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Interactive comment

Interactive comment on "Elevated 3D structures of PM$_{2.5}$ and impact of complex terrain-forcing circulations on heavy haze pollution over Sichuan Basin, China" *by* Zhuozhi Shu et al.

Anonymous Referee #2

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General Comment

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This paper analyzed the three-dimensional distribution of PM2.5 concentrations in Sichuan Basin during a heavy haze pollution episode in January 2017. The topic is quite interesting; However, many discussions are only general descriptions of phenomena and processes, lacking in-depth analysis and discussion. This makes the article as a whole difficult to follow.

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Discussion paper

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Specific Comments

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Line 115

The Multi-resolution Emission Inventory for China (MEIC) has been updated to 2017 (http://www.meicmodel.org), while the authors used the data of 2012 for the simulation period in January, 2017. The author should explain the mismatch.

Further, the first domain (D1) of the study area includes China and its neighboring countries/regions. In this section, the author only stated that the anthropogenic emission sources used in their study is MEIC data, but as far as I know, MEIC data only includes the anthropogenic emission sources in China, while the emissions from natural sources and neighboring countries/regions are not included. How did the author consider this in their simulation process? If the emission data of neighboring countries/regions are not included, there will be great uncertainty about the results of the section 3.5 (Contribution of local emission and outflow transport), because the surrounding emissions are ignored.

Line 157

3.1 Model evaluation As we know, China has adopted active pollution source control policies in the last 5 years, and the intensity, the temporal and spatial distribution of emission sources will vary greatly from year to year. The author selected the 2012 MEIC inventory as its emission data. Thus the model evaluation result may not be convincing.

Line 216

To examine the vertical structures of PM2.5 concentrations over SCB, we selected the urban site 1 (104.02° E; 30.67° N) in Chengdu (cf. Fig. 1) as a reference point to

investigate the distributions of PM2.5 and the atmospheric circulations respectively in the vertical-meridional and vertical-zonal cross-sections.

Why do you select he urban site 1 (104.02° E; 30.67° N) in Chengdu for the vertical discussion. Do you have any special purpose? Chengdu is located in the far west side of the SCB, and other sites in the central area of SCB maybe are better choices, as the wind vectors shows in Figure 6.

Line 275

Figure 10 showed the PM2.5 concentrations emitted from the regional air pollutant sources over the SCB region and the relative contribution rates to air pollution changes. The expression here shows the author's conceptual misunderstanding of the source of PM2.5. How can the "PM2.5 concentrations" be "emitted"?

Line 278

The SCB's regional air pollutant emissions provided surface PM2.5 concentrations from 40.6 to 136.2 μg m-3, contributing 75.4–94.6 % of surface PM2.5 concentrations for the heavy pollution episode over SCB, indicating its dominant role over this isolated deep basin in Southwest China.

What does " indicating its dominant role over this isolated deep basin in Southwest China " mean? It is hard to follow.

Line 279

The regionally emitting PM2.5 concentrations averaged over SCB were 88.64, 91.04 and 65.96 μg m-3 for the formation, maintenance and dissipation periods, respectively. Same as above. How can the "PM2.5 concentrations" be "emitted"?

Line 284

We think the exchanges of PM2.5 between the polluted air over SCB and the cleaner environment air over the surrounding plateaus and mountains in Southwest China play

a role in this process. (Figs. 7 and 8).

How do you think the PM2.5 can be "exchanged" between the polluted air over SCB and the cleaner environment air?

Line 560

Table 5. Please give the definite range of the eastern TP edge (ETP), northern YGP edge (YGP) and DBM region.

Line 600

Figure 5(a). Why only 8 hours data are presented here? There is an abnormal value around half past 10 a.m., please give the reason.

Line 610 -615

Figure 8. Does this cross section along 104.02° E? Please specify. Same as previous mentioned, why do you select this site 1 (104.02° E; 30.67° N)? Do you think it may be a better choice if you put the cross section along the wind vectors from northeast to southwest?

Line 625

Figure 10. How the values of surface PM2.5 concentrations are calculated? The regional average of the SCB or the average of several monitoring sites in SCB?