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Atmospheric Chemistry and Physics Discussions

Interactive comment on "An aerosol chamber investigation of the heterogeneous ice nucleating potential of refractory nanoparticles" *by* R. W. Saunders et al.

M. Rapp (Referee)

rapp@iap-kborn.de

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The current paper describes ice nucleation studies on nanoparticles of iron oxide, silicon oxide and magnesium oxide using the AIDA chamber in Karlsruhe, Germany. This work is of very high significance for understanding the formation of ice clouds in the upper parts of the Earth's atmosphere, such as polar stratospheric clouds and noctilucent clouds in the mesopause region. The nanoparticles under investigation have all been proposed to be candidates for so-called meteor smoke particles which have long been speculated to exist and be involved in the formation of these ice clouds. Until now, however, solid experimental laboratory work investigating the feasibility of this concept has

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not been conducted. In this sense, the here presented work is indeed ground-breaking. The experiments and their results are very well described well documenting both the significant new results of this study as well as the limitations in terms of applicability to atmospheric conditions. As such this excellent paper clearly qualifies for publication in ACP provided that some minor – mainly editorial – comments are taken care of. I am looking forward to reading the final revised version in ACP!

List of minor comments:

- Abstract and corresponding part in the manuscript: I find it worthwhile pointing out that the derived mass accommodation coefficient of 0.1 is very low compared to assumptions used in many previous model studies of noctilucent cloud microphysics which all rather used values close to 1.
- page 23273, line 27: The authors might like to add that in a follow up-paper by Strelnikova et al., GRL, 34, L15815, doi: 10.1029/2007GL030635, 2007 it was actually shown that radar detection of (charged) meteor smoke particles is indeed feasible.
- page 23280, line 7/8: please indicate: perpendicular and parallel to the direction of linear polarization of the laser.
- General comment to figures with multiple panels: Many of the figure legends and axis titles are hard to read in its current form. Please increase the font sizes.
- Lowermost panels in Figure 3: I find it hard to find quantitative information in this type of presentation and would suggest showing probability distribution functions instead.
- Discussion of aerosol dilution by pumping: Are losses to the chamber walls completely irrelevant?

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- Page 23285, line 19/20: The authors state that the primary particles are 6 – 7 nm in diameter. This is, however, already larger than particle sizes thought to occur at mesopause altitudes. Isn't this a hint that particles in the mesosphere must be of very different structure?
- Page 23292, line 5/6: Klostermeyer 1998 is a modeling paper and as such surely a poor reference for vertical wind speeds in the mesosphere. I suggest referring to the original experimental work by Hoppe and Fritts, JGR, 100, 16813 – 16825, 1995.
- Page 23293, line 16: The authors refer to the lidar results by von Cossart et al. for estimates of mesospheric ice particle number densities. They should, however, be aware that measurements in the PMSE-environment indicate that total ice particle number densities (i.e., also involving smaller, 'sub-visible' particles) are much larger than this, see e.g., Rapp and L'ubken, ACP, 4, 2601 – 2633, 2004, for a corresponding review.
- Page 23294, line 3: Please refer to the orginal work of ion induced nucleation by G. Witt and J. Gumbel instead of the cited review paper.

Interactive comment on Atmos. Chem. Phys. Discuss., 9, 23271, 2009.