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Initial public response to the Parkfield Earthquake prediction

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Mileti and Hutton

QRR # 16

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A. The Earthquake Prediction

The 5 April 1985 Parkfield earthquake prediction was a unique event. Scientists had collected data that led them to conclude that they could predict the next Parkfield earthquake and speak to the four elements of an earthquake prediction: time, place, magnitude and probability. The basis for this prediction was presented to the National Earthquake Prediction Evaluation Council (NEPEC) on November 16, 1984. This council reviews such predictions and evaluates their scientific merit. Additionally, on February 13, 1985 the California Earthquake Prediction Evaluation Council (CEPEC) met to evaluate the prediction. Both councils judged the scientific merits of the prediction to be sound, and on 5 April 1985 the U.S. Geological Survey (USGS) issued a public statement predicting the next earthquake in Parkfield, California. This prediction (see Appendix A) constituted a scientifically credible earthquake prediction.

B. Purpose and Method

The purpose of this research was to catalogue initial impacts of the 5 April 1985 Parkfield earthquake prediction on the members of the public in-and-around the area of Parkfield. We sought to gather information on this topic by doing field work and interviews as soon after the public announcement of the prediction as was possible, but not so immediately that people would not have had a little time to think about the prediction. We began our field interviewing approximately 2 weeks after the prediction was announced.

Interviews were conducted on a non-randomly chosen set of Parkfield residents. The official population of Parkfield is 34. We interviewed 9 adults and 9 school-aged children. The interviews were qualitative and largely unstructured; however, some structure was imposed upon the interview format in that five routine questions were asked in reference to the prediction. These were: (1) what has changed?, (2) what is better?, (3) what is worse?, (4) what are you and others doing? and (5) what are you and others not doing?

Additionally, we conducted a review of all local newspapers (The Daily Press) from 1966--the time of the last characteristic Parkfield earthquake--through eight months after the 5 April 1985 prediction. We reviewed these papers for three things: stories about earthquakes and earthquake-related issues, stories about the 5 April 1985 prediction, and stories about earthquake and earthquake prediction research.

C. Findings and Conclusions

The findings and conclusions that can be drawn from this work are tentative because of the limited scope of the data collection effort. Nevertheless, several insights can be drawn from this research. These findings and conclusions are best viewed as grounded hypotheses induced from the limited data collected, and each is in need of more elaborate systematic investigation.

Our general conclusion regarding initial public response to the Parkfield prediction is that there was virtually no response. The prediction was issued on 5 April 1985, and it would have largely gone unnoticed by the residents of Parkfield and its environs had not national media attention been focused on the event. Locally, the

prediction was not even newsworthy. The daily Press, the local newspaper for Northern San Luis Obispo County, for example, did not run a story on the prediction. On April 16th, 17th and 19th--all about two weeks after the prediction was issued--the paper covered earthquake stories concerning Earthquake Preparedness Week, the 1906 San Francisco Earthquake, and an earthquake drill in Los Angeles, respectively. In May of 1985, the paper ran six earthquake-related stories (on May 2, 3, 7, 10, 17 and 30th). The 17 May 1985 story covered earthquake research in Parkfield, and how the quake history of Parkfield was attracting scientists to do research. June of 1985 also saw stories published about earthquakes, but not in Parkfield. The point is that the Parkfield prediction, while the target of national newsmedia attention in April on the heels of the prediction, was not newsworthy in the local community. When a story about the prediction surfaced in mid-May, some 1 1/2 months after the prediction was issued, it focused on earthquake research and not the prediction.

The prediction did not go unnoticed by local residents. Locals learned of the prediction from the national media. The national media not only publicized the prediction, they also decended upon Parkfield to film and interview residents. They found locals, as did we, altered by the prediction in two ways. First, locals were talking more about earthquakes in Parkfield than they would have had the prediction not been issued. However, this was not the result of the prediction. It was a consequence of having the media in the area asking questions about the prediction and Parkfield earthquakes. Second, children in the local school had earthquake issues made part of their lessons. Again, however, this was more a response to

national media interviews than the prediction per se; that is, lessons on earthquakes were above all else an attempt to educate children so that they might not become scared from the questions being posed by national reporters.

The significant question regarding initial public response to the Parkfield prediction, therefore, becomes why was the prediction virtually ignored. There are four answers to this question provided by the Parkfield case.

