

Atmos. Chem. Phys. Discuss., referee comment RC3
<https://doi.org/10.5194/acp-2021-166-RC3>, 2021
© Author(s) 2021. This work is distributed under
the Creative Commons Attribution 4.0 License.

Comment on acp-2021-166

Anonymous Referee #3

Referee comment on "Intensified modulation of winter aerosol pollution in China by El Niño with short duration" by Liangying Zeng et al., Atmos. Chem. Phys. Discuss., <https://doi.org/10.5194/acp-2021-166-RC3>, 2021

Title: Intensified modulation of aerosol pollution in China by El Niño with short duration

The El Niño (ENSO) is an irregular periodic variation in sea surface temperature in the tropical Pacific Ocean, affecting the Walker Circulation and displacing the convective area. It can lead to significant anomalies in atmospheric general circulations and weather conditions, which may further impact on haze pollutions in China. In this article, authors used the state-of-the-science Energy Exascale Earth System Model version 1 (E3SMv1) to estimate the impacts of El Niño with short and long durations on PM_{2.5} during winter in China. They further investigated underlying mechanisms of PM_{2.5} variations controlled by ENSO-related circulation and precipitation changes. The results are helpful to improve the understanding of modulation of aerosol pollution in China by El Niño over the study region. I think the manuscript can be accepted after the following concerns are addressed.

General Comments:

- The Introduction should be more concise. The authors should work further to reduce the main text to exclude any unnecessary contents like "clean air actions", and explain how spatiotemporal variations of aerosol in China controlled by ENSO-related changes in not only in wind speed and precipitation, but Walker Circulation and convections as well in more detail.
- The authors intended to show the difference of El Niño with short and long durations in

section 2.2, where the background climates are quite different. Thus more discussion on their difference in climatological means (e.g. general circulation, temperature, precipitation, humidity and wind) are recommend.

Minor suggestions:

- Line 92, "Based on haze day counting mainly using atmospheric visibility, many studies found" may be replaced with "Many studies counted haze days based on atmospheric visibility and found".
- Line 96, "several studies ... from satellite retrievals". Insert some references there.
- Line 141, "... have different impacts on the aerosol distribution in China". Insert a suitable reference at this point.
- Why not used the observed PM₅ data during 2014-2017? Please check whether the number of stations is 1657.
- Please identify the simulation period in this study.
- It is recommended to list a table to introduce the experiments.
- Precipitation can exert notable scavenging effects on PM₅ concentrations, whilst weak precipitation might increase PM_{2.5} concentrations by hygroscopic increase associated with increased humidity. Therefore, it is recommended to examine the relative humidity anomalies in section 3.2, which might be able to explain opposite pattern of precipitation and wet deposition anomalies.
- It is recommended to show probability density distributions of PM₁₀