



The effect of a proglacial lake during formation stage on terminus dynamics of Rhonegletscher, Switzerland

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In recent years two ice marginal lakes (L1 and L2) have formed at the terminus of Rhonegletscher (Switzerland) as a result of a retreat into a basal over deepening. Such terminal lakes are expected to accelerate glacier retreat and may also pose a risk for flood waves from calving into the lake. In this study we investigate the development and effect of these lakes on the terminus dynamics over the last two years by a variety of field observational methods, such as GPS and terrestrial survey measurements, surface ablation, an automatic camera, lake level monitoring and repeated laser-scanning.

We find spatially and seasonally constant and surprisingly high ice speeds over the whole of the ice tongue indicating block flow and high basal sliding all year round. At the margin of lake L1, where the ice is near flotation and the surface flat, buoyancy driven detachment of tabular ice blocks dominates the retreat process. In summer 2009 a large part of this flat ice tongue started to float and dynamically decoupled from the main ice flow through the rapid development of a shear zone. The calving ice cliff at the margin of lake L2 does not show accelerated retreat and in places even slightly advanced. However, a strong surface lowering is observed there and transformed from a vertical ice face into an inclined slope. The observed ice foot beneath the lake surface is expected to play a crucial role for this transformation by providing some additional backstress to the margin.