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[Start](#) | [Grid View](#) | [Author Index](#) | [View Uploaded Presentations](#) | [Meeting Information](#)

Southeastern Section - 70th Annual Meeting - 2021

Paper No. 11-3

Presentation Time: 9:05 AM

DECIPHERING THE “FOOTPRINT” OF THE NEOACADIAN METAMORPHIC EVENT IN THE SOUTHERN APPALACHIANS: INSIGHTS FROM $^{40}\text{Ar}/^{39}\text{Ar}$ GEOCHRONOLOGY IN THE EASTERN BLUE RIDGE AND INNER PIEDMONT OF NORTH CAROLINA

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The southern Appalachians preserve a composite thermal and deformational history that involves at least four orogenic pulses and spans >800 Myr from the middle Mesoproterozoic to the late Paleozoic. This complex history has made the discrete separation of metamorphic and deformational events persistently challenging, particularly for Paleozoic events. To address this, we report results from a new suite of amphibole $^{40}\text{Ar}/^{39}\text{Ar}$ data from the eastern Blue Ridge and Inner Piedmont (Tugaloo and Cat Square terranes) of western North Carolina to constrain the timing of cooling from thermal conditions greater than ~550 °C. Samples were collected along an orogen-normal transect from the Newton window, near the Central Piedmont suture, to the eastern Blue Ridge, west of the Grandfather Mountain window. Amphibole gneiss from the Spruce Pine area and Wilson Creek gneiss from the Grandfather Mountain window record dates of 380 and 496 Ma, respectively. Across the Brevard Fault zone, one sample from the western Inner Piedmont Tugaloo terrane yields a date of 377 Ma. Southeast of the Brindle Creek fault in the Cat Square terrane, three samples yield dates of 344-320 Ma while two samples from Tugaloo rocks of the Newton window yield dates of 335-330 Ma. Together, these dates suggest regional cooling of the Inner Piedmont progressed from northwest to southeast following the Neoacadian orogeny. The data also indicate either that high-grade (>550 °C) Alleghanian metamorphism may have only reset the amphibole $^{40}\text{Ar}/^{39}\text{Ar}$ systematics in the most southeastern parts of the Inner Piedmont, near the Central Piedmont suture, or that these high-grade Neoacadian rocks were not exhumed from the mid-crust until the Alleghanian. Additionally, our new amphibole $^{40}\text{Ar}/^{39}\text{Ar}$ dates northwest of the Brevard Fault zone are not reset during Neoacadian orogenesis. Collectively, we interpret that high-grade metamorphism in this part of the southern Appalachians must have occurred prior to the Alleghanian, placing limits on the northwesternmost extent of mid- to high-grade Alleghanian metamorphism in this part of southern Appalachians. Additional data from the Sauratown Mountains window to the northeast and South Carolina and Georgia to the southwest may further constrain the spatial extent of the Neoacadian thermal event in the southern Appalachians.

Session No. 11

[D3. Southern Appalachian and Analogous Terranes I](#)

Friday, 2 April 2021: 8:00 AM-12:00 PM

FMR, Inc. Room (Online)

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[Back to: D3. Southern Appalachian and Analogous Terranes I](#)
[<< Previous Abstract](#) | [Next Abstract >>](#)

