

LATE ORDOVICIAN TO SILURIAN ARC AND BACK-ARC SEQUENCES, SOUTHWESTERN NEW BRUNSWICK AND EASTERN MAINE

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The belt of Late Ordovician to Silurian volcano-sedimentary sequences of southwestern New Brunswick and eastern Maine comprises several lithotectonic blocks, or subbelts. From northwest to southeast these subbelts are the Oak Bay (OBSB), Passamaquoddy Bay (PBSB), Mascarene (MSB) and Kingston (KSB) subbelts. The Nerepis subbelt (NSB) is along strike to the northeast of the PBSB and the MSB. Attempts to correlate rocks across the belt and to establish unifying tectonic models have been hampered by differences in lithological/structural features between subbelts, structural complexity, paucity of age dates, an incomplete geochemical database and limited outcrop in places. Recent mapping programs, isotopic ages, geochemical data and stratigraphic correlations allow new interpretations of this ancient arc and back arc as it evolved throughout the Late Ordovician and Silurian. The oldest rocks of the belt are in the Mascarene and Kingston subbelts. These rocks are Late Ordovician to Early Silurian in age (Late Caradocian or Ashgillian to mid Llandoveryan), and are relatively highly deformed in comparison with younger sequences in the belt. Volcanism is characterized by episodic, continental arc-type magmatism that changes in composition from mafic and intermediate, to intermediate and felsic up section. By Late Llandovery time, mafic to intermediate volcanism predominates in the MSB, KSB, and NSB, and is characterized by rocks with mixed arc, MORB and marginal basin chemical affinity. The Passamaquoddy Bay and the Oak Bay subbelts are about the same isotopic age. The last vestige of arc volcanism may be represented by the subaqueous pyroclastic units of the OBSB. The PBSB is exposed in discontinuous outcrops extending from southwestern New Brunswick and south along the coast of Maine, and comprises several deep-water to subaerial volcanic and sedimentary formations. Volcanic rocks are primarily bimodal, exhibit within-plate geochemical signatures, and are characterized by varying styles of volcanism. These rocks are interpreted to represent an extensive zone of within-plate extension perhaps in a back-arc basin. Volcanism of the PBSB began shortly after and along with the arc-related volcanism of the KSB, MSB, and NSB, but continued to much younger ages, persisting into the Late Silurian. The Silurian evolution of arc and back-arc sequences in this part of the Appalachians, is complex. Nevertheless, this information in conjunction with other studies allows for a paleogeographic reconstruction with interpretations regarding magma production and evolution, showing arc-type volcanism that migrates in space and time, and its relationship to volcanism associated with extension.