

EARTHQUAKE UNIT

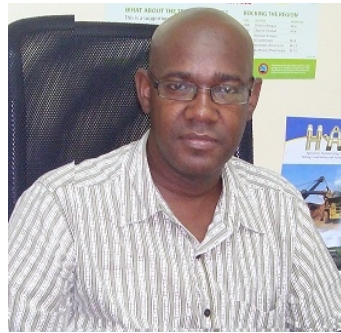
Lyndon Brown, BSc UWI, MA CUNY, PhD UDEL – Head of Unit

EARTHQUAKE UNIT'S MISSION STATEMENT

Through operating the Jamaica Seismograph Network and affiliation with other Caribbean and regional networks, the Earthquake Unit seeks to understand earthquake processes in and around Jamaica and advise the society about earthquake hazards, thereby encouraging earthquake awareness and the application of mitigative strategies to development.

The Earthquake Unit

In January while celebrating earthquake awareness week, we recorded one of the strongest earthquakes occurring in this region in over a century with several aftershocks. The epicenter of the earthquake was believed at that time to be located along the Enriquillo fault located in an eastward extension of the Plantain Garden Fault (recent research has pointed to the



Leogan fault as being responsible for this event). The Enriquillo-Plantain Garden fault runs from Haiti and extends across the southern portion of Hispaniola through the Caribbean Sea to the region of the Plantain Garden River in Jamaica. Through collaborative research with the University of Wisconsin, we have been studying this fault and the major faults in Jamaica for several years using GPS to measure strain accumulation with equipment installed at 36 points across the island and four points offshore at Pedro Cays, Morant Cays, Goat Island and Manatee Bay. Through this research the forecast was made of the likelihood of a magnitude 7.2 size event happening along the Enriquillo Plantain Garden Fault.

As a result of the death toll and devastation resulting from the Haiti event and then later the Chile event, most Jamaicans were made more aware of the effects of earthquakes and the need to prepare. Hence the Unit had an increase in requests for information, providing assistance to safety departments in several organizations. We also fulfilled the increased requests for educational outreach through presentations and talks and took part in several media interviews and panel discussions.

The Earthquake Unit (EQU) is a research unit of the University that is funded directly by the Government of Jamaica (GOJ) as the sole agency responsible for the monitoring of earthquakes and researching seismic hazards in Jamaica. The EQU operates The Jamaica Seismograph Network (JSN) which is a network of 12 analog short period seismograph stations installed across the island (see figure 1). The data from the JSN station is transmitted to the Central Recording Station (CRS) at UWI-Mona in real time using radio equipment where the data is recorded on computers running data acquisition and processing software.

The EQU also operates the Jamaica Strong Motion Network which is a network of 8 accelerographs installed across the island to record ground shaking for larger earthquakes. These instruments operate in a standby mode and start recording when triggered by an earthquake. They provide very important data to be used in seismic hazard assessment, studying the response of sites to ground shaking and provide parameters to be used in constructing or retrofitting important structures.

Another area of operation is the GPS network which has over 36 points across the island to monitor fault movement or strain accumulation over time. Finally, Four broadband stations which were temporarily installed as part of a joint project between the Earthquake Unit and the University of Wisconsin to study Jamaica Mantle were returned. However, collaboration continues in the use and processing of the data.

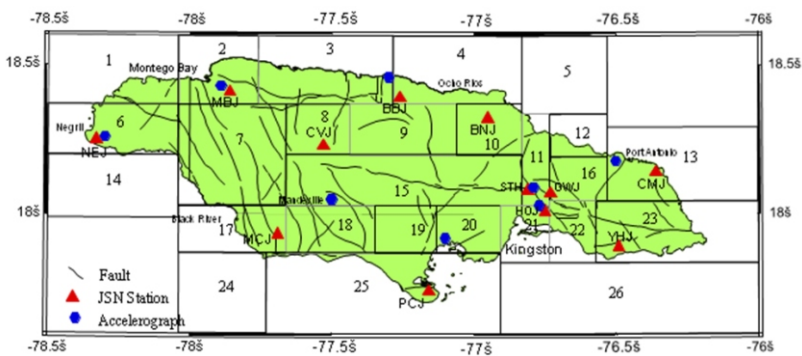


Figure 1: Location of instruments forming the Jamaica Seismograph Network that are used to capture and transmit ground motion in and around Jamaica to the Central Recording Station at the Earthquake Unit at UWI, Mona.

