

Interactive comment on “Simulated coordinated impacts of the NAO and El Niño on aerosol concentrations over eastern China” by Juan Feng et al.

Anonymous Referee #2

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The manuscript presents analysis of the impacts of NAO and El Niño on the anthropogenic aerosols in China. It uses mostly GEOS-Chem model simulations driven by GEOS-4 reanalysis. Understanding the changes in aerosols is a relevant topic for improving our knowledge of relationship between natural cycle and aerosols. Model simulation show the circulation anomalies during the co-occurrence events of negative NAO and El Niño, and therefore influence on aerosol concentrations over eastern China. However, a sole negative NAO is linked with anomalous aerosols over central China. Overall the manuscript is well written and clear, the figures are also appropriate and clear. After addressing the following minor concerns, I suggest publishing this work.

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1. I suggest that the authors could also select more sample size (negative NAO + El Niño and El Niño events) from reanalysis data in a longer time, i.e., 1979–2016, and compare the distribution of wind anomalies. 2. Data part. In the whole study, the authors used mostly the model data, even in analyzing the atmospheric circulation, why? And what are the differences between model data and reanalysis data? Can their differences influence the results of the research? 3. Figure 11, discuss the contribution from wet deposition, I think the limited role of wet deposit on the aerosol concentrations over central China is partly due to the small amount of rainfall during winter. However, the winter rainfall amount over south China is greater than that over central China. The author should further examine this point. 4. Finally, why the impacts of positive NAO on the aerosol concentrations are insignificant, the authors should shed more light on this issue. The corresponding variations in the underlying thermal and dynamical process should be included to give a full understanding. 5. The related reference the authors might be interested in: Li, X., Z. Wu and Y. Li, 2019: A link of China warming hiatus with the winter sea ice loss in Barents–Kara Seas. *Clim Dyn.*, DOI:10.1007/s00382-019-04645-z. Wu, J. and Z. Wu, 2018: Interdecadal change of the spring NAO impact on the summer Pamir-Tianshan Snow Cover. *Int.J. Climatol.*, DOI: 10.1002/joc.5831. Wu, Z., X. Li, Y. Li and Y. Li, 2016: Potential Influence of Arctic Sea Ice to the Inter-annual Variations of East Asian Spring Precipitation. *J. Clim.*, 29, 2797–2813. Wu, Z., J. Li, Z. Jiang and J. He, 2011: Predictable climate dynamics of abnormal East Asian winter monsoon: once-in-a-century snowstorms in 2007/2008 winter. *Climate Dyn.*, 37, 1661–1669. Lyu, M., Z. Wu, X. Shi and M. Wen, 2019: Distinct effects of the MJO and the NAO on cold wave amplitude over China. *Quart. J. Roy. Meteor. Soc.*, DOI: 10.1002/qj.3516. Zhang, P., B. Wang and Z. Wu, 2019: Weak El Niño and Winter Climate in the mid-high latitude Eurasia. *J. Climate*, 32, 4021–4042. Zhang, P., Z. Wu and J. Li, 2019: Reexamining the relationship of La Niña and the East Asian winter monsoon. *Climate Dyn.*, DOI: 10.1007/s00382-019-04613-7. Ye, X. and Z. Wu, 2018: Contrasting Impacts of ENSO on the Interannual Variations of Summer Runoff between the Upper and Mid-Lower Reaches of the Yangtze River. *Atmosphere*,

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