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CONTENTS

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The NARS-Netherlands Project

Hanneke Paulssen, Suzan van der Lee, and Guust Nolet

Dept. of Geophysics, University of Utrecht, The Netherlands

The portable, 3-component, broadband (1 Hz - 100 s) NARS network is since the end of 1989 deployed in The Netherlands, Germany, and Belgium (fig. 1). As its aim is to investigate upper mantle structure, the NARS-Netherlands project can be considered as a (more detailed) follow-up experiment of NARS-Europe (1983-1988).

The direct motivation for installing the stations as a relatively dense network with a station spacing of about 50 km stems from some anomalous observations obtained with NARS-Europe. *P*-to-*S* converted phases from the 670-km discontinuity sometimes show anomalously high amplitudes (Paulssen, 1988). Figure 2 shows an example of such an observation with the direct *P* phase (solid) and its *P*-to-*S* converted phase (dashed) plotted on top of each other. The excellent agreement of the waveforms presents evidence for an at least locally sharp 670-km discontinuity beneath western Europe. The extremely large amplitude of the converted phase can, however, not realistically be explained without invoking focussing mechanisms. Most effective is focussing due to topography of the 670-km discontinuity, but other contributions can not be ruled out completely. Unfortunately, the station spacing of NARS-Europe (ca. 200 km) was too large to be able to correlate the phase from one station to another. With NARS-Netherlands we hope to zoom in on the 670-km discontinuity by investigating the coherence of the phase in an area where previously large *P*-to-*S* conversions have been measured.

In its present configuration the NARS network is also suitable for other types of body wave studies of the upper mantle, such as coda wave analyses, or an investigation of the upper mantle triplications.

The network will be deployed in its current configuration until fall 1991. Data will be available through the ORFEUS Data Center.

Paulssen, H., *JGR,* **93,** 10489-10500, 1988.

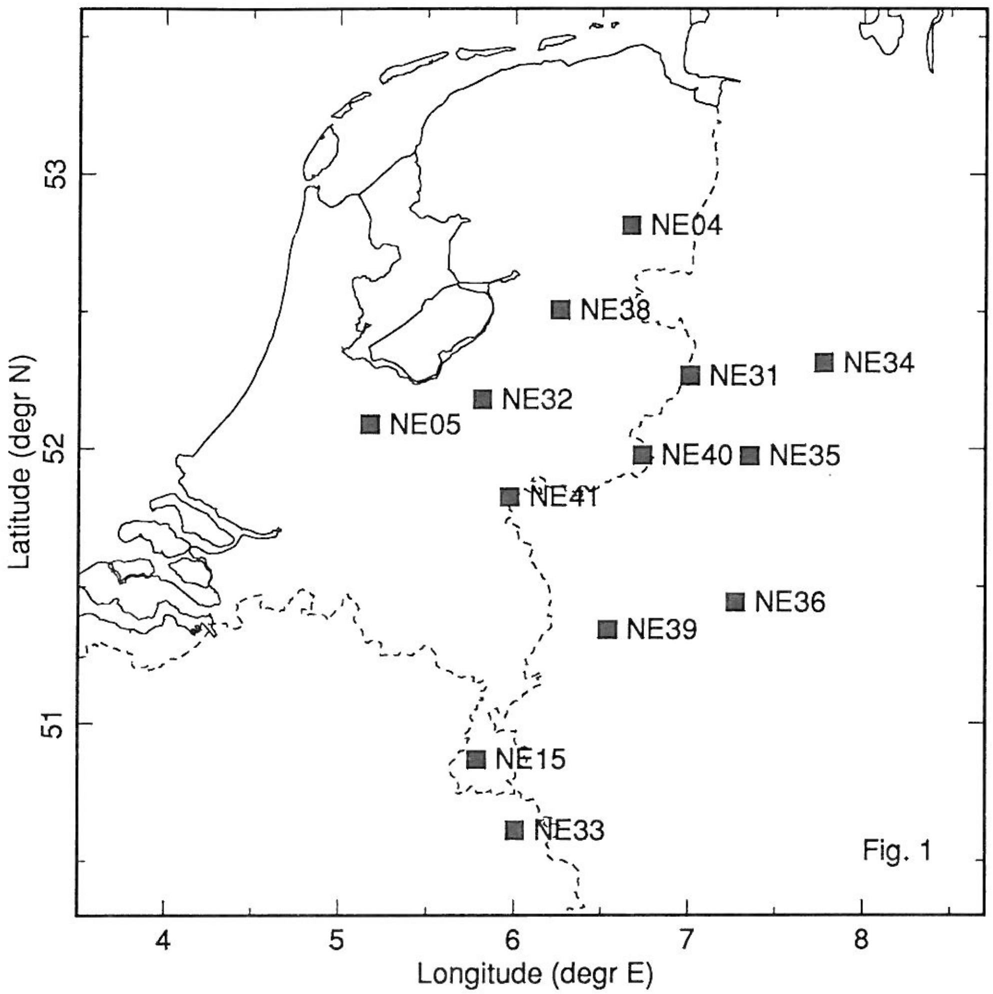

NE04
NE38
NE31
NE34
NE32
NE05
NE40
NE35
NE41
NE36
NE39
NE15
NE33
53
52
51
Latitude (degr N)
4
5
6
7
8
Longitude (degr E)

Fig. 1

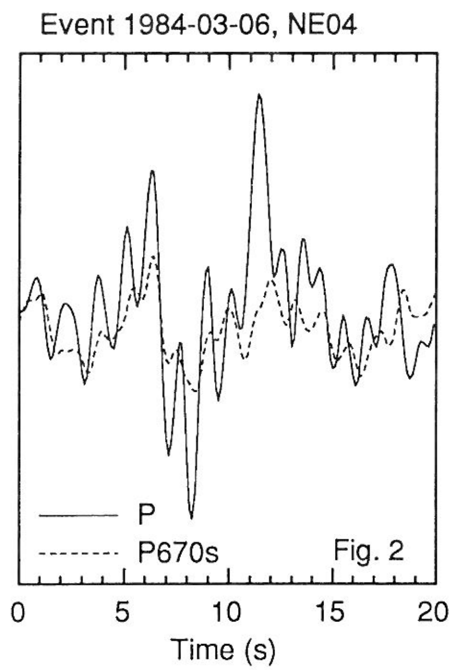

Event 1984-03-06, NE04
P
P670s
0
5
10
15
20
Time (s)

Fig. 2

Wide-angle Seismic Imaging in the Peninsular Ranges, Southern California: Piggyback onshore recording of marine airgun sources

Tom Henyey, David Okaya, Yong-Gong Li (USC),
Paul Davis (UCLA), Steve Day (SDSU), Bob Bohannon (USGS)

The USGS collected marine multichannel seismic reflection profiles in the southern California Borderlands during May, 1990. A group of southern California researchers cooperated with the USGS to conduct an onshore/offshore piggyback experiment as a pilot study to examine wave propagation, attenuation, and imaging aspects of the southern California Borderlands and Peninsular Ranges. The offshore Borderlands have a complex history of compressional and extensional tectonics and the Peninsular Ranges are composed of large-scale Mesozoic batholiths. Both regions are prominently dissected by major strike-slip faults associated with the San Andreas fault system. The USGS collected 30 multichannel profiles totaling 3000 km using the S.P. Lee.

In order to examine wave propagation characteristics in this region using marine airgun sources, portable seismometers were deployed in a fixed array oriented N59E degrees from the coastal city of Oceanside, CA to Anza, CA, 85 km inland (Figure 1). Six PASSCAL 3-component Refteks and four 2-component Kinemetric SSR seismometers at approx. 10 km spacing were deployed in night-time continuous-mode recording. The USGS SP Lee began at a designated time an offshore transect between offshore Oceanside and Santa Catalina Island using a 2300 cubic-inch airgun source at 20 sec intervals. Absolute timing was recorded at the source and at all receiver sites to allow for subsequent zero shot-time seismogram reconstruction.

The Reftek instruments stored the continuous recording of each component in five minute blocks. After the experiment, all blocks for each component from each station were transferred from Exabyte to SUN disk. Using zero-time information provided by the USGS, seismograms of 40 sec length were cut from the blocks and stored as SIERRA-SEIS-compatible binary data. SIERRASEIS was used to display all seismograms recorded at a given component/station (i.e., plot of a common receiver gather). Data was archived in SEG-Y format on magnetic tape.

Figure 2 illustrates first arrivals for a station 20 km inland from the Oceanside coastline with source point locations 40-55 km offshore for a total of 60-75 km offsets. The primary first arrival is interpreted as Pg; the structure exhibited in the arrival is due to sea floor topography beneath the S.P. Lee airguns. The major arrival 0.7 sec after Pg is not caused by a water bottom multiple as the sea floor is approximately 1.2 sec as observed in the vertical incidence CDP profile.

The primary objective of this field exercise was to determine propagation distances and quality of seismic energy generated by the S.P. Lee. P-wave first arrivals are recorded to a distance of at least 60 km inland for airgun sources offset up to an additional 80 km from the coastline. Also, P-S converted energy appears after the P arrivals and may be due to conversion at the sea floor and at more local interfaces. Strong-amplitude wide-angle reflections are visible at >60 km offset. Examination of horizontal components indicates anisotropic wave propagation.

Although the airgun source of the S.P. Lee was relatively small (2300 cubic inches), the source propagated fairly well given the transmission properties of the Borderlands and batholithic Peninsular Ranges. Given the difficulties of access within the Peninsular Ranges, both in terms of concentrated cultural regions and the ruggedness of the ranges in remote areas, onshore fixed receiver recording of walkaway offshore sources appears to be an effective approach to imaging the Borderlands/Peninsular Ranges transition region. Improved data quality will be possible with a larger airgun source and careful selection of additional receiver sites.

