

EERI-NSF Rapid and Research Needs Workshop

Breakout Session Title: Earth Sciences/Geotechnical Discipline Breakout

Discussion Leaders and Recorders: Sean Gulick and Scott Olson

Panel Members: Eric Calais, Cecilia McHugh, and Roger Bilham

Session Overview: Based on our breakout discussions, we identified a clear need to connect research into the Haiti January 12, 2010 earthquake and northern Caribbean plate tectonics with the social and economic experiment currently underway in the rebuilding of Haiti. Scientists have important roles in: (1) aiding with educational capacity building; and (2) assessing future earthquake hazard.

Specific Research Goals

- Defining and properly characterizing potential earthquake sources including locating terrestrial and submarine faults, identifying or refuting creeping behavior, determining the existence or lack of slow earthquakes, calculating earthquake recurrence interval, and investigating fault segmentation.
- Understanding earthquake effects such as the behavior of calcareous and coral fills, the presence of sedimentary basins and the impact of such basins on site response, the effects of topography on site response, and generation of tsunamis resulting from combined terrestrial/coastal geologic processes.
- Understanding coastal physical and chemical processes and their mitigating or exacerbating impact on secondary effects of future earthquakes.
- Evaluate land use effects on hazards such as submarine landslides and resulting tsunamis.

Specific Data Needs- Regional Scale

- Targeted GPS coverage using roads and shorelines
- Develop seismometer network with geotechnical site characterization at seismometer stations
- Collect subsurface images of faults onshore and offshore
- Onshore and offshore paleoseismologic evaluation of seismic sources
- Installation of tide gauges
- Define crustal structure of Hispaniola
- Sponsoring Hispaniola as a remote sensing supersite

Specific Data Needs- Targeted Studies

- Higher density campaign style deployments of GPS and seismometers to understanding tectonic complexities
- Deployment of rupture/creepmeters to determine active faulting and modes of deformation
- Defining Port-au-Prince basin characteristics for hazards assessment
- Evaluating surface geology and collecting shear wave velocity profiles for microzonation studies
- Collecting high-resolution topography and bathymetry for fault mapping, topographic effects, landslide studies, and tsunami research
- Modeling and determining the dynamic behavior of calcareous sand and coral fills

- Mapping high resolution basin stratigraphy
- Determining surface changes using remote sensing
- Studying segmentation of the Enriquillo Plantain Garden Fault and its connection to Muertos Trough
- Determining the segmentation and cause of long recurrence interval on Septentrional Fault

Multidisciplinary Approach

- These Earth Science and Geotechnical research goals and needs above are required to answer to overarching questions:
 - What is the primary and secondary earthquake hazard for Hispaniola?
 - Are there repeatable earthquake sequences, specific fault segmentations, and determinable recurrence intervals?
- Moving outside the geosciences, participants in the breakout session agreed that we need to examine and justify earthquake preparedness through Scenario Earthquake Studies over different times scales (1 y, 5 y, 20 y, etc), similar to those funded by FEMA for San Francisco and the New Madrid seismic zone, and performed by multidisciplinary teams.
- Public participation is a must in Haiti and similar societies, and thus we should exploit short term earthquake awareness to education the Haitian public as to best earthquake-resistant construction practices, which may in turn help in the fight against corruption. Specific research is needed to determine how to influence human behavior before, during, and after an earthquake to mitigate damage and loss of life.