Automated hypocenter detection system using both Hi-net and online temporal observation data

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Fundamental seismic observation networks such as NIED Hi-net and F-net enable us to monitor moderate size seismic activity uniformly for whole Japan. Once a large earthquake occurs, its hypocenter location, magnitude, and mechanism are automatically determined. The earthquake information and the seismograms are opened to the public through the web site. It is also important to correctly monitor the spatial and temporal distribution of its aftershocks in order to assess and prepare for the events that possibly occurs after the large earthquake. However, the fundamental seismic observation networks are not suitable for correctly monitoring the aftershock and swarm activities because the station distribution is too sparse for the detail hypocenter determination. We, hence, constructed an online analysis system and examined its performance. We incorporated mobile observation records into continuous Hi-net records for automated hypocenter determination. We first developed a system in which the seismograms obtained by a mobile observation are transmitted to the NIED Data Management Center in Tsukuba and are compiled with the continuous Hi-net records for the automated analyses. The observed data were continuously stored in the integrated system within a few minutes. We investigated the performance of the automated hypocenter determination by taking the 2015 swarm activity of Hokone volcanic area, Japan as example. The records of a mobile station installed adjacent to the swarm activity increased the number of the automatically determined hypocenters. Also, the hypocenter locations were improved, in particular, the depths of the earthquakes were well constrained and became a few km shallower than those without using a mobile station.

Keywords: fundamental seismic observation network, mobile observation, automated hypocenter detection

