

Interactive comment on “Aerosol dynamics and gas-particle conversion in dry deposition of inorganic reactive nitrogen in a temperate forest” by Genki Katata et al.

Anonymous Referee #3

Received and published: 15 November 2019

Review of submission ACP-2019-703 by Katata et. al.

General The author present the development of an advanced deposition model, here for the inorganic reactive nitrogen gas phase species HNO_3 and NH_3 and particle species NO_3^- and NH_4^+ . I suggest to use not use the term ‘aerosol’ when solely particles are addressed. Use the term ‘aerosol’ when you address particle together with the gas phase where they are dispersed in. Otherwise use ‘particle’. Surely, deposition much deserves a better treatment in many atmospheric model, so in principle an improvement in deposition schemes is highly welcome. Overall, I feel the model can deliver useful results but there are many approximations it its set-up. This should be

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treated most carefully. In my view, the paper needs a huge amount of improvement but I rate this as still doable and not recommend rejection. I would therefore like to recommend major revision according to all reviewer comments with external re-review necessary.

Details Abstract: I feel the abstract should give more information, at best, in a quantitative manner. It now reads too much like an introduction. What is the main numerical outcome ? What is better than before ? The abstract should clearly state what is treated. Line 13: Maybe a word should be added after 'nitrogen' ? Like 'input' ? Line 15, 16: Why is these only Japanes references, please check other deposition work. Line 29: This is not only known from / for deposition studies but also for myriad of particle characterization studies. Are there more recent references ? Line 51: What does SOLVEG mean ? Line 74: Reference Genuchten's concept Line 99: How does Eqn (3) relate to the Henry Constant ? Can you clarify more what if written in the text ? Line 104ff: Where does Eqn (4) come from ? 'Affinity' is a strange term. Better justify the approximation for SO₂ deposition. Line 117 ff: See initial remark on nomenclature and revise this whole treatment consistent with clear naming. Line 139, end: ...of the Tokyo... Line 148: What is a 'grass fiber filter' ? Line 200ff: There seem to be a lot of approximations for the particle size distribution initialization. How critical can this be for the overall study ? Line 231: ...fine particles. Lien 296: This headline must be revised. The size distribution does not have a formation mechanism, only the particles have Line 361: I think feasibility might be the wrong term. Figures: It would be great to show correlation plots for some key properties rather than only time-series plots.

Interactive comment on Atmos. Chem. Phys. Discuss., <https://doi.org/10.5194/acp-2019-703>, 2019.

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