Determining the Age of the Great Barrier Reef through sedimentary facies analysis

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MIS 11 is proposed as a time of worldwide increased barrier reef production that shifted carbonate partitioning between the shallow and deep ocean. However, the ages of the reefs suggested to have initiated at this time are poorly constrained primarily due to difficulty dating diagenetically altered sequences. Here, we indirectly assess the age of the Australian Great Barrier Reef (GBR), located on a mixed carbonate-siliciclastic margin strongly effected by high seasonal precipitation and river discharge. The traditional "reciprocal" sedimentation model suggests that upper slope terrigenous sedimentation is highest during sea-level lowstand, However, according the "transgressive shedding" model, developed for the GBR region, terrigenous sediment initially accumulates behind the barrier reef and is redeposited on the slope during the subsequent sea-level transgression, which occurs during glacial terminations. Planktic foraminifer oxygen isotope stratigraphy and terrigenous mass accumulation rates from ODP Hole 1198A on the Marion Plateau, a continental slope feature seaward of the south-central GBR, indicates that from MIS 19 each glacial termination was accompanied by increased terrigenous sediment accumulation. This suggests that the scattered patch reefs coalesced into an effective barrier during the previous interglacial. Prior to MIS 21, off-shelf transport of terrigenous sediment appears to be in mixed response to both sea-level change and summer monsoon intensity variability. These initial results suggest that the GBR was emplaced prior to MIS 11 and the observed poor deep-ocean carbonate preservation at that time may not be related to its formation. The results further suggest that the reciprocal sedimentation may not be applicable to this continental margin prior to the formation of a rimmed morphology due to the interplay of the out-of-phase insolation forcing.

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