Geophysical Research Abstracts, Vol. 7, 04634, 2005
SRef-ID: 1607-7962/gra/EGU05-A-04634

Landslide monitoring in Norway using SAR systems

J. F. Dehls, L. H. Blikra

International Centre for Geohazards, Geological Survey of Norway, Trondheim, Norway
(John.Dehls@ngu.no / Fax: +47 73921620 / Phone: +47 73904454)

Norway faces several challenges involving ground deformation. Urban areas built upon soft sediments are subject to subsidence. Underground excavation can also lead to subsidence. Significant areas of Norway are characterized by post-glacial marine silts and clays that are subject to sudden liquefaction (quick clays). Mountainous areas are subject to landslide hazards. Due to the very large areas involved, remote sensing is vital in identifying and monitoring these types of deformation.

A successful early warning system must include the ability to identify small precursor movements. In the case of landslides, these may be on the order of centimetres per year. Change detection based upon satellite-borne optical sensors is unable to resolve such small movements. Active sensors (e.g. ERS, Radarsat, COSMO SkyMed) that supply phase information must be used. The change detection algorithm should also be as automated as possible so that large areas can be monitored efficiently.

Since the early 1990's satellite-based radar interferometry has been used to identify large ground movements due to earthquakes and volcanic activity. Data stacking methods that take advantage of a growing archive of radar images, as well as increasing computing power, have led to a large increase in the precision of the technique (e.g. Ferretti et al., 2001; Lanari et al., 2004).

The ERS archive has been exploited to detect ground movements in four areas of Norway. Both urban and rural areas have been studied. Urban subsidence, both natural and anthropogenic, has been identified and quantified at various scales. Gravitational creep of landslide deposits has also been observed. Many challenges remain, however. Vegetation and steep topography hinder acquisition of data in some critical areas. Future work will concentrate on the use of the different acquisition modes and geometries of Radarsat 1 and 2, as well as the use of permanent ground-based SAR systems. In

one test area, the interferometric data will be complemented by data from GPS, laser leveling, seismic monitoring and various geophysical surveys.