# EVOLUTION OF SOUTH JOULTER CAY, GREAT BAHAMA BANK – A TALE OF STORM DEPOSITION?

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## PROJECT OBJECTIVES

- To further calibrate the timing of key depositional events within the history of South Joulter Cay by radiometric dating of select island ridges.
- Thereby testing whether the initial ridges of the island, as well as the ridges associated with shifts between growth stages, are the results of storm deposition and resulting changes to the local hydrodynamic setting.

## PROJECT RATIONALE

Our ongoing examination of South Joulter Cay (SJC), a key part of the modern Joulters ooid sand body on Great Bahama Bank (GBB) north of Andros Island, targets a better delineation of the timing and processes that formed the island. High resolution imagery and a digital elevation model (DEM) constructed from a drone survey helped to formulate a scenario for island development which emphasized growth stages reflecting variations in dispersal of ooid sands by tidal channels, wind and wave energy, and longshore and storm-related currents (Fig. 1). We are testing the hypothesis that the initial ridges of the island, as well as the ridges associated with shifts between growth stages, are the results of storm deposition and resulting changes to the local hydrodynamic setting.

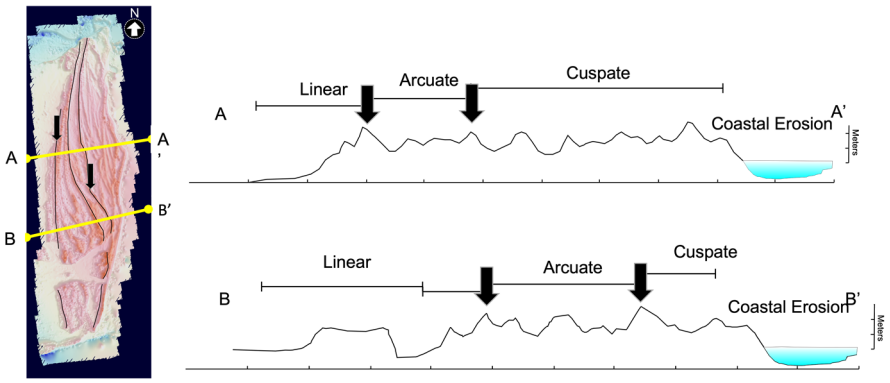


*Figure 1: DEM from high-resolution drone imagery (Harris et al., 2021) annotated to show interpreted morphological stages of island growth. Stage 1 Linear Ridges represent initial island formation; Stage 2 Arcuate Ridges formed as part of an ebb tidal delta lobe related to a channel cutting the island; and Stage 3 Cuspate Ridges were deposited as multiple prograding beach ridge sets driven by longshore currents. Note the boundaries between the growth stages shown by black arrows are consistently formed by higher ridges suggesting extraordinary depositional conditions.*

## APPROACH

From observing the impacts of recent hurricanes, we believe that major storms proximal to Joulters and delivering east to west energy and sediment transport are most likely to have played a role in island development, but that a single storm by

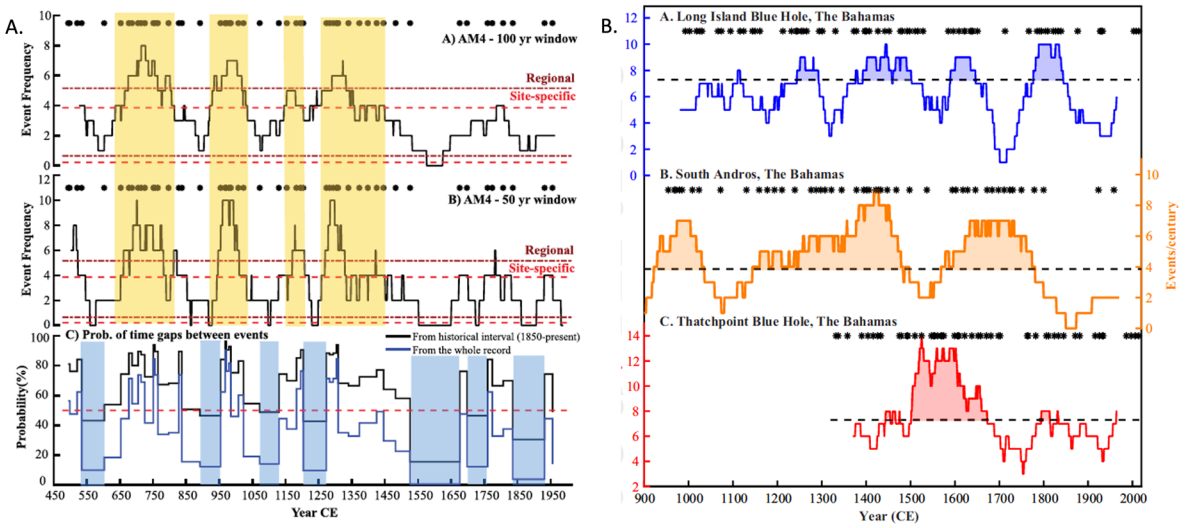


*Figure 2: (A) from Wallace et al., 2019, shows results from sediment coring in a blue hole on South Andros to assess timing of storm deposits and therefore storm frequency. Yellow highlighted portions of plot indicate four periods of intense hurricane activity. (B) from Wallace et al., 2021, zooms in on the South Andros data as well as results from two other Bahamas sites to better delineate multi-decadal periods of intense storm activity.*

itself may be insufficient to cause change. Instead, it is more likely that multi-decadal periods of intense storm activity as determined for the last 1100-1500 years by recent sediment coring and dating from several blue hole sites on GBB (Fig. 2) provides the type of collective storm activity that can relate to the initiation and growth change variability observed at SJC.

## SIGNIFICANCE

This study has relevance to facies interpretation and correlation within subsurface grainstone reservoirs as well as the interpretation of their sequence stratigraphic and diagenetic development. The development of islands like SJC introduces an element of spatially constrained facies variation and meteoric diagenesis. Thus, at the EOD scale, islands like SJC add significantly to complexity and potential localized heterogeneity within a broader development of reservoir quality grainstone. Assessing the impact of storms in forming the island and changing ridge morphology will continue to help refine our understanding of the broad suite of controls over shallow carbonate platform facies patterns.

## REFERENCES

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