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**Seismic Geomorphology of Microbial-Dominated Margin and Slope Environments around
an Isolated Platform, Tengiz Field, Kazakhstan**

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A newly acquired 3D seismic dataset over the Tengiz Field, Kazakhstan, has been interpreted to better understand the heterogeneity of microbial-dominated carbonate margin, slope, and associated basinal environments. Variation in margin, slope, and basin characteristics illustrates regional changes in sedimentary processes that occur on coeval margins at different positions around the platform.

The Tengiz Field is a Middle Devonian to Upper Carboniferous (Bashkirian), steep-sided, isolated platform with microbial boundstone upper slope to margin environments and associated boundstone debris in the middle slope to basin (Fig. 1). Detailed descriptions of these facies at Tengiz Field are provided by two additional abstracts in this volume (see Kenter and others; Andres and others).

Detailed seismic mapping of the top of the microbial-dominant interval (Late Visean to Bashkirian; Unit 1 reservoir) indicates a major difference in slope depositional processes acting on the NE/SE margin versus the NW margin. The NE/SE margins are characterized by large-scale (1000 m wide) arcuate-shaped, truncation features observed in the uppermost slope, which are interpreted as catastrophic collapse (i.e., slope failure) of early cemented microbial boundstone facies of the uppermost slope (Fig. 2). These erosional scars produce an irregular margin-slope boundary at these locales. Debris fields down-dip from these slope failures are interpreted from the data based on topographic relief, surface rugosity, and isopach mapping.

In comparison, the NW margin is characterized by closely-spaced (200-300 m), low-relief, “gullies” characterized by a highly serrated upper slope to platform margin transition (Fig. 3). These features are suggestive of erosion from tractive sediment gravity flows and provide a strong contrast in slope processes in comparison to the NE/SE margins. Base of slope oolitic deposits, recognized in core, are the products of deposition at the base of this gullied slope. The SW margin appears to be characterized by massive slope failure that has resulted in removal and downslope redeposition of a significant portion of upper slope and margin deposits.

Small, circular mega-amplitude anomalies observed within slope facies are low impedance events interpreted to be cavernous porosity (in microbial boundstone and debris) that developed

from dissolution by corrosive fluid flow along fracture networks. Locations of the mega-amplitude features correlate to wells with lost circulation zones and higher average productivity indexes. Better understanding of the distribution of these potential high porosity and permeability anomalies will greatly impact field development and drilling decisions.

