Social Response to the Second "A" Alert of the Parkfield Earthquake Prediction Experiment

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Final Report

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Introduction

Parkfield, California is a small village of 34 residents located approximately 220 miles south of San Francisco and 240 miles north of Los Angeles. This places the village in the center of the state. What makes the village unique to seismologists and others interested in earthquake related issues is that it experiences earthquakes with an uncanny regularity. Using historical records, one can anticipate an earthquake almost every 22 years. To date earthquakes have occurred in Parkfield in 1857, 1881, 1901, 1922, 1934, and 1966. Given this past history it was selected by the United States Geological Survey (USGS) to be part of an experiment.

The experiment was a bold plan by the USGS to use Parkfield in an extensive effort to predict earthquakes. The logic was simple. Since Parkfield experiences earthquakes with such regularity, what one needed to do was to be ready for the next quake. Once instruments were in place seismologists could measure every earth movement and change, limited only by modern technology, to see exactly what happens in an earthquake.

With this knowledge of all possible anomalies that occur shortly before an earthquake, one could then look for those same anomalies elsewhere to predict earthquakes at other locations. Some of the instruments in the study includes: creep meters to detect earth surface slippage, laser guided survey equipment to detect earth movement over large land areas, and ground water

detection devices. To date considerable resources of the USGS and the State of California been allocated to the project in the hope of furthering American earthquake prediction capabilities.

Parkfield itself is hardly in danger. The village of 34 has a long history of seismic activity. Residents have learned to deal with earthquakes. There is even a certain amount of pride that goes along with all of the attention residents receive. This is shown, for example, on the water tower in town, which proudly proclaims Parkfield to be "the earthquake capital of the world". In addition there is little to be damaged in the farm countryside surrounding Parkfield. If, however, the next earthquake should be larger than the characteristic 6.0R temblor, for example in the 7.0R range, then the threat to human life increases. The larger earthquake could have potential damaging impacts in the counties of Santa Barbara, San Luis Obispo, San Benito, Monterey, Kings, Kern, and Fresno. One area of particular concern is the nuclear power plant located outside San Luis Obispo.

The original announcement by the USGS that it was embarking on this bold plan was made in 1985. It was watched by many here and abroad for its long-range implications in earthquake prediction. The undertaking proceeded with the endorsement by the National (NEPEC) and California (CEPEC) Earthquake Prediction and Evaluation Councils. The prediction was for an earthquake of magnitude 6.0-7.0R to occur before the end of 1993.

Parallel to the USGS effort at Parkfield were social scientists also looking at the experiment from a public response

viewpoint. The initial public reaction to the prediction was formally investigated shortly after it was publicly announced (Mileti and Hutton 1987).

Since that initial social study, others have been completed. Specifically the California Governor's Office of Emergency Services distributed a brochure to the seven county region. It detailed a description of the USGS experiment, preparedness, and mitigation activities, where to get additional information and an explanation of the alert levels. Social scientists were actively involved in measuring how effective the model of risk communication was (Mileti, Fitzpatrick and Farhar 1990, Mileti and Fitzpatrick 1992, Mileti and Fitzpatrick 1993).

Since that 1985 date, Parkfield has been the center of much activity and media coverage. This attention climaxed on October 20, 1992, when, based on pre-planned models of earth activity, the USGS issued an A-level alert. This was an historic event for the first NEPEC/CEPEC approved prediction issued in the history of the United States. This alert also provided social scientists the opportunity to measure public response to this alert (Fitzpatrick and O'Brien 1992).

Considerable media attention was focused on the Parkfield area around the October 20, 1992, event. The alert came and passed without the predicted earthquake. Although the scientific community openly acknowledged some disappointment, offices of emergency services reported that even without the anticipated event, many of the people in the seven county region were once

again reminded that this is earthquake country and one always needs to be prepared. Many saw the A-alert not as a failure, but a call to preparedness and mitigation action. Social research also found that the public also knew that this not yet an exact science and did not "hold-a-grudge" against the USGS for them having called the alert in the first place (Fitzpatrick and O'Brien 1992).

On November 14, 1993, the second A-alert was announced by the USGS. The alert was called after a 4.5R magnitude earthquake struck the area. From the monitoring instruments located in Parkfield, it was felt that the larger 6.0R to 7.0R earthquake might occur. Again the USGS notified the California Governor's Office of Emergency Services (OES), who in turn notified the seven county OES offices in the effected areas. This report is a result of that second A-alert.

Purpose

This second A-alert represents a unique opportunity to measure both public and organizational response to a short-term earthquake prediction sanctioned by both the NEPEC and the CEPEC for the second time. Many aspects of Parkfield are based on the historical record since earthquake prediction is still such a new endeavor. Each action that the USGS and other players in the event take are taken for the first time and thus offer great insights into actions and reactions of all those involved.

