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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Opposite Effects of Aerosols on Daytime Urban Heat Island Intensity between Summer and Winter" *by* Wenchao Han et al.

Anonymous Referee #2

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This study investigated the relationships between daytime surface urban-heat-island (SUHI) intensity and aerosol pollution in summer and winter and their seasonal difference in China by using multi-source observations. The topic is very interesting and has important climate, environment and health implications. This study has the potential to provide new insights about urban climate change and their seasonal change under heavy air pollution context. The manuscript is written clearly, and I really like the schematic diagram in figure 12. While I found some minor issues need to be addressed. My recommendation is to accept with minor revision. 1. Introduction: UHI can be defined by satellite-based Land surface temperature (LST) (i.e., surface UHI) and also can be defined by surface air temperature (SAT) recorded by stations. There

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still is a bit differences in these two definitions and their drive factors, although SAT is closely related to LST. Therefore, some papers in the Introduction need to be stated clearly for which definition. In addition, suggest that surface is added in the paper Title and the MS. 2. Method: about meteorological station should be added in figure 1 or in the supplementary? How did you choose the urban and rural (i.e. reference) stations in each city? 3. Sample numbers should be added in Figure 2. 4. Please check whether eq.3 matched with the text in lines 239-240? Also y-axis title should be MUHII (or MSUHII) ? 5. Lines 251: aS4ll? What do you mean? 6. Lines 272-276: excepting temperature inversion-induced stable PBL, aerosol pollutions usually accompanied with low wind speed (particularly <2m/s), which is also favorable to both heat accumulation/store and UHI enhancement. 7. Lines 292-293: In the daytime during winter, the high aerosol concentrations in the rural areas, due to high emission induced by coal heating in rural area in the north China, while in south more industries in rural areas under stagnant atmospheric conditions? This seasonal variation in urban-rural difference may modulated by the combined effects of PM2.5 emission, transportation and diffusion (please refer to Urban-rural differences in PM2.5 concentrations in the representative cities of China during 2015∼2018. CHINA ENVIRONMENTAL SCIENCECE, 2019, 39(11): 4552-4560.). 8. Subfigures in Figure S5 and S7 are very small unclear for readership.

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