

**Structure and tectonics of the external Humber Zone, western Newfoundland:
implications for hydrocarbon exploration**

Glen S. Stockmal¹, John W.F. Waldron² and Art Slingsby³

¹*Geological Survey of Canada, 3303-33rd Street N.W., Calgary, Alberta T2L 2A7, Canada*

²*Department of Geology, Saint Mary's University, Halifax, Nova Scotia B3H 3C3, Canada*

³*Diamond M Resources Limited, 1802-9 Street S.W., Calgary, Alberta T2T 3C3, Canada*

Much of the Appalachian structural front in western Newfoundland lies in the immediate offshore, where it is marked by a thin-skinned, north-northeast-striking, structural triangle zone, or tectonic wedge. The west-northwest-directed basal detachment of the triangle zone lies above the Cambro-Ordovician platform, whereas the east-southeast-directed upper detachment (the Tea Cove Thrust) is structurally overlain by, and folds, Upper Ordovician through Lower Devonian sediments of the Anticosti foreland basin. Therefore, the triangle zone, which is occupied by the Humber Arm Allochthon and slices of foreland basin and platform rocks, is probably a Middle Devonian (Acadian) feature.

This thin-skinned package is known to be overridden obliquely by thick-skinned structures in two locations: (1) on Port au Port Peninsula, by the east-northeast to northeast-striking Round Head Thrust, and (2) southwest of Portland Creek Pond, by the north-northwest to north-northeast-striking Parsons Pond Thrust. The Round Head and Parsons Pond thrusts carry Grenville basement, the platform succession, and overlying Taconian foreland basin deposits in their hanging walls. These Taconian foreland successions include the

spectacular conglomerates of the Cape Cormorant Formation (Round Head Thrust hanging wall) as well as the conglomeratic Daniel's Harbour Member (Parsons Pond Thrust hanging wall). Published provenance data and the known, limited, spatial distribution of the Cape Cormorant Formation suggests the Round Head Thrust is a reactivated fault with normal offset in Taconian time; it may even be a reactivated rift-stage fault. We infer a similar history for the Parsons Pond Thrust, where the hanging wall carries an anomalous thickness of Goose Tickle Group sediments and the spatially restricted Daniel's Harbour Member.

The thick-skinned Round Head and Parsons Pond thrusts were reactivated following thin-skinned deformation, with reverse motion occurring prior to Viséan (middle Early Carboniferous) time, and probably in Middle Devonian (late Acadian) time. Subsequently, the region was exposed to regional pre-Viséan erosion, and significant Viséan and later sedimentary burial. Both the thin-skinned and thick-skinned structures are targets in the latest round of petroleum exploration onshore and in the near offshore of western Newfoundland.