

Earth Surf. Dynam. Discuss., author comment AC3
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Reply on RC2

Da Huo and Michael P. Bishop

Author comment on "Modeling Supraglacial Ponding and Drainage Dynamics: Responses to Glacier Surface Topography and Debris Flux Conditions" by Da Huo and Michael P. Bishop, Earth Surf. Dynam. Discuss., <https://doi.org/10.5194/esurf-2021-53-AC3>, 2021

Thank you for this in-depth review and all the comments! I learnt a lot simply by reading through this review report.

The reviewer pointed out that there are several major issues to be addressed:

- This model assembled too many processes, and many of them do not have enough observational or modeling support. As a result, the overall uncertainty of this integrated representation of multiple complex processes is high.
- This work requires more testing/validation and sensitivity analysis on parameters, process representation, input data quality and resolution.
- Some assumptions and interpretations may be inappropriate, such as the neglect of englacial and subglacial drainage, the longitudinal gradient, the cliff-pond interaction, the albedo of pond, the melt enhancement at periphery, and the positive feedback mechanisms.

I agree with reviewer that more work need to be done to address these issues and achieve a more rigorous model, but we will not be not able to solve all these questions in this study as that would require developing many new models and designing completely new research.

I think the scope of the study is the fundamental issue regarding many of the reviewer's comments. As the reviewer suggested, it is impossible to account for all these processes at this scale given the complexity of the system, which involves numerous parameters and processing that control climate, glacier, hydrology, sediment transport and the couplings between them. Also, we do not have the high-resolution data required to model these more complex processes, such as multi-temporal DEM, debris thickness variation, water temperature, englacial structures. Our aim was not to provide a more comprehensive model that can predict the magnitude of ablation or pond distribution at higher accuracy. Instead, we intended to only focus on surface processes, particularly some new ideas on the potential effects of debris transport and topography on ponding. We plan to make major changes in the revised version, we will further clarify our scope, provide more testing and sensitivity analysis on the core processes, and remove components that introduce high degree of uncertainty.

The line-by-line comments are very helpful, and we have made notes about all these details that we missed and the related suggestions and literatures. We will used them to

improve this study and our future work.