The Second World Landslide Forum Abstracts
WLF2 - 2011– 0360
Rome, 2011

The use of stereoscopic satellite images to prepare a landslide inventory map

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A landslide inventory map is essential for geomorphological studies, especially to understand the evolution of the landscape processes and to evaluate landslide hazard and risk. Landslide maps, including geomorphological, event based, and multi-temporal inventory maps, are commonly prepared through the visual interpretation of stereoscopic aerial photographs, aided by more or less extensive field surveys, and by the compilation and analysis of chronicle and archive information on historical landslide events. New remote sensing technologies are proving very useful to detect, map and prepare landslide inventory map. For a study area in Umbria (central Italy), where shallow landslides are triggered mainly by intense or prolonged rainfall, a landslide inventory map was prepared using stereoscopic, optical images acquired by very-high-resolution satellite sensors. The stereoscopic images, available in digital format, enabled to recognize, map and store, in a GIS environment, landslide features. For the experiment we used: (i) panchromatic images acquired by the WorldView satellite sensor on 8 March 2010, and (ii) panchromatic images taken by the GeoEye satellite sensor on 27 May 2010. The satellite images have a ground sampling distance (GSD) of 50 cm, resulted adequate for landslide features mapping. We also acquired ground information through field surveys in the period from March to May 2010 and we prepared a landslide inventory map. A 3D software visualization system was used to map the instability features instead of traditional stereoscopic instruments. The hardware and software system, allows a 3D visualization of the territory, simplifies the acquisition of morphological information and directly allows the digital mapping of the failures. The most relevant advantages of this technology are the ability to: (i) have a wide vision of the study area, (ii) dynamically zoom in and out, (iii) change the contrast during the visual inspection, and (iv) digitize during the image interpretation phase. The latter in particular increases the mapping accuracy and avoids the traditional digitizing process, necessary in the case of classical photo-interpretation method proved to be affected by errors. We present the two landslide inventory maps, the results of their comparison and the relative frequency-size distribution of landslide area.