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Continuous monitoring of active rock blocks slide in the northern Apennines

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A large and morphologically spectacular rock slope instability is detected in the northern Apennines of Italy. Ten of metres of blocks and columns, in calcareous rock formation, slide and spread on clay shale, dipping down slope 30°.
The geological structures and the morphological features of the slope deformation have been identified with use of high-resolution digital elevation models obtained from ground based laser scanner and airborne LiDAR.
The actual morphological setting of the slope is characterized, also far away form the main scarp, by some metres high columns in vertical position. This suggests that the main deformations are parallel to the slope. Inside the landslide, rock falls are also frequent, due to the failure of large blocks and columns through set of joints.
The origin of the instability is probably related with the erosion of the clay formation, at the foot of the slope, by the close torrent. From the analysis of aero-photographs of the past fifty years is possible identified an enlargement of the mass instability in the up slope direction. A destructive event was recognized in the Seventies, when the road and the bridge below the landslide were destroyed. During the event was documented the passage between slow to very fast moving.
In the summer 2009, after the increase of the slope deformations of the last years, a continuous monitor system was installed. The system is a robotic station that every two hours measures 20 benchmarks fixed in the rock blocks and columns in the landslide area. Today, tens centimetre of displacements are recorded. The data show an increase of the deformations rate with the distance from the main scarp. At the moment, the evolution of the slope is controlled by continuous creeping processes and by period with accelerates deformations. These last correlate with wet and snow melt periods, which are responsible of the variation in the groundwater regime and of the changes in the material behaviour within the sliding zone.