

Review of: "Influence of the ambient humidity on the concentration of natural deposition ice nuclei" by M. L. López and E. E. Ávila.

This paper reports on ground level deposition mode IN levels measured in Cordoba, Argentina, during the winter and spring seasons of 2014. The key finding of the research is that the ice nuclei concentrations are strongly impacted upon by the relative humidity at ground level. This result is striking, and may have important implications for our understanding of what factors govern IN levels close to the surface. Accordingly, the paper is sure to be of interest to the community of researchers active in this area. My main comments below suggest that the authors further elaborate on the possible reasons for the observed trends in their discussion. I recommend publication of this paper, after consideration of the comments below:

Specific Comments:

- In the discussion of possible reasons behind the observed trend of IN concentrations with RH_{amb} , two hypotheses are presented in the paper. The authors discuss the hypothesis that (1) nucleation below water saturation may take place in pores and cavities, as per Marcolli (2014) and (2) that the observations may be related to increases in bioaerosol concentrations. However, only a mention of the first hypothesis is raised in the abstract- why? Is this seen as the authors as being the more likely explanation?
- Further to the first point above, the study does not appear to provide a means to suggest that either hypothesis (1) or (2) above is a more likely explanation. Accordingly, in relation to the impacts of bioaerosols, the discussion of possible impacts of relative humidity /precipitation on ice nucleating biological particles is too short (e.g. at Page 16703 Line 25-29). For instance, why might biogenic IN levels be increased due to changes in RH and precipitation? Numerous references to results from recent important papers with relevance to this discussion are absent. These include T.P. Wright et al. (2014) *Aerosol Science and Technology*, 48:11, Hader et al. (2014) *Atmos. Chem. Phys.*, 14, 5433–5449 and Bigg et al. *Atmos. Chem. Phys.* (2015), 15, 2313–2326.

- Page 16703 Line 25-30. Were the nucleation modes probed by Prenni et al. and Huffman et al. the same as that probed here? Possible differences should be mentioned.
- Page 16704 Line 22: I think the phrase “support the idea that the deposition nucleation can be a pore condensation and freezing” is a little bit too strong here, even with the preceding caveat in the sentence. In the absence of further evidence, I suggest weakening this statement slightly and inserting a phrase like “may support...”, or “could support”, given that other, different, hypotheses exist to explain the observations.
- Page 16698 Line 26: The definition of immersion mode freezing here states that the particle must “penetrate” the droplet, suggesting that the lines between immersion and condensation freezing are unambiguously different. I suggest the definition should be simply “suspended in the droplet”, as per Vali (1985).

Technical comments:

Page 16698 Line 13: “was discussed as a possible...”

Page 16699 Line 19: of the atmosphere, not “on the atmosphere”

Page 16700 Line 1: Change “Then, the study....” to “Furthermore, the study....”

Page 16701 Line 20: “a size large enough...”

Page 16703 Line 24: “or known at this time” is redundant in this sentence. Remove.

Page 16703 Line 29: “Even though” doesn’t really make much sense here. I suggest changing to “While in the present work....”

Page 16705 Line 15: “too scarce to make an analysis”

Page 16706 Line 16: change to “to differentiate between these mechanisms”