Paper No. 134-37

Presentation Time: 8:00 AM-12:00 PM

LATE PLEISTOCENE BEDROCK CHANNEL INCISION OF THE LOWER SUSQUEHANNA RIVER: HOLTWOOD GORGE, PENNSYLVANIA

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10-Be analysis of 47 samples reveals that flights of bedrock strath terraces preserved within Holtwood Gorge are Late Pleistocene features, and that the Susquehanna River has incised nearly 20 m in the past ~100 ky and >8 m in the past 20 ky. Within Holtwood Gorge, model exposure ages increase with elevation above the modern river bed. The lowest terraces, levels 1 and 2, are 0.25 and 3 m above the modern channel. They yield, respectively, mean exposure ages of 14.0 +/- 1.3 ky (n=11) and 19.2 +/- 3.1 ky (n=25). A single sample from the level 3 terrace (8.5 m above the channel) yields an age of 31.6 +/- 3.3 ky. A heavily weathered and eroded high point, standing ~20 meters above the modern channel yields a lower limiting age of >97.2 +/- 10.5 ky. Model ages for samples collected between the level 2 and 3 terraces range from 17.6 +/- 1.9 ky and 23.0 +/- 2.5 ky.

In order to constrain the spatial and temporal pattern of erosion recorded within the gorge and infer the driving force(s), we collected samples at different spatial scales on each of the three prominent terraces levels. Ages for clusters of three samples 10 to 15 meters apart on both the level 1 and 2 terraces are in tight agreement (<10%, 1 sigma). Mean ages for samples collected in downstream transects along the level 1 and 2 terraces are distinguishable ($t=-5.93$, $p<0.0005$). However, the two terraces display different patterns of longitudinal exposure age variance. There is no relationship between model age and distance for 2 km downstream along the lower level 1 terrace. In contrast, model ages steadily decrease upstream along the higher level 2 terrace with an age gradient of ~1.5 ky/km over a distance of 5 km. Ages along the level 2 terrace coincide with a >50 m drop in sea level during the LGM, implicating climate as the driver of incision. Decreasing ages upstream suggest that this terrace is a time-transgressive surface, sequentially abandoned as the river incised toward level 1 by way of knickpoint retreat. Deglaciation outburst flooding down the Susquehanna River, as suggested by Kochel and Parris (2000,GSA-Abstracts with Programs, v. 32, p. A-28) probably lowered the channel bed further via block quarrying of level 1. Such outburst floods are a plausible explanation for the Latest Pleistocene mean model age, the rough surface texture, and lack of an age gradient along the level 1 terrace.

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