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DEADLINES FOR FUTURE ISSUES

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WORKSHOPS ON EARTHQUAKE AND LANDSLIDE HAZARDS IN THE WASATCH FRONT REGION OF UTAH

July 10-11, 1985
July 30 - August 1, 1985

USGS, Federal Emergency Management Agency, Utah Geological and Mineral Survey (UGMS), Utah Division of Comprehensive Emergency Management (CEM), and the University of Utah joined together to convene two workshops in Salt Lake City to define the essential elements of the earthquake hazards reduction program in Utah. The objective of the two workshops was to increase the capability of State and local governments, private industry, academic institutions, and engineers and architects to increase their capabilities to reduce losses from earthquake and landslide hazards. The workshops continued the planning process begun in FY-84 which involved 150 people at a workshop on August 14-16, 1984, in Salt Lake City.

Twenty-five scientists, emergency managers, architects and engineers attended the first workshop which was held at the UGMS offices in Salt Lake City. At that time, UGMS, with the assistance of the workshop participants, identified its roles and responsibilities in the hazard reduction program before, during, and after an earthquake. Its role as "Utah State Geologist" included specific responsibilities of:

1) Collecting, managing, and distributing information and maps
2) Assisting and advising local governments.
3) Reviewing site and development plans for local and State government at their request.
4) Evaluating hazards.
5) Monitoring hazards.
6) Advocating seismic safety.

From these responsibilities the group identified 3 major ones:

1) Provide technical advice to State and local agencies.
2) Evaluate geologic hazards.
3) Document surface and subsurface effects and damage.
4) Coordinate with post-earthquake investigation teams, USGS and CEM and other State and local agencies.

The group agreed that the UGMS needed to perform these roles in anticipation of an earthquake, in response to an earthquake, and during the post earthquake investigation and reconstruction phases. At the second day of the meeting, the group concentrated on the role of the UGMS after an earthquake, during the response and recovery phases. As the Utah State Geologist, UGMS would be called upon to:

(Workshops continued....)

1) Provide technical advice to State and local agencies.
2) Evaluate geologic hazards
3) Document surface and subsurface effects and damage.
4) Coordinate with post-earthquake investigation teams, USGS, and CEM and other State and local agencies.

Two other activities were discussed at the workshop, hazard monitoring and loss estimation studies. UGMS shares a role with other State and Federal agencies to monitor hazards. The University of Utah monitors seismicity, USGS monitors strong ground motion and seismicity, and UGMS monitors water wells. In addition UGMS maintains the data basis for the information and acts as advocate for continued hazard monitoring.

Earthquake loss estimation studies require cooperation between CEM, UGMS, and local government. UGMS has the best source of geologic data which CEM can utilize in earthquake loss-estimation studies. County and city governments can contribute land use and building information for the studies.

At the conclusion of the two-day workshop, all participants recognized the urgency of institutionalizing the relationships and activities of all the partners in the Utah hazards reduction program, giving UGMS the role of coordinating hazard information collection, translation, and dissemination. The participants agreed that a successful program will require close communication between all the partners in the program.

The second workshop focused on assisting the Utah Division of Comprehensive Emergency Management (CEM) and city and county urban planners and geologists to use hazard information and maps to reduce losses from earthquakes and landslides. For two days, 60 emergency managers, urban planners, and county geologists participated in discussions of earthquake and landslide hazard mapping, earthquake risk analysis and their uses in land-use and emergency response planning. On the third day of the workshop, the participants took a field trip to see the landslides, fault scarps, and examples of appropriate land use in earthquake-and landslide-prone areas.

The workshop participants benefited from presentations made by leaders in the fields of geology, seismology, hazard mapping, risk analysis, earthquake engineering, and urban planning. Examples from California were shared with the group in order to present innovative methods for reducing potential losses from earthquake and landslide hazards.

