

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: In the discussion paper presented by Olsen et al. a comparison of different global aviation emission inventories is provided. The discussion paper is well written with covering a representative number of global aviation inventories. The paper uses adequate measures and quantities for the systematic intercomparison, however could be more detailed in terms of conclusions. The paper is relevant as estimates of global aviation climate impact rely on such emission inventories. Atmospheric chemistry models require aviation emission as input values, in order to integrate a realistic representation of the impact of aviation on atmospheric chemistry and climate. The paper presented addresses this highly relevant scientific topic, by presenting, discussing and comparing

C10287

individual dataset of aviation emissions in a systematic way. Conclusion section should be more complete on intercomparison of regional and vertical distributions, where differences are obvious from the results section, as both characteristics are important elements for application in global atmospheric modelling. The described objective in the introduction to provide a footing for expanding these data sets to the past and to the future, should be addressed in more detail. Are all inventories in all species suited for being used in atmospheric modelling, or are there particular limitations? Clear statements should be provided based on intercomparison presented, and highlight differences found.

R: We have updated and expanded the conclusions section to address these concerns. (see revised manuscript)

C: The abstract provides a concise summary, however could be more complete on conclusions. Results from regional comparisons should be included, and not only on vertical distribution. Title, english language, units used, and references to related work are adequate.

R: Have added sentence to abstract on regional comparisons ‘Overall the emissions distributions are quite similar for fuelburn and NO_x with regional peaks over the populated land masses of North America, Europe, and East Asia. For CO and HC there are relatively larger differences.’

C: Figures and table in general are clear, however individual improvements are highly recommended. For regional intercomparison figures an alternative representation is suggested, in order to allow the reader to better distinguish between individual inventories. E.g. figure 3 should be presented in an alternative format (left-right instead of top-bottom) in order to better show spread of individual distributions.

R: We are not sure what the left-right format instead of top-bottom means. Does it refer to putting the figures next to each other in a left right layout? If so, we are not sure how that will that show the spread more clearly.

C10288

C: More variability between the datasets for CO and HC emissions are presented (Figure 8, 9). A more uniform axis range is suggested to better present regional differences. In the text the authors refer to the uncertainty involved in their calculation in order to provide an explanation. Here they should be more explicit and specify related uncertainty.

R: We chose to use different scales on the figures in order to emphasize and contrast the differences between the model datasets. If the axis ranges are the same then for some regions the difference between the datasets completely collapses. The regional totals can be read from the figures and are addressed in the text. For clarity, we have added a note in the figure captions that the scales are different.

C: The authors present an interesting analysis of temporal resolution of aviation emission inventories. Graphical representation of this diurnal aviation fuel burn analysis is suggested to be improved (Figure 11). Identical x-axis is suggested, and clearer distinction between both "time" axis is suggested.

R: Have updated figure xaxis labels for clarity. Labels now read 'UTC hour of day' and 'Local hour of day'

C: The authors highlight implications of presented differences between inventories for aerosol and cloud contrail interaction (page 16896). Here also reference to non-linear photochemical processes should be given. Similarly, here numerical diffusion of coarse model resolution becomes important. Photochemistry is one of the relevant processes beside aerosol and cloud interaction, when studying aviation emissions atmospheric and climate impact.

R: Added photochemistry, sentence now reads 'This difference could have implications on the resulting simulated impacts particularly with photochemistry and aerosol and cloud contrail interactions.' I would recommend this paper for publication after the conclusion section has been expanded and the following minor revisions being performed:

C10289

C: Page 16887, Line 10 lighting -> lightning

R: Done

C: Page 16887, Line 23 reference Kohler missing

R: Reference added.

C: Page 16892 Reference to emission data set as published and distributed should be provided. If presented data differs from those values, e.g. due to scaling of totals, this should be indicated with short comment.

R: We had tried to make this clear in the original manuscript. However we have added text to help clarify '... The released version of the QUANTIFY dataset was scaled to the IEA aviation fuelburn total for 2000.' ... 'In this comparison we use the unscaled emissions data and thus are just evaluating the commercial aviation emissions.'

C: Page 16894, Line 13: Sentence is not clear. Why is given reference to table 1 which does not list neither CO₂, HO₂, SO₂.

R: Yes, this was an error, the reference should be to table 2, updated in text.

C: Page 16894, Line 17 Numbers indicated are rounded vs table, different numbers of significant digits are used. Same number of digits should be used for consistency.

R: Done, numbers in text updated to be same as those in table.

C: Page 16899, Line 22: Add "LT" for 22:00-6:00

R: Done

C: Page 16901, Line 4: "Aviation emission generally increases" = was not shown, but fuel burn increase.

R: Made more specific, changed to 'Aviation fuelburn and NO_x emissions' which was shown in the paper.

C10290

C10291