

EARTHQUAKE UNIT

Professor Simon Mitchell, BSc Hull, PhD Liverpool – Head of Unit



INTRODUCTION

The Earthquake Unit (EQU) at the University of the West Indies continues to operate the Jamaica Seismograph Network (JSN), Jamaica Strong Motion Accelerograph Network (JSMAN) and GPS Network along with operating the USGS-GSN broadband digital station at Mount Denham in Manchester. The EQU is also Jamaica National Data Center (NDC_JM) for the Preparatory Commission for Nuclear Test Ban Treaty Organisation (CTBTO) where we operate equipment to access Seismic data, Hydro-acoustic data, Infrasound data and Radionuclide data from over 337 stations around the world.

Prof Simon Mitchell continued as head of the unit and Mr Kevel Daily joined the staff of the EQU as GIS office during the year.

WORK OF THE UNIT

On November 5, 2018 the EQU observed World Tsunami Awareness Day with an outside broadcast from the Faculty of Science and Technology (FST) in collaboration with the Office of Disaster Preparedness and Emergency Management (ODPEM) on RJR radio's Hotline. Host Clive Mullings conducted interviews with EQU and ODPEM staff along with other disaster management experts.

On November 20, 2018 the EQU participated in observer capacity to earthquake drill in the Department of Chemistry.

In December 2018 the Portmore Municipal Council kicked-off its Caribbean Development Bank sponsored **National Disaster Risk Management in the CARIFORUM** project to strengthen disaster risk management (DRM) in Portmore. Project objectives are update DRM profile, create DRM and evacuation plans with community based DRM capacitation. The DRM outputs will feed into a concurrently developed GIS Hazard-Risk database and management system which be available online all stakeholders to support future planning and development. The EQU participated since the

proposal development stage and sits on the project steering committee which is chaired by the Ministry of Local Government and Community Development. The project is slated for completion in September 2019.

From January to March of 2019 the EQU participated in earthquake simulation planning and execution along Marcus Garvey Drive. The Kingston and St. Andrew Municipal Corporation (KSAMC), Emergency Operations, Communications and Public Utilities sub-committee wished to test response to a major earthquake, focusing on mass casualty capability and the incident command system. The participating industrial partners were Seprod Limited and West Kingston Power Partners. Response and traffic control was exceptional as simultaneously there was a real but unrelated fire at the Riverton City Dump.

The EQU participated in Earthquake Awareness Week (EAW) with a statement on earth activity for the year 2018 on January 14, 2019 at the ODPEM press launch. On January 16, 2019 we exhibited at ODPEM EAW day for school at Fort Charles, Port Royal. The event featured an outside broadcast with Cliff Hughes of Nationwide Radio.

In January proposal evaluations were done for the micro-zonation component of the Jamaica Social Investment Fund (JSIF) – Disaster Risk and Vulnerability Project (DVRP).

On January 25, 2019 a presentation on Jamaica's vulnerability to earthquakes was given to Caribbean Maritime Institute preliminary year students.

On February 6–7 the EQU participated in UWI- Research Days 2019.

On March 1, 2019 the EQU attended the inaugural meeting of the Specially Vulnerable Area technical working group (SVA-TWG). The Disaster management Act, 2015 speaks to the process of declaring SVAs which would require special precautionary plans to mitigate and prevent disasters upon declaration. The Act does not define what makes a particular area specially vulnerable. SVA-TWG's role is to define SVA, develop criteria tools which can be applied scientifically to identify SVAs, identify a pilot SVA and ensure through guidance the establishment of SVA regulations. The SVA-TWG reports to the Regulations Committee, Ministry of Local Government and Community Development.

On March 11, 2019 a presentation was given to Mona High School teachers as part of a staff development workshop on disasters.

The EQU participated in the Planning institute of Jamaica (PIOJ) Economic and Social Survey Jamaica (ESSJ) 2019.

In June 2019 a draft of the Landslide Report was reviewed for JSIF – DVRP.

NETWORK

Disaster Risk and Vulnerability Project

The Jamaica Social Investment Fund (JSIF) implements the six year Government of Jamaica funded Disaster Risk and Vulnerability Project (DVRP). DVRP began in 2016 and is funded through a US \$30M loan agreement with the World Bank to promote climate and disaster management for sustainable development. To this end EQU has benefited from vast improvements to the seismic and strong motion networks as outlined below.

