Puerto Rico Seismic Network
Status Report 2005 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.
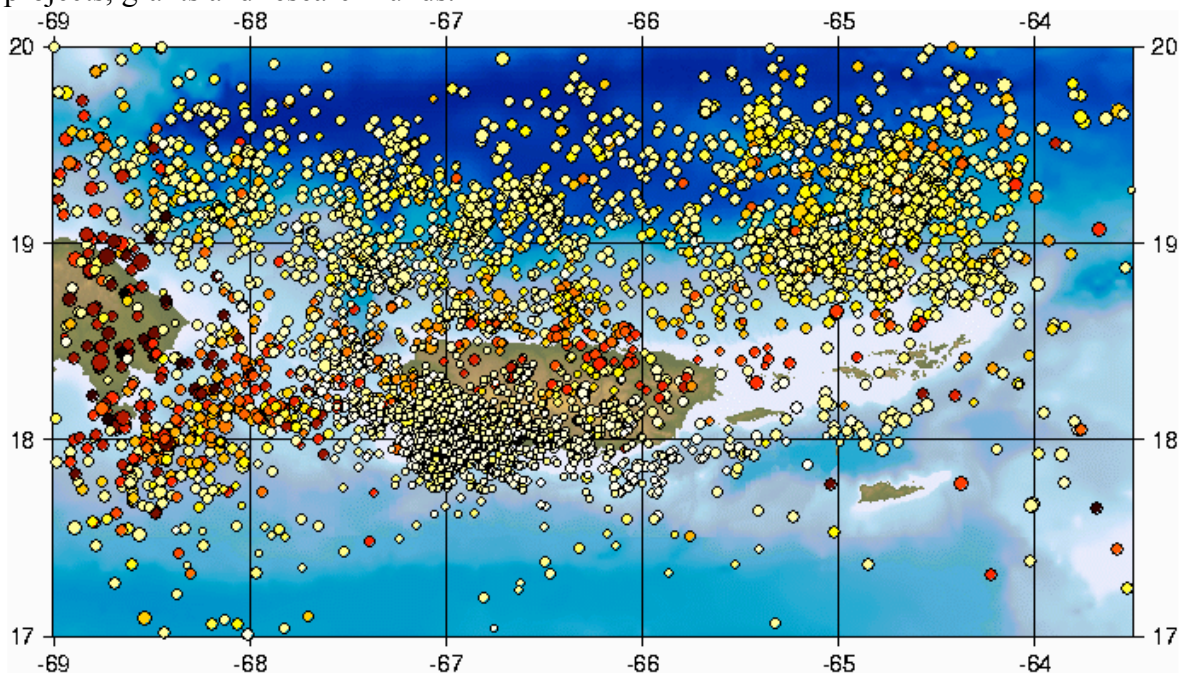

Figure 1. Distribution of seismicity in the Puerto Rico region located by the Puerto Rico Seismic Network for Sept. 2001-Sept. 2005, magnitude range (.6-5.3), depth (1- 191 km).

Instrumentation

The PRSN operates a network of short period and broadband stations throughout Puerto Rico and the Virgin Islands (Figure 2). The PRSN broadband network currently consists of 14 24-bit, 9 digital telemetry 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, Quanterra and DAQ Systems. All the broadband stations are sampled at 40 sps. They are linked to the central data collection center via VHF, UHF and digital radios, 56K telephone lines, spread-spectrum radios and Internet service (Table 1).
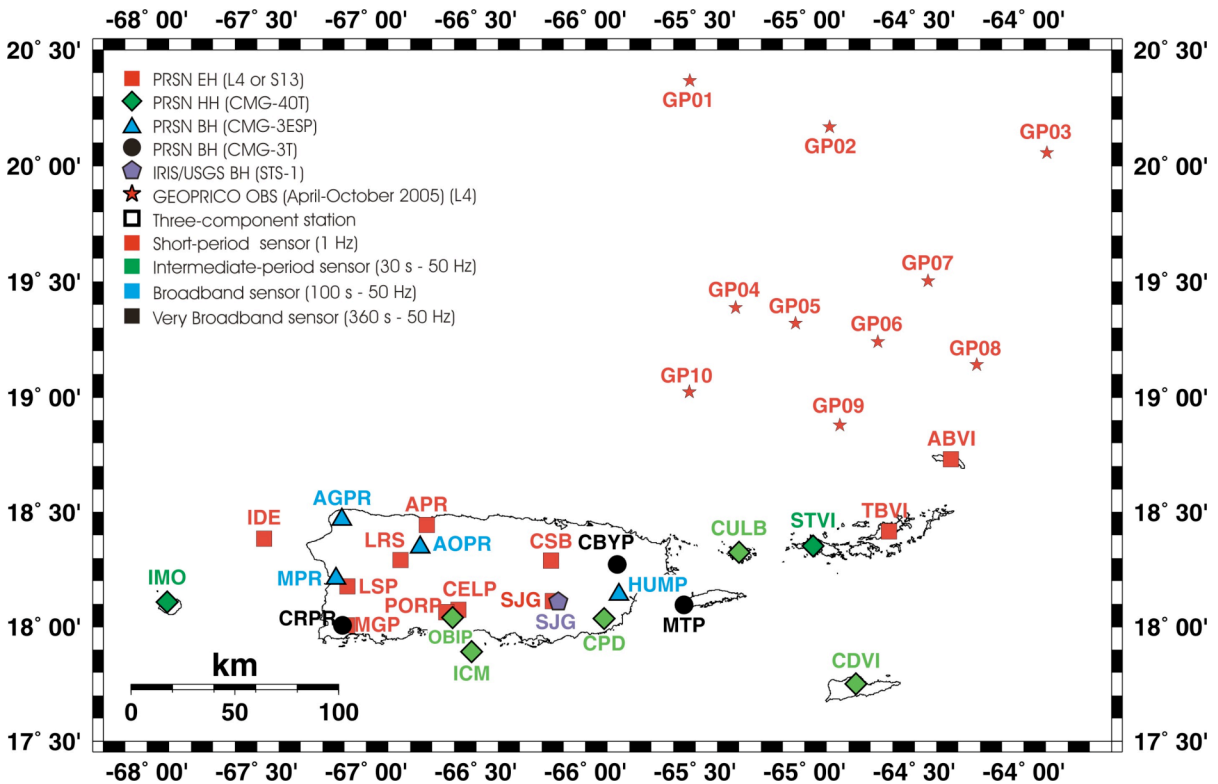

