

## ***Interactive comment on “The Effects of El Niño-South Oscillation on the Winter Haze Pollution of China” by Shuyun Zhao et al.***

**Anonymous Referee #3**

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Using observations and model simulations, the authors investigated the possible influences of ENSO events on aerosols over China. Understanding the changes in aerosols is a relevant topic for improving our knowledge of relationship between natural cycle and aerosols. Based on the observational data, they concluded that the haze days of southern China tend to be less (more) than normal in El Niño (La Niña) winter, however the relationship is not significant. However, inconsistent result is seen based on the simulated result. And they concluded it is due to the fact that heavy haze days are more frequent in El Niño winter. I agree with the authors that the influence of ENSO events on aerosol concentrations over China cannot be ignored. And it is an important interdisciplinary issue which needs more attention and deep researches. However, there are many problems of this manuscript, and it cannot be accepted by ACP as it is

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now. Some specific comments or suggestions are listed as follows.

1. The authors mainly focused on the influence of ENSO via EAWM on the haze over China, however, what is exact influences of the ENSO influence on the EAWM? And the involved physical processes. The authors did not give a detailed explanation regarding this point neither concluded the existed explanations. I suggest the authors do not avoid discussing this question, but make complete statement about this point.
2. The influences of ENSO on the aerosols have been discussed in recent works. Regarding the impacts of El Niño and La Niña Modoki events on aerosol concentrations over eastern China, and the impacts of EASM on O<sub>3</sub> over eastern China. The authors should include the relevant work into the present study, compare the differences, and further highlight the motivation of the present study.
3. The abbreviations of JJJ, JZH, and GG show no sense, the abbreviations should include geographic information and easy remember. I suggest using north China, southern China to replace.
4. The contradict description in the manuscript, for example, P5L21, “After the year of 2000, the winter-average monthly haze days over the three regions grew dramatically, especially over JZH and GG”; but in P5L25, “haze days over JZH and GG increased too abruptly after the year of 2010, especially in 2013”.
5. The reasons for the applying a linear-trend removing and a 2-8 years band-pass filtering showed be illustrated, and the valid freedom of significant should be applied to the significance test. In Figure 3, it is seen that the hazes days show nonlinear variations, even within 1950-2010. And whether the hazes days show a 2-8 years periods is not clear, it makes me hard to understand why the authors removed the linear trend and a band pass filter.
6. As to the influences of ENSO on the EAWM, many researchers have illustrated that the ENSO shows important role in impacting the intensity of EAWM, and the climate, including temperature, rainfall and winds over north China, central China are impacted by the EAWM. However, the result shows the role of ENSO on hazes over JJJ and JZH is not evident. I suggest the authors to separate the stronger and moderate ENSO events, or separate the eastern and central ENSO events to further explore the result, and it is unknown the exact years of El Niño and La Niña in the present work.
7. The performance of

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the model used to perform the simulations in reproducing ENSO patterns as well as its variations is unknown. Since ENSO is a complex air-sea interaction process, it is necessary to assess the performance in simulating ENSO whereas given the circulations over eastern China during winter and summer. And the observed variations in rainfall should be shown while the simulated result for the poor simulations of rainfall in the models. 8. Figure captions, the blank in figure 5a, b, should be mentioned, however not in c and d. Figure 7, shaded for hgt not contour. Figure 9, it is better if the relative changes is shown whereas the absolute values, considering that the climatology mean shows big differences as shown in Figures 1 and 6.

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