



Estimating mass-wasting processes in active earth slides – earth flows with time-series of high-resolution DEMs from photogrammetry and airborne LiDAR

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The research deals with the use of time-series of High Resolution DEMs (HR-DEMs) to quantify the amount of mass wasting occurred as a consequence of the activity of the Valoria earth slide – earth flow in the 2001 – 2007 period. The landslide, located in the northern Apennines of Italy, resumed activity in 2001 involving up to 15 million cubic meters of clay rich material. In the last years, recurrent movements have caused a significant depletion in the source area and an alternation in time of accumulation and depletion in the track and, partly, in the toe zones. In this framework, estimating the amount of mass wasting in the various landslide sectors is of great importance for a better identification of potential future event scenarios. The analyzed dataset comprised: DEM of march 2003 obtained via supervised photogrammetry, HR-DEM of October 2006 obtained by helicopter-based LiDAR; HR-DEM of June 2007 obtained by helicopter-based LiDAR. As regards LiDAR, the on-board system was composed of an Optech ALTM 3100 airborne laser scanner system, a dual frequency Global Positioning System (GPS) receiver and an Inertial Measurement Unit (IMU). The acquisition parameters were set to obtain an average data density of about 4 pt/m² and an expected vertical accuracy of about 15 cm. The results of multi-temporal DEMs quantitative comparison provided an interesting insight on post-failure landslide mechanisms, by quantifying the remarkable changes in topography caused by the main events and, also, the residual displacements of these mass

movements in the so called “suspended” activity phases. Moreover, the successful experimentation of airborne LiDAR surveys for earth-slides analysis underpins the great potential of the system for risk management in the emergency, in the planning and in the mitigation phases. As a matter of fact, under certain organizational conditions, airborne LiDAR surveys could be also used as a near-real time monitoring system during major failure events, at least for this type of landslides.