The highlight of the workshop was the interaction between geologists, seismologists, and social scientists, who collect and translate hazard information, and urban planners, emergency managers, and architects and engineers, who need to use the information in their communities and for their clients. Researchers learned what types of ground-shaking, liquefaction potential, and landslide maps are useful and the application of various map scales. The planners gained a greater understanding of hazard mitigation. At the close of the workshop, each group understood better each others' roles and the difficulties in collecting, analysing and applying hazard information to reduce losses from earthquakes and landslides. The participants agreed that any earthquake reduction program in Utah will require the coordinated effort of geologists, seismologists, urban planners, emergency managers, engineers, and architects.

DEADLINE AND FORMAT FOR THE U.S. GEOLOGICAL SURVEY PAPER ON

"Evaluation of Urban and Regional Earthquake Hazards and Risk in Utah"

Deadline for transmittal of ABSTRACTS for the above professional paper is OCTOBER 11, 1985. Deadline for transmittal of manuscripts which have received 2 peer reviews on APRIL 1, 1986. Abstracts and manuscripts should be sent to Walter Hays, Office of Earthquakes, Volcanoes, and Engineering, U.S. Geological Survey. 905 National Center, Reston, Virginia 22092.

ABSTRACTS MUST BE 4-8 PAGES LONG AND MEET THE FOLLOWING FORMAT:

1) Abstracts must be typed in "prestige elite 12".
2) Top, bottom, and side margins must be 1 inch. Do not justify right margins.
3) The title, your name, affiliation, city and State must be centered at the top of the page.
4) Main headings must be typed in capitalized letters. Subheadings must be typed in lowercase letters.
5) Paragraphs must be indented 5 spaces.
6) The abstracts must be typed in DOUBLE SPACE.

Manuscripts for the above professional paper will need to meet U.S. Geological Survey style requirements which are explained in detail in SUGGESTIONS TO AUTHORS OF REPORTS OF THE USGS by Elna E. Bishop and Edwin B. Eckel, and others, U.S. Government Printing Office, Washington D.C., 1978.

Those of you who are not familiar with USGS requirements should make special note of the requirements guiding references, abstracts, and art work. Also, your manuscripts will be edited and redrafted according to standard professional paper review.

UTAH EARTHQUAKE BIBLIOGRAPHY

By Janine Jarva

The Utah Geological and Mineral Survey has an ongoing effort to compile all published references relating to earthquake and earthquake hazards in Utah. Topics include studies directed toward hazard evaluation, hazard planning, and hazard mitigation as well as strictly scientific studies, e.g. historical, seismological, geophysical, and risk assessment studies. It is hoped that this bibliography will be a useful tool for scientists, engineers, architects, developers, planners, public officials, emergency managers, sociologists, policymakers, and interested members of the public. No purely theoretical or general introductory references have been included unless specifically related to Utah. Relatively strict geographic limitations are imposed. Studies conducted in Utah or having a database that includes parts of Utah are the primary focus of this bibliography. A few studies in southern Idaho and extreme eastern Nevada are also included.

Major sources in compiling the bibliography to date include 1) the U.G.M.S. Bibliography of the Geology of Utah, 2) the University of Utah Seismograph Stations' printout of their publications and the reference lists from those publications, 3) the references from theses and dissertations of graduate students at the

(Earthquake Bibliography continued....) University of Utah, 4) the Utah Division of Comprehensive Emergency Management's Earthquake Bibliography compiled in 1983, 5) the October 1980 special issue of the Seismological Society of America Bulletin on the Intermountain Seismic Belt, 6) the U.S. Geological Survey's Redbook Conference X, "Earthquake hazards along the Wasatch and Sierra-Nevada frontal fault zones", 7) the U.S. Geological Survey's Redbook Conference on August, 1984, "Evaluation of regional and urban earthquake hazards and risk in Utah", 8) publications of the U.S. Geological Survey, 9) publications of the Utah Geological and Mineral Survey, 10) publications of the Utah Seismic Safety Advisory Council, 11) various scientific journals including, EOS, Transactions of the American Geophysical Union, Seismological Society of America Bulletin, Geophysics, Journal of Geophysical Research, Tectonophysics, Earthquake Notes, Geological Society of America Bulletin and Abstracts with Programs, Earthquake Information Bulletin, Geology, Science, and 12) proceedings of various national and international conferences.

