

Interactive comment on “Unravelling the microphysics of polar mesospheric cloud formation” by Denis Duft et al.

Anonymous Referee #2

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This is a very important study. It shows - for the first time - that H₂O ice will form on metal silicate particles smaller than 2 nm in radius, at H₂O supersaturations that are regularly encountered in the upper mesosphere at high latitudes during summer. The study therefore answers a long-running problem: what is the source of the nuclei for polar mesospheric clouds. The work also shows that the metal oxide/silicate particles do not need to be charged to act as effective ice nuclei under these conditions.

The paper describes a beautiful experimental study, carefully carried out. The precision is such that the authors are able to derive three equations (6, 7 and 10), which determine the ice cloud activation threshold as a function of humidity and temperature, as well as the radius and iron content of the nucleating particle. This is exactly what modellers need to predict where and when these clouds will form, and hence to under-

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stand their relevance as a marker for climate change in the middle atmosphere. The authors are to be congratulated on their achievement.

The paper is clearly written and illustrated, and I have only a few grammatical corrections and other minor suggestions which are listed below.

p. 1, line 12: "We observe that ice growth ..." i.e. remove the comma

p. 1, line 13: define NLC

p. 1, line 25: space-borne

p. 2, line 10: "Model simulations have shown that ..." i.e. remove the comma

p. 4, line 13: the method used to estimate the number of monolayers is described in the next section, and should be referred to here e.g. "(see Section 3.1 for method of calculating layer thickness)"

p. 6, line 3: "we assume is similar..."

p. 7, line 5: " in Nachbar et al. (2018a) ..."

p. 11, line 21: perhaps you could suggest here why there is this disagreement?

p. 12, line 9: "Our findings show that due ..." i.e. remove the comma and "that"

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