



Ediacaran-Devonian opening and closing of the complex Iapetus Ocean and the formation of an accretionary orogen in the northern Appalachians and British Caledonides

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Prior to the formation of Pangea, the Northern Appalachians-British Caledonides accretionary orogen formed over ca. 150 my by piecemeal accretion of outboard terranes to a progressively growing composite Laurentian margin. The accreted material originated either in seaways and marginal basins in the peri-Gondwanan or peri-Laurentian realms and comprises micro-continental ribbons with arc supra-structure and, to a lesser extent, supra-subduction zone oceanic slivers. The preponderance of micro-continental ribbons in Iapetus necessitates detailed knowledge of the opening history in order to understand the closure. The final opening of Iapetus took place between 550 and 540 Ma following a ca. 70 my period of rifting and formation of extensive hyper-extended, non volcanic segments with adjacent seaways partially underlain by exhumed lithospheric mantle along the Laurentian margin. The conjugate margin to Laurentia likely was represented by Arequipa-Antofalla, which was left behind when Amazonia departed earlier during the Ediacaran. Subduction in Iapetus initiated at ca. 515 Ma at opposite margins, probably as a result of a major plate reorganization following the terminal amalgamation of Gondwana. Shortly thereafter Ganderia and Avalonia diachronously rifted-off Gondwana and drifted towards Laurentia, opening the Rheic Ocean in their wake. Meguma could have travelled with Avalonia or as a separate microcontinent.

Closure of the main tract of the Iapetus Ocean took place during the Late Ordovician following arc-arc collision. Iapetus' main closure did not lead to widespread orogenesis; most collisional damage took place as a result of arrival of continental ribbons at the composite Laurentian margin following closure of narrow oceanic, Iapetus-related seaways or marginal basins. The resultant deformation is grouped into Cambro-Ordovician Taconic-Grampian, Silurian Salinic-Scandian and Devonian Acadian orogenies; however, these orogenies are all composite and involve several discrete or progressive accretionary events marked by arrival of multiple terranes. Few remnants of true Iapetan oceanic lithosphere or its sedimentary pelagic cover are preserved and hence, were subducted.