THE SOUTHERN CALIFORNIA EARTHQUAKE PREDICTION OF 1976 : A PREDICTION UNFULFILLED

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1. INTRODUCTION

On 15 April 1976, at the annual meeting of the American Geophysical Union in Washington, D.C., a paper entitled "Time-dependent V_p and V_p/V_s in an area of the Transverse Ranges of southern California" was presented by Dr. James H. Whitcomb, Senior Research Fellow at the Seismological Laboratory of the California Institute of Technology. Although the published abstract was relatively specific in identifying a 1.8-year-long V_p/V_s anomaly in an area of 140-km diameter centered in the vicinity of the earlier 1971 San Fernando earthquake, the word "prediction" was not used in the abstract, and the area was simply identified as "a candidate for intensified geophysical monitoring". It was several days before members of the news media realized that something akin to a prediction had indeed been made, and the first major publicity followed a news conference at Caltech on 21 April— somewhat hastily called to head-off rapidly spreading rumors. At that time, Dr. Whitcomb indicated that the recent termination of the velocity anomaly (i.e., a return to normal velocities) suggested, on the basis of experience in the Soviet Union and elsewhere, that an earthquake of magnitude 5.5 to 6.5 might occur within the following 12 months in the aforementioned area— which included not only much of the City of Los Angeles, but also the Palmdale area. As was consistent with the theory at that time, the projected magnitude of the earthquake was related to the length of the anomalous period, and the time window for the projected event was related to the time of termination of the anomaly.

The inclusion of Palmdale within the affected area was significant because this area was already the subject of considerable public concern owing to the announcement by the U.S. Geological Survey only two months earlier of the existence of the southern California uplift—better known locally as the "Palmdale Bulge". Dr. Whitcomb went out of his way to emphasize that there was no necessary relationship between the uplift and his prognostication, and he preferred to use the term "hypothesis test" rather than "prediction" in describing his analysis.

In southern California, nevertheless, the episode has usually been referred to as the "Whitcomb prediction".

2. PUBLIC RESPONSE TO THE PREDICTION

Response of the news media to the Whitcomb prediction was varied, from flamboyant television coverage to somewhat muted newspaper response. The Los Angeles Times, the region's most widely read newspaper, reported the story on a lower corner of the front page under the minor headline, "Caltech Scientist Offers Cautious Quake Prediction", emphasizing the unproved validity of the V_p/V_s method and the generalized nature of the prediction. A number of stories concerning public reaction appeared in the same paper the following day, including an analysis by psychologists that the prediction was "too vague and open-ended to have much of a psychological effect on people". Indeed, concern did seem to dissipate quickly, with almost no further newspaper reference to the episode until the time of the scientific hearing by the California Earthquake Prediction Evaluation Council about a week later. Immediately following the initial publicity, a Los Angeles City Councilman threatened to sue both Whitcomb and Caltech for allegedly lowering property values in the San Fernando Valley, but the City Attorney quickly headed-off this action, and it became clear within a few days that public reaction was not nearly as intense as the Councilman had evidently thought. Nor were property values at any time significantly affected.

3. FORMAL EVALUATION OF THE PREDICTION

Although many scientists were aware of Dr. Whitcomb's analysis even before the presentation of his paper at the American Geophysical Union meeting, the publicity resulting from the press conference on 21 April spurred the California Earthquake Prediction Evaluation Council into action, and the Council held a one-day formal hearing in Pasadena on 30 April. The entire meeting, including the Council's own deliberations and vote, were open to the public and to the press— a policy whose wisdom has since been questioned and is discussed in the author's other paper at this Seminar. (The National Earthquake Prediction Evaluation Council had not yet been formed at this time.) Dr. Whitcomb presented his data in great detail and emphasized that, although he had great confidence in the accuracy of the seismological data, the V_p/V_s prediction method itself was still only a hypothesis, and therefore his total confidence in the accuracy of the prognostication was limited; in fact, he specifically recommended that, as a result of his statements, the public in the affected area should take no special actions that they would not take anyway in response to the long-term continuing seismic hazard in southern California.

In general members of the Council (including the present author), while agreeing with Dr. Whitcomb that the method itself was unproved and debatable, could furthermore not be as convinced as was he that the velocity data were persuasive, particularly in the smoothed form in which the anomaly was allegedly most obvious.

The Council's formal statement at the conclusion of the meeting was that it "did not conclude that the probability of an earthquake in the area in question is higher than average for similar geological areas of California. Nevertheless, the data are sufficiently suggestive of such an increase to warrant further intensive study and testing of the hypothesis presented by Dr. Whitcomb. It remains possible that a moderate or major earthquake could occur in the area at any time, as is true for many other similar geologic areas of California".

