

CENOZOIC TECTONICS OF THE CARIBBEAN:
STRUCTURAL AND STRATIGRAPHIC STUDIES IN JAMAICA AND HISPANIOLA

by

William Paul Mann

A Dissertation

Submitted to the State University of New York at Albany

in Partial Fulfillment of

the Requirements for the Degree of

Doctor of Philosophy

College of Science and Mathematics

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ABSTRACT

Structural and stratigraphic field studies in Jamaica and Hispaniola (Dominican Republic and Haiti) and synthesis of published data from surrounding areas refine previously proposed models for convergent and strike-slip plate interactions in the northern Caribbean. Specifically: 1) new data and regional stratigraphic analysis of major unconformities in the Greater Antilles supports the idea of two distinct arcs that terminated by collision at slightly different times in the latest Cretaceous and Paleogene; unconformities and sedimentation associated with both collisions are used to constrain a pre-strike-slip, early Oligocene reconstruction of the northern Caribbean; 2) field studies in the Port Maria area of northeastern Jamaica essentially complete mapping of the Wagwater Belt, a reactivated Paleogene graben and overlying sedimentary basin, that records approximately east-west extension normal to the trend of the latest Cretaceous Jamaican island arc; the relatively narrow Wagwater Graben contains at least 5.6 km of coarse clastic terrestrial sediments and is overlain by the much larger, saucer-shaped basin filled with a fining-upward section of 1.2 km of marine sediments; consideration of the orientation, distribution, and ages of other Cenozoic graben in Jamaica, the Nicaragua Rise and Central America suggests that all of the graben, including the Wagwater, may have formed by internal deformation of the northern Caribbean plate as it moved eastward during the Cenozoic around a promontory in the North America plate in southern Mexico; and 3) the interpretation of satellite imagery and aerial photographs and field studies in the Enriquillo Valley and Sierra el Numero, Dominican Republic; the Cul-de-Sac

Valley and southern peninsula of Haiti; and the Clydesdale area of eastern Jamaica indicate the presence of a 700 km long, approximately east-west trending throughgoing left-lateral strike-slip fault zone - named here, the Enriquillo-Plantain Garden Fault Zone; field studies in the Clydesdale area and the overall fault pattern of Jamaica suggest that the island constitutes a large restraining bend or compressional segment in the Enriquillo-Plantain Garden Fault Zone; the overall structure of the Enriquillo-Plantain Garden Fault Zone is remarkably consistent with the east-west direction of Caribbean-North America relative plate motion which has been previously determined from earthquake slip vectors and fault-strikes mostly from the Cayman Trough. Although many problems remain in the late Cretaceous and Cenozoic geology of the Caribbean, a plate tectonic framework into which many of them can be accommodated is beginning to emerge.

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