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Cenozoic Carbonate Stratigraphy of the Yucatan Shelf, Southern Gulf of Mexico

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The Yucatan shelf in the southern Gulf of Mexico has developed as a large shallow ramp shelf, tectonically stable that preserves a continuous sedimentary record for the Late Mesozoic and Cenozoic. We present the preliminary results of a study involving well stratigraphy, X-ray diffraction and petrography of the Cenozoic sequence sampled in the UNAM–5, UNAM-6 and UNAM-7 exploratory boreholes drilled in the southwestern and southern sectors of the Yucatan state. The boreholes were drilled as part of the Chicxulub Drilling Project aimed to investigate the formation and characteristics of the large crater, formed by an asteroid impact at the Cretaceous/Paleogene (K/Pg) boundary. Our study aims to investigate the stratigraphic relations, textural changes and characteristics of the sedimentary units, to identify events associated with the evolution of the platform during the Cenozoic. We constructed detailed stratigraphic columns for the three borehole cores and prepared samples collected across the stratigraphic section for petrography and clay analyses. The petrographic studies were made at different depths above the K/Pg boundary to recognize textural variations, the identification of dolomite was made by the method of staining thin sections, and the dolomite fabrics were analyzed to identify the nature and shape of their crystal boundaries. The method of X-ray diffraction was used to identify clay types.

The three boreholes cross the K/Pg boundary at different depths. The stratigraphic column is formed, from bottom to top, of a limestone sequence with evaporites nodules, little contents of benthic foraminifera, scarce planktic foraminifera and oogonia fossils suggesting internal lagoonal environments that vary to outer lagoon. This sequence is underlain by limestones with different degrees of dolomitization that in many cases present poorly preserved microfossil contents. Above this sequence, there is a clay bed identified as palygorskita, which has a variable thickness from 10 to 50 m thick. Towards the top, the sequence is formed by several interbedded limestones, with varying degrees of dolomitization and calcareous breccias, collapse breccias and limestones with higher contents of intraclasts and little fossil contents, which suggest lagoonal and shallower shelf environments. Dolomitization is dominant towards the top of the sequence, mostly in the upper 100 to 50 meters, displaying fabrics of mosaics inequigranular xenotopic and epidiotopic dolomites, planar type-e, zones with dedolomited crystals and incipient dedolomitization.