"Numerical Simulation Analysis on the Sources of Haze over Zhongshan City in southern China Using WRF-CMAQ Model"

## **General comment:**

Haze problem over the megacities in China is one of the hottest topics in the air quality community in recently years and attracts more and more scientific researches. In this paper, the author used WRF-CMAQ model to investigate reasons leading to the haze over Zhongshan City in Guangdong province in January 2014 and quantitatively calculated their contributions of local and regional emission sources or a long range transport. In the conclusion, the author also suggested an emission control strategy to the local government in term of reducing PM25 concentration and increasing visibility. The highlight of this study is the author concluded his findings based on the different weather patterns (w/o cold fronts). However, there are several weaknesses in this manuscript when the author presented his results (please see the reviewer's specific comments below). In General, the reviewer recommends this paper to be accepted and published after revising.

## Specific comment:

- 1. Line 21"PM2.5 concentration and visibility in Zhongshan", averaging all the grids in Zhongshan or averaging all the grids where observation sites are in Zhongshan? How many observation sites in Zhongshan?
- 2. Lines 86 to 89 "Simulation tests adopted ----- Province", what is the boundary condition used in the simulation domain 1?
- 3. Lines 117 to 119 "The emission source data -----was 0.25° x 0.25°". 0.25° is about 28km. The resolution of simulated domain 2 in 9km. Using a coarse resolution emission in a finer resolution model grid is not encouraged. Can the author describe how he did this emission conversion?

- 4. Line 132, Figure 2b, Annual NO emission. It seems that NO area sources are dominant. No mobile signals are clearly observed from the plot, for example line emissions along the high way. Why?
- 5. Lines 172 to 173 "The observational data ----- (113.35° E, 22.53° N)" only one site observation used in meteorological evaluation is far from enough.
- 6. Lines 177 to 180 "Figure 3 ----- the observational data" hourly data is more convincing that daily average data and please define what is 24-hour pressure variation.
- 7. Line 205 "Evaluation of CMAQ model results", please describe the observation data that is used in CMAQ evaluation.
- 8. Line 217 "the weak simulation of cold front", please define clearly what the weak cold front is and provide the criteria of the author categorized the weather pattern into no cold front, weak cold front and strong cold front.
- 9. Line 312 Figure 6, what does others mean? Please describe clearly in the text.
- 10.Line 388 Table 5, since there is no PM25 speciation evaluation, the results shown in Table 5 may not be that convincing.
- 11. Line 438 Table 7, Are they all based on Zhongshan emission turning off case?