Application of satellite remote sensing in natural hazard management: the Mount Mangart landslide case study

Abstract

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The use of remote sensing is becoming increasingly frequent in environmental studies. Recently, there has been almost no serious research of the environment performed without advanced image processing and analysis. One of the most important applications of remote sensing can be found in the case of natural disasters, where satellite imagery can be a valuable data source used in order to support rescue operations and damage estimation. With advanced studies, remote sensing can also be used to predict catastrophic events and to determine hazardous areas.
This study presents the application of remote sensing and GIS analysis in the Mount Mangart landslide study. The landslide, which happened in Western Slovenia in November 2000, was the first event observed within the 'Space and Major Disasters' charter. A short description of the charter, its aims and recent activities (more than forty yet) will be given first. The disaster below Mount Mangart is a classical case used to show the value of satellite remote sensing and an even better example for merging optical and radar data. The landslide happened in late November 2000 after several weeks of heavy rainfall and the extent of the event is such that it can be clearly detected with the available satellite sensors.
Shortly after the disaster a group of professionals was established in order to monitor the slide and propose solutions for its stabilization. As the area was dangerous and further slides could occur at any time, the group relied heavily on remote sensing techniques, both airborne and space-borne. In total, 13 satellite images from 1992 to 2000 were utilized: five ERS (both ERS-1 and 2), two RADARSAT, four SPOT (two pan and two multi-spectral), and two Landsat images. In the analysis, an additional layer – a DEM of Slovenia, produced using radar interferometry from ERS images with advanced modelling – was also used. Details on processing optical (SPOT, Landsat) and radar (ERS, RADARSAT) satellite imagery will be presented. Both basic image interpretation and advanced GIS integration and analysis together with the obtained results will be described. The presentation will conclude with general remarks on the usability of remote sensing in hazard studies and the 'Space and Major Disasters' Charter.