

Interactive comment on “Present and future impact of aircraft, road traffic and shipping emissions on global tropospheric ozone” by B. Koffi et al.

Anonymous Referee #1

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General Comments

Koffi et al. use global chemistry-climate simulations to calculate the influence of transport (aircraft, road, ship) emissions on global ozone distributions. This work quantifies the effects of transport emissions for the present day and future, accounting for changes in climate and emissions. For the present day, road emissions are found to be the most significant source of ozone (from transport emissions). In the future, aircraft and ship emissions are increasingly important as road emissions are significantly reduced. The net global change in ozone from the transport sector is dependent on the future scenario used, since they have different predictions for aircraft and ship emis-

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sions. In total, climate change reduces the impact of transport sector emissions on global ozone, but climate change can have significant positive or negative effects over regions. The regional response is dependent on altitude and season.

The manuscript is well organized and generally well written. I suggest publication in ACP after the following concerns and corrections are addressed.

Specific Comments

I have one suggestion and numerous smaller comments:

I'm curious how the change in column ozone translates to radiative forcing. I suggest presenting the radiative forcing from each transport mode and discussing how climate change would affect the forcing, which is similar to the change in ozone column already presented. This would make the changes in ozone particularly useful to policymakers.

Page 15763: Is this version of the model the same as was used by Cariolle et al. (2009), which is mentioned on page 15759, line 25? If it is not, these plume effects should be listed later as an uncertainty in the results section.

Page 15763, lines 2-6: Does the model predict a change in tropopause height or is it fixed at 150 hPa? If the tropopause is allowed to shift there could be an artificial increase in ozone in the upper troposphere.

Page 15764: The authors correctly point out the importance of using realistic emissions. At the same time, I'm curious how well the model compares to observations when using realistic emissions. A full evaluation is not necessary, but there should at least be a citation specifically referring to previous model-observations comparisons.

Page 15770, line 6: It's unclear what the preliminary LMDz-INCA simulations are. I am assuming the versions in Hoor et al. (2009), but this should be explicitly mentioned.

Page 15770-15771, also Figures 2-4: It's not clear to me what is learned from presenting a transport mode as being x% of transport emissions' impact. I think it's important

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to explain why this information is important (is it because all transport emissions are lumped together in the later climate simulations?). It might be clearer to present the absolute impact of each mode.

Technical Corrections

Page 15756, line 11: "a moderate" rather than "amoderate"

Page 15756, line 13: "a drastic" rather than "adrastic"

Page 15756, line 15: "a very" rather than "avery"

Page 15756, line 18: "a similar" rather than "asimilar"

Page 15756, line 21: "a significant" rather than "asignificant"

Page 15757, line 16: "very sensitive" rather than "very sensitivity"

Page 15758, line 21: Dalsoren and Isaksen (2006) is not specifically about shipping

Page 15760, line 27: "are sensitivity rather than prediction" rather than

Page 15765, final paragraph: I was confused by this paragraph. I suggest comparing emissions through relative terms (twice as much, 50

Page 15767, line 23: Six sets of experiments, not five.

Page 15768, line 3: "which leads to" rather than "which lead to"

Page 15768, line 22: "The first three" rather than "The three first"

Page 15768, line 24: "Like the emissions change" rather than "Likewise the emissions change"

Page 15769, lines 19: "traffic emissions" should be "transport emissions"

Page 15774, line 19: The transport NOx emissions listed here do not match Table 1.

Page 15774, line 25: "scenario A1B" rather than "scenario A1"

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Page 15776: The final paragraph of section 4.2.2 doesn't particularly fit in the B1 ACARE section. Perhaps it'd be better in the previous section?

Page 15776, line 21: Should the year be 2100 rather than 2010?

Page 15776, line 25: Simulations G and H are not listed in Table 2.

Page 15778, line 19: "ozone production efficiency" rather than "production ozone efficiency"

Page 15779, line 1: "impact of future transport emissions" rather than "impact of future transport emissions"

Page 15779, line 11: I believe the applicable results of the simulation using 2003 met data is in Fig. 1b.

Page 15779, lines 13-14: Two references to Fig. 10c, I believe the latter should be 10b.

Page 15779, lines 26- : I don't understand this sentence.

Page 15781, line 10: "magnitude as the" rather than "magnitude than the"

Page 15790-15791: Matthes citation is listed twice.

Page 15794, Table 1: I think the source "Total Traffic" would be better labeled "Total Transport." If possible, it'd be best to bold-face "Total transport," "Total" and "Transport contribution" so that they stand out more.

Page 15795, Tabel 2: I think the last sentence of the caption is meant to say "The first three years have been. . ."

Page 15806, Figure 9: The lower two panels showing changes in CO are never discussed in the paper. Are they necessary?

All figures: The figures could be improved by darkening/thickening the continental outlines, graph axes and the line indicating the tropopause.

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