

## ***Interactive comment on “Factors influencing the contribution of ion-induced nucleation in a boreal forest, Finland” by S. Gagné et al.***

**Anonymous Referee #1**

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### General Comment

Authors deserve praise for their persistent efforts over many years on understanding the contribution of the IIN to the NPF in the atmosphere. There is no doubt that authors are knowledgeable on this subject, and they provide meaningful discussions on their experimental results. Authors provide convincing interpretations on the observed difference in the temperature and H<sub>2</sub>SO<sub>4</sub> between overcharged and undercharged events. Hopefully in the future, authors use their computational chemistry model and quantify the probability of IIN and neutral nucleation and corresponding energy barrier under the measurement condition.

I list my comments below.

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Page 25800, line 14-18. These last two statements are vague. The word “tentative” seems unnecessary. It is better to mention “neutral nucleation and IIN” rather than “different nucleation mechanisms”. It would be more effective to state some specific ideas the author would like to propose the most.

Page 25803, line 11. It is helpful to add the half life of Ni-63, so that the activity level does not change significantly over 2~3 year. It is critical to re-state the measurement size range of the Ion-DMPS.

Page 25807, line 7~13. It is unclear why both polarities need to be overcharged for them to be categorized as “overcharged”. The chemical composition of initial nuclei are different between positive and negative IIN (Eisele et al. 2006). IIN can occur on one polarity or both polarities. It seems inconsistent that authors considered the NPF event having the charged fraction being at steady state as “undercharged” although authors are aware of the memory effects on the charged fraction during the particle growth. We do not know whether the neutral nucleation or ion-induced nucleation was the dominant nucleation mechanism.

Eisele, F., Lovejoy, E. R., Kosciuch, E., Moore, K. F., Mauldin III, R. L., Smith, J. N., McMurry, P. H. and Iida, K. (2006). Negative atmospheric ions and their potential role in ion-induced nucleation. *J. Geophys. Res.* 111:D04305/04301-D04305/04311.

Page 25811, Figure 2b. Readers would like if the values on the vertical and horizontal axis are switched. It is more conventional that the true values, which are NAIS, are given along the horizontal axis.

Page 25818, line 23-. It is recommended that authors investigate whether the formation rate under positive or negative IIN is proportional to either closer to H<sub>2</sub>SO<sub>4</sub><sup>1</sup> or <sup>2</sup>. Has anyone show this analysis before using field data? Authors seem to be the only research group that has large enough data set to do such analysis.