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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Intra-regional transport of black carbon between the south edge of North China Plain and Central China during winter haze episodes" *by* Huang Zheng et al.

Anonymous Referee #1

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The authors present a simultaneous field measurement dataset of BC at five sites in this paper with the aim to investigate the intra-regional transport between the south edge of North China Plain and Central China based on the variations of BC mass concentration, sources and optical properties. The dataset is important, and would be with good scientific significance to help people to model the BC aerosol climate effect in East Asian by studying the changes of BC physio-chemical and optical properties during the transport. My major concern is, as the authors stated in their paper (in the introduction), one of the key purpose of this study were to quantify the regional transportation of BC at multiple observation sites in CC and SE-NCP. . . . But the backward trajectory method used by the authors can just get some qualitative analysis of the

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Discussion paper

air parcels transport as presented in their study. The paper will be greatly improved if the authors consider using models to simulate the emissions and then to quantify the intra-regional contributions at the sites based on the measured BC concentration data. In addition, there are also a lot of language issues and editing needs that have to be addressed. The authors thus need to make a careful revision and correction on the language, especially revisions on some seemingly illogical expression, to improve the overall quality of the paper for publication in the journal. I would recommend the editor to reconsider the papers after a major revision by the authors.

Other specific comments,

Section 3.1, the authors should more focus on discussing and comparing the different BC levels between the studied 5 sites and other regions in China or over the globe, not on North China and other regions.

Line 214, "...Despite the sampling periods, site types, inlet of aerosol and 213 instruments were different between different studies (Table S1), BC was generally higher in North China and lower BC levels were found in remote areas and coastal areas... " Here, it is not appropriate and logical expression by saying the two things using the "despite".

Line 242 "..At WH, the concentration and percentage of BCbb both decreased from clean to pollution, which suggested that more BCff was emitted during haze episodes...", should revise as "... both the concentration and percentage of BCbb decreased from clean to pollution"..." also, you say more fossil fuel BC was emitted. But the increased BC is probably due to the accumulation of pollutes during polluted days when the PBL is lowered.

Lines 248-250, "...the pollution episodes (Huang et al., 249 2014), and the increased secondary aerosols would be more adsorbed on the surface of BC...." Do you mean that more secondary aerosols will be coated on BC? "...the σabs also elevated by 11.7−254% as the air quality switched from clean to pollution (Fig. 4e). There are

more secondary aerosols (i.e., sulfate, nitrate) during the pollution episodes (Huang et al., 249 2014),..” Do you have some observations of chemical composition that would support your conclusions.

Line 253, “The decreasing of AAE from clean to polluted days was also reported elsewhere (Zhang et al., 2015b) and it can be partly attributed to the source variation. . .”, the AAE is very sensitive to particles size, so you may need to think about the particles growth due to the secondary formation processes.

Lines 257-267, you only show the diurnal variations of mass concentrations of BC, how about the absorption coefficient?

Line 271, You say “. . .combustion (traffic) and agricultural burning are higher than those from industrial emissions such as manufacturing and mineral products. But you give an example for the lower ratios from residential wood combustion, which is not an industrial source.

L291, It would be more interesting if you discuss whether the BC at downwind sites is more aged because of the transportation, because you say that “. . .the BC/CO is used to reflect the BC aging during the transport.

Line 307, “. . ...The same result was also found at WH. High level of BCbb was due to more biomass burning in the southeast direction of HA and WH. . .”How do you know that more biomass burning in the southeast? Do you have some evidences to support your statement?

Section 3.5, The paragraph may need to revise very carefully for that the current statements on the influences of the air parcels (CWT analysis) on each sites are too trivial and wordy to understand. The authors are suggested to simulate the emissions and to quantify the intra-regional contributions at the sites based on the measured BC concentration data by using regional models.

Line 367, “. . .the travelling time (aging time) from LH to HA and from HA to LH were 28

h and 31 h, respectively, which suggested that the BC particle should be coagulated through complex atmospheric processes. Therefore, the new emission inputs along the trajectory enhanced the eBC mass concentration during the transport. . .." How do you infer that "the new emission" enhanced the eBC mass concentration from the previous sentence (longer aging time and coagulation processes) here?

Line 370, ". . .However, slight differences found for BCbb transport: BCbb increased from LH (1.28 $\pm$ 0.06 μg m$-$3) to HA (2.57 $\pm$ 0.47 μg m$-$3), while BCbb decreased from HA (2.37 $\pm$ 0.23 μg m$-$3) to LH (2.14 $\pm$ 0.14 μg m$-$3). . ." What do you mean about this?

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