

Shelf/Margin Deltas: Attributes of an Ideal Hydrocarbon Trap

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Shelf/margin deltas have four primary attributes that make them such significant reservoirs: Shelf-edge deltas progrades into relatively deep water where wave energy is less attenuated than for similar environments inboard on the shelf. The high energy wave dominated environment facilitates mechanical weathering of the sands resulting in reservoirs that retain producible porosity and permeability to depths of 20,000 feet (6,200 meters). Following shelf/margin delta deposition the transgression is rapid across the relatively planar coastal plain. Coarse-clastics are impounded progressive farther landward resulting in deposition of clean organic-rich and ductile clays on the outer shelf and upper slope. These clays resist fracturing and provide fault sealing gouge making ideal seal for the deltaic sands.

Shelf-edge growth-faulting is most active during differential loading when the sand-rich rivers are supplying high volumes of sediment to the shelf/margin. The sediment supply in-fills the fault generated accommodation space depositing thick multistoried sand packages in the hanging wall section. As the fault continues growing the hanging wall is folded into a roll-over anticline placing the deltaic sands into a trapping configuration. During growth-fault movement there is relative extension of the fault zone allowing fluids to move upward along the fault plane. If the fault system taps into a hydrocarbon kitchen or pool of migrated hydrocarbons, the oil and gas can migrate up the fault into the trapping reservoirs sealed by the Transgressive claystone. The presentation includes both subsurface and outcrop examples of shelf-margin deltaic complexes from foreland, convergent, cratonic and passive margin basins.