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The use of downstream sediment mini-cores to indicate changes through time in the spatial pattern and process contribution of erosion within a small, selectively logged rainforest catchment in Sabah, Malaysian Borneo

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Multi-proxy sediment fingerprinting (using changes in geochemical variables within downstream floodplain or lateral bench cores and relating them to differences in geochemical character of upstream tributary sediment inputs and/or down soil profiles, preferably in combination with dating using Pb-210 and Cs-137) provides the potential for assessing changes in sediment sources through time. This has rarely been done in tropical rainforest catchments, but needs to be tested at a variety of spatial scales. This poster paper presents the results of an attempt to use mini-cores of bankside sediment to explore changes through post-logging time in the relative contributions made by different sub-catchments to the sediment budget of a small (0.44 sq.km.) Baru catchment (selectively logged in the first half of 1989) in the Danum Valley area of Sabah, Malaysian Borneo. The catchment provides a good testing ground for the technique, as it has been monitored for slope erosion and stream suspended sediment transport continuously from before logging to the present day.

The research design comprised (1) sampling (at 2 cm vertical intervals) fluvially deposited sediment down replicated pit profiles at three bankside locations at the downstream end of the catchment between the long-term gauging station and the confluence with a higher-order stream: (2) sampling of the finer bed-sediment the three principal tributaries (2West, 2Middle and 2East) and of surface, sub-surface and deep surface soil material from soil pits and road-cuttings across the catchment; (3) geochemical analysis of the <63μ, 63-125μ and 125μ-2mm fractions of all samples (following drying and sieving), using a portable Niton elemental analyser; (4) graphical and statistical analysis of the data. Pit 1 (34 cm deep) was considered to provide the longest and most dependable sediment record and marked changes in the levels of some elements were detected, with Mn, Fe, Ti and Zr proving to be the most useful. Local spatial variations within the soil geochemistry dataset proved too great for changes in core geochemistry to be linked conclusively to changes in topsoil, shallow subsurface and deep subsurface sources at the catchment level. Down-core variations through time, however, were linkable to changes in the relative contributions from the three sub-catchments. In particular, Mn and Fe are much lower and Zr higher in 2East bed-sediment than for the other two sub-catchments, which in turn are distingishable by differences in Cu. Thus periods of low Mn and Fe and high Zr in the downstream core are interpreted as indicating disproportionately high inputs from the 2East subcatchment. The periods of low Mn and Fe found at 20-30 cm and 2-10 cm depth are tentatively considered to be linked respectively to (i) a phase of major landslide activity linked to a logging road in the 2East sub-catchment in 1994-1996 and (ii) a period of pronounced excavation of toe deposits and landslip scars associated with increased rainfall in recent years. Prospects, problems and requirements in applying the technique are outlined.