



## **Integrated geological, geomorphological and geotechnical approaches in long-term monitoring of the large Craco Landslide (Southern Italy).**

**G. Delmonaco** (1), M. De Donatis (2), C. Margottini (1), F. Moia (3) D. Spizzichino (4)

(1) ENEA CR Casaccia, Rome, Italy, (delmonaco@casaccia.enea.it / Fax: +39 06 3048 4029 / Phone: +39 06 3048 4502), (2) University of Urbino “Carlo Bo”, Campus Scientifico, Urbino, Italy (3) CESI Ricerca S.p.A., Milano, Italy, (4) Consorzio Civita, Rome, Italy

The village of Craco (Basilicata Region, Italy) is being affected by large and diffuse slope instability phenomena that have caused, in the recent past, a progressive abandon by the population.

Various landslide typologies affect the historical village and surroundings such as rock-falls in the upper part of the hill, rotational and translational earth slides, earth flows, rock lateral spreading.

In order of better understanding the geology setting of the area, a new digital mapping work has been carried out. The accuracy of GPS location integrated with the data captured in a mobile GIS environment directly in the field has allowed to elaborate a new digital map showing the lithostratigraphic framework and the structural features with their cinematic evolution. The allocthonous units (Argille Varicolori and the thrust-top Albidona e Saraceno formations and the lower Pliocene conglomerates where the village of Craco is located) cover the Pliocene clay and sand marine deposits. All these outcropping units were involved in the fold deformation related to NE verging thrust system.

Landslides are mainly promoted by the geological and structural setting of the area as well as by very low mechanical characteristics of sediments outcropping in the area.

In the last three decades, the southern slope has exhibited the most hazardous conditions with large and very deep slope instability phenomena occurred in 1961 and

1975. A multi-temporal analysis, through an integrated historical and geomorphological approaches, was implemented by processing aerial photos from 1954 to 1999 and indicated a retrogressive activity of the large Craco landslide affecting the outer portions of the conglomerate bedrock.

Since a programme of protection and restoration of the main cultural heritage is intended to be implemented by local authorities, geological and geotechnical investigations were focused to analyse active deformations in the soils outcropping in the upper part of the southern slope.

Since April 2006, monitoring instruments for controlling slope deformations, in vertical and inclined boreholes, and pore pressure evolution have been installed. The monitoring system included also wire extensometers placed along fractures in buildings and structures located in active slope areas, a meteorological station and a central unit for remote acquisition and transmission of monitoring data.

The integrated investigation of landslide evolution acting along the southern slope of Craco permitted to reconstruct the geomorphological activity of the area in the last 60 years. This may help, along with a high-resolution monitoring system, to understand and predict landslide hazard and risk conditions as well as promote effective and long-term sustainable mitigation strategies for the protection and restoration of cultural heritage.