Predicting New Zealand Earthquakes Using the 'M8' Algorithm

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Abstract

The M8 algorithm uses seven time series to issue intermediate term earthquake predictions, stipulating which areas have an increased probability of a strong earthquake in the next five years. The series measure the frequency of earthquakes, change in frequency, energy release, and numbers of aftershocks. If six out of seven series (including series 7) cross the thresholds specified a 'Time of Increased Probability' is declared. This thesis takes the series as given and examines the role of each series. It also explores using alternative ways of summarising the predictive information in the series, using linear combinations of them rather than considering the number of series which cross certain thresholds.

It was found that the maxima of the series, rather than linear combinations of them, are related to future earthquakes. It was also found that the series have no predictive power unless they are all considered. Both of these findings are consistent with M8s own treatment of its series. The models using the M8 series that were constructed here can not be generalised to data they were not constructed with, so they cannot be used as a prediction tool. However, because of the scarcity of large earthquakes, earthquakes targeted for prediction have magnitudes less than the magnitudes that M8 is intended to predict. When data is available with enough target magnitudes that the algorithm is designed to predict the algorithm may yet be proven to be a successful tool for intermediate term earthquake prediction.

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