For the year August 1, 2018 to July 31, 2019 we had twelve of the seismic stations in the Jamaica Seismograph Network upgraded. The Yallahs seismograph station was the only seismograph station not to be upgraded as work is ongoing to better secure the station which was broken into and all the equipment stolen. There were also fifteen new free-field accelerograph stations installed at selected hospitals and schools across the island to expand the strong motion accelerograph network on the island (Figure 1). In addition to the free field accelerograph stations installed, we installed single accelerographs on six hospital buildings. These new accelerograph stations operated in addition to the other free field and building installations that were in place before.

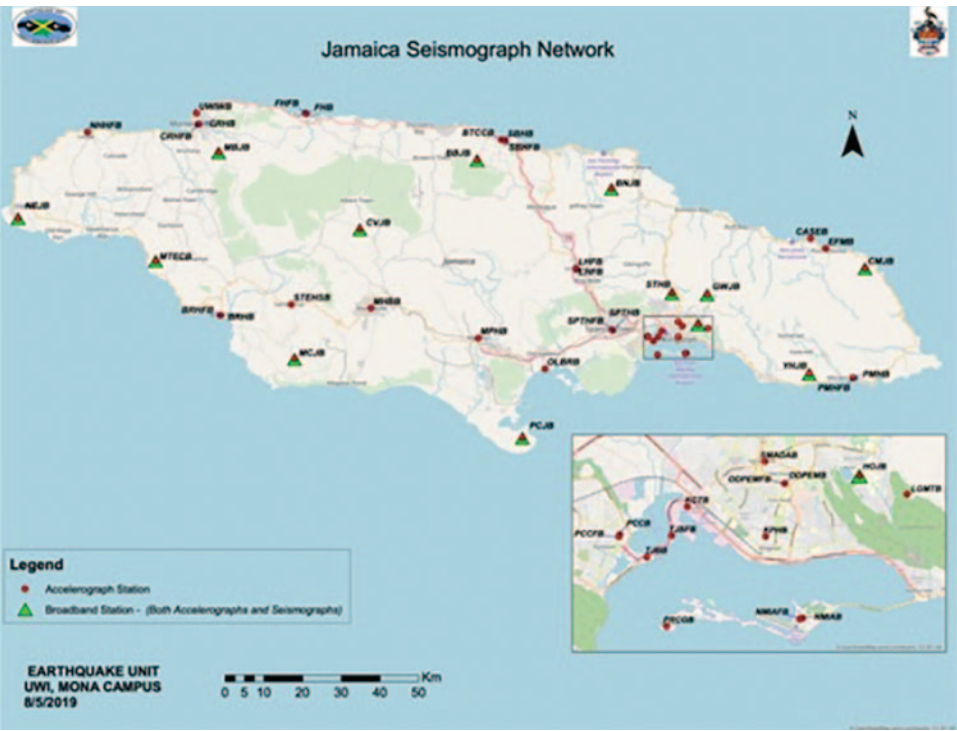


Figure 1. Jamaican Seismograph and Accelerograph Station networks

One of our objectives was to improve the quality of the seismic data recorded across the island and this was achieved with the construction of five seismometer vaults. These vaults were built at Negril Seismograph Station in Westmoreland, Pike Seismograph Station in Manchester, Greenwich Seismograph station in St. Andrew, Castle Mountain Seismograph Station in Portland and the Montego Bay Seismograph station at Kempshot in St. James. Repair work was also carried out on the Bonny Gate vault in St. Mary. For the other seismograph stations at Stony Hill in St Andrew, Munro College in St Elizabeth, Portland Cottage in Clarendon, Mount Edgecombe in Westmoreland, Bamboo in St Ann and Yallahs in St Thomas we have seismometer piers instead of the vaults to accommodate the installation of the sensors (Figure 2).



Figure 2. Equipment at one of the upgraded seismograph station at Stony Hill.

We also had improvement work done with the lightning protection and grounding systems at the seismic stations to protect the equipment installed at these stations. All of the seismograph stations are powered by solar power which resulted in more reliable uptime of the stations and reduced possible damage to equipment from surges on the Jamaica Public Supply lines.

