

Interactive comment on “Exploratory experiments on pre-activated freezing nucleation on mercuric iodide” by Gabor Vali

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The manuscript discusses experimental results on the phenomenon of pre-activated freezing nucleation (PFN), which was then a topic of discussion, but has received renewed interest recently. In contrast to pore condensation it is a phenomenon associated with immersion freezing and is operational at temperatures only slightly below the melting point. It is therefore of great interest to mixed phase cloud research.

The submission is somewhat unusual as it describes experiments which were performed 48 years ago in the laboratory of the author but have not been published comprehensively since then. The experiments deal with Hgl₂ as an nucleant and constitute quantitatively an impressive piece of work, especially when the experimental

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means of the 1970's are taken into account. The methods and the results are described comprehensively and the effect of PFN is clearly worked out. In particular, the range of the warm limit temperature, up to which the effect is sustained, has been thoroughly characterized. The author shows convincingly that “active sites” responsible for PFN are not identical to the sites responsible for heterogeneous freezing without PFN. A large part of the manuscript discusses variability on a single droplet level and repeatability between subsequent cooling cycles. It is surprising that the droplet- to droplet variability is high in parallel cooling cycles even though each droplet contains about 10^{11} particles of Hgl₂ according to the authors estimate. This touches on one (not mendable) weakness of the manuscript, which is the fact that the samples are no longer available and neither particle size distribution nor particle concentration were measured back then. The manuscript carefully mentions and discusses this and other deficiencies of the experiment and their implications for the interpretation of the results.

The author puts his results into a stringent conceptual background and discusses the implications for a mechanistic understanding of heterogeneous ice formation and possible ramifications for cloud research.

I clearly recommend to publish this manuscript once my remark below is addressed. I hope that the publication will advance more work on this fascinating effect and will foster the search for more materials, possibly of greater atmospheric relevance, that exhibit PFN.

Remark: I am not convinced that the more qualitative figure 18 is helpful in its current form. In particular, I cannot easily see how it is quantitatively in accord with the data presented earlier, e.g. in Figure 3, which to my understanding, should map out the same space if the vertical bars are taken into account. I would suggest to either remove figure 18 or to augment it with overlaid experimental data, e.g. in the form of a box-whisker plot.

Minor remark: There are several typographical errors that should be corrected, e.g.

C2

“understading” in the abstract, typos are particularly frequent in paragraph 6.1

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