Section 3.1).

Line 19-20 : See comment on Figure 4.

Line 27 : I don't understand how seasonal variations can be evaluated when looking at a 3 month-period ? Please clarify or adjust (also in the Abstract, last line).

Page 14

Line 6-9 : As for O3, add, in the figure (by a line or shading..), the vertical range (17 to 45 km) you considered the retrieval to be scientifically useful.

Line 9 : And reaching quite high relative difference values (out of range in the figure, please adjust), any ideas why?

Line 10-11 : I don't understand what you mean here.

Line 12-17 : See my comment on Figure 7.

Page 16

Line 1-11 : See previous comments on Page 14 and Figure 7.

Section 2

How is the spectrum calibrated (liquid nitrogen..?)?

Here you only describe the beam-switching technique, please add a few words on how the spectrometer output signal is converted to a brightness temperature. In Sect. 3.1 you define errors in the receiver temperature (Trec) and opacity as so-called data scaling errors. A few sentences here on the calibration with at the same time a description of terms like Trec and opacity can make that section (3.1) clearer as well.

Section 3.1

I actually wanted to suggest to plot the errors in the figures in percentage instead of ppm.

In the text you quantify the errors in percentage, but then the measurement noise in ppm. Be consistent, or add both (as you do at Page 10, Line 2)?

Section 3.2

Here you describe the different panels of Figures 1 and 2 very well (Line 20-26). Your discussion in Section 3.1, starting at Line 16 would be clearer with your description of panels f and g you give here.

I suggest to transfer a few of these sentences from Line 20-26 to Section 3.1 (before Line 16).

Figure 1

(a-b) x-axis: Please put the exact frequency instead of channel number. Your simulated spectrum (red line) is hardly visible.

Figure 2

(a-b) x-axis: Here as well, please put the exact frequency instead of channel number.

Figure 4

I find it very difficult to distinguish between MLS and MLS convolved. Please use a different colour.

The label of the x-axis is cut off.

Figure 7

Same comments as for Figure 4 (label x-axis and colours MLS versus MLS convolved). This figure is not satisfactory. You're showing three levels every 4 km of GBMS data with a vertical resolution varying from 9 to 14 km. If you look at your averaging kernels, there's a great overlap of the information content you're showing here in the panels (especially 22 and 26 km). Why do you not show the same levels as for O3? It would be very interesting to see results for levels around 35-40 km.

Figure 8

The symbols are very big, it makes it difficult to see the different datapoints.

Interactive comment on Atmos. Meas. Tech. Discuss., 6, 2979, 2013.