Monday, February 20, 2006

Westchase Hilton • 9999 Westheimer
Social 5:30 p.m., Dinner 6:30 p.m.

Cost: $25 Preregistered members; $30 non-members & walk-ups

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International Explorationists Dinner Meeting

by ***Scot I Fraser and Mike Lentini***
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New Insights into South Atlantic Rifting from the Santos and Campos Basins, Offshore Brazil — A Tale of Two Basins

The Santos and Campos basins, offshore Brazil, resulted from the Early Cretaceous break-up of Gondwanaland. South Atlantic margin plate reconstruction models propose uniform east-west extension; rift-basin symmetry is thus inferred with the conjugate African margin. This would imply that half-graben development and planar dip-slip faults would characterise the structural style and geometry of the Santos and Campos syn-rift basins. Interpretation of depth-migrated regional 2D seismic data has revealed important structural relationships previously obscured by post-rift Aptian salt cover. Fault geometries and syn-rift isopach maps infer a more complex rift-margin evolution that controlled sediment dispersal patterns for the two basins during rifting. Pre-rift lineaments inherited from Archaean basement had imparted an important mechanical anisotropy to South Atlantic crust rheology. Contrasting basement response to extension differentiates deformation styles in the Santos and Campos basins, with the Santos Basin margin evolution more consistent with oblique extension and asymmetric rifting. Onshore igneous extrusives allow the direction of extension to be constrained temporally, with shallow crustal heat flow a primary influence on brittle versus more ductile rift kinematics.

These observations challenge the simple symmetric rift model and explain the spatial relationship of syn-rift tectonic and 'sag' phase thermal subsidence patterns with associated fault styles. Reconstruction of the continent/ocean boundary along the Campos and Santos basin margins and consideration of their conjugate African basins demonstrates clear rift asymmetry. The structural expression of the transition from continental to oceanic crust in the Campos and Santos basins is distinctive and is related to the primary rifting mechanism inferred for each part of the margin. The presence of the 'outer-horst' that seismically defines the continental oceanic boundary is well evidenced in the Campos Basin whilst in the Santos Basin this is equivocal. The conspicuous remnant intra-basinal Sao Paolo Plateau/Ridge, however, does suggest that the loci of oceanic crust formation in the Santos Basin may have experienced a dynamic basinward translation as a response to continued asymmetric lithosphere extension. The Cabo-Frio Arch structurally partitions contrasting Campos and Santos syn-rift basin architectures, and the new interpretation has fundamental implications for their respective petroleum systems. ■

Biographical Sketch

Scot Fraser is a geologist in the Shell Regional Framework Studies group based in Houston. Over the past five years he has worked on developing new play concepts at a regional scale across the Shell global exploration portfolio. Current interests have been the rift-evolution of extensional basins worldwide and, more specifically, the South Atlantic margin. He has worked extensively on the pre-salt evolution of the Brazilian margin, in particular the Campos, Santos, and Espirito Santo Basins. Generic interests have been the interaction of structure and sedimentation on the development of important petroleum systems.

Prior to joining Shell International E&P, he spent 6 years from 1994 with Amerada Hess, predominantly involved in regional analysis of the Jurassic of NW European basins. He was educated at Edinburgh University where he graduated with honors in geology, returning in 1990 as a post-graduate to pursue a PhD in geology and geophysics. He has published extensively on regional geological themes and is currently editing the proceedings from the recent "Return to Rifts Conference" for a special publication of the Geological Society of London. His technical interests remain basin analysis, seismic and sequence stratigraphy, and petroleum geology at a regional scale.

As an elected member of the Geological Society of London Petroleum Group he has convened the "Petroleum Geology of Deepwater Depositional Systems," "The Petroleum Geology of Northwest Europe," and "Return to Rifts" international conferences held in London, UK. He is invited co-convener of the session on "Tethyan Basins" at the AAPG International Conference in Perth, Australia in 2006.