Tuesday, January 19. 2010

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.

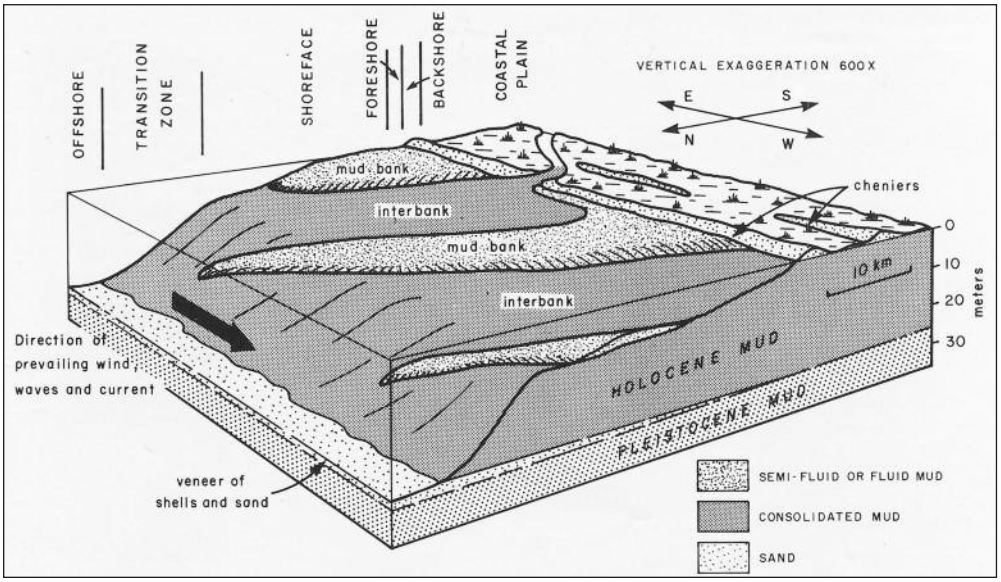
To guarantee a seat, you must pre-register on the HGS website and pre-pay with a credit card.
Pre-registration without payment will not be accepted.
You may still walk up and pay at the door, if extra seats are available.

Clues to Depositional Processes of Ancient Mudrocks – Comparison of the Quaternary Shallow Marine Amazon Dispersal System with the Barnett, Haynesville, and Mancos Shales

A key to prediction of depositional facies in sandstones, carbonates, or siliceous mudrocks is an understanding of the processes forming these deposits. Past studies of modern mud environments coupled with recent laboratory flume investigations (Schieber and Yawar, 2009) show that mud is a dynamic sediment controlled by many of the same lateral, traction transport processes that affect coarser sediment particles. In this presentation, a portion of the 1600-km-long shallow water Amazon dispersal system (ADS) is utilized to illustrate the sedimentary processes that form many of the sedimentary structures found in the strata of the Barnett (Mississippian), the Haynesville (Upper Jurassic), and the Mancos (Cretaceous) shales in the U.S. Some large-scale depositional facies patterns found within the ADS are also compared with similar patterns within the Mancos.

…mud is a dynamic sediment controlled by many of the same lateral, traction transport processes that affect coarser sediment particles…

Examination of small scale characteristics, shows that laminations and scour features found in the subtidal to intertidal sediments of the ADS are formed by fluidized mud pushed by longshore currents (Rine and Ginsburg, 1985). In the deepwater Barnett, similar features are created by high density flows driven by gravity (Loucks and Ruppel, 2007). The high degree of bioturbation found in the Haynesville Shale can be found in the more distal offshore edge of the coastal ADS mud wedge or in the nutrient-rich ebb-tidal deposits of the adjoining coastal estuaries. Regarding the Mancos Shale, on the small scale ADS strata associated with migrating mud banks contain sedimentary structures that resemble the laminated and scoured "hyper-pycnites" of the Mancos as described by Bhattacharya and MacEachern, (2009).



Block diagram showing relative distribution of depositional facies along the coast of Suriname in South America. The typical mud bank is 50 to 60 km long, 10 to 20 km wide, and up to 5 m in relief. Along the coast and inner shelf of Suriname coast, these mud banks migrate 1.5 km annually. From Rine and Ginsburg, 1985.

