AAPG Annual Convention
Salt Lake City, Utah
May 11-14, 2003

Allen Lowrie[1], Ian Lerche[2], Bradley Matthew Battista[3] (1) Consultant, Picayune, MS (2) University of South Carolina, Columbia, SC (3) Consultant, La Jolla, CA

Strike-Slip Tectonics and Multi-Phase El Nino Development Contribute to Northwest Peru's Complex Hydrocarbon System

The NW Peruvian continental margin, characterized by subduction, complex geology and petroleum systems, is a hydrocarbon province with 1.6 billion barrels of oil production since the 1860's within the forearc Talara Basin. Since at least the Neogene, there has been oblique and flat subduction. The plates shear past each other producing a strike-slip fault complex that commences south of Peru Bank and continues into the Gulf of Guayaquil where it connects with the landward extension of the Pallatanga Fault as part of the Dolores-Guayaquil Megashear. Initial fault mapping results from earthquake patterns, bathymetric anomalies, and seismic reflection interpretation. Such a major fault feature may extend through the crust and underlying lithosphere, with mantle upwelling along fault base, impacting thermal maturation and hydrocarbon migration. Flat subduction causes Andean cordilleran rising, assisting the stike-slip fault creation.

This petroleum system uses offscrapped organic material from the oceanic plate and from the upwelling Humbolt Current, together with coarse sediments for reservoirs from El Nino activity. At present, El Nino produces coarse-grained sediments that are of reservoir quality. A preliminary El Nino activity was likely over the past 20-25 My once the Indonesian Arc was emplaced to block the east-to-west flowing equatorial currents. With blocked warm waters and a decrease in the east-to-west equatorial winds, the eastward flow of warm waters reaches the Americas and a proto-El Nino occurs. The Central American portal closing in the upper Miocene may be essential to produce an effective El Nino. Coarse debris would then have been provided to the upper and middle slopes, making reservoirs to entrap rising hydrocarbons.