geoconvention
Calgary • Canada • May 15-19 2017

Basin-margin reactivation due to episodic rifting in Jeanne d'Arc Basin: experimental models and outcrop analogs

Iain K. Sinclair[1], Craig Bateman[1], Martha O. Withjack[2], Mattathias Needle[2], Roy W. Schlische[2], Caroline McIlroy[1] and Nadine Emberley[1]

1 Husky Energy, Canada

2 Rutgers University, USA

Summary

The petroleum-rich Jeanne d'Arc Basin, located on the Grand Banks of Newfoundland on the western margin of the North Atlantic Ocean, underwent a long period of episodic rifting (>130 million years) during the Mesozoic breakup of the Pangean supercontinent. Areas of nearly continous sedimentation developed locally during the successive rifting phases and the relatively quiescent periords between them. Deposition of a thick Upper Triassic to Lower Jurassic evaporite package occurred during the first rifting episode.

High quality, modern 3D seismic-reflection data on the southeast margin of the basin provide for detailed imaging and analyses of the fault interactions generated by the episodic rifting in the Jeanne d'Arc Basin. Examples of fault interactions include truncation and offset of pre-existing faults, reactivation of older structural lineations, fault nucleation and growth controlled by pre-existing faults, and oblique-slip reactivation of older structures due to re-alignment of stresses regionally and through time.

Experimental models replicating reactivation of inherited basin-margin structures provide vivid and informative analogs for comparison with and evaluation of the multi-episode rift structures. These models replicate the presence of pre-existing basement structures and deep, ductile detachment zones comparable to the Upper Triassic to Lower Jurassic salt in the Jeanne d'Arc Basin.

Outcrop structures exposed in the Bay of Fundy region provide another record relevant to the interplay of inheritance and changing stress regimes on structural interactions through time. This includes recognition of the critical role that the presence of accretionary structures in basement plays on subsequent extensional reactivation and later oblique-slip reactivation.