

## ***Interactive comment on “Comparison of global 3-D aviation emissions datasets” by S. C. Olsen et al.***

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The authors would like to thank the reviewer for the many detailed and thoughtful comments. They certainly helped improve the manuscript.

C: This paper describes a number of aircraft emission datasets, which have been widely used by the scientific community, especially in global 3D atmospheric models, to calculate the environmental impacts of civil (in some cases also military) aviation. The description of the datasets is very brief, while the main focus of the paper is on differences between them. My only concern with this paper was already risen in my 'quick report', i.e. the question if a rather brief comparison of emission data sets is really worth a peer-reviewed ACP publication. The fact that these emission data sets differ is well-known in the community, and there are no substantial new concepts, ideas, methods or data in this study. On the other hand we don't publish only for ourselves, and the

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paper might serve as a convenient reference when conveying uncertainty messages to our potential audience (policy, industry, ...). To my knowledge this is the first paper quantifying the differences between all these datasets at least in some detail.

R: This is also the first paper in the literature quantifying the differences in aviation emissions datasets to our knowledge too and we agree that it has a large potential audience.

C: Apart from my more fundamental concern, the paper is very well written. The issue of aircraft emissions and their impacts is well introduced, with sufficient (and not too much) detail, the chapters are well balanced and the figures are illustrative. Thus there is not really that much to correct or add. The Conclusions section is probably the weakest part of the paper (although it is not particularly weak). At least it should start by summarizing very briefly (2 sentences?) what has been done in this study, keeping in mind that some people only read abstract and conclusions. The second paragraph ('Military aviation ...') is good, but the first paragraph omits some important messages. It could, e.g. mention that there are also differences in terms of horizontal distribution as described on page 16897. Also the differences in resolution that were discussed in section 3.2 deserve some mentioning.

R: We have strengthened the Conclusions section and added a more detailed description of the results as suggested. (see revised manuscript) It was, e.g., interesting to read about the implications this might have for modelling and model results.

C: I recommend this paper for publication in ACP after the Conclusions section has been improved and the following minor changes have been made:

C: page 16886, line 21: 'lower' -> 'smaller' R: Done

C: page 16887, line 26: write 'impact of aircraft emissions (per kg emitted) is larger than' R: Done

C: page 16888, line 29: maybe put the long name in parentheses and take the acronym

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out? I.e. QUANTIFY (Quantifying ...) R: Done

C: page 16888, line 28 - page 16889, line 3: a bullet list of the five emission datasets would make all this easier to absorb R: We have changed the rather long sentence to a numbered list.

C: page 16889, line 4: 'not necessarily' -> 'not always'? And: 'these databases' – do you refer to future emissions mentioned in the previous sentence or aviation emission datasets in general? R: changed to 'not always' and removed the sentence referring to future emissions since it is clear from the previous sentence that we are not including future emissions in this analysis.

C: page 16890, line 24: remove 'an' or replace 'models' by 'model' R: Done (models -> model)

C: page 16891, line 8: 'each of these is' -> 'each of these are' or 'each of these uncertainties are' R: Done

C: page 16891, line 27: it might be helpful to define the term 'general aviation' (either here or when the term first occurs), some readers may think 'general aviation' also includes scheduled flights R: Added explanatory sentence on GA 'General aviation is defined as all civil aviation operations other than scheduled air services and non-scheduled air transport operations for remuneration or hire.'

C: page 16892, line 2: remove 'model' R: Done

C: page 16892, line 5: maybe one should add that 610 m was chosen because it better coincides with flight levels (2000 ft) than, e.g., 500 m! R: Done, added sentence to text.

C: page 16892, line 7: 'does' -> 'do' R: Done

C: page 16894, line 13: 'The commercial fuelburn ... correspond ...' -> 'The change in commercial fuelburn ... corresponds ...', and: percentage changes would be more interesting than absolute changes! R: Done, added percentage. Updated to 'The

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commercial fuelburn in the gridded datasets increased by 71 % (AEDT 2006 – NASA-Boeing 1992). This change corresponds to emissions changes of  $2.5 \times 10^{11}$  kg CO<sub>2</sub>,  $1.0 \times 10^{11}$  kg H<sub>2</sub>O, and  $4.7 \times 10^{10}$  kg SO<sub>2</sub> assuming constant emission indices of 3.159 kg CO<sub>2</sub> (kg fuel)<sup>-1</sup>, 1.231 kg H<sub>2</sub>O (kg fuel)<sup>-1</sup>, and  $0.6 \times 10^{-3}$  kg S (kg fuel)<sup>-1</sup> (Table 2).’

C: page 16895, line 4: ‘Fig. 5’ -> ‘Fig. 4’ R: Done

C: page 16895, line 7: ‘cover’ -> ‘covers’ R: Done

C: page 16896, line 4: remove ‘(not shown)’ (repetition) R: Done

C: page 16897, line 9: ‘resolve individual flight tracks not gridded emissions data’ – rephrase R: split into 2 sentences for clarity ‘... however, sub-gridscale plume models require detailed chord level emissions which resolve individual flight tracks. This level of detail is not available in gridded emissions data.’

C: page 16897, line 15: ‘Fig. 6’ -> ‘Fig. 5’ R: Done

C: page 16898, line 23-27: this sentence is not good (too many whiles, whereases, ands, and parentheses, and also different tenses). Maybe split into two sentences? R: split into 2 sentences for clarity ‘Regionally, about 40% of CO and HC emissions occur over the North America regions whereas only about 32% of fuelburn occurred over this region. Approximately 25%, 2.5%, and 5.5% of CO and HC emissions occur in the Europe region and the Atlantic and Pacific flight corridors, respectively while these regions account for 22%, 8%, and 8% of fuelburn. ‘

C: page 16899, line 12: ‘these data’ R: Done

C: page 16900, line 14: ‘dataset has’ R: Done

C: page 16908, footnote d: ‘0.600’ -> ‘0.0006’ R: Done

C: Fig.11 caption: strictly speaking, ‘data’ is plural... R: True, changed ‘is’ to ‘are’ for agreement

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C: Fig.12: figure could probably be enlarged by cropping white margins? R: Perhaps, figure sizing always seems to be problematic. We will try to readjust to increase readability.

C: Figs.13 and 14: use colors that are more different, on some printers the blue and greenish colors turn out very similar. R: Done, colors have been changed red and green to increase readability.

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Interactive comment on Atmos. Chem. Phys. Discuss., 12, 16885, 2012.

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