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Interactive comment on "Global sensitivity and uncertainty analysis of an atmospheric chemistry transport model: the FRAME model (v. 9.15.0) as a case study" *by* Ksenia Aleksankina et al.

Anonymous Referee #1

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This paper presents a very useful approach for quantification of the impact of emissions uncertainty on modelled concentrations and deposition of sulphur and nitrogen species. The material is presented clearly and the conclusions are supported by the results presented.

I have a few minor comments about the methods section, where I think some further details would be useful.

The annual average wind rose and wind speed used to calculate trajectories in the FRAME model are generated from WRF - what period was used to generate these trajeories, what resolution was WRF run at, what version of WRF was used and what

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meteorology was used to drive WRF at the boundaries?

More detail of the inorganic chemistry scheme in FRAME and information on the type of inorganic aerosol module used, with references for both of these.

The approach taken to the representation of the emission uncertainty (varying the emissions in all grid boxes by the same fraction in each run) is justified in the context of this study. However, it does mean that several important aspects of emissions uncertainty are not included. In particular any uncertainties in the spatial distribution or height of emission are not captured. There are also important sources of emission related uncertainty that FRAME cannot capture such as uncertainty in diurnal or seasonal cycles of input. These limitations should be noted here.

Finally, it would be interesting to see the impact of these uncertainties on the secondary inorganic aerosol mass. This may be beyond the scope of this study, but concentrations of PM2.5 are highly relevant for air quality forecasting and policy relevant research. If the results are available, it would be a valuable addition to this study.

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