

Calculation of Fractal Dimension and Its Relation to Some Morphometric Characteristics of Iranian Landforms

Authors : Mitra Saberi, Saeideh Fakhari, Amir Karam, Ali Ahmadabadi

Abstract : Geomorphology is the scientific study of the characteristics of form and shape of the Earth's surface. The existence of types of landforms and their variation is mainly controlled by changes in the shape and position of land and topography. In fact, the interest and application of fractal issues in geomorphology is due to the fact that many geomorphic landforms have fractal structures and their formation and transformation can be explained by mathematical relations. The purpose of this study is to identify and analyze the fractal behavior of landforms of macro geomorphologic regions of Iran, as well as studying and analyzing topographic and landform characteristics based on fractal relationships. In this study, using the Iranian digital elevation model in the form of slopes, coefficients of deposition and alluvial fan, the fractal dimensions of the curves were calculated through the box counting method. The morphometric characteristics of the landforms and their fractal dimension were then calculated for 4 criteria (height, slope, profile curvature and planimetric curvature) and indices (maximum, Average, standard deviation) using ArcMap software separately. After investigating their correlation with fractal dimension, two-way regression analysis was performed and the relationship between fractal dimension and morphometric characteristics of landforms was investigated. The results show that the fractal dimension in different pixels size of 30, 90 and 200m, topographic curves of different landform units of Iran including mountain, hill, plateau, plain of Iran, from 1.06 in alluvial fans to 1.17 in the mountains are different. Generally, for all pixels of different sizes, the fractal dimension is reduced from mountain to plain. The fractal dimension with the slope criterion and the standard deviation index has the highest correlation coefficient, with the curvature of the profile and the mean index has the lowest correlation coefficient, and as the pixels become larger, the correlation coefficient between the indices and the fractal dimension decreases.

Keywords : box counting method, fractal dimension, geomorphology, Iran, landform

Conference Title : ICGES 2022 : International Conference on Geography and Environmental Studies

Conference Location : Rome, Italy

Conference Dates : September 15-16, 2022