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Testing the timing of radiocarbon-dated events between proxy archives

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For interpreting past changes on a regional or global scale, the timings of proxy-inferred events are usually aligned with data from other locations. However, too often chronological uncertainties are ignored in proxy diagrams and multi-site comparisons, making it possible for researchers to fall into the trap of sucking separate events into one illusionary event (or vice versa). Recently we largely solved this "suck in and smear syndrome" for radiocarbon (^{14}C) dated sequences. In a Bayesian framework, millions of plausible age-models are constructed to quantify the chronological uncertainties within and between proxy archives. We test the technique on replicated high-resolution ^{14}C dated peat cores deposited during the "Little Ice Age" (c. 1400-1900 AD), a period characterised by abrupt climate changes and severe ^{14}C calibration problems. Owing to internal variability in proxy data and uncertainties in age-models, these (and possibly many more) archives are not consistent in recording decadal climate change. Through explicit statistical tests of palaeoenvironmental hypotheses, we can move forward to systematic interpretations of proxy data. However, chronological uncertainties of non-annually resolved palaeoclimate records are too large for answering decadal timescale questions.