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Interactive comment on "Validation of the CrIS Fast Physical NH_3 Retrieval with ground-based FTIR" *by* Enrico Dammers et al.

Anonymous Referee #2

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The article presents the comparison results between CrIS Fast Physical NH3 retrievals and ground-based remote sensing measurements from FTIR. Given the limited information on the global distribution of CH3, this paper presents an important improvement of our current knowledge. The methodology is sound and after addressing some remaining issues I fully support its publication.

General Comments:

One particular issue that could hamper the interpretation of the results is the potentially limited information content captured by the CrIS retrievals. The current DOFS cut off is taken at >0.1, which entails that some measurements are/could be heavily dominated by the a-priori. The authors allude that particularly measurements with low NH3 concentrations could be effected. One way to at least give some information on this is

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Discussion paper

to replot Fig2, whereby each measurement is coloured related to its (average) DOFS. Another way to test whether observed differences between CrIS and FTIR are driven by differences in a-priori rather than the actual retrieval, is to (prior to mapping CrIS to FTIR –see eq(1)) conform the CrIS retrieval to the FTIR a-priori as in Rodgers (2000):

x(CrIS,ftir apriori corrected)=x(CrIS) +[A(CrIS)-I]*[apriori(CrIs)-apriori(ftir)]

In any case, the authors need to look deeper into the possible effects of the DOFS on the bias.

A second general comment is the error analysis which could be improved. The document either misses a general statement that all presented errors correspond with the 1-sigma standard deviation or it sometimes needs to be more specific when it uses the term 'error' as it sometimes relates to the standard deviation on the bias and sometimes on the bias itself. That said, 1-sigma standard deviations often tell little with regards to the statistical significance of an observed difference. For instance one claim made by the authors is that in the 0.5-1.0 e16 bin CrIS is significantly higher. This is likely to be true but from the article alone I cannot verify this. In Figure 4 the observed binned biases are shown with their standard deviations. A much better metric to show statistical significance would be the 95 or 99% confidence interval on the mean. This goes for all metrics where statistical significance is claimed or investigated.

Specific comments:

L155: A list of the dominant interfering species would be useful here

L165: A representation of the used collocation area would be useful in this figure

L305: show the error (be more specific= standard deviation is better)

L319: Pasadena looks worse at elevated values

L320: in, and low bias ("in" is obsolete)

L465: red diamond -> red square

L468: Summary of the errors. . . Could be interpreted as the uncertainty on the biases, not the actual absolute and relative bias

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