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Tracking and interpreting ground surface deformations with PSI techniques in landslide-prone hilltop towns: case study from Italy

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By applying the Persistent Scatterers Interferometry (PSI) techniques to the currently available C-band satellite radar imagery, it possible to detect and monitor very slow displacements (from millimetres to centimetres per year), occurring on selected point targets (PS) exhibiting coherent radar backscattering properties (mainly buildings and other man-made structures). In this study we focus on some difficulties in interpreting the exact geological/geotechnical origin of the PSI results obtained by applying the SPINUA algorithm to ERS1&2 radar data. The work, conducted in the framework of the EU project LEWIS, regards the Daunia region (Southern Apennines), which includes several isolated small hilltop towns affected by slope instability problems. Examples from Daunia urban/peri-urban areas are used to illustrate that, when very slowly moving PS are detected on hillslope areas, this does not necessarily mean that their motions represent slow landslide movements. In general, on slopes, surface displacements over time might be found to be in a downslope direction but such deformations might not necessarily always reflect shear movements or movements leading to shear failure, i.e. to landsliding. The interpretation of PS displacement data on urbanised hillslopes is further complicated, because their movements may arise from a variety of natural or anthropogenic processes and thus may reflect complex deformation mechanisms. Indeed, with the exception of “natural” PS (e.g. corresponding to rock outcrop target), without an appropriate in situ investigation, several different interpretations of the very slow PS displacements are possible: i) deterioration of man-made structures, ii) settlement of engineering structures, iii) volumetric strains within soils, iv) natural or anthropogenic subsidence or uplift, v) extremely slow slope defor-

mations that may or may not lead to failure. The recent PS results showing ground surface deformation changes over time on landslide susceptible slopes are very promising, but the geotechnical parameter and geological boundary uncertainties which control them need to be investigated and better understood before they can be confidently used directly for landslide hazard/risk zonation or for predicting (warning) of potential instabilities. Further research is certainly needed using the technique on test areas with different geological and geomorphological scenarios and giving more attention to the structural behaviour of man-made objects that act as PS targets.

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