Geophysical Research Abstracts
Vol. 16, EGU2014-3259-1, 2014
EGU General Assembly 2014

Adaptive forecasting of aftershock activity after the main shock

Takahiro Omi (1), Yosihiko Ogata (2), Yoshito Hirata (1), and Kazuyuki Aihara (1)
(1) The University of Tokyo, Japan, (2) The Institute of Statistical Mathematics, Japan

Forecasting aftershock activity is useful to reduce seismic risks in the affected area after the main shock. The difficulties to forecast aftershocks are (i) a forecasting model should be tailored to each aftershock sequence because the statistical property varies greatly according to an individual aftershock sequence and (ii) the forecasting model has to be estimated from highly deficient data where a significant fraction of early small aftershocks are missing from seismic records. To overcome this difficulty, we have been developing a statistical model to deal with incompletely detected aftershocks, in which the detection rate of aftershocks is sequentially estimated in a state-space modeling approach. Our method enables us to robustly estimate the forecasting model of underlying aftershocks including not only observed aftershocks but also missing ones from the incomplete catalog. We show that the Omori-Utsu formula can be well estimated only from a few hours of the data, and then it can be revised by the epidemic type aftershock sequence (ETAS) model to adaptively forecast an aftershock sequence with the individual cascading feature as the data size increases in real-time. We demonstrate that how these estimated models can effectively forecast the aftershock activity. We also discuss how these models can be implemented in an operational system for earthquake forecasting.

References:
T. Omi, Y. Ogata, Y. Hirata, and K. Aihiara, “Forecasting large aftershocks within one day after the main shock”, Scientific Reports, 3, 2218 (2013).

T. Omi, Y. Ogata, Y. Hirata, and K. Aihiara, “Estimating the ETAS model from an early aftershock sequence”, (In submission).