We improved on seismic monitoring in the western parts of the island by building a new seismograph station at Mount Edgecombe in Westmoreland to fill the gap between Munro College (St. Elizabeth) and Negril (Westmoreland). This will greatly assist in monitoring seismic activity on the Montpelier-New Market fault and off-shore Black River which are seismically active areas.

The Central Recording Station at Mona has also been updated. The station is now



Figure 3. Solar Panel for the Earthquake Unit's Central Recording System.

powered by an upgraded solar power system (Figure 3). The data acquisition and processing equipment at the Earthquake Unit Central Recording Station operated without any problem as a result of the new solar power system which is a 48 volts system consisting of twelve 315 watt solar panels, twenty four S605 Rolls 468Ah 6 volts Deep Cycle Batteries, one 6800 watts Xantrex inverter and a Schneider 60Amp Charge Controller. Work has begun in the data acquisition and processing room to install eight 40 inch Samsung monitors. Due to delay in receiving the material needed for the installation the display room was not completed in this period. A new 30 foot communication tower with grounding and lightning protection was installed on the roof of the Earthquake Unit's building.

GPS NETWORK

For this period we acquired GPS data from the National Land Agency (NLA) for all their stations to use in our ongoing research. The Earthquake Unit 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 was downloaded and uploaded for processing. Figure 4 shows the continued movement of the GPS points in Jamaica relative to the Caribbean plate.

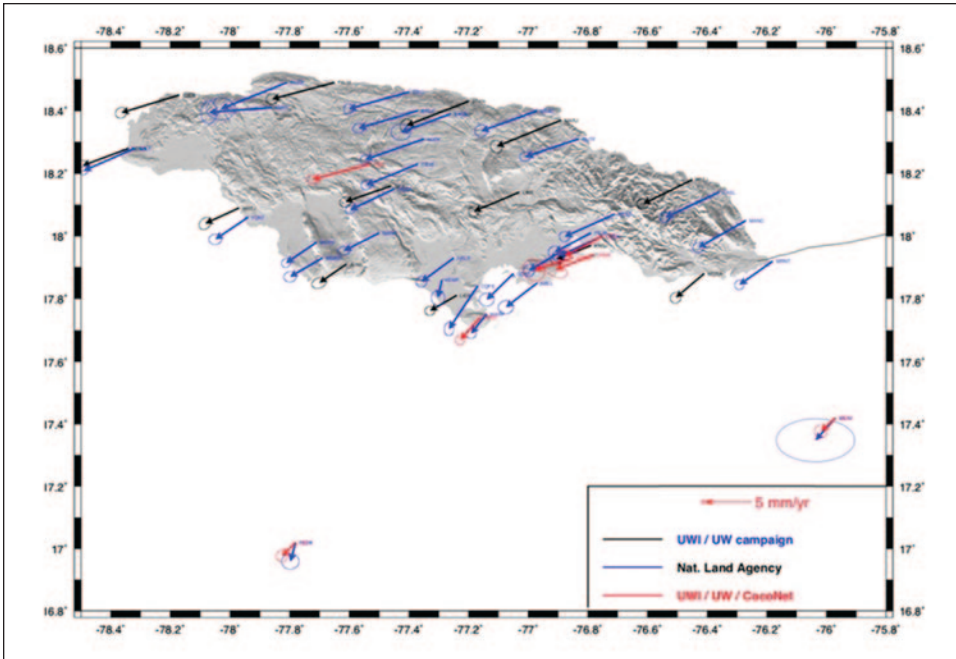


Figure 4. GPS point movement in Jamaica, showing the general NE-SW compression

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 we were 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 Seismic Analyst visited the CTBTO for a one month Data Analyst Capacity Building training and the Network Engineer attended a one week training course on Seiscomp3 in Vienna. In addition all the technical staff members at the EQU received training in house.

EARTHQUAKES RECORDED

The JSN recorded 132 local events (Table 1, page 500) for the period from August 2018 to July 2019, compared to 74 recorded in the previous year. This is within the norm for annual fluctuations and does not reflect an increase in activity.

The largest 'cluster' of earthquakes was located to the north-east of Kingston in the north-western Blue Mountains Block/Wagwater Belt. A small cluster of earthquakes was also recorded to the north of Spanish Town and scattered earthquakes were recorded elsewhere (Figure 5, page 500).

