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Atmospheric Chemistry and Physics Discussions

Interactive comment on "The 2013 severe haze over the southern Hebei, China: model evaluation, source apportionment, and policy implications" *by* L. T. Wang et al.

Anonymous Referee #1

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General comments:

During the past three years, the severe and persistent haze pollution episodes which mainly happened in the Central and North China have aroused worldwide concerns owing to its potential negative effects on regional air quality and human health. In this article, the authors have conducted a comprehensive modeling work by using the MM5/CMAQ system, in order to understand the temporal and spatial features of PM2.5 and PM10 concentration, and quantify the contributions of local and regional sources to

the extremely severe haze pollution over the major cities in southern Hebei province of China. Some new datasets and several new methods have been tried to be adopted to evaluate the Modeling system in order to make the modeling results more reasonable and reliable. Within this reviewer's knowledge, this work maybe the first study to specially target to explore the heavy haze pollution in the three cities in the southern Hebei province of China, which were all often listed as three of the top 10 heavily polluted cities in China in 2013.

In general, this paper is well written, and the scientific contents fall in the scope and interest of the journal of ACP. Thus, this referee recommends it to be accepted for final publication in the distinguished journal of Atmospheric Chemistry and Physics (ACP) with minor revisions in response of the following comments and suggestions.

Specific comments:

(1) Line 6 on Page 4: Normally, Hebei is reportedly as one of provinces located in North Plain of China. Northeastern China generally refers to the following three provinces: Liaoning, Jilin and Heilongjiang. Thus, "northeastern China" in this sentence should be better revised as "Northern China".

(2) Line 7 on Page 4: "It extends east to the Taihang Mountain and north to the Yellow River,..." should be "It extends west to the Taihang Mountain and south to the Yellow River," Since Taihang Mountains are located in the western side of Hebei, and the Yellow River flows in the Henan province which is located in the south of Hebei Province.

(3) Line 27 on Page 4: "All of the them..." should be "All of them...".

(4) Line 8 on Page 5: ".... those four provinces account for" should be "... these four provinces account for" in this sentence.

(5) Line 12 on Page 5: the fragment of "air quality modeling system" should be omitted owing to duplication.

(6) Line 19 on Page 7: it is better to change "The paper is organized as follows: Sect.2"

into "This paper is organized as follows: Section 2" for clarity and coincides with the description of following sentences.

(7) Line 24-29 on Page 8: Timely emission inventory with high temporal and spatial resolution is critical for obtaining reliable modeling results when using regional air quality model. In this study, the input emission inventory is based on the emission estimation of base year 2010, different with the modeling period of January 2013. Notably, both the GDP and manmade activity levels in these provinces have grown substantially during the past several years, which mean that large variation has happened for various air pollutants emissions. This maybe one of the main reasons for the under-prediction of the modeling works in this study, which should be discussed in much detail.

(8) Line 1-2 on Page 12: in this statement, the biomass open burning should not be considered as natural sources and uncontrollable. Since it belongs to manmade activities and can be controlled under some policies.

(9) Line 5-12 on Page 12: although over 30 simulations have been conducted in this study, and source contribution of each source area and sector have been checked to identify the regional and sectoral contribution for the three targeted cities. However, there are lack of the simulations of the pollution contribution for these three cities themselves, e.g., the influence of Xingtai and Handan on Shijiazhang city, the influence of Shijiazhuang and Handan on Xingtai city, as well as the influence of Shijiazhuang and Xintai on Handan city. These impacts maybe also of great importance to understand the pollution in these most polluted cities of Hebei and the multiple influences among them. Thus, if possible, this reviewer recommends it can be considered to be added and discussed in this paper.

(10) Line 13-15 on Page 14: this sentence is confusing and bad wording. It should be rewrite to make it clear and easy understandable. In addition, what information can be obtained to sum up the monthly total number of hazy days occurred in the seven representative cities as shown in Fig.2? It seems that there is lack of substantial

physical meanings. So, I recommend this section can be reorganized and improved to make it more clarity.

(11) Line 18-27 on Page 15 and the related Figure 3b: it is better to change the bars in this Figure (Figure 3b) in to the mean value with up and low limits, so as to make it clear to know the best and worse visibility situation in each month. Also, it is much better if the haze frequency in each month of the seven cities will be given out simultaneously.

(12) Line 20 on Page 17: "The simulated PM10 concentrations in the those" should be "The simulated PM10 concentrations in those"

(13) Line 14-28 on Page 18: As regard to the overall underprediction of PM2.5 and PM10 concentrations, just as mentioned in the No.(7), one possible reason maybe come from the base year emission inventory, right?

(14) In the section 3.2.4: overall, compared with PM2.5, the PM10 concentrations are all underpredicted at the three cities. Except for the reasons that the authors have mentioned, is there a possibility that the temporal variation allocation of annual emissions for some sources in winter is somewhat underestimated, such as domestic fuel use?

(15) Section 4.1: just like the former comment (9), except for the regional contributions of outside SHB, the multi-effects of these three cities is recommended to be added to discuss in more detail if possible.

Interactive comment on Atmos. Chem. Phys. Discuss., 13, 28395, 2013.