SLUMPS MASS-TRANSPORT DEPOSITS IN THE BRAZILIAN CONTINENTAL MARGIN DEEP WATER: OFFSHORE POTIGUAR BASIN, NE BRAZIL

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Introduction

The Brazilian Continental Margin (BEM) deep-water regions contain important geological features that need advance in their characterization. Mass-transport deposits (MTD) are important not only by their significance in the sedimentary but also because of their negative impact economically. A slump is a coherent mass of sediment that moves on a concave-up glide plane and undergoes rotational movements causing internal deformation and one of the basic types of MTD. The study area comprises part of the offshore Potiguar Basin in NE Brazil, on the distal eastern portion of the Touros High and Fernando de Noronha Ridge (Fig. 1). This portion of the Potiguar Basin comprises a transform rift system that has evolved into a continental passive margin. This basin represents an important location related to the breakup between South America and Africa. The database used in this work included 2D post-stack time-migrated seismic profiles (Figs. 2, 3 and 4) from the Brazilian Agency of Petroleum, Natural Gas, and Biofuels (ANP). The slumps reflectors are identified on the continental shelf profiles in form of present clinoform configuration, medium to high continuity, high amplitudes, and medium to high frequencies, representing a sigmoidal oblique complex prograding reflector. The slump scars at the continental slope indicate that this is a gravitationally unstable area that will eventually collapse, resulting in erosional features on the continental slope and deposition on the continental rise. Our results provide some insights regarding MDT slumps sedimentary evolution in the BEM deep water area as well as their interrelation with the other sedimentary deposits.

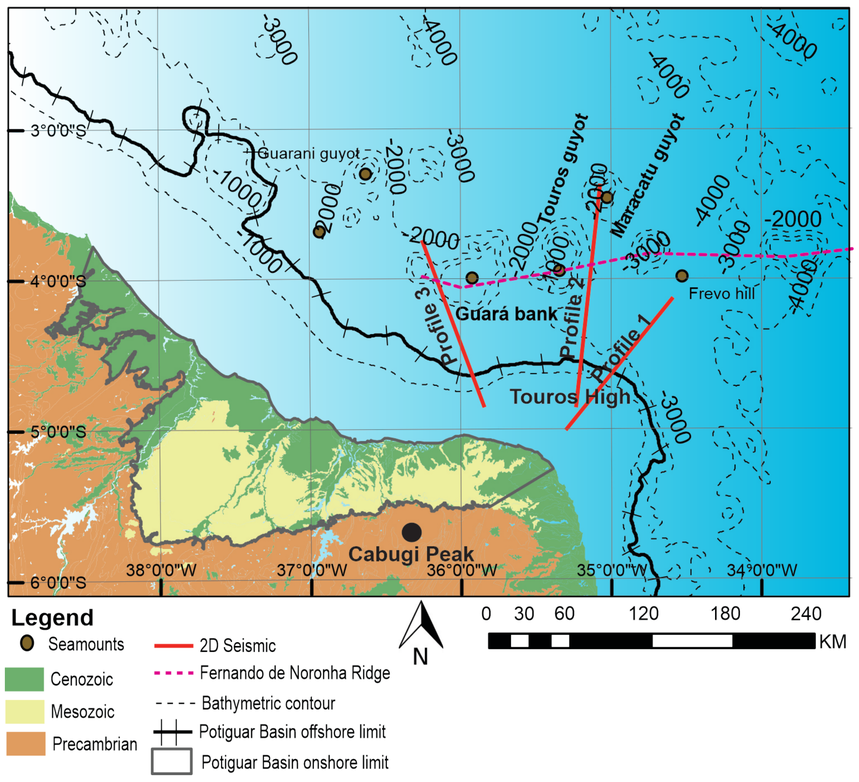

Fig. 1. Simplified geological map of the eastern portion of the Brazilian equatorial margin, showing the location of the seismic lines , the Potiguar Basin offshore and onshore limits and he Fernando de Noronha Ridge.

Materials and Methods

The database used in this work included three seismic lines from the Brazilian Agency of Petroleum, Natural Gas, and Biofuels (ANP). These data represent almost 370 km of 2D post-stack time-migrated seismic profiles (Figs. 2, 3 and 4). The seismic processing was performed by Seismic Australia Inc. applying the basic processing sequence. The seismic profiles cover the Touros High, part of the continental shelf and slope, seamounts, and deep-water basins (Figure. 1). An image processing workflow with seismic attribute and filters (e.g., median filter, structural smoothing, and outcrop attribute) was applied to each seismic profile with the aim of improving the seismic interpretation. Major reflectors were identified based on the physical parameters of reflectors: geometry configuration, continuity, and amplitude. This last parameter denotes the high reflection peaks and depends on the reflection coefficient. Reflector terminations (onlap, downlap, etc.) were equally used in the seismic stratigraphy interpretation.