The format used throughout the bibliography is that of the "U.S. Geological Survey Suggestions to Authors" and "The Chicago Manual of Style", 13th ed.". The bibliography is intended to be dynamic in nature with frequent periodic updates done by the Utah Geological and Mineral Survey. It is also hoped that all references contained therein will be available at at least one of the following three locations: the Utah Geological and Mineral Survey library, the U.S. Geological Survey Public Inquiries Office library in Salt Lake City, or the University of Utah Marriott library. Finally, we hope to index the bibliography in such a way that it can be searched by topic(s) or keyword(s). The first draft of the Utah Earthquake Bibliography is currently in review by the U.S.Geological Survey.

FROM CAROLYN PERRONI, OFFICE OF PUBLIC AFFAIRS, FEDERAL EMERGENCY MANAGEMENT AGENCY

FEMA GRANT HELPS DAVIS COUNTY, UTAH PROMOTE EMERGENCY PREPAREDNESS

When disaster strikes, your neighborhood could be your first line of protection. With that idea in mind, a group of concerned residents in Davis County, Utah, has developed a community emergency and disaster preparedness program which could become a model for other communities throughout the country.

Public awareness of the need to prepare for a range of potential emergencies is a crucial part of the Davis County preparedness program. With a grant from the Federal Emergency Management Agency (FEMA) the county's Office of Emergency Services has developed an education program that involves communities, neighborhoods, households, business and industry and schools. At the heart of the effort is a videotape presentation, "Your Neighbors: Survival Kit to the Future," which dramatizes the simple steps individuals and families can take to better prepare for emergencies. The videotape also outlines a plan for organizing neighbors into an emergency and disaster preparedness network.

A narrow strip of land consisting of 633 square miles with the Great Salt Lake to the east and the Wasatch Mountains to the west, Davis County is particularly vulnerable to the effects of high winds and to flooding in its 27 canyons and along its many streams. With the Wasatch Fault running the entire length of the county along the base of the mountains, 146,000 Davis County residents must be prepared for a possible earthquake as well.

Another videotape program to be produced under the Davis County grant will show how to develop an effective emergency plan to deal with an earthquake, fire or other emergency that might occur when the family is apart. The purpose of this and other planned videotapes is to aid community leaders in their efforts to raise public awareness about potential emergencies and promote preparedness. Davis County Emergency Services will provide copies of the videotapes at cost to neighborhood groups, community and civic groups interested in promoting emergency preparedness.

The Community Emergency Videotape Program is one of 11 projects nationwide funded under FEMA's Public Information Challenge Grants Program. Each small grant of approximately $10,000 is for development of a model project to promote hazard awareness and preparedness. Grantees are required to gain local support for their projects at the start by securing a matching share from a non-federal source.

Other Challenge Grant projects include an exhibit on hazardous materials preparedness, a series of radio dramas for students on hazards in a major metropolitan area, a series of graphic symbols depicting emergency actions for people who cannot read English, and an emergency awareness/preparedness computer game for families.

FEMA plans to give wide exposure to the successful techniques and strategies developed under the Challenge Grant Program so that eventually the models can be adapted for use in emergency public information programs throughout the country."

FEDERAL EMERGENCY MANAGEMENT AGENCY

A status report on federal efforts to achieve the goals of the National Earthquake Hazards Reduction Program (NEHRP) has been completed. As lead agency for the program FEMA submitted the report of Fiscal Year 1984 activities to Congress on behalf of the U.S. Geological Survey, the National Science Foundation, and the National Bureau of Standards, the other agencies with principal responsibilities under the program.

