EARTHQUAKE UNIT

Professor Simon Mitchell, BSc *Hull*, PhD*Liverpool*
Acting Head of Unit

INTRODUCTION

The Earthquake Unit (EQU) is a research unit in the Department of Geography and Geology that is funded directly by the Government of Jamaica (GOJ) as the sole agency responsible for the monitoring of earthquakes and research in seismic hazards in Jamaica. The EQU budget is supported by the Government of Jamaica with allocations through the Ministry of Science Technology Energy and Mining (MSTEM). The EQU acts as a Data Centre for the Comprehensive Test Ban Treaty Organization (CTBTO) and contributes data to the upcoming Caribbean Tsunami Warning Network in conjunction with the United States Geological Survey (USGS).

WORK OF THE UNIT

The EQU in conjunction with the Department of Geography and

Geology ran two workshops during the year on training on Tsunami Modelling and Hazard Assessment in collaboration with the Environmental Hydraulics Institute IH Cantabria, AECID (Spanish Corporation Agency), the Caribbean Disaster and Emergency Management Agency (CDEMA), and the Office of Disaster Preparedness and Emergency Management (ODPEM). The workshops were hosted by the Department of Geography and Geology and ran from the 15th-19th of September, 2014, and the 26th–30th January, 2015. Funding came from by AECID and Chilespana.

On the 10th November, 2014, the EQU participated in the Clarendon Parish Council Workshop/Disaster Management Group Sector Meeting. The objective of this activity was to gather insights into what is needed to finalise the Clarendon Parish Disaster Plan and where to garner this information. A map of earthquakes for a 5 year period of earthquake activity (up to December 2013) was submitted highlighting the ones occurring in Clarendon. This served to emphasise the fact that Clarendon does have an active fault running through it, and so can be directly impacted by earthquakes having epicentres within the parish.

On the 2nd–3rd of December, 2014, the EQU was involved with the Common Alerting Protocol (CAP) Workshop held at the Webster Memorial United Church, 53 Half-Way-Tree Road, Kingston. The training workshop was organized by the Met Office, the Finnish Meteorological Institute (FMI) and the World Meteorological Organization (WMO) as part of the SHOCS II project (Strenghtening Hydrometeorological Operations and Services in Caribbean SIDS Phase II). Its' objective was to introduce the CAP messaging format for Early Warnings as recommended by the WMO. CAP is the standardized alerting protocol recommended by the WMO as the messaging format for Early Warnings. Messages for emergencies are formulated from standardized XML template forms. This ensures uniform alerting jargon and format for all hazards/emergencies from all authorised alerting authorities.

During January and February, 2015, the EQU was involved with various expos during ODPEM's Earthquake Awareness Month. Expos were run at Mandela Park, Half Way Tree (5th January 2015); The Transport Centre, Saint Ann's Bay (16th January 2015); The Transport Centre,

Santa Cruz (23rd January 2015); and Sam Sharpe Square, Montego Bay (6th February 2015).

At the UWI Research Days (9th–11th February 2015), the EQU had a display on the landing of the EQU entrance, where visitors were able to view the exhibit and tour the facility.

On the 25th February 2015, the EQU was involved in the launch of ODPEM's Jamaica Hazards Handy Manual at the ODPEM head office on Haining Road, Kingston. The manual was made possible by JICA with support from relevant Jamaican institutions such as the UWI and the Mines and Geology Division. There was a symbolic handover ceremony to the Hon. Noel Arscott, Minister, Ministry of Local Government and Community Development by JICA.

On the 9th of June 2015, the EQU participated in the State of the Environment (SOE) 2013 – Resilience, Disaster Risk Reduction and Adaptation to Climate Change, run by the Ministry of Water, Land, Environment & Climate Change. The workshop was conducted by NEPA in order to seek stakeholder contributions. The SOE is conducted on a three year cycle, and the last report was for 2010.

The EQU was involved with the GOJ/ODPEM Project: Improvement of Emergency Communication System. The Japan International Cooperation Agency (JICA) Team visited the EQU twice on the 14th and 22nd July 2015. The purpose of the visit by the JICA project team was to conduct a preparatory survey for the project. Questions were mainly on the network and the instrumentation used to gather and transmit earthquake information.

A total of 23 schools visited the EQU during the 2014–2015 reporting period, with totals of 935 students and 53 teachers. The Seismic Analyst and Education Officer provided presentations to the visitors detailing the operation of the Earthquake Unit and also information on Jamaica's seismic activity and earthquake awareness.