Morphostructural Features

The uppermost reflectors in the continental shelf prograde toward the continental slope. The clinoforms observed on the continental slope form sigmoidal complexes that indicate a prograding system to the deep-water basin in Profiles 1, 2, and 3 (Figs. 2, 3 and 4). The reflector representing the ocean bottom in the continental slope shows an irregular morphology, indicating the following features:

1) Slumps: these morphological features were identified at the continental slope on Profiles 1, 2, and 3 (Figs. 2,3 and 4) associated with gravitational movements of sediments along the slope.

2) Submarine canyon: between 10.4 km and 8.6 km long, observed in Profiles 1 and 2 (Figs. 2 and 3), respectively. According to Vital et al. (2008) and de Almeida et al. (2015), several submarine canyons intersect the continental slope in the continental margin of the Potiguar Basin. These canyons are the result of erosional processes that occurred on the shelf break and continental slope and they are related to the general tectonic setting.

The submarine canyon and slump scars at the continental slope indicate that this is a gravitationally unstable area that will eventually collapse, resulting in erosional features on the continental slope and deposition on the continental rise. Therefore, gravitational flow shapes the morphology of the continental slope and rise (de Almeida et al. 2015; Scarselli et al. 2016), as well as the infill of the deep-water basins.

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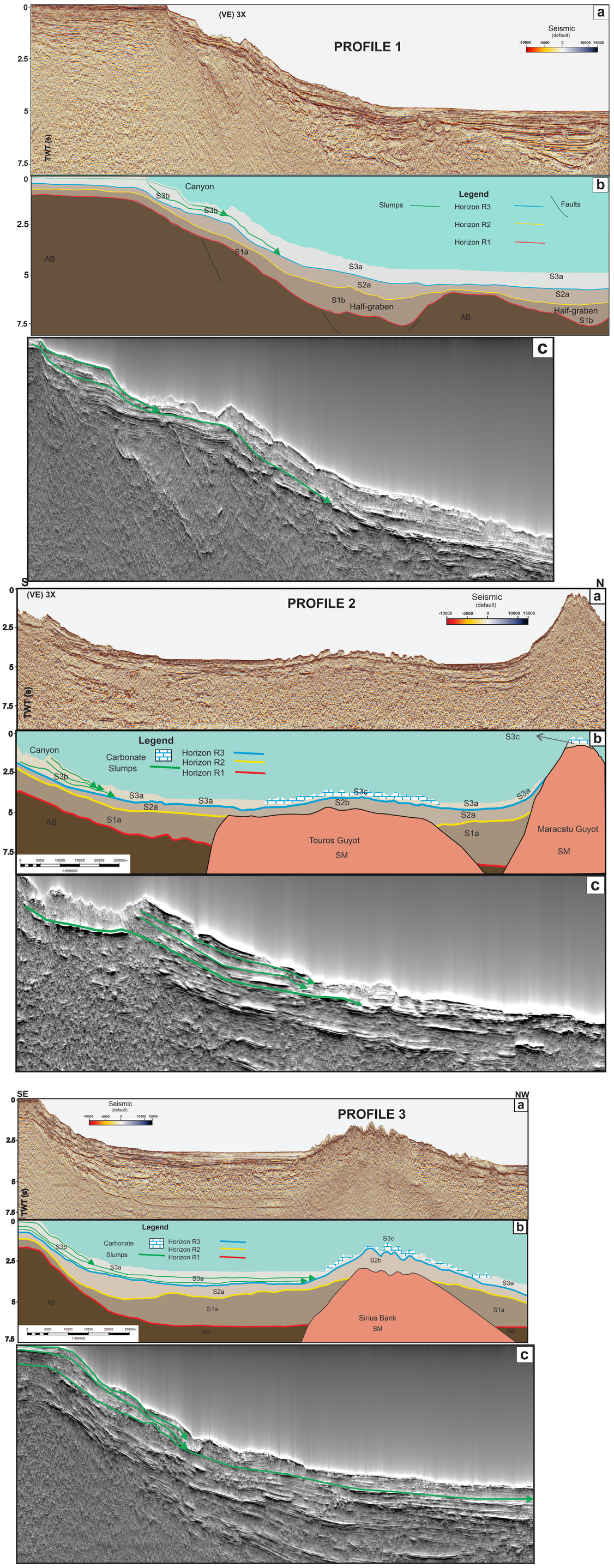

Figs. 2,3 and 4 a) Seismic profiles 1, 2 and 3 b) Seismic profiles with seismic stratigraphy interpretation **c)**Zoomed image with seismic attribute evidencing the slumps