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Robust chronologies for landform development

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Obtaining chronological control for geomorphic sequences can be problematic due to the fragmentary and non-sequential nature of sediment and landform archives. The robust analysis of ^{14}C ages is often critical for the interpretation of these complicated sequences. This paper demonstrates a robust methodology for the ^{14}C dating of geomorphic sequences using a case study from the lower Ribble valley, northwest England. The approach adopted incorporates using greater numbers of ages, targeting plant macrofossils, obtaining replicate ages from single horizons to assess the extent of reworking, and the use of Bayesian approaches to test models of the relative order of events. The extent of reworking of organic materials and space-time dynamics of fluvial change means that it is critical that chronological control is sufficiently resourced with ^{14}C measurements. As a result Bayesian approaches are increasingly important for the evaluation of large data-sets. Assessing the conformability of relative order models informed by interpretation of the geomorphology can identify contexts or materials that are out of sequence, and focuses attention on problem materials (reworking) and errors in interpretation (outlier ages). These relative order models provide a framework for the interrogation of sequences and a means for securing probability-based age ranges for events that occur between dated contexts. This approach has potential value in constraining the sequence of geomorphic development at scales that vary from individual sites to a catchment or region, furthering understanding of forcing and change in geomorphic systems.