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Geological Architecture and Reservoir Characteristics of Fine-Grained and Coarse-Grained Turbidite Systems

Abstract

Exploration and production of oil and gas from deepwater turbidite systems is of high interest to most companies. Several models have been developed, emphasizing the architecture and several aspects of reservoir characterization. Application of a non-suitable model can result in dry holes, bypassed oil, and other frustrations. Of all general models available the most important ones are the coarse-grained and the fine-grained turbidite systems.

The coarse-grained systems are canyon-fed prograding fans that gradually become thinner and finer in the down-dip direction. The fine-grained systems are delta-fed bypassing fan types with well developed leveed channels and significant depositional lobes or sheet sands on the outer/lower fan. Calculations on the Mississippi Fan and Tanqua Karoo fans in South Africa indicate that 75% or more of all the sand in fine-grained fans is stored in the sheet sands. Just to indicate that coarse-grained turbidite systems are related to active margins and fine-grained ones to passive margins is only partially correct. The terms active and passive margins should not be used to identify turbidite system types.

A general understanding of the types of transport and depositional processes responsible for the distribution and characteristics of the sands and shales is essential. The factors (tectonics, climate, sediment, relative sea level fluctuations) that influence basin setting, transport, deposition and timing interact rather variably with one and another.

The coarse-grained turbidite systems are rather well understood because those deposits are common in outcrop, often adjacent to productive fields. Fine-grained turbidite systems commonly do not outcrop. That makes it very difficult to determine

architectural changes in down-dip and lateral direction, as well as reservoir continuity. The non-tilted Permian Tanqua Karoo fan systems in South Africa are the only ones known to make it possible to conduct such observations.

Biographical Sketch

ARNOLD H. BOUMA was born in the Netherlands where he received his B.S. at the University of Groningen (1956) and his M.S. (1959) and Ph.D. (1961) at the University of Utrecht. From 1962 to 1963 he had a Fulbright post-doctoral fellowship at the Scripps Institute of Oceanography, La Jolla, California. In 1966 the Bouma family immigrated to the USA. Ten years of teaching at Texas A&M University was followed by working several years for the USGS in Menlo Park and Corpus Christi. He later joined Gulf Oil Co., which became Chevron. In 1988 he came to LSU where he received the McCord Chair.



Bouma is interested in marine sediments, emphasizing submarine fans (modern and ancient) and the interaction between shallow and deep water. Many other aspects of geology are of interest, to him, including environmental geology. He has authored/ edited/co-edited 11 books, over 180 papers, and many abstracts, reviews and reports. He is active as editor and organizer of research conferences and is a member of several professional organizations, including AAPG, SEPM, IAS, HGS, KNGMG, AAAS and Sigma XI. At present he is President of the SEPM. □

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