

Interactive comment on “Influence of boundary layer structure on air quality in Beijing: Long-term analysis based on self-organizing maps” by Zhiheng Liao et al.

Anonymous Referee #2

Received and published: 31 January 2018

General comments

The paper deals with the influence of boundary layer structure on air quality using 4-year observations. The article presented very interesting study between air pollutants and meteorology, and the study built on very good meteorological measurements data. The paper is certainly worth of publishing as the study itself is extremely interesting. However, some improvements/corrections are suggested.

Specific comments

1. The title should be modified. Throughout the manuscript, I haven't found the description concerning the calculation of the BLH. Therefore, the title using boundary

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layer structure is not exactly correct. Maybe atmospheric stability or boundary layer meteorology are much better. In addition, 4-year is not long-term for the observation period. In section 3.4, the authors also discussed the impact of the aerosols on BLH. However, the title just represented the influence of boundary layer meteorology on air quality. I suggest removing section 3.4 or please revise the title correspondingly.

2. The radiosondes the authors used mainly represent the stable condition of the boundary layer. However, the air pollutants were observed in the whole day. Especially, the AOD data were just observed during the daytime. As well known, the boundary layer height will develop rapidly during the daytime. Lacking of the daytime observations of boundary layer structures, how about the creditability of the relationship of air pollutants and boundary layer meteorology?

3. The instruments of US Embassy for PM are not the same as the MEP. Do you consider the differences?

4. For the boundary layer meteorology, potential virtual temperature and Richardson number are much better indicators to do the SOM analysis. Why the authors using temperature to do the SOM analysis? I suggest using potential virtual temperature to do the classification of different nodes.

5. How to evaluate atmospheric stability? Do you have the quantitative basis? Node 3 represent slow wind, high humidity and more stable than node 7.

6. Because emissions are different in different seasons, I suggest discussing the concentrations of air pollutants in different nodes for each seasons.

7. For the boundary layer ozone analysis, please refer Tang et al., 2017a, 2017b.

Technical comments

1. Line 48. Beijing has two directions adjacent to mountains. The west one is Tai hang Mountains and two north one is Yan Mountains.

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2. Line 56. Ground-based remote sensing.
3. The second paragraph in the introduction section is too long. Please separate it.
4. Section 3.3 is too long, please use subtitle to separate it into several small parts.

References

Tang, G., Zhu, X., Xin, J., Hu, B., Song, T., Sun, Y., Zhang, J., Wang, L., Cheng, M., Chao, N., Kong, L., Li, X., and Wang, Y. Modelling study of boundary-layer ozone over northern China - Part I: Ozone budget in summer. *Atmos. Res.*, 187, 128-137, doi: 10.1016/j.atmosres.2016.10.017, 2017a.

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