

Review of acp-2020-596: Synoptic drivers of co-occurring summertime ozone and PM_{2.5} pollution in eastern China

The authors use the T-mode PCA to objectively classify the summertime synoptic weather pattern across East-Asia and the western Pacific Basin aiming to identify the mode(s) most favorable for compound pollution events across sub-regions in China, specifically for PM_{2.5} and O₃. Many factors governing these events operating across an array of scales are explored. The PCA identified 4 synoptic regimes characterizing the seasonal set up of the 500 hPa WPSH from 2015-2018. An additional large-scale circulation is also at work here, the East-Asian monsoon, which is discussed in context to the WPSH. Additionally, the authors discuss the effects of precipitation frequency and boundary layer characteristics on regulating compound pollution events. Occurrences of pollution are based on Chinese governmental standards.

The authors present a much-improved manuscript. The authors now show a clear connection between different synoptic modes and compound pollution events across different sub-regions in eastern Asia. The authors link the favorable synoptic modes to favorably meteorological conditions in Tmax, wind, stability, and more.

I believe that this paper will be ready for publication once its grammar has been improved. Thus, I recommend major revisions at this time, but I must emphasize that the authors should be proud of the improvements they have made to this manuscript. There is a strong message developing. With the proper grammatical improvements, this will be a significant contribution to the literature.

1. The abstract can and should be shortened considerably. The authors have identified two preferred SWPs conducive for compound pollution events and then provide many details. The details can be left to the main text and omitted from the abstract. Furthermore, the abstract should be in the same tense. Currently, there is a mix of past tense and present tense expository.
2. Line 79: What does “gradually been prominent” mean? Do the authors mean that O₃ pollution in summer has increased in recent years?
3. Line 90: WS, please define as wind speed. I do not it is defined previously in the main text.
4. Line 105: When referring to previous studies, present material in the past tense, but the rest of the paper should be written in the present tense.
5. Line 116: “anomalies” should be “anomaly”
6. Line 129: Are the winds southerly or northwesterly?
7. Line 137: Delete “simulation”
8. Line 146: Should be “pollutants”
9. Line 192: “consists” should be “consisting”
10. Line 193: “pattern” should be “patterns”
11. Lines 194-197: This sentence needs to be reworked grammar-wise.
12. Line 205: Are the authors counting days as O₃ and PM_{2.5} days when > 50% of the sites exceed the aforementioned thresholds? If so, the grammar here needs to be reworked.

13. Line 231: "The" should be "the"
14. Line 232: New sentence should begin at ", as a result"
15. Lines 233-237: Are the authors referring to the total days in the 2015-2018 period?
16. Line 237: This sentence is repeated
17. Line 255: Wait – are Figs. 2-3 composited only on days characterized by SWPs 1-4? I thought these for all days? If for all days, delete "days for four SWPs"
18. Lines 247-248: Change the wording of this sentence. "These results indicate that, despite PM_{2.5} reductions, compound pollution events deserve public attention." Delete the following sentence.
19. Lines 261-263: This sentence needs to be reworded from "which might..." onwards
20. Line 273: Change "in" to "across"
21. Lines 275-278: This sentence is hard to follow and needs to be reworked. For example, how can the sea-land interaction interact with the southeastern region across China? I think the authors can just explain the different spatial configurations of the different modes of the WPSH and leave discussion for later on when discussing the compound pollution event conditions
22. Line 535: "locating" should be located
23. Line 415: Prevailing..."winds?"
24. Lines 418-420: Were the prevailing winds driving pollution transport from the southern plains? This sentence needs to be reworked grammatically.
25. Fig. 11: Panels are uneven. Please replot
26. Lines 427-463: These points can be shortened, and the grammar needs to be revised. A lot of the discussion for this passage was made in previous sections.