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Assessment of optimal short-term earthquake forecasts based on ULF seismo-magnetic data

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Our previous statistical studies have indicated that the ULF seismo-magnetic phenomena contain precursory information and can be useful in short-term forecasting of sizable earthquakes. In practice, for given series of precursory signals and related earthquake events, the efficiency of forecast is a function of the leading time of alarms (delta) and the length of alarm window (L). To find out the best prediction strategies, Molchan's error diagram has been employed. The same as our previous study, we utilized geomagnetic data and earthquake events registered in Kakioka (KAK), Japan during 2001-2010. Ratios of observed energy to modeled background are applied to indentify precursory signals. A modified area skill score, which measures the area between actual prediction curve and random prediction line, is introduced to assess the efficiency of different prediction strategies. The results indicate that ULF magnetic data at KAK contains higher precursory information when delta is around 1 week and L is less than 4 days or delta is 13-14 days and L is less than 1 week; the optimal strategy of short-term forecasts is: delta =8 days and L =1 day. The methodology proposed in this study could help to evaluate the prediction policy and find out the optimal solution of other different measurements for short-term earthquake forecasting.

Keywords: ULF seismo-magnetic phenomena, Molchan's error diagram, optimal short-term earthquake forecast