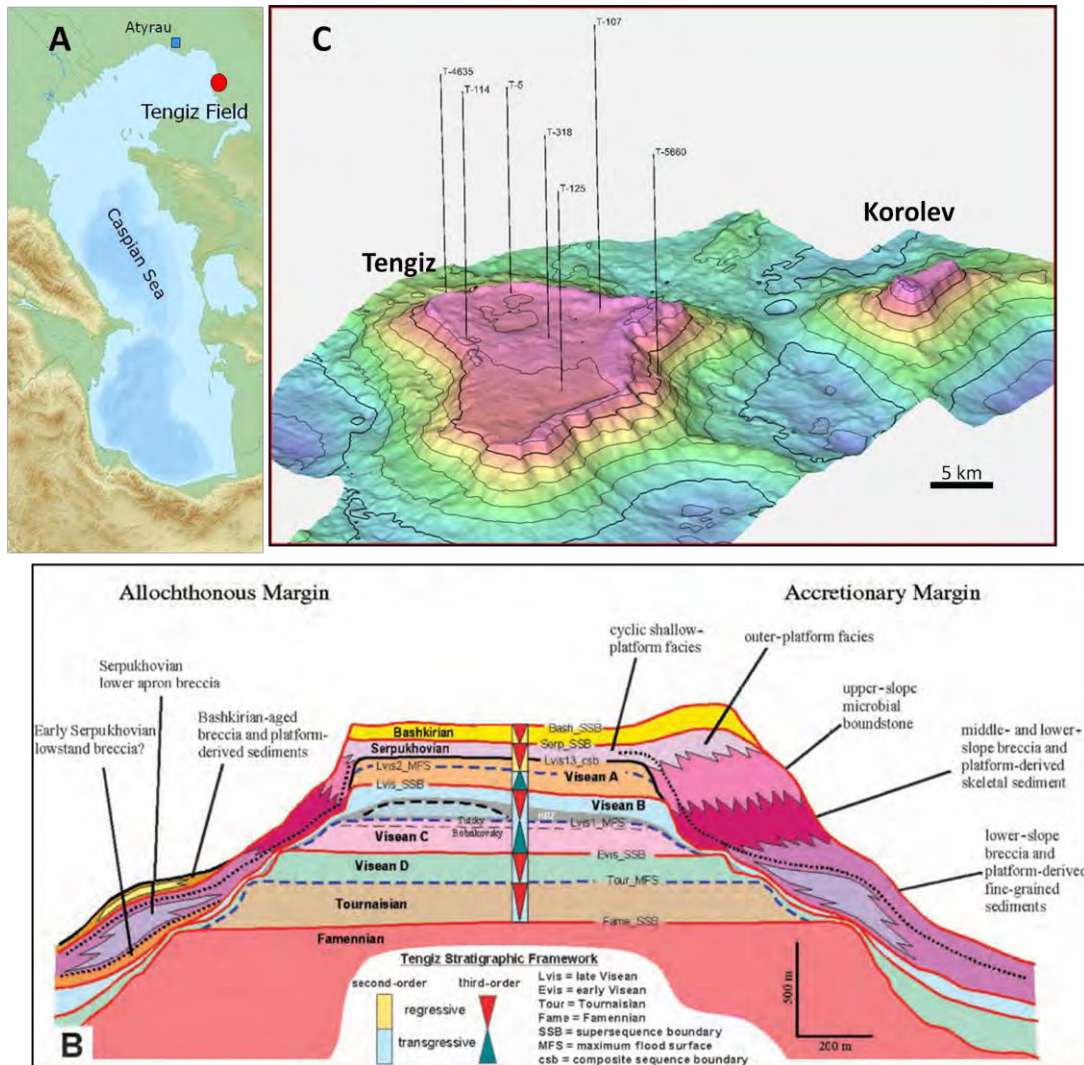


Figure 1. A) Location map for Tengiz field in western Kazakhstan, B) Cross section showing stratigraphic framework and facies regions in platform and steep slopes (from Collins *et al.*, 2006); C) Seismic depth map highlighting structure of isolated platform.

