Response to referee 2

We thank the referee for their helpful comments.We have endeavoured to improve the paper as recommended, the reviewer comments are italic, our response is in normal type and major changes to the manuscript are reproduced in bold type.

P 9510 L 21: *Cloud droplets*

Changed

P 9511 L27: *clouds-sized*

Changed

P 9512 L 6-8: *What exactly do the authors mean by 'more than covering the range of relevance for the atmosphere'? Perhaps the authors mean 'beyond the range of atmospherically relevant dust aerosol concentrations'? Please clarify. In addition, the motivation of the µL-NIPI development may be better stated in L 17, followed by 'This therefore allows. . .". The authors may consider rephrasing these sentences.*

Referee 1 also commented on this section. The section has been substantially modified in order to make it clearer. We reproduce the change here:

'In general, instrumentation employing single aerosol particles suspended in gas and droplet experiments working with cloud sized droplets (10's of micrometers) report values of ns down to about 103 cm-2 (e.g. see Fig. 18 of Murray et al., 2012 for a compilation). These measurements are clearly valuable and applicable to the atmosphere, but even smaller ns values are also relevant (Murray et al., 2012). For example, if we consider a dust influenced atmosphere with 5 dust particles per cubic centimetre with a mean radius of 500 nm, then in order to generate 10 ice crystals per cubic metre an ns of only 60 cm-2 would be required. Hence, it is important that we have the capacity to measure ns smaller than 103 cm-2 in addition to the capacity to measure larger values.'

P 9514 L 3: *−20 and −100 ◦C*

This is supposed to be +20°C.

P 9514 L 8: *before using*

Changed

P 9518 L 2: *show that this*

Changed

P 9519 L 13: *What is the minimum wt%, which μL-NIPI can reliably handle? For example, for K-feldspar in Fig. 7, do the K-feldspar data points extend to the higher ns values than 10ˆ3 cmˆ-2 if K-feldspar <0.01 wt% is employed? If so, I assume the data points overlap with ones from pL-NIPI up to -20 ◦C?*

In the specific method used here, where material is weighed out prior to dilution with water the uncertainty from the scales became very large at lower weight percents. There is no reason to suppose that these experiments could not be done with better scales or through dilutions but we have not yet conducted them as yet.

P 9520 L 6-14: *The authors may consider mentioning the study done by Wex et al. (2015). I am not expecting any quantitative comparisons, but Wex et al. is rather comprehensive so worth mentioning as an example of the previous Snomax IN studies.*

Yes, Wex et al has been published subsequent to the initial version of this paper, we have included a brief comparison to this data.

'Recently, Wex et al (Wex et al., 2015) have published an extensive intercomparison of instruments using Snomax® as the test sample. The most similar instrument to µL-NIPI intercompared, BINARY (Budke and Koop, 2015) gave qualitatively very similar results to those generated here at the most similar weight fraction tested. Our experiment ($2.4x10^{-4}$ wt%) and those from from Wex et al (Wex et al., 2015) ($2.9x10^{-4}$ wt%) both gave very steep fraction frozen curves at -4°C.'

P 9520 L 17*: setup (as first given in P 9514)*

Changed

P 9520 L 24: *pL*

Changed

P 9521 L 4-6: *Figure 7 supports uniform distribution of particles in individual droplets (P 9514 L 10-12) & mass-independent specific surface area. How about some variables in solution preparation and their effect on IN properties? Some discussions are given in P 9514 L 10-12, but how about the length of time employed for the suspension preparation? For instance, can the longer suspension* *preparation alter surface (e.g., specific surface area) and IN properties over time when compared to the shorter one?*

All these things are possible and there is an awful lot of interesting science here which could be done in the longer term. For this work we simply kept preparation as consistent as possible.

P 9521 L 26: *cloud droplet sizes*

Changed

P 9522 L 1-2: atmospheric relevance of what? Ts?

This is connected to the above point; we have made this clearer we hope.

'This allows the determination of nucleation efficiencies to over a wider range of temperatures than is possible using only smaller droplets and complement the flowing aerosol and cloud-sized droplet techniques in widespread use.'

P 9522 L 2: cloud-sized

Changed

P 9531 Fig. 2 legend: et al.,

Changed