Hazardous calving event on Isfallsglaciären in Northern Sweden as a result of climate warming

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Isfallsglaciären in Northern Sweden is a steep polythermal valley glacier located in the Kebnekaise Mountains, which is well studied and thoroughly observed because its proximity to Tarfala Research Station run by Stockholm University. Isfallsglaciären is also included in the Swedish monitoring program for glaciers reported to WGMS.

The glacier advanced during the 1990s, but continues to recede and thin at a high rate since the turn of the century. On August 26, 2018, a 5x \(10^5\) m\(^3\) large portion of Isfallsglaciärens ice tongue decoupled from the main glacier and began to slide down-valley. Within 5 days, a 50 m wide gap had formed which increased to a width of c. 80 m later during the autumn. The front of the decoupled ice section advanced 50 m (timeframe?) over moderately inclined bed topography, and came eventually to a halt, without developing into an ice avalanche. The upstream cliff of the main glacier advanced first at a high rate and then progressively slowed down forming a new glacier front. [NK1]

The event is very well documented by recurrent aerial photography taken during 2016-2020, as well as more frequent image acquisition a few weeks before, and shortly after, the event. The photos have been analyzed using structure-from-motion photogrammetry to reveal the magnitude of change at a decimeter-level.

Departing from a description of this event, we discuss the impact of hazardous changes on glaciers becoming steeper and thinner due to recession, as well as complications arising for glacier front monitoring as part of the WGMS program.

Similar events have been reported at glaciers elsewhere in Sweden but these events are less well documented and do not influence the monitoring program. In this paper we will describe how data have been handled and inspire to similar studies in any glacier area. We will also discuss the issue in a glacier monitoring perspective.