Atmos. Chem. Phys. Discuss.,
https://doi.org/10.5194/acp-2020-1135-RC1, 2021

Atmospheric Chemistry and Physics Discussions

Interactive comment on "Spectrometric measurements of atmospheric propane (C_3H_8)" *by* Geoffrey C. Toon et al.

Anonymous Referee #1

Received and published: 3 January 2021

The paper decribes the first spectroscopic measurements of atmospheric propane (C3H8) using the solar absorption spectrometry. The paper is very well written, very interesting, and should be published. ACP is the right journal.

Major comments:

The paper states that 5000 ground-based spectra have been recorded with the Mark4 at 1200 days, and 12 different sites (lines 59-60). Figure 2 gives a result for the average of all 5000 spectral fits. I assume that these 5000 spectra have been recorded at a variety of many different solar zenith angles. Also, I assume the figure gives the average of the retrievals for spectra recorded at very different altitudes, from the ground up to 2.5 km altitude. I do not see that its possible to average the results of these very different retrievals. This might be possible, but requires an explanation. Or, is it possible

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Discussion paper

to show the result for one spectral fit?

The paper discusses in several Figures the correlation between C3H8 and C2H6. When I look at Figure 2, it seems that both trace gases absorb in the same spectral region. The paper mentions ... litte spectroscopic "cross talk" between these two gases (line 109) but it might be useful to discuss this a bit more quantitatively, if possible. I accept that the absorption features of both trace gases are very different, but a small discussion would be helpful.

The comparison between in-situ and total column data is difficult. However, using the assumed a-priori profile used, together with the scaling factor for the retrievals, it is possible to get a rough idea on the surface concentration. This would be useful for the comparison. It could show a good agreement, or that the a-priori assumption is wrong (assumed that the spectroscopy is correct).

Minor comments: The absorption of C3H8 is quite weak, and the retrieval has been performed very carefully and at its limits. It would be good to have a small discussion about the possibility to measure C3H8 at other NDACC sites. Does it make sense that other groups look at C3H8 in their spectra?

Figures 3, 4 and 6 contain a lot of information, but since data from different sites are in one Figure, the reader might get the impression that the overall scatter is extremely high, and that the measurements are useless. I suggest to start with Figure 10, which gives a clear and nice indication of the measurements and their limits. The other results might also be presented differently, may be showing the results for the different sites individually.

For Figure 11, left it might make sense to plot annual averages instead of the individual data. This holds also for several other Figures.

Line 37: ... essentially zero at ... What is essentially zero? Please give a concentration, or upper limit.

Line 143-146: As far as I understand, its written: At lower altitudes the uncertanties are quite high. In the next sentence its written: This allows to detect C3H8 under polluted conditions. I dont understand these two sentences, for me this is contradictory.

Line 148: 'use' should be 'us'

Line 203-209: I dont see why it is important to discuss CH4. For me this chapter could be deleted.

Line 266: The estimation given in this chapter is interesting, but I have the feeling that the 4%, given in line 266 is not an assumption, but a result, giving meaningful data. This chapter might be rewritten.

Line 278: I would suggest to include the averaging kernel figures in the main text.

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