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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Tracking the emission and transport of pollution from wildfires using the IASI CO retrievals: analysis of the summer 2007 Greek fires" *by* S. Turquety et al.

Anonymous Referee #1

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The paper by Turquety et al. analyzes CO measurements of the Greek forest fires in August 2007 taken with the IASI instrument on board the METOP-A satellite. After discussing the retrieval approach used in this analysis, the data are presented. Both the CO emitted from the fires and its transport over the Mediterranean Sea are discussed. Correlations with aerosols are explored using satellite data from MODIS and CALIOP. The paper clearly shows the potential of the IASI instrument for monitoring emission and transport of CO from fire events. I recommend publication in Atmos. Chem. Phys. once the following aspects have been taken into account:

Major comment:

The paper contains a large amount of irrelevant general information which distracts the reader from the main subject and the most interesting part of the paper which are the IASI CO retrievals during fire events. Especially the introduction is wordy. While interesting to know, the number of people killed, the destruction of buildings and protected natural sites, as well as the total area burned in Portugal in 2003 are irrelevant for the scope of this particular paper. These are just a few examples. On the other hand, some essential information is missing, most of which is presented later on in the paper as introductory material, e.g. at the beginning of section 2.1 and in section 3.1. I recommend to significantly shorten the current introduction: it can easily be reduced by 50% or even more. In addition, I suggest to move the introductory material from the sections 2.1 and 3.1 to the introduction. See the specific comments below for some suggestions.

Specific comments:

1. p.7415 lines 23-27, p.7416 lines 1-4 and line 7: This information is not relevant for the scope of this paper.

2. p.7416 lines 19-29: It is not clear what the relevance of this information is for the scope of this paper. I suggest to leave it out or to shorten it significantly.

3. p.7417 lines 23-29 and p.7418 lines 1-8: Like the previous comment, it is not clear what the relevance of this information is for the scope of this paper. I suggest to leave it out altogether.

4. p.7418 line 18: Why is the correlation between CO and aerosols explored and not e.g. the correlation between CO and O3? Is there a special reason for this? What does the correlation between CO and aerosols tell you about the fires?

5. p.7418 lines 23-26 and p.7419 lines 1-15: These are general remarks and I suggest to move them to the introduction section.

6. p.7421 line 3: How many iterations are typically needed to reach convergence?

7. p.7421 line 10 How do the measurement error and model parameter error compare? Are these of the same magnitude or is one significantly larger than the other?

8.p.7422 line 22: Do you use the temperature and water vapor profiles as well as the surface temperature from ECMWF data? What surface pressure do you use? The ECMWF surface pressure? What is the temporal and spatial resolution of the ECMWF data used? E.g., 1x1 degree or 0.5x0.5 degree; 3 or 6 hourly data? Have the ECWMF data been interpolated to the overpass time and foot print of IASI? It would be worthwhile to add this information to the text.

9. p.7423-7424 Section 3.1: Most of this section is either a repetition of what has already been said in the introduction section or are just general remarks which belong to the introduction section. Therefore, I suggest to remove the details provided in lines 19-26 on p.7423 and in lines 1-2 on p.7424 and incorporate the remaining text of this section into the introduction section.

10. p.7424 line 16: Over Italy only enhancements during the day are visible in Fig. 3.

11. p.7424 line 18: I suggest to leave out the part between brackets mentioning the value of 30x10^{18} molecules/cm^2, since it calls for an explanation here and this is only given on the next page.

12. p.7424 line 20: Do you mean 'outside the plume regions' ?

13. p.7425 lines 4-10: What is the total uncertainty of these measured mixing ratios? The value of 22 ppmv close to the fires is still a factor of 5.5 larger than the value reported by Hobbs et al. close to the savanna fires. Do you expect such a large difference based solely on the different types of vegetation burned? The value of 22 ppmv is dominated by the value found for the level closest to the surface (see Fig.4). If the lack of sensitivity near the surface in this case is caused by saturation of the absorption lines then the retrieved values are expected to be much more sensitive to calibration errors than for unsaturated absorption lines. Hence, I would expect a large

uncertainty in the retrieved value and possibly an overestimation of the value rather than an underestimation as stated in line 22. Can you elaborate a bit more on the effect of saturation on the error in the retrieved CO values close to the fires?

14. p.7427 lines 27-29; p.7428 lines 1-2: What is the impact of the different foot print sizes of MOPITT and IASI on the differences presented here?

15. p.7428 lines 2-3: Is this solely due to the fact that the available MOPITT product only contains cloud-free data, thus rejecting measurements containing smoke, or are other data rejected as well?

16. p.7429 lines 3-11: Why not compare the total CO burden before or after the fire event with the total CO burden during the fire period in order to estimate the CO burden due to the Greek fires?

17. p.7429 lines 8-9: How do tourists cause increased anthropogenic emissions? Because of increased (air) traffic? Or other sources as well? Please explain.

18. p.7430 line 19-22: Instead of providing a lot of information between brackets it would be good to write this information out in a few sentences summarizing the characteristics of the MODIS observations used. Please also add the spatial resolution of the MODIS observations used here.

Minor comments:

1. Please change 'shown on Fig.' into 'shown in Fig.' throughout the paper.

2. p.7415 lines 7-8: 'Several studies... Northern Hemisphere.' Can you add some references?

3. p.7418 line 20: Please write out the abbreviations CALIOP/CALIPSO.

4. p.7420 line 14: It consists in minimizing -> It minimizes

5. p.7421 line 10: errors -> error

6. p.7423 line 7: "clear" : cloud-free would be a more self-explaining term when used later-on in the paper.

7. p.7428 line 6: ...by compared to in situ... -> ...by comparisons with in situ...

8. p.7429 line 13 and p.7434 line 17: ...GFED inventory... : Which version: version 2? Please add a reference for this data base.

9. p.7431 lines 17-18: What is the overpass time of CALIPSO?

10. p.7433 line 21: ...estimated to 8 km -> ...estimated to be 8 km

11. p.7434 line 6: As far as I can see this value is not mentioned earlier in the paper. Please also add it to section 3.2 (e.g. on page 7426).

12. Table 1: Please indicate in the table which column presents the average and which the standard deviation. It would also help to have a somewhat larger separation between the average and standard deviation columns.

13. Figure 8: Please add to the caption that here the additional RMS filter has been applied. This explains why the panels for 25 August in Fig. 8 differ from Fig. 3.

14. Figures 3,5,6,7,8,9,11: If one wants to indicate that e.g. CO is plotted in units of 10^{18} molecules/cm^2 I believe the official notation is to write 'CO (10^{18} molecules/cm^2)' and not 'CO (x 10^{18} molecules/cm^2)'. In the latter case the 'x' indicates that the CO values have been multiplied by 10^{18} which is not the case. Instead, one could also write CO/10^{18} (molecules/cm^2). The same holds for the units of the RMS and residuals in Figs. 5 and 6, and the back scatter coefficient in Fig. 11.

Interactive comment on Atmos. Chem. Phys. Discuss., 9, 7413, 2009.