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ASSESSMENT OF GULLY EROSION IN RELATION TO LITHOLOGY IN THE SOUTHWESTERN ZAGROS MOUNTAINS, IRAN USING ASTER DATA, GIS AND STOCHASTIC MODELING

Abstract: *Assessment of gully erosion in relation to lithology in the southwestern Zagros Mountains, Iran using ASTER data, GIS and stochastic modeling.* (IT ISSN 0391-9839, 2018).

Soil erosion in arid areas is a major environmental threat. Gullies, as one of the most intensive soil erosion processes, are very common in the southwest of Iran. Lithology, vegetation density and climate change, as well as land use and land cover change are effective drivers of soil loss in general, and gully erosion in particular. The overall objective of this research is to assess the relation between, lithology and the spatial distribution of gullies in the Mazayjan basin. Data were collected by field survey, interpreting aerial photos and analyzing ASTER multispectral images. Modeling of spatial gully susceptibility was performed with a GIS-based statistical mechanics approach (Maxent). The analysis of ASTER bands ratios yields valuable results in terms of the mineral differentiation of the Zagros Mountain substrates and hence, can be utilized as a tool for lithological mapping. Additionally, the statistical mechanics approach used to assess the relation between existing gully locations and the combinations of lithologic predictor variables show that gullies have a high probability in areas showing substrates with high amounts of salt, gypsum and marl, especially in the plain areas. The model performance shows a very high accuracy both for train and test data. The spatial prediction highlights concentrated gully erosion in areas with aeolian sediments on top of alluvial substrates.

Key Words: Gully erosion, ASTER multispectral data, lithology, topographic indices.

INTRODUCTION

In southern and southwestern Iran, gully erosion is one of the most serious types of soil erosion causing land degradation in cultivated and range land areas (Wasson & *alii*, 2002; Masoudi & Zakerinejad, 2010; Shahrivar & *alii*, 2012; Zakerinejad & Maerker, 2014). The diversity and impact of various factors driving the formation and development of gully erosion are highly variable. Thus, the understanding of the most significant drivers of gully initiation is an important prerequisite to improve land use management and to prevent soil erosion. Gully erosion is the major land degradation process notably in arid and semi-arid areas (see Pickup, 1991; Pringle & *alii*, 2006).

Various researchers have studied the factors and mechanisms which affect gullying in many parts of the world with major emphasis on arid and semi-arid areas (Ghodosi, 2006; Kheir & *alii*, 2007; Samani & *alii*, 2010; Shahrivar & *alii*, 2012; Zakerinejad & Maerker, 2015). Areas with scarce vegetation and a high amount of silty soils are particularly affected. Most gullies occur in unconsolidated materials, including colluvium and alluvium, deeply weathered substrates (Ahmadi, 2007; Conoscenti & *alii*, 2008; Maerker & *alii*, 2008; Frankl & *alii*, 2012) or aeolian deposits such as loess formations. Moreover, soils prone to piping and tunneling, such as dispersive soils (Faulkner & *alii*, 2003; Valentin & *alii*, 2005; Shahrivar & *alii*, 2012), often show features of gully erosion.

Factors such as erodibility of substrates and soils, topography, neotectonic effects, land use or land cover changes, and climate change are considered as the main drivers of gullying. These factors are particularly common in large parts of Iran (Onwuemesi, 1990; Obiefuna & Adamu, 2012), where gully erosion occur especially in pediments, colluvial slopes and alluvial plains.

In the recent past the authors assessed various factors influencing gully erosion in the study area concentrating mainly on topographic settings, land use and vegetation

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