



Monitoring the evolution of the Candela Landslide (Apulia, Southern Italy) using remote sensed data

I. Callegari (1), L. Disperati (1), E. Guastaldi (1), & **D. Naldini** (1)

CGT - Centre for Geotechnologies, University of Siena, Italy (monacinald@unisi.it)

At the end of April 2005 a large landslide occurred in Apulia Region (Southern Italy) hitting the motorway and displacing its route for dozens of meters close to the village of Candela (Foggia Province). The dimensions of the gravitational movement are approximately 1000 square meters and more than 50 meters thick, stretching from an altitude of 400 m a.s.l. to 250 m . This study refers the results of a geomorphological characterisation of the landslide mechanism and its reactivations. The landslide involved clayey-sandy rocks of Ariano Irpino Unit (Lower-Middle Pliocene) and the geomorphological setting of the slope involved is closely connected to the interbedding of these materials, following its variations of competence and texture. Furthermore the area is characterised by the presence of tectonic elements like features that seem to displace the transgressive overlap between the Pliocene and the older units. Two main typologies of landslide are observed: deep rotational slides and superficial flows. A field geological and geomorphological study has been integrated with boreholes, standard penetrometer tests, samples laboratory analyses, installation of inclinometers and piezometers. A photointerpretation has been performed not only in a traditional way using a mirror stereoscope but also with modern techniques as digital photogrammetry of the airborne data. This allowed the realisation of a database organised in a GIS framework. Moreover 3D representations enhanced the meaningful geomorphological features on the basis of a digital terrain model obtained from numerical topography. The analysis has been performed in a multitemporal way, starting from the most recent data which postdate the gravitational phenomena, and advancing afterwards with the photointerpretation of the previous stereopairs (related to the 50s, 70s, 80s, 90s, 00s) which predate the above mentioned phenomena. Each evolutionary phase has been studied by airborne data related to different scales, in order to obtain a good detail. The comparison among databases related to different phases

allows to outline the spatial-temporal evolution of the gravitational movements in the area, beginning from the oldest data. By means of this methodology it has been possible to get information about the possible interference between the realisation of the motorway and the triggering of the landslides. Furthermore the characteristics of the superficial features (trenches, extensional and shear cracks) permitted to highlight the supposed displacement vectors inside the areas involved in active movements. Beginning from the year 1953 the constant recurrence of some key features in the area involved by the landsliding of the year 2005, allows to assume that the final event is the last phase of a mechanism of progressive failure triggered before the realisation of the motorway. The main predisposing factors can be identified in three elements: the clayey lithology, thus the geotechnical properties of the lithologies involved in the movement; the stratigraphic setting of the clayey impermeable formations, overlaying permeable limestones with a discordant contact dipping with the same gradient of the slope; the structural setting and its related hydrogeological implications determined by the intersection of a fault with the slope involved in the phenomenon.