

Evidence for the role of the Pocologan, New Brunswick and Burlington, Massachusetts shear zones in the Neoproterozoic Wilson cycle

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The Proterozoic rocks of the Avalon belt, in part a former epicontinental volcanic arc, in coastal New Brunswick (NB) and in southeastern New England (NE), in both places contain an extensive shear zone at least 50 km long and 2 to 5 km broad: the Pocologan and the Burlington mylonite zones respectively. Both have been polyphasally deformed and intruded by arc-batholiths of the 625 Ma Cape Spencer Granite and the 630 Ma Dedham Plutonic Suite. The rock sequence cut by the Pocologan zone consists of gneissose basement associated with the Green Head Group carbonates, pelites and quartzites; of still younger volcanic and volcanoclastic rocks of the Coldbrook Group; and intrusive granodiorites, gabbro-diorites, granophyres, porphyries, and mafic dikes. The rock sequence cut by the Burlington zone consists of the Westboro Formation and Blackstone Group of quartzites, pelites and some carbonates, and of the Middlesex Fells Volcanic Complex and associated gabbro-diorites intruded by granitoids, porphyries and mafic dikes. The Burlington mylonite zone is intruded by the ca. 630 Ma Dedham Plutonic Suite. Therefore, in general, the sequence of events in New Brunswick and Massachusetts is similar.

That part of the Avalon terrane which hosts the mylonites is bounded on the northwest in New Brunswick by the Lubec-Long Reach fault and in the northeast by the Bloody Bluff

fault. The eastern margin of the Nashoba belt, of suspect affinities, includes ca. 750 Ma gneisses. Within the Avalon belt of Massachusetts and southeast of the shear zone lies the Late Neoproterozoic to Cambrian Boston basin, now overthrust from the north by older rocks including those of the shear zone.

We propose a four stage model for the pre-arc evolution of the two great mylonitic shear zones: (1) The Avalon belt, in the breakup of the late Proterozoic supercontinent, was involved in the formation of grabens. This led to the sub-Green Head and sub-Westboro unconformities at ca. 700 Ma. (2) Extensional grabens led to the formation of a passive margin marked by the Middlesex Fells Volcanic Complex and the older Coldbrook Group, and intruded by alkalic gabbro-diorites and minor granitoids. (3) The extensional regime changed to transpressional, leading to the formation of the Pocologan and Burlington mylonite zones. (4) The transpressional regime was succeeded by compression associated with the formation of a subduction zone and a related epicontinental island arc with major granitic to dioritic intrusives and calc-alkaline volcanicity at ca. 600 Ma in Massachusetts, and even younger volcanic events in New Brunswick.