SOCIETAL RESPONSE TO AN AMBIGUOUS FOREWARNING: A CASE STUDY OF THE SOUTHERN CALIFORNIA UPLIFT[1]

Joanne M. Nigg
Department of Sociology
Arizona State University
Tempe, Arizona 85287, USA

1. INTRODUCTION

In February 1976, southern California residents were first told that a vast uplifted area in the desert northeast of Los Angeles had been dicovered. While the precise meaning of the Southern California Uplift (then popularly known as the "Palmdale bulge") remained an anomaly to seismologists, earth scientists admitted that such an uplift could be a precursor to an earthquake. If it were a precursor, its size, (covering approximately 100 miles along the San Andreas Fault) could indicate an earthquake of a magnitude 8 on the Richter scale. Even though the meaning of the Uplift remained uncertain, in April 1976 the California Seismic Safety Commission declared that "the Uplift should be considered a threat to public safety and welfare in the Los Angeles metropolitan area" and encouraged public agencies to review their earthquake preparedness and response plans.

Although no formal prediction had been issued,[2] this was the first scientifically-based near-prediction or forewarning of a potentially destructive earthquake in the United States. This situation provided a unique opportunity to investigate how communities respond to such forewarnings, what kind of information people remember about them, and what types of preparedness activities these cautions produced.

2. DATA

The data for this report come from five sets of interviews, conducted at approximately six-month intervals between January 1977 and December 1978, with randomly selected residents of Los Angeles County. Each wave of interviews included questions to obtain information about: (1) the saliency

of an attitude toward earthquakes and earthquake predictions or forewarnings that were remembered; 2) understanding of the relevance of the Southern California Uplift; 3) preparedness measures that the respondent had taken; and 4) perceptions of governmental preparedness. Topical questions were also included to determine how current events were affecting earthquake-related perceptions and actions. After the primary field survey of 1,450 residents in January-March 1977, the goal for each of the four subsequent telephone surveys was to secure a comparable sample of 500 or more new respondents. The actual numbers of completed interviews were 551, 516, 536, and 550, respectively.

Also, six major newspapers in the Los Angeles area were monitored daily for a three-year period from January 1976 to December 1978. Those papers included two major metropolitan daily papers, three of the largest circulation community papers, and the prenominant Spanish language newspaper in Los Angeles county. Any article that mentioned earthquakes, earthquake predictions, earthquake preparedness or hazard mitigation were included in a content analysis.

3. MEDIA COVERAGE

The best way for the public to be informed about earthquake prediction events is through the dissemination of that information by the media. Figure 1 shows the varying amounts of coverage given to the Uplift over the three-year study period.

While interest in the Uplift did not seem to attract much media attention in the first couple of months after its disclosure, it did get extensive coverage at two points in time - in April and December 1976 - both of which coincided with other forewarnings.

In April 1976, a major Los Angeles paper reported that a professor from the California Institute of Technology's Seismology Laboratory had "predicted" a quake between the magnitudes of 5.5 and 6.5 to occur any time from that date until April, 1977. The quake might occur on any of several faults in the area and anywhere within an irregularly shaped circle some 140 kilometres in diameter. Although the Caltech scientist tried to make it clear that he was merely engaged in testing a controversial hypothesis, the media treated this event as a prediction.

