

Interactive comment on “Roles of Climate Variability on the Rapid Increase of Winter Haze Pollution in North China after 2010” by Yijia Zhang et al.

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General comments: This paper presents results from a study on the impact of climate variability on the rapid increase of winter haze pollution in northern China around 2011-2015. It is a well written paper on an important subject. The authors have posed a pivotal scientific question about the haze pollution in northern China, which can have a critical implication on the long-term trends of haze. In addition, the authors have addressed the scientific question effectively by using a nested-grid global photochemical model. I believe that the paper deserves publication in ACP provided that the following two specific comments are addressed.

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Specific comments: 1. The main argument of the paper depends fundamentally on the validity of model simulations described in the “section 2.2 Geos-Chem description and experimental design”. It is essential that the performance of the model used to simulate haze pollution in North China is validated or at least evaluated against observations. Figure 1 of the paper could be used to some extent for evaluating the model performance, but additional simulations with historical emissions are needed. Judging from the trends of anthropogenic emissions, this reviewer is afraid that results from simulations with historical emissions might turn out to be significantly different from observed haze days. In any case, uncertainty in the model needs to be included in the discussions of sections 3-5. 2. “The autumn SST in the Pacific and Atlantic, Eurasian snow cover and central Siberian soil moisture, which exhibited completely opposite trends before and after 2010, were proven to stimulate identical trends of meteorological conditions related to haze pollution in North China.” in the abstract and conclusion section maybe an overstatement, at least in terms of the relatively large uncertainty of the model. A more fundamental concern is that the method used in evaluating contributions of the four climate drivers does not imply any causal relationship.

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