THOLEIITIC "GREAT DIKES" ACROSS NEW ENGLAND AND ATLANTIC CANADA

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Extremely large dolerite "great dikes" are traceable for distances of 100 to 400 km across southern and eastern New England, New Brunswick, Nova Scotia, and portions of the continental shelf. The largest in New England is up to 70 m wide and at least 210 km long, extending northeastward through central Connecticut (Higganum dike) and Massachusetts. Similar dike segments in southeastern New Hampshire are found at Raymond and Durham. Limited exposures in Maine reveal great dike segments up to 50 m wide at Hiram, Harpswell Neck, Pemaquid Harbor, and Schoodic Point. Other Maine dike exposures at Milo and Grand Lake are along a linear magnetic anomaly that stretches at least 140 km, and represent the U.S. extension of the Caraquet dike that extends another 330 km across New Brunswick. This dike may connect with the Higganum, revealing a dike or system of dike segments at least 1000 km long. At least two other Canadian dikes, the Shelburne dike of coastal Nova Scotia and the Avalon dike of eastern Newfoundland, are more than 100 km long. Other large tholeiite dikes in New Brunswick occur at Beaver Harbour, Passamaquoddy Bay, and Grand Manan Island.

The dikes all appear to be quartz-normative, high-titanium tholeiites with subophitic plagioclase-augite groundmasses, microphenocrysts of bronzite or hypersthene, and interior zones of quartz-feldspar granophyres. Their total volume is vast: Assuming 100 km of depth, a dike 20 m wide by 200 km long contains 400 billion cubic meters of dolerite, with a mass of 1.2 trillion metric tons. Such dikes are known to be feeders to large Early Jurassic (c. 190 Ma) flood basalts in southern New England and Nova Scotia, and their presence through eastern New England and New Brunswick could mark areas in which regional erosion has removed much more extensive Jurassic flood basalts.