Tuesday, October 18, 2005

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by ***W. Charles Barnes***
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Subsurface Vents Under the Gulf of Mexico Shelf: Characteristics and Significance for Hydrocarbon Migration and Trapping

Mud volcanoes throughout the world erupt with mixtures of mud, brine and hydrocarbons. As the apex of expulsion systems, these features give insight into the process of hydrocarbon expulsion and shale dewatering at depth. Many eruptions are believed to be sourced from overpressured shales lying at great depths.

Subsurface vents may be important point sources of hydrocarbon migration into larger fields nearby

Compact structures observed on seismic data near the top of geopressure appear to be at the root of expulsion systems and are interpreted as "subsurface vents" where fluids are expelled from overpressured shales into the transitional and normally pressured section above. The structures are located downthrown on deeply rooted faults. Collapse topographies surrounding the vents appear to have been created by fluid withdrawal from geopressured shales subjacent and upthrown to the vents. As fluid expulsion is often linked with fault movement, the vertical reach of conducting faults above these vents may be governed by the effective fountainhead of the ascending pressured fluids. Bright spots occasionally stream from these faults and may be evidence of actively migrating hydrocarbons.

The significance of subsurface vents related to petroleum exploration is two fold. First, subsurface vents appear to be almost always charged. In fact, this author has yet to document a case that lacks hydrocarbon accumulations. Additionally, these structures are often filled to the spill point with reserves in the range of 5 to 50 BCF. Second, subsurface vents may be important point sources of hydrocarbon migration into larger fields nearby. A better understanding of these structures and their evolution may aid in predicting hydrocarbon accumulations in neighboring structures and lead to a knowledge of specific migration pathways within a basin. ■

Biographical Sketch

Charley Barnes holds a BS degree from Baylor University and an MS degree from Texas A&M University, both in geophysics. He is an explorationist with experience in the U.S. Gulf Coast, both onshore and offshore. He explored for BP Amoco, Pioneer Production Co., Trinity Resources, Amerada Hess and Apache, before joining Stone Energy in 1999. His focus is on play concept generation, with particular interests in salt and shale tectonics in relationship to petroleum migration and entrapment. Mr. Barnes is a member of AAPG and SEG and recently presented his findings on subsurface vents at the AAPG Convention in Calgary.