Monday, May 10, 2010

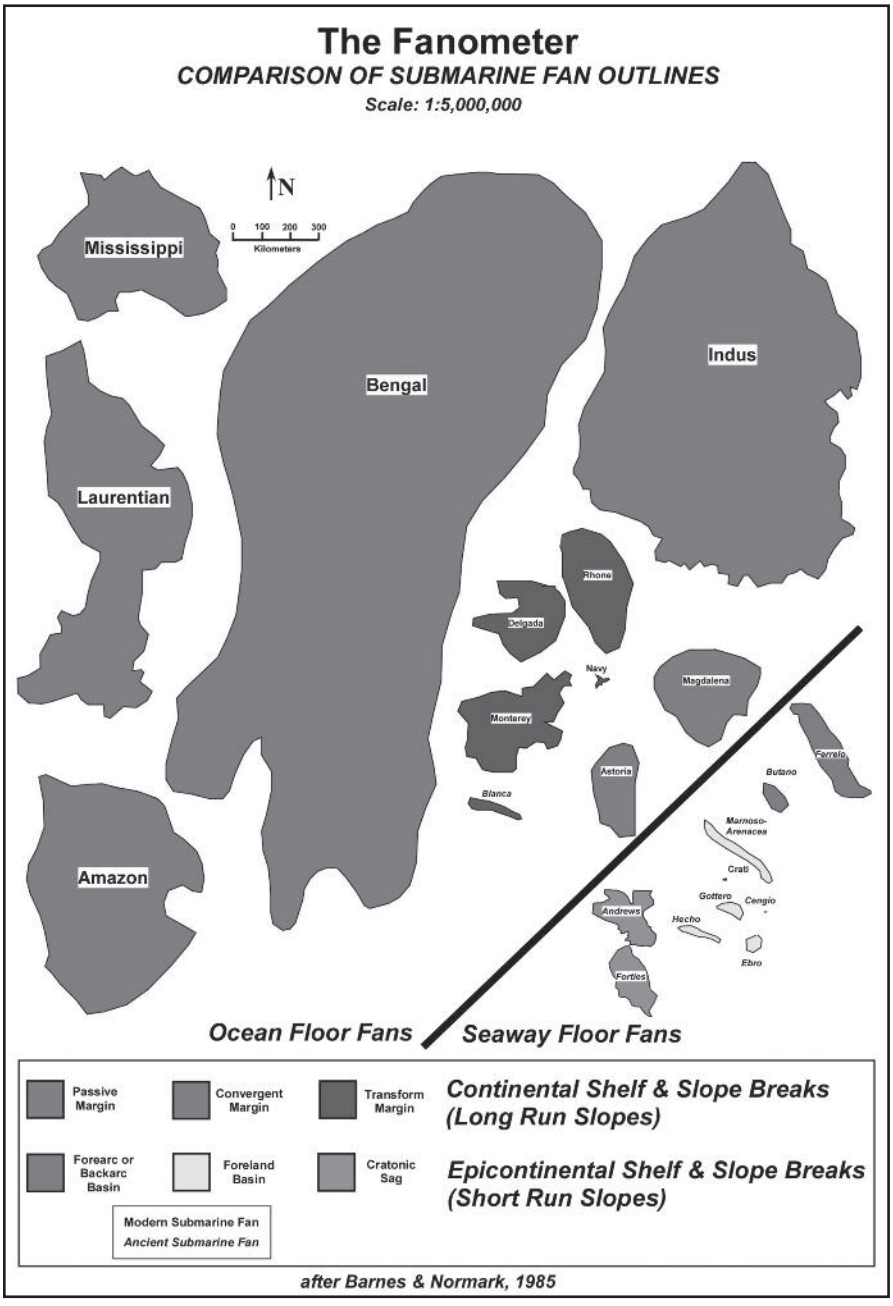
Westchase Hilton • 9999 Westheimer
Social Hour 5:30–6:30 p.m.
Dinner 6:30–7:30 p.m.

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.

