



## The Hítardalur landslide in West Iceland in July 2018

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A large landslide fell from the eastern side of the Fagraskógarfjall Mountain in the Hítardalur valley, W-Iceland, on the morning of July 7th, 2018. The landslide crossed the salmon fishing river Hítará along 1.6 km of the river path, blocked the river and led to the formation of a ~47 ha lake upstream of the slide. The Hítará River was subsequently diverted to the east into the Stekká River, a riverbed that reconnects with Hítará River a few km farther downstream. The Hítardalur landslide is considered among the largest landslides in historical time in Iceland.

The landslide was detected on a seismograph at 05:17 in the morning of July 7th, but signs of instability in the mountain were detected 6 hours prior to the slide, when a foxhunter noticed a small landslide at the location where the large landslide was subsequently released. The landslide fell from an area of mountainside with evidence of earlier displacements.

The release was at around 630 m a.s.l. in the eastern side of the mountain 3.5 km inside the valley mouth and had a vertical drop of around 450 m. The width of the debris tongue is approximately 1.5 km and the run-out length approximately 2.3 km. The run-out angle is 12–13° which indicates high mobility of the moving material. The debris covers approximately 1.5 km<sup>2</sup> of the valley floor. The maximum thickness of the tongue above the original valley bottom is ca. 30 m and the average thickness is around 7 m.

Volume calculations were made by comparing DEMs from before and after the event. The results show that approximately 7 million m<sup>3</sup> of material were released from the source area. The landslide entrained a substantial amount of material on the way down the mountainside. The surface elevation changes in the bottom of the valley indicate a debris volume of ca. 10 million m<sup>3</sup> above the former terrain. Field observations show that the landslide ploughed through sediments at the foot of the mountain and on the valley bottom and, therefore, the debris tongue probably reaches several meters below the former terrain surface. It is hard to estimate the volume of displaced material below the former terrain, but the total slide volume might be 10–20 million m<sup>3</sup>.

InSAR analysis of Sentinel-1 satellite radar data shows major displacements in the source area weeks prior to the event with displacements in the last days before the landslide of tens of cm. The source area also appears to have been moving in 2015, 2016 and 2017 but at a slower rate. The detection of movement before the Hítardalur landslide indicates that large landslides may be associated with precursors that can be detected by satellite data or other measurements. It is planned to analyze slopes above settlements and frequently travelled areas in Iceland where instability is suspected, and detect areas where displacement is occurring. Such areas could then be monitored in near real-time with the same technology.