**Atmospheric
Measurement
Techniques**
Discussions

Interactive comment on "Observation of tropospheric δD by IASI over the Western Siberia: comparison with a GCM" *by* M. Pommier et al.

J. Worden (Referee)

john.worden@jpl.nasa.gov

General comments: Overall the paper reads very well. However, as discussed below, additional discussion is needed on how temperature related errors affect the retrievals and comparisons to the LMDZ model.

Comments:

1) Page 11063 Line 18: Also state the percentage error into approximate per mil values so that the reader can relate the delta-d values to its uncertainties.

Page 11063 Line 22: The measurement covariance usually only includes the measurement error as the temperature error is not necessarily known a priori whereas

the measurement error is typically known. It looks like your adding an ad hoc error to the measurement covariance presumably because your using the IASI temperature profiles instead of re-retrieving temperature? If so some additional discussion on this issue is needed in this section.

2) Page 11066: Fix grammar in this sentence "HDO AKs can usually be been interpreting"

3) Section 3.6.2: Temperature error is asserted even though its one of the larger errors. What are the uncertainties on the temperature profile and how are these generated? Also, presumably error in the surface temperature also greatly impacts the error in delta-d..is this uncertainty from surface temperature calculated or assumed? For example, we are finding with ozone retrievals generated from IASI radiances that the surface temperature at least needs to be re-retrieved in order to get consistent calculated and actual error characteristics (as evaluated using ozone-sondes).

Section 4.2: Additional discussion on the error characteristics are necessary here for the IASI and LMD comparisons. The best case uncertainty for the IASI mean values results from assuming a Gaussian error distribution, in which case the error on the mean is the (sqrt) of the sum of the error covariances divided by the number of samples. You should calculate this uncertainty for comparisons with the IASI data as this residual error could explain why the observed and modeled variations are different, for example, perhaps the data and model are consistent within the error.

The worst case uncertainty for the IASI mean values are that the temperature errors are all correlated.

The likely scenario is that the errors are some combination of bias and random as the temperature error has both a bias and random component. For example, the temperature errors could be biased in the same direction on one day but randomly vary from day-to-day (Kuai et al., AMT, 2012). Bounds on the errors from these scenarios should be estimated in order to provide some attribution to the observed random and bias

differences between LMD and the IASI data.

4) Page 11069 Line 5: There are several general statements comparing LMD to "other GCMS'. These statements need references or alternatively the comparisons to other GCMS need to be removed.

5) Page 11073: Can you elaborate on the WSIBISO project so that the reader can understand how the measurements are related to the WSIBISO science objectives?

6) The word "his" needs to be replaced on page 11071 line 10 and 11073 Line 9

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