Single-grain OSL dating of Welsby Lagoon, Queensland:

Bridging Australia's MIS 3 Gap

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ABSTRACT

Marine Isotope Stage 3 (MIS3: ~29 – 57 ka) is an important period in Australian prehistory as it contains the key events of human arrival and megafauna extinction. A firm understanding of palaeoenvironmental conditions during this period is needed to disentangle the relationship between these events and climatic change. However, there are currently few palaeoenvironmental records in Australia which detail this period and which have reliable chronological constraints. This study examines a new sedimentary record from Welsby Lagoon, North Stradbroke Island, which has the potential to advance our understanding of MIS3 climate change in eastern Australia. The study explores the feasibility of applying single-grain optically stimulated luminescence (SG-OSL) in subtropical Queensland's Welsby Lagoon, as a means of constraining a key paleoenvironmental record spanning MIS 3. Specifically, the study aims to establish the dateability of Welsby Lagoon using OSL, create an age-depth model and assess the continuity of the sedimentary record. OSL provides direct age constraints on sediment depositional events and is able to surpass the age constraints and assumptions of conventional radiocarbon (14C) dating. SG-OSL dating is applied to 5 lacustrine and 4 basal sand samples from Welsby lagoon. These results are combined within a Bayesian framework to produce two continuous age-depth models extending to at least MIS 4 at 83.4-70.4 ka (2σ confidence interval) for Welsby Lagoon. Statistical analyses of grain populations, through OSL and sedimentology, suggest aeolian forcing as the primary grain transportation mechanism, with sourcing primarily from local dunes. Geochemical data obtained through ITRAX scanning and correlation with the age-depth models identifies a continuous sedimentation history which, in conjunction with the ability to date the sedimentary record using OSL, identifies Welsby Lagoon as potentially one of the most highly resolved and robustly dated pre-MIS 2 records in eastern Australia. Studies such as this are essential for understanding climate systems during an important period of palaeoecological change in Australian prehistory.

KEYWORDS

OSL dating, single-grain, Welsby Lagoon, North Stradbroke Island, multi-gran, MIS 3

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