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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Long-range Transport Impacts on Surface Aerosol Concentrations and the Contributions to Haze Events in China: an HTAP2 Multi-Model Study" *by* Xinyi Dong et al.

Anonymous Referee #3

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The manuscript submitted by Dong et al. assesses how changes in aerosol emissions in Europe and Russia influences haze events in China, using simulations from the HTAP2 project. Analyses include a thorough model evaluation towards various surface- and satellite-based observation data, presentations of the seasonality of the long-range impacts from the two regions on China, evaluation of how the long-range impacts are distributed between within- and above-PBL layers, comparison of results to findings for earlier years, as well as an analysis of estimated horizontal visibility and how this variable is affected by the two source regions. The authors have performed many and rigorous analyses, and the results are likely to be of broad interest to the community. There are, however, some issues that need to be resolved before the paper should be

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Discussion paper

accepted for publishing.

General comments: -The language of the manuscript could greatly benefit from a thorough read-through by a person fluent in English. - The manuscript is at times unnecessarily lengthy. I have suggested several sentences that could be removed, but going through the manuscript and removing sentences and statements that contain irrelevant information or information that has already been given, will help the reader. - In the Introduction, it would be good to see a bit more background on haze in China – for instance, write out in more detail what the references around lines 15-20 find. Do that Wang studies referred to on line 19 look at sources in China only, or is there an element of long-range influences here that could be relevant for this study? - The "Results and Discussion" section is at times too much description of figures and numbers, and too little discussion of results. I believe a lot of the numbers could be put in a table so that more time can be spent on the main highlights and how they agree/differ from other findings. There are several interesting results and features here that deserve to be accentuated.

Specific comments: - P1 L37: add "from EUR" after "long-range transport"? - P1 L38: change "aerosol response" to "the aerosol response in EAS" - P1 L44: to compare how much 1-3 days change in haze frequence is to the percentages given above, please consider changing 1-3 days to percent change - P2 L12: It is a bit difficult to catch the meaning of the sentence starting with "Although" – a rewording would be good! - P2 L28: Not necessary to introduce the AQMEII and MICS-Asia projects, as data form these are not used in the present study? Instead, line 26 could instead start with "One of these is the Task Force on Hemispheric. . ." - P2 L34: These last two sentences are not strictly necessary. - P3 L27: The first part of this sentence "To quantify . . ...sensitivity simulations, " is superfluous – one could instead start directly at "Emission perturbations are conducted with all.." - P3 L31: Fix reference Guido R. can der Werf? - P3 L41: the sentence starting with "These datasets are essential" can also be removed. - P4 L2: Here you could stop after "descend into the PBL." and

then start a new sentence motivating the remaining text by stating the relevance of the PBL-analysis to haze (for instance, that pollutants within the PBL give more haze, and therefore it is necessary to understand the contributions of within- and above-PBL) - P4 L37: I may have missed something, but P3 L19 says that all models have resolution of 0.1x0.1 – where does the 2.8x2.8 come from? Please clarify. - P5 L1: Please define MB - P5 L5: Please consider replacing all uses of "temporal" in this section with "seasonal", as the "temporal" gives an impression of temporal (year-to-year) development. - P5 L6: you write that models tend to underestimate the high peaks in spring, but Fig. 2d seems to me to show that models _over_estimate in spring (or at least all models are higher in March, and the observations are in the midst of the models in April)? - P5 L15: Remove "shows significantly . . . than the others", which is given from the previous sentence. - P5 L16: Do you have any data on the occurrence or tendency for wildfires near this specific stations? If not, this comment should perhaps be removed. - P9 Section 3.3 heading: I am a bit skeptical to the use of the word "Trend" in this heading and in the section text, as a trend can hardly be quantified based on a comparison between the years 2000 and 2010 (data for years 2008 and 2009 helps, but the data are scarce). Consider changing "trend" to "change" or something similar. - P9 L39: Please add a reference after "the past decade." - P11 L25: How would the results look if you use CAM-chem only for all the years? - P12 L16: ECE –> CEC? - P13 L10: "The participating models. . . to 5.5%" can be removed as it has just been said above. - P13 L14: It says Frequency_Full_Impact15 twice :) - P13 L34: Please give this in % change as well. - P14 L37: Please add references after "recent years".

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