Performance of a Low-Cost Earthquake Early Warning System (P-Alert) and shake map production during the 2018 Mw 6.4 Hualien (Taiwan) Earthquake

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On February 6, 2018, a Mw 6.4 earthquake struck near Hualien city, in eastern Taiwan with a focal depth of 10.4 km. The earthquake caused strong shaking and severe damage to many buildings in Hualien. The maximum intensity during this earthquake reached VII (> 0.4 g) in the epicentral region, which is extreme in Taiwan, and capable of causing damage in built structures. Seventeen people died and approximately 285 were injured. Taiwan was one of the first countries to implement an earthquake early warning (EEW) system that is capable of issuing a warning prior to strong shaking. In addition to the official EEW run by the Central Weather Bureau (CWB), a low-cost EEW system (P-Alert) has been deployed by National Taiwan University (NTU). The P-Alert network is currently operational and is capable of providing on-site EEW as well as a map of expected ground shaking. In present work, we demonstrate the performance of the P-Alert network during the 2018 Hualien earthquake. The shake maps generated by the P-Alert network were available within 2 minutes and are in good agreement with the patterns of observed damage in the area. These shake maps provide insights into rupture directivity which are crucial for earthquake engineering. During this earthquake individual P-Alert stations acted as onsite EEW systems and provided 2-8 s lead-time in the blind zone around the epicenter. The co-seismic deformation (Cd) is estimated using the records of P-Alert stations. The higher Cd values (Cd > 2) in epicentral region are very helpful for authorities to respond for the purpose of damage mitigation.