Tuesday, October 20, 2009

Crowne Plaza Hotel - Greenspoint (former Sofitel)
425 North Sam Houston Pkwy E

Social 11:15 AM, Luncheon 11:30 AM

Cost: $31 pre-registered members; $35 for non-members & walk-ups.

To guarantee a seat, you must pre-register on the HGS website and pre-pay with a credit card.
Pre-registration without payment will not be accepted.
You may still walk up and pay at the door, if extra seats are available.

Andrew Pepper
Hess Corporation
Houston, TX

Burial History and Its Impact from the Petroleum Systems of Rio Muni Basin, Equatorial Guinea: Delivery, Capture and Degradation [1]

The Rio Muni Basin, offshore Equatorial Guinea, is a volumetrically significant petroleum system sourced primarily from Lower Cretaceous source rocks and reservoired primarily in Senonian deep marine clastics. The thermal evolution of the source intervals, including the impact of Miocene uplift, erosion and re-burial, effected the timing of expulsion of oil and gas volumes into the system. Differences in source, reservoir and trap histories relating to uplift in-board, vs. little to no uplift out-board, lead to differing fluid properties. These are exemplified in the Elon and Ceiba pool, respectively.

The primary controls on the timing and volume of hydrocarbons expelled are present day crust type and thickness, and overburden thickness at time of maximum burial. Much of the outboard area lies on oceanic crust, while the inboard area contains a structurally complex and variable continental crust. Crustal thickness derived from 3-D gravity inversion, temperature data, and a series of 1-D basin models to map and predict lateral variation in heat flow were all used to determine the thermal evolution of the basin. The eroded section was restored beneath the Miocene unconformity using e-logs and biomarker thermal stress indicators. Uplift and erosion was quantified using both maximum thermal stress indicators with 1D models, and geophysical log responses. From

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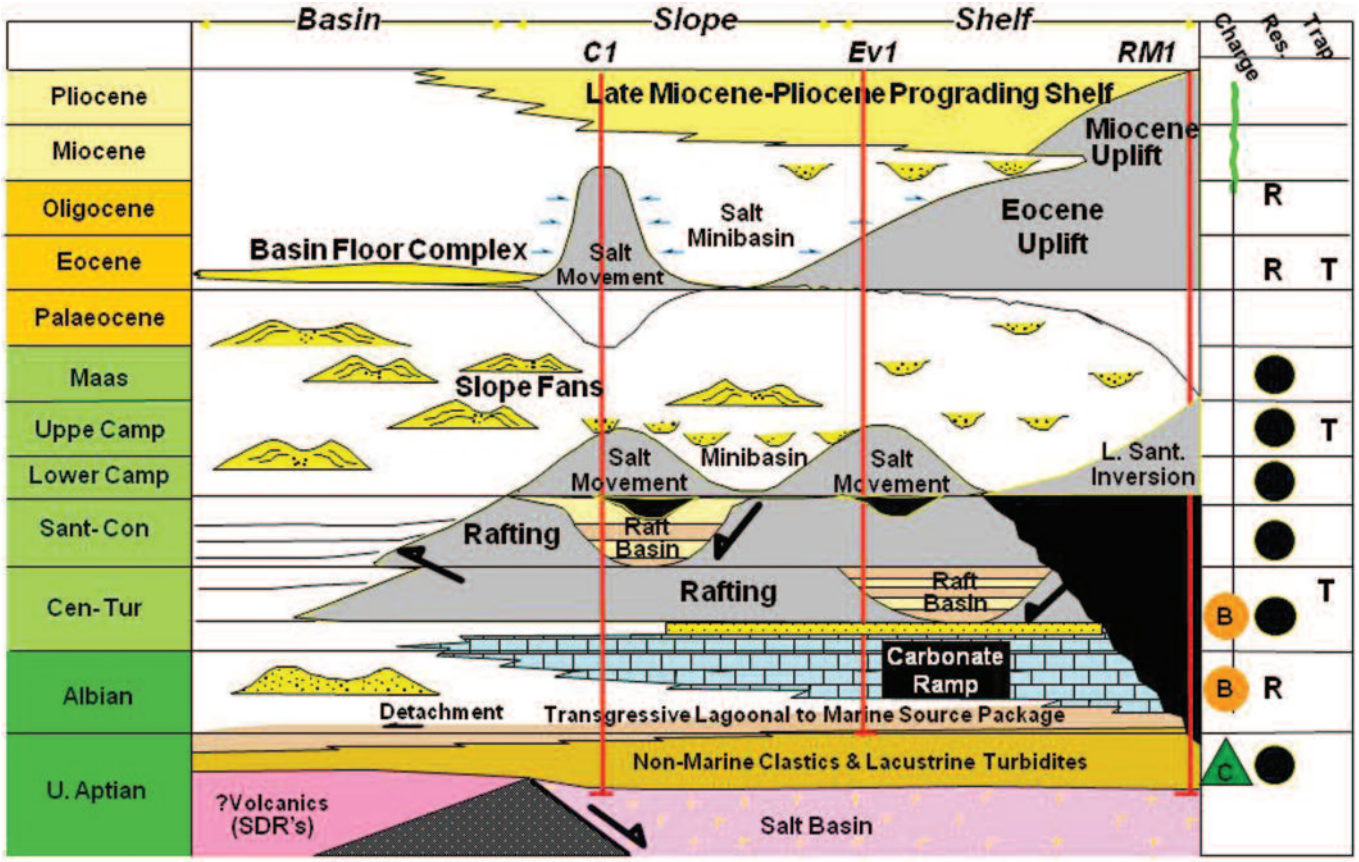