The report described activities in five broad categories: hazard delineation and assessment; earthquake prediction research; preparedness planning and hazard awareness; and fundamental seismological studies. It highlights not only work by the four principal agencies, but also that of other federal agencies and a number of interagency committees and working groups.

Copies of the NATIONAL EARTHQUAKE HAZARDS REDUCTION PROGRAM: FISCAL YEAR 1984 ACTIVITIES are available by writing to Earthquake Annual Report, Federal Emergency Management Agency, P.O. Box 8181, Washington D.C. 20024.

RESEARCH IN PROGRESS

NATIONAL SCIENCE FOUNDATION FUNDED PROGRAM

Professor J.B. Schneider
University of Washington
Civil Engineering, 121 More Hall, FX-10, Seattle, Washington 98195

Population Estimates in Time and Space (PETS)

The ebb and flow of people in a metropolitan area during a typical weekday is a significant phenomenon, but its spatial structure and dimensions are largely unknown. This research has developed a computer model, called PETS, that will generate estimates of the number of people in each of several small zones (e.g., census tracts) within a large metropolitan area during an average weekday. The total population estimate for each zone (TPOP) is further subdivided into three categories: (1) people in buildings (BPOP), (2) people in vehicles (VPOP), and (3) pedestrians (PPOP). Estimates are generated for 144 observation times (every 10 minutes) during a 24-hour average weekday. These figures can be used to devise estimates of the number and location of deaths and injuries that can be expected given the occurrence of an earthquake or other disaster, whose time, location, and intensity is postulated.

The model has been programmed in the PASCAL language and has been implemented on a CDC Cyber 180/855 at the Academic Computer Center at the University of Washington in Seattle. It is a large program and produces a lengthy printed and graphic output. For a 500 zone city, 144 estimates would be produced for each zone of 4 population categories (a total of 288,000 estimates). These data can also be displayed in the form of line graphs and three-dimensional surfaces to aid their comprehension. To date, data for a 25-zone hypothetical but realistic city with a population of 200,000 has been processed successfully. An application to an actual city is currently being planned.

The data requirements of the model are substantial but every effort has been made to use only those data that are normally available from the transportation section of a metropolitan planning agency. In those cities which currently use the Federally-sponsored Urban Transportation Planning system or one of a number of other similar transportation planning software packages, the required data are normally readily available and can be assembled quite easily. Data on home-based work, home-based other and non-home based travel by auto and transit are required. Travel distributions, time away distributions, building space data, pedestrian trip generation rates and highway and transit network descriptions are also required.

It is suggested that the model be implemented and maintained at one location where it could be used to serve cities in various parts of the nation. Cities would send their data to this site for processing on an annual or biennial basis and receive printed and graphic reports in return. The estimates would be in tabular and graphic form suited for off-the-shelf use. When matched with microzonation data, zones that have large populations in high risk categories can be readily identified. Development of appropriate injury/death ratios is beyond the scope of this research.

The costs for processing the data for the 25-zone test city have been about $25, using evening rates at the Academic Computer Center at the University of Washington. At present, we expect the $1/zone rate to hold for larger cities as well. If special graphics are desired, the cost will be somewhat higher.

FROM ART TARR, U.S. GEOLOGICAL SURVEY

(The following information was obtained from Semi-Annual Technical Reports prepared at the completion of mid-Fiscal Year 1985 for projects funded in the Branch of Engineering Geology and Tectonics. Complete reports will appear in a USGS Open-File Report to be published in early 1986.)

The Inter-Mountain seismic belt earthquakes of October 28, 1983 (Borah Peak, Idaho) and October 18, 1984 (Laramie Mountains, Wyoming) continue to be studied in conjunction with Wasatch Front investigations. CHARLEY LANGER has now located over 400 aftershocks using data from USGS portable stations and using readings provided by the University of Utah, Boise State University, Idaho National Engineering Laboratory, University of Washington, and Montana Bureau of Mines and Geology. The epicenters with the best locations delineate two northwesterly-trending clusters separated by a small gap. The southern cluster clearly defines a plane dipping 45 to 55 degrees SW whereas the northern cluster is more diffuse, perhaps indicating that two planes, dipping 45 degrees SW and NE, respectively, are involved. The gap separating the two clusters is associated with the location where faulting has splayed away from the primary northwest trend. Focal mechanisms derived from 55 out of 60 aftershocks show consistent normal faulting with a small strike-slip component; the predominant strike is 155 degrees and the dip is 45 degrees.

