



Influence of crustal-scale structural lineaments on Mesozoic basin development offshore Ireland: insights from the Slyne & Erris basins

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This study uses a combination of 2D and 3D seismic reflection surveys, borehole data, and regional potential field datasets from across the Irish Atlantic margin to delineate the offshore extent of major crustal-scale lineaments across the Irish Continental Shelf and understand their influence on the structural and stratigraphic development of Mesozoic rift basins offshore Ireland.

The Irish Atlantic margin is characterised by a series of westward-stepping interconnected rift basins which are the remnants of a long-lived rift system that formed prior to the opening of the Atlantic Ocean. The rift system is the result of a long, episodic extensional history stretching from post-Caledonian orogenic collapse to continental break-up and onset of formation of oceanic crust during the Eocene. Within this rift system the Slyne and Erris basins form a series of NE-SW trending, narrow and elongate half-grabens and grabens that developed between the Late Permian and Late Cretaceous. The Slyne and Erris basins are separated into a series of sub-basins which display differences in structural style and polarity of major basin-bounding faults and associated half-grabens. Rift segmentation and polarity reversal are associated with transfer zones that are coincident with underlying transecting crustal-scale lineaments representing the boundaries and suture zones between Caledonian and Precambrian basement terranes.

The most significant transfer zone within the Slyne and Erris basins is the Central Slyne Transfer Zone which separates the Central and Northern Slyne sub-basins and occurs where the offshore extension of the Great Glen Fault intersects the Slyne Basin. Sub-basins on either side of this transfer zone show significant geological differences, including basin polarity, presence of salt, preservation of post-rift stratigraphy and dominant hydrocarbon fluid phase. Other pre-existing structural lineaments define the boundaries of sub-basins along the Slyne and Erris rift system, with associated transfer zones usually defined by soft-linked rather than hard-linked fault systems. Whatever the nature of individual transfer zones, Mesozoic basin development reinforces the importance and longevity of pre-existing Caledonian basement terranes boundaries which exercise a fundamental control on the localisation and evolution of later basins.

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