

EARTHQUAKE UNIT

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WORK OF THE UNIT

Threat of Tsunamis



The Earthquake Unit is the hub of seismic monitoring and research in Jamaica. We respond to the Government and people of Jamaica in incidences related to earthquakes. Arising from the December 26, 2004 Indian Ocean tsunami which claimed over 200,000 lives and resulted in huge property losses the EQU was asked to respond to the question of whether such an event could affect Jamaica and/or the wider Caribbean and what a warning system would entail.

To this end M. Wiggins-Grandison was interviewed by about 20 journalists from three countries -Jamaica, Cayman, and the Bahamas, presented at least six talks locally, and prepared an article on the subject which appeared in the Jamaica Gleaner's ODPEM supplement. In addition, she participated in a regional workshop hosted by officials from the United States Geological Survey in Puerto Rico on July 21.

Central Jamaica Earthquake (see Figure)

On the night of Sunday, June 12, 2005 central Jamaica was rocked by a magnitude 5.1 event that was felt practically island wide. About nine o'clock on Monday morning personnel from the EQU headed for the Aeon Town/Top Alston area and found that indeed quite a bit of damage was done. The intensity of the event was determined to be VII on the European Macroseismic Scale. A series of interviews with the local media followed and three more reconnaissance trips were made on June 14, 21 and July 5, though our personnel are few in number. A report on the event with location and intensity maps was submitted to the ODPEM and the Ministry of Land & Environment at the end of June.

Above: Earthquake of June 12, 2005, magnitude 5.1. Stars mark epicentres of main shock and aftershocks.

Below: (left) Small girl sits on the steps to what was her family house at Lemon Walk, southeast Trelawny; (right) top of a cockpit toppled by the earthquake, southwest St. Ann.



Grand Cayman earthquake M 6.8

On Tuesday December 16, 2004 a magnitude 6.8 earthquake occurred just south of Grand Cayman which shook the island quite badly and was felt marginally in parts of Kingston. The earthquake

made several holes in the ground in parts of Grand Cayman island though there were no reports of damage to the buildings. At the request of the Cayman Government M. Wiggins-Grandison visited the island from Friday December 17th to Sunday the 19th. Information pertaining to the earthquake and its aftershocks were presented, the holes were visited and explained and she was interviewed by the Cayman Information Service. One Geosig self-contained digital three-component seismograph was installed at the Mosquito Research Unit to record future earthquakes and Dr. Alan Wheeler was trained in how to operate the instrument and download events. During the first week of February, Dr. Wheeler visited the EQU and received further training in locating earthquakes using a single three-component station.

Performance of the Jamaica Seismograph Network (JSN)

The main task of the EQU is to operate the JSN, which is a perpetual business. Before Hurricane Ivan of September 10, 2004, ten out of twelve stations of the JSN were working. After the hurricane five stations remained – at Pike, UWI, Munro, Negril and Stony Hill. Stations at Yallahs and Kempshot were not working from before the hurricane. The station at Portland Cottage lost its roof and two solar panels; in general there were power outages at the sites that resulted in damage to the radio equipment, wind mangled antenna cables and one was broken due to a broken tower. Over \$400,000.00 was required to rehabilitate the network. However, the Central Recording Station at UWI which is solar powered operated throughout the onslaught. Recovery of the stations took from one to nine months, starting with Greenwich in St. Andrew, ending with Castle Mountain in Portland.

At July 31, stations at Yallahs and Negril were down. The refurbished Yallahs building (courtesy of Globe Insurance Co. Ja Ltd.) was occupied in April, but severe damage to the road resulting from Hurricanes Dennis and Emily in July made the site inaccessible to effect repairs to the equipment. As expected, the hurricane damage and consequent down-time of the stations resulted generally in worse performance this year than last. Conversely, five stations improved – those that were at the bottom (below 30%) last year. Four showed marginal improvements and one, BBJ, significant improvement jumping from 15 to 47%.

The medium term goal for the JSN is to upgrade stations to include digital recording at the sites and transmit the data by digital radio, telephone or internet whichever is readily available. This would yield cleaner signals with larger earthquakes being recorded on-scale. In 2004 a short proposal was submitted to the Ministry but no funding has been approved so far. Also there is a need to improve the efficiency of the solar plant at the CRS and to use solar power at more field stations.

The Jamaica Strong Motion Network

The number of ground acceleration records on file has grown to twelve as three accelerographs successfully recorded the June 12 earthquake. Two others were found inoperable with one of these adjudged to have damaged circuit boards. Another goal is to be able to check on these instruments regularly by telephone or wireless modems which would ensure their state-of-readiness to record earthquakes and facilitate remote uploading of data. Efforts by F. Ionica to secure telephone links to these instruments have not been successful to date.

Expansion of GPS network

Since 1999, the University of Wisconsin at Madison and the EQU have deployed Global Positioning Systems (GPS) across Jamaica to measure small ground movements related to aseismic fault slip. A number of existing sites were occupied during this year including sites proximal to the epicentre of the June 12 earthquake, and data were collected from the continuous sites at Pike and Portland Cottage, which are now both in need of repairs. The Ashtech antenna at Portland Cottage survived

Hurricane Ivan but not the receiver. A similar instrument at PIKE was taken down in May as signal quality had deteriorated. Continuous data will now come from the Government of Jamaica's three sites at Lionel Town, Linstead and Kingston. Meanwhile, three new monuments were installed, at Kemps Hill, Portland Cottage, and North-East Cay on the Pedro Banks. This last one was facilitated by the Jamaica Defence Force Coast Guard on May 24, 2005. More monuments are scheduled for the east coast and the Morant Cays as the project seeks to understand the movements of Jamaican faults.

