

## **TDR used for the first time to monitor slope movements in Iceland. A case study from the Almenningar landslide in central North Iceland**

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### **ABSTRACT**

The Tjarnardalir landslide is in the Almenningar area, in the outermost part of the Skagafjörður fjord, in central North Iceland. The landslide, which is a part of extensive landslide area extending about 4 km from the farm Hraun in the south, northwards to the Almenningsnöf, have shown signs of large displacements since a road was constructed in 1965. Almost every year, severe damages occur on the road often causing hazardous condition. These damages manifest themselves as the opening of large transversal and lateral crevasses. In 1977, the Icelandic road authorities started monitoring the sliding movements, and from 2003, extensive studies have been carried out to look for the cause for these displacements.

The front of the Tjarnardalir landslide reaches the present coast, forming up to 60 m high coastal cliffs that show clear indications of extensive coastal erosion. The stratigraphic record shows that the old rockslide deposit rests partly on a fine grained glaciomarine deposits (silt/fine sand) in exposed sections along the shoreline. It also confirms that the compact and lithified glaciomarine deposits forms an impermeable boundary which prevents groundwater penetrating through the old rockslide deposit to percolate farther down. Geomorphological indications show that the landslide mass has a constant westward movement towards the sea, with a maximum rate in the Skógar area up to 70–80 cm/year.

In late 2018, a 43 m deep hole was drilled through the landslide mass. A coaxial cable was installed in the borehole to be able to use the TDR (Time Domain Reflectometry) method to measure the deformation and detect subsurface deformations in the old Tjarnardalir landslide. This is the first time that this technique is used in Iceland.