Towards reconstructing environmental conditions related to Australian Great Barrier Reef initiation

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Previous work exploited the unique mixed carbonate-siliciclastic environment of Northeast Australia to identify the timing of changes in off-shelf sediment transport with respect to sea-level variation. Because sediment transport from the continental shelf to slope is strongly controlled by the presence/absence of a rimmed morphology, this provides a means for indirectly estimating the age of the Great Barrier Reef (GBR). Preliminary results indicate that a change in the timing of maximum off-shelf terrigenous sediment accumulation occurred during the glacial termination of MIS 20. This in turn suggests that an effective barrier morphology was emplaced during the MIS 21 interglacial. Instead of being deposited directly to the continental slope by incised rivers, terrigenous material first accumulated behind the barrier during the MIS 20 sea-level lowstand and was then redoposited as rising sea level reflooded the shelf.

Here we present initial results attempting to understand if and how changing environmental conditions promoted enhanced reef growth. The results include a higher-resolution isotope stratigraphy for improved chronological control, additional terrigenous mass accumulation rate measurements, and initial results of Mg/Ca analyses, which allow for calculating sea surface temperature changes and the oxygen isotopic composition of sea water that is expected to better resolve glacial-interglacial cycles. In the future we expect to add additional information from micro and/or nanofossil faunal assemblage data.

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