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Interactive comment on "Sources of organic ice nucleating particles in soils" *by* T. C. J. Hill et al.

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In this paper, Hill et al. detail their efforts to unravel the sources of biogenic INPs in soils collected from Wyoming and Colorado. The authors employ a variety of extraction techniques, chemical/biochemical and physical tests to elucidate the origins of the biological INPs in the soil samples. The paper is an important piece of work, generally well-written and yields new insights into the relative contributions of different sources to the reservoir of INPs in soils. I recommend that it be published following consideration of the comments below:

Main Comments:

Page 3 lines 8-20: Am I correct in assuming that the soils weren't sieved at all before INP assays were performed? While roots were removed, what about gravel and stones? How could this subsequently impact upon calculation of INPs per gram soil?

Page 3 line 14/15: There is some ambiguity here. At line 14 it says that soils were stored at 4 °C before testing. Then, in the next sentence, it is mentioned that subsamples were frozen at -20°C for "later analyses". Was INP analysis one of the later analyses specified here? If so, the effects of freezing on the soils (e.g. promotion of dessication, lysing microbial cells and effects of SOM structure) are worth noting. Additionally, were the samples air dried before freezing?

Page 3, line 23: On the "appropriate INP-free diluent", what was this? I may have just missed this, but I can't seem to find what this was for untreated soils (e.g. figure 1). Were there any runs performed where just water was used? Were there any differences observed between when a buffer was used, versus when it wasn't for untreated soils?

Page 3, line 25-26: Could the authors state what the temperature ramping profile used here was (rather than the reader having to consult Garcia et al.). It might also be appropriate to discuss how ramp rate could potentially lead to differences if others were to conduct similar style experiments but with different ramping profiles.

Page 4, line 9: What was the pH restored with?

Page 5, line11-21: Adsorption of proteins to mineral surfaces can affect their susceptibility to thermal denaturation (some examples: Steadman et al., 1992;Rao et al., 2000)- probably worth a mention of this here.

Page 8, lines 18-23: Line 19 states that O'Sullivan (2014) used a gentler peroxide treatment than used here. Conversely, this paper is subsequently referenced at line 23 noting that peroxide has no effect on K-feldspar. But the treatment was different from that used in this paper? With the peroxide treatment used in this paper, does it have an effect on K-feldspar? Also, for the effects of peroxide on montmorillonite, how do the peroxide treatments used by Conen et al. compare to those used here?

Page 8, line 25-28: The similarity in the results from aerosolized dusts from Tobo (2014) to the drop freezing assays here is interesting, but despite the very different techniques

used (0.6 μm vs. unsieved soils) no discussion of potential caveats is presented here. Between both techniques, very different populations of particles are being probed, yet there's no discussion of this. There's no reason to assume that active site densities for 0.6 μm and unsieved soils will continue to overlap over the entire temperature range of the plot. For the avoidance of ambiguity, I suggest discussing this point.

Typos: Page 6, line 2: Seems to be a typo here- "from (grown in nutrient broth. . .")

References: Rao, M. A., Violante, A., and Gianfreda, L.: Interaction of acid phosphatase with clays, organic molecules and organo-mineral complexes: kinetics and stability, Soil Biol. Biochem., 32, 1007-1014, 2000.

Steadman, B. L., Thompson, K. C., Middaugh, C. R., Matsuno, K., Vrona, S., Lawson, E. Q., and Lewis, R. V.: The effects of surface adsorption on the thermal stability of proteins, Biotechnol. Bioeng., 40, 8-15, 1992.

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