

Introduction to the Puerto Rico and Virgin Islands High-Rate GPS Network

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The Puerto Rico Seismic Network (PRSN) at the University of Puerto Rico at Mayagüez is a regional earthquake and tsunami monitoring institute. One of its primary objective is to provide timely and reliable earthquake and tsunami information and warning to the state (Puerto Rico) and local governments, the US and British Virgin Islands, as well as to the general public. Funded by a NSF Major Research Instrumentation (MRI) project, we have established a real-time high-rate GPS network in the Puerto Rico and Virgin Islands (PRVI) region with the major aim of improving the ability of the PRSN in rapidly and precisely monitoring large earthquakes. Traditional broadband seismometers are generally unable to capture the full bandwidth of strong ground motions following very large earthquakes. As a result, it is difficult to rapidly estimate the true magnitudes of large earthquakes using only seismic data. High-rate GPS has been justified as a very useful tool in recording long-period and permanent earthquake ground motions. Estimation of the true magnitude (and therefore tsunami potential) of large earthquakes can be determined more accurately in a timely manner (minutes after the quake) using high rate GPS observations. The current PRVI GPS network includes 10 permanent GPS stations. All of these permanent GPS stations are collocated or very-closely spaced (< 1 km) with seismic stations operated by the Puerto Rico Seismic Network and the Puerto Rico Strong Motion Program. They are also closely spaced (< 2 km) to the Tide Gauge stations operated by PRSN and NOAA. Therefore the GPS network will also complement current sea-level observation system to get accurate absolute sea-level changes after large earthquakes. The integrated Seismic-TideGauge-GPS observation system will certainly improve tsunami early-warning in this region. Continuous GPS observations from the PRVI GPS network have been integrated to the weather prediction and hurricane intensity forecasting system operated by UCAR. The PRVI GPS network also provides a stable reference frame for regional landslide monitoring and land surveying. Raw GPS data from the PRVI GPS network are freely available through the UNAVCO archive. As a result, a large number of researchers can potentially benefit from this GPS network.

