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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Global distribution of upper tropospheric formic acid from the ACE-FTS" *by* G. González Abad et al.

Anonymous Referee #1

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Global distribution of upper tropospheric formic acid from the ACE-FTS Gonazalez Abad et al

General Comments

The paper describes global retrievals of HCOOH from spectra from the ACE-FTS instrument, using new spectroscopic data. Detailed comparisons are made with results obtained from a similar, balloon-borne instrument and there is passing reference to agreement with other measurements but I would describe these as inconclusive. The dataset is also presented as seasonal, zonal means where some features that may be linked to biomass burning and vegetation growth.

The lack of any previous global scale measurements is sufficient justification for the

publication of this paper but, given the limited data available for validation, better use could have been made of it, eg a) inclusion of results from in situ measurements (rather than mentioned in text) b) comparison of HCOOH results from Rinsland et al (using same instrument, but different spectroscopy) c) use of model data for the seasonal/latitudinal variability d) use of other ACE-FTS products, eg CO, for source attribution

Specific Comments

1. The paper mentions that they use the Q-branch of the v6 mode, which I imagine is a fairly narrow feature, within a microwindow of 10cm-1 width. I'd like to see a plot of actual and simulated data for this region to get some visual impression of the signal-noise and interferences from other gases.

2. The "Validation" against the MkIV instrument retrievals are unconvincing. The data from the two instruments may lie within 1SD, but the SD is so large that it is not clear that either instrument is telling us anything useful. This is just qualitative, rather than quantitative, agreement. Given the difficulty of the comparison, including lack of spatio-temporal colocation of the two instruments, it is probably the best that can be done, but I would just describe this as a "comparison" rather than a "validation".

3. Section 4 also mentions that the latitudinal profiles "are consistent" with published aircraft profiles, but I would have liked to see those profiles also overplotted so I can judge this for myself. Assuming that the aircraft profiles are more accurate than the MkIV instrument, a key question would be: is the level of consistency such that the ACE-FTS retrievals agree better when taken at the same time-location as ACE-FTS or is the level of disagreement so large that it swamps the seasonal/latitudinal variation of ACE-FTS?

4. Given the lack of suitable colocated measurements, I would therefore have expected to see some model results which might at least reproduce the observed seasonal/latitudinal variability.

5. The calculated HCOOH/CO ratio is described as in "good agreement" with the values of Rinsland et al. Their result is quoted as 0.0114pm0.0076 compared to your value of 0.0051pm0.0015. First of all, their error bar is so large that "consistent with" is probably a better description. Secondly, given that you both use the same data, why is their error bar so much larger than yours? And thirdly, how do your actual retrieved HCOOH profiles compare with theirs (given the adjustment for different spectroscopy)?

6. This also leads to a further question of why is more use not made of ACE-FTS data to understand your HCOOH climatology? For example, correlation with CO seems a good method of distinguishing HCOOH associated with biomass burning from that associated with other sources. Would anticorrelations with H2O show anything useful (you mention that HCOOH is highly soluble)? CH4 if related to vegetation growth?

7. Fig 3 presents the latitudinal profiles as a series of small, separate plots. However, since the purpose is to intercompare these profiles, this would be easier if they were all plotted on a single, large graph, eg colour-coded for different latitudes.

Interactive comment on Atmos. Chem. Phys. Discuss., 9, 12465, 2009.