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41688

LIMA DISASTER PREPAREDNESS REPORT

VOLUME XIII-B

SELECTED AVAILABLE DOCUMENTATION:

THE BRADY EARTHQUAKE PREDICTIONS

BOOK B: Reports, Memoranda, Correspondence
and Other Communication

Chronological Collection 1981 - 1982

Office of U. S. Foreign Disaster Assistance
Agency for International Development

October 1982

FOREWORD

This is one of four books which together form a compilation of documentation available to the author concerning the earthquake predictions for Peru in 1981 of Dr. Brian T. Brady. The set of four books together comprise Volume XIII of a fifteen volume report concerning disaster preparedness in Lima, Peru. It was researched in Lima by a team of disaster specialists during the period July - November, 1981, for the Agency for International Development's Office of Foreign Disaster Assistance and USAID Mission in Peru. Further research was conducted in the Office of Foreign Disaster Assistance, Washington, D. C., in Fall, 1982.

October 1982

This work was done under Contract #PDC-0018-0-00-2075-00
by Robert Gersony.

The Lima Disaster Preparedness Report has 15 sections:

Volume I	Methodology Employed
Volume II	Port of Callao Infrastructure Security and Emergency Evacuation Needs
Volume III	Electricity
Volume IV	Water and Sewerage
Volume V	Heavy Equipment Rehabilitation and Maintenance
Volume VI	Airport and Aircraft Resources
Volume VII	Education
Volume VIII	Food Supply and Consumption
Volume IX	Low-Income Housing
Volume X	Emergency Medical Care
Volume XI	International Donor Coordination
Volume XII	Critical Abstracts from the Literature: A Field Perspective on Major Earthquakes Peru, 5-31-70 Nicaragua, 12-23-72 Guatemala, 2-4-76
Volume XIII	Selected Available Documentation: The Brady Earthquake Predictions
Volume XIV	Sewerage and Water: Supplementary Information
Volume XV	Summary

COMMONLY USED ABBREVIATIONS

USGS	U. S. Geological Survey [U. S. Department of the Interior]
USBM	U. S. Bureau of Mines [U. S. Department of the Interior]
DOI/OES	U. S. Department of the Interior/ Office of Earthquake Studies
AID	Agency for International Development
OFDA	Office of U. S. Foreign Disaster Assistance [Agency for International Development]
IGP	<u>Instituto Geofísico Peruano</u>
CERESIS	<u>Centro Regional de Sismología para</u> <u>América del Sur</u>

Reports, Memoranda, Correspondence
and Other Communication

January - February 1981

UNITED STATES GOVERNMENT

DOCUMENT NO. 77

Memorandum

TO : PDC/CFDA, Mr. Oliver Davidson

DATE: January 2, 1981

FROM : LAC/SA, William W. Rhodes *WWR*

SUBJECT: Peru Earthquake Assistance Request

REFERENCE: Your Memorandum of December 3, 1980

Paragraph 1 on page 2 of the reference noted that I would follow up with Dr. Jerry Eaton of USGS to obtain and distribute a copy of his report of his trip to Peru last August. During telephone conversations with Dr. Eaton, who is based in California, we discussed A.I.D.'s primary interests in his trip. His report was prepared accordingly. Herewith are two copies of his report and a copy of a report, in Spanish, prepared by the Peruvian Geophysical Institute (IGP), which is referred to by Dr. Eaton.

Attachment: As Stated

CC: USAID/Peru:PGVitale (with Spanish report)
ARA/AND:APurnell



5010-110

Buy U.S. Savings Bonds Regularly on the Payroll Savings Plan

Ms. Dinny Avignone
Federal Emergency Management Agency
1725 Eye St. N.W.
Washington, D.C. 20472

January 5, 1981

Dear Ms. Avignone:

The Government of Peru has requested U.S. Government assistance in disaster preparedness. You may have read that a massive earthquake has been predicted by two U.S. scientists to occur in Peru during 1981. Although the U.S. Government does not endorse this prediction, the continuing earthquake risk in Peru makes it one of the most vulnerable areas in Latin America. As a part of its continuing preparedness program, the Office of U. S. Foreign Disaster Assistance (OFDA) is preparing a mission to Peru to evaluate the state of preparedness and to make recommendations to strengthen the Peruvian civilian preparedness capability. Representatives from the UN Disaster Relief Office (UNDRO), the Pan American Health Organization (PAHO), the League of Red Cross Societies (LORCS), OFDA, and if possible, civil defense experts from the U.S. will form the team.

The purpose of the mission will be to review the status of Peruvian civil preparedness (Civil Defense, Red Cross, and private and voluntary agencies) and recommend assistance which could be provided from U.S. and international resources. OFDA is expecting a more specific request from the Peruvian Government in the near future, since disaster preparedness has been the subject of several discussions between Peruvian officials and the U.S. Embassy in Lima. It appears from our initial analysis that the following areas will be of interest to Peru: national and regional disaster planning, public awareness and preparation, communications, emergency center operations, transportation and logistics, etc.

If formally requested by the Government of Peru, OFDA is prepared to select experienced, bilingual civil defense experts who are familiar with U.S. disaster preparedness resources to accompany the mission to Peru, Ecuador and Colombia. OFDA will pay the travel and related costs of the two experts for the duration of the mission, approximately two weeks, tentatively scheduled to begin in late January 1981.

I am writing to request your assistance in identifying appropriate individuals to accompany this mission and also to identify resources such as training courses, written materials, and on the job training opportunities, which might be appropriate for Peruvians with limited or no English language qualifications

Thank you for your interest and initial information. I look forward to working closely with you on this and possibly other preparedness efforts.

Sincerely,

Oliver Davidson
Disaster Preparedness Officer
Latin America/Caribbean

Distribution:

Alex Cunningham, California
George Jones, Virginia
Robert Wilkerson, Florida
Dinny Avignone, FEMA

Attachments:

Cable to Latin America
Newspaper articles on
Peruvian prediction



United States Department of the Interior

GEOLOGICAL SURVEY
RESTON, VIRGINIA 22092

DOCUMENT NO. 79

In Reply Refer To:
Mail Stop 905

January 9, 1981

Memorandum

To: Members, National Earthquake Prediction Evaluation Council
From: Chief, Office of Earthquake Studies
Subject: Next meeting - January 26-27, 1981

The next meeting of the National Earthquake Prediction Evaluation Council (NEPEC) will be on January 26-27, 1981, in Golden, Colorado. The meeting will be 2 full days starting at 8:30 a.m. on each day. The meeting location is as follows:

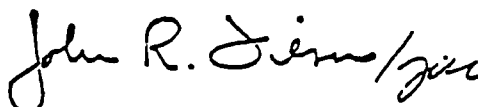
Metals Hall
Green Center
Colorado School of Mines
16th & Cheyenne
Golden, Colorado

A block of rooms has been reserved for the Council members at the Holiday Inn West in Golden for the nights of January 25, 26, and 27. Please call Ms. Marge Edgell at the Holiday Inn to confirm your room reservation—specifying that you will be attending the National Earthquake Prediction Evaluation Council meeting. The address and phone number are:

Ms. Marge Edgell
Holiday Inn West
707 West Colfax
Golden, Colorado 80401
(303) 279-7611

The following materials relevant to this meeting are enclosed:

- Travel Packet (confirmed attendees only).
- Memo (including enclosures) to Chief, Branch of Global Seismology from Chief, OES dated May 27, 1980.
- Memo to Chief, OES from Chief, Branch of Global Seismology dated November 3, 1980.
- Memo to Chief, OES from Chief, Branch of Global Seismology dated December 3, 1980.
- Theory of Earthquakes, I. A Scale Independent Theory of Rock Failure by B. T. Brady.
- Theory of Earthquakes, II. Inclusion Theory of Crustal Earthquakes by B. T. Brady.
- Theory of Earthquakes, Part III: Inclusion Collapse Theory of Deep Earthquakes by B. T. Brady.
- Theory of Earthquakes - IV. General Implications for Earthquake Prediction by B. T. Brady.



John R. Filson

cc: H. W. Menard J. Purnell (State)
 R. Wesson E. Coy (AID)
 D. Peck A. Van Egmond
 Asst. Dir., Central (Don Watson) 911
 Regional Geologist, Central (R. Erickson) 911

UNITED STATES INTERNATIONAL DEVELOPMENT COOPERATION AGENCY
AGENCY FOR INTERNATIONAL DEVELOPMENT

WASHINGTON D C 20523

DOCUMENT NO. 80

January 12, 1981

Dr. John Filson
Director, Office of Earthquake Studies
Mail Stop 905 National Center
U.S. Geological Survey
Reston, Virginia 22092

Dear John:

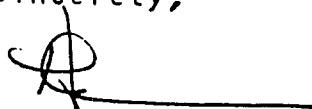
I would like to follow-up our recent telephone conversation and express my appreciation for your efforts to convene the National Earthquake Prediction Evaluation Council later this month. I look forward to attending this meeting as an observer. Also, thank you for sending along a copy of the Eaton report in addition to materials on the Council meeting.

I hope that USGS will pursue expeditiously the proposed visit by an IGP scientist from Peru in connection with requirements for earthquake monitoring and detection. We are following your lead concerning additional equipment which may be necessary for enhanced seismic detection. A key question remains relative to U.S. and Peruvian capabilities for detecting low magnitude events and relaying data on a real-time basis.

In connection with this component, I would like to review the trip report, equipment priority list, and program design prepared by Drs. Spence and Algermisson for upgrading the IGP network following their visit to Lima last October. I would be grateful if you could send me these materials at the earliest opportunity.

Again, thank you very much for your diligent efforts on these matters. Best regards,

Sincerely,



Alan Van Egmond
Assistant Director for Preparedness
and Planning
Office of U.S. Foreign Disaster
Assistance

cc: AID/AA/LAC:Ed Coy
ARA/AND/P:John Purnell



FEDERAL EMERGENCY MANAGEMENT AGENCY

Washington, D.C. 20542

January 12, 1981

MEMORANDUM FOR: John W. Macy, Jr.

FROM:

Frederic Ackerson
 Frederic Ackerson, Director
 Office of International Affairs

SUBJECT:

Agency for International Development (AID) Request
for Civil Defense and Disaster Preparedness Expert

Attached is a letter from AID which requests U.S. assistance in disaster preparedness. Basically, AID wants an experienced, bilingual civil defense expert who is familiar with U.S. disaster preparedness resources to accompany a mission to Peru, Ecuador, and Colombia.

This office sent memos to Mr. Robert Young, P&P, Dr. Charles Thiel, M&R, and the Regional Directors of Regions II, IV, VI, and IX asking for assistance in naming candidates for this mission.

Mr. Oliver Davidson, AID, has just notified us that Mr. Jose Bravo, Region II, has been selected as the FEMA representative for the team. The Office of Foreign Disaster Assistance will pay the travel and related costs of Mr. Bravo for the duration of the mission, approximately two weeks.

Before we proceed further, would you please give your approval for FEMA's participation on this team.

APPROVAL of participation

JWM 1/12/81

NON-APPROVAL of participation



United States Department of the Interior

GEOLOGICAL SURVEY
RESTON, VIRGINIA 22092

13 JAN 1981

Memorandum

To: Director, U.S. Bureau of Mines

Through: Assistant Secretary--Energy and Minerals

From: Director, U.S. Geological Survey

As we have discussed with Dr. Robert L. Marovelli, Director, Mineral Health and Safety Technology, the Government of Peru has asked for an authoritative statement by the United States on the prediction of a major earthquake off the coast of Peru in 1981 by Dr. Brian T. Brady of the Bureau of Mines and Dr. William Spence of the Geological Survey. Specifically, we have been asked to convene the National Earthquake Prediction Evaluation Council to evaluate the prediction by Drs. Brady and Spence and, to this end, we shall convene the Council in Golden, Colorado, on January 26-27, 1981. With the advice of the Council we are prepared to make a formal statement on the scientific credibility of the prediction.

The purpose of this memo is to formally inform you of the Council meeting and to request that Dr. Brady be prepared to describe before the Council the theory, data, and analysis that have led him to conclude that a major earthquake will occur off the coast of Peru during a specific time period next year. To increase the efficiency of the Council deliberation, we further request that any written materials to be used by Dr. Brady in his presentation be distributed to the Council beforehand so that they may be studied in depth. The Council charter and a list of the Council members and their addresses are enclosed. If we can be of any assistance in the distribution of these materials, please request such assistance from Dr. John Filson of our Office of Earthquake Studies (703/860-6471).

Last May at our request, Dr. Brady provided, through your office, details of the precursory seismicity expected to precede the major event and to begin off the coast of Peru in mid-September 1980. We directed our National Earthquake Information Service to use its facilities and data

to search for the foreshock sequence predicted by Dr. Brady. To date we have received two reports from the chief of the National Earthquake Information Service, both negative. We have enclosed copies of these reports and shall forward additional reports to you as they become available.

ROBERT L. WESSON

FOR H. William Menard

Enclosures

Copy to: W. Dalton
J. Purnell
E. Coy
M. Finerelli
R. Marovelli

UNITED STATES GOVERNMENT

U.S. Geological Survey
Office of Earthquake Studies
Reston, Virginia

File: Peru

Memorandum

NOV 7 3:11

TO : Acting Chief, Office of Earthquake Studies

RECEIVED

DATE November 3, 1980

FROM : Chief, Branch of Global Seismology

SUBJECT: Prediction of Earthquakes Off Peru

A foreshock-mainshock sequence has been predicted by Brian Brady to begin off the coast of Peru in mid-September 1980. We have been directed to use the facilities and data available to the National Earthquake Information Service (NEIS) in efforts to detect the foreshock sequence predicted by Brady. This is the first monthly report on seismicity detected in the region of the predicted earthquake sequence.

For purposes of this exercise we define the region of interest to be described by figure 1 of the Brady letter to Marovelli dated May 1, 1980. This region has approximate geographic boundaries of 11.5° to 14.0° south latitude and 75.5° to 79.0° west longitude. In the year preceding September, 1980, four earthquakes, at least three of which were greater than m_b 4.5, were detected in this region. For purposes of comparison these can be considered as normal background for seismicity detected in the region by NEIS. On the basis of these data and earlier studies we conclude that the NEIS threshold magnitude for the region lies between m_b 4.5 and 5.0. This suggests that data provided to NEIS will not ordinarily permit us to locate all earthquakes above m_b 4.5 that might have occurred in the region. However, the Peruvian local network appears to have been making recent special efforts to provide NEIS with data from small magnitude events in the region so that this condition may no longer be valid.

Summary for September, 1980—only one earthquake was detected by NEIS in the region of interest. The hypocentral parameters for this event are:

September 20, 1980, origin time = 4h 42m 23.5s (GMT), latitude = 12.475° S, longitude = 77.718° W, depth = 33 longitude M_b = 3.2. This earthquake was detected solely on the basis of data reported from six stations of the Peruvian local network. An examination of the seismogram from our Albuquerque, New Mexico, station revealed no detection for this event, which meant that it was at least less than m_b 3.8 (about one millimicron of ground motion at that station). On the basis of this report on detectable seismicity in the region of interest for September, 1980, we must conclude that the pattern of seismicity predicted by Brady has not commenced.

E R. Engdahl



UNITED STATES GOVERNMENT

Memorandum

TO : Chief, Office of Earthquake Studies

DATE: December 3, 1980

FROM : Chief, Branch of Global Seismology

SUBJECT: Prediction of Earthquakes Off Peru

A foreshock-mainshock sequence has been predicted by Brian Brady to begin off the coast of Peru in mid-September 1980. We have been directed to use the facilities and data available to the National Earthquake Information Service (NEIS) in efforts to detect the foreshock sequence predicted by Brady. This is the second monthly report on seismicity detected in the region of the predicted earthquake sequence.

For purposes of this exercise we define the region of interest to be described by figure 1 of the Brady letter to Marovelli dated May 1, 1980. This region has approximate geographic boundaries of 11.5° to 14.0° south latitude and 75.5° to 79.0° west longitude. In the year preceding September, 1980, four earthquakes, at least three of which were greater than m_b 4.5, were detected in this region. For purposes of comparison these can be considered as normal background for seismicity detected in the region by NEIS. On the basis of these data and earlier studies we conclude that the NEIS threshold magnitude for the region lies between m_b 4.5 and 5.0. This suggests that data provided to NEIS will not ordinarily permit us to locate all earthquakes above m_b 4.5 that might have occurred in the region. However, the Peruvian local network appears to have been making recent special efforts to provide NEIS with data from small magnitude events in the region so that this condition may no longer be valid.

Summary for October, 1980—with the exception of the September 20, 1980, $ML = 3.2$ earthquake previously reported, no activity in the region of interest has been detected and reported by NEIS through PDE No. 45-80, dated December 3, 1980.

U.S. Geological Survey
Office of Earthquake Studies
Reston, Virginia

DEC 9 A.M.

RECEIVED



CHARTER

NATIONAL EARTHQUAKE PREDICTION EVALUATION COUNCIL

Purpose: The purpose of this charter is to establish the National Earthquake Prediction Evaluation Council to advise the Director of the United States Geological Survey (USGS) and to set forth the Council's duties, functions, and responsibilities.

Authority: The Council is established pursuant to Item 2 on page 25 of the National Earthquake Hazards Reduction Program transmitted to the Congress on June 22, 1978, by the President under Sec. 5(f)(1) of the Earthquake Hazards Reduction Act of 1977 and in furthering the objectives of Sec. 202 of the Disaster Relief Act of 1974.

Membership: The Council shall be comprised of a Chairman, Vice Chairman, and not less than 8 and not more than 12 members appointed by the Director of the USGS. Appointment shall be for a staggered 3-year term except that the Chairman shall serve until a successor is appointed. The Chairman shall not be a USGS employee. The members may be Federal or non-Federal representatives who are experts in scientific disciplines related to the field of earthquake prediction. A member, with the approval of the Director, can designate a standing alternate should he be unavailable. At least one-half of the members shall be other than USGS employees.

The Chief, USGS Office of Earthquake Studies, will serve as Vice Chairman. The USGS Hazards Information Coordinator will serve as Executive Secretary, but as a nonvoting member.

The Council may request scientific experts as appropriate to participate in its discussions, in a nonvoting capacity. Other individuals may be invited to participate as observers as determined appropriate by the Chairman or the Director.

Functions/Responsibilities: The Director shall be responsible for deciding when and/or whether to issue predictions or other information pertinent to the potential for the occurrence of a future significant earthquake (e.g., negative evaluations or advisories). A prediction is defined to mean a statement on the time of occurrence,

location, and magnitude of a future significant earthquake based on qualification of the uncertainty of those factors. The first offices to be advised of the Director's decision to issue a prediction, negative evaluation or advisory shall be those of the Director of the Federal Emergency Management Agency (FEMA) and the Governor(s) of the State(s) affected by the Director's issuance(s).

The Council shall advise the Director on issuing predictions as to the completeness and scientific validity of the available data and on related matters as assigned by the Director. Specifically, the Council shall be responsible for assessing data and issuing reports on their findings in a timely manner.

The Council's duties will involve the evaluation of predictions made by other scientists, from within or outside of Government, rather than issuance of predictions based on data gathered by the Council itself.

The Executive Secretary will be responsible for the administrative support to the Council and providing any necessary technical support required by the Council or any of its members, whenever they have been convened, in order for them to be able to evaluate any prediction.

Operating Procedures: The Council will report to the Director of the USGS. The Council shall operate in accordance with the Federal Advisory Committee Act of 1972, 5 U.S.C. App. I, OMB Circular A-63, as revised, and Executive Order 12024. In any case where a member of the Council has been personally involved in developing the prediction which the Council has been convened to review that member shall not vote in the Council's evaluation of that prediction. Any additional rules to assure objectivity, operating procedures, or guidelines to be established by the Council will require approval by the Director and be made part of the public record.

In evaluating predictions, the Council's objectives are:
 (1) to provide objective and critical review, by a uniform process, of any scientific data or interpretation of scientific data that might warrant issuance of a formal USGS prediction of a specific earthquake, or that might warrant a

formal USGS position other than a prediction (e.g., negative evaluation or advisory); (2) to recommend to the appropriate scientists any actions that might be desirable or required to clarify or verify the basis for a prediction; (3) to maintain an accurate record of predictions evaluated and evidence pertinent to them; and (4) to provide the Director a timely and concisely written review of the evidence relevant to a prediction of any potentially damaging earthquake (usually those of magnitude 5 or greater on the Richter scale) and a written recommendation as to whether the evidence is sufficiently clear that an official prediction by the Director should be issued or, if not, what if any other official position the Director should take. Where the recommendation is not unanimous, the report should include the full range of viewpoints expressed by Council members. When time is of the essence, the written documents may follow verbal presentations to the Director. The Director bears the ultimate responsibility for a decision as to whether or not a prediction is to be issued.

Meetings may be called by the Chairman, Vice Chairman, or Director. Four voting members will represent a quorum provided at least two non-USGS employees are present.

Reports on the Council's findings will be issued as soon as possible to the individual or institute that submitted the data and to the Director.

The Director shall have a notice published in the Federal Register within nine (9) working days after receiving a report from the Council advising the public that the report is available for inspection.

Funding: Members of the Council other than USGS employees shall be reimbursed for travel and per diem expenses only. Because the number of predictions to be evaluated annually are not known and could vary, it is not possible to estimate accurately the number of meetings that may be required each year. All annual costs directly attributable to operations of the Council are not expected to exceed \$30,000; staff support will require less than 0.1 person-years. Funds for Council expenses will be made available from the USGS's Earthquake Hazards Reduction Program.

Continuation/Termination: In view of the goals and purposes of the Council, it is anticipated that it will continue beyond the foreseeable future. The Council will terminate 2 years from the date this Charter is filed, unless prior to that date it is renewed in accordance with the provisions of the Federal Advisory Committee Act of 1972.

SECRETARY

8-9-79

Date Signed

9-4-79

Date Charter Filed

Members of the National Earthquake Prediction Evaluation Council

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Massachusetts Institute of Technology
Cambridge, Massachusetts 02139
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Home - (617) 527-8108

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California Institute of Technology
Pasadena, California 91125
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Dr. T. Neil Davis
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Mr. Neil L. Frank, Director
National Hurricane Center
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Dr. Thomas V. McEvilly, Chairman
Department of Geology & Geophysics
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Dr. James C. Savage
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Mr. Jerry C. Stephens
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Dr. Lynn R. Sykes
Lamont-Doherty Geological
Observatory
Columbia University
Palisades, New York 10964
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(914) 359-3084 (Weekends/nights)
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Dr. Robert E. Wallace
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UNITED STATES INTERNATIONAL DEVELOPMENT COOPERATION AGENCY
 AGENCY FOR INTERNATIONAL DEVELOPMENT
 WASHINGTON, D.C. 20523

January 16, 1981

MEMORANDUM FOR THE RECORD, Office of U. S. Foreign Disaster Assistance

FROM: PDC/OFDA, Paul F. Krumpe, Science Advisor *PFK*

SUBJECT: Current Status of Peru Earthquake Prediction

Recent conversations with Drs. Brady (USBM) and Spence (USGS) indicate they will present in detail*their current interpretation of the available data and historical perspective (plausibility arguments) concerning the current status of Brady's prediction of a catastrophic earthquake off the coast of central Peru in August 1981. This memo offers my current awareness of the prediction status (seismicity) based on available documentation, discussions, and reported events. * NEPEC Meeting, Jan.26-27.

The following excerpts from internal U.S. Government memoranda concerning the prediction's foreshock (seismic) events sequence, provide the background necessary to better understand the current status of the prediction are arranged chronologically.

August 25, 1977 (Brian Brady, USBM)

"The hypothesis that the PIZ (Primary Inclusion Zone) of an impending great earthquake may have formed within 65 Km off the coast of central Peru on November 9, 1974 can be tested.... In addition, there may be low magnitude seismic events occurring within the focal region (aftershock area of the impending mainshock) whose magnitudes will decrease with increasing time into the preparation phase as cracks within the focal region close. There should be an increase in seismic activity outside what will become the aftershock region of the impending event. Teleseismically reported data suggests this condition is present. Lastly, there may be an increase in deep focus earthquake activity down-dip from the focal region of the impending shock as increasing volumes of the upper mantle are involved in the preparation process."

June 19, 1979 (Brian Brady, USBM)

"My introductory comments included the current status of the prediction. (1) Secondary foreshock series commencing on or before 800915 (September 15, 1980). There will be a total of (approximately) thirteen foreshocks, including the possibility of a M 7 event prior to the mainshock."

"There are local regions near Lima (11.6 degrees South, 76.5 degrees West; 12 degrees South, 7.8 degrees South) where low magnitude (M 5) events can be expected." (prior to the impending mainshock)

August 1, 1979 (William Spence, USGS)

"A critical part of the prediction is a foreshock series to commence in early September, 1980. Independently of these specific foreshocks, it is possible that seismic activity will dramatically increase in the entire zone around what will be the primary aftershock zone of

the predicted earthquake, including possibly a very large intermediate - depth, normal faulting earthquake occurring down-dip from the predicted hypocenter. If the predicted foreshock activity does not occur, then the probability of occurrence of the predicted mainshock will be lowered considerably, and we will make this revised status a matter of record."

March 7, 1980 (Brian Brady, USBM)

"The status of the prediction is as follows: A foreshock series will commence in mid-September 1980. The time duration of this series will be approximately 328 days. There will be a total of twelve-to-thirteen foreshocks which will be temporally distributed in two active phases, each of whose time durations will be approximately 109 days. The foreshock series will terminate on July 30, 1981, with the occurrence of the mainshock ($M_w \geq 9.8$). This event will nucleate in the vicinity of 12.6 degrees South and 77.6 degrees West and will initiate a rupture to the S-SE from 12.6 degrees South to approximately 26 - 28 degrees South. This event will eliminate the largest generally recognized seismic gaps in the world, e.g., the inferred rupture zones of the 1868 and 1877 great earthquakes. The event will be followed by a vigorous aftershock series. My current interpretation of the spacetime seismicity patterns in central Peru also leads me to hypothesize that a second event ($M_w \approx 8.8$) will nucleate 276 days later (ca May 2, 1982) near 12.5 degrees South and 77.6 degrees West. This event will rupture to the NW from 12.5 degrees South to approximately 8 degrees South. The second event will also be preceded by a foreshock phase with characteristics identical to that preceding the $M_w \geq 9.8$ event. I cannot make more precise predictions of the occurrence times of the mainshocks ($M_w \geq 9.8$; $M_w \approx 8.8$) until the initiation times of their respective foreshock series are known. I cannot overemphasize that the occurrence of the foreshock phases are necessary and sufficient for the occurrence of the predicted mainshocks. If the foreshocks do not occur, the prediction is invalid.

May 1, 1980 (Brian Brady, USBM)

"The status of the foreshock series for the predicted July 1981 central Peruvian event is as follows: the foreshock series will commence in mid-September 1980. The time duration of this series will be approximately 328 days. There will be a total of twelve or more events in this series which will be temporally distributed in two active phases at the beginning and end of the series, each of whose time durations will be approximately 109 days. The magnitude range of these events will be greater than mb 4.5. Their general locations will be along the boundaries of the inclusion zone shown in figure 1 (red). I expect that the majority of the foreshocks will cluster in the vicinity of the predicted mainshock locations (stars

in figure 1). The foreshock series will terminate on or about July 30, 1981. The exact time will depend on the initiation time and length of the active phases of the foreshock series, with the occurrence of the mainshock ($M_w \geq 9.8$). This event will nucleate in the vicinity of 12.6 degrees South and 77.6 degrees West ("star 1" in figure 1) and will initiate a rupture to the S-SE from 12.6 degrees South to approximately 26 - 28 degrees South (yellow zone).

"My current interpretation of the space time seismicity patterns in central Peru also leads me to hypothesize that a second event ($M_w = 8.8$) will nucleate 276 days later, the exact date depending on the initiation and characteristics of its own foreshock series, near 12.5 degrees South and 77.6 degrees West (ca May 2, 1982). This event will rupture to the NW from 12.5 degrees South (star 2 in figure 1) to approximately 8 degrees South. This second event will have a foreshock phase with characteristics identical to that preceding the $M_w \geq 9.8$ mainshock. I cannot make more precise predictions of the occurrence times of the mainshocks until the initiation times of their respective foreshock series are known. Please understand that the occurrences of the foreshocks are necessary and sufficient for the occurrence of the predicted mainshocks. If the foreshocks do not occur, the prediction is invalid.

"The exact locations and magnitudes of the predicted foreshocks cannot be predicted until their respective preseismicity data are known. Unfortunately, the preseismicity patterns preceding each foreshock will not be reported teleseismically because of their low magnitude range ($\leq M=1 \rightarrow M=2$). The Peruvian local network could detect these events.

"Dr. Spence and I are in agreement with the predicted foreshock characteristics. We are also of the opinion that the possibility exists for the occurrence prior to the mainshock of a large ($> M = 7.5$) ~~nominal~~ faulting event down-dip of the predicted July 1981 event." ~~normal~~

November 3, 1980 (Robert Engdahl, U.S.G.S.)

Summary for September, 1980 -- only one earthquake was detected by NEIS in the region of interest. The hypocentral parameters for this event are:

September 20, 1980, origin time = 4h 42m 23.5s (GMT), latitude = 12.475 S, longitude = 77.718 W, depth = 33 longitude ML = 3.2. This earthquake was detected solely on the basis of data reported from six stations of the Peruvian local network. An examination of the seismogram from our Albuquerque, New Mexico, station revealed no detection for this event, which meant that it was at least less than mb 3.8 (about one milimicron of ground motion at that station). On the basis of this report on detectable seismicity in the region of interest for September, 1980, we must conclude that the pattern of seismicity predicted by Brady has not commenced.

November 12, 1980 (Paul Krumpke, A.I.D.)

"The "Brady Prediction" currently (November 1980) is "on schedule" (preliminary data suggest seismicity has occurred in the predicted zone) according to Drs. Brady and Spence (following their examination of local seismicity and rock strain data obtained by the regional Peruvian network (IGP)). The status of the prediction is as follows: low magnitude foreshocks occurring in the inclusion zone August 14 and September 20 indicate initiation of the first active foreshock phase (low magnitude events, some teleseismic, occurring at the specified time (August-September 1980) within the specified region (inclusion zone, 65 Km SW of Lima, Peru)). Additional seismic activity may occur in the inclusion zone until mid-December, at which time no seismicity is expected again until April-May in the inclusion zone. At that time, the second active foreshock phase would begin and would culminate in the mainshock Mw 9.9 and rupture to the South (24 degrees South) to be followed 35 days later with another shock, Mw 9.2 to rupture 700 Km to the North along the Peru-Chile trench. The "prediction" will be revised by Brady as deterministic "marker" events occur and establish the sequence, timing and pattern of future events leading to the occurrence of the mainshock. Examination of the IGP rock strain data by Brady and Spence indicated that the elasticity of rock within the coastal region follows the predictive model and therefore supports the seismicity data analysis. Geotectonic anomalies are apparently occurring in the region, as evidenced by seismicity patterns, unusual rock strain data, geodetic data (uplift is continuing), and other "phenomena" (submarine light emanations are reported near Chilca)."

November 24, 1980 (John Filson, U.S.G.S.)

"The USGS National Earthquake Information Service (NEIS) is monitoring the seismicity off the coast of Peru through a world-wide network of seismographic stations. The NEIS also receives reports from Peruvian stations. In May 1980 Brady stated that a premonitory foreshock sequence should begin in mid-September, 1980, and quote the magnitude range of these events will be greater than 4.5 unquote. Although quote the exact locations and magnitudes of the predicted foreshocks cannot be predicted until their respective preseismicity data be known unquote. During September 1980 no events of magnitude 4.5 or greater were reported by NEIS at the location or in the broad vicinity of the location specified by Brady. The USGS will provide the Embassy monthly reports of the predicted precusory phenomena based on data available to NEIS."

December 2, 1980 (William Spence, U.S.G.S.)

"The end of the first phase of foreshocks to the main predicted earthquake should occur by January 10, 1981. It appears that low magnitude earthquakes ($3.8 > M_b > 2.5$) have occurred in the delimited Brady target zone during the stipulated time frame of first phase

foreshocks. Peruvian sources claim that this sequence of events, beginning August 14, 1980, is the only such activity to have occurred in the last few years in the delimited target zone. However, apparently there is no reliable data base with which to compare this activity and thus permit me or Brady to conclude beyond a reasonable doubt that this activity definitively corresponds to the predicted sequence of first phase foreshocks. Therefore, if no teleseismically locatable earthquake of $M_b > 4.5$ occurs in the delimited Brady target zone by January 10, 1981, I shall view the probability of the predicted earthquake to be significantly lowered...

"On the other hand, if a teleseismically locatable earthquake of $M_b > 4.5$ does occur within the delimited Brady target zone by January 10, 1981, then it would lend credence to the interpretation of the current low magnitude earthquake series in the delimited Brady target zone as first phase foreshocks. In this case I shall hold to the opinion that the possibility of the predicted catastrophic Peru-Chile earthquake should be considered further."

December 3, 1980 (Robert Engdahl, U.S.G.S.)

In the year preceeding September, 1980, four earthquakes, at least three of which were greater and $m_b > 4.5$, were detected in this region. For purposes of comparison these can be considered as normal background for seismicity detected in the region by NEIS. On the basis of these data and earlier studies we conclude that the NEIS threshold magnitude for the region lies between $m_b 4.5$ and 5.0 . This suggests that data provided to NEIS will not ordinarily permit us to locate all earthquakes above $m_b 4.5$ that might have occurred in the region. However, the Peruvian local network appears to have been making recent special efforts to provide NEIS with data from small magnitude events in the region so that this condition may no longer be valid.

Summary of October, 1980 -- with the exception of the September 20, 1980, $M_L = 3.2$ earthquake previously reported, no activity in the region of interest has been detected and reported by NEIS through PDE No. 45-80, dated December 3, 1980.

The following excerpt from DISCOVER magazine, January, 1981 is based on telephone interview with Alberto Giesecke in Peru and corroborates that low magnitude shocks did occur during the anticipated first phase of foreshocks (December 2 memo) as mentioned by Dr. Spence:

Brady published the first stage of the forecast four years ago in a technical journal, and as early as three years ago he predicted privately that Peru would start experiencing low-magnitude tremors in the fall of 1980 that would lead to a major quake in the summer of 1981. Alberto Giesecke, director of the Geophysical Institute of Peru, confirms that light shocks did occur last August and October, but adds that "whether this supports Brady's theory is anybody's

guess, because few months pass without some seismic activity in Peru."
(DISCOVER, Jan. 1981)

To date the seismicity occurring in the inclusion zone, according to Brady and Spence, as reported to them by the IGP (Giesecke) is as follows:

August 14, 1980 Magnitude 3.5-3.7
September 20, 1980 Magnitude 3.5
October 25, 1980 Magnitude 3.5-4.0
(Swarm)

These events were not teleseismic and therefore located only by the local Peruvian network and not detected by NEIS, Golden, Co.

Receipt of data from IGP by Dr. Spence has been described as standard, unreduced, raw data which had already been routinely received by NEIS; P-arrival times with no analysis provided with respect to offshore seismicity patterns; however, epicenter data for the period August thru November 1980 has recently been provided by the IGP to Dr. Brady or Spence for further analysis.

The following summarizes that which is understood to date concerning Brady's prediction of the foreshock sequence (occurrence) and its relevancy to the mainshock (August 1981) prediction as well as the predicted second active foreshock phase:

- Based on best available low magnitude ($M \leq 4.5$) seismicity data located within the specified inclusion zone (see above), Dr. Brady believes that his prediction is "on schedule," even though the reported events were not teleseismic ($M_b > 4.5$) as originally anticipated in his May 1, 1980 memo. He indicated in this memo that the "exact-magnitude of the predicted foreshocks cannot be predicted until their respective preseismicity data ($M=1 > M=2$) known." These data have not been available to Drs. Brady and Spence, due to the IGP's inability to collect, reduce, and analyze low magnitude seismic data in real-time.
- Brady considers the occurrence of the August 14, September 20 and October 25 events in the inclusion zone to be significant "first phase" foreshocks clustered in the vicinity of the predicted mainshock location. Reliability of IGP data (event location) and lack of detailed analysis of these events vs. historical seismicity (background data) in the inclusion zone (as determined by the IGP) has led to speculation by Spence as to the real significance of the reported inclusion zone events (see Spence memo, December 2, 1980).
- The onus probandi lies with Brady because the prediction is based on his Scale Invariant Inclusion Hypothesis. However, without accurate, reliable low-magnitude seismicity data collection, reduction, and analysis in near real-time made available to Brady by the IGP for interpretation based on his model, he is not able to predict precursory events exactly in time and space. Brady has repeatedly placed caveats on

this aspect (foreshock events prediction) (see March 7, May November 24 memos).

- Brady has indicated that he expects a period of "quiet", (i.e. no teleseismic activity) in the inclusion zone from mid-January through mid-April. In late April or early May he anticipates initiation of the "second active foreshock phase" with several teleseismic events occurring with the inclusion zone and around the boundry of the potential aftershock zone and culminating in the predicted mainshock $M \geq 9.9+$. This late April-early May sequence will be monitored by NEIS and IGP and would be evident if it occurs as predicted. Brady believes that the occurrence of this "second phase series" would make the mainshock prediction (currently, August 1981) an absolute.
- Two years ago, Brady informed Giesecke (IGP) that he should expect an increase in seismicity in the southern portion of the inclusion zone boundary as the preparation process proceeded into the first foreshock phase. This is also reflected in Brady's August 1977 memo and Spence's August, 1979 memo.
- Brady believes that the August 20 event ($M=4.0$ to 5.0) occurring near San Jose and Ayacucho in south central Peru corroborate his interpretation that an increase in seismicity along the southern portion of the inclusion zone boundry would occur as the preparation process proceeds toward the mainshock event. However, Mr. Giesecke is quoted recently as saying "There is no reason to believe the Ayacucho tremors are the prelude to a larger quake." (Lima Times, Nov. 21, 1980).
- The National Earthquake Prediction Evaluation Council Meeting Scheduled for January 26-28 in Golden, Co., will undoubtedly investigate the "foreshock series occurrence" issue as well as Spence's contention that unless a teleseismically locatable earthquake of $M_b=4.5$ occurs in the delimited Brady target zone by January 10, 1981, then the probability of the predicted earthquake would be significantly lowered. Brady is expected to provide a detailed interpretation of events (or lack thereof) in and around the inclusion zone at the NEPEC meeting.

Until the interpretation is provided by Brady (in view of limited data acquired during the Brady/Spence visit to Lima in late October and data received last week from IGP) and unless the IGP continues to provide timely data reduction and analysis (it is their responsibility to do so) we will not really know what, when, or where to expect events which could more convincingly demonstrate the Brady prediction. The NEPEC meeting should provide an excellent opportunity to more fully comprehend the prediction criteria and most current interpretation of available data. It is also apparent that the currently predicted second phase foreshock sequence (late April-Early May) is now the most significant "marker" indicative of the possible occurrence of a potentially catastrophic earthquake (with global implications) to occur off the coast of Peru. Whether the (potential) mainshock occurs in August 1981 or before (the possibility exists) will be a topic of significance in the

presentations given at the NEPEC meeting, based on current analysis of recently acquired Peruvian data.

cc: USAID/Lima, Leonard Yager
Amembassy Lima, Alf Cooley
PDC/OFDA, Alan Van Egmond
PDC/OFDA, Ollie Davidson
AID Desk, William Rhodes
AA/LAC, Ed Coy
PPC/PB, Ronald Nicholson
PDC/OFDA, George McCloskey
USBM, Brian Brady
AA/PDC, Gordon Pierson

JAN 23 1981

MEMORANDUM TO: PDC/OFDA, Mr. Alan VanEgmond
FROM : PPC/PB, Ron Nicholson *Ron*
SUBJECT : National Earthquake Prediction Council (NEPC)

Per our discussions and after consultation with C. Paolillo I called ARA Acting Assistant Secretary John Bushnell to register our concern over the way the NEPC will be convened. He expressed his general support of my suggestions and asked that I speak to DAS Samuel Eaton which I did.

Eaton, anticipating my call, had spoken to the State Desk John A. Purnell. He informed me that Purnell said he had spoken to USGS and been assured that they would give us a definitive decision from the Council on Monday or Tuesday and that the decision would be negative. Purnell responded that USGS already had a "commission" working on Brady's theory and were convinced that their work would result in a quick Council decision completely "debunking" the Brady model.

I remarked that I was surprised by the apparent "star chamber" proceedings given seriousness of Brady's prediction and publicity (rightfully or wrongfully) it has received. I also suggested that USGS would be hard pressed to deny theory categorically given the inadequacy of the data base -- reasoning that USGS reports on technical and equipment inadequacies of the IGP implied their acceptance of thesis that Peru now does not have an adequate info base to allow us to either discard or embrace Dr. Brady's mechanistic prediction model. Mr. Eaton seemed somewhat impressed by this argument.

Turning to the question of public nature of Council's deliberation (openness to media and press) expressed our concern that anything less than a complete turndown of the Brady prediction (e.g., a recommendation to seek further data) would almost certainly set off a new round of speculation and panic in Peru and because of possible effects in South Pacific and Hawaii, in the U.S. press as well. Eaton asked if it were too late to "close" Council proceedings. I replied that I didn't know but suggested he call USGS Director Menard to express our concern on both points. Eaton responded that he would look further into it.

cc: DAA/PPC, C. Paolillo
AA/LAC, E. Coy

Department of State

TELEGRAM

PAGE 01
ACTION ARA-16

LIMA 00006 272209Z DOCUMENT NO. 85

063639 AID8645

INFO AALA-01 LAEM-02 LASA-03 LADR-03 PERS-05 DRC-01 ERS-01
/016 A1

INFO OCT-01 ADS-00 AID-07 SSO-00 PA-02 OES-00 ICAE-00
SPRS-02 /037 W

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FM AMEMBASSY LIMA
TO SECSTATE WASHDC IMMEDIATE 4920
INFO NEILS GOLDEN CO IMMEDIATE

UNCLAS LIMA 0006

EO 12065: N/A
TAGS: SWEL, TPHY, PE
SUBJ: EARTHQUAKE SCARE STORIES REAPPEAR

27 January 1981

1. SENSATIONAL FIRST PAGE HEADLINES CARRIED IN MOST LIMA DAILIES JAN. 26 RAISED PUBLIC CONSCIOUSNESS ONCE MORE ON THE BRADY EARTHQUAKE PREDICTION. TRIGGERING THE EXTENSIVE AND ALARMIST (E.G. BRADY ANNOUNCES 9.9 EARTHQUAKE FOR SEPTEMBER) COVERAGE IS THE CONVOKING OF THE EARTHQUAKE PREDICTION COUNCIL IN GOLDEN, COLORADO TO CONSIDER BRADY'S FORECAST. AP, EFE AND AFP WIRE SERVICE REPORTS SERVE AS THE BASIS FOR MOST OF THE PROMINENTLY PLACED STORIES WHICH HAVE BEEN FURTHER EMBELLISHED BY IMAGINATIVE LOCAL HEADLINE WRITERS. AN END-OF-JUNE 7.5-8.0 EVENT FOLLOWED BY A 9.2 SHOCK FORTY DAYS LATER, CULMINATING THIRTY DAYS STILL LATER IN A 9.9 CATASTROPHE IS THE SCENARIO DESCRIBED. IT IS NOTED THAT THE BRADY-SPENCE PREDICTION HAD "NOT BEEN ENDORSED BY THEIR AGENCIES" AND THAT THE COUNCIL MEETING WAS REQUESTED BY THE GOP TO EVALUATE THEIR THEORY.

2. THE HEIGHTENED AWARENESS OF THE PERUVIAN POPULACE TO THE EARTHQUAKE PREDICTION MEANS THAT PRESS COVERAGE OF THE CONCLUSIONS OF THE GOLDEN MEETING WILL BE EXTREMELY CRUCIAL IN DETERMINING THE DEGREE OF PUBLIC PANIC. THE INITIAL REPORTING HAS DONE ANYTHING BUT ALLAY FEARS. AS A RESULT, WE RECOMMEND THAT GREAT CARE BE EXERCISED BY THE PARTICIPANTS IN THE GOLDEN MEETING WHEN SPEAKING TO THE PRESS.
CORR

JS
HW
1/28

UNCLASSIFIED

The Director of the U.S. Geological Survey has received the following statement from the National Earthquake Prediction Council:

STATEMENT BY THE NATIONAL EARTHQUAKE PREDICTION
EVALUATION COUNCIL, JANUARY 27, 1981

"At the request of the Government of Peru, the Director of the U.S. Geological Survey has convened the National Earthquake Prediction Evaluation Council to review the prediction of a major earthquake in Peru. Specifically, the prediction by Drs. Brian Brady and William Spence states that a series of large earthquakes will begin at the end of June 1981, off the coast of Peru. The sequence is predicted to contain a magnitude 7.5-8.0 event on or about June 28, 1981, a magnitude 9.2 event on or about August 10, 1981, and a magnitude 9.9 event on or about September 16, 1981. The predicted epicenters of these events are all near Lima. We understand that if there is not a substantial increase in the number of earthquakes of magnitude 4.5 or greater in a specific area off the coast of Peru by mid-May 1981, Drs. Brady and Spence will withdraw the prediction.

The members of the Council are unconvinced of the scientific validity of the Brady-Spence prediction. The Council has been shown nothing in the observed seismicity data, or in the theory insofar as presented, that lends substance to the predicted times, locations, and magnitudes of the earthquakes. The Council regrets that an earthquake prediction based on such speculative and vague evidence has received widespread credence outside the scientific community. We recommend that the prediction not be given serious consideration by the Government of Peru. We cannot say with complete confidence that major earthquakes will not occur at the predicted times, but we judge the probability of this happening to be very low indeed. On the

basis of the data and interpretation currently available, none of the members of the Council would have serious reservations about being present personally in Lima at the times of the predicted earthquakes. We are particularly distressed that although this prediction has been publicized in various forms for several years, nothing in the scientific literature or in other written form has been made available to this Council on the detailed theoretical basis and methodology of the Peruvian prediction as currently formulated. In fact, the prediction specified in a memorandum by Dr. Brady on May 1, 1980, is quite different from that presented orally at this meeting.

Our rejection of the specific prediction by Drs. Brady and Spence should not be taken as minimizing the risk to lives and property from earthquakes in Peru. Since its founding, Lima has experienced many strong earthquakes, and others must be expected in the future both there and elsewhere along the coastal regions of Peru. Despite the continuing need to prepare for earthquakes in Peru, we do not recommend any special measures in response to the Brady-Spence prediction."

The U.S. Geological Survey endorses the conclusions reached by the Council.



United States
Department of the Interior
Geological Survey, National Center
Reston, Virginia 22092



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For release: p.m. EST, January 28, 1981

PREDICTION OF PERUVIAN EARTHQUAKE NOT ENDORSED BY U.S. PANEL

The Acting Director of the U.S. Geological Survey, Doyle G. Frederick, announced today (January 28, 1981) that the U.S. Geological Survey formally concurs with the overall conclusions reached yesterday by the National Earthquake Prediction Evaluation Council. The Council reported that they were unconvinced of the scientific validity of a prediction of a specific series of major earthquakes in June-September in Peru.

The USGS has advised the Government of Peru through the U.S. State Department that the evaluation process has been completed and that the Council saw "nothing in the observed seismicity data, or in the theory insofar as presented, that lends substance to the predicted times, locations, and magnitudes of the earthquakes."

The meeting of the Council in Golden, Colo., January 26-27, 1981, to evaluate the prediction of a series of major Peruvian earthquakes by U.S. scientists Dr. Brian Brady (Bureau of Mines) and Dr. William Spence (USGS) included a day and a half of public testimony by the two scientists and a half day of closed-door deliberation by the Council. The final statement by the Council and the general concurrence of the USGS were transmitted to the Government of Peru by the State Department Tuesday evening.

At the same time, the USGS noted that a continued serious threat to lives and property exists in Peru because of the long recognized earthquake hazards of the region. Since its founding, Lima has been affected by many strong earthquakes and will continue to be so affected.

The National Earthquake Prediction Council was established in August 1979 in response to the Earthquake Hazards Reduction Act to aid the Director of the U.S. Geological Survey, Department of the Interior, in evaluating and issuing any formal predictions of earthquakes. The Council is designed to help assure that the best outside scientific expertise is available to the USGS and that an orderly process exists to help evaluate earthquake predictions and data, but the final responsibility for whether and in what manner a prediction will be issued rests with the USGS Director.

The meeting in Golden, Colo., was the first by the Council to actually evaluate a prediction. The Council is currently composed of six voting federal earth scientists and five voting nonfederal earth scientists. The Council is chaired by Dr. Clarence Allen of the California Institute of Technology. Dr. John Filson, chief, Office of Earthquake Studies, USGS, serves as vicechairman.

