

# Is the Simultaneous Onset of the Florida, East Australia, and Indian Ocean Currents Related to Himalayan tectonics?

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## Abstract

Carbonate drift deposits in the Santaren Channel, on the Marion Plateau and in the Inner Sea of the Maldives were cored and dated by ODP and IODP expeditions. The ages based on biostratigraphy of these drifts are 11.4 Ma (Marion Drift), 12.3 Ma (Santaren Drift) and 12.9 Ma (Maldives Inner Sea), indicating a near simultaneous onset of the Florida, East Australia and Indian Ocean Currents that are all part of the global ocean current system. The Himalayan tectonics started with the collision of the Indian continent with Asia about ~50 Ma ago and continues today. The uplift of the Himalaya and Tibetan Plateau was not steady and not consistent across the mountain belt. The uplift of the southern and central Tibetan Plateau occurred from 40–35 Ma, at the northern Tibetan plateau at approximately 25–20 Ma, and at the northeastern to eastern Tibetan plateau at ~15 Ma. Significant increases in altitude of the entire Tibetan plateau are thought to have occurred about 10–8 Ma ago. More recently, some 3 myrs after the onset of the modern Indian Ocean monsoon-driven circulation system that is dated at 12.9 Ma. This sudden onset or intensification is puzzling in light of the continuous uplift of the Himalaya and Tibetan Plateau. If a linkage between tectonics and climate exists, the uplift must have stepped over a threshold that caused the climate to change dramatically. The near simultaneous onset of the global ocean circulation and the intensification of the monsoon is strong evidence that a combination of factors caused the sudden climate change. It is likely that onset of the intense monsoon is the combined result of the tectonic configuration, consisting of the Himalayan uplift but also the closing of the Tethyan seaway, and progressive glaciation on Antarctica.

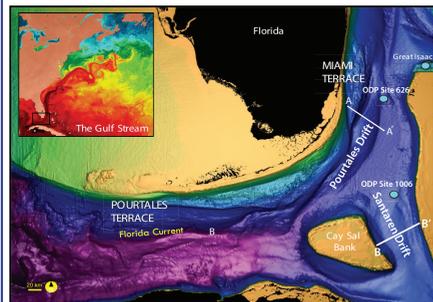
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<sup>1</sup>CSL - Center for Carbonate Research, University of Miami, <sup>2</sup>University of Hamburg, <sup>3</sup>University of Edinburgh, <sup>4</sup>University of Fribourg

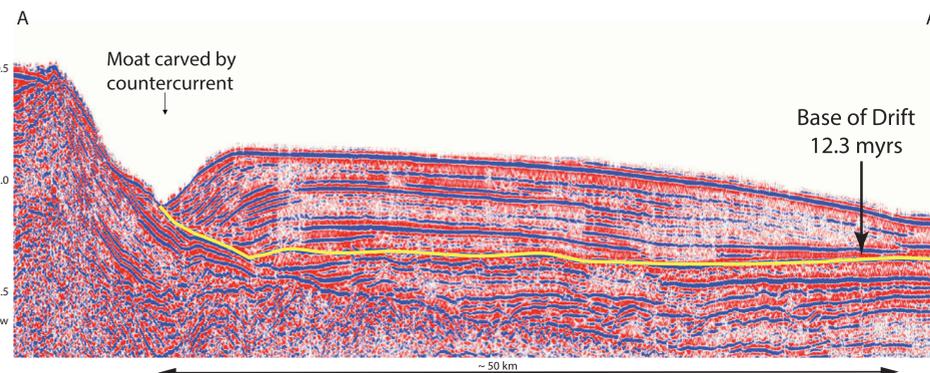
## Straits of Florida and Santaren Channel

### Location

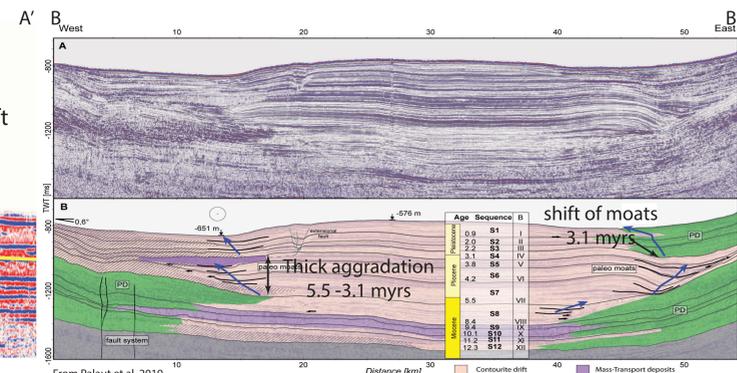


Bathymetric map of the Straits of Florida showing the contourite drifts deposited by the Florida Current and its tributaries. A-A' seismic line across Pourtales Drift. B-B' seismic line across Santaren Drift.

