



Refining the age and rate of abrupt climate changes during the Last Termination: an integrated Bayesian approach

S.P.E. Blockley (1), C. Bronk Ramsey (1), C.S. Lane (1), A.Lotter (2), J.J. Lowe (3), S.D.F. Pyne-O'Donnell (3), M.J.C. Walker (4)

(1) Research Laboratory for Archaeology, Dyson Perrins Building, South Parks Road, University of Oxford, Oxford UK, (2) Palaeoecology, Institute of Environmental Biology, Laboratory of Palaeobotany and Palynology, University of Utrecht, Utrecht, The Netherlands,

(3) Department of Geography, Royal Holloway, University of London, Egham, Surrey UK,

(4) Department of Archaeology & Anthropology, University of Wales, Lampeter, Ceredigion, Wales, UK

The goal of the INQUA's North Atlantic INTIMATE project is to synthesise ice-core, marine and terrestrial records that span the Last Termination (ca. 30 to 11.5 ka). The key objective is to determine whether abrupt climatic changes during that period, as reflected in a range of proxy records, were regionally synchronous or whether there were significant 'leads' and 'lags' between the atmospheric, marine, terrestrial and cryospheric realms. Establishing the precise order of events during the Last Termination has proved an elusive goal, however, principally because limitations in the dating tools currently available inhibit the temporal resolution of the individual climatic episodes (Lowe et al., 2001). The Greenland ice-core records have demonstrated beyond reasonable doubt that during the Last Termination marked climatic shifts occurred within a matter of decades – sometimes even in less than 20 years. Few dating methods can match this degree of precision. Most sequences of Last Termination age employ the radiocarbon method, where the errors are frequently centennial or even millennial in scale (Lowe et al., 2007). However, an improved chronology of events and more precise synchronisation of records are possible using a combination

of Bayesian-based procedures for radiocarbon calibration and age model construction (Blockley et al., 2004, 2007; Bronk Ramsey 2008) and correlation based on volcanic ash marker horizons (Lowe et al., 2008). Here we show how an integrated Bayesian-based age model approach facilitated the synchronisation of North Atlantic, terrestrial European and Greenland ice-core records. The work formed part of a project funded by the RAPID Climatic Change thematic programme of the Natural Environment Research Council (UK). The results provide a robust test of the degree of synchronicity of regional responses to climate forcing, and suggest that this approach may have wider application for synchronising records beyond the North Atlantic realm.

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