Members of the Council present for the evaluation of the Brady-Spence prediction were: Dr. Clarence Allen (California Inst. of Technology), Dr. John Filson (USGS), Dr. E. Engdahl (USGS), Dr. David Hill (USGS), Dr. James Savage (USGS), Dr. C. B. Raleigh (USGS), Dr. Thomas V. McEvilly (University of California, Berkeley), Dr. Lynn R. Sykes (Columbia University), Dr. James Rice (Brown University), an authority on the physics of rock failure, attended the meeting as an expert consultant at the request of the Council.

(Note to editors: attached is the final statement issued by the National Earthquake Prediction Evaluation Council to the Director of the U.S. Geological Survey.) - 250 -

Department of State

OUTGOING
TELEGRAM

DOCUMENT NO. 88
STATE 022485

PAGE 01 STATE 022485
ORIGIN ARA-16

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INFO LASA-03 LADP-03 PPCE-01 PDPR-01 PPP0-03 PPEA-01 PPIA-02
IDCA-01 PDC-02 CNA-01 DRC-01 CH9-01 ES-01 /021 A4 728

INFO OCT-00 ADS-00 AID-07 INR-10 CIAE-00 EB-01 10-15
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DRAFTED BY ARA/AND/P - JAPURNELL:LEE
APPROVED BY ARA/AND/P - JAPURNELL
OES/SGT: T. KADYASHI (INFO)
ARA/SG: R. SERVICE

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INFO AMEMBASSY SANTIAGO IMMEDIATE

UNCLAS STATE 022485

E.O. 12065: N/A

TAGS: TPNY, PE

SUBJECT: REPORT BY NATIONAL EARTHQUAKE PREDICTION EVALUATION COUNCIL

REFS: A) LIMA ,086; B) STATE 011329; C) 80 STATE ,2486

1. FOLLOWING IS TEXT OF REPORT BY EARTHQUAKE PREDICTION COUNCIL ON BRADY/SPENCE PREDICTION; IT HAS BEEN ENDORSED BY THE USGS. AMBASSADOR S'NHVALB HAS OFFICIALLY RECEIVED THE REPORT AND CONCURS IN ITS RELEASE TO THE PRESS AND PUBLIC. THE AMBASSADOR HAS ALREADY READ PORTIONS OF IT TO PRESIDENT BELAUNDE BY TELEPHONE. PUBLIC RELEASE WILL OCCUR AT 11:00 AM COLORADO TIME AT A PRESS CONFERENCE BY COUNCIL MEMBERS.

2. BEGIN TEXT: AT THE REQUEST OF THE GOVERNMENT OF PERU, THE DIRECTOR OF THE US GEOLOGICAL SURVEY HAS CONVENED THE NATIONAL EARTHQUAKE PREDICTION EVALUATION COUNCIL TO REVIEW THE PREDICTION OF A MAJOR EARTHQUAKE IN PERU. SPECIFICALLY, THE PREDICTION BY DRS. BRIAN BRADY AND WILLIAM SPENCE STATES THAT A SERIES OF LARGE EARTHQUAKES WILL BEGIN AT THE END OF JUNE 1981, OFF THE COAST OF PERU. THE SEQUENCE IS PREDICTED TO CONTAIN A MAGNITUDE 7.5-8.0 EVENT ON OR ABOUT JUNE 28, 1981, A MAGNITUDE OF 8.2 EVENT

ON OR ABOUT AUGUST 18, 1981, AND A MAGNITUDE 8.0 EVENT ON OR ABOUT SEPTEMBER 16, 1981. THE PREDICTED EPICENTERS OF THESE EVENTS ARE ALL NEAR LIMA. WE UNDERSTAND THAT IF THERE IS NOT A SUBSTANTIAL INCREASE IN THE NUMBER OF EARTHQUAKES OF MAGNITUDE 4.5 OR GREATER IN A SPECIFIC AREA OFF THE COAST OF PERU BY MID-MAY 1981, DRS. BRADY AND SPENCE WILL WITHDRAW THE PREDICTION.

THE MEMBERS OF THE COUNCIL ARE UNCONVINCED OF THE SCIENTIFIC VALIDITY OF THE BRADY-SPENCE PREDICTION. THE COUNCIL HAS BEEN SHOWN NOTHING IN THE OBSERVED SEISMICITY DATA, OR IN THE THEORY INsofar AS PRESENTED, THAT LENDS SUBSTANCE TO THE PREDICTED TIMES, LOCATIONS, AND MAGNITUDES OF THE EARTHQUAKES. THE COUNCIL REGRETS THAT AN EARTHQUAKE PREDICTION BASED ON SUCH SPECULATIVE AND VAGUE EVIDENCE HAS RECEIVED WIDESPREAD CREDENCE OUTSIDE THE SCIENTIFIC COMMUNITY. WE RECOMMEND THAT THE PREDICTION NOT BE GIVEN SERIOUS CONSIDERATION BY THE GOVERNMENT OF PERU. WE CANNOT SAY WITH COMPLETE CONFIDENCE THAT MAJOR EARTHQUAKES WILL NOT OCCUR AT THE PREDICTED TIMES, BUT WE JUDGE THE PROBABILITY OF THIS HAPPENING TO BE VERY LOW

INDEED. ON THE BASIS OF THE DATA AND INTERPRETATION CURRENTLY AVAILABLE, NONE OF THE MEMBERS OF THE COUNCIL WOULD HAVE SERIOUS RESERVATIONS ABOUT BEING PRESENT PERSONALLY IN LIMA AT THE TIMES OF THE PREDICTED EARTHQUAKES. WE ARE PARTICULARLY DISTRESSED THAT ALTHOUGH THIS PREDICTION HAS BEEN PUBLICIZED IN VARIOUS FORMS FOR SEVERAL YEARS, NOTHING IN THE SCIENTIFIC LITERATURE OR IN OTHER WRITTEN FORM HAS BEEN MADE AVAILABLE TO THIS COUNCIL ON THE DETAILED THEORETICAL BASIS AND METHODOLOGY OF THE PERUVIAN PREDICTION AS CURRENTLY FORMULATED. IN FACT, THE PREDICTION SPECIFIED IN A MEMORANDUM BY DR. BRADY ON MAY 1, 1980, IS QUITE DIFFERENT FROM THAT PRESENTED ORALLY AT THIS MEETING.

OUR REJECTION OF THE SPECIFIC PREDICTION BY DRS. BRADY AND SPENCE SHOULD NOT BE TAKEN AS MINIMIZING THE RISK TO LIVES AND PROPERTY FROM EARTHQUAKES IN PERU. SINCE ITS FOUNDING, LIMA HAS EXPERIENCED MANY STRONG EARTHQUAKES, AND OTHERS MUST BE EXPECTED IN THE FUTURE BOTH THERE AND ELSEWHERE ALONG THE COASTAL REGIONS OF PERU. DESPITE THE CONTINUING NEED TO PREPARE FOR EARTHQUAKES IN PERU, WE DO NOT RECOMMEND ANY SPECIAL MEASURES IN RESPONSE TO THE BRADY-SPENCE PREDICTION. END QUOTE THE US GEOLOGICAL SURVEY ENDORSES THE CONCLUSIONS REACHED BY THE COUNCIL.

3. FOR SANTIAGO. THOUGH YOU LACK REFTELS, THIS CARLE IS SELF-EXPLANATORY. CHILEAN EMBASSY HERE HAS EXPRESSED SOME INTEREST IN BRADY PREDICTION OF A MAJOR EARTHQUAKE OFF PERU AND ASSOCIATED TIDAL WAVE. NAIG

UNCLASSIFIED

DOCUMENT NO. 89

TODAY

THURSDAY, JANUARY 29, 1981

11

Two years ago, major collective bargaining settlements resulted in average wage increases of 7.4% in the first year of the new contract. Last year, 9.5% was the average raise. This year, unions are expected to seek wage increases of about 10%. Union leaders say even that won't enable their members to keep up with the cost of living, which is now going up at a 12% rate.

Irving R. Levine, NBC News, Washington.

HIT: 7:34:53 COMMERCIAL

HIT: 7:37:00

→ TOM BROKAW: From one form of forecasting to another this morning. Nothing is more terrifying of course or destructive than earthquakes, believe me. I've had personal experience, and their toll in death and devastation have rarely seemed -- been more evident than in this past year. Earthquake predicting is still a developing science but science correspondent Bob Bazell, who's with us this morning, says, what, researchers are getting better at it all the time?

BOB BAZELL: They are getting better. One specific prediction to talk about this week. Researchers have learned so much about earthquakes in the past few years that the federal government set up a panel of experts to tell people what to do if an earthquake is predicted. The panel had its first meeting this week in Golden, Colorado. The prediction they considered called for a major earthquake in Peru, but the experts didn't think much of that one.

A lot of Peruvians have been understandably frightened by the forecast that Lima and other cities will be devastated by earthquakes this August and September. Dr. Brian Brady of the U.S. Bureau of Mines made the prediction. He says there will be initial shocks.

BRIAN BRADY: Thirty-six days after this earthquake will come the largest one. This one will be a magnitude of 9.9. It will rupture from 12.2 south all the way down to 26.27 degrees south into north central Chile.

BAZELL: That would be ten times greater than the 1906 earthquake in San Francisco, and one hundred times bigger than the one which struck Italy last November. For two days this week, Dr. Brady tried to convince the panel of experts that his theories were correct. The experts did not believe him.

Dr. James Savage, U.S. Geological Survey:

MAN: We found numerous serious errors, sections that we could not understand at all, and the rest was just speculation.

BAZELL: His prediction is based largely on laboratory experiments

here pieces of rocks are shattered. The other scientists didn't follow is logic.

Dr. Barry Raleigh, U.S. Geological Survey:

MAN: Frankly, I feel apologetic to our Peruvian colleagues and the people from Peru that have had to go through this exercise.

BAZELL: Finally, the panel informed the Peruvian government that there is nothing to worry about. Despite the negative verdict on Dr. Brady, the science of earthquake prediction is actually improving. Researchers at Columbia University have made this map showing earthquake danger around the world. The red areas show where the next big quakes are expected. One red area is southern California.

Cities like San Bernadino sit right on the San Andreas fault where experts say a major earthquake could strike any time. In the past few years, instruments, such as this laser ranging device, have detected strains in the earth. These could be precursors of a big quake. The scientists don't know yet when a big jolt might hit, but they say the next time the panel meets it may be talking about southern California.

Dr. Robert Wesson, U.S. Geological Survey:

MAN: We're concerned about southern California. We know that on the average big earthquakes have occurred in southern California about every hundred and forty years or so. It was 1857 when we had the last big earthquake, so just based on that the probability of a big earthquake down here is increasing.

BAZELL: There is a lot of concern that if an earthquake were predicted or one in southern California would be quite sure what to do about it.

BROKAW: That's a good point. What would you do, just get out of town?

BAZELL: Well, no, they don't say that. Most wooden frame houses of the type that people live in in southern California apparently would be safe, even in a big quake. There'd be danger in those high rises though. If there were prediction people might be advised to stay away from work for a while.

BROKAW: I'd be glad to do that on any occasion. I remember the first earthquake I ever went through in southern California. I was on the air and everything in the studio began to swing back and forth, and one of the stage managers said very calmly to me we're having an earthquake, and I said believe we're having an earthquake, and we'll be right after this station break.

HIT: 7:42:09 STATION BREAK

HIT: 7:42:49

UNITED STATES INTERNATIONAL DEVELOPMENT COOPERATION AGENCY
AGENCY FOR INTERNATIONAL DEVELOPMENT

WASHINGTON, D.C. 20523

DOCUMENT NO. 90

February 4, 1981

MEMORANDUM

TO: PDC/OFDA, Joseph A. Mitchell
Director

FROM: PDC/OFDA, Alan Van Egmond
Assistant Director, Planning and Preparedness

RE: Meeting of the National Earthquake Prediction Council (NEPEC)
January 26-27, 1981

I. Introduction

The purpose of the meeting was to evaluate a prediction made by Dr. Brian Brady for a series of three potentially catastrophic earthquakes to occur off the coast of Peru during the summer of this year. The meeting was held at the request of the Peruvian Government. The Council's findings were communicated to the President of Peru following the meeting. (A copy of the Council's charter and final report is attached.)

The purpose of this memo is to provide summary observations of the Council's proceedings and to offer some recommendations for action in the future. A more comprehensive and detailed report of the Council's work will be completed within the next few days. I have attempted to prepare this memo as objectively and impartially as possible. I am not a scientist, and the "Brady Prediction" has generated considerable controversy.

II. The Prediction

As set forth before the Council, Dr. Brady now predicts the occurrence of three earthquakes off the coast of Peru; the first occurring around June 28, 1981 at a magnitude of 7.5 - 8.0 on the Richter Scale; the second occurring about 40 days later, around August 10, 1981, in the same area with a magnitude of about 9.2; and the third occurring about 26 days later, September 16, 1981, at 9.9 - 10 on the Richter scale. All three predicted quakes, but particularly the last could cause catastrophic damage to Peru and adjacent countries, including the destruction of major cities such as Lima. These quakes would also generate seismic sea waves, threatening coastal areas in Southern California, Hawaii, and New Zealand.

Dr. Brady may call his prediction off by mid-May 1981 if an unspecified number of teleseismic events (i.e. > 4.5 on the Richter scale) do not occur in the subject area prior to that time. However, based on the data he has available through December 1980, Dr. Brady is convinced that his prediction is still "on schedule."

Dr. Brady is a research scientist with the U.S. Bureau of Mines. The prediction for Peru emanates from his work on the physics of rock failure, and prediction of rock bursts in mines. Based on his research, Dr. Brady pur-

ports to have discovered a revolutionary new approach to rock mechanics, quite different from conventional physics. He has developed a model which allows one to predict rock failure under certain levels of stress. Dr. Brady contends that he can interpret seismicity patterns according to a "clock;" i.e. these patterns do not occur randomly.

According to officials with the U.S. Bureau of Mines, Dr. Brady's model has been applied successfully thus far to rock bursts. Miners were evacuated, bursts predicted by Brady did occur, and lives were saved. The USBM is now instituting a system for monitoring seismic activity in mines, based on Dr. Brady's work.

During the early 1970's, Dr. Brady was encouraged to apply his work to earthquakes by Dr. William Spence, a research geophysicist with the U.S. Geological Survey (USGS) in Denver, Colorado. Since this time, Dr. Brady has developed and applied his model to Peru on a part-time basis, as his other responsibilities with USBM allow.

Dr. Spence is an expert in applied seismology and plate tectonics. Based on his research on the movement of plates off the coast of Peru, Dr. Spence has concluded that Dr. Brady's prediction is plausible based on the tectonic anomalies in the area.

III. The Council's Proceedings

The NEPEC was formed in January 1980 to advise the Director of USGS, who is the official responsible for commenting on earthquake predictions in the name of the U.S. Government. The Council is composed of 12 individuals, half of whom are from the USGS, and half from academic institutions. The Council is chaired by Dr. Clarence Allen of Caltech. The Vice-Chairman is Dr. John Filson, Director, Office of Earthquake Studies with USGS. No scientists from private industry have been invited to serve on the panel.

This was the first occasion in which the Council met to formally evaluate an earthquake prediction. It is The Council's policy to evaluate earthquake predictions abroad only at the official request of a foreign government. Participating in the Council's proceedings were five persons from USGS and three from academic institutions. Another official with USGS, and a scientist from Brown University were invited to participate as consultants. The Council's hearings were held in public. Major television networks and newspaper reporters were present at the meetings.

The Council had no agenda, nor were any papers submitted to the Council by Drs. Brady and Spence beyond the papers which had been published over four years ago.

On the first day, the Council's time was initially occupied by a discussion concerning format. The Chairman wanted to confine presentations to a total of five hours; a half hour would be allotted after each hour of presentation for members of the Council to question or comment. Drs. Brady

and Spence argued for more time, but the Council decided to abide by the Chairman's decision.

The first half of the second day was occupied by a series of random interchanges between Drs. Brady and Spence and members of the Council. The latter half of the day was devoted to a meeting of Council members only, during which time they prepared their report. I was not allowed to be present during this latter session.

To the best of my knowledge, Paul Krumpe and I were the only persons present at the meeting representing a U.S. government agency, apart from USGS and the USBM. There were no representatives from AID's Latin America Bureau, the State Department, nor from the Office of Science and Technology. Dr. Alberto Geiscke of the Peruvian Geophysical Institute (who played an instrumental role in Peru's request for the Council to meet) also was not present. The Institute was represented instead by Dr. Daniel Huacho. Another person, acting in a private capacity was present on behalf of the Peruvian Academy of Sciences.

The Council's work was hampered by the following factors:

1. No recent paper setting forth Dr. Brady's theory, model, or current status of his prediction was available to the Council for review. Drs. Brady and Spence said they had less than one month to prepare for the meeting, and much of this time was devoted to developing presentation materials. Thus far, no official request has been made by the USGS or the Secretary of the Interior for Dr. Brady to set his model and prediction down in writing, in a rigorous, scientifically acceptable way.
2. Given the limited time available, no one on the Council understood the complex mathematical formulations on which Dr. Brady's model supposedly is based.
3. Some members of the Council (particularly the USGS officials) were familiar with the Brady Prediction, and were openly critical of it from the onset. These members were hardly objective or impartial in their questions or comments.
4. Time pressures did not allow for comprehensive follow-up of lines of questioning by Council members, particularly on the theoretical basis of Dr. Brady's prediction.

IV. What the Council Established

In my judgment the Council helped resolve uncertainty in the following areas:

1. There is great potential for a major, potentially catastrophic earthquake to occur in the region focused upon in Dr. Brady's prediction.

2. Dr. Brady's model and interpretations of seismic patterns do not correspond to earthquake science as seismologists know it.
3. Dr. Brady's claim of being able to predict the time, magnitude, and area of occurrence for a major earthquake is unprecedented, and unsubstantiated given the conceptual and scientific tools available to seismologists today.
4. While Dr. Brady's prediction is deterministic (i.e., certain events have to happen if the model is to remain valid), his prediction has several areas of uncertainty given the lack of a complete data set for the region in question (such as number of foreshock activities necessary to generate the earthquake predicted). Also, his prediction has been revised over the past few years and in recent months, as new data and refined predictive techniques have been developed.

V. What the Council Failed to Establish

In my judgment, the Council did not resolve uncertainty in the following areas:

1. Whether the theory and laboratory findings underlying Brady's model are spurious;
2. Whether certain foreshock sequences experienced thus far in the subject area are indeed random and incongruent with the Brady prediction;
3. Whether Dr. Brady's findings associated with the behavior of rock bursts can be applied in scientifically acceptable ways to seismology;
4. Whether Dr. Brady's previously published work is unscientific or in error in important respects. (Actually, the panel did not extensively discuss the merits of Dr. Brady's previously published work, except to point out that one paper Dr. Brady submitted to a professional journal was not accepted by its editors).

VI. Conclusions

It is unrealistic to expect a panel, no matter how distinguished and unbiased, to scientifically assess and critique such a complex and intricate formulation in a day and a half, with little advance preparation. Also, it is unfortunate that many of the panel members have strong institutional and other ties (e.g. funding relationships, superior-subordinate relations) which could unduly affect the Council's deliberations.

It is extremely unfortunate that Drs. Brady and Spence's formulations and findings during the past two years have not been set down in writing. It is incumbent on both persons to devote their full time and energies to accomplishing this task as an immediate priority.

The Council has pronounced negatively on the Brady prediction, yet the earthquake hazard threat to the region remains. Also Dr. Brady holds steadfastly to his prediction, and will continue to do so, until May 1981 when certain precursory foreshocks either have, or have not occurred in the subject region. I sincerely believe that he does this not out of hubris, or obstinacy, but out of a moral conviction that there is a large enough chance he is right, people should be forewarned.

Obviously, OFDA is not in any position to judge the validity or errors of Dr. Brady's work, and should abide by the Council's ruling for the time being. OFDA has a disaster preparedness program for the Andean region. Following the recent OFDA-organized international mission to Colombia, Ecuador, and Peru, this program is being expanded to take advantage of the heightened local awareness of the earthquake hazard.

VII. Recommendations

Certain steps need to be taken by other U.S. government agencies which are beyond OFDA's mandate and AID's role as a foreign assistance agency. Nevertheless, there are some initiatives I have recommended below which would be both helpful and prudent, without in any way casting doubt on the Council's findings.

Recommendation 1

Appropriate senior officials in AID, the State Department and the National Security Council should become familiar with the Brady Prediction, and possible contingencies associated with the occurrence of a major earthquake in the Andean region.

Recommendation 2

AID and the State Department should request the Director of USGS to provide timely monthly assessments of foreshock activity in the subject region with regard to whether predicted teleseismic foreshocks have or have not occurred. Currently there is at least a two month delay in receiving this information from USGS. It is also possible that such monitoring might be curtailed all together as a result of the Council's report.

Recommendation 3

OFDA should reiterate its desire for support from other AID offices, particularly the Latin America Bureau, in responding to requests for disaster preparedness assistance in the Andean region.

DOCUMENT NO. 91

UNITED STATES INTERNATIONAL DEVELOPMENT COOPERATION AGENCY
AGENCY FOR INTERNATIONAL DEVELOPMENT
WASHINGTON, D C 20523

X

MEMORANDUM

February 6, 1981

TO: PDC/OFDA, Alan Van Egmond, Assistant Director for Preparedness and Planning

FROM: PDC/OFDA, ^{PFK}Paul F. Krumpe, Science Advisor

SUBJECT: Review of National Earthquake Prediction Evaluation Council Meeting (NEPEC) on Peru 1981 Earthquake Prediction by Dr. Brian Brady (USBM)

I. Introduction

Subject meeting was held January 26 and 27 at the Colorado School of Mines, Golden, Colorado to evaluate the prediction of Dr. Brian Brady (USBM) that a series of great earthquakes will occur off the coast of Lima, Peru in summer 1981. The NEPEC council was convened by the Director's Office of the U.S. Geological Survey at the request of the Government of Peru to conduct an authoritative expert review of the physical, theoretical and plausible bases upon which Brady has made the prediction with collaborative support from Dr. William Spence (U.S.G.S.). With the advice of the Council, the Director of the USGS planned to, and on January 28, did in fact release a formal statement (State 022465) concerning the lack of scientific credibility of the prediction. Of the thirteen currently listed members of the NEPEC, ten were present at the subject Council meeting and two additional individuals (Dr. Rice, M.I.T. and Dr. Robert Wesson, U.S.G.S. served as alternative consultative council members. The council as constituted was composed of six U.S. Geological Survey scientists and five non-government physical scientists, including the Chairman.

II. Meeting Organization

As indicated by the opening comments and ensuing debate among the Council members, no format or agenda for the meeting had been planned or provided in advance to either Drs. Brady or Spence. Consequently, Drs. Brady and Spence had prepared a comprehensive 1-1/2 day detailed, systematic presentation with accompanying slides of theory, data, analysis, interpretation and conclusions which led to Brady's prediction of specific dates, times, place and magnitudes of potentially catastrophic earthquakes to occur off the coast of Peru later this summer. Drs. Brady and Spence were notified of the Council meeting in mid-January (about two weeks lead-time), however, they had already begun preparation in anticipation of a March meeting. In expectation of the later date neither Brady, nor Spence had time to prepare any specific written material to provide to Council members on such short notice.

The Council Chairman, with concurrence from the members, decided that Drs. Brady and Spence would be limited to only five hours of presentation time interspersed with several 1/2 hour Q/A sessions on the first day. The second day consisted of about 3 hours of Q/A with brief council summary and conclusion sessions and brief comments by Dr. Brady and Spence. The proceedings were tape recorded while being transcribed by court reporter and videotaped by NBC and CBS for future production. A transcript of the meeting is presumably available from

the U.S.G.S. as a matter of record. The proceedings were open to the public and media on January 26 and in the morning of January 27 until the meeting ended abruptly at 12:15 p.m. Council members then met in a closed session Tuesday afternoon in order to reach their conclusions and prepare a formal statement to be delivered to the Director of the U.S.G.S. concerning the scientific credibility of the Brady prediction. A press conference was also scheduled to release the Council's conclusions as soon as the Government of Peru (GOP) had been notified of the Council's decision. OFDA observers did not attend the Council's closed session or following press conference.

III. Prepared Technical Presentation and Outcome

The planned presentation (12 hours or 1-1/2 days) by Brady and Spence was to be divided into six parts as follows:

1. Laboratory studies and conclusions in support of the development of an inclusion zone model which delineates why and how rock fractures at the sub-molecular level.
2. Theoretical basis supporting the Scale Invariant Inclusion Theory: Development of a new set of non-linear tensor field equations which allow the prediction of space/time seismicity patterns (regardless of scale) with "clock-like" precision.
3. Applications of this new advancement in theoretical physics to the U.S. Bureau of Mines rockmine bursts (operational) prediction and early warning system.
4. Application of the new theoretical physics to Southern California seismicity patterns (i.e. Palmdale anomaly and San Fernando earthquake retrodiction).
5. Analysis of tectonic plausibility arguments in support of the possible future occurrence of great earthquakes off the coast of central Peru.
6. Application of the inclusion zone model and the theoretical basis for predicting the occurrence of great earthquakes in Peru, summer 1981.

Brady appeared before the Council under the assumption that he would be presenting his case in full, i.e. in a cohesive logical comprehensive yet detailed manner, using recently prepared slides and graphics, as well as current viewgraphs and data showing the detailed time (prediction) sequence for each of the main events, as well as other data supporting his retrodiction on the 1971/74 San Fernando earthquake. He looked disappointed when told he was being required to cut his technical presentation in half. He appeared to soon realize that the Council was not genuinely interested nor qualified to evaluate his theoretical work. In fact, he did not present his theoretical basis for predicting earthquakes because several Council members stated he was wasting time by attempting to do so, and no one understood his presentation anyway. No Council member appeared capable of grasping Brady's explanation of why rocks fracture at the sub-molecular level and how the "new" physics enables one to predict the time of rock failure.

IV. Revolutionary Elements of The Brady Hypothesis

Brady's current hypothesis appears unique in that it departs from accepted Einstein physics (Field Theory) and classical rock mechanics. He offers a comprehensive rational physical explanation for the following elements which, regardless of scale, contribute to lab rock failure, rock bursts and the occurrence of earthquakes. According to Dr. Brady, when rock breaks the following are operative:

1. Failure of triaxial compression (the state of tension in a dilated zone).
2. "Causative mechanism" for cracks in rock under stress is coalescence and formation of a void wherein collapse occurs (mainshock).
3. "Feedback mechanism" for energy exchange between the inclusion zone and outer boundry (influence horizon) directs the self-sustaining process which leads to rock failure (mainshock).
4. Conditions of thermodynamic stability are violated as the preparation process begins which accounts for the evaporation of molecular bonds and breaking of rock.
5. Precursor time is proportional to the surface area of an inclusion zone. Linear tensor equations are no longer applicable in this context.
6. Seismic events are not random; rather they are deterministic and have causes which can be explained by an entirely new set of field theory equations.

V. Current Prediction Parameters

The Brady prediction of three large earthquakes to occur on or about June 28 (Mw=8.0+); August 10 (Mw=9.2) and September 16 (Mw=9.9) became a matter of record on January 26, 1981. The additional event (June 81) and altered dates (revised since 1 May 1980 Memo) are not inconsistent with caveats previously established by Brady (See Krumpke Memo dated January 16). He has stated in several memoranda that prediction of the mainshocks and their respective foreshocks is necessarily dependent on analysis of preseismicity data. Since the model is deterministic and subject to recalculation and interpretation as current precusory seismicity data becomes available, it is not incongruous that Brady provided an updated prediction at the Council meeting. The objective was to present an updated prediction which was as current and as accurate as possible based on local Peruvian (IGP) data acquired one week before the meeting. This data included a teleseismic (Mb=4.5) event December 26 located on the boundary of the inclusion as specified and anticipated by Brady several months before. Additionally, on January 27, the USGS/NEIS released the relocated position and magnitude of the September 20, 1980 event originally predicted by Brady for mid-September. That revised data placed this foreshock exactly right above

the "nucleation" zone for the predicted mainshock at 17 Km depth (12.57 degrees South and 77.45 degrees West) with a revised magnitude of $M_b=4.0$. This occurrence of a nearly teleseismic crustal earthquake exactly on target and within the predicted timeframe cannot be dismissed as a random event according to Brady. The U.S.G.S. at the Council meeting claimed location errors (ellipses) within the region for $M_b=4.0$ to 4.5 to be about ± 100 Km. This is meaningless because the local network from which the revised data is determined based on Dewey's U.S.G.S. Joint Hypocenter Determination Program (computerized relocation of crustal earthquakes) has errors of <5-6 Km according to Dr. William Spence.

VI. Presentation of Laboratory Research in Rock Failure and Supporting Theory

The first presentation on January 26 by Brady concerning his laboratory work was received with little comment and some impatience. Council members indicated that they had read Brady's "Theory of Earthquakes, Parts I, II, III and IV" and questioned his work in the laboratory (i.e. his research results are invalid) so it was suggested he proceed to the Peru case. Brady commented that what he had to present concerning the lab work included new observations and data that completely break from currently accepted thought, that directly bear on his derivation of a new set of non-linear field equations which enable him to predict with "clock-like" precision space/time seismicity patterns essential to the Peru case and other case studies he is working on, including Southern California. The Council indicated disinterest in Brady's approach to understanding California seismicity and the physics which controls precursor time and mathematically defines what precusory seismicity actually is. The Council characterized Brady's work as speculative. Presentation of the theoretical basis, assumptions, criteria and constraints as well as physical and observational evidence supporting the scale invariant theory was received with ambivalence. Dr. Savage (U.S.G.S.) stated, "We (the Council) are not properly constituted to evaluate this" (Brady's theory). Brady refrained from further presentation of theory when told he was "turning the Committee off." Brady indicated the remaining material he had to present hinged on explanation of the theory section. The Council reply was, "do your thing, but at the end of the five hours allotted, that's it."

VII. Application of Research Results to California Earthquake Retroactive Prediction

Brady proceeded with an explanation of how he was able to apply his prediction model retroactively to the 1971/74 San Fernando earthquakes. He presented data and diagrams indicating a remarkable time sequence (Quiet-Active-Quiet-Foreshocks-Mainshock) preceeding the destructive San Fernando earthquake. The periods of activity and quiet were nearly identical as the rock failure process proceeded irreversibly from the point in time when the "inclusion zone" formed and the conditions of criticality were met that then led to the mainshock. Brady stated that if he had had the data prior to the San Fernando earthquake, he would have made a reliable and accurate prediction. The Council was not interested or impressed with Brady's interpretation of the sequence, how it

was derived mathematically, or how it supported his Peru prediction analysis. His presentation in this case was characterized as "fitting the model to the data" (or vice versa) and declared unscientific, vague and speculative by the Council.

VII. Plausibility Arguments Presentation

Dr. Spence presented a one hour session on the tectonic plausibility arguments supporting the possibility that such great earthquakes as predicted by Brady could occur in the specified region. The Council, familiar with many of his arguments as detailed in a memo dated June 1979, listened with interest but rejected his conclusions as faulty. Spence's main arguments can be summarized as follows:

1. Rates of uplift and subduction along the central Peruvian coast are anomalous as indicated by perched shells on high cliffs, receding ocean front and recent coastal terracing.
2. Strain meter data trends indicate non-random anomalous E-W compressive stress along the boundary (inland) of Brady's inclusion zone forming event (mainshock) aftershock zone and across the Peru-Chile trench.
3. The 1974 Lima earthquake did not lead to a de-coupling of the Nazca and South American Plates. Aseismic slip cannot account for the rapid uplift and subduction occurring in the region because of the relatively quiet seismicity in the region. About 10 meters of uncompensated slip exists in the zone.
4. T-shaped oscillatory aftershock sequence for 1974 Peru earthquake is indicative of a region approaching criticality for a mainshock.
5. The Lima Basin is highly active (seismically) which could be indicative of the aftershock zone of the predicted large events.
6. The 1946 tsunami producing earthquake near Callao was a great earthquake ($M_w > 8.0$) as inferred from the isoseismals (shaking to the north and south) as well as sea inundation inland. This central Peru event accounts for about 2-3 meters of seismic slip leaving about 20 meters of uncompensated slip. Hence, the seismic gap is not filled.
7. The focal mechanism solution for the 1974 Peru event indicates the possibility that a reverse thrust fault is potentially operative in the delineated zone of the mainshock. This follows Brady's interpretation of the formation of an inclusion zone to the west while events occurring inland (to the east) define this zone as it forms, thus characterizing such a fault mechanism.
8. Tide gauge data indicates periods of anomalous uplift and subsidence within the zones. This data can be examined and calibrated for verification purposes.

9. The "spreading rate" in the zone is about 10-11 cm per year which is anomalous considering that the region is seismically inactive even to low magnitude events (as recorded by the IGP network).

IX. Peru Prediction Arguments

In the last hours of presentation time on Monday, Dr. Brady attempted to delineate arguments, both theoretical, plausible and based on interpretations of recent data, in support of his Peru prediction. He showed detailed time sequences, maps of events, and discussed the revisions in his prediction. He did not have enough time to complete his presentation of the Peru data which led to the prediction. He contends that the Lima Basin is imploding in a 24 square kilometer source zone known as the "inclusion zone". This zone is the source for earthquake generation from 8 degrees South to 27 degrees south along the South American Coast. This zone is the cause of anomalous horizontal compression as well as uplift along the coast according to Dr. Brady. This zone will be the source and location for the three large earthquakes predicted. Brady discussed the significance of the predicted foreshocks (August 14, September 20, December 26, 1980) and events occurring inland (Ayacucho) which map the influence boundary of the primary aftershock zone of the predicted mainshock.

X. NEPEC Council Critique of Prediction and Theory

On Tuesday morning the Council was clearly prepared to challenge and publicly discredit the arguments, interpretation and data analyses presented by Brady and Spence presented on Monday. The Council focused on the following issues:

1. Why is the Scale Invariant Inclusion Theory advanced by Brady relevant or necessary to the specific Peru prediction?
2. Is the occurrence of an under thrusting fault plane crucial to the Peru prediction in view of the fact that the 1974 focal mechanism is controversial?
3. What are the equations or physical evidence (which can be replicated) which support Brady's delineation of the earthquake propagation and aftershock zone mapping?
4. Is precursor time proportional to fault length as specified in Brady's 1976 paper or has he revised his work?
5. Brady's approach appears to be empirical, subjective, vague, speculative, "ad hoc" and unsubstantiated.
6. Brady's interpretation of elasticity theory appears faulty. Why has he chosen to pursue an approach differing from that accepted in the literature?

7. The accuracy of the Peruvian data set used by Brady and Spence is questionable. Errors in location, magnitude, focal mechanisms, frequencies, etc. make Brady's interpretation spurious and unsubstantiated.
8. The results obtained by Brady in his laboratory analysis of rock failure and his work in rock mine burst prediction is based on conclusions that the U.S.G.S. has disproven in the laboratory. Brady's findings are a result of "instrument noise" and do not represent a new advance in rock mechanics and the physics of rock failure.
9. There is no physical evidence or basis for the Spence/Brady tectonic arguments. Aseismic slip is common in other parts of the world. The "anomaly" is not real according to the U.S.G.S.
10. The Council is aware of "numerous, serious" past errors in Brady's work (not specified) and therefore has reason to believe his current work is faulty.
11. The lack of written material by Brady for review by the Council severely limited their examination of the theory and his arguments due to the complexity of the subject and Brady's illusory presentation, explanations, and answers to direct questioning. Peer review is a prerequisite in presenting new scientific approaches to solving complex problems such as predicting earthquakes.
12. The foreshock sequence as predicted by Brady (May 1, 1981 memo) did not occur as predicted, therefore his prediction is invalid. Brady changes the prediction dates and magnitudes periodically apparently to suit the incoming data and keep the prediction active.
13. The rock strain data recorded in Peru is not worth using because of the extremely large rates (5 orders of magnitude larger than in California). Therefore it must be invalid regardless of trend.
14. The claim by Spence that the possible occurrence of an inland normal faulting earthquake preceeding the late June target date for the first mainshock would increase the conditional probability of the predicted events is unsubstantiated. Japanese data indicate a lag time of up to 6 years from the occurrence of normal faulting events to possible mainshock.
15. The seismicity patterns Brady shows in his interpretation of time/event sequences are purely "ad hoc" and empirical with no apparent physical reason for them.
16. Brady's work on the San Fernando "retrodiction" has been revised to suit the data set and therefore is invalid, or empirical at best.

17. The Council contends that the timing of the earthquake prediction for Peru is not based on any quantitative calculations or the theory that Brady has developed. The "clock" claimed by Brady is an assertion without evidence to support it in the Peru case.
18. Brady's inability to present his arguments with codified equations and basic physics upon which the Council can comment leads to an unconvincing case.
19. Spence's presentation was well done, although his arguments and conclusions are faulty and do not support the Brady hypothesis in any way which would convince the Council that the predicted earthquake sequence is even probable.

XI. Predicted Earthquake Precursors: February - June, 1981

Dr. Brady made several statements concerning his expectations for the Peru prediction precursors (based on interpretation of the model) for the time period between February and June, 1981. These are summarized as follows:

1. If seismic events in the zone between February and June, 1981 are not teleseismic ($M_w > 4.5$) then the prediction for events on June 28, August 10, and September 16 would be incorrect and would be withdrawn.
2. About 4 or 5 teleseismic foreshocks are expected in the inclusion zone. These foreshocks must develop or the prediction will be invalid.
3. Earthquakes should occur along what will be the aftershock zone boundary. A continuation of shallow crustal teleseismic events inland are expected in addition to larger events in northern Chile and North Central Peru.
4. An increase in seismic activity within the inclusion zone is expected. "It should really get active above the nucleation zone before it goes."
5. If a medium-sized normal faulting earthquake develops inland from the inclusion zone, then a program to pick-up short term precursors (radon gas, strain-pulse, etc.) would be imperative.
6. Unless seismicity data within the region is collected, reduced, transmitted and made available to Brady for interpretation on a near real-time basis, he will be unable to withdraw the prediction. On January 27, 1981 Brady stated, "Right now, from the information I see and my interpretation of it, I cannot withdraw the prediction at this stage."

XII. NEPEC vs. Brady: Summary Technical Arguments

The National Earthquake Prediction Evaluation Council Meeting conclusion resulted in a prepared statement to the Director of the U.S.G.S. for subsequent transmittal to the President of Peru. The statement (attached) apparently attempts to absolve the Council (and U.S.G.S.), and the USG from further

responsibility in all possible outcomes of the Brady prediction. The statement of the Council rejecting the Brady hypothesis, Spence's plausibility arguments, and the deterministic sequence of events to possibly occur between now and summer 1981 remains inconclusive and subject to controversy. The following comparative analysis demonstrates how disparate the Council and Dr. Brady were during the meeting concerning the Peru prediction, its theoretical basis, and possible future outcome:

NEPEC Council

1. Dr. Brady's theory, hypothesis, laboratory work, rock burst studies, earthquake prediction and San Fernando retrodiction are empirical and therefore unscientific.
2. Dr. Brady's observations in the laboratory which led to his theory of rock failure have no physical basis and are due to instrument "noise" as proven in similar U.S.G.S. studies which directly contradict Brady's findings and conclusions.
3. Dr. Spence's plausibility arguments supporting the possibility that very large earthquakes could occur in Central Peru as Brady predicted are faulty and without foundation. Aseismic slip is occurring in Central Peru which is not anomalous, although uplift and subduction are continuing.
4. There are "numerous serious" errors in Brady's past work and publications i.e. Brady (1976) indicates that precursor time is proportional to fault length as one of his principle assumptions....his work to date is based on this faulty premise and is therefore in error (Aki, 1981).

Dr. Brian Brady (U.S. Bureau of Mines)

1. Though some empiricism led to discovering and developing the Peru prediction, the physics and mathematical basis for the Scale Invariant Inclusion Theory upon which the Prediction lies has a sound scientific basis involving classical field theory.
2. The phenomena observed in the laboratory, documented on high speed film, and analyzed, using highly advanced techniques, are real and are not due to "instrument noise" or procedural errors. The experiments have been replicated and the results point to the development of a new aspect of quantum mechanics based on non-linear tensor physics.
3. The tectonic plausibility arguments offer physical evidence that uncompensated slip and spreading is occurring between the two tectonic plates indicating they are locked. This condition could lead to a catastrophic earthquake. The zone is quiet and is approaching criticality for a major event and is seismically anomalous.
4. The assumption that precursor time is only a function of fault length is the "height of idiocy." Although postulated in earlier work, experimental evidence over the last seven years has proven that precursor time is directly proportional to the surface area of the inclusion zone. Linear tensor equations are no longer applicable in this context.

NEPEC Council

5. The South American and Nazca tectonic plates are de-coupled and no seismic gap currently exists in Central Peru.
6. We do not recommend any special measures in response to the Brady/Spence prediction.
7. If there is not a substantial increase in the number of earthquakes of magnitude 4.5 or greater in a specific area off the coast of Peru by mid-May 1981, Drs. Brady and Spence will withdraw their prediction.
8. The members of the Council are unconvinced of the scientific validity of the Brady prediction.
9. We cannot say with complete confidence that major earthquakes will not occur at the predicted times, but judge the probability of this happening to be very low indeed.

Dr. Brian Brady (U.S. Bureau of Mines)

5. The South American and Nazca tectonic plates are not de-coupled. An "asperity" is locking the plates which will be broken by the predicted events in 1981. The tectonic arguments presented provide evidence that a very large earthquake is possible in this region..."If these arguments don't convince you of this possibilitythen nothing will."
6. "The best way out of this problem is to have the data on a rapid basis...the December 26 inclusion zone event must be examined in greater detail...." We need to study differential uplift rates and calibrate strain gauges to monitor strain pulse....we need to monitor random anomalies and access seismicity data in real-time."
7. "The foreshock sequence must develop or I'll call the prediction off....the only thing that will convince you (the Council) if this is right or wrong....is if the events occur....I expect to see the zone become really active before it goes....I cannot withdraw the prediction at this stage."
8. The only way to prove if aseismic slip is occurring is to measure plate motion... otherwise one must accept the possibility that the plates are locked and aseismic slip is not occurring. The prediction is deterministic.... unless specific events occur on a precise timetable, then the prediction is invalid.
9. The prediction of the mainshocks is based on a "clock-like" time sequence of quiet and active periods of near equal time duration. If the timing remains on schedule as predicted....the probability

NEPEC Council

Dr. Brian Brady (U.S. Bureau of
Mines)

of the mainshock is 1, i.e.
absolute.

10. The San Fernando earthquake after-shock zone data presented by Brady is "hindsight" or ad hoc....fitting the data to the model as proof the model can predict....
11. The timing aspects of the Peru prediction are not based on any quantitative calculations or on the "Theory" Brady has developed.
12. "No member of the panel understands what you are saying....We are not properly constituted to evaluate this."
13. The network monitoring the 1974 aftershock sequence has serious errors associated with E-W locations of events. The accuracy of the data set is in question.
14. The theory does not seem relevant or necessary to the specific Peru prediction.
10. The San Fernando aftershock zone delineation and period of occurrence is not hindsight....anyone can examine the Caltech data and derive the same conclusions in outlining the aftershock zone.
11. The Peru prediction is definitely based on the theory which enables precise prediction of foreshocks and mainshocks, provided preseismicity data is available for analysis. Each of the predicted mainshocks has its own characteristic event sequence in time and space.
12. Brady's work breaks completely with classical theory to develop a whole new set of non-linear field equations which define what a precursor and precursor time actually is. No seismic event is random....it is deterministic.
13. The oscillatory nature of the offshore seismicity sequence following the 1974 inclusion zone forming event, indicates the region is approaching criticality. The Lima Basin is imploding with horizontal compression and extreme uplift along the coast.
14. The theory is essential to understanding critical events and prediction of the mainshock in the region. The theory delineates the physical basis for why and how rock fractures nucleate, whereas the prediction is based on seismicity/space/time relationships derived from the theory and interpretation of events.

XIII. Conclusions

1. The NEPEC has rejected Brady's theory of earthquakes and 1981 Peru prediction as well as Spence's supporting plausibility arguments, and has recommended to the Government of Peru that no serious consideration be given to Brady's prediction.
2. The NEPEC members stated their willingness to be present in Lima, Peru on any of the predicted dates indicated by Dr. Brady in order to demonstrate their consensus that the prediction is scientifically invalid as well as improbable.
3. The NEPEC has rejected the need for further seismic precursor monitoring of the potentially affected region, implying that additional real-time data collection and analysis would not yield any evidence to support or invalidate Brady's hypothesis or specific prediction.
4. The NEPEC expects that Dr. Brady will retract his prediction by the end of May 1981 if there is no substantial increase in anticipated teleseismic activity in the specified zone.
5. The NEPEC complimented Spence's presentation (though totally rejecting his arguments) and faulted Dr. Brady for not preparing written material on the prediction for critical review prior to the meeting.
6. The NEPEC clearly viewed the meeting and their conclusions as having successfully debunked Brady's presentation on his theory, supporting data and Peru prediction.
7. Dr. Brady's opinion of the meeting indicates that the NEPEC did not debunk or in any way scientifically discredit his theory, laboratory results or prediction with any valid argument, conclusion or evidence (data). Rather, the NEPEC persistently attempted to create a "smoke screen" during his presentation in order to obscure the fact that the Council, as constituted, was not capable of scientifically invalidating his conclusions and theory, even though he has published on the theoretical aspects, and his work was available to Council members prior to the meeting.
8. Dr. Brady is unable to withdraw the Peru prediction at this time because the tectonic evidence and seismicity patterns in the target region remain "on schedule" as essentially predicted months in advance. Without an adequate continuous, reliable flow of near real-time seismic data from the target zone available for his analysis, it is unlikely that he will withdraw his prediction in mid-May (unless no seismicity occurs in the region).

XIV. Recommendations

Inasmuch as no other agency of the U.S.G. except AID/OFDA is taking action to prepare for or monitor these improbable predicted events, the following recommendations should be considered by OFDA:

Recommendation 1: Inasmuch as anxiety may increase in Lima if foreshocks occur in the near future, OFDA should consider establishing a PASA with the U.S. Geological Survey to schedule invitational travel for NEPEC members and/or their consultants to visit Peru periodically from May thru September to provide assistance to the Peruvian Civil Defense and IGP in accelerating public awareness in earthquake risk analysis, hazards reduction and disaster preparedness and prevention. The publicized presence of NEPEC members in country would provide a significant deterrent to fear during the times of the predicted earthquakes. These experts could also provide authoritative comment on the science of earthquake prediction and the need for implementing protective measures.

Recommendation 2: A "Blue Ribbon" Committee of international disaster experts should be assembled by OFDA to travel to Peru to specifically ascertain the consensus of GOP officials, USG officials, American community and Peruvian population concerning their personal feelings and anticipated actions between April and October 1981. This sample of opinion could be used to develop realistic contingency plans in the event that possible teleseismic activity occurs as predicted.

Recommendation 3: OFDA should collaborate with A.I.D. Latin American Bureau to obligate required funding (FY 81-82) to upgrade the Peru Geophysics Institute seismic network. This program, under the technical direction of the Carnegie Institution, would greatly assist Peruvian seismologists in locating low magnitude earthquakes in real-time with great accuracy and precision. This capability would significantly improve disaster early warning. This program would also increase confidence in the Peruvian population (thru media campaign) that their government was taking prudent measures to ensure their future safety in the event of disaster.

UNITED STATES GOVERNMENT

memorandum

DATE: February 10, 1981

TO: PDC/OFDA, Paul F. Krumpe, Science Advisor

SUBJECT: USGS Earthquake Monitoring of Brady Prediction Target Zone 65
Kilometers SW of Lima, Peru

TO: PDC/OFDA, Alan Van Egmond, Assistant Director for Preparedness and Planning
Office of U.S. Foreign Disaster Assistance

This memo is to inform you that reliable sources indicate that the U.S. Geological Survey, Office of Earthquake Studies, Branch of Global Seismology located in Denver, Co. has apparently ceased monitoring seismicity in the "Inclusion Zone" delimited by Dr. Brian Brady (U.S.B.M.) in his May 1, 1980 memorandum (provided to U.S.G.S. at their request). The last summary report provided by U.S.G.S. evaluated seismicity in the target zone during the month of October, 1980. Monitoring initiated by a May 27, U.S.G.S. memo from Dr. John Filson (USGS/OES) to Dr. Robert Engdahl, Chief, Global Seismology Branch has apparently been terminated as a result of the NEPEC decision to reject the Brady prediction as unscientific and speculative.

I recommend that the above be officially verified by the Department of State and Ambassador Corr be so informed immediately if the above is confirmed. The NEPEC statement clearly indicated that Dr. Brady expects a "substantial increase in the number of earthquakes of magnitude 4.5 or greater in a specific area off the coast of Peru by mid-May 1981." If these events do not occur then presumably Dr. Brady will withdraw his prediction. However, if the region is not being monitored, and USGS data is not freely available to Dr. Brady for his analysis, then there is no rational for him to withdraw the prediction at any future date without verification of the occurrence (or not) of regional seismicity patterns anticipated.



