Atmos. Chem. Phys. Discuss., 9, C7633–C7635, 2009
www.atmos-chem-phys-discuss.net/9/C7633/2009/

Atmospheric Chemistry and Physics Discussions

Interactive comment on "Validation of Ozone Monitoring Instrument (OMI) ozone profiles and stratospheric ozone columns with Microwave Limb Sounder (MLS) measurements" *by* X. Liu et al.

Anonymous Referee #1

Received and published: 30 November 2009

This is a very good paper on the validation of OMI ozone retrievals against MLS. Scientific quality and presentation quality are both high. Some specific and technical comments are listed below. My main concern is whether this paper belongs into ACP(D), because the sister journal AMT(D) would be much more appropriate for papers focusing on measurement technique, retrieval, and validation. However, since the paper has already been accepted for ACPD, the decision if the scope of the paper fits into ACP(D) or not has already been made and it would not be fair to block publication in ACP(D) at this stage. Thus I will restrict my review to specific and technical comments and

recommend publication in ACP after revision.

Specific comments:

Section 2.1, p24918, l22: How can the vertical resolution be at worst 14 km in the troposphere if the tropospheric degrees of freedom go down to zero? This seems to contradict each other.

Section 2.1, p24918, l7: Application of Eq 1 does not remove the total OMI smoothing error but it removes the smoothing-error related component of the difference between the OMI and the MLS profile. The text should be clearer about this.

Section 3.1, p24923, l3-4: I appreciate that the authors consider the error reduction by convolution, an issue forgotten in many papers I have read. However, the reduction by a square root of 2 seems to be based on the assumption that retrieval errors are uncorrelated between adjacent altitudes. This assumption often is not fulfilled. Either evidence for the uncorrelated nature of errors should be provided, of the correlations should be taken into account.

Section 3.1. p24926, l20: Evidence must be provided that these correlations are indeed positive. Oscillating errors, i.e. errors anticorrelated with altitude, are a typical feature of profile retrievals. On the other hand, I disagree with the conclusion that positive correlations would further reduce the error. The contrary is true: negative error correlations (the ones I actualle expect!) reduce the column error because of compensation effects. If error correlations were positive, the column error tends to the linear (not quadratic) sum of the layer-related errors.

Figure 3: Is the purple line the combined precision based on original MLS data or that based on reduced MLS errors due to degradation of the vertical resolution? The latter one would be the appropriate one for comparison with the red line.

Technical corrections and wording issues etc:

Abstract, l9: It is not quite clear what the standard deviation is. On page 24914 it

ACPD

9, C7633–C7635, 2009

becomes clear that the standard deviation of differences is meant, but this information should be given earlier.

Intro, p2497 l1: Here the term ‘retrieval error’ is defined. Later in the paper, the term ‘solution error’ is used. Is this the same? If so, I would prefer to use the term ‘retrieval error’ throughout, because it is better established in this context.

Section 2.1, p24918, l7: I would suggest abundanceS

Section 2.1, p24918, l 14: It is not usual to use the verb ’constrain’ in the context of random noise measurement errors. I suggest :“The retrievals are constrained ... (McPeters et al.2007) under consideration of OMI random-noise measurement errors.”

Section 3.1, p24921, l12: Not clear what the ‘also’ refers to.

Section 3.1, p24922, l13: ‘a priori values’ is a bit vague. Better ‘square roots of the a priori variances’.

Section 3.1, p24923, l11: caN

Figures 1 and 2 are very small and should be enlarged.

Figures 3–6: In figure titles and figure captions the term ‘standard deviation’ should be replaced by ‘standard deviation of differences’.

Figure 9: Please explain the meaning of the color scale in the figure caption.

Interactive comment on Atmos. Chem. Phys. Discuss., 9, 24913, 2009.