40-8 - POLYPHASE DEFORMATION RECORDED BY THRUSTS ALONG THE WESTERN EDGE OF THE BERKSHIRE MASSIF, MASSACHUSETTS

Sunday, 19 March 2023

10:40 AM - 11:00 AM

Regency Ballroom B (Hyatt Regency Reston)

Abstract

Along the western edge of Berkshire massif, mylonitic rocks from fault zones have long been interpreted to record Taconic thrusting of Laurentian basement and its unconformable cover over autochthonous metasedimentary rocks of Middle Ordovician to Cambrian age. $^{40}Ar/^{39}Ar$ ages postdating the Ordovician Taconic Orogeny obtained from these rocks have largely been interpreted as cooling and/or mixed ages due to Acadian metamorphic overprinting. Subsequent pilot studies dating monazite from fault zones in the Berkshire Massif, however, suggested instead that thrusting occurred during the Silurian and/or Devonian. We present new $^{40}Ar/^{39}Ar$ dating results from three thrust fault localities in southern Massachusetts that, when interpreted in the context of microstructural evidence, support a polyphase deformation history. $^{40}Ar/^{39}Ar$ ages from the Benton Hill thrust vary from higher to lower structural levels. Mylonitic Tyringham Gneiss from the structurally highest level we sampled contains synkinematic biotite that partially replaced amphibole and yielded a weighted mean age (WMA) of 417.3 ± 3.4 Ma (2σ). A structurally lower sample of gneiss from a higher strain zone lacking amphibole contains biotite that yielded a plateau age of 374.1 ± 2.6 Ma. Mylonitic quartzite below the thrust contains white mica that gave a WMA of 349.2 ± 2.6 Ma. The structurally lowest sample is graphitic schist, which preserves multiple microstructural domains based on grain size and deformation mechanisms, resulted in a 370 ± 2.6 Ma biotite plateau age and a 355 ± 3.0 Ma WMA from white mica. The hanging wall of the Dry Hill thrust exposes mylonitic Cheshire Quartzite, which contains white mica that yielded a plateau age of 367.6 ± 3.0 Ma. Mylonitic Tyringham Gneiss sampled just above the thrust at Tyringham Cobble yielded complex apparent age spectra, consistent with complex microstructures. Biotite porphyroclasts yielded a plateau age of 565.0 ± 4.4 Ma. This generation of biotite is locally replaced by synkinematic white mica, for which two different analyses yielded segments with ages of ~375–370 Ma. In combination with our recent $^{40}Ar/^{39}Ar$ results from thrusts along the western front of the Green Mountains in Vermont, we infer a major phase of thrusting at ~420–410 Ma, followed by periods of reactivation at ~375–370 Ma and ~355–350 Ma.

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