Rio Muni Basin – Stratigraphic Architecture

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the resulting points, a map of net erosion was created and used in two and a half dimension map-based thermal history modeling.

The resultant quantitative forward model of expelled fluid volumes from the source rocks, linked with the burial and thermal history of the reservoirs, explains differences in fluid properties. This model explains the presence of biodegraded residues in oils reservoired presently at high temperatures in the Ceiba field, and the non-biodegraded oil in the presently cool reservoir of the Elon pool. ■

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Biographical Sketch

After receiving a First Class Batchelor's degree in Geological Sciences at Leeds University in 1981, **Andy Pepper** joined the oil industry as a geologist with British Petroleum, on assignments to Pakistan, China, Scotland, and Indonesia. From 1985-1989 he took the opportunity to work at BP's Sunbury Research Center, applying the then-emerging technologies of geochemistry and basin modeling to global exploration problems. He went on to research and develop geochemical tools such as the models of petroleum generation and expulsion [2,3,4,5] that are used in a number of commercial basin modeling packages today.

In 1994 Andy came to Houston to work in the exploration team to develop the subsalt play in the GoM [6] and in 2000 founded and became the Leader of BP's Global Petroleum Systems Technical Network.

Andy joined Hess in 2003 to build a petroleum systems capability and was subsequently appointed Manager of Global Geology on the Exploration Leadership Team in 2004. From 2006-2007 he was transferred to Hess' New York office as advisor to the President of Exploration and Production. He now manages Global Basin and Play Analysis in Hess' Global Basins and Unconventional Resources business in Houston.

References:

[1] Niall J. McCormack, Michelle Thomas Stanley, and Andrew Pepper (2008)
Burial History and Its Impact on the Petroleum Systems of Rio Muni Basin, Equatorial Guinea: Delivery, Capture and Degradation. *AAPG International Conference and Exhibition, Cape Town, South Africa 2008*. AAPG Search and Discovery.
[2] Andrew S. Pepper (1991) Estimating the Expulsion Behaviour of Source Rocks: A Novel Quantitative Approach. *Petroleum Migration, Geol Soc. London. Spec.* Pub.
[3] Andrew S. Pepper and Peter J. Corvi (1995a) Simple Models of Petroleum Formation, Part I: Generation of Oil and Gas from Kerogen. *Marine and Petroleum Geology*.
[4] Andrew S. Pepper and Timothy A. Dodd (1995) Simple Models of Petroleum Formation, Part II: Oil to Gas Cracking. *Marine and Petroleum Geology*.
[5] Andrew S. Pepper and Peter J. Corvi (1995b) Simple Models of Petroleum Formation, Part III: Modeling an Open System. *Marine and Petroleum Geology*.
[6] Andrew S. Pepper and Alan Yu (1994) *GCAGS 1994 Meeting "Salt, Sediment and Hydrocarbons"*.