

Basin hypsometry and topographic evolution in the Arabian Peninsula

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Hypsometric Integral (HI) and hypsometric curves have long been used as indicators of stages in landscape evolution. They are also used as a geomorphic tool to detect tectonically active regions. The Tertiary Red Sea rifting, subsequent uplift and formation of drainage basins in the western part of the Arabian Peninsula provide an arena to study the relation between basin hypsometry and topographic evolution. This study analyzes 36 drainage basins whose main axes are perpendicular to the Red Sea coast. The basins were extracted from the 30 m ASTER GDEM. The size of the basins ranges from 522 to 8292 km² with an average of 3121 km². These basins were further divided into subordinate basins according to the Strahler orders. Mean HI values for the main 36 basins are approximately 0.3, but HI varies significantly according to the distance from the southwestern tip of the Arabian Peninsula. High values of HI (>0.35) are found for distances up to 400 km from the tip, and at distances between 1200 and 1400 km. This pattern may be attributed to the lithological variation. Higher values of HI are associated with the Cenozoic flood basalts, while low values of HI are associated with Precambrian crystalline rocks. This empirical study may thus be useful to discuss the nature of the topography and their evolutionary stages in relation to bedrock geology.

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