

Northeastern Section (39th Annual) and Southeastern Section (53rd Annual) Joint Meeting (March 25–27, 2004)

Paper No. 35-5

Presentation Time: 10:00 AM-10:20 AM

GREAT FALLS IS 30,000 YEARS OLD - EPISODIC INCISION ALONG THE POTOMAC RIVER REVEALED USING FIELD MAPPING AND 10-BE ANALYSIS

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Distinct down-river changes in soil thickness, outcrop preservation, and 10-Be activity in >35 quartz samples collected from fluvially-sculpted bare rock outcrops along the both banks of the Potomac River all indicate that vertical channel incision and headward knickzone retreat were episodic. Periods of more rapid bedrock erosion punctuate periods of stasis where this major passive margin river crosses the fall zone. Major knickzones, such as Great Falls, appear to establish themselves rapidly, deepen over time, and then remain stable until they are dissected during the next incision event.

Mather Gorge, a steep-walled bedrock canyon, located just downstream of Great Falls, is rimmed by a bare-rock strath terrace. Samples collected along a 2 km stretch of this terrace give ages between 30 and 37 ky, not younging upstream as would be expected from steady knickzone retreat. Vertical incision occurred either simultaneously along the entire Mather Gorge reach or knickzone retreat happened so quickly that a headward retreat rate can not be measured using 10-Be. In contrast to rapid rates of headward retreat, samples collected from outcrops within Mather Gorge suggest slow, steady vertical incision at 0.8 m/ky from 37 ky until 13 ky. Samples collected from slightly higher points on the strath terrace above Mather Gorge are more weathered and give older apparent ages (53-86 ky) suggesting low rates of incision for many ky prior to strath abandonment during the formation of Mather Gorge.

Two samples collected from the terrace dissected by Great Falls indicate that the Falls were established in their current location by 30 ky. A series of 6 samples taken from a vertical transect just below the falls, indicates that vertical incision continued a rate of 0.5 m/ky between 27 and 12 ky, increasing to nearly 1.0 m/ky during the Holocene. These data suggest that the drop over Great Falls is growing with time. A dramatic increase in outcrop weathering and soil depth 3.5 km downstream of the Falls, suggests that prior to establishment of the Great Falls knickzone, a similar feature was likely present near Black Pond. 10-Be data are not yet available for this paleo knick zone; however, a 10-Be model age >200 ky from the top of Plummers island 5 km down stream of Black Pond suggests a much older period of retreat led to the formation of the Black Pond paleo knick zone.

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[General Information for this Meeting](#)

Session No. 35

[Geomorphic Process Rates on the Passive Margin](#)

Hilton McLean Tysons Corner: Sully A

8:00 AM-12:00 PM, Friday, March 26, 2004

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