

MESOZOIC INTRUSIONS AS PALEOSTRESS INDICATORS IN EASTERN NORTH AMERICA

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Linear trends of dike swarms and plutons in eastern North America reflect a combination of high-angle crustal structures and extensional stress patterns. Many radiometric dates and dike maps are now available for paleostress modeling. Triassic and Jurassic intrusions are confined to the eastern side of the Appalachian orogen, and were emplaced along Appalachian-parallel structures in the crust during pre-Atlantic rifting. Cretaceous and younger intrusions are spread across the orogen, often with trends at high angles to the older structures. Notable differences between the two groups also exist in their petrologic character.

Early Jurassic tholeiitic dikes indicate southwesterly to westerly extension in the southern to central Appalachians at the same time as northwesterly extension in the northern Appalachians. Several convection cells in the upper mantle are needed to explain the stress patterns for the different trends along more than 3000 km of the new Atlantic basin. Triassic and Jurassic fault strains through the region appear to be developed independently from most of the dikes, and the faults may only show extensional stresses that are restricted to shallow crustal levels.

An Early Cretaceous shift in plate motion and resultant stresses fractured the lithosphere along a series of cross-trending belts, allowing alkalic magmas to upwell from deeper sources. East-west to northwest trends predominate among Cretaceous dikes in the western and central Appalachians of New England, but Cretaceous dikes also trend northeast along the eastern Appalachians in response to overwhelming fracture controls in shallow levels of the crust.