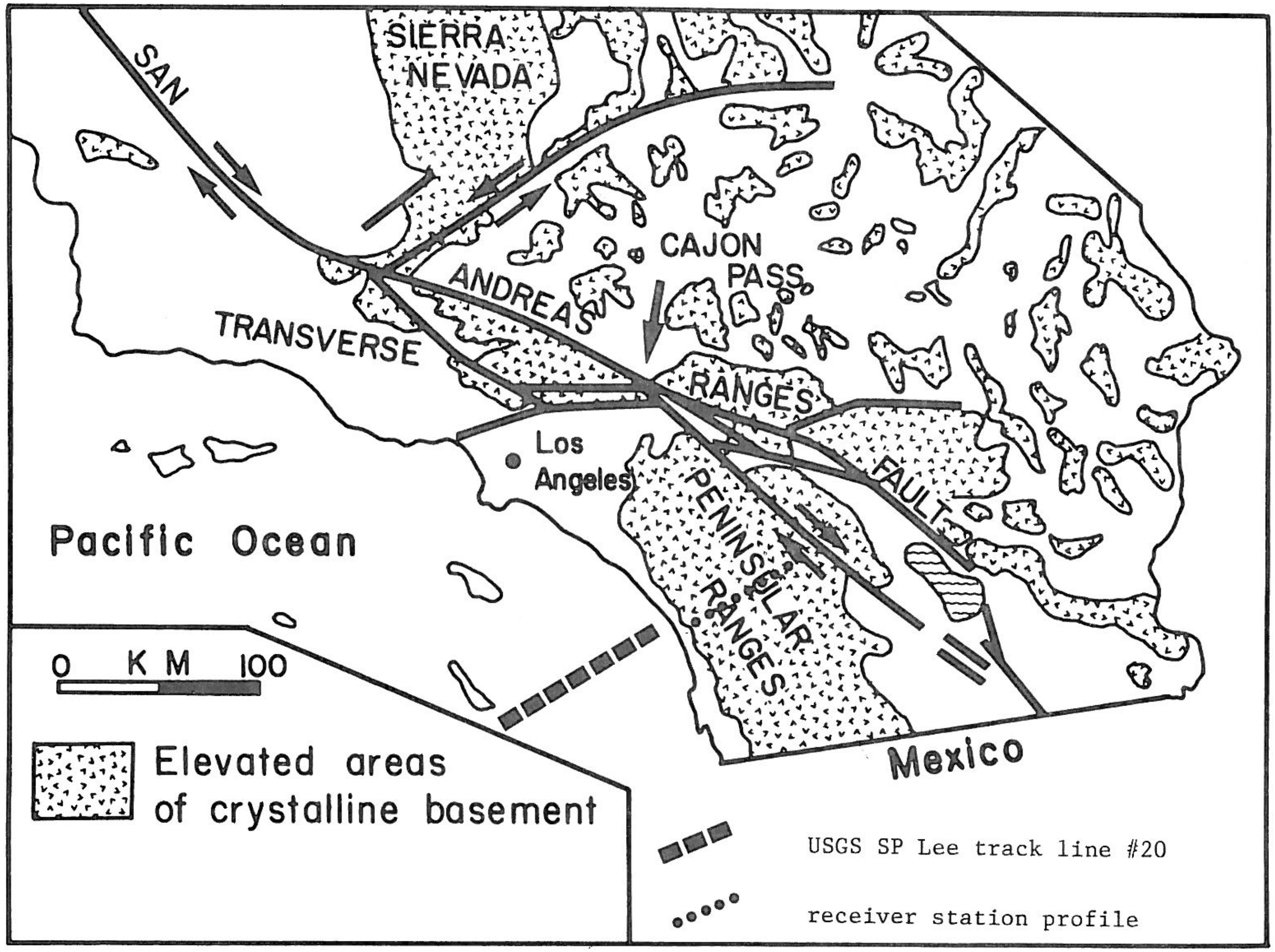

SAN
SIERRA NEVADA
ANDREAS
CAJON PASS
TRANSVERSE
RANGES
FAULT
Los Angeles
Pacific Ocean
PENINSULAR RANGES
Mexico
0 KM 100
Elevated areas of crystalline basement
USGS SP Lee track line #20
receiver station profile

Figure 1

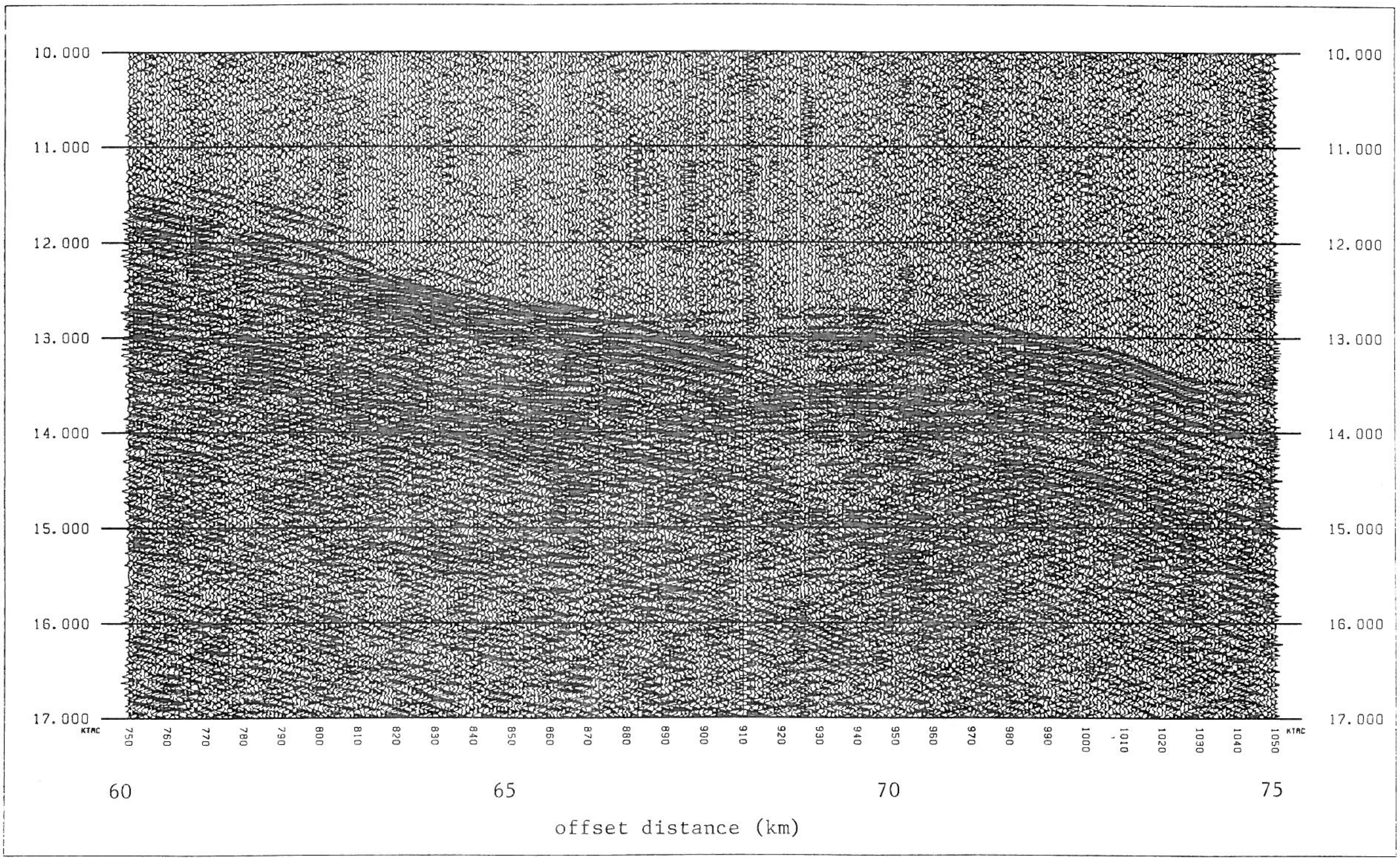

10.000
11.000
12.000
13.000
14.000
15.000
16.000
17.000
KTRC
750
760
770
780
790
800
810
820
830
840
850
860
870
880
890
900
910
920
930
940
950
960
970
980
990
1000
1010
1020
1030
1040
1050
60
65
70
75
offset distance (km)

Figure 2

1990 Loma Prieta Teleseismic Experiment

H. M. Iyer, J. R. Evans, and P. B. Dawson

U.S. Geological Survey, Menlo Park, California

This study was prompted by the unusual character of the 17 October 1989, M = 7.1, Loma Prieta earthquake. The depth of focus of 18 km and presence of significant thrust component on an inclined focal plane suggested that our knowledge of the heterogeneous lithospheric structure beneath the Santa Cruz Mountains was incomplete. Additionally, Eberhart-Phillips et al [1990] have shown using local-earthquake-wave tomography and magnetotelluric sounding that a complex three-dimensional velocity and electrical structure is present in the upper crust containing the Loma Prieta earthquake source zone. Therefore, we designed a teleseismic-wave tomography experiment with the following two goals: 1) to model the regional velocity structure (spatial resolution 10-15 km) from San Francisco to south of the Monterey Peninsula, an area of approximately 100X170 km, to a depth of about 150 km. 2) to model in detail (spatial resolution of 5 km) the velocity structure immediately surrounding the Loma Prieta source zone to a depth of about 50 km.

