Petroleum Systems of the Carbonate Platform Areas of the Southern Gulf of Mexico: South Florida, the Greater Peten Basin of Guatemala-Belize, and the Yucatan and Chiapas areas of Mexico

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Abstract

We examine commonalities between petroleum systems driven by 'mid Cretaceous' source rocks in the southern Gulf of Mexico using a database of previously unpublished produced oils combined with published oil and source rock data from Guatemala, Belize, the Chiapas area of Mexico and the South Florida Basin. These basins developed on the 'steers head' margins of the Gulf of Mexico, beyond the onlap limits of the prolific Oxfordian through Valanginian source rock acmes developed earlier in more basin-centered areas.

Previously, the candidate source beds for these oils were variously assigned 'Lower Cretaceous,' Aptian,' or 'mid Cretaceous' ages: firstly we reexamined the published ages of the source beds and assigned potential acme ages ranging from Acme 120 (earliest Aptian) to 93 (early Turonian).

Using published well and cross-section data for these intra-shelf basins, we created present day burial maps and, after restoration of eroded section as necessary, thermal stress maps at maximum burial to examine the potential extent of oil expulsion kitchens and their expelled fluid properties. Generally low thermal stress levels were attained by the candidate source acmes in these thermally conductive carbonate settings, under moderate maximum depths of burial.

Finally we attempted actual and speculative oil-source acmes correlations after establishing their organofacies—dominated in these carbonate shelf environments by clay-poor organofacies A. The combination of organofacies and low thermal stress levels explains the observed reservoir fluid properties which are generally low GOR and viscous, with dense (low API gravity), high sulfur stock tank liquids.