THE JAMAICA SEISMOGRAPH NETWORK (JSN)

The Jamaica Seismograph Network performed at a satisfactory level during the year. At the end of this period three of the four digital broadband stations (STHB, YHJB and MTDJ) working. Montego Bay (MBJ) went down due to damage to the station from a lightning strike, and there was a lengthy delay in restoring service as a result of not having the necessary spares and waiting on the bursary to make payment. The twelve (12) analog short period seismograph stations worked at an acceptable level for most of this period with minor adjustments needed to improve on the signals from the western end of the island. There were delays in establishing the new broadband station at Castle Mountain due to the National Land Agency's (NLA) slow process of completing their processing to give us the go ahead to proceed with the installation at the site. In the meantime, we have made arrangements with the Police to assist with transmitting the data to Kingston on their data network once we complete the installation.

There was an expansion of the Jamaica Strong Motion Network (JSMN) with the installation of three new stations bringing the total number of seismographs up to seventeen (17). The new stations were at the Office of Disaster Preparedness and Emergency Management (ODPEM), Portmore Community College (PCC), and the Kingston Public Hospital (KPH). We have data from the station at the ODPEM coming into the Earthquake Unit's Central Recording Station in real-time but the other two sites are not transmitted in real-time as we do not have the radio equipment needed to transfer the data to the Earthquake Unit. We also completed the housing for stations that were part of the Caribbean Catastrophe Risk Insurance Facility (CCRIF) project at the Kingston Container Terminal (KCT) and the Long Mountain Country Club (LMCC). The Kingston Container Terminal (KCT) installation was completed and the station worked fine for all of this period with the data transmitted to the Earthquake Unit in real-time. We also continued to maintain the accelerographs installed at the Norman Manley International Airport (NMIA) and at TransJamaica Highway Limited. There are two accelerographs installed at each location with one unit installed as a free-

field station and the other installed on the control tower for NMIA and a free-field station at the Portmore Toll Plaza and the second unit on the Portmore Toll Bridge for TransJamaica Highway. There is also a Kinematrics ETNA accelerograph installed at SMADA Consultants in Half Way Tree at the SMADA office that continued to operate.

We had a busy lightning season from August to the end of November but we did not have much lightning damage to our equipment as measures were put in place to minimize the damage from such strikes.

The EQU continues to collaborate with the University of Wisconsin by working with Professor Chuck DeMets to process the GPS data for use in ongoing research work. We also have access to the data from the three UNAVCO GPS stations at Morant Cays, Pedro Bank and at the University of the West Indies. We also operate one GPS Continuous Station with a Trimble NETRS receiver at Pike in Manchester where data were downloaded and uploaded for processing. No temporary GPS installations were done during this reporting period. Engineers from UNAVCO visited in September, 2014, to check on the unit at the UWI.

The Earthquake Unit continued to operate the Jamaica National Data Center (NDC_JM) for the Comprehensive Nuclear Test Ban Treaty Organization (CTBTO). There were no major issues with the CTBTO equipment this year and the unit was able to do the necessary routine maintenance needed on the equipment. Earthquake Unit staff members continued to have access to all the CTBTO data.

The USGS-GSN station at Pike in Manchester had work undertaken on the station in October, 2014, to upgrade and to facilitate migrating from one telecommunication satellite provider to another. Two Engineers from the USGS visited in October to install equipment and to re-align the satellite for optimal performance. Earlier in the period we assisted in working with Spectrum Management in securing the VSAT license needed for the upgrade. I also visited the station (MTDJ) a few times to do routine maintenance and to sort out issues that came up during the year.

The EQU continues to seek additional collaborative possibilities. Recently, through the ODPEM, the EQU has been involved with JICA and a

Chile-Spain Cooperative Agreement in trying to source additional funding and technical support. Also in the 2014–2015 reporting period, the EQU has been working with ODPEM and the PIOJ in a proposal to the World Bank to increase the number of broadband stations and strong motion seismographs across the island. Funding from this project is hoped to be available in the 2015–2016 reporting year.

The EQU still faces significant challenges. We still operate without the necessary spare equipment and parts needed to ensure a smooth operation and hence long hour in the laboratory and in the field are necessary to keep the stations operating. Lightning strikes during the hurricane season (May to November) are a particular concern as stations may go down and there is a significant time lag to facilitate repair and reinstallation. There is still the challenge of the length of time it takes for the university to process orders and some local companies have stopped accepting UWI purchase orders.

EARTHQUAKES RECORDED

The JSN recorded 74 local events for the period from August 2014 to July 2015, slightly more than in the previous year when 68 were recorded (Table 1).

