高密度地震観測網による即時強震動予測

Real Time Strong Motion Prediction by High Dense Seismic Observation Network

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Most of the damages by shallow inland earthquakes are concentrated on the fault and surrounding areas. For instance, the highest level of intensity by an event of M7 class is often located within an area of 50-60 km from the source area. It is also noted that the shaking duration in the source area is approximately of 20-30 s. However, the current Earthquake Early Warning (EEW) in Japan has the difficulty to reach the strong motion prediction information in this area. In this study, we argue the possibility of using the peak ground accelerations (PGAs) and peak ground velocities (PGVs) obtained from P-wave amplitude for EEW. We investigated PGAs and PGVs in time step of 0.1 s (10 samples) of P-waves using 100,000 records from 2,000 events. The data were obtained from K-NET of National Research Institute for Earth Science and Disaster Prevention (NIED) from 1996 to 2016. Events were located in inland and coast regions, and records with a maximum epicenter distances of 20 km were included. In our results, the amplitude ratio of PGAs and PGVs obtained from S-wave to those obtained from P-wave has approximately a value of 5.9, which is close to the theoretical value (i.e., value of 5). The amplitude ratio shows a strong correlation with the time step when reach 0.5 s and follows, measured from the onset of P-wave. The PGAs and PGVs amplitude obtained from short period of P-waves are likely proportional to the scale of destruction, which it makes possible to estimate the microscopic seismic source parameters such as the inhomogeneity, strong motion generation area (i.e., asperity size), and the stress drop in the source area. We discuss the changes of the apparent velocity with different azimuthal angles of the source and surrounding areas. We also discuss the optimum network distribution for EEW using the proposed method. This study shows the potential of strong motion prediction obtained from short-period amplitudes by densely distributed seismic networks.

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