



Upland catchment response to base level lowering, climate and dam events. A combined field and modelling approach.

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Combining field reconstruction and landscape evolution modelling can be useful to investigate the relative role of different drivers on catchment response. The Geren Catchment, a small ($\sim 45 \text{ km}^2$) upland catchment in western Turkey is a suitable catchment for such a study. This catchment endured gradual Quaternary uplift-driven incision of its trunk river, the Gediz. Additionally, fieldwork and dating results show that its outlet has been dammed repeatedly by lava flows since $\sim 300 \text{ ka}$, resulting in infrequent base level rise and fall. Incision of the Geren trunk gully has been delayed until at least the end of MIS 5, after which an incision phase lowered the Gediz by around 30 m. Subsequent erosion and aggradation sequences demonstrate how the Geren Catchment has responded to base level lowering at least since MIS 4 by stepped net incision. Field reconstruction left us with uncertainty about what the main drivers of terrace formation were, therefore, possible scenarios were simulated using landscape evolution modelling. Three scenarios of landscape evolution in the Geren Catchment were investigated: i) uplift with climate (rainfall and vegetation based on arboreal pollen), ii) uplift, climate and short damming events and iii) uplift, climate and long damming events. Output was evaluated for erosion-aggradation evolution in trunk gullies at two different distances from the catchment outlet. Climate influences erosion – aggradation activity in the upstream reach, although internal feedbacks influence timing and magnitude. Lava damming events leave an aggradation signal in the downstream reach, while complex and lagged response to these dams obscure correlations with climate and leave a legacy on current landscape evolution. Catchment response to long damming events correspond best with field reconstruction and dating. The combination of climate and base level explains a significant part of the landscape evolution history of the Geren Catchment. By combining model results with fieldwork, additional conclusions on landscape evolution could be drawn.