Earthquakes Recorded

The Jamaica Seismograph Network (JSN) recorded and processed over two hundred and six (206) earthquakes during the period (August 2009 – July 2010). The most active sub-area (as seen in Figure 2) was the Blue Mountain Block (labelled 16 in Figure 3) followed by Kingston (labelled 21 in Figure 3) and the Montpelier-Newmarket Belt (labelled 7 in Figure 3). There were seven (7) felt earthquakes during this period with the largest magnitude being 7.0 which occurred near Port-au-Prince, Haiti on January 12. This was reported felt in eastern parishes of the island.

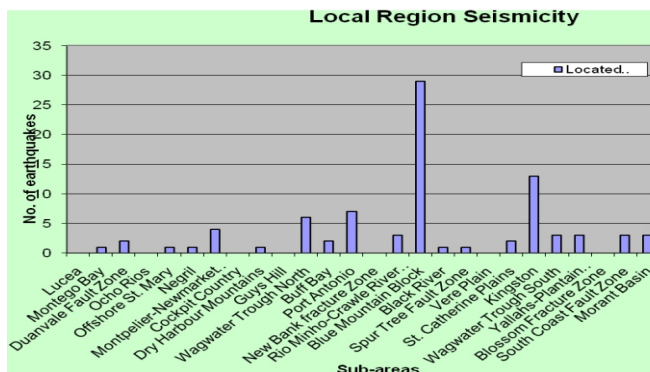


Figure 2: Seismic activities according to different Sub-Area for August 2009 – July 2010

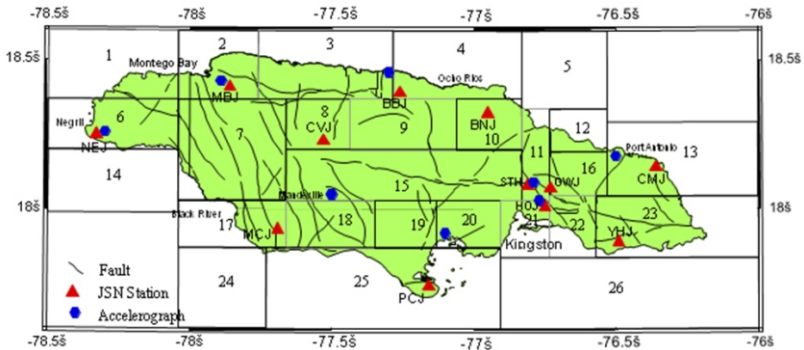


Figure 3: The Jamaica Seismograph Network local region sub areas and the major fault lines across the island.

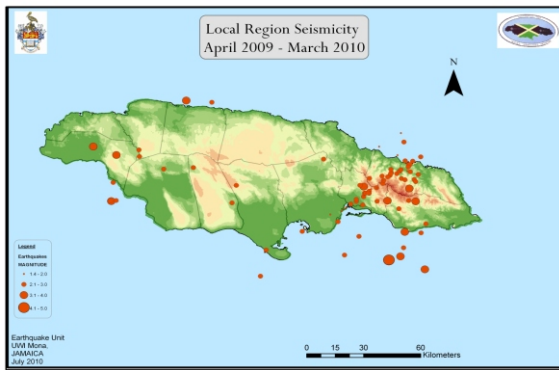


Figure 4: Seismic activity within the local region sub-areas of Jamaica for the period of April 2009 – March 2010

Activities at the Unit

The EQU host visits from schools and the public each year in educating the public at large about earthquakes. For this year we had 23 schools (see Table 1) visiting the unit with over one thousand students and sixty teachers (table 1). In addition, several presentations were made to organizations where staff members visited on invitation. There were also several media interviews and forum to discuss matters relating to earthquakes and development.

In expanding the Jamaica Strong Motion Network we started work with several organizations in encouraging them to acquire accelerographs for installation at important facilities to build a database of strong ground motion data that will be important in improving the seismic codes of Jamaica. Airports Authority of Jamaica and The Norman Manley International Airport (NMIA) has agreed to purchase two units to be installed at the NMIA. The EQU also maintains and operates a Kinometrics accelerograph purchased by SMADA Consultants which is installed in Half Way Tree. TransJamaican Limited has two accelerographs installed, one on the Hunts Bay Bridge and one at the Toll plaza in Portmore. The EQU is in a contractual arrangement with TransJamaican Highway to maintain and use data from these instruments. There are continued discussions with other organizations to install these instruments on their buildings to improve the seismic network across Jamaica and at the same time use these instruments to monitor structural integrity.

