

Review of paper acp-2020-223: Rapid mass growth and enhanced light extinction of atmospheric aerosols during the heating season haze episodes in Beijing revealed by aerosol-chemistry-radiation-boundary layer by Lin et al.

Dear author, co-authors,

Having found finally the time to carefully check again the reviews, your response to these reviews and revised version of your paper on analysis of the aerosol-chemistry-radiation-BL feedback, I was triggered to still provide an editor's comment. The reviews were generally positive on the presented analysis although there were also some major issues addressed.

Reviewer #3 (you refer to this reviewer being #1) makes a good point about the issue on the number of haze events and how many of these are considered in your actual analysis; you then indicate that you have selected one specific event that can be deemed being representative for many more events. This should be made very clear already in the abstract as indicated also by the reviewer. You address this in your comment but subsequently you have not acted upon this having modified the text to better describe this essential feature of the methodology.

The next point by reviewer #3 is that it should be better stressed what the novel feature is of your work compared to previous studies on the aerosol-chemistry-radiation-BL feedback. You mention then in your response that other studies mainly focused on the physical component of this feedback whereas your study focusses more on the chemistry component; First of all, your reply is very short and not very concise but also see that you have not really handled this comment not having included a more extensive review of the main findings of previous studies and what distinguishes your work from that previous work. For example, reading the sentence 68/70: “ **The increased stability of the boundary layer leads to enhanced air pollution in the mixed layer, which further suppresses the development of boundary layer**” triggers the question how then the air pollution is suppressing BL development; is this through reducing surface radiation (short/longwave), energy balance? Is this through the effect on temperature profile? Or is there also a moisture effect (aerosol-water/evapotranspiration)? Your reply is that the text lines 92-95 make clear what the novel feature is but these lines only state what your paper focuses on.

Again, here at the end of the introduction it seems to be very useful to already mention that you mainly present a detailed analysis of one haze event deemed being representative for the multiple events that occurred in the period “October 2018 to February 2019”

Reviewer #3's comment on ToF-ACSM measurement; Your response is long and has been a puzzle to find out how parts of your response has then also been used in the revision. Could you please provide a more optimally organized response clearly indicating which modifications have been included in the revision!

Further reading through the response file and seeing how reviewers #3 comments are being handled, I realize that for this discussion on instrumental issues I really want to invite once more again reviewer #3 to provide an evaluation of some of these details.

But my overall point is that your response is not well organized. It is not clear which part of the long responses have been finally used to also revise the manuscript. Instead of further completing here a detailed editors review, I have decided to first allow you to provide at this stage an improved revision/response to handle this observation and then to reinvoke

reviewer #3 to reevaluate your revised ms. Note that I checked the whole revision and replies but restrict my detailed comments up a point where I got really got convinced that continuation of this review process first needs now you to provide an improved revision consistent with an improved response file. Anyhow, below you can find some of the minor issues I already found in carefully checking especially the first part of the revision.

Minor comments:

Line 68: ...near-surface air (Ding et al., 2016

Line 72: “creating more favourable conditions for homogeneous and heterogeneous **chemistry** on aerosol surfaces or inside them..”

Line 138: “calculated by **the** thermodynamic equilibrium model ISO...”