GSA Connects 2022 meeting in Denver, Colorado

Paper No. 147-11
Presentation Time: 11:05 AM

INTEGRATING PETROLOGY, GEOCHRONOLOGY, AND THERMOCHRONOLOGY TO UNRAVEL THE COMPLEX PALEOZOIC TECTONOMETAMORPHIC HISTORY OF THE SOUTHERN APPALACHIAN OROGENIC CORE

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The southern Appalachians record three Paleozoic collisional events, including the Taconic (Ordovician), Neoacadian (Devonian-Mississippian), and Alleghanian (Carboniferous-Permian) orogenies. The complex nature of thermal and structural overprinting related to these events, coupled with a lack of widespread modern geo-, thermo-, and petrochronologic studies here has limited our ability to unravel the precise timing, spatial extent, and conditions of Paleozoic deformation and metamorphism. In the Blue Ridge (BR) and Inner Piedmont (IP) of Tennessee, North Carolina, and Georgia, which represents the orogenic core of the composite southern Appalachians, new monazite laser ablation split stream (LASS) analyses, amphibole $^{40}Ar/^{39}Ar$ dates, and metamorphic phase equilibria models are integrated with pre-existing geo- and thermochronology data to test holistic models of Paleozoic orogenesis. In the BR west of the Brevard fault zone (BFZ), monazite U-Pb dates are 459-441 Ma and are related to a pronounced Taconic metamorphic peak (to upper amphibolite facies) during development of an eastern Laurentian subduction-accretionary complex, followed by exhumation and cooling during later Neoacadian and Alleghanian thrust stacking, indicated by thermochronologic data. In the BFZ and the IP to the east, monazite U-Pb dates range from 373-356 Ma and delimit the timing of peak Neoacadian kyanite-sillimanite II metamorphism in the IP driven by accretion and partial subduction of Laurentian and mixed-affinity IP rocks beneath the overriding Carolina superterrane. The relatively clear separation of Taconic and Neoacadian monazite dates across the BFZ indicate that this shear zone acted as a Neoacadian thermal-rheologic transition zone that partitioned SW-directed crustal “escape” channel flow of melt-weakened material, as proposed by earlier studies. Late Paleozoic monazite U-Pb dates derived from within the BFZ (~335 Ma) and in the southeasternmost parts of the IP (~324 Ma) reflect Alleghanian reactivation of the BFZ and the northwesternmost extent of Alleghanian Barrovian metamorphism, respectively, but the majority of the BR and the IP in the study area reveal no evidence of post-Neoacadian metamorphic overprinting.

Session No. 147

T29. Structural Analysis of Polyphase Deformation from Orogen to Thin Section I: A Special Session in Honor of Sharon Mosher
Tuesday, 11 October 2022: 8:00 AM-12:00 PM

605 (Colorado Convention Center)

Geological Society of America *Abstracts with Programs.* Vol 54, No. 5
doi: 10.1130/abs/2022AM-382105

Back to: T29. Structural Analysis of Polyphase Deformation from Orogen to Thin Section I: A Special Session in Honor of Sharon

Mosher

<< Previous Abstract | *Next Abstract*