Wednesday, March 31, 2010

Petroleum Club • 800 Bell (downtown)
Social 11:15 AM, Luncheon 11:30 AM

Cost: $30 pre-registered members; $35 for non-members & walk-ups; Emeritus/Life/Honorary: $15; Students: FREE

To guarantee a seat, you must pre-register on the HGS website (www.hgs.org) 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.

HGS General Luncheon Meeting

Lauren Peschier

The Boquillas (Eagle Ford) Formation of South Texas: Potential Outcrop Analogs for Nonconventional Eagle Ford Shale Reservoirs in the Subsurface

The Eagle Ford Shale (and the laterally equivalent Tuscaloosa Shale) of the Gulf Coast Basin has long been considered to be a source rock for Mexico, Texas, and northern Louisiana production, but is now drawing interest as a resource play. With industry focus on non-conventional reservoirs and advancements in multilateral horizontal completion technology, fractured bituminous shales have become viable exploration targets. Well-known examples of shale reservoirs include Bakken Shale (Mississippian of Williston Basin), Barnett Shale (Mississippian of Forth Worth Basin), Woodford Shale (Late Devonian/Early Mississippian of Arkoma Basin), and Marcellus Shale (Middle Devonian of Appalachian Basin). The Cretaceous experienced three major oceanic anoxic events, including one at the Cenomanian-Turonian boundary, represented by the Eagle Ford, and it is not surprising that exploration interest is now being attracted.

Deep road cut exposing fresher rock of the middle member of the Boquillas (Eagle Ford) Formation.

The current study is concerned with outcrops observed along U.S Highway 90 in Val Verde and Terrell counties, Texas, where the Eagle Ford (locally called the Boquillas Formation) lies on the northern margin of the Maverick Basin. The Boquillas Formation (Cenomanian-Turonian) is about 200 ft thick in this area but thickens ten-fold into northern Mexico. It was deposited during a time of exceptionally high sea levels and represents a transgressive-regressive sequence. For the purpose of the study, the formation was divided into three members based on lithological differences, including limestone to shale ratio. Attention was focused on the lowest member, which has characteristics of slope depositional

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conditions. Features seen in this member contradict previous interpretations of the Boquillas in this area, which had been thought to be composed of tidal-flat or shallow shelf sediments. The sedimentary features of the lower member include slump folds, debris flows, probable turbidites, and possible contourites (previously interpreted as hummocky cross-bedded grainstones). The strata consist mainly of interbedded limestone and calcareous shales. These sediments were probably once black and organic-rich, but there are no exposures where the lower member is sufficiently unweathered for proper description. Diagenetic differentiation, the repartitioning of carbonate from the shales into the limestone, has selectively exaggerated the geometry of the contourites and caused their resemblance to hummocky cross-stratification. When freshly broken, the limestone beds emit a hydrocarbon odor. The faunal assemblage of the lower and middle members consists mainly of planktonic foraminifera, calcispheres, and ammonites. Bottom-dwelling fossils are less common and are mainly found in the matrix of debris flow deposits, with the exception of Inoceramus sp. This bivalve genus has species that are adapted to low-oxygen conditions. The lack of bioturbation and scarcity of fossils suggests deep water and possibly anoxic bottom conditions. The combination of the lithofacies observed in outcrop and the fauna suggests that the lower member of the Boquillas represents the beginning of sea level rise, with sediment accumulating on the upper margin of the basin's slope, in moderately deep water.

Features seen in this member contradict previous interpretations of the Boquillas

The transition between the lower and middle members is marked by the abrupt end of the unstable slope features and a much higher proportion of organic-rich shales to limestones. At the base of the three deepest road cuts along Highway 90, fresher rock is exposed. When freshly broken, these shales are black. They are very finely laminated on a millimeter scale, and contain planktonic foraminifera and calcispheres. Coarser laminae, ranging from millimeter to centimeter thick, consist of microfossil concentrations that are thought to be a product of winnowing by bottom currents. Inoceramids are also present in the middle member. Some of the interbedded limestones are laterally continuous while others are more nodular in appearance. The preservation of fine laminae, with little to no bioturbation, combined with the fauna present, indicate anaerobic to dysaerobic conditions with a total lack of infauna during the time of deposition. Water depth

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for the majority of the middle member was probably deeper than for the lower member, with sediment being deposited on the middle to lower basin slope. Nearing the top of this member there is an increase in limestone beds suggesting a decrease in water depth, consistent with the interpretation of a transgressive-regressive cycle.

The upper member consists mainly of somewhat bioturbated limestones that are much thicker than those of the other two members. Trace fossils include Chondrites, which still suggests relatively low oxygen levels. The upper member appears to lack the high organic content present in the rest of the Boquillas. This top unit represents a progressive return to shallower, better oxygenated conditions. Along with pyrite-filled burrows, an abundance of regular and irregular echinoids supports this interpretation. ■ **HGS General Luncheon** *continued on page 39*

Poorly sorted debris flow of the lower member of the Boquillas Formation. Also shown is the contact between the Boquillas and Buda formations.

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Biographical Sketch

Lauren Peschier received her B.S. in geology in 2004 and M.S. in geology in 2006 from the University of Louisiana at Lafayette. She has six years of experience as a geologist in the oil and gas industry, working exploration, development, and operations in the Gulf of Mexico. She worked for Marlin Energy, LLC in Lafayette, Louisiana from 2004 through 2006 as an associate geologist and is currently employed as a geologist by Newfield Exploration. At Newfield, she worked the Gulf of Mexico shelf from 2006 to 2009 and currently works subsalt exploration in the deepwater Gulf of Mexico.

Slump fold with bedding preserved, lower member of the Boquillas Formation.