

The Appalachian structural front, Port au Port Peninsula, western Newfoundland: balanced cross sections and implications for Humber Zone tectonics

G.S. Stockmal

Geological Survey of Canada, Institute of Sedimentary and Petroleum Geology, 3303-33rd Street Northwest, Calgary, Alberta T2L 2A7, Canada

and

J.W.F. Waldron

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

The traditional view that the carbonate platform of the western Newfoundland Humber Zone is autochthonous to parautochthonous has been challenged by Stockmal and Waldron (1991, *Geology*, 18, pp. 765-768) and Waldron and Stockmal (in press 1991, *Canadian Journal of Earth Science*, 28) on the basis of new geological mapping on the Port au Port Peninsula and interpretation of nearby offshore industry seismic reflection data. A series of balanced cross sections, constructed across the peninsula, demonstrate that a great variety of seemingly unrelated structural features on the peninsula and in adjacent areas can be explained as a consequence of progressive triangle zone (tectonic wedge) development where both the carbonate platform and the underlying basement and rift-related rocks are transported tens of kilometres to the northwest during the Acadian (Siluro-Devonian) Orogeny.

Our preferred interpretation involves: (1) normal-sense reactivation of an Iapetan(?) rift-stage basement-cutting normal fault (southeast-dipping) and associated antithetic faults during progressive encroachment of the Humber Arm Allochthon (the obducted accretionary wedge) during the Taconian (Middle Ordovician) Orogeny, with concomitant in-filling of this half-graben; (2) preservation of the half-

graben "foreland" fill as the Humber Arm Allochthon structurally overrode this isolated basin; (3) thrust-sense reactivation of the southeast-dipping normal fault during the Acadian Orogeny, initiating a tectonic wedge or triangle zone structure, within which the carbonate platform and its underlying basement were structurally duplicated and transported to the northwest; (4) relatively late (post-Pridolian), out-of-sequence stepping of the triangle zone upper detachment, resulting in imbrication of the transported platform sequence and complete structural inversion of the half-graben "foreland" fill; and (5) minor dismemberment by strike-slip and inferred oblique-slip Carboniferous faults associated with regional transpression-transension.

Total shortening across the Triangle zone associated with Step (4) is approximately 9.5 km. However, shortening associated with Step (3) must be at least 25-30 km because the autochthonous footwall of the Iapetan(?) normal fault must lie near Stephenville or farther east. The position of interpreted autochthonous platform and basement in Lithoprobe East Vibroseis lines 12 and 11 bears directly on the magnitude of transport of Humber Zone rocks during the Acadian Orogeny.