The Laramie Mountains earthquake was the largest (M_L = 5.5) on record to have occurred in eastern Wyoming. The mainshock was deep (about 24 km) and was felt over a wide area, about 287,000 square km. The focal mechanism, determined by DAVE GORDON and RUSS NEEDHAM, indicates predominant strike-slip faulting. The nodal planes strike 69 degrees and 334 degrees, respectively; the trend of the P-axis is 289 degrees and the plunge is 25 degrees, while the T-axis trend is 23 degrees and plunge is 9 degrees. A network of 16 smoked-paper and seven digital portable seismic systems was deployed by the USGS and U.S. Bureau of Reclamation. The 35 best-located aftershocks occurred in a very tight cluster covering an area of only 13 square km; depths were between 21 and 26 km and duration magnitudes ranged from 1.8 to 3.7. Focal mechanisms indicate both strike-slip and dip-slip modes of faulting; in all solutions, the T-axis is horizontal and trends at 23 degrees, the same trend as the main shock. ART TARR has computed seismic moment and stress drop for some of the larger aftershocks; preliminary results indicate that the stress drops are high, averaging about 350 bars.

KEN KING reports continuing progress in expanding the strong-motion instrumentation program in the Salt Lake City area. Seven seismoscopes have been installed to supplement the strong-motion accelerograph array already in place. Shallow reflection profiles have been run at all the strong-motion sites and in the Springville-Provo area where the profiles are on hard rock and on thin, medium, and thick unconsolidated alluvium; the reflection data are being processed at this time. Experiments at the Denver Federal Center (where the section is well-known) indicate the feasibility of mapping beds in unconsolidated sediments when there is a water table in the 20 to 100 foot depth range.

Previous ground motion data recorded in the Wasatch Front region were supplemented this Spring with recordings of an NTS nuclear event. AL ROGERS reports that digital data were successfully recorded at six sites, selected to represent a range of surficial materials and depth to bedrock. The sites included one near Utah Lake that had been occupied previously and a

(Project reports continued.....)

site near Hobble Creek. A spectral ratio in excess of 10 (in the 0.7 to 1.0 seconds band) has been calculated in 1983 for the Utah Lake site, located on thick Quaternary deposits. The spectral ratio data will be correlated with information derived from existing well logs, now being collected in collaboration with the UGMS, and from additional wells to be drilled in the future.

ART TARR has reported on continuing refinement of source parameters, such as seismic moment and stress drop, determined from digital seismic data recorded in 1981 at the Nevada Test Site. The methods of data analysis are applicable to digital seismic data recorded elsewhere in the Great Basin and Inter-Mountain seismic belt. Already he has used the package of computer programs to analyze digital data recorded in Utah of a nuclear event at NTS and aftershock data from the Laramie Mountains earthquake. The results of the southern NTS data show that microearthquakes in the 0.1 to 2.8 magnitude range were characterized by very low stress drops, ranging from a few hundreths bar to about one bar.

ERNIE ANDERSON and TED BARNHARD are continuing their analysis of paleostress data in the central Sevier Valley area south of the Wasatch fault. Stress axis orientations determined from hundreds of observations show that strike-slip faulting and associated folding is common, even locally predominant, in the region. The data show consistent east-west orientation of the axis of least principal compressive stress (σ_3); the axis of maximum principal compressive stress (σ_1) is oriented north-south for strike-slip faults and vertical for dip-slip faults. The mapper fault and fold patterns and fault-plane solutions of microearthquakes in the area are compatible with north-south crustal shortening due to the contemporary stress field. The existence of large, young strike-slip faults in the area suggests that evaluation of earthquake hazard in the area should consider strike-slip faulting as well as normal faulting.

