Monday, February 22, 2010

Westchase Hilton • 9999 Westheimer
Social Hour 5:30–6:30 p.m.
Dinner 6:30–7:30 p.m.

Cost: $28 Preregistered members; $35 non-members & walk-ups

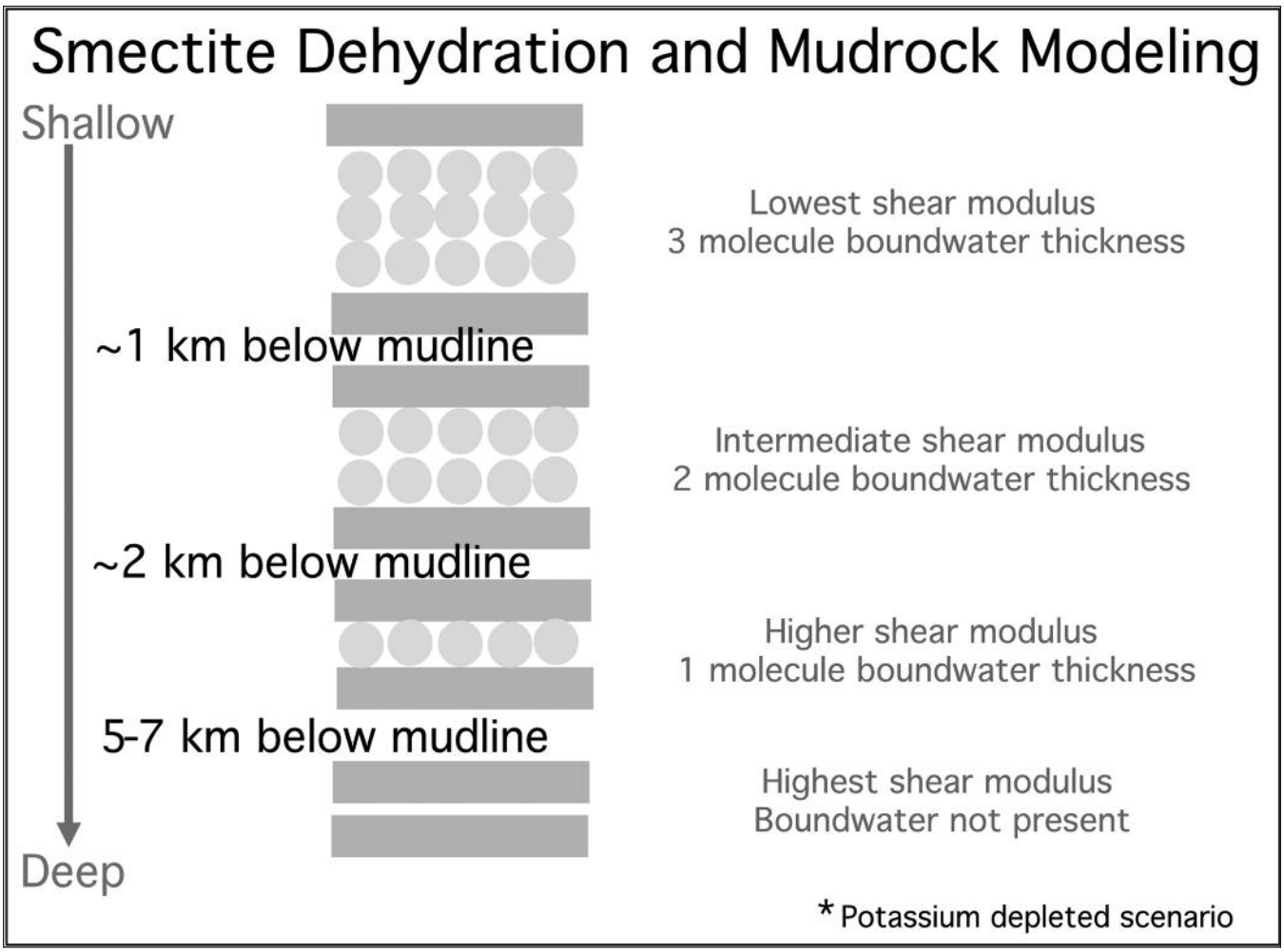
To guarantee a seat, you must pre-register on the HGS website and pre-pay with a credit card.
Pre-registration without payment will not be accepted.
You may still walk up and pay at the door, if extra seats are available.

Phil Heppard *and*
Dan Ebrom

Compaction and Overpressure in Shales: Practice and Theory

Pressures in the subsurface control the migration of fluids, including hydrocarbons, and hence are of interest not only to drillers (whose wells must deal with these pressures) but also to explorationists generally. Away from well control, the most common source of pressure information is P-wave seismic velocities. Converting shale velocities to pressures requires an understanding of the normal (hydrostatic) compaction curve for shales in a given region. Absent a normal compaction curve, it is impossible to state whether a given shale velocity represents normal pressure, overpressure, or underpressure. We will show the expected range of normal compaction curves and discuss the driving factors that influence compaction. A quantitative model of shale compaction has been developed that accounts for many of the features of shale porosity evolution with depth, including predictions of P-wave and S-wave velocities. We conclude with a big picture review of the place of pressure analysis in hydrocarbon exploration. ■

HGS North American Dinner *continued on page 21*



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References

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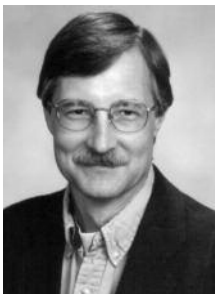
Katahara, K., 2003, Analysis of overpressure on the Gulf of Mexico Shelf: Offshore Technology Conference, May 5-8, 2003, OTC15293, p. 10

