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Hydrological and vegetational response to the Younger Dryas climatic oscillations: a high resolution case study from Quoyloo Meadow, Orkney, Scotland

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The Younger Dryas (Loch Lomond) Stadial is a well defined period of cold climate that in North West Europe punctuated the climatic amelioration during the Last Glacial – Interglacial Transition (LGIT ca. 16-8 ka). A palaeolake record from Quoyloo Meadow, Orkney Islands (N59.067, E-3.309) has been analysed for pollen and stable isotopes on biomarker lipids.
n-Alkanes from terrestrial and aquatic sources are present throughout the core. The average chain length (ACL) is relatively low during the interstadial (∼28.0) and shows a distinct increase during the Younger Dryas (to 29.0 +), attributed to an increase in grasses and drought resistant shrubs (e.g. Artemisia, Castañeda et al., 2009, Bunting, 1994). At the beginning of the Holocene, the ACL rapidly drops to 28.3 and from thereon gently increases again to ∼29.0. There is a continued odd-over-even n-alkane predominance, although even n-alkanes are present in greater quantities in the interstadial, indicating an increasing terrestrial contribution in the Holocene.
Ongoing deuterium isotope measurements of the n-alkanes will give independent evidence for palaeohydrological changes and can be compared to the other proxy evidence within the same core. Using a combination of nC29 and nC23 (terrestrial and aquatic end-members, respectively), a change in relative humidity (rH) can be qualified. This is based on the idea that terrestrial vegetation is affected by evapotranspiration processes, whereas aquatic vegetation is not (Rach et al., 2014).
This data is supported by a high resolution palynological study; the contiguously sampled record demonstrates ecosystem/environmental responses to millennial-scale climatic change and allows for the possible detection of vegetation shifts at the sub-millennial scale. Vegetation aside, the pollen data can further aid in the interpretation of the recorded n-alkanes and isotopic analyses.
This data is placed within a chronological framework derived from a high resolution crypto- and macrotephra study (Timms et al in prep).

References:

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