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Interactive comment on "Sensitivity of particle loss to the Kelvin effect in LES of young contrails" *by* Aniket R. Inamdar et al.

Anonymous Referee #1

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This is well written and clearly describes a study of how the Kelvin effect can influence the evaporative loss of particles in contrails. The approach and methods are laid out well, and the figures and tables are appropriate.

Two minor comments:

Somewhere in the text (probably page 3, third paragraph or so), the range of particles sizes used as inputs should be listed, and perhaps also in Table 1. This range appears in the figures, but the reader should be explicitly informed as well.

End of page 2 (line 20), it is stated "it is necessary to examine the impact ... [of jet exhaust enthalpy]". Yet in the conclusions, the result of this examination is a minor clause of conclusion 4 ("though the effect of exhaust heat is not seen to be persistent"). If it is considered necessary and important, the conclusion should be more prominent

and more fully stated.

But my major comment is the following:

While the impact of the Kelvin effect on particle loss is studied here, even the results shown in this paper indicate that the potential impact on initial particle growth is much more significant. Looking at figure 1 b, the steep slopes for particles in the 10 - 100 nm range show that much that is going on is sensitive to the early particles sizes (which start at 10s of nm for aircraft PM emissions). Further, comparing Figure 2 a and b shows that the initial particle number has a larger impact than the variation in Kelvin parameter. The initial size and number is defined by competition for water vapor by the initial condensation nuclei (soot particles). Thus, if the Kelvin effect is important for evaporative loss, it also will affect the initial condensational growth. Figures 1 and 2 strongly suggest that the initial number and size, as determined by Kelvin effect mediated competition for water vapor are much more important than the more subtle effects of Kelvin effect on evaporative loss.

My opinion is that the authors should have noticed this, and extended their study to understand the more important end (the initial size and number) of where the Kelvin effect influences things. I don't take issue with the effect of loss, but the paper gives the strong impression that this is the important consequence, when the results they present suggest otherwise.

At the very least, the potential for even bigger Kelvin effects on initial particle properties (size and number) must be clearly stated. And then state that these big effects on initial properties also affect the loss that they are studying (per Figs 1 and 2) and this must be explained fully. But really, it is my opinion that to be scientifically honest, the authors should go back an include a study of the impact of the Kelvin effect on initial condensational growth and have a more complete package, since I think they have focused on a secondary process which is is strongly influenced by what they have left out.

My recommendation is to reject this paper, and the authors should do the complete study that includes the influence of Kelvin effect on the initial condensational growth. If the editor finds this paper's limited scope acceptable, I would strongly maintain that it should only be accepted if the limitations of leaving out the likely dominance of the Kelvin effect on condensational grown are clearly discussed and the results of this study and how they are used are caveated appropriately. But I would prefer that they go back and explore the broader impact of the Kelvin effect by exploring how it affects initial size and number via condensational growth as well as evaporative loss.

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