FEB. 17, 1981

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PATUIJAZ RUWLSFB0482 0482203-UUUU--RUWLSFB.

P 172203Z FEB 81

FM RUWLSFB/NEIS GOLDEN CO

TO RUESLM/AMEMBASSY LIMA

TO RUWLSFB/NEIS GOLDEN CO

INFO RUWLSFB/NEIS GOLDEN CO ATTN: W. J. SPENCE

BT

UNCLAS

SUBJECT: SEISMIC DATA TRANSMISSION

1. ALL SEISMIC DATA SENT VIA POUCH OR APO FOR TRANSMISSIONS DATED 17 DECEMBER THROUGH 31 JANUARY, 1981 HAVE BEEN RECEIVED VIA STATE DEPARTMENT TELEGRAPHIC MODE. GENERALLY THE POUCH OR APO TRANSMITTAL ARRIVES 7-10 DAYS AFTER RECEIPT OF TELEGRAPHIC TRANSMITTAL. 2. THERE HAVE BEEN NO MISSING MESSAGES THROUGHOUT THE DURATION OF THIS EXPERIMENT. NOW THAT THE RELIABILITY OF RAW DATA FLOW HAS BEEN ASCERTAINED I RECOMMEND THAT THE POUCH OR APO TRANSMITTALS OF RAW SEISMIC DATA BE STOPPED. 3. DR. BRADY WAS UNAWARE OF THE ABOVE RELIABILITY EXPERIMENT IN TRANSMISSION OF RAW SEISMIC DATA. 4. RAW SEISMIC DATA FROM PERU IS PUT INTO THE NEIS EARTHQUAKE LOCATION SYSTEM AND PROCESSED ROUTINELY WITH ALL OTHER RAW SEISMIC DATA THAT IS RECEIVED. PRELIMINARY RESULTS ARE PUBLISHED ABOUT 4 WEEKS FOLLOWING OCCURRENCE OF EARTHQUAKE. 5. IF EARTHQUAKES OCCUR THAT ARE RECORDED ONLY BY PERUVIAN STATIONS, IT IS LIKELY THAT MANY OF THESE SMALL QUAKES WILL NOT SURVIVE THE STRINGENT LOCATION CRITERIA REQUIRED FOR PUBLICATION BY THE NEIS. FOR LOCATIONS OF THESE EVENTS TO BE RELIABLY AND RAPIDLY DETERMINED, A SPECIAL LOCATION EFFORT WOULD BE REQUIRED IN PERU.

) SPENCE

BT

#0482

NNNN

03 WLSFB

FEB 19 1981

INFORMATION MEMORANDUM FOR THE ACTING ADMINISTRATOR

THRU : ES 
FROM : AA/PDC, Gordon K. Pierson (Acting)
SUBJECT: Peru Earthquake Prediction

Given the high level attention to the Peru earthquake prediction in recent months, a status report to you seems in order.

The attached cable and memo are self-explanatory. The National Earthquake Prediction Council found no specific basis for the Brady prediction but, of course, stated that a serious earthquake could occur in the region at any time. In this context, OFDA will be working with Peruvians to improve their preparedness for such a possibility.

I propose to send copies of Allan Van Egmond's memo to LAC, State and the USGS. As you will note, he accepts the Council's judgment, and we will be guided accordingly. However, the nature of the review was not what one would have wished and others should at least be aware of those reservations.

Attachments:a/s

Drafted:AA/PDC:GKPierson:tlb:2/19/81:Ext. 23478

0022050

DATE: February 20, 1981

memorandum

REPLY TO
ATTN OF: Alan Van Egmond, Assistant Director PDC/OFDA

SUBJECT: Development Assistant Programming in Disaster Prone Areas

TO: Charles Paolillo, Acting AA/PPC

Attached is an example of what we were talking about over lunch. Nowhere in the CDSS for Peru, or the issues paper attached, is there any mention or hint of recognition that perhaps millions of people are at risk due to a severe earthquake hazard. Considering the sizable amount of resources we are putting into Peru, it seems to me this is an oversight of major proportions. There are numerous ways impending disaster threats can be handled in development programming, but I would suggest that looking completely the other way should not be one of them, certainly not in this case.

Next week, I am meeting with Ed Coy (who has been part of two major disaster relief operations in Nicaragua and Guatemala) to see if something can be done about this issue at the LA Bureau level. Meanwhile, I will wait to hear back from you on how we should proceed in studying and perhaps defining an Agency-wide policy on disasters and development.

cc: Ed Coy Acting AA/LAC
George McCloskey OFDA/PDC
Larry Smucker PPC/PB
Ron Nicholson PPC/PB



Buy U.S. Savings Bonds Regularly on the Payroll Savings Plan

OPTIONAL FORM NO. 10
(REV. 7-78)
GSA FPMR (41 CFR) 101-11.6
5010-112

Reports, Memoranda, Correspondence
and Other Communication

March - April, 1981



EMBASSY OF THE DOCUMENT NO. 96
UNITED STATES OF AMERICA

Lima, Peru

March 4, 1981

Dr. Brian Brady
U.S. Department of Interior
Bureau of Mines
Denver Research Center
Denver Federal Center
Bldg. 20
Denver, Colorado 80225

Dear Brian:

It was good talking with you the other day. I attach a copy of the epicenter data I read to you over the telephone and a copy of the letter (phones were down) I later sent to Dr. Ocola concerning your needs. If there are any further hitches, please let me know.

Sincerely,


Alford W. Cooley
Economic Section

Enc. As Stated

P.S. I attach the preliminary report for epicenter No. 19-IGP-81. *AL*

telephoned to US Embassy Lima 4 March, 1981 11:45 AM

PRELIMINARY EPICENTER

Number of Event	19 - IGP - 81
Date (UT)	4 Mar 81
TIME (UT)	10 h 20 m 57 s
S. Latitude	<i>12.92</i> 12 degrees 25 min
W Longitude	<i>77.67</i> 77 degrees 40 min
Depth	25 km
Local Magnitude	4.0
Number of Stations	6
Reporting	

U. S. NATIONAL SECTION DOCUMENT NO. 97
PAN AMERICAN INSTITUTE OF GEOGRAPHY AND HISTORY
ORGANIZATION OF AMERICAN STATES

Defense Mapping Agency
Bldg 56, US Naval Observatory
Washington, D. C. 20305
4 March 1981

MEMORANDUM FOR: Dr. Brian T. Brady
Dr. Clarence Allen
Dr. Paul Krumpe
Dr. L. T. Aldrich

SUBJECT: Note from Dr. Alberto Giesecke

During meetings of the Directing Council of the Pan American Institute of Geography and History (PAIGH) this past week, Dr. Alberto Giesecke of Peru provided me with the attached note and copy of the Roberts article. I am sending you these per his request. He remarked that he highlighted certain phrases, and these appear blanked out in the attached article. The handwritten notes are Giesecke's.

Sincerely,



OWEN W. WILLIAMS
Vice Chairman
US National Section, PAIGH

Enclosure a/s

AGENCY FOR INTERNATIONAL DEVELOPMENT

Office of the Executive Secretary

March 9

Lake Prediction

TO: Mr. Pierson, AA/PDC (Acting)

REF: Peru

with a status report.

Please see Mr. McPherson's note:

- What is the nature of Peruvian and AID preparations in the event that there is an earthquake in June. //

Please respond by information memorandum-
due March 13.

May
Douglas Clark

*What is the nature of
Peruvian and AID
preparations in the event that
there is an earthquake
in June.*

Ref No:	3-10-1
Action:	PDC/OFDA
Information Memo for	
Pierson's Signature	
3/13	
GP	

MAR 10 10 42 AM '81
9 00 AM '81
PDC/OFDA

March 11, 1981

Dr. Alberto A. Giesecke H.
 Director, CERESIS
 Apartado 3747
 Lima, Peru

Dear Alberto:

Mr. Owen Williams recently conveyed to me the contents of Dr. Roberts' article. I find Dr. Roberts' article quite interesting, but there are several points that should be clarified. Roberts refers to the Brady/Spence prediction at several places in the text and to the Brady prediction at other places. I recommend he use Brady prediction only and not the former. Bill is not and has never been formally involved in the prediction phase of this problem. Bill and I have collaborated on the plausibility or rather, tectonic, arguments which tend to support the view that the region in question is susceptible to earthquakes in the magnitude range predicted by me.

I hope everything is well for you and your family. I am looking forward to receiving data from Leo's network in the near future.

Best regards,

Brian T. Brady
 Supervisory Physicist
 Mine Design Division
 Denver Research Center

REFER TO	INITIAL
HOOVER	BTB
WADDELL	WJW

cc: Division of International Activities

BTBrady/lew
 Chron
 Subj. ✓
 Res. Dir.

DOCUMENT NO. 100
UNITED STATES INTERNATIONAL DEVELOPMENT COOPERATION AGENCY
AGENCY FOR INTERNATIONAL DEVELOPMENT
WASHINGTON, D C 20523

X

March 11, 1981

MEMORANDUM

TO: PDC/OFDA, Alan Van Egmond, Assistant Director for Preparedness
FROM: PDC/OFDA, ^{PFK} Paul F. Krumpe, Science Advisor
SUBJECT: Chronology of OFDA Actions Related to Peru Earthquake Prediction

October 5, 1978

OFDA Science Advisor, Mr. Paul Krumpe, attends UN Regional Conference in Brazil on the application of satellite technology to disaster monitoring. While preparing an invitational lecture on geophysical monitoring, Mr. Krumpe researched an American Geophysical Union (AGU) review article (EOS, 1978) of an AGU meeting in 1976 on earthquake prediction which detailed elements of Dr. Brian T. Brady's earthquake prediction model.

December 5, 1978

OFDA Science Advisor, Mr. Krumpe, met with USGS, Office of International Affairs, Mr. John Reinmund and Mr. Alberto Giesecke, Director of the Geophysics Institute of Peru (IGP) to discuss The CERESIS proposal, - "Seismic Risk in The Andean Region". Mr. Giesecke informed OFDA of Dr. Brady's Peru 1981 earthquake prediction and the IGP interest in evaluating it.

January 30, 1979

OFDA obtained an internal USGS memorandum directed to the USGS Office of Earthquake Studies (OES) which detailed Dr. Brady's prediction and discussed the IGP request for a technical briefing and evaluation.

May 2, 1979

OFDA received an announcement from the USGS Office of Earthquake Studies concerning a USGS meeting to be held in Golden, Co. at the request of the GOP/IGP to review the earthquake prediction of Dr. Brady for July, 1981.

May 24, 1979

USGS meeting at Golden Co. to evaluate the Peru 1981 earthquake prediction by Dr. Brady (USBM). OFDA Science Advisor, IGP Peruvian Scientists and others attended the meeting where Dr. Brady presented his theory and prediction and Dr. Spence (USGS) presented plausibility arguments supporting the possibility of such events.

June 19, 1979

Memorandum from Mr. Krumpe to Ms. Anne Martindell, Director OFDA concerning details of USGS meeting (Golden, Co.) to evaluate earthquake prediction by Dr. Brady. Action items and OFDA options/recommendations included.

October 3, 1979

OFDA Science Advisor prepared and provided detailed memoranda and background

information to State Department S/T officials preparing briefing materials for OSTP Dr. Frank Press visit to Andean Region and Peru to establish future scientific and technological exchange programs.

November 4, 1979

OFDA Science Advisor obtains copy of Brady/Spence letter dated October 26, 1979 to IGP Mr. Giesecke containing a preliminary recommended program for monitoring short-term precursors to the predicted July 1981 mainshock.

November 13, 1979

OFDA Memorandum from Mr. Krumpe to Mr. Dalton, Assistant Director for Preparedness, (interagency distribution) containing a disclaimer concerning potential OFDA funding of technical assistance support to the Peru IGP to monitor the predicted 1981 earthquake precursors as specified by Dr. Brady, U.S. Bureau of Mines.

January 4, 1980

(C) Lima 0090

Confidential Cable

January 8, 1980

Letter from Dr. Robert Wesson (USGS) to Mr. Dalton (OFDA) stating the USGS position on the Brady prediction. The USGS does not endorse the Brady prediction that a catastrophic earthquake may occur in Summer, 1981 off the Coast of Central Peru.

January 15, 1980

Letter from Mr. Dalton (OFDA) to Dr. Wesson (USGS) stating OFDA's position concerning Dr. Brady's 1981 Prediction for Peru.

January 29, 1980

OFDA Memorandum from Mr. Dalton to the file concerning contact by Peruvian Embassy to set up a meeting with Sr. Juan Garland of the Peruvian Red Cross to discuss Peru disaster preparedness matters and contingency planning.

January 27, 1980

OFDA received a copy of a letter from IGP's Director, Mr. Alberto Giesecke to USGS Director, Dr. Wm. Menard, concerning the IGP's desire to meet with USGS Staff to discuss the Brady earthquake prediction.

February 11, 1980

OFDA Director, Mr. Joseph Mitchell, met with Sr. Juan Garland, President of the Peruvian Red Cross and affirmed OFDA willingness to help coordinate USG efforts towards establishing a Peruvian national disaster preparedness program to meet the potential threat of a very large (future) destructive earthquake. OFDA received an International Appeal by the Peruvian Red Cross for "Preventive Logistical Support in Case of Disasters."

February 13, 1980

Letter from Mr. Paul Vitale USAID/Lima (MDRO) to Mr. Robert Harris, OFDA, concerning the Mission's need for information on the Brady prediction and also revision of the Mission Disaster Relief Plan. Mission learned of Brady's prediction of 1981 earthquake from local press reports.

February 14, 1980

OFDA memorandum from Dr. Denise Decker to Mr. Fred Cole (Acting OFDA Assistant Director for Preparedness) concerning the appeal (document) received from the Peruvian Red Cross.

February 22, 1980

Letter from Mr. Robert Marovelli, U.S. Bureau of Mines (USBM) to Mr. Dalton (OFDA) providing clarification of the official position of the U.S. Bureau of Mines on the Peru 1981 Earthquake prediction of Dr. Brady.

February 29, 1980

Lima 1782

Limited Official Use Cable

March 1980

OFDA directed ETI (contractor) to update the Peru Country Profile. USAID/Lima was asked for inputs and clarification of officials and disaster related institutions.

March 5, 1980

OFDA briefing paper (draft) prepared by Mr. Weston Emery (Senior Planning Officer) for principal witness testifying in defense of OFDA FY 81 program.

March 5, 1980

OFDA Memorandum from Mr. Cole to Mr. Dalton concerning contingency planning for Peru: Disaster Preparedness Options to be initiated within OFDA.

March 8, 1980

State 062283 (LOU)

Limited Official Use Cable

March 14, 1980

USAID/Lima cable requesting OFDA to keep mission informed of changes in the Brady prediction as well as outcome of Interagency Working Group meeting. Mission plans to pouch a copy of revised Mission Disaster Relief Plan for OFDA review.

March 18, 1980

Meeting at OFDA to discuss the 1981 Peru earthquake prediction and possibility of USG contingency planning. Interagency representatives from USBM, NBS, NSF, FEMA, USGS, AID and State were in attendance.

March 21, 1980

OFDA Science Advisor provides one copy each to Mr. Dalton, Dr. John Filson (USGS), Mr. Marovelli (USBM), Mr. Purnell (State desk) Mr. Wm. Rhodes (AID Desk) and Mr. Paul Vitale (MDRO, USAID/Lima) of chronological background - memos and papers on the Brady earthquake prediction.

March 28, 1980

Memorandum from Mr. Dalton to Mr. Mitchell (OFDA) concerning details of the interagency meeting to review and discuss the 1981 Peru earthquake prediction and possibility of USG contingency planning held March 18, 1980.

March 31, 1980

OFDA Science Advisor provides a list to OFDA officials of impartial scientists capable of reviewing Brady's theory and its application to earthquake prediction.

April 1, 1980

OFDA memorandum from Mr. Emery (Senior Planning Officer) to Mr. Dalton concerning recommended actions with regard to Brady's earthquake prediction. Mr. Emery suggests that NSF convene a technical review panel to determine reliability of Brady's prediction.

April 3, 1980

OFDA interagency meeting (NBS, NSF, FEMA, OSTP) to discuss the modus operandi of the Working Group in Seismic Disaster Preparedness with Mr. Dalton presiding.

April 11, 1980

Letter from Mr. Mitchell, OFDA Director, to UNDRO Ambassador Berkol commenting on draft record of the UNDRO Technical Advisory Panel meeting (Geneva, March 18-19, 1980) and suggesting revisions clarifying OFDA's position on disaster preparedness assistance to Peru.

April 14, 1980

OFDA received copy of revised Disaster Relief Plan for Peru from USAID/LIMA MDRO, Mr. Paul G. Vitale.

April 19, 1980

State 103001

OFDA cable requests Embassy transmittal of OFDA findings concerning available Defense Mapping Agency (DMA) archived geodetic survey mapping data for Peru obtained in the 1930's and 1940's.

April 22 1980

Lima 3563 (LOU)

Limited Official Use Cable

April 28, 1980

Memorandum from OFDA, Mr. Cole to interagency distribution (FEMA, NSF, USGS, NBS and desks) concerning OFDA meeting on "contingency planning for earthquakes which may affect Latin America." Attached outline detailed elements for contingency planning analysis.

May 1, 1980

OFDA received a copy of Dr. Brady's memorandum to Mr. Robert Marovelli, Director, Minerals Health and Safety Technology, Bureau of Mines, detailing his earthquake prediction and general locations and characteristics of the predicted foreshock sequence off the central Peruvian coast.

May 4, 1980

Letter from Dr. Wm. Menard (USGS Director) to Dr. Frank Press (OSTP) indicating USGS official position on Brady prediction and also indicating that the prediction does not merit review by The National Earthquake Prediction Evaluation Council (NEPEC).

May 15, 1980

Letter from OSTP to Mr. Dalton (OFDA) indicating that the Brady Prediction is not an official USG position. Mr. Menard's letter to Dr. Press attached. OSTP indicates that the USGS does encourage general disaster preparedness planning exercises such as OFDA is initiating with other USG agencies.

May 28, 1980

Letter from Dr. John Tomblin (UNDRO) to Mr. Dalton (OFDA) with note requesting material on Peru prediction. Dr. Tomblin was assigned the task of preparing hazards assessment and risk management scenarios for Peru in 1981 relative to Brady Prediction.

June 4, 1980

Meeting between OFDA representatives and NSF on South American contingency planning. Subjects included post-prediction response, earthquake hazards mitigation, contingency planning, and vulnerability analysis. NSF appears ready to assist in a Peru disaster contingency planning program sponsored by OFDA.

June 6, 1980

Letter from Mr. Dalton (OFDA) to Dr. Margaret Finarelli (OSTP) concerning USGS Director Dr. Menard's letter to OSTP Director, Dr. Frank Press on the subject of the Brady earthquake prediction. Mr. Dalton indicates that OFDA is proceeding with NSF and FEMA to "Develop a schematic for a planning exercise based on heavy seismicity."

June 9, 1980

Letter from Mr. Dalton (OFDA), Assistant Director for Disaster Preparedness to Dr. John Tomblin, UNDRO, transmitting sensitive background memoranda and information on the Brady prediction.

June 26, 1980

Letter from American Embassy, Lima to OFDA transmitting information pamphlets concerning the "International Seminar on Earthquake Prediction and Evaluation of Seismic Risk, to be held Oct. 20-24, 1980 in San Juan, Argentina.

July 14, 1980

Mrs. Sbarbaro, Peru Embassy, Counselor, Scientific Affairs, called Mr. Krumpke, OFDA to request a meeting with the OFDA Director on Peruvian disaster preparedness matters. Mr. Krumpke referred the call to Mr. Clark, OFDA Executive Assistant.

July 17, 1980

State 188396

OFDA cable requesting mission advice concerning possible OFDA initiatives in disaster preparedness planning for earthquakes. Several detailed options/recommendations are made and OFDA "is prepared to coordinate USG activities in contingency planning for earthquake threat to Andean countries per their requests."

July 22, 1980

OFDA representatives, Mr. Clark, Mr. Cole, and Mr. Oliver Davidson met with Embassy of Peru Officials, M. Sbarbaro and Mr. Pomareda, to discuss USG assistance for earthquake preparedness and Civil Defense.

July 22, 1980

The Embassy of Peru transmitted an Aide Memoire to Department of State requesting assistance in increasing cooperation in civil defense and disaster preparedness matters.

July 24, 1980

(LOU) State 195465

Limited Official Use Cable

July 28, 1980

OFDA receives set of correspondence between Dr. Eaton (USGS) and Mr. Giesecke (IGP) concerning Dr. Eaton's TDY to Peru to make recommendations for an earthquake monitoring program. TDY coordinated by USAID/Lima.

July 28, 1980

Letter from Mr. Faruk Berkol (UNDRO) to OFDA Director, Mr. Mitchell, transmitting background paper prepared by UNDRO on earthquake disaster preparedness in the (Peru) region. UNDRO encourages the OFDA idea of convening a regional disaster preparedness conference.

August 6, 1980

Lima 7023

Embassy requests Washington notify USGS and USBM of IGP and Mr. Giesecke's desire for Drs. Brady and Spence to participate in San Juan Conference and stop-over in Lima to meet with IGP scientists concerning the prediction.

August 30, 1980

State 231436

Embassy of Peru Aide Memoire received by OFDA is transmitted by cable to USAID/Lima.

September 5, 1980

Letter from Dr. Harold Loomis, NOAA Joint Institute for Marine and Atmospheric Research (JIMAR) indicates interest in tsunami instrumentation and observational program relative to possible outcome of Brady prediction.

September 15, 1980

Lima 8389

USAID/Lima Mission discusses Dr. Eaton (USGS) TDY while in country and encourages OFDA attendance at San Juan Conference on Earthquake Prediction.

September 17, 1980

Lima 8479

USAID Lima informs OFDA of Dr. Giesecke's (IGP) desire for OFDA representation at San Juan, Argentina Earthquake Prediction Conference; indicates USAID Mission Director met with Peruvian Civil Defense Director; Mission pouches details of International Earthquake Prediction Conference.

September 21, 1980

State 251850

OFDA informs mission that OFDA is reviewing the USAID/Lima Mission Disaster Relief Plan.

September 23, 1980

State 253818

OFDA requests USAID periodic mission update on status of proposed Peru IGP and USGS cooperative arrangement and requests copy of Dr. Eaton's trip report and recommendations concerning earthquake prediction and technical assistance proposals. OFDA concurs on mission suggestion that OFDA representatives attend San Juan Conference. OFDA drafts reply to GOP Aide Memoire.

October 10, 1980

State 270416

OFDA informs mission of Krumpe/Cole TDY to San Juan Argentina and Lima, Peru regarding earthquake prediction, disaster preparedness matters and civil defense.

October 16-24, 1980

Disaster Preparedness Officers, Mr. Cole and Mr. Krumpe, attend Earthquake Prediction and Hazards Analysis Conference at San Juan, Argentina.

October 17, 1980

(LOU) Lima 277384

Limited Official Use Cable

October 25-30, 1980

Mr. Krumpe and Mr. Cole on TDY to Lima, Peru, concerning disaster preparedness matters. Meetings are held with USAID, American Embassy, Official Peru Civil Defense Director and the President of Peru. (Detailed trip report prepared.)

November 10, 1980

(LOU) Lima 10336

Limited Official Use Cable

November 12, 1980'

OFDA Information Memorandum transmitted to the AID Administrator (Mr. Douglas Bennett) from Mr. George McCloskey, Acting Director, concerning an earthquake alert for Peru and neighboring coastal States of South America.

November 12, 1980

OFDA Memorandum from Mr. Krumpe and Mr. Cole to the Assistant Director for Preparedness Planning, Mr. Alan Van Egmond, detailing conclusions and recommendations for disaster preparedness and contingency planning in Peru relative to Brady's earthquake prediction for August-October 1981.

November 14, 1980

OFDA Science Advisor received Telcon from Dr. Brady confirming the occurrence of an Mb=3.5-4.0 earthquake within the specified inclusion zone.

November 18, 1980

OFDA informs mission of informal interagency (AID, State, USGS, USBM, OSTP, NSF) meeting convened by OFDA to discuss Brady's prediction; review proposed disaster preparedness program for Peru and possible USG options for earthquake hazards mitigation.

November 24, 1980

OFDA met informally with USAID/Lima MDRO designate, Engineer Edilaberto Alercon (Peruvian national) in Washington.

November 24, 1980

OFDA received by telecopier, USGS input to State Department cable to be sent to Lima the concerning Brady prediction and USG position on its lack of credibility.

November 25, 1980

Meeting held between USGS Office of Earthquake Studies, USGS Director's Office, OFDA, Bureau for Latin America, Acting Assistant Administrator, and PDC Bureau, Deputy Assistant Administrator concerning USG response to Peruvian Earthquake hazard and specifically the Brady prediction.

November 28, 1980

(C) Lima 10889

Confidential Cable

December 2, 1980

Letter from USSOUTHCOM Chief, Logistics Division, Lt. Col. J.A. Linnemann to OFDA mentions including the Brady prediction as an agenda item at a Spring, 1981, conference sponsored by the Secretary of State.

December 3, 1980

State/AID meeting held with Peru desk officers, AA/LAC and OFDA representatives to discuss American Embassy request for Peru Earthquake disaster preparedness assistance and seismic monitoring equipment.

December 5, 1980

OFDA informal meeting with AID/PPC and LA Bureau representatives to review priority needs and funding requirements for improved IGP Seismic monitoring in Peru.

December 8, 1980

(LOU) State 324986

Limited Official Use Cable

December 10, 1980

(LOU) Lima 1198

Limited Official Use Cable

December 21, 1980

OFDA memorandum from Mr. Krumpe, Science Advisor to Mr. Alan Van Egmond, Assistant Director for Preparedness and Planning, concerning the scheduled meeting of the National Earthquake Prediction Evaluation Council on Peru Earthquake. Meeting scenarios are provided.

December 22, 1980

(LOU) Lima 10984

Limited Official Use

December 22, 1980

OFDA received a copy of Letter, (Dec. 17, 1980) from Mr. A.H. Cooley (AmEmbassy, /Lima) to Dr. William Spence (USGS) which constituted a test run of a system for expediting seismic data transfer from the IGP to Drs. Brady and Spence in Golden, Co.

January 2, 1981

Memorandum from LAC/SA Mr. Rhodes to OFDA, Mr. Davidson transmitting a copy of Dr. Eaton's trip report (USGS) and recommendations following his AID supported TDY to Peru to consult with the IGP. A copy of Dr. Leo Ocola's proposed program for the IGP attached.

January 5, 1981

Letter from Mr. Davidson (OFDA) to Ms. Avignone (FEMA) concerning GOP request to USG for disaster preparedness assistance and OFDA's planned Technical Assistance Mission to the Andean Region.

January 5, 1981

OFDA Operations Division received a letter from the Chief, Logistics Division, DOD, Southern Command requesting additional information on Dr. Brady's prediction.

January 15, 1981

State 010168

OFDA cable detailing composition and objectives of Disaster Preparedness Assessment Team TDY to Lima, Quito and Bogota.

January 22, 1981

OFDA Science Advisor Mr. Krumpe prepared a memorandum to the OFDA Assistant Director for Disaster Preparedness and Planning on the current status of the Peru earthquake prediction. Memo provided excerpts from previous USBM and USGS memos (1977-81) detailing the prediction's foreshock events sequence according to Dr. Brady and USGS/OES analysis.

January 23, 1981

OFDA Assistant Director for Disaster Preparedness, Mr. Van Egmond submits an information memo to OFDA Director Mr. Mitchell concerning an update of the Brady earthquake prediction for Peru.

January 23, 1981

OFDA Telcon to American Embassy, Lima to suggest to Ambassador Corr that Embassy representative should attend NEPEC meeting to observe proceedings and gain firsthand knowledge of Brady prediction for Peru in Summer, 1981.

January 23, 1981

A.I.D. memorandum from PPC/PB, Ron Nicholson to PDC/OFDA, Mr. Van Egmond concerning NEPEC meeting.

January 26-27, 1981

OFDA Assistant Director for Preparedness Planning, Mr. Van Egmond and OFDA Science Advisor, Mr. Krumpe, attended the National Earthquake Prediction Evaluation Council Meeting at Golden, Co. convoked to evaluate the Peru earthquake prediction by Dr. Brian Brady.

January 28, 1981

State 022465

Report by the National Earthquake Prediction Evaluation Council (NEPEC) conveyed to the President of Peru; entire text of NEPEC decision on Brady prediction released to the media by USGS.

February 3, 1981

State 026904

OFDA cable to USAID/Lima requesting Mission assistance in arranging travel plans for three Peruvian Civil Defense officials to visit the U.S. to observe disaster simulation exercises and become familiar with California disaster response systems.

Februaru 4, 1981

OFDA memorandum from Mr. Van Egmond to OFDA Director, Mr. Mitchell with conclusions and recommendations following NEPEC meeting in Golden, CO.

February 5, 1981

OFDA received memorandum (dated November 26, 1980) from Dr. Wm. Spence to Dr. John Filson (USGS/OES) concerning recommendations for a geophysical monitoring program in Peru.

February 6, 1981

OFDA memorandum from Mr. Krumpe to Mr. Van Egmond concerning NEPEC meeting in Golden, Co. Review of NEPEC conclusions and technical considerations in rejection of Brady's Peru 1981 earthquake prediction.

February 10, 1981

OFDA memorandum from Mr. Krumpe to Mr. Van Egmond indicating that USGS Office of Earthquake Studies has ceased monitoring seismicity in the inclusion zone specified by Brady prediction. USGS monthly reports terminated in October, 1980.

February 13, 1981

OFDA Science Advisor, Mr. Krumpe conducts preliminary review of rough draft IGP/Carnegie Institute proposal to upgrade the IGP seismic network. Dr. Huacho (IGP) and Dr. Sacks (Carnegie) met with AID/PPC Mr. Ron Nicholson concerning funding for their proposal.

February 19, 1981

Information memorandum for the A.I.D. Acting Administrator (Joe Wheeler) from AA/PDC, Gordon Pierson (Acting) concerning the Peru Earthquake Prediction (status report references "reservations" concerning NEPEC review in late January.)

February 24, 1981

Meeting between OFDA Disaster Preparedness Officers, and AA/LAC, Mr. Ed Coy, and AID Latin American Bureau Officials concerning matters of Peru disaster preparedness (awareness) program and IGP request for seismic monitoring equipment (FY81-\$550K; FY 82 - \$250K) to be submitted in a proposal from the Carnegie Foundation.

February 25, 1981

Mr. Krumpe (OFDA) received copies of AmEmbassy (Feb 10) and USGS/NEIS (Feb. 17) Golden, CO. cables discussing seismic data transmissions via Telex from IGP and AmEmbassy Lima to NEIS. NEIS enters raw data into earthquake location system, processes it routinely and publishes locations in about 4 weeks.

March 4, 1981

OFDA Memorandum from Mr. Krumpe to Mr. Van Egmond providing detailed chronology of OFDA actions related to Peru Earthquake Prediction by Dr. Brian Brady.

March 4, 1981

(LOU) Lima 2345

Limited Official Use

March 9, 1981

AID/OFDA receives proposal summary from The Carnegie Institution and IGP to upgrade seismic network in Peru.

Budgeted cost: FY 81 \$413.6 K (U.S.); \$250 K (GOP)
FY 82 \$343 K (U.S.); \$209 K (GOP)

DEPARTMENT OF STATE
AGENCY FOR INTERNATIONAL DEVELOPMENT
Office of U.S. Foreign Disaster Assistance
Washington, D.C. 20523

March 11, 1981

Dear Alf:

I recently received a copy of the enclosed paper by Dr. John Roberts (New Zealand) who intends to publish it in Geofisica Revista. See note from Mr. Giesecke. Have you seen this? I believe sections may be considered sensitive. Roberts attended the Embassy planning meeting as well as the visit to see the President on Oct. 29, 1980. Perhaps you should meet with Giesecke to discuss your opinion on this. I see no factual errors, however the sections marked may be sensitive from the Embassy view. Perhaps Jerry Lamberty should see this paper and comment. Giesecke has Roberts' address and phone number.

FYI: Wm Spence views the probability of the Brady prediction as very low, however if events pickup as Brian has forecast, then Spence feels more attention may be warranted.

FYI: For the record, I have compiled a detailed annotated chronology of OFDA actions etc. concerning the prediction and possible outcome.

Have you reviewed my recent memo to AVE re: the Golden meeting?

PFK

Paul



DOCUMENT NO. 102

United States Department of the Interior

GEOLOGICAL SURVEY
RESTON, VA. 22092

In Reply Refer To:
EGS-Mail Stop 720

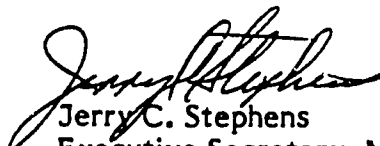
MAR 16 1981

Mr. Paul F. Krumpe
Science Advisor
PDC/OFDA - Room 1262A
Agency for International Development
Washington, D.C. 20523

Dear Mr. Krumpe:

The minutes of the January 26-27, 1981, meeting of the U.S. National Earthquake Prediction Evaluation Council are enclosed. At this meeting, the Council reviewed and rejected the prediction of a series of three major earthquakes near Lima, Peru, for this summer. The Council's statement is appended to the minutes. The length and complexity of the presentation and discussion preclude a short yet comprehensive summary of the arguments.

Sincerely yours,


Jerry C. Stephens
Executive Secretary, NEPEC

Enclosure

**National Earthquake Prediction Evaluation Council
Minutes of the Meeting
January 26-27, 1981
Green Center - Metals Hall
Colorado School of Mines
Golden, Colorado**

The following persons were in attendance:

Clarence R. Allen, Chairman
John R. Filson, Vice-Chairman
Robert L. Wesson, representing the Director, U.S. Geological Survey
Jerry C. Stephens, Executive Secretary
E. R. Engdahl
David P. Hill
Thomas V. McEvilly
C. B. Raleigh
James C. Savage
Lynn Sykes (only on January 26)
James R. Rice (non-voting consultant to the Council)
Brian Brady, U.S. Bureau of Mines - presenting earthquake prediction
William Spence, U.S. Geological Survey - presenting earthquake prediction
Clement F. Shearer - staff to Council
David Schleicher - staff to Council
Donald Findley - Public Affairs Officer for Council

And approximately 100 members of the public, including representatives of the Government of Peru, the U.S. Agency for International Development, and the media.

The Council met to evaluate a prediction of earthquakes to occur this summer near Lima, Peru. The evaluation was formally requested by the Government of Peru through the U.S. State Department and the U.S. Geological Survey (USGS), the latter of which has specific and sole legislative authority to evaluate and communicate on behalf of the Federal Government statements about geologic hazards.

The meeting was called to order at 8:35 a.m.

After Mr. Findley described ground rules for media representatives covering the Council meeting, Mr. Allen, Chairman of the Council, proposed the following schedule for the first day. Messrs. Brady and Spence, who predicted a series of three earthquakes for the summer of 1981, would have five 1-hour presentations interspersed with

half-hour question and answer periods. The second day's schedule would be flexible but ostensibly provide opportunity for unstructured discussion of the prediction. Although Messrs. Brady and Spence felt that 5 hours would be inadequate to fully explain the theory and data that lead to their prediction, they and the Council agreed to Mr. Allen's proposed schedule.

Mr. Brady presented his prediction; namely, on or about June 28, 1981, a magnitude 7.5-8.0 earthquake off the coast of Peru, a second earthquake of magnitude 9.2 on or about August 10, 1981, and 36 days later, on September 16, 1981, a magnitude 9.9 earthquake. All these earthquakes are to be centered near Lima, Peru. Messrs. Brady and Spence divided their presentation in this manner.

Part I - Laboratory study and support.

Part II - Development of space-time relationships supporting prediction theory.

Part III - Application to specific predictions in mines and California earthquakes in 1971 and 1974.

Part IV - Plausibility arguments based on seismicity and field data.

Part V - Application of theory to Peru.

Mr. Brady covered Parts I, II, III, and V; Mr. Spence covered Part IV. Further, Mr. Brady acknowledged all responsibility for development of the predictive theory.

The presentation of Messrs. Brady and Spence is too complicated to adequately summarize in these minutes. The presentation, though, was marked by a significant number of challenges and refutations of both the theory and interpretation of laboratory and field data by the Council and their defense by Messrs. Brady and Spence. The proceedings, however, will be available at cost once they are transcribed and edited. Interested

should contact Jerry C. Stephens or Clement F. Shearer of the Earth Sciences Assistance Office, U.S. Geological Survey, 720 National Center, Reston, Virginia 22092.

Messrs. Brady and Spence concluded their presentation at 5:05 p.m. Mr. Allen then opened the meeting to technical questions from the audience. Several scientists in attendance, but not on the Council, asked questions, which Messrs. Brady and Spence answered. Mr. Allen adjourned the meeting at 5:45 p.m.

The second day of the Council's meeting was opened by Chairman Allen at 8:40 a.m. This portion of the meeting was essentially an exchange of scientific concerns between Messrs. Brady and Spence and the Council. The Council continued to challenge and refute the statement and claims of the two predictors, who continued to assert the merit of their work and predictions. Mr. Brady did state, however, that if there is not a substantial increase in the number of earthquakes of magnitude 4.5 or greater in a specific area off the coast of Peru by mid-May 1981, he would withdraw the prediction. Mr. Spence agreed and Mr. Brady defined the requisite number of such earthquakes to be 5. There was some concern that this frequency of magnitude 4.5 earthquakes approximates the historical level of seismicity in that region.

The presentation and the question and answer sessions ended at 11:40 a.m. Mr. Allen opened the meeting to closing remarks by the Council and then to Messrs. Brady and Spence. Both Messrs. Raleigh and Savage of the Council presented detailed negative criticisms of Messrs. Brady's and Spence's work. While both professed some value and qualitative plausibility in Mr. Spence's analysis of the seismicity data and field observations, they both expressed little confidence in Mr. Brady's theory and interpretation of data used to construct and support that theory. Mr. Allen noted his distress, as well as that of the other Council members, at not having written documents from

Messrs. Brady and Spence to review before the Council convened. Mr. Filson agreed with Mr. Allen and further noted that a plea for such documentation and its submission to normal review by the scientific community was made as early as 1979.

The open session and presentation of evidence was closed at 12:05 pm.

The Council reconvened in closed session at 1:00 p.m. to vote for either acceptance or rejection of the prediction and to draft a report, with any minority opinions, for submission to the Director, USGS, for whom the Council serves as an advisory board. The Council unanimously adopted the statement, reproduced as Appendix A.

The statement was forwarded by the Director, USGS, to the President of Peru through the U.S. State Department in Washington, D.C., and the Embassy of Peru, Washington, D.C.

The Council concluded its affairs regarding the prediction on Wednesday, January 28, 1981, with a press conference. The press conference opened at 9:08 a.m. Messrs. Filson and Wesson conducted the conference. Mr. Filson gave background information about the predictions. He also outlined the chronology of the USGS's knowledge and involvement in Mr. Brady's work and prediction. Mr. Wesson then read the Council's statement. Both Messrs. Filson and Wesson responded to questions from news reporters.

The press conference ended at 9:45 a.m.

The Director of the U.S. Geological Survey has received the following statement from the National Earthquake Prediction Council:

STATEMENT BY THE NATIONAL EARTHQUAKE PREDICTION
EVALUATION COUNCIL, JANUARY 27, 1981

"At the request of the Government of Peru, the Director of the U.S. Geological Survey has convened the National Earthquake Prediction Evaluation Council to review the prediction of a major earthquake in Peru. Specifically, the prediction by Drs. Brian Brady and William Spence states that a series of large earthquakes will begin at the end of June 1981, off the coast of Peru. The sequence is predicted to contain a magnitude 7.5-8.0 event on or about June 28, 1981, a magnitude 9.2 event on or about August 10, 1981, and a magnitude 9.9 event on or about September 16, 1981. The predicted epicenters of these events are all near Lima. We understand that if there is not a substantial increase in the number of earthquakes of magnitude 4.5 or greater in a specific area off the coast of Peru by mid-May 1981, Drs. Brady and Spence will withdraw the prediction.

The members of the Council are unconvinced of the scientific validity of the Brady-Spence prediction. The Council has been shown nothing in the observed seismicity data, or in the theory insofar as presented, that lends substance to the predicted times, locations, and magnitudes of the earthquakes. The Council regrets that an earthquake prediction based on such speculative and vague evidence has received widespread credence outside the scientific community. We recommend that the prediction not be given serious consideration by the Government of Peru. We cannot say with complete confidence that major earthquakes will not occur at the predicted times, but we judge the probability of this happening to be very low indeed. On the

basis of the data and interpretation currently available, none of the members of the Council would have serious reservations about being present personally in Lima at the times of the predicted earthquakes. We are particularly distressed that although this prediction has been publicized in various forms for several years, nothing in the scientific literature or in other written form has been made available to this Council on the detailed theoretical basis and methodology of the Peruvian prediction as currently formulated. In fact, the prediction specified in a memorandum by Dr. Brady on May 1, 1980, is quite different from that presented orally at this meeting.

Our rejection of the specific prediction by Drs. Brady and Spence should not be taken as minimizing the risk to lives and property from earthquakes in Peru. Since its founding, Lima has experienced many strong earthquakes, and others must be expected in the future both there and elsewhere along the coastal regions of Peru. Despite the continuing need to prepare for earthquakes in Peru, we do not recommend any special measures in response to the Brady-Spence prediction."

The U.S. Geological Survey endorses the conclusions reached by the Council.



United States Department of the Interior

BUREAU OF MINES

P. O. BOX 25086
BUILDING 20, DENVER FEDERAL CENTER
DENVER, COLORADO 80225

March 20, 1981

Mr. Alford W. Cooley
Economic Section
Embassy of the United
States of America
Lima, Peru

Dear Alf:

Thank you for your recent letter. I find the March 4, 1981, event most interesting, as it occurred approximately 115 days prior to the predicted June 28, 1981, event.

I will not need Leo's station readings, as that information is transmitted directly to NEIS (Golden, Colorado). I do require IGP's monthly listing of local events, particularly those listings from November 1980 to the present. These data are absolutely essential to me, as I have no other source of information at this time.

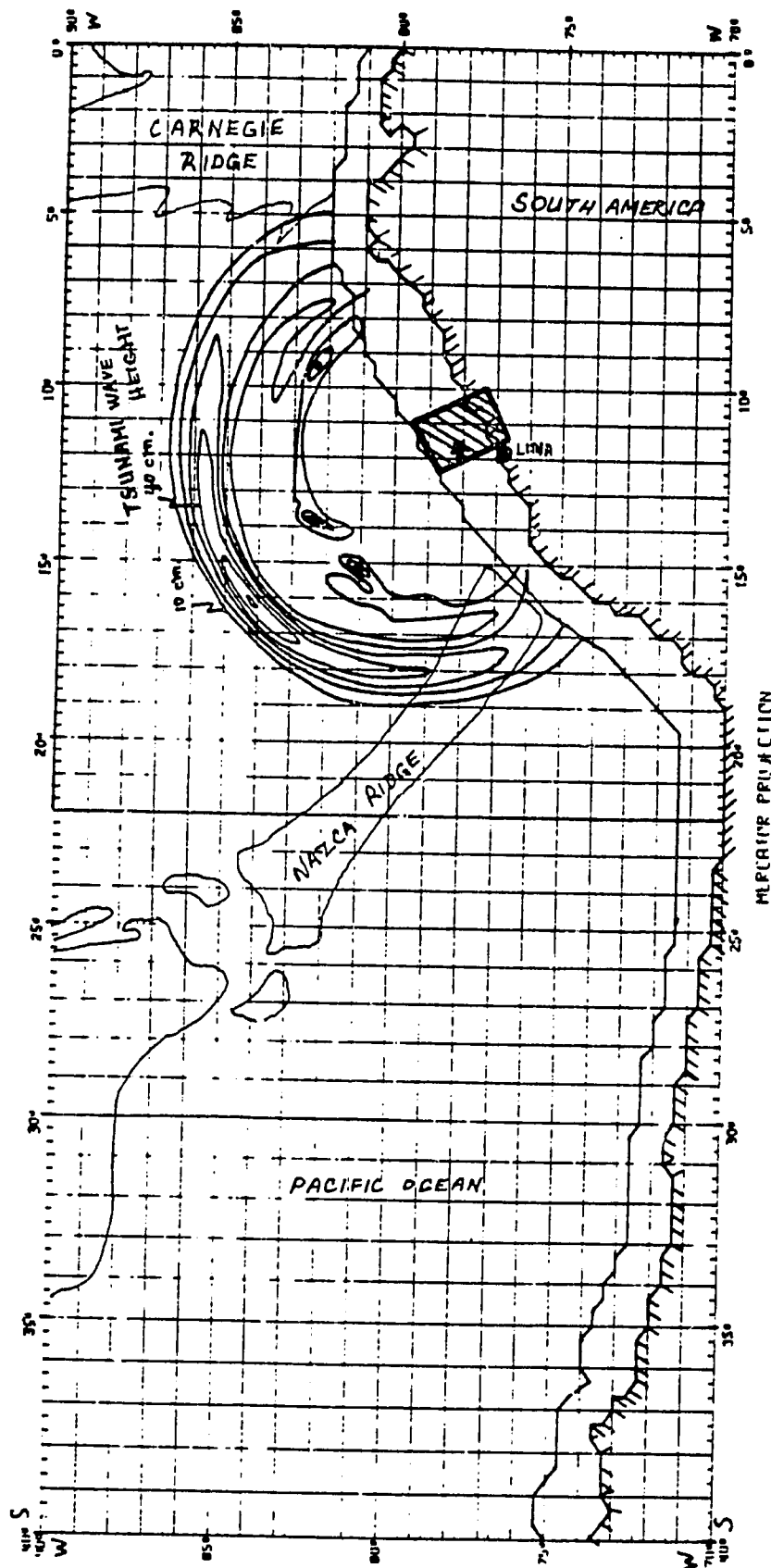
I wish you well and hope you are in good health.

