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Geological Architecture of Fine-grained Submarine Fan Reservoirs

by Arnold H. Bouma, Louisiana State University

The interpretation of 2-D and 3-D seismic and suites of well logs from submarine fans known to be important reservoirs lacks an important companion, namely detailed studies of major outcrops. Such studies can provide data to construct synthetics that may be sufficiently comparable to subsurface information to provide a guide to interpretation and a framework for understanding the reservoir architecture.

Outcrops of coarse-grained, sand-rich fans are rather common. However, tectonic tilt normally prevents lateral correlation of many features which commonly are larger than the outcrop. In addition, resulting fan models are not very applicable to fine-grained

fans. Studies of the Mississippi Fan (DSDP Leg 96), the salt-withdrawal basins in the northern Gulf and the adjacent basin floor south of the Sigsbee Escarpment, combined with the non-tilted Permian Tanqua Karoo in South Africa, provide an excellent framework for exploration- and reservoir-scale investigations of fine-grained basin-floor fans.

Basin-floor fan deposits start with an updip-pinching-out channel complex at the base of slope where the erosional characteristics typical of the continental slope change into depositional characteristics. Amalgamated channel sandstones with remnants of shale-rich levee deposits result in a somewhat complex tortuosity of the fluid flow.

Downdip, the complex changes into one or more individual leveed channels. Major massive channel sands are surrounded by rather clean levee deposits (low-resistivity, low-contrast, thin-bedded sandstones) that can be very oil prone. Further down dip, the channels become less channelized and lose their confining influence to the head of density currents, and sheet sand deposition results. The sheet sands are wide and thin, but as a total deposit they form major reservoir sand thicknesses. The complexity of the vertical and lateral continuity of these sands is not well understood, which results in miscommunication between geologists/geophysicists and reservoir engineers.

Biographical Sketch



Arnold H. Bouma

Arnold H. Bouma was born and educated in The Netherlands. He received his B.S. at the University of Groningen and his M.S. and Ph.D. at the University of Utrecht. In 1966, the Bouma family emigrated to the USA. Ten years of teaching marine geology at Texas A & M University was followed by working in the marine division of the US Geological Survey in Alaska and later in the Gulf of Mexico.

In 1981 he joined Gulf Oil Company, and in 1988 he came to Louisiana State University where he accepted the Charles T. McCord Chair.

Bouma has authored/co-authored over 160 articles, abstracts, reports, and books. In 1982, he received the Shepard Award for Excellence in Marine Geol-

ogy from the SEPM. He is editor-in-chief of *Geo-Marine Letters*, and co-organizer of several research conferences. He is a member of AAPG, SEPM, HGS, IAS, KNGMG, AAAS, and Sigma XI. He is the program chairman of the 1995 GCAGS meeting that will be held in Baton Rouge, Louisiana.