When comparing the Mancos Shale with ADS sediments on a depositional-facies-scale, the ADS offers a good analogue for

Northsiders Luncheon

continued on page 27

HGS Northsiders Luncheon continued from page 24

Aerial view of exposed mud bank at low tide showing surface flow features within the fluid mud. Approximate width of view is 500m.

Isolated coarse-grained sandstone body is within the shelfal portion of the Mancos Shale, Middle Mountain to Floy Wash region of the Book Cliffs, east-central Utah. This trough cross-bedded sandstone contains mudstone clasts, shell debris, fish teeth, bone fragments, and marine-bored wood fragments (Pattison et al, 2009). Photo is from Stop 12, AAPG Field Trip No. 18.

depositional facies patterns found in the Mancos of east-central Utah where swallow carbonates, shelf sandstones, and fine-grained distal delta deposits are juxtaposed (Pattison et al, 2009; Chan, 1992). Within the Quaternary sequence of the ADS, variations in sediment input from the Amazon River combined with fluctuations in sea level create a depositional facies pattern that is dominated by fine-grained sediments but also contains significant deposits of sand and even lenses of carbonates. Similar facies patterns present in the Mancos of eastern Utah can also be explained by similar sedimentary processes that have lateral transport of mud sediments as a critical component. ■

Citations:

Bhattacharya, J.P. and MacEachern, J.A., 2009, Hyperpycnal rivers and prodeltaic shelves in the Cretaceous Seaway of North America: *Journal of Sedimentary Research*, V. 79, p. 184-209.

Schieber, J. and Yawar, Z., 2009, A New Twist on Mud Deposition – Mud Ripples in Experimental and Rock Record: *The Sedimentary Record*, v. 7, n. 2, p. 4-8.

Pattison, S.A.J, Taylor, K.G., and Macquaker, J.H.S., 2009, A shore-to-basin transect through the Mancos Shale mud belt: sedimentological control on lithofacies variability in unconventional hydrocarbon plays, Book Cliffs, Utah: *Field Trip No. 18 Guidebook*, Society for Sedimentary Geology (SEPM), American Association of Petroleum Geologists Annual Convention and Exhibition, 7-10 June 2009, Denver, CO, 168 p.

Loucks, R.G. and Ruppel, S.C., 2007, Mississippian Barnett Shale: Lithofacies and depositional setting of a deep-water shale-gas succession in the Fort Worth Basin, Texas: American Association of Petroleum Geologists *Bulletin*, v. 91, n.4, p. 579-601.

Chan, M.A., 1992. Oolitic ironstone of the Cretaceous Western Interior Seaway, East-Central Utah: *Journal of Sedimentary Petrology*, v. 62, n. 4, p. 693-705

Rine, J.M., and Ginsburg, R.N., 1985, Depositional facies of a mud shoreface in Suriname, South America: A mud analogue to sandy nearshore marine deposits: *Journal of Sedimentary Petrology*, v. 55, p. 633-652.

Biographical Sketch

Jim Rine began his geology career in 1973 at the Rosenstiel School of Marine and Atmospheric Sciences (U of Miami) where he studied under the carbonate expert R.N. Ginsburg. At Ginsburg's prompting, Jim examined the muddy coastline of Suriname in northeast South America and down drift of the world's largest river, the Amazon. Ever since his early observations of the Amazon dispersal system, Jim has been impressed with the capabilities of shallow marine processes to move large volumes of sediment. While at Cities Service Research in Tulsa where Rine was part of a team researching shallow marine sandy sediments along the east coast of the US, he documented that significant shallow marine sedimentation is also occurring in the relatively sediment starved setting of the eastern North America continental shelf. Since Jim's early marine geology work, he has done numerous field studies of petroleum bearing rocks from the jungles of Colombia to the deserts of eastern Pakistan. Rine has also published a number of hydrogeology papers based on a decade of research at the U of South Carolina. During the last five-plus years Jim has returned to fine-grained sediment studies in Houston as a principal geologist and geologic advisor within the Sedimentology Group at Weatherford Laboratories.