The experiment started in late August 1990. We are currently recording data on a 137-station network (Figure 1). One hundred and six of these stations are part of the central California seismic network (CALNET). The remaining thirty one stations are temporary installations over the 1989 seismogenic zone which will provide higher spatial resolution in that area. Ninety five of the CALNET sites consist of single-component short-period vertical seismometers, with the remaining eleven stations having 3-component short-period seismometers. The temporary stations all have three-component short-period seismometers recording on analog tape recorders or digital GEOS or REFTEK instruments. We plan to continue the experiment into mid-December, weather permitting.

A significant inovation in the retrieval of teleseismic waveforms from CALNET has been achieved by implementing a real-time PC based digital aquisition system. Up to 128 channels of the analog network can be converted to digital traces by an analog-to-digital board in the PC. A real-time teleseism-specific trigger algorithm is used to discriminate the seismic signals at selected stations, 8 of which must trigger simultaneously to verify an event. The digital waveforms are then available in near real-time for processing.

References

Eberhart-Phillips, D., Labson, V. F., Stanley, W. D., Michael, A. J., Rodriquez, B. D., Preliminary velocity and resistivity models of the Loma Prieta earthquake region, *Geophys. Res. Lett.*, 17, 1235-1238, 1990.

Seismic Network for the Loma Prieta Teleseismic Experiment
1990

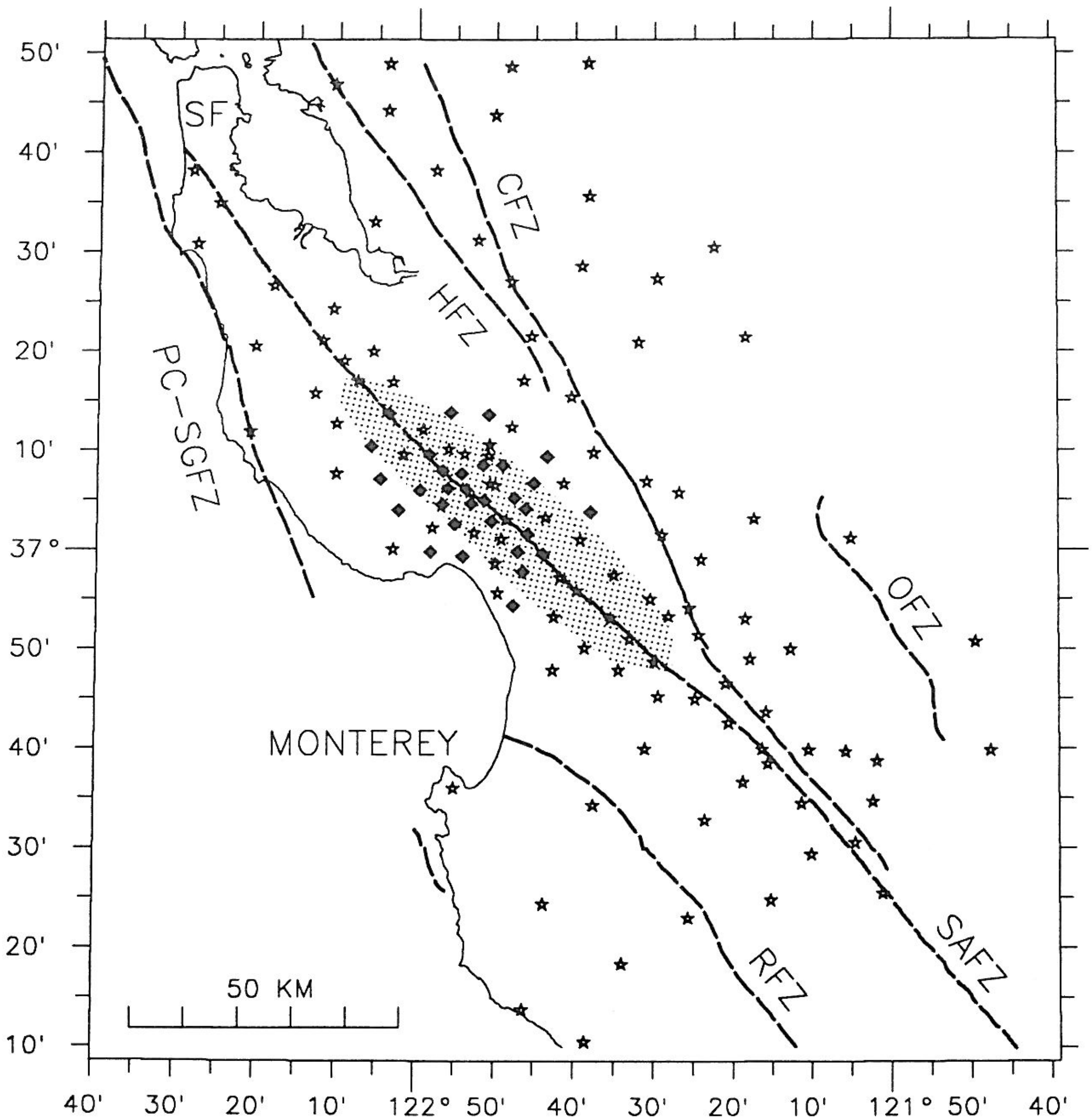


Figure 1. Map of the region covered by the 1990 Loma Prieta Teleseismic Experiment. Heavy dashed lines are the primary fault zones in the region: SAFZ - San Andreas; RFZ - Rinconada; OFZ - Ortigalita; CFZ - Calaveras; HFZ - Hayward; PC-SGFZ - Palo Colorado-San Gregorio. CALNET stations labeled with stars, solid diamonds indicate temporary analog and digital sites. Stippled area is the approximate rupture zone of the 1989 Loma Prieta event. SF indicates San Francisco.

Update on Project ALOHA, Hawaii

Clifford H. Thurber
University of Wisconsin-Madison

William A. Prothero, Jr.
University of California-Santa Barbara

Yingping Li
SUNY at Stony Brook

The array deployment phase of Project ALOHA (Arrays for Lithosphere Observations in HAwaii) is nearing completion. The project is supported by the National Science Foundation, supplemented by support from the Graduate School and the Department of Geology and Geophysics of the University of Wisconsin-Madison. We also acknowledge the invaluable logistical support of Paul Okubo and colleagues at the Hawaiian Volcano Observatory. The main goal is to image the major crustal discontinuities beneath the southeast flank of Mauna Loa volcano, i.e., the base of the volcano and the Moho. Instrumentation has been deployed primarily in the form of 4 to 6 station arrays of three-component instruments, with apertures on the order of 5 km or less (Figure 1). Sensors in use include S-13, L-4, and CMG3-ESP. The PASSCAL instruments are set up with "microearthquake" (100 sps, 60 s record) and "teleseismic" (10 sps, 900 s record) triggered data streams, plus continuous 1 sps recording for the 1 to 2 broadband sensors. The UCSB instruments are set up for triggered teleseismic recording only. As of the end of October, the arrays have recorded thousands of local events, but only a handful of teleseisms due to the extreme ocean microseismic noise.

The availability of an event catalog from the USGS Hawaiian Volcano Observatory allows us to readily identify the overwhelming majority of events recorded by multiple stations in each array. Interestingly, the main category of "unidentified" events we have been detecting are recognizable as being long-period (magmatic) earthquakes from a active region at 12 to 15 km depth beneath Kilauea Caldera. These events often trigger the RefTek's on both the local and teleseismic data streams (Figure 2).

Some of the most exciting observations are being obtained from deep (upper mantle) local events. We were fortunate to record a relatively rare M 4.0, 35 km deep event directly beneath the south coast of Hawaii on September 30 with the "South Flank" array, situated roughly 10 km due north of the epicenter. Records of this event provide relatively clear evidence for S to P conversions from major structural discontinuities at depth (Figure 3). Stations SF2 and SF3 were each set up with a 3-component L-4 sensor (channels 1-3) augmented by 2 additional vertical L-4 sensors (channels 4-5). Following the first P arrival (and its near-surface reverberation), we observe fairly sharp arrivals 1.5 and 2.5 seconds later, with the S arrival at 3.5 seconds post-P. We believe these are S to P conversions because of their fairly high amplitude well back in the coda, in which case they would correspond to interfaces at depths of about 16 and 6 km, respectively, for a Vp/Vs about 1.73. The former interface might be the Moho, but the latter is probably too shallow to be the basal zone of Kilauea volcano. Comparable observations from deep events beneath the Ainapo array do show clearer evidence for a conversion at the base of Mauna Loa volcano (about 11 km depth), in a region where we have previously reported basal reflections from shallow earthquakes. A preliminary perusal of data from shallow events indicates fairly consistent visibility of shallow reflections, both near-vertical-incidence P to P reflections and wide-angle S to P converted reflections, although we await the determination of improved hypocenters before proceeding further with that data.

We have also successfully recorded a number of teleseisms, mostly from stations with the Guralp sensor. Two of the more spectacular examples are shown in Figures 4 and 5 - the M 7.0 earthquake in the Solomon Islands on August 17, and the M 6.2 earthquake in the Vanuata Islands on August 12. We have also obtained excellent body and/or surface wave records from the following events:

07/22/90	M 5.9	South of Fiji Islands
08/05/90	M 6.2	Ascension Islands
08/10/90	M 6.0	Molucca Passage
10/17/90	M 6.5	Peru-Brazil border

Thus we have demonstrated the feasibility of using PASSCAL instruments and available portable broadband sensors (in this case, the relatively affordable CMG3-ESP) for mixed-mode GSN/PASSCAL experiments. As part of our experiment, we will also be examining the suitability of a site near the center of the Big Island for a possible GSN station, where the ocean microseismic noise may be significantly less than at our experiment sites near the south coast. An indication of the possibility for improvement over the GSN site in Kipapa is apparent in Figure 6, which compares the Kipapa and Punaluu Gulch 6 (Guralp) records of the deep Peru-Brazil border event.

