Testing ElarmS with Japanese Earthquakes

Holly Brown[1], Richard Allen[1], and Veronica Grasso[2]

1. Seismological Laboratory, University of California, Berkeley, United States
2. Group on Earth Observations, Geneva, Switzerland

Earthquake Alarm Systems, or ElarmS, is a network-based earthquake early warning methodology developed in California. It is currently processing seismic data in realtime from stations throughout California. Here we test the methodology's ability to process large-magnitude events, using a dataset of 84 Japanese earthquakes recorded by the K-NET strong motion seismic network including 43 with magnitude greater than 6.

Using the first few seconds of the P-wave arrival we determine regional scaling relations between magnitude and peak displacement, and between magnitude and maximum predominant period. We consider the effect of the number of seconds of P-wave data used and number of stations reporting data, and examine ElarmS' ability to process large-magnitude events. Our results show that ElarmS estimates the magnitudes of large earthquakes in Japan within half a magnitude unit on average.

From the observed errors in magnitude, location, and ground acceleration estimates, we develop an error model for ElarmS. The model predicts the error in any ElarmS estimate, based on the quantity of station observations included in the estimate. The model separates out error due to magnitude estimation, location estimation, and attenuation relations. We determine that the attenuation relations used by ElarmS contribute the largest error to the final prediction of regional ground shaking after each event.