Monday, September 16, 2002

Westchase Hilton • 9999 Westheimer
Social 5:30 p.m., Dinner 6:30 p.m.

Cost: $25 Preregistered members; $30 Nonmembers & Walk-ups

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International Explorationists Dinner Meeting

by K. A. Nibbelink and J. D. Huggard,
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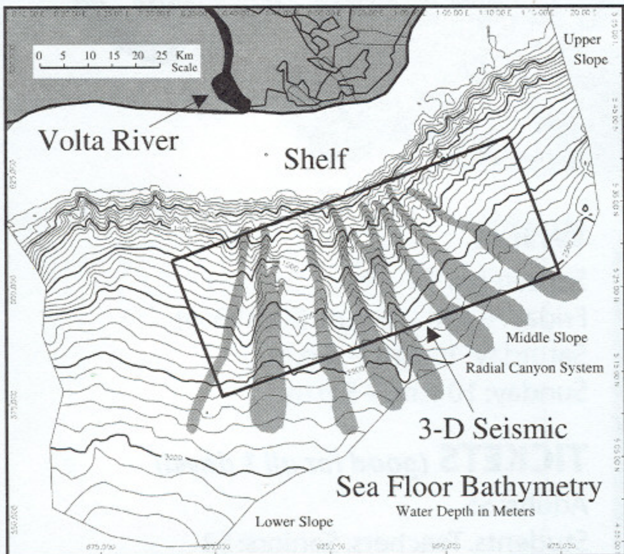

Volta Fan Fold Belt, *Ghana, West Africa*

Abstract

The Volta Fan Fold Belt occurs in eastern Ghana, West Africa in 1000 to 2500 meters of water. Recent seismic data defines inversion and extension structures, numerous Upper Cretaceous and Miocene deep water sandstone reservoirs, and a radial canyon pattern on the sea floor.

During the Late Cretaceous, the Volta River may have drained a much larger area to the north, including the southwestern part of the Sahara desert and the Niger River drainage west of the Benue Trough rift shoulder. During the rapid deepening as the continental margin of Brazil moved west along the Romanche strike slip fault zone, a thick wedge of Cenomanian clastics filled the rift topography followed by Santonian basin floor fans.

Inversion structures of the Volta Fan Fold Belt developed during the Late Cretaceous in response to right-lateral strike-slip movement along a restraining bend in the Romanche fault zone across the Keta Arch. The depositional architecture of the Oligocene to Miocene deep water sandstone reservoirs was controlled by topography created by the inversion structures and subsequent erosion during the Late Oligocene, 30-my lowstand of sea level. Erosion at the 30-my sequence boundary cut 15 to 20 canyons across the shelf. These canyons were cut 200 to 500 meters deep, 1 to 2 km wide, and provided a critical part of the sediment delivery system from the Volta River, across the shelf to the deepwater.

Amplitude patterns define deepwater sequences that systematically fill the topographic relief created by the inversion structures and erosional event. Upper Oligocene to Lower Miocene sedimentation consisted of 1) base of shelf fans at the mouth of the shelf canyons, 2) ponded fans behind the inversion structures, and 3) basin floor fans in front of these structures. Middle Miocene fan systems were deposited in a back stepping succession with the larger fans on the flanks of the Keta Arch. During the Late Miocene, a major progradation of the shelf allowed fan sedimentation across the entire arch and developed an extensional, listric normal fault system.

A radial canyon system is observed on the sea floor in 1500 to 2500 meters of water on the Volta Fan. Eight straight canyons form a radial pattern on a 2 to 3 degree incline in the middle slope of the Volta Fan. They are 20 to 30 km long, 150 to 200 m deep, 2 to 4 km wide, and have flat floors with high seismic amplitude. The straight canyons are distinctly separated from shelf edge, V-shaped, meandering canyons on the 4 to 5 degree upper slope. Between the radial canyons, a weak seismic reflection interval is interpreted as gas hydrate ridges. Below these hydrate ridges a thick interval of high amplitude is interpreted as free gas in the shallow sediment. The interface between the gas hydrate and free gas zone is interpreted as a décollemont surface, which allows slumping and progressive headward erosion that forms the canyon system.

Biographical Sketch

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KEN NIBBELINK is a Geologic Advisor in business development with Devon Energy Corporation in Houston. He received a BA in geology from Western State College of Colorado in 1979 and an MS in geology from Colorado State University in 1983. Over the last 20 years he has worked for Rocky Mountain Energy, Amoco, Santa Fe Snyder and Devon Energy in various US and international assignments including the Rocky Mountains, West Africa, North Africa, South America, and the Gulf of Mexico. His research interests are focused on hydrocarbon systems in unconformity-bounded sequences of the Atlantic margins, from Jurassic to Pleistocene including North America, South America, Europe, and North and West Africa.