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Geomorphological Investigation on the Siah-kuh Mass Rock Creep Deformation (Zagros Mts., Iran) Through Space-borne Synthetic Aperture Radar (SAR) Interferometry and Quantitative Geomorphic Analysis

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Abstract. The Siah-kuh Deep Seated Gravitational Slope Deformation (DSGSD) affected the SE slope of the homonym anticline in its SE periclinal closure in the Ilam region, only 30 km south of the Seymareh landslide, defined as the largest landslide on Earth surface (Zagros Mts., Iran). The deformation is driven by Mass Rock Creep (MRC) process and covers an area of about 6 km^2. The evolution of the gravity-driven slope deformation is strictly related to the drainage evolution of Dowairij River, since its erosion produced the stress kinematic release at the base of the slope likely starting the deformation process. Such instability is still active, and it has not been evidenced by the scientific community.

The geomorphological study of the area was carried out firstly through the analysis and interpretation of remote data (Google Earth satellite optical images), which led to the first detection of possible gravity-induced landforms, such as bulges and lateral releases within the deformed area of the Siah-kuh fold. To confirm the existence of ground displacement due to landsliding, InSAR techniques and quantitative geomorphic analysis were applied to the area.

On one hand, we produced a surface velocity map and displacement time series in the Siah-kuh slope and surrounding areas by processing 147 radar images of the Sentinel-1 (A and B) satellite on ascending orbit from 17 October 2014 to 31 March 2019. The software SARscape (ENVI) was used to process the images and measure the surface displacements. On the other hand, a quantitative morphometric evaluation was also performed through the *Tu* index, to predict the catchment-scale suspended sediment yield on the deformation area produced by the Dowairij River system. We derived the erosion rate of the drainage network, responsible of the kinematic release of the slope and then, the time at which the MRC process could have started.

Keywords: Mass Rock Creep; SAR Interferometry; Quantitative Geomorphic Analysis; Siah-kuh fold; Iran.