Atmos. Chem. Phys. Discuss.,
https://doi.org/10.5194/acp-2017-295-RC2, 2017

Atmospheric Chemistry and Physics Discussions

Interactive comment on "Mixing layer height on the North China Plain and meteorological evidence of serious air pollution in southern Hebei" *by* Xiaowan Zhu et al.

Anonymous Referee #3

Received and published: 27 October 2017

This study reveals the spatial variation of mixing layer height (MLH) over northern China plain (NCP) based on a two-year measurement at four primary cities with different geographical location across NCP. The authors attribute the different spatial pattern of MLH between southern Hebei and northern NCP to the distinct wind shear features between the two interested regions. The analysis on the long-term measurement of MLH in this study provides a meaningfully insight on the climatological features of boundary layer condition during the haze episodes over NCP. Also, the discussions about the associations of MLH and other meteorological factors with the near-ground particle pollution are sufficiently presented in this work. However, the following concerns should be addressed before publication.

Printer-friendly version

Discussion paper

Specific comments

1. Considering the possible strong aerosol-radiation interaction because of the heavily pollution, the surface net radiation is supposed to be lower over the regions with more heavily pollution because of the strong scattering and/or absorbing of solar radiation by aerosols. However, in this study, though the near-ground PM2.5 concentration over southern Hebei is 1.3 times higher than that of north China plain (NCP), there is no significant difference in the net radiation at Shijiazhuang (SJZ) located southern Hebei from at Beijing (BJ) located over NCP. One probable reason is because the aerosol optical depth (AOD) over the two sites are comparable, leading to comparable capacity reducing solar radiation. The authors may check the AOD data to obtain a convinced explanation for why the net radiation is spatial consistent, given the presence of aerosol-radiation interaction.

2. In addition to the difference in mixing layer height (MLH), how likely does the spatial variation in pollutant emissions contribute to the difference in the near-ground PM pollution between SJZ and BJ?

3. Th authors attribute the spatial difference in wind shear over NCP during winter to the influence of front passing associated with the Siberian High (lines 403-405). Is the front also the dominant control of the relative humidity over NCP during winter? Is there any other reason leading to the discrepancy in relative humidity between the two regions in question?

4. Given that both Tianjin (TJ) and Qinhuangdao (QHD) are located at coastal region and suffering highly frequent sea breezes during summer (Fig. 5), why the MLH of TJ is much higher than the case in QHD, since the relatively low MLH in QHD is attributed by the authors to the intensive occurrence of sea breeze during summer (lines 265-266)?

Technical comments

1. Fig. 7: the unit for the wind shear should be m s-1 km-1.

2. The descriptions on Figs. 5c and 5d in lines 320-322 seems not consistent with what was shown in figure. For example, the prevailed wind direction during spring and summer for TJ is southerly as shown in Fig. 5c, which is not the case stated by the text in lines 320-322, i.e. easterly wind is prevailed in TJ.

Interactive comment on Atmos. Chem. Phys. Discuss., https://doi.org/10.5194/acp-2017-295, 2017.