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Quantifying flood response to Late Holocene global change

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Predicting flood response to global change is a major challenge for river managers as: 1) it may be problematic to decipher between land use and climate change impacts on flooding; and 2) instrumental data series are usually too short to gather reliable data on extreme events. One approach to this problem is to reconstruct flood hydraulic data (e.g. discharge and stream power) from before the instrumental record using combined stratigraphic and hydraulic modelling approaches. In this paper two such case studies are presented: 1) the modelling of palaeoflood magnitude from the River Till (NE England); and 2) the effect of long-term human impact on flood hydraulics of the River Erme (SW England). In September 2008, the Till witnessed the largest flood on record and evidence from historical flood marks shows that it was also bigger than the 1948 Great Borders flood, believed to be the highest magnitude flood of the 20th Century. Surveying of flood stage indicators after the event indicated that floodwaters were up to 3 m deep across a 1 km wide floodplain. However, within a bedrock gorge reach in the lower Till basin there is consistent evidence from benches of slackwater flood deposits for larger magnitude palaeoflood events. Preliminary modelling indicates palaeofloods with peak discharges up to 40% larger than the 2008 flood. The stratigraphy of the River Erme study reach indicates major shifts in floodplain palaeoenvironments over the last 2000 years, primarily brought about by human impact (hydraulic tin mining), that have impacted on the nature of flooding at the reach. HEC-RAS modelling of reconstructed palaeo-floodplains was used to investigate the changing flood geomorphology at the reach. Preliminary results indicate that sediment supply and autogenic response to changing sediment loads were the primary drivers of changing flood hydraulics at the reach.