

Carbon isotopes of marl and lake sediment organic matter reflect terrestrial landscape change during the late Glacial and early Holocene (16,800 to 5,540 cal yr B.P.): a multiproxy study of lacustrine sediments at Lough Inchiquin, western Ireland

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Abstract

A 7.6-m lake sediment core from a marl lake, Lough Inchiquin, records variation in landscape evolution from 16,800 cal yrs B.P. to 5,540 cal yrs B.P. We observe significant variations (up to 12‰) in $\delta^{13}\text{C}_{\text{org}}$ and $\delta^{13}\text{C}_{\text{calcite}}$ values that are interpreted to reflect secular changes in lake water $\delta^{13}\text{C}_{\text{DIC}}$ values that result from a regional landscape transition from barren limestone bedrock to a forested ecosystem. Lake water $\delta^{13}\text{C}_{\text{DIC}}$ values are therefore influenced by two isotopically distinct sources of carbon: terrestrial organic material (-27.1 to -31.2‰VPDB) via oxidized soil organic matter and weathered limestone bedrock ($+3.4\text{‰VPDB}$). Isotope excursions in lacustrine sediment records are forced not only by changes in productivity but also by changes in the terrestrial environment. This has profound implications for the interpretation of paleoclimate records derived from lacustrine sediment and suggests that selection of appropriate lakes can provide records of terrestrial change where other related records are not available.