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Geostructural and geomorphic constraints for landscape evolution modelling and stress-strain numerical analysis of the giant Seymareh landslide (Zagros Mts., Iran)

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The Seymareh rock slide-debris avalanche is the largest known subaerial non-volcanic landslide on Earth (44 Gm3), occurred ∼10 ka in the Zagros Mountain Range along the NE flank of the Kabir Kuh fold (Iran). Because of the giant dimensions and the exceptional nature of the event, the landslide was studied by several Authors with different aims, among which identifying the triggering mechanisms. In this frame, our study is aimed at providing new insights on the geostructural and geomorphological factors for this kind of gravitational instability, starting from the reconstruction of the evolutionary and the geotechnical model of the Seymareh river valley before and after the exceptional event.
Geomorphic markers of the valley evolution have been identified after detailed geotechnical and geomorphological surveys and OSL dating of Quaternary deposits. River profile metrics showed the evidence of a transient landscape and the plano-altimetric distribution of the geomorphic markers has been correlated to the detectable knickpoints along the Seymareh river longitudinal profile. The analysis leaded to the identification of five different sectors of the NE flank of the Kabir Kuh fold, whose geostructural and geomorphological characters account for a different proneness to a massive rock slope failure such as the one occurred on the Seymareh landslide slope. Based on the reconstructions of the Seymareh river valley evolution and on an engineering-geological modelling of the outcropping succession of rock masses, the following geostructural and geomorphic factors have been identified as possible constraints for planned landscape and stress-strain numerical modelling: i) the stratigraphic setting, ii) the structural setting, iii) the relief conditions, iv) the kinematic releases, v) the time available for rock mass creeping. More in particular, the Landscape Evolution Model (LEM) of the Seymareh river valley before and after the emplacement of the landslide will be used as input as shape input for stress-strain numerical modelling under creep conditions of slope to calibrating the rock mass rheology by a back analysis and verify the possible role of seismic trigger for the Seymareh landslide as ultimate paroxysmal scenario following a rock mass creep process.