

## ***Interactive comment on “Acetylene (C<sub>2</sub>H<sub>2</sub>) and hydrogen cyanide (HCN) from IASI satellite observations: global distributions, validation, and comparison with model” by V. Duflot et al.***

**Anonymous Referee #2**

Received and published: 17 July 2015

General Comment: This is a well written, clearly structured article, documenting the fast retrieval and evaluation of HCN and C<sub>2</sub>H<sub>2</sub>. I recommend publication after the following (minor) comments have been addressed.

Abstract, lines 8 and 14: Please include the range of correlations coefficients found for the agreement.

Intro, line 19-20: Please include some information on atmospheric levels (background, urban, biomass burning) from literature.

Intro: Think including an extra table for C<sub>2</sub>H<sub>2</sub> and HCN summarizing their budgets

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(sources/sinks etc) would be useful to the reader & improve paper.

Page 12363, line 11: Why were the million spectra only chosen from 2009? Surely a sample selected from 2008-2010 would have been better? Were all these observations cloud free? If not, how does the HRI vary with different amounts of cloud cover?

Page 12363, line 24: Here I assume you mean minimal interference from CO<sub>2</sub>, H<sub>2</sub>O and O<sub>3</sub>? Sentence read ok, but could be phrased slightly better.

Page 14364, line 15: Please add the units of B\_HCN and B\_C<sub>2</sub>H<sub>2</sub>.

Page 14364, line 20: Where the C<sub>2</sub>H<sub>2</sub> and HCN profiles taken from (i.e. before the 1 km perturbations were applied)? Were they from a model, climatology, or aircraft observations?

Page 14365, line 2: what are ‘standard absorption profiles’? Please clarify.

Page 14365, line 13: Please add the units of b\_HCN and b\_C<sub>2</sub>H<sub>2</sub>.

Page 14366, line 6-11: Think some discussion of the Jacobians with respect the HCN and C<sub>2</sub>H<sub>2</sub> vertical distribution is warranted, and/or also include or add to the figure some HCN and C<sub>2</sub>H<sub>2</sub> profiles. I would like to see where the HCN and C<sub>2</sub>H<sub>2</sub> is.

Page 14366, line 14-18: There is no mention of cloud cover/contamination. Is it important? Please add some brief discussion.

Page 14366, line 23: Why was a 1.5 km altitude chosen? What is the justification of this level? If a level of 1 km, 2km or 3 km were chosen how would this impact the sensitivity analysis?

Page 14367, line 18: Sorry, why was a 30% confidence level chosen? Please explain in more detail.

Section 3.1: How do the IASI/FTIR comparisons change if the 0% cloud contamination is used, or if the co-location limits are shrunk or expanded? Also why were these four

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sites selected, it was not clear in the text (but I assume because they only measured these target gases)?

Page 14369, line 23 and onward: How does the peak-to-peak accuracy of the measurements compare (i.e. how well does IASI actually capture the timing and magnitude of peak events)? Please add this statistic, as it is important given HCN and C<sub>2</sub>H<sub>2</sub> biomass burning sources.

Page 14370, line 3-6: Could the FTIR averaging kernels be applied to the IASI data? Or could the IASI Jacobians be applied to the FTIR data (as done later for the model comparison)?

Section 3.2: Nicely summarised!

Section 3.3: The key point for me here (which is not discussed) is how well does the model agree with the FTIR data? I think a sub-section addressing this point needs to be added to the paper (& probably an extra figure).

Figure 9: There are some C<sub>2</sub>H<sub>2</sub> enhancements over the China coast in DJF and MAM, simulated by the model that are not observed by IASI. I don't think this was raised in the text. Can you elaborate?

Figures: Overall, very nice plots! Although I wish ACPD would make the global maps much bigger in the articles.

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Interactive comment on Atmos. Chem. Phys. Discuss., 15, 14357, 2015.