

## ***Interactive comment on “Model for acid-base chemistry in nanoparticle growth (MABNAG)” by T. Yli-Juuti et al.***

**Anonymous Referee #1**

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This manuscript presents a new, size-resolved particle growth model that couples the extended Aerosol Inorganics Model (e-AIM) to dynamic condensation calculations. Several scenarios are modeled using measured or estimated gas phase ammonia, amine, sulfuric acid, organic acid, temperature, relative humidity, and nanoparticle growth rates in Hyytiälä, Finland, a remote boreal forest environment. Salt formation is found to be an important contributor to nanoparticle growth under conditions where the base concentrations are high, but this pathway is not as important under conditions more typical to the remote boreal forest. Under most conditions relevant to the boreal forest, organic acid salts are unlikely to be observed in substantial abundance. Condensed organics are found to have an average vapor pressure on the order of 10-6 Pa. This manuscript has great relevance, is within the scope of Atmospheric Chemistry and Physics, and should be published once the very minor comments below are

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addressed.

Comments:

1. Page 7186, line 22: The only time the authors describe the Hyytiälä site is in the Appendix. The authors should at least mention here (the first occurrence of the site in the manuscript) that it is a remote boreal forest environment in Finland.
2. Section 4: It would enhance clarity to the reader if, for each section discussing a particular simulation, the authors included an introductory sentence to the effect of: “In this simulation, X and Y were varied while A, B, and C were held constant in order to determine the effect of . . .” to remind the reader more explicitly of the purpose of each simulation.
3. Page 7190, lines 25-26: Be more explicit. The fraction of bases in the particle dry mass decreased as particle size was increased.
4. Page 7191, lines 4-6: The authors state that under the high base conditions, the acid-base chemistry is driven by the bases (as opposed to the acids). Is this because there is no correlation between sulfuric acid content and base content? The authors should make this point clearer.
5. Page 7194: On this page, the authors compare MABNAG to a conceptual growth model. The authors state that qualitatively similar results are obtained for both models and then provide a somewhat vague comparison of the two. This discussion could be enhanced by inclusion of a table that explicitly compares the calculated composition using each model.
6. Page 7198, lines 23-27: Validation of this model could also be achieved by comparing to nanoparticle composition measurements. Obviously, those measurements are hard to make, but this should be mentioned.
7. The manuscript would benefit from a more thorough proofreading for grammar and typographical errors. Below are a list of some of them:

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- a. Page 7182, line 10: The reference to Eq. (7) actually refers to Eq. (6).
- b. Page 7178, line 13: Change “is” to “are”
- c. Page 7188, line 16: Change “in” to “is”.
- d. Page 7191, lines 17-19: “As the underlying assumption. . . .” This is not a sentence. Please revise.
- e. Page 7191, lines 24 and 27: Should “of the bases” be “for the bases”?

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Interactive comment on Atmos. Chem. Phys. Discuss., 13, 7175, 2013.