Earth Surface Dynamics Discussions

Earth Surf. Dynam. Discuss., author comment AC1
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Reply on CC1

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-AC1, 2021

Thank you for the comments, and here are our responses:

1. The scale questions: We only focus on the glacier surface processes in this paper, so processes occurred outside or from outside of the glacier surface are not accounted for. Debris transport from the hillslopes will definitely change the debris thickness over longer period, but given the scope of our simulations (one ablation season), the valley scale processes are less dominant at such small time scale. This reason also applies to the ice flow question, the locations of the ponds are unlikely to change much during one ablation season especially in the lower ablation zone where the ice flow slows down significantly. We have stated this in line 150-152 and 401-403, and will further clarify this in the revised version.

2. The englacial process question: The englacial filling and drainage will have major impacts on larger supraglacial lakes, but since we focus on the more common and smaller meltwater ponds that may only exist for less than a year before englacial channels fully develop to connect them, the englacial processes are therefore less important in this study. In addition, we do not have any data about the internal structure of the glacier and no existing model is able to predict englacial hydrology without enough data. In the real-world scenario, part of the surface water will indeed be drained via englacial channels, so our model inevitably overestimates the amount of meltwater stored on the surface for some lakes/ponds. We will clarify this in the revised version.