Basin-Scale Salt Tectonic Processes at the North-Central Scotian Margin: Insights from Integrated Regional 2D Seismic Interpretation and 4D Physical Experiments

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The complex salt-related deformation styles characterizing the diverse Scotian Basin salt provinces are the result of basement topography, salt thickness, and sedimentation during the Jurassic and Early Cretaceous. Exploration concepts developed in salt basins around the Atlantic margins cannot be adapted reliably to the Scotian Margin. Consequently, new tectono-stratigraphic concepts of the Scotian Margin must address the unique basin characteristics including palaeogeography, sediment supply, and rift basin geometry.

Regional seismic sections of the GXT NovaSpan data allow structural and analogue modelling of regional transects extending from the shelf to the deepwater basin. The Salt Dynamics Group utilizes physical experiments to analyze salt tectonic processes including the interaction of salt tectonics and depositional systems from early post-rift salt mobilization to late post-rift allochthonous salt complexes. 4D strain data and experiment sections enable mechanical modelling of fault and salt tectonic processes. Salt tectonic concepts derived from our experiments relate characteristic salt structures to the palaeo-depositional environment and kinematic stages of the basin evolution.

Preliminary results demonstrate that the Scotian salt provinces differ strongly from the salt basins of the Gulf of Mexico and the younger South Atlantic salt basins. Low mechanical coupling of the sediment overburden due to thick original salt in narrow interlinked rift basins has favored rapid down-building and sediment aggradation rather than progradation in the early post-rift stage. Initial salt mobilization started in the Laurentian Basin and propagated in southward direction along the margin driven by shelf-parallel sediment transport sourced by the Laurentian Fan from the NE. This depositional pattern has led to diachronous salt extrusion shown by the southward younging of the allochthonous salt canopies and salt nappes in the North-Central Scotian Basin.