

## **To Reviewer 2:**

Assessing the association between the concentrations of multiple airborne pollutants and driving factors is important for identifying the underlying mechanisms for explaining air pollutants' variations. Xu et al. investigate the effects of temporal scales on the identification of dominant meteorological factors for PM and ozone levels across China in 2020. The results showed that temperature is the most critical meteorological factor at both 3h and 24h scales and pollutant-meteorology associations are in a higher degree of agreement in highly polluted regions.

This work is a good contribution that is meaningful and fills some knowledge gaps to understand the influence of temporal scales in the attribution of airborne pollution in China. I would be glad to see its publication, yet there are still some questions, as elaborated in the article. Please correct and clarify them, which will make this manuscript more reasonable and better present the effects.

**R: Thanks so much for all your constructive remarks and useful suggestions, which has significantly raised the quality of the manuscript. We have addressed the issues you raised in the response letter and the revised manuscript. By clarifying the issues you suggested, the manuscript has been largely improved. Thanks again for all your encouragement and valuable comments.**

**Please feel free to contact us if additional revisions are required and we are more than willing to conduct further revisions according to your comments.**

## **Specific comments:**

1. How to extract the reliable association between airborne pollutants and meteorological factors is the key to revealing the temporal efforts on pollutant-meteorology causation, and the selection of robust methods is crucial. Therefore, why CCM is suitable for this research and other models not suitable for such analysis should be clearly explained. In the current form, authors have briefly introduced CCM, yet its principle and advantage remained unclear to me. Please elaborate on the advantages and limitations of CMM model and the advantages and rationality of the CMM model compared with other mainstream models.

**R: Thanks so much for this comment. According to our recent model-comparison paper (Chen et al. 2022), CCM may be the most suitable model for causal inference of atmospheric environment. Theoretically, firstly, CCM is specifically designed to deal with the nonlinear relationship between two variables and is fully suitable for the nonlinear relationship between atmospheric factors. Secondly, CCM automatically considers all possible interaction forms and lag effects between the time series of two variables, which effectively reduces the influence of interference and avoids the influence of other factors. Third, CCM requires less parameter setting and prior knowledge, eliminating the uncertainty caused by improper parameter setting. Therefore, CCM model was an ideal tool for this research.**

**The relevant references and explanation has been added to the revised manuscript. Thanks so much for this comment, which improved the rationality of this research significantly.**

*Chen, Z., Xu, M., Gao, B., et al. Causation inference in complicated atmospheric environment. Environmental Pollution, 2022, 303, 119057.*

2. Some further details in the Discussion section can help explain the motivation and main findings of this study. In particular, some discussions on the related works revealed different dominant meteorological factors when the temporal scale is different. This can re-stress the necessity of considering temporal scales.

**R: As stressed in the manuscript, the major innovation and findings of this research was the temporal scale played an important role in the extracted pollutant-meteorology association. Specifically, despite a generally strong influence of temperature, we found that the number of cities with temperature as the dominant meteorological and the mean  $\rho$  value of temperature presented notable differences at the 3h and 24h scale. The difference of pollutant-meteorology association at different temporal scales was not investigated quantitatively before and was the major innovation and contribution of this research.**

**Thanks so much for your comment. In the revised manuscript, we further pointed out that the major meteorological elements of air pollutants was clear in previous studies and the temporal effects on revealed difference of pollutant-meteorology association was the new knowledge to the field. In this case, the major innovation of this research was clearly highlighted.**

**Technical comments:**

1. The time of the data (last access date) should be included according to the requirement of ACP.

**R: Corrected. Thanks so much for pointing this out.**

2. The English is understandable, yet with some typos. I suggest the authors carefully read through the manuscript and correct them. Some examples are listed below:

Line 13: Should be "24h".

Line 95: There's a space missing between "(Chen et al., 2022)" and "proved".

Line 103: There's a missing word.

Line 196: Should be "was".

Line 267: Should be "NO<sub>2</sub>".

The first letter in " (e.g., ) " is not uppercase or lowercase.

**R: Thanks so much for this comment. We have corrected all these typos in the revised manuscript. Meanwhile, we have re-checked the manuscript carefully and polished the English. Thanks again for your comment.**