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Interactive comment on "Impact of low-pressure systems on winter heavy air pollution in the northwest Sichuan Basin, China" *by* Guicai Ning et al.

Anonymous Referee #1

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This paper conducted the weather analysis of heavy PM10 pollution events in Chengdu, Deyang, and Mianyang in the northwest Sichuan Basin. Authors extracted major weather patterns, including winds, air temperature, BLH, and pressure system during the occurrence of heavy pollution in this region. The Sichuan Basin is one of several heavily contaminated regions across China and has a typical geographic terrain and persistent weather system. It is necessary to summarize the influences of such the typical terrain and weather system on air pollution prediction in the Basin. To be published in ACP, the paper needs to be improved by addressing following points.

1. From my understanding, authors used measured met data in their weather analysis.

They highlighted a dry low-pressure system at 700 mb, a warm southerly wind flow, and temperature inversion above the ABL as favorable weather pattern contributing to heavy pollution in their study area. A question might be raised: what is the background weather pattern in Sichuan Basin? Perhaps a better way to present their analysis is to show anomalies of these met variables from their respective long-term means during the deteriorating and improving air quality, instead of real-time measurements, such as figures 2, 4 ,5, 8, 9, etc. For example, many readers might not understand what fig. 2 is all about because we cannot figure out that wind vectors in this figure are not prevailing winds vectors and if geopotential heights represent the background GH. 2. Likewise, Table 2 presents relative vorticity at 700 hPa showing positive in deteriorating air quality but seems not telling readers how these relative vorticities were calculated. Are these departure from the mean averaged over all deteriorating and improving air quality events? Similarly, how were positive and negative BLH, LTS, and MWS in Table 3 estimated? 3. Authors constructed an index based on the results presented in Table 3 to predict the occurrence of heavy air pollution. To demonstrate the usefulness of this index, authors need to apply this index to several independent pollution events and see if the index could successfully forecast heavy pollution in the study area. 4. Discussions on Figs. 4 and 8. Discussions and interpretations of these two figures could be improved by clearly describing the lifespan of the low-pressure system and other met conditions during the pollution event. For instance, Fig. 4a shows the beginning of weather pattern causing air pollution and Fig. 4d illustrates the met conditions in the end of pollution event. As aforementioned, try to present anomalies rather than real-time data.

Other comments:

Line 123, visibility, how is visibility measured? I don't think visibility helps discussions.

Line 143, not clear wind speed on the ground. In terms of no-slip condition, wind speed at the ground surface is zero. Or the wind speed at 10 m height? How many levels from the ground surface to 700 mb? V with an upper arrow is wind vector. If Eq 3 denotes

wind speed, this upper arrow should be removed.

Line 154, any criteria being used to define a "persistent" pollution event?

Line 172, in front of low-pressure, better say east or west of the low-pressure system
Line 214, "being" should be "were"