

How far were the Newfoundland Taconian allochthons transported during the Salinic and Acadian orogenies?

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Seismic reflection data, from both the LITHOPROBE East deep seismic program and from industry sources, indicate that the platform succession of western Newfoundland was transported tens of kilometers or more during the Siluro-Devonian Salinic and Acadian orogenies. Structural and stratigraphic relationships on land support this interpretation of Humber zone tectonics. The absolute position of the Taconian allochthons in western Newfoundland at the end of the Taconian orogeny can be estimated, based on calculations of flexure of an elastic lithospheric plate in response to tectonic loading.

Industry seismic and potential field data indicate the presence of thick foreland basin sediments beneath the Gulf of St. Lawrence; correlation with on-land outcrops allows subdivision into Middle Ordovician (Taconian) and Upper Ordovician and younger (Salinic and Acadian) packages. Importantly, the thickness of Taconian foreland sediments is less than 10% of the preserved thickness of Salinic and Acadian foreland sediment in the immediate offshore. The Taconian sediments thin to zero a few tens of kilometers to

the west. This relationship implies that the Taconian tectonic loads were much smaller than Salinic-Acadian loads, or more distant, or both.

We assume a relatively simple, flexural foreland basin, and an effective length for the flexural plate during Taconian orogenesis that was not shorter than at the present day. For reasonable values of density, plate strength, and pre-existing passive margin geometry, our calculations indicate that the toe of the Taconian allochthon was ~75 km from the present-day deformation front, implying at least that much transport since the Middle Ordovician. The position of the passive margin hinge line (shelf-slope) break prior to overthrust emplacement and structural incorporation into the Salinic-Acadian Port au Port Allochthon was ~115 km from the present-day deformation front (~10 km west of the Red Indian Line).

These arguments imply that the magnitude of Acadian overthrusting was far greater than previously interpreted and suggest that substantial amounts of Laurentian crust must be present at depth beneath central Newfoundland.