

Long-Term MRI Algorithms, Short-Term Radon Anomalies, and Early Warning: the Mexican Experience

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The Mexican experience in earthquake prediction provides encouraging results in long-term forecasting by the moment-ratio imaging method (MRI). This method is based on the suggestion that an earthquake of magnitude 7+ lowers the seismic moment potential over an epicentral distance on the order of 17 fault lengths, which may either enhance or depress the relative moment potential (MR) in adjacent regions. It was found that an MRI peak appeared 10-15 years before a major earthquake, such as the 1985 Michoacan event. So far all major events have been preceded by MRI peaks, including the 1985 Chile and the 1995 Kobe earthquakes. So far the method is applicable only to regions of high activity; otherwise the MRI records become too noisy. Short-term prediction using radon and other geochemical precursors has shown promising initial results for artesian springs located in the coastal batholith. High radon peaks were detected in soils before large volcanic eruptions. Ground-water measurements appear to be sensitive to near earthquakes in the 3-4 magnitude range. No major shock has yet been recorded in the experimental area. Finally, an attempt to exploit the unusually large epicentral distances of damaging shocks to Mexico City for early warning purposes has yielded disappointing results. The rate of false alarms to legitimate alarms has been around 50:1 and the record of casualty prevention has been dismal. A moderate effort in earthquake prediction seems more likely to pay off, especially as the presence of the expensive early warning system provides an alibi for laxity in enforcing building regulations. Mexico may represent a natural laboratory for testing new approaches to earthquake prediction.