

Deep Crustal Structure of the Newfoundland Appalachians

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Two marine deep seismic reflection experiments have been carried out in the vicinity of Newfoundland: a 1000 km traverse northeast of the island between the Labrador coast and Orphan Knoll during 1984; and an 1100 km grid of lines in the Gulf of St. Lawrence during 1986. This work, done as part of Lithoprobe East, has provided new insights into the structure and tectonic evolution of the crust and upper mantle to depths of approximately 50 km.

The lower crust seen on the 1984 line can be divided into three major blocks. The most northwesterly of these is the deep manifestation of the Grenville craton and can be traced beneath the Dunnage zone for approximately 70 km east of the Baie Verte - Brompton line. The most southeasterly block is the deep manifestation of the Avalon zone, being bounded on the north-west by a crustal scale strike-slip fault spatially correlative with the Dover fault. The intervening deep crustal block, referred to

as the Central Block, underlies the surface expression of both the Gander zone and the eastern half of the Dunnage zone. The Dunnage zone, therefore, is seen as allochthonous on both the Grenville and Central Blocks.

The same pattern of lower crustal blocks is seen on the 1986 data gathered within the Gulf of St. Lawrence and its approaches. The continuity of this structural pattern along strike implies that the lower crustal blocks are related to the Paleozoic surface zones and that both lower blocks and surface zonations had their origin in a common set of Paleozoic tectonic processes. The deep structure of the Appalachian orogen can be followed around the orthogonal bend of the St. Lawrence promontory. The promontory appears to have played a major role both in determining the location of the Carboniferous Magdalen basin and in converting the orogen from a subaerial to a submarine expression within the Gulf of St. Lawrence.