

Review of: “Retrieval of nitric oxide in the mesosphere from SCIAMACHY nominal limb spectra”,
by Stefan Bender, Miriam Sinnhuber, Martin Langowski, and John P. Burrows

The paper is clear and well written, and promises to deliver a data set that is timely and important for the community. There are several minor comments that are included below. There are only two major comments

With regard to the procedure of halving the a priori values mentioned on page 11, line 9.

Firstly, has the value 0.5 been optimized in some way?

What is the justification for fixing this value? I understand having an a priori that varies as little as possible, but here you are using a highly variable model a priori, so allowing this value to vary would not seem to be a problem. It would seem that halving the NOEM values based on the fact that they were taken during solar maximum would indicate that this factor should vary with respect to the point in the solar cycle at which you are retrieving the SCIAMACHY results. You do not mention if there is any overlap in solar conditions between SNOE and SCIAMACHY. If there is, should the factor not be one during these conditions?

Finally, why would this scaling be justified for the regression model which should not have this effect? It seems as if there is some other effect occurring here.

A second major comment regards contamination issues:

The high latitude data during the summer will contain contamination from Polar Mesospheric Clouds (PMC). Has this been taken into account in the analysis?

Minor comments

Page 1 lines 1 and 16: Though there are a number of chemical names for NO that are technically correct, I agree with reviewer 1, “nitric monoxide” should be changed to “nitric oxide” for consistency with the title and common usage in the literature.

Page 1 line 7: Spell out Nitric Oxide Empirical Model (NOEM) in the first appearance in the abstract (Page 1 line 7) and article body (Page 5 line 14).

Page 1 line 10: “misinterpretation” might be better as “attribution” or “incorrect attribution”.

Page 2 line 12: “Sub-Millimetre” (which would be a tiny hat for a bishop), should be “Sub-Millimetre”.

Page 4 line 16. The phrase “Here we use both, that is, we use prior input and regularise vertically and horizontally” could perhaps be expressed more clearly as: “Here we use both prior input as well as vertical and horizontal regularization.”

Page 4 line 20: Again, “...for the a priori covariances, the vertical, and the horizontal regularisation” could be expressed more clearly as: “...for the a priori covariances, and the vertical and horizontal regularisation.”

Page 5 line 12: The phrase: "...get correct number densities, also below 100 km", might be more clearly expressed as: "...to get correct number densities below 100 km", or "...to get correct number densities, especially below 100 km".

Page 5 line 15: One should spell out "Student Nitric Oxide Experiment (SNOE)".

Page 6 line 10: "Equivalently to the MLT..." might be better expressed as: "As in the MLT...".

Page 7 line 13: "smaller then" should be "smaller than".

Page 8 lines 2-3: Since you have explained which tangent points are affected in the previous sentence, would the phrase: "no slant column densities from dedicated limb tangent points." be better as: "no slant column densities from these limb tangent points."

Page 8 line 7: Again, the word "dedicated" is not necessary.

Page 8 line 8: "To compensate these enhanced values" should be "To compensate for these enhanced values".

Page 8 line 10: "Similar" should be "Similarly".

Page 8 line 21-22: The sentence: "The median of the number densities retrieved from the restricted MLT scans in these three latitude bands compared to the results from the full MLT retrieval are shown in the top panel of Fig. 6", is unclear. I would suggest this be re-written as: "The zonal median number densities retrieved from the full MLT scan as well as the restricted MLT scans with and without a priori information above 90 km are shown in the top panel of figure 6 for the three latitude bands." This is because the retrieved values are being presented and these MAY be compared on the graph, but what is presented is not the comparison to the full MLT retrieval. The latter implies they have been ratioed or subtracted. One should also mention that negative number densities can result from the retrievals of the restricted scans using a priori information above 90 km.

Page 11 line 8: "...using the a priori values seem to over-correct" should be "using the a priori values seems to over-correct"