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SPEAKERS CLUB

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Mechanics of waterfall formation and retreat

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Landscapes often respond to changes in climate and tectonics through the formation and upstream propagation of waterfalls. Despite the role waterfalls play in setting the pace of landscape evolution, there has been relatively little work investigating the mechanics of waterfall formation and upstream retreat; instead, most landscape-scale models neglect waterfalls or use empirical erosion rules that must be locally calibrated. In this talk I combine field observations and laboratory flume experiments to develop new, process-based models describing waterfall plunge-pool sediment transport and bedrock erosion, and show how pool deepening and sediment deposition can drive the autogenic formation and upstream retreat of waterfalls. The experiments and theory support the idea that waterfall escarpments retreat through vertical drilling by successive plunge pools, rather than the classic undercutting mechanism, and suggest that waterfall retreat rate increases in response to increases in sediment supply which may be driven by tectonic and climatic perturbations.