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Sequence Stratigraphic Evolution of the Oficina Formation in the Zuata Area of the Faja Petrolifera del Orinoco, Eastern Venezuela Basin

The Eastern Venezuela Foreland Basin formed by the ongoing oblique collision of the Caribbean and North American plates during the Cenozoic. On the southern flank of the basin, the Faja Petrolifera del Orinoco contains an estimated 1.4 trillion barrels of heavy oil, mostly in deposits of the early Miocene Oficina Formation. Evaluation of whole core, well logs, biostratigraphic data, 2-D and 3-D seismic data, and remote sensing imagery has led to an integrated tectonics and sedimentation scenario for the sequence stratigraphic evolution of the Oficina Formation in the Zuata area of the Faja. Main reservoir intervals comprise a complex mix of fluvial, estuarine, incised valley and deltaic facies deposited in a retrogradational sequence set under conditions of increasing accommodation. Non-reservoir facies are a variety of low-energy paralic, marine, and coastal plain sediments. Biostratigraphic data indicate that these sequences began forming in the Aquitanian Stage and ended in the late Burdigalian Stage. The best reservoir facies are amalgamated coarse-grained fluvial successions in the lower accommodation older sequences, deposited by rivers that drained the Guyana Shield. Sedimentary structures, ichnology, and biostratigraphy indicate that marine influence increased through successive sequences. This trend reflects increasing accommodation from Early Miocene eustatic rise and eastward movement of the Serranilla del Interior thrust front, bringing the higher subsidence foredeep closer to and forcing the lower subsidence peripheral bulge further away from the Zuata area. Younger sequences are less amalgamated and contain greater proportions of estuarine, paralic, and marine facies. This facies distribution correlates closely to variation in reservoir quality.