

Residence times of reef-island sediments constrained by post-mortem precipitates

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The precipitation of carbonate cements is a rapid process in tropical marine environments. Distinct from calcification, the onset of cementation coincides with the termination of ^{14}C uptake within carbonate-sediment forming organisms. Here we show that this relationship presents new opportunities for examining the temporal lag between organism death and deposition in carbonate systems – the prerequisite for reliable depositional chronologies. We dated skeletal constituents collected from discretely stratified reef-island deposits in Indonesia. In each of the strata, internally least cemented segments of the calcifying green alga *Halimeda* yield the youngest ages. Complementary mesocosm experiments on cementation rates reveal that post-mortem cement growth initiates within months after transport commences. Continuous pore-filling cementation promptly stabilizes the initially fragile *Halimeda* skeleton. Furthermore, abrasion experiments show that such cementation significantly increases the durability of segments during transport. Implications of these findings are profound in two respects; first, evaluating residence times of skeletal carbonate constituents based on abrasion features is far from being adequate. Second, the absence of cements within sedimentary *Halimeda* segments signals that post-mortem transport through the intertidal zone occurred quasi-instantaneously. Radiometric ages from such specimens should minimize the temporal lag between organism death and deposition thus making them reliable indicators of sedimentation in supratidal environments.