1. Earthquake Culture. An "earthquake culture" exists among the residents of Parkfield and its environs. It appears that locals have long ago--and well before the 5 April 1985 prediction--fully incorporated the earthquake hazard into their local culture, beliefs and norms. Resulting perceptions and behaviors include not only recognition and acceptance of earthquake risk, but also ideas about what to do to "successfully" live with earthquake risk and earthquakes.

Earthquakes are both experienced and anticipated by the residents of Parkfield; they are expected and defined as much as a part of living in the areas as is true for any other local characteristic. The earthquake hazard, and ideas about what to do because of it, are such a strong component of local culture that the belief system surrounding the hazard is passed on from generation to generation in much the same way as other more basic cultural traits transcend and are shared across generations.

That people in Parkfield and its environs have fully incorporated the earthquake hazard into their local culture is not a surprize. Earthquakes occur there often; for example, Richter magnitude earthquakes of approximately 6 have occurred there in 1881, 1901,

1922, 1934 and 1966. Many local residents recollect the 1966 event, and many other well-know of prior earthquakes either because they too were personally experienced, or because others have told them stories of their experiences with these historical events. It is common folk knowledge, based on the historical record of the characteristic Parkfield earthquake, that earthquakes occur every now and then, and that more should be anticipated in the future. In this way the residents of Parkfield and its environs have also incorporated earthquake prediction into their local culture; most presume that earthquakes will occur in their locale in the future. The historical track record of earthquake occurrences provide a standing folk prediction for the future that locals understand and accept.

The earthquake culture in Parkfield does more than accept and anticipate earthquakes. It also clearly defines and limits the risk posed by Parkfield earthquakes. Local residents contemplate the risk of loss in future Parkfield earthquakes on the basis of prior events experienced and recollected. Relatively recent events--recent in the sense that their intensity, magnitude and impacts are part of the collective knowledge shared by residents--have not posed a serious threat to life and property. Consequently, locals anticipate that future earthquake events will be of the same sort. For the most part, locals have adjusted to accommodate this perceived level of risk. People have, for example, kept cupboard doors tied shut in anticipation of a future earthquake and anticipated minimal damage. People take pride that their homes are able to withstand Parkfield earthquakes. People are even reassured that it's safer to live closer to the San Andreas Fault as they do because damage, in their minds, would likely be higher further away.

The Parkfield earthquake culture, therefore, fully recognizes that earthquakes have and will occur in Parkfield; anticipates future earthquakes on the basis of a standing folk prediction based on the historical record; limits perceptions of future damage in future earthquakes based on experiences with Parkfield earthquakes that are part of the local collective recollection.

Given the Parkfield earthquake culture, it is quite understandable why the 5 April 1985 prediction went virtually unnoticed by locals. One of our respondents summed up the local viewpoint: "When scientists started doing research on earthquakes around here, that meant scientists finally realized what we always knew: earthquakes happen here. When that panel of government people issued their prediction, that just meant that government finally noticed too." From a public viewpoint, the Parkfield prediction was not one cast in the model of how earthquake prediction is typically viewed by scientists, scholars and government officials; scientists find something out and tell officials who in turn inform the public; instead, the Parkfield prediction is better cast in the opposite direction. The public viewed the prediction as "they" finally noticed what we have always known.

2. Earthquake Ownership. Earthquakes and predicted earthquakes in the Parkfield area, and likely other places as well, are "owned." Parkfield residents were very familiar with their earthquake history, but they define the recent earthquake in Coalinga as Coalinga's. Conversely, Coalinga citizens recollect Parkfield's historical earthquakes as Parkfield's. People in Coalinga and Paso Robles, for example, when questioned about the Parkfield prediction, viewed the predicted quake as someone else's problem. This is unfortunate since the predicted Parkfield earthquake could cause damage in, for example, Coalinga.

It appears that the naming and labelling of earthquake predictions with the names of towns can act as a perceptual constraint to action by members of the public in other places to mitigate earthquake loss. Predictions labelled with the name of one town may actually constrain preparedness and mitigation in other towns because to so name a prediction "labels" the impending quake as someone else's problem. Initial public response to the Parkfield prediction in neighboring Coalinga and Paso Robles suggests that an alternative scheme for labeling earthquake predictions could do much to increase action by the public-at-large to prepare for and mitigate losses from predicted earthquakes.

