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Late Jurassic Sub-Basin Differentiation Defines Significant Exploration Potential in the Southern Lusitanian Basin, Portugal

Tectonic activity beginning in late Dogger through Malm delineated 3 sub-basins in the southern Lusitanian basin. Two of these, Turcifal and Arruda, developed discrete depositional systems resulting in multiple Jurassic source rocks and reservoirs. Oil seeps, drilling shows and live oil recoveries are abundant in this area.

Dogger-age left-lateral movements along Porto do Mos and Sobral wrench zones were linked by development of the Montejunto anticline. These structural trends isolated the Arruda sub-basin from open marine circulation during Oxfordian time, resulting in deposition of the Cabacos Fm, a carbonate source rock/anhydrite couplet. High-energy carbonate grainstone and reef facies developed along the crest of the Montejunto anticline. High-standing basement blocks within the Vila Franca da Xira wrench zone formed the east side of the sub-basin and shed a major fan-delta system into the basin. Miocene tectonism (Alpine) reactivated wrench faults, and related thrusting further deformed the Montejunto anticline.

The Turcifal sub-basin was a narrow, deep trough during Dogger and Malm time. Seismic data indicate the very steep western margin developed a shelf-edge reef complex, which was most extensive during the Malm. Oxfordian source rocks >6.0%TOC have been sampled from northern margin outcrops where they are early oil mature. The persistent deep-basin axis suggests anoxic conditions should have generated significant source rocks in the Turcifal since Dogger. Porous reef facies have been drilled in the Bombarral sub-basin, and an exhumed Malm reef complex is reported to have several million bbls of tar and heavy oil in place in outcrop along the Montejunto anticline.