Best regards,

Brian T. Brady
Supervisory Physicist
Mine Design Division
Denver Research Center

PARAMETERS FOR HYPOTHETICAL CATASTROPHIC EARTHQUAKE

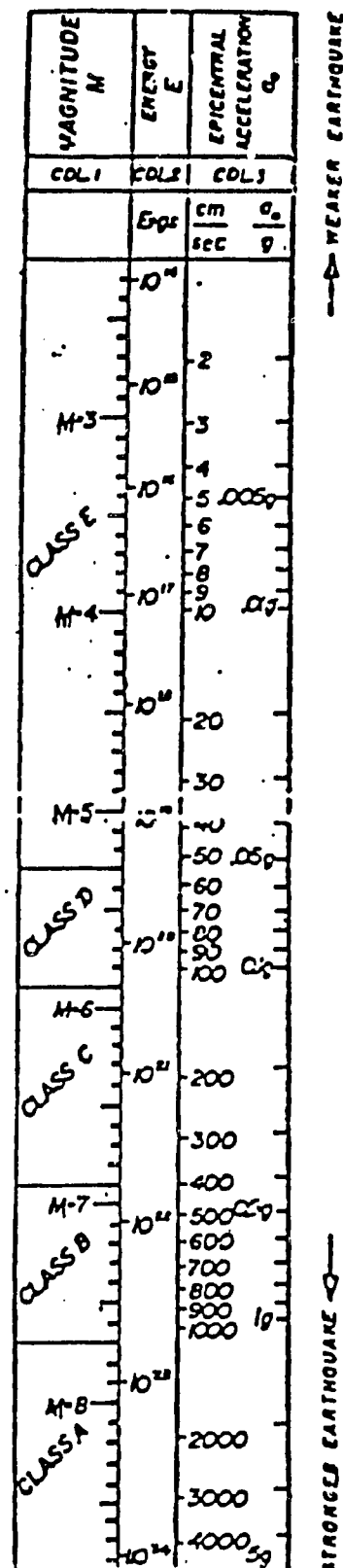
Source Location:	12.5°S/77.6°W, 65km SW of Lima, Peru												
Fault Zone Length:	150 km (along trench, NW to SE from 10°S to 12°S)												
Fault Zone Width:	150 km (SW to NE, perpendicular to trench)												
Magnitude (Kanamouri Scale):	Mw= 8.3												
Mean Vertical Bottom Displacement:	3.7meters												
Area of Displacement (ocean bottom):	22,500 km ²												
Rate of Propagation:	3 km/sec.												
Tsunami Effects:	<table border="0"> <tbody> <tr> <td>Japan coast</td> <td>2 meter wave height</td> </tr> <tr> <td>Australia coast</td> <td>3 meter wave "</td> </tr> <tr> <td>Indonesia coast</td> <td>2 meter wave "</td> </tr> <tr> <td>Hawaii</td> <td>4 meter wave "</td> </tr> <tr> <td>Peruvian coast</td> <td>2 meter wave "</td> </tr> <tr> <td>California coast</td> <td>1 meter wave "</td> </tr> </tbody> </table>	Japan coast	2 meter wave height	Australia coast	3 meter wave "	Indonesia coast	2 meter wave "	Hawaii	4 meter wave "	Peruvian coast	2 meter wave "	California coast	1 meter wave "
Japan coast	2 meter wave height												
Australia coast	3 meter wave "												
Indonesia coast	2 meter wave "												
Hawaii	4 meter wave "												
Peruvian coast	2 meter wave "												
California coast	1 meter wave "												
Source Depth:	18 km												
Fault Type:	Reverse thrust												
Date:	June 23, 1981												
Felt Area:	1,500,00 km ² (coastal South America)												
Felt distance:	1,000 km North of Lima, Peru 500 km South of Valpariso, Chile												
Mercalli Intensity (MM):	X in the fault zone												
Energy Release:	4.1 x 10 ²⁷ dyne-cm												
Ground Acceleration:	3500 cm/sec												
No. Killed in source zone:	~300,000 initial count (conservative estimate)												
No. Seriously injured in source zone:	1.1 million												
No. Victims (homeless)	2 million (initial estimate)												

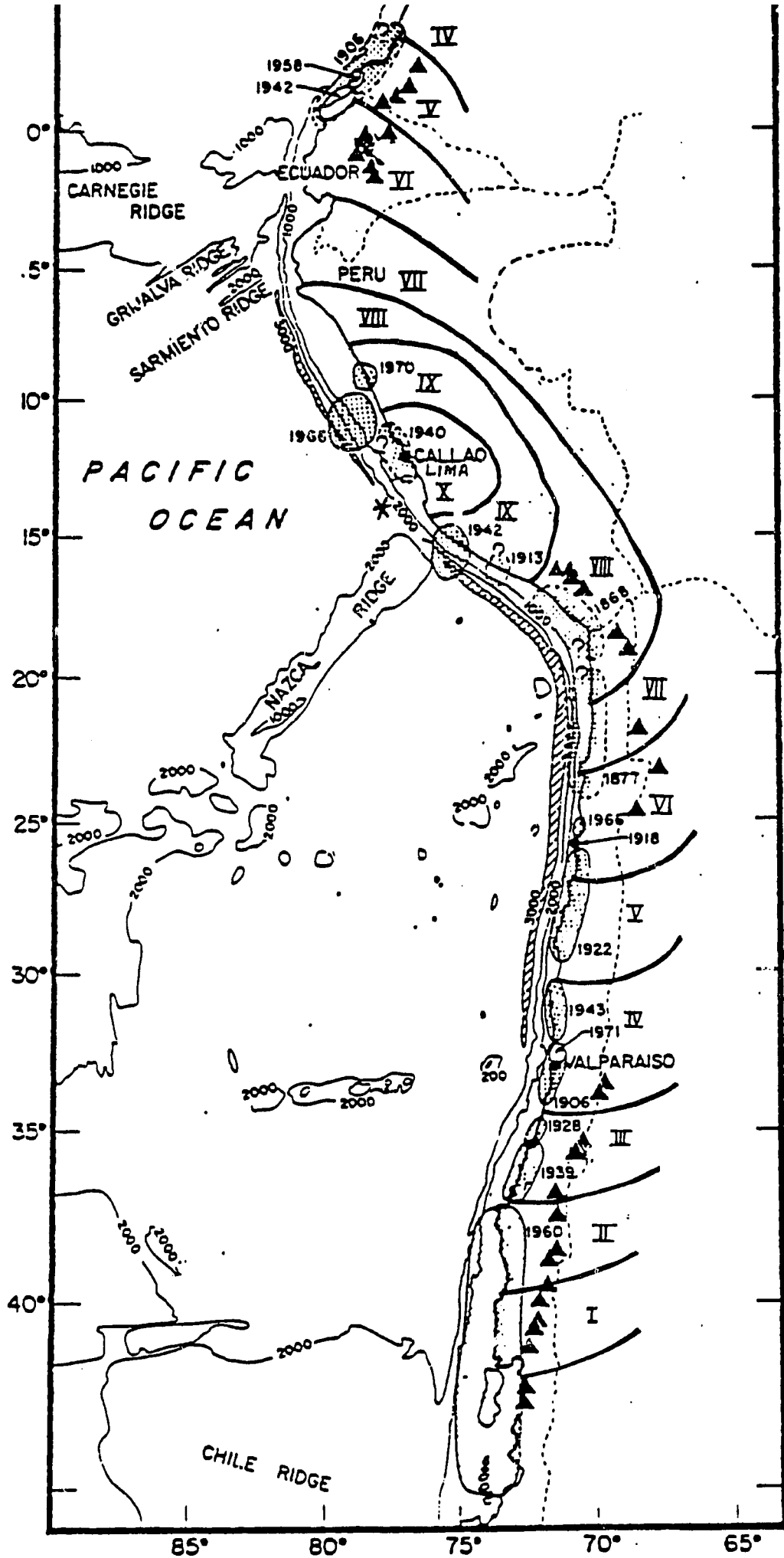


Hypothetical Epicentral Location (*), Rupture Zone
 Displacement (///), Tsunami Wave Height (60 minutes
 after rupture)

APPROXIMATE RELATION CONNECTING EARTHQUAKE MAGNITUDE, INTENSITY, ACCELERATION AND ENERGY RELEASE

ROSSI-FOREL INTENSITY SCALE (1883)	MODIFIED-MERCALLI INTENSITY SCALE (1938, WOOD AND NEUMANN I	GROUND ACCELERATION a
COL.1	COL.2	COL.3
	I Detected only by sensitive instruments.	$\frac{\text{cm}}{\text{sec}^2}$ $\frac{a}{g}$
II The shock felt only by experienced observer under very favorable conditions.	II Felt by a few persons at rest, especially on upper floors; delicate suspended objects may swing.	2
III Felt by a few people at rest; recorded by several seismographs.	III Felt noticeably indoors, but not always recognized as a quake; standing autos rock slightly; vibration like passing truck.	3 4 5 .005g 6 7 8 9 10 .01g
IV Felt by several people at rest; strong enough for the duration or direction to be appreciable.	IV Felt indoors by many, outdoors by a few; at night some awoken; dishes, windows, doors disturbed; motor cars rock noticeably.	
V Felt by several people in motion; disturbance of movable objects, cracking of floors.	V Felt by most people; some breakage of dishes, windows, and plaster; disturbance of tall objects.	20 30
VI Felt generally by everyone; disturbances of furniture, ringing of some bells.	VI Felt by all; many frightened and run outdoors; falling plaster and chimneys; damage small.	40 50 60 70 80 90 100 .05g
VII Overthrow of movable objects, fall of plaster, ringing of bells, panic with great damage to buildings.	VII Everybody runs outdoors; damage to buildings varies, depending on quality of construction; noticed by drivers of autos.	200
VIII Fall of chimneys; cracks in walls of buildings.	VIII Panel walls thrown out of frames; fall of walls, monuments, chimneys; sand and mud ejected; drivers of autos disturbed.	300 400 500 .25g 600 700 800 900 1000 1g
IX Partial or total destruction of some buildings.	IX Buildings shifted off foundations, cracked, thrown out of plumb; ground cracked; underground pipes broken.	2000
X Great disasters, ruins; disturbance of strata, fissures, rockfalls, landslides, etc.	X Most masonry and frame structures destroyed; ground cracked; rails bent; landslides.	3000 4000 5000 .5g 6000
	XI New structures remain standing; bridges destroyed; fissures in ground; pipes broken; landslides; rails bent.	
	XII Damage total; waves seen on ground surface; lines of sight and level distorted; objects thrown up into air.	

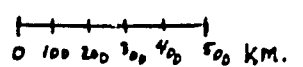




June 28, 1981

M_w = 8.3

Hypothetical Mercalli Intensities

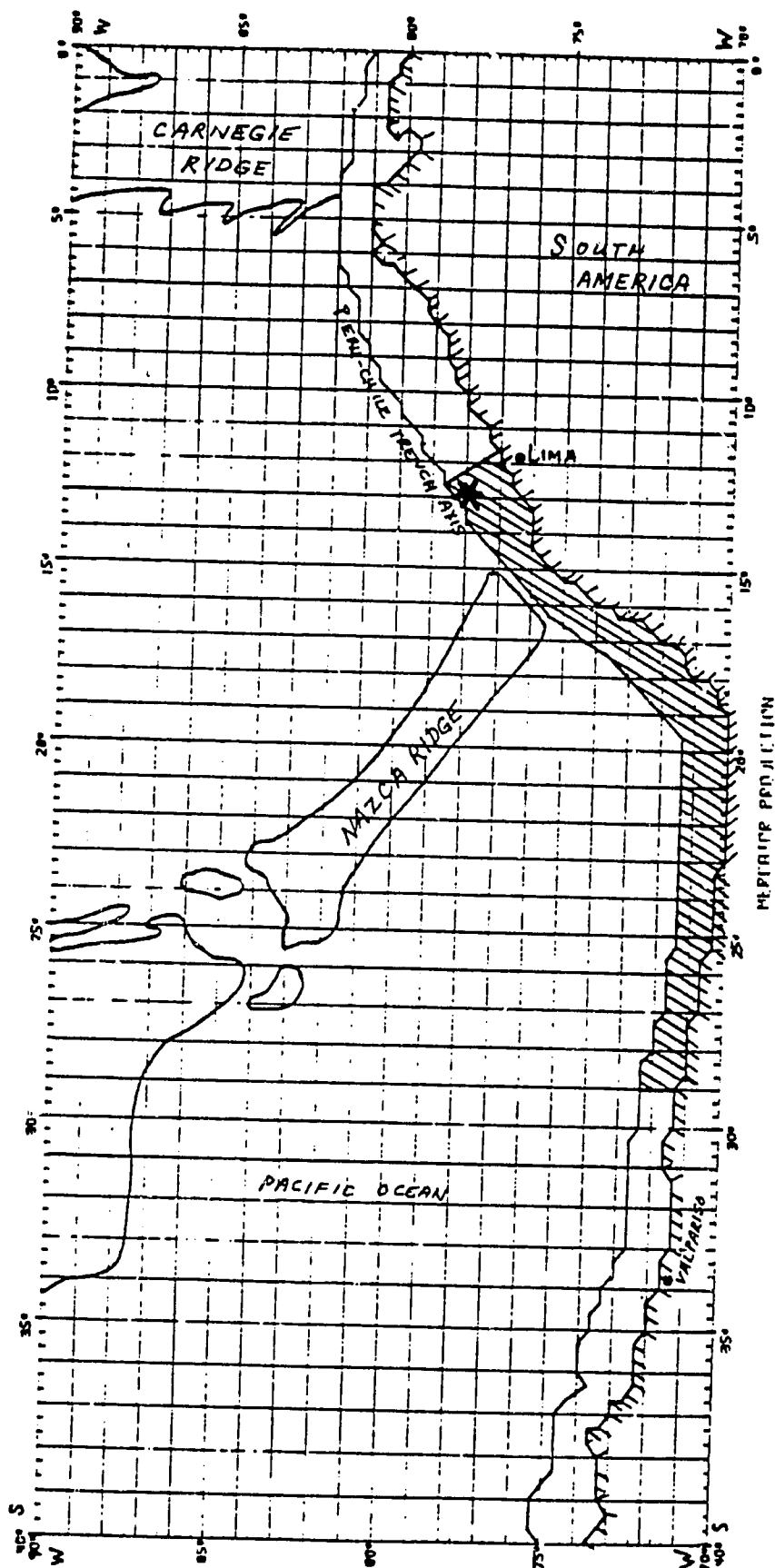




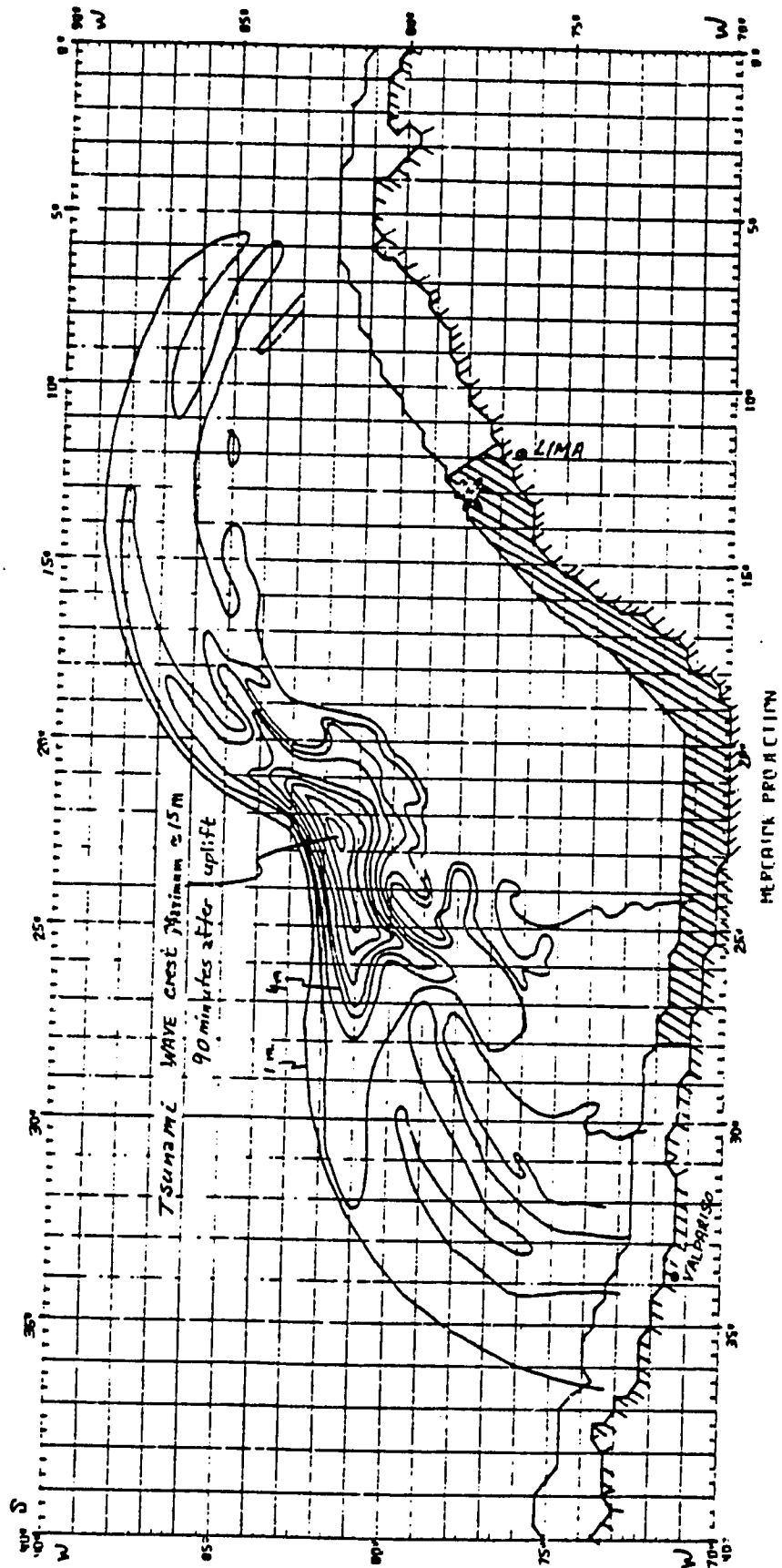
Hypothetical Threat from Tsunamis to Western Pacific Margins

PARAMETERS FOR HYPOTHETICAL CATASTROPHIC EARTHQUAKE

Source Location:	13°S and 78°W, 65km SW of Lima, Peru
Fault Zone Length:	2000 km (along trench, NW to SE from 12°S to 27°S)
Fault Zone Width:	150 km (SW to NE, perpendicular to trench)
Magnitude (Kanamouri Scale):	M _w = 9.2
Mean Vertical Bottom Displacement:	14 meters
Area of Displacement (ocean bottom):	300,000 km ²
Rate of Propagation:	4 km/sec. or 575 sec. (total uplift)
Tsunami Effects:	Japan coast 7 meter wave height Australia coast 6 meter wave " Indonesia coast 7 meter wave " Hawaii 25 meter wave " Peruvian coast 10 meter wave " California coast 4 meter wave "
Source Depth:	20 km
Fault Type:	Reverse thrust
Date:	August 10, 1981
Felt Area:	2,400,000 km ² (coastal South America)
Felt distance:	2,500 km North of Lima, Peru 1,000 km South of Valpariso, Chile
Mercalli Intensity (MM):	XII in the fault zone
Energy Release:	2.0 x 10 ²⁷
Ground Acceleration:	7000 cm/sec
No. Killed in source zone:	~ 800,000 initial count (conservative estimate)
No. Seriously injured in source zone:	1.8 million
No. Victims (homeless)	4 million (initial estimate)



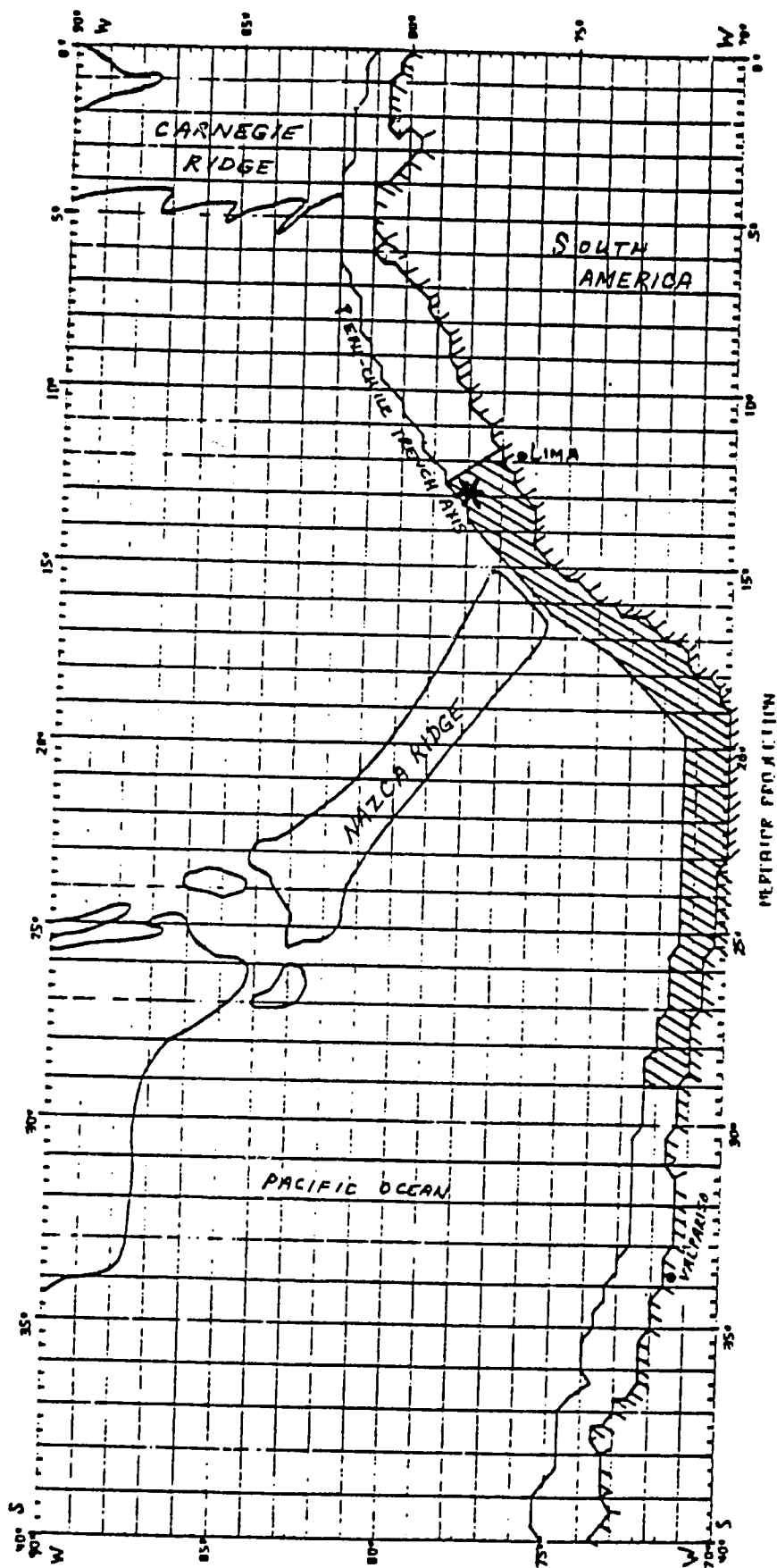
Hpyothetical Epicentral Location and Rupture Zone Displacement



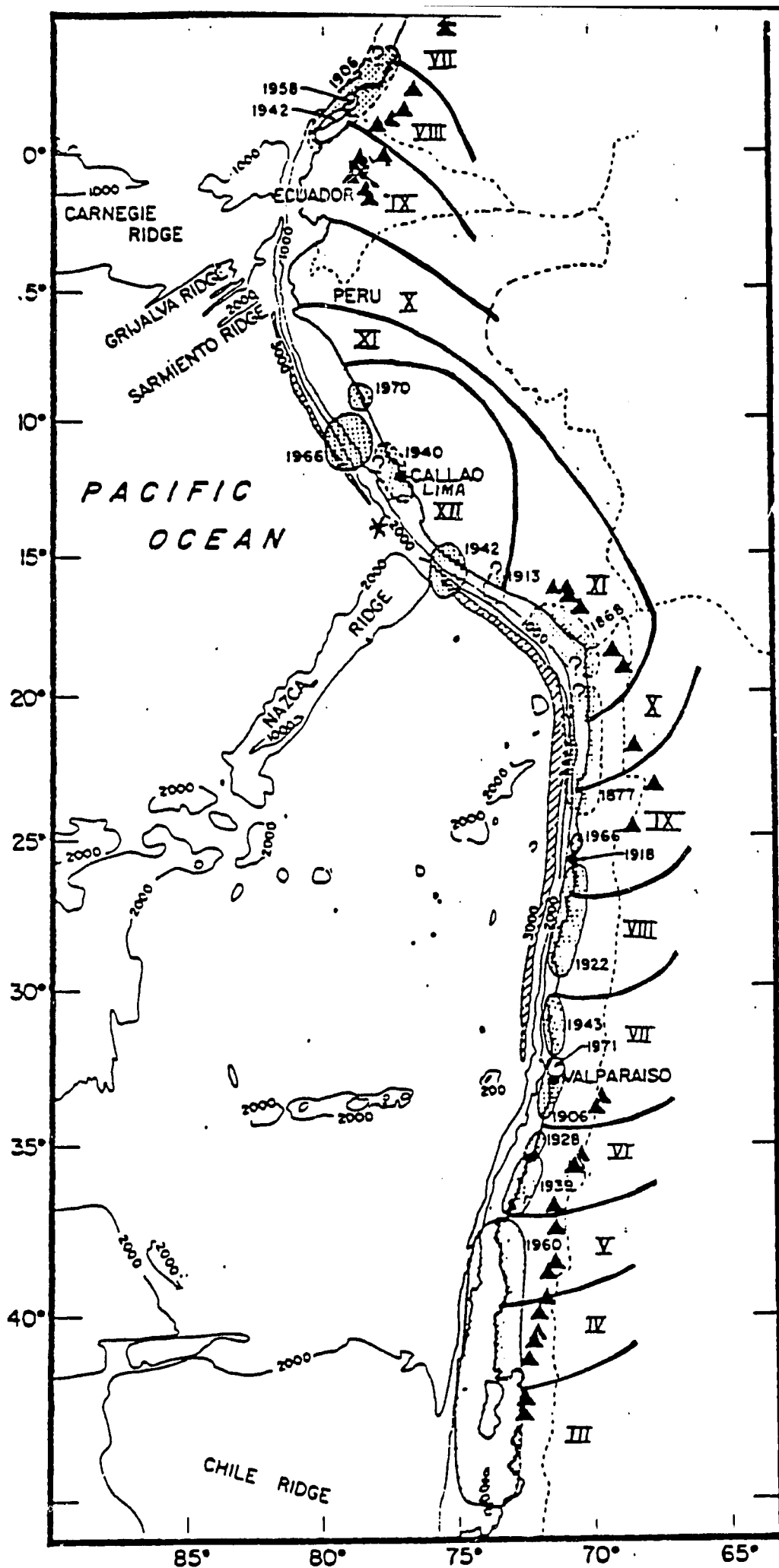
Hypothetical Tsunami Wave Height (90 Minutes after rupture)

PARAMETERS FOR HYPOTHETICAL CATASTROPHIC EARTHQUAKE

Source Location:	13°S and 78°W, 65km SW of Lima, Peru												
Fault Zone Length:	2000 km (along trench, NW to SE from 12°S to 28°S)												
Fault Zone Width:	180 km (SW to NE, perpendicular to trench)												
Magnitude (Kanamouri Scale):	M _w = 9.9 +												
Mean Vertical Bottom Displacement:	16 meters												
Area of Displacement (ocean bottom):	350,000 km ²												
Rate of Propagation:	4 km/sec. 575 sec. (total uplift)												
Tsunami Effects:	<table border="0"> <tbody> <tr> <td>Japan coast</td> <td>10 meter wave height</td> </tr> <tr> <td>Australia coast</td> <td>11 meter wave "</td> </tr> <tr> <td>Indonesia coast</td> <td>8 meter wave "</td> </tr> <tr> <td>Hawaii</td> <td>26 meter wave "</td> </tr> <tr> <td>Peruvian coast</td> <td>12 meter wave "</td> </tr> <tr> <td>California coast</td> <td>6 meter wave "</td> </tr> </tbody> </table>	Japan coast	10 meter wave height	Australia coast	11 meter wave "	Indonesia coast	8 meter wave "	Hawaii	26 meter wave "	Peruvian coast	12 meter wave "	California coast	6 meter wave "
Japan coast	10 meter wave height												
Australia coast	11 meter wave "												
Indonesia coast	8 meter wave "												
Hawaii	26 meter wave "												
Peruvian coast	12 meter wave "												
California coast	6 meter wave "												
Source Depth:	23 km												
Fault Type:	Reverse thrust												
Date:	September 15, 1981												
Felt Area:	3,000,000 km ² (coastal South America,												
Felt distance:	2800 km North of Lima, Peru 1400 km South of Valpariso, Chile												
Mercalli Intensity (MM):	XII in the fault zone												
Energy Release:	7.0 x 10 ³⁰												
Ground Acceleration:	7000 cm/sec												
No. Killed in source zone:	~ 1.5 mil. initial count (conservative estim.												
No. Seriously injured in source zone:	4.5 million												
No. Victims (homeless)	7 million (initial estimate)												



Hypoetical Epicentral Location and Rupture Zone Displacement

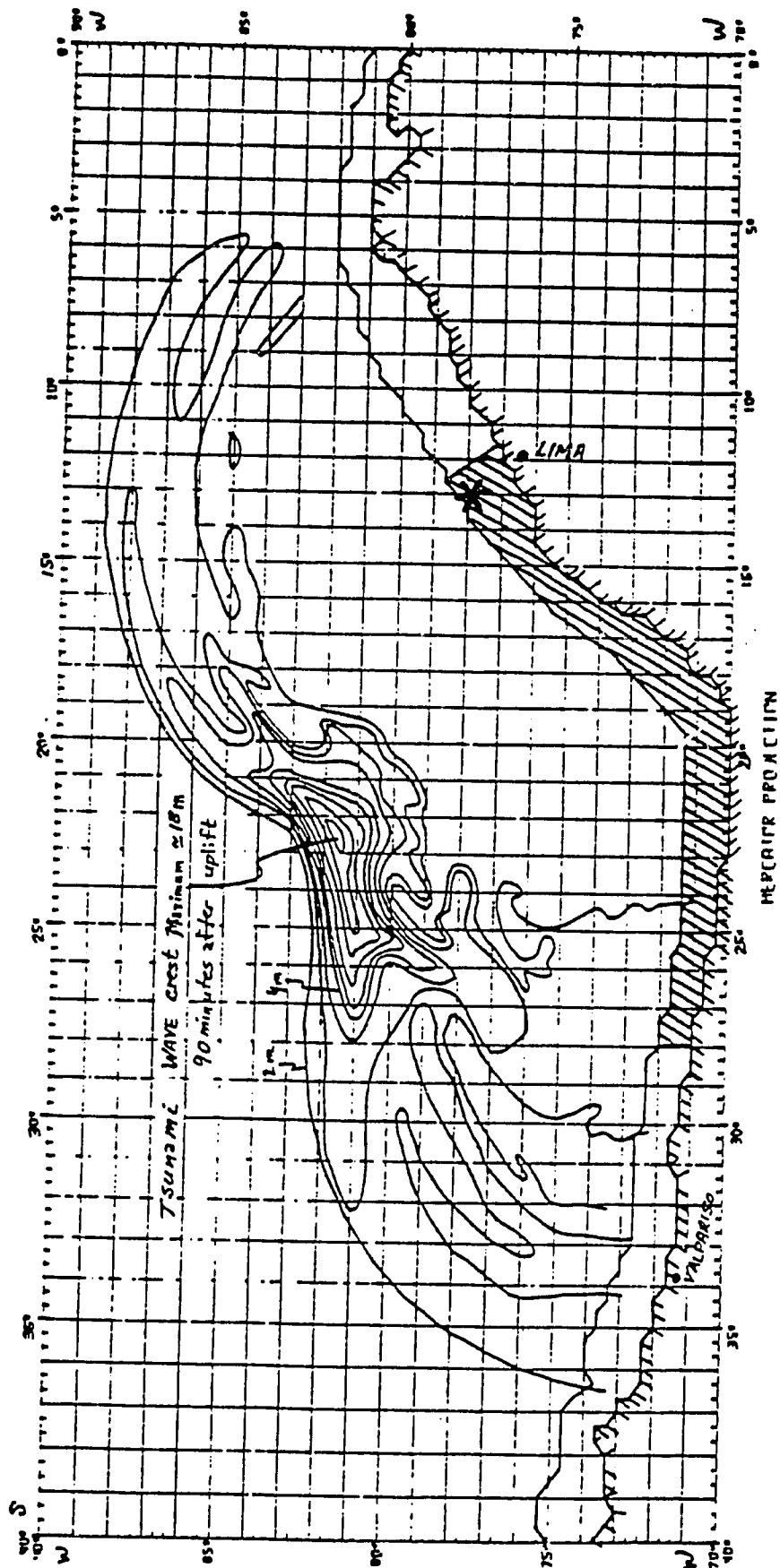


September 15, 198

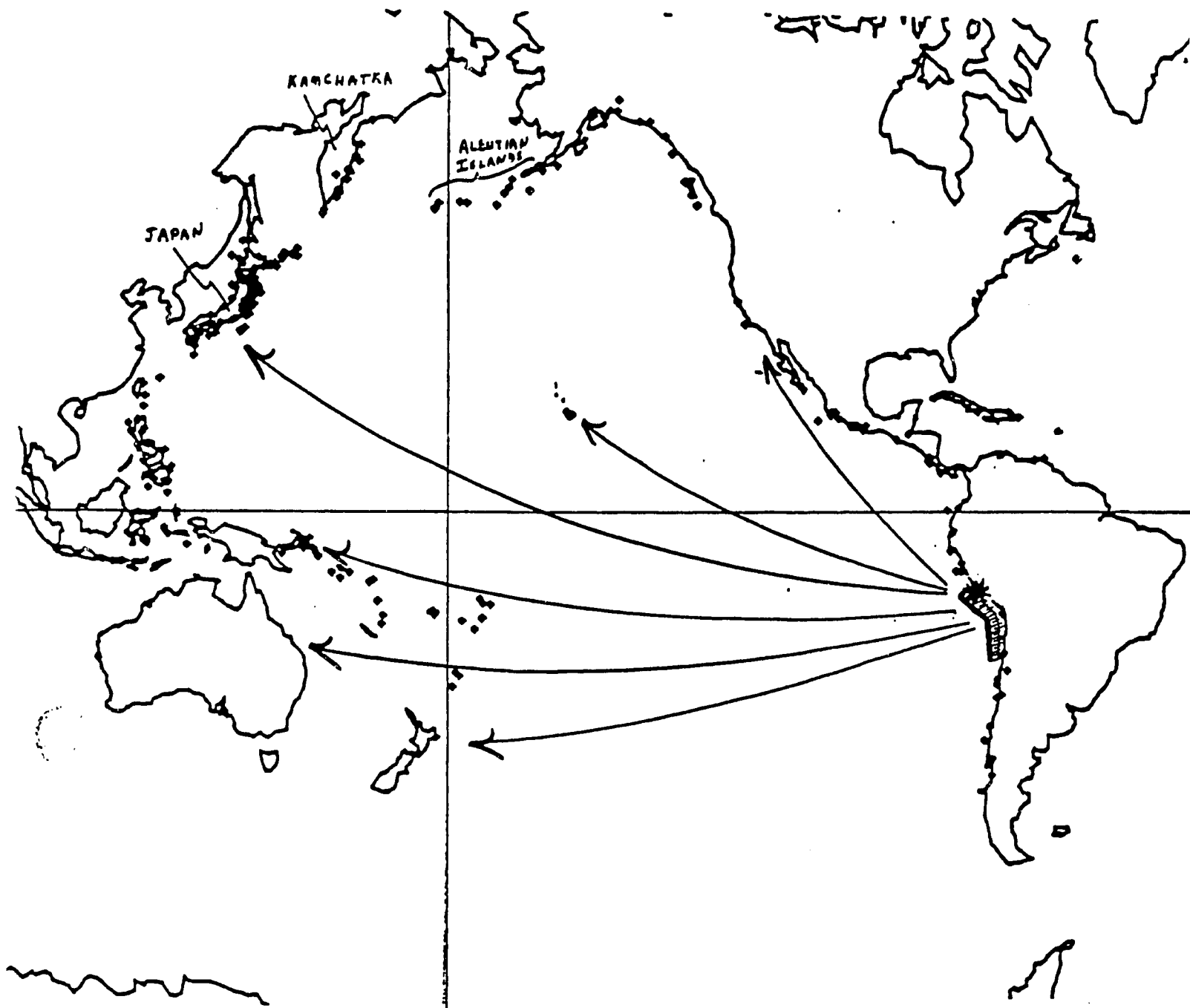
$M_w = 9.9 +$

Hypothetical Mercalli Intensities

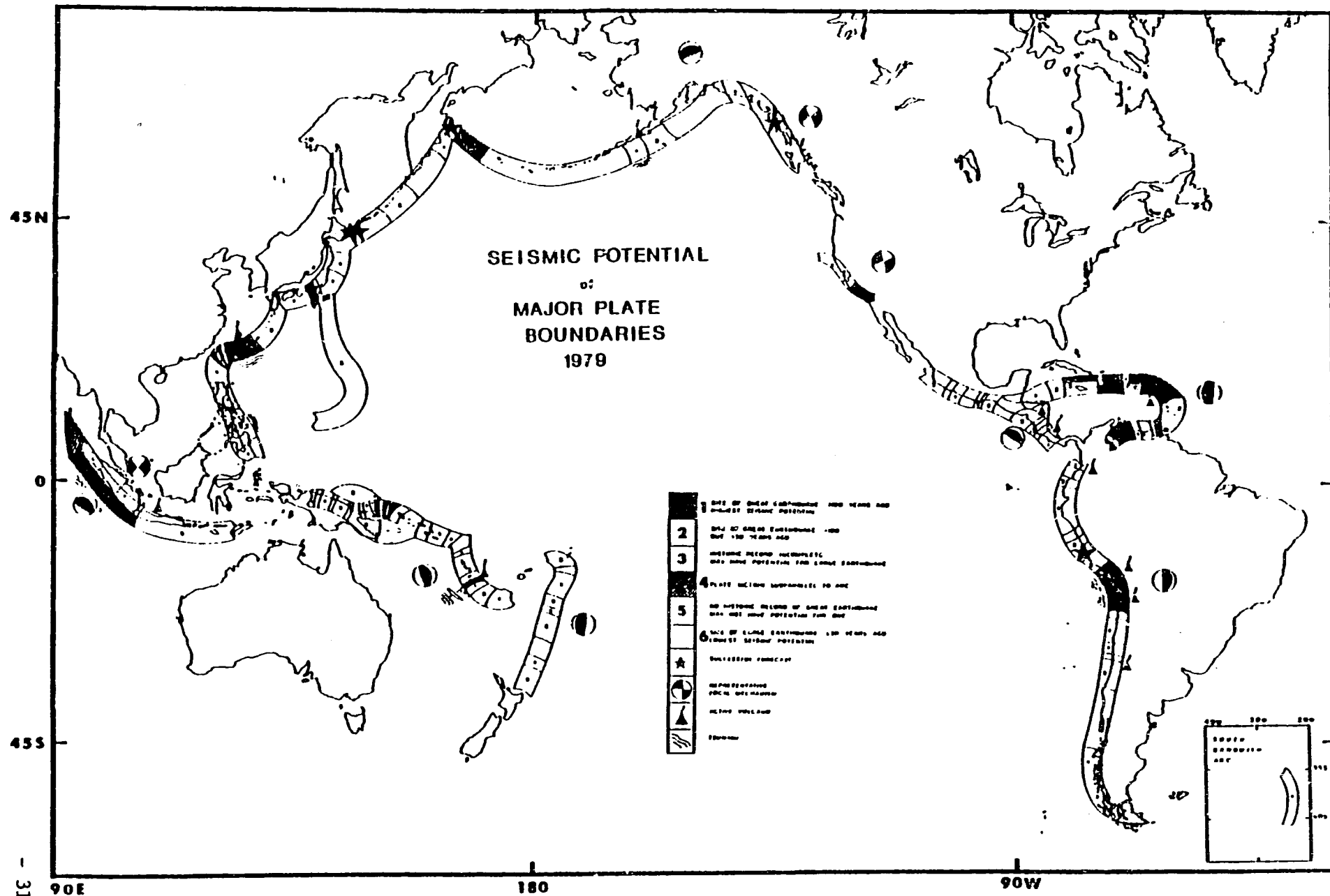
0 100 200 300 400 500 km.



Hypothetical Tsunami Wave Height (90 Minutes after rupture)



Hypothetical Threat from Tsunamis to Western Pacific Margins



Edwin H. Spirgi

Disaster Management

Comprehensive Guidelines for Disaster Relief



The great earthquakes in Latin America (Peru, Nicaragua, and Guatemala) caused between 20,000 and 140,000 casualties. One generally expects three injured for each death. The emergency need for blood, plasma, and surgical equipment was extremely small despite the large number of injured. Surgeons, blood, and mobile hospitals have become a myth in the «disaster trade». The same rush of mobile hospitals of all kinds, tons of sorted emergency drugs and more tons of unsorted useless drugs, teams of specialized surgeons, and above all «blood, blood and again blood by the hectolitre» (M. F. LECHAT) characterized the disorganized foreign aid during the tragic avalanche in Huascarán, Peru, in 1970, which killed 70,000 and caused 4,600 casualties (ratio of 1 injured to 15.2 killed).

	Morbidity	Mortality	Morbidity/ mortality ratio
Peru (31 May 1970)	143 331	66 974	2.2
Nicaragua (23 December 1972)	20 000	6 000	3.3
Pakistan (28 Decembre 1974)	15 000	4 700	3.2
Guatemala (4 February 1976)	76 504	22 778	3.4

Fig. 10 Morbidity/mortality observed after four major earthquakes.


(Courtesy of de VILLE DE GOYET et al., reprinted from «Bull. Pan. Am. Health Org.», 1976, X, 95).

UNITED STATES INTERNATIONAL DEVELOPMENT COOPERATION AGENCY
AGENCY FOR INTERNATIONAL DEVELOPMENT
WASHINGTON, D.C. 20523

MEMORANDUM

March 24, 1981

TO: PDC/OFDA, Alan Van Egmond, Assistant Director
for Preparedness and Planning

FROM: PDC/OFDA, Paul Krumpé, Science Advisor 

SUBJECT: Carnegie Institution Proposal on Behalf of the Geophysics
Institute of Peru to upgrade the National Seismic Network
for Disaster Early Warning and Seismicity Analysis

The Geophysics Institute of Peru (IGP) and the Carnegie Institution as technical liaison for the IGP have submitted a preliminary proposal to AID's Office of U.S. Foreign Disaster Assistance requesting FY 81, \$413,000 and FY 82, \$343,000 to upgrade and modernize Peru's earthquake monitoring network. This national network is composed of local networks in Talara-Piura region of north coastal Peru, the Lima-Ica, a region of central coastal Peru and the Cuzco-Machupiccho region of the Peruvian altiplano. A significant problem exists with the national and regional networks which centers on the inadequacies inherent in a fragmented, varied and non-interactive system as currently operating. The national system and its regional components lack the capability to simultaneously monitor earthquake events and accurately locate them, determine depths and magnitudes and provide for adequate understanding and analysis of event sequences and developing patterns of seismicity. Peru's historical incidence of destructive seismicity clearly indicates a high vulnerability to potential disaster. This potential danger is recognized by the USGS Office of Earthquake Studies, NASA's Crustal Dynamics Program, National Science Foundation, and many experts in seismology, geophysics, seismic risk analysis and disaster mitigation research. AID has recently funded a USGS directed program with the Centro Regional de Seismologia para America del Sur (CERESIS) for Earthquake Disaster Mitigation in the Andean Region. This program concentrates on compiling historical seismicity in the Andean countries and developing risk maps suitable for future site and disaster planning. A cornerstone of this \$500,000 program is the analysis of seismicity patterns along coastal South America to determine levels of vulnerability to population and industrial centers. A principal component of risk-assessment is reliable earthquake data collection. IGP's ability to provide quality data in such an endeavor in the future can be significantly improved by upgrading the national network and providing for real-time integrated analysis.

Although the equipment and technical assistance requested by the IGP can be used ultimately for linking the entire national network, the IGP's immediate concern lies with real-time data collection and analysis within the central region. The current system lacks the flexibility and proper geometric configuration to accurately locate events without a time delay of sometimes up to several months. Lack of radio telemetry to transmit seismic data from remote, unmanned locations limits the IGP's ability to optimally deploy instruments in the central region. A long lead-time exists currently in acquiring data, transferring it to IGP facilities in Lima, analyzing it and understanding what it means with respect to potentially developing patterns which may clearly indicate earthquake danger and upon which early warning and/or prediction could be based. The IGP currently can't get good locations, magnitudes, and depths of smaller earthquakes because their network lacks the sensitivity and

analytical capability to integrate the data once it is assembled in Lima. The IGP network lacks the proper geometry to adequately determine seismic events in a meaningful timeframe. The IGP lacks the ability to maintain remote jungle stations and provide for realistic transfer of daily weekly or even monthly data to Lima for analysis. The IGP central region network currently lacks the proper geometric design and IGP has little or no flexibility in modifying their network's configuration. No ability to collect, synthesize, reduce, integrate, analyze and/or assess national seismic data in real-time exists within the IGP National network. The current system is not very cost effective, lacks analytical flexibility, is not able to provide meaningful analysis in a short time-frame, and is relatively old-fashioned with respect to currently available seismic analysis systems.

The USGS, IGP and Carnegie Institution agree that the portion of Peru's National Seismic Network in most urgent need of upgrading lies in the central region. Data collected from this improved network would be analyzed at IGP in Lima. In addition to seismic and telemetry equipment required in remote field locations, a central processing analysis and recording facility is needed. Unmanned radio-linked seismic data collection units in the field would enable maximum flexibility and geometric configuration in network design. With this equipment, good earthquake locations, depths, and magnitudes could be determined from real-time transmitted data and correlation analysis. Radio telemetry would enable data collection, synthesis, reduction, and analysis in a short timeframe suitable to determining seismic patterns and migration of events, possible prediction of larger events given low-magnitude earthquake swarms or seismic anomalies, and would enable seismologists to determine if a given event was a tsunamigenic earthquake and therefore potentially hazardous. Reduced lead-time in data collection and analysis would significantly alleviate the problems IGP currently has with respect to understanding seismicity (or the lack of it) in the central region. An upgraded radio-transmitted field recording system would 1) minimize maintenance, 2) reduce technical personnel needs, 3) provide continuous monitoring capability 4) reduce delay in data analysis, 5) provide for optimal network design, and 6) enable flexibility in data collection. In short, the IGP would be able to determine immediately what is occurring, when and where events are occurring, and be able to understand the focal mechanisms or how the events occur. In order to analyze the data to understand why and how events occur in relation to each other throughout the region and along the coast, integration of the upgraded central regional network with the other IGP regional networks is necessary. This can be done in real-time only if radio telemetry and a central processing computer system and related software are dedicated to seismic data collection, research and analysis.

The proposal recently submitted to AID is a synthesis of priorities, needs, practical applications, and system components proposed by IGP, USGS, and other experts. The radio telemetry equipment for single-component seismic stations, (15 proposed) is readily available from Teledyne-Geotech. No alternatives to this equipment exist which would enable the desired results to be achieved cost effectively. Telemetry must be purchased and installed in the field. No leasing or rental of this equipment is available. The proposed Kinometrics AutoSeis real-time seismic analysis system, a central computer processing facility electronically engineered and dedicated to continuous monitoring and analysis of digital seismicity data telemetered from the field,

is the only system available to accomplish the necessary data analysis function in real-time. This system approach requires constant, dedicated operation, analyzing enormous amounts of precision digital data, and has interactive computer peripherals such as automatic plotters and graphics screen (CRT display). Associated computer software is specifically designed for use with this system and is not available elsewhere. The AutoSeis seismic analysis system is specifically designed to solve the seismicity data analysis problem currently experienced by the IGP. The system is not available for rental or lease. The AutoSeis is not simply a computational computer, such as is currently available to IGP on a time sharing basis (I.B.M.), rather the AutoSeis is a dedicated system for continuous acquisition, automatic detection, reduction and analysis of seismic data from many remote sources or regional networks. Telemetry or telephone links can feed data into the system where the seismologist can interact with the computer in real-time in order to fully analyze and understand the significance of event sequences, either foreshocks or aftershocks of main events. The system is fully capable of monitoring and integrating data from micro-seismic (low-magnitude) events and determining focal mechanisms of events automatically without time delay. No cost-effective alternative exists to the AutoSeis system which would enable IGP seismologists to monitor seismicity in their region in real-time. No viable alternative exists which would enhance IGP's ability to analyze and perhaps predict future earthquake events other than the proposed system.

The IGP and Carnegie Institution proposal to AID is the most appropriate solution to a problem experienced by many earthquake-prone countries. Earthquake disaster early warning is a real possibility in Peru with the AutoSeis system. Given such an interactive system Peruvian seismologists and Civil Defense experts can effectively implement an early warning program and save thousands of lives. Such a system is currently operational in California. This system could be operational in Peru within 4-5 months. There are no known technical delays to full implementation. This proposal is cost-effective indeed, given the magnitude of possible disaster now threatening Peru.

MAR 25 1981

INFORMATION MEMORANDUM FOR THE ADMINISTRATOR

THRU : ES

FROM : AA/PDC, Gordon K. Pierson (Acting)

SUBJECT: Peru Earthquake Prediction

After reading our recent status report on the Peruvian earthquake prediction, you asked the nature of preparations underway by the Agency for International Development (AID) and the Peruvian Government in the event there is an earthquake in June.

As described below, the Agency, the Government of Peru (GOP), and international organizations have taken a number of steps in preparation for a possible earthquake in Peru. These measures are not being pursued in the context of the Brady prediction, given the recent determination of the National Earthquake Prediction Evaluation Council, but rather in the knowledge that Peru "has experienced many strong earthquakes and others must be expected in the future both there and elsewhere along the coastal regions."

There is general agreement that adequate planning for an earthquake of the magnitude of the Brady prediction probably is impossible. As the President's Special Coordinator for International Disaster Assistance, you should be aware, however, that there are varying views in the Office of U.S. Foreign Disaster Assistance (OFDA), the Latin American Bureau (LAC), the Department of State, and the US Geological Survey (USGS) on the nature and extent of the preparedness warranted in this instance. For example, OFDA would like the USGS to quietly monitor for the precursor events which Brady says must occur in coming weeks if his model is valid, even though the USGS believes there is no scientific basis for doing so. I suggest you meet with Ed Coy (LAC) and us to discuss these views.