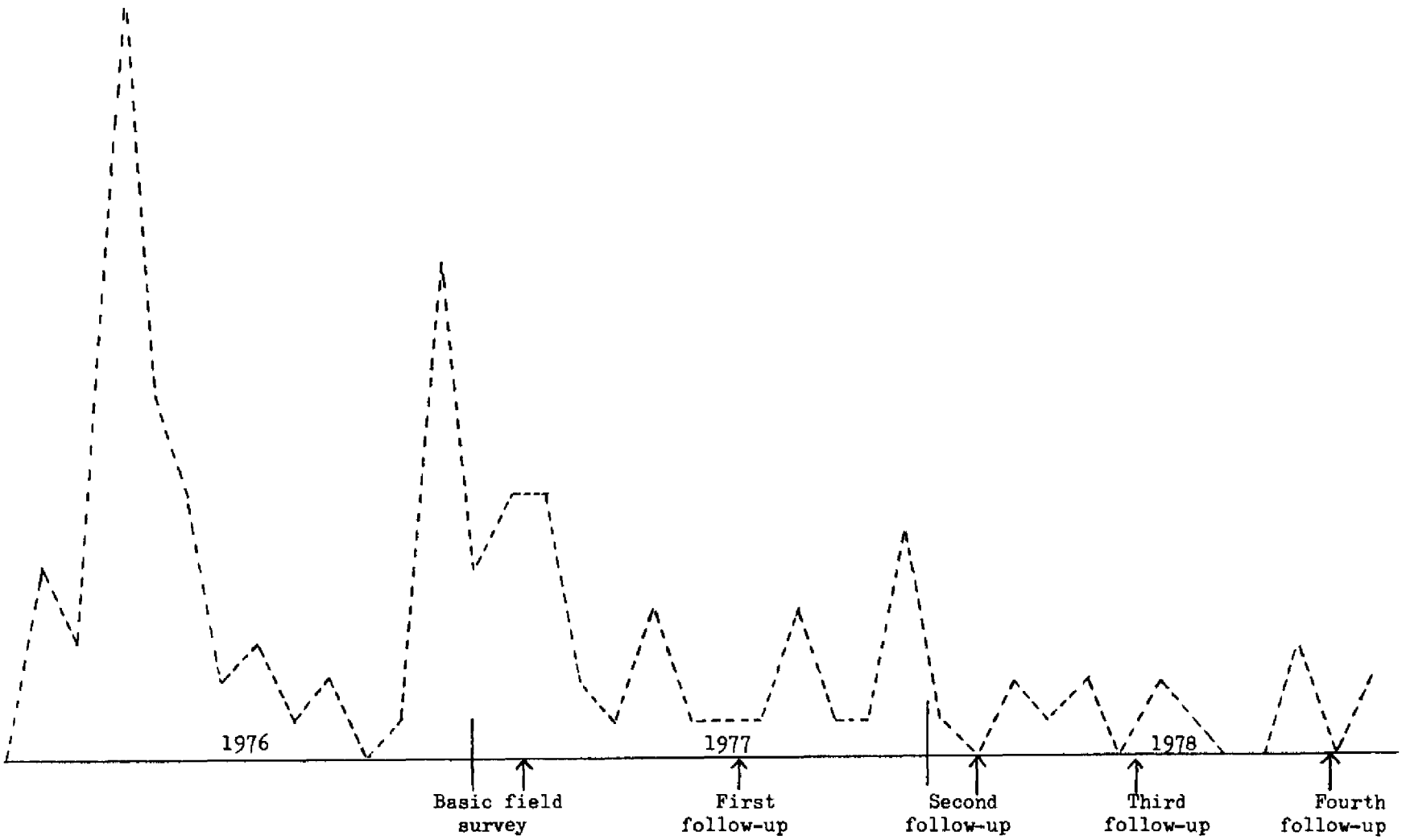


FIGURE 1

NEWSPAPER ATTENTION TO UPLIFT AND AWARENESS OF UPLIFT

The resurgence of interest in the Uplift accompanied a forecast from outside the established scientific community in late November of 1976. A self-proclaimed geophysicist, unknown to the scientific community, claimed to have predicted many earthquakes successfully in the past, including a small one that occurred while he was being interviewed on a local television evening newscast. On the air he forecast an earthquake for the Solomon Islands on December 7, to be followed by a quake in Los Angeles on December 20. Although recognized earthquake scientists consistently disparaged his method and his predictions, interest in the forecast mushroomed and media coverage was extensive.

After the decline of interest in this end-of-the-year prediction, the media never again gave a great deal of coverage to the Uplift. When it was mentioned in the press, it was in one of two contexts. First, it was either used as an explanation why an agency was taking a particular hazard mitigation or preparedness measure, thus conveying the impression that the Uplift could be a credible precursor to a major earthquake. Or, conversely, alternative explanations for the Uplift's existence and changes in its characteristics were presented,[3] possibly suggesting to the public that the Uplift was truly an anomaly, unrelated to earthquake threat.

4. PUBLIC UNDERSTANDING OF THE UPLIFT

Against this background of fluctuating and then declining media interest in the Uplift, how did the public formulate an understanding of this phenomenon, this first scientific near-prediction with no lead time an an open-ended time window? Was it dismissed as just another indication that because they were living in "earthquake country", southern Californians should expect a quake at any time? Or was it given more significance by the public than ever the geo-scientific community gave it?

