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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Measurements of atmospheric ethene by solar absorption FTIR spectrometry" *by* Geoffrey C. Toon et al.

Anonymous Referee #1

Received and published: 3 July 2017

This paper describes the retrieval of atmospheric ethene amounts from 30 years of solar remote sensing measurements from the ground and stratospheric balloon. Ethene absorbs only weakly in the spectra, and the analysis is very careful, comprehensive and reliable. The measurements are described in detail, and compared to a range of other published remote sesnig and in situ measurements. The conclusions focus on the observed decrease in C2H4 amounts over the period, but the discussion of reasons for this decline is somewhat disjointed and anecdotal. A restructure of the discussion and conclusions sections would improve the paper and do justice to the high quality measurements.

The paper is suited to ACP readers and I recommend publication after minor revisions listed below.

L 11 ethane should read ethene

L 11 1990s not 1990's

L 17-18. Suggest rephrasing without "etc." for example "Atmospheric ethene is formed primarily by incomplete combustion from sources such as biomass burning, power plants and combustion engines."

L 17-25 Ambiguity: Sawada and Totsuka are referenced 3 times, redundantly, together with Goldstein, but it is not clear if the referenced fluxes are all fluxes or just biogenic. Please rephrase.

L 31 Not all readers will be familiar with "MkIV" - briefly describe "MkIV" at first use, for example ". . . with the remote sensing results described here from the MkIV solar infrared interferometer.

L44 The website reference may change in the future. Could a snapshot or table of the webpage be added as an appendix or supplementary info to the paper?

L 55/Fig 1 The red C2H4 and H2O spectra are almost impossible to distinguish, please choose a colour that makes C2H4 stand out. It is in fact clearer in Figure 2, but the reader may not realise this.

L107 This text is exactly repeated in the Figure 2 caption. It could be left out of one or the other.

L125 The solid lines in Figure 3 show. . . (not shows. . .)

L 148 The names and locations of the 12 sites should be provided here or in a table. Many (most) readers will not be familiar with the MkIV sites.

L177 "Where" or "While" rather than "Whereas"?

L 184 et seq. This statement is out of place here – it is more in the nature of discussion than presentation of results, and represents the authors' opinion without real quantita-

tive backup. This sentence and other similar points in the results section may be better collected in the discussion section.

L198 have => having

Figure 6 The colours are different from those in Fig 1 & 2, can they be made consistent (with C2H4 easy to distinguish from other gases).

L 296 spell out AOD and MIR

L311 Figure 2 of ???? et al.

L 319 Is it possible to ask Herbin or co-author rather than speculate about the log-retrieval?

L321 retrieval mis-spelt

L335 Ethene measurements, not ethane

L337 lower case P in Profiles

Discussion L404-417. This paragraph is a little frustrating – do the authors believe that the urban areas are NOT responsible for the high CO and C2H4, or that the trajectories are inaccurate ("wrong" is a strong word). Having mentioned both possibilities, the discussion is left hanging without any conclusion.

L418-424 There a few points scattered through the results pointing towards the secular decrease and its causes that could be pulled together here into the discussion, which is currently rather light. Some of this discussion currently resides in the summary and conclusions – I would recommend expanding the discussion and reducing the Conclusions to the main points of the study

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