I. AID Activities:

The Agency's development priorities have not been focused extensively on Peru's earthquake monitoring and warning capability. Aside from several projects in earthquake resistant low cost housing techniques which the Agency

page 2

has supported, most disaster preparedness activity regarding Peru has been initiated in the past with International Disaster Assistance Account funding. Three senior Peruvian Civil Defense officials participated in an earthquake simulation exercise in California and visited U.S. seismic installations. Contract negotiations are underway for a preparedness expert to work with the GOP to identify small projects to protect the population. OFDA proposed, in collaboration with the Pan American Health Organization (PAHO), to work with the GOP to reinforce wells which could be used as an emergency water supply in the event that the single water system is damaged. At GOP request, OFDA is sending a public information and education specialist to Peru to assist the GOP to incorporate disaster preparedness instructions into education and public information programs.

Further OFDA preparedness efforts include developing an assessment of seismic sea wave threat throughout the Pacific Basin and coastal South America resulting from possible great earthquakes near coastal central Peru; revising and updating the mission disaster relief plan and expanding the Peru country profile.

The Office of U.S. Foreign Disaster Assistance is also engaged in dialogue with the Carnegie Institution. It has designed a system which would be used to upgrade Peru's National Institute of Geophysics (IGP) earthquake monitoring and early warning capabilities, although no Agency or other commitment has yet been made. Procurement and installation of the equipment needed would require lead time of about eight months. Peru's National Institute of Geophysics' request and a possible Agency response are not currently linked to the Brady prediction timeframe.

It should be recognized that the earthquakes predicted by Brady could require USG relief responses of a magnitude and complexity beyond that for which AID/OFDA is normally prepared. The Office of U.S. Foreign Disaster Assistance has recently begun an internal contingency planning effort, as a training exercise directed at responses to earthquakes in Andean South America based on a Brady-type hypothetical scenario. First steps have been taken to determine areas likely to be hardest hit by a quake and seismic sea waves as the basis for estimating destruction to communications and transportation infrastructure, and for assessing probable damage to basic resources such as shelter, medical facilities, water, food, electricity and fuels. Judgments can then be made regarding possible assistance needs and delivery options, budgetary and temporary staffing requirements, and the involvement in a relief effort of other U.S. Government agencies and private voluntary organizations. The Office of U.S. Foreign

page 3

Disaster Assistance believes that this exercise will result in an improved U.S. readiness to respond to massive disaster such as is predicted, but that the state of readiness could be further enhanced if OFDA could selectively draw on the expertise of non-OFDA AID experts and other agencies, such as the Department of Defense (DOD).

II. Activities of Peru:

Although the Brady prediction has been public knowledge in Peru for the past five years, public awareness has escalated sharply in the past 12 months. The GOP has long considered high earthquake vulnerability to be a very serious problem but is reluctant or unable to assign to it a high priority in a fiscal or developmental context. Peru recognizes that it is not well prepared for disasters, but fears that a highly visible preparedness effort would raise the anxiety level of an already-tense population. Peru's National Institute of Geophysics, although competently staffed, is beset with budgetary and bureaucratic problems.

The GOP is, however, revising disaster response plans for Lima and other major cities, identifying national resources which could be mobilized following a disaster, collaborating with university scientists to study vulnerability of population centers, and requesting international expertise to assist it in preparing for a continuing disaster threat. These efforts are commendable and may eventually result in a greatly improved earthquake preparedness system, but are unlikely to provide an adequate response if Brady's prediction is proved to be correct.

An international team (the Office of the United Nations Disaster Relief Coordinator, PAHO and League of Red Cross Societies) coordinated by an AID/OFDA officer, visited Peru in January to consult with GOP agencies charged with disaster preparedness and with the Peruvian Red Cross and voluntary agencies to determine what immediate actions could be taken to minimize loss of life and property in the event of a disaster, although not in the context of Brady's prediction.

Drafted:AA/PDC:GKPierson/OFDA:GMcCloskey:vso:tlb:3/24/81:
Ext. 23478

cc: ed cny

March 25, 1981

X

MEMORANDUM

TO: PDC/OFDA, Alan Van Egmond, Assistant Director for Disaster Preparedness and Planning

FROM: PDC/OFDA, Paul F. ^{P.F.K.}Krumpe, Science Advisor

SUBJECT: General Status of Earthquake Detection and Analysis in Peru

Development of plate-tectonics theory in the last two decades has given earth scientists in Peru an advanced understanding of the major source of earthquakes in the Andean Region. Many of these geophysicists have received advanced degrees from U.S. educational institutions. Clearly, Peruvian scientists' complete understanding and, ultimately, the ability to predict earthquakes, depend on obtaining a more detailed picture of the crustal plate tectonics of South America and Central Peru, than is available now. The present system of seismic observing stations in Peru is not adequate for that task.

Of the many seismic recording stations in the country, virtually none are fully equipped with up-to-date instruments and radio telemetry. In fact, Peru's system of earthquake monitoring stations is an incomplete patchwork of varied network quality; many stations are equipped with old-fashioned instruments capable of only limited measurements. No Peruvian stations are capable of making the complex measurements required by modern seismic theory nor record them in the digital form needed for advanced instantaneous integrated computer analysis.

A comprehensive national, as well as regionally linked modern earthquake-monitoring system is needed. With such a system, every Peruvian and regional tremor big enough to be felt by human beings would be recorded simultaneously by at least five well-equipped stations, the minimum number necessary to determine immediately the location, strength, and other important characteristics of the quake and its foreshocks and aftershocks. To maintain coverage of the continental shelf along the Peruvian coastline and to provide information on tsunami generation, additional remote stations on the ocean bottom are needed.

An advanced system such as Kinematics Auto Seis would provide detailed digital data for Peru in a standard format for instant analysis for at least the next decade. Currently, different stations use different instruments and equipment, making integration and comparison of data difficult. Some stations are not fully operational or not in-service because of lack of funding. Peruvian seismologists and geophysicists, as well as Civil Defense officials, lack the continuous, detailed record of earth movements necessary to detect, and perhaps to predict, low magnitude precursory events and seismic patterns.

To discern the location of the disturbance, its strength and the characteristics of the crust that gives way in an earthquake, Peruvian seismologists will need considerable quantities of data on the waves generated by earth movements. By analyzing the jagged peaks and valleys of wave graphs (seismographs) and by being able to use this information in digital form, the Peruvian scientists can get stronger clues to the nature of the rock through which the waves move and accelerate. Through such study, Peruvian seismologists would be able to get a better picture of the structure of the subduction zone and plate tectonics in central Peru and to warn of danger in their threatened region.

Even in today's rudimentary state of earthquake prediction, seismographic information is in great demand worldwide. Seismic reports from the IGP will receive great scientific and public attention, especially in areas of obvious concern -- Lima, Arica, Valpariso, Quito, etc. -- but the menace of earthquakes along the coast of central Peru is far-reaching throughout the Pacific Basin as the threat of seismic seawaves, tsunamis, is ever present. Most of the population and economic viability of the Andean region resides in coastal areas vulnerable to earth movements strong enough to seriously threaten life and property.

Planners and builders will be able to check seismic records and risk maps for a site before building critical structures (such as hospitals, liquid natural gas storage facilities, dams, nuclear reactors, pipelines, etc.) to check for earthquake threats and to assess environmental impact. Smaller localized networks of seismometers will be able to measure earth movements around existing structures such as large dams, nuclear reactors and geomorphologically unstable zones.

The coastline too demands attention. Hundreds of thousands of people in Peru, Chile, Ecuador, and other regions of the Pacific Basin face the possibility of tsunamis, the great waves generated by underwater earth movements, occasional volcanoes, and continental shelf landslides. Scientists recognize that major problems exist in identifying which earthquakes may cause tsunami and, if a tsunami has been generated, in predicting the potential wave height at distant and near shores. Confirmation that a tsunami has been generated must wait until an actual water wave has been observed which may delay the issuance of a warning by several critical hours (as these waves travel at up to 600 m.p.h.). Peruvian and U.S. scientists hope that acquisition of high quality, real-time, digital seismic data specifying accurate location, depth, and magnitude will allow them to tell soon after a tremor whether earth movement was great enough to generate a tsunami. This would permit faster warnings and perhaps reduce unnecessary precautionary measures such as moving ships out of harbor at distant vulnerable locations.

Clearly, the underlying concern among Peruvian seismologists today is their desire to see data from their network not just being collected but, rather, used as widely as possible in the early warning and mitigation of disaster throughout the Pacific region. An upgraded, state-of-the-art Peruvian seismic monitoring system would be not only a better disaster early warning tool, but also a wise investment in future scientific discoveries. In the 1960s worldwide recording at stations equipped with improved instruments resulted in profound contributions to the concept of plate tectonics and the science and art of earthquake prediction.

Future improvements in Peruvian seismic observation can be expected to provide new and important initiatives in earthquake hazards mitigation, seismic source mechanisms, continental plate structure analysis, earthquake prediction and early warning, the distribution of strategic minerals resources, and related energy matters such as the location and mapping of oil reserves and geothermal resources. These studies are of economic concern and link to U.S. interests, to humanitarian and moral imperatives in the protection of life, and to military and strategic planning and political stability throughout the regions affected.

UNITED STATES GOVERNMENT

memorandum

DATE:

March 27, 1981

TO:
OF:

PDC/OFDA, Paul F. Krumpe, Science Advisor

SUBJECT:

U.S. Geological Survey Concurrence on OFDA Funding of Carnegie Institution/
I.G.P. proposal

TO:

PDC/OFDA, Alan Van Egmond, Assistant Director for Disaster Preparedness

Conversations this week with Dr. Roger Stewart, Deputy for Research, Office of Earthquake Studies of the U.S. Geological Survey confirm U.S.G.S. concurrence concerning A.I.D.'s commitment to funding the Carnegie Institution of Washington (C.I.W.) and Geophysics Institute of Peru (I.G.P.) proposal to upgrade Peru's seismic network instrumentation and analysis capability. Dr. Stewart has reviewed the Carnegie/I.G.P. proposal as well as recommendations made by Dr. Jerry Eaton (U.S.G.S.) and agrees that the C.I.W. technical approach, justification, and equipment recommendations are practical, appropriate, technically feasible and needed at this time.

As you know, implementation of this proposal supports the U.S. Embassy's request of November 1980. This program will significantly advance the Peruvian capability to monitor and analyze earthquake activity in real-time, develop regional hazards maps, conduct risk assessments, provide Tsunami early warning, possibly forecast earthquake occurrence and assist Civil Defense in earthquake disaster preparedness, early warning, and mitigation.



Buy U.S. Savings Bonds Regularly on the Payroll Savings Plan

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OPTIONAL FORM NO. 10
(REV. 7-76)
GSA FPMR (41 CFR) 101-11.6
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ACTION AID-35

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3 April 1981

AIDAC

EO 12065: N/A
 SUBJ: DISASTER PREPAREDNESS SPECIALIST

REF: STATE 078054

1. AS A FOLLOW UP TO THE AGREEMENTS REACHED DURING THE INTERNATIONAL PREPAREDNESS TEAM VISIT, THE GOVERNMENT OF PERU THROUGH THE NATIONAL CIVIL DEFENSE COMMITTEE HAS REQUESTED AID'S ASSISTANCE FOR OBTAINING THE SERVICES OF A PREPAREDNESS SPECIALIST, WHO WOULD PROVIDE ASSISTANCE TO THE COMMITTEE AND TO THE VARIOUS LOCAL PREPAREDNESS GROUPS.

2. THE SPECIALIST WOULD ASSIST ON THE FOLLOWING TASKS:
 A. REVIEW OF CURRENT PREPAREDNESS PLANS TO MAKE THEM COMPATIBLE WITH AVAILABLE RESOURCES.
 B. DEVELOPMENT OF OPERATION PROCEDURES FOR EMERGENCY CENTER.
 C. PREPARATION OF RESOURCES INVENTORIES.
 D. DEVELOPMENT OF COORDINATED OPERATION PROCEDURES WITH VOLAGS AND OTHER LOCAL AND INTERNATIONAL AGENCIES.
 E. IDENTIFICATION OF PRIORITY NEEDS FOR PUBLIC INFORMATION PROGRAM.
 F. DEVELOPMENT OF PLANS FOR SIMULATION EXERCISES.
 G. DEVELOPMENT OF PROPOSALS FOR OTHER PREPAREDNESS PROJECTS, INCLUDING SCOPE OF SERVICES FOR OTHER SPECIALISTS.

3. MISSION CONCURS WITH THIS REQUEST FOR ASSISTANCE AND WITH THE PROPOSED SCOPE OF SERVICES AND REQUESTS OFDA TO CONTRACT THE SERVICES OF THE SPECIALIST. SINCE IT IS DIFFICULT AT THIS TIME TO DETERMINE THE DURATION OF SERVICES, WE SUGGEST AN INITIAL PERIOD OF EIGHT TO TWELVE WEEKS. THIS WOULD BE FOLLOWED BY ADDITIONAL TRIPS AS REQUIRED.
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UNITED STATES INTERNATIONAL DEVELOPMENT COOPERATION AGENCY
 AGENCY FOR INTERNATIONAL DEVELOPMENT
 WASHINGTON, D.C. 20523

MEMORANDUM

April 15, 1981

TO: PDC/OFDA, Mr. Alan VanEgmond, Assistant Director for Disaster Preparedness

FROM: PDC/OFDA, Paul F. Krumpke, Science Advisor

SUBJECT: Comparative Analysis of Brady Earthquake Prediction Statements and the Occurrence of Events

The following comparison of statements made by Dr. Brian T. Brady (USBM) since 1977 concerning the predicted catastrophic earthquakes to occur off the coast of central Peru during the summer of 1981 provides a simplified means for verification of possible future events in that region. An update of the prediction status by Brady is expected by the first week of May. He is currently analyzing data recently obtained from the Geophysics Institute of Peru (IGP) and will revise the prediction accordingly. The prediction space-time seismicity patterns are model dependent and require seismicity data input and analysis as well as interpretation by the predictor. If events prior to the predicted mainshock dates occur essentially as specified, and Brady's access to IGP synthesized data is assured, then the deterministic model will enable Brady to predict the mainshock times of occurrence accurately. If predicted events do not occur as essentially specified by Brady, and in particular, the end of June event with expected pick-up of teleseismic foreshocks, then Dr. Brady will be expected to withdraw the mainshock prediction. Below is a summary of prediction elements for your review:

1. The predicted mainshock target zone (see attached map) known as the Primary Inclusion zone (PIZ) has approached criticality (near collapse). This irreversible process may culminate in Summer 1981 (as predicted by Brady) in ocean bottom uplift and sudden collapse (displacement) as the mainshocks occur. Space-time seismicity patterns may support the above conclusions, however, by the end of June this will be either confirmed or negated.

PREDICTION STATEMENT

- The Lima Basin is imploding in a 24 Km² area known as the primary inclusion zone (PIZ) (Brady 1/27/81)
- The prediction's physical basis is linked to specific space-time seismicity patterns occurring off the coast of central Peru since 1963. These patterns consist of alternating active and quiet periods between 12°S and 13.5°S (Brady 3/7/80)

OCCURRENCE OF EVENTS

- Neither confirmed nor denied until the end of June, 1981.
- | | | |
|-------------|----------|--------------------------------|
| 8/26/66 to | 11/26/67 | Active Period |
| 5/28/71 to | 10/3/71 | PIZ Formation |
| 11/26/67 to | 9/6/73 | Quiet Period |
| 9/6/73 to | 11/18/74 | Active Period |
| | 10/3/74 | PIZ event M _s = 8.1 |
| 11/18/74 to | 9/15/80 | Quiet Period |
| 8/14/80 to | 12/27/80 | Active Foreshocks |
| 12/30/80 to | 3/4/81 | Quiet Period |
| 3/4/81 to | 6/28/81 | Active Foreshocks |
| | 6/28/81 | Expected M _w = 8.3 |
| | 8/28/81 | Expected M _w = 9.2 |
| | 9/16/81 | Expected M _w = 9.9+ |

2. The predicted foreshock phases (space-time seismicity patterns) and events to follow have commenced essentially as predicted. Without access to preseismicity data, exact prediction of foreshock events (magnitude, location, date) is severely limited and constrains exact prediction of mainshock characteristics.

PREDICTION STATEMENT

- The exact locations and magnitudes of the predicted foreshocks cannot be determined until their respective pre-seismicity data are known. These events ($M=1$ to 2) will be detectable only by the local Peru network. (Brady, 5/1/80)
- Precise predictions of the date of the mainshocks cannot be made until the dates of their respective foreshocks are known (Brady 3/7/80)
- A critical part of the prediction is a foreshock series to begin in early September 1980. (Brady 8/1/79)
- The occurrence of the foreshock phases are necessary and sufficient for the occurrence of the predicted mainshocks. (Brady 3/7/80)
- A foreshock series to begin on or before September 15, 1980.... about 13 foreshocks will occur prior to the mainshock (Brady 6/19/79)
- The foreshock series will commence in mid-September 1980 (Brady 3/7/80)
- Duration of this series will be approximately 328 days (Brady 3/7/80 and 5/1/80)

OCCURRENCE OF EVENTS

- Micro-seismic earthquake location data are not readily available from the IGP network. Some data has been obtained and is being analyzed by Brady. A revised prediction status is expected in May 1981
- IGP network data promised since 11/80 is essential to prediction of mainshock events. Lack of this data will reduce accuracy of prediction and increase the uncertainty of possible outcomes.
- Low magnitude events occurred in the specified target zone (according to Brady and IGP location data) on August 14 ($M_b=3.8$), September 20 ($M_b=4.0$), October 25 (swarm $M_b=3.5$ to 4.0), November 16 ($M_b=4.0$) and December 26 ($M_b=4.5$ Teleseismic) in 1980. These events constitute the first foreshock active phase according to Brady.
- According to Brady, the predicted first phase foreshock series began on August 14, 1980 and terminated on November 16, 1980. Also a teleseismic event of $M_b=4.5$ occurred in the inclusion zone.
- Peruvian sources claim that a sequence of events began on August 14, 1980 in the zone. They claim this is the only activity to have occurred in this area in the last few years. It appears that low magnitude earthquakes ($3.8 > M_b > 2.5$) have occurred in the delimited target zone during the stipulated timeframe of the first phase foreshocks.
- August 14, 1980 ($M_b=3.8$)
September 20, 1980 ($M_b=4.0$)
- Mainshock predicted for September 16, 1981
Time duration is ca. 328 days from the October 25, 1980 (third) foreshock of the first active phase.

- 12-13 foreshocks are expected in two active phases of approximately 109 days each (revised 4/81 to 115 days)
- Magnitude range of the predicted foreshocks will be greater than $M_b = 4.5$.
- Foreshocks will cluster in the vicinity of mainshock locations (see attached map)
- The end of the first phase of foreshocks to the main predicted earthquake should occur by January 10, 1981 (Spence 12/2/80)
- The second active foreshock phase will terminate on July 30, 1981 (Revised to September 16, 1981) with a mainshock of $M_w = 9.8$ (9.9) $12.6^\circ\text{S}/77.6^\circ\text{W}$ rupturing from 12.6°S to 28°S . (Brady 3/7/80, revised on 1/26/81)
- August 14 to November 16, 1980 = 92 days.
- September 20 to December 26, 1980 = 117 days
- March 4, 1981 to June 28, 1981 = 115 days
According to Brady, an event on March 4, 1981 ($M_b = 4.0$) in the target zone marked the initiation of the second active phase of the predicted foreshocks.
- Magnitude range of predicted foreshocks appears to be less ($M_b = 0.5$) than expected, except for the December 26, 1980 event ($M_b = 4.5$).
- IGP epicenter locations of August 14, September 20, October 25 swarm, November 16 and December 26, 1980 events are within the specified "inclusion zone".
- On December 26, 1980 a teleseismic event ($M_b = 4.5$) occurred in the zone. From December 27 to March 4 the zone appears to have been quiet. Brady is analyzing available data from the IGP.
- To be confirmed or denied in the future.

3. As the times of the predicted mainshocks approach (Summer 1981), earthquakes are expected to occur on the boundary of the postulated aftershock zone of the main event.

PREDICTION STATEMENT

- Seismic activity will possibly dramatically increase in the entire zone around what will be the primary aftershock zone of the predicted earthquake (Brady 8/1/79)
- A continuation of shallow crustal teleseismic events inland are expected in addition to larger events in northern Chile and north central Peru. (Brady 1/27/81)

OCCURRENCE OF EVENTS

- On March 23, 1981 an earthquake $M_s = 6.0$ occurred near Valparaiso, Chile. This event may be significant as its epicenter is located at the southern margin of the predicted rupture zone of the Sept. 16, 1981 mainshock.
- USGS reported that on March 23, 1981 a strong earthquake $M_s = 6.0$ occurred in the Santiago- Valparaiso area of Chile.

- There may be an increase in deep focus earthquake activity down-dip from the focal region of the impending shock (Brady 8/25/77)
- A series of earthquakes (9 tremors) occurred on November 10 thru 12, 1980 ($M_b = 5.0$) near Ayacucho, Peru, inland and SE of Lima. Other events in this area (on boundary of aftershock zone) occurred August 20, 1980 ($M_b = 5.2$); August 14 and 16 ($M_b = 5.0$); & September 2, 1980 ($M_b = 5.0$). According to Brady these events are significant because they occur on the boundary of the aftershock zone.
- On March 26, 1981 an earthquake $M_s = 5.8$ occurred at 19°S and 69°W near Arica, Chile. Hypocenter depth was 136 Km deep. Brady considers this event significant as it occurs down-dip from the inclusion zone.
- Earthquakes should occur along what will be the aftershock zone boundary. (Brady 1/27/81)
- The events near Ayacucho $M_b = 4$ to 5 are on the aftershock boundary (predicted).

4. The predicted timeframe of the predicted mainshocks has remained fixed for the June to September 1981 period. However, the dates of the predicted mainshocks have been revised as seismicity data becomes available and is subject to further interpretation and analysis by Brady.

PREDICTION STATEMENT

OCCURRENCE OF EVENTS

- There is a possibility of a $M=7.0$ event prior to the mainshock (Brady 6/19/79)
- A fourth event may occur during the first week of July in the $M_s=7.0$ range. (Brady 4/10/81)
- Local regions near Lima ($11.6^{\circ}\text{S}/76.5^{\circ}\text{W}$); ($12^{\circ}\text{S}/76.5^{\circ}\text{W}$) and ($7.8^{\circ}\text{S}/76.5^{\circ}\text{W}$) where low magnitude events can be expected prior to impending mainshock (Brady 6/19/79)
- Current interpretation (revised later, Jan. 1980) leads to the hypothesis that a second event $M_w=8.8$ will occur 276 days later at $12.5^{\circ}\text{S}/77.6^{\circ}\text{W}$, rupturing from 12.5°S to 8°S .
- This interpretation has been revised based on available data. The preferred date for the event is on or about August 10, 1981 at $M_w = 9.2$

- An increase in seismic activity within the inclusion zone is expected in May and June 1981. It should really get active in the inclusion zone just prior to the first main event. (Brady, 1/27/81)
- A series of large earthquakes will begin at the end of June 1981. The sequence is predicted to contain a magnitude 7.5-8.0 event on or about June 28, 1981; a magnitude 9.2 event on or about August 10; and a $M_w=9.8$ event on or about September 16, 1981. A minimum of 4 or 5 foreshocks $M_b=4.5$ in the inclusion zone are expected to occur from February thru May, 1981.
- On March 4, 1981 an event $M_b=4.0$ occurred in the specified target area. Though not teleseismic, Brady contends that this event marks the initiation of the second active foreshock phase of ca. 109 days to culminate in the end of June event of ca. $M_w=8.3$. Brady is examining recently acquired Peruvian data to determine the status of the second active foreshock phase.

5. The possibility of a the occurrence of a normal faulting earthquake in the $M=7.0$ range prior to the mainshock had been hypothesized by Spence and considered by Brady as early as two years ago. However, Brady now views the occurrence of this event with very low probability. This possibility is not model dependent according to Dr. Brady.

PREDICTION STATEMENT

- There may possibly be a very large intermediate-depth, normal faulting earthquake occurring down-dip from the predicted hypocenter (Brady, 8/1/79)
- The possibility exists for the occurrence prior to the mainshock of a large ($M_w=7.5$) normal faulting event down-dip of the predicted mainshock (Brady 5/1/80)

OCCURRENCE OF EVENTS

- Brady currently views the probability of occurrence of this event to be very low.

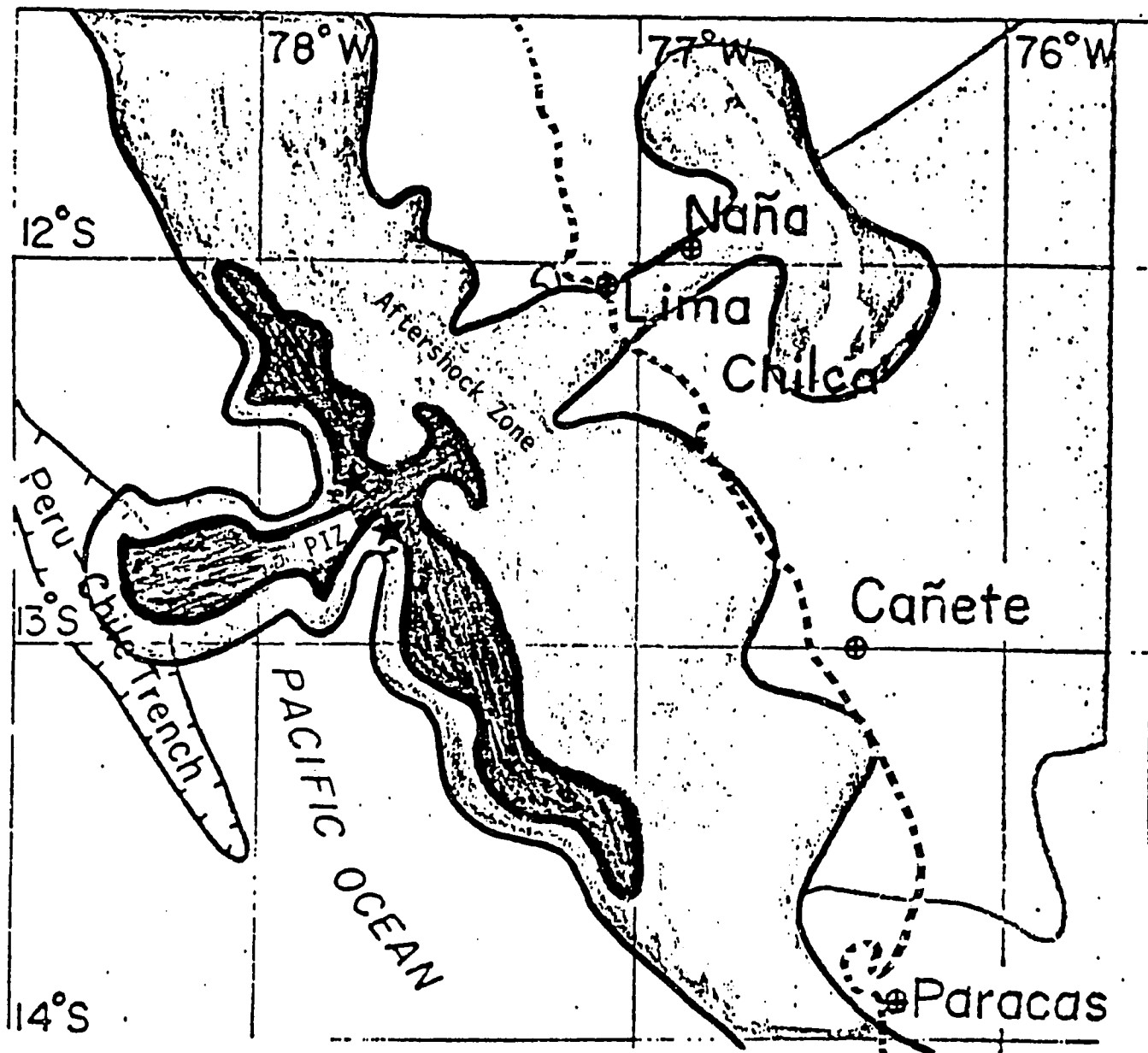


Figure 1. Primary Inclusion Zone (PIZ) (gray area) delineated by Dr. Brian T. Brady. The boundary of the aftershock zone (deformation) can be seen impinging along the coastline (hatched line). Predicted mainshocks of August 10 and September 16 are indicated as No. 1 and 2 respectively (stars).

UNITED STATES INTERNATIONAL DEVELOPMENT COOPERATION AGENCY
AGENCY FOR INTERNATIONAL DEVELOPMENT
WASHINGTON D C 20523

DOCUMENT NO. 111-

April 22, 1981

MEMORANDUM

TO: PDC/OFDA, Dr. Martin D. Howell, Director

THRU: PDC/OFDA, Alan Van Egmond, Assistant Director for Preparedness
and Planning *AE*

FROM: PDC/OFDA, Paul F. Krumpe, Science Advisor *PFK*

SUBJECT: Update on Comparative Analysis of Brady Earthquake Prediction
Statement and the Occurrence of Events

Reference OFDA Memorandum (4/15/81) from Paul Krumpe to Alan Van Egmond

This memorandum is the first addendum (update) to my April 15, 1981 memorandum to Mr. Van Egmond concerning recent occurrence of seismic events in Peru which correlate with prediction statements made by Dr. Brian Brady since 1977.

1. As indicated in Reference A (para 1 and 2) the period 3/4/81 to 6/28/81 is a time when an increase in seismicity in the target zone (foreshocks) would tend to support Brady's prediction statements. Though not in the teleseismic range, events did occur on March 4, March 28, and April 10 at magnitude 4.0.
2. The attached Reuter News release indicates earthquakes occurred near Ayacucho, Peru during the period April 18-20. The Peruvians have confirmed the dates and magnitudes of reported events. The magnitude range was 4.0 - 5.2. Some events were teleseismic. In my judgement, this series of earthquakes correlates with prediction statements made by Dr. Brady and indicated in Reference A.3.
3. As seismic events occur and are reported from Peru, I will provide you with updates on the status of the prediction as well as corroborating data.

Attachments:

Reference A
Reuter News Release

.***R080

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TAM-TREMOR

LIMA: APRIL 20; REUTER -- FOUR PEOPLE WERE KILLED AND 15 INJURED BY AN EARTH TREMOR WHICH FLATTENED A VILLAGE IN THE SOUTHERN PERUVIAN PROVINCE OF AYACUCHO; CIVIL DEFENSE OFFICIALS SAID TODAY.

ABOUT 75 FAMILIES WERE LEFT HOMELESS BY THE TREMOR WHICH DEVASTATED THE VILLAGE OF PACCHA, 375 MILES SOUTHEAST OF LIMA, FRIDAY.

THE TREMOR, MEASURING SIX DEGREES ON THE MERCALLI SCALE, WAS FOLLOWED BY OTHERS OVER THE WEEKEND, CAUSING PANIC BUT NO SERIOUS DAMAGE; THE OFFICIALS SAID.

THE AREA OF AYACUCHO HAS BEEN SHAKEN BY AT LEAST 60 EARTH TREMORS THIS YEAR.

REUTER 1157 AL

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Department of State

INCOMING
TELEGRAM

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SUBJ: REQUEST FOR DR. JOHN FILSON TO VISIT PERU

PASS USGS FILSON AND AID/OFDA

EMBASSY HEREBY REQUESTS THAT DR. JOHN FILSON OF USGS, IN COORDINATION WITH AID/OFDA, TRAVEL TO LIMA IN NEAR FUTURE FOR DISCUSSIONS WITH PERUVIAN GEOPHYSICAL INSTITUTE (IGP) AND PERUVIAN CIVIL DEFENSE AUTHORITIES CONCERNING EARTHQUAKE RISK IN GENERAL. AS DEPARTMENT AWARE, PREDICTIONS OF DR. BRIAN BRADY THAT CATASTROPHIC EARTHQUAKE IS APPROACHING CONTINUE TO RECEIVE CONSIDERABLE PRESS COVERAGE. EMBASSY STRONGLY BELIEVES THAT VISIT TO PERU BY DR. FILSON AT THIS TIME WOULD GO LONG WAY TO HELP ALLAY PUBLIC FEAR AND PUT BRADY'S PREDICTIONS IN PROPER PERSPECTIVE.
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DOCUMENT NO. 113
UNITED STATES INTERNATIONAL DEVELOPMENT COOPERATION AGENCY
AGENCY FOR INTERNATIONAL DEVELOPMENT
WASHINGTON, D C 20523

April 28, 1981

MEMORANDUM

TO: PDC/OFDA, Dr. Martin D. Howell, Director

THRU: PDC/OFDA, *JMC* Fred Cole, Acting Assistant Director for Preparedness and Planning

FROM: PDC/OFDA, *PFK* Paul F. Krumpe, Science Advisor

SUBJECT: Update on Comparative Analysis of Brady Earthquake Prediction Statements and the Occurrence of Events

Reference: OFDA Memorandum (4/15/81) from Paul Krumpe to Alan Van Egmond

This memorandum is the second addendum (update) to my April 15, 1981 memorandum to Mr. Van Egmond concerning recent occurrence of seismic events in Peru which tend to correlate with prediction statements made by Dr. Brady since 1977.

1. As indicated in para 3 of the referenced memo Dr. Brady views the occurrence of... larger events in northern Chile and North Central Peru... as supportive of his prediction hypothesis. He has indicated on many occasions his expectation that as the times of the predicted mainshocks approach (summer 1981), earthquakes are expected to occur on the boundary of the postulated aftershock zone of the main event.
2. On Monday, April 27, 1981 Dr. Brady called to inform me that a Peruvian friend of his in Golden, Co. had received a call from Lima indicating an earthquake had been felt in Lima over the weekend. I called The National Earthquake Information Service (USGS/NEIS) in Golden Co. and was told an event was recorded April 25 at 3.7°S and 76.5°W; 100 km depth at magnitude $M_b = 5.3$. I called the AmEmbassy Lima to confirm events as reported by The Geophysics Institute of Peru (I.G.P.). Dr. Leo Ocola at I.G.P. indicated an event occurred April 26 at 9:36 P.M. local time 270 km NE of Moyobamba, Peru. Richter Magnitude was reported to be 7.1 at the epicenter. These data are preliminary and based only on three stations reporting. The Embassy will keep Dr. Brady informed on these events.
3. At this time Dr. Brady is examining the data in light of his prediction. It appears that the events reported over the weekend are far inland, east of the Andes Mountains in the headwaters region of the Amazon Basin. This region in North Central Peru is historically non-seismic. Whether these events correlate with Brady's prediction will be subject to Dr. Brady's interpretation in the near future and further discussions. I will continue to keep you informed on Peruvian seismicity.

April 28, 1981

Dr. Alberto A Giesecke M.
 Centro Regional de Sismologia para America del Sur
 Av. Arenales 431
 Apartado 3747
 Lima, Peru

Dear Alberto:

Thank you for your kind letter and, in particular, the seismic data from the national network. Needless to say, I am always delighted to receive letters from you, and to talk with you was an unexpected pleasure.

I am particularly upset about the newspaper accounts of the two "interviews" (Expresso, Ultima Hora). These articles are mostly false and many of the comments attributed to me are not only untrue, but are figments of some reporter's imagination. I find it difficult to believe that a serious subject like this prediction has been and apparently continues to be, irresponsibly treated by the press. Obviously, the last thing the public needs at this time is this type of press coverage. I apologize to you Alberto and to the Peruvian public for consenting to these two interviews. However, I want you to know that I stated to these reporters only what is common knowledge. Daniel had suggested in January that these interviews would be a good thing to do. In the future, and as I had done earlier, I will refer all requests to IGP.

I have been following the seismic situation in Peru carefully and the addition of the local data has been invaluable. I have been studying the local network data, and at this time, there have been a total of nine events (magnitudes 3.8-4.5) in the nucleation zone. With the exception of the December 26, 1980, event (M_b 4.5), all the remaining events are below the teleseismic detection threshold. I have stated repeatedly in both memoranda and privately that the magnitudes of the "foreshocks" could not be predicted in advance. Local data is essential to accomplish this task. However, it appears to me at this time that the final active foreshock phase to the June 28, 1981, event (\pm several days) began on August 14, 1980 ($M_L = 4.0$). If the June event ($M_w = 8.2-8.4$) occurs, the other events (M_w 9.2, M_w 9.9+) will follow. If this event does not occur, I will withdraw the prediction.

In my study of the local network data, I have found patterns (space-time) that have occurred prior to other events that did take place (1971 San Fernando, California (M_L 6.6); 1975 Kalapana, Hawaii (M_L 7.2)) as well as several rockbursts predicted (in advance) by our research group. On my own and in confidence with my colleagues at the Bureau of Mines in Denver, I made several tentative predictions of several recent events I expected to occur in the foreshock phase prior to their actual occurrence. These included the March 4, 1981

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the March 28, 1981, and the April 10, 1981, events in the nucleation zone. Each event occurred within several hours of their "predicted" times. Alf Cooley informed me over the telephone of the March 4 and the April 10 events. The Expresso article indicated the occurrence of the March 28 event (M_L 4.0) offshore from Canete.

I believe that the overall characteristics of the final foreshock phase are occurring as I had indicated to you earlier. Their average magnitudes are of the order of $M_L = 4.0$. A "rule of thumb" for estimating the magnitude of the mainshock is to add 4.1-4.3 units to the average foreshock magnitude to obtain the mainshock magnitude. This rule suggests the first event, on or about June 28, 1981, will have a magnitude of $M_w = 8.1-8.3$. I believe that the rupture will extend from 12.2°S to 13.7°S , a range similar to the October 3, 1974, event. This event, should it occur, will decouple the Nazca and South American plates between 12.2°S and 13.7°S and will lead immediately to the final foreshock phase culminating in the August and September mainshocks. I still believe that the September event, should it occur, will be the largest, although further examination of the foreshocks and the characteristics of the first event may lead me to revise the timing and magnitudes of the August and September shocks.

While I am convinced that the area affected by the predicted shocks ($7^\circ\text{S}-28^\circ\text{S}$) is capable of sustaining earthquakes of the predicted magnitudes, and that the Nazca and the South American plates are locked between these latitude limits, I would be remiss in not conveying to you my reservations concerning the validity of these predictions. I am, however, convinced that the space-time offshore seismicity patterns are real and that they conform with my theory. This does not, however, prove that the theory is correct and that larger earthquakes will occur! Whether these patterns are unique or just random fluctuations remains a question of conjecture at this time. I personally believe the prediction is correct.

Alberto, I need to be kept fully abreast of what the local network is detecting. I believe that as we approach the first event, the overall magnitude of events occurring offshore will continue to decrease. With the exception of the December 26, 1980, event (which was on the borderline of teleseismic detectability), the magnitudes are diminishing. The last reported teleseism in the Lima area occurred on July 15, 1979! I would expect extreme quiet to prevail within the zone in the weeks or so preceding the first event. I would appreciate your assistance in obtaining all seismic data (March-April) as soon as possible. The strain data (since 1979) from Deza's network, would be of considerable value to me. I need these data soon.

I wish you and your family my fondest regards and I look forward to hearing from you soon.

Sincerely yours,

Brian T. Brady
Physicist
Mine Design Division
Denver Research Center

cc: Division of International Activities, Washington, DC

- 339 -

CHRON

Reports, Memoranda, Correspondence
and Other Communication

May - June, 1982

Lima

May 5, 1981

rec'd 5:30 PM '81
RECEIVED

Dr. Leo Ocola
Instituto Geofisico del Peru
Avenida Armendariz 497
Miraflores

Dear Leo:

As always it was a pleasure speaking with you this afternoon. We have appreciated the flow of data concerning earthquakes which the Instituto Geofisico del Perú has been sending us in the form of "IGP Epicenters", of which we have now received thirty-six.

In the telephone conversation of May 4 with Dr. Brian Brady, which we discussed, I was asked to see if additional information could be provided him using the same format and method of delivery as before.

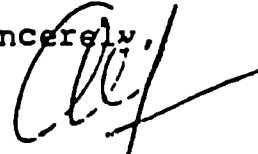
- A) He would like to be provided with epicenter sheets on all earthquakes of M_L 3.0 and above starting on March 1 and continuing for the next several months, if, of course, they have not previously been reported. From what you told me, I understand that this will require a great deal of additional effort on the part of IGP and appreciate your willingness to undertake the task.
- B) Brian would like IGP confirmation of a 28 March earthquake near Cañete. Although Dr. Giesecke sent him a newsclipping about it, he apparently has not received the IGP epicenter sheet.
- C) He would also like any data available on the tremor felt by several U.S. Embassy people at about 5:30 p.m. (local) on Friday, April 24.
- D) And finally, he would like an IGP epicenter sheet on the earthquake which occurred between Iquitos and Moyabamba on April 25. In our conversation, you said its magnitude had been scaled down considerably from the 6.5 reported in the newspapers.

2.

E) While Brian did not request it, my record of items sent to him does not show that we sent the IGP monthly bulletins for March or April. Would it be possible to do so?

Again many thanks for all your assistance.

Sincerely,



Alford W. Cooley
First Secretary
Economic Section

cc: Dr. Brian Brady
Mr. Paul Krumpe, AID/OFDA



DOCUMENT NO. 116
United States Department of the Interior

BUREAU OF MINES

P. O. BOX 25086
BUILDING 20, DENVER FEDERAL CENTER
DENVER, COLORADO 80225

May 7, 1981

MAY 7 3 34 AM '81
PDC/OFDA

Memorandum

To: Robert L. Harvelli, Director, Division of Minerals
Health and Safety Technology, Washington, DC

Through: Verne E. Hooker, Research Supervisor, Mine
Design Division, Denver Research Center

Calen G. Waddell, Research Director, Denver
Research Center

From: Brian T. Brady, Physicist, Mine Design
Division, Denver Research Center

Subject: Status report of Peru earthquake predictions

The objective of this memorandum is to inform you of current seismicity patterns in central Peru and my interpretation of these data in light of the prediction.

The current status of the prediction is as follows. Please understand that these dates are preliminary and will be subject to change as additional data from the local Peruvian seismic network become available and evaluated during May and early June 1981. There will be at least three large events. The first event will occur on or about July 6, 1981, with a magnitude $M_w = 8.1-8.3$. This event will rupture between 12.2°S and 13.7°S . The first shock will initiate the decoupling of the Nazca and South American plates between 12.2°S - 13.7°S and will lead immediately to the final foreshock phase culminating in the August (on or about August 18, 1981; $M_w = 9.2^-$) and the September (on or about September 24, 1981; $M_w = 9.9^+$) events. The latitude limits of the August and September shocks, as described in earlier memoranda to you, remain unchanged. I still believe that the September event, should it occur, will be the largest, although further examination of the foreshocks and characteristics of the first event may lead me to revise the relative timing and magnitudes of the August and September events. Source depths of each event will be approximately 25 km. The August and September events will nucleate between 12.4°S - 12.7°S latitude and 77.3°W - 77.6°W longitude, that is, the approximate locations of the October 3, 1974, and November 9, 1974 events, respectively. At this time, I am not sure of the exact coordinates where the first event will nucleate, although the most probable location will be in the immediate vicinity of the second and third events.

These events and their characteristics are a departure from the preliminary predictions listed in earlier memoranda to you (March 7, 1980) and to Dr. Wesson (May 1, 1980), although the essential characteristics of these events remain unchanged. Updates of the preliminary predictions were discussed at the 1980 San Juan, Argentina and the NEPEC meetings. You will recall that I had discussed, in earlier memoranda to you and at the May 1979 Golden, Colorado, meeting, the possibility of a large ($M_s > 7$) event prior to the M_s 9.9⁺ shock. The first event, tentatively predicted to occur July 6, 1981, represents an update of this earlier forecast. My analysis of what I believe to be the foreshock sequence, that is, seismic activity since August 14, 1980, indicates that the M_s = 9.2⁻ event will not occur 328 days following the M_s = 9.9⁺ event, as originally indicated in my March 7, 1980, memorandum, but rather will occur roughly midway between the first and last mainshocks. Reasons for this change will be presented later in this memorandum.

CURRENT SEISMICITY PATTERNS IN CENTRAL PERU

I have been in contact with Alford Cooley and John Jurecky of the American Embassy in Lima, Peru, and Dr. Alberto Giesecke, Director of CERESIS. They have recently been providing me (on a somewhat timely basis) seismic data detected by the Peruvian national seismic network. As you are aware, I have been following the seismic situation in Peru carefully, and the addition of the local data has been invaluable. At this time, there have been a total of nine events [magnitude (local) range M_L = 3.8-4.5] in the offshore nucleation zone. Figures 1 through 5 illustrate seismicity patterns in central Peru between August 26, 1966, the initiation of what I believe to be the first active phase of the pending mainshocks and the present. Figures 1 and 3 list teleseismic data while figures 2, 4, and 5 show local network data obtained either from the USGS local network (figure 2), operative from October 7 through November 9, 1974, or from the Peruvian network (figures 4 and 5) obtained from April 1979 to the present. While I cannot personally account for the veracity of the Peruvian data, that is, locations and local magnitudes, I have compared the IGP analysis of larger events ($m_b > 4.5$) to the NEIS analysis. I have found little difference between IGP and NEIS locations and magnitudes for the events that I have examined. I would prefer to use local data that has been relocated with the same precision and care as done with local USGS network data in operation during 1974. Unfortunately, this is not feasible at this time. However, I believe that the IGP data display a reasonably accurate picture of the current seismic situation in central Peru.

As you can see from figures 3 and 4, no events have occurred within the "target zone" (zone A), either local or teleseismic from December 24, 1974 to August 14, 1980. Please note that the character of the seismicity from

the Peruvian network between April 1979 and August 1980 (figure 4) exhibits nearly identical characteristics with seismicity reported teleseismically from NEIS (and ISC) from December 24, 1974 to the present (figure 3), that is, events N-NW on the offshore limb (zone A) and the onshore limb (zone B). Figure 5 represents local data plotted since August 14, 1980. Assuming, of course, that these data are reasonably well located, I believe that figure 5 clearly suggests that a change in the space-time seismicity patterns occurred on August 14, 1980. My detailed analysis of the space-time patterns of individual events since August 14, 1980 (presented below) also support this observation.

Table 1 lists each event plotted in figure 5 along with their respective magnitudes, locations, depths, and origin times. Please note that the September 20, 1980, event (#2, table 1) was of magnitude $M_L = 4.0$ and not 3.2 as reported by Dr. Engdahl (USGS, Golden, Colorado) and widely circulated in various articles (e.g., Science, February 20, 1981, article by R. Kerr, "Prediction of Huge Peruvian Quakes Quashed"). Dr. Leo Ocola of IGP has confirmed this magnitude which was published in the IGP monthly summary. You are also aware that I have stated repeatedly (e.g., Marovelli memorandum to Dr. Filson, USGS, May 14, 1980) that the magnitudes of the foreshocks could not be predicted in advance since local network data is essential in my theory to pinpoint magnitude and location of each event.

I have labeled in figure 5, in chronological order, the events in zones A and B since August 14, 1980. Please note the oscillatory character of these events. For example, the alternation existing between the offshore limb (A) and the onshore limb (B). Thus, when zone A is active, zone B is quiet, and vice versa. Dr. Spence (USGS) observed exactly this behavior between the October 3, 1974 ($M_w = 8.1$) and the November 9, 1974 ($M_w = 7.1$) mainshocks. In this case, activity shifted between the offshore limb (A) and the onshore limb (B) and, in particular, the Chilca a and b clusters (figure 2). This pattern of alternating activity in limbs A and B was found independently by both Spence and myself to persist even down to the lowest magnitude events located with the USGS local network. This oscillatory character between limbs A and B was terminated on November 9, 1974 with the $M_w = 7.1$ mainshock. It is also interesting to note that the teleseismically reported foreshocks, S_i ($i = 1, 2, \dots, 6$), beginning on September 6, 1973, and including the $M_S = 6.6$ January 1, 1974 event, and terminating on September 27, 1974 (5.9 days prior to the October 3, 1974 mainshock) also exhibit periods of alternating active and quiet. I interpreted this behavior as one characteristic of a physical system at a critical state. Briefly, a system at criticality will exhibit identical behavior over large distances. That is, a small perturbation or change at one point in the system can produce a corresponding perturbation at a distant point, even though the apparent extent of the disturbance is orders of magnitude smaller than the dimensions of the system in question. Thus a

magnitude 3-4 earthquake with a rupture length of several hundred meters at most can influence the entire system by inducing an event several hundred kilometers away (= rupture length of October 3, 1974). The occurrence of the November 9, 1974, shock, in conjunction with its general absence of aftershocks, was evidence to me that this system (central Peru zone A) had entered the final preparation phase which would culminate in the 1981 earthquake sequence. At this time, I believe we have evidence for a similar situation which apparently began August 14, 1980, about the same time predicted several years earlier by me for the initiation of the foreshock series. Since August 14, 1980, there have been a number of earthquakes ($M_L = 5.4$, etc.) near Ayacucho, about 2° east of figure 5 at 13°S , approximately 400 km SE of Lima, producing several tens of casualties and considerable damage to buildings. The events in the Ayacucho region also show an oscillation, except that here the oscillation is between limb A and the Ayacucho segment, nearly 450 km distant from the nucleation zone where the predicted mainshocks will nucleate. I believe this oscillatory sequence began on August 14, 1980, (event #1, figure 5). This was followed with an event [$m_b = 5.1$, 13.05°S , 74.40°W (NEIS), $M_L = 5.0$, 13.00°S , 73.70°W (IGP)] on August 16, 1980. The next event occurred on September 20, 1980, [event #2, figure 5] in the offshore limb (A). The next event occurred inland [$m_b = 4.0$, 12.9°S , 75.3°W (NEIS); $M_L = 4.4$, 12.6°S , 75.5°W , depth 96 km (IGP)] on September 21, 1980. The next event occurred offshore (event #3, figure 5) followed by the primary Ayacucho sequence on November 10-16, 1980, ($M_L = 5.3, 5.3, 5.7, 5.7$; depth = 33 km, 13.0°S , 74.0°W). The Ayacucho area quieted following the November 16, 1980 event [$M_L = 4.0$, 13.0°S , 74.0°W (IGP)]. The next event occurred offshore on November 16, 1980, (event #7, figure 5). The Ayacucho segment became active again on December 2, 1980, [$M_L = 4.5$, 13.0°S , 73.9°W (IGP)] and terminated on December 17, 1980, [$M_L = 5.0$, 13.2°S , 74.6°W (IGP)]. The next event occurred offshore (event #8, figure 5), and so on. I am currently analyzing recent data from the Ayacucho segment and will forward this information to you once the analysis is completed. However, the data indicate the oscillatory pattern is continuing.

