

# TECTONIC IMPLICATIONS OF WHOLE-ROCK AND TRACE ELEMENT GEOCHEMISTRY OF METABASITES OF THE TALLULAH FALLS, CHAUGA RIVER, AND ASHE FORMATIONS

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The tectonic origin of metabasites can be effectively characterized through analysis of whole-rock and trace element geochemistry. Determining the crustal setting in which metabasite protoliths form (continental rift, mid-ocean ridge, etc.) can be valuable in establishing the tectonic evolution of the formation in which the rocks are found. Analyses of scattered metabasite units throughout the Appalachians have suggested a wide range of protoliths. A more thorough understanding of the chemistry, tectonic origin, and interrelation of Piedmont and Blue Ridge metabasites is essential to fully understanding the geologic history of the southern Appalachians.

The Lynchburg Group of central Virginia, the Ashe Formation of south-central Virginia and western North Carolina, and the Chauga River and Tallulah Falls Formations of northwestern South Carolina and Georgia are interpreted as correlative sequences by a number of authors (e.g. Hatcher, Field Guide, 2004; Wehr, Ph.D dissertation, 1983). Decades of petrologic and geochemical work have led to the interpretation of the Lynchburg Group by numerous workers as a rift-to-drift sequence of metasediments and metavolcanics originally deposited during Neoproterozoic-Early Cambrian rifting of Laurentia. Wehr (Ph.D dissertation, 1983) suggested correlation between the Lynchburg Group and Ashe Formation to the south. Hatcher (Field Guide, 2004, and other publications) interprets the Ashe, Chauga River, and Tallulah Falls Formations as Neoproterozoic to Cambrian metasedimentary and metavolcanic rocks of uncertain (potentially rift) tectonic origin. The collective work of these authors indicates a continuous “belt” of potentially correlative metabasite-bearing formations stretching several hundred kilometers northeast-southwest both east and west of the Brevard Fault Zone. The nature of the interrelation of these metabasites and the tectonic origin of their protoliths remain poorly understood.

The lack of whole-rock and trace element geochemical data for the Chauga River and more southwestern Tallulah Falls Formations presents an obstacle to the definitive association of these units with the Ashe Formation and Lynchburg Group. This study proposes to gather whole-rock and trace element data from Tallulah Falls, Chauga River, Ashe, and Lynchburg metabasites in order to establish tectonic setting/crustal affinity and allow comparison of data between the formations to establish their interrelation. Additional investigations will involve the use of electron microprobe-determined metabasite mineral chemistry to conduct thermobarometric calculations. While Ashe and Lynchburg rocks have been previously studied, no study has yet attempted to develop one cohesive body of data simultaneously gathered from all four formations. Analyzing metabasites from all formations in one study will facilitate a coherent, regional-scale tectonic analysis of results and should produce a valuable contribution to the understanding of southern Appalachian geology.

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