

**Wednesday, April 25, 2018**

Petroleum Club of Houston • 1201 Louisiana (Total Building)  
 Social Hour 11:15 a.m.  
 Luncheon 11:45 a.m.

**Cost: \$35 Preregistered members; \$40 non-members/walk-ups**

**To guarantee a seat, pre-register on the HGS website & pre-pay by credit card.**

**Pre-registration without payment will not be accepted.**

**Walk-ups may pay at the door if extra seats are available.**

*If you are an Active or Associate Member who is unemployed and would like to attend this meeting, please call the HGS office for a discounted registration cost. We are also seeking members to volunteer at the registration desk for this and other events.*

## HGS General Luncheon Meeting

**Paul Mann**

*University of Houston*

# Hydrocarbon Prospectivity of Rifted, Conjugate Margins of the Gulf of Mexico, Central Atlantic, and South Atlantic

The concept of upper and lower plate margins formed on opposite sides of a low-angle detachment during the early rift phase was proposed over three decades ago Wernicke and Burchfiel (1983), Lister et al. (1986) and others. This conceptual model remains controversial to the point that the upper and lower plate terminology seldom appears in recent studies on conjugate margins. In this talk I will show that many conjugate margins can be classified into the upper and lower plate types using the basic, crustal elements and geometries outlined by the early asymmetrical rifting proponents that are summarized in the diagram below from Davison (2012). Less extended, upper plates in cross section have narrow and steep crustal profiles while the more extended lower plates produce tapered profiles with lower-relief belts of rifts where the sag phase can localize giant salt basins. Examples of these two different margin profiles was noted by Marton and Buffler in the 1990's for the less extended Yucatan GOM margin (upper plate) and the more extended US GOM with an extensive salt basin (lower plate). Similarly, Davison (1997) noted the alternation of the two margin types along the Brazilian margin.

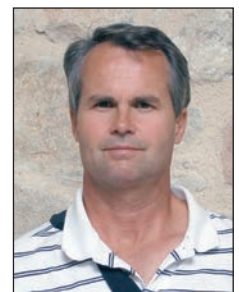
Within the framework of these concepts of upper and lower plates a comparison from geophysical seismic reflection and refraction data are used to characterize upper and lower plates, symmetrical or neutral conjugates – in a much more systematic approach that was not available to the early proponents of the upper and lower plate concept. These geophysical data can also be used to compile the locations of volcanic margins that form late in the rifting process and are characterized by voluminous, volcanic flows expressed as “seaward-dipping reflectors”. The regional map of the locations of proposed upper and lower plates along with volcanic margins is then overlain on a map of present hydrocarbon production to identify the most promising areas for future exploration. ■

### References

- Davison, I., 1997, Wide and narrow margins of the Brazilian South Atlantic, *Journal of the Geological Society*, v. 154, p. 471-476.
- Davison, I., 2016, South Atlantic margins: Geology and hydrocarbon potential, HGS/PESGB Africa pre-conference shortcourse, September 12, 2016.
- Lister, G., Etheridge, M., and Symonds, P., 1986, Detachment faulting and the evolution of passive, continental margins: *Geology*, v. 14, p. 246-250.
- Marton, G., and Buffler, R., 1993, Application of simple-shear model to the evolution of passive continental margins of the Gulf of Mexico basin: *Geology*, v. 21 p. 495-498.
- Wernicke, B., and Burchfiel, C., 1982, Modes of extensional tectonics, *Journal of Structural Geology*, v. 4, p. 105-115

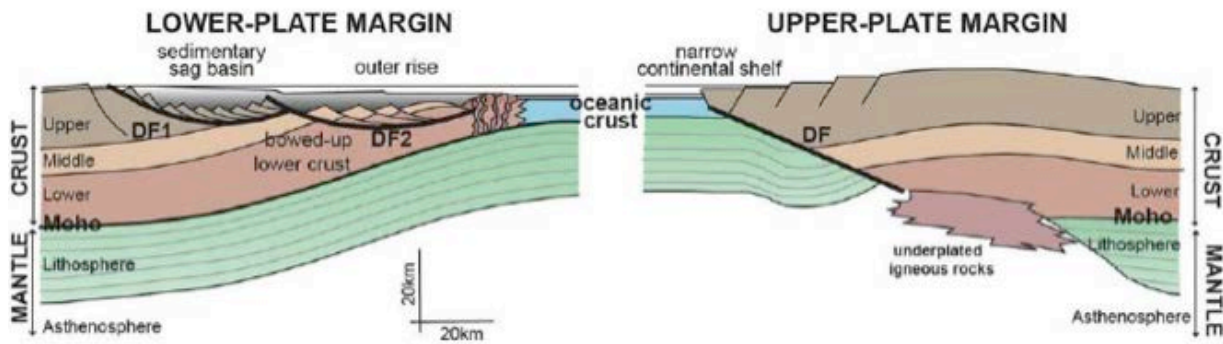
### Biographical Sketch

**PAUL MANN** graduated with a BS in geology from Oberlin College and a PhD from State University of New York at Albany. He is currently is the Robert E. Sheriff endowed professor of geology at the University of Houston. Dr Mann has led the CBTH study of conjugate margins in the Caribbean, Gulf of Mexico and circum-Atlantic since 2005.



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## Hydrocarbon pros and cons of an asymmetrically rifted margin



### Highly extended, lower plate margins

- + Wider fairways, giant salt basins
- + Broad, shallow-water prospective section
- + Slopes generates large, gravity-driven structures
- Sediments captured on broad shelf
- High, rift-related heat flow, charge timing problems
- Lack of structures on low-relief passive margin

Modified from Ian Davison (2012)

### Narrow upper plate margins

- + Limited footwall uplift, coarse clastics can access rift (in transtensional settings)
- + Uniform heat flow, no charge timing problem
- + Late transpression common
- Sediments bypass shelf, limits shallow water potential (but enhances deepwater)
- Play fairways generally narrow
- Exploration on shelf does not inform deepwater potential