This behavior suggests to me that a definite change in the overall seismicity patterns occurred with the August 14, 1980, event. I believe at this time that the foreshock sequence has begun and that the system is undergoing cooperative behavior over large distances (several hundred kilometers). This behavior is similar to that observed prior to the October 3 and November 9, 1974 Peru events.

I believe that the overall characteristics of the final foreshock phase are occurring as I had indicated to you in previous memoranda. The average magnitudes of these events is $M_L = 4.0$, approximately one-half magnitude unit below teleseismic detectability. A "rule of thumb" for estimating the magnitude of the first decoupling event is to add 4.1-4.3 units to the average foreshock magnitude to obtain the magnitude of the mainshock. Application of this rule suggests the first event, tentatively predicted for July 6, 1981, will be of magnitude $M_L = 8.1-8.3$.

Spacetime Seismicity Patterns in Central Peru

I will briefly describe in this section the theoretical model and the application of this model to central Peru seismicity patterns.

The essential elements of the theory are as follows: A nucleation zone develops in a material prior to the occurrence of a phase change or, in our case, a failure or earthquake. The presence of this zone controls the behavior of material in its immediate vicinity. That is, the material undergoes cooperative motion which is occurring in response to any changes occurring within the nucleation zone. Thus, matter outside this zone can be said to have "knowledge" of the existence of this zone. The range of this cooperative motion is a function both of the time interval between its formation and the final failure and also of the energy required to complete the process. Thus, the greater the energy required, the greater the range and usually, though not necessarily, the time required to complete the failure preparation process. Because fracture is a local phenomenon (see, for example, Theory of Earthquakes, Part I, for experimental confirmation) any realistic description of the physics of fracture must necessarily be a local field theory with the additional complication that the theory describe a local second-order tensor field. The field equations I have developed are similar in form to the Einstein equations except with a different coupling constant between the geometrical description of the field and the energy momentum tensor. Solutions of the simplified equations predict the existence of a nucleation zone prior to the occurrence of the failure. The zone does not form instantaneously but rather evolves over its lifetime. A more correct description would be the zone "condenses out" within its environment and begins its evolutionary process of growth followed by eventual collapse. Collapse of the zone signals the occurrence of the mainshock (failure).

The nucleation zone possesses interesting physical properties, namely negative values of specific heat (C_v) and compressibility (β). For example, a material with positive β has the well-known property that its volume increases once pressure applied to the material is released. A material with negative β will continue to implode even when the applied pressure is released. A material with positive C_v has the property that it cools as it radiates heat to its immediate environment. However, for an object with negative C_v , the temperature increases as it radiates heat energy to its surroundings. Negative values of C_v and β imply unstable thermodynamic entities; materials with these properties exhibit nonlinear deviations from equilibrium which increase with time. Applied to the fracture problem in its simplest terms, the theory implies that once the nucleation zone has reached its maximum dimension, that is, the zone has extracted the maximum amount of energy from its environment, implosion of the zone begins and its temperature begins to increase. Matter affected by the

implosion process will become progressively more "quiet" in the seismic situation while matter outside the implosion zone will become seismically active. Thus, an observer should detect a quiet zone (which becomes the aftershock zone) bounded by an active zone. Many seismologists now agree that many earthquake zones in the world have exhibited this behavior prior to an earthquake. As you are aware, we observed this behavior prior to numerous rockbursts in the Coeur d'Alene district and coal bumps in western Colorado.

The theory is still in the developmental stage and is quite complex. However, it is recognized that field theories in general, and field theories describing massive spin 2 particles, in particular, are highly complex. I firmly believe that this type of approach is necessary if we are to correctly describe the failure preparation process. What continues to surprise me is that current earthquake prediction research still uses simplistic models and global-type theories, such as the Griffith theory of fracture, in which precursory phenomena are not intrinsically embedded within the mathematical framework. Unless additional complexities are added, such as fluids present within the material, these models do not predict anomalous behavior prior to failure. Many within the seismological community are currently infatuated with simple fault models made more complex by the addition of asperities (hard zones along the fault surface) which tend to inhibit free body motion along the fault; an earthquake occurs once the asperities are broken. Thus, one "gets out" only what one "puts in" —in my opinion, a most unsatisfying state of affairs. I believe we need to address the fundamental problem of how the fault gets there in the first place. My theory does exactly this and, in addition, predicts the existence of a preparatory phase prior to the fractures. The Bureau's experience in rock bursts, where new faults are induced by the mining process, show dramatically that precursory effects, similar to those reported prior to some earthquakes, precede rock bursts. As you are aware, many of these bursts have been predicted prior to their occurrence.

The physical model of the failure preparation process I have deduced predicts that the evolutionary history of the nucleation zone is not a simple process. The zone undergoes periods of activity (low magnitude seismic events) along its boundary which are followed by quiet (no seismic activity). Literally, the zone undergoes a "breathing" type of deformation. Thus, a period of activity consists of a sequence of events along the zone's boundary which fracture much of the solid material left over from the previous active cycle. The zone quiets, evidenced by further implosion, until the next cycle during which portions of the remaining solid material within the zone fracture. Eventually the zone becomes a fine powder ("gouge") incapable of sustaining "tensile stress." The zone then collapses, resulting in the release of gravitational energy to its environment. This condition initiates the mainshock sequence. Further collapse of the zone produces aftershocks within what was the imploding surrounding.

The prediction of failure requires, in a figurative sense, a "clock." In my theory, seismic events are the "ticks" of the "clock." In simple terms, the theory predicts that seismic events occurring either within the nucleation zone or along the active boundaries of what will become the after-shock zone, are not random events, but rather occur in response to changes developing within the nucleation zone. Thus, seismicity is the key to understanding the failure preparation process. The theory predicts that the evolutionary process of the zone will consist of active and quiet periods with the constraint that the cycle frequency will double following each cycle; that is, the time to failure is halved after each cycle. The problem can be likened to Zeno's classic paradox in which the distance to the wall is halved, halved again, and so on ad infinitum. However, in our problem, "you do eventually reach the wall." The major difficulty in failure prediction consists of determining which cycle one is observing. Once this is accomplished, "prediction" of the final event and the initiation time of the next cycle is possible. Once the next cycle initiates, the final event time is updated and so on. Mathematically, the system undergoes an infinite series of iterations and associated updates of the final failure and the particular solution to the field equations describing this particular failure converges to the final date and mainshock occurrence. Because the theory is scale invariant, this process is operative on all scales.

Figures 6 through 8 represent the application of this procedure to central Peru seismicity from 1967 to the present for each of the three predicted events. These plots are broken down into iteration cycles (1 through 6) and show event occurrence versus time. Additional iterations cycles will be made available in May and June. For example, iteration cycle number 1 for event 1 begins on July 7, 1967. This event denotes the initiation of the active phase within the P_1^{81} time interval (8/26/66-12/24/67). This event gives the initiation time for the first iteration or "prediction" of the occurrence of the first event, June 28, 1981. The first event in the sequence occurred on July 3, 1974. The P_1 or "first" active phase for the 1981 sequence began on August 26, 1966, and ended on December 29, 1967. (See figure 1, events 1 and 8, respectively.) Event 2 in figure 1 is July 7, 1967. The time duration for events 2 through 8 was approximately 5 months and 22 days. The P_2 phase, shown in figure 2, began on September 6, 1973, and terminated on December 24, 1974. The final active phase for this sequence began on July 3, 1974, (event 8₃, figure 2) and its time duration was approximately 5 months and 21 days, approximately one day less than the time interval for the active phase within the P_1^{81} cycle. The theory predicts that initiation in one cycle carries over to the next cycle initiation. The final event, mainshock of one cycle, occurs at the beginning of the next cycle. The 'predicted' foreshock time for the first event is approximately 10 months, 11 days, (8/26/66-7/7/67) or approximately 9 months, 27 days (9/16/73-7/3/74). Thus, the predicted foreshock initiation time is either (approximately) August 16, 1980, or September 1, 1980 using the first event iteration time of "June 28, 1981."

As discussed earlier, I believe this sequence began August 14, 1980. The next iteration consists in finding an event midway between 7/3/74 and "6/28/81". The predicted is "1/1/78", the observed, 1/22/78. This iteration sequence continues and must eventually occur on the first foreshock event. The predicted is "8/27/80" (iteration No. 3). The observed is 8/14/80. Application of this procedure to the remainder of these figures, while straightforward, is complicated and I will discuss these data in detail at the May 13, 1981 technical briefing in Washington, D. C. and in additional memoranda to you in the following weeks.

I hope my comments are of value to you. The seismicity patterns now developing in Peru lead me to suspect that the predicted events will occur; the precise dates will become firmer during May and early June. If the first event occurs, the August and September events will follow. Should the first event occur, I believe the Peruvian local network will be effectively out of commission. I would then need to have rapid access to the NEIS data file. Events in central Peru would have to be located rapidly and these data made available to me on a very timely basis. These data would be needed to determine the dates of the August and September events.

I need to be kept fully abreast of what the local network is detecting. I believe that as we approach the first event, the overall magnitude of events occurring offshore will continue to decrease. With the exception of the December 26, 1980 event (which was on the borderline of teleseismic detectability), the magnitudes are diminishing. The last reported teleseism in the Lima area occurred on July 15, 1979! I would expect extreme quiet to prevail within the zone in the weeks preceding the first event. It will be necessary to obtain all seismic data (March-April-May-June) as soon as possible in order to determine whether the patterns are valid and to determine a more precise time estimate of the first event.

Brian T. Brady

LOCAL NETWORK DATA

8/14/80 - Present

Event No.	Date m/d/y	Origin Time h/m/s (UT)	Latitude °S	Longitude °W	Depth km	Magnitude M _L
1	8/14/80	11h25m00	12.30°	77.60°	25km	4.0
2	9/20/80	04h42m28s	12.56°	77.44°	33km	4.0
3	10/25/80	22h32m03s	12.50°	77.50°	25km	3.5
4	10/26/80	02h12m45s	12.70°	77.00°	33km	3.8
5	10/26/80	06h05m18s	12.70°	77.30°	25km	4.2
6	10/27/80	06h16m00s	13.00°	76.80°	33km	3.9
7	11/16/80	19h41m19s	12.60°	77.20°	33km	3.8
8	12/22/80	22h18m12.5s	12.80°	76.60°	33km	4.0
9	12/26/80	08h19m59.0s	12.90°	77.40°	33km	4.5
10	12/30/80	17h24m59.0s	13.80°	76.80°	33km	4.0
11	1/14/81	14h03m23.0s	12.50°	76.30°	25km	4.0
12	1/30/81	15h59m12.5s	12.80°	77.50°	25km	4.0
13	2/10/81	16h46m38.0s	13.70°	76.80°	25km	4.0
14	2/16/81	15h24m06.0s	12.80°	76.90°	25km	3.5
15	3/04/81	10h20m57.0s	12.42°	77.67°	25km	4.0
16	3/28/81	-----	12.85°	76.75°	33km	4.0
17	4/10/81	14h39m10.3s	12.35°	77.65°	25km	3.0

Event No. 1

 $M_w = 8.2$

Sequence

H
A
I
N
S
H
O
C
K
No.1Iteration
No.

1st

1	07/07/67	"01/05/71" 01/30/71	07/03/74	"01/01/78" 01/22/78	"06/28/81"
---	----------	------------------------	----------	------------------------	------------

time (M/D/Y)

2nd

2	07/03/74	"04/13/76"	01/22/78	"11/02/79" 10/15/79	"06/28/81" ("08/11/81")
---	----------	------------	----------	------------------------	----------------------------

time (M/D/Y)

3rd

3	01/22/78	"12/04/78" 12/26/78	10/15/79	"08/27/80" 08/14/80	"08/11/81" ("07/08/81")
---	----------	------------------------	----------	------------------------	----------------------------

time (M/D/Y)

4th

4	10/15/79	"03/15/80" 03/17/80	08/14/80	"01/14/81" 01/14/81	"07/08/81" ("06/13/81")
---	----------	------------------------	----------	------------------------	----------------------------

time (M/D/Y)

5th

5	08/14/80	"10/29/80" 10/26/80	01/14/81	"03/29/81" 04/10/81	"06/13/81" ("07/06/81")
---	----------	------------------------	----------	------------------------	----------------------------

time (M/D/Y)

6th

6	01/14/81	"02/27/81" 03/04/81	04/10/81	"05/23/81"	"07/06/81"
---	----------	------------------------	----------	------------	------------

time (M/D/Y)

Event No. 2

$M_v = 9.2$

MAINS
HOCK
No.2
*

Sequence

Iteration
No.

1st

1 11/26/67 "04/29/71" 10/03/74 "03/06/78" "08/10/81"
03/10/78
time (M/D/Y) *

2nd

2 10/03/74 "06/21/76" 03/10/78 "11/28/79" "08/10/81"
07/24/76? 12/07/79 ("08/17/81")
time (M/D/Y) *

3rd

3 03/10/78 "01/24/79" 12/07/79 "10/20/80" "08/17/81"
12/26/78? 09/20/80 ("09/04/81")
time (M/D/Y) *

4th

4 12/07/79 "04/29/80" 09/20/80 "02/12/81" "09/04/81"
04/13/80 03/04/81 ("07/04/81")
time (M/D/Y) *

5th

5 09/20/80 "12/12/80" 03/04/81 "05/26/81" "07/04/81"
12/22/80? ? ("08/18/81")
time (M/D/Y) *

6th

6 03/04/81 "04/11/81" 05/23/81 "07/07/81" "08/18/81"
04/10/81 ? ?
time (M/D/Y) *

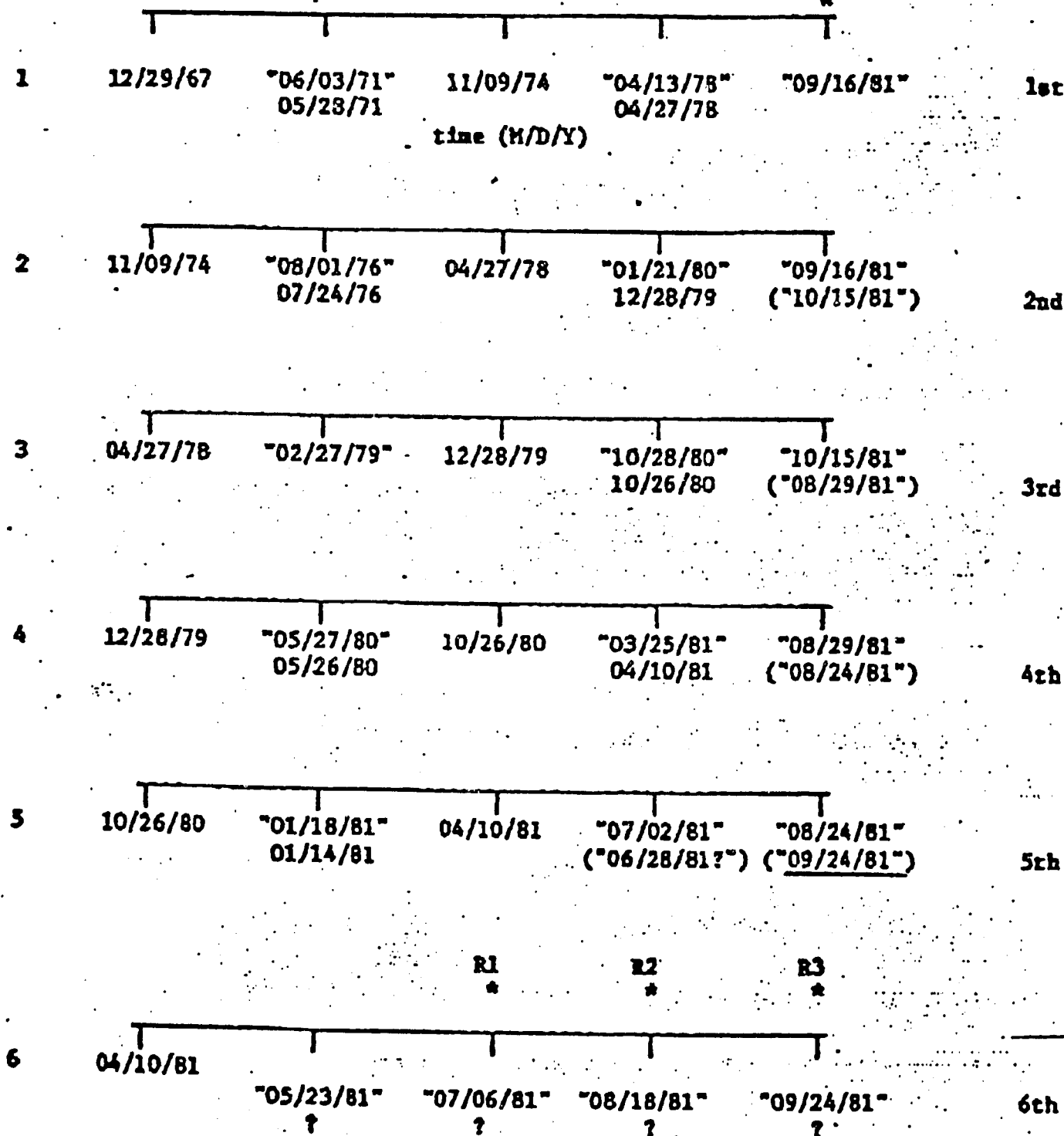
Event No. 3

$M_w = 9.9^+$

H
A
I
N
S
H
O
C
K
No. 3
*

Sequence

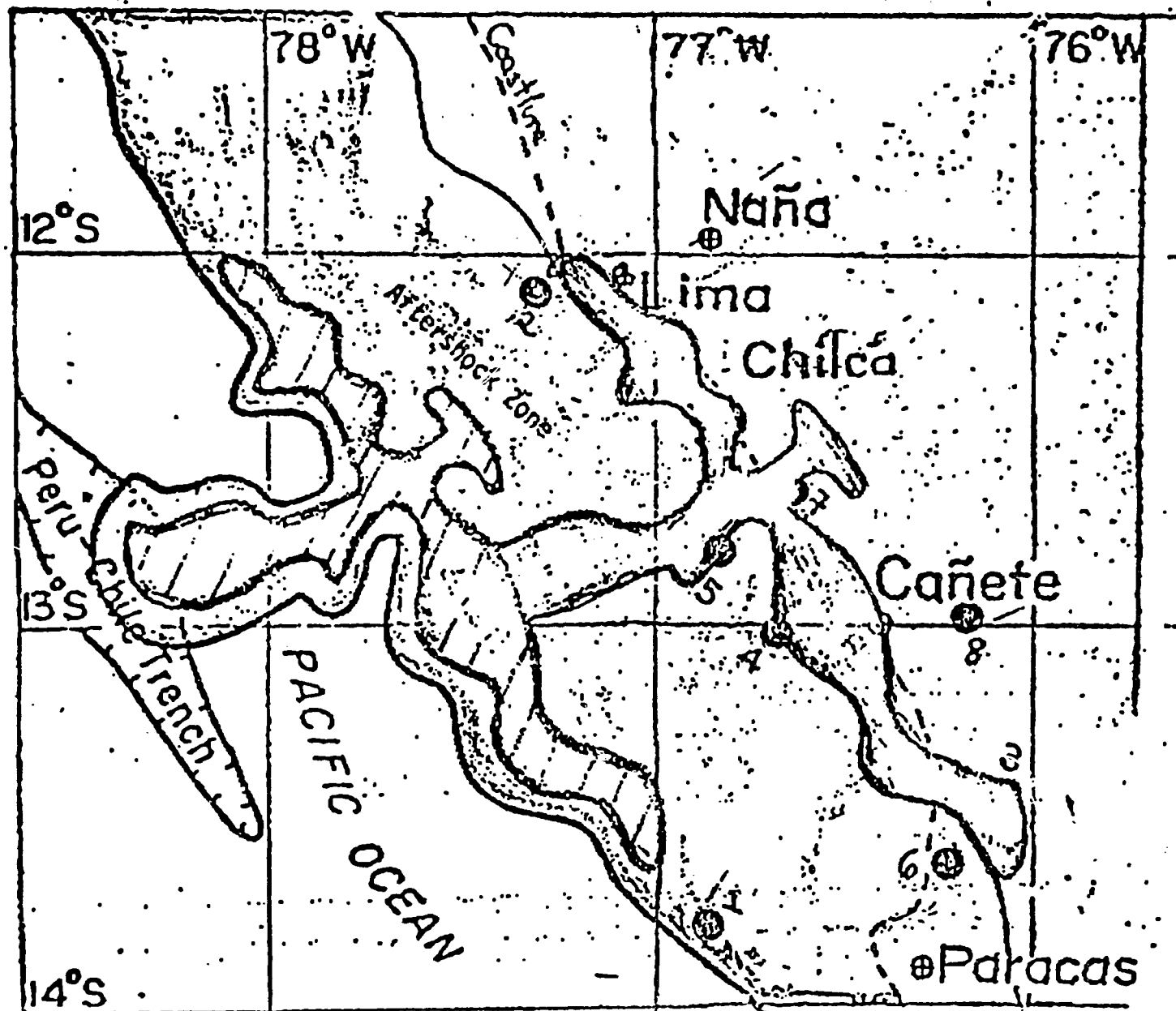
Iteration
No.



Tekseismic (8/26/66 - 12/29/67)
(P₁st phase)

#1

- ① 8/26/66
- ② 7/7/67
- ③ 7/24/67
- ④ 8/1/67
- ⑤ 8/22/67
- ⑥ 10/17/67
- ⑦ 11/26/67
- ⑧ 12/29/67

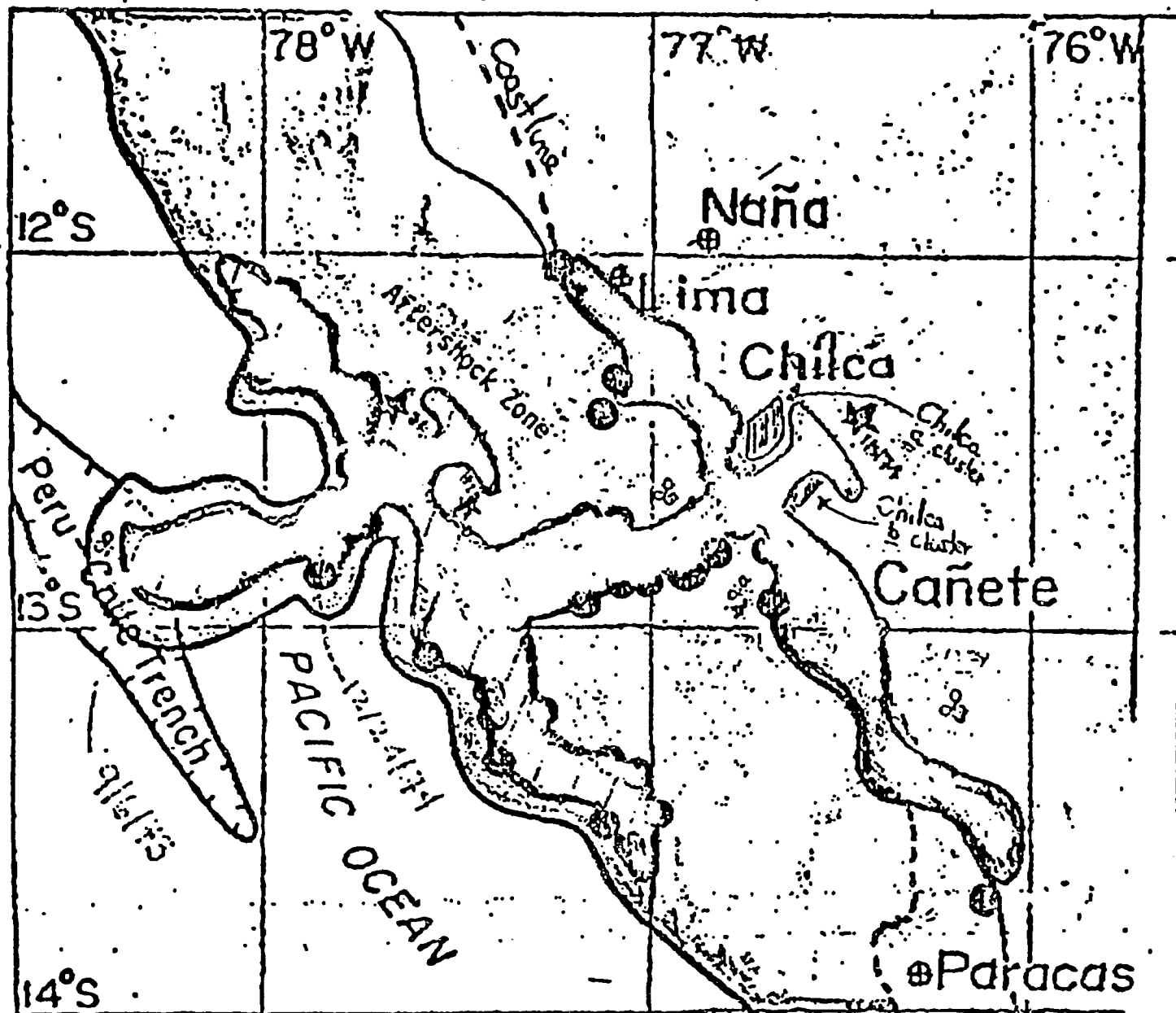


#2

USGS Local Network (10/7/74 - 11/9/74)

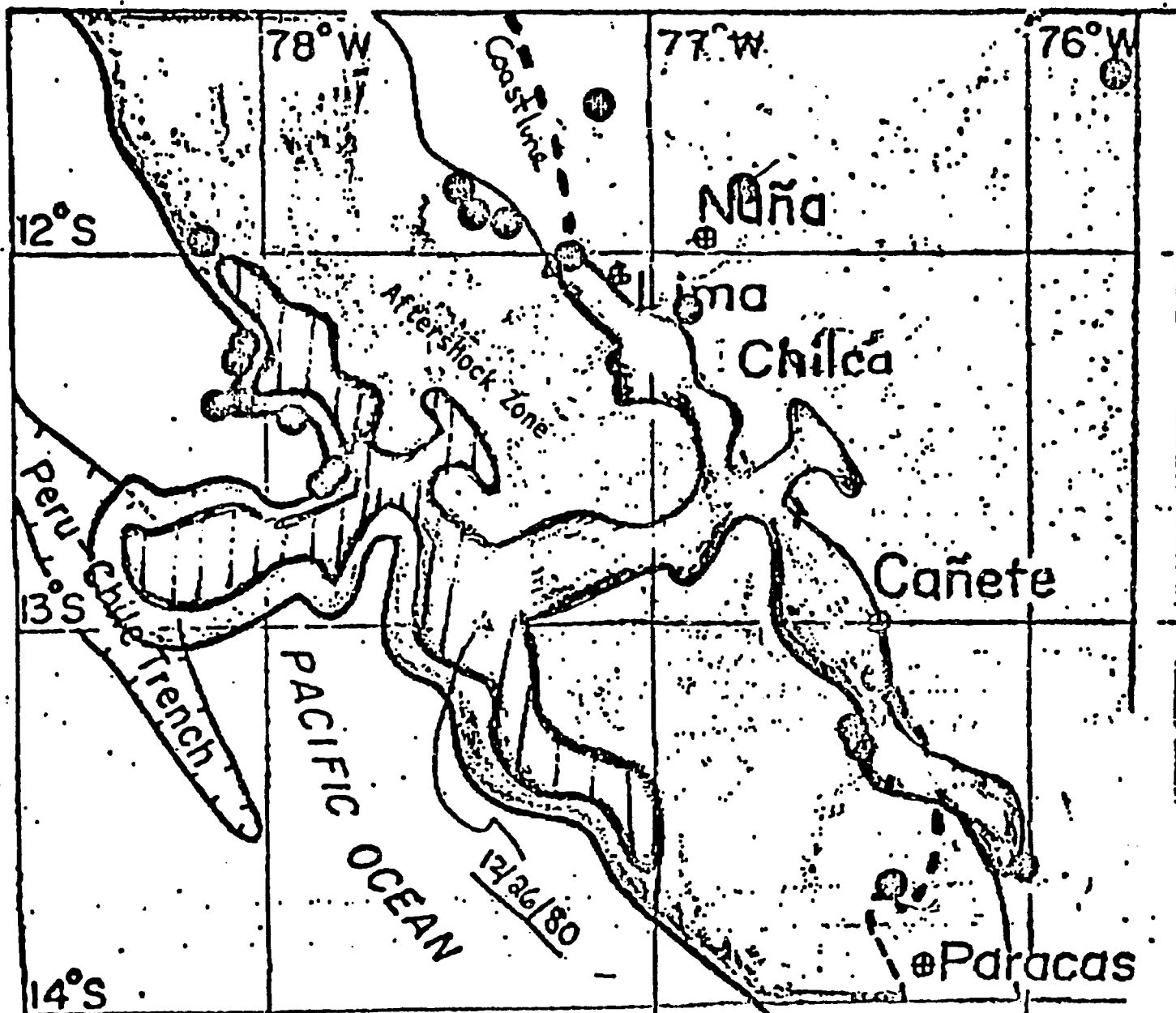
P₂⁸¹ phase

Teleseismic (9/6/73 - 12/24/74)



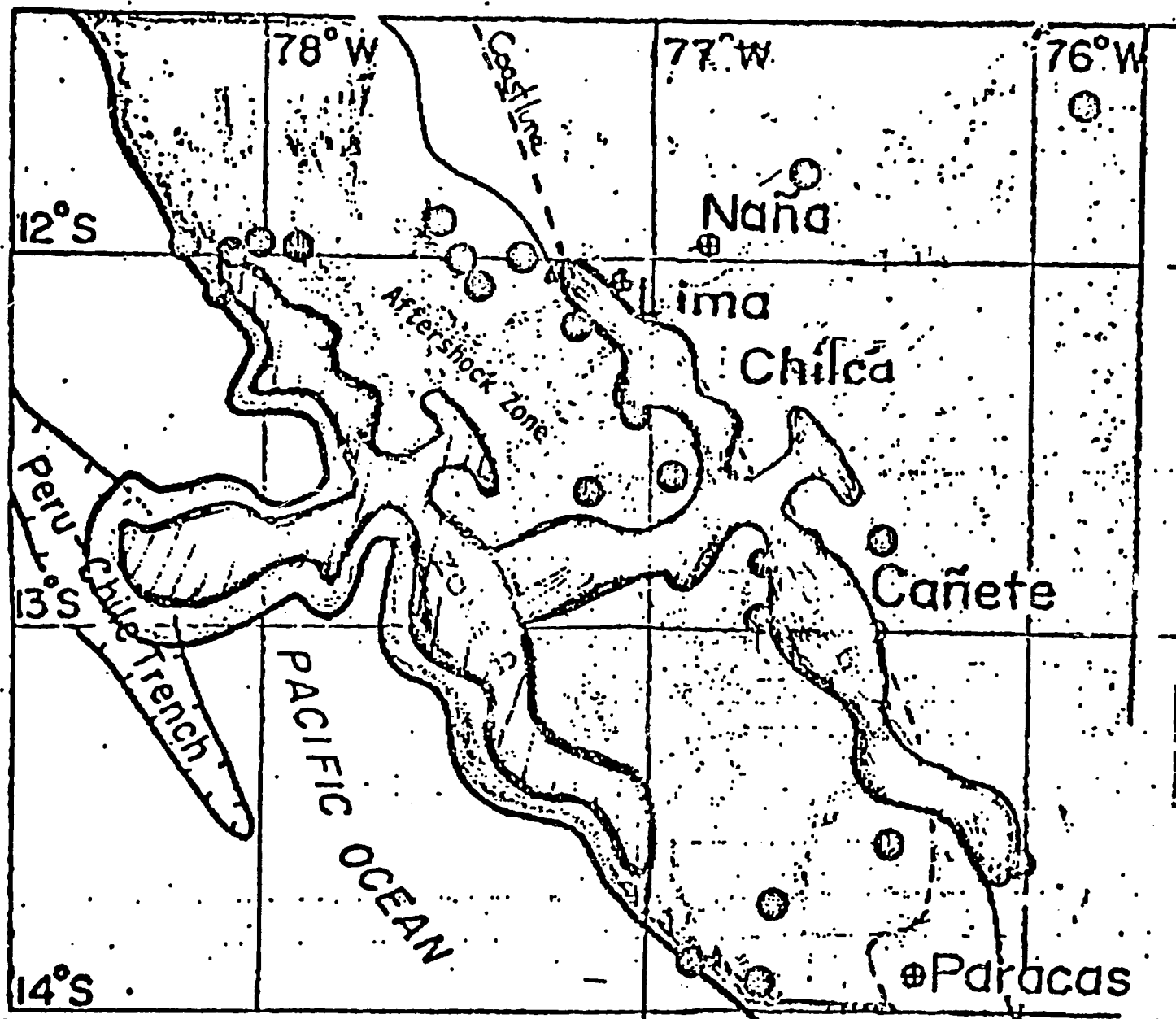
#3

Teleseismic (12/24/74 - Present).

(Q₂⁹¹ phase)

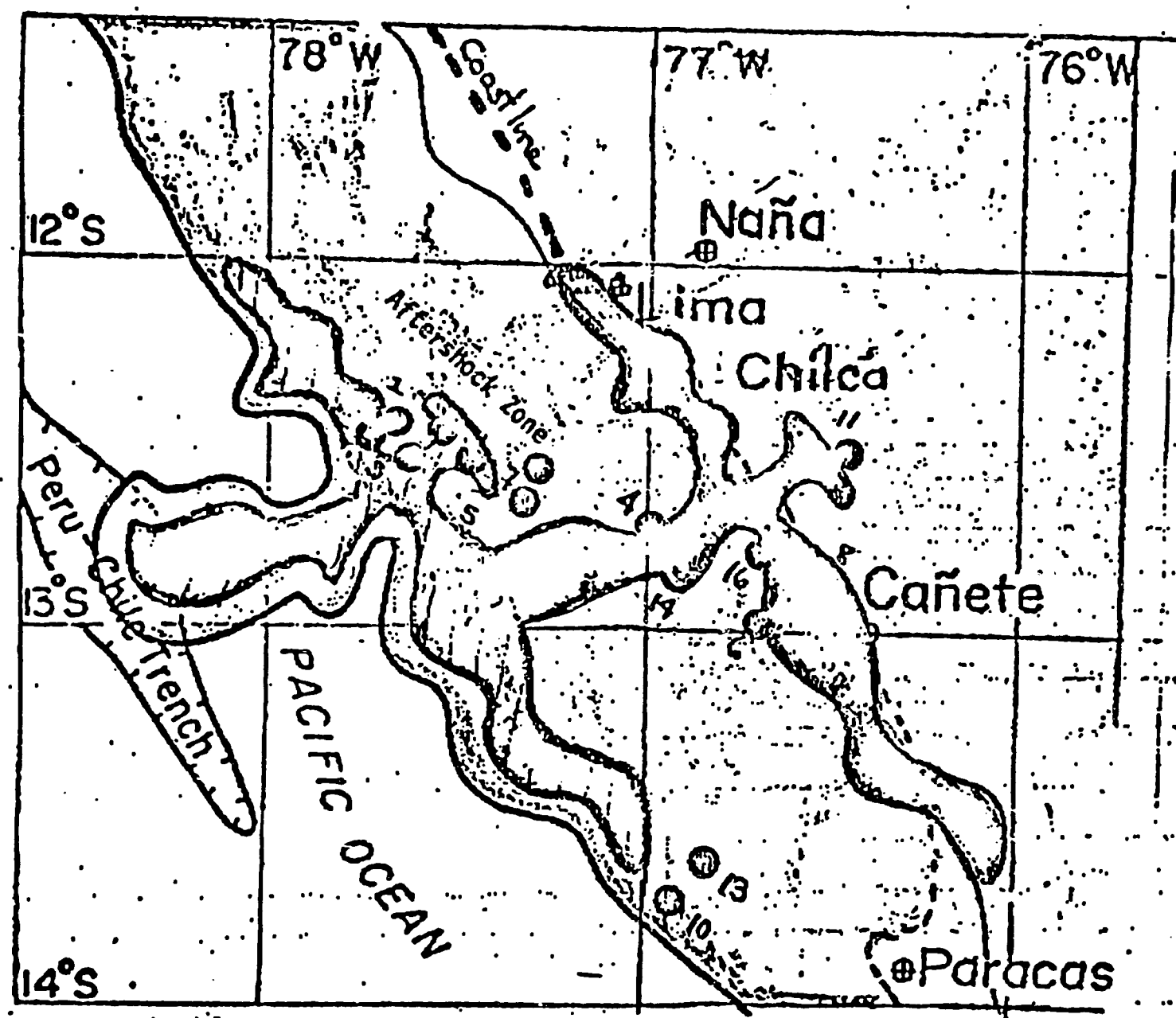
#4

Local Network (4/79 - 8/80)



#5- Fig

Local Network (P₃¹ - August 14, 1980 - Present)



UNITED STATES INTERNATIONAL DEVELOPMENT COOPERATION AGENCY
AGENCY FOR INTERNATIONAL DEVELOPMENT
WASHINGTON D C 20523

DOCUMENT NO. 117

MEMORANDUM

May 7, 1981

TO: OFDA Staff

FROM: PDC/OFDA, Dr. Martin D. Howell, *12/7/81* Director

SUBJECT: OFDA Disaster Simulation

Plans for OFDA's disaster simulation now call for the exercise to occur sometime during the work week of June 8-12, 1981. The simulation will be carried out over a continuous thirty hour period, and will resemble as much as possible the circumstances of a major earthquake occurring off the West coast of an Andean country named "La Plata." The exercise itself will be carried out on an L.O.U. basis.

During this period, please adjust your schedules for leave, TDY, conferences, etc., since all OFDA staff will be required to participate in the exercise. I have asked Alan Van Egmond to be responsible for the planning and execution of the simulation. George Beauchamp will provide technical support. They will be the only OFDA staff members who will not act as players

The firm of BDM will prepare the scenario and act as controllers. BDM will operate in such a way as to minimize any demands on the time of OFDA staff.

Please be assured that the simulation is intended to serve as a learning exercise, and will be conducted on a "no-fault" basis. I am very proud of OFDA's past accomplishments, and believe that the simulation will enhance our readiness to respond effectively and efficiently when a major disaster occurs.

Clearance:

PDC/OFDA:GMcCloskey *5/7/81* Date *5/7/81*

PDC/OFDA:AVanEgmond:bjp:5/7/81:x29755

MEMORANDUM

May 8, 1981

TO: AID/PDC/OFDA, Dr. Martin D. Howell, Director

FROM: AID/PDC/OFDA, *PFK* Paul F. Krumpe, Science Advisor

THRU: AID/PDC/OFDA, Alan Van Egmond, Assistance Director for Preparedness and Planning *AE*

SUBJECT: Proposed Agenda for Briefings on the Peru Earthquake Prediction by Dr. Brian Brady

A meeting has been set-up in the Operations Center at 9:30 a.m. on May 13 for Dr. Brady to present his current interpretation and analysis of recent Peruvian seismicity. According to Dr. Brady, the data supports his prediction of a catastrophic earthquake to occur between mid-June and early July off the coast of Peru. Dr. Brady has prepared a detailed technical memorandum presenting the data and analysis to be discussed at our meeting on May 13. An afternoon session, (2:00 - 4:00 p.m.) is scheduled to enable Dr. Jerry Hebenstriet of Science Applications, Inc. to present his analysis of potential Tsunamis generated by the events predicted by Dr. Brady. Both sessions will deal with technical considerations, but will be presented as concisely and uncomplicated as possible. There will be ample opportunity for questions and answers. The presentations will be tape recorded. Attendees invited have been carefully selected to include appropriate agency representation and expertise. (A list of attendees will be provided Monday, May 11.)

The purpose of the meeting on May 13 is to allow Dr. Brady the opportunity to present and discuss his prediction, its possible implications, and provide evidence of it's probable occurrence. The morning of May 14 (Thursday) is scheduled for additional discussions with you, the AID Administrator, and others as appropriate. The afternoon of May 14 will include a brief technical presentation at Science Applications, Inc., McLean, Virginia who are focusing on the tsunami threat.

If this agenda meets with your approval, I will finalize arrangements, inform agency representatives, and prepare an action memorandum for the Administrator to arrange a brief meeting on the morning of May 14.

MAY 11 1981

ACTION MEMORANDUM FOR THE ADMINISTRATOR

THRU: ES *PL*

MAY 11 12 27 PM '81

FROM: AA/PDC, Gordon K. Pierson (Acting).

EXECUTIVE SECRETARIAL

Problem: Dr. Brian Brady, a research physicist with the U.S. Bureau of Mines, has predicted that a series of catastrophic earthquakes will occur off the coast of Peru beginning the end of June 1981. This prediction has been formally rejected by the U.S. Geological Survey and the National Earthquake Prediction Evaluation Council. Nevertheless, the Office of U.S. Foreign Disaster Assistance is monitoring the prediction as part of its contingency planning responsibility. There also continues to be great uneasiness on the part of the Peruvian public concerning the possible occurrence of a major earthquake.

Dr. Brady will be conducting technical briefings for the AID/OFDA Director and interagency representatives concerning the present status of his prediction on May 13 and 14. Dr. Brady's visit to Washington affords you the opportunity to personally meet with him if you so desire.

Background: In two previous information memos you were informed of policy considerations, OFDA contingency planning, and activities in Peru related to the Brady prediction. Dr. Brady contends that his prediction remains on schedule.

Options: We can arrange for Dr. Brady to meet with you at your convenience on May 13th, or before noon on May 14th.

Recommendation: Your schedule permitting, I recommend that you meet briefly with Dr. Brady, Joe Wheeler, Gordon Pierson, and appropriate OFDA staff.

Approved: _____

Disapproved: _____

Date: _____

Clearance:

PDC/OFDA: MHowell *ML* Date *5/13/81*PDC/OFDA: AVanEgmond *AV* Date *5/13/81*

PDC/OFDA: PKrumpe:bjp:5/8/81:x21834

0024703

MEMORANDUM

May 12, 1981

TO: PDC/OFDA, Dr. Martin D. Howell, Director

THRU: PDC/OFDA, Alan Van Egmond, Assistant Director for Preparedness and Planning

FROM: PDC/OFDA, ^{PFK}Paul F. Krumpke, Science AdvisorSUBJECT: Attendee List for Technical Briefing at OFDA to be held on May 13 at 9 a.m.
by Dr. Brian T. Brady (U.S. Bureau of Mines)

<u>Name</u>	<u>Expertise</u>	<u>Affiliation</u>
Dr. Selwyn Sacks	Applied Geophysics	Carnegie Institution of Washington Department of Terrestrial Magnetism
Mr. Mark Spaeth	Geophysical Engineer	Tsunami Early Warning Task Force, National Weather Service
Dr. Glen Flittner	Ocean Scientist	Chief, Ocean Services Division National Weather Service
Mr. Fred Ackerson	Disaster Management	Director, Office of International Affairs, Federal Emergency Management Agency
Mr. Ugo Morelli	Disaster Research	Office of Mitigation Research, Federal Emergency Management Agency
Dr. Jerry Hebenstreit	Oceans Physicist	Science Applications, Inc.
Dr. Richard Lambert	Oceans Physicist	Science Applications, Inc.
Mr. Patrick Kujawa	Research Scientist	Science Applications, Inc.
Mr. Don McNutt	Contingency Planning	BDM Corporation
Mr. Jeff Tuten	Contingency Planning	BDM Corporation
Dr. Donald Rogisch	Research Scientist	Director, USBM Division of Research Center Operations
Mr. Robert Marovelli	Mine Safety Technology	Director, USBM Mineral Health and Safety Technology
Dr. Paul Lowman	Remote Sensing Tectonics	NASA Goddard Space Flight Center Geophysics Branch, Earth Survey Division
Mr. Peter Modley	Remote Sensing	State/INR
Mr. William Rhodes	Peru Desk Officer	AID
Mr. Ron Nicholson	Policy Coordination	AID/PPC

Lima - Peru

Mar 22 4 42 PM '81

May 14 1981

Dr. Leo Ocola
Instituto Geofísico del Perú
Ave. Armendariz 497
Miraflores

May 14 1981

Dear Leo:

Today we had a telephone conversation with Brian Brady and Paul Krumpe together in Washington. Brian had been espousing the Peru prediction to a group from several government and private agencies at an all-day meeting yesterday. They said that the trip of Dr. John Filson of USGS to Peru would probably be taking place from June 25 to July 1.

Brian is still concentrating on the "occillation" pattern of earthquakes he has recently been investigating. As usual, he is hungry for data. In particular, he reiterated some of the requests contained in my letter of May 5 to you (attached). Specifically he wants information on:

- ML 3.0 and above events
- 28 March event near Canete
- 24 April event near Lima (17:30 local)
- 25 April event between Moyobamba and Iquitos

New data Requested:

- Epicenter sheets for events of 4.0 up occurring in Ayacucho from March 1, and
- Back issues of hypocenter sheets, from IGP #1 through # 36, (you could omit numbers 28-36 as #19, on which I have record of having sent him.
- Confirmation Epicenter sheets on events reported by the press and by employees of the embassy, viz:

Paracas 10 May 6:22 AM local 3.7 Richter
 Chimbote 10 May 8:30 AM Local 5.1 Richter
 Arequipa 11 May 12:19 AM Local 3 mercalli
 Arequipa 11 May 14:10 PM Local 3 mercalli
 Lima 11 May 21:00 local
 Lima 12 May 7:30 AM local

The last two did not appear in the newspapers, at least to my knowledge.

Brian said that before going to Washington to meet the group assembled by Krumpe, he sent us a copy of the paper he was going to present. I will send you a copy as soon as it arrives.

Paul Krumpe had the following information to pass on:

-- He was working to get \$600,000 (of the \$786,000 proposal by Dr. Sachs of Carnegie Institute) obligated for FY 81 (October, 1980 to September 30, 1981).

-- The failure to set up the radio seismic station on the Islas Hormigas was distressing. If not available in Peru, his office would be keen to supply any additional technical assistance for setting up that station or for general purposes of refining data.

--A consultant could be made available on short notice to fill identified needs.

I again reiterated the difficulty the IGP was encountering in obtaining, especially the low intensity data. They are aware, but Brian needs all he can get to revalidate or call off the prediction.

Sincerely,

Alford W. Cooley
 First Secretary
 Economic Section

Att: Letter of May 5.

cc: Mr. Paul Krumpe, OFDA
 Dr. Brian Brady, US Bureau of Mines


DOCUMENT NO. 122

DEPARTMENT OF STATE
AGENCY FOR INTERNATIONAL DEVELOPMENT
Office of U.S. Foreign Disaster Assistance
Washington, D.C. 20523

May 14, 1981

NOTE

TO: Mr. M. Peter McPherson

FROM: PDC/OFDA, Martin D. Howell, Director 

Next under is a proposed memo to Al Haig on Dr. Brady's earthquake predictions. Also attached is a biography on Dr. Brady and a detailed rationale for his prediction as requested.

