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Airborne Laser Scanner, optical high-resolution images analysis and geophysical survey for investigating the slope of Bosco Piccolo village (Basilicata region, southern Italy)

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The characterization of geomorphological features of slopes involved in complex landslide phenomena proves to be very difficult and often requires the combined use of different methodologies. We adopted an integrated approach, based on different observing techniques, to study a landslide (Bosco Piccolo) located in the surroundings of Potenza in Basilicata region (southern Italy), which is often affected by reactivation phenomena of quiescent landslides developing in clayey-marly formation after extreme rainfall or snowmelt events.
The most important reactivation in the study area (8 x 5 km) occurred on February 2005 due to intense snowfalls and rapid snowmelt. The phenomenon was very dangerous causing the collapse of about 80% of the buildings of the village and the subsequent depopulation of the area.
We elaborated optical high-resolution images to provide a general characterization of the involved area by detecting changes in the surface properties, such as vegetation removal and bare soil exposition. For a detailed reconstruction of the Bosco Piccolo slope, a high resolution digital terrain model (DTM) with a cell size 0.5 m was obtained by a full-wave form Airborne Laser Scanner (ALS). Such a configuration allows the detection of surface elevation also under vegetation canopy giving a more detailed topographic information compared to the maps obtained by using conventional instruments (e.g. aerial-photogrammetry). Data were acquired by an integrated system constituted by a laser scanner, a digital metric camera, a Global Positioning System (GPS), and an inertial navigation systems (INS). In order to support and integrate the results obtained from remote sensing techniques, a geoelectrical in-field survey was performed. In particular, electrical resistivity tomographies were carried out to reconstruct the subsoil geometry and to better define the boundaries of landslide body (sliding surface, lateral limits).
The obtained results provided a complete characterization (surface and subsoil features) of landslide area enhancing the effects of 2005 phenomenon as well as those due to the previous events even if hidden by vegetation. The proposed integrated approach can be profitably adopted for slope surveying at different spatial scale in operative context.