Geophysical Research Abstracts
Vol. 16, EGU2014-10634, 2014
EGU General Assembly 2014

Object-based change detection for landslide monitoring based on SPOT imagery

Daniel Hölbling, Barbara Friedl, and Clemens Eisank
Interfaculty Department of Geoinformatics - Z_GIS, University of Salzburg, Austria (daniel.hoelbling@sbg.ac.at)

The steadily increasing availability of Earth observation (EO) data from a wide range of sensors facilitates the long-time monitoring of mass movements and retrospective analysis. Pixel-based approaches are most commonly used for detecting changes based on optical remote sensing data. However, single pixels are not suitable for depicting natural phenomena such as landslides in their full complexity and their transformation over time. By applying semi-automated object-based change detection limitations inherent to pixel-based methods can be overcome to a certain extent. For instance, the problem of variant spectral reflectance for the same pixel location in images from different points in time can be minimized. Therefore, atmospheric and radiometric correction of input data sets - although highly recommended - seems to be not that important for developing a straightforward change detection approach based on object-based image analysis (OBIA).

The object-based change detection approach was developed for a subset of the Baichi catchment, which is located in the Shihmen Reservoir watershed in northern Taiwan. The study area is characterized by mountainous terrain with steep slopes and is regularly affected by severe landslides and debris flows. Several optical satellite images, i.e. SPOT images from different years and seasons with a spatial resolution ranging from 2.5 to 6.25 m, have been used for monitoring the past evolution of landslides and landslide affected areas. A digital elevation model (DEM) with 5 m spatial resolution was integrated in the analysis for supporting the differentiation of landslides and debris flows. The landslide changes were identified by comparing feature values of segmentation-derived image objects between two subsequent images in eCognition (Trimble) software. To increase the robustness and transferability of the approach we identified changes by using the relative difference in values of band-specific relational features, spectral indices and texture instead of by applying absolute spectral thresholds. Especially the Normalized Differenced Vegetation Index (NDVI) turned out to be useful as indicator for change. In this course, recent landslides can be differentiated from already existing mass movements. Furthermore, old landslides, which are already overgrown by vegetation, can be identified as well as reactivated ones. The presented approach can be applied for the regular update of existing landslide inventory maps or for the identification of areas that are potentially susceptible to landslides by analyzing the frequency of landslide events in the past. This might be of interest for decision makers and local stakeholders, as this kind of information can serve as useful input for disaster prevention and risk analysis.