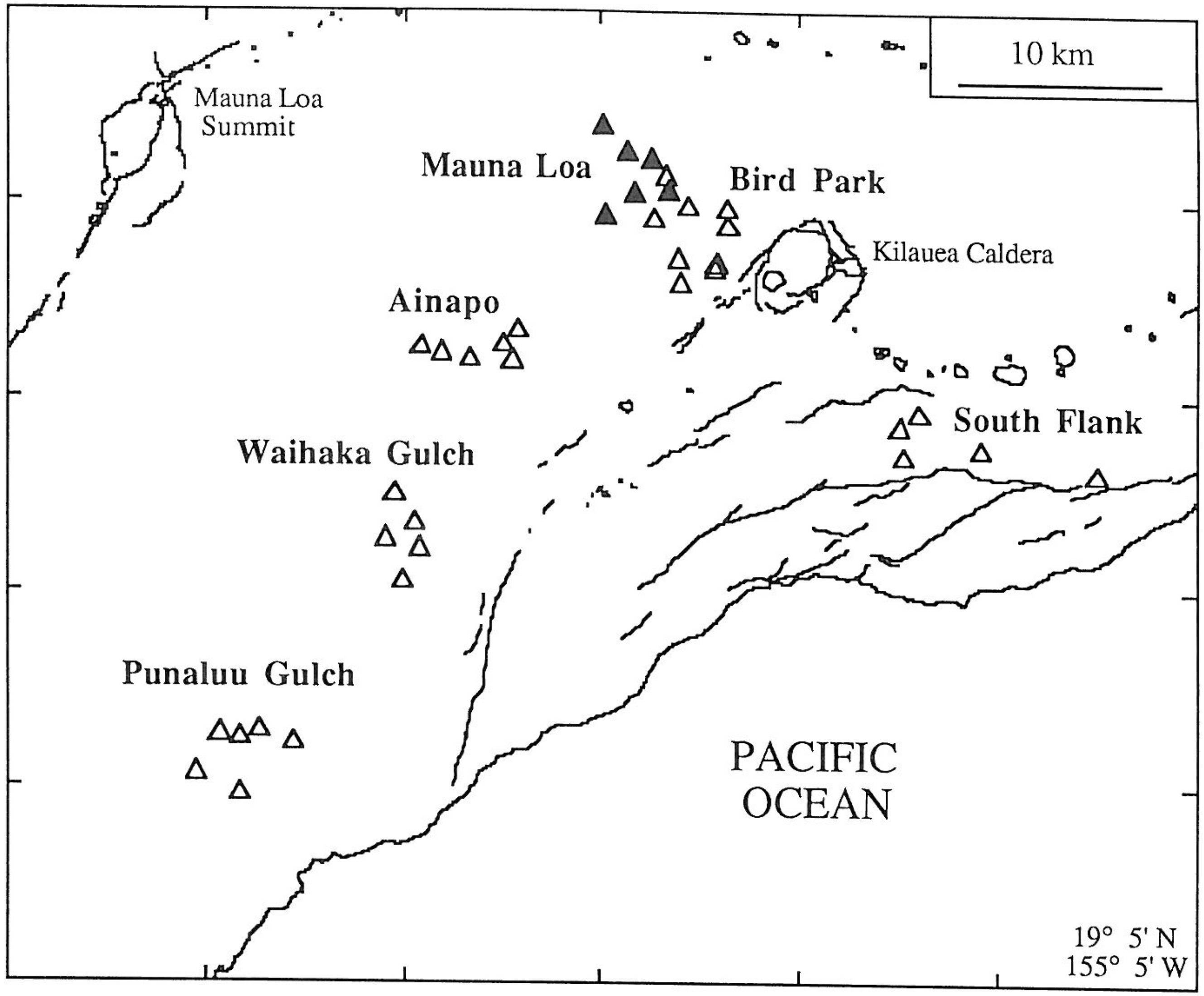


Figure 1. PASSCAL array deployments in southern Hawaii, July - November 1990, as part of Project ALOHA (UW-Madison, SUNY at Stony Brook, UC-Santa Barbara). Solid triangles are UCSB teleseismic recorders and unfilled triangles are RefTek units.

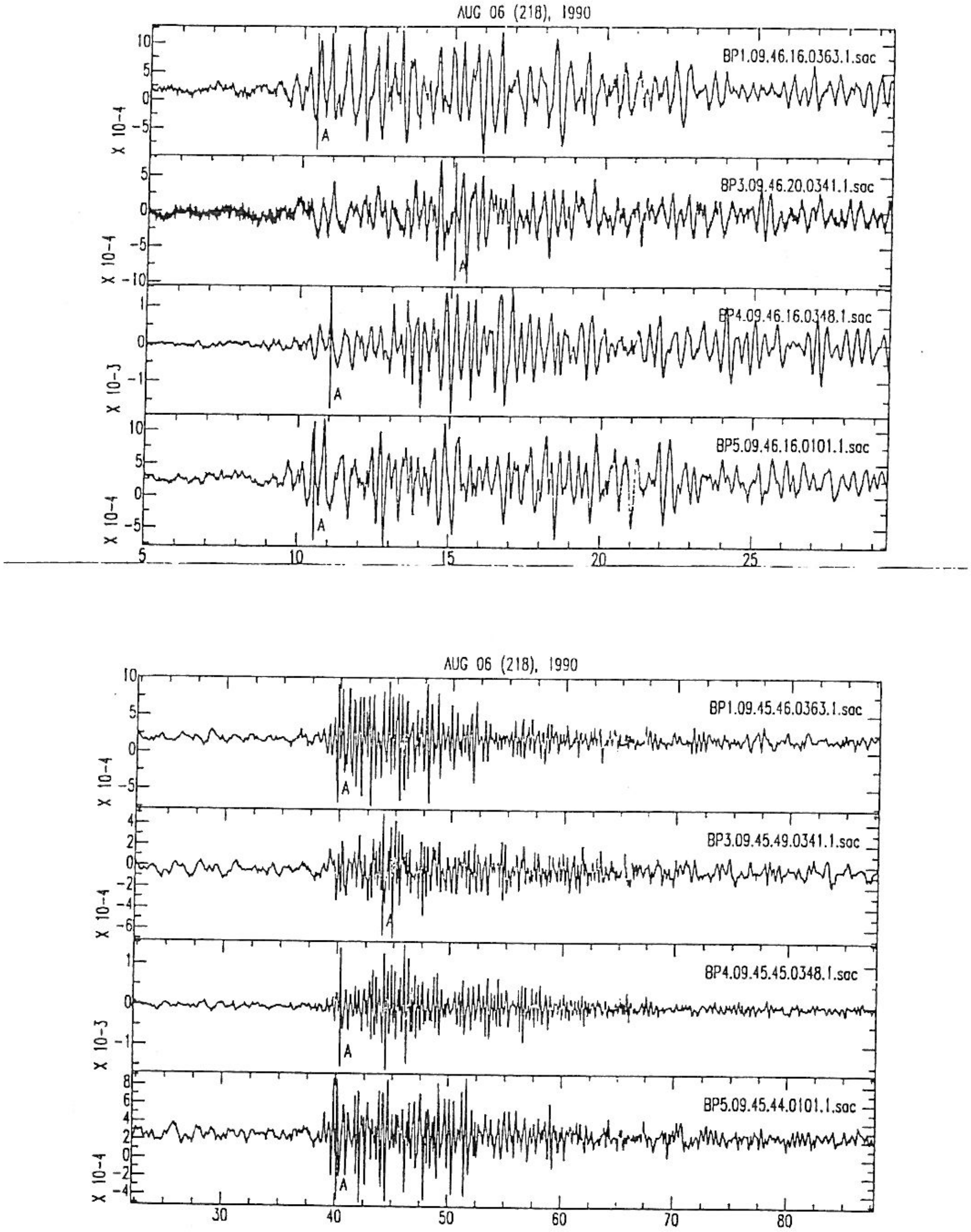
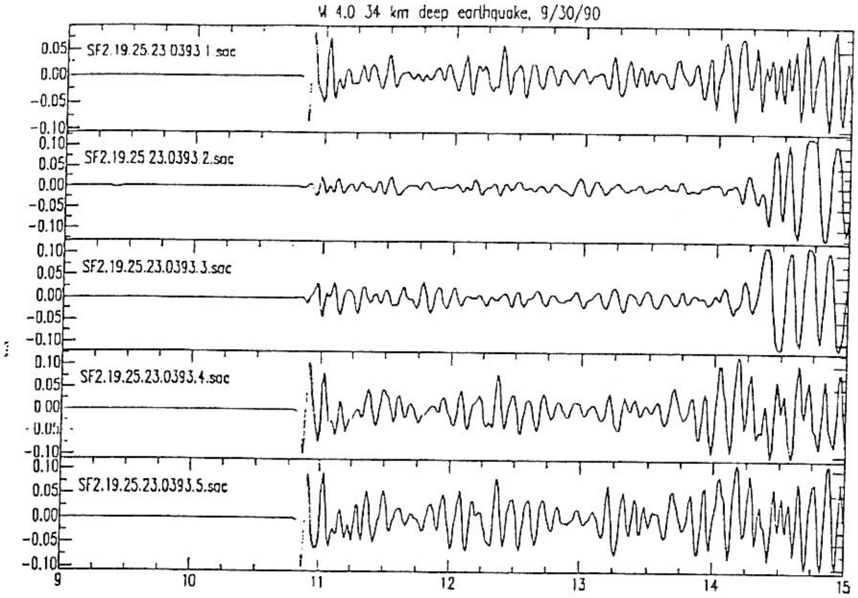


Figure 2. Long-period event from a depth of about 15 km beneath the summit of Kilauea Caldera, which triggered both the "local" and "teleseismic" data streams on the RefTek's in the Pird Park array. These narrow-band sources are associated with increased rate of uplift (tilt) at Kilauea's summit, indicating the increased passage of magma through Kilauea's magma conduit system.



