Landslide detection and mapping by remote sensing

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ABSTRACT

Landslides are an example of natural disaster of geological nature that seriously threaten and influence socio-economic conditions around the globe. Geology of the region, land cover, soil type, spatial distribution of heavy rainfalls and topography are relevant elements that, when monitored with help of remote sensing, can advance our understanding and prediction capabilities to detect adverse conditions that can trigger landslides. After a landslide event, timely delivery of remote sensing based maps may be of aid for disaster response, documentation and understand of processes involved. Remote sensing data for damage assessment of landslides is mainly of interest if high spatial resolution imagery can be timely obtained, processed, and delivered to the actors involved.

We have tested change-detection algorithms for identification and outline mapping of landslides. The clay landslide on 13 March 2009 in the Gullholmen coastal area in Namsos, Norway, was chosen for an experimental case study applying synthetic aperture radar (SAR). The landslide-affected area could be detected and outlined in a pair of Radarsat-2 backscatter images (VH polarisation), acquired on 7 March 2009 and 31 March 2009. The analysis also revealed differences in the backscattering signal due to other events in the region. Another experiment tested a candidate algorithm for very-high resolution optical data. It successfully mapped landslides-affected areas after a tragic event that took place in Nova Friburgo, Brazil, in 2001.

The presentation will discuss SAR and optical remote sensing techniques for detection and mapping of landslides from satellite observations. It will also discuss the prospects of providing early warning based on land-cover and accumulated rainfall. Algorithm approaches for detection and outline mapping will discussed and supplemented with examples.