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Mid infrared spectroscopy as a potential new method for reconstructing past lake salinity

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Many aquatic ecosystems in Australia are impacted or threatened by salinisation, however, scant quantitative data pertaining to historical conditions are available. Such information is essential for understanding the extent and degree of lake salinisation induced by land use change and climatic variability. Diatom inference models are one means of reconstructing past salinity levels, however in Australia, their applicability is limited by the impact of land use changes on diatom communities. Mid infrared (MIR) spectroscopy can be used to assess a range of sediment characteristics thus providing information about environmental parameters within a water body at the time of sediment deposition. Consequently, MIR spectroscopy may potentially offer an alternative method of reconstructing past salinity levels in Australian lakes.

This paper presents a pilot study investigating this possibility. We used a small calibration dataset to develop a lake water salinity inference model ($r2 = 0.64$), then used this to reconstruct salinity from a short sediment core from Tower Hill in western Australia. Comparisons with monitoring data from this site suggest that the MIR inferred model may perform better than diatom inferred models for salinity. Expanding the calibration dataset may enable a more broadly applicable inference model to be developed for Australian lakes.