RICH MADOLE has been investigating the use of amino acid racemization as an age dating technique in his studies of landslide recurrence in central Utah. Racemization is the slow, spontaneous conversion of almost exclusively L-form (left-handed) amino acids in an organism (that has just died) into the right-handed D-form, until an equilibrium mixture of equal amounts of L-and D-forms is attained. The rate of racemization is dependent on several factors, two of which are species type and temperature. In principle, the age of a fossil can be determined if the rate of racemization can be estimated from independent age dates (^{14}C, say) and from reasonable assumptions about the temperature history of the sample; the method is known to be applicable to material of Pleistocene age but it is not clear if it is appropriate for samples of Holocene age. Fossil mollusks, chiefly snails, are common in landslide deposits of the western Wasatch Plateau. One particular snail, Stagnicola elodes, meets several criteria for a sample to be desirable for age dating. Rich has collected samples of S.elodes and three other fossil fauna from pond deposits in the Manti landslide and recent fauna from a pond in the Twin Lake landslide. Because there is a tendency for pond-forming depressions to remain in the same position, even though older pond sediment moves downslope during large slides, the potential is there for recording the number of mass movement events, in addition to age determination. The amino acid age determinations have not yet been completed.

SOUTHERN CALIFORNIA EARTHQUAKE PREPAREDNESS PROJECT

Over the past four years, FEMA has supported the Southern California Earthquake Preparedness Project in their development of earthquake planning strategies, planning guidelines, and educational materials.

Through a cooperative agreement, SCEPP produced a variety of materials on earthquake preparedness designed for public and private planners, local government officials, business and industry, school systems, and the general public. SCEPP has provided FEMA with prototypical brochures, pamphlets, and slide/tape programs on earthquake preparedness and awareness for adaptation and use in other areas with a high seismic risk. A synopsis of the SCEPP products follows.

REPORTS:
Earthquake Preparedness Information for People with Disabilities - intended for people and organizations who work with the disabled, rather than the disabled themselves.

PRINTED MATERIALS/BROCHURES:

Preparedness in Apartments and Mobile Homes - provides earthquake preparedness and safety information for people living in apartments and mobile homes.

Preparedness for People with Disabilities - provides specific preparedness information for people with mobile, visual, and hearing disabilities.

Preparedness in High-Rise Buildings - provides preparedness and safety information for people living and working in high-rise buildings.

Comprehensive Earthquake Preparedness Planning Guidelines: City, County and Corporate - prototypical preparedness planning guidelines produced through partnerships with the County of San Bernardino, the Cities of Westminster and Los Angeles, and the Security Pacific National Bank Corporation. The guidelines will assist county, city, and corporate organizations elsewhere to either initiate earthquake preparedness planning or review and evaluate their existing plans.

Guidelines for Local Small Businesses - provides general information on how small business can reduce financial and property losses as a result of an earthquake.

Reducing the Risks of Nonstructural Earthquake Damage: A Practical Guide - provides preparedness and mitigation information to homeowners/managers of commerical buildings about potential nonstructural damage.

SLIDE/TAPE PROGRAMS (available for loan):

The Earthquake Threat to Southern California - designed as an awareness and education device.

The Planning Process: Preparedness Planning in Earthquake Country - describes SCEPP's earthquake planning process and guidelines.

Earthquake Preparedness in Mobile Home Communities - suggests community organization and preparedness for earthquake response in a mobile home park.

The Earthquake Threat: Living in Apartments - suggests organization and preparedness for an apartment complex.

Earthquake Preparedness in High-Rise Office Buildings - describes nonstructural hazard reduction, preparedness planning, and employee readiness for high-rise office buildings.

