

## ***Interactive comment on “Cross-track Infrared Sounder (CrIS) satellite observations of tropospheric ammonia” by M. W. Shephard and K. E. Cady-Pereira***

**Anonymous Referee #2**

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This paper describes a retrieval procedure for ammonia in CrIS measurements. The details of the retrievals are described clearly and completely, employing both synthetic and real atmospheric spectra. I would recommend publication with minor changes.

The authors deduce a lower detection limit of 1 ppb, but there is no mention of what sort of geographic coverage that implies for the CrIS NH<sub>3</sub> measurements. They define scenes with less than 1 ppb of NH<sub>3</sub> as unpolluted, and in the real measurement example provided, NH<sub>3</sub> was apparently below the detection limit for a small number of scenes, but this strongly polluted region is obviously not typical. I do not think a detailed discussion is required, but I thought it might be worthwhile to indicate whether their 1

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ppb detection limit means 1) they would only be measuring a relatively small number of localized “hot spots” or 2) they anticipate observing a broad range of geolocations (and seasons) for which NH<sub>3</sub> will exceed 1 ppb.

page 11393, line 5: There is a reference to Section 6.1.2, but that is the section we are in. I believe the reference should have been to Section 6.1.1.

page 11388, line 9 and line 11: You refer here to Section 3.3 showing the spectral region employed in the retrievals. I believe you intended to refer to Figure 1, not Section 3.3.

page 11383, line 11: the acronym SNR is used here without defining it. However, the acronym is loosely (linking it to signal-to-noise instead of signal-to-noise ratio) defined later, on page 11385, line 12 and again (more properly this time) on page 11389, line 7 and once again on page 11393, line 5. Define the acronym only once, when it is first used.

page 11385, line 20: the acronym RVMR is used without definition.

In Section 2.1.2 (and elsewhere), the units ppbv are used, while in Section 2.1.3, ppb is used. It should be consistent. I believe the “v” is redundant when talking about a volume mixing ratio, which means ppb should be used rather than ppbv, but perhaps there is an accepted standard of usage that should be followed.

page 11389, line 25: here you mention the TES averaging kernel, when you should probably be talking about the CrIS averaging kernel. The discussion is general, of course, not tied to a particular instrument, but there is certainly no reason to be referring to the TES averaging kernel here.

page 11380, line 24 . . . directly or indirectly impact air quality, . . . should be . . . directly or indirectly impacts air quality, . . .

page 11382, lines 20-21: . . . using IASI observations . . . should be . . . used IASI observations . . .

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page 11383, line 1: ...in order to development and evaluated a new... should be ...in order to develop and evaluate a new...

page 11383, lines 18-19: ...with coincident TES satellite, Quantum Cascade-Laser... should be ...with coincident TES satellite and Quantum Cascade-Laser...

page 11384, line 9: ...a across... should be ...a cross...

page 11392, line 26: ...where full atmospheric state... should be ...where the full atmospheric state...

page 11392, lines 27-28: ...on average the peak sensitive in the vertical region from ~850-750 hPa... should presumably be something like ...on average the peak sensitivity occurs in the range ~850-750 hPa... There appears to be some confusion about the sensitivity peak in the article. Here you give the range 850-750 hPa. This agrees with the value 800 hPa mentioned in the abstract, but on page 11396 and in the caption of Figure 9, you state a value of 900 hPa, which does not fall in that range. On page 11397, you give a range of 900-750 hPa. Perhaps this could be made more consistent.

page 11393, line 12: ...contains a scatter plots of... should be ...contains scatter plots of...

page 11397, line 3: ...and range from 900-750 hPa... should be ...and ranges from 900-750 hPa...

page 11397, line 4: ...information content with most 1 piece... should be ...information content with at most 1 piece...

Caption to Figure 1: an acronym (TOA) is used here that is not defined in the text.

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Interactive comment on Atmos. Meas. Tech. Discuss., 7, 11379, 2014.

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