In order to measure some of the responses to the second A-alert, a sociologist was sent to the area to investigate some of the societal dynamics surrounding the event. This field trip was supported by National Science Foundation funds that are distributed by the Natural Hazards Research and Applications Information Center located at the University of Colorado at Boulder. It sent one researcher from California State University-Stanislaus to central California to collect data on the event. This was done almost immediately after the announcement so that the data could be collected as the actual event unfolded.

The primary purpose of this research was to investigate the social response to the A-alert. Specifically the public was targeted to form the core of the project. In addition, governmental agencies and the private sector were questioned about what effect, if any, the A-alert had on them. Questions asked can be broken down into three general categories including:

1) How did the public respond to the 72 hour warning? Did the public take it seriously and did they engage in preparedness activities?

2) What was the official government response? Did agencies prepare for a possible earthquake?

3) How does this alert differ from that of one year ago? Have government agencies, the private sector and the public changed their attitudes toward the Parkfield Prediction Experiment, the California Office of Emergency Services, and the USGS with the issuing of a second alert that did not occur?

These three areas were the focus points in this research. The concluding sections of this paper detail the alert itself, the response by different entities and finally conclusions.

The Alert

During the initial years of the prediction experiment criteria were established as to what constitutes an alert. Based on work by the CEPEC and the Parkfield Earthquake Prediction Response Plan, issued by the California Governor's Office of Emergency Services in 1988, six levels of alert status were established. Important to this study are the three highest levels C, B and the highest level A. When the USGS predicts that there is at least a 37 percent chance of a typical Parkfield earthquake in a 72-hour time frame the A-alert is issued. A B-alert means an 11 to 37 percent likelihood of an earthquake in a 72-hour time period. The C level is a 2.8 to 11 percent chance of an earthquake occurring in the 72-hour time frame. All occurrences therefore are for a 72-hour time period, however, the highest likelihood is immediately following the announcement of an alert and slowly deteriorates as time passes (Governor's Office of Emergency Services, 1988).

There have been several B- and C-alerts issued over the life of the experiment. These are only given minor attention by both the public and the media. On October 19, 1992, the USGS issued the first A-alert. This was acted upon by the California Governor's Office of Emergency Services (OES). Societal lessons

learned from that experience have been documented (Fitzpatrick and O'Brien, 1992).

The second alert came from the California State Director of OES in Sacramento on November 14, 1993, at 5:49 am. The message read: "The USGS informed the Governor's Office of Emergency Services today that there is a significant likelihood that an earthquake of about magnitude 6R will occur on the San Andreas fault near Parkfield in the next 72 hours". This message was sent to all seven county OES offices located in the effected region. This alert was issued after a 4.8R earthquake occurred at 4:25 am the morning of November 14, 1993, within four miles of Parkfield (OESa 1993).

The State OES office alerted its county offices through the teletype and then via fax communications. The San Luis Obispo County Emergency Operations Center (EOC), the OES Southern and Inland regions' EOCs and the State Operations Center activated on minimal staffing. Monterey, Fresno, Kern, Kings, San Benito, and Santa Barbara counties were all on standby, although Kern county activated its EOC briefly the first day (OESb 1993). The local county OES offices began their standard procedures. The first being a call down procedure. This notifies police and fire departments. In addition, city managers and other high level county and local authorities are notified. Once these actions were taken the OES offices answered questions from the public and the media and waited.

Research Methodology

This research proceeded within days of the USGS announcement of the A-alert. In order to get into the field to collect perishable data, qualitative data collection methods were utilized. Upon arrival at the targeted area the interview process began immediately. This allowed for the immediate gathering of data on the A-alert before people left the area and public reaction waned with time.

Towns included in this study are: San Luis Obispo, Paso Robles, Coalinga, and Parkfield. This included San Luis Obispo, Kings, and Fresno counties. Data collection concentrated on these three counties since they are in closest proximity to the San Andreas fault where the predicted earthquake was most likely to occur. In addition, Paso Robles was seen as a town which lacked recent experience with earthquakes; Coalinga, the opposite, having experienced a damaging earthquake in 1983. A total of 18 interviews with officials and dozens with the public were completed during the field work.

The sample included three different units of analysis. The first were public officials who are responsible for the protection of the public. These public officials came from all levels of government. Local city, county, and state officials were interviewed in the course of this research. Examples included: police, fire, California Highway Patrol (CHP), and county Offices of Emergency Services.

The second group of interviews were conducted with the business sector. Members of this group included: stores in all areas of retail trade, banks, and a variety of service industry businesses. All of these business were selected with the following purpose. It is thought that these service industry businesses would be more sensitive to the societal effect of the A-alert than the manufacturing sector which does not have daily contact with the general public.

