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Sequence Stratigraphy of Aggrading and Backstepping Carbonate Shelves, Oligocene, Central Kalimantan, Indonesia

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Abstract

Four major Oligocene carbonate sequences were studied in the Teweh area of Central Kalimantan, Indonesia, to better understand how they might serve as reservoirs for hydrocarbons in the area. Each sequence (200–500 m thick) was delineated in outcrops and/or on seismic lines: (1) early Oligocene, (2) middle Oligocene, (3) early late Oligocene, and (4) middle to late Late Oligocene. In landward areas to the south, sequence 1 consists mainly of sandstones and shales with thin limestone beds. Isolated carbonate buildups and shales occur in basinal areas to the north in sequence 1. An erosional unconformity separates sequences 1 and 2. During deposition of sequences 2–4, carbonate shelves developed in the southern part of the Teweh area, while shales were deposited in basinal environments to the north. The carbonate shelf margin of sequence 2 was established along a structural hinge line. Boundaries between sequences 2–4 do not show onlap or erosional truncation in this area. On seismic lines, boundaries between carbonate sequences 2–4 are defined by surfaces of renewed carbonate growth (mounding and/or downlap) on the shelf immediately above the sequence boundary. Subaerial unconformities were not found in or between sequences 2–4 on outcrop, so boundaries between sequences 2, 3, and 4 were placed where strata first indicated a substantial deepening of depositional environments. Rapid rises in relative sea level (subsidence + eustatic sea level) resulted in drowning and “backstepping” of carbonate shelf margins in some locations, and stacking of shelf margins in other locations.

Internally, the carbonate shelves of

sequences 2 and 3 are characterized by vertically building shelf margins with landward-dipping (south-dipping), shingled clinofolds indicating progradation of shallow carbonate environments from the shelf margin into the lagoon. Sequences 2 and 3 have well-developed transgressive systems tracts overlain by highstand systems tracts. In outcrop, the transgressive systems tracts contain interbedded large-foram wackestones/packstones and coral wackestones/packstones with poorly defined facies belts. The highstand systems tracts are characterized by well-developed facies belts which include from the basin shelfward: (1) shale and carbonate debris flows deposited on the lower slope; (2) argillaceous large-foram wackestones on the upper slope; (3) discontinuous coral wackestones and boundstones in bioclastic packstones on the shelf edge; (4) coralline-algae, large-foram packstones and grainstones of back reef flats and shelf-margin shoals; and (5) thin-branching coral and foraminiferal wackestones and packstones in the lagoon. Seismic lines show the carbonate shelf of sequence 4 as a massive buildup which thins substantially into the basin.

Biographical Sketch



Art Saller

Art Saller currently works as a carbonate sedimentologist for Unocal Energy Resources in Brea, California. He did undergraduate studies at the University of Kansas (1974–78), received a masters degree from Stanford University in 1980, and a Ph.D. in Geology from Louisiana State University in 1984. From 1984 to 1986, he worked as a Research Geologist with Cities Service Oil and Gas in Tulsa, Oklahoma, and joined Unocal in 1986. At Unocal, Art teaches courses, performs technical service work, and conducts research related to exploration and development in carbonate rocks.