Rainfall Erosivity Mapping in Kerman Province based on Geostatistical Methods

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Extended Abstract
Introduction
Rainfall erosivity, the propulsion or power of causing erosion in separation and transport of soil particles, is in relation to water erosion. Rainfall erosion is causing loss of soil, damage to agriculture and infrastructures which is followed by water pollution. Changes in rainfall patterns exacerbate risk of erosion globally. Rainfall erosivity plays an effective role in soil erosion and represents potential erosion in the study areas. Following the rainfall erosion, all types of water erosion can be occurred. Consequently, it not only makes soil to be eroded but also lead to filling of dam reservoirs, channels, water pollution and ecological changes. Regarding these mentioned problems, it is necessary to investigate various aspects of water erosion. Under the same condition, rate of soil loss is directly proportional to the rainfall erosivity. This can be expressed as erosivity factors which are based on rainfall characteristics. Various researchers have attempted to provide factors that are based on rainfall characteristics using simultaneous measurement of soil splash (or soil loss) and rainfall characteristics to determine relationships between them. Various factors have been proposed throughout the world. These factors are different because of geographical location, scale, local conditions and type of instruments. The concept of rainfall erosivity was proposed by wischmeier and smith (1958) in order to consider the effects of climate on soil erosion. Rainfall erosivity can be determined either using direct

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measurements or appropriate factors. Direct measurement method is a suitable method to determine rainfall erosivity which is done by measuring the amount of splashed soil. Event-based measurement of erosivity of rainfall for broad area is difficult and time-consuming. Therefore, researchers have attempted to provide factors that are based on rainfall characteristics using simultaneous measurement of soil loss and rainfall characteristics and relationships between them. For different areas, rainfall erosivity can be determined using these characteristics without direct measurement. In general, rainfall erosivity factors can be divided into two groups: 1) factors based on energy and intensity of rainfall; 2) factors based on readily available data. One of the most famous factors is EI_{30} which is based on kinetic energy and intensity of rainfall. One limitation in using this factor and also other factors which are based on rainfall erosivity is that they need long-term data (>20years) recorded with short intervals. Such data are recorded in the stations equipped with rain gauge. Therefore, due to lack of these long-term data, researchers have proposed factors that use available rainfall data (i.e., daily and monthly data). This recent factors are computed based on regional sediment analysis or its relationship with EI_{30}.The purpose of this study is to prepare rainfall erosivity map for Kerman province with semi-arid climate and to determine the most suitable interpolation method. Although such a map has been produced by Nicknami (2014) for Iran, it's not available for Kerman specifically.

Material and Methods

This study was carried out in Kerman province. The province has an area of181714 square kilometers and is located in the southeastern Iran. Kerman covers more than 11 percent of the area of Iran. It is the largest province in terms of land area which is located in the southeast part of the Central Plateau. In order to estimate EI_{30} index for the areas without rain gauge, the regression analysis were used between this index and some readily available indices of the 17 stations equipped with rainfall stations. Based on average maximum monthly rainfall index, the most fitted regression has R^2=0.882. Twenty years data (rainfall intensity & daily rainfall) for all stations (include: Synoptic, Climatology, Evaporation and Rain gauge stations) were used for this study. Outliers were removed by visual surveying of all collected data. Normality of the data distributions was tested using Kolmogorov-Smirnov in SPSS version 22. Finally, 135 meteorological stations and 17 rain gauge stations were chosen.

Conclusion

The results showed the maximum and minimum index equal to 74.213 and 91.24 (MJ-mm acres per hour) for Soltani and Dolatabad Esfandagheh stations, respectively. Simple kriging method was selected as the most appropriate interpolation method using cross-validation techniques. The zoning map of rainfall erosivity factor was prepared in ArcGIS software. The results also showed the highest rainfall erosivity values for Baft, Bardsir and Sirjan cities (located in southwest of province), and the lowest values for Bam, Jiroft, Kahnouj and Ravar cities (located in east, south and north of province), respectively.

Keywords: cross-validation, ei_{30}, Kerman Province, index, recording rain gauges.