

## ***Interactive comment on “Ice nucleation and its effect on the atmospheric transport of fungal spores from the classes *Agaricomycetes*, *Ustilaginomycetes*, and *Eurotiomycetes*” by D. I. Haga et al.***

### **Anonymous Referee #1**

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This is nice study using experimental and model tools to investigate the importance of fungal spores in the atmosphere. I have some minor comments, and I recommend publication after these comments are addressed.

Classes of fungal spores are examined for their ice nucleation properties. Atmospheric relevance of these spores needs to be discussed. Why these spores are important; any ice residues or rain water samples show the evidence of these spores? Atmospheric relevance needs to be discussed?

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Figure 2: Show mineral dust immersion freezing data points from literature. Authors have compared  $N_s$  densities in Figure 4 to Asian mineral dust, but surface area approximation used in this study (for spores) would affect the comparison. Looking at Figure 1, it is clear that spores are not spherical particles. Actual surface area would be higher than assumed. If substituted in the  $N_s$  calculation, the actual  $N_s$  densities would be even lower than shown. Please add these error bars. Please also revisit the conclusions stated in section 4.1 (line 11 to 25 on page 5033 and line 1 to 2 on page 5034).

Figure 8 showing comparison with previous studies should be revisited. I suggest show the raw data, for e.g., Figure 2. Surface area approximations would affect the comparison, as mentioned above. If authors like to compare, I suggest CNT derived nucleation rates per unit area should be showed.

For EMAC studies it is assumed that spores are efficient CCN. I'm not sure how CCN and IN activities are related. Efficient CCN does not mean efficient IN. According to Figure 2, this frozen fraction plot shows that spores are not efficient IN at mixed-phase cloud (just because their frozen efficiency is less than 1). How this assumption affects the cloud model results should be discussed, at least briefly. Also, I'm not sure about the emission rates. It is fixed at a single rate from all land surfaces. Line 12 to 15, page 5025. Discuss how this assumption will affect the results. This will give an idea about sensitivity of this parameter. Is it right to assume a single rate from all land surfaces.

Page 5034: line 21 to 28. Why acid coating studies are important. Which acid, sulfuric or nitric?. Why organic coating studies are not important? You may want to generalize the statement otherwise. I was not sure why so many papers were cited for coating work. Do all these papers studied acid coating affect. Is there any evidence (field, laboratory) that shows the spores can be coated with acids?

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Interactive comment on Atmos. Chem. Phys. Discuss., 14, 5013, 2014.

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