



Monitoring active earth-slides failure dynamics by means of an integrated GPS - automatic total station approach

A. Capra (2), A. Corsini (1), E. Bertacchini (2), L. Borgatti (1), C. Castagnetti (2), F. Cervi (1), M. Dubbini (2), F. Ronchetti (1), C. Bonanno (3), E. Piantelli (3)

(1) Earth Sciences Department University of Modena and Reggio Emilia, Italy, (2) Mechanical and Civil Engineering University of Modena and Reggio Emilia, Italy, (3) Leica Geosystems, Italy, (alessandro.capra@unimore.it, alessandro.corsini@unimore.it)

The research deals with the integration of surface displacement measurements obtained using geodetic and topographic instruments such as GPS and automatic total station in a large-scale active earth-slide. The slide, located in the northern Apennine of Italy, damaged roads and endangered houses during a sequence of reactivations in 2001, 2005 and 2007. Monitoring has been performed by means of an automatic total station measuring about 40 prisms located to a maximum distance of 1.650 km, double-frequency GPS receivers for periodic static acquisitions in 11 benchmarks, 3 single frequency permanent GPS receivers connected to a double-frequency GPS master station. Until December 2007 the monitoring network was operated with periodic static surveyings followed by the data post-processing; while since January 2008 both the total station and the permanent GPS receivers systems were automated in order to allow continuous data acquisition and near-real-time data processing. The monitoring network has been able to cope with displacement rates ranging from millimeters to meters per day, a performance not achieved by borehole systems operated in the slope, such as in-place inclinometers, that were damaged when displacements exceeded some decimeters. The data so far collected, integrated with geomorphic, geologic and borehole data, allowed the complex spatial and temporal pattern of slope movements to be tracked and the relationships between rainfall pattern and acceleration-deceleration phases to be highlighted.