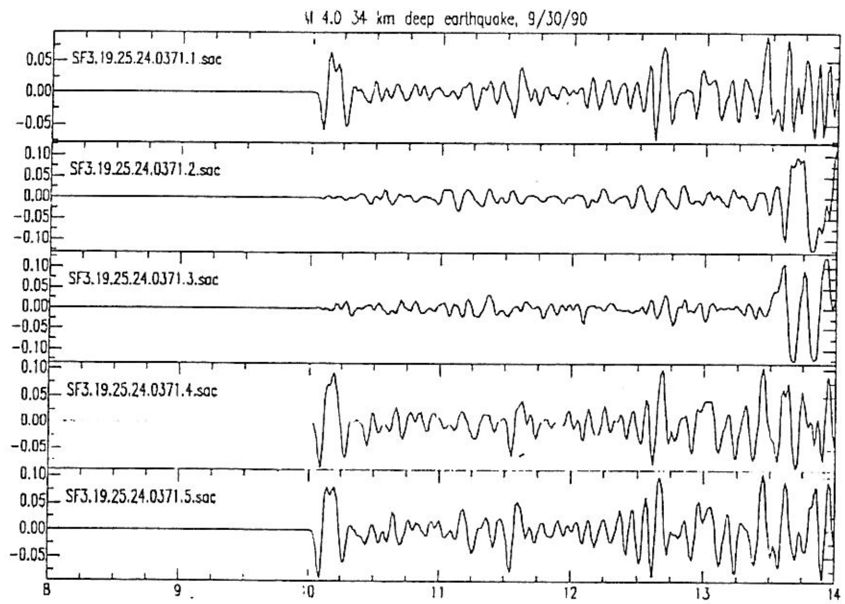


Figure 3. Records from a magnitude 4 event at a depth of about 34 km beneath the south coast of Hawaii, observed at stations of the South Flank array. Traces are ordered Z, N, E for the 3-component L-4 sensor (channels 1-3) followed by the two Z channels (4 and 5) for the added vertical L-4's. The records have been filtered with a Butterworth low-pass filter with a 10 Hz corner. Note the reverberation in the first P arrival and the two arrivals on the vertical channels about 1.5 and 2.5 s after first P, followed by the S arrival on the horizontals 3.5 seconds after first P. We interpret these pre-S arrivals as S to P conversions from discontinuities at depth within and/or beneath the volcano.

Solomon Islands earthquake, 8/17/90, M 7.0 (0.1 Hz LP)

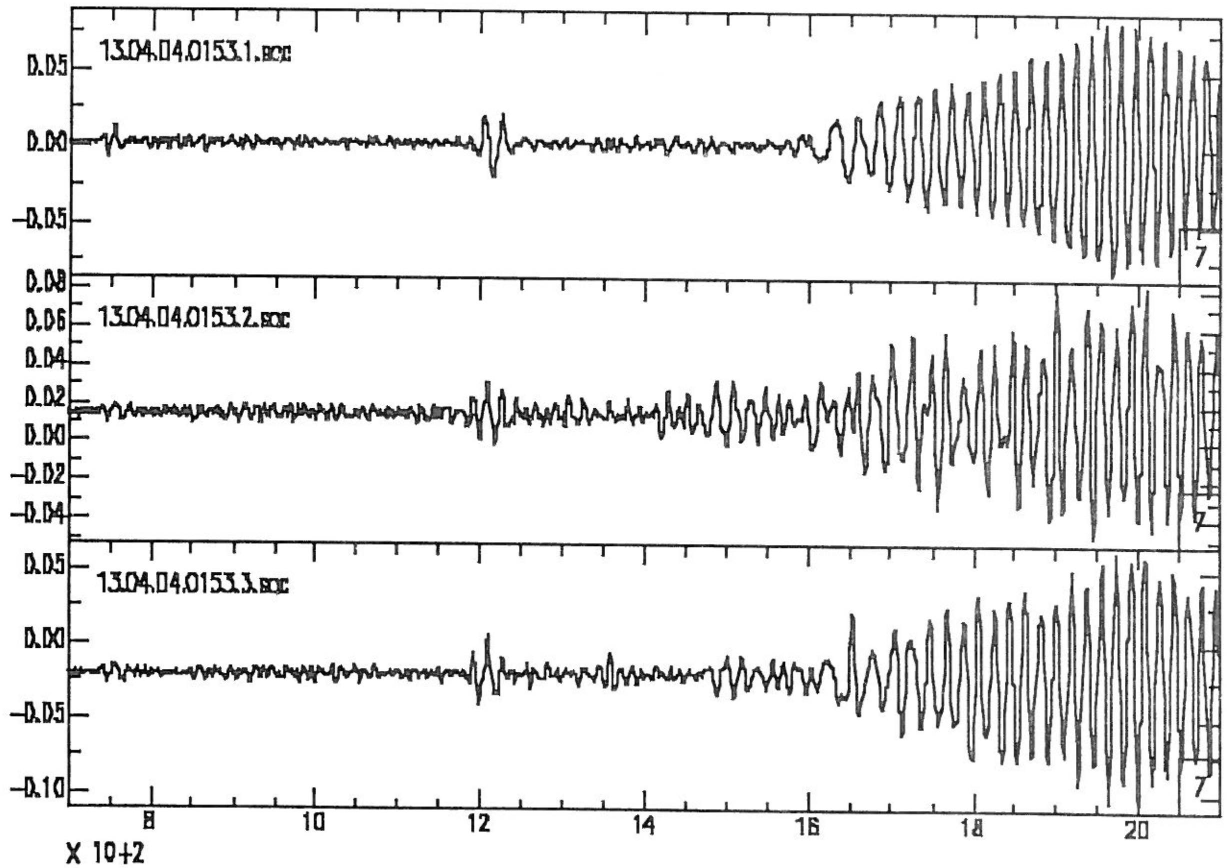


Figure 4. M 7.0 Solomon Islands earthquake of August 17, 1990, recorded on ALOHA station BP6 with a Guralp CMG3-ESP sensor.

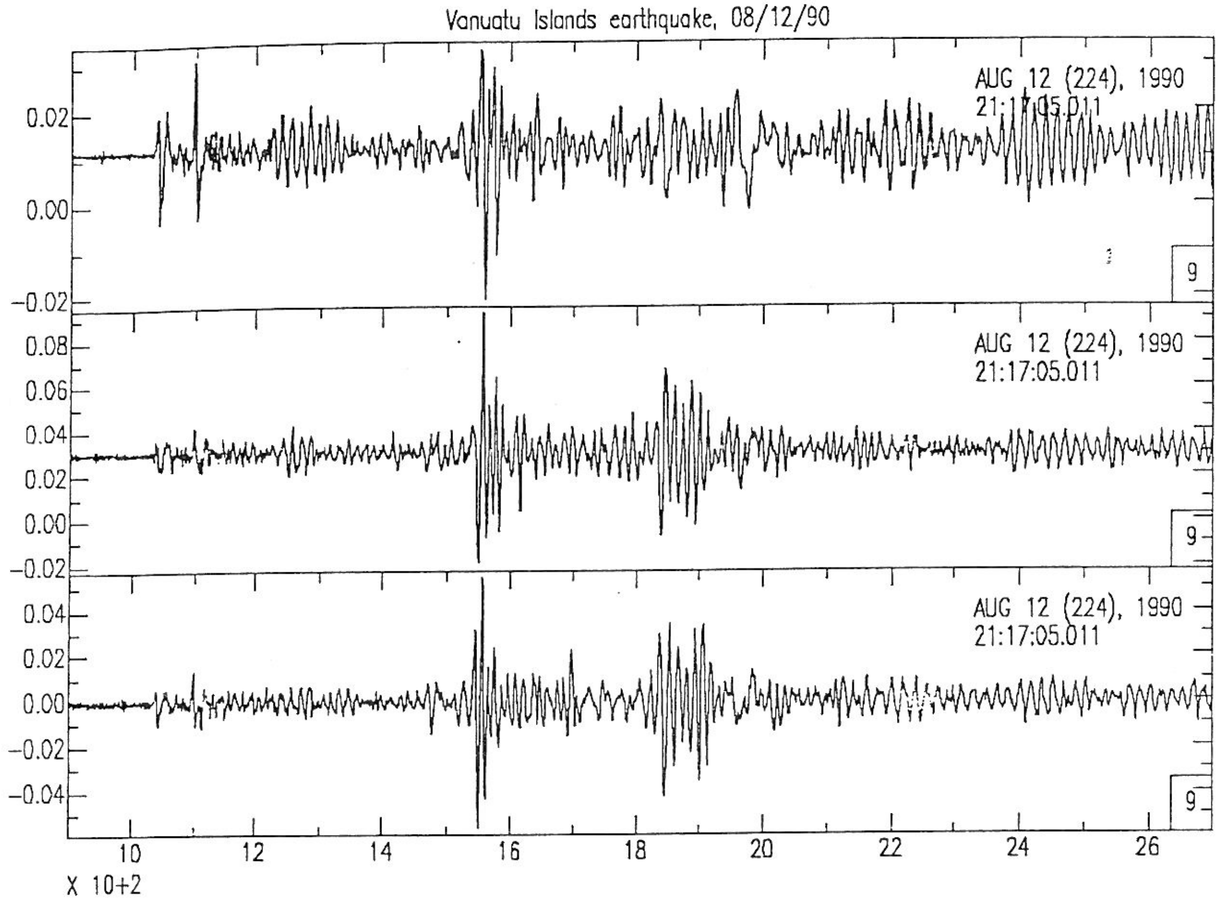


Figure 5. Mb 6.2 Vanuatu Islands earthquake of August 12, 1990, recorded on ALOHA station BP7 with a Guralp CMG3-ESP sensor.