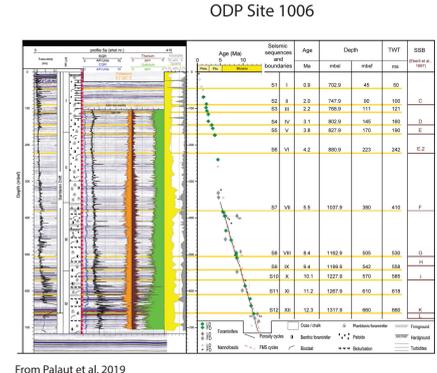
### Pourtales Drift



### Santaren Drift

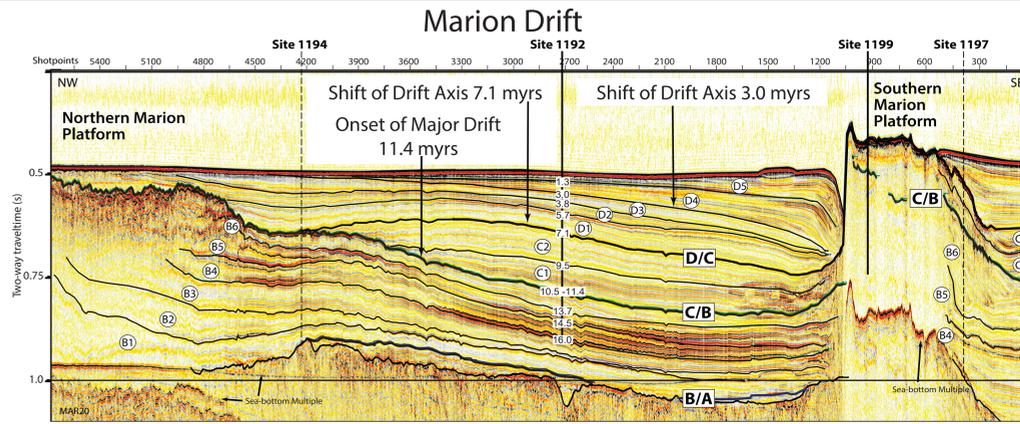
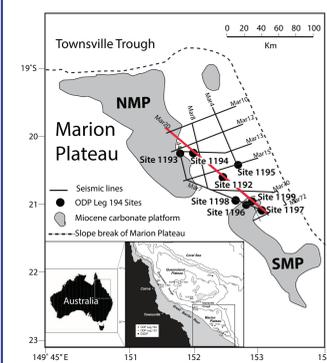


