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The 2.8 BP Event: a high-resolution multiproxy perspective from Diss Mere, Norfolk, UK.

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The INTIMATE group has, for a number of years, outlined the most robust approaches for comparing high resolution palaeoclimate archives in order to understand the regional pattern of response to climate change, and hence test models of climate forcing. These have tended to focus on the Last glacial and Early Holocene, until recently. However, in the later Holocene there are similar climatic oscillations with a variety of proposed mechanisms and regional responses. One such climatic oscillation, the 2.8 ka BP event, is a cold spell thought to be driven by a grand solar minimum with potential impacts on atmospheric dynamics and hydrology across parts of Western Europe[1]. At present there are only a small number of independently-dated, high-resolution records for this event, limiting the extent to which a regional expression of this event can be understood. This is a problem, as there is significant interest in understanding the impact of solar minima on recent and future climates[2].

High resolution, multiproxy records of this event are limited in the UK, however, annually laminated sediments from Diss Mere, Norfolk, UK, provide an excellent opportunity to improve our understanding of the environmental impacts of this climatic oscillation on ecosystems of the region. Here we consider multiple proxies including diatoms, chironomids, pollen, $\delta^{18}O$ and $\delta^{13}C$ isotopes, integrated through a highly constrained age model based on varve counts, radiocarbon dating, tephrochronology and Bayesian modelling[3]. Our analyses highlight distinct responses linked to the associated cooling of the 2.8 ka BP oscillation. These include an opening of the landscape around the lake, documented in our pollen record, accompanied by diatom community changes, linked to alterations in temperature, nutrients, turbidity and water clarity. These are potentially a result of increased landscape instability changing the nutrients entering the lake water and its clarity, while increased wind shear due to a more open environment, is linked to the changes in turbulence. Chironomid inferred temperatures also indicate cooling during this period. We compare the Diss palaeorecord with another annually-resolved lake record for this event, Meerfelder Maar, Germany, and with peat bog sites in Ireland, where the event is also associated with tephra layers, to outline the similarities and differences in the regional response to this solar induced event. These results are particularly significant for studies of environmental/ecological impact[1] of grand solar minima on future climates in a warming world, through the potential for

palaeodata climate model comparisons[2].

References:

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3. Martin-Puertas, C. et al. (2020) European Geosciences Union.