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Atmospheric Measurement Techniques Discussions

Interactive comment on "Cross-verification of simulated GEMS tropospheric ozone retrievals and ozonesonde measurements over Northeast Asia" *by* Juseon Bak et al.

Anonymous Referee #1

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Main comments

1. This paper is about the testing of the GEMS retrieval algorithm on OMI radiances, and the subsequent comparison with ozonesondes. This is interesting and worthwhile study in the run-up to the launch of GEMS.

2. I see the paper as having two main purposes with respect to GEMS. First, it is an exercise of the retrieval algorithm on real OMI data. The fact that this is successful gives confidence that the retrieval is ready to receive the first GEMS data after launch. However, quantitative verification of the retrieval performance is harder, and the discussion of the GEMS retrieval algorithm performance on OMI radiances against sondes, com-

pared with the OMI-algorithm retrievals against the same sondes should be expanded. The second purpose is to identify those ozonesonde measurements that might be good for GEMS validation, in as much as the work here suggests that they are useful or not for OMI validation.

3. If there is a cross-verification here, it is really about OMI validation between OMI and the radiosondes. The fact that the GEMS algorithm is used to process the OMI radiances does not change this, especially with comparisons that should adequately account for how a priori profile and smoothing error assumptions differ between the GEMS and usual OMI algorithms. As such, the title of the manuscript does not clearly describe what is done in the paper, and I suggest that the authors modify the title to better reflect the above two goals.

4. Section 2.1 describes the retrieval algorithm applied to the OMI radiances. A discussion should be included as to how the retrieval algorithm characteristics are expected to change for the GEMS radiances.

5. Section 3.1. The discussion of the differences between satellite/sonde agreement at the different sites is interesting. In addition to the differences between the sonde characteristics and reliabilities, one might expect greater standard deviations at sites that are polluted and/or show greater variability in ozone loadings due to meteorology. Some further discussion would be useful about the chemical-transport environment before eliminating sites from potential GEMS validation based on instrumentation/experimental method arguments alone. It would also help this reader if the current dense text were broken up into descriptions of the various reasons for good/bad agreement.

6. Section 4.2 and Fig. 7. The impact on correlation of smoothing or not smoothing the sonde profiles might be dependent on how close the GEMS retrieval a priori profile is to the sonde "truth". How do these compare and how do they vary between locations of good and poor comparison? How far does a priori profile go toward explaining the

bias?

7. Section 4.2 should be split into another sub section at Line 354 that starts the discussion of the evaluation of the GEMS algorithm against the OMI algorithm. This should be presented as one of the main results sections of this paper: a quantitative evaluation of the GEMS algorithm against other widely used algorithms based on the same OMI radiances.

8. Given the previous discussion in the paper of the various limitations of some of the sondes, it might additionally be useful to directly compare the results of the different retrieval algorithms and explain differences in results on the basis of different features of the algorithms. This would help make the case that the GEMS algorithm is performing as expected.

9. The paper requires careful, and extensive, editing for English usage, and cut-paste typos, e.g. line 75, that should have been corrected before manuscript submission.

Minor comments

âĂć Several times “GEMS” measurements are described. The word “simulated” should be added each time to avoid confusion.

âĂć Line 83: consistent perhaps, but not homogeneous as the authors point out in the text above.

âĂć Line 100: Rodgers method is more correctly described as maximum a postiori.

âĂć Line 105: Instrument errors certainly, but also instrument design sensitivity.

âĂć Line 106: Common geophysical conditions can reduce sensitivity, not just extreme.

âĂć Line 123: Information may be limited but is a goal of the GEMS mission. This should be clarified.

âĂć Line 157: Any more recent references to new measurement technique and instru-

mentation? âĂć Line 200: How do these coincidence criteria for OMI and the sondes affect the results? What is the expected variation within the time and space windows? What is the representativeness uncertainty? How do these results here with the OMI comparison inform on the expected GEMS comparisons with hourly measurements at $\sim$7km resolution?

âĂć Line 231: Is “troposphere” written where is should be stratosphere?

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