

Complex Deformational History of Parts of the North Carolina Eastern Blue Ridge, Southern Appalachians: New Evidence of Widespread Alleghanian Deformation

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The Tugaloo terrane in the eastern Blue Ridge, located in the high-grade southern Appalachian crystalline core, consists of internal basement massifs, the Neoproterozoic Tallulah Falls Formation, and several peraluminous plutons that intruded during the Taconic (e.g., Whiteside, ~466 Ma), Neocadian (e.g., Pink Beds, ~371 Ma), and Alleghanian (e.g., Looking Glass, ~333 Ma) orogenies. Detailed geologic mapping in North Carolina has questioned the regional tectonic history.

At least six deformations are recognized in the Tugaloo terrane. Inclusion trails in garnets, foliations preserved in boudins, and intrafolial folds in the ~1.15 Ga Toxaway Gneiss preserve D_1 . D_2 includes the regionally dominant S_2 foliation and F_2 inclined to recumbent isoclinal folds. Crosscutting relationships and map patterns show that D_2 was coeval with Whiteside intrusion. D_3 deformation crosscuts D_2 . D_4 structures include northeast- and southeast-plunging crenulations, four Alleghanian plutons, and several steep, northwest-dipping strike-slip and thrust faults. Later open to gentle, northeast and northwest-trending folds are also present. All deformations are recognized in the Toxaway dome, but the map structure is an F_3 fold.

Although D_2 has been described as the principal regional deformation, structural evidence suggests otherwise. Tectonic foliations in Mississippian plutons parallel regional foliations, suggesting that Mississippian orogenesis coaxially overprinted and possibly reactivated older planar fabrics. Regional foliations near the Brevard fault zone are folded about a northeast-plunging axis, while further west in the Tugaloo terrane, foliations in Mississippian plutons are folded about a gently southwest-plunging axis. These variations suggest that Alleghanian deformation produced larger, map-scale, gently northeast-southwest plunging folds.