

[ScienceWatch Home](#)[Inside This Month...](#)[Interviews](#)[Featured Interviews](#)[Author Commentaries](#)[Institutional Interviews](#)[Journal Interviews](#)[Podcasts](#)[Analyses](#)[Featured Analyses](#)[What's Hot In...](#)[Special Topics](#)[Data & Rankings](#)[Sci-Bytes](#)[Fast Breaking Papers](#)[New Hot Papers](#)[Emerging Research Fronts](#)[Fast Moving Fronts](#)[Corporate Research Fronts](#)[Research Front Maps](#)[Current Classics](#)[Top Topics](#)[Rising Stars](#)[New Entrants](#)[Country Profiles](#)[About Science Watch](#)[Methodology](#)[Archives](#)[Contact Us](#)[RSS Feeds](#)

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TRACKING TRENDS & PERFORMANCE IN BASIC RESEARCH

[Interviews](#)[Analyses](#)[Data & Rankings](#)

2009 : February 2009 - Fast Breaking Papers : Richard C. Chiverrell

FAST BREAKING PAPERS - 2009

February 2009



Richard C. Chiverrell talks with *ScienceWatch.com* and answers a few questions about this month's Fast Breaking Paper in the field of Geosciences.

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Article Title: Hillslope gullying in the Solway Firth - Morecambe Bay region, Great Britain: Responses to human impact and/or climatic deterioration?

Authors: Chiverrell, RC;Harvey, AM;Foster, GC

Journal: GEOMORPHOLOGY

Volume: 84

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SW: Why do you think your paper is highly cited, and would you summarize the significance of your paper in layman's terms?

The paper examines an issue identified in the geomorphological development of upland northwest Britain, in which there appears to have been a significant increase in hillslope instability in the last 3,000 years. The paper presents new data that place this interpretation on a firmer chronological footing, through the wider application of radiocarbon dating to the alluvial fan sediments that have accumulated at the base of hillslope gully networks.

These radiocarbon ages constrain these episodes of instability to four 300-200-year-duration phases after 2,500–2,200, 1,300–1,000, 1,000–800 and 500 years ago. This instability is strongly linked to the lowering of landscape erosion thresholds due to increases in human-mediated land pressure (agriculture). Nevertheless, high magnitude rainfall events (storms) are the mechanism for gully inception.

The paper has significance perhaps in that it expands the database upon which these findings are based and refines the previous work both in the region and on this topic. The paper also draws together paleoecological data that show how land-cover (vegetation) and climatic wetness have varied during this time period in order to better understand the factors responsible for landscape instability in upland UK during the last 3,000 years.

SW: Does it describe a new discovery, methodology, or synthesis of knowledge?

This paper presents new data, as well as refining the existing body of knowledge and it also presents a synthesis of available data for the uplands of northwest

England and southwest Scotland.

SW: How did you become involved in this research, and were there any problems along the way?

Originally, this work commenced owing to collaboration with **Prof. Adrian Harvey** of the University of Liverpool, who had been engaged in this type of research since the 1980's. The process of combining his geomorphological interests with my background, then in paleoecology—the use of pollen records to understand changes vegetation cover and the mire surface wetness indications preserved in peat deposits—coupled with a NERC-funded program of radiocarbon dating, led to the advances in our understanding presented in this paper.

"Wider implications of this work stem largely from the importance of land-use in conditioning the geomorphological regime and sediment flux from upland regimes."

SW: Where do you see your research leading in the future?

I have continued to refine this work expanding the database of radiocarbon dated alluvial fan/gully locations. I also changed focus in order to examine the connectivity between hillslope instability and process response in down-system lake basins and rivers. In essence, this focuses on the landform (geomorphological) response of rivers and lake basins to increases and declines in sediment supply. This has led to a series of papers published in *Earth Surface Processes and Landforms*, *The Holocene*, and *Catena*.

These are as follows: Chiverrell, R.C., *et al.*, "Late Holocene environmental change in the Howgill Fells," *Northwest England Geomorphology* 100, 41-69, 2008; Chiverrell, R.C., *et al.*, "Evidence for changes in Holocene sediment flux in Semeer Water and Raydale, North Yorkshire, UK," *Geomorphology* 100, 70-82, 2008; Chiverrell, R.C., *et al.*, "Robust chronologies for landform development in fluvial environments," *Earth Surface Processes and Landforms*, 2008; Foster, G.C., *et al.*, "Catchment hydro-geomorphological responses to environmental change in the Southern Uplands of Scotland" *The Holocene* 18, 935-50, 2008; Foster GC, *et al.*, "Fluvial development and the sediment regime of the lower Calder, Ribble catchment, northwest England" *Catena*, 2008; Shen, Z.X., *et al.*, "Holocene environmental reconstruction of sediment-source linkages at Crummock Water, English Lake District, based on magnetic measurements" *The Holocene* 18, 129–40, 2008.

SW: Do you foresee any social or political implications for your research?

Wider implications of this work stem largely from the importance of land-use in conditioning the geomorphological regime and sediment flux from upland regimes. Given the trajectories for land-use change implicit in UK Government and European Agricultural Policies, an awareness of the implications of reducing or increasing grazing pressure in the uplands of temperate regions is important, particularly given the increased weight placed on stewardship in the rural land management of conserved landscapes (e.g., national parks and other areas of outstanding natural beauty).

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Keywords: gully; alluvial fan; holocene; climate change; human impact; vegetation; hillslope; instability, northern lake district; holocene alluvial-fan; northwest england; howgill-fells; landscape sensitivity; vegetational history; environmental-change; soil development; fluvial systems; pollen analyses.



[back to top](#)

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