
An orogen-wide perspective on the Appalachians

JAMES HIBBARD

*Department of Marine, Earth, and Atmospheric Sciences,
North Carolina State University, Raleigh, North Carolina
27695, USA <jim_hibbard@ncsu.edu>*

Early, far-sighted Appalachian syntheses by Hank Williams provide the springboard for modern analyses that encompass the evolution of the entire orogen. At present, sufficient data have been accrued to allow for a more integrated and meaningful, orogen-wide perspective of Appalachian architecture and evolution. These data reveal that some first-order concepts derived from one portion of the orogen are applicable to other segments, implying periods of evolutionary convergence along the orogen. For example, recognition of a Dashwoods microcontinent in Newfoundland and documentation of mid-Paleozoic dextral translation of the Virginia promontory both have bearing on the interpretation of the entire orogen.

First-order contrasts between the northern and southern Appalachians are also recognized; some signify evolutionary

divergence between these segments. The limited northerly distribution of Avalonia strongly supports the idea that the Acadian Orogeny is strictly a northern Appalachian event. The significance of other first-order contrasts in the orogen is more ambiguous; e.g., Grenville basement in the southern Appalachians contains a significant component of exotic Mesoproterozoic rock, whereas northern Appalachian basement is native Laurentian Mesoproterozoic rock; does this contrast contribute to differences between the northern and southern orogen? The contrast in Carboniferous tectonic styles between the northern and southern segments is also poorly understood. Likewise, the concentration of Devonian magmatism in the north and significant Carboniferous magmatism in the south is not fully understood; however, this pattern may well place constraints on the extent of strike-slip modification to the orogen.

Considering Appalachian evolution from an orogen-wide perspective raises broader questions that provide challenges to be addressed in the future. Upper crustal growth of the Appalachian orogen is clearly a progressive, outward accretion of crustal elements; however, is there any evidence of this growth pattern in the lower crust and lithospheric mantle? If not, what pattern is preserved? Also, Appalachian promontories persistently preserve the Iapetan ridge-transform geometry of the continental margin; what are the rheological implications of these long-lived features? And if the Appalachian Moho and mantle were rejuvenated in the late Paleozoic-Mesozoic, is the memory of this ridge-transform template preserved only in the crust?