Puerto Rico Seismic Network
Dept. of Geology, University of Puerto Rico, Mayagüez
Status Report 2004 for FDSN

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Introduction

The Puerto Rico Seismic Network (PRSN) has been part of the Geology Department, University of Puerto Rico at Mayagüez, since 1987. It was installed in 1974 by the USGS for the Puerto Rico Electrical Power Authority. The PRSN monitors and routinely processes earthquakes generated in the Puerto Rico Region (latitudes 17.00N-20.00N and longitudes 63.5W-69.00W). The main objective of the PRSN is to record, process, analyze, provide information and research local and regional earthquakes. It also monitors teleseismic earthquakes. The ultimate goal is to produce high quality data and information to be able to respond to the needs of the emergency management, academic and research community, and the general public. Almost 1000 earthquakes a year are located by the PRSN in the Puerto Rico Region (Figure 1). Recurrent funding for the Network is provided by the University of Puerto Rico and the State Government of Puerto Rico which are supplemented by special projects, grants and research funds.

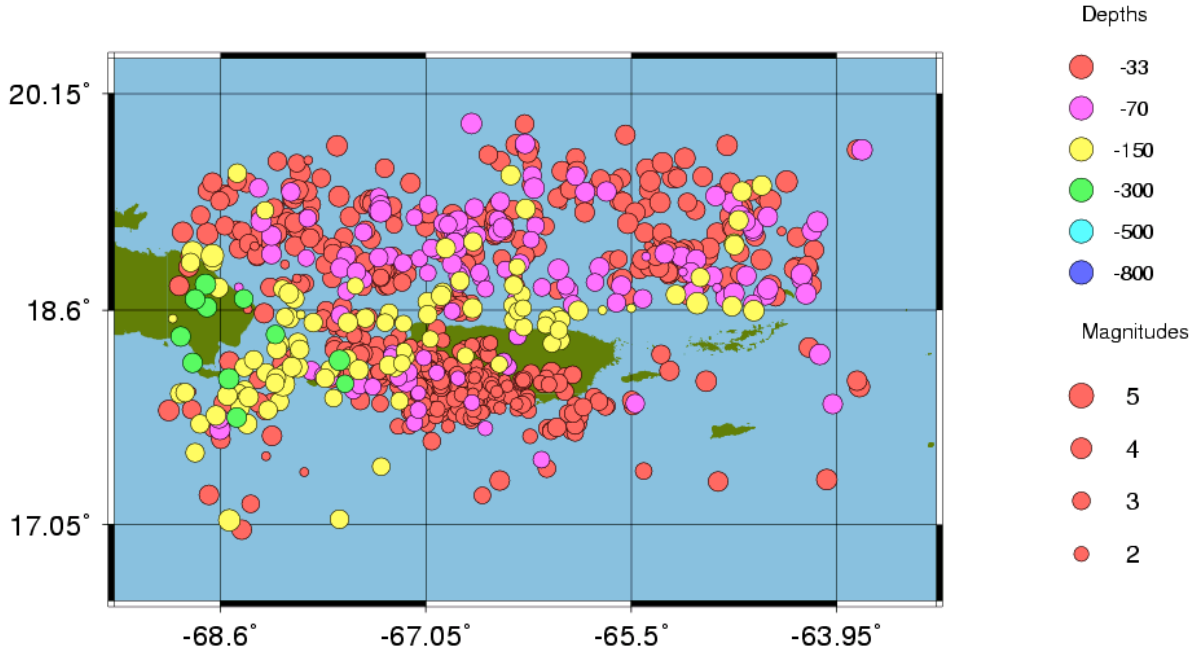

Figure 1. Distribution of seismicity in the Puerto Rico region located by the Puerto Rico Seismic Network for 2003.

Instrumentation

The PRSN operates a network of short period and broadband seismometers throughout Puerto Rico and the Virgin Islands (Figure 2).

