Basement-involved inversion at the Appalachian structural front, Western Newfoundland: Interpretation of seismic reflection data and implications for petroleum prospectivity

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ABSTRACT

Recent exploration in Western Newfoundland has resulted in six new wells in the Port au Port Peninsula area. Port au Port No.1, drilled in 1994/95, penetrated the Cambro-Ordovician platform and underlying Grenville basement in the hanging wall of the SE-dipping Round Head Thrust (RHT), terminated in the platform succession in the footwall of this inverted basement-involved structure and discovered the Garden Hill pool. The most recent well, Shoal Point K-39, was drilled in 1999 to test a model in which the RHT loses reverse displacement to the NE, eventually becoming a normal fault. This model hinged on interpretation of a seismic reflection survey in Port au Port Bay, now in the public domain.

In our interpretation of these data, the RHT is antithetic to another basement-involved feature, the NW-dipping Piccadilly Head Fault (PHF). Initiated as normal faults in the Taconian foreland, both these faults were later inverted during Acadian orogenesis. The present *reverse* offset on the PHF was previously interpreted as the SE-dipping RHT with a normal motion sense. Our interpretation is consistent with mapping on Port au Port Peninsula and north of Stephenville, where all basement-involved faults are inverted and display a reverse sense of motion. It also explains enigmatic reflections as the conglomeratic Cape Cormorant Formation, a unit associated with inverted thick-skinned faults. The K-39 well, which targeted the *footwall* of the RHT, actually penetrated the *hanging wall* of the PHF. The apparent magnitude of structural inversion across the PHF suggests other plays to the east of K-39.