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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Acetylene (C_2H_2) and hydrogen cyanide (HCN) from IASI satellite observations: global distributions, validation, and comparison with model" *by* V. Duflot et al.

Anonymous Referee #1

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The manuscript by Duflot *et al.* reports on global distributions of total column acetylene and hydrogen cyanide obtained from IASI for a three-year period. The dataset is compared with ground-based FTIR spectrometer measurements at four sites and further with simulation results from the chemical transport model MOZART.

The paper is well written and structured, the assumptions made are generally clearly stated and related work is adequately referenced. I consider that this paper constitutes a valuable addition to the literature on these atmospheric trace species, usefully complementing previous published studies. I therefore recommend publication in ACP.

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However, I would like the authors to consider addressing the following:

- The references given in section 3.3.1 (pages 14374–5) do not appear to explicitly describe how the anthropogenic source (fossil fuel and biofuel) of HCN that was used in the model simulation was estimated. Given that the HCN emissions are currently poorly constrained, it would be of particular interest, from the perspective of future modelling studies that could potentially try to build upon previous work in order to improve our understanding of the atmospheric behaviour of this species, to have the anthropogenic HCN source used in this specific case properly documented. The same would apply for the oceanic sink.
- The "standard chemical mechanism" of Emmons *et al.* (2010) (cited on page 14374, line 19) does not include HCN chemistry. An updated reference or a short description of the HCN chemistry implemented in the model version used in the manuscript would be welcome.
- Model output is sensitive to the injection height of biomass burning emissions. How was the issue of distributing these emissions in the vertical addressed in the simulation described in the manuscript?
- Is it possible to elaborate in what way "the modeled species lifetime could be improved to simulate the impact of the long range transport for these species" (page 14376, line 26; page 14378, line 16)?
- The temporal span (three years) of the dataset presented in this paper is relevant information and should probably be mentioned in the abstract.

Corrections

- Page 14359, line 15: Rather than stating that "...the model seems to overestimate [...] emissions" it would be accurate to say that "...the emissions used in

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the model seem to be overestimated. . .” Same in *Conclusions*, page 14378, line 14.

- Page 14367, lines 20 & 25: Change “. . .measurements is. . .” to “. . .measurements are. . .”

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