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# Mapping rainfall-induced landslides and inundated areas using remote sensing technology and field surveys: the 1 October 2009, Messina, Sicily, event in southern Italy

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In Italy, severe meteorologically induced geo-hydrological events are characterized by a complex combination of landslides and floods, and may cause casualties and damage to urban areas and the utility network. On 1 October 2009, a high intensity rainstorm in the Messina area, Sicily, triggered more than 500 shallow landslides in an area of about 60 km2, mostly in the soils mantling the metamorphic and crystalline bedrock of the Peloritan Arc. The high intensity rainfall further resulted in massive erosion and deposition of debris along the ephemeral drainage channels, widespread inundation, and local modification of the coastline. Damage was particularly severe in the several small villages present in the area, including Giampilieri, Scaletta Zanclea, Guidomandri, Pèzzolo, Altolìa, and Itàla. Damage to the transportation network was also severe and widespread. The several rainfall-induced landslides and the inundations have resulted in 31 deaths, 6 missing persons, numerous injured persons, and more than 2500 evacuated and homeless people. In the aftermath of the event, we: (i) completed a preliminary field survey in the area most affected by landslides and inundations, documenting the ground effects of the intense rainfall, (ii) acquired satellite imagery, including very-high-resolution optical images taken by QuickBird and high-resolution radar images taken by COSMO-SkyMed, and (iii) acquired stereoscopic aerial photography, including pre-event aerial photographs taken in 1954, 1995, and 2005, and post event, very-large scale images taken by helicopter immediately after the event. In this work, we present preliminary results of the exploitation of multiple remote-sensing technologies and information for the identification, mapping and classification of the rainfall induced landslides, and of the eroded and the inundated areas. Emphasis is given to the critical analysis of the capacity and limits of the available airborne and satellite remote sensing technologies for the rapid mapping of geo-hydrological events, and the associated damage.