4.1 Salience

In order to determine how salient[4] the Uplift was for Los Angeles County residents, survey respondents were asked if they had heard any predictions, statements, or warnings about earthquakes in the southern California area during the past year (1976). If the answer was positive, the respondent was then asked what he or she had heard.

During the first set of interviews conducted almost one year after the initial announcement of the Uplift had been made public, only about 8% (110 of 1450) of the sample mentioned hearing about the Uplift. The existence of the Uplift plainly had little salience for most of the residents of Los Angeles County.

4.2 Awareness

In order to measure awareness of the Uplift, the following question was asked of **everyone who had not mentioned the Uplift earlier: "Do you remember** hearing about a bulge in the earth near Palmdale in the Mojave Desert?".

Combining respondents who answered "yes" to this question with respondents who mentioned the Uplift in answer to the prior question, almost 60% (857 of 1450) of the sample, or three out of five residents, were aware of the Uplift.

Merely having heard about a bulge in the desert may not signify any understanding of the Uplift's potential significance. Hence, respondents were asked if they remembered what scientists were saying that the bulge signified, to ascertain whether they understood that the Uplift might be the precursor to an earthquake.

Table 1 shows that 11% of the respondents believed that scientists had made a definite connection between the Uplift and a coming quake, overestimating scientific **confidence** in the meaning of the Uplift, but at least having the right idea about the Uplift. The 32% who believed scientists interpreted the Uplift as probably or possibly being an earthquake precursor **had most** adequately grasped the view presented in the responsible media. But the 16% **who did not** know or who **believed scientists were saying the Uplift was not an earth**quake precursor **lacked something in awareness of the Uplift and its significance.** If this 16% is eliminated, we find that almost 73% of the people who **had heard** of the Uplift also understand that it may be an earthquake precursor.

4.3 Relevance

Awareness of the Uplift and of its possible significance as an earthquake precursor still does not **ensure** that the earthquake threat has a personal meaning for the individual. Some people may think of Palmdale as a long way away from Los Angeles and any associated earthquake as very remote.

Some may view the earthquake threat with interest and curiosity but not seriously examine whether it might affect them. Still others may be aware of scientific discussions but not take them seriously. Two questions were asked in order to judge whether the earthquake threat associated with the Uplift was personally meaningful or relevant to the public.

First, all of the respondents who had heard of the Uplift and thought it could signify a coming quake were asked whether they expected damage where they lived in the event of an Uplift-connected earthquake. Under 6% of the people expected a great deal of damage where they lived and about the same percent were prepared to say there would be no damage where they lived (Table 2). Of those people interviewed, then, about one-quarter had heard of the Uplift, understood that it might be an earthquake precursor, and expected some damage where they lived in case of an Uplift-connected earthquake.

The same set of respondents were also asked how seriously they took the Uplift as a sign of a coming earthquake (Table 3). More than half said they took the Uplift fairly or quite seriously. However, two of every five people who had heard of the bulge said they did not take it seriously.

The findings of awareness, understanding, relevance, and salience are summarized in Figure 2. From left to right the graph identifies groups to whom the Uplift is decreasingly significant. Those who have heard, understood, and seen the relevance of the Uplift, constitution one-quarter of the sample, are those for whom the Uplift is most relevant. The next segment includes those who had heard and understood, but did not see the Uplift as personally relevant, followed by those who had heard of the Uplift but missed its significance as a possible earthquake precursor. The largest single segment of the population are those who had not even heard of a "bulge in the earth near Palmdale in the Mojave Desert" or who had forgotten about it.