EARTHQUAKE EVENT SUMMARY 2014 to 20

Year	Month	Located Events		Total	Recorded Events					Total	F
		Local	Near	located	Local	Near	Regional	Distant	Blasts	recorded	Ev
2014	Aug	5	0	5	5	0	3	0	1	9	
2014	Sep	5	7	12	5	7	5	0	1	18	
2014	Oct	7	6	13	7	6	12	0	0	25	
2014	Nov	2	5	7	2	5	5	0	2	14	
2014	Dec	5	4	9	5	4	7	0	0	16	
2015	Jan	9	5	14	9	5	8	0	1	23	
2015	Feb	9	1	10	9	1	8	0	2	20	
2015	Mar	6	5	11	6	5	8	0	2	21	
2015	April	12	7	19	12	7	6	0	2	27	
2015	May	5	4	9	5	4	2	0	2	13	
2015	Jun	5	2	7	5	2	1	0	2	10	
2015	Jul	4	3	7	4	3	8	0	2	17	
ALL	Totals	74	49	123	74	49	73	0	17	213	

Table 1: *Events recorded by the Central Recording Station at the EQU from August 2014 to July 2015; of the 74local events recorded, one was felt.*

The largest 'cluster' of earthquakes was located to the north-east of Kingston in the south-western Blue Mountains Block/Wagwater Belt, which is the main subarea for earthquakes in Jamaica. Scattered earthquakes also occurred elsewhere but there were no other clusters (Figures 1 & 2). A single felt event was recorded in the north-eastern Blue Mountains (Figure 2).

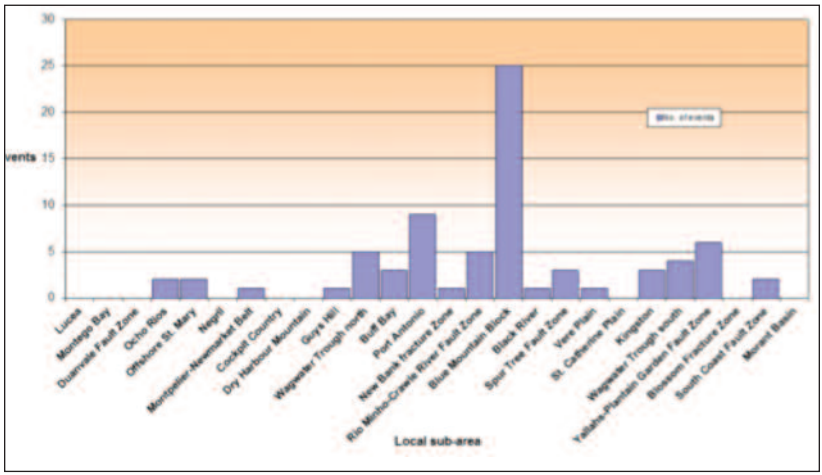

Figure 2. *Breakdown of earthquakes by subregion for the period from August 2014–July 2015.*

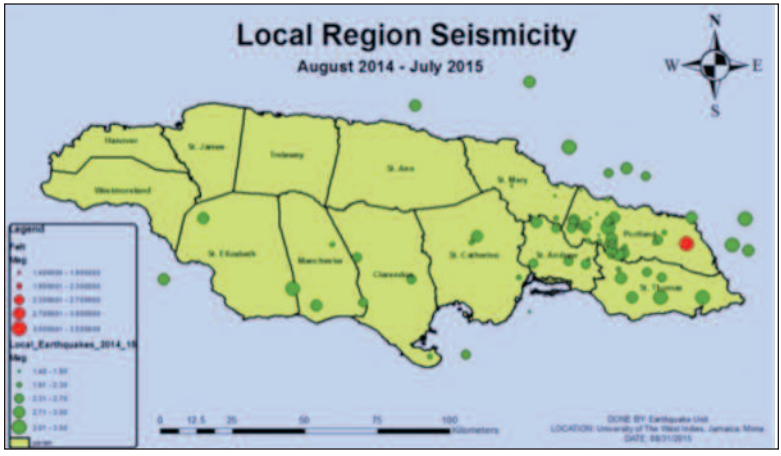

Figure 3. *Earthquakes in Jamaica from August 2014 to July 2015; felt earthquakes shown in red.*

The total number of event processed by the Jamaica Seismic Network was 213, which included: 74 local events, 49 near events, 73 regional events, and 17 blasts (Table 1).

PRESENTATIONS

- **Karleen Black**. "Jamaica's vulnerability to Earthquakes" ODPEM Earthquake Awareness Month, Press Launch, 6th January 2015.
- **Arpita Mandal, Simon F. Mitchell** and **K.-A. Mitchell.** "The Standard for Tsunami Inundation Modeling" CDEMA-ODPEM CHILESPANA AECID workshop "Regional Seismic and Tsunami Risk Workshop, ODPEM Headquarters, Jamaica, 3rd March 2015.
- S**imon F. Mitchell**. "Jamaica and Earthquake Risk" Warden Conference, 12th September 2014, U.S. Embassy, 142 Old Hope Road, Kingston, Jamaica.

COMMUNITY SERVICE

The Earthquake Unit works in close collaboration with ODPEM and the Jamaica Institution of Engineers in disseminating the findings of research. The EQU also provides information/advice that is of national significance to both institutions.