Abstract for Poster Presentation - Hedberg Conference, Geology of Middle America – The Gulf of Mexico, Yucatan, Caribbean, Grenada and Tobago Basins and Their Margins, Sigüenza, Spain 2018

Exploration Potential in NW Cuba

Ian Davison[1], Alex Kurobasa[1], Ian Steel[2] & Mathew Taylor[2]

1. Earthmoves Limited, Camberley, United Kingdom
2. GEO International Limited, Camberley, United Kingdom

This poster presents an updated overview of structural styles and play types in the offshore sector of NW Cuba. Exploration and production has been focused in the onshore North Cuban fold belt which contains many heavy oil discoveries, but with only 10 oil fields still in production. The offshore area is very lightly explored. It consists of a Jurassic age passive continental margin with rift basins containing good source rocks of late Jurassic age and Oxfordian age San Cayetano sandstones. Early Cretaceous carbonate banks were developed on the footwall highs.

Plate subduction initiated in the Cretaceous with development of a volcanic arc and later ophiolite obduction and development of the North Cuban Fold Belt and offshore foreland basin. Cretaceous limestones are documented in the offshore section with good reservoir properties in the high energy marine carbonate facies, with thin hypersaline source rocks and evaporites found in restricted depocentres.

A thick Cretaceous carbonate sequence was developed on the adjacent Yucatan Platform to the NW. The Chixculub meteorite impact at 66 Ma produced a major collapse of the platform edge and a 400m thick debris flow is present throughout the NW Cuban shelf. These carbonate debris flows are the main reservoir rock in the Cuenca del Sur basin in Mexico where over 100 billion barrels are trapped. However, the intrinsic porosity and permeability characteristic are poor and structural reactivation and secondary leaching are required for this reservoir to be commercially viable. This is illustrated by the Yamagua-1 well which only found oil shows in these reservoir rocks.

Obduction and contraction of Cretaceous arc-volcanics, sedimentary and metamorphic terranes led to formation of stacked imbricate thrust sheets in NW Cuba. The stacked sheets consist of Upper Jurassic to Lower Cretaceous carbonates and sandstones interleaved with ophiolites. The major onshore oil fields produce heavy oil from both fractured ophiolites and the carbonates. Recovery factors are low and significant enhanced production should be possible with extended reach horizontal wells and injection techniques. Deeper imbricate sheets remain to be tested.

Although no commercial hydrocarbon volumes have been found in the offshore, recent exploration has proven three main source rock intervals in the Oxfordian, Tithonian and Aptian-Turonian. Stratigraphic traps are expected in the offshore foreland basin and these have still to be tested. The Jurassic rotated fault blocks are sufficiently buried in the outer part of the foreland basin to generate oil. However, north of the foreland basin the depth of burial is not sufficient to bury the Jurassic source rocks into the oil window and this area is less prospective. The poster will illustrate these untested plays with seismic data.

earthmoves