Geogr. Fis. Dinam. Quat.
28 (2005), 23-36., 9 figg.

DAVID HARBOR (*), AMY BACASTOW (*), ANDREW HEATH (*) & JACKSON ROGERS (*)

CAPTURING VARIABLE KNICKPOINT RETREAT IN THE CENTRAL APPALACHIANS, USA

ABSTRACT: HARBOR D., BACASTOW A., HEATH A. & ROGERS J., *Capturing variable knickpoint retreat in the central Appalachians, USA*. (IT ISSN 1724-4757, 2005).

In the upper James River basin (Virginia, USA), topography includes incised valleys in limestone uplands, high-elevation low-relief surfaces, and knickpoints/knickzones in resistant and nonresistant rocks.
Mainstream and tributary profiles are irregular and stepped. Some have obvious floodplain abandonment and strath terrace formation at the heads of bedrock knickpoints. Although stream knickpoints can be compared on log-distance-downstream plots, the ability to correlate tributary knickpoints with those on the confluent stream is limited. Automated mapping of the entire drainage network using deviation from a predicted areaslope relationship identifies landscape knickzones. These diffuse zones of incision connect steep stream segments with sometimes distant, steep valley sidewalls.
Computing area-slope curves requires significant smoothing to remove the effects of random error and contour interval stepping of streams in 30 m DEMs. Random error is addressed using a median value filter. Comparison of stream profiles yields variability in the distance of knickpoint retreat from the basin outlet. In the folded sedimentary rocks of the Valley and Ridge, bedrock resistance, sediment character, and possibly, alignment of streams to structural orientation cause this change of retreat. Substantial changes of rock type from shale or limestone to sandstone significantly retard the retreat. The extreme case of increased rock resistance in structurally-repeated quartz arenite strata leads to foreshortening of the distance between knickzones as they collapse into a singularly high profile convexity.
The abundance or absence of abrasive sediment load promotes or retards knickpoint retreat for streams in carbonate bedrock and changes the shape of the retreating knickpoint.

KEY WORDS: Knickpoint, DEM, Stream power, Fluvial erosion.

(*) *Geology Department, Washington and Lee University, Lexington Virginia 24450 USA.*