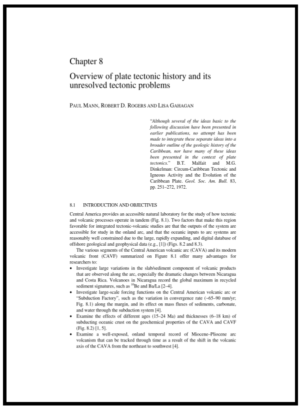
Geologic and tectonic development of the North America-Caribbean plate boundary in Hispaniola. by Paul Mann, Grenville Draper and John F. Lewis

Geological Society of America - Actively evolving microplate formation by oblique collision and sideways motion along strike


Chapter 8

Overview of plate tectonic history and its unresolved tectonic problems

PAUL MANN, ROBERT D. ROGERS AND LISA GAHAGAN

"Although several of the ideas basic to the following discussion have been presented in earlier publications, no attempt has been made to integrate these separate ideas into a broader outline of the geologic history of the Caribbean, nor have many of these ideas been presented in the context of plate tectonics." B.T. Malfait and M.G. Dinkelman: Circum-Caribbean Tectonic and Igneous Activity and the Evolution of the Caribbean Plate. *Geol. Soc. Am. Bull.* 83, pp. 251–272, 1972.

8.1 INTRODUCTION AND OBJECTIVES

Central America provides an accessible natural laboratory for the study of how tectonic and volcanic processes operate in tandem (Fig. 8.1). Two factors that make this region favorable for integrated tectonic-volcanic studies are that the outputs of the system are accessible for study in the onland arc, and that the oceanic inputs to arc systems are reasonably well constrained due to the large, rapidly expanding, and digital database of offshore geological and geophysical data (e.g., [1]) (Figs. 8.2 and 8.3).

The various segments of the Central American volcanic arc (CAVA) and its modern volcanic front (CAVF) summarized on Figure 8.1 offer many advantages for researchers to:

- Investigate large variations in the slab/sediment component of volcanic products that are observed along the arc, especially the dramatic changes between Nicaragua and Costa Rica. Volcanoes in Nicaragua record the global maximum in recycled sediment signatures, such as ^{10}Be and Ba/La [2–4].
- Investigate large-scale forcing functions on the Central American volcanic arc or "Subduction Factory", such as the variation in convergence rate (~65–90 mm/yr; Fig. 8.1) along the margin, and its effect on mass fluxes of sediments, carbonate, and water through the subduction system [4].
- Examine the effects of different ages (15–24 Ma) and thicknesses (6–18 km) of subducting oceanic crust on the geochemical properties of the CAVA and CAVF (Fig. 8.2) [1, 5].
- Examine a well-exposed, onland temporal record of Miocene–Pliocene arc volcanism that can be tracked through time as a result of the shift in the volcanic axis of the CAVA from the northeast to southwest [4].

Description: -
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Geology - Hispaniola
Plate tectonics - Hispaniola
Island arcs - HispaniolaGeologic and tectonic development of the North America-Caribbean plate boundary in Hispaniola. by Paul Mann, Grenville Draper and John F. Lewis
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This paper is the first to quantify these effects, demonstrating substantial variation in slip rates over a few to tens of earthquakes, but much less at longer timescales.

SE

. Colors denote depth below sea level and elevation on land. There are currently no active volcanoes in Puerto Rico and the Virgin Islands; the last volcanoes were active approximately 30 million years ago.

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Spontaneous subduction is modelled only if extreme mechanical conditions are assumed.

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Results are compared with earthquake catalogues.

Map of the North American

We found that an increase in the sediment input to the foreland results in prolonged activity of the active frontal thrust.

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