Uncertainties in the palaeoflood record – interpreting geomorphology since 12, 500 BP

J Moloney, T Coulthard, and M Rogerson

Jessica Fox (née Moloney), Geography, Geology and Environmental Sciences, University of Hull
Jessica.Fox@hullcc.gov.uk
Tom Coulthard, Geography, Geology and Environmental Sciences, University of Hull
Mike Rogerson, Geography, Geology and Environmental Sciences, University of Hull

Conference overview

This research was presented at the European Geosciences Union in April 2017. This work contributed to the session titled: 'the role of geomorphology in flood risk management' as a poster presentation.

Project summary

This study assesses the uncertainty and viability of palaeoflood records in relation to the British database, which is a collection of radiocarbon dated geomorphological fluvial deposits used to infer the flood-frequency record during the Holocene. There are different forms of evidence used to interpret flood-frequency records and there are inherent uncertainties associated with both the data used to for analysis and the method of data analysis used.

Previous studies, which have used summed probability distribution functions, have failed to show how sensitive the shape of the curve is to characteristics of the data used and to the radiocarbon calibration curve.

This study firstly applies sensitivity analysis testing to the British database using the summed probability distribution methodology. This study also discusses the potential to apply a robust quality control protocol to the British database to verify the ^{14}C ages currently available in line with geochronology studies that apply ^{14}C dating. Sub-datasets of the British database were created based on the following criteria: number of samples per site, sample material, archaeological context and likely association to a flood event and analysed using summed probability distribution functions.

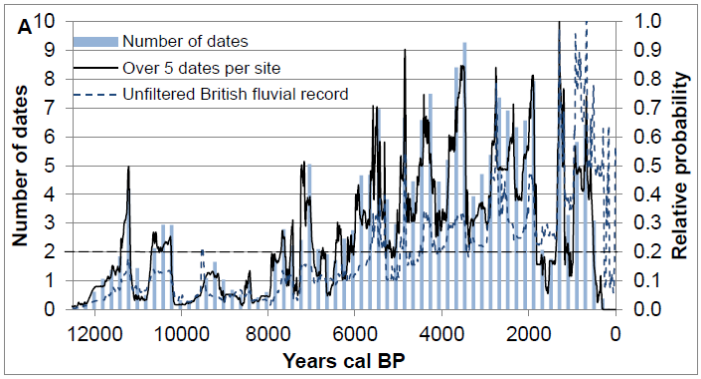

Figure 1 Summed probability distribution function of radiocarbon dated A: samples from sites with five or more dates from the British database plotted with the number of calibrated dates per 200 years.

Table 1 Statistical comparison of samples taken from site with five or more dates and under five dates in relation to the British database.

	Number of dates	Sum of squares of deviation (SSD)	Sum of mean square error (SMSE)
Site with > 5 dates	219	0.457	51.890
Sites with < 5 dates	557	5.546	108.915
British fluvial record	776	7.641	150.579

Statistical indicators were used to show how similar the sub-datasets were to the unfiltered British database. This study identifies that statistically the most reliable results are generated when five or more samples from a single site location are analysed.

Personal reflection

Thanks to the generous support for the British Society for Geomorphology, I was able to show data to support the key role that geomorphology plays in understanding past flood events and demonstrate how multi-disciplinary fields can be used alongside geomorphological techniques to support a growing evidence base of palaeoflood events in the UK.

Acknowledgements

This PhD project was funded by the Natural Environment Research Council (NERC) as part of the Flooding From Intense Rainfall project. My attendance to the EGU 2017 meeting was also supported financially by the research support fund at the University of Hull.