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Rock falls landslides in Abruzzo (Central Italy) after recent earthquakes: morphostructural control

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Recent earthquakes show that damages due to collateral effects could, in some cases exceed the economic and social losses directly connected to the seismic shaking. The earthquake heavily damaged urban areas and villages and induced several coseismic deformations and geomorphologic effects, including different types of instability such as: rock falls, debris falls, sink holes, ground collapses, liquefaction, etc. Among the effects induced by the seismic energy release, landslides are one of the most significant in terms of hazard and related risk, owing to the occurrence of exposed elements.
This work analyzes the geomorphological effects, and particularly the rock falls, which occurred in the L'Aquila area during and immediately after the April 2009 earthquake. The analysis is focused mainly on the rock fall distribution related to the local morphostructural setting.
Rock falls occurred mostly on calcareous bedrock slopes or on scarps developed on conglomerates and breccias of Quaternary continental deposits. Geological and geomorphological surveys have outlined different types of rock falls on different morpho-structural settings, which can be summarized as follow:
1)rock falls on calcareous faulted homoclinal ridges;
2)rock falls on calcareous rock slopes of karst landforms;
3)rock falls on structural scarps on conglomerates and breccias of Quaternary continental deposits.
The first type of rockfall occurred particularly along main gorges carved on calcareous rocks and characterised by very steep fault slopes and structural slopes (i.e. San Venanzio Gorges, along the Aterno river). In these cases already unstable slopes due to lithological and structural control were triggered as rockfalls also at high distance from the epicentre area.
These elements provide useful indications both at local scale, for seismic microzonation studies and seismic risk prevention, and at regional scale, for updating studies and inventory of landslides.