

Investigating the interaction between rivers and sand dunes in arid and semi-arid regions of Iran

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Extended abstract

1- Introduction

Fluvial and aeolian processes are important factors in changing the surface of morphology in the Earth. When rivers and sand dunes meet, the transportation of sediment between them can lead to one of the systems or both of them change. With their connection between river sediment and wind systems there would be lots of reactions, but very little has been studied. According to the previous studies in Iran, river and wind systems have been studied separately. Whereas ground-level processes rarely interact with each other, there is so many important proofs that river and wind processes simultaneously are interacting. The interaction between these two processes is important for maintaining the purposes of an intergrated management of fluvial and aeolian systems, considering the wide vastness of Iran's effect by wind and river erosion. This research is the first inventory of interactions between rivers and sand dunes with the aim of systematically analyzing of the interactions between fluvial and aeolian geomorphology and determining the dominance of Fluvial and aeolian systems in different environments.

2- Methodology

The method of this research is descriptive-analytical. This study is a visual search of the interactions between rivers and sand dunes using satellite imagery hosted by Google Earth (GE) as well as Landsat 8 (USGS) images in the arid and semi-arid regions of Iran. Using these images, surface and landforms from fluvial and aeolian processes can be identified. Because of this reason, this study focuses on the interactions between sand dunes and rivers, where the characteristics of both are easily reconized. To intensify this research, library resources including books and articles have also been used. The search of methodology started at the margins of dryland areas visually identified within Google Earth. Than Identifiable river courses were (bieng traced up and down the streams to find places where aeolian dunes interact with river courses. Interactions were identified at a regional scale. In this research, 304 sites, where rivers and sand dunes met, are identified and analyzed by using imagery satellites for the first time in the country. The classification scheme of Liu and Coulthard (2015) has been used to classify the types of interactions between the sand dunes and rivers. At each site a key word has been used to classify the types of interactions between the sand dunes and rivers. At each site key attributes such as river direction, sand transport direction, fluvial aeolian meeting angle, sand dune type, and river channel pattern were identified and their relationships between each factor was investigated. Based on the data, six different types of interactions between rivers and sand dunes were classified, that reflected changes between the fluvial and aeolian systems.

3- Results

According to the data from 304 sites in arid and semi-arid regions of the country, although longitudinal sand dunes are most occurring among all the sand dunes, a similar distribution of channel patterns can be observed for each level. Braided channel patterns have the highest frequency and straight channel patterns and others have the lowest frequency. In all of different channel patterns, the most frequent interaction is fully fluvial

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dominant and the less frequent one which is the type of mostly aeolian dominant and balanced. In braided channel patterns, the frequency of interactions from types of mostly aeolian dominant and balanced more than other patterns. In balanced conditions, rivers and dunes connect more in the angles of 45 to 90 degrees

4- Discussion & Conclusions

Four variables changes has been analyzed to seek possible relationships between fluvial and aeolian systems, including dune type, channel pattern, meeting angle and the interaction. The results showed that there is a significant relationship between the type of meeting angle and the type of sand dune, the meeting angle and the type of interaction, the channel pattern and type of interaction. These relationships have shown that active river channel patterns are most common where aeolian or fluvial systems are dominated, but the balance between them is not sustainable. There was also no relationship between sand dunes and channel patterns. The results of this study are in line with Liu and Coulthard (2015) studies that show significant relationships between fluvial and aeolian processes. The results of a survey of 304 distributed sites in the arid and semi-arid regions of Iran showed an extensive interaction between rivers and sand dunes. According to the results, it can be said that in many sites, wind and river processes have a significant impact on each other and then on the landforms and geomorphology of the site. Nevertheless, more research is required to investigate how each fluvial and aeolian processes affect each other, as well as geomorphologic changes caused by them in Iran.

Keywords: Fluvial–aeolian interaction, Dunes, River, wind/river direction, Geomorphology.