

Deep-marine Reservoir Distribution Against the Flanks of a Syn-Depositionally Active Salt Diapir in the Basque-Cantabrian Basin, N. Spain

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ABSTRACT

Deep-marine successions onlapping salt diapirs can form excellent reservoirs with some combination of stratigraphic and structural trapping. However, these are typically poorly-imaged in the subsurface due to salt overgrowth, steep structural dips, fractures, and variable lithological distributions. Using an outcrop analogue is therefore a useful way to constrain facies and geometrical configurations of these complicated onlaps. The Bakio Diapir, Basque-Cantabrian Basin, N. Spain, provides excellent exposure of a halokinetically influenced deep marine succession. The Triassic-aged gypsum body, which was growing in the Albian, is flanked and capped by Albian-Cenomanian aged deep-water deposits. Within exposed strata there is evidence of extensional faulting and localised flank failure, and a complex interbedding of slides, slumps, debrites, hybrid beds, siliciclastic turbidites and calc-turbidites. These facies generate a complicated onlap geometry with variable rates of reservoir deterioration towards the pinch-out. Systematic logging of the complexly deformed units allows for the study of facies changes and reservoir heterogeneities on both sides of the diapir. Mapping the extent and consistency of composite halokinetic sequence boundaries distinguishes the controls of reservoir distribution and stacking-patterns as a combination of halokinetic growth and autocyclic flow processes. Petrographical analysis of thin sections reveal grain-scale controls on reservoir deterioration; heterogeneities arise from textural and compositional maturity, particularly clast type (bioclasts, lithic fragments, mafic inclusions).

Understanding reservoir deterioration towards pinch-out is critical for estimating hydrocarbon column height and stratigraphic trapping potential; these outcrop-based, process-driven observations are applied in the development of conceptual facies models for Paleocene-aged salt-affected reservoirs in the North Sea, UK.