2007 GSA Denver Annual Meeting (28–31 October 2007)

Paper No. 190-2

Presentation Time: 8:20 AM-8:35 AM

COSMOGENIC EROSION RATES AND LANDSCAPE EVOLUTION OF THE BLUE RIDGE ESCARPMENT, SOUTHERN APPALACHIAN MOUNTAINS

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The Blue Ridge escarpment, located within the southern Appalachian Mountains of Virginia and North Carolina, forms a distinct, steep boundary between the less rugged lower-elevation Piedmont and higher-elevation Blue Ridge physiographic provinces. While it is generally agreed that great escarpments are the result of rifting, the rugged topography of the Blue Ridge escarpment and the antiquity of the passive margin of eastern North America have lead to questions about the rates and patterns of erosion that have acted on the escarpment since the opening of the Atlantic Ocean basin. A clear understanding of the rates at which processes controlling the erosion and evolution of the Blue Ridge escarpment act may provide insight about the geomorphic evolution of similar escarpments on younger passive margins.

To understand better the geomorphic evolution of the Blue Ridge escarpment and to investigate how quickly this landform is changing, we measured cosmogenic ^{10}Be in sediment (n=47) from stream basins (n=29) and in exposed bedrock (n=3) along four escarpment-normal transects. These ^{10}Be measurements have allowed us to model erosion rates on the time scale of 10^4 to 10^5 years. Basin averaged cosmogenic erosion rates measured on and near the Blue Ridge escarpment, integrated over 10^4-10^5 years, are slow (6.5-38 m My^{-1}). These erosion rates are generally consistent with those measured elsewhere in the southern Appalachians and show a positive relationship between erosion rate and average basin slope. Thermochronologically estimated rates of erosion are similarly slow (8-29 m My^{-1}). These data indicate that the majority of erosion that shaped the Blue Ridge escarpment occurred immediately following rifting in the Mesozoic, and since then, the escarpment's position has generally remained stable. Our data suggest that the escarpment is eroding more rapidly than the adjacent upland Blue Ridge province, which is eroding more rapidly than the adjacent lowland Piedmont province. If this relationship has been maintained over time, the escarpment has been retreating and lowering but at extremely slow rates.

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General Information for this Meeting

Session No. 190
Using Geochronology to Build Better Records and Solve Geomorphic and Paleoclimate Questions—Recent Advances and Findings
Colorado Convention Center: 407
8:00 AM-12:00 PM, Wednesday, 31 October 2007