

Tectonic Subdivisions of the Avalon Zone In Southeastern New England, USA

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The eastern margin of the Appalachian orogen in Massachusetts and New Hampshire, east of the Siluro-Devonian rocks in the Kearsarge-Central Maine Synclinorium, is subdivided into three major fault-bounded blocks. Each has a distinctive geological and magmatic history.

The easternmost, the Boston block (Milford-Dedham zone of Zen et al., 1983), contains many of the features common to Avalonian terranes in the Northern Appalachians. These include a predominance of Late Proterozoic (580-650 m.y.) calc-alkaline granitic through dioritic plutonic rocks and associated volcanics, covered by a thin veneer of Upper Proterozoic to Lower Paleozoic platform sediments and fluvial Carboniferous basin deposits. This terrane is itself potentially composite and can be further subdivided into three subzones on the basis of the character and age of igneous rocks, depth of burial, and style of deformation. More highly deformed mafic rocks, formed prior to

the main Avalonian magmatic pulse, predominate along the western margin of this terrane. The principal metamorphism, generally assigned an Alleghanian age, is no higher than greenschist facies in the Boston area but locally increases to the upper amphibolite facies near the southern and southwestern terrane margins in Rhode Island.

To the west, across the prominent Bloody Bluff fault zone, the geologically different Nashoba block is a terrane largely underlain by mafic volcanics and volcanogenic sediments metamorphosed to the sillimanite and second sillimanite zones. These rocks are most likely Late Proterozoic to Early Paleozoic in age, with 730 m.y. gneisses (e.g., Fish Brook Gneiss) assumed to be basement.

During the Ordovician-Silurian, the Nashoba terrane was simultaneously intruded by pervasive peraluminous granites and a series of intermediate calc-alkaline plutons. The youngest granites (400-415 m.y.) likely formed

at least in part by local anatexis, give an upper age limit to the metamorphism.

West of the Nashoba block, across the Clinton-Newbury fault zone, lies another potential terrane, the Merrimack trough. It is underlain by a thick sequence of pre-Middle Ordovician flysch and calcareous flysch. These are assigned an age on the basis of dates on cross-cutting plutons. It is also believed that these plutons establish an upper limit for the ages of deformation and polymetamorphism. The

sediments and at least some of the deformation and metamorphism could be as old as Late Precambrian.

Are the Nashoba block and Merrimack trough separate terranes, a composite terrane joined in the Late Precambrian-Early Paleozoic or part of a single terrane? And how do these terranes relate to the terrane containing more classic Avalonian geological features to the east? These are questions that still need to be resolved.