

SEISMIC FACIES AND STRATIGRAPHY OF THE YUCATAN PLATFORM

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PROJECT OBJECTIVES

- Assess the tectonic deformation of the Cretaceous portion of the Yucatan Platform and place the evolution of the Yucatan Platform into the regional context of Caribbean tectonics.
- Map the seismic sequences in the intraplateform seaway of the Yucatan Platform.
- Document the influence of the currents on the Neogene deposits on the eastern portion of the Yucatan platform.

REGIONAL SETTING AND PROJECT RATIONALE

The Yucatan Peninsula and adjacent shelf form the 350,000 km² Yucatan Platform. The platform hosts the Chicxulub impact crater generated by the asteroid that led to the mass extinction at the end of the Cretaceous (Schulte et al., 2010). The asteroid impact deformed the underlying basement and created a multi-ring crater that is 200 km in diameter. Scientific drilling penetrated the post-impact carbonates, an ~ 130 m thick sequence of impact strata and shocked and fractured basement rocks (Gulick et al., 2016). Regional seismic data reveals that the impact crater is located within a large N-S trending depression – the Intra-platform Yucatan Basin (Fig. 1; Guzman et al., 2019).

The Cretaceous strata displays faults and deformation that are reminiscent of wrench faults. The question is how much of this deformation is the result of the asteroid impact and how much is related to changes in the regional stress regime? The boundary between the Cretaceous and Paleocene strata is a well-defined seismic horizon. The Yucatan Basin that houses the impact crater is filled with prograding clinoforms, probably starting as early as the Early Eocene (Whalen et al., 2013, Canales-García et al., 2018).

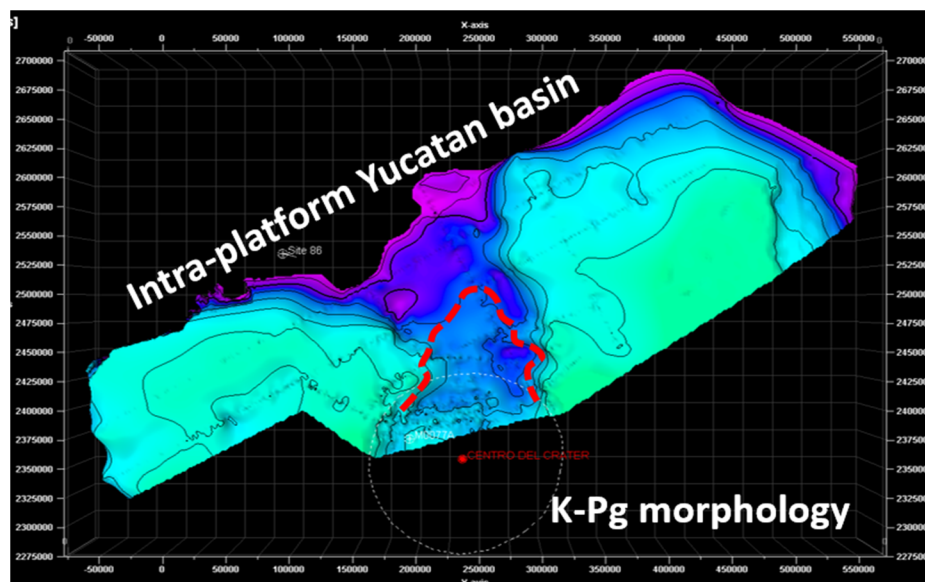


Figure 1: Topography of the Yucatan Platform at the Cretaceous-Paleogene boundary, displaying the roughly north-south oriented Intraplateform Yucatan Basin, which is nearly 180 km wide and up to 1200 m deep (from Guzman et al., 2019).

This project aims to a) assess the structural evolution of the Yucatan Platform, b) analyze the prograding sequences with regards to sea-level control, and c) evaluate how many of the prograding clinoforms at the eastern fringes of the Yucatan Platform are influenced by the Yucatan Current that today flows across this area. A comparison of the timing and style of the deformation and the infill of the intraplatform basin are strikingly similar to the deformations observed in Great Bahama Bank and the Straits of Andros that are also filled with prograding clinoforms. We plan to compare and contrast these two areas.

DATA SET AND WORKPLAN

The seismic data in hand consists of seismic lines collected in conjunction with the IODP drilling of the impact crater, older data collected by the University of Texas, and newer data from the National Hydrocarbons Information Center (CNIH) in Mexico. In addition, we expect to secure more seismic data from CNIH in Mexico to cover crucial areas for our study goals.

We plan to build a robust seismic stratigraphic framework of the Yucatan Platform that relies on the ages acquired by dating material provided by existing onshore and offshore cores. Faults and deformation will be mapped within this framework and placed into the larger regional context. A detailed sequence stratigraphic analysis will be performed in the prograding sequences that fill the intraplatform basin. Results of the sequence analysis will be compared to timing and style of the prograding clinoforms in the Straits of Andros within Great Bahama Bank.

SIGNIFICANCE

The Yucatan Platform is a large and important – yet underexplored – carbonate platform within the Caribbean. It also offers the opportunity to investigate the consequences of a large impact on the deformation and subsequent recovery of a carbonate platform.

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