4. REACTIONS TO THE EVALUATION

The Council's conclusions were duly and accurately reported by the news media, and the issue quickly disappeared from public attention. The Los Angeles Times headlined its resulting story:"Experts Won't Accept Quake Prediction". It was particularly interesting that those news-media reporters who sat through the entire day-long hearing, most of which consisted of somewhat tedious discussions of sophisticated scientific points (such as the data-smoothing technique), were the ones who presented stories most sympathetic to both Whitcomb and the Council; they seemed surprised and impressed that scientists were willing to go to such an effort to reach a decision in the public interest. Although Dr. Whitcomb obviously disagreed with the Council's position, as well as with some aspects of the hearing procedure, he found within a few months that the continuing V_p/V_s data did not support the original prediction, and he himself withdrew the prediction (or "hypothesis test") at that time. And no earthquake in the 5.5 to 6.5 magnitude range has occured in the specified area since then. It should be noted that Dr. Whitcomb conducted himself professionally and responsibly throughout, and the scientific community seemed to come through the episode with reasonable credibility in the public eye.

That the Whitcomb prediction did not at the time create greater public concern has surprised some people. But it should be noted that the designated area of some 15,000 km^2 was very large, and in particular, the time-span of the prediction of 12 months was very long; most people simply couldn't regard it as a personal threat— or at least there wasn't much

they could do about it anyway, in view of its unspecificity. Furthermore, partly as a result of the highly publicized announcement of the "Palmdale bulge" only a few months earlier, most southern Californians were by this time accustomed and even a bit blasé to warnings of impending earthquakes, and they simply couldn't get excited about a prediction as "vague and open-ended" as the Whitcomb statement. Most of the earlier publicity on the Palmdale bulge had to do with the possibility of it being a precursor to a truly great earthquake, such as last occured here in 1857, and everyone recognized that the Whitcomb prediction was for a considerably smaller and potentially less damaging event. Also, it should be added, both Dr. Whitcomb and most of the news media treated his prognostication in a relatively low-key fashion; unlike some earlier and subsequent predictions in southern California by amateurs and psychics, no one was "beating the drum" to draw public attention for personal gain.

5. LESSONS LEARNED

What lessons can be drawn from the 1976 prediction episode in southern California ? In the author's opinion, these points should be emphasized :

(1) An earthquake prediction, however justified and well documented, is unlikely to create great public concern if it is as unspecific in both place and time as was the Whitcomb prediction, particularly in a region where the ongoing seismicity as is as high as in southern California.

(2) An earthquake prediction, once formulated and discussed with one's colleagues, is almost impossible to keep confidential, at least in an area of high earthquake awareness and concern such as southern California.

(3) Announcement of an earthquake prediction to the news media must be carefully planned in advance. Insufficient forethought was given to this problem in the cases of the Whitcomb prediction, and we became caught-up by circumstances.

(4) Those news-media reporters who were most thoroughly involved in the prediction and its evaluation, and with whom the various scientists communicated most easily and forthrightly, were the ones who released the most accurate stories and who were most helpful in creating a constructive and responsible public response.

(5) Newspaper coverage was generally more accurate, thorough, and responsible than was television coverage.

(6) Although the public quickly forgot the 1976 prediction, many members of the scientific community did not, and Dr. Whitcomb's scientific reputation was— in the author's opinion— unduly damaged because of this one episode. We must find ways in which young scientists can be involved in earthquake-prediction research without putting their scientific carreers in unreasonable jeopardy.

(7) In the case of the Whitcomb prediction, his institution (Caltech) and his colleagues (including the author) should have been more active in helping him by reviewing and criticizing the prediction prior to its public release.

(8) Even where there are obvious differences in scientific opinion, professional and responsible behaviour by the involved scientists can serve to maintain credibility with the public.

(9) The prompt response to the Whitcomb prediction by the California Earthquake Prediction Evaluation Council was helpful in alleviating undue public concern, although the specific procedures used by the Council are still the subject of some debate (e.g., the openness of the hearings).

(10) The allegation that any publicized earthquake prediction will necessarily lead to widespread public alarm is certainly not warranted.

DISCUSSION

A general discussion took place on the modalities to be considered in dealing with earthquake prediction. Some participants suggested that resolutions be passed by the Seminar as regards ethics and rules of behaviour for scientists.

Dr. Kárník observed that whereas the Seminar itself is not in a position to pass resolutions, recommendations should obviously be made. He mentioned that the forthcoming IUGG and IASPEI assembly to be held in Hamburg in August 1983 will address the problem.

Prof. Rikitake reported on a letter sent to him by Dr. Evison suggesting that a Code of Practice on Earthquake Prediction be established.

At the invitation of the Chairman, Dr. Fournier d'Albe defined the difference between a prediction and a statement of hazard.

On the necessity of having a consensus among scientists for closed-door discussions on prediction, Prof. Nigg observed that the public became confused by any divergence of opinions expressed by different scientists. However, closed-door evaluations are difficult in the USA.

Dr. Isikara gave information on earthquake prediction research by the Council of Europe and the Sub-commission on Earthquake Prediction of the ESC.

N.B.

Prof. Allen was unable to attend the Seminar. The above paper was read in his absence and the discussion held without his participation.