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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Effects of global ship emissions on European air pollution levels" *by* Jan Eiof Jonson et al.

Mingxi Yang (Referee)

miya@pml.ac.uk

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This is a very detailed assessment of the impact of ship emissions (both from nearby and far away locations) on air pollution levels in Europe, focusing on PM2.5, S and N depositions, as well as ozone. There are a number of important results coming out of this study, including the contribution of ship-derived sulfate and nitrate to the aerosols, seasonality in coastal ammonium sulfate/nitrate related to agriculture-derived NH3, and the transition between O3 formation/titration as a function distance from emission and VOC availability. The source receptor relationship will be a useful reference for policy makers and other users. Model sensitivity studies are done on both a global and regional scale, which help to constrain the effects of non-linearity, grid resolution, and boundary conditions.

My only major complaint is that the discussion section seems to be on the light side. There is no comparison made between these modelling results with previous observational or model estimates. As such, the model results look to be qualitatively reasonable and sensible, but it's hard to know how quantitative they are.

Finally, while perhaps not the standard output of EMEP, it'd be interesting to explore some additional parameters that are also important for air pollution/atmospheric chemistry with the model, such as:

- Fraction of ship-derived PM that is secondary vs. primary as a function of distance from emission?

- Estimation of ship-derived PM1 and total aerosol number concentration?

A few minor edits:

Line 151. NMVOC instead of NMVOX

Line 184. What's the difference between NOx and ShipNOx? That ShipNOx doesn't participate in O3 chemistry, and only deposits? Assigning 50% of NOx to this channel seems like a very simplistic way of treating the non-linear nature of ship plume chemistry. Is this how terrestrial stack NOx emission gets treated also?

Further works on plume chemistry modeling include (Charlton-Perez et al. ACP, 9, 7505-7518, 2009; Song et al JGR, vol 108, D4, 2003)

Line 373. SECAs instead of NECAs?

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