

Giant dikes, rifts, flood basalts, and plate tectonics: A contention of mantle models

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ABSTRACT

Giant dike swarms, often hundreds of kilometers long, have produced flood basalts in large igneous provinces since the early Proterozoic. Dike patterns described as radiating from a central source are actually syntectonic swarms that curve and diverge according to lithospheric stress regimes, but they are similar in origin to smaller swarms with parallel dikes. Giant radiating patterns of dikes do not characterize most hotspots or large igneous provinces, and they are not always linked to crustal uplift swells. These mafic intrusions and the fractures they follow are essentially features of plate tectonics, not products of indeterminable deep mantle plumes. As a compelling example, the Early Jurassic central Atlantic magmatic province and its associated Pangaeian rift zone are evidential products of subducted materials and convection in the upper mantle beneath the insulating Pangaeian plate. Giant dike swarms were formed along lithospheric structures through plate tectonics, not by a coincidental deep mantle plume.