

Author Comment

We sincerely thank the reviewer for the thorough and constructive review of our manuscript. We appreciate the time and effort taken to provide detailed comments, which we find highly valuable for improving our work.

We acknowledge the main concerns raised, including:

- the need for a more comprehensive review of previous studies on albedo and dust/debris impacts on glacier melt;
- a clearer connection between our laboratory experiments and existing albedo models;
- the overly simplified design and analysis of the numerical experiments, and the necessity to frame them in relation to established albedo models;
- the need to refine the discussion and avoid redundancy with already existing models;
- as well as several points regarding presentation, assumptions, and references.

We fully agree that our manuscript will benefit significantly from addressing these issues. Specifically, in the revised version we plan to:

1. Substantially expand the literature review and clarify the novelty of our study compared to existing albedo models and field studies.
2. Re-analyze the laboratory experiment data to derive ice albedo for clean and dusted ice, and compare these with existing parameterizations.
3. Reconsider and strengthen the numerical experiments, possibly by simplifying the computational setup and aligning the analysis with established energy balance approaches.
4. Revise the discussion to directly evaluate our findings against existing models, highlighting the specific added value of our approach.
5. Address all minor comments, including improvements to figures, references, and phrasing.

We thank the reviewer again for the constructive feedback. We will carefully address each of these comments in detail and provide a revised manuscript at the end of the discussion period.