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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.

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The paper by Pummer et al. is a timely investigation into the ice nucleation ability of biological particles; a topic which has recently come into focus of atmospheric research. Their experiments find evidence that the parts of pollen that lead to ice nucleation contain no proteins, in contrast to bacterial and fungal ice nuclei. Instead, the ice nucleation activity of pollen might be due to polymers or polysaccharides found on their surface.

Those are very interesting findings which need to be published. However, the manuscript needs some revisions first, as described below, and would benefit from being proofread by a native speaker. I also suggest that the authors think about submitting the manuscript to the special issue on properties of biological aerosols and their impact

on atmospheric processes in the Biogeosciences journal http://www.biogeosciences.net/special_issue31.html instead of ACP.

1 General Comments

The structure of the manuscript in the present form is confusing. I suggest presenting the material and methods section before the results, i.e. try to merge chapters 2 and 5, or at least move chapter 5 right after the introduction.

In order to facilitate the understanding, use present tense for accepted facts and the past tense for methods and results.

There are typographical and grammatical errors present throughout the manuscript. Please correct them.

2 Specific Comments

p. 27221 l.20ff: Please mention here where you procured the pollen from (e.g. collected in the field or from plants grown in greenhouse conditions). As suggested in the review by Cindy Morris, it would be also prudent to check the pollen for microbial activity. As plants are not sterile, the pollen might contain IN active bacteria or fungal spores on their surface.

p. 27224 l.3: You speak about the surface topology. This would be an opportunity to mention active sites for ice nucleation.

p. 27224 l.12: You write here about mixing the pollen with water. However, it would be good to know the details of the procedure. The pollen being "left for some hours" seems quite imprecise and might lead to further questions: could some chemical reac-

tions have happened during that time? Are you really measuring the pollen surfactants or some newly created compounds? Where were the samples left? In the dark, or exposed to sunlight?

Chapter 3 in general: Please add here your definition of ice nucleation activity. It would also be interesting to see the activity per pollen grain or mass. I agree with Cindy Morris' comment that it is important to know the number of pollen tested, in order to make the results comparable in between the plant species and to mineral dust on a per-grain basis.

p. 27230 l.20: I would like to point out here that while polymers might indeed be a candidate for IN, Wowk & Fahy (Cryobiology, 44, 2002, 14–23) found that polyglycerol polymers can actually inhibit bacterial ice nucleation. I wonder if they would have the same effect on pollen.

p. 27232 l.1-10: Linking the IN activity of pollen to the adaptation of plant species to colder climate is a great idea. However, I think that this hypothesis needs to be fleshed out a bit. Looking up following books might help:

Mauseth, J. D., Botany, Jones Bartlett Publishers, 2008 – for general information.
Körner, C. Alpine Plant Life, Springer, 2003 – for insight into the ecology of plants adapted to cold climate.

Table 1: What were the criteria for choosing pollen species which were to be investigated in the smog chamber? Why were not all species investigated in the chamber?

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