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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Birch and conifer pollen are efficient atmospheric ice nuclei" *by* B. G. Pummer et al.

Anonymous Referee #2

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In this manuscript the authors investigated the ice nucleation properties of several different types of pollen in the immersion mode and also assessed what makes the pollen efficient ice nuclei. The topic is very interesting and well suited for Atmospheric Chemistry and Physics, since knowledge of the ice nucleation properties of atmospheric particles is needed to predict ice clouds and precipitation reliably. Although the topic is well suited for ACP, several major improvements are needed before I can support publication of this manuscript. First, the authors should address the comments raised by C. Morris and D. O'Sullivan as well as the other referee. Second, the authors should address the additional comments listed below:

1)I suggest modifying the title so that it accurately reflects all the topics covered in this manuscript.

2)The freezing temperature for Snowmax is warmer than what some have reported in the literature (See for example reference 1). What is the reason for the difference?

3)What was the mode of freezing in the chamber experiments (i.e. deposition freezing, immersion, etc.)?

4)In the chamber experiments the authors used artificial rainwater. Do the components of the rainwater affect freezing, and if so, is it appropriate to use the chamber experiments to validate the emulsion experiments?

5)The authors used the data from Table 1 to make conclusions on the relative ice nucleation efficiencies of different pollens. The authors should consider either the surface area available for nucleation or the number of pollen particles in each droplet if they want to compare directly the ice nucleation efficiencies of different pollens. For example, Birch pollen may give the warmest freezing temperatures because the experiments had more Birch pollen in the droplets. The warmer temperatures may have nothing to do with the ice nucleation efficiencies.

6)Abstract, line 12-14. "Once extracted, they can be distributed further through the atmosphere than the heavy pollen grains and so augment the impact of pollen on ice cloud formation even in the upper troposphere." This is a strong statement and should be better supported. What is the mechanism by which the ice nuclei are removed from the pollen surface and re-suspended? What concentrations can be generated by this mechanism? Are the concentrations high enough to influence ice clouds in the upper troposphere? If the statement made by the authors cannot be strengthened, it should be removed or weakened.

References:

(1)Wood, S. E.; Baker, M. B.; Swanson, B. D. Rev Sci Instrum 2002, 73, 3988.

Interactive comment on Atmos. Chem. Phys. Discuss., 11, 27219, 2011.