Atmos. Chem. Phys. Discuss.,
doi:10.5194/acp-2016-1048-RC1, 2016

Atmospheric Chemistry and Physics Discussions

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 #1

Received and published: 20 December 2016

This paper investigates the role of different weather conditions in modulating summertime boundary layer and further surface pollution in Beijing. A novel technique is applied to classify summertime circulation patterns into seven major weather types. More importantly, the authors thoroughly investigated the mechanism how different synoptic conditions impact on the variability of boundary layer height and structure, which is the major factor governing the vertical transport of pollutants and thus surface pollution level. The paper is also well presented and logically organized. I think this paper addresses an important issue and makes great contribution to our understanding of summer haze in Beijing. I thus recommend the paper be accepted for publication in ACP only with several minor comments.

Specific comments:

1. The introduction seems too long (4 pages). I think it could be shortened with an emphasize on the relationship between summer time boundary layer height and pollution in Beijing, and the novel method and data used in this study. 2. Section 2.3: While the T-mode PCA is conventionally used in classification, the oblique rotation may not be familiar to the major audience. It's better to elaborate here with some mathematical explanation of this technique. 3. Section 3.2: The authors identified seven dominant weather types. I wonder how is the order (No. 1-7) of these seven types determined? In traditional PCA, the modes are usually ordered by the amount of variance explained. Here it does not seem to be the case as their frequencies of occurrence are not ordered from high to low? Perhaps some explanation would help? 4. Also in this section, as types 1, 4 and 5 are associated with heavy pollution, I wonder if a composite analysis of these three types and the other four types would help better distinguish between their different characteristics in meteorological variables (RH, BLH, CLD, etc) and PM2.5 concentration? 5. Previously, there are also studies on the relationship between synoptic (circulation) patterns and pollution over the Beijing area, such as those cited by the authors in the introduction section. I wonder how is the current study compared with these previous results? Some discussions in a general context would help. 6. Figure 9 caption: "seasonally" should be "summer" because only summer data is analyzed here.

Typos:

Page 2, line 23: in the further suppression Page 3, line 25: the past decades Page 4, line 5: On local scale, or "On regional scale" Page 4, line 15: impacts on Page5, line 25: which subjectively defines a priori,... and in which the case assignment Page 9, line 2: ...PCA which is in the S-mode... Page 11, line 12: the lifting condensational level can drop... Page 12, line 3: understanding the effects of ... Page 12, line 7: As illustrated in Fig. 8, ... Page 12, line 18: well captured Page 12, line 2d: over the ENTIRE study region Page 12, line 26: impose a negative thermal anomaly ON the

PBL there Page 13, line 5: leading to THE suppression of . . .

Interactive comment on Atmos. Chem. Phys. Discuss., doi:10.5194/acp-2016-1048, 2016.