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Atmospheric Chemistry and Physics Discussions

Interactive comment on "High concentrations of biological aerosol particles and ice nuclei during and after rain" *by* J. A. Huffman et al.

Anonymous Referee #1

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The authors present simultaneous observations of ice nuclei concentrations and measurements of biological particles, using a variety of methods, from a field campaign in a temperate forest. Based on these observations, they argue that an observed increase in biological particle concentrations (as estimated from fluorescence measurements) immediately after rainfall can explain a simultaneous and highly correlated increase in the atmospheric concentration of ice nuclei observed at -25 deg C. They present a compelling case for this scenario. In addition, they identify two previously unknown warm-temperature ice nuclei among the fungal spore species in their samples. This is an excellent and novel contribution to the literature on both atmospheric biological particles in general, and the ice nucleation activity of atmospheric particles. While the release of biological particles after rainfall has been reported previously, this may be the first such report using real-time fluorescence measurements. Furthermore, I

believe this is the first time that such a direct link has been demonstrated in field observations between atmospheric concentrations of naturally-occurring biological particles and ice nuclei. I highly recommend this paper be published in Atmospheric Chemistry and Physics after a few very minor revisions, discussed below.

p. 1775, lines 4-8: "The total concentration of coarse particles ... increased ... which is in contrast to the traditional view ... that assumes efficient removal of large aerosol particles by precipitation." This sentence seems to question that large particles are removed efficiently by rainfall, but I don't think that this is what you mean. Perhaps consider rephrasing, e.g. something like "...in contrast to our expectation that the concentration of large particles would decrease following rainfall due to efficient removal"?

p. 1777, l. 29 – p. 1778, l. 1: The authors write "that aerosol samples collected during rain events exhibited the strongest IN activation at temperatures above -20 deg C and sizes around 1.8-5.6 μm (Figs 3 and S1)." I find this phrasing imprecise and a bit confusing; I'd suggest something like "that for aerosol samples collected during rain events, the atmospheric concentrations of warm-temperature IN (active at -15 deg C) were highest at sizes around 1.8-5.6 μm (Figs 3 and S1)."

p. 1778, lines 4-6: there is a similar problem here. All samples (not just those collected during dry weather) display higher IN concentrations at T < -20 deg C than at T > -20 deg C, but the text seems to imply otherwise; also, Figs 1 and S3 show IN number per liter of sampled air, not the IN activation efficiency (# IN / # particles) as the text seems to imply.

SOM:

Fig S1: This figure shows IN number per liter of sampled air, rather than the IN activation efficiency (# IN / # particles). If it is easily available, it would be interesting to also see the IN activation efficiency for the sampled particles in a second, similar figure in the SOM.

I have a final comment on Figs 1(E) and S1: For individuals with some common types of color-blindness, the colors of all lines in Fig S1 except stages 4 and 5 are indistinguishable or nearly so; as a result, this figure will be partially illegible to some readers (you can cross-check this at www.vischeck.com). The UV-APS data in Figure 1(E) is also somewhat reduced in legibility for color-blind individuals. While this of course not a scientifically critical issue, it could be easily corrected by choosing different colors. If the authors wish to address this, many good recommendations for improving color-blind accessibility of scientific graphics are available on the internet, for example here: http://jfly.iam.u-tokyo.ac.jp/color/.

Interactive comment on Atmos. Chem. Phys. Discuss., 13, 1767, 2013.