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Use of Upper Jurassic Coral-Microbial and Thrombolitic Reefal Buildups of Northeast Spain as Outcrop Analogs for Upper Jurassic Coral-Microbial and Microbial Petroleum Reservoirs in the U.S. Gulf of Mexico

Upper Jurassic (Kimmeridgian) coral-microbial and coral-bearing thrombolitic reefal buildups are excellently preserved in outcrops around Jabaloyas, Tormón and Arroyo Cerezo, northeast Spain. Characterization of these patch reefs greatly facilitates the design of hydrocarbon exploration and development strategies for Upper Jurassic microbial reefs in the subsurface. These Spanish reefs occur as irregularly spaced, cylindrical to conical shaped buildups with steep slopes (pinnacles up to 16 m in height) on a continuous ramp gradient over a distance of 15 km chiefly in proximal to distal middle carbonate ramp settings in the Iberian Basin. Associated reef facies include pre-reef and inter-reef (oid, peloid and bioclastic grainstone and packstone to skeletal wackestone, from proximal to distal areas) and post-reef (oncooid, ooid, peloid and bioclastic grainstone and packstone in middle ramp areas). The facies are mappable and predictable. Reef growth is initiated on a cemented and encrusted (microbial crust), sediment starvation surface developed during flooding of the ramp. Reef growth occurred chiefly during the time of sea level rise. Corals (*Thamnasteria*, *Microsolena*), chaetids and stromatoporoids with microbial crusts dominated the reef assemblage of the proximal buildups. The assemblage of the distal buildups are characterized by coral-bearing thrombolites of 12 m in height. During sea level highstand conditions, the relative proportion of microbial crusts to corals decreased, and the growth of the reef was reduced. Characterization of the stratigraphic distribution, lateral facies changes, geometries, and dimensions of these Spanish patch reefs provide an exploration strategy and development scenario for Upper Jurassic coral-microbial and microbial reefs in the U.S. Gulf of Mexico.