

# CAY SAL BANK, BAHAMAS — A PARTIALLY DROWNED CARBONATE PLATFORM

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## ABSTRACT

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Recent high-resolution seismic reflection profiling, sediment sampling, SCUBA observations and Landsat imagery show that Cay Sal Bank (CSB) has very limited reef development, no active sand shoals, few islands, a thin to non-existent sedimentary cover and a relatively deep margin (20–30 m) and shelf lagoon system (10–20 m). Windward and leeward margins can be discerned, but their general development is poor when compared to the shallower, more active margins of Little Bahama Bank (LBB) and Great Bahama Bank (GBB).

Windward margins (facing north and east) along CSB are generally deep, rocky, sediment-baren terraces supporting limited, low-relief, relict(?) reefs. Leeward margins have small sand bodies (maximum thickness 10 m) covering reef structures at the bank edge indicating that offbank transport of sands has occurred. However, these marginal sand bodies are limited in areal extent, suggesting that this transport system was not ubiquitous along the south- and west-facing margins.

Seismic and grab sample data from the deep (200–500 m) slopes seaward of the leeward margins show a thin, discontinuous unit of periplatform sand containing *Halimeda*, molluscs, and non-skeletal components derived from shallow water. The limited basinward extent (no deeper than 300 m) of this unit, recognized by its reflection-free seismic facies, also indicates that sand production and transport off the bank were never prolific. This is in stark contrast to new seismic data from the leeward margins of GBB which clearly show thick (20 m) sand bodies covering high reefs 12–15 m along the outer margin and multiple reflection-free units extending to great depths (600 m) all along the adjacent slope.

The apparent immature development of normal bank-top processes and facies, and the absence of key modern depositional environments on CSB may be related to the rate at which this platform was submerged. Due to its comparatively low elevation, the initial Holocene flooding occurred at approximately 8–10 ka when sea level rise was rapid ( $6 \text{ m ka}^{-1}$ ). By comparison, the higher LBB/GBB were flooded later at a much slower rate ( $1.5 \text{ m ka}^{-1}$ ). The relatively rapid flooding of CSB provided little time for the shallow depositional environments to start up. The continued rapid rate of sea-level rise after drowning, and offbank transport of sediment and the export of chilled waters formed during winter months, prevented the resulting facies from catching up. Consequently, CSB appears to be partially drowned, particularly when compared to the other "healthier" rimmed Bahamian platforms.