The manuscript analyzes cluster ion data from the SMEAR station in Hyytiala, Finland, from three springtime measurement periods. Data from anion measurements with an API-TOF mass spectrometer and an NAIS instrument are analyzed. The focus of the analysis is on H2SO4-NH3 cluster ions in comparison to HOM ions and their relation to aerosol nucleation events. It is found that the ratio between [HOMs] and [H2SO4] controls the presence of large H2SO4-NH3 clusters. Furthermore, the probability for IIN to occur is largest and reaching almost 100% when clusters containing 6 or more H2SO4 molecules are present. The contribution of IIN to the total nucleation is reported to range between 4 and 45%, with an average of 12% contribution for cases that are dominated by H2SO4-NH3 nucleation and 18% in HOM-driven events.

The manuscript is an extension of a series of papers focusing on results from the API-TOF measurements in Hyytiala (e.g. Ehn et al., 2010 and 2011, Schobesberger et al., 2013 and 2015; Yan et al., 2016; Bianchi et al., 2017). The previous papers focused mostly on the role of HOMs while this one focuses on the role of H2SO4-NH3 anion clusters, therefore the paper presents sufficient new material to warrant publication in ACP.

There is a number of minor points and technical corrections to consider before publication in ACP:

**Minor points**

1. line 43: The paper by Dunne et al., Science, 2016 should be referenced here as well.

2. 136: quantification of the API-TOF results. Was the transmission of the API-TOF characterized as described by Heinritzi et al., AMT, 2016? Can you be sure that the transmission did not change due to the changes in tuning (l 139)?

3. 181: What about recombination with ions larger than 3.5 nm?

4. Figure 2: panel B is as important as panel A. Why is B just shown as a small inset? Please show B as a separate panel of the same size as A, or even as a separate Figure.

5. 347: Please explain in detail how $J_{\text{min}}$ for 2.5 nm particles was calculated (here, or in Section 2).

6. 404-575: **Please check all references carefully**: In many cases there are co-authors missing (and no “et al.” is included), e.g. Bianchi et al., 2017, Dada et al., 2017, Ehn et al., 2010, Ehn et al., 2011, Kulmala et al., 2004, Schobesberger et al., 2013 and 2015, and even in Yan et al., 2016, and many others.

7. General comment on choice of cited references: There is no doubt that the Kulmala group has produced lots of important research with respect to ground-based cluster ion composition measurements with the API-TOF in Hyytialä, and it is therefore ok to reference the previous work of your own group frequently. Nevertheless, there have been various contributions to the field of H2SO4-NH3-IIN by other groups and the choice of references discussed for example in the introduction seems somewhat unbalanced. Out of the 34 references listed in the references section, 29 are from the Kulmala group or co-authored by the Kulmala group (and the 5 remaining references are mainly general ones such as reviews or the IPCC report). It is expected in scientific publications to give reference also to the previous work by others that is relevant for your work. Therefore I suggest to mention/discuss also work from other groups, e.g. Eisele et al., JGR, 2006; Iida et al., JGR 2006, Tammet et al., Atm. Res. 2014; Rose et al., ACP, 2013; Boulon et al., ACP 2010; Kurten et al., JGR, 2016; Froyd and Lovejoy, JPC, 2011, etc. to give some credit also to the rest of the scientific world.
that performed measurements of H2SO4-NH3 ion induced nucleation and other ion clusters. Also Bianchi et al., Science, 2016; Dunne et al., Science, 2016, and Wagner et al., ACP, 2018, should be included and discussed in the context of this paper (I recognize that these are also co-authored/authored by the Helsinki group).

**Technical corrections:**

line 65 and 67. Bianchi et al. is referenced twice, one time within a sentence is sufficient.

75: understandings → understanding

92: insert space between semicolon and Ehn, as well as between semicolon and Yan

111: “daytime spectrum in the daytime...” → avoid duplication

113: “of an ion in the API-TOF...”

115: “note that the API-TOF...”

119: instruments → instrument

120: “is a best instrument” → “is a good...” or “is a well-suited...”

127: not the same in the three years...

129: “clusters contained 6 clusters” → “clusters contained 6 SA molecules”

130: “in the clusters were observed” → were observed in the clusters

131: larger than 700 Th for the measurements in 2011.

133: Figure 3 is called here before Figure 2 is called. → Change order of Figures 2 and 3.

139: tunings of CI-API-TOF → tuning of the CI-API-TOF

181, 184: “Eq. S2” → change numbering of the Equation to “Eq. 2”

197: A similar approach

204: measurements → measurement

204: dependant → dependent

242: prevents → suppresses

261: “by observing an increase...” (delete “of”)

262: “sub-2nm ions”, I think you mean “ions larger than 2 nm” here?

279: “…unclear is IN occurred was counted...” → “…unclear if IIN occurred were counted...”

289: permanence → continuity

319 and 324: the other type of events

321: less → lower

322: clusters at high temperatures that can evaporate NH3 back to the atmosphere.
Figure 5, panel B: “cloudiness parameter” should probably be “clear-sky parameter”, or it should be explained that 1 = clear-sky = 0% cloudiness; and 0 = 100% cloudiness.

This indicates

Figure 6, panels B and C could be depicted with identical y-range (e.g. 10^-2 to 20), then a comparison would be easier. At least some tick marks should be added to panels B and C.

“Summary and Conclusions” → “Summary” (there are no new conclusions, it is just a summary of the findings presented previously)

from → for

on other days

a mechanism

at least responsible for → responsible for at least

Reference → References