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Atmospheric Chemistry and Physics Discussions

# *Interactive comment on* "Decadal evolution of ship emissions in China from 2004 to 2013 by using an integrated AIS-based approach and projection to 2040" *by* Cheng Li et al.

**Anonymous Referee #2**

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This manuscript touches an important field and shows interesting results. Both the backward estimation and the forecasting for future years are important for policy making. Establishing an integrated ship emission estimation and validation approach will enhance the understanding of activity and emissions as well. There are a few comments that need to be addressed to improve the paper. The most important, to make the calculation solid and transparent to readers. It's very hard to evaluate the accuracy of results based on limited information provided in paper. Maybe it's mainly due to the unclear description. The following questions need to be answered and described in detail for this revision. 1. The cargo-based approach is very unclear. How do you get emissions other than 2013? This method is the key for the whole paper. The authors



use only ten lines to give a very brief description. Without detailed data, it's hard to prove the results are convinced. 1) I suggest to list all the data in tables. 2) What is the transport volume? Is it based on port statistic? 3) How many ports with transport volume do you have? How do you generate regional transport volume based on port statistics? 4) Do you considered those ship only pass the region without a destination in that region? If those ships were overlooked, are the results still reliable? 5) How do you define the transport distance? With AIS information only, you cannot get the origin and destination of each trip. Fig. SI-1 didn't explain how you get the distance. 6) Do you mean that all the cargo share the same transport distance? Is it true? 7) Section 2.3.2. No data was provided at all! How can I evaluate your calculation results without any input data? You can decide to provide data in tables or delete all the related results. 8) The data source should be clearly provided in linkage or with DOI. Such general description, such as "China yearbook", means nothing to most of the audients who can not read Chinese! 2. How's the quality of the AIS database? It seems the authors make calculation based on very limited AIS data. 1) Page 6, Line 10-13, I was confused by the two methods you mentioned. Monthly variation is not from AIS? You have only one day per month for AIS? 2) If so, is there large weekly or monthly variation of shipping activity in China? 3) Page 7, line 26, only 700 AIS-based trajectories from 2013? That means, you have two trajectories for each day. If so, how can you estimate emissions from other ships? 3. The ship information database is far from enough. Only 5000 ships from LRS and 7600 RVs from local MDs were collected. How many ships were observed in your AIS or port calls database? You may lose most of the ships by doing this. You mentioned another study reported 18000 ships, which actually cannot support your study. If you want to catch 20000 ships travelling in to your study domain, you need to prepared a database much larger than this number. So the missing ships in your database is at least more than half. 4. What is the boundary of China sea area? Do 200nm regions all belong to China? Without a boundary, the emissions can't be considered as the China's emissions. 5. What is the definition of China's emission control area? Through the manuscript, it seems the 200 nm is defined as the emission

control zone. It seems very strange to me. The zone is extended to other countries, like Viet Nam, Korea and etc. 6. Page 14, line 8-11, why the fuel consumption were in a good agreement with those in cargo and container turnover? In the past 30 years in US, the fuel consumption increased much slower than the cargo turnover. Because the ship fleet gets larger and more fuel efficient. Actually, authors calculated fuel consumption based on the cargo turnover. It's your assumption the fuel should be in the same trend with cargo, not a conclusion. So, this conclusion is not correct. 7. All the abbreviations should be listed with full name when first appeared, and using only abbreviations for latter. Such as MHO, line 18 Page 8, line 12 page 9. There are a lot of these errors. . . 8. Usually we don't say marine heavy oil, but HFO (heavy fuel oil). 9. The format of references need to be checked carefully. Some references missed information, eg. journal name. For example: Li C., Yuan Z.B., Ou J.M., Fan X.L., Ye S.Q., Xiao T., Shi Y.Q., Huang Z.J., Ng S.K.W., Zhong Z.M., and Zheng J.Y.. 2016. An AIS-based high-resolution ship emission inventory and its uncertainty in Pearl River Delta region, China. 573:1-10. http://dx.doi.org/10.1016/j.scitotenv.2016.07.219 For journal names, both the abbreviation and full name were used, eg. Atmosphere Chemical Physic and Atmos. Chem. Phys. 10. Figure 2 and 3 should be put into supplementary information.

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