4.4 Correlates of Awareness

It has long been recognized that news spreads unevenly through any population, that some groups of people hear and grasp the significance of important information more quickly than others. An important task in preparing

TABLE 1

SIGNIFICANCE OF THE UPLIFT

Answer to the question: do you happen to remember what scientists are saying the bulge signifies? Does it signify that:	Percent
There is definitely an earthquake coming,	10,8
There is probably an earthquake coming,	15,8
There might be an earthquake coming, or	16,3
The bulge does not signify that an earthquake is coming?	6,1
DON'T KNOW AND NOT ANSWERED	10,1
Total who heard of the bulge	59,1
All others	40,9
Total percent	100,0
Total number	1450

TABLE 2

EXPECTED DAMAGE WHERE RESPONDENT LIVES

Answer to the question: if the bulge should signify a coming earthquake, in your opinion, do you think there will be damage where you live? Would you say:	Percent
A great deal,	5,7
Some,	23,7
Not very much, or	13,6
None at all?	5,5
DON'T KNOW AND NOT ANSWERED	4,5
Total asked (see text)	53,0
All others	47,0
Total sample	100,0
Total number	1450

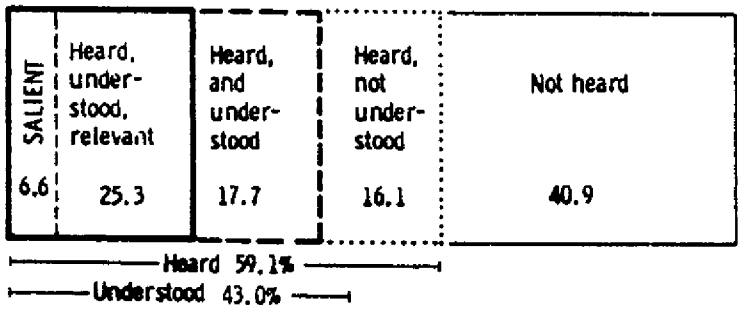
TABLE 3

HOW SERIOUSLY RESPONDENTS TAKE THE UPLIFT

Answer to the question: How seriously do you take the Palmdale bulge as the sign of a coming earthquake?	Percent
Quite seriously	11.4
Fairly seriously	17.9
Not very seriously, or	14.3
Not seriously at all?	6.4
DON'T KNOW AND NOT ANSWERED	3.0
Total asked (see text)	53.0
All others	47.0
Total sample	100.0
Total number	1450

FIGURE 2

AWARENESS OF THE SOUTHERN CALIFORNIA UPLIFT



a community to cope successfully with an earthquake and respond constructively to an earthquake prediction is to identify groups of people who are out of the mainstream of public communication channels. Public officials and leaders in the private sector can then advise ways to see that these people have the same opportunity to protect themselves from danger as others. When awareness of the Uplift was compared across different population segments, it was possible to identify groups in need of special attention.

For example, a strong positive correlation was found between age of the respondent and an understanding of the Uplift's relevance. This finding indicates that efforts should be made to reach younger adults in the population to make them aware of an earthquake threat related to the continuing scientific concern about the Uplift. Other groups that were found to have either not heard or not understood the Uplift's potential significance, include those with lower edicational attainment and lower household incomes, those who do not regularly read newspapers, members of the ethnic and racial minority groups, and those who do not have strong ties to their own local communities.

5. AWARENESS OF THE UPLIFT OVER TIME

The succeeding waves of interviews provided the opportunity to assess responses to the Uplift as they developed over time. In each of the four subsequent surveys, new samples of respondents were asked the same questions to determine how many had heard of the Uplift, understood its potential significance as an earthquake precursor, and felt that the threat was personally relevant.

Table 4 indicates that the rates of awareness over the two year period are surprisingly stable. None of the types of awareness increase or decrease significantly except during the survey of July 1978. A small but apparently significant increase in all of the "aware" categories occurred between January and July 1978, followed by a significant decrease to original levels of awareness by November-December 1978. In the absence of a persistent trend, however, it is concluded that the increased salience of the Uplift did not signify any spreading awareness and appreciation of the Uplift in the population at large during the two year study period.