Attachments

UNITED STATES INTERNATIONAL DEVELOPMENT COOPERATION AGENCY
AGENCY FOR INTERNATIONAL DEVELOPMENT
WASHINGTON DC 20523

THE ADMINISTRATOR

MEMORANDUM FOR THE SECRETARY

SUBJECT: Peru Earthquake Prediction

Dr. Brian Brady, a research physicist with the U.S. Bureau of Mines, has predicted a series of great earthquakes to occur off the coast of Peru this summer. Based on available data, Dr. Brady contends that the first event will occur near Lima on or about July 6. Earthquakes of catastrophic magnitude, affecting the entire Pacific region, are predicted to follow in mid-August and late September. Dr. Brady's prediction technique is based on many years of research in the Department of Interior, Mine Safety program. He has successfully predicted mine collapse (small earthquakes) in the northern United States with the saving of many lives. In discussions with the Agency for International Development (A.I.D.), Dr. Brady explained the prediction technique and provided the attached memorandum (Tab 2) to update his Peru prediction. The discussions were attended by the U. S. Geological Survey, Carnegie Institute of Washington, Federal Emergency Management Agency, Bureau of Mines, Agency for International Development, the U. S. Geological Survey, and State representatives. The U.S. Geological Survey and the National Earthquake Prediction Evaluation Council have formally rejected Dr. Brady's theory and its application in the Peru prediction. Nevertheless, A.I.D. is monitoring the prediction as a necessary part of its disaster contingency planning responsibility. The cooperation of the U.S. Embassy in Peru has been outstanding and I am most appreciative.

M. Peter McPherson

Attachments:

- Tab 1 - Biographical Information on Brian Brady
- Tab 2 - Memo from Brian Brady to Robert Marovelli, Minerals Health and Safety Technology, dated May 7, 1981

BIOGRAPHICAL INFORMATION

BRIAN BRADY

Brian Thomas Brady was born in Cleveland, Ohio, Sept. 7, 1938.

He received his bachelor of science degree in mathematics, physics and geology from the University of Dayton (Ohio) in 1961; his master of science degree in geophysics and continuum mechanics from the Massachusetts Institute of Technology in 1964; and his Ph.D. in mathematics, physical metallurgy and mining engineering from the Colorado School of Mines in 1969.

Brady has been employed as a research scientist with the U.S. Bureau of Mines in Denver, Colo. since 1967.

His research with the Bureau of Mines has concentrated on the physics of rock failure and the prediction and control of rock bursts. He has published 46 professional papers on the subject.

Brady is married and the father of four children. He and his family live in Golden, Colo.



United States Department of the Interior

BUREAU OF MINES

P. O. BOX 25086

BUILDING 20, DENVER FEDERAL CENTER

DENVER, COLORADO 80225

May 7, 1981

Memorandum

To: Robert L. Marovelli, Director, Division of Minerals
Health and Safety Technology, Washington, DC

Through: Verne E. Hooker, Research Supervisor, Mine
Design Division, Denver Research Center

Calen G. Waddell, Research Director, *D&W*
Denver Research Center

From: Brian T. Brady, Physicist, Mine Design
Division, Denver Research Center

Subject: Status report of Peru earthquake predictions

The objective of this memorandum is to inform you of current seismicity patterns in central Peru and my interpretation of these data in light of the prediction.

The current status of the prediction is as follows. Please understand that these dates are preliminary and will be subject to change as additional data from the local Peruvian seismic network become available and evaluated during May and early June 1981. There will be at least three large events. The first event will occur on or about July 6, 1981, with a magnitude $M_w = 8.1-8.3$. This event will rupture between $12.2^\circ S$ and $13.7^\circ S$. The first shock will initiate the decoupling of the Nazca and South American plates between $12.2^\circ S-13.7^\circ S$ and will lead immediately to the final foreshock phase culminating in the August (on or about August 18, 1981; $M_w = 9.2^-$) and the September (on or about September 24, 1981; $M_w = 9.9^+$) events. The latitude limits of the August and September shocks, as described in earlier memoranda to you, remain unchanged. I still believe that the September event, should it occur, will be the largest, although further examination of the foreshocks and characteristics of the first event may lead me to revise the relative timing and magnitudes of the August and September events. Source depths of each event will be approximately 25 km. The August and September events will nucleate between $12.4^\circ S-12.7^\circ S$ latitude and $77.3^\circ W-77.6^\circ W$ longitude, that is, the approximate locations of the October 3, 1974, and November 9, 1974 events, respectively. At this time, I am not sure of the exact coordinates where the first event will nucleate, although the most probable location will be in the immediate vicinity of the second and third events.



DOCUMENT NO. 123

EMBASSY OF THE
UNITED STATES OF AMERICA

Lima

JUN 4 1 41 PM '81

1005/OFDA

May 20, 1981

Dr. Leo Ocala
Instituto Geofisico del Peru
Av. Armendariz 497
Miraflores

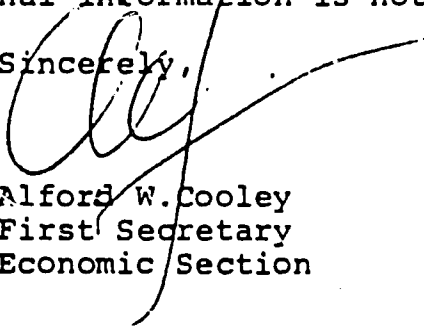
Dear Leo:

We had another telephone conversation today with Brian Brady and he is again requesting, as in my enclosed letter of May 5, specific data on the absolute location, as determined by the IGP, and the local magnitude of the 28 March earthquake. Brian would also greatly appreciate any data on any seismic event on May 3, 4, 5 or 6, occurring offshore and felt in Lima, of a magnitude of 3.0 or greater.

Finally, Brian has asked for complete IGP data for the central region, including Ayacucho, from March 1 to the present.

Because the time is growing so short, Brian needs the information as soon as it can possibly be sent so that he can refine or cancel his prediction. He is anxious to receive even preliminary data if final information is not available.

Sincerely,


Alford W. Cooley
First Secretary
Economic Section

Encl: Letter of May 5

cc: Dr. Brian Brady
Mr. Paul Krumpke, AID/OFDA

Department of State

INCOMING
TELEGRAM

PAGE 01 LIMA 05079 212222Z

9335 010917 AID7297

ACTION OFFICE DRC-01
INFO LASA-03 LADP-03 LADR-03 PDC-02 CH8-01 CH9-01 INT-04
RELO-01 MAST-01 /020 A2 X21

INFO OCT-01 ARA-16 INT-05 OES-09 /066 W
-----164460 212240Z /72 60

P 212144Z MAY 81
FM AMEMBASSY LIMA
TO SECSTATE WASHDC PRIORITY 0825

DOCUMENT NO. 124

UNCLAS LIMA 5079

DEPT ALSO PASS TO INTERIOR FOR USG

AND AID/OFDA

EO 12065: N/A
TAGS: SWEL, TPHY, PE
SUBJ: TRAVEL OF USGS'S JOHN FILSON

REF: (A) LIMA 4135, (B) STATE 123264

1. ADM. EDMUNDO MASIAS, HEAD OF PERUVIAN CIVIL DEFENSE (CD) HAS REQUESTED THAT JOHN FILSON'S TRAVEL TO PERU, WHICH WE UNDERSTAND IS BEING PROGRAMMED FOR JUNE 26 TO JULY 1, BE MOVED FORWARD TO THE END OF MAY. THIS WOULD ALLOW CD AND OTHER PERUVIAN AUTHORITIES TO CONSULT WITH FILSON AND TO MAXIMIZE THE IMPACT OF VISIT TO CALM APPREHENSIONS OF PUBLIC ABOUT THE EARTHQUAKE SERIES PREDICTED BY USBM SCIENTIST DR. BRIAN BRADY TO HIT LIMA ON JUNE 28.

2. FACT THAT BRADY HAS NOW TOLD EMBOFF THAT RECENT DATA INDICATE JUNE 14 IS THE MOST LIKELY DATE FOR THE FIRST LIMA EARTHQUAKE LENDS FORCE TO THE CD REQUEST.
CORP

21 May 81

Handwritten notes:
Bik
G.T.
PK
Info
H.H.
H.W.
K.J.
OD
PE
CS
WE

AC 10 1000

18. 12 12 01 27 180

UNCLASSIFIED

DOCUMENT NO. 125

UNITED STATES INTERNATIONAL DEVELOPMENT COOPERATION AGENCY
AGENCY FOR INTERNATIONAL DEVELOPMENT
WASHINGTON DC 20523

May 21, 1981

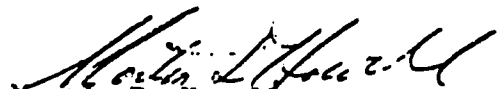
Dr. Brian Brady
U. S. Department of Interior
Bureau of Mines, Building 20
Denver Federal Center
Denver, Colorado 80225

Dear Dr. Brady:

Thank you for your most excellent presentation on your Inclusion Theory and update on your earthquake predictions. Your sincerity and dedication in data evaluation and warning of a possible danger are commendable. For the sake of potential disaster victims, we hope that your prediction is wrong -- off some hundreds of years; but it would be a tremendous accomplishment for mankind if we can one day predict with accuracy the timing of natural catastrophes.

Please keep us informed as you refine the raw data and know that we stand ready to assist you in any way possible.

Sincerely,


Martin D. Howell
Director
Office of U. S. Foreign Disaster
Assistance

memorandum

DATE: May 22, 1981

TO: Patricia E. Whitman

SUBJECT: Initial Reaction to Review of Files Re Brady Earthquake
Prediction

TO: ECON - Alford Cooley

As a layman never previously exposed to the file about Dr. Brian Brady's theories and predictions about earthquakes, I am struck by two things: first, the lack of written substantiation for his theory as applied to earthquakes and second, the lack of specific scientific objections to it.

Brady is clearly not a quack. His theories about rock failures work well enough in the laboratory and in the mine to have been the basis for evacuations which have saved lives. But nothing I have seen indicates, even in the relatively controlled areas of the laboratory or the mine how accurate his predictions (or his failures to predict) are as to occurrence, time and magnitude of rock failure. He has never predicted an earthquake which has happened. He is supposedly preparing a paper showing, retrospectively, how the pattern of events preceding several significant earthquakes substantiates his assertion that his theory on rock bursts is "scale irrelevant" and allows prediction of earthquakes as well as rock bursts. This is not ready for publication.

Because Brady has not presented his theory in writing, complete with data, to the scientific community for evaluation, the scientific community does not endorse it. This is of course completely reasonable and lack of a written theory certainly explains lack of specific objections to it. But the scientific community seems to have gone further and denounced the theory. This is not reasonable. The theory's validity, or lack thereof, does not depend upon its being written down. Unfortunately, substantiation seems to depend largely on whether Lima survives September, 1981.

So let us, as laymen, assume for the moment that Brady's theory and his assertion that it is "scale irrelevant" are basically correct. There are still a multitude of reasons to doubt its precise application to Peru. First, the quality of the data--especially the data on which Brady based his original prediction in 1976. Second, the interpretation of the data. Spence, Brady's co-theorist, "parted intellectual company" with Brady when Brady accepted a series of seismic events different from what he had predicted (events in the range of 3.2 rather than 4.5), as fitting his model. Third, the



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OPTIONAL FORM NO. 10
(REV. 7-76)
GSA FPMR 41 CFR 101-11.6
5010-112

the fact that Brady himself says the theory "is still in the developmental stage." Since this is Brady's first attempt to predict a major earthquake, perhaps Brady is treating Lima as an eager neurosurgeon might treat the first lucky recipient of a brain transplant. Brady also says the theory is "quite complex". As a layman, I see every complexity as an opportunity for error.

ECON:PWhitman:fb

UNITED STATES INTERNATIONAL DEVELOPMENT COOPERATION AGENCY
AGENCY FOR INTERNATIONAL DEVELOPMENT
WASHINGTON D C 20523

May 29, 1981

Dr. Donald G. Rogich
Director, Research Center Operations
Department of Interior
U. S. Bureau of Mines
241 E. Street, N. W.
Washington, D. C. 20241

Dear Dr. Rogich:

Thank you for recently allowing Dr. Brian Brady to visit Washington to present an analysis of his Peru earthquake prediction at the Agency for International Development (AID). Dr. Brady's sincerity and dedication in updating the prediction and warning of a possible catastrophe are commendable. His technical briefing was outstanding and was well received by agency representatives and others present. Certainly he reflects great credit on the Bureau.

Although we hope this specific prediction is wrong--off by several hundreds of years; it would be a tremendous accomplishment if we can someday predict, with accuracy, the occurrence of earthquakes. Your cooperation in helping the Office of U. S. Foreign Disaster Assistance staff in better understanding Dr. Brady's prediction methodology is greatly appreciated. As part of AID's contingency planning responsibility, we will continue to maintain close liaison with Dr. Brady as we approach the times of the predicted events.

Sincerely,

Martin D. Howell
Director
Office of U. S. Foreign Disaster
Assistance

1981

CUMULATIVE RECORD OF TRANSMISSIONS

Amemb Lima to Dr Brady

DOCUMENT NO. 128

50-10

TRANSMISSION
DATE

ITEM.

- 4 Mar 16P #19 - 4 Mar, 10h, 20m 57s, 12.25°S, 77.40°W, ↓ 25 km M_L 4.0.
Feb-MAR 2 or 3 earthquake data sheets for 16P
10 MAR letter from Mateo Casaverde
27 Mar Newspaper article on ARIKA QUAKE (6 Mar)

1 Apr. 16P Monthly Bulletin for Nov, Dec, Jan, Feb

3 Apr 16P #28 revised epicenter 31-III-81, 15°25'S, 76°0'W, 33 km deep (M_L 4)

31 Mar Telecon (Coolay-Brady)

8 April Telecon (Lambert, JS, ANC - Brady)

13 April. 16P #29

14 April 2 Telecons [Coolay-JS - E.L. - Brady]

" " 16P #30 prelim. 13 April - 12h, 34min, 0.6 sec, 15°4'S, 75.8°W, ↓ 25 km M_L 3.5

14 April Article on Thunderstorm

20 April 16P - #30 + 31. 31 + 32

21 April 16P - #32 + 33. 33 + 34

(16P) Krumpal

Telecon w/ Spencer

28 April Iquitos Epicenter (not analyzed)

4 May Telecon w/ Krumpal, w/ Brady

5 May 16P's 35 + 36 prelim. to Brady, Krumpal.

→ 29-IV, 12h 4.12.3, 15.5°S, 75.8°W M_B 4.0

→ 3-V, 12h 18m 36s, 14.8°S 76.3°W M_L 3.7

- 5 May Telecon w/ Krumpal, w/ Ocola, letter to Ocola asking 13B's q's 95 May, Brady, Krumpal

9 May 16P 27 prelim. - 20 Mar, 14h 58m 44.0 sec / 11.3°S, 75.7°W - 100 km ↓

9 MAY 16P 34-A ^{M_L 3.4} - 24 April, 22h 09m 21.4s / 12.1°S, 77.3°W - 72 km ↓
^{4 stations}

9 MAY 16P 35 ^{M_L 3.5} - 3 stations

EARTHQUAKE

26 April 1981

9:36 AM, local time (= E.S.T.)

Epicenter: 270 km NE of Moyobamba,
San Martín Dept.

(= 200 WSW of Iquitos)

Mag: 6.5 Richter

"Magnitude at Epicenter = 7.0"

3 stations recording.

Source: - Newspaper report - confirmed by Dr. Ocola of
I.G.P. by telephone to US Embassy 27 Apr

Additional info from Golden, Colo - via Paul
Kramer, OFDA

Depth - 100 km

Coords - $3.7^{\circ}S$, $76.5^{\circ}W$

→ Telephoned to Paul Kramer on 27 April.
Sent to B Brady on 28 April.

epicenters recorded by M. Camacho, IGP.
on May 20 1981

PAPACAS

JUN 4 1 42 PM '81

10 MAY 1981 06:22 Local, UFDA

S.9 Pisco

3.7 local magnitude

3 stations reporting

10 May 1981 08:57 local

CHICLAYO

(= "Parasmayo")

5.0 local magnitude.

CHIMBOTE

18 May 02:17 local

near Casma / Huarmey (coastal towns S. of Chimbote)

4.8 M_L

2 stations reporting

Copied to B. G. S. +
P. K. M. P.

20 MAY 81

CHIMBOTE

18 MAY 1981, 02:17 local

250 km NNE of Lima
(in ocean off Chimbote)

5 Richter

SOURCE - IGP, reported in newspaper

Station at Islas Hormigas
Still not functioning - 19 May

PARACAS

10 May

242 km S. of Lima

3-5 Richter

(ca 85 km W of Isla Tumbes -
clavija, Ica Prov. Ica Dept
Ani Goley. est)

PACASMAYO

10 May

656 km N. of Lima

5.1 Richter

Near PACASMAYO, port is La Libertad.
~~San Martín Dept~~
~~San Martín Dept~~
~~San Martín Dept~~

Source: Newspaper 19 May 81

all 3 confirmed orally
with Dr Daniel Hueso-IGP

to Paul Krumpal + Brian Brady - 19 May 1981

Will send
IGP "epicenters"

BRIAN

PRELIMINAR HYPOCENTER

27

QUAKE N° : 027-IGP/81
DATE (U.T.) : March 20, 1981
ORIGIN TIME (U.T.) : 14 h 58m 44.0 sec
LATITUDE : ° S 11.3
LONGITUDE : ° W 75.7
DEPTH : Km 100
MAGNITUDE : M_L 3.4
N° REPORTING STATIONS: 4

.....
S. E. S. - DICGA
DATE: May 06, 1981

MAY 27 11 58 AM '81
PUS/UFDA

rec'd US Embassy 9 May 81 - forwarded to Brady & Krumpal 9 May


approx in Tama City, Tama Prov., Tama Dept.

Ad Cooley

REVISED EPICENTER

34 A

QUAKE N° : 34 A - IGP/81
 DATE (U.T.) : April 24, 1981
 ORIGIN TIME (U.T.) : 22 h 09m 21.4 sec
 LATITUDE : ° S 12.1
 LONGITUDE : ° W 77.3
 DEPTH : Km 72.0
 MAGNITUDE : M_L 3.5
 N° REPORTING STATIONS: 3
 REVISION N° : 1°


 S. E. S. DICGA
 DATE: May 06, 1981

rec'd US Embassy 9 May 81 forwarded to Brady + Krumpe 9 MAY
~~information~~
 approx on Isla San Lorenzo (off Callao) - AntCoaly

4:09 UT: this wd. = 5:09 PM Lima time — i.e. it's the quake two
 embassy people ~~that~~ felt & one thought happened
 "around 5:30"

PRELIMINAR HYPOCENTER

QUAKE N° : 035-IGP
DATE (U.T.) : April 29, 1981
ORIGIN TIME (U.T.) : 18 h 04m 12.3 sec
LATITUDE : ° S 15.5 °
LONGITUDE : ° W 75.8°
DEPTH : Km 33 or shallower
MAGNITUDE : M_B 4.0
N° REPORTING STATIONS: 5

21
S. E. S. - DICGA
DATE: 04.05.81.

rev.1 C.O.B 4 May - Amending Limit

sent 5 May to: DFDA - Krumpal
Bumines - Brady

Location is roughly 60 km due West of San Juan
(Mancora), Nazca Province, Ica Dept.)

AW Cookley

-INSTITUTO GEOFISICO DEL PERU

SECTOR EDUCACION

Apartado 3747 - Lima 100 - Perú

Telfa. 477247 - 477254 - 471778

LA LIMA-PIURA-LIMA

Lima, 1° de Junio de 1981

Mr. Alford W. Cooley

Primer Secretario para

Asuntos Económicos y Comerciales

Embajada de los Estados Unidos

de América

PRESENTE

Acuso recibo de sus comunicaciones de fechas 20.05.81 y 14.05.81 y de la copia del memo del Dr. E. Brady del 7 de Mayo de 1981.

En vista que más y más queda asociada la Dirección Científica de Geofísica Aplicada a la documentación del seguimiento de los eventos sísmicos predichos por el Dr. I. Brady, veo por conveniente de jar establecida mi posición, como geofísico, ante la predicción de los eventos de Lima, así como el grado de compromiso futuro que implica el apoyo al seguimiento de la hipótesis.

En diferentes oportunidades desde 1976, los Drs. E. Brady y W. Spence, proporcionaron la oportunidad de analizar y discutir por largas horas algunos aspectos e implicancia de la hipótesis que ellos preconizaban. Estas reuniones fueron complementadas con los beneficios de haber asistido a dos de sus exposiciones científicas integradas de la hipótesis.

Tanto el Dr. Brady como el Dr. Spence saben concretamente cuál es mi posición. Sin embargo, aún no la he puesto por escrito, lo cual creo que es conveniente hacerlo dado el grado de participa -- ción que actualmente la Dirección a mi cargo mantiene en el proce -- so de seguimiento de la hipótesis.

Veo con simpatía la introducción de los tres criterios físicos la estabilidad-inestabilidad mecánica y termodinámica de los procesos naturales internos, así como el esfuerzo de describirlos en su nivel más general posible, utilizando un aparato matemático similar al de la 'teoría general de la relatividad de Eisten. Hasta aquí, por lo menos conceptualmente, no hay mayor discrepancia. Donde sí discrepo es en la relación de fechas secuenciales coincidentes con ciertos sismos y no con otros que ocurren dentro de la misma zona epicentral durante la 'supuesta' etapa de preparación.

La evolución de la etapa de preparación, quedará descrita correctamente y será verificable por la ocurrencia de eventos si es que :

- i) El aparato matemático propuesto describe correctamente los fenómenos naturales que ocurren en la zona sísmogénica.

INSTITUTO GEOFISICO DEL PERU

SECTOR EDUCACION

Apartado 3747 - Lima 100 - Peru

Tel/a. 462347 - 477254 - 471773

- ii) Se caracteriza apropiadamente el medio que se deforma.
- iii) Se identifican las condiciones de 'frontera o borde' correctas.
- iv) Se establecen cuáles son las condiciones iniciales (tiempo) del proceso.

A la fecha, no conozco cuáles son sus condiciones de bordes ni las iniciales que el Dr. Brady ha utilizado, ni mucho menos he visto ni una solución general o una formulación significativa de las ecuaciones generalizadas que permitan identificar los eventos en tiempo-espacio e indicar a la proximidad de la etapa final: la ocurrencia del sismo mismo.

Si no se cuenta con lo descrito líneas arriba, evidentemente, sólo queda la intuición para seleccionar las 'fechas' de la secuencia, y esto es un procedimiento no muy científico. Aún cuando concorde mos con K. Feynman cuando dice: "We have found it of paramount importance that in order to progress we must recognize the ignorance and leave room for doubt. Scientific knowledge is a body of statements of varying degrees of certainty - Some most unsure, some nearly sure, none absolutely certain" ('The Value of Science'). Evidentemente la hipótesis en cuestión es de los 'most unsure'.

Al convenir la cooperación de la DICGA con Ud. para continuar suministrando datos sísmicos al Dr. E. Brady fue en la base de "Unselfish Cooperation in Research" (AGU). Para que el Dr. Brady viera culminada su inquietud científica, más no para que como resultado de la investigación se de una alarma pública, ni que se pretenda salvar al Perú de los efectos del sismo catastrófico. Con siderando el nivel de certeza de la predicción, la experiencia de las agencias gubernamentales para manejar alertas de las predicciones sísmicas, el grado de preparación de la población en general para actuar en respuesta a una alerta: el 'cataclismo' que causaría una alerta pública sería quizás peor que los efectos del fenómeno mismo. Por este motivo, esta Dirección colabora con Ud. y el Dr. Brady única y exclusivamente bajo los lineamientos de la investigación científica.

Asimismo, deseo reiterar que siendo el área de preocupación la de Lima y vecindades y teniendo en cuenta lo establecido por la hipótesis del Dr. Brady durante la gestación y ocurrencia del evento sísmico: Evento netamente local, la información que remitiremos a Ud. será la pertinente a la zona crítica de la costa central del Perú.

INSTITUTO GEOFISICO DEL PERU

SECTOR EDUCACION

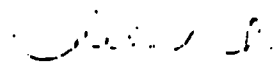
Apartado 5747 - Lima 101 - Peru

Telfs. 42347 - 477254 - 471778

Quiero asimismo aclarar la información de la página 3, párrafo segundo, líneas 6-8 del memo del 17.03.61 del Dr. Brady. Las magnitudes que se publican no son datos finales. Estas son rutinariamente calculadas por nuestro Departamento de Servicio y Estadística Sísmica, salvo cuando hay un pedido específico.

Es propicia la oportunidad para expresar a Ud. los sentimientos de mi especial consideración más distinguida.

Atentamente,


Leonidas Ocotea
Director DIOGA

LO:ma

CC: Jefatura IGP

X

Lima, Peru

-W. B. Krumpke

-OFDA

June 2, 1981

Dr. Brian T. Brady
Dept. of Interior
US Bureau of Mines
Denver Federal Center
Building 20
Denver, Colorado 80225

Dear Brian:

You know full well how difficult it has been to get data from the IGP lately. Yesterday, at Paul Krumpke's suggestion, Pat Whitman went down to the IGP and camped out on them until she got the enclosed data. In the main they are bulletins put out by IGP from November 1980 through April 1981. Please note that the April Bulletin is only in draft form. The May Bulletin will probably not be available for another week, though we have stressed how urgently you need the data and how little time remains before the date of the first predicted event.

We will continue to press for the data and we will give whatever data we get to Paul Krumpke by telephone for him to pass on to you.

A letter from Leo Ocola just arrived concerning your 7 May paper and is attached.

Sincerely,

Alford W. Cooley

Encl. Boletins Sismicos for
Nov. 1980 - April 1981

cc: Mr. Paul Krumpke, AID/OFDA

Ed. Note

The Letter from Leo Ocola to Mr. Cooley to which this letter refers, and which is dated June 1, 1981, appears under that date in this volume.

File # 409347 - 477254 - 17.774

Lima, 3 de Junio de 1951

For the purpose of this study, the following hypotheses were formulated:

1. A. B. C. D. E. F. G. H. I. J. K. L. M. N. O. P. Q. R. S. T. U. V. W. X. Y. Z.
2. A. B. C. D. E. F. G. H. I. J. K. L. M. N. O. P. Q. R. S. T. U. V. W. X. Y. Z.
3. A. B. C. D. E. F. G. H. I. J. K. L. M. N. O. P. Q. R. S. T. U. V. W. X. Y. Z.
4. A. B. C. D. E. F. G. H. I. J. K. L. M. N. O. P. Q. R. S. T. U. V. W. X. Y. Z.

and, eventually, a sequence of non-increasing positive integers p_i such that p_i converges to 0, then $\lim_{i \rightarrow \infty} p_i = 0$. In fact, p_i is a positive integer, and, hence, $p_i \geq 1$ for all i . Therefore, p_i is bounded below by 1, and, hence, p_i converges to 0.

As previously reported, the mean expected number of children per woman is 2.15, and the expected number of children per woman is 1.55.

2000

1. The first group of people who are interested in the results of the study are the researchers themselves. They want to know if the study was successful in achieving its objectives and if the data collected is reliable and valid.

10:55

ROUTING AND TRANSMITTAL SLIP		Date	
TO: (Name, office symbol, room number, building, Agency/Post)		Initials	Date
1. OFDA - Paul Krupa			
		JUN 12	11 37 AM '81
2.			100 / OFDA
3.			
4.			
5.			
Action	File	Note and Return	
Approval	For Clearance	Per Conversation	
As Requested	For Correction	Prepare Reply	
Circulate	For Your Information	See Me	
Comment	Investigate	Signature	
Coordination	Justify		

REMARKS

④ - We have told IGP
 that we'd tell the IGP
 if Brady gave out
 any alert of a major
 quake -

DO NOT use this form as a RECORD of approvals, concurrences, disposals, clearances, and similar actions

FROM: (Name, org. symbol, Agency/Post)	Room No.—Bldg.
Lim: ECON - Alf Cools	Phone No.

5041-102

U.S. GPO: 1975-281-647/2210

OPTIONAL FORM 41 (Rev. 7-76)
 Prescribed by GSA
 FPMR (41 CFR) 101-11.206

MEMORANDUM

JUN 12 10 26 AM '81 June 12, 1981

TO: AID/OFDA, Dr. Martin D. Howell, Director ~~OFDA~~

THRU: AID/OFDA, Alan Van Egmond, Assistant Director for Disaster Preparedness

FROM: AID/OFDA, Paul F. ^{PFK}Krumpe, Science Advisor

SUBJECT: Update on the Status of the Peru Earthquake Prediction by Dr. Brady

Dr. Brady has received data sets for the months March thru May from the Geophysics Institute of Peru (IGP). This has been accomplished with the assistance of Mr. Alf Cooley of the AmEmbassy who has sent three memos to the IGP detailing Brady's requests for location and magnitude of all seismic events in the central region above $M_1 = 3.0$.

Dr. Brady also has obtained preliminary seismic data for the month of June to the present. Frequent telephone contact with Mr. Cooley, Ms. Pat Whitman, and Mr. John Jurecky is now necessary to ensure daily transfer of reported events to Dr. Brady for his analysis.

Dr. Brady has reported that the most likely period for the first event ($M=8.3$) extends from June 13 thru July 10. Based on the receipt of the most recent seismic data, Dr. Brady now believes the "preferred" date is on or about June 15. He has also mentioned June 16-17 as likely timeframe. He is most concerned about accessing low magnitude events data in "real-time" (i.e. daily). This can be accomplished by daily calling the Embassy for information.

On April 27 Brady told me he expected an event in the target zone on or about May 3-6. The Embassy was asked to check with IGP on felt seismicity during this period. Nothing was reported. However, the USGS in its May 30th bulletin of worldwide determination of epicenters, has reported a May 6 earthquake in the target zone. This fact does not prove anything, however it lends support to Brady's interpretation of recent seismicity in light of the prediction of large earthquakes to possibly occur this summer. As you know, he "predicted" a May 23 event in the target zone which "occurred" on May 20 and has led to the revised preferred date of the first event to be on or about mid-June.

Other information which may tend to corroborate Brady's "preferred" time for the first event include: 1) an apparent abnormal increase in the presence of fleas in Lima. This occurrence was observed in Arica in 1868 just prior to a large ($M=9.0$) earthquake on August 8. 2) ants have been reported swarming out of the ground during the last few days (it is the dormant season, winter, in Peru). 3) within the target zone seismicity appears to be very low in magnitude and frequency, however, along the boundary of the primary aftershock zone (inland up and down the coast) a significant increase in teleseismic events began the first week in June. This appears consistent with statements made by Dr. Brady in his recent memo (May 7). None of the above prove the earthquake will happen as predicted or is imminent. However, abnormal animal behavior has been observed prior to large earthquakes. Dr. Brady, in my opinion, has "predicted" several of the smaller events in the target zone prior to their occurrence. This was discussed at his briefing last May 13th at which he emphasized the need for low magnitude event data in "real-time"



United States Department of the Interior

Page 1 of 2

BUREAU OF MINES

P. O. Box 2296

BUILDING 20, DENVER FEDERAL CENTER

DENVER, COLORADO 80225

June 19, 1981

Memorandum

To: Donald E. Foglich, Director, Research Center Operations, Columbia Plaza, Washington, D.C.

Through: Verne E. Hecker, Research Supervisor, Mine Design Division, Denver Research Center

Calvin C. Waddell, Research Director, Denver Research Center

From: Brian T. Brady, Supervisory Physicist, Mine Design Division, DMC

Subject: Current Status of Predicted First Peruvian Event

I believe at this time that the first event in central Peru will occur between June 26 and June 30, 1981. This latest revision is based on the addition of data obtained recently from the Peruvian local network. These data include the occurrence of an event ($M_L = 2.8$) west of Cuzco on June 3, 1981. I believe this event corresponds to one of the last iteration cycles for the first mainshock. As I discussed last week with you, I had originally thought that the May 30, 1981, event ($M_L = 2.5$), also occurring W-NW of Cuzco, marked the initiation of an iteration cycle.

There have been no reported events in the epicentral zone (11.8°S - 14.3°S) since the June 3 event. I have been informed by the American Embassy in Lima that extreme quiet now prevails in this region. This quiet apparently includes any felt earthquakes. This quiet may indicate that the threshold ($M_L = 2.0$) of the local network is too high to detect the occurrence of any events occurring within the epicentral region. Please note that in my May 7 memorandum to Robert L. Marovelli I indicated on page 8, last paragraph, that extreme quiet will prevail in the region in the weeks preceding the first event. In the absence of data from other geophysical indicators, such as changes in radon flux, strain rates, etc., I must rely on the recent period of extreme seismic quiescence as the best suggestion of impending failure.

If the first earthquake does not occur by June 30, 1981, I must conclude that my interpretation of space time seismicity patterns in central Peru is in error and, accordingly, the probability of the occurrence of the predicted earthquakes in Peru this summer will be lessened considerably. If the first event does not occur by July 10, 1981, I will formally withdraw the prediction and will prepare a statement to be transmitted to Dr. Alberto Ciraacks on that date.

Bna7

Brian T. Brady

37/265

June 1981

PRELIMINARY HYPOCENTER

QUAKE N° : 62-16P/81
DATE (U.T.) : 16.06.81
ORIGIN TIME (U.T.) : 23:54:02.0
LATITUDE : 13.1 ° S
LONGITUDE : 74.1 ° W
DEPTH : 25 Km or shallower
MAGNITUDE : 3.8 M_L
N° REPORTING STATIONS : 5



[Signature]
S.I.S. - DICCA
Date: 240681

INSTITUTO GEOFÍSICO DEL PERÚ
SECTOR EDUCACION
Av. Amadoriz 497 - Miraflores
PERÚ

PALLIMINAR HYPOCENTER

QUAKE N° : 63-16P/01
DATE (U.T.) : 1806:81
ORIGIN TIME (U.T.) : 07:14:37.0
LATITUDE : 8.4 ° S
LONGITUDE : 75.0 ° W
DEPTH : 100 Km or shallower
MAGNITUDE : 5.2 M_L
N° REPORTING STATIONS : 6



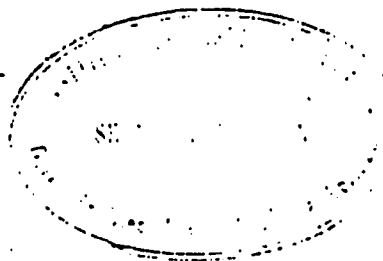
PJ

S.I.S. - DICGA
Date: 2406/7

INSTITUTO GEOFISICO DEL PERU
SECTOR EDUCACION
A. . Amadoriz 497 - Miraflores
• • PERU • •

PRELIMINAR HYPOCENTER

QUAKE N° : 64-160/81
DATE (U.T.) : 20.06.81
ORIGIN TIME (U.T.) : 15:12:32.0
LATITUDE : 14.0° S
LONGITUDE : 76.6° W
DEPTH : 25 Km or shallower
MAGNITUDE : 3.5 M_L
N° REPORTING STATIONS : 5



[Signature]
S.I.S. - DICGA
Date: 240681

INSTITUTO GEOFISICO DEL PERU
SECTOR EDUCACION
Av. Amadoriz 497 - Miraflores
• • PERU • •

PRELIMINARY HYPOCENTER

QUAKE N° : 65-162/81
DATE (U.T.) : 21.06.81
ORIGIN TIME (U.T.) : 10:30:01.8
LATITUDE : 21.2° S
LONGITUDE : 71.6° W
DEPTH : 25 Km or shallower
MAGNITUDE : 5.8 M_L
N° REPORTING STATIONS : 7




[Signature]
S.I.S. - DICGA
Date: 240681

INSTITUTO GEOLOGICO DEL PERU
SECTOR EDUCACION
A. A. Amadoriz 497 - Miraflores
PERU

PRELIMINAR HYPOCENTER

QUAKE N° : 66-18P/81
DATE (U.T.) : 21.06.81
ORIGIN TIME (U.T.) : 06:59:00.0
LATITUDE : 4.7 ° S
LONGITUDE : 76.4 ° W
DEPTH : 60 Km or shallower
MAGNITUDE : 5.7 M_L
N° REPORTING STATIONS : 7

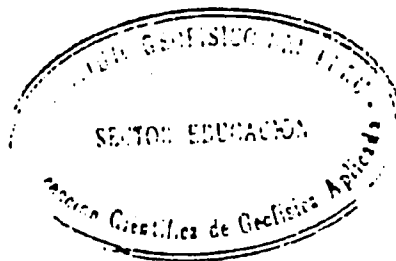



S.I.S. / DICGA
Date: 2406/81

INSTITUTO GEOLOGICO DEL PERU
SECTOR EDUCACION
A. A. Amadoriz 497 - Miraflores
PERU

PRELIMINARY HYPOCENTER

QUAKE N° : 67-16P/81
DATE (U.T.) : 22.06.81
ORIGIN TIME (U.T.) : 07:12:44.7
LATITUDE : 15.5° S
LONGITUDE : 76.0° W
DEPTH : 25 Km or shallower
MAGNITUDE : 4.6 M_L
N° REPORTING STATIONS : 6

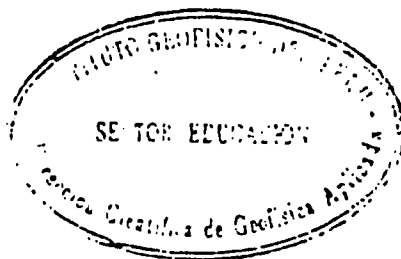


[Signature]
S.I.S.- DICGA
Date: 2408H

INSTITUTO GEOFÍSICO DEL PERÚ
SECTOR EDUCACION
A. . Amendarias 427 - Miraflores
• • PERU • •

REVISED HYPOCENTER

QUAKE N° : 68-169/81
DATE (U. T.) : 22.06.81
ORIGIN TIME (U. T.) : 17:53:13.5
LATITUDE : 13.2 ° S
LONGITUDE : 74.4 ° W
DEPTH : 10 Km
MAGNITUDE : 5.8 M_L
N° REPORTING STATIONS : 9
REVISION N° : 1



[Signature]
S. E. S.-DICGA
Date : 24.06.81

INSTITUTO GEOFISICO DEL PERU
SECTOR EDUCACION
Av. Armendariz 497 - Miraflores
* * PERU * *

PRELIMINARY HYPOCENTER

QUAKE N° : 69-16P/81
DATE (U.T.) : 23.06.81
ORIGIN TIME (U.T.) : 02:28:17.4
LATITUDE : 13.3 ° S
LONGITUDE : 74.4 ° W
DEPTH : 15 Km or shallower
MAGNITUDE : 5.0 M_L
N° REPORTING STATIONS : 2



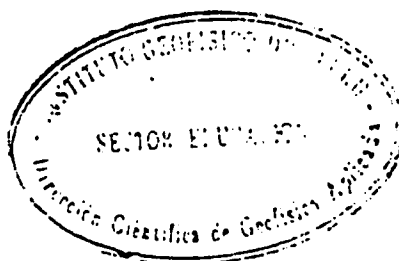
[Signature]

S.I.S. - DICCA
Date: 24.06.81

INSTITUTO GEOLÓGICO DEL PERU
SECTOR EDUCACION
A. Amadoriz 497 - Miraflores
• • PERU • •

PRELIMINAR HYPOCENTER

QUAKE N° : 70-16P/H
DATE (U.T.) : 23.06.81
ORIGIN TIME (U.T.) : 06:49:34.0
LATITUDE : 13.2 ° S
LONGITUDE : 74.3 ° W
DEPTH : 15 Km or shallower
MAGNITUDE : 3.7 M_L
N° REPORTING STATIONS : 6



[Signature]

S.I.S. - DICGA
Date: 240681

INSTITUTO GEOFÍSICO DEL PERÚ
SECTOR EDUCACION
Av. Amadoriz 497 - Miraflores
• • PERU • •

UNITED STATES GOVERNMENT

Memorandum

TO : PDC/OFDA, Dr. Martin D. Howell

DATE: JUN 22

FROM : AAA/LAC, *Edward W. Coy*
Edward W. Coy

SUBJECT: Proposal to Furnish Seismic Monitoring Equipment to Peru

On June 19, I saw a copy of the proposed PIO/T covering the furnishing of equipment and technical assistance to the Geophysics Institute of Peru at a cost to A.I.D. of over \$700,000.

In February, Mr. Van Egmond and Mr. Krumpe of your office, met with me to discuss such a proposal. At the end of that meeting, I thought there was a consensus that the proposal was not appropriate for A.I.D. funding, although a more modest program of technical assistance might be reasonable. It is true that Peru has a long history of earthquakes, but much of the West Coast of South America and Central America has a similar history. Assistance to a single technical institute might well generate many requests from similar institutions around the world. Unless this proposal is part of a coordinated plan for worldwide collection and reporting of data, it appears to be too much assistance to one country to do what that country could readily do for itself if the authorities in that country perceived the same level of threat.

I strongly support modest, low key technical assistance efforts to assist countries to improve their organizational capability to deal with the various natural disasters which beset them. However, before we undertake a massive program of sophisticated equipment drops, it seems to me we should carefully consider the eventual worldwide cost implications and whether A.I.D. has or wants to have the technical capability



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-2-

to handle such a program. In view of the sad history of the Brady affair, singling out Peru for an equipment project only tends to reopen a controversy we have been trying to close.

CC: PPC/PB:RNicholson

Clearance:

STATE/ARA/AND:JAPurnell (Draft)

FDCC WSH

22 June 1981

FDCC WSH

2234173 R 1-13-01-068081 TWX SVC 7108221900
 OATUIJAZ RUWLSPB1734 1732230-UUUU--TWX E 7108221975 FDCC WSH
 O 222230Z JUN 81
 FM RUWLSPB/NEIS GOLDEN CO
 TO RUEOLMA/NWS WASHINGTON DC
 TO RUWRMOR/FEMA NATIONAL WARNING CENTER CHEYENNE MTN COMPLEX CO
 TO RUHHAJA/PACIFIC TSUNAMI WARNING CENTER HONOLULU HI
 TO 7108221911/FEMA DRR WASHINGTON DC
 TO 7108229488/FEMA WSHA WASHINGTON DC
 TO 899153/JOHN FILSON OES USGS RESTON VA
 TO 7108221975/SEC STATE FOR G MCCLOSKEY OFDA -- EMERGENCY
 TO 147203/UNITED PRESS INTERNATIONAL NY
 TO 14152/UNITED PRESS INTERNATIONAL DALLAS
 TO 892387/REUTERS WSH
 TO 126800/CBS NEWS NEW YORK
 TO 45509/NEIS GOLDEN CO

BT

UNCLAS

THE FOLLOWING IS A RELEASE BY THE UNITED STATES GEOLOGICAL SURVEY, NATIONAL EARTHQUAKE INFORMATION SERVICE: A MODERATE EARTHQUAKE OCCURRED IN PERU ABOUT 180 MILES SOUTHERST OF LIMA AT 11:53 AM MDT TODAY, JUNE 22, 1981. THE MAGNITUDE WAS COMPUTED AT 5.0 ON THE RICHTER SCALE. THE QUAKE WAS RECORDED BY THE U. S. GEOLOGICAL SURVEY AT GOLDEN COLORADO. THIS QUAKE IS IN THE SAME GENERAL AREA AS A 5.1 QUAKE ON APRIL 18, 1981 WHICH KILLED 8 PEOPLE AND INJURED 15 AND CAUSED DAMAGE IN THE AYACUCHO AREA.

BT

NNNN

FDCC WSH

FDCC WSH

FDCC WSH

2248173 R 1-13-01-068353 TWX SVC 7108221900
OATUIJAZ RUWLSPB1736 1732230-UUUU--TWX E 7108221975 FDCC WSH.
O 222230Z JUN 81
FM RUWLSPB/NEIS GOLDEN CO
TO RUEOLMA/NWS WASHINGTON DC
TO RUHHAJA/PACIFIC TSUNAMI WARNING CENTER HONOLULU HI
TO 152315/NEWPORT OBSERVATORY WASH
7 5509/NEIS GOLDEN CO
INFO 7108221975/SECSTATE FOR FREDERICK COLE AID/OFDA

BT

UNCLAS

PLEASE BROADCAST THE FOLLOWING FOR WORLD-WIDE DISTRIBUTION: MES-
SAGE SEXXI - KWBC CLLLL=15050 IMI 15050

THE FOLLOWING IS FROM THE UNITED STATES GEOLOGICAL SURVEY, NA-
TIONAL EARTHQUAKE INFORMATION SERVICE: PRELIMINARY HYPOCENTER FOR
THE EARTHQUAKE OF 1981 JUNE 22: LATITUDE 13.0 DEGREES SOUTH,
LONGITUDE 74.2 DEGREES WEST ORIGIN TIME 17 53 22.5 UTC, DEPTH 33
KM, MAGNITUDE 5.0 MS. THIS QUAKE IS IN THE SAME GENERAL AREA AS
A 5.1 QUAKE ON APRIL 18, 1981 WHICH KILLED 8 PEOPLE AND INJURED
15 AND CAUSED DAMAGE IN THE AYACUCHO AREA.

BT

.. 08
08 UP 0.14
1 04:34 PED

OFDA

UP111

U I

(QUAKE)

LIMA, PERU (UPI) -- A STRONG EARTHQUAKE FOLLOWED BY TWO MINOR TREMORS JOLTED A PERUVIAN PROVINCIAL CAPITAL HIGH UP IN THE ANDES TODAY, TOPPLING SMALL BUILDINGS AND TRIGGERING WIDESPREAD PANIC, AUTHORITIES SAID.

THERE WERE NO IMMEDIATE REPORTS OF CASUALTIES.

AUTHORITIES SAID THE STRONGEST QUAKE TO HIT THE SOUTHEASTERN PROVINCIAL CAPITAL OF AYACUCHO IN THE PAST TWO YEARS WAS REGISTERED AT 1:44 P.M. EDT AND FELT FOR SOME 15 SECONDS.

IT WAS FOLLOWED BY TWO MINOR ONES AT 20 MINUTE INTERVALS, THEY SAID.

UPI 06-22-81 04:36 PED

UNITED STATES INTERNATIONAL DEVELOPMENT COOPERATION AGENCY
AGENCY FOR INTERNATIONAL DEVELOPMENT
WASHINGTON D C 20523

June 24, 1981

MEMORANDUM

TO: AID/OFDA, Mr. Alan Van Egmond, Assistant Director for Planning and Preparedness

FROM: AID/OFDA, Paul F. ^{FFK}Krumpe, Science Advisor

SUBJECT: Cable Prepared for transmittal to AmEmbassy Lima concerning status of Brady Earthquake prediction

The attached draft cable was prepared June 24, 1981 for immediate transmittal to Alf Cooley, AmEmbassy, Lima.

AID desk officer, William Rhodes, cleared the cable whereas State desk officer, Andy Purnell refused to clear it. Purnell became quite agitated with the idea that this message be transmitted to Lima.

I informed Mr. Purnell that I gave Dr. John Filson (USGS) (on June 23) a copy of Brady's June 19 memo. Mr. Purnell demanded that if the memo were to go to Lima it should be hand carried by Dr. Filson on June 26, the ETA for his Lima TDY.

cc: May Kido
File.

06/23/81 11:25 AM '81
AID/OFDA

**NOT SENT TO LIMA
BY CABLE**

AID/OFDA:PKRUMPE: BP
06/23/81 EXT. 21834
AID/OFDA:MHOWELL

AID/OFDA:AVANEGMOND
AID/LAC:WRHODES

AID/OFDA:GMCCLOSKEY
STATE/ARA/SA:JPURNELL

ROUTINE

LIMA

AIDAC

E.O. 12065: N/A

TAGS:

SUBJECT: BRADY EARTHQUAKE PREDICTION STATEMENT

1. THE FOLLOWING STATEMENT BY DR. BRIAN T. BRADY ON THE CURRENT STATUS OF THE PREDICTED PERUVIAN FIRST EVENT HAS BEEN WRITTEN IN AN INTERNAL MEMORANDUM DATED JUNE 19, 1981 FROM DR. BRADY TO THE DIRECTOR, RESEARCH CENTER OPERATIONS, U.S. BUREAU OF MINES, WASHINGTON, D.C.: QUOTE. I BELIEVE AT THIS TIME THAT THE FIRST EVENT IN CENTRAL PERU WILL OCCUR BETWEEN JUNE 26 AND JUNE 30, 1981. THIS LATEST REVISION IS BASED ON THE ADDITION OF DATA OBTAINED RECENTLY FROM THE PERUVIAN LOCAL NETWORK. THESE DATA INCLUDE THE OCCURRENCE OF AN EVENT {ML = 2.8}, WEST OF CANETE ON JUNE 3, 1981. I BELIEVE THIS EVENT CORRESPONDS TO ONE OF THE LAST ITERATION CYCLES FOR THE FIRST MAINSHOCK. AS I DISCUSSED LAST WEEK WITH YOU, I HAD ORIGINALLY THOUGHT THAT THE MAY 30, 1981, EVENT {ML = 2.5}, ALSO OCCURRING W-NW OF CANETE, MARKED THE INITIATION OF AN ITERATION CYCLE. THERE HAVE BEEN NO REPORTED EVENTS IN THE EPICENTRAL ZONE {11.8 DEGREES S - 14.0 DEGREES S} SINCE THE JUNE 3 EVENT. I HAVE BEEN INFORMED BY THE AMERICAN EMBASSY IN LIMA THAT EXTREME QUIET NOW PREVAILS IN THIS REGION. THIS QUIET APPARENTLY INCLUDES ANY FELT EARTHQUAKES. THIS QUIET MAY INDICATE THAT THE THRESHOLD {ML = 2.0} OF THE LOCAL NETWORK IS TOO HIGH TO DETECT THE OCCURRENCE OF ANY EVENTS

MH
PK **PK**
AVE **HH**
GM **PK PK**
WR **WW/2** **AVE**
JP **GM**
WR WW/
JP

OCCURRING WITHIN EPICENTRAL REGION. PLEASE NOTE THAT IN MY MAY 7 MEMORANDUM TO ROBERT L. MAROVELLI I INDICATED ON PAGE 8, LAST PARAGRAPH, THAT EXTREME QUIET WILL PREVAIL IN THE REGION IN THE WEEKS PRECEDING THE FIRST EVENT. IN THE ABSENCE OF DATA FROM OTHER GEOPHYSICAL INDICATORS, SUCH AS CHANGES IN RADON FLUX, STRAIN RATES, ETC. I MUST RELY ON THE RECENT PERIOD OF EXTREME SEISMIC QUIESCENCE AS THE BEST SUGGESTION OF IMPENDING FAILURE.

