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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Antarctic new particle formation from continental biogenic precursors" *by* E.-M. Kyrö et al.

Anonymous Referee #2

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General comments

This article presents new and original scientific material on new particle formation (NPF) in Antarctica. For the first time, melt water ponds have been identified as local NPF source. This field study is based on state of the art instrumentation and the authors present a successful synthesis of experimental lay-out and data evaluation. The presented data set is unique and the main conclusions drawn from the results are important for a better understanding of NPF in Polar Regions in general, especially in continental Antarctica, which is so far believed to be essentially free of secondary aerosol sources. The methodology is sound and assumptions are clearly identified. The paper is largely written and organized in a clear and concise way, though sometimes a more detailed description of the evaluation methods would be beneficial, prefer-

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ably as Supplementary Material. These points are listed below. Finally, I am confident that the data presented here are of high quality and in principle sufficient to support the drawn conclusions. On the whole, the subject is clearly appropriate to ACP and the paper should be accepted after some (minor) revision according to my specified suggestions listed below.

Detailed scientific comments

Page 32747, lines 18-26: Calculation of condensation and coagulation sink (CS and CoagS). I accept that the authors refrain from describing in detail the formalism to calculate CS and CoagS, but instead provide some references. However, I suggest specifying at least the measured parameters and assumptions to calculate CS and CoagS.

Page 32748-9, chapter 2.4.1 & Figure 1: As far as I have understood, you could identify about 261 individual (chemical) compounds in your aerosol samples. In which way the classification presented in Figure 1 has been accomplished? For example, there are surely plenty of compounds with simultaneous hydroxyl, carboxyl, ... etc. functional groups. Furthermore: what is really meant with the statement at the end of the paragraph "In comparison with the results provided in the literature for aerosol particles collected at the SMEAR II station (Ruiz-Jimenez et al., 2011b), the total number of identified compounds in the Aboa samples was smaller, but the relative composition of the particles in terms of number of compounds was the same"! Finally, please specify the abbreviations "BSTFA" and "TMCS".

Page 32750, chapter 3, last section: Awkward sentence! Please reword.

Page 32752, chapter 3.1.2 lines 18-25: I agree that contamination originating from snow mobiles could be easily identified by their spiky appearance. But close to the main station, which is only 200 m away from the measuring site (chapter 2.2), I guess a diesel operated current generator was in continuous duty. Hence exhaust fumes from the generator are a huge source for particle nucleation, probably much larger

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than biogenic emissions from melting ponds. During very low wind velocities ("stagnant flow"), continuous (!) emissions from the diesel engine could be very well a potential contamination source. How could this impact be excluded or certainly identified?

Page 32755, chapter 3.2.1 and Figure 8: As to me, the meaning of the bewildering different markers is far from being comprehensible; please clarify! How many trajectories were typically followed back in time for each nucleation event?

Page 32759, line 19-21: Please shortly discuss a potential reason for the mentioned correlations. Does this simply mean that Aitken and accumulation mode particles are the dominant CS?

Page 32762, chapter 3.3.2: The authors argue that the depletion of particles above about 60 nm diameter is caused by the fact that these particles acted as cloud condensation nuclei. In this regard the potential role of particle scavenging by existing cloud droplets should be considered and discussed.

Table 4: Abbreviations "VP" and "AHvap (most probably delta-Hvap is meant)" should be explained.

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