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Interactive comment on "Effectiveness evaluation of temporary emission control action in 2016 winter in Shijiazhuang, China" *by* Baoshuang Liu et al.

Baoshuang Liu et al.

fengyc@nankai.edu.cn

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This manuscript reports a study that evaluates the effectiveness of temporary emissions controls during 2016 winter in Shijiazhuang, China by utilizing measurements of standard air pollutants' concentrations and filter measurements of concentrations of PM2.5 and its components. The entire study period was divided into four sub-periods: NCANHP, NCAHP, CAHP, ACA. By defining P-heating and P-action as differences in concentrations measured during the certain sub-periods, the authors conclude on the effects of heating and emission controls on the local air quality. The authors also employed PMF for source contribution analyses and conducted backward trajectory and

PSCF analysis. Several concerns came from this reviewer: (1) NCAHP and ACA, both are a sub-period of no control plus heating period by nature, why treat the two sub-periods differently and only include NCAHP in P-heating and P-action definition. Considering NCAHP is only 3 days by definition, and it is at the very start of the heating season, isn't NCAHP a special period against the entire heating season?

Response: Yes, NCAHP and ACA, both are a sub-period of no control plus heating period by nature. However, the meteorological conditions during the NCANHP and ACA were significantly distinct (Table 1). In addition, from NCANHP to ACA, with the decrease of temperature (Table 1), the load of coal-fired heating is different, and the emission and intensity of pollutants from coal combustion are significantly different. Therefore, the NCANHP and ACA are separately analyzed in this study. The related contents have been revised in the revised manuscript (on the line 336). Indeed, the NCANHP is the beginning of heating period, and the load and degree of coal-fired heating are lower compared to other stages, so that the representative of the heating period for NCANHP is limited. However, the main purpose of this study is to evaluate the effectiveness of temporary emission control action. Compared to the beginning of the heating period, the control effects of temporary emission control action is found to be obvious (as shown in the manuscript); therefore, compared to the other stage during which the heating loads are higher, the control effects of temporary emission control action should be more obvious. Therefore, it is possible to use NCAHP to evaluate the effects of control action. In addition, the weather conditions in the ACA are significantly worse than the CAHP (Table 1). If ACA is used to calculate P-heating for evaluating the effects of control action, the effect of control action is not well evaluated.

(2) In PMF results section, there is inconsistency from the previous analyses to report source contribution results only for CAHP and ACA, why left out NCANHP and NCAHP for analysis in source contribution changes? This is where the observations can be somehow directly traced back to the control strategies, it needs a better usage of the materials.

Response: We have added the results of source apportionment during the NCANHP and NCAHP to the revised manuscript (Fig. 10). The related contents in the revised manuscript have been revised based on the added contents.

(3) PSCF analysis itself is good to weigh relative importance of transported source impacts. However, does the PSCF results help much here to add anything on making the major conclusion, especially on the condition that it doesn't tell anything about the relative importance between the local and transport contributions?

Response: PSCF model can only qualitatively analyze the potential source-areas that affect the concentrations of air pollutants in Shijiazhuang (Lucey et al., 2001; Liu et al., 2017; Zhang et al., 2017; Zong et al., 2018), which cannot be quantified by local source and regional transmission. The purpose of this study is to evaluate the effects of control measures for local sources. Although quantitative research on regional contribution is also important, it is not the focus of the work. We will follow up the relevant research. In view of the length of this paper and the aim of the study, this article is not easy to analyze in details.

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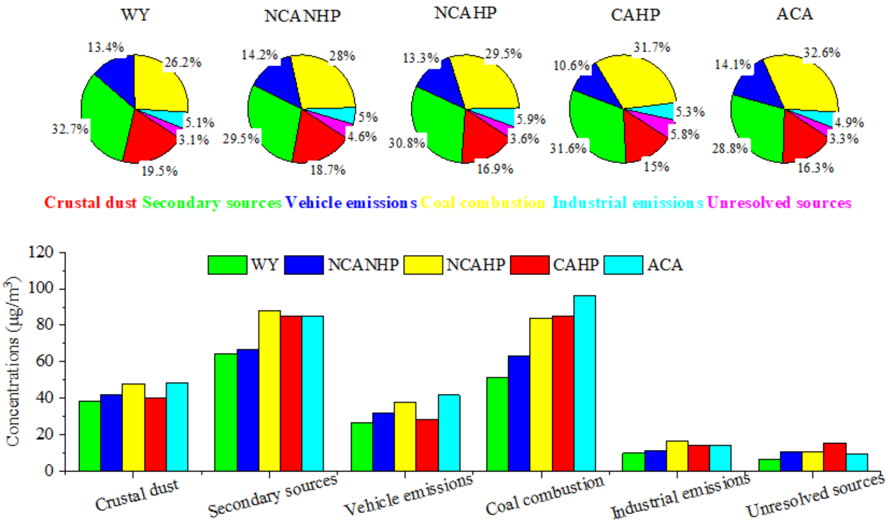

Fig. 10. Source contributions of $PM_{2.5}$ during different stages in Shijiazhuang. WY represents whole year: November 24, 2015 to January 9, 2017.

Fig. 1.

Table 1. The meteorological conditions during the four stages (NCANHP, NCAHP, CAHP and ACA) of the TECA period in Shijiazhuang.

	NCANHP		NCAHP		CAHP		ACA	
	Ave.	S.D.	Ave.	S.D.	Ave.	S.D.	Ave.	S.D.
Temperature (℃)	8.4	3.6	7.4	2.4	3.1	3.8	0.7	2.7
Relative humidity (%)	77.7	17.0	73.4	15.7	71.5	18.0	83.3	18.1
Wind speed (m/s)	0.7	1.2	0.6	0.6	0.4	1.0	0.5	1.1
Height of mixed layer (m)	540	144	590	274	474	299	431	360

Ave. represents average value, S.D. represents standard deviation. NCANHP represents the no control action and no heating period, NCAHP represents the no control action and heating period, CAHP represents the control action and heating period, and ACA represents after control action.

Fig. 2.