Geoscientific Model Development Discussions

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Comment on gmd-2022-62

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Referee comment on "Simulations of aerosol pH in China using WRF-Chem (v4.0): sensitivities of aerosol pH and its temporal variations during haze episodes" by Xueyin Ruan et al., Geosci. Model Dev. Discuss., https://doi.org/10.5194/gmd-2022-62-RC1, 2022

Geoscientific Model Development Discussions: "On the simulations of aerosol pH in China using WRF-Chem (v4.0): sensitivities of aerosol pH and its temporal variations in haze episodes". Ruan et al. investigates the aerosol pH simulations in WRF-Chem model focusing on haze episodes in Beijing. Overall, the paper is scientifically sound, clearly written and easy-to-follow. I only have a few minor comments:

Line204: WRF-Chem

Section4.1.1: I think the minimal response to elevated NVCs in the nearly neutral cases may be related to the role of carbonate. At least in E-AIM and ISORROPIA, the aerosol pH cannot get very high (8 or 10) because of the buffer role of carbonate.

Section4.3: It is interesting to see a systematic difference between ISORROPIA and MOSAIC even when the model inputs are the same. The authors list several possible contributing factors including AWC, phase-partitioning method, activity coefficients and solution method. I suggest the authors to investigate this issue further: (1) is there any difference in the predicted gas-phase ammonia concentrations between the two models? This can give some clues on the contribution of phase partitioning method; (2) the authors note the large difference in AWC in the paper. It seems that both ISORROPIA and MOSAIC use the ZSR method. ISORROPIA uses a look-up table for hygroscopic curves of different electrolytes. One possible way to further examine the role of AWC calculation method is to replace the hygroscopic curves in ISORROPIA by the ones from WRF-Chem.

Figure5&6: it is good to show the different subplots in the same vertical scale or write a note to remind the different scales.