

The authors have investigated the effects of three different aerosol mechanisms coupled with gas-phase chemical schemes on the simulated PM_{2.5} mass concentrations in Delhi using the WRF-Chem model. The manuscript is well written although some clarifications and improvements are necessary as outlined below before it can be recommended for publication.

Comments

1. It's not clear which SOA scheme was used in the MOZART-MOSAIC model configuration. Please specify with an appropriate reference.
2. How do the models perform with respect to dust? In the present manuscript no evaluation is presented for dust. It would be very useful to show modeled dust mass even if no speciated observations are available for dust.
3. The sentence at lines 410-411 doesn't make sense. For instance, the MM and CMS models appear to partition nearly all the available HNO₃ to NH₄NO₃ while some NH₃ still remains available in the gas phase. This indicates that NH₄NO₃ was limited by the formation of HNO₃. It does not mean that the models are inefficient in partitioning HNO₃ to NH₄NO₃. Since the models also predict higher NO₂ than observed, then it suggests that not enough NO₂ is oxidized to HNO₃ in the gas phase in both models. Can the authors comment on this aspect of the model? How are the models performing in HNO₃ production via NO₂ oxidation by OH radicals during the day and via N₂O₅ hydrolysis at night?
4. Since all models have the same emissions of NH₃, why does CMS predict lower NH₃ and NH₄⁺ than in the MM model (Figure 6)? NH₃ + NH₄⁺ should be conserved. So if NH₃ is underpredicted then NH₄⁺ should be overpredicted. But that doesn't seem to be the case here.

Editorial Comments

Line 18: Change "effect" to "effects".

Line 22: Change "filed" to "field".

Line 35: Replace "composition" with "species".

Line 100: Change "scare" to "scarce".

Line 151 and 154: MOSAIC is spelled incorrectly.

Line 161: Replace "option to which the focus" with "option when the focus". Also, clearly state which option was used in this study.

Line 205: Change "CL-" to "Cl-".

Line 206: Please spell out the MARGA acronym and provide a reference for the instrument's performance.

Line 327: Insert "be" after "might"

Line 330: Please remove the brackets around NH₄ in ammonium bisulfate. It should be written as NH₄HSO₄.

Line 351: NO₃ should be NO₃⁻

Line 351-352: Suggest changing this sentence to simply: "Particulate NH₄NO₃ is formed from condensation of gas-phase NH₃ and HNO₃."

Line 353: Delete the first word "While".

Line 362: Change "HCL" to "HCl".

Line 408: NO₃ should be NO₃⁻

Figure 2: Suggest removing the black line from the observed profile and removing the filled circles from the simulated profiles. This should make the plots less congested and easier to read.

Figure 6. Is it OC plot showing organic carbon mass or is it actually organic aerosol mass?

Figure 6. The symbols in the gas-phase plots are barely visible, and please add a legend to explain all the symbols in the box plot.

Figure 6. Change "Chlorine Aerosols" to "Chloride". Additionally, change "Nitrate Aerosols" to "Nitrate", "Ammonium Aerosols" to "Ammonium", and "Sulfate Aerosols" to "Sulfate"