Optimizing the methods used for seismic source localization in earthquake early warning and precise localization

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China is one of the countries affected by great earthquakes in recent years. Although domestic and foreign seismologists have been focusing on studying earthquake prediction and exploring the mechanism of earthquake precursors, making an accurate real-time earthquake prediction is still impossible. Instead, the earthquake early warning (EEW) system has been used and became an important technique in reducing the impact of earthquake disaster to the society. In addition to forecast for the three seismic parameters, the method called numerical shake prediction and an improved method by using the spectrum of the full waveform have been developed recently (Hoshiba et al., 2015; Stankiewicz et al., 2015).

The project aims to develop a method to ensure higher localization accuracy for EEW (one, two and three seismic recordings are used) and for precise seismic source localization (multiple seismic recordings are used). The techniques for precise localization have been well developed, but most of them are based on seismic networks. In order to complete the earthquake location within the first 3 to 4 seconds after detection of an earthquake motion, a different approach based on the information of waveform and arrival time within the first a few (3-4) seconds after detection of P wave from one, two, three and multiple stations is needed. Therefore, how to use the data recorded by the stations within a local network to dynamically make an optimal real-time earthquake location is the key point. So, this project will study (1) the rapid determination of seismic location by using one, two and three seismic recordings, (2) precise seismic localization when multiple stations are triggered.