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Episodic Emplacement of Sediment + Carbon within Large Tropical River Basins

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Application of advanced methods for imaging (sub-bottom sonar and ERGI), dating (high resolution 210-Pb and 14-C from deep cores), and biogeochemical analysis have facilitated the characterization and inter-comparison of floodplain sedimentation rates, styles, and carbon loading across disparate large river basins. Two examples explored here are the near-pristine 72,000 km2 Beni River basin in northern Bolivia and the similarly natural 36,000 km2 Strickland River basin in Papua New Guinea – that are located on either side of the Equatorial Pacific warm pool that drives the ENSO phenomenon.

Our published research suggests that large, rapid-rise, cold-phase ENSO floods account for the preponderance of sediment accumulation within these two tropical systems. New results to be presented at EGU further clarify the extent of modern deposits ($\sim$100 yrs) within both systems and add a deeper perspective into how these extensive floodplains developed over the Holocene, both in response to external forcing (climate and base level) and internal system morphodynamics. The vast scale of these temporally discrete deposits (typically 100s of millions of tonnes over relatively short time periods) involved equate to high burial rates, which in turn support the high carbon loadings sequestered within the resulting sedimentary deposits.

We have identified the principal source of this carbon and sedimentary material to be extensive landslides throughout the high-relief headwaters – failures that deliver huge charges of pulverized rock and soil directly into canyons (in both the Bolivian Andes and the PNG Highlands), where raging floodwaters provide efficient transport to lowland depocentres. We present recent results from our research in these basins, providing insight into the details of such enormous mass budgets that result in a signicant carbon sink within the floodplains.

Processes, timing, and rates are compared between the two systems, providing insight into the nature of geomorphic hillslope-channel coupling within tropical dispersal systems.