Finally the third group included a wide cross-section of the general public. Interviews with the public form the core of this project. Their actions, reactions, and personal perceptions of the public response to the Alert were seen as the central focus of this investigation. Members of different sexes, racial and ethnic backgrounds, and social classes were sought for the widest cross section of respondents possible. This goal was realized over the course of the data collection.

Data were collected conducting unstructured interviews. With the limited numbers and kinds of interviews completed, the data collected can not be generalized beyond the limited geographically A-alert area.

Findings

Police, fire, and offices of the CHP all have specific instruction on what to do, and how to perform. They followed their standard pre-scripted procedures. Offices of Emergency Services perform a special role in these events. They form the

core communication set-up for all other agencies and train for these types of incidents on an on-going basis. Again, as with the past A-alert, OES offices performed as planned. They did their notification process and several counties set up their EOCs. Also central to their mission is fielding phone calls from the public about what the alert means for them.

The state OES office activated the State Operations Center in Sacramento. In addition, it alerted, and activated the regional EOCs. Lastly the state sent a limited number of personnel to Parkfield to coordinate the State's activities and to be available for the media.

The USGS also activated some of its emergency plans once the announcement of the Alert became known. The USGS made staff available, in its Menlo Park headquarters, to answer questions. In addition, the USGS also sent personnel to Parkfield to coordinate activities and to make itself available to the media.

The media played a central role in the unfolding event surrounding the A-alert. Both radio and television began running earthquake stories immediately following the official announcement of the alert. This was followed up by a large number of stories about the alert itself, including mitigation, and preparedness activities that the public could and should take. In interviews with residents, widespread praise of the media's quick response and thorough reporting on and about the event was noted.

This was also true for the print media. It was impossible to pick up a newspaper during a five day period that did not have an alert or alert related article. The event was taken very seriously by the print media and considerable space was allotted to the story. Some editorials questioned the alert process itself, but these articles were an exceedingly small proportion of all the articles that printed.

This high level of professional media involvement is the result of several alerts. The media has had the opportunity to interact with government authorities on several occasions now and a close working relationship is obvious. The actors in all areas of the alert are gaining an understanding of each other and this researcher feels that a level of trust is developing. In addition, the public wants information and the media tries to fill that desire.

Business organizations were interviewed in the affected areas. The cities of San Luis Obispo and Paso Robles reported business as usual following the alert. There was, however, a different response in Coalinga. Businesses in Coalinga did take preparedness actions, and reported the same for the public. Businesses reported not only their heightened awareness, but that the public responded by purchasing water, batteries, and other emergency supplies. The reason for the different response is thought to lie in the fact that Coalinga has had a recent (1983) damaging earthquake unlike the other cities. This experience keeps the threat of possible damage at a higher level of

awareness. This theory has been borne out by other research (Fitzpatrick and O'Brien, 1992).

The public response varied by location as noted above in the business response to the alert. Depending on where one was located had a real impact on the level of preparedness. Preparedness was highest in Coalinga and lowest in San Luis Obispo and Paso Robles. Everyone knew of the alert, but few actually took concrete actions to prepare for it.

Of all interviews completed, not one suggested that the prediction experiment should not proceed. There were many, however, who were beginning to question the chances of the USGS having success with the project. The public can be broken down into three distinct groups. The first believed the alert and took preparedness actions as recommended by their local OES offices.

The second group simply did not and does not believe that earthquake prediction is possible and used that as a justification to ignore information given out by a variety of sources. This group was in the minority, but nevertheless, sizable.

The final group of the public uses the USGS predictions literally. They followed recommendations and give the USGS credit for perhaps more prediction capabilities than they really have. If there is an alert, then they go on a higher level of awareness. Conversely, when there is no USGS alert in effect,

then there is no danger. This group lives in real danger in that they use the USGS alert system as a fail-safe system for their safety. If no alert is "on" then no danger exists.

This final group and its reactions to the alert is thought to be the major finding coming out of this Quick Response Grant. As noted before, many findings coming out of the Parkfield Prediction Experiment are new and unique, given the uniqueness of the project itself. Never before has a public had to deal with a possible earthquake prediction and subsequent alerts. How the public responds to alerts is of great importance to public safety. Recommendations on how to deal with this segment of the population appear in the final conclusion section.

Conclusions

The alert process is working well in central California. The USGS alerts the Governor's Office of Emergency Services, which in turn notifies all of its effected regions. This process worked well in the first A-alert of October 19, 1992, and again on November 14, 1993.

