Silurian-Devonian subsidence history of the Arisaig Group, Nova Scotia: a record of terrane interaction?

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The Arisaig Group contains one of the best documented successions of fossiliferous Silurian strata in Atlantic Canada. It overlies bimodal volcanics of the Bear Brook Group that records local Early Silurian crustal extension, which may be synchronous with strike-slip motion associated with the accretion of the Avalon Composite Terrane. The Arisaig Group was deposited in generally shallow water; the thicknesses of the various units are therefore related to subsidence of the underlying basement.

To obtain a quantitative record of subsidence, formations are successively removed from the top of the succession (backstripping) and units are allowed to expand according to an empirical depth-porosity relationship derived from modern basins (decompaction). The tectonic component of subsidence can then be identified assuming an Airy or other model for isostatic compensation. Small corrections to the subsidence curve result from variations in water depth (estimated from sedimentary facies and paleontological evidence) and eustatic sea-level fluctuations (estimated from published curves). Thicknesses have also been corrected to account for tectonic strain, which probably thickened the whole package approximately homogeneously.

The resulting subsidence curve for the lower Arisaig Group fits predictions for thermal subsidence of crust rapidly stretched by about 20% (beta = 1.2). However, a conspicuous acceleration of subsidence occurred approximately at the time of the Late Silurian Moydart Formation. This acceleration coincides with a change from southeastward to northwestward paleocurrent flow noted by previous workers.

We propose that accelerated subsidence reflects early stages in Meguma-Avalon terrane interaction. However, the sedimentary record in the Meguma Terrane continues into the Early Devonian, suggesting that no major uplift of the Meguma block occurred at this time; the data therefore probably reflect transcurrent motion along the Avalon-Meguma boundary rather than major overthrusting.

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