**Atmospheric
Chemistry
and Physics
Discussions**

Interactive comment on "**Atmospheric boundary layer characteristics over the Pearl River Delta, China during summer 2006: measurement and model results**" *by* **S. J. Fan et al.**

Anonymous Referee #2

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General comment by reviewer:

This manuscript presents " Atmospheric boundary layer characteristics over the Pearl River Delta-China during summer 2006: measurement and model results". The authors discuss the well known situations of atmospheric conditions which related to the high pollution episodes. That's fine if can present good enough of the data quality and simulation results. The simulation part is quite important for this study owing to the limitation of the observations. However, the authors employ the original USGS land use in their simulation. This USGS land use data set is totally outdate (nearly no urban) and has been identified by number of papers. As we know the boundary layer development

is strongly related the correct atmosphere-land surface processes and even the urban canopy. This paper fails to include some most important signals in the simulation and the presentation skills still need to significantly improve.

1. Abstract: The presentation is inappropriate for the abstract, parts of the contents should be moved to Introduction section.

2. P4808, lin4, Abstract, "Furthermore, the modelled results also suggest that the high Air Pollutant index (API) episode was caused predominately by subsidence."

This is conclusion is inadequate, since you do not run the air quality model. Also, the sea breeze also can act the air pollutants accumulation during the sunny day as shown in Figure 2.

3. P4809-P4810: As mentioned in introduction section, " There have been several investigations on the characteristics of atmospheric boundary layer (ABL) over PRD from the 1980s to 1990s (Huang and Liu, 1985; Guo, 1991; Liang et al., 1992)" …." Many results pointed out that the meteorological fields were closely interacting with the chemical composition, chemical reaction process and physical optical characteristics" "Results from some model studies (Feng et al., 2007; Wu et al., 2005) also showed that most severe air pollution episodes in PRD region are very often associated with the subsidence by tropical cyclone or sea-land breeze." What's new in this study comparing to previous investigations?

4. P4812-4813: There were two periods of high temperature weather from 12–14 July and 23–25 July, corresponding to strong tropical cyclone"Bilis" and typhoon "Kaemi", respectively"

How do you classify the period"12-15" is typhoon process and the period"20-23" is sunny day period? What is major reason you are according to for the classification?

5. P4811: It seems to me the significant different between this study and other studies is the model resolution. (P4811, line 1-5).

6. P4814:" The original USGS 24-category land cover data was employed." As we all know the boundary layer development is strongly associated with land-surface processes and even the urban canopy. The correct land use classification is quite important for modeling study about the near surface air temperature and boundary layer development. There are number of papers discussing about the land use of the original USGS in the model is totally outdate. There are nearly no urban in the USGS land use data set. How can you convince the reader that USGS land use in your model is good enough to study this issue?

7. P 4816: "It should be noted in Table 1 that except for the wind speed in period II, the average simulated wind direction, wind speed and temperature in three periods are all close to the observations. "

It does not make sense only to present the 2-m absolute value to examine the model performance. I suggest you need to calculate the difference below the boundary layer (at least 1 km) since this paper is to discuss the atmospheric boundary layer characteristics. More important, the absolute values seem not large but those differences occupied significant percentage comparing to the mean value. For example, the RMSE for wind speed is as high as about 56% of mean simulation for Period I and period III.

8. Figure 6, According to the simulation results at different stations, the boundary layer development heights are quite different. Actually, the boundary high is significant related to land surface. How can you compare boundary layer measurement by lidar in Hongkong with your simulation results? Do you think the lidar measurement in Hongkong can represent the boundary layer in whole PRD ?

9. Also, for the lidar detection, it still has about 500m height during night time but simulation results are almost zero. The authors explain that it was caused by the MRF high resolution planetary boundary layer parameterization scheme used in the model. This reviewer think this simulation does not including correct land use, couple detail atmosphere-land surface process model and even the urban canopy model will be

C2543

other important reasons. The model simulation is an important part for this study. The author should including those important modules.

10. P.4822, What is" the aforementioned stations were all controlled by west" ? There are lots of similar sentences, Please check the whole article by native English speaker.

11. P4821, Why "at Xinken station, located in the Pearl River Estuary, the winds were from the south. It was obviously influenced by the sea breeze." " It does not make sense, the sea breeze prevailing at 20, 00LST according to your explanation. At 0800LST and 1400 LST, the wind directions are mostly easterly and your explanation is "The winds at Xinken station changed to the west, it was also affected by the sea-land breeze(P 4821, line 21-22)" If so, why simulation wind direction is same at 0800LST and 1400LST ? Furthermore, the simulation wind direction is significant different from the observation at 14 00LST.

12. This study including three type of simulation, why just discuss in detail during the period of 12-14 July ? and, How can you conclude the results say" The features of ABL under three kinds of weather: subsidence days, rainy days and sunny days......, The results show that the model can reproduce the meteorological fields well" on page 4824.

I do not think so, because the rainy day period your simulation is quite far from observation (table 1)

13. How can you conclude "The differences are induced by the local effects in PRD areas, such as sea-land breeze effects, urban heat island effects and mountain valley effects."

I think you even do not include the correct land use in the model simulation.

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