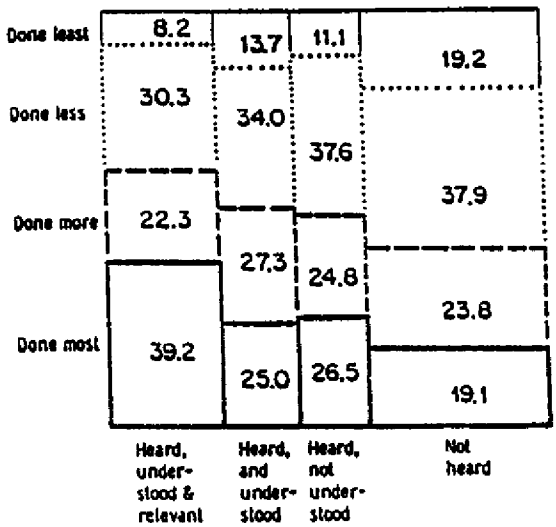
TABLE 4

AWARENESS OF THE SOUTHERN CALIFORNIA UPLIFT

Extent of awareness	February 1977	August 1977	January 1978	July 1978	Nov/Dec 1978
Not heard	40.9	41.9	40.3	33.0	41.3
Heard, not understood	16.1	20.5	18.2	19.0	18.7
Heard and understood not relevant	17.7	14.4	16.7	19.4	16.9
Heard, understood, and relevant	25.3	23.2	24.8	28.6	23.1
TOTAL	100.0	100.0	100.0	100.0	100.0
Number of persons	1450	551	516	536	550

FIGURE 3

EARTHQUAKE PREPAREDNESS BY AWARENESS OF THE UPLIFT



However, the stability of the awareness level over time, even though media coverage declined, is an important finding. Once the awareness of the Uplift had been fairly widely diffused during the early months of more intensive coverage, a continuing lower level of media attention was sufficient to maintain the level of awareness. The pattern of attention to the Uplift is not greatly unlike the more inclusive pattern of attention to predictive matters in general. But while the reduced level of newspaper coverage can be plausibly viewed as a prime cause of a lessened recall of other specific announcements and a declining sense of imminence concerning earthquake threat in general, it is not accompanied by lessened recognition awareness of the Uplift. Thus after an extended period of occasional reminders, the underlying awareness of the Uplift remained steady.

This persistence is particularly impressive because it applies to recognition of the Uplift as personally relevant as well as to simple recognition that it existed. It would not have been surprising to find that people continued to recall the existence of the "bulge" while increasingly coming to feel that it had no significance for them. Instead, having once understood the message, people retained the awareness of what it could mean to them with the help of a low-keyed series of media reminders.

6. AWARENESS AND HOUSEHOLD PREPAREDNESS

One obvious question to be answered is whether awareness and relevance of the Uplift were converted into precautionary action by southern Californains. Did it have any effect on their behaviour? To get a measure of how well prepared households were to deal with the effects of a damaging earthquake, respondents were asked a list of 16 precautionary measures that could have been taken for their households. Adjusted index scores for each household were collapsed into four ordinal-level categories of preparedness, ranging from "done least" to "done most".

Those for whom the Uplift was relevant acknowledged the potential danger which the Uplift may signify for the area in which they live. Figure 3 shows that there is a clear correlation between awareness and action. When people who had heard of the Uplift, understood its significance and realized that the earthquake it signified might cause damage where they live, were compared

with people who did not remember hearing of the Uplift, twice as many of the former were among those who had taken the most steps toward preparing themselves. While their motivations may have come partly from other sources, it is apparent that stressing the personal relevance of prediction announcements will have an important impact on the populace. Merely being aware of predictions may not be sufficient to motivate adaptive response.

One of the common misperceptions heard about the Uplift was that if it were a precursor to a large quake, that quake would be much more destructive in the Palmdale area where the bulge and the San Andreas Fault are located than in the Los Angeles metropolitan basin. To determine whether the level of preparedness was a function of proximity to Palmdale, preparedness scores for people in the Palmdale area were compared with scores for people living elsewhere in Los Angeles County (Table 5). Although the small size of the sample from Palmdale prevents the apparent difference from reaching an acceptable level of statistical significance, there was a tendency for Palmdale area residents to be better prepared than other county residents.

7. AWARENESS AND GOVERNMENTAL PREPAREDNESS

In anticipation of any large, damaging earthquake in a major metropolitan area, significant hazard mitigation and emergency preparedness efforts must be taken to safeguard the populace. Did an understanding of the Uplift announcement have any impact on the public's attitudes toward or support for such programmes?

