EGU2020-18990
https://doi.org/10.5194/egusphere-egu2020-18990
EGU General Assembly 2020

A high-resolution ostracod-derived δ18O record of early Holocene abrupt climatic change from N. Scotland.

Joanna Tindall[1,2], Jonathan Holmes[1], Ian Candy[2], Melanie Leng[3], Rhys Timms[2], Christopher Francis[2], Daniel Petts[2], Simon Blockley[2], Ian Matthews[2], and Adrian Palmer[2]

[1]University College London , Department of Geography, London, United Kingdom (joanna.tindall.15@ucl.ac.uk)
[2]Royal Holloway, University of London, Department of Geography, Egham, United Kingdom
[3]British Geological Survey, Keyworth, Nottingham, United Kingdom

Oxygen-isotope ratios can be measured on a range of materials (e.g. ostracods, bulk carbonates, diatom silica) and this, alongside their sensitivity to changes in temperature and precipitation has resulted in oxygen-isotope analyses becoming a well-established tool for investigating palaeoclimatic change. We use $\delta^{18}O$ of calcite from ostracod shells to reconstruct palaeotemperature and palaeo-precipitation variability during an early Holocene abrupt climatic event in Crudale Meadow, SW Orkney Mainland, Scotland, UK. The research ultimately aims to further our understanding of the driving mechanisms of palaeoclimatic change during the early Holocene by producing a high-resolution palaeoclimate record from Crudale Meadow and comparing this to the existing data of NW Europe.

Crudale Meadow is an ideal study site for this research. Spatially, it completes a transect of published early Holocene $\delta^{18}O$ records that span Western Ireland[1], NW England[2] and into Scandinavia[3]. It has a ~3m thick early Holocene carbonate sequence which offers a multi-decadal or multi-centennial scale study resolution and its proximity to the N. Atlantic makes it highly likely to have been influenced by any climatic changes in the region. A previous study[4] presented a bulk carbonate $\delta^{18}O$ record for Crudale Meadow but the skeletal chronology limits its usefulness for comparing with regional trends. Here, we present an improved chronology using tephra and pollen stratigraphy, in addition to the ostracod-derived $\delta^{18}O$ record. The studied sequence is anchored by the previously identified Saksunarvatn visible tephra layer dated to 10,210 ± 70 cal. years BP[5].

Ostracods are micro-crustaceans with low-Mg calcite shells which take on the isotopic signal of the water body they are in, at the time of shell calcification. In this study, we use winter calcifying *Candona* spp. for isotopic analysis. These were abundant and well preserved throughout the sequence. Members of this genus have a well-characterised vital offset[6] so the $\delta^{18}O$ curve can be reliably corrected for vital effects. Moreover, the species analysed are probable winter calcifers, thus reducing the impact of isotopic enrichment through lake water evaporation during summer months. The high-resolution study allows us to identify structure within the identified isotopic excursion and suggest palaeotemperature estimates from the ostracod- and chironomid-inferred

temperatures.

The new data presents a clear climatic event with internal structure, which with the current chronology, we hypothesise to be the 9.3ka event. The 9.3ka event has fewer detailed records in comparison to other early Holocene abrupt climatic events (e.g. 8.2ka). Consequently, to identify a structured isotopic signal of the 9.3ka event in NW Europe is an important contribution to our early Holocene records. It emphasises the need for high-resolution $\delta^{18}O$ studies during the early Holocene across NW Europe in order to be able to fully identify subtle abrupt climatic events.

References: [1]Holmes, J.H. *et al.* (2016) *QSR*, p.341-349; [2]Marshall, J.D. *et al.* (2007) *Geology*, 35, p.639–642; [3]Hammarlund, D. *et al.* (2002) *The Holocene,* 12, p.339–351; [4]Whittington, G. *et al.* (2015) *QSR*, 122, p.112–130; [5]Timms, R.G.O. *et al*. (2018) *Quat. Geochron.* 46, p.28–44; [6]Holmes, J.H & Chivas, A. (2002) *AGU Geophysical Monograph,* p.118-204.