EARTHQUAKE EVENT SUMMARY AUGUST 2018 to JULY 2019											
Year	Month	Located Events		Total located	Recorded Events					Total recorded	Felt Events
		Local	Near		Local	Near	Regional	Distant	Blasts		
2018	Aug	12	6	18	12	6	13	0	2	33	1
2018	Sep	14	4	18	14	4	15	0	0	33	3
2018	Oct	10	5	15	10	5	10	0	3	28	2
2018	Nov	9	3	12	9	3	29	0	5	46	1
2018	Dec	11	4	15	11	4	9	0	5	29	0
2019	Jan	15	4	19	15	4	16	0	6	41	2
2019	Feb	13	1	14	13	1	5	0	2	21	0
2019	Mar	9	4	13	9	4	10	0	7	30	0
2019	April	15	5	20	15	5	7	0	2	29	3
2019	May	8	0	8	8	0	12	0	6	26	0
2019	Jun	4	1	5	4	1	2	0	2	9	0
2019	Jul	12	3	15	12	3	3	0	3	21	1
ALL	Totals	132	40	172	132	40	131	0	43	346	13

Table 1: Events recorded by the Central Recording Station at the EQU from August 2018 to July 2019; of the 132 local events recorded, thirteen were felt.

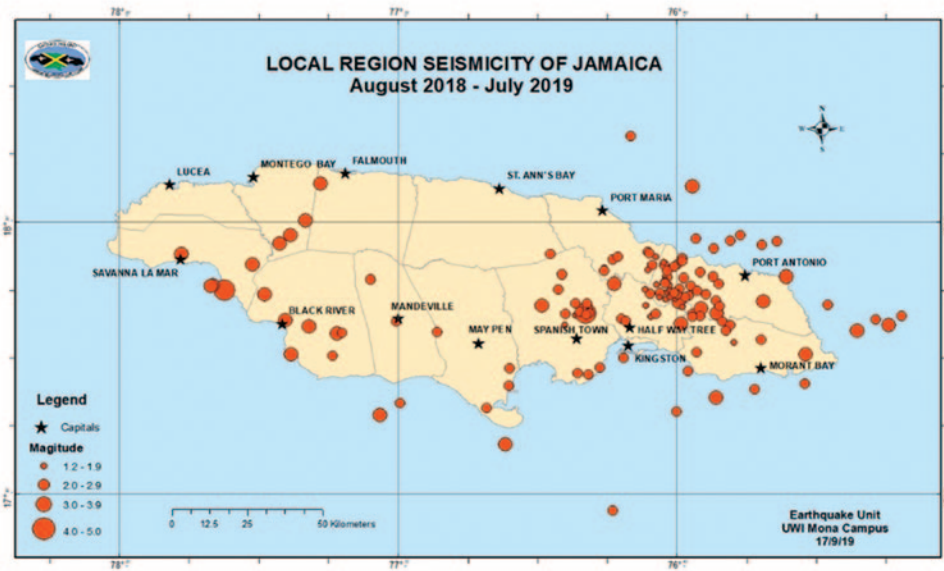


Figure 5. Earthquakes in Jamaica from August 2018 to July 2019.

The total number of event processed by the Jamaica Seismic Network was 346, which included: 132 local events, 40 near events, 131 regional events, and 40 blasts (Table 1).

COMMUNITY SERVICE

The Earthquake Unit works in close collaboration with ODPEM to disseminate the findings of research and bolster disaster risk reduction efforts. Other partners are, KSAMC, PIOJ, Jamaica Institution of Engineers, Portmore Municipal Council.

There were twelve school visits to the EQU during the year comprising totals of 554 students and 52 adults.

There were media engagements throughout the year with CVM-TV, RJR radio, TVJ, Nationwide Radio, Power 106, Loop Jamaica, Northern Caribbean radio.

COMMITTEES

- National Disaster Risk Management Council (NDRMC): Prevention and Mitigation, Preparedness and Emergency Operations, Recovery Planning, Public Education and Information
- Project Steering Committee: Strengthening the Disaster Risk Management of the Portmore Municipal Council
- Specially Vulnerable Area – Technical Working Group.