

Basin-Scale Salt Tectonic Processes and Sediment Progradation in the Slope and Deepwater Basin of the North-Central Scotian Margin

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The complex salt deformation styles characterizing the diverse Scotian Basin salt provinces are the result of complex basement topography in the narrow linked rift basins, variable salt thickness, and high clastic sediment input during the Jurassic and Cretaceous. Recent disappointing exploration results have shown that salt tectonics concepts developed in salt basins around the Atlantic margins cannot be adapted reliably to the Scotian Margin. Consequently, the next generation of basin models must investigate the role of the unique basin characteristics including palaeogeography, sediment supply, and rift basin geometry.

Basin-scale seismic sections of the GXT NovaSpan data of regional transects of the Laurentian, Abenaki, and Sable subbasins extending from the shelf to the deepwater basin allow structural modelling and provide the parameter for basin-scale physical experiments. The Salt Dynamics Group utilizes physical experiments to analyze salt tectonic processes and their dynamic interaction with depositional systems. 4D strain data and experiment sections enable mechanical modelling of salt tectonic processes from early post-rift salt mobilization to late post-rift allochthonous salt complexes. Salt tectonic concepts derived from our experiments relate characteristic salt structures to the palaeo-depositional environment and kinematic stages of the basin evolution.

Our study demonstrates 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 linked rift basins has favored rapid down-building and sediment aggradation rather than progradation in the early post-rift stage. Salt mobilization and very efficient basinward salt inflation started in the Laurentian Basin and propagated in southward direction along the margin due to shelf-parallel sediment transport sourced by the Laurentian Fan from the NE. This depositional pattern has led to diachronous salt extrusion shown by southward younging of allochthonous salt complexes in the North-Central Scotian Basin.