

Atmos. Chem. Phys. Discuss., referee comment RC2
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Comment on acp-2021-918

Anonymous Referee #2

Referee comment on "Intraseasonal variation of the northeast Asian anomalous anticyclone and its impacts on PM_{2.5} pollution in the North China Plain in early winter" by Xiadong An et al., Atmos. Chem. Phys. Discuss., <https://doi.org/10.5194/acp-2021-918-RC2>, 2022

In this study, the authors investigated the impacts of the northeast Asian anomalous anticyclone (NAAA) on the PM_{2.5} concentrations in the North China Plain (NCP) on the intraseasonal timescale. The authors found that, under NAAA condition, the probability of regional air pollution for at least three days in the NCP is 69% in NDJ (November to January) period 2000-2021. The manuscript is well written, and results are clearly presented. I have a few comments for the authors to consider.

General Comments:

The authors mentioned in the abstract that there is considerable intraseasonal variability of NAAA in NDJ period. One of the objectives for this study is to derive the characteristics of air pollution evolution in the NCP under the background of the NAAA in NDJ on the intraseasonal timescale. It is a little unclear to me that what the authors mean for intraseasonal variability. Is it for temporal evolution (up to 17 days) of the PC time series for 94 NAAA events and evolution of PM_{2.5} concentration anomaly? If yes, it seems more like synoptic/weather scale to me.

I wonder how many NAAA events of the selected 94 events occurred in November and January. Are these events evenly distributed in the three months? Are there any differences for the characteristics of NAAA in the three months, like time duration and strength? Is the probability of regional air pollution under NAAA similar for all three months in NDJ? There are some similar composite analyses from Zhong et al. (2019) for

December. I wonder if there are any notable/important differences for the impacts of NAAA on the air pollution among the three months. Or the inclusion of November and January is just for more NAAA events?

It is interesting that air pollution occurs in the NCO one day before the peak day of the NAAA. I agree with the other reviewer that the cause and effect between NAAA and $PM_{2.5}$ pollution should be fully discussed.

Specific comments:

Line 88, due to emission instead of "due emission"?

Equation (2) and Line 114-115, please explain the formula in a better way, especially for the variables. Please give descriptions for a , ρ , λ , and Φ ? Should it be $\rho \cos \Phi$ in Equation (2)?

Line 150-155, what are the wavenumbers 1-10, especially 5-10. Please give some description.