

Interactive comment on “Modeling Regional Air Quality and Climate: Improving Organic Aerosol and Aerosol Activation Processes in WRF/Chem version 3.7.1” by Khairunnisa Yahya et al.

Anonymous Referee #1

Received and published: 21 January 2017

Regional models exhibit large uncertainties in the simulation of secondary organic aerosol (SOA) which have substantial impacts on climate due to aerosol-cloud interactions. This paper reviewed the current Volatility Basis Set (VBS) treatments and investigated the model performances in SOA simulation with a series of scenarios by changing the model configuration in chemical mechanisms and aerosol activation parameterization. Results suggest that simulations with VBS treatments present better agreement with observations compared to the traditional OA method, however, parameters such as the enthalpy of vaporization, percentage of fragmentation and functionalization, and POA emissions can largely influence the result. The paper is well written. I would recommend it to be published after minor revisions.

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Apparently, the POA emissions play an important role in the simulation of SOA. Better performance is suggested in scenarios with increased POA emission. Does that imply that POA emission is underestimated in current NEI emissions? I would suggest the authors to provide some discussion about that.

Page 47: “SSummary” should be “Summary”

Page 50: Table 4. Note of “The simulations without the suffix “POA” indicate the cases with nonvolatile default POA emissions” need to be clarified, it should be “The simulations without the suffix “POA” or “FF””.

Page 52: Table 6. Poor correlation is suggested in most of cases, implying that some important SOA source is missing, biogenic SOA?

Page 53: for CASTNET, the simulated Max 8h O₃ is very close to the simulated Max 1h O₃, especially in CB6 (41.9 vs 41.8), but the observation doesn't (51.8 vs 47.4). Does that mean the model underestimate the peak value of O₃?

Page 54: “CB05-25%FF-EM3” present different values in Table 8 and 9, while observation is the same. Please double check.

Page 55: Figure 1, “A/OC ratios” should be “OA/OC ratios”

Page 64: Figure 10, it is very interesting that low CDNC shows at the edge of simulation domain, any explanation about that?

Interactive comment on Geosci. Model Dev. Discuss., doi:10.5194/gmd-2016-288, 2016.

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