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Atmospheric Measurement Techniques Discussions

Interactive comment on "Evaluation of ozone profile and tropospheric ozone retrievals from GEMS and OMI spectra" *by* J. Bak et al.

Anonymous Referee #2

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General comment:

This paper presents a study of the impact of the available spectral range on profile ozone retrievals, with an objective to evaluate the achievable accuracy of the future GEMS instrument to measure tropospheric and stratospheric ozone columns. The authors perform this evaluation by comparing ozone profiles retrieved from OMI L1B data in different spectral ranges using the same algorithm, and by comparing these OMI retrievals with Aura/MLS ozone profiles. They concluded that the accuracy of GEMS tropospheric and stratospheric ozone measurements is only slightly worse than that of OMI, which has a wider spectral coverage (270-500nm, hence more ozone sensitive channels extended into the shorter wavelength range) than that of the GEMS

(300 – 500 nm). Therefore the reduced spectral coverage is capable of fulfilling GEMS objectives of ozone measurements.

The conclusion about the tropospheric ozone measurement accuracy of GEMS is made based on the following two observations and one implicit assumption. First the DFSs of GEMS and OMI spectral range are essentially the same, and second the stratospheric ozone columns derived from two respective spectral ranges have similar quality, i.e., similar biases and standard deviations from the comparisons with the common reference, MLS ozone. The implicit assumption is that retrievals from these two spectral ranges yield essentially the same total ozone columns.

Clearly the implicit assumption is a very reasonable assumption, because total ozone columns are mostly determined from the radiance measurements at the longer wavelengths, which are in both GEMS and OMI spectral range. However the authors still need to show the comparisons of the total columns from these two spectral ranges, to illustrate the agreement and difference under different observing conditions.

If this total ozone assumption is valid, it implies that even a small error or bias in the stratospheric ozone column could translate into a large error or bias in the tropospheric ozone column, simply because the tropospheric component is usually a small part of the total column. This is why this paper needs to include the direct comparisons of total and tropospheric ozone columns between the two retrievals to support the conclusions of this paper.

Furthermore, the authors should include validation results by comparing tropospheric ozone columns retrieved from the GEMS spectral range with the available ozonesonde profiles at various locations over the globe to show conclusively that the exclusion of shorter wavelength measurements makes little difference for tropospheric ozone retrievals.

Specific comment:

Page 6739, line 7, ‘cloud top heights’ is not the correct phrase to use for cloud pressure derived from the effects of O2-O2 absorption or rotational Raman scattering. It is an effective cloud pressure and RRS derived cloud pressure is usually referred to as Optical Centroid Pressure (OCP) by the developer of this product.

Interactive comment on Atmos. Meas. Tech. Discuss., 5, 6733, 2012.