

TITLE: Late Holocene sea-level fall and turn-off of reef flat carbonate production: Rethinking bucket fill and coral reef growth models

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ABSTRACT:

Research Article | February 01, 2015 Late Holocene sea-level fall and turn-off of reef flat carbonate production: Rethinking bucket fill and coral reef growth models Daniel L. Harris; Daniel L. Harris 1Geocoastal Research Group, School of Geosciences, University of Sydney, Sydney, NSW 2006, Australia 2ZMT (Leibniz Center for Tropical Marine Ecology) and MARUM (Center for Marine Environmental Research), The University of Bremen, Fahrenheitstrasse 6, 28359 Bremen, Germany *Current address: School of Geosciences (F09), University of Sydney, Sydney, NSW 2006, Australia; E-mail: daniel.harris@sydney.edu.au. Search for other works by this author on: GSW Google Scholar Jody M. Webster; Jody M. Webster 1Geocoastal Research Group, School of Geosciences, University of Sydney, Sydney, NSW 2006, Australia Search for other works by this author on: GSW Google Scholar Ana Vila-Concejo; Ana Vila-Concejo 1Geocoastal Research Group, School of Geosciences, University of Sydney, Sydney, NSW 2006, Australia Search for other works by this author on: GSW Google Scholar Quan Hua; Quan Hua 3Australian Nuclear Science and Technology Organisation, Locked Bag 2001, Kirrawee DC, NSW 2232, Australia Search for other works by this author on: GSW Google Scholar Yusuke Yokoyama; Yusuke Yokoyama 4Department of Earth and Planetary Sciences, University of Tokyo, Tokyo 113-0033, Japan Search for other works by this author on: GSW Google Scholar Paula J. Reimer Paula J. Reimer 5School of Geography, Archaeology and Palaeoecology, Queen's University Belfast, Belfast, Northern Ireland BT9 6AX, UK Search for other works by this author on: GSW Google Scholar Geology (2015) 43 (2): 175-178. <https://doi.org/10.1130/G35977.1> Article history received: 10 Jun 2014 rev-recd: 26 Nov 2014 accepted: 27 Nov 2014 first online: 09 Mar 2017 Cite View This Citation Add to Citation Manager Share Icon Share Facebook Twitter LinkedIn MailTo Tools Icon Tools Get Permissions Search Site Citation Daniel L. Harris, Jody M. Webster, Ana Vila-Concejo, Quan Hua, Yusuke Yokoyama, Paula J. Reimer; Late Holocene sea-level fall and turn-off of reef flat carbonate production: Rethinking bucket fill and coral reef growth models. *Geology* 2015;; 43 (2): 175-178. doi: <https://doi.org/10.1130/G35977.1> Download citation file: Ris (Zotero) Refmanager EasyBib Bookends Mendeley Papers EndNote RefWorks BibTex toolbar search Search Dropdown Menu toolbar search search input Search input auto suggest filter your search All Content By Society Geology Search Advanced Search Abstract Relative sea-level rise has been a major factor driving the evolution of reef systems during the Holocene. Most models of reef evolution suggest that reefs preferentially grow vertically during rising sea level then laterally from windward to leeward, once the reef flat reaches sea level. Continuous lagoonal sedimentation ("bucket fill") and sand apron progradation eventually lead to reef systems with totally filled lagoons. Lagoonal infilling of One Tree Reef (southern Great Barrier Reef) through sand apron accretion was examined in the context of late Holocene relative sea-level change. This analysis was conducted using sedimentological and digital terrain data supported by 50 radiocarbon ages from fossil microatolls, buried patch reefs, foraminifera and shells in sediment cores, and recalibrated previously published radiocarbon ages. This data set challenges the conceptual model of geologically continuous sediment infill during the Holocene through sand apron accretion. Rapid sand apron accretion occurred between 6000 and 3000 calibrated yr before present B.P. (cal. yr B.P.); followed by only small amounts of sedimentation between 3000 cal. yr B.P. and present, with no significant sand apron accretion in the past 2 k.y. This hiatus in sediment infill coincides with a sea-level fall of ~1.3 m during the late Holocene (ca. 2000 cal. yr B.P.), which would have caused the turn-off of highly productive live coral growth on the reef flats currently dominated by less productive rubble and algal flats, resulting in a reduced sediment input to back-reef environments and the cessation in sand apron accretion. Given that relative sea-level variations of ~1 m were common throughout the Holocene, we suggest that this mode of sand apron development and carbonate production is applicable to most reef systems. You do not have access to this content, please speak to your institutional administrator if you feel you should have access.

PDF URL: None

CITED BY COUNT: 36

PUBLICATION YEAR: 2015

TYPE: article

CONCEPTS: ['Reef', 'Queen (butterfly)', 'Coral reef', 'Holocene', 'Geology', 'Archaeology', 'Oceanography', 'History', 'Ecology', 'Hymenoptera', 'Biology']