ABSTRACT

Determining an Optimal Seismic Network Configuration

Using Self-Organizing Maps

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The Seismic Research Centre (SRC), University of the West Indies operates a seismic network, the Eastern Caribbean Seismic Network (ECSN), spanning the Lesser Antilles island arc that may perform sub-optimally in detecting and correctly determining the magnitude of earthquakes. This is partly due to a diverse constitution of seismometers with regards to make, model and performance; and the utilization of a site selection process that relies on very intimate knowledge of the region's seismicity. This study seeks to apply Self-Organizing Maps (SOM), an Artificial Neural Network technique, to arrive at near optimal seismic network configurations with regards to the minimum detectable magnitude and magnitude precision. It is expected that the products of this project will aid the SRC in site selection and strategic instrumentation upgrade and placement that will improve the completeness of their earthquake catalog. The completeness of the SRC's earthquake catalog has direct implications in quantifying the seismic hazard the population of the region is exposed to.

By implementing Self-Organizing Maps a reconfigured ECSN yields a 47% increase in magnitudes less than $M_t = 3.0$.

Keywords: Earthquake Magnitude Detection; Seismic Network; Adaptive Neural Network; Self-Orgranising Map; Kohonen Network.