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Controls of pre-existing structural pattern on carbonate platform evolution: the Derbyshire platform (East Midlands, UK)

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The Mississippian Derbyshire Platform, located in the Pennine Basin of Northern England was deposited due to the back-arc extension during subduction of the Rheic Ocean. Platform growth was strongly affected by a pre-existing Caledonian structural pattern, and regional stresses related to the two main tectonic phases: (i) Mississippian rifting and (ii) Pennsylvanian-early Permian shortening associated with the Variscan Orogeny. The rifting stage was associated with N-S extension and resulted in development of WNW-ESE, W-E oriented grabens along a series of NW-SE and NE-SW trending faults. These faults were inherited from the pre-existing pattern of Caledonian structural weaknesses, and were likely to be reactivated during both rifting and orogenic tectonic stages.
Seismic profiles across the studied area show evidence of Carboniferous extensional growth faulting and inversion during Variscan shortening (Fraser and Gawthorpe, 1990). Field analyses include characterization of faults orientation, kinematics and their crosscutting relationships. Additionally, lineament analysis of satellite images and structural maps was performed and structural elements of different hierarchies were recognized. Based on these analyses, the importance of strike-slip tectonics as a result of reactivation of earlier-formed Caledonian structural weaknesses is highlighted. The Derbyshire platform, therefore, emphasizes the controls of pre-existing structural pattern on a carbonate platform growth, geometry, structural architecture and facies distribution. As such, understanding the full tectonic history, and preceding tectonic events specifically, is crucial for understanding structural controls on platform growth.

References
Fraser A.J. and Gawthorpe R.L. 1990. Tectono-stratigraphic development and hydrocarbon habitat of the Carboniferous in northern England. Special Publications of Geological Society of London 55 (1), 49-86.