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Interactive comment on "Potential relevance of Mortierella alpina as a source of ice nucleating particles in soil" *by* Franz Conen and Mikhail V. Yakutin

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We thank Referee #1 for assessing our manuscript and are grateful for all comments. The general remarks question the novelty of our study. We agree that earlier work has already convincingly shown the ubiquity of ice nucleating particles (INP) in soils around the world and merely adding more data from different soils does not necessarily justify a publication. However, our study clearly goes further. It shows that INP with characteristics similar to those of a recently described fungus over-proportionately contribute to INP concentrations in soils where they are generally higher than elsewhere. Admittedly, the discussion of this finding may have been too short. In addition to what

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is already said in the manuscript, we speculate that the great plasticity in the contribution of cell-free fungal INP results from their property of being macromolecules that can be washed-off from the mycelium. In principle, the production of a macromolecule requires less resources than the production a complete cell carrying an INP. Hence, an organism capable to release such macromolecules has a greater range over which it can potentially modify its surrounding in terms of ice nucleation.

In response to comments by Cindy Morris (Referee), we made another effort to valorise the results in a wider context (please see our reply to Cindy Morris).

Replies to Specific comments

Thank you for the additional literature on soils as a relevant source of INP and earlier findings regarding the large abundance of INP in regions with a cold climate.

Showing the sampling locations on a map would unfortunately duplicate the much more precise information about the geographic locations shown in Table 1. We hope to give the reader a better idea of where the samples were taken by mentioning the regions to which the locations belong (i.e. Novosibirsk (Western Siberia), Saskatoon (Saskatchewan), Colmar (France), La Brévine (Switzerland), Ranau (Borneo).

Where present, aboveground parts of vegetation were removed and soil samples were collected with a small shovel from the surface of the soil. Each sample consisted of 100 g to 300 g of soil.

In our experiments we used a 0.1% NaCl solution instead of water because it improves the detection of phase change with our apparatus (Stopelli et al., 2014), especially at slight supercooling.

We added a Figure with the freezing curves (please see below). As for the deactivation, we can say that smaller fractions of INP active at -10 °C or warmer passed the challenge tests. On average 81% (+/- 6%) passed through 0.22 μm and only half (51%, +/- 9%) of all INP active at -10 °C or warmer were also active after heating to 60 °C.

Stopelli, E., Conen, F., Zimmermann, L., Alewell, C., and Morris, C. E.: Freezing nucleation apparatus puts new slant on study of biological ice nucleators in precipitation, Atmos. Meas. Tech., 7, 129-134, doi:10.5194/amt-7-129-2014, 2014.

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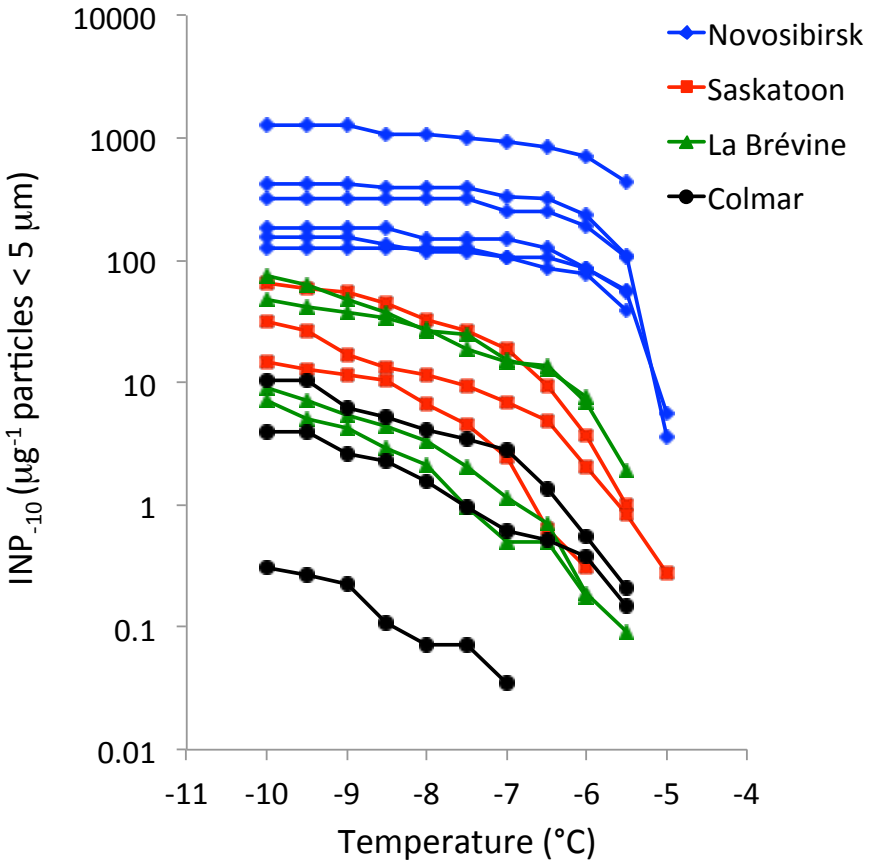

Fig. 1. Freezing curves of untreated samples

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