



Seismic investigation of the mouth of Babitonga Bay, SC, and its adjacent Internal Platform

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This paper was prepared for presentation during the 17th International Congress of the Brazilian Geophysical Society held in Rio de Janeiro, Brazil, 16-19 August 2021.

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Abstract

This study presents a model for the geological evolution of the mouth of Babitonga Bay (the northern coast of Santa Catarina) based on investigation of Holocene and Upper Pleistocene sedimentary deposits in the bay mouth and adjacent Internal Platform. The coastal plain adjacent to the surveyed area is composed of marine-beach sediments deposited during the Quaternary as a series of sandy ridges, coastal lagoons, and dunes. We collected and analyzed 106 km of high-frequency seismic data (CHIRP; frequency: 0.5 - 7.0 kHz) from the southern portion of the mouth of the main channel of the bay. From this, five seismostratigraphic units were identified, which reveal the succession of depositional environments from the end of the Pleistocene to the present. The first unit is ubiquitous, internally transparent, and characterized by an irregular upper surface. This acoustic basement is interpreted as igneous rocks, contiguous with those outcropping along the coast. Inside the bay and close to the headlands, the basement is close to the surface. Unit II, characterized by transparent seismic facies, represents Pleistocene sedimentary deposits, which were excavated by the local drainage system. These were subsequently capped by Unit III, consisting of continuous, high-amplitude reflectors and interpreted as middle Holocene transgressive deposits. Here, the morphostratigraphy of a barrier-lagoon system is observed along the Internal Platform, whereas inside the bay, Unit III deposits are predominantly channel fill. Characterized by internal parallel and/or subparallel reflectors, Unit IV is composed of characteristic sea-level highstand deposits (e.g., tidal flats and estuarine deposits) in the interior of the bay, and sandy barriers at the mouth. Finally, present throughout the survey area, Unit V consists of modern deposits characterized by high-intensity and continuous internal reflectors. Bedforms occur in this unit. Based on these findings, an evolutionary model of coastal change during the late Pleistocene to late Holocene regressive-transgressive episode is proposed. In this model, channels within the bay excavated earlier Pleistocene deposits as they flowed over the exposed platform. Then, with sea level at or near its middle Holocene maximum, estuarine deposits were formed within the bay, capping the channels that were filled during the transgression. Meanwhile, the barrier-lagoon system on the Inner Platform was abandoned and overtopped with marine sediments. Finally, with sea level near its maximum or slowly falling over the last 5000 years, modern sedimentation patterns were established, with active seafloor bedforms marking locations with more intense flow.