Determinatin of source areas of aolian sands Based on Mineralogy and Morphoscopy of Sand grains (Case Study: Sufian Qom Hill - North of Lake Urmia)

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1. Introduction

Our country lies in the arid and desert belt of the world and is two-thirds of its size in the realm of dry land. Works such as the drying up of inland lakes, sandstorms, dust, and the intensification of wind erosion have prevented the rate of desertification in recent years in the country (Shiravi & Sepehr et al., 2016). The area of arid and ultra-arid regions is 472566 and 573884 km², respectively, which is approximately 631.5 arid and semi-arid territories based on the modified Damarton system. In this system, the areas with drought index between 0-5 and 10-15 are considered as arid and ultrasound respectively. The amount of erosion and the volume of material transport in arid regions depend on the wind speed, direction and frequency characteristics, and on the ground, topography, and sedimentary features. Understanding the geomorphologic features of the toll that develops in the morphoclimatic environments of arid regions can inform us of such environments and aware the human beings towards actions that may alter ecosystems and natural habitats. The geomorphologic features of arid lands especially sand dunes are the result of specific dynamics and variability in these areas (Xin-Rong Li et al … 2010).

Investigating and studying the related research background, it was found that most of the geomorphologic classifications and analysis of arid lands were done using the most important factors affecting the geomorphologic, geomorphometric parameters, and the prevailing winds. The present research was conducted to identify and investigate several sections through dominant wind and mineralogical analysis in the hilltop sand dunes located on the western side of the Sufian city, which today is experiencing the development of downstream industries.

2. Material and Methods

One of the important factors which is necessary for the formation of wind dunes is the source and the origin of the sand. It is not formed without the elements in the size and size of the dune sand. Therefore, in areas where there is wind erosion and the source of
sand harvesting, they are heterogeneous. Pie and Tsevar (1990) find that the amount of sand supply is dependent on the type of rocks exposed in the area, the speed, weathering conditions, the erosion, and the efficiency of other sediment transport factors in separating the sand particles from the larger particles. According to Smith (1982), running water often plays a key role in the sorting and concentration of weather-induced crop transfer products. In order to provide the source and the origin of sand, conditions, and factors are known as morphogenesis and morph dynamic systems.

3. Results and Discussion

Morphoscopy of sand dune elements
For morphoscopy examination of sand in hill tribe, 5 specimens were selected systematically according to their dispersion while the microscopic examination was performed on them. In this study, the grains were studied from two aspects, one being the surface condition of the grains having matte, aura, luminous, physical, and chemical degradation modes, and the other in terms of abrasion; thus, the grains are more exposed to water and wind. The more it is worn, the more rounded it is and the distance traveled can be determined in addition to the shipment.

Wind situation based on synoptic stations
The purpose of this study is to study the mineralogy of the origin and to analyze sand dunes cross section in Qom Sufi hills, firstly, based on daily wind statistics of Shabestar and Tabriz synoptic stations, which is the nearest synoptic study site. Using Land Rose software, wind direction prediction (annual and monthly) was done. Based on the theoretical basis that wind flows from a high-pressure cell to a low-pressure cell, the temperature gradients have an effect on the temperature between the two currents. Considering the direction of the winds in the region, the study has been attempted to identify the topography of the wind erosion forms, their location, and how they affect the direction of the region’s winds. The wind data from the Tabriz Synoptic Station and Shabestar West between 2012 and 2017 were used to investigate the wind situation in the region. Accordingly, high winds at the Shabestar station, northwest-northeast and at Tabriz station, east-northeast with high frequency and speed. Of course, there were also winds with less abundance in the north, northwest, south, and southeast.

The early origin of the hill folk dunes
The wind dunes of the Northeast Highlands (Moreau), the Northwest Highlands (Misho), and the North Sufian Highlands can be considered as the primary from their original location sources after the impact of morphogenesis and degradation of the rocks due forming these mountains. Directly transported by wind and deposited in the local wind dunes it accumulates in the form of sand dunes. But, in the Qom hill Sufian can such a sand be found to have the properties to move and precipitate directly after being separated from the base stone by wind. Morphoscopy on the sands of the region also confirms this. Therefore, the material produced in these mountains by morphogenic processes is transported by transport agents, especially current waters and is accumulated in lower areas after decelerating; thereby, providing a secondary source for the dunes are examined.
Secondary origin of the hill folk wind dunes

Secondary origin is that the dispersed material is transported in elevated areas and at its initial location under the influence of morphogenic factors, especially water, and is accumulated in sediments, alluvial fans, rivers, and pits (Jian Hua XIAO et al. 2015), and then as these discrete elements dry up, the wind moves them and accumulates as wind dunes. As the dunes expand and the southwest wind prevails over other winds, the secondary origin of these dunes will be mostly in the west and southwest of the region. This does not mean, of course, that only sand is transported to the area. Because of the prevailing winds and their predominance at certain times of the year, they can move sand from other areas, especially east and northeast, due to the dominance of the east and northeast winds in summer according to the charts. Therefore, the secondary origin of wind dunes in the region can be divided into:

4. Conclusion

Like most sand dunes in Qom, the sand dunes have a gentle slope to the direction and side to the wind and a steep slope to the back. On the back side of the wind, there are protrusions and recesses. The protrusions are made by connecting the arms to each other and have a lower height and slope while indentations are longer and have a higher slope. The origin of the winds in the region is mainly due to the predominantly sandy soils as well as the occurrence of fine sediments at the end of the area's fan cone and plate floodplain, which may not account for much of the surface area. And the end of by cones feeders that bring out the sedimentary are provided. In fact, the rivers of the area, after exiting the mountains, developed on the plainland and aware of there are processes affecting the development and evolution of the sandy surfaces of their have surrounding land. The results show that wind erosion is more frequent wherever plate floods are wider. As a result, the main source of sand supply is the sediment of the old rivers and the barren lands without its hard surface cover. In order to orient the source regions, the status and direction of the winds of the area were analyzed using the Globad diagrams and field data were selected from five sections systematically. High energy verifications indicate that the main contributors to sand supply and dominant winds by transport of fine sediments and rocks (carbonate and volcanic) are bedrock of old rivers and barren lands without surface cover wherever floods occur. The wider the plate, the higher the wind erosion in favor of dune development.

Keywords: Sand Dunes, Geomorphology, Cross Sectional Analysis, Qom Hill Sufian, XRF, XRD Tests

References (In Persian)


Reference (In English)


