

2006 Philadelphia Annual Meeting (22–25 October 2006)

Paper No. 112–3

Presentation Time: 1:30 PM–5:30 PM

10-BE ESTIMATES OF EROSION RATES IN THE SUSQUEHANNA RIVER BASIN: IMPLICATIONS FOR MODELS OF APPALACHIAN GEOMORPHOLOGY AND CONSIDERATION OF RATES IN A GLOBAL CONTEXT

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We use ^{10}Be -derived erosion rates from the 71,250 km² Susquehanna River Basin in the central Appalachians to test models, such as those of Hack and Davis, that describe topographic change over time. Concentrations of ^{10}Be in fluvial sediment samples demonstrate that small Susquehanna sub-basins (0.6 to 25 km²) have been eroding between 4 and 54 m/My during the last 104 to 105 years. These rates are consistent with rates from other regions of relatively low relief and tectonic quiescence, as determined from a GIS-based analysis of ^{10}Be erosion rate measurements from more than 450 drainage basins on six continents. Fifty-nine Susquehanna samples are from non-glaciated basins that span a range of mean slopes (2° to 21°) in three physiographic provinces. All of these sampled basins are mapped within a single lithology: sandstone in the Appalachian Plateaus, sandstone or shale in the Valley and Ridge, and schist in the Piedmont. Overall, erosion rate correlates positively with slope ($R^2 = 0.57$); the strongest relationship is found for the Appalachian Plateaus sandstone basins ($R^2 = 0.72$). After accounting for slope, lithology does not appear to affect basin-scale erosion rates in the Valley and Ridge. However, samples of exposed sandstone bedrock at and near ridge tops are eroding more slowly (2.5 to 4.9 m/My, $n = 4$) than most sampled basins. The results imply that on a 104 to 105 year time scale, the topography and relief of the Susquehanna landscape is changing as valleys lower faster than ridges and steep slopes erode more quickly than gentle slopes. Erosion rates and the strength of the slope-erosion relationship increase toward the Susquehanna headwaters, from the Piedmont to the Valley and Ridge to the

Appalachian Plateaus; this suggests that the Susquehanna Basin is not in steady state and may be experiencing a transient response to a drainage network perturbation.

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General Information for this Meeting

Session No. 112--Booth# 8

Erosion: Processes, Rates, and New Measuring Techniques (Posters)

Pennsylvania Convention Center: Exhibit Hall C

1:30 PM–5:30 PM, Monday, 23 October 2006

Geological Society of America Abstracts with Programs, Vol. 38, No. 7, p. 278

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