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Modelling response to natural damming in an artificial catchment using LAPSUS

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Fluvial landscapes respond non-linearly to damming. Until now, research to these phenomena has focussed on fieldwork studies. Using a Landscape Evolution Model (LEM) to systematically understand fluvial response to damming has not been done yet. LEM LAPSUS is capable of dealing with depressions in a natural way and has recently been enhanced to incorporate 3D geology and to identify newly deposited sediments. The aim of this study was to model landscape evolution using LAPSUS in a small artificial catchment, that experienced base level change due to natural-damming. A rectangular catchment of 2100 x 6000 m with a 20 m resolution was given a net annual rainfall of 300 mm for a period of 10000 year. Two different landscapes, having a high erodible substrate and a low erodible substrate were modelled. For both landscapes, Three scenarios were evaluated: (i) dam and substrate having equal erodibility; (ii) dam being 10 times more erodibile than substrate; and (iii) dam being 10 times less erodible than substrate. Results showed differences in lake siltation rate, plan channel evolution, longitudinal profile evolution and sediment redistribution patterns. These differences related non-linearly to erodibilities and demonstrate complex response to local base level change. Fluvial archives of landscapes which are regularly undergoing natural dammings should be approached with caution as terrace formation does not necessarily reflect basin wide climate signals.