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The Structural Evolution of The Giant Cantarell Field, Mexico: Implications for Modelling of a Fractured Carbonate Reservoir

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The Cantarell area within the Campeche Basin, southern Gulf of Mexico hosts a world class petroleum system. The most productive reservoir of the giant Cantarell Field is a complex brecciated and fractured Upper Cretaceous carbonate system that has been interpreted as a response to subearial exposure and karstification. Our 3D seismic interpretation shows the Cantarell area to be intensely deformed by a complex array of thrusts, normal, reverse and strike-slip fault systems that uplifted the Mesozoic carbonate sequences. This presentation outlines this structural evolution in detail and shows how the broader understanding of the structural history allows a re-examination of the reservoir model and in particular the development of key fracture sets, that are so critical for the production strategy deployed on the field.

From the spatial distribution of seismic facies assemblages, we propose a polyphase model for the origin of the fractured the Upper Cretaceous breccias: (1) Late Cretaceous sedimentary breccias occurring in a basinal setting as cyclic talus deposits in a carbonate-slope-apron system. (2) Subaerial to medium depth karstification related to the Neogene structural evolution of the area which resulted in a thrust controlled uplift of 1000 metres, affecting the breccias situated at the crest of the Akal block, (3) During and post-thrust emplacement, the Akal area, became subaerially exposed, pervasive erosion of the crest of the thrust propagation fold occurred and synsedimentary deposition of a melange of Upper Cretaceous to early Tertiary reworked sediments, were deposited as talus and debris flows down the thrust front. This model has major implications for future field development and the understanding of the fractured reservoir system in this basin.

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