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PreSEIS - Applications to a Neural Network Approach for Earthquake Early Warning

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Presented will be results of parameter studies for earthquake early warning using PreSEIS, an earthquake early warning approach for finite faults (Böse, 2006). It is based on artificial neural networks (ANNs), which are used to estimate the likely source parameters of an earthquake, i.e. the hypocentral location and the moment magnitude, from ground motion records observed at early warning stations in a seismic network. PreSEIS integrates the available information on ground motion at the different stations and updates the estimates of seismic source parameters every 0.5 seconds, beginning at the time of the initial P-wave onset.
PreSEIS has been developed and successfully tested with synthetic waveform data on the example of Istanbul, Turkey (Böse, 2006). We will present results of the first applications of PreSEIS to real data. The parameter studies include data from Southern California in a moment magnitude range between 2 and 7.1, recorded at stations from the Southern California Seismic Network. Due to the fact that not all of the considered stations have recorded each earthquake, the missing records were replaced by synthetic envelopes of ground motion, which were calculated using envelope attenuation relationships developed by Cua (2004). These synthetic envelopes together with the envelopes of the observed ground motions were used as an input for PreSEIS and for training the ANNs. The actual estimation of location and magnitude was then performed using a couple of example earthquakes from the dataset. The results are promising and show robust performances of source parameter estimations in terms of earthquake early warning.