3. Research as a Prediction. The Parkfield prediction is one earthquake-related event in a long history of such events in that area. Stories and explanations provided by many respondents suggest another reason why the prediction went virtually unnoticed by local residents. The field investigations and research carried out by scientists in the area, which provided the scientific basis for the prediction, was more the actual prediction for residents than was the prediction itself. In fact a large amount of newspaper coverage was devoted to the emerging science of earthquake prediction and prediction research long before the 5 April 1985 prediction. This coverage described at-length the scientific research being conducted to predict the next Parkfield earthquake.

Public definition of earthquake predictions may not be equal to scientific and government definition of earthquake predictions, e.g., time, place, magnitude and probability. In Parkfield, the act of stepping up highly visible earthquake prediction research was itself perceived as an earthquake prediction. If this phenomenon is

generic, it may or may not have consequences in a community depending on the amount of earthquake culture in-place, and local perception of risk from the impending quake which was low in Parkfield. The Parkfield case, therefore, perhaps suggests a useful way to view predictions in other areas is to use the act of prediction research to help locals gradually become used to the idea that an earthquake may occur. Precluding other earthquake predictions from "falling from the blue" may be a worthwhile model that can he borrowed from Parkfield and used in other future predictions.

APPENDIX A

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STUDIES FORECASTING MODERATE EARTHQUAKE NEAR PARKFIELD, CALIF., RECEIVE OFFICIAL ENDORSEMENT

The forecast that an earthquake of magnitude 5.5 to 6 is likely to occur in the Parkfield, Calif., area within the next several years (1985-1993) has been reviewed and accepted by state and federal evaluation panels according to an announcement today (April 5, 1985) by the U.S. Geological Survey.

A letter summarizing the results of the scientific review of the Parkfield forecast was sent to Mr. William Medigovich, Director of the California Office of Emergency Services, by Dr. Dallas Peck, Director of the U.S. Geological Survey.

Parkfield has been the site of a USGS earthquake prediction experiment that is using sophisticated distance measuring devices and other monitoring equipment in an attempt to determine and monitor signals that might presage an earthquake.

The research that led to today's statement has been carried out by William H. Bakun and Allan G. Lindh of the U.S. Geological Survey and Thomas V. McEvilly of the University of California. Their conclusions are based on analyses of reports of earthquakes in the Parkfield area in 1857, 1881, and 1901 and seismograph records of events near Parkfield in 1922, 1935, and 1966. The average interval between these events is 22 years and statistical analyses indicate a high probability (over 90 percent) of another earthquake in the region within the 1985-1993 interval. The seismograph records of the last three Parkfield earthquakes are very similar, leading to the hypothesis of a characteristic earthquake in the Parkfield region of about magnitude 6 on the Richter Scale.

Parkfield lies along the San Andreas fault in a sparsely populated region about 170 miles south of San Francisco and 180 miles north of Los Angeles. An earthquake of magnitude 6 is of moderate size, at the threshold of being able to cause modest damage to some structures that have not been designed for earthquake resistance.

(more)

The last characteristic Parkfield earthquake occurred on June 28, 1966, registered a magnitude slightly less than 6, and caused only minor damage to wood-frame houses in the region.

The results of the Parkfield studies by Bakun, Lindh, and McEvilly have recently been reviewed and endorsed by the National Earthquake Prediction Evaluation Council and the California Earthquake Prediction Evaluation Council. These bodies advise federal and state officials respectively on the validity of statements and studies regarding the occurrence of future earthquakes. The national council concluded that the findings at Parkfield constitute a long-term prediction, a term adopted by both councils to describe a statement on the occurrence of an earthquake at a specific place and within a time interval of a few years to a few decades.

In their evaluation of the research, the two prediction review panels said that the potential exists for the next earthquake in the Parkfield region to be larger than the 1966 shock, and for the fault rupture to extend southeast into the adjacent 25-mile segment of the San Andreas fault. Both panels agreed, however, that the evidence for this larger earthquake was speculative and required additional data and review.

Under a program of earthquake prediction research, the U.S. Geological Survey maintains an array of sensitive geophysical monitoring instruments in the Parkfield region in an attempt to predict the occurrence of the expected earthquake more precisely. The California Division of Mines and Geology also maintains a large number of instruments to measure the effects of the earthquake.

The California Office of Emergency Services has reviewed the evaluation with local officials and will take coordinated action should the extensive monitoring equipment arrayed throughout the Parkfield region indicate that the anticipated earthquake is imminent.

* * * USGS * * *