

Interactive comment on “The global impact of the transport sectors on atmospheric aerosol in 2030 – Part 1: Land transport and shipping” by M. Righi et al.

Anonymous Referee #2

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Summary:

This paper quantifies the impact of land transport and shipping emissions on global atmospheric aerosol and resulting radiative forcing in 2030 for four different Representative Concentration Pathways. The authors use the EMAC global climate-chemistry model combined with the aerosol model MADE, in the same configuration as they have done in a prior paper for the year 2000.

General comments:

The paper is within the scope of ACP, and I commend the authors for its conciseness.

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In some instances, however, it would make the paper stronger if some more discussion was added. I'll give specific suggestions below. The impact of this study could also be increased if it was made clear what the new and original contribution is. The authors make several references are made to existing work (which is good), but I am left wondering what the new results are. Overall, I recommend this paper for publication with minor revisions.

Specific comments:

1. The study is based on present-day meteorology. I understand the reason for doing this, i.e. to focus on the impact of changes in emissions. However, the conclusions about in increasing nitrate concentrations might not hold if the temperatures increase in a future climate. Please point out this caveat in the text. Is it possible to roughly estimate if the nitrate will indeed stay in the particle phase given the expected increases in temperature?
2. p. 22991, line 1: Is there any aging process included for hydrophobic black carbon and hydrophobic POM? Please clarify.
3. Figure 3: The result for RCP6.0 over Africa look very different from the other RCPs. Why is this?
4. p. 22997, line 18-22: Why does this opposite behavior occur?
5. p. 22998, line 8-13: Can you explain why these difference between southern and eastern Asia occur?
6. p. 23003, line 4-6: Regarding the shipping impact on number concentration: Nucleation can occur in ship plumes, which would increase the number concentration. Do you account for this?
7. p. 23004, line 1: This is only a suggestion for future work: Would it be possible to employ the emulator technique by Lee et al. to address this question of uncertainty? (Lee, L. A., et al. "Emulation of a complex global aerosol model to quantify sensitivity to uncertain parameters." Atmospheric Chemistry and Physics 11.23 (2011): 12253-12273.)

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8. Figure 11: I am surprised that the different RCPs give so similar results for the RF due to land transport. Can you please explain this?

Minor points and typos:

1. Notation for the “D” quantities in equations 2, 3, 4: Given that the r.h.s of these equations has an index for the RCP scenario, the l.h.s. should have one, too.
2. Notation for aerosol nitrate, ammonium and sulfate: Should be NO_3^- , NH_4^+ , SO_4^{2-} .
3. p. 22987, line 11: should read “affect” (plural)
4. p. 22987, line 18: “microphysical”
5. p. 22992, line 21: novelty “aspects” (plural)
6. p. 22999, line 25: should read “These”

Interactive comment on Atmos. Chem. Phys. Discuss., 14, 22985, 2014.