



Testing the seismology-based landquake monitoring system

Wei-An Chao

Department of Geosciences, National Taiwan University, Taipei, Taiwan (vvnchao@gmail.com)

I have developed a real-time landquake monitoring system (RLMs), which monitor large-scale landquake activities in the Taiwan using real-time seismic network of Broadband Array in Taiwan for Seismology (BATS). The RLM system applies a grid-based general source inversion (GSI) technique to obtain the preliminary source location and force mechanism. A 2-D virtual source-grid on the Taiwan Island is created with an interval of 0.2° in both latitude and longitude. The depth of each grid point is fixed on the free surface topography. A database is stored on the hard disk for the synthetics, which are obtained using Green's functions computed by the propagator matrix approach for 1-D average velocity model, at all stations from each virtual source-grid due to nine elementary source components: six elementary moment tensors and three orthogonal (north, east and vertical) single-forces. Offline RLM system was carried out for events detected in previous studies. An important aspect of the RLM system is the implementation of GSI approach for different source types (e.g., full moment tensor, double couple faulting, and explosion source) by the grid search through the 2-D virtual source to automatically identify landquake event based on the improvement in waveform fitness and evaluate the best-fit solution in the monitoring area. With this approach, not only the force mechanisms but also the event occurrence time and location can be obtained simultaneously about 6-8 min after an occurrence of an event. To improve the insufficient accuracy of GSI-determined location, I further conduct a landquake epicenter determination (LED) method that maximizes the coherency of the high-frequency (1-3 Hz) horizontal envelope functions to determine the final source location. With good knowledge about the source location, I perform landquake force history (LFH) inversion to investigate the source dynamics (e.g., trajectory) for the relatively large-sized landquake event. With providing aforementioned source information in real-time, the government and emergency response agencies have sufficient reaction time for rapid assessment and response to landquake hazards. Since 2016, the RLM system has operated online.