

Seismic Monitoring of the Unstable Rock Slope at Åknes, Norway

M. ROTH ^{a,c)} & L.H. BLIKRA ^{b)}

^{a)} NORSAR, Kjeller, Norway.

^{b)} Åknes/Tafjord Early-Warning Centre, Stranda, Norway.

^{c)} International Centre for Geohazard, Oslo, Norway.

A sudden failure of the unstable rock slope at Åknes, Norway, has the potential to generate a local tsunami in the inner Storfjord system. The slope is monitored continuously by a multitude of systems, amongst them a microseismic network and a newly installed seismic broadband station. The seismic systems are considered complementary to the direct measurement equipment (extensometers, crack-meters, DMS-columns, laser ranging, optical total station, etc) installed at the site. They record seismic events associated directly with the movement of the slope, as well as secondary events such as small-scale slides and rock falls. Our expectation is that an acceleration of the slope will be accompanied by a change/increase of the microseismic activity.

The seismic network consists of 8 3-component geophones installed on an area of about 250 x 150 m at the upper part of the slope. It has been operational since October 2005, with only very few and brief outages. Data are transferred over radio link in real-time to NORSAR where an automatic event detection is performed. These results are immediately (about 10 min delay) made available in terms of simple daily and monthly overviews, event lists and waveform plots on the project webpage <http://www.norsar.no/pc-47-48-Latest-Data.aspx> and forwarded to the early warning centre <http://www.aknes.no/>. We observe increased microseismic activity during snow melt and heavy/persistent rainfalls. During these periods, also acceleration phases of the slope occurred.

In November 2009, we expanded the seismic monitoring with a high-sensitive broadband station (Guralp ESPC 60 s-100 Hz). The station AKN provides continuous real-time data and it is fully integrated into the NORSAR station network, the Norwegian National Seismic Network and ORFEUS. Data are stored permanently at these institutes and are open to the public. The purpose of the station is to get a better constraint on the location of the microseismic events and to get an overview on local, regional (and teleseismic) events. Real-time displays of the data are made available in terms of short and long-period helicorder plots at <http://www.norsardata.no/NDC/heliplots>.

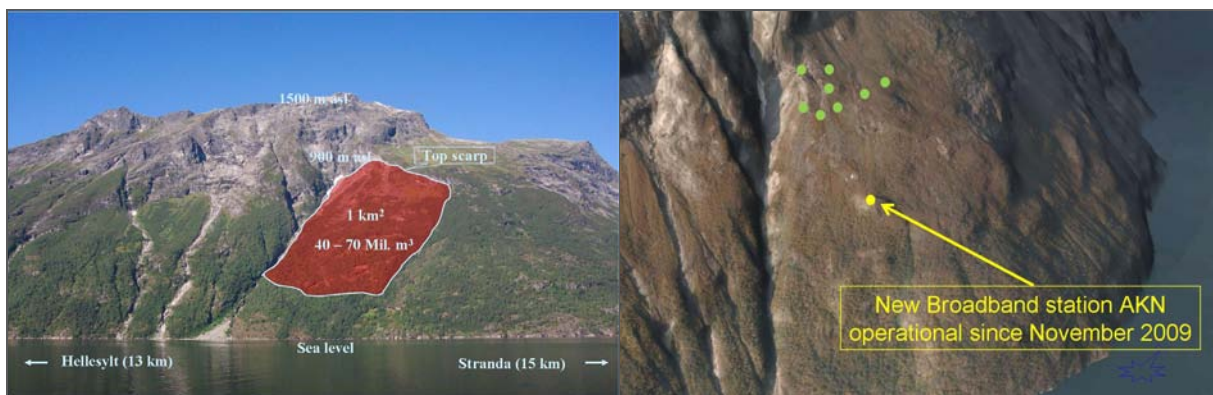


Fig. 1: Left: The unstable Åknes rock-slope in the county of Møre og Romsdal, Norway. Right: Location of the geophone network (green dots) and the new broadband station AKN (yellow dot).

