

Tectonic Studies of Southeastern North America: The Brunswick Suture Zone, Osceola Arc,  
Suwannee Basin, and Gondwanan-Laurentian Suture

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**ABSTRACT**

A series of exotic terranes with complex tectonostratigraphic relationships construct the southeastern North American margin and record information critical to understanding the evolution of the Appalachian orogeny. These terranes were accreted through a series of Paleozoic collisional events along the Laurentian margin, often overprinting the geologic and tectonic record. The final collisional event, the Alleghanian orogeny (325-260 Ma), resulted in the formation of Pangea, as the super-continent Gondwana collided with the eastern margin of Laurentia. Following subsequent rifting in the Triassic, a piece of Gondwana was left behind on the southeastern Laurentian margin, prompting the decades-long search for the Alleghanian suture zone and efforts to identify the boundaries of the stranded piece of Gondwanan continental crust.

The Charleston and Suwannee terranes are the two most outboard terranes along the southeastern margin of North America and have been the subject of significant geophysical and geological inquiry, as their tectonostratigraphic histories appear to hold the key to understanding the terminal collision in the evolution of the Appalachian orogen. The thick Coastal Plain cover remains a challenge in this region; however, the synthesis of seismic reflection data (including

the once proprietary legacy industry dataset), well data, and aeromagnetic maps allows for an integrative approach to better understand the basement rocks and structures that comprise the crust of southeastern North America. These data reveal that the previously recognized Gondwanan passive margin sequence, termed the Suwannee basin, is more extensive than previously thought and provides critical new constraints on the age and origin of features identified along the boundaries of the Charleston and Suwannee terranes. This study's results: (1) resolve the controversy surrounding the age and origin of dipping reflectivity along the boundary between the Charleston and Suwannee terranes, (2) reveal a Neoproterozoic subduction zone and paired continental-margin arc are preserved in southeastern North America, and (3) demonstrate the Gondwanan-Laurentian suture zone resides further northwest and can be identified as a tectonic *mélange* of variable width along strike. These findings will play an important role in future tectonic reconstructions as well as our understanding in how continents collide and break apart.