EXTRACTING LANDFORM ELEMENTS FROM DEM BASED ON MORPHOMETRIC ATTRIBUTES

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ABSTRACT

Landforms are very important to understand the influence of terrain topography on hydrologic and sedimentary processes and soil spatial distribution within the landscape. Many attempts have been made to partition continuous land surface to discontinuous landforms with specific geometric and topological characteristics. This paper presents a semi-automatic approach to extract five landform elements of ridge (summit), slope shoulder, backslope, slope foot, and valley from DEM based on its derived attributes using a fuzzy c-means classification. By analyzing the characteristics of popular morphometric attributes used for landform classification such as slope, plan and profile curvature, compound topographic (wetness) index, horizontal and vertical relative position indices, and so on, two new attributes are introduced for a more precise and suitable landform partition in a large rugged mountainous area. That is, an average percent slope modified by Jacek is adopted to enhance identification of convexities, concavities, and flats in a large scale spatial context, while a relative elevation index based on the concept of lacunarity analysis is developed to reduce errors of classifying local elevation maxima as ridge or summit. The landform classification based on these attributes derived from DEM is a fuzzy c-means clustering algorithm that is implemented by Python and Numpy package. The resulted landform elements are finally compared by visually overlaying with contour lines, stream network, and drainage divides, it shows the present morphometric features and classification methods are capable of modeling fundamental landform elements that can be used in land resource management.