The Cryosphere Discussions

The Cryosphere Discuss., author comment AC3
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Reply on EC1, community comment by H. Jiskoot

Paul Willem Leclercq et al.

Author comment on "Brief communication: Detection of glacier surge activity using cloud computing of Sentinel-1 radar data" by Paul Willem Leclercq et al., The Cryosphere Discuss., https://doi.org/10.5194/tc-2021-89-AC3, 2021

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1) I think a reference/comparison to Herreid & Truffer (2015: https://doi.org/10.1002/2015JF003502) is in order, as you do discuss several other "static" methods of detecting surge-type glaciers morphological evidence from, this is an automated method based on medial moraine but displacement amount.

author reply: We will include this paper in the introduction.

2) In your comparison to reported glaciers you only use the RGI 6.0 classification (thus Sevestre and Benn, 2015). First, there are gross errors in their classification and they were very selective in certain regions: in East Greenland they only classified glaciers as surge-type when there had been an observed surge even though they used my Jiskoot et al (2003) database. If you compare your "newly found" Greenland surge observations in your Appendix table to my maps in Jiskoot et al. (2003; is your reference list) then you can see that several of the glaciers that you list have indeed been reported as having surge evidence. This includes Rosenborg and several nearby glaciers. Further, Sevestre and Benn's classification is now old (we have >10 more years of observations) and glaciers such as Wykeham Glacier South in the Canadian Arctic (which was already classified as surge-type by Copland et al., 2003: https://doi.org/10.3189/172756403781816301, but not in RGI) has now had some further observations of surging (Van Wychen et al., 2021: https://doi.org/10.1080/07038992.2020.1859359). So, these are just two examples of where your detection of surge-type glaciers is not really a new detection, but rather an independent confirmation of what had already been observed as surge-type by others. I suggest you are a bit more thorough and careful in your reporting on specific glaciers.

Author reply: Both Rosenborg Glacier and Wykeham Glacier South are not among the 69 glaciers where we detected surge activity, but among the 18 where we detected backscatter change that we didn't classify as surge activity (last part of Table S1). We did not classify those 18 glaciers as surging as we were not sure the backscatter change was due to surge activity or to another process such as calving instability. Wychen et al. [2020] ascribe the recent acceleration of Wykehame Glacier South and other Arctic Canadian glaciers to dynamic thinning caused by climate change or calving instability, not to surge activity. This supports our choice not to classify this backscatter change as indication of surge activity. In addition is Wykeham Glacier South included as a surging glacier in the RGI (class 3). So the two examples of Rosenborg Glacier and Wykeham Glacier South do not affect our results.

Nevertheless, it is a fair point that also among the 45 glaciers we found to have surge activity but were not classified as surge-type glaciers in the RGI there could be glaciers that have been identified as surge-type in literature without this being included in the RGI. An example of this is the glacier in East Greenland with GLIMS ID G330976E68786N. This glacier is classified as "likely surge-type" in Jiskoot et al. [2003], but has no surge classification in the RGI. We will include this issue in the Discussion.

References:

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Wychen, W. V., Burgess, D., Kochtitzky, W., Nikolic, N., Copland, L., and Gray, L.: RADARSAT-2 Derived Glacier Velocities and Dynamic Discharge Estimates for the Canadian High Arctic: 2015–2020, Canadian Journal of Remote Sensing, 46, 695–714, https://doi.org/10.1080/07038992.2020.1859359, 2020.