In the first survey conducted in early 1977, it was found that people who understood and appreciated the relevance of the southern California Uplift had a poorer opinion of the accomplishments of public officials with respect to earthquake preparedness than did people with less appreciation of the Uplift. This finding suggests that an awareness and appreciation of the earthquake hazard as reflected in understanding the significance of the Uplift leads to disappointment with government progress in dealing with earthquake hazard. In addition, those respondents who had the most ideas about what government should be doing to prepare for a damaging earthquake also had the least favourable evaluations of official progress, and were those for whom the Uplift was most significant. Clearly, perceptions of immediate or personal threat may have resulted in a greater demand for the government to take substantial

TABLE 5

EARTHQUAKE PREPAREDNESS FOR RESIDENTS OF
PALMDALE AND OTHER AREAS OF LOS ANGELES COUNTY

Preparedness index	Palmdale and vicinity	Other areas
Done least	4.3	14.4
Done less	28.3	35.5
Done more	30.4	24.0
Done most	37.0	26.1
TOTAL	100.0	100.0
Total number	46	1404

preparedness actions in early 1977 due to the recent heightening of community concern about earthquake threat in general.[5]

8. CONCLUSIONS

This paper gives some indications that the forewarning of a potentially damaging earthquake in the southern California area resulted in a relatively stable perception of the significance and relevance of the Uplift for local residents. That perception continued to exist for at least three years, even though major media attention to the Uplift declined. Those who heard of the Uplift understood it could be a precursor and believed that the Uplift could have personal consequences were also more likely to have taken preparedness actions to safeguard their own families and were more likely to want to see the government improve its preparedness in specific ways. It must be remembered, however, that the Uplift announcement and the reaction to it did not take place in a vacuum - a great deal of media and public attention were being given to earthquake prediction and preparedness during the study period. But, the first scientific forewarning of a damaging quake in the USA appears to have been accepted as credible by a substantial proportion of the potentially affected populace, creating a climate in which both personal preparedness could take place and public preparedness could be enhanced.

FOOTNOTES

[1] This research was supported by grants from the National Science Foundation (ENV-76-24154 and PFR-78-23887), Ralph H. Turner, Principal Investigator. Any options, findings, or conclusions are those of the author and do not necessarily reflect the view of the Foundation.

[2] The Panel on Earthquake Prediction (1976) recommended that credible predictions from geoscientists should include six elements:

Lead Time - A statement of how far in the future an earthquake will occur.

Time Window - A statement about the time period in dates between which the earthquake will occur.

Magnitude - A statement about the size of the expected earthquake.

Location - A statement of the geographical area in which the earthquake will occur.

Impact - A statement about what damage will occur.

Probability - A statement about the liklihood or confidence that the first five parameters will occur as specified.

[3] One alternative interpretation given to the Uplift was that it was part of a recurrent and benign mountain-building process that had originally produced the magnificent San Gorgonio mountains. Reports of changes in the Uplift discussed its sinking or migrating southward.

[4] The term salience, as distinguished from mere awareness, is used to indicate that people think immediately of the Uplift when the topic of earthquake predictions and warnings is broached.

[5] For more information on a general heightening of earthquake concern, see R.H. Turner, J.M. Nigg, B.S. Young, D.H. Paz, Community Response to Earthquake Threat in Southern California, Part 9 (Los Angeles: Institute for Social Science Research, UCLA) 1980.

DISCUSSION

Dr. Tomblin pointed out that Palmdale, although not one of the more dramatic predictions, had been closely covered by sociologists. It would be desirable to obtain similar coverage for other predictions.

Prof. Nigg agreed and amplified on the subject of Southern California predictions. Prof. Lomnitz asked whether the usefulness of the Palmdale Bulge publicity had depended on whether the prediction was effective or not. Prof. Nigg responded that the increase in public awareness and preparedness did not seem to depend on the eventual outcome of the prediction.

Dr. Kárník asked about government response to the Palmdale Bulge alarm. Prof. Nigg gave details of several instances where safety programmes were stepped up and new safety legislation was established. However, little attention was given by government agencies to the matter of response to earthquake prediction.

Prof. Roberts asked whether criticism by the public was directed against any specific agencies, and for what reason? Prof. Nigg replied that lack of adequate safety measures and hazard mitigation was the aspect most criticized. On another question by Prof. Roberts, she stated that no influence on property values was detected.

Dr. Kárník asked about earthquake insurance. Prof. Nigg replied that no change was detected in public attitudes on earthquake insurance.