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

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Emissions from shipping are large sources of air pollution and depositions of oxidized nitrogen and sulfur. This study investigates effects of global ship emissions for specifically European area. The topic is important for further understanding on air pollution mechanism and source-receptor relationship. Although the shipping emission estimation for CAP2020 is rough, the air quality modelling part was well designed and conducted. Results are interesting and most of which were explained in detail. So, this manuscript could meet the quality requirements of journal. However, following concerns should be addressed before acceptance.

Specific comments: 1. Globally the highest d(PM) concentrations are calculated over

parts of Asia and North Africa. Authors have not cited any regional results in East Asia or North Africa, or observation. A comparison on the results for regional level is necessary. At least, Fig 2b shows significant underestimation in China (please refer to "Impacts of shipping emissions on PM2.5 pollution in China. Atmospheric Chemistry and Physics 2018, 18, 15811-15824").

2. I don't understand the logic for ozone part, specifically Fig. 5. The ratio between NOx and NMVOC, which determine the ozone titration of formation, is for the receptor instead of source. How can Fig. 5 present opposite effects in the same receptor region, same season by different source regions' shipping emissions? Same problem for Fig. 6. The only explanation is that ozone was transported instead of the precursors. If so, the way authors discuss the issue in section 3.2 should be revised to focus on the ozone transportation. Then another question comes, if the ozone titration happens in where the emissions were released, does the model show ozone reduction in the emission region as well? Anyway, ozone transportation related analysis needs to be conducted. Current version could not provide full support for results.

3. SR (Source Receptor) calculations are not described very clearly. How to determine the 100% of the effects of source contribution by 15% reduced source emissions? If 10% or 20% were chose, will the source contribution (100%) be different?

4. Pseudo-species "ShipNOx" also needs further explanation. 50% as shipNOx, then how about other 50%? In this 50%, how much will go to R1 and how much for R2?

5. The connections with authors' previous paper of "Effects of strengthening the Baltic Sea ECA regulations" need to be built. Are the 2016 and 2017 results comparable in Baltic Sea region? Any differences? Connections on scenarios?

6. Line 214-217. The well-known mechanisms explained here were not connected to the specific findings in either text or figures. So what? Any nitrate ammonia peak in spring, or in summer?

7. No speciation was provided for PM2.5. Thus, the talking ammonia, nitrate or sulfate was not supported well, which also linked to question 6.

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