General comments

This study investigated the impacts of preceding boreal winter North Atlantic Oscillation (NAO) and El Niño-Southern Oscillation (ENSO) on the following spring dust activities over North China during 1980-2022. The authors demonstrated that the significant impacts of NAO and ENSO on the dust activities over North China is only manifested in the negative phases, and discussed the physical mechanism involved to illustrate why the negative phases of NAO and ENSO show a synergistic effect on the following dust events in North China. The message is conveyed clearly and the topic is interesting. The results of this study provide an insight to further understand the dust activities over North China. The conclusions are substantiated based on composite analyses. If published, this work could serve as a valuable reference for dust weather. However, it needs to be minor revised before accepted this paper for publication in ACP with addressing those comments listed below:

Specific comments are as follows:

1. *The NAO is a large-scale seesaw in atmospheric mass between the subtropical high and the polar low. It is the dominant mode of atmospheric circulation variability in the North Atlantic sector throughout the year. The definition of the NAO index derived using EOF is commonly employed to depict the variation of NAO. However, the SLP difference between 35°N and 65°N within the Atlantic section is used to define the NAO index. A full comparison of the NAO index is necessary to establish the robustness of result.*

2. *The authors focus on the relationship between preceding winter NAO and ENSO and dust weather in late spring. The introduction mentions that "the impacts of winter NAO and ENSO on the climate in China is more pronounced" by citing results from previous work. However, it is unclear whether the cross-seasonal impacts also apply when exploring the relationship between NAO, ENSO and dust weather in North China. Therefore, it would be better to provide some references to explain why we should investigate the impacts of previous winter of NAO and*

ENSO on spring dust weather.

3. *In the paper, the authors primarily discuss the effect of NAO and ENSO negative phases on the dust activities over North China. However, given the various phases combinations between these two factors, a more detailed explanation as to why only the negative-negative combinations are considered.*

4. *In Figures 1-2, the authors illustrate the relationship between NAO, ENSO and dust weather over North China through the spatial distribution of correlation coefficients, and that the relationship is only manifested when NAO and ENSO are in negative phases. A quantitative analysis is needed to further establish the robustness of the result.*

5. *From Fig 3 and Table 1, it is evident that there are two types when NAO and ENSO are in their negative phases: negative phases of the NAO and ENSO, and negative phases of the NAO and ENSO occurring separately (remove the years with concurrent negative phases of NAO and ENSO). Furthermore, the subsequent composite analyses in the study, focus on the cases with negative phases of the NAO and ENSO. The authors should explain why they have made this choice.*

6. *In Figs 4 c, f, and i, the variations in the near-surface wind field caused by anomalies of Siberian High, lead to dust emissions from the source areas. However, the depiction of the wind field anomalies appears unclear. It is recommended to modify the Figs to highlight the variations in the wind field.*

7. *In Table 2, the value of correlation coefficients between the previous winter NATI and spring NATI are similar in scenarios of ENSO- phase (when the negative phase of ENSO occurs alone) and NAO- & ENSO- phase (when the negative phases of both NAO and ENSO co-occur). However, if there exists a synergistic effect of NAO and ENSO on the dust weather, the correlation in the scenario where both NAO and*

ENSO negative phases co-occur should be higher than when the negative phases of NAO and ENSO occur separately. The authors should have provided a more detailed explanation to clarify this point.

8. The main mechanism for the impact of the winter NAO on the spring dust is the maintenance of the North Atlantic SST anomalies from winter to spring, consistent with previous findings (Chen et al. 2020; Wu and Chen 2020; Song et al. 2022). Several discussions could be added.

Song, L.-Y., et al, 2022: Distinct evolutions of haze pollution from winter to following spring over the North China Plain: Role of the North Atlantic sea surface temperature anomalies. Atmos. Chem. Phys., 22, 1669–1688.

Wu and Chen, 2020: What leads to persisting surface air temperature anomalies from winter to following spring over the mid-high latitude Eurasia?. Journal of Climate, 33, 5861-5883.

Chen et al. 2020: Strengthened connection between springtime North Atlantic Oscillation and North Atlantic tripole SST pattern since the late-1980s. Journal of Climate, 35(5), 2007-2022.

9. There are lots of clerical errors, i.e.,

Line 17-18, sea surface temperatures (SST) in the North Atlantic

Line 220, with regard to the description of the graphs, there may be some errors that

"(b) and (d) As in (a) and (b) " -> "(c) and (d) As in (a) and (b)".

The authors should carefully check the whole manuscript.