

North Atlantic Permo-Triassic Rift Basins: Their Evolution, Infill Architecture and Implications for Future Exploration

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Permian - Triassic rift basins offer important hydrocarbon targets along the Atlantic margins. These relatively lightly explored basins span both the Atlantic and Tethyan realms and developed above a complex basement with inherited structural fabrics. They are filled with a varied suite of sediments dominated by continental red beds, comprising braided fluvial, alluvial fan, aeolian, floodplain and lacustrine facies. The poor constraints on their depositional geometries and sedimentary architecture in offshore regions are further impeded by deep burial beneath younger strata, combined with the effects of later tectonism and continental breakup.

A multidisciplinary analysis of basins along the North Atlantic margin is currently underway. Regional seismic and well data, combined with geochemical provenance analysis from the European North Atlantic margin are being integrated with detailed outcrop studies in Morocco and Nova Scotia. The research is providing new insights into the regional basin tectonostratigraphic evolution, sediment architecture, reservoir distribution, and quality at a range of scales.

Regional seismic mapping suggests a variety of large-scale basin geometries and development. Significantly, Permo-Triassic basin geometries are different and more varied than the overlying Jurassic and younger basins. Application of a new Pb K-feldspar provenance technique to Triassic sandstones in NE Atlantic margin basins offer new and robust controls on sediment dispersal patterns in the North Atlantic region.

Analysis of key outcrops of age equivalent Permian-Triassic rifts in Morocco and Canada involved detailed sedimentological and LIDAR analysis. The results document the evolving sedimentary architecture and allow the identification and characterization of key marker horizons and sequence boundaries. They provide insights into the interplay of tectonic and climatic influences on sedimentation, which has significant implications for reservoir distribution and quality.