Geophysical Research Abstracts
Vol. 18, EGU2016-520, 2016
EGU General Assembly 2016

Object-based Landslide Mapping: Examples, Challenges and Opportunities

Daniel Hölbling (1), Clemens Eisank (2), Barbara Friedl (1), Kang-Tsung Chang (3), Tsai-Tsung Tsai (4), Gro Birkefeldt Møller Pedersen (5), Harley Betts (6), Francesca Cigna (7), Shou-Hao Chiang (8), Benjamin Aubrey Robson (9), Silvia Bianchini (10), Petra Füreder (1), Florian Albrecht (1), Raphael Spiekermann (1), Elisabeth Weinke (1), Thomas Blaschke (1), and Chris Phillips (6)

(1) Department of Geoinformatics - Z_GIS, University of Salzburg, Austria (daniel.hoelbling@sbg.ac.at), (2) GRID-IT - Gesellschaft für angewandte Geoinformatik mbH, Austria, (3) Department of Geography, National Taiwan University, Taiwan, (4) Disaster Prevention Research Center, National Cheng Kung University, Taiwan, (5) Nordic Volcanological Center, University of Iceland, Iceland, (6) Landcare Research, New Zealand, (7) British Geological Survey, United Kingdom, (8) Center for Space and Remote Sensing Research, National Central University, Taiwan, (9) Department of Geography, University of Bergen, Norway, (10) Department of Earth Sciences, University of Florence, Italy

Over the last decade, object-based image analysis (OBIA) has been increasingly used for mapping landslides that occur after triggering events such as heavy rainfall. The increasing availability and quality of Earth Observation (EO) data in terms of temporal, spatial and spectral resolution allows for comprehensive mapping of landslides at multiple scales. Most often very high resolution (VHR) or high resolution (HR) optical satellite images are used in combination with a digital elevation model (DEM) and its products such as slope and curvature. Semi-automated object-based mapping makes use of various characteristics of image objects that are derived through segmentation. OBIA enables numerous spectral, spatial, contextual and textural image object properties to be applied during an analysis. This is especially useful when mapping complex natural features such as landslides and constitutes an advantage over pixel-based image analysis. However, several drawbacks in the process of object-based landslide mapping have not been overcome yet. The developed classification routines are often rather complex and limited regarding their transferability across areas and sensors. There is still more research needed to further improve present approaches and to fully exploit the capabilities of OBIA for landslide mapping.

In this study several examples of object-based landslide mapping from various geographical regions with different characteristics are presented. Examples from the Austrian and Italian Alps are shown, whereby one challenge lies in the detection of small-scale landslides on steep slopes while preventing the classification of false positives with similar spectral properties (construction areas, utilized land, etc.). Further examples feature landslides mapped in Iceland, where the differentiation of landslides from other landscape-altering processes in a highly dynamic volcanic landscape poses a very distinct challenge, and in Norway, which is exposed to multiple types of landslides. Unlike in these northern European countries, landslides in Taiwan can be effectively delineated based on spectral differences as the surrounding is most often densely vegetated. In this tropical/subtropical region the fast information provision after Typhoon events is important. This need can be addressed in OBIA by automatically calculating thresholds based on vegetation indices and using them for a first rough identification of areas affected by landslides. Moreover, the differentiation in landslide source and transportation area is of high relevance in Taiwan. Finally, an example from New Zealand, where landslide inventory mapping is important for estimating surface erosion, will demonstrate the performance of OBIA compared to visual expert interpretation and on-screen mapping.

The associated challenges and opportunities related to case studies in each of these regions are discussed and reviewed. In doing so, open research issues in object-based landslide mapping based on EO data are identified and highlighted.