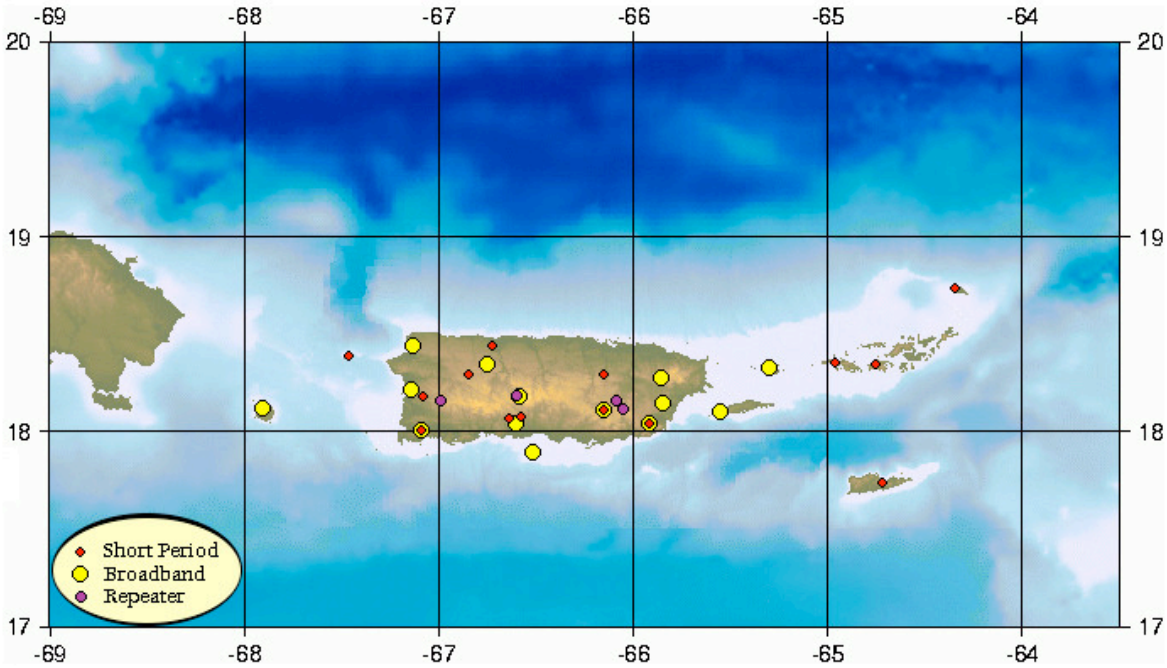

Figure 2. Distribution of short period and broadband seismic and repeater stations of the Puerto Rico Seismic Network.

The PRSN broadband network consists of 8 24-bit, digital telemetered and 5 tcp/ip stations. The GSN SJG station located in Puerto Rico is also accessed for routine data analysis and research. The PRSN uses Guralp CMG 40T, CMG 3 ESP and CMG 3T seismometers. The digitizers are from Refraction Technology and DAQ Systems. All the stations are sampled at 100 sps. They are linked to the central data collection center via Monitron UHF digital radios, DDS 56K telephone lines, spread-spectrum radios and Internet service (Table 1).

Table 1. List of Broad Band Stations located in the Puerto Rico region. At the broadband stations where there is additional equipment, the collocated instruments have been included.

STATION CODE	LOCATION	CHANNELS	DIGITIZER	NET WORK	*SENSOR	LOCATION		
						LAT (N)	LONG (W)	ELEVATION (M)
CBYP	Cubuy, Canóvanas, PR	HHZ HHN HHE	REF-TEK 72A-08	PR	CMG-40T	18.2716	65.8566	606.90