THE SCEPP PRODUCTS WILL BE AVAILABLE LATER THIS SUMMER THROUGH FEMA`S DENVER REGIONAL OFFICE, FEDERAL CENTER, BUILDING 710, DENVER, COLORADO 80225, OR BY WRITING FEMA, P.O. BOX 8181, WASHINGTON D.C. 20024. FOR MORE INFORMATION CONTACT JERRY OLSON IN DENVER (303) 322-4834 OR TERRY FELDMAN IN WASHINGTON D.C. (202) 646-4145.

UTAH EARTHQUAKE ACTIVITY

APRIL THROUGH JUNE 1985

by
James C. Pechman

UNIVERSITY OF UTAH SEISMOGRAPH STATIONS
DEPARTMENT OF GEOLOGY AND GEOPHYSICS

The University of Utah records a 76-station seismic network designed for local earthquake monitoring within Utah, southeastern Idaho, and western Wyoming. During the time period April 1 through June 30, 1985, 117 earthquakes were located within the Utah region (Figure 1). The only earthquake reported felt was a magnitude 1.8 event on April 21, 1985, located 1 km south of our recording laboratory on the University of Utah campus in Salt Lake City, This event was felt in the immediate vicinity of the campus. There were three earthquakes of magnitude 3.0 or greater during the reporting period: (1) a magnitude 3.2 event on April 5 in southeastern Idaho 75 km north-northeast of Logan, Utah; (2) a magnitude 3.0 event on June 11 approximately halfway between Richfield and Price, Utah; and (3) a magnitude 3.0 event 70 km west of Cedar City, Utah on June 19.

Other significant aspects of earthquake activity during the report period shown in Figure 1 include (from north to south):

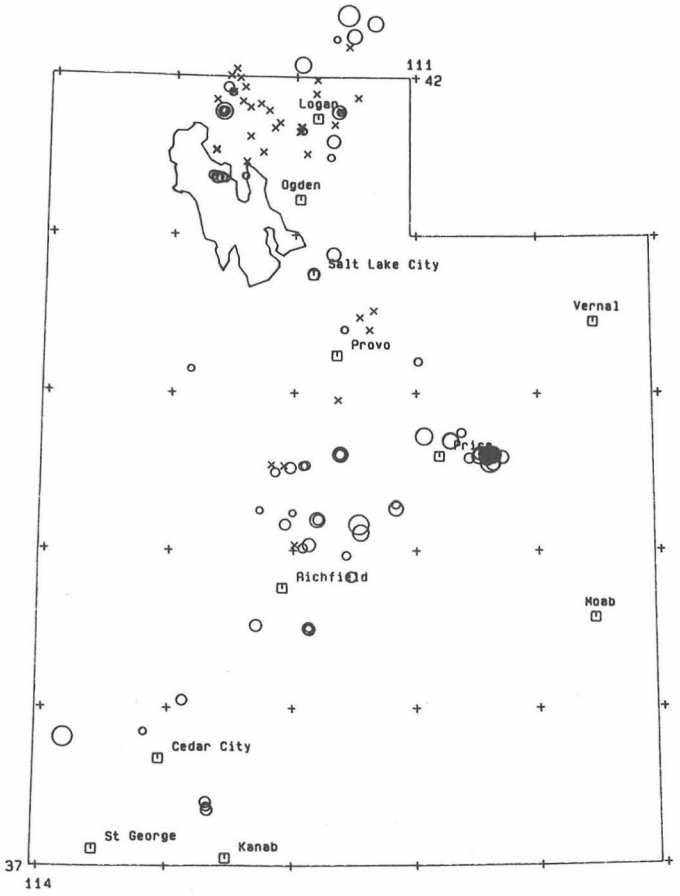
1) activity in the Utah-Idaho border region, including a cluster of small-magnitude events north of the Great Salt Lake;

2) a swarm of four earthquakes (M 1.4-1.8) on April 9 and 10, centered beneath the Great Salt Lake 60 km west-northwest of Ogden, followed by a fifth event (M 1.3) in the same area on April 20;

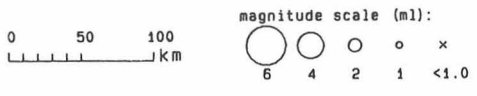
3) small magnitude ($M \leqslant 2.7$) earthquakes in the vicinity of active underground coal mining east and north of Price, Utah; and

4) scattered small earthquakes in central and southwestern Utah.

