



The use of InSAR measurements for assessing landslide activity at a basin scale

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For the assessment of landslide hazard at a basin scale the evaluation of the time factor, which is strongly related to the state of landslide activity, is a fundamental issue. Up to now the most common method used for evaluating the landslide activity is the approach based on multi-temporal aerial photo interpretation.

Thanks to recent advances in applying InSAR techniques for landslide monitoring based on multi-interferogram approaches, i.e. Permanent Scatterer (PS), it is possible to use such a multi-temporal InSAR analysis for evaluating the state of activity of landslides. Combining PS analysis with landslide inventories obtained from conventional methods allows the retrieval of information about displacements on slow moving landslides.

For the catchment area of the Arno river in Tuscany (Italy), that is characterised by the prevalence of slow moving landslides greater than 90%, such an approach was applied using an existing landslide inventory and two PS data sets covering two different time intervals. The landslide inventory was built up by using aerial image interpretation and other conventional geomorphologic tools. By analysing about 350 radar images a dataset of about 600,000 PS was obtained. One dataset of PS was calculated for a time period of ten years (1992-2002) while the other dataset consists of PS from the last two years (2000-2002).

Exploiting such PS analysis enabled the identification of two different states of activities of landslides. Dormant landslides showed no significant movement during the last two years, but movements on the ten years data set, whereas active landslides were characterised by movements during the whole observation interval of ten years. On

the other side, inactive landslides remain without movement in both datasets.

For the Arno river basin the existing landslide inventory consists of entries for about 27,000 unstable areas on a total area of 9,100 km². The overlay of the inventory with the results from the InSAR analysis shows that about 7 % of the landslides carries PS information. Even if a number of 7 % is not so high as expected the PS information is a significant result for the temporal assessment of the state of activity of landslides, especially in urban areas, where risk is higher.