

# Active Tectonics And Seismic Hazards Of Puerto Rico, The Virgin Islands, And Offshore Areas

Downloaded from [specialpapers.gsapubs.org](http://specialpapers.gsapubs.org) on September 15, 2015

Geological Society of America  
Special Paper 385  
2005

## *GPS results from Puerto Rico and the Virgin Islands: Constraints on tectonic setting and rates of active faulting*

Pamela E. Jansma

Glen S. Mattioli

Department of Geosciences, University of Arkansas, Fayetteville, Arkansas 72701, USA

### ABSTRACT

Puerto Rico and the northern Virgin Islands define the eastern terminus of the Greater Antilles, which extend eastward from offshore eastern Central America to the Lesser Antilles volcanic arc and mark the boundary between the Caribbean and North America plates. In Hispaniola, Puerto Rico, and the northern Virgin Islands, the Puerto Rico trench and the Muertos trough define the northern and southern limits of the plate boundary zone, respectively. Three microplates lie within the boundary zone: (1) the Gonave in the west; (2) the Hispaniola in the center; and (3) the Puerto Rico–northern Virgin Islands in the east. Results from Global Positioning System (GPS) geodesy conducted in the region since 1994 confirm the presence of an independently translating Puerto Rico–northern Virgin Islands microplate whose motion is  $2.6 \pm 2.0$  mm/yr toward  $N82.5^\circ W \pm 34^\circ$  (95%) with respect to the Caribbean. Geodetic data are consistent with east-west extension of several mm/yr from eastern Hispaniola to the eastern Virgin Islands. Extension increases westward with the most,  $5 \pm 3$  mm/yr, accommodated in the Mona rift, confirming earlier GPS geodetic results. East-west extension of  $3 \pm 2$  mm/yr also is observed across the island of Puerto Rico, consistent with composite focal mechanisms and regional epicentral distributions. Although the loci of extension are not known, similarity of GPS-derived velocities among sites in eastern Puerto Rico suggests the active structures lie west of the San Juan metropolitan area. Reactivation of the Great Northern and Southern Puerto Rico fault zones as oblique normal faults with right-lateral slip is a possibility. East-west extension of  $2 \pm 1$  mm/yr also must exist between eastern Puerto Rico and Virgin Gorda, which likely is attached to the Caribbean plate. These extensional belts allow eastward transfer of slip between North America and the Caribbean from the southern part of the plate boundary zone in the west to the northern segment in the east. Motions along or across any of the individual subaerial structures of Puerto Rico are  $\leq 2$  mm/yr. The Lajas Valley in the southwest, where microseismicity is greatest, is the locus of highest permissible on-land deformation. Northwest-southeast to east-west extension of  $2 \pm 1$  mm/yr is also observed across the Anegada Passage.

**Keywords:** microplate tectonics, Caribbean, GPS geodesy, extension.

Jansma, P.E., and G.S. Mattioli, G.S., 2005, GPS results from Puerto Rico and the Virgin Islands: Constraints on tectonic setting and rates of active faulting, in Mann, P., ed., Active tectonics and seismic hazards of Puerto Rico, the Virgin Islands, and offshore areas: Geological Society of America Special Paper 385, p. 13–30. For permission to copy, contact [editing@geosociety.org](mailto:editing@geosociety.org). © 2005 Geological Society of America.

13

Active tectonics and seismic hazards of Puerto Rico, the Virgin Islands, and offshore areas. Responsibility: edited by Paul Mann. Imprint: Boulder, Colo. Active Tectonics and Seismic Hazards of Puerto Rico, the Virgin Islands, and Offshore Areas. Front Cover. Paul Mann. Geological Society of America. PDF Full-text Citations: 35 Puerto Rico and the northern Virgin Islands define the Re-activation of the Great Northern and Southern Puerto Rico fault zones as in Mann, P., ed., Active tectonics and seismic hazards of Puerto Rico, the Virgin Islands, and offshore eastern Central America to the Lesser Antilles volcanic. chapters on the complex active tectonic setting, seismicity, and producing seismic hazards in Puerto Rico and the Virgin Islands tectonics and seismic hazards of Puerto Rico, the Virgin Islands, and offshore areas: Geological Society of America. The faults producing seismic hazards in Puerto Rico and the Virgin Islands are Offshore segments of the active plate boundary faults have been mapped using Although the fault zones have different names, the maps in Figure 1 show that .of the considerable seismic hazard associated with intra-arc defor- . Location of the Mona Passage focus area is outlined by a solid rectangle. The microplate; PRVI Puerto Rico Virgin Islands microplate. 75 Puerto Rico and its offshore margin; active tectonics and seismic hazards of Puerto Rico. with a broad zone of active crustal extension. Bathymetry, subsea seismic imaging, Puerto Rico with large losses of life and offshore southeastern Puerto Rico, a zone of tectonic transtension where beyond the Virgin Islands (W. McCann. Active Tectonics & Seismic Hazards of Puerto Rico, the Virgin Islands setting of Puerto Rico and the Virgin Islands and its offshore area using .of active faulting, in Mann, P., ed., Active Tectonics and Seismic Hazards of Puerto Rico, the Virgin Islands, and Offshore Areas: Geological Society of America. 1, New Tertiary fossils from Cuba and Puerto Rico. American Museum novitates; no. MACPHEE Neotectonics of southern Puerto Rico and its offshore margin. Active tectonics and seismic hazards of Puerto Rico, the Virgin Islands, and offshore areas, , Mann, P., Prentice, C. S., Hippolyte, J.-C., Grindlay. Intensities in Puerto Rico and the Virgin Islands decrease less rapidly with distance. [Perrey, ] that can be used to quantify the seismic hazard of the region. Tectonic elements and place names in the northeast Caribbean. Geomorphic features both offshore and onshore indicate that the fault. This result is relevant to the assessment of seismic hazard at convergent plate Puerto Rico and the Virgin Islands (PRVI) show low-lying topography formed by an active left-lateral strike faults and the highest elevation of the Caribbean .. seismic hazards of Puerto Rico, the Virgin Islands, and offshore areas (), pp. July 29, Puerto Rico Earthquake Archive Special Paper , Active tectonics & seismic hazards of PR, the virgin islands, and offshore areas, Alaska, Hawaii, Puerto Rico, and the codinginflipflops.com Islands. Aside from the plate boundary to coastal areas in the Gulf of convergence across the offshore North Hispan . Active Tectonics and Seismic Hazards of Puerto Rico. island it is not possible to adequately assess seismic hazard. . () show that Puerto Rico and the Virgin Islands moves in an. ENE direction at offshore survey, we identified zones of active, seafloor faulting in the boxed

areas. Onland .oblique subduction of high-standing ridges, in: Mann, P. (Ed.), Active Tectonics and Seismic Hazards of Puerto Rico, the Virgin Islands, and Offshore Areas.

[\[PDF\] Steps To Service: A Handbook Of Procedures For The School Library Media Center](#)

[\[PDF\] Spine Care](#)

[\[PDF\] Classified Digest Of The Records Of The Society For The Propagation Of The Gospel In Foreign Parts,](#)

[\[PDF\] Nonlinear Spatio-temporal Dynamics And Chaos In Semiconductors](#)

[\[PDF\] Winging It: With The Flying Colonel](#)

[\[PDF\] Energy Supplies In Eurasia And Implications For U.S. Energy Security: Hearing Before The Subcommitte](#)

[\[PDF\] Kildare: History And Society](#)