Abstract

The interplay of depositional and erosional processes and their evolution in time are unraveled by the correlation of new high-resolution hydroacoustic data with sediment- and isotope data from ODP Leg 166 cores on the slope of Great Bahama Bank, providing new insights into sedimentation patterns of carbonate platform slopes through time. In result, a high-frequency sequence stratigraphic scheme encompassing the Marine Isotope Stages (MIS) 1 to 11 (the last 400 ka) is presented. High-frequency sequences consist of sea level highstand sediments bound by well-lithified lowstand intervals. The sequences display, however, considerable variations in morphology along strike and through time. In the northern part, all sequences contain mass transport complexes and channels accompanied by a lateral variable sediment thickness. In the southern part, by contrast, sediment thickness along the slope is controlled by off-bank transport and bottom currents. Large mass transport complexes leveled the slope morphology during MIS 11 to 9, whereas younger sequences (MIS 7 to 1) show a uniform along-strike thickness of the sequences without evidence of large gravity mass movements. A geological model was developed, based on the sedimentological data of two ODP cores and the hydroacoustic reflection patterns. This model evaluates how the changes in slope morphology influence the lateral facies distribution. Sequences of MIS 11 to 9 show a downslope and along strike facies variability, whereas younger sequences (MIS 7 to 1) are characterized by downslope variations only. The encountered changes in slope morphology and sediment distribution along the slope of Great Bahama Bank provide implications on established slope models and allow improved prediction of sediment heterogeneities in such sedimentary successions.
Sea-floor characteristics

Echinoderm

- wackestones.
- are delimited by the sequence boundaries.
- The cut-and-fill structures form a gullies cut deep into the underlying strata. In the high-frequency sequences, several LINE

Original composite seismic

Grainstone

Sequence d, MTC deposits interfinger with the d and f. Since Sequence f, a continuous upslope channels occur along the sequence boundaries. Compared to the southern slope, channels are

Composite line 4

2362

200 m

9(

2605

2727

MIS

9

3DFNVWRQH 3DFNWRJUDLQVWRQH

500

Depth [mbsf]

3OHLVWRFHQH3OLRFHQH ene o i M

Fish debris

500 µm

PhD position of M.W. is funded by CliSAP.

To resolve the slope architecture at a sub-seismic contour currents

81°W 80°W 79°W

Santaren          Channel

Great

Depositional model:

During the deposition of Sequence g the current and triggered the incision of minor channels. Continuous erosion oversteepened the toe of slope currents merge with the north-directed contour eastwards. At the northern slope, where the Florida Santaren drift

F

500 m

G

Gullies

During the formation of Sequence d, the moat was backfilled by MTC material was transported in the channels, which were During deposition of Sequence c, the progradation of the MTC deposits with depressions and gullies; leveled and refilled during subsequent sea-level highstands. These slope failures created a complex slope morphology. Since the Late Miocene, the slope geometry transition consists of three major types of deposits. The first are sea-floor multiple}

Southern slope: lower current velocities

- drift deposits of the Santaren drift, which is shaped by slope failures that displaced slope material as mass transport

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