EARTHQUAKE UNIT

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WORK OF THE DEPARTMENT

Caribbean Tsunami Warning System

On March 12, 2007 a memorandum of understanding between the Government of Jamaica through the Ministry of Local Government and Environment and the United States Geological Survey was signed to enable one Global Seismograph Network station to be built in Jamaica. This station will be one of nine state-of-the-art seismograph stations that will form the core of a Caribbean Tsunami Warning System (CTWS). Four DART II buoys for detecting the actual tsunami wave in the sea have already been deployed.

Following the signing of the MOU a container of seismic equipment and parts will be shipped to Jamaica shortly and construction of the station infrastructure will begin. The station, code named MTDJ will be at Mount Denham/Pike in Manchester. The Earthquake Unit is the local partner/contact in the project and will be responsible for maintaining the station. To this end training has already been provided to the two technical staff as outlined below.

June 22-30, 2007: L. Choy attended USGS training in EARTHWORM software for seismic monitoring and automatic data processing and the USGS/UNESCO IOC and PRSN Caribbean Training Course in Seismology and Tsunami Warnings. Both courses were held at the Seismic Research Unit in Trinidad.

July 23-27, 2007: P. Williams and L. Choy attended the Caribbean Network Station Operator Technical Training Program at the USGS' Albuquerque Seismological Laboratories, in New Mexico.

Global Positioning System (GPS) project

On Feb 22 a GPS monument was established on Middle Cay of the Morant Cays (Figure 1). The GPS was left for one week collecting continuous readings and it was collected on March 2. The JDF Coast Guard facilitated both excursions. This concluded the phase of densifying the network of measuring points in Jamaica that started in 2005. Ten new sites have been added bringing the total number to thirty. In addition the data from three Government of Jamaica VRS sites was investigated and those from Linstead and Lionel Town were found to be useful to this project.

This year, twenty-three sites were occupied with the portable Trimble GPS and twelve sets of data downloaded from the permanent sites at Portland Cottage and Pike. The aim of the denser network is to attempt to identify how much movement is being accommodated on particular faults. The outcome from the first five years of monitoring (see Publications below) concluded that 8-11 mm/yr of deformation is being accumulated in the Jamaican crust and mostly along the south coast of Jamaica, hence the need for more stations on the south coast and on the cays.

Jamaica Seismograph Network (JSN)

Three stations had infrastructural upgrades this year, GWJ, NEJ and YHJ. In the case of GWJ and NEJ where the building was shared with communications providers often with undesirable results, the initiative was taken to implement stand alone metal cabinets planted in a concrete base, similar to that used by some telephone service providers. EQU cabinets and solar mounts were manufactured by the relatively new Mechanical Engineering Workshop (MEW) on campus. This new style housing for the station electronics will cost less and is easier to implement than even a small concrete building. The seismometers were buried temporarily to observe noise levels before the permanent pier/vault is built. In the case of GWJ the station was moved to lands owned by the Gibsons who kindly gave their consent. NEJ property is managed by RJR Communications group who also supported the move. YHJ already has a small private building but a proper seismometer pier had to be built.

At the end of May, all stations were working, but this was short-lived due to thunderstorms that rolled in by the middle of July. Fifty-nine (59) trips were made during the year to service the stations, and forty-

five transmitters and receivers were repaired in-house, most of the damage caused by lightning.

There are on-going discussions with representatives of the National Water Commission to erect an 80-foot communications tower on their property at Long Mountain. This should improve the communications infrastructure of the EQU and replace Cooper's Hill relay which is the most significant source of downtime and damage to equipment caused by lightning.

Earthquakes Recorded

This year, three hundred and one (301) earthquakes were detected by the JSN which contributed 3,917 records to the existing database. One hundred (100) were local natural earthquakes and 22 declared to be due to man-made explosions; one hundred and twenty-five (125) were regional events and 54 distant. One hundred and eighty-three (183) earthquakes originated in the local and near Jamaica regions, seven (7) of which were reportedly felt on Jamaica. The largest and most widespread felt event originated on the Oriente Fracture Zone near southern Cuba and had a magnitude of 6.1 (USGS). The largest local earthquake had a magnitude of 3.9 and originated in Portland parish. Intensity reports were collected for these two events in the parishes most affected.

The Jamaica Strong Motion Network

The sites where these instruments are installed are mostly unsatisfactory. Permanent and secure free-field sites need to be developed for best results. Talks along these lines were initiated with the Permanent Secretary who plans to develop ties between the Unit and some Local Government agencies such as the Parish Councils and the Fire Stations in rural towns where ideal sites could be developed in the future. About twelve (12) maintenance visits were made to the eight accelerographs which are mostly ETNA type. One was redeployed in Port Antonio, this time at the marina. The unit from NEJ was removed and placed at STH as that unit is in need of repairs. The older SSA-2 unit at Old Harbour was removed pending repairs to the building. The unit from Mandeville was repaired and is to be redeployed shortly.

Other Accomplishments

At the Central Recording Station, SEISLOG and SEISAN software were fully implemented one of the new IBM PCs and several hours were spent training staff in basic data processing using SEISAN. XWIN-32 interfacing software was ordered through MITS in April. This will enable PCs on which it is installed to be used as terminals to the UNIX computer which is a safer and more efficient operating platform for SEISAN and the Unit's databases.

Development of a manual of procedure for the CRS began and compilation of a proposed station book was re-started. Data exchange continued with the ISC. This year about fourteen (14) months of data were sent covering up to May 2006.

K. Black represented the Unit in the 'Hazard Reduction and Climate Change' task force of the Planning Institute of Jamaica whose goal was to formulate plans that would bring first world status to Jamaica by 2030 in that sector.

A third workshop of the UNESCO-IUGS-IGCP Project 487, "Microzonation of Latin American Cities" was hosted by M. Wiggins-Grandison at the EQU from November 13-26, 2006.

National Data Centre

The EQU is Jamaica's National Data Centre (NDC) for the CTBTO through which data from its four global monitoring networks in seismology, hydroaccoustics, infrasound and radionuclide detection, can be made accessed. Checks and reports regarding the VSAT link were made regularly to the CTBTO's International Data Centre. The VSAT itself withstood all weather related phenomena up until now. However, it was necessary to effect repairs to the cable this year. This was carried out by engineers from Hugh's Corporation. An upgrade of the system is being scheduled. The CTBTO continues to support the NDC with training for staff.

PUBLICATIONS

Refereed Journal Articles

* DeMets, Charles and Margaret Wiggins-Grandison, "Deformation of Jamaica and motion of the Gonave

microplate from GPS and seismic data", Geophysical Journal International (2007) 168, 362-378.

Technical Reports

* Wiggins-Grandison, Margaret, "Seismic Risk in Jamaica: The NEM Portfolio", NEM Insurance Company Ltd., December 2006.

INCOME GENERATION

The year-long project valued at $2.1 million on seismic risk assessment for NEM Insurance Company Limited was completed in January. Discussions with NEM board members and re-insurers continued into March.

Five short consultations had combined earnings of $93,000.00.

PUBLIC SERVICE

M. Wiggins-Grandison

- Representative, Comprehensive (Nuclear) Test-Ban Treaty Organization
- Member, Federation of Digital Seismograph Networks
- Member, International Seismological Centre
- Member, Middle America Digital Seismograph Consortium
- Representative, National Committee on Science and Technology
- Member, National Disaster Committee
- Member, Seismological Society of America
- Member, Earthquake Engineering Research Institute