		HGZ HGN HGE	REF-TEK 72A-08	PR	FBA-23	18.2716	65.8566	606.90
+**CDPB**	Cerro Punta, Jayuya, PR	HHZ HHN HHE	REF-TEK 72A-08	PR	CMG-40T	18.1744	66.5911	1284.89
		HGZ HGN HGE	REF-TEK 72A-08	PR	FBA-23	18.1744	66.5911	1284.89
		+EHZ	DSP-A64	PR	S-13	18.0369	65.9150	376.62
CPD	Cerro La Pandura, Yabucoa, PR	HHZ HHN HHE	REF-TEK 72A-07	PR	CMG-40T	18.0368	65.9151	385.67
		HHZ HHN HHE	REF-TEK 72A-08	PR	CMG-40T	18.1094	67.9080	90.94
+**IMO**	Isla de Mona, PR	HGZ HGN HGE	REF-TEK 72A-08	PR	FBA-23	18.1094	67.9080	90.94
		EHZ	DSP-A64	PR	S-13	18.0076	67.0891	35.16
MGP	Maguayo, Lajas, PR	HHZ HHN HHE	REF-TEK 72A-07	PR	CMG-40T	18.0076	67.0891	35.16
		HGZ HGN HGE		PR	ETNA	18.0076	67.0891	35.16
		EHZ EHN EHE	DSP-A64	PR	L-4	18.1091	66.1502	456.88
SJG	Cayey, PR	BHZ BHN BHE	Q-680	IU	STS-1	18.1117	66.1500	457
		HGZ HGN HGE		PR	ETNA	18.1117	66.1500	456.88
		HHZ HHN HHE	REF-TEK C130	PR	CMG-3ESP	18.4675	67.1111	119.87
AGPR	Aguadilla, PR	HGZ HGN HGE	REF-TEK C130	PR	FBA-23	18.4675	67.1111	119.87
		HHZ HHN HHE	REF-TEK 72A-07	PR	CMG-40T	17.8933	66.5210	77.24
ICM	Isla Caja de Muerto, PR	HGZ HGN HGE		PR	ETNA	17.8933	66.5210	77.24

MTP	Monte Pirata, Vieques, PR	HHZ HHN HHE	REF-TEK 72A-07	PR	CMG-3ESP	18.0972	65.5525	120.00
		HGZ HGN HGE		PR	ETNA	18.0972	65.5525	120.00
+**CULB**	Monte Resaca, Culebra, PR	HHZ HHN HHE	REF-TEK 72A-08	PR	CMG-40T	18.3264	65.3006	50.00
		HGZ HGN HGE	REF-TEK 72A-08	PR	EPISENSOR	18.3264	65.3006	50.00
MPR	UPR/RUM, Mayagüez, PR	HHZ HHN HHE	NET-DAS	PR	CMG-3T	18.2117	67.1398	22.41
		HGZ HGN HGE	NET-DAS	PR	EPISENSOR	18.2117	67.1398	22.41
HUMP	Humacao, PR	HHZ HHN HHE	NET-DAS	PR	CMG-3T	18.1421	65.8489	79.1
		HGZ HGN HGE	NET-DAS	PR	FBA-23	18.1421	65.8489	79.1
OBIP	Ponce, PR	HHZ HHN HHE	NET-DAS	PR	CMG-40T	18.0428	66.6062	102.62
		HGZ HGN HGE		PR	ETNA	18.0428	66.6062	102.62
AOPR	Arecibo, PR	HHZ HHN HHE	NET-DAS	PR	CMG-3T	18.3466	66.7539	355.15
		HGZ HGN HGE	NET-DAS	PR	EPISENSOR	18.3466	66.7539	355.15

* The Episensors, Etna y FBA-23 belong to the Puerto Rico Strong Motion Program (http://www.uprm.edu/prsmp/)

\+ Out of service (August, 2004)

Seismic Data Acquisition and Distribution

Earthworm is used for the real-time acquisition and exchange of all the seismic data. These modules run on two separate computers for redundancy purposes. A Reftek rtpd server is used for the Reftek stations, while grfd is used for the Net Das from DAQ Systems. A separate computer is used as a waveserver to export waveforms (Figure 3). Waveforms from the broadband stations are exported to IRIS DMC and USGS NEIC. As of 2004, the

data is archived in GSE 2.1 format. Previous data is being converted from WGSN into GSE 2.1 format. During 2004, the PRSN has prepared the corresponding metadata files for these stations. At the PRSN the data is backed up on CDROM and is available upon request. As soon as all the metadata files are prepared the data will also be available through the IRIS DMC.

For processing local and regional earthquakes and documenting recorded teleseismic events, PRDANIS, a locally developed program is used. The Early Bird system of the West Coast and Alaska Tsunami Warning Center has been running since 2003 to automatically locate and calculate the magnitude for local earthquakes of magnitude greater than around 3.5 and larger earthquakes in the Caribbean region; this is as part of an emergent tsunami warning system.

