QUANTITATIVE GEOMORPHOLOGY OF A MIXED CARBONATE SILICICLASTIC SHELF-TO-BASIN SUBMARINE DRAINAGE SYSTEM, MIOCENE, BROWSE BASIN, NORTHWEST SHELF OF AUSTRALIA

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ABSTRACT

Recent studies using high-resolution bathymetric data in the Great Barrier Reef and the Bahamas archipelago slope reveal a more complex architecture than in classic carbonate slope models. These studies show that modern carbonate slopes have well expressed canyons and sinuous channels similar to their siliciclastic slopes. This study aims to quantify carbonate and mixed carbonate-siliciclastic slope architectural elements from 3D seismic data and generate an updated model on these slope systems.

The research area of this project is the upper to toe-of-slope region of a Miocene mixed carbonate-siliciclastic carbonate shelf in the Browse Basin of NW Shelf Australia. The study uses seismic geomorphology techniques on a 3D dataset covering a total of over 25,000 km^2. This slope can be divided into three parts: (1) a low angle upper slope between the shelf platform and break; (2) a steep middle slope filled with canyons; and (3) a lower angle outer slope with channel-levee systems (CLS), MTDs, and fans. Using advanced 3D volume slicing and coherency and frequency decomposition attributes, the slope architectural elements were imaged to extract geomorphic data. Canyons were defined to be wide (1-2 km), low sinuosity (1.00-1.14) channels on the steeper gradients of the mid-upper slope. Some canyons developed downstream into CLS, which are narrower (<1 km) and more sinuous (1.05-1.30). In many cases, the evolution of canyons into CLS can be observed in the middle-outer slope. The development of CLS is controlled by slope gradient and frequently interrupted by MTDs. Many channels show signs of avulsion, lateral migration, and lateral and vertical accretion.

This dataset provides an excellent example of geomorphology of a mostly carbonate slope to toe-of-slope systems and geomorphic information for these architectural elements. This new information can be used to update models of such systems and provide a new analogue for exploring other carbonate slope and basin environments.

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