### Age Model

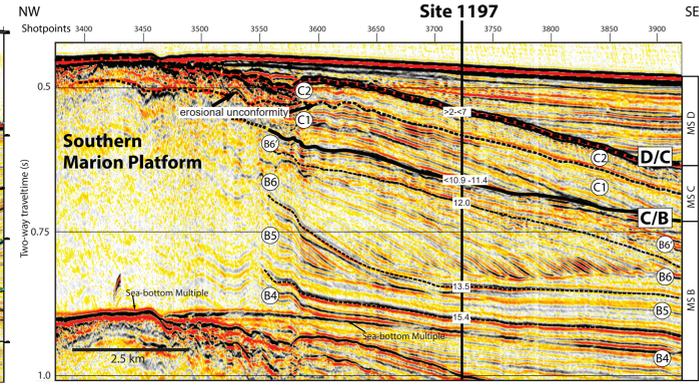


## Marion Plateau - East Australian Margin

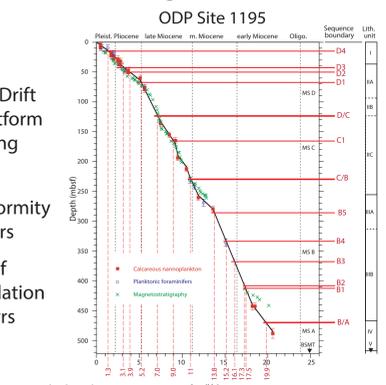
### Location



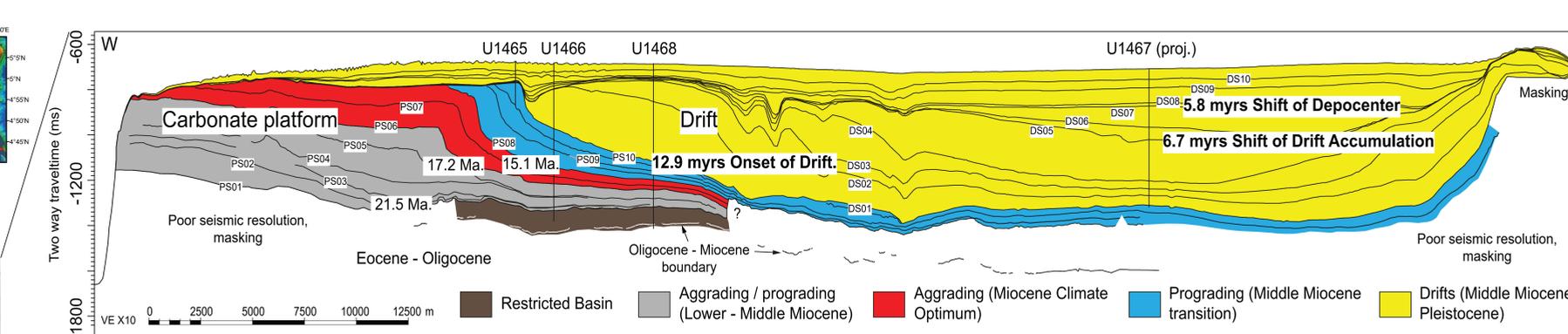
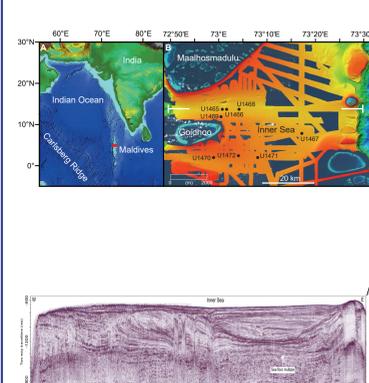
### Current-Controlled Progradation



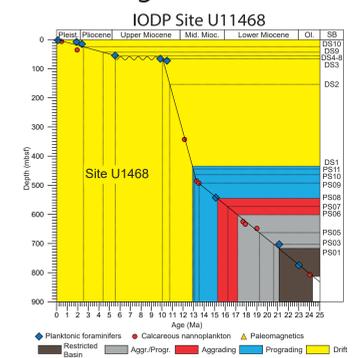
### Age Model



## Maldives Inner Sea



### Age Model



### Florida Current events

Based on Palaut et al. 2019

- 3.1 myrs  
Shift of moats and increase of flow
- 5.5 - 3.1 myrs  
Highest accumulation rates within the drift in a mounded elongated drift
- 12.3 myrs  
Onset drift deposition

### Regional Tectonic events

Based mostly on Poore et al. 2006

- 3.5 - 2.8 myrs  
final closure of Central America Seaway (CAS)
- 4.6 myrs  
CAS shallower than 100 m
- 13.1 - 12.2 myrs  
Separation of benthic fauna between Caribbean/Pacific begin of closure of CAS

### E Australian Current events

Based on Eberli et al. 2010

- 3.1 myrs  
Shift of drift axis
- 7.1 myrs  
Shift of drift axis
- (13.5) - 11.4 myrs  
Onset current-controlled progradation and drift deposition

### Regional Tectonic events

Based on Holm et al. 2015

- 3.0 myrs  
Closure of Solomon Sea
- 7.0 myrs  
slab break-off and lithospheric delamination and a second phase of orogenesis in New Guinea
- 12 myrs  
Continent collision Australia - New Guinea and start of orogenesis

### Monsoon Current events

Based on Betzler et al. 2016 and Ludmann et al. 2018

- 5.8 myrs  
Shift of depocenter eastward
- 6.7 myrs  
Top of delta drift deposition
- 12.9 myrs

### Regional Tectonic events

Based on Reuter et al. 2009

- ~ 20 myrs  
Closure of Tethyan Seaway

### Himalaya Tibet

Based on Molna et al. 2010; Trumbley et al., 2015; Yin, 2006)

- 7 - 4 myrs  
Development of Lesser Himalayan duplex system
- 12 - 11 myrs  
Rapid exhumation of Himalaya - Tibet
- 15 myrs  
Abrupt rise of Tibetan Plateau

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