Biogeosciences Discuss., 10, C4089–C4091, 2013
www.biogeosciences-discuss.net/10/C4089/2013/

Biogeosciences
Discussions
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Interactive comment on "Spores of most common airborne fungi reveal no ice nucleation activity" *by* B. G. Pummer et al.

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Received and published: 6 August 2013

This work was motivated by one important question: "Which common airborne fungi show ice nucleation activity?" Their findings show that most of the investigated fungal species had no significant IN activity. The paper is well structured and well written. However, some questions remain and the manuscript can be improved as suggested below: Introduction: What was the motivation for the freezing stress experiments mentioned in the abstract? I suggest adding a few sentences at the end of the introduction. I also suggest clarifying that for lichen IN the IN activity was found to come from the mycobiont (Kieft and Ahmadjian 1989). The authors write that most studies tested only mycelium and not fungal spores. It would help to add references of studies where only mycelia were studied. Pouleur et al., 1992 did indeed not mention the spores, but from

the method they describe they might have had a mycelium-spore mixture whereas Jayawera and Flangan, 1982 and Iannone et al, 2011 analyzed fungal spores. The statement that 56% of all fungal spores in the atmosphere are Agaricomycetes should be corrected. The study of Fröhlich-Nowoisky et al., 2009 was focused on the investigation of species richness not on spore numbers (i.e. 56% of the detected species belonged to the Agaricomycetes). The following reference should be added to the list of IN fungi studies: Morris, C. E., Sands, D. C., Glaux, C., Samsatly, J., Asaad, S., Moukahel, A. R., Gonçalves, F. L. T., and Bigg, E. K.: Urediospores of rust fungi are ice nucleation active at > -10 °C and harbor ice nucleation active bacteria, Atmos. Chem. Phys., 13, 4223-4233, doi:10.5194/acp-13-4223-2013, 2013. Are 28 strains really a broad spectrum of fungi as written in the last paragraph of the introduction? This should be extenuated. Material and Method: It would be useful to give more information about the Agaricomycetes spores. How fresh were they? Were they treated somehow? Were they washed? How were they stored until analysis etc.? How were the sampled food molds identified? By morphology? Microscopy? DNA-analysis? I suggest adding a few sentences in the method section. Which kind of freezer was used for the freezing events? -21°C? -80°C? Were the plates incubated after or between the events? How many freezing events were performed for each fungus? Results, Discussion and Conclusion: The main finding was that out of the tested species/strains just 1 species showed significant IN activity. The authors discuss the loss of ice nucleation activity due to sub cultivating which was already found in earlier studies. I am wondering why the authors decided mainly for fungi from culture collections and not from environmental samples. In particular these culture collection fungi may have lost the IN activity due to many sub cultivations and/or long term storage or due to spore treatment. Furthermore, it is known that not all strains of a certain species exhibit IN activity (e.g. 12 out of 42 F. oxysporum strains were IN active – Richard et al., 1996, also reviewed in Despres et al., 2012- Tellus B 2012, 64, 15598, DOI: 10.3402/tellusb.v64i0.15598). The authors tested a very small selection of fungi strains. Table 1 and Table 2 are not consistent when one counts the number of strains. Table A gives

28 strains of Ascomycota whereas Table 2 has 21 Ascomycota plus 5 Basidiomycota. Thus, Table 1 and 2 should be corrected and the captions can be optimized. The number of total tested strains should be mentioned in the manuscript. However the number of testes strains is very limited and this can be discussed to explain the results. The number of different fungal species on earth is estimated to be $\sim$ 1.5 mio or more. To my knowledge there is no estimate of fungal strains, but from the limited number of strains tested in this and other studies the statement made in the title and conclusion may not hold. There are much more species and/or strains that are abundant in the atmosphere, many of them may be unknowns or not cultivable and were not tested for IN activity. One should keep that in mind and include these points into the discussion, and optimize the title. The link to the atmosphere is missing in the discussion and conclusion. Figure 2: Why do non-frozen wells have median freezing Temperatures? The figure is not clear.

Interactive comment on Biogeosciences Discuss., 10, 10125, 2013.