With all the attention focused on the Parkfield area and the A-alerts, several new problems have arisen. One of the main barriers to be overcome is what are the USGS and the Governor's Office of Emergency Services to do in the future? Working together they have now issued two A-alerts, neither of which has resulted in the "promised" earthquake. Many people reported that a "cry-wolf" syndrome might eventually happen in the area, but that is not yet the case. Both organizations enjoy wide-spread

support among the public, especially the USGS. Whether this will remain the case is yet to be seen.

Social research on the "cry wolf" syndrome has been carried out. Its conclusion is that if false alerts are given to the public there can be an adverse effect. The way to avoid the negative affect is to explain to the public why there were false alarms (Sorensen and Mileti, 1989 p.360). This is an area where both the USGS and the California Office of Emergency Services needs to put their emphasis following this second alert.

How many alerts, however, will it take? One more, three being the number or perhaps four or maybe five? This question was asked during all interviews. All had a different "magical" number, but threat or fear of one too many false alerts is real among the public, government, and the private sector. Thus the explaining of the false alerts needs to be a top priority of all involved agencies. The experiment itself is taking science into new uncharted territories and this holds true for government, the private sector and the public. Unfortunately no one has a crystal ball or prior experience to guide them in the best course of action to take at this juncture. The limited past experience, as noted above, would strongly suggest a steady flow of information to the public as the best course of action.

The USGS and the Governor's Office of Emergency Services now find themselves in an uncomfortable position: what to do when the anomalies present themselves in the future. What different actions do these organizations, charged with the public's

welfare, do in that event? To issue the alert is the responsible thing to do. Losing their credibility is the danger to these organizations. A succession of false alerts could also create a public that no longer bothers to prepare and mitigate.

The other possible scenario is as unappealing: if the anomalies again present themselves and the USGS in conjunction with the State OES office were to do nothing. To further complicate the process and an earthquake strikes, what would be the end result? Naturally there would be a full investigation of why the public was not warned. The USGS and State OES risk political annihilation, depending on the severity of the earthquake. Thus the USGS and state OES office are in a very uncomfortable and potentially dangerous Catch 22.

Any scientists and most people in the emergency management field know what an experiment is. It is not something that is guaranteed, rather it is an attempt to learn new lessons. That distinction between something that is guaranteed and something that is for knowledge acquisition is lost on many in the general public. When they hear earthquake alert, they react to that and not that this is an experiment. Perhaps public education is needed now more than ever by the USGS and other governmental organizations directed at the public.

The State OES office is aware of this and have called for a re-evaluation of the entire alert process. This will be easier said then done. One new possible approach won almost instant approval from the local OES offices interviewed. One of the

state's regional people equated the prediction to the weather forecast. When the state issues an A-alert it should mean that there is a higher chance of an earthquake, but not a guarantee of one. This would not be unlike the weather forecast that predicts a 30 percent chance of rain. Once rain is predicted does that mean that the public panics and stops their lives? No, rather it means that one takes prudent measures, e.g., take a raincoat when one goes out. In the event of the predicted earthquake one would not stop living. Rather one would take prudent measures to protect oneself, and one's family and property.

But this advice also carries potential risk. While reading a newspaper in a restaurant about the alert, the waitress came over and said not to worry about earthquakes since the alert was over. Many of the public are already taking these alerts like weather reports. **If there is no report then there is no danger**. Naturally this is not the case. But many in central California are now using the USGS alert system as a way to deny risk. It won't happen if the USGS hasn't announced it. This is leaving a public at risk open to danger if they feel that nothing is guaranteed to happen if the USGS doesn't say so.

Public information is seen as playing a key role in two major problems that have come out of this second alert. The first problem is dealing with the false alerts and the second problem being people taking the alerts literally. Common to both problems is a public that is making decisions based on no or poor information. The solution appears to be to keep the lines of

communication between the USGS and the State OES with the public an ongoing process. The USGS has been at the forefront of using basic principles of risk communication in its public outreach efforts to inform the public. The USGS needs to redouble its efforts to ensure success of the Parkfield Prediction Experiment. State OES is in a unique position to have local staff throughout the affected region, which lends itself to a more effective outreach if it is tasked to do so by majors powers within that organization.

This alert leaves more questions than answers. There are many things that now needed to be dealt with before the next event. A coherent strategy needs to be devised that all parties are a part. Only in this way can the experiment proceed with the necessary autonomy it needs to be successful. The private sector and public are willing to give USGS scientists time to have success in the area. The public ultimately knows the value of earthquake prediction. It is a public that has experience with earthquakes in varying degrees and will give the USGS the benefit of the doubt. It is not, however, a public that will endure endless alerts without negative effects. The USGS and state OES need to devise a realistic policy that is understood by the public and the public will support it.

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