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Calibration of a catchment-scale model of sediment and water fluxes using paleo-records of river activity from 125,000 years ago

Gareth Mottram (1), Rebecca Briant (2), and John Wainwright (3)
(1) Birkbeck College London (gareth.mottram@gmail.com), (2) Birkbeck College London, (3) University of Sheffield

River systems are critical components of the landscape. An understanding of their response to variations in the Earth's climate is vital in light of the expected changes in global climate (e.g. 1.8 to 4.8°C temperature rise) that are forecast to occur over the next c. 100 years. Most future river-basin-scale predictions focus on water, assuming channel stability and minimal sediment movement. Whilst this may be appropriate in the very short term, over the medium to longer-term, channel positions are likely to shift, even if artificially constrained, and sediment movement will be an important feature of landscape change to which human populations must adjust. It is therefore crucial to understand climate-driven flows of both sediment and water within river basins, especially since 'little work has been done on the expected impacts of climate change on sediment loads in rivers and streams' (IPCC 4AR WG3, 2007, p.190).
This paper describes a pilot study seeking to develop and apply a numerical model, integrating both sediment and water movements utilising cellular automaton strategies, to a paleo-record from the last interglacial (c. 125,000 years) onwards. The value of calibrating the model against a record over this time period is that it emulates the scale of changes that are increasingly likely to be seen over the longer term future (c. 5-6°C). The Model itself has been conceived to represent the landscape evolution of the drainage system.
The data against which the model will be calibrated come from stacked fluvial sediments distributed across the catchment, for which the timing of deposition has been estimated using a combination of radiocarbon and optically-stimulated luminescence dating. The model will be driven with oxygen isotope data derived from ice and ocean sediment cores.
The paper will discuss how sediment supply and movement is dealt with in a modeling environment and the comparison between model runs and geological data.