Figure 2. Distribution of short period and broadband seismic and repeater stations of the Puerto Rico Seismic Network. Positions of the temporary Ocean Bottom Seismograph (March – November, 2005) are also included.

Table 1. List of Broad Band Stations of the Puerto Rico Seismic Network.

STATION	TYPE	NET	LOCATION	LATITUD	LONGITUDE	ELEVATION	SENSOR	ACQUISITION
ABVI	BH?	PR	Anegada, BVI	18.72967 N	64.332534 W	7.97 m	CMG-40	NET-DAS Stand Alone
AGPR	BH?	PR	Aguadilla, PR	18.46749 N	67.11118 W	119.874 m	CMG-3T	Quanterra 330 Earthworm
AOPR	BH?	PR	Arecibo, PR	18.34665 N	66.75398 W	355.146 m	CMG-3ESP	REF-TEK 130 Earthworm
CBYP	BH?	PR	Canóvanas, PR	18.27167 N	65.85663 W	606.903 m	CMG-3ESP	REF-TEK 72A-08 Earthworm
CDVI	BH?	PR	St. Croix, USVI	17.75176 N	64.76613 W	31.140 m	CMG-40T	NET-DAS Earthworm
CPD	BH?	PR	Yabucoa, PR	18.03679 N	65.91511 W	385.670 m	CMG-3ESP	REF-TEK 72A-07 Earthworm
CRPR	BH?	PR	Cabo Rojo, PR	18.0064 N	67.1096 W	64.88 m	CMG-3ESP	REF-TEK 72A-07 Earthworm
CULB	BH?	PR	Culebra, PR	18.275617 N	65.300709 W	161.25 m	CMG-40T	REF-TEK 130 Earthworm
HUMP	BH?	PR	Humacao, PR	18.14207 N	65.84885 W	79.095 m	CMG-3T	REF-TEK 130 Earthworm
ICM	BH?	PR	Isla de Caja de Muerto	17.89336 N	66.52097 W	77.242 m	CMG-40T	REF-TEK 72A-07 Earthworm
IMO*	BH?	PR	Isla de Mona, PR	18.10947 N	67.90807 W	90.941 m	CMG-40T	Quanterra 330 Earthworm
MPR	BH?	PR	Mayagüez, PR	18.21169 N	67.13977 W	22.409 m	CMG-3T	NET-DAS Earthworm
MTP	BH?	PR	Vieques, PR	18.09722 N	65.55250 W	191.886 m	CMG-3ESP	REF-TEK 72A-07 Earthworm
STVI	BH?	PR	St. Thomas, USVI	18.35244 N	64.95662 W	383.053 m	CMG-40T	NET-DAS Earthworm

