Exaggerated Claims About Earthquake Predictions

The perennial promise of successful earthquake prediction captures the imagination of a public hungry for certainty in an uncertain world but, given the lack of any reliable method of predicting earthquakes [e.g., Geller, 1997; Kagan and Jackson, 1996; Evans, 1997], scientists regularly have to explain news stories of a supposedly successful earthquake prediction when it is far from clear just how successful that prediction actually was. When journalists and public relations offices report the latest ‘great discovery’ regarding the prediction of earthquakes, seismologists are left with the much less glamorous task of explaining to the public the gap between the claimed success and the sober reality that there is no scientifically proven method of predicting earthquakes. A striking example of this situation occurred when NASA posted a feature article on its Web site in 2004 in which an earthquake prediction project it funded was heralded as an ‘amazing success’ (see http://www.nasa.gov/vision/earth/environment/0303_earthquake.html).

BY A. L. KAFKA AND J. E. EBEL

Exaggerated Claims

From page 1

where event triggering due to static stress changes might take place.

Applying this model to the entire ‘before’ catalog yields a map (covering 6% of the map area) that correctly predicts the locations of 11 of 15 (73%) of the ‘after’ earthquakes (Figure 1, right). If an additional five-kilometer margin of error is then added around the cellular zones for this case, the same 14 of 15 earthquakes are correctly predicted as were forecast with the RT method (and the cellular zones cover 22% of the map area). Furthermore, the margin of error is only five kilometers, as opposed to the 11-kilometer margin of error of the RT method.

NASA’s ‘Remarkably Unremarkable’ Success Rate

On the basis of the analysis presented above, the success rate referred to in the NASA announcement is perhaps better characterized as ‘remarkably unremarkable’ rather than amazing. The simple analysis presented here suggests that the RT method does not predict the locations of future earthquakes any better than merely assuming that future earthquakes occur near past earthquakes. There may be something more significant to the RT method than just proximity to past earthquakes, and this analysis does not demonstrate that it is not. However, the amazing success of predicting 14 of 15 of the ‘after’ earthquakes listed in the scorecard is not a variogram test of the RT method.

In education and outreach efforts at Western and elsewhere, scientists are often approached by people who tell them they are reading a news report about a scientist who figured out how to predict earthquakes. After the NASA announcement was posted on the Web, some people still refer to the news stories that followed it. A public hungry for certainty in an uncertain world can be quick to interpret NASA’s exaggerated claims as an example of a successful short-term prediction (i.e., the specified time, location, and magnitude of an impending event). However, as demonstrated above, the RT forecast did not perform any better than merely forecasting that future earthquakes will occur near past earthquakes. This leaves scientists with the challenging yet necessary task of explaining the scientific reasons as to why the NASA claim is exaggerated, and emphasizing as accurately as possible how difficult (if not impossible) it is to scientifically predict earthquakes at the present time.

Charles Richter lamented that ‘he had a horrid of predictions and predictions and predictions of what the general public had any interest in hearing’ [Richter, 1977]. This situation remains today and scientists who are involved in earthquake prediction research ought to be careful to assure that their public statements convey an accurate picture of the true level of success of their predictions.

References


Fig. 1 (left) Black dots are epicenters of ‘before’ earthquakes (1932–1999, M ≥ 4.2) and shaded zones are constructed by filling in an 11-kilometer radius around those epicenters (i.e., adding an 11-kilometer ‘margin of error’). Open squares (both left and right) represent ‘after’ earthquakes, i.e., locations of the 15 earthquakes listed in the Jet Propulsion Laboratory scorecard. Shaded zones cover 25% of the map area and capture 55% of the ‘after’ earthquakes (right). Shaded zones are not perfect in predicting the ‘before’ epicenters (1932–1999, M ≥ 4.0) using a relationship between magnitude and radius as described in the text. As plotted, this model predicts a location of 25% (13 of 15) of the ‘after’ earthquakes (with 5% of the map area). Though not pictured, allowing for a five-kilometer margin of error, 14 of 15 of the ‘after’ earthquakes are successfully forecast (and the cellular zones cover 22% of the map area).

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