Geomorphology at Stone Mountain, Georgia Records Major Cenozoic Climate Changes in North America

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Stone Mountain rises 210 meters from a stream-dissected upland surface. It occurs near the west end of a granitic pluton intruded 290 million years ago. Stone Mountain and some nearby inselbergs display annular drainage circumscribing a central knob, quite different from the regional dendritic drainage pattern. The Stone Mountain vicinity displays three concentric annular drainage patterns or concavities, each less well developed inward toward the mountain. These were probably initiated as slope foot depressions (Bergfüssniederung) during times of intense weathering and development of deep saprolite.

Three progressively smaller radius valleys/concavities in profile are related to episodes of high sea level and warm and moist climate with shoreline encroachment to nearby: 1) late Eocene; 2) mid-Miocene , and 3) brief early Pliocene sea-level high associated with the Orangeburg Scarp on the Coastal Plain. Progressively smaller diameter topographic highs are linked with drier climate in the early Eocene, with Oligocene cooling as Antarctic glaciation began, with late Miocene cooling and sea-level lowering , and a convexity at the base of Stone Mountain formed during cooler Quaternary climates. Average radius reduction of Stone Mountain at 28 meters/million years is consistent with weathering rates of 2-5 millimeters/century of dated carvings on Stone Mountain during the past 180 years.

Nearby inselbergs of Panola Mountain also display an annular drainage pattern; Arabia Mountain shows a subannular drainage pattern; Pine Mountain has two concentric annular drainage patterns. Development of concentric annular drainage around Stone Mountain is not a peculiar oddity, but is part of a regional development history of drainage around inselbergs composed of both granite and of intricately deformed gneiss.