

Collaborative Research UTIG and UNCW: Towards an Integrated Understanding of Late
Holocene Fault Activity in Western Puerto Rico: Offshore Geophysical Survey

Grant Number 00-HQ-GR-0064

Paul Mann

Institute of Geophysics, The university of Texas at Austin
4412 Spicewood Springs Road, Bldg. 600
Austin, TX. 78759-8500
Telephone: 512-471-0442
<mailto:paulm@ig.utexas.edu>

Nancy R. Grindlay and Lewis Abrams
University of North Caroling at Wilmington
Department of Earth Sciences
601 South College Road
Wilmington, NC 28403
Telephone: 910-962-7421
Fax: 910-962-7077
<mailto:grindlay@uncwil.edu> & <mailto:abramsl@uncwil.edu>

Program Element: NI

Key words: Neotectonics, Reflection Seismology, Quaternary fault behavior, Surface
deformation

Technical Abstract

This report covers the period from March 2000 through October 2000. An investigation of fine scale seafloor morphology, sediment distribution, and areas of recent faulting on portions of the insular shelf of western and southern Puerto Rico was conducted aboard the University of Puerto Rico's R/V Isla Magueyes from May 5-14, 2000. The survey focuses on shallow areas not covered by the U.S. Geological Survey in a GLORIA long-range side scan survey of the Exclusive Economic Zone (EEZ) around Puerto Rico and the U.S. Virgin Islands (EEZ-SCAN 85 Scientific Staff, 1987). Approximately 900 km of digital side scan sonar DF-1000 system and the Geoacoustics GeoPulse Boomer system (Figure 1). In contrast to the deeper areas already surveyed within the Mona Passage where strong bottom currents can potentially sweep clean young sediments, the coastal zone areas that we have chosen include areas of recent deltaic deposition in which any recent faulting should be evident from deformed and /or offset Holocene deposits. The objectives of the investigation are to: (1) examine the relationship between active faults identified offshore by our survey and active faults identified onland in adjacent western and southwestern Puerto Rico; (2) define the subsurface geometry of offshore faults and characterize the style of recent faulting by integrating surface side-scan information and sub-bottom profiling with pre-existing marine single-channel (SCS) and multichannel seismic (MCS) data; (3) examine the relationship between active offshore fault patterns and the distribution of seismic events by the local seismic network; (4)

demonstrate the agreement of these data with the wide array of models for the neotectonic setting of the Mona Passage and southwestern Puerto Rico within the North American Caribbean plate boundary zone. Mann's role in the first year of this two year study was to: 1) help in planning the May 2000, cruise and insure that the results of his field work with Prentice in January & February of 2000 was fully utilized in the cruise plan (Prentice et al., 2000; Lau ET al. 2000); 2) participate in the 10 day cruise; and 3) to help in the interpretation of the cruise results. In October 2000, Mann hosted Luke Del Greco, a master's student from UNCW, for ten days at UTIG and to cross correlate features on the seismic data into the Geoquest interpretation software at UTIG and to cross correlate features on the seismic data with features seen on the sidescan imagery produced at UNCW (Del Greco et al., in press). A preliminary analysis of all components of this project will be presented at the Fall AGU meeting (cf. Report Published).

Non-Technical Summary

The objective of our research is to map the shallow seafloor and sub-seafloor surrounding western and southwestern Puerto Rico to identify recent faulting activity in the sediment and rocks. Initial observation reveal evidence of recent faulting in some, but not all. Of the areas surveyed. In some cases, fault zone identified onland can be traced into adjacent offshore area. Ultimate, the results of this study will provide information about fault activity needed to further refine earthquake hazard maps of this densely populated region being compiled by the U.S. Geological Survey.