* Non operational 2005

Seismic Data Acquisition and Distribution

The Earthworm modular system is used for the real-time acquisition and exchange of all the seismic data (figure 3). These modules run on two separate computers for redundancy purposes. A Reftek rtpd data concentrator 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. Waveforms from the broadband stations are exported to IRIS DMC, USGS NEIC and the Pacific Tsunami Warning Center. As of 2004, the data is archived in GSE 2.1 format. Previous data is being converted from WGSN into GSE 2.1 format. The corresponding metadata files have been prepared for these stations. At the PRSN the data is backed up on CDROM/DVD and is available upon request. The data is also 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.
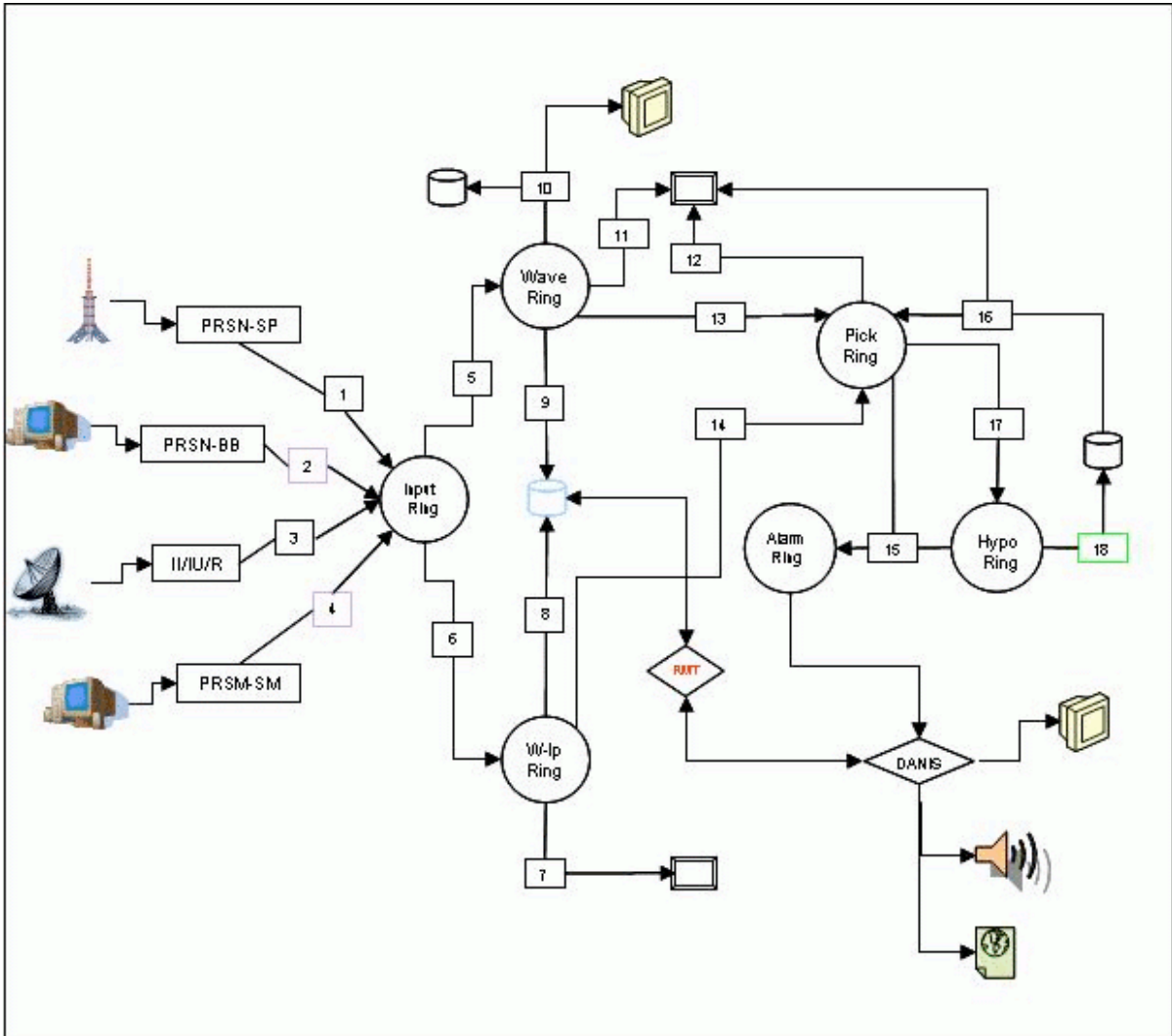

Figure 3. Seismic flow chart in the PRSN. Data sources are from refTEK (rtpd) dedicated lines, NETDAS (grfd) internet links, analog telemetry and the Internet (TCP/IP). Data are exported in two forms: (1) waveforms, wave server (worm3) and parametric data (PR DANIS) via internet (TCP/IP).

Future Work

Over the next year the PRSN is planning to install two joint PR-Dominican Republic broadband stations on the eastern side of the island. With the support of the USGS, satellites will be installed at Anegada and Isla Mona for real time communications. Funding has been requested to install a network of 6 tide gauge stations with a GOES receiver at PRSN for real time access to the data. The metadata documentation of the stations will continue to be a priority.