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Geomorphologic, Stratigraphic, and Seismic Visualization Analysis of Deepwater Deposits

Abstract

Detailed seismic-geomorphologic, seismic-stratigraphic, and seismic vizualization analyses of 3D seismic data offshore Indonesia, Nigeria, and the Gulf of Mexico reveal the presence of extensive turbidite and debrite deposits. Key depositional elements include: turbidity flow leveed channels, channel overbank sediment waves, frontal splays/distributary channel complexes, and debris flow channels, lobes and sheets. These depositional elements will be described and the mode of formation discussed within the context of deepwater sedimentary process and interaction with local bathymetry.

Turbidity flow channel widths range from 2 km to less than 200 m. Sinuosity ranges from moderate to high, and channel meanders are observed to migrate in a down-system direction. High-sinuosity channels are associated with extensive sediment wave development in proximal overbank settings, especially in association with outer channel bends. The long axes of these sediment waves are oriented normal to the inferred direction of turbidity flows. These sediment waves reach heights of 20 m and spacing of 3 km. Overbank thickness decreases systematically down-system. Near to where overbank thickness can no longer be resolved seismically, high-sinuosity isolated channels feed low-sinuosity distributary channel complexes/frontal splays. Low sinuosity distributary channel complexes are expressed as lobate sheets, in excess of 5-10 km wide and potentially tens of kilometers long. Notably, they appear to be characterized by channelized flow all the way to the edges of these systems.

Debris deposits are in the form of low-sinuosity channel fill, narrow elongate lobes, and sheets. These deposits are characterized seismically by a contorted, chaotic seismic facies that commonly overlies a striated/grooved pavement. These striations/grooves can be up to tens of kilometers long, 15 m deep, and 25 m wide. In areas where flows are unconfined, striation patterns suggest that divergent flow is common. Within the constraints of the seismic data coverage, the debris deposits extend as far basinward as the turbidite deposits. Individual debris units reach 80 m in thickness.

Examples utilizing different visualization techniques will be presented. Other examples and techniques will also be shown by Veritas Exploration Services in the Vendor's Corner during the social hour.

Biographical Sketch

DR. HENRY W. POSAMENTIER joined Veritas as a senior technology advisor based in Calgary. Prior, he was a senior exploration advisor with ARCO Indonesia Inc., concentrating on ARCO's exploration and production offshore, Java. He has employed an interdisciplinary approach using borehole and seismic data to unravel basin fill histories. Most recently, he has focused on seismic geomorphology, using 3D seismic volumes to identify and characterize elements of depositional systems. In addition to working with ARCO from 1991 to 2000, Dr. Posamentier was with Exxon Production Research Company, Esso Resources Canada, Ltd. and was assistant professor of geology at Rider University for 5 years. While at Exxon, he was part of the team that pioneered the development of sequence stratigraphy, which remains one of his research interests. In 1971-1972, Dr. Posamentier was a Fulbright Fellow to Austria. He has served as an AAPG Distinguished Lecturer to the United States (1991-1992), AAPG Distinguished Lecturer to the former Soviet Union (1996-1997), and AAPG Distinguished Lecturer to the Middle East (1998-1999). Dr. Posamentier holds a Ph.D. in geology from Syracuse University. □

HGS Emerging Technology Meeting • Thursday, January 18, 2001 • Westchase Hilton, 9999 Westheimer
Social 5:30 p.m., Dinner 6:30 p.m.