National Data Centre (NDC) activities

M. Wiggins-Grandison attended CTBTO training course for NDC Managers from April 18 to 23, 2005 at the CTBTO HQ in Vienna, Austria. Efforts are underway through MITS to have the VSAT linked to the EQU's hub so that authorized staff can log in from their desktops.

Microzonation of Kingston

M. Wiggins-Grandison attended two workshops in preparation and commencement of UNESCO-IUGS-IGCP Project 487, "Microzonation of Latin American Cities". The first was on "3-D Modelling of Seismic Wave Generation and Propagation" at the International Centre for Theoretical Physics in Trieste, Italy from October 10 – November 6, 2004. While in Italy a visit was made to SARA Electronics Inc. the proposed new suppliers of analogue-to-digital recorders. The next workshop was in Havana, Cuba from April 9 12, 2005. A new Geology graduate, Leonard Green, was employed for the summer to compile GIS maps of the Kingston subsurface based on available well and borehole logs.

Office space Issue

In December 2004 the EQU received one 12'x 24' room from the Physics Department. With this additional space the unit was reconfigured to provide an office for M. Wiggins-Grandison and more working space in general for all employees. Thanks to everyone who played a role in settling this long overdue problem.

Teaching

In the first semester M. Wiggins-Grandison taught half of GL36A the combined Marine Geology and Applied Geophysics Course, which was offered for the first time in that format. This comprised twelve lectures and five 3-hour practical exercises. Thirteen students took the course.

Consultation

The EQU delivered four small consultations in which earthquake data was requested for specific areas, which earned just over \$30,000.00. One was complimentary for the GOJ regarding the Sligoville area.

Other

A new Library Studies graduate, Anmarietta Staines was employed for the summer to document and organise material in the EQU's small library. The list of holdings was turned over to the main library

for cataloguing and eventual inclusion in the UWI library's on-line database.

Leonard also developed web-pages, some interactive, for the EQU and we await the campus webmaster to have these uploaded.

The EQU employs two academic staff, a Seismologist and a Network Engineer. Per capita publications is 1.0.

Outreach

Over 500 students from schools across Jamaica visited the Unit.

PAPERS PRESENTED

M. Wiggins-Grandison

- . • “Earthquakes and Seismic Hazard in Jamaica”, Panel discussion on “Earthquake Threats – How prepared are we?” at the launch of ODPEM's Earthquake Awareness Week, Jamaica Pegasus Hotel, Kingston, January 10, 2005 [Power Point Oral presentation].
- . • “Atlantic Tsunamis with special reference to the Caribbean”, UWI's Research Day Symposium, “Living with Natural Hazards in Jamaica”, Social Science Lecture Theatre, January 28, 2005
- . • “Seismicity of Jamaica and the Caribbean”, Symposium on Natural Hazards, Northern Caribbean University, Mandeville, February 15, 2005
- . • “Earthquakes and Seismic Hazard in Jamaica” (abridged version), Ministry of Land & Environment Exhibition & Symposium, Methodist Church Hall, Montego Bay, February 17, 2005
- . • “The science of tsunamis and exposure of the Caribbean people to this natural phenomena”, Panel Discussion on Coastal Vulnerability and Tsunami Hazard in Jamaica by the Jamaica Geographical Society, UWI – Department of Geography & Geology, March 10, 2005
- . • “Microzonation of Kingston”, First International Conference on Earth Sciences, Havana, Cuba, April 5-8, 2005
- . • “Tsunami Warning in the Caribbean”, National Council on Ocean & Coastal Zone Management, Ministry of Foreign Affairs and Foreign Trade, Kingston, May 4, 2005
- . • “Jamaican Seismicity & the Jamaican Seismograph Network”, 17th Caribbean Geological Conference, San Juan, Puerto Rico, July 17 -21, 2005

PUBLICATIONS

Refereed Journal Articles

- * M.D. Wiggins-Grandison, K. Atakan. “Seismotectonics of Jamaica”. *Geophysical Journal International* 160 (2005): 573-580.

Non-refereed

- * M. D. Wiggins-Grandison, “Tsunamis and Jamaica”. *The Gleaner*, ODPEM's Disaster Supplement, January 2005.

PUBLIC SERVICE

M.D. Wiggan-Grandison

- .- Jamaican Representative, UN Comprehensive Nuclear Test Ban Treaty Organization
- .- Member, Earthquake Engineering Research Institute
- .- Jamaican Representative, Federation of Digital Seismograph Network
- .- Member, Geological Society of Jamaica
- .- Member, Jamaica Geographical Society
- .- Jamaican Representative, Middle America Digital Seismograph Consortium
- .- Member, National Committee on Science and Technology
- .- Member, National Disaster Committee
- .- Member, Seismological Society of America
- .- Jamaican Representative, US /Caribbean Seismic Station Network (USCaribNet)

