

Holocene Climate Variability in Western Ireland: Do Lacustrine Carbonate Sediments Record Ambient Temperature?

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Oxygen and carbon isotopic compositions from carbonate lacustrine sediments have been used as temperature and productivity proxies in paleoclimate studies. Indeed, our current study of Holocene climate variability in western Ireland depends upon these records. It is assumed that precipitated carbonate sediment record the ambient temperature and that this record is preserved through post-depositional processes. Our purpose is to determine whether post-depositional processes such as dissolution and re-precipitation of calcite by groundwater influence this record and, if so, to model the extent of their influence on the isotopic temperature and paleoproductivity record.

Dissolution of calcite due to acidity is possible beneath the peat-marl interface, where organic acids from the overlying peat may flow downward into the underlying marl, dissolving some of the carbonate and re-precipitating it further down section. Dissolution and re-precipitation of carbonate of this type would alter the isotopic signature of the affected carbonates. Similarly, chemical exchange with porewaters in deposited carbonates and additional precipitation of carbonate below the water sediment interface and further down section may influence isotopic signatures of the marl.

To investigate these possibilities water samples were taken from rivers and lakes in the Lough Corrib and Lough Inchiquin drainage basins to gain an understanding of local hydrogeology and geochemistry. Push cores and pore waters were obtained from Lough Corrib and Lough Carra for analysis of modern depositional processes and the geochemical dynamics of the marl.