MAGNITUDE CORRELATION BETWEEN EARTHQUAKES IDENTIFIED IN AFTERSHOCK SEQUENCES

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Key words Earthquakes, magnitude correlation, short-time aftershock incompleteness (STAI).

Although the time and space clustering of seismic occurrence is well established [1, 2], the existence of correlations between earthquake magnitudes is a rather controversial subject. They have historically been considered as non-existent, until recent works reporting magnitude correlations between earthquakes that are close in space and time [3, 4]. However, these results could be influenced by catalogue incompleteness, and their relevance is still being discussed [5, 6]. Here we present an original analysis that confirms the existence of magnitude clustering in aftershock sequences. We eliminate temporal correlations by converting the power law distribution of times (Omori's law) into a uniform distribution. In this new aftershock sequence, the number of low and medium magnitude earthquakes suffer from catalogue incompleteness at the beginning of the sequence, before getting a value that remains constant during the whole period of analysis. However, high magnitude earthquakes are abnormally more numerous at the beginning of the sequence, which reveals the existence of correlation between the mainshock's high magnitude and the aftershocks magnitudes. These results challenge the idea of randomly distributed magnitudes, indicating a need for updating the forecasting of high-energy events in aftershock sequences and opening new perspectives in the modelling and analysis of earthquake time series.

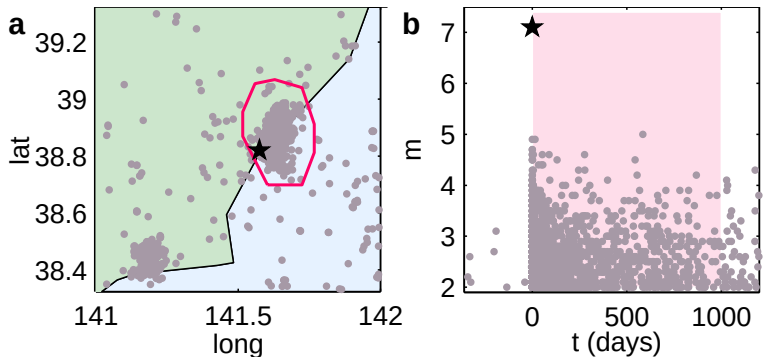

Figure 1. Example of data analyzed in the study. **a,** Part of the Japan map, near the east coast of Honshu, where earthquakes occurring from 26.05.2002 to 07.09.2006 are represented by gray dots. The star marks the earthquake of magnitude (JMA) 7.1 of May 26 2003. The delimiting polygon of the cluster is represented with the plain pink line. **b,** Time distribution of the events within the cluster on (a), for the same time period.

References

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