Effect of Volcanic Bodies on Hydrocarbon Reservoirs in the North-Eastern Part of Chicontepec Foredeep, Mexico

Sarkar, Supratik [1]; Marfurt, Kurt J.[1]; Slatt, Roger [1] (1) ConocoPhillips School of Geology and Geophysics, University of Oklahoma, Norman, OK.

Foredeep basin turbidite systems develop in elongated highly subsiding troughs in front of fold-thrust belts associated with plate convergence or collision. Deep water sedimentation in the Chicontepec foredeep is an example of such a turbidite system in front of the Sierra Madre Oriental fold thrust belt. The reservoirs here are primarily formed by submarine fans although large portions of the systems are dominated by mass transport complexes (MTCs). These MTCs along with poor grain sorting, grain maturity, diagenesis, and tectonic effects make the reservoirs highly complex and compartmentalized. Intrusive and extrusive volcanic events in this convergent tectonic margin add to the complexity of the reservoir.

Previous studies indicate that the majority of the volcanism in this region took place from pre-Oligocene to Quarternary. Age of the turbidite reservoirs at Chicontepec is predominantly Paleocene-Eocene. As part of a comprehensive reservoir characterization process, our goal is to identify the effects of the large scale volcanic intrusive and extrusive bodies on the reservoir. The eastern part of the Amatitlan 3D seismic survey includes four separate oil fields. Spectral decomposition and other attribute stratal slices indicate that the main reservoir interval in all the four oil fields is part of a large submarine fan system. A large volcanic body and several smaller intrusive and extrusive volcanic features predominantly overlay the 'Coyotes' field, which is one of the four fields. Ant tracking and most positive curvature attributes indicate the presence of natural fractures in the reservoir interval with a greater concentration in 'Coyotes'. Furthermore, the permeability and net-to- gross ratio in 'Coyotes' is higher than that in the adjacent fields where the volcanic features are less obvious or nonexistent. One hypothesis is that the intrusive volcanic bodies created fractures or secondary porosity in its close proximity and it was emplaced before the migration of hydrocarbons into the reservoir. We are currently conducting outcrop studies and rock physics based studies to validate our seismic amplitude and attribute based hypothesis. Well logs from only a few wells encountered the volcanic interval, which show spikes of low gamma ray, high resistivity, variable density and low velocity at the volcanic layers. The velocity anomaly might be indicative of fractures within the volcanic bodies.