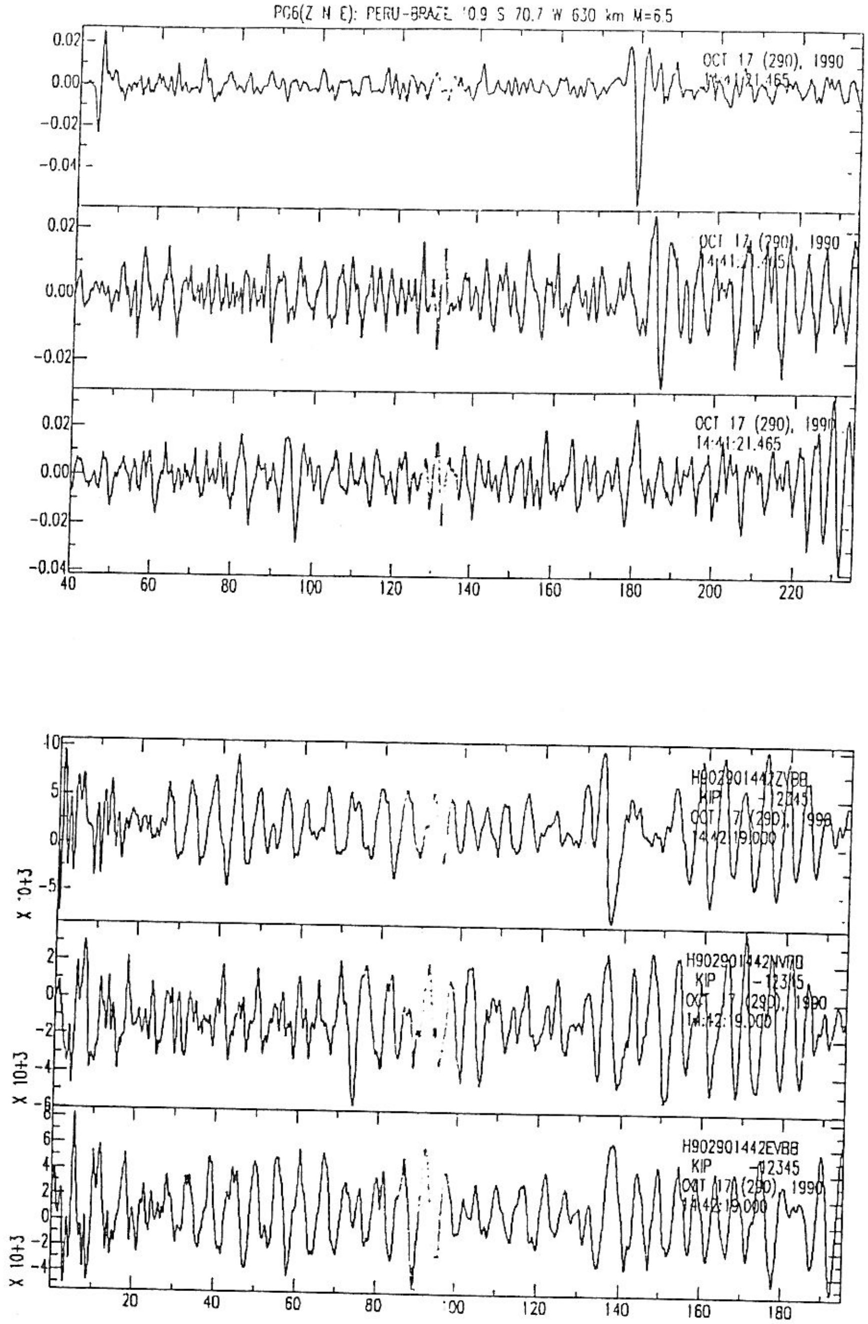
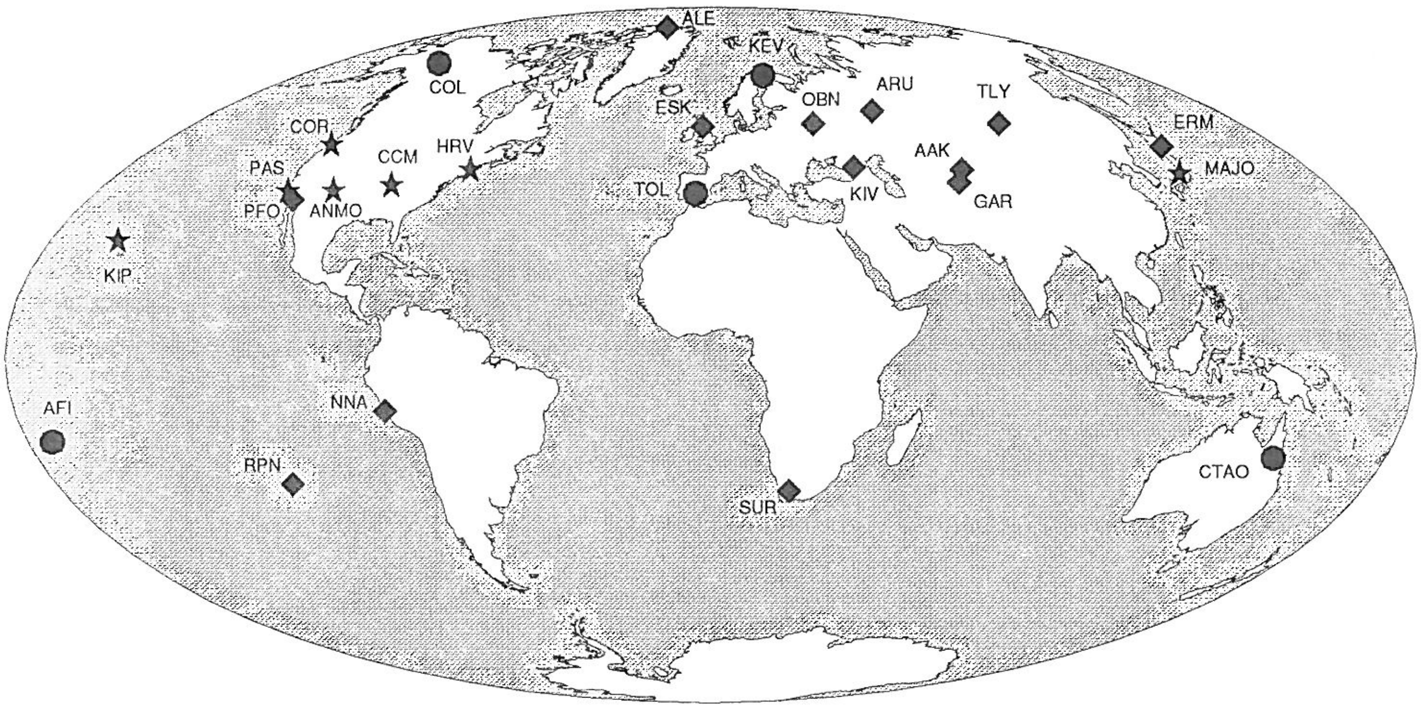


Figure 6. Comparison of the GSN Kipapa and ALOHA PG6 (Guralp) records of the 630 km deep M 6.5 event near the Peru-Brazil border on 10/17/90. Both records show the direct P and pP arrivals, although P is at the very beginning of the the Kipapa record (obtained with IRIS DMC's GOPHER utility). Note the diminished microseismic noise level (dominant period about 5 seconds) at PG6 compared to Kipapa.

IRIS

Global Seismographic Network

November, 1990



★ Broadband Seismometer + 24-bit IRIS-1 or IRIS-2 • dial-up access	◆ Broadband Seismometer + 16-bit dual-gain IRIS-3	● Broadband Seismometer + DWWSSN or ASRO data logger

IRIS Global Seismographic Network Stations

AAK

ALA–ARCHA, U.S.S.R.

Host	Inst. Physics Earth, Academy of Sciences
Location	42.63°N 74.50°E
Data Logger	RefTek IRIS-3 (16-bit)
Seismometers	Streckeisen STS-1 VBB
	Continuous: 20; 0.1 sps high gain
	Triggered: 20; 0.1 sps low gain
	Geotech GS-13
	Triggered: 100 sps
Data Collection Center	IRIS/IDA
Affiliation	IRIS/IDA Network

AFI

Afiamalu, Apia, Western Samoa

Host	Apia Observatory
Location	13.9093°S 171.7773°W
Data Logger	DWWSSN (16-bit)
Seismometers	Streckeisen STS-1 VBB
	Continuous:1 sps
	Triggered: 20sps
Data Collection Center	Albuquerque Seismological Laboratory
Affiliation	IRIS/USGS Network

ALE

Alert, Canada

Host	Geological Survey of Canada
Location	82.4833°N 62.4000°W
Data Logger	RefTek IRIS-3 (16-bit)
Seismometers	Streckeisen STS-1 VBB
	Continuous: 20 sps high gain
	Triggered: 20 sps low gain
	LaCoste-Romberg accelerometer
	Continuous: 0.1 sps; 1 sample/minute
Data Collection Center	IRIS/IDA
Affiliation	IRIS/IDA Network

ANMO Albuquerque, New Mexico

Host	United States Geological Survey
Location	34.9462°N 106.4567°W
Data Logger	Martin Marietta IRIS-1 (24-bit & 16-bit)
Seismometers	Geotech KS36000-I
	Continuous: 20; 1; 0.1; 0.01 sps
	Geotech GS-13
	Triggered: 100 sps
Data Collection Center	Albuquerque Seismological Laboratory
Dial-up Number	1-505-846-0384
Affiliation	IRIS/USGS Network

ARU Arti, U.S.S.R.

