DEFINING INTRASHELF BASIN MARGINS – EXAMPLE FROM THE MAVERICK BASIN/DEVIL'S RIVER TREND, SOUTHWEST TEXAS

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ABSTRACT

Intrashelf basins (ISBs) are shallow depressions in carbonate platforms, formed by localized declines in carbonate production. Common in greenhouse systems like the Cretaceous and Jurassic, ISBs are shaped by low latitudinal temperature gradients, sluggish ocean currents, and low oxygenation during anoxic events. ISBs position high-quality source rocks near high-energy reservoir grainstones and reefs. The well-exposed Maverick Basin serves as an important analog for similar ISBs like the Bab and Kashdumi in the Middle East by focusing on the facies architecture of the reservoir facies along the basin margins. In the Maverick Basin, the Devils River Trend (DRT) is a high-energy depositional system with grainstones and rudist reefs. Key questions regarding the Maverick ISB and DRT include: (1) to what extent do ramp margin grainstones extend around the ISB?; (2) what are the compositional and stratigraphic characteristics of the marginal facies?; (3) what currents or combination of currents drive this high-energy system on a relatively shallow shelf, 300 km from the Stuart City margin?

Field techniques included measuring eight detailed sections (~650 meters), collecting 60 samples for petrographic analysis, and generating drone-based photogrammetric models for geometric analysis. By leveraging the outcrop data and an International Boundary Water Commission core, a sequence framework comparable to the Pecos River system, with Albian 18-23 sequences and a main tie-point at the top Albian 21 sequence, was defined.

Fresno Creek, the landward-most DRT section, has 20-degree dipping clinoforms with a coarsening-upward trend, indicating a high-energy wave-dominated setting (Figure 1). The San Francisco section, representing ISB-margin deposition, shows tidal bars and channels with >15 m relief. These findings show DRT grainstones extended 100 km landward of the ISB margin, doubling previous estimates and offering new insights into facies architecture and reservoir geometries.

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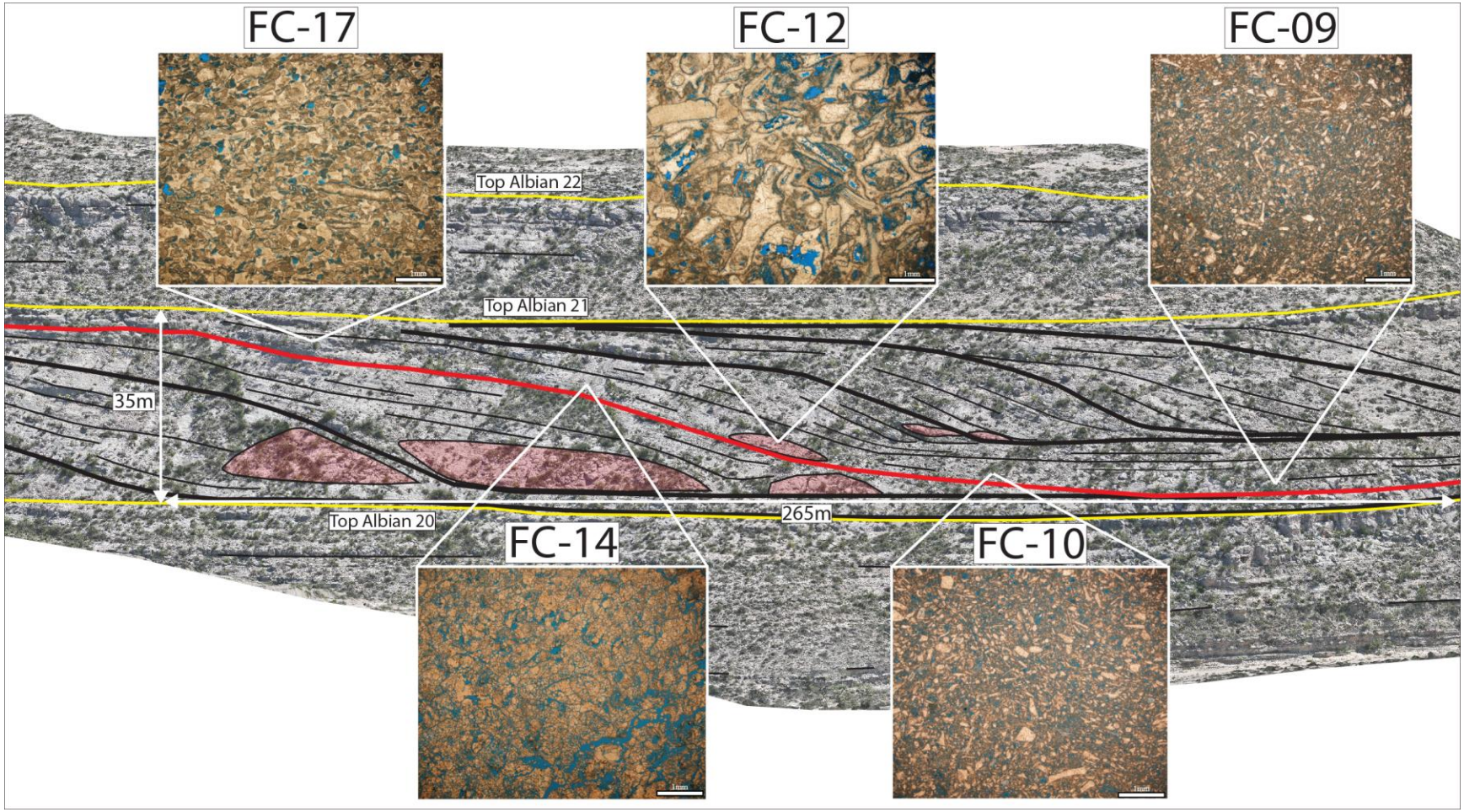

Figure 1: Interpretation of the Albian 20-22 sequences at the Fresno Creek outcrop on the Cox Ranch. This highlights the Albian 21 HFS and the prograding clinoforms that build it. The red line portrays a depositional dip line while the yellow lines mark the sequence boundaries. The red areas mark caprinid rudist debris flows. The photographs of FC-09, FC-10, FC-12, FC-14, and FC-17 are of thin sections on the 1mm scale and show the upward coarsening high-energy wave-dominated depositional environment. Note the difference in organization, roundness and alignment of grains at each depositional locality.