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Application of Persistent Scatterers deformation inventories to assess regional landslide susceptibility

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The consistency of landslide inventories is an important issue when analyzing a hazard scenario. Landslide Inventory maps depends on the scope, the available resources, and the scale of investigation, and are conditioned by factors such as the chosen data acquisition technique (e.g. field survey or aerial photo-interpretation), the experience of the geomorphologist, and the complexity of the study area (Guzzetti et al. 2000). In addition, the time available to complete the landslide inventory may be a constrain regarding its reliability.
It is now generally accepted that landslide inventories must be permanently up to date. However, it is not easy to guarantee the complete update as well as the robustness of landslide inventories for large areas, because of the time consuming process of landslide data acquisition. In this context, Interferometric Synthetic Aperture Radar (InSAR) methods can provide data to turn more reliable the existent landslide inventories and consequently improve landslide susceptibility assessment at the regional/basin scales.
The aim of this work is: i) to evaluate the possibility to use Interferometric Synthetic Aperture Radar data to generate landslide inventories; ii) to assess landslide susceptibility at a regional/basin scale with Persistent Scatterers-based landslide inventories; and iii) to validate the reliability of this landslide susceptibility map with an independent filed survey-based landslide inventory.
A dataset of 58 ERS-1/2 SAR images, from 1992 to 1998, and a second dataset of 25 ENVISAT/ASAR images, from 2003 to 2009, were processed. The Persistent Scatters (PS) technique was used to estimate the Line Of Sight (LOS) surface deformation. All PSs located on a slope and with a positive LOS velocity (subsidence) are believed to be indicative of landslide activity. The main assumption after images processing and verification (validation) is that the resultant PS data-base corresponds to landslide activity, so, each PS is assumed to be a landslide.
The next step is the integration of this set of PS, assumed as landslide modelling group, with a data-set of landslide predisposing factors (e.g. lithology, slope angle, slope aspect, slope curvature, soil type, and land use) for the basin of Rio Grande da Pipa, Arruda dos Vinhos (Portugal), using a multivariate statistical method (Logistic Regression). As for the majority of landslide susceptibility studies, we assume that conditions that led to slope instability in the past are more likely to generate new instability in the future.
The landslide susceptibility map is validated by the construction of success rate and prediction rate curves, as well as by the computation of the respective Area Under the Curve (AUC). Independent validation of landslide susceptibility map (prediction rate curves) is obtained by crossing the susceptibility map with an independent landslide inventory obtained by field survey at the 1: 2000 scale.

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Guzzetti, F., Cardinali, M., Reichenbach, P. and Carrara, A. (2000) Comparing landslide maps: A case study in the upper Tiber River Basin, central Italy. Environmental Management, 25:3, 247-363.