Host	Inst. Physics Earth, Academy of Sciences
Location	56.40°N 58.60°E
Data Logger	RefTek IRIS-3 (16-bit)
Seismometers	Streckeisen STS-1 VBB
	Continuous: 20 sps high gain
	Triggered: 20 sps low gain
Data Collection Center	IRIS/IDA
Affiliation	IRIS/IDA Network

CCM Cathedral Caves, Missouri

Host	St. Louis University
Location	38.0557°N 91.2446°W
Data Logger	Martin Marietta IRIS-1 (24-bit & 16-bit)
Seismometers	Streckeisen STS-1 VBB
	Continuous: 20; 1; 0.1; 0.01 sps
	Geotech GS-13
	Triggered: 100 sps
Data Collection Center	Albuquerque Seismological Laboratory
Dial-up Number	1-314-245-6555
Affiliation	IRIS University Network

COL College, Alaska

Host	United States Geological Survey
Location	13.9093°S 171.7773°W
Data Logger	DWWSSN (16-bit)
Seismometers	Streckeisen STS-1 VBB
	Continuous:1 sps
	Triggered: 20sps
Data Collection Center	Albuquerque Seismological Laboratory
Affiliation	IRIS/USGS Network

COR

Corvallis, Oregon

Host	Oregon State University
Location	44.5857°N 123.3032°W
Data Logger	Quanterra IRIS-1 (24-bit)
Seismometers	Streckeisen STS-1 VBB
	Continuous: 20; 1; 0.1; 0.01 sps
Data Collection Center	Albuquerque Seismological Laboratory
Dial-up Number	1-503-737-0853
Affiliation	IRIS University Network

CTAO

Charters Towers, Australia

Host	University of Queensland
Location	20.0883°S 146.2544°W
Data Logger	ASRO (16-bit gain ranged)
Seismometers	Streckeisen STS-1 VBB
	Continuous: 1 sps
	Triggered: 10 sps
Data Collection Center	Albuquerque Seismological Laboratory
Affiliation	IRIS/USGS Network

ERM

Erimo, Japan

Host	Hokkaido University
Location	42.0158°N 143.1614°E
Data Logger	RefTek IRIS-3 (16-bit)
Seismometers	Streckeisen STS-1 VBB
	Continuous: 20; 0.1 sps high gain
	Triggered: 20; 0.1 sps low gain
Data Collection Center	IRIS/IDA
Affiliation	IRIS/IDA Network

ESK

Eskdalemuir, Scotland

Host	British Geological Survey
Location	55.3167°N 3.2050°W
Data Logger	IDA Mark 3 (16-bit)
Seismometers	Streckeisen STS-1 VBB
	Continuous: 5; 0.1 sps high gain
	Triggered: 5; 0.1 sps low gain
	Triggered: 20 sps high and low gain
	LaCoste-Romberg accelerometer
	Continuous: 0.1 sps; 1 sample/minute
Data Collection Center	IRIS/IDA
Affiliation	IRIS/IDA Network

GAR

Garm, U.S.S.R.

Host	Inst. Physics Earth, Academy of Sciences
Location	39.00°N 70.32°E
Data Logger	RefTek IRIS-3 (16-bit)
Seismometers	Streckeisen STS-1 VBB
	Continuous: 20 sps high gain
	Triggered: 20 sps low gain
Data Collection Center	IRIS/IDA
Affiliation	IRIS/IDA Network

HRV

Harvard, Massachusetts

Host	Harvard University
Location	42.5072°N 71.5625°W
Data Logger	Harvard Prototype IRIS-1 (24-bit)
Seismometers	Streckeisen STS-1 VBB
	Continuous: 20; 1; 0.1; 0.01 sps
Data Collection Center	Albuquerque Seismological Laboratory
Dial-up Number	1-508-456-3099
Affiliation	IRIS University Network

KEV

Kevo, Finland

Host	University of Helsinki
Location	69.7553°N 27.0067°E
Data Logger	DWWSSN (16-bit)
Seismometers	Streckeisen STS-1 VBB
	Continuous:1 sps
	Triggered: 20sps
Data Collection Center	Albuquerque Seismological Laboratory
Affiliation	IRIS/USGS Network

KIP

Kipapa, Oahu, Hawaii

Host	Pacific Tsunami Warning Center
Location	21.4233°N 158.0150°W
Data Logger	Martin Marietta IRIS-1 (24-bit & 16-bit)
Seismometers	Streckeisen STS-1 VBB
	Continuous: 20; 1; 0.1; 0.01 sps
	Geotech GS-13
	Triggered: 100 sps
Data Collection Center	Albuquerque Seismological Laboratory
Dial-up Number	1-808-671-0268
Affiliations	IRIS/USGS & GEOSCOPE Networks

KIV

Kislovodsk, U.S.S.R.

Host	Inst. Physics Earth, Academy of Sciences
Location	43.95°N 42.68°E
Data Logger	RefTek IRIS-3 (16-bit)
Seismometers	Streckeisen STS-1 VBB
	Continuous: 20 sps high gain
	Triggered: 20 sps low gain
Data Collection Center	IRIS/IDA
Affiliation	IRIS/IDA Network

MAJO

Matsushiro, Japan

Host	Japan Meteorological Agency
Location	36.5417°N 138.2089°E
Data Logger	Quanterra IRIS-1 (24-bit)
Seismometers	Streckeisen STS-1 VBB
	Continuous: 20; 1; 0.1; 0.01 sps
Data Collection Center	Albuquerque Seismological Laboratory
Dial-up Number	011-81-262-78-9393
Affiliation	IRIS/USGS Network

NNA

Ñaña, Peru

Host	Instituto Geofisico del Peru
Location	11.9875°S 76.8422°W
Data Logger	IDA Mark 3 (16-bit)
Seismometers	Streckeisen STS-1 VBB
	Continuous: 5; 0.1 sps high gain
	Triggered: 5; 0.1 sps low gain
	Triggered: 20 sps high and low gain
	LaCoste-Romberg accelerometer
	Continuous: 0.1 sps; 1 sample/minute
Data Collection Center	IRIS/IDA
Affiliation	IRIS/IDA Network

OBN

Obninsk, U.S.S.R.

Host	Inst. Physics Earth, Academy of Sciences
Location	55.10°N 36.60°E
Data Logger	RefTek IRIS-3 (16-bit)
Seismometers	Streckeisen STS-1 VBB
	Continuous: 20 sps high gain
	Triggered: 20 sps low gain
Data Collection Center	IRIS/IDA
Affiliation	IRIS/IDA Network

PAS

Pasadena, California

Host	Caltech/USC/USGS
Location	34.1483°N 118.1717°W
Data Logger	Quanterra IRIS-1 (24-bit & 16-bit)
Seismometers	Streckeisen STS-1 VBB
	Continuous: 20; 1; 0.1; 0.01 sps
	Kinemetrics FBA-23
	Triggered: 100 sps
Data Collection Center	Albuquerque Seismological Laboratory
Dial-up Number	1-818-795-6415
Affiliations	IRIS University Network & USGS

PFO

Piñon Flat, California

Host	University of California, San Diego
Location	33.6092°N 116.4553°W
Data Logger	IDA Mark 3(16-bit)
Seismometers	Streckeisen STS-1 VBB
	Continuous: 5; 0.1 sps high gain
	Triggered: 5; 0.1 sps low gain
	Triggered: 20 sps high and low gain
	LaCoste-Romberg accelerometer
	Continuous: 0.1 sps; 1 sample/minute
Data Collection Center	IRIS/IDA
Affiliation	IRIS/IDA Network

RPN

Rapa Nui, Easter Island

Host	Universidad de Chile
Location	27.1267°S 109.3344°W
Data Logger	RefTek IRIS-3 (16-bit)
Seismometers	Streckeisen STS-1 VBB
	Continuous: 20; 0.1 sps high gain
	Triggered: 20; 0.1 sps low gain
	LaCoste-Romberg accelerometer
	Continuous: 0.1 sps; 1 sample/minute
Data Collection Center	IRIS/IDA
Affiliation	IRIS/IDA Network

SUR

Sutherland, South Africa

Host	Geological Survey of South Africa
Location	32.3800°S 20.7283°E
Data Logger	RefTek IRIS-3 (16-bit)
Seismometers	Streckeisen STS-1 VBB
	Continuous: 20; 0.1 sps high gain
	Triggered: 20; 0.1 sps low gain
Data Collection Center	IRIS/IDA
Affiliation	IRIS/IDA Network

TLY

Talaya, U.S.S.R.

