Atmos. Chem. Phys. Discuss.,
doi:10.5194/acp-2016-192-RC2, 2016


Atmospheric Chemistry and Physics Discussions

# *Interactive comment on* "Ice nucleating particles in the Saharan Air Layer" *by* Yvonne Boose et al.

**Anonymous Referee #2**

Received and published: 10 May 2016

Boose et al. presented a two-month observational study on ice nucleation particles at the Izana observatory. The INP concentrations between 233-253K were measured with the PINC ice nucleation chamber, together with comprehensive measurements of aerosol properties. They find the increase of ammonium sulfate has a small positive effect on the INP and the biological particle number seems to be higher in INPs than in ambient aerosols. Two widely-used IN parameterizations predict higher number of INPs than the observation. They conclude the current data analysis suggest that the aging process in SAL can lead to an increase ice nucleation efficiency of Sahara mineral dust.

This work is very relevant to the scope of ACP. Such INP measurements are useful for cross validation of existing results from lab experiments and in-situ observations, as well as for model evaluations. The manuscript is clearly written and well organized. Overall I think it is a nice work and I would recommend to publish the paper after some



minor revisions.

Specific comments:

Page 1, Line 14-19: Can you summarize the impact of aging on the deposition nucleation and the condensation nucleation separately? Also, I think it is justified to say the INP measurements and analysis suggest the aging process in SAL can lead to an increase ice nucleation efficiency of Sahara mineral dust, but in my opinion the overestimation of INPs by D10 and D15 (using the observed aerosol properties) does not deliver the same message. Many data used to derive D10 and D15 parameterizations were collected over the Pacific and western/central US, which are far from the Sahara and are more affected by East Asian dust and local dust sources. If the authors indeed want to convey this message (as the current text shows), additional evidences are needed.

Page 3, Line 13: It should be noted that while Sullivan et al. (2010) shows nitric acid can lead to higher ice nucleation rate under supersaturated conditions, it also inhibits the deposition nucleation (sub-saturated).

Page 4, Line 22: Could you please elaborate why RHw= 92% and RHw=105% were chosen for the measurement setup? If a small perturbation was added to it, would the result be sensitive to the change?

Page 5, Line 3: Is the size threshold (>3 micrometer) the only criteria to distinguish ice crystals from droplets? What is the typical size of the droplets measured in PINC?

Page 7, Line 19: Do you mean "analysis"? Reanalysis data are often at coarser resolutions.

Page 10, section 3.3: The analysis and discussion here are very interesting and useful. Would it be useful to calculate the ns function for smaller particles (< 0.5 micro m.) and larger particles separately and compare them?

Page 13, Fig2: Is there a particular reason for using ".8" on the time axis? Would be

nice to use integer numbers. Is the time local time?

Page 14, Line 15: Does this limitation also apply to other types of instruments? In other words, is the poor relationship between INP and the number of >0.5um particles solely because of the instrument limitation? Please comment on this.

Page 29, Fig5: This figure is very informative. I think it is important to mention that the derived ns functions can differ at about one magnitude between various dust events.

Page 36, Fig12 caption, Line 2: “Color coding is as in Fig 2. . .” What does black color indicate? Background conditions? Please consider adding a legend for convenience of the reader.

Page 36, Fig12 caption: It would be useful to provide a formula showing how the uncertainties were calculated/combined.

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Interactive comment on Atmos. Chem. Phys. Discuss., doi:10.5194/acp-2016-192, 2016.