Geophysical Research Abstracts
Vol. 21, EGU2019-9650, 2019
EGU General Assembly 2019

Risk of major rock slope failure at the Svínafellsheiði mountain, SE Iceland

Þorsteinn Sæmundsson (1,4), Jón Kristinn Helgason (2), Daniel Ben-Yehoshua (3), Bergur H. Bergsson (2), Benedikt Ófeigsson (2), Eyjólfur Magnússon (4), Ásta Rut Hjartardóttir (4), Vincent Drouin (4,5), Joaquin Munoz Cobo Belart (4,5), Harpa Grímsdóttir (2), Gro Birkefeldt Møller Pedersen (4), Finnur Pálsson (4), Snævarr Guðmundsson (6), and Halldór Geirsson (4)

(1) University of Iceland, Faculty of Life and Environmental Sciences, Department of Geography and Tourism, Reykjavík, Iceland (steinis@hi.is), (2) Icelandic Meteorological Office, Bústaðarvegur 9, Reykjavík. , (3) Svarmi, remote sensing company, Árleyni 22, Reykjavík. , (4) University of Iceland, Institute of Earth Sciences, Askja, Reykjavík., (5) National Land Survey of Iceland, Stilliholt 16-18, Akranes. , (6) South East Iceland Nature Research Center, Litlubrú 2, Höfn in Hornafjörður.

One of the most visible consequences of temperature rise in Iceland during the 20th and 21st centuries are fast retreat and thinning of outlet glaciers. The consequences of this retreat are unstable mountain slopes above the outlet glaciers and formation of proglacial lakes. This development increases the risk of large mass movements onto outlet glaciers and into proglacial lakes, causing jökulhlaups.
In 2014, about 115-m long and up to 30-cm wide (in bedrock) fracture was discovered in the Svínafellsheiði mountain slope, above the Svínafellsjökull outlet glacier in the western Öræfajökull ice cap. The fracture is located at 850 m a.s.l. in the uppermost part of a 500-m high, almost vertical mountainside.
During the summer 2016, the fracture was mapped and survey points installed in bedrock on both sides of it. A Digital Survey Model (DEM) was made by drone imagery of the fracture in 2016 and 2017.
In spring of 2018, another fracture was discovered, on recent aerial photographs, in the lower part of the Svínafellsheiði mountainside. Field survey showed that these two fractures are connected and form an up to 1.7-km long fracture system, which can be traced from 850 m height down to the surface of the Svínafellsjökull outlet glacier at around 300 m a.s.l. The lower part of the fracture is located only 1.5 to 3-km from the snout of the glacier. It is assumed that around 1 km2 of the mountain slope is unstable, which might mobilize ∼60 million m3 of bedrock, but the depth to the sliding surface within the bedrock is not know at this point.
Several instruments have been installed on Svínafellsheiði after the discovery of the lower part of the fracture in 2018, to monitor the movement of the slope in real-time. Two permanent GPS stations were installed above and below the fracture and two extensometers were installed on the upper fracture. A TLS lidar survey from the opposite mountainside and a DEM of the lower fracture by drone imagery were also done.
After two years of surveying the fracture system on Svínafellsheiði it is evident that it has been developing over the last 10-15 years as it was not visible on aerial photographs from 2003 but shows on lidar images from 2011. Today, the width of the fracture in bedrock is up to 30-cm and the survey points on the upper fracture show a widening of the fracture of about 1.3-cm per year between 2016 and 2018.
Data obtained by satellite radar interferometry (InSAR) show similar movement rate in the upper slope between 2016 and 2017. Interestingly, the same data reveal 4-5-cm displacement on the lower fracture during the same time interval.
It is evident that the Svínafellsheiði mountain slope shows signs of instability. If the whole area which seems unstable today will collapse as a single rockslide the volume will probably be 60-100 million m3, which would make it one of the largest mass movements in Iceland during the Holocene.