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Interactive comment on "Ground based measurements of immersion-freezing in the eastern Mediterranean" *by* K. Ardon-Dryer and Z. Levin

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1. This paper is a welcome contribution. It shows the potential of an attractive technique for measuring airborne concentrations of ice nucleating particles (INPs). Capturing INPs on filters and subsequent laboratory analysis is more flexible and more widely deployable than in situ instruments.

2. The crucial question is how effective is the removal of INPs from the filter*. There are other lesser issues as well and most of those are mentioned in the paper. The removal efficiency was assumed to be unity in this paper, based on the vigorous and lengthy

application of mechanical liberation of particles from the filter. How did the authors settle on the degree of agitation to be used? Vali (J. Rech. Atmos. 3, 175-177, 1968) used reverse flushing of the filter and determined the efficiency of removal by repeating the process several times with the same filter and observing the decrease of transfer rate with time. A time integral of the total transfer (exponential with time) compared with the first rinse yielded a correction factor (6 for that method) that was then applied to the measurement obtained with the first sample. This is a valid approach to any method of elutriation and it would be useful to always make such tests in order to eliminate reliance on the assumption of full transfer efficiency. Of course, the removal efficiency can be expected to be a function of the size and type of aerosol being tested and of the method of elutriation. However, there are at least two possible practical solutions. First, the decay rate of the transfer could be checked for a number of different aerosol types and sizes. Then, with knowledge of the particle type being sampled an appropriate correction factor could be selected. Second, with at least two extractions for every sample and assuming an exponential decrease in the rate of transfer a fairly good estimate can be obtained for the particular sample. Either method would reduce significantly the uncertainty associated with the method. Also, the accuracy so achieved could be stated clearly in terms of probable errors. Other possible approaches can be thought of as well; for example variations in the length of time and intensity of the force applied in liberation of particles from the filters. Such test could also provide some indications on whether some breakup of particles is occurring or not.

3. As a minor point, it is worth emphasizing that parameters such as the temperature at which 50% of the drops were frozen is not the best way to quantitate the results. Drop size and dilution influence these values. Concentrations at given temperatures are more definitive measures. Both types of data are given in this paper; deleting the former would not detract from the information presented.

4. The comparison of the data in this paper with those of Bigg and Stevenson (1970) need to be viewed while bearing in mind the differences in techniques. The difference

in results cannot be automatically associated with a true trend due to location or timing of the samples.

5. The summary graph, Fig. 6, prompts the question why the spectra from the various samples show lesser spread at the lower end of the range than at higher values. A rough estimate is that 90% of the spectra fall within about a factor 5 at -22°C, while the spread is more like a factor 50 at -18°C. Similar trends are seen in many other data sets. Yet, on the average, the dusty and clean days differ to about the same degree all through the temperature range.

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* Vali (1968) used the term elutriation for this process; it is not a perfect but adequate expression.

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