Structural Diagenesis: Application in Fractured Reservoirs Characterization. Examples from Southeastern México

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This work presents results of the application of the Structural Diagenetic Petrographic Analysis (SDPA) to three fractured reservoirs from southeastern México. The main objectives were to identify and to characterize conductive fracture sets through which the hydrocarbons can flow, based on the relationships between fracturing and diagenetic processes.

Analysis of seventeen wells from Cactus, Níspero and Río Nuevo oil fields, and twenty-seven oriented thin sections from cores, allowed the recognition and characterization of fracture sets attributes such as: aperture, porosity, degree of cementation, intensity, and connectivity (fractures and matrix relationships), leading to an estimation of the conductivity for each set. Two variables conditioned the petrophysical properties of the reservoir, one diagenetic and another tectonic, dividing the reservoir into two flow units: the Lower to Middle Cretaceous, producing from both matrix and fractures, and the Upper Cretaceous, producing mainly from fractures. Dynamic calibration was performed in the Lower Cretaceous unit showing two main conductive fractures sets that control the production of the reservoir. Additionally, two conductive fracture sets, with different qualities, but with the same orientation can be explained by their timing and the diagenetic processes that affected the carbonate sequence of the reservoir.

Finally, as a result of the SDPA, new well locations and well designs were proposed to optimize the development of these three fields.