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**Assessment of intermediate-term earthquake prediction algorithms**

This SCEC research was targeted at SCEC Task 4: Intermediate-Term Earthquake Prediction. In support of the activities of Working Group A (Master Model). Our goal was to advance and finalize our ongoing worldwide test of the M8 algorithm, originally developed for intermediate-term prediction of large events, which uses a catalog of mainshocks to identify large scale seismicity patterns before large earthquakes in a given region (e.g. Gabrielov et al., 1986; Keilis-Borok et al. 1988; Keilis-Borok et al., 1990; Updyke et al., 1989; Healy et. al, 1992; Kossobokov et al., 1992, Keilis Borok and Rotwain, 1994; Kossobokov and Mazhkenov, 1994). Unfortunately, the principal researcher on this problem was severely incapacitated for much of the grant period, so that this work has proceeded very slowly.

However, given the nature of the method, additional calculations are not needed very often. We have updated previous work to cover the period 1963-1998, and have presented the updated results at the ACES inaugural workshop in Brisbane Australia in Feb, 1999, and at the Erice, Italy, workshop in July, 1999. A significant new result, which is still under evaluation, is that although the M8 algorithm performs better than one which samples the available space-time according to a uniform probability distribution, it performs not nearly as well as an algorithm wherein recent seismicity levels are the indicator used to predict future levels. This hypothesis test is consistent with the one proposed by Jackson and Kagan as a null hypothesis. A paper summarizing these results is being prepared for insertion either in the special issue of PAGEOPH (ACES meeting) or the special Erice volume.

The main result is displayed in the attached figure, which contains an updated Receiver Operating Characteristic Curve (ROC) for the performance of the algorithms. The ROC plots the success rate (proportion of successfully predicted events) as a function of the fraction of space-time in which an alarm is declared. For the case of a uniform probability density function, the 0 percent and 95 percent confidence bands are derived from the classical hypergeometric distribution function, and for the predictor based on recent seismicity levels (blue dots), the confidence intervals are derived from a distribution-free estimate (Kendall and Stuart, 1977). The M8 performance (red dots) falls between the two bands, and is outside of the 95 percent confidence bands in both cases.

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**ROC curve for 45 Worldwide events  
with  $M \geq 7.5$  (catalog 1985-1997)**

