Geoscientific
Model Development
Discussions

Interactive comment on "Tracking influential haze source areas in North China using an adjoint model, GRAPES–CUACE" *by* X. Q. An et al.

Anonymous Referee #1

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I recommend this manuscript be published with some reversion listed in following: 1. Do you construct the adjoint model manually or automatically? If automatically, then which automatic differentiation tool do you use? 2. This paper aims at tracking influential BC emission regions. The following points may be added to its content: a) Typical adverse impacts of excess BC aerosol in the atmosphere: climate change, melting of glaciers, damage to plants, et al. (in Section 3) b) Explicitly explain what enlightenment can be drawn from BC sensitivity analysis. For example: can this adjoint methodology be applied on haze/PM2.5 pollution control? Infer possible results of applying this adjoint sensitivity analysis method to SOA control. 3. The description of the adjoint model construction is not very clear. Section 2.1 presents that GRAPES-CUACE aerosol module involves six types of particles. If the adjoint of all these processes are constructed, then why only BC is analyzed in this research? Does this adjoint model

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include SOA adjoint processes? If not, besides explicitly explain it, a "future work" part might be added at the "conclusion" section as: Conclusions and Future Work. 4. In section 3.4, explain the reason for the sharp decrease in time series sensitivity coefficients (Fig. 8a) at 17-18 h ahead of the most polluted time point. 5. The content in section 2.2.4 is too simple. Details have better be added, for example: what modification has been made to the standard model to facilitate the specific adjoint sensitivity analysis goals of the present study? Besides, move detailed captions in Figure 1 to this section.

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