Additional information on earthquakes within Utah is available from the University of Utah Seismograph Stations, Salt Lake City, Utah 84112 (telephone 801-581-6274).



Utah Earthquakes: April 1 - June 30, 1985



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TERRA NON FIRMA: Understanding and Preparing for Earthquakes, James M. Gere and Haresh C. Shah, W.H.Freeman & Company, 1984, 203 pp, clothbound $19.95, paperback $11.95

EMERGENCY PLANNING: Proceedings of the Conference on Emergency Planning, J.M. Carroll, Editor. Simulation Series, Volume 15, #1, 155 pages, $30.00. Order from The Society for Computer Simulation, P.O. Box 17900, San Diego, California 92117.

EIGHTH WORLD CONFERENCE ON EARTHQUAKE ENGINEERING PROCEEDINGS. International Association of Earthquake Engineering. 1985, 6,995 pages, $210.00. Order from the Earthquake Engineering Research Institute, 2620 Telegraph Avenue, Berkeley, California 94704.

U.S. GEOLOGICAL SURVEY
OPEN FILE REPORTS

(Information on ordering and prices is available from the USGS, Public Inquiries Office, 8105 Federal Building, 125 South State Street, Salt Lake City, Utah 84138-1177....801-524-5652)

OF84-760	Proceedings of the Geological and Hydrologic Hazards Training Program. M.E. Williams, 1,128 pages.
OF84-761	Proceedings of Conference XXIV; a workshop on Geologic hazards in Puerto Rico. edited by P.L. Gori and W.W.Hays, 160 pages
OF84-840	Earthquake Data Archiving and Retrieval System; reference manual. G.R. Cran, W.H.Lee and J.T. Newberry, 163 pages
OF84-939	Proceedings of Workshop XIX;Active tectonic and magmatic processes beneath Long Valley Caldera, eastern California, Volumes I and II, edited by D.P. Hill and others, 952 pages
OF85-22	Summaries of technical reports, Volume XIX; prepared by participants in the National Earthquake Hazards Reduction Program, December 1984. Compiled by M.L. Jacobson and T.R. Rodriguez, 619 pages
OF85-44	Proceedings of Workshop XXVII; Mechanics of the May 2, 1983, Coalinga earthquake, 445 pages
OF85-119	Geologic map of the Shivwits and West Mountain Peak quadrangles, Washington County, Utah. L.F. Hintze, 19 p, 3 plates, 1:24,000
OF85-120	Geologic map of the Castle Cliff and Jarvis Peak quadrangles, Washington County, Utah. L.F. Hintze, 19 pages, 3 plates 1:24,000
OF85-201	Minutes of the National Earthquake Prediction Evaluation Council, C.F. Shearer, 84 pages
OF85-216	Geologic map and structure of the Logan 30` by 60` quadrangle, Utah and Wyoming. J.H. Dover, 33 pages, 3 plates, 1:100,000
OF85-243	HP-85 computer program "HYP85"; an earthquake location program, P.B. Dawson, R. Cutler and J.R. Evans, 33 pages
OF85-278	Evaluation of the National Earthquake Information Center`s quick epicenter determinations. R.E. Needham, 115 pages

WORLD SEISMICITY MAP, 1974
Compiled by A.C. Tarr, 1974
Lat 70° N to 84 °N 65 °E to 105 °W
Sheet 36 by 48 inches, REPRINT $3.10

ALLMENDINGER, R.W., MILLER D.M., JORDAN, T.E.
Known and inferred Mesozoic deformation in the Hinterland of the Sevier Belt, Northwest Utah, Utah Geological Association Publication, v. 13, 1984, p. 21-34

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