## Real-time monitoring of the 2016 Kumamoto Earthquake sequence by new automatic hypocenter determination method

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The Japan Meteorological Agency (JMA) unified seismic catalog has been widely used for research and disaster prevention purposes for more than 20 years. On April 1, 2016, JMA started operating a new automatic hypocenter determination method [PF method; Tamaribuchi, 2018]. The PF method can determine the hypocenters that occur simultaneously by searching for the optimal combination of P- and S-wave arrival times and the maximum amplitudes using a Bayesian estimation technique.

Since the introduction of the PF method, the number of detected earthquakes has almost doubled due to a decrease of the completeness magnitude around the Tohoku region, where seismicity has been very active in the aftermath of the 2011 Tohoku earthquake. We also considered the use of automated event characterization in real-time monitoring of earthquake sequences. Especially, in the 2016 Kumamoto earthquake sequence, we successfully detected about 70,000 events automatically during the period from April 14 to May 31. The PF method is capable of monitoring the migration or expansion of the hypocentral distribution and can support statistical analyses such as variations of the b-value distribution.

Furthermore, this method can be also applied to the Earthquake Early Warning. In December 2016, JMA started operating the new automatic hypocenter determination method (called IPF method; Integrated Particle Filter method). Further improvements in automatic hypocenter determination will contribute to a better understanding of seismicity as well as rapid risk assessment, especially in cases of swarms and aftershocks.

## Reference

Tamaribuchi, K., 2018, Earth Planets Space, 70:141. https://doi.org/10.1186/s40623-018-0915-4