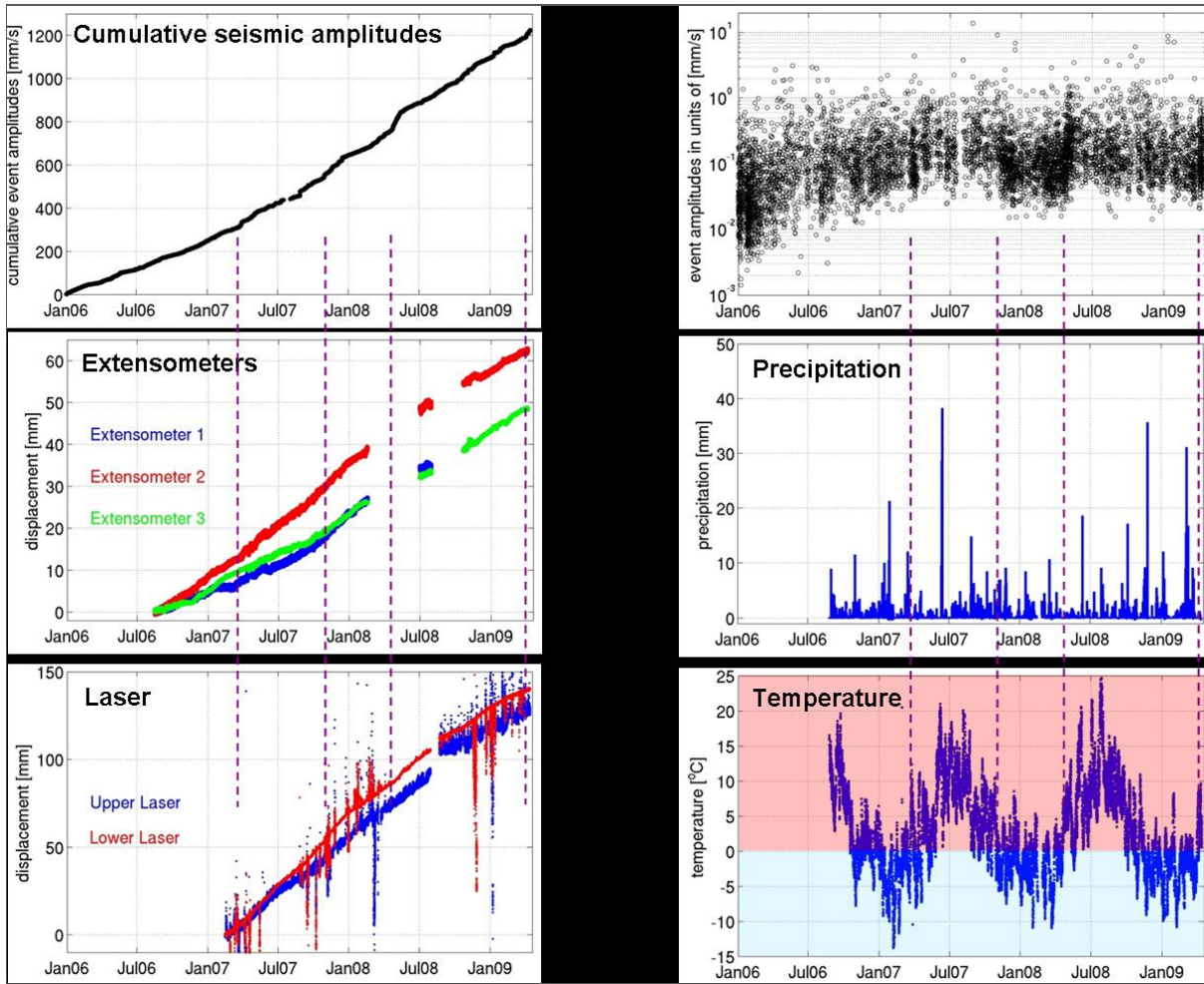
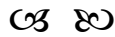


Fig. 2: Overview on cumulative seismic amplitudes, seismic amplitudes, extensometer, laser, precipitation and temperature measurements for the time period January 2006 to March 2009.



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Digitale Literatur/Digital Literature

Zeitschrift/Journal: [Berichte der Geologischen Bundesanstalt](#)

Jahr/Year: 2010

Band/Volume: [82](#)

Autor(en)/Author(s): Roth M., Blikra L. H.

Artikel/Article: [Seismic Monitoring of the Unstable Rock Slope at Aknes, Norway 67-68](#)