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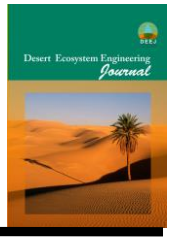

Analyzing the Spatial Pattern of Drought in Central and South Zagros Using Remote Sensing Indicators

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Extended Abstract

Introduction: As a complex phenomenon occurring due to a long period of poor precipitation, drought causes water scarcity in the soil and the hydrological system via hydrological, bringing about long-term consequences which may lead to severe economic, environmental, and social problems worldwide. Droughts are classified into four types: meteorological (rainfall), agricultural (soil's moisture), hydrological (flow and groundwater), and socio-economic droughts. It should be noted that all types of droughts originate from meteorological ones, bringing about social and economic damages. on the other hand, Iran has long been known as a dry country with a low annual precipitation rate. Moreover, the development of spatial and satellite sciences, the application of remote sensing techniques, and GIS together with previous methods have led to more accurate results. Therefore, investigating the relationships between satellite-derived indicators and meteorological droughts could improve our understanding of the response of such indicators to climate change.

Research Methods: This study sought to investigate the relationship between remote sensing indices and the drought index (SPI). To this end, first, the daily precipitation statistics of 103 meteorological stations located in the study area were collected from the Iranian Meteorological Organization's website for the 2000- 2019 period and their quality was controlled. Then, the SPI drought index was measured for all such data on monthly and annual scales using the McKay method, according to which the total annual precipitation was compared to the fit of different distributions. Then the probability of the observations' experimental occurrence was calculated based on the relationship between the aforementioned equations.

Moreover, after measuring the SPI index in the stations located in the study area, the MOD021KM outputs of the Terra sensor for the 2000-2019 period were obtained from the USGS website, to which necessary geometric, radiometric, and atmospheric corrections were applied. Finally, the NDVI, VCI, TCI, VHI, DDI, NDDI, EVI, NDWI, and SAVI indices were used to assess the drought conditions, and a monthly time series database was created for each of the indices over the past 20 years.

Results: The study's findings indicated the acceptable efficiency of remote sensing indices in extracting the data required for analyzing the drought in Central and South Zagros via the SPI index. The drought-related data

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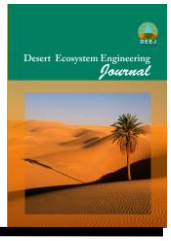

and indicators of the study area were obtained and identified using the KMO and Bartlett index, whose range varies from zero to one. Accordingly, in cases where the index value is close to one, the collected data are suitable for factor analysis; otherwise, the results of factor analysis would be not appropriate for the intended data. In this regard, the results of Bartlett's statistics also suggested that the remote sensing indices affecting the drought in the study area were suitable for factor analysis, indicating that the confirmation of the opposite hypothesis, according to which there was a significant correlation between the variables.

Discussion and Conclusion: This study sought to investigate nine remote sensing indices affecting the analysis of drought in Central and South Zagros. The results of factor analysis revealed that the drought in the study area was affected by three factors. In the first factor, SAVI, NDVI, VCI, and EVI indices showed the highest correlation. In the second factor, NDVI, DDI, TCI, and VHI were of great significance, and in the third factor, the NDDI index played the most important role. In the next phase, the relationship between the spatial pattern of remote sensing indices and drought's spatial clusters was examined. Spatial relations analysis is a method to spatially analyze the randomness and non-randomness of the distribution of spatial variables. Furthermore, spatial autocorrelation is one of the most practical and important analytical tools for researching spatial relationships. In this regard, it was found that remote sensing indices and SPI drought index possessed a positive spatial autocorrelation in terms of spatial relationship in eastern, southern, and some parts of the central regions of the study area. Therefore, it could be argued that the areas were more affected by drought in terms of spatial autocorrelation index G *. On the other hand, out of the indices investigated in this study, SAVI and NDVI had the most similarity in terms of regions with positive cluster patterns, possessing the most positive spatial patterns. The results of the impact factor analysis performed on the correlation between the SPI and remote sensing coefficient confirmed that the spatial distribution of drought was of cluster type.

Keywords: Drought, Zagros, SAVI, NDVI, VCI, EVI, SPI.