

The Carolina Terrane: is it part of Avalon?

S.D. Samson

Department of Earth Sciences, Syracuse University, Syracuse, New York 13244-1070, USA

The Carolina Terrane of the southern Appalachians is one of the largest terranes in the entire orogen. Because it contains a number of lithologic, chronologic and faunal similarities to the Avalon Terrane, it is often considered to be the southernmost portion of Avalon. However, gross simi-

larities may exist between crustal blocks that have had significantly different evolutionary histories. A full understanding of the chemical evolution of a terrane is thus fundamental to determining its affinity to any other crustal fragment.

Nd data have recently become available for the Avalon

Terrane in Canada. Most samples from Newfoundland have moderately high positive initial ϵ_{Nd} values indicating that this part of Avalon is composed of juvenile crust. The ϵ_{Nd} values for New Brunswick and Cape Breton Island are in general lower, most are between -1.5 to +2.5, indicating a greater degree of a more evolved crustal component. The oldest igneous rocks within the Carolina Terrane have ϵ_{Nd} values ranging from +1.5 to +5.9, although most values are $> +3.5$; thus, the terrane is similar to Avalon, although possibly less isotopically evolved.

U/Pb zircon geochronological studies also provide insight into the nature of terranes. U/Pb studies of Cape Breton Island and Newfoundland show no evidence of inherited zircons. New U/Pb zircon data from St. John, New Brunswick, how-

ever, do show evidence of ancient xenocrysts. Rare, round pink zircons from a tuff at the Precambrian-Cambrian boundary have a $^{207}Pb/^{206}Pb$ age of 2660 Ma. This age is comparable to the ages of pink detrital zircons extracted from an overlying volcanoclastic rock. Average $^{207}Pb/^{206}Pb$ ages of multigrain zircon fractions range from 2214 to 2360 Ma while two single zircon have ages of 2472 and 2612 Ma. The xenocrystic age of zircons from the volcanic is direct evidence that this part of Avalon was constructed on Archean crust; the detrital ages indicate that ancient crust was exposed as a source of the sediment. Similar evidence of zircons with such antiquity has yet to be documented for the Carolina Terrane. Either Carolina is not part of Avalon, or its ancient ancestry has yet to be discovered.