

## **Exploitation of amplitude and phase of satellite SAR images for landslide mapping: the case of Montescaglioso (South Italy)**

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Pre- event and event landslide deformations have been detected and measured for the landslide that occurred on 3 December 2013 on the south-western slope of the Montescaglioso village (Basilicata Region, southern Italy). The event, triggered by prolonged rainfalls, created significant damage to buildings and local infrastructures. Ground displacements have been mapped through an integrated analysis based on a series of high resolution SAR (Synthetic Aperture Radar) images acquired by the Italian constellation of satellites COSMO-SkyMed. Analysis has been performed by exploiting both phase (through multi-image SAR interferometry) and amplitude information (through speckle tracking techniques) of the satellite images. SAR Interferometry, applied to images taken before the event, revealed a general pre-event movement, in the order of a few mm/yr, in the south-western slope of the Montescaglioso village. Highest pre-event velocities, ranging between 8 and 12 mm/yr, have been recorded in the sector of the slope where the first movement of the landslide took place. Speckle tracking, applied to images acquired before and after the event, allowed the retrieval of the 3D deformation field produced by the landslide. It also showed that ground displacements produced by the landslide have a dominant SSW component, with values exceeding 10 m for large sectors of the landslide area, with local peaks of 20 m in its central and deposit areas. Two minor landslides with a dominant SSE direction, which were detected in the upper parts of the slope, likely also occurred as secondary phenomena as consequence of the SSW movement of the main Montescaglioso landslide. This work demonstrates that this complementary approach, based on the synergistic exploitation of phase and amplitude SAR data, can become a powerful tool for landslide investigation, allowing the detection of slow, precursory deformation patterns as well the retrieval of full 3D surface displacement fields caused by large, rapid-moving landslides.