[JJ] Evening Poster | S (Solid Earth Sciences) | S-CG Complex & General

[S-CG65]Reducing risks from earthquakes, tsunamis &volcanoes: new applications of realtime geophysical data

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As the number of population centers grows in regions with earthquake, tsunami and volcano hazards, the importance of improving methods for rapid, realtime estimates of activity increases. Realtime monitoring, analysis, and prediction of seismic ground motion, crustal movement and tsunami will be powerful tools to contribute to earthquake and tsunami disaster preparedness/mitigation. Tsunami and Earthquake Early Warning systems exist today in many locations around the world. Now JMA has started to promptly provide Eruption Notices to inform people of impending and beginning volcanic eruptions. Large events like the 2011 Tohoku Earthquake (Mw9.0) have demonstrated some of the shortcomings of existing techniques. In this session, we invite presentations on new ideas, methods and applications of (near) realtime analysis of seismic, geodetic and tsunami data, to the problem of realtime prediction aimed at improving disaster preparedness/mitigation in the fields of earthquake, tsunami and volcano observation. Presentations are encouraged to bring together scientists, engineers, and practitioners from a broad range of backgrounds from around the world, and to promote collaborative communication at the leading edge of the science and technologies.

[SCG65-P03]A feasibility study on the PLUM method with a dense observation network: An application to MeSO-net stations

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The PLUM method is an earthquake early warning (EEW) algorithm that predicts a seismic intensity at a target site directly from observed intensities within 30 km from the site (Kodera et al., 2018). Although the prediction procedure is very simple, the PLUM method outperforms conventional point source algorithms, which are implemented into many EEW systems, in terms of robust ground motion prediction for large earthquakes with complex rupture behavior and intense seismic activities. On the other hand, the PLUM method has a shortcoming in that long warning times are not available, which resulted from the limited use of observed intensities only within 30 km. A rough estimate of the maximum warning time is 10 s, assuming the S-wave velocity of 3 km/s and no system delay.

In this study, we investigated the feasibility of the PLUM method with a dense observation network, using Metropolitan Seismic Observation network (MeSO-net) stations, deployed around the Tokyo metropolitan area with a several-km interval. The use of a dense network would enhance the timeliness of the PLUM method; multiple stations can immediately detect earthquakes that occur beneath the network. In addition, the dense network may allow to estimate detailed characteristics of ongoing wavefields such as propagation direction and apparent velocity. Incorporating such wavefield features would improve the prediction procedure of the PLUM method.

As the first step, we simulated the original PLUM method using waveform records of MeSO-net stations and evaluated the prediction accuracies and available lead times. Site corrections used in the PLUM method were obtained by comparing observed intensities at target sites to an interpolated intensity distribution based on seismic intensity data reported by the Japan Meteorological Agency (JMA). When applied to 81 M>=5 earthquakes that occurred around the network from 2009 to 2016 except earthquakes in March 2011, the PLUM method provided predicted intensities with an error of less than 0.4 unit on the JMA instrumental intensity scale in average for sites with observed intensities of 3.5 or more. The average of available lead times was 3.6 s for a seismic intensity threshold of 3.5. Compared to simulation results using KiK-net stations (Kodera, 2018), several-second additional lead times were provided in this simulation for seismic intensity thresholds of 2.5, 3.0, and 3.5; however, the prediction errors were ~0.2–0.6 units larger, and the overpredictions were apparent especially for sites with relatively low intensities (<= ~3). Although the PLUM method exhibited acceptable performance for sites with high seismic intensities, the prediction procedure may need to be improved for more accurate predictions for sites with low intensities.

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