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Improvement of Automatic Hypocenter Determination in JMA

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Estimating spatial and temporal hypocenter distributions in swarms and aftershocks quickly is essential for taking a measure to mitigate earthquake disaster. The automatic hypocenter determination method is important to grasp seismic activities in real time, especially after the 2011 off the Pacific coast of Tohoku Earthquake.

JMA can usually determine 90% or more hypocenters automatically compared with JMA catalog (M $>=$ 2.0). However their determination rate fall to 10-30% in swarms and aftershocks due to rise of a trigger level and wrong pickings. We examined several approaches to solve these problems.

First, we examined to pick phases every second by AR-AIC method, without using trigger by STA/LTA. This approach increased wrong pickings, but also increased correct pickings.

Second, we examined the particle filter method [Yamada (2011)] and the pattern matching method [Tsukada and Ohtake (2001)]. These methods can separate earthquakes that occurred at the same time. We applied these methods for some swarms and aftershocks activity, including the 2011 off the Pacific coast of Tohoku Earthquake.

In addition, we examined the stacking algorithm [Sakai (1998), Tamaribuchi et al. (2011)] and the scanning method [Nakagawa and Hirata (2000)] for swarms. We also applied the envelope correlation method [Obara (2002)] for detect low-frequency earthquake swarms.

References:
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