A.D. Donovan
BP

What are the Shelf and Slope Breaks and Why the Rise and Run of the Intervening Slope Matters for Deep-Water Plays and Sequence Models



In sequence stratigraphic literature few terms have been used for such a wide variety of different physiographic features in the geologic record and resulted in more utter confusion than the terms shelf and slope breaks. In order to bring clarity to these key sequence stratigraphic concepts, the term shelf break should be reserved to convey the inflection point between the shelf and slope profile along depositional sequence boundaries, while the term slope break should be used to mark the inflection point between the slope and basin floor portion of this profile. In this context, the shelf break marks the down dip limit of sub-aerial erosion produced by the loss of accommodation during relative falls in sea level. The slope rise is the vertical distance between the shelf break and the slope break, while slope run is the horizontal distance. It is the slope rise and run which control the development and distribution of deep-water plays in the geologic record.

Shelf breaks may occur inboard of the continental margin (epicontinental shelf breaks) or coincident with the continental margin (continental shelf breaks). Epicontinental shelf breaks have short slope runs where the coeval shelf and slope breaks are just kilometers apart. "Small" seaway-floor fans develop in epicontinental settings when the slope rise begins to exceed 150m (500'). However, these seaway-floor fans are located just kilometers (miles) from the coeval "shelf break" and their size is commonly limited by the scale

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of the fluvial drainage networks which feed them. Furthermore, a robust portfolio of deep-water plays (slope fans, confined channels, etc.) do not develop along slopes in epicontinental settings simply due to their short runs.

In contrast, continental shelf breaks have long slope runs and robust slope rises. Downdip of the major fluvial drainage systems which rim the continental margins, "large" ocean-floor fans develop tens of kilometers (miles) outboard of the coeval continental margins. Furthermore, the long slope runs in these settings provide a suitable pallet for a robust portfolio of deepwater plays (levee channel, confined channel, and slope fans) to develop on the continental slope.

In summary, it is critical to differentiate epicontinental shelf breaks, which have slopes with short runs, from continental shelf breaks which have slopes with long runs, in order to explain and predict the development and distribution of deep-water plays in the geologic record. In terms of predictive 21st century depositional sequence models, low- and moderate-relief sequence models are proposed for sequences associated with epicontinental shelf breaks and short slope runs, while a high-relief sequence model is offered for sequences associated with the continental shelf breaks and long slope runs. Low-relief sequences have slopes with short rises and lack basin-floor fans. Moderate-relief sequences have slopes with moderate rises, and have seaway-floor fans with limited spatial extent, located just kilometers (miles) from the coeval epicontinental shelf break. High-relief sequences have slopes with robust rises and runs. Large ocean-floor fans are positioned tens of kilometers (miles) outboard of the continental margin in these settings, especially along passive plate margins. Furthermore, high-relief sequences can develop a robust portfolio of deep-water plays on the continental slope due to their associated long runs. ■

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Biographical Sketch

Art Donovan is a Senior Corporate Advisor for Sedimentology and Stratigraphy at BP and since mid-2008 has worked on the Reserves and Renewal Team for BP's North American Gas (NAG) Business Unit. Prior to this posting, he served as BP's Sed/Strat Discipline Lead and worked on BP's Technical Assurance Team for Global Exploration.

Art received his PhD from the Colorado School of Mines (CSM) in 1984. His PhD work on the Gulf Coastal Plain in the eastern United States was one of the pioneering efforts to apply sequence stratigraphic concepts to outcrop and shallow subsurface data. Upon graduation from CSM, Art was employed by Exxon for 16 years where he had the opportunity to work numerous basins around the world and develop his skills in the fields of sequence stratigraphy, seismic stratigraphy, and basin analysis.

The author of many papers and abstracts on sequence stratigraphy, Art has taught short courses for GSA, AAPG, SEPM, and The Geological Society. He is presently the Chair for the North American Commission of Stratigraphic Nomenclature (NACSN), an Adjunct Professor of Geology and Geophysics at Texas A&M University, and the Vice President of the HGS.