

Implementing ElarmS for the Israeli Seismic Network – New Tools and Approaches

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Israel proximity to the Dead Sea Transform (DST) have led the Israeli government to initiate the building of an Earthquake Early Warning System (EEWS). The prime objective of this research is to implement, adjust and validate the ElarmS EEWS for the Israeli Seismological Network (ISN). Our approach for analyzing ElarmS performances with the non-EEW optimized ISN is threefold: (1) We analyze the system in real-time between April 2015 and July 2015; (2) analyze the results of replaying historical data from 39 events ($M_d > 3.0$) between January 2012 and May 2015; (3) analyze 4 simulated earthquake records for magnitudes $5.1 < M < 7.8$. We develop new tools for replaying historical and simulated data and to visually monitor and analyze ElarmS performance.

Historical playback results show near complete detection of all events. We adjusted magnitude estimation equation with a previously developed equation for Israel. Using the adjusted magnitude, the performance of the system shows a good agreement with catalog magnitudes.

The real-time implementation of ElarmS in Israel is performing well. It issued a warning for the widely felt June 27, 2015 M5.5 Nueba, the July 30, 2015 M4.4 Dead Sea and the November 19, 2016 M3.3 Lebanon earthquakes. However, the alert time is very short due to the significant latencies (2-4 sec) and long data packets (up to 10 sec) that exist for the ISN which has still to be optimized for EEWS.

The earthquake simulations results show a very good agreement with data, demonstrating the potential of using earthquake simulated scenarios for developing and testing EEWS. Further work is needed for creating more realistic simulations using more complex 3D velocity models, broader bandwidth and scenarios including foreshock/aftershock or simultaneous events.

The methods and tools developed during this work may be useful for implementing ElarmS in other regions and similar efforts are being made in the US Pacific Northwest, Turkey, Chile and South Korea.