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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

Received and published: 18 February 2015

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 NH₃ measurements. They define scenes with less than 1 ppb of NH₃ as unpolluted, and in the real measurement example provided, NH₃ 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 NH₃ 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.

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

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