

Interactive comment on “Classification of summertime synoptic patterns in Beijing and their association with boundary layer structure affecting aerosol pollution” by Yucong Miao et al.

Anonymous Referee #2

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This study utilizes four-year sounding measurements, surface PM measurements and reanalysis data to examine the influence of the synoptic patterns on the planetary boundary layer (PBL) structure and air pollution in Beijing. As Beijing has been experiencing extremely severe particulate pollution in the past few years, this study shed light on the contribution of the regional scale dynamics to the haze formation in a quantitative way. Using a synoptic pattern classification method, three patterns are identified to be closely related with heavy pollution condition in Beijing and the underlying dynamical processes are revealed in details. The cloud influence on PBL is also assessed. Overall, the manuscript is well written and I recommend publishing this study on ACP after some minor questions below can be addressed by the authors.

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1. Page 3, Line 9-19. I am kind of surprised that the contribution from the automobile exhaust to the Beijing air pollution was not even mentioned. Some associated references can be added here (Zhang et al., 2015, Chem. Rev.; Peng et al., 2016, PNAS)
2. Page 4, Line 19. Please be specific on how the sea-breeze affects PBL and if it alleviates or deteriorates air pollution.
3. Page 10, Line 11. I don't understand how come R is low as -0.37 but p-value is less than 0.01. What significance test is performed here?
4. Section 3.2. Does a haze event have to be tied to a synoptic pattern? How about a 'no wind' condition? It seems not belonging to none of the seven synoptic patterns listed there, but it did occur during some severe haze event.
5. Fig. 13. The schematic diagram is very interesting, but the mechanism only works for daytime. The pollution is typically even worse during the nighttime. It will be interesting to have some discussion about the possible PBL-synoptic pattern interactions during the nighttime.

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