Success & Challenges of the EQU

For 2009/2010 several challenges were faced in achieving set targets as a result of a reduction in the EQU's budget. For the financial year 2009-2010, the unit received a shortfall in the request from 36 million to 25 million dollars. Necessary upgrades and modernization of equipment that were planned for the unit had to be postponed. The EQU continues to seek funding through partnership with other institutions and grant proposals and, in general, assistance from corporate Jamaica in helping to improve the network. Once funding becomes available the upgrade will be done on a phased basis. The strong motion study that the EQU had been undergoing with the University of Wisconsin has ended and as such the unit now does not have any broadband instruments in its possession. After the Haiti event and after strong request to the Government and Private sector, the Unit has received funding from the Office of Disaster Preparedness and Emergency Management (ODPEM) to purchase one of these instruments. The short term goal is to obtain three of these instruments in order to move the unit from an analog system to a digital system in order to better use earthquake signals in our research and also to provide more real time data to disaster relief agencies. We are currently

involved in several joint projects with the University of Wisconsin which provides some level of funding for projects such as the Jamaica Mantle Study and the GPS project.

We are currently working to meet most of our targets set out in our 2009/2010 operational plan. We have not been able to purchase spares necessary to maintain the network and hence the technical staff has to spend more time in maintaining the network by doing repairs in the laboratory and in the fields. For this period over 55 trips were made in the fields to install equipment to collect data, repair seismograph stations and collect intensity reports after felt earthquakes.

Projects

Global Positioning System (GPS) Network (In collaboration with The University of Wisconsin at Madison)

In monitoring deformation and movements across faults in Jamaica, the EQU continues to install equipment to collect data at thirty-six (36) GPS sites across the island with four of these points being offshore at Morant Cay, Pedro Banks, Goat Island and Manatee Bay. Sites are occupied for a minimum period of seven (7) days after which the equipment collected and the data downloaded and processed. There are two (2) continuous GPS stations, one at Portland Cottage in Clarendon and the other at Mount Denham/Pike in Manchester where trips are made periodically to download data for analysis. Arrangements were also made with the Jamaica Defence Force (JDF) Coast Guard to transport EQU staff and equipment to Pedro Banks and Morant Cays.

Global Seismograph Network/Caribbean Tsunami Warning System

The Earthquake Unit accesses the earthquake data from the Global Seismograph Network (GSN) station at Mount Denham/Pike MTDJ. We are also in the process of tying this in with the local network data to provide immediate solutions of earthquake data using the open source Earthworm software.

CTBTO (Comprehensive Nuclear Test Ban Treaty Organisation) National Data Centre (NDC) activities.

The EQU continues to operate the National Data Center (NDC) at the Central Recording Station (CRS), Mona. The Earthquake Unit is linked to the International Data Center (IDC) in Vienna and has access to the data from the CTBTO's International Monitoring System.

Funding/Consultation

The Earthquake Unit has undertaken a number of consultations during this year, among these are:

NEM Project to assess the ground acceleration of a theoretical magnitude 7 event along the Plantain Garden Fault with focal mechanism similar to the Haiti event.– **\$J289,000.00**

Jamaica Energy Partners: Ground acceleration study along proposed power plant site: **\$J98,000.00**

TransJamaican Highway monitoring accelerograph on Tolls Bridge and Plaza – **\$J233,750**

Smaller consultation from Insurance companies or specific events – **J\$30,000**

Funding from Office of Disaster Preparedness and Emergency Management (ODPEM) to purchase a Broadband Seismometer for the Jamaica Seismograph Network upgrade – **J\$2.2 million**

Personal Development

Lyndon Brown (Research Fellow/Head): nominated to be a surrogate inspector of the Comprehensive Test Ban Treaty Organization, completed first phase of training in Hungary during June-July, 2010

Nicaragua: Caribbean Tsunami Early Warning System (EWS) Consultations and Planning meeting

Trinidad: CROSQ CARICOM Regional Organizations for Standards and Quality: Seismic Risk Atlas for Jamaica.

Paul Williams (Network Manager/Engineer)

Chile: IRIS (Incorporated Research Institution for Seismology) workshop/training

Karlene Black (Scientific Officer): Currently pursuing a Masters degree in Seismology in Japan through a scholarship funded by the Japan International Corporation Agency (JICA), expected to complete and return to EQU in September 2011.

Verdine Stephenson (Administrative Assistant): Completed a B.Sc. in Library Studies from UWI and has returned to the EQU after a one year study leave.