Katahara, K., 2006, Overpressure and shale properties: Stress unloading or smectite-illite transformation?: Society of Exploration geophysicists Annual Meeting, New Orleans, 2006, [extended abstract], p. 1520-1524

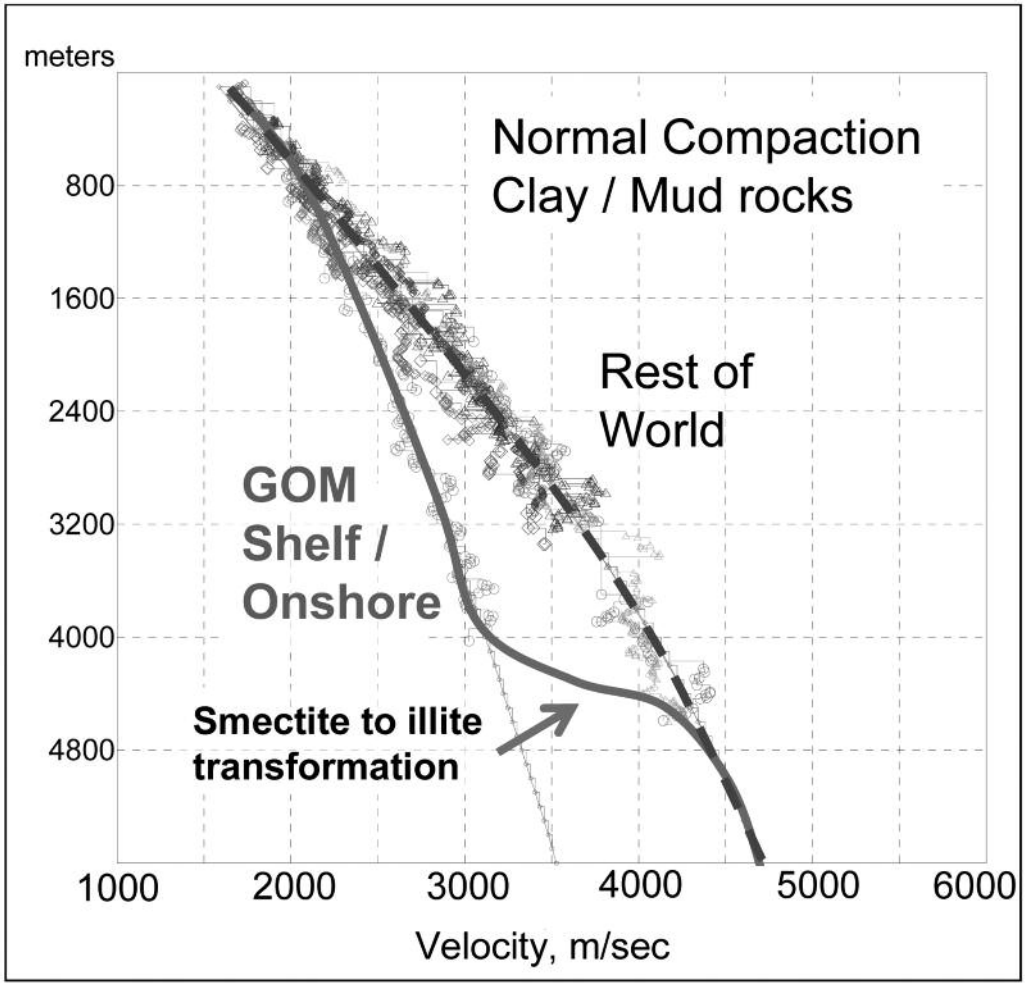
Lahann, R. W., 2002, Impact of smectite diagenesis on compaction modeling and compaction equilibrium: in, eds. A. R. Huffman and G. L. Bowers: AAPG Memoir 76, Pressure Regimes in Sedimentary Basins and Their Prediction, p. 61-72

Lahann, R. W., 2004, A broader view of framework weakening: AAPG Annual Meeting, April 18-21, 2004 [expanded abstract]

Biographical Sketch



Philip D. Heppard is a principal geologist with ConocoPhillips in Houston, Texas. Since 1988 Philip has been a pore-pressure expert supporting worldwide exploration and development efforts encompassing most known petroleum basins and has been a lecturer on pore pressure for AAPG and related professional organizations. In 2003 he won the AAPG best international poster award for "Using shear and Vp/Vs to predict overpressure in petroleum basins" with his four co-authors. His interest has been the integration of well and seismic data to predict overpressure in the subsurface for well planning and the evaluation of seal quality, as well as operational support for drilling wells. He has worked as a development geologist in the Permian Basin of Texas, and Trinidad, West Indies. Mr. Heppard received his B.S. in geology from Juniata College, Pennsylvania, in 1977 and his M.S. in geology from the University of Akron, Ohio, in 1984. He joined Amoco Production Co. in 1979 and then BP after the merger of the two in 1999. He joined ConocoPhillips Company in February 2006 to become a leading member of their GeoPressure network within the Subsurface Technology group in Houston.



A depth versus velocity plot of normally compacting clay rocks (shale) normalized to the sea floor from seven basins including Beaufort-McKenzie, eastern offshore Canada, USA Gulf of Mexico, offshore Trinidad, offshore Nigeria, offshore Indonesia, and NW Australia from Recent to Jurassic age rocks. The normally pressured clay rock from Gulf of Mexico shown in green are smectite-rich and noticeably slower than the other, mixed-clay mineral shales. Previous authors who have discussed clay diagenesis, log response and compaction are Lahann (2002, 2004), Alberty and McLean (2003), and Katahara (2003, 2006).