Geophysical Research Abstracts, Vol. 8, 00915, 2006
SRef-ID: 1607-7962/gra/EGU06-A-00915

The northern Appalachians: an accretionary orogen

C. van Staal (1), J. Lissenberg (2), N. Rogers (1), V. McNicoll (1), P. Valverde-Vaquero (3), J. Whalen (1) and A. Zagorevski (1)

(1) Geological Survey of Canada, Ottawa, Canada, (2) Woods Hole Oceanographic Institution, MA, USA, (3) Instituto Geologico y Minero de Espania, Madrid, Spain

Laurentia's Appalachian margin, north of Long Island, expanded eastwards (present coordinates) during the Early to Middle Paleozoic (500-370 Ma) due to a protracted history of accretion of suprasubduction zone oceanic terranes and ribbon microcontinents. Normal oceanic lithosphere was rarely, if ever accreted and generally lost during subduction of the main tract of the Iapetus Ocean. The accretion of the Dashwoods, Ganderia, Avalonia and Meguma microcontinents induced the Taconic (500-450 Ma), Salinic (445-425 Ma), Acadian (421-400 Ma) and Neoacadian (395-360 Ma) orogenies respectively, with the locus of collsion progressively shifting eastwards. Both the peri-Laurentian Dashwoods and peri-Gondwanan Ganderia microcontinents independently interacted with supra-subduction zone oceanic crust during the Late Cambrian to Early Ordovician on opposite sides of the Iapetus Ocean, prior to their accretion to Laurentia. The accretion of the Dashwoods microcontinent with its arc suprastructure and associated oceanic arc terranes during the Early to Middle Ordovician caused the Taconic orogeny, leading to significant tectonic thickening of the colliding arc terranes. The Taconic orogeny terminated with accretion of all outboard peri-Laurentian suprasubduction zone rocks during the late Ordovician, mainly due to arrival of the leading edge of Ganderia (Popelogan-Victoria-Bronson Hill arc). Closure of the wide oceanicTetagouche-Exploits back-arc basin that separated this ensialic arc from Ganderia's trailing edge, culminated in accretion of the latter with Laurentia during the mid Silurian (433-425 Ma), causing the main phase of the Salinic orogeny. Coincident with Ganderia's accretion to Laurentia, Avalonia started to converge with Ganderia by closing the narrow oceanic seaway that separated them. This convergence produced the Silurian coastal volcanic arc. Inversion of its accompanying back-arc basin (Mascarene-La Poile basin) at c. 421 Ma signals the start of the Acadian collision between composite Laurentia and Avalonia. The timing and mechanism by which

Meguma was accreted to Laurentia is still poorly constrained at present. Late Early Devonian (c. 395 Ma) deformation of its Lower Devonian cover is used as a proxy for its time of accretion. Meguma was situated on a shallowly-dipping (flat slab) lower plate and its transfer to Laurentia involved wedging and formation of west-vergent structures.

Continental growth mainly took place by the Late Cambrian to Early Silurian obduction and underthrusting of suprasubduction zone ophiolites and associated arcs, dominantly as a result of the closure of marginal basins and narrow seaways and subsequent intrusion of isotopically primitive arc plutonic suites. Classic continental growth by forearc accretion of juvenile crust and concomitant arc-trench migration is rare. A small degree of continental growth continued during the Devonian, but solely as a result of intrusion of primitive, mantle-derived melts formed during Laramide-like (flat slab) tectonic events.