

Hypocenter determination around the 2011 off the Pacific coast of Tohoku Earthquake by automatic processing using PF method

*Koji Tamaribuchi¹, Shigeki Nakagawa²

1. Meteorological Research Institute, 2. Earthquake Research Institute, The University of Tokyo

The 2011 off the Pacific coast of Tohoku Earthquake caused extremely active seismicity over a wide area. In this situation, because all the detectable earthquakes could not be completely scrutinized, the Japan Meteorological Agency (JMA) set the higher threshold of the magnitude for registering with the JMA unified catalog. In the Tohoku case, JMA used $M \geq 3$ in offshore and $M \geq 2$ in inland of the aftershock area as the threshold. However, the automatic hypocenter determination system using Bayesian estimation (PF method; Tamaribuchi et al., 2016) was developed to determine hypocenters in the wide aftershock area, and JMA has started to operate this method since April 2016. For example, this method could determine over 70,000 hypocenters in range of two months for the 2016 Kumamoto Earthquake. In this study, we applied this method to the continuous seismic waveform data in March 2011 with the petabyte-scale large continuous seismic data analyzing system (Nakagawa et al., 2016) of the Earthquake Research Institute. As a result, this method determined 122,353 events more than twice as much as the JMA unified catalog (55,273 events) in March 2011. Comparing our results with the JMA unified catalog, a large number of missing events was found and the detection rate is approximately 90% for $M \geq 1$ events at the shallow inland area (Depth ≤ 30 km). The PF method is effective for monitoring spatio-temporal aftershock activity even in the wide aftershock area such as the Nankai Trough earthquake. We also report the detailed features of seismic activities revealed by newly detected events.

Keywords: automatic hypocenter determination, the 2011 off the Pacific coast of Tohoku Earthquake