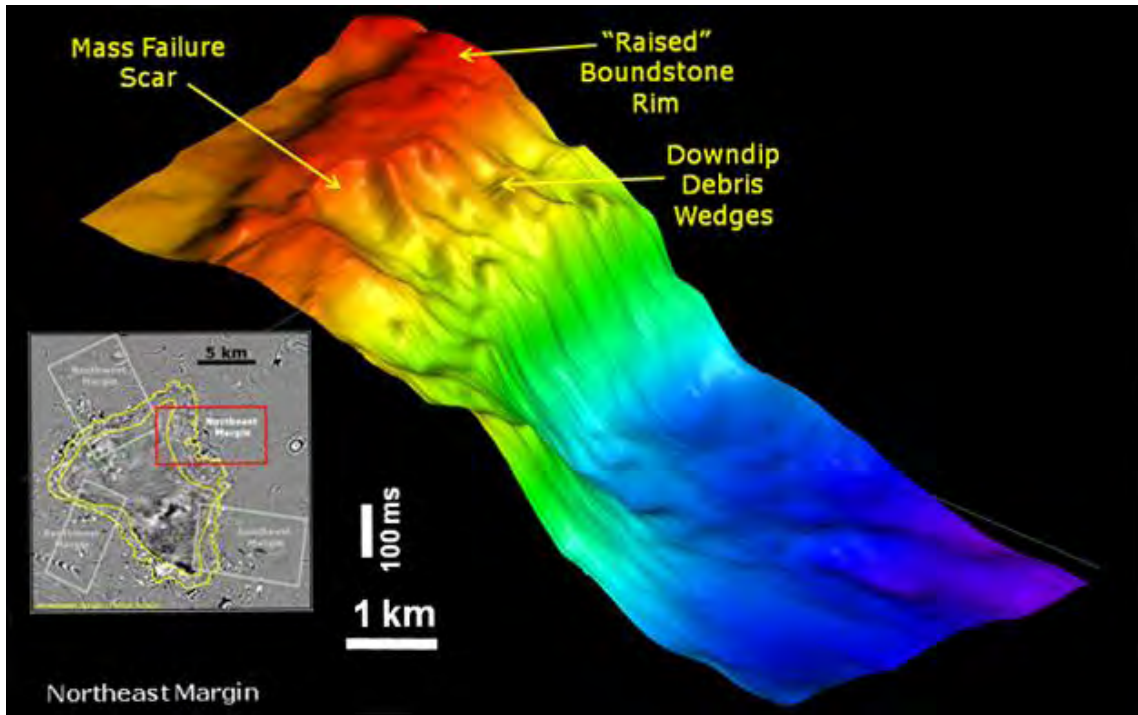


Figure 2. Bashkirian time-structure surface draped with color time scale. Reds are topographic highs and purples are lows. Note large, kilometer-scale mass failure scars in the upper slope region of the platform. Mapped area from the northeast margin of the Tengiz isolated platform (see RED rectangle in inset map).

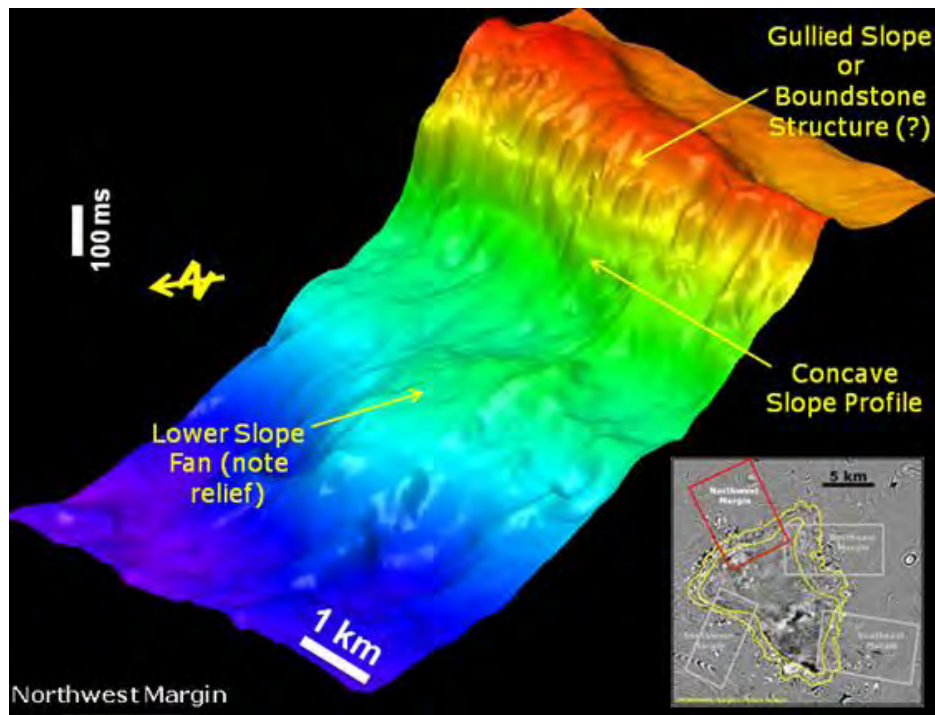


Figure 3. Bashkirian time-structure surface draped with color time scale. Reds are topographic highs and purples are lows. Note smaller relief “gullies” in the upper slope region of the platform possibly made by tractive sediment flows (or potentially in-place boundstone growth structure). Mapped area from the northwest margin of the Tengiz isolated platform (see RED rectangle in inset map).