



Automatic determination of seismic phase arrival times for microearthquakes in local to regional distances

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P- and S-wave phase arrival picking is important for hypocenter source inversion. This study developed a method for the automatic determination of arrival times of seismic phases. The implementation of the method consists of five steps. The first one is the initial declaration of an event in continuous seismic data using a characteristic function, which was also designed in this study. The second is the automatic determination of the P-wave phase arrival time using the normalized squared-envelope function. The third is the application of three-axes rotation using the energy ratio computed as a combination of the three-component seismograms of the detected events. The fourth is the automatic determination of the S-wave phase arrival time. The final step is the removal of falsely determined time in some records using a Wadati diagram, which plots S-P times against P-wave phase arrival times for the stations used in the initial stage. The method is applied to continuous waveform data from a temporary broadband seismograph network consisting of 20 stations distributed throughout Jeju Island. Comparison is made with the results of KMA and KIGAM which administrate the regional seismic networks in Korea. It is confirmed that the automatic event detection and determination of phase arrival times using the proposed algorithm were accurate, resulting in a hypocenter difference of only about 0.5 km in a comparison with the manual analysis, but difference of about 3 km with KMA and KIGAM.