Future Work

Over the next one to two years the PRSN is planning to install two joint Dominican Republic-PRSN broadband stations in eastern Dominican Republic. It also has plans to upgrade the seismic stations of Anegada, British Virgin Islands and St. Croix, US Virgin Islands to broadbands. The metadata documentation of the stations will continue to be a priority.

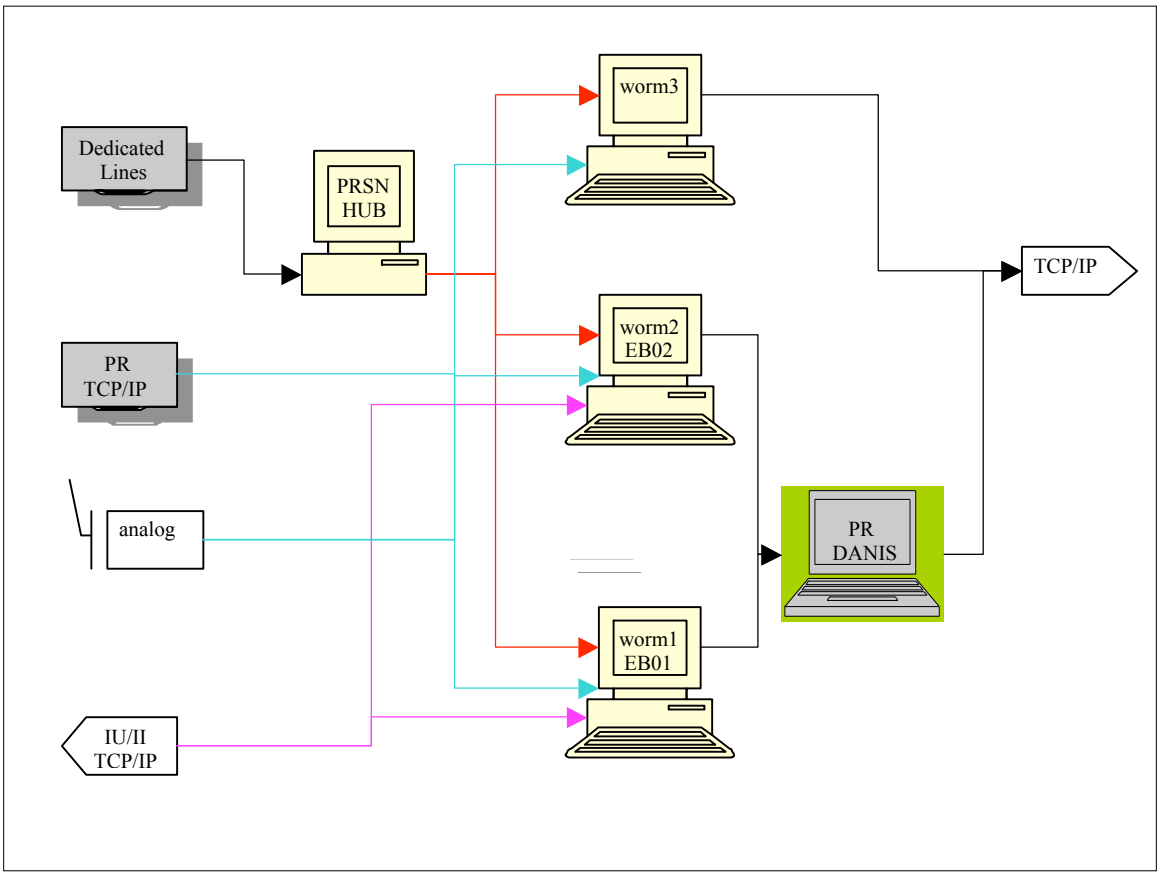

Figure 3. Seismic flow chart in the PRSN. Data sources are from refTEK (rtpd) dedicated lines, netDAS (grfd) internet links, analog telemetry and the Internet (TCP/IP). Data are

exported in two forms: (1) waveforms, waveserver (worm3) and parametric data (PR DANIS) via internet (TCP/IP).