

Interactive comment on “Ship-borne FTIR measurements of CO and O₃ in the Western Pacific from 43° N to 35° S: an evaluation of the sources” by T. Ridder et al.

Anonymous Referee #2

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General Comments: This paper presents a suite of measurements of carbon monoxide and ozone from a ship transit from 43 N to 35 S. Solar absorption Fourier Transform infrared spectrometry measurements of total and partial column amounts are complemented by in-situ FTIR measurements of concentrations of CO and other trace gases at the surface and occasional flask sampling and O₃ sondes. The chemical transport model GEOS-Chem is used in full chemistry mode and in tagged CO and Ox modes to help interpret the measurements and source regions of various pollution events sampled. Fire-maps and back-trajectory analysis and HCN total column amounts measured from the ship are also used to help interpret the measured pollution events. The measurements presented here are important because they are from a region of the

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globe with a great scarcity of atmospheric measurements. The generally good agreement seen between the measurements and the GEOS-Chem model is heartening although a weakness in the model's ability to get the vertical mixing correct is revealed. It is also evident from the discussion paper that a serious and careful effort has gone into the interpretation of these measurements. For this reason I think that this paper is worthy of publication and is certainly suitable for ACP although I recommend a number of minor revisions.

Specific Comments:

1. My first specific comment is about the structure of the paper which I found somewhat cumbersome to read. I believe that the paper would be much easier to understand if the results section discussed each pollution event sampled in turn using all the available measurements and modelling to draw its conclusions. The current structure (where each technique is discussed in isolation so that the reader needs to be reminded about what the other evidence was) is not conducive to getting the main points across. However – I realise that to re-structure the paper might involve a great deal of work – so I recommend that the authors consider this point carefully and make up their own minds as to whether this change is worthwhile.
2. In section 4.2 page 22962 lines 5-7 it is stated that the pollution event PE1 is captured by solar absorption FTIR measurements of O₃ and yet in the previous section 4.1 page 22960 lines 25-27 it is stated that solar absorption FTIR measurements were not possible because of bad measurement conditions as a result of typhoon Melor. These seem to be contradictory statements.
3. Indeed – the coverage of O₃, CO and HCN measurements shown in figures 4,5 and 8 are different and the reasons for this are not explained.
4. The profiles and the column amounts do not seem to line up properly in Figure 4b and 4c and 5a and 5b. Is this just a formatting problem? The column amount of CO at around 40N has no corresponding profile – why is this?

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5. Again – the solar absorption FTIR measurements of CO in figure 4b plot are shown with error bars but no explanation is given as to what these are – or why these are the only measurements for which error bars are given. Are they a standard deviation of a number of measurements or a theoretical uncertainty of the retrieval of a single measurement?

6. Is the GEOS-Chem modelled tropopause height used to determine the partial column used for tropospheric O₃ from solar absorption FTIR measurements – or is there some other definition used?

7. The agreement between sonde, FTIR and modelled tropospheric O₃ is remarkably good. I recommend that the authors stress this point and maybe include it in the conclusions.

8. In my opinion the last section of the conclusions needs to be rephrased as it seems to extrapolate from the four individual pollution events sampled to all pollution experienced in these areas. Maybe express as “in the pollution events sampled”

Technical Corrections:

1. Section 5 line 23 replace “measured” with “modelled”

2. Suggest replace heading “conclusions” with “Summary and Conclusions”

Also some very minor suggestions to improve the readability of the English:

3. Line 6 Abstract, suggest “results obtained” rather than “obtained results”

4. Line 11 Abstract, suggest “make it possible to” rather than “allow to”

5. Section 5.1 line 27, replace “origins” with “originates”

6. Conclusions, line 19-20 insert “with contributions” between “pollutants” and “from” at end line 19 and delete the word “partly” from line 20.

Interactive comment on Atmos. Chem. Phys. Discuss., 11, 22951, 2011.

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