IF THE FIRST MAINSHOCK DOES NOT OCCUR BY JUNE 30, 1981, I MUST CONCLUDE THAT MY INTERPRETATION OF SPACE TIME SEISMICITY PATTERNS IN CENTRAL PERU IS IN ERROR AND, ACCORDINGLY, THE PROBABILITY OF THE OCCURRENCE OF THE PREDICTED EARTHQUAKES IN PERU THIS SUMMER WILL BE LESSENEED CONSIDERABLY. IF THE FIRST EVENT DOES NOT OCCUR BY JULY 10, 1981, I WILL FORMALLY WITHDRAW THE PREDICTION AND WILL PREPARE A STATEMENT TO BE TRANSMITTED TO DR. ALBERTO GIESECKE ON THAT DATE. UNQUOTE.

2. THIS CABLE IS TRANSMITTED AT THE REQUEST OF ALF COOLEY {WHITMAN/KRUMPE TELCON JUNE 23, 1981} IN RESPONSE TO THE GEOPHYSICS INSTITUTE OF PERU REQUEST TO AMEMBASSY {NO. 138-DICGA-IGP/81} DATED JUNE 3 FOR STATEMENTS OF DR. BRADY CONCERNING HIS PERU PREDICTION STATUS. YY

UNITED STATES INTERNATIONAL DEVELOPMENT COOPERATION AGENCY
AGENCY FOR INTERNATIONAL DEVELOPMENT
WASHINGTON D C 20523

June 24, 1981

MEMORANDUM

TO: AID/OFDA, Mr. Alan Van Egmond, Assistant Director for Planning Preparedness

FROM: AID/OFDA, Paul ^{PFK}Krumpe, Science Advisor

SUBJECT: AA/LAC, Ed Coy's memo to Dr. Howell--my understanding of raised issues

The subject proposal is in response to meetings held in February with you, Ed Coy (AAA/LAC) and his staff. Although you had hoped the LAC Bureau would have shown interest in sharing in the financial support of the proposed program in the interest of A.I.D. development in Peru at no time during the meeting or in subsequent meetings with Mr. Rhodes (AID Desk) was it the stated position of the Bureau that this program should not be funded with OFDA disaster preparedness funds. I have heard no objection to the program from the Bureau or elsewhere until Dr. Howell received Ed Coy's memo of June 22. On the contrary, the U.S. Geological Survey has expressed support for program development and Ambassador Corr has repeatedly requested updates on program design progress. (i.e. L.O.U. March 4) This subject proposal is not linked to the Brady prediction in any way. Dr. Howell informed Mr. Rhodes on June 19 and June 23 that OFDA will not proceed in funding The Carnegie Institution's proposal on behalf of the Geophysics Institute of Peru without full concurrence from The U.S. Geological Survey, the Bureau and State Peru Desk. In the meantime, I presume OFDA (Ollie Davidson) will continue to support low key technical assistance efforts in Latin America to improve institutional capacity to deal with natural disasters.

Department of State

OUTGOING
TELEGRAM

PAGE 01 STATE 167209 DOCUMENT NO. 140 5265 003111 AID1209
ORIGIN AID-35

ORIGIN OFFICE DRC-01
INFO LASA-03 LADP-03 LADR-03 STA-10 CHS-01 ES-01 RELO-01
WAB-01 30-00 /024 A0

INFO OCT-00 ARA-10 4051 R

DRAFTED BY AID/OFDA: PKRUMPE: BP
APPROVED BY AID/OFDA: MHOWELL
AID/OFDA: AVANEGMOND
AID/OFDA: GMcCLOSKEY
AID/LAC: WRHODES (PHONE)
STATE/ARA/SA: JPURNELL (PHONE)

25 JUNE 1981

MH
HW
PJ
PK
OD
WE

-----273126 250238Z /61
D 250156Z JUN 81
FM SECSTATE WASHDC
TO AMEMBASSY LIMA IMMEDIATE

UNCLAS STATE 167209

AIDAC

E. O. 12065: P A

TAGS:

SUBJECT: DISASTER PREPAREDNESS

REF: WHITMAN/KRUMPE TELCON JUNE 22, 1981

1. PER SUGGESTION OF STATE DESK OFFICER WRITTEN STATEMENT REQUESTED IN TELCON ON CURRENT STATUS OF PREDICTION (AS OF JUNE 19) WILL BE HAND CARRIED BY DR. FILSON TO LIMA. FILSON ETA IS 10:15 A.M. JUNE 26 ON BRANIFF 979. FILSON'S DEPARTURE IS JUNE 30, HOWEVER TDY COULD BE EXTENDED IF REQUIRED. STOESEL

FOUO/OFDA

JUN 25 11 07 AM '81

- 410 -

UNCLASSIFIED

Department of State

001001111
TELEGRAM

PAGE 01

STATE 167208

5256 003110 AID1208

ORIGIN AID-35

DOCUMENT NO. 141

ORIGIN OFFICE DRC-01

INFO LASA-03 LADP-03 LADR-03 PDC-02 CH9-01 RELO-01 WAB-01
3B-00 /015 AB

INFO OCT-00 /035 R

DRAFTED BY AID/OFDA: CASIEGEL:DLV

APPROVED BY AID/OFDA: MJHOWELL

AID/OFDA: GMCCLOSKEY

AID/OFDA: HWILKINSON

AID/OFDA: AVEGMOND

25 June 1981

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FM SECSTATE WASHDC

TO AMEMBASSY LIMA IMMEDIATE

UNCLAS STATE 167208

AIDAC FOR ALARCON

E.O. 12055: N/A

TAGS:

SUBJECT: ARRIVAL OF DISASTER PREPAREDNESS TEAM

REF: TELECON SIEGEL/ALARCON 06/24/81

1. THERE HAS BEEN A CHANGE IN THE ARRIVAL DATE OF BOB GERSONY, SUBJECT TEAM LEADER, FROM 6/27 TO 7/2 ON BRANIFF 909 AT 5:25 AM. PLEASE CHANGE HOTEL RESERVATIONS ACCORDINGLY. STOESSEL

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AID/OFDA

UNCLASSIFIED

DOCUMENT NO. 142
UNITED STATES INTERNATIONAL DEVELOPMENT COOPERATION AGENCY
AGENCY FOR INTERNATIONAL DEVELOPMENT
WASHINGTON, D.C. 20523

MEMORANDUM

June 25, 1981

TO: AID/OFDA, Dr. Martin D. Howell, Director

THRU: AID/OFDA, Mr. Alan Van Egmond, Assistant Director for
Planning and Preparedness

FROM: AID/OFDA, Paul F. Krumpe, Science Advisor *PFK*

SUBJECT: Current Update on Dr. Brady's Peru Earthquake Prediction

The attached memorandum (June 19) from Dr. Brian Brady to Mr. Donald Rogish, Director, Research Center Operations, U.S. Bureau of Mines, Washington, D.C. provides Brady's interpretation of seismicity in the central Peru region as of June 19 relative to the first predicted event.

Earthquakes occurred in the vicinity of Ayacucho along the delineated aftershock zone boundary of the predicted events beginning on June 16. Two $ML = 5.0+$ events occurred on June 20-22 which caused considerable structural damage to adobe dwellings in the region. (6/22/81, $ML = 5.8$) These Ayacucho events appear to be consistent with what Brady believes to be an oscillatory pattern between Ayacucho and the inclusion zone. Ostensibly, when Ayacucho becomes quiet on or about June 23-24, then several days later the inclusion zone would activate (during the final iteration) and the first predicted event $M_s = 8.0$ would occur. Brady has prepared extensive written material in support of his interpretation of these recent events but will not have it in final form prior to the time of the first predicted earthquake. Presumably he will use this data analysis to convince others of his interpretation of the last two catastrophic events, should the first event occur as predicted.

The AmEmbassy called me on June 24 to report on May-June Peruvian data obtained June 22-23 from rock strain meters (measuring tilt) in Ica and Nanya. The Geophysics Institute reports "peculiar" tilt due to accumulated rock strain in the Ica region. The tilt is to the south, not toward Lima according to the IGP. No accumulated strain is reported in Lima. This condition appears to be consistent with Brady's laboratory studies which indicate that prior to rock-burst (mainshock) the rock strain (tilt) shifts away from the point of principle stress. This appears to be happening in the Ica region and may be a precursor to imminent rock failure (first event).

Dr. Brady informed me today that the first earthquake is expected to nucleate at 12.9° S and 77.4 or 77.5° W on or about June 28. He anticipates low-magnitude events (tremors) to occur at sea just prior to the first shock.

Reports, Memoranda, Correspondence
and Other Communication

July - December 1981

INTERNATIONAL COMMUNICATION AGENCY

OUTGOING TELEGRAM

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<p>TO: AMEMBASSY LIMA IMMEDIATE</p> <p>SUBJECT: VTR OF "WALTER CRONKITE'S UNIVERSE", PERUVIAN EARTH- QUAKE SEGMENT</p> <p>REFERENCE: CLYDE/MAREK TELCONS 6/22/81 AND 6/25/81</p> <p>1. THANKS TO EXTRAORDINARY EFFORTS AND COOPERATION ON PART OF CBS, PGM/TFN CHIEF JACK GAINES AND PAUL KRUMPE OF USAID'S DISASTER ASSISTANCE OFFICE, ONE 3/4 INCH VTR OF JUNE 23 EDITION OF "WALTER CRONKITE'S UNIVERSE" PROGRAM WAS PROVIDED TO DR. JOHN FILSON OF BUSGS, WHO WAS TO HANDCARRY TAPE TO LIMA. FILSON ARRIVING LIMA JUNE 26 VIA BN 979. JUNE 23 EDITION OF "UNIVERSE" CONTAINS SEGMENT ON U.S. SCIENTISTS WHOS IS PREDICT- ING MAJOR EARTHQUAKES IN PERU THIS SUMMER.</p> <p>2. PGM/T REMINDS POST THAT VTR MAY ONLY BE USED FOR IN-HOUSE STAFF SHOWINGS.</p> <p>3. ID-31PE-81-0164-PGM/T CHARGED 300 DOLS.</p>					
DO NOT TYPE MESSAGE BELOW THIS LINE					
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2 AR:PMOSER MGT/CFM:WKELLEY{INFO} AID:OFDA:PKRUMPE{INFO}					

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- 414 -

PERU EARTHQUAKE PREDICTION: JULY 1981

Dr. Brian T. Brady

The status of the prediction is as follows. A foreshock series will commence in mid-September 1980. The time duration of this series will be approximately 328 days. There will be a total of twelve-to-thirteen foreshocks which will be temporally distributed in two active phases, each of whose time durations will be approximately 109 days. The foreshock series will terminate on July 30, 1981, with the occurrence of the mainshock ($M_s \geq 9.8$). This event will nucleate in the vicinity of 12.6°S and 77.6°W and will initiate a rupture to the S-SE from 12.6°S to approximately $26^\circ\text{--}28^\circ\text{S}$. This event will eliminate the largest generally recognized seismic gaps in the world, e.g., the inferred rupture zones of the 1868 and 1877 great earthquakes.² The event will be followed by a vigorous aftershock series. My current interpretation of the spacetime seismicity patterns in central Peru also leads me to hypothesize that a second event ($M_s = 8.8$) will nucleate 276 days later (ca May 2, 1982) near 12.5°S and 77.6°W . This event will rupture to the NW from 12.5°S to approximately 8°S . The second event will also be preceded by a foreshock phase with characteristics identical to that preceding the $M_s \geq 9.8$ event. I cannot make more precise predictions of the occurrence times of the mainshocks ($M_s \geq 9.8$, $M_s = 8.8$) until the initiation times of their respective foreshock series are known. I cannot overemphasize that the occurrence of the foreshock phases are necessary and sufficient for the occurrence of the predicted mainshocks. If the foreshocks do not occur, the prediction is invalid.

The predicted mainshocks will be shallow (source depths $\sim 20 - 30$ km) underthrusting (dip angle $\sim 30^\circ\text{NE}$) events. They will be tsunamigenic events. For example, using Abe's³ results, I estimate the mainshock ($M_s \geq 9.8$) is capable of generating a sea wave whose maximum amplitude at Hilo will be at least 25 meters (82 feet) approximately 13-14 hours following the mainshock. Other regions throughout the Pacific basin will also be affected, e.g., Aleutian Islands - Honolulu - California, 4 meter (14 feet) wave; Japan, 6.3 meter (21 feet) wave.

The physical basis used in making this prediction has been the occurrence of very specific recent (post 1963) space-time patterns of seismicity which have occurred off the central Peruvian coast and, in particular, the patterns that began August 26, 1966. These patterns have consisted of alternating active and quiet periods of seismicity between 12°S and 13.5°S . The first active period began on August 26, 1966, and ended November 26, 1967. The second active period began September 6, 1973, and terminated on November 18, 1974. There have been no seismic events within the predicted aftershock zones of either predicted event during November 26, 1967 - September 6, 1973, or since November 18, 1974 - present. Telesismically reported events have occurred in both Peru and northern Chile but only along the boundaries of what will be the predicted aftershock zones. The final active period, the foreshock phase, is predicted to initiate in mid-September 1980. It is of interest that similar behavior has been observed prior to other large earthquakes.

The theoretical bases for these types of space-time seismicity patterns, e.g., "quiet" periods followed by seismically "active" periods prior to failures, were outlined in some detail by myself at the May 24, 1979, meeting in Golden, Colorado⁴. I presented several applications of the theory to past earthquakes at this meeting as well as to predicted rock bursts in northern Idaho. I went into considerable detail on the seismicity patterns that existed prior to the February 9, 1971, San Fernando, California earthquake ($M_s = 6.6$). I presented evidence showing how the space-time seismicity patterns prior to the San Fernando event could have been used to accurately predict the occurrence time as well as the characteristics of aftershock sequence of this event to within several hours of its actual occurrence (See Addendum D). I also applied the theory to the seismicity patterns prior to the October 3, 1974, ($M_s = 8.1$) and November 9, 1974, ($M_s = 7.1$) Peruvian events with identical success at this meeting. Since the May 24 meeting, I have obtained the seismicity data preceding the November 29, 1975, Kalapana (Hawaii) event ($M_s = 7.2$). I have been able to apply these data to show that this event and the characteristics of its aftershock sequence could have been accurately predicted to within several hours nearly one month prior to its actual occurrence.



BUREAU OF MINES

DOCUMENT NO. 145

P. O. BOX 100

BUREAU OF MINES RESEARCH CENTER

DENVER, COLORADO 80202

July 5, 1981

Dr. Alberto A. Glasocke H.
Director
Ceresis
Avenida 3747
Lima, Peru

Dear Alberto:

I believe that my prediction of large seismic events off the coast of central Peru as originally stated at the ISEPC meeting in late January 1981 is incorrect. At this meeting I introduced the possibility of an event to occur on or about June 28, 1981, off the coast of central Peru and that this event would initiate the decoupling process between the Nazca and South American plates. Without the occurrence of this event, I judge the probability of the occurrence of the two remaining large events to be exceedingly low.

I would like to thank you and your staff for the expert assistance you have given to me over the past several years and in particular to Mario and Leo for their recent assistance in providing me with the data from the Peruvian seismic network.

I am relieved that circumstances now suggest that my interpretation of the space time seismicity patterns in central Peru is incorrect.

Very truly yours,

Brian T. Brady
Supervisory Physicist
Mine Design Division
Denver Research Center

CALIFORNIA INSTITUTE OF TECHNOLOGY

PASADENA CALIFORNIA 91126

SEISMOLOGICAL LABORATORY 252-21

TELEPHONE (213) 398-6912
(213) 398-6910

10 July 1981

The Honorable M. Peter McPherson
 Administrator
 Agency for International Development
 320 21st Street, N. W.
 Washington, D. C. 20523

Dear Mr. McPherson:

Now that the time has come and gone for the occurrence of the great Peruvian earthquake predicted for June 28th by Dr. Brian Brady of the U. S. Bureau of Mines, I write to you to express my dismay at the activities of the Agency for International Development during this tragic episode. As Chairman of the National Earthquake Prediction Evaluation Council, which was asked by the Peruvian government to evaluate the prediction, and which in January advised the President of Peru of its total rejection of the Brady prediction, I have been deeply concerned over the far-reaching human and economic effects of the entire incident.

Acting against the advice of virtually every seismologist in the United States, the Agency for International Development appears to have continued to put credence in the Brady prediction, bringing great and unnecessary trauma to the Peruvian people and considerable frivolous expense to the American taxpayer. This seems to have come about because one of your staff members, Mr. Paul Krumpke of OFDA, has taken it upon himself not only to embrace the Brady prediction, but actually to aid and abet Dr. Brady in its promulgation. I use the words "aid and abet" advisedly, as a result of having observed Mr. Krumpke at an international earthquake-prediction meeting in Argentina last October and at the meeting of our National Earthquake Prediction Evaluation Council in January, as well as having heard of his various other activities here and in Peru. He has clearly been unwilling to accept the unanimous recommendation of the scientists on the Evaluation Council -- which was set up specifically to advise federal agencies on such problems -- and he seems to have gone his own way without effective guidance from his supervisors in your own Agency.

I do not know of a single recognized American geologist or geophysicist who has come to the defense of Dr. Brady's hypothesis. (Dr. William Spence, his former partner, formally disavowed the prediction in early June.) Yet, Mr. Krumpke seems to have perceived his proper role as one of protecting the brilliant, young martyr from the big, bad scientific establishment. It is indeed true that a number

10 July 1981

of important scientific discoveries have resulted from hypotheses that were broadly criticized at the time, and earth scientists in particular can point to several such episodes. But is it really appropriate for the Agency for International Development, with its very limited scientific expertise, to be involved in such a scenario, particularly when it is the people of a foreign country who are the innocent "guinea pigs" involved? Of course, the Evaluation Council is not above criticism, and we have learned a number of lessons from this difficult experience. But we find it odd that much of the criticism is coming not from other members of the scientific community, or from the affected people of Peru, or even from the news media, but instead from your Agency.

Much as I disagree with Dr. Brady's scientific (and social) judgment, I find his behavior easier to understand than that of your Mr. Krumpe. Dr. Brady has reasonable scientific credentials and has considerable experience in rock-mechanics studies that are relevant to earthquakes, and I can understand his zeal to make a significant scientific breakthrough -- however misguided this particular effort may have been. But Mr. Krumpe's primary obligations, it seems to me, are to serve his Agency and the American people in giving the best possible scientific advice on problems related to foreign disasters. Instead of doing this in a reasonably professional and dispassionate way, he has chosen to become himself the enthusiastic advocate of a highly debatable hypothesis -- and he has evidently carried along others in the Agency with him. I find the whole episode almost incredible.

This letter is a difficult one to write, because it is not at all impossible that a major earthquake will occur somewhere in western South America as soon as I put the envelope in the mail. And I suspect, based on past performance, that Dr. Brady will contend that the earthquake somehow vindicates his position, regardless of the specifics of his announced prediction. I hope you realize that the west coast of South America is one of the most highly active seismic zones in the world, and hardly a day passes without significant seismicity somewhere in the region. It has been pointed out in the scientific literature for a number of years that among the most likely places for a truly great earthquake is the current "seismic gap" in southern Peru and northern Chile. A repetition of the great 1868 Arica and/or 1877 Iquique earthquakes would be a major disaster in this region, even with its low population, and such an event within the next few years -- or tomorrow -- would come as no scientific surprise. But virtually all American scientists agree that our ability to predict the specific times of such events is as yet very limited.

Some of our Peruvian colleagues, as well as people within AID, had hoped that the Brady prediction would help funnel American funds into seismological research programs in Peru and adjacent areas. This

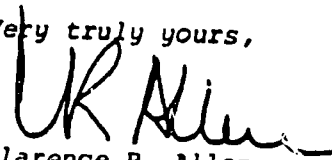
Mr. McPherson

- 3 -

10 July 1981

is in fact an area that deserves a greater research effort, but it would have been indefensible -- and almost dishonest -- for us to recommend such an effort on the basis of a specific prediction with which we could not agree. Now that the trauma of the Brady prediction is gradually subsiding, I sincerely hope that AID and other agencies can get back to business and consider such a program on a rational scientific basis. And I hope that you can get better scientific advice this time; both the American and Peruvian people deserve it.

Very truly yours,



Clarence R. Allen
Professor of Geology and Geophysics
and
Chairman, National Earthquake Prediction
Evaluation Council

CRA:dp

cc: Members, National Earthquake Prediction Evaluation Council

✓ The Honorable E. G. Corr, U. S. Ambassador to Peru

Dr. Brian Brady, U. S. Bureau of Mines

Mr. Paul Krumpe, OFDA

Dr. Dallas Peck, Director Designate, U. S. Geological Survey

Dr. Frank Press, President, National Academy of Sciences



United States Department of the Interior

GEOLOGICAL SURVEY
RESTON, VA. 22092In Reply Refer To:
Mail Stop 905

July 14, 1981

*copy to Preparedness
Plo. [Signature]*

*cc [Signature]
[Signature]*

Memorandum

To: Dr. Martin D. Howell
Director, Office of Foreign Disaster Assistance
Agency for International Development

From: Dr. John R. Filson *John R. Filson*
Chief, Office of Earthquake Studies
U.S. Geological Survey

Subject: Proposal entitled "A seismological network in Peru for disaster preparedness and early warning"

At a meeting in late June 1981, in your office, I expressed some misgivings about the appropriateness of the subject proposal for earthquake hazard mitigation in Peru. My two chief points were:

1. The proposal should not be looked upon as providing a "turn-key" earthquake prediction system. Such a system, let alone a reliable theory for earthquake prediction, does not exist.
2. There may be more urgent needs in Peru for earthquake hazard mitigation such as the development of building codes and effective earthquake recovery measures.

You asked me to review these issues with United States and Peruvian government officials during my trip to Lima, June 26-29, 1981. During my trip I discussed the proposal with Ambassador Corr, Admiral Masias of the Ministry of Civil Defense, and scientists at the Institute of Geophysics of Peru.

Ambassador Corr strongly supports the proposed effort. He realizes that this effort will not provide an automatic earthquake prediction system, but that it will be useful in providing rapid and accurate locations of potentially damaging earthquakes after they occur.

Admiral Masias expressed a similar view. One of the most difficult problems he has regarding earthquake relief is delay and uncertainty in epicenter locations provided by the Institute of Geophysics (IGP). After a strong earthquake in the remote interior of Peru, it is often days before the epicentral region is accurately located and damaged villages identified. For these reasons, he strongly urged that the proposal be funded.

The scientists at the Institute of Geophysics are first-rate; however, they require real-time data from a network such as described in the proposal and a facility with which to provide rapid analyses of this data. Presently only a few stations are telemetered to IGP and the data from these stations are processed by hand or through a remote computer with limited access. Thus, they are forced to issue information on the occurrence of earthquakes with inadequate data and processing facilities. Lives are endangered because relief measures cannot be quickly dispatched to the right location.

The subject proposal, if funded, would, in my opinion, solve this problem. It would provide a "turn-key" early earthquake notification (not warning) system and would go far to help mitigate and relieve the effects of damaging earthquakes in Peru. Although it might be done more inexpensively in the United States, by purchasing components of the processing system separately, the purchase of an integrated system for the IGP is definitely the proper course. The technical support required to build a processing system from components does not exist at IGP.

Scientists at the IGP described for me the existing building codes in Peru and showed me the documentation on which those codes are based. I see no reason to direct funds from the subject proposal to further development of building codes. Admiral Masias described his disaster relief plans and stressed that no amount of equipment and relief supplies will be of any use if he doesn't know where to send them.

In summary, I withdraw the reservations I previously expressed regarding this proposal. It will provide a much needed early earthquake notification system by giving IGP scientists timely data and a modern data processing facility. The IGP scientists are fully capable of operating this equipment and conducting the analyses. The building codes and disaster relief plans are more advanced than I expected. This effort will also facilitate earthquake prediction research in Peru and may eventually provide "early warnings" of earthquakes. What is needed and is realizable now, however, is a means to provide an early and accurate location of damaging earthquakes. The subject proposal will provide this capability. I strongly urge that it be funded and that the work proceed forthwith.

21 July 1981

PAGE 21 LIMA 26427 221726Z 6459 329712 AID7931
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SUBJ: THE EARTQUAKE THAT WASN'T

1. SUMMARY: THE POPULATION OF LIMA PASSED A QUIET SUNDAY, 28 JUNE, THE DATE MOST WIDELY BELIEVED TO BE THAT PREDICTED BY DR. BRIAN BRADY OF THE U.S. BUREAU OF MINES FOR A LARGE EARTHQUAKE TO HIT THE CITY. MEDIA COVERAGE OF THE PALLIATIVE STATEMENTS BY PRESIDENT BELAUNDE IN VISITING COASTAL PISCO (NEAR THE PREDICTED EPICENTER), ON JUNE 28, BY DR. JOHN FILSON OF THE U.S. GEOLOGICAL SURVEY VISITING LIMA, AND BY THE CHIEFS OF CIVIL DEFENSE AND THE PERUVIAN GEOPEYSICAL INSTITUTE HELPED TO TAKE MOST OF THE VOLTAGE OUT OF THE SOMEWHAT CHARGED ATMOSPHERE IN THE CAPITAL CITY. WITH THE 28TH "SAFELY" PAST, THE MEDIA ARE NOW HAPPILY BURYING THE BRADY PREDICTION. END SUMMARY.

2. SINCE FEB 1982, KNOWLEDGE OF THE PREDICTION BY DR. BRIAN BRADY OF THE U.S. BUREAU OF MINES OF A SERIES OF EARTHQUAKES TO STRIKE LIMA, CULMINATING IN A ONCE IN 802,000 YEAR JOLT OF 9.9 ON THE RICHTER SCALE, HAS CAUSED VARYING AMOUNTS OF ANXIETY AMONG THE LOCAL POPULACE. WORKING FROM A CONTINUOUS FLOW OF SEISMIC INFORMATION FROM PERU, EARLY ON, DR. BRADY FIXED ON JUNE 28 AS THE LIKELY DATE FOR THE FIRST OF THESE SHOCKS. ALTHOUGH HE HAD SHIFTED THE PREDICTED DATE SEVERAL TIMES SINCE, THE 28TH WAS THE DATE WHICH RECEIVED EARLY AND BROAD PUBLICITY AND ON WHICH BELIEVERS IN THE PREDICTION AND SKEPTICS ALIKE FIXED THEIR ATTENTION.

3. THE VISIT OF DR. JOHN FILSON, CHIEF OF THE OFFICE OF EARTHQUAKE PREDICTION OF THE U.S. GEOLOGICAL SURVEY, FROM JUNE 25 THROUGH

BE PROVED MOST USEFUL. HIS STAY WAS HIGHLIGHTED BY TWO PRESS CONFERENCES.

THESE WERE DEVOTED ALMOST ENTIRELY TO QUESTIONS ABOUT THE BRADY PREDICTION. FRONT-PAGE TREATMENT WAS GIVEN BY THE MEDIA TO DR. FILSON'S REITERATION AT THOSE CONFERENCES OF THE U.S. NATIONAL EARTH-quake PREDICTION EVALUATION COUNCIL'S REJECTION OF THE BRADY PREDICTION.

4. PERUVIAN AUTHORITIES WERE ALSO ACTIVE IN PUBLICLY REJECTING THE BRADY PREDICTION, AND IN TERMS MORE UNEQUIVOCAL THAN PREVIOUSLY. THE CHIEF OF THE PRESTIGIOUS PERUVIAN GEOPHYSICAL INSTITUTE SPOKE OUT AGAINST THE SCIENTIFIC VALIDITY OF THE BRADY THEORY AND THE INSTITUTE'S SCIENTIFIC DIRECTOR OF SEISMOLOGY DENIED THAT RECENT EARTHQUAKES IN THE SOUTHERN MOUNTAINS OF PERU (AYACUCCHO) HAD ANYTHING TO DO WITH THE BRADY PREDICTION.

5. THE MOST PROMINENT PUBLIC STATEMENT AGAINST THE BRADY PREDICTION WAS THAT OF PRESIDENT BELAUNDE. THE PRESIDENT CLAIMED TO THE MEDIA THAT A TRIP HE WAS MAKING ON THE 28TH TO PISCO TO DEDICATE THE LA PUNTILLA FISH FREEZING AND CANNING PLANT AND OTHER PUBLIC WORKS WAS BEING UNDERTAKEN IN DEFIANCE OF BRADY'S PREDICTION OF THE EARTHQUAKE EPICENTERED IN THE SEA TO THE WEST OF THAT TOWN. THE PRESIDENT'S GESTURE CAME IN NEAT COUNTERPOINT TO THE AIRFORCE'S QUIETLY PULLING THEIR PLANES OUT OF THE LOW-LYING SEA FRONT AIRBASE AT PISCO (AT WHICH THE BELAUNDE PARTY LANDED). THE AIR FORCE APPARENTLY HAD MISREAD THE PREDICTION TO INCLUDE A 60 FOOT TSUNAMI (TIDAL WAVE) AT THE TIME OF THE PREDICTED FIRST MAINSHOCK. THE AIRFORCE WAS NOT ALONE IN ITS MISCUE, THE COUNTRY'S FIRST CENSUS IN MANY YEARS WAS POSTPONED FROM THE 28TH IN PART TO AVOID THE PREDICTED EARTHQUAKE.

6. THE REACTION TO THE PASSING OF THE PREDICTED DAY HAS BEEN ONE OF RELIEF AND EXHILARATION, BEST TYPIFIED BY THE JUNE 29 EXPRESSO HEADLINE: "PERU, SI! BRADY, NO!". SOME INQUIRIES HAVE BEEN MADE REGARDING WHEN DR. BRADY WILL RETRACT HIS PREDICTION, BUT THE GENERAL FEELING IS THAT THE FACT THAT NO EARTHQUAKE OCCURRED ON THE TWENTY-EIGHTH ENDED THE AFFAIR. THE RETRACTION WILL BE WELCOME WHEN IT MAY COME BUT ITS RECEPTION HERE IS LIKELY TO BE DISTINCTLY LESS THAN EARTHSHAKING.

CORR

DOCUMENT NO. 148

UNITED STATES INTERNATIONAL DEVELOPMENT COOPERATION AGENCY
AGENCY FOR INTERNATIONAL DEVELOPMENT
WASHINGTON D C 20523

22 JUL 1961

Dr. Clarence R. Allen
Professor of Geology and Geophysics
and Chairman, National Earthquake
Prediction Evaluation Council
California Institute of Technology
Seismological Laboratory 252-21
Pasadena, California 91125

Dear Dr. Allen:

Thank you for your letter to Administrator McPherson concerning Dr. Brady's earthquake prediction for Peru. The Agency for International Development (A.I.D.) shares your deep concern about the prediction's human and economic effects in Peru. The deliberations and findings of the National Earthquake Prediction Council were helpful in reducing these effects. This Agency sponsored the travel of the Council's Vice-Chairman, Dr. John Filson, to Peru recently. I understand from the U.S. Embassy in Peru that Dr. Filson's presence was very useful in quieting people's fears.

The Agency for International Development supported the Council's review of the Brady prediction and abided by its findings. At the same time, A.I.D. continued to respond to requests for assistance from the Government of Peru in seismic detection, disaster preparedness, and contingency planning on the basis of the recommendations of the U.S. Embassy and A.I.D. mission there. This was not done to lend credence to the Brady prediction, but to fulfill A.I.D.'s Congressional mandate to help countries save lives. It would have been unacceptable for A.I.D. to wait several months until the Brady prediction had passed before continuing these projects. However, A.I.D. was careful to emphasize that its focus was directed toward the chronic earthquake hazard which confronts Peru and not the Brady prediction.

Following the Council's meeting, the U.S. Bureau of Mines permitted Dr. Brady to continue his work on the prediction. The U.S. Embassy in Peru continued to ask for Dr. Brady's analysis of seismicity data on the basis of their conversations with the Geophysics Institute of Peru. Under these circumstances, A.I.D. would have been remiss in not remaining informed until the prediction was withdrawn by Dr. Brady. Mr. Krumpe had the task of gathering this information. He is a loyal and dedicated officer who was seeking to keep A.I.D. advised under very difficult circumstances.

The Agency for International Development stands ready to receive advice and recommendations concerning ways in which we can assist in saving lives through prediction and preparedness from any source. The American seismological community has contributed greatly to our efforts for many years in connection with earthquake related disasters and we count on and value your continued support.

Sincerely,



Martin D. Howell

Director

Office of U.S. Foreign
Disaster Assistance



DOCUMENT NO. 149

Av. Arenales 491 - Of. 702 - Telf. 247421
Apartado 3747, Lima (Perú)
Cables: CERESIS
Telex IGP-LIM 25507

Centro Regional de Sismología para América del Sur

Agosto 28, 1981

Dr. Paul F. Krumpe
Science and Technology Officer
Office of U.S. Foreign Disaster Assistance
U.S. Department of State
Agency for International Development
Washington, D.C. 20523
USA


Dear Paul:

I should have written some weeks ago but it is better late than never. I want to thank you for your interest and participation during the many months during which Brian Brady's prediction developed. I think that there is too little understanding of the complex effects of a scientific prediction on society. Much can be learned from the Peru situation. For example, I believe that the U.S. seismological community should have reacted to Dr. Brady's paper in Pure and Applied Geophysics very soon after it was published, by convening on workshop to discuss with the author the theory and substantiating evidence, for as long as necessary to come up with an unbiased and well-founded opinion. Such an opinion, back in 1977, would have been a most important reference both for guiding further research and field work in Peru as well as for information to the public. U.S. seismologists, and even our own, underestimated the inevitable social and economic impact of a prediction, the more so when the author of a prediction is a reputable physicist, a Ph.D., acting on good faith. A prediction can not be kept secret and it is front page news whether it has any scientific merit or not. I think that your awareness of the problem and your many memoranda on the subject were, on the whole, of much value to us, and we can point to many positive steps that have been taken in Peru as a result of this process. We are all very glad that Brian's specific prediction did not hit the target. In Peru are now more aware of our seismic environment and the fact that a large earthquake can occur at any time and preventive measures have been taken because of the prediction which otherwise would not have been taken.

I would appreciate very much receiving from you as much information on the handling of this prediction as you may be allowed to send us. I have a large file on publications and local memoranda and some time in the near future I want all of the relevant material examined so that the experience in Peru can be of some benefit to other countries who will undoubtedly go through the same situation in the near future.

With best regards,

ab 1 15 00 11 18


Alberto A. Giesecke M.
Director

AAG/is

UNITED STATES GOVERNMENT

memorandum

DATE August 28, 1981

COPY TO
THROUECON - Alford W. Cooley *AWC*

SUBJECT: Paul Krumpe and the Brady Earthquake Prediction

TO: The Ambassador

Thru: DCM - Mr. Lamberty

Before my transfer to Bogota, I would like to leave a memorandum concerning the role played by Paul Krumpe of AID's OFDA during the period of great interest here in the Brady prediction.

I think it is important to recollect that the interest in Dr. Brady and his prediction existed here in Lima long before the National Earthquake Prediction Evaluation Council was able to give its welcome judgment that the prediction was wrong. The local tabloid press knew they could get good copy by calling Dr. Brady on the telephone, feeding him leading questions, and the answers. Mr. Krumpe was the one who counseled Dr. Brady about how to handle these press inquiries, and these unsettling type of stories soon disappeared.

Since Dr. Brady found it very difficult to put his thoughts into writing, Mr. Krumpe was able to perform a particularly useful role in his putting the theory and prediction into black and white at a time it was most sought after by the Peruvian seismological community.

Mr. Krumpe played a key role in working through this Embassy with the Instituto Geofisico del Peru to see that Dr. Brady had sufficient current data on local tremors to be in a position to retract his theory at as early a date as possible. It was no secret to us or the Peruvian scientists with whom we worked that Mr. Krumpe was convinced that Dr. Brady's theory was correct and that the prediction should not be disregarded. While most of us here did not share this belief, that should not obscure the fact that Mr. Krumpe with his great energy and ability to synthesize and write up a series of complex data, played a useful role for critics of the theory to pick out the specific gaps in the events what the theory did not explain. Without Paul's work we would have been shooting in the dark.

I have spoken with leading Peruvian seismologists who too were unconvinced of the validity of the theory and the prediction, and they also feel Mr. Krumpe played a positive

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- 427 -

OPTIONAL FORM NO. 10
(REV. 7-76)
GSA FPMR (41 CFR) 101-11.6
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2.

role within keeping of the requirements of his position. They realize that he was reacting to the prediction and its social consequence as a disciplined moral man and have no criticism of his activities in a time of stress in serving in a non-publicized way as a highly effective channel, in passing data between them and Dr. Brady.

ECON:AWCool^mey:fb



SEP 28 11 30 AM '81
EMBASSY OF THE
UNITED STATES OF AMERICA
Lima, Peru

September 17, 1981

Mr. Martin Howell
Director, Office of Foreign
Disaster Assistance
Department of State
Washington, D.C. 20520

Dear Mr. Howell:

I understand that AID has received some correspondence concerning USAID employee Paul Krumpke's performance related to the Brady earthquake prediction for Peru. Consequently you might appreciate the enclosed memo from acting Economic Counselor, who was the Embassy officer who worked most directly on the earthquake matter.

Sincerely,

Edwin G. Corr

Edwin G. Corr
Ambassador

Enclosure: as stated

DOCUMENT NO. 152

UNITED STATES INTERNATIONAL DEVELOPMENT COOPERATION AGENCY
AGENCY FOR INTERNATIONAL DEVELOPMENT
WASHINGTON, D.C. 20548

September 28, 1981

The Honorable Edwin G. Corr
American Ambassador
c/o U.S. Embassy
Lima, Peru

Dear Mr. Ambassador:

Thank you very much for your letter of September 17 with the enclosure from Mr. Alford W. Cooley in reference to the role played by Paul Krumpe during the period of the Brady prediction. I appreciate greatly Mr. Cooley's comments and also your support of his efforts to procure data for Dr. Brady's model. Fortunately, the prediction was wrong, but I do believe that Peru is now better prepared for disasters whatever the form than they were previously.

It would have been unconscionable not to have viewed with concern the picture painted by a qualified physicist who in the past has saved lives through his predictions. I think that Mr. Krumpe was maligned and that his every effort was motivated by an interest to preclude suffering and the loss of life.

Hopefully, our efforts in Peru will continue to have your support. I am a great believer in the old adage that "an ounce of prevention is worth a pound of cure."

Sincerely,



Martin D. Howell
Director
Office of U.S. Foreign
Disaster Assistance

bcc: Krumpe

UNITED STATES INTERNATIONAL DEVELOPMENT COOPERATION AGENCY
AGENCY FOR INTERNATIONAL DEVELOPMENT
WASHINGTON, D.C. 20523

October 5, 1981

Dr. Alberto A. Giesecke, M.
Director
CERESIS
Av. Arenales 431 of. 702
Apartado 3747
Lima, Peru

Dear Alberto:

I appreciate receiving your August 28 letter very much. Your perspective on the Brady prediction has been and remains most credible indeed. I absolutely agree with your contention that the U.S. seismological community should have challenged Dr. Brady's published papers sooner rather than later. As you know in June 1979 I made specific recommendations for detailed examination of Dr. Brady's hypothesis (peer review) and the need to design critical tests of postulated predictive parameters that could have provided early warning in the event of a possible great earthquake. I am pleased to know that Peru today is better prepared to meet the threat of disaster than in the past. I remain convinced that free scientific inquiry and investigation are essential to developing objective and realistic disaster preparedness and prevention strategies based on real or hypothetical threat. Scenario analysis and threat definition are most difficult problems to resolve when conclusions feedback into the public sector and increase fear and uncertainty.

As you know, I have compiled much information, memoranda, media articles and cables on the handling of the prediction. I am sure Brian has other materials of interest also. I am very interested in collaborating with you on examining relevant materials in view of future policy formulation, documentation of the decision-making process and economic impact of disaster prediction. Please let me know when and how you plan on proceeding with the project and the role I can play in assisting you.

Sincerely,



Paul F. Krumpke
Science Advisor
Office of U.S. Foreign
Disaster Assistance



AGENCY FOR INTERNATIONAL DEVELOPMENT

UNITED STATES AID MISSION TO PERU

C/O AMERICAN EMBASSY DOCUMENT NO. 154

LIMA, 1 PERU

TELEPHONE: 286200

Anexo 475/467

Direct: 244657

Residence: 222842

CABLE: USAID/LIMA

October, 1981

Robert Gersony
Disaster Preparedness Team
c/o LIMA (ID)
APO Miami 34031 Florida

Mr. Oliver Davidson
Disaster Preparedness Officer
Office of Foreign Disaster Assistance (OFDA)
Agency for International Development
Washington, D. C. 20523

Re: Evaluation of Socio-Economic and Information Management
Aspects of Brady Prediction

Dear Ollie,

This morning I had a chance to talk with Dr. Alberto A. Giesecke Matta, Director of CERESIS, who has been concerned that Peru's experience with respect to the Brady Prediction not be lost to other countries which might find themselves in the same situation.

The general idea would be to evaluate social impact; economic impact, and the way in which the information was managed. The evaluation would include both favorable and unfavorable aspects of such management, and would be published by CERESIS in Spanish and, in addition (subject to funding) in English.

Dr. Giesecke proposes that there would be two types of "actors" in this activity: those who were actually directly involved (persons such as Dr. Giesecke, Paul Krumpke, Alford Cooley, etc.) and independent scientists not involved (he mentioned John Turner, a sociologist, as an example).


He conceives the activity as a series of two short meetings in Lima, and believes that all participants would contribute their own time. The financial needs of the activity would be travel and per diem for U. S. experts and perhaps funds for an English-language publication of the conclusions.

Key among the fruits of this work would be recommendations on how especially Latin American countries could most effectively handle earthquake predictions which might take place in future.

I understand that Dr. Giesecke has been in touch with Paul Krumpe on a somewhat regular basis..

I would hope that during our next phone conversation we might have a chance to discuss Dr. Giesecke's suggestion. I know that Paul J. Flores mentioned to me that the State of California has considerable interest in the Peru experience.

Sincerely,



Robert P. Gersony
Disaster Preparedness Team

cc: Dr. Giesecke

Reports, Memoranda, Correspondence
and Other Communication

1982



AV. ARENALES 431 - OF. 702
APARTADO: 3747
CABLES: CERESIS
TELEX: IGPLIM - 25507
TELEFONO: 247421

Centro Regional de Sismología para América del Sur

DOCUMENT NO. 155

January 11, 1982

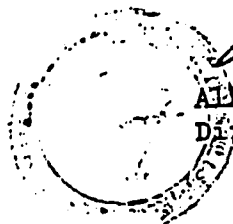
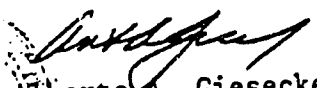
Dr. Martin D. Howell
Director
Office of U.S. Foreign
Disaster Assistance
Agency for International Development
Washington, D.C. 20523
USA

Dear Dr. Howell:

Before 1981 ends I want to express our appreciation of Dr. Paul F. Krumpke's dedication and interest in improving our capability to observe, record and interpret seismological activity as a means of mitigating the effects of earthquake.

We feel that Dr. Krumpke's support of our proposals presented by CERESIS and by Instituto Geofísico del Perú - Carnegie Institution was an important element in obtaining AID's approval and financing. I should also mention the role that Dr. Krumpke had with regard to the Brady prediction. Looking back, I am more than ever convinced that we benefited from his report and his action as a contact with Dr. Brady. It is not very often that one finds government functionary so keenly dedicated to support basic activities that are essential for the understanding of the mechanisms which cause disasters.

Sincerely,



Alberto A. Giesecke M.
Director

AAG/is

JAN 26 4 07 PM '82
PDC/OFDA

UNITED STATES INTERNATIONAL DEVELOPMENT COOPERATION AGENCY
AGENCY FOR INTERNATIONAL DEVELOPMENT
WASHINGTON, D C 20523

8 FEB 1982

Ing. Alberto A. Giesecke M.
Director
Centro Regional de Sismologia para
America del Sur (CERESIS)
Apartado 11363
Lima 14, Peru


Dear Dr. Giesecke:

Thank you so much for your kind letter of January 11 concerning Paul Krumpe's dedication and interest in improving Peru's capability to interpret seismological activity. I know that Paul is most dedicated, but I feel that he must have had some inspiration from you to kindle that dedication.

We in the Office of U.S. Foreign Disaster Assistance feel that we do indeed have a friend, and you are also a partner in our efforts to serve humanity wherever there is or might be suffering.

Please know that your advice and assistance is always welcome and that we look forward to a visit from you at your convenience.

Sincerely,


Martin D. Howell
Director
Office of U.S. Foreign
Disaster Assistance

DOCUMENT NO. 157

May 29, 1982

Robert Gersony
c/o Regional Development Office/Caribbean
U. S. Embassy
Bridgetown, Barbados, West Indies

Dr. Paul Krumpe
Mr. Oliver Davidson
Office of Foreign Disaster Assistance
Agency for International Development
Room 1262A NS
Washington, D. C. 20523

Dear Paul and Ollie,

As you know, I am in the process of finalizing our team's report on our disaster preparedness activities in Lima last Summer and Fall. One of the volumes which will be included in the report will be a simple, chronological collection of correspondence, media coverage, and other documentation which was available in the Embassy and USAID Mission in Lima. The purpose of this collection is to have together in one place at least a basic set of information on the prediction.

The collection of documents and their indexing is now complete. Of course, it would be useful to include as many unclassified documents as possible in the set.

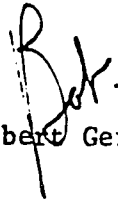
I would be prepared, during my next visit to OFDA, to review OFDA's official files or any other files which could offer additional material. To this task, I would bring my typed index of documents already collected. I would be very pleased to bring to your attention any documents which I feel would be useful for our volume. I would not want to include any documents which are personal -- for example, your own analyses and notes -- unless you felt you would wish them to be included.

I know there are various angles to this suggestion, so I leave it in your hands. All I ask is that by the time I come to Washington next, you would have an answer prepared as to whether I can or cannot work with these records. If not, I'll just submit the collection as I have it. If I can, I'll make a quick inventory of whatever materials you feel should appropriately be made available to me, copy those which would be of use, check them with you, integrate them and submit the volume to the Project Officer.

- 2 -

Thanks to you both for any consideration you could give to this request.

Yours sincerely,

A handwritten signature in dark ink, appearing to be 'R. Gersony', written over the printed name.

Robert Gersony

UNITED STATES INTERNATIONAL DEVELOPMENT COOPERATION AGENCY
AGENCY FOR INTERNATIONAL DEVELOPMENT
WASHINGTON, D C 20523

18 JUN 1982

Mr. Robert Gersony
c/o Regional Development Office/Caribbean
Box 302
U. S. Embassy
Bridgetown, Barbados, West Indies

Dear Bob:

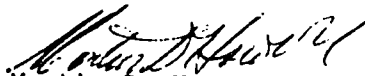
I am writing in response to the request in your May 29 letter to Ollie Davidson and Paul Krumpke to obtain documentation available to the Embassy and USAID Mission in Lima concerning the Peru prediction.

During your visit to Washington you are welcome to review OFDA's official files and collaborate with Ollie and Paul to determine appropriate materials for inclusion in the chronological collection of documents.

In order to expedite your request, we would appreciate receiving a copy of your index and the volume of documents collected to date.

With best regards,

Sincerely,



Martin D. Howell
Director
Office of U. S. Foreign
Disaster Assistance