

Morphotectonic Study of Iring watershed, Tamenglong District, Manipur, India

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Abstract

The primary focus of study is on the morphotectonic investigation of the Iring watershed in the Manipur district of Tamenglong. Various morphotectonic factors were studied using data from Aster-DEM, SENTINEL-2 satellite, Survey of India Topographical Maps, and field verification. Drainage Basin Asymmetry (AF), Transverse Topographic Symmetry (T), Basin Elongation Ratio (Eb), and Valley Floor Width to Valley Height ratio (V_f) are a few examples of geomorphic indices that were examined. It was found that the 118.67 km² basin is tectonically active, as evidenced by structural characteristics and geomorphic parameter values. River stress knick sites are indicated by regions with an SLK index greater than 10. The watershed exhibits asymmetry, as indicated by the average T value of 0.195. Actively incising V-shaped valleys linked to uplift are indicated by V_f values between 0.192 and 0.263. The river is migrating to the western side due to elevation on the eastern side, as shown by the AF result of 47.72%. A basin that is extended and experiencing tectonic activity has a basin elongation ratio of 0.66. The hypsometric curve and hypsometric integral (~50%) indicate that the erosion process in the basin is at its early mature stage.

Keywords: Morphotectonic Indices, Active Tectonics, Geology, Morphometry, Drainage Basin, Hypsometry

Introduction

In order to examine the landforms and relative level of tectonic activity of the Iring watershed, a number of geomorphic indices are estimated. Aster-DEM, satellite data, and topographic maps are used to compute various quantified geomorphic indices, which provide important details about the tectonic history of a region (Keller, 1986). Utilising geomorphological, structural, and neotectonism data in a constructive multidisciplinary manner provides valuable insights into the active tectonics of a region (Wells *et al.*, 1988). We therefore analysed six geomorphic indices: stream gradient index (Hack, 1973), hypsometric integral (HI), (Strahler, 1952) along with convex-up hypsometric curve, drainage basin asymmetry factor (AF), (Hare and Gardner, 1985; Keller and Pinter, 2002), basin elongation ratio (Eb), (Schumm, 1956), ratio of valley floor width to valley height (V_f), (Bull and McFadden, 1977), and transverse topography symmetry factor (T). These features are very useful and important indicators in exploring the relative tectonic activity (Bull and McFadden 1977; Keller and Pinter 1996; Burbank and Anderson, 2001). The aforementioned indicators are used to assess the basin's relative tectonic activity level and to corroborate the findings of the SL-index study conducted in the western portion of the Imphal valley. Further, all of

the calculated geomorphic indices are connected in order to comprehend the relative tectonic activities and tectonic history of the research area. Numerous tectonically active areas have proven the value of this type of methodology, including the northeastern Indian Shillong Plateau (Mukteshwar, 2019), Costa Rica's Pacific Coast (Wells *et al.*, 1988), the Southwest United States (Rockwell *et al.*, 1985), Spain's Mediterranean Coast (Cox, 1994), the southwest Sierra Nevada of Spain (El Hamdouni *et al.*, 2007), and Kashmir Valley (Ahmad and Bhat 2012; Ahmad *et al.*, 2013). Additionally, we assessed and linked the morphometric studies' findings with field-based geomorphological data.

Location of Study Area and Its Drainage Characteristics

The Iring watershed lies on the western side of the Imphal valley, between latitudes 25°00'38.19" and 24° 51' 24.47" N and longitudes 93°43'57.56" and 93° 35' 37.52" E. The research location is located in the Indian state of Manipur's Tamenglong district (Fig. 1). It has a total catchment area of 118.67 Km². The Ijai River flows on its eastern side, while the Tupul River flows on its southern side, where the rivers confluence at Noney.

The drainage characteristics of the Iring River Basin are shown in Fig. 2. It originates from Taduining of Tamenglong District and extended up to Noney of Noney District, Manipur where it confluences with Ijai River. It generally flows in the direction NE to SW up to Noney of Noney District with a perennial