

Interactive comment on “The day-to-day co-variability between mineral dust and cloud glaciation: A proxy for heterogeneous freezing” by Diego Villanueva et al.

Anonymous Referee #2

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This study is aimed to estimate the role of dust aerosol on the cloud thermodynamic phase using CALIPSO-GOCCP and DARDAR products for cloud phase and the MACC reanalysis for dust mixing ratio. There are some interesting results regarding the relationship between dust and cloud ice. However, I personally found the manuscript to be difficult to follow, which makes it difficult for me to evaluate the scientific merit of this study.

I have the following major concerns for the authors to considered and clarified:

1. Since this paper talks about the role of dust aerosol on the cloud thermodynamic phase, I thought the analyses would focus on mixed-phase clouds. However, mixed-

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phase clouds are categorized into liquid clouds in this manuscript (Section 2.3). Does the analysis focus on pure ice clouds? If yes, what about the effect of dust on cloud phase?

2. Why only stratiform clouds are considered in this study?

3. How would the uncertainties in MACC data, such as the significant overestimate of the fine-dust fraction, affect the analysis results?

4. How would the authors ensure the consistency among the different datasets, i.e., satellite products and reanalysis data? And how would the inconsistency affect the analyses and conclusions?

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