

デジタル地形モデルと地理情報システムを用いた中国丹霞地形の地形解析 Morphometric analyses of Danxia landforms in China using GIS and DEMs

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We conducted DEM-based geomorphometric analyses to assess the influence of lithology and geologic structures in shaping the morphology of sub-tropical mountain stream channels in the Chishui, Mt. Danxia and Longhu areas, the typical Danxia landforms in China. The areas show different stages of erosion: young, mature and old. Basic properties of drainage structure such as stream order, drainage density, the bifurcation ratio, hypsometry and the stream length ratio, as well as slope angle data for sub-watersheds were obtained from DEMs. Then relationships among the morphometric properties were investigated. The relationship between drainage density and slope angle for each sub-watershed can be divided into four types that correspond to the different stages of channelization. Stream longitudinal and transverse profiles for the watersheds were then examined, and anomalous points where the morphometric characteristics change abruptly were identified. The locations of ca. 80% of the identified anomalous points correspond to the knickzones where relative steep river segment were identified based on analyses of stream gradient. The geomorphic indices of concavity and steepness were calculated from stream slope-area data. Concavity is a measure of stream-profile curvature and is a function of channel substrate properties. Transition from incision to deposition and lithology are responsible for the change in concavity. A prominent knickzone may represent the upstream propagation of base level lowering is accommodated by headward erosion. Some knickzones are also related to the boundaries of lithology and flow perturbation around major stream confluences. We suggest that the relative location of the watersheds play a significant role in the evolution of morphology of the landscape for the early stage region; whereas, the shape of the topographic profile in the old and mature stage regions mainly corresponds to lithologic contrasts and relief structures.

Keywords: Danxia Landform, DEM, Knickzone, Concavity and steepness, Longitudinal and transverse profiles