Contrasting Thermal Histories Across a Portion of the Norumbega Fault Zone, Southwestern Maine: Evidence From $^{40}Ar/^{39}Ar$ Mineral Ages

David P. West Jr. and Daniel R. Lux
Department of Geological Sciences, University of Maine, Orono, Maine 04469

The Norumbega Fault Zone (NFZ) consists of a series of high-angle, NE trending subparallel faults extending across eastern and southern Maine and into New Hampshire. To the northeast it correlates with the Fredericton Fault in New Brunswick and to the southwest it may be related to the Clinton-Newbury/Lake Char Fault system in Massachusetts.

The NFZ is widest in southwestern Maine where several faults displace the metamorphosed Late Precambrian (?) to Early Ordovician (?) volcanic and volcaniclastic sedimentary rocks of the Casco Bay Group. The most significant of these faults appears to be the Flying Point Fault (FPF). The FPF divides the Casco Bay Group into two distinct lithotectonic packages. The high-grade migmatized Falmouth-Brunswick (FB) sequence lies to the northwest and the lower grade unmigmatized Saco-Harpswell (SH) sequence lies to the southeast of the fault.

Over 25 hornblendes from amphibolites were dated using the $^{40}Ar/^{39}Ar$ incremental heating method. These samples are from a 120 km long NE trending transect which is bisected by the FPF. In the FB sequence plateau ages show a systematic decrease from 367-377 Ma in the NE to 270-290 Ma in the SW. Several samples from the middle portion of the transect have intermediate ages (325-350 Ma) and disturbed release spectra, suggesting ^{40}Ar loss. In the SH sequence no strong spatial pattern is recognized for hornblende ages (324-368 Ma).

The time-temperature histories of rocks exposed on either side of the FPF differ substantially. Numerous hornblende samples west of the fault did not close to ^{40}Ar loss until about 285 Ma ago whereas all hornblendes east of the FPF had closed to ^{40}Ar loss by 324 Ma. Plateau ages of hornblendes collected on opposite sides of the FPF (less than 10 km apart) show differences of up to 65 Ma. This suggests that the time-temperature histories of the two sequences were distinctly different until at least Early Permian time.

Possible explanations for the contrasting thermal histories are: (1) a discrete Late Paleozoic metamorphism which only affected rocks northwest of the FPF, (2) juxtaposition of the two sequences by strike-slip faulting subsequent to 280 Ma ago, (3) juxtaposition of the two sequences by dip-slip faulting less than 280 Ma.