Atmospheric
Chemistry
and Physics
Discussions

Open Access

ACPD

Interactive comment on "HCOOH distributions from IASI for 2008–2014: comparison with ground-based FTIR measurements and a global chemistry-transport model" *by* M. Pommier et al.

Anonymous Referee #1

Received and published: 4 April 2016

This paper presents results from an improved retrieval method for obtaining total columns of formic acid globally during seven years from IASI radiance spectra. This simple and computational inexpensive method has been used before for other species and presents some improvements to results obtained before for HCOOH by the same group. It is based on the calculation of conversion factors starting from a representative set of formal retrievals with the optimal estimation method, and using these to convert brightness temperature differences to column amounts. The results presented show improvements to previous attempts to derive reliable global distributions of HCOOH. This work has the potential to be published in ACP after a significant improvement of the manuscript is carried out by the authors.

Printer-friendly version

Discussion paper

In particular, I would like to point out that it is very poorly written in terms of wording and sentence structures, which makes the text at times very difficult to read and follow. Some (but clearly not all) minor corrections are listed below. It is important that the text is revised and improved by someone with good English skills. Also, some sections could be shortened and the key points could be better explained in a more concise manner without leaving important information out. Additionally to this, please consider the following points for improving the content and structure of the manuscript:

l.61 why would this be necessarily from a direct flux of HCOOH, couldn't it be also secondary formation from other unknown VOCs?

l94. Please comment on how (and why) the Averaging Kernels of the ground-based FTIR retrievals can be compared to the normalized Jacobians from the IASI retrievals. I could't find any information on this also in section 3.2

Fig 2. This figure would be more appropriate later on in the section describing the comparison with FTIR. Also, separate into two adjacent plots with common y-axis and individual x-axis for both the normalized Jacobians (left) and FTIR AK (right). Avoid the inset and use larger labels if it is to fit into a one column of the text.

Fig 2 caption. What is a "degree of freedom of signal"?? Ground-based FTIR retrievals often report the degrees of freedom (DOF) with respect to the independent layers sensed. A value of 1 would mean that no information in the vertical distribution is accessible. Does DFS refer to the same thing?

l.101 use the more conventional expression with B as subscript ΔT_B here and throughout the manuscript.

l.102 I think the use of spectral microwindows is here more appropriate than "spectral channels".

l.110 what are these "mean RMS" differences? Do you refer to residuals? Please be clearer.

l.117 again, unclear of how you define channels. Are these mean brightness temperatures within a spectral range (microwindow) or rather just a value at a specific wavenumber?

l.123 Why not use tao for termal contrast as in previous studies?

Fig 3. Labels are missing in the plot to the right, if same as the one to the left, just include it to the x-axis. Also for the color palette. Use a) and b) to describe the plots as in Fig 4.

l.125 The linear regression for obtaining the conversion factors from the correlation between the OEM method and the ΔT_B's was gathered from retrievals performed in different areas of the world, representing different conditions, which is good. The question is if these areas are treated separately would result in very unique conversions factors (something not shown in Fig. 3) and which could be used to improve the conversion from ΔT_B to total columns. Is it sufficient to consider a correction for the dependance to the thermal contrast? Please comment.

Fig 4b. Use same scales in the x and y-axis as in Fig 3a.

l.152. What do you mean with only negative averages are being filtered out? You have just stated that negative values would produce a bias, so no filtering should be performed. Do you refer to columns used for the comparisons with FTIR and modeled data?

l.178 The results part showing the description and interpretation of the obtained global distributions should go AFTER the comparison with ground-based FTIR measurements and the model results. Maybe as section 4: Results. It is important to know how reliable (or not) the data are before using them for interpretation.

l.276 If the large biases found between the retrieved columns and this work does not come from using a simplified retrieval method as opposed to the OEM, then explain where the bias comes from. The explanation that IASI overestimates for background

levels in La Reunion because of the larger errors in the conversion from brightness temperatures is not valid in the case of Wollongong, or is it?. Please provide with a more solid explanation.

l.255 The altitude correction performed to both FTIR and IASI total columns is poorly argumented. Despite the fact that the correlation might improve, it may do so for the wrong reasons. I don't agree the authors should do this correction. It is quite feasible that a mountain site might not be sensing a plume further down while the broader pixel size of the IASI instrument covering lower altitudes might very well be detecting it.

l.260 If daily averages from FTIR are used instead of a more constrained time with respect to the IASI overpass time, then the authors should present the results showing that there is no improvement. I don't understand why they say the correlation does increase when using a +/-2h criterion and still don't apply it. In my opinion for a compound with such a short lifetime, in the range of hours, a more constrained time criterion than daily averages should be used in this study.

l.288 The authors decide to use a broad spatial coincidence criterion when comparing IASI with FTIR measurements, broader than in previous studies. Please provide with a more thorough explanation of why this decision was made. There seems to be enough IASI measurements to still have enough coincidences.

Minor corrections

l.20 "There are, however, large uncertainties on the sources and sinks of HCOOH and is therefore misrepresented . . ."

l.24 "The dependence. . ." sentence unclear

l.40 rewrite "is among the most. . ."

l.49 rewrite to make a clear and correct sentence

l.54 rewrite "despite the. . ."

l.58 rewrite "of emissions. . ."

l.67 rewrite "provided. . ." since that instrument is no longer operational

l.68 missing argument, ACE provides what in the upper troposphere and how often?

l.71 rewrite ", so it is a challenge to . . . radiances."

l.74 rewrite "during the summer. . ."

l.74-82 sentences poorly written, rewrite.

l.76 which method?

l.77 rewrite "over the period 2008-2014"

l.86 rewrite ". . . Fourier transform infrared spectrometer."

l.87 rewrite "on board"

l.101. why would you use the word robust if the drawback of this method, apart of being computationally cheap, has large errors and no AKs (see l.156).

l.111 "This" refers to what? Use proper sentence structures.

l.112 redundant use of "conversion" in one sentence

l.202-211 This paragraph should probably go a the end of the listing 1-10 as it refers to something general and not a specific region.

l.243. remove "way"

l.266 "strict of stricter"?

Interactive comment on Atmos. Chem. Phys. Discuss., doi:10.5194/acp-2016-86, 2016.