

Sub-Thrust Hydrocarbon Potential of Block 107: A Potential Giant Field Complex Along the Peruvian Mountain Front

D. Westlund, R. Fife, C. Monges, J. Rebaza, R. Erlich* and Margaret A. Stratton

Gran Tierra Energy, 300, 625 11th Ave SW, Calgary, Alberta, Canada T2R 0E1

* Hess Corporation, 1501 McKinney Street Houston, Texas 77010

GeoConvention 2012: Vision

Recent and historical drilling along the Peruvian Andean mountain front has concentrated on hanging wall anticlinal traps, formed mainly during the Eocene to Pliocene phase of Andean deformation. Unfortunately, the recent string of spectacular successes has not resulted in an effort to test other structural plays in the region. We believe that the most prospective untested play type within the region is developed in a sub-thrust setting below typical hanging wall features.

Commonly, the potential for material sub-thrust resources exists where lateral displacement and structural reactivation have occurred in combination with a known petroleum system, world-class reservoirs, and effective regional seals. Those conditions exist in numerous areas along the Andean mountain front where sub-thrust exploration drilling has been very successful, especially in Colombia and Eastern Venezuela. However, a similar setting can also be found along restricted parts of the Peruvian mountain front, where evaporites and mature source rocks have formed detachment horizons that permit the development of classic overthrust deformation styles.

One of the clearest examples of sub-thrust deformation and trap formation can be found in Block 107, Ucayali Basin, where extensive field mapping combined with new 2D seismic has revealed a trend of large sub-thrust structures. Seismic data (PSDM) clearly show the development of a ramp-flat architecture of the San Matías thrust sheet, with between 4-15 kilometers of Miocene shortening. Deformation of the footwall section and the formation of sub-thrust structures were produced by the reactivation of pre-existing normal faults, principally in two phases: one during the Lower-Middle Cretaceous and one during the Miocene-Pliocene.

Control on footwall stratigraphy (as demonstrated by field mapping) shows that proven Cretaceous reservoir units can be tested within structural closures along the deformation front.

The presence of only lightly biodegraded, 34° API oil seeps within the block indicates that active oil generation is occurring under the San Matías hanging wall section. Biomarker data interpreted from these seeps suggest that the oils are being generated mostly from Lower Cretaceous Raya Formation shales, with some potential contribution from a pre-Cretaceous source.

Although the sub-thrust play type has not yet been tested in Peru, we believe that fields discovered along the Llanos mountain front of Colombia (Cusiana Field) provide the best analogues for the structures mapped in Block 107. Future successful exploration drilling will likely open this new play along the mountain front of Peru, with the potential discovery of several new giant fields.