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Controls on the Genesis, Evolution and Breaching of Relay Ramps: New Insights from Field Studies (Hurricane Fault, Southwest Utah) and 3-D Seismic Analyses (Offshore West Africa)

The geometry and evolution of a number of breached relay ramps from three contrasting structural regimes have been studied using 3-D seismic interpretation, analysis of displacement patterns and fieldwork. The study is illustrated with examples of relay ramps from SW Utah(U.S.A), offshore Angola and offshore Côte d'Ivoire.

This study suggests that overlapping and offset basement controlled faults will interact more strongly with one another than salt-related growth faults. The ability of basement controlled faults to accrue displacement is greater than for growth faults because the former fault surfaces are generally taller and more importantly, planar. Listric normal faults have a tendency (especially in halokinetic provinces) to develop welded fault surfaces that reduce their ability to accrue displacement and may counter the influence of mechanical interaction. In the Angola study, partial welding of a listric fault surface from a Pliocene aged relay ramp is thought to have resulted in the by-pass of a footwall/hangingwall breach in favour of an intra-ramp breaching style. Breached relay ramps from the basement controlled fault systems are characterised by upward bifurcations of a single fault strand and a change in breaching style from one structural level to another.

The temporal ability of faults to accrue displacement together with the degree of mechanical fault interaction are therefore considered to be important controls on the breaching of relay ramps. Understanding the evolution and breaching of relay ramps is important for constraining sediment dispersal patterns, hydrocarbon migration pathways and potential trapping mechanisms.