

Interactive comment on “The immersion freezing behavior of ash particles from wood and brown coal burning” by Sarah Grawe et al.

Anonymous Referee #4

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Comments have been uploaded in the attached pdf

Please also note the supplement to this comment:

<http://www.atmos-chem-phys-discuss.net/acp-2016-208/acp-2016-208-RC3-supplement.pdf>

Interactive comment on Atmos. Chem. Phys. Discuss., doi:10.5194/acp-2016-208, 2016.

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Discussion paper



Review of "The immersion freezing behavior of ash particles from wood and brown coal burning" by Grawe et al.

In this study the authors examine the immersion mode freezing efficiency of combustion ashes from different woods and brown coal burning using LACIS. Ashes from brown coal burning are found to exhibit higher nucleating abilities than those from the ashes generated from wood burning. The results presented here also seem to indicate that sample preparation can have impacts on ice nucleation efficiencies; an important point which will need to be considered in future studies.

My major comments below surround increasing the specificity and clarity of statements made. In particular, there are some vague statements made in attempting to account for observations in this work, and how it compares to others such as Umo (2015). Sentence and paragraph structure can also at times make it difficult to make out what is being said without multiple rereads of certain passages. While I recognize that investigating the nature of nucleating sites in a mixture as complex as ash is challenging, I suggest the authors could discuss the difficulties surrounding this endeavour and limit sweeping statements.

I am of the opinion that, following careful consideration of the points below and improvement of the manuscript in the areas listed, this could be accepted in ACP.

Main comments:

- The authors need to evaluate the use of 300 nm particles in this paper. It can be anticipated that physical and chemical composition varies with particle size, and in turn, perhaps the ice nucleating efficiencies. Without further experiments on larger particles it is difficult to see how the results of this study can be generalised to larger particles. I suggest that at the points in the manuscript where the authors are referring to size selected particles, they explicitly state this for clarity (e.g. section 3.1 L1-8).
- P2L12: "As a result, coal ashes contribute a major proportion.....". This strong statement needs a reference.
- P2L13-15: On the one hand, "the importance of ash particles as potential INPs must be put into perspective by comparing with concentrations" yet in the next sentence an emission rate is given, not a concentration. While both sentences on their own are fine, having these sentences one after the other could be misleading.
- P4L6: Why is this important? Reference to publications demonstrating that surfaces typically used for ice nucleation assays interfere with the nucleation process would seem to be appropriate here, bearing in mind that many studies have been performed where droplets are supported by substrates and this does not appear to be an issue.
- P4L7-8: This statement also needs referencing and elaboration: what size droplets are you speaking of? Homogeneous nucleation CAN be probed in picolitre sized droplets on cold stages.
- P4L24: only three woods are investigated in this study; is this representative of all "deciduous vs. coniferous" trees?

Fig. 1.