Host	Inst. Physics Earth, Academy of Sciences
Location	51.72°N 103.60°E
Data Logger	RefTek IRIS-3 (16-bit)
Seismometers	Streckeisen STS-1 VBB
	Continuous: 20; 0.1 sps high gain
	Triggered: 20; 0.1 sps low gain
	Geotech GS-13
	Triggered: 100 sps
Data Collection Center	IRIS/IDA
Affiliation	IRIS/IDA Network

TOL

Toledo, Spain

Host	Instituto Geografico Nacional
Location	39.8814°N 4.0486°W
Data Logger	DWWSSN (16-bit)
Seismometers	Streckeisen STS-1 VBB
	Continuous:1 sps
	Triggered: 20sps
Data Collection Center	Albuquerque Seismological Laboratory
Affiliation	IRIS/USGS Network

Status of the PASSCAL Program

J. C. Fowler

All of the 6-channel PASSCAL Instruments have under gone a modifications during the last two months. The oscillator board have been replaced with new temperature crystal controlled oscillators and new software designed to improve system performance when the OMEGA clocks cannot stay locked. The new software also provides the information necessary to correct for timing drift if the OMEGA clock is unlocked for extended periods of time. Initial tests indicate that the new timing system goes a long way toward meeting our goal of having all of the units in a given array synchronized to within 1 msec.

The prototype 3-channel PASSCAL Instruments are scheduled for delivery by the end of November. These instruments are simplified versions of the 6-channel instruments. Field testing of the prototypes will begin in January. A final decision as to the suitability of the instrument will be made during the Spring and it is hoped that an order for the first production run of instruments can be placed at that time.

We are currently supporting 4 major field experiments. These experiments are the Rio Grande Rift Experiment being conducted by New Mexico Institute of Technology and New Mexico State University, the Aloha Experiment being conducted by Wisconsin and the University of California Santa Barbara, the Antarctic Experiment being conducted by Stanford University, and the SAMSON Experiment being conducted by Oregon State University. These experiments are effectively utilizing all of the instruments. Instrument usage for 1990 was approximately 70%. This is close to the maximum that can be sustained for a long period of time. Instrument requests for 1991 are significantly ahead of requests at this time last year. The schedule for 1991 will be published at the end of December.

The SierraSEIS Maintenance Center has been established at Lawerence Berkeley Laboratory. IRIS SierraSEIS users will be hearing from David Okaya in the near future about the services which will be available to them through the center.

Data Management Systems
Status as of November 11, 1990
by Tim Ahern

The Use of the DMC During 1990

The TASC report identified that the DMS program would be servicing about 250 data requests per year when it reached maturity. During the first ten months of 1990, the IRIS DMC actually serviced 122 customized requests for GSN data, 60 requests for DMC GSN Products and about 20 PASSCAL requests. This total of more than 200 requests is well on the way to surpassing the original design goal. It is our feeling that the lack of an archive covering many years has eliminated a significant fraction of IRIS users. This shortcoming should be eliminated with the inclusion of the historical data in 1991. We also feel that our effectiveness in data distribution was limited due to the large percentage of our effort that was directed toward the development of the first working prototype. As the system matures we believe that we can more actively promote the DMC and increase the number of users. At the present time we anticipate that the DMS will ultimately service about eight requests per day from the seismological community.

During the first 10 months of 1990, we have distributed data to 67 different users in 22 states and 6 foreign countries. These data have been distributed to 33 IRIS institutions, nearly one half of the IRIS membership. In addition to this, the majority of IRIS institutions have received software from the DMC. We are unable to identify all of the institutions that have used the GOPHER system but the list is extensive.

The following tables represent some of the more significant statistics related to the IRIS DMS program, current as of November 1, 1990.

CUSTOMIZED USAGE OF THE DATA MANAGEMENT SYSTEM

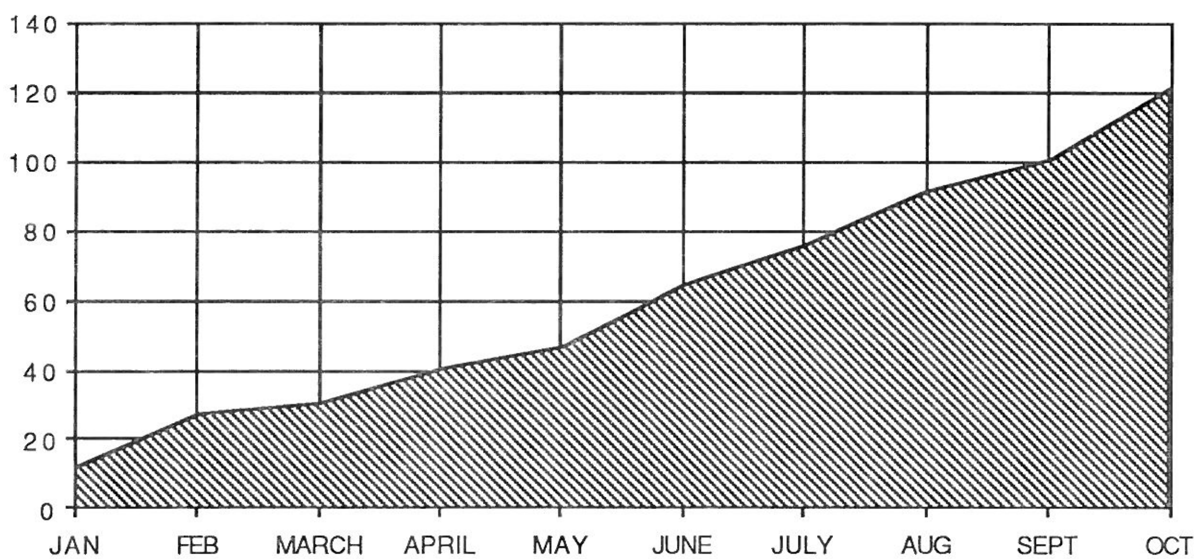
The Data Management System allows users to extract specific seismograms from the large IRIS archive. These are called customized requests. These are generated either by using the RETRIEVE software in the Electronic Bulletin Board or by submitting a specially formatted BATCH file.

MONTH	NUMBER OF REQUESTS	AVERAGE NUMBER OF SEISMOGRAMS	AVERAGE REQUEST SIZE (MBYTES)
JANUARY	12	91	*
FEBRUARY	16	341	*
MARCH	3	517	*
APRIL	10	327	12.7
MAY	6	189	21.9
JUNE	18	538	37.2
JULY	11	298	19.1
AUGUST	16	214	36.6
SEPTEMBER	9	186	23.7
OCTOBER **	21	855	54.5
1990 (to October)	122	398	33.9

* information not available
** Batch request available

The following graph illustrates the steady growth in the number of customized data requests that have been serviced by the DMS program this year.

Cumulative Customized Requests - 1990



The Distribution of Standardized Data Products

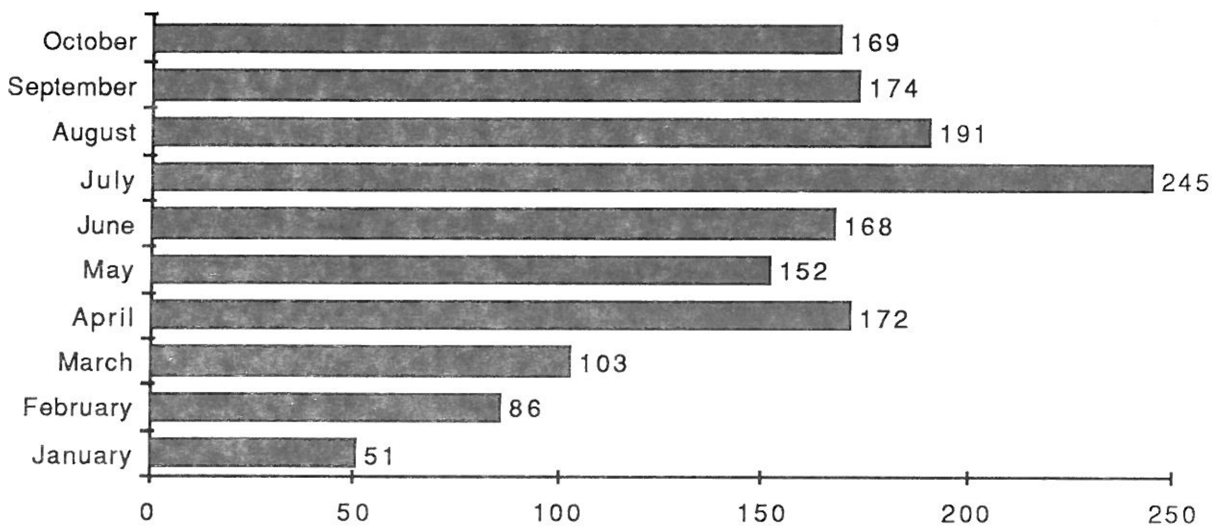
The IRIS DMS program routinely produces standard collections of seismograms for significant earthquakes all around the world. These Data Products make it easier for a user to obtain data for significant events as well as reducing the effort required at the DMC since data can be assembled once and then simply copied. The following table indicates the number of each of these products that have been shipped by the DMC for the 12 month period November, 1989 through October, 1990.

PRODUCT	Description	Type	Number Distributed
JVE1	U.S. Joint Verification Exp.	Mixed	11
JVE2	Soviet Joint Verification Exp.	Mixed	11
ARM	Armenian EQ.	GSN	103
MCQ	Macquarie EQ	GSN	102
WIR	Western Iranian EQ	GSN	3
PHI	Philippine EQ	GSN	3
LPR	Loma Prieta EQ	GSN	26
NEV	Basin & Range '86	PASSCAL	1
BRE	Basin & Range '88	PASSCAL	1
LPP	Loma Prieta Passcal	PASSCAL	16

Accesses of the Electronic Bulletin Board

The Electronic Bulletin Board is used as the principal method of exchanging information with the members of IRIS. It is a heavily used system. The following chart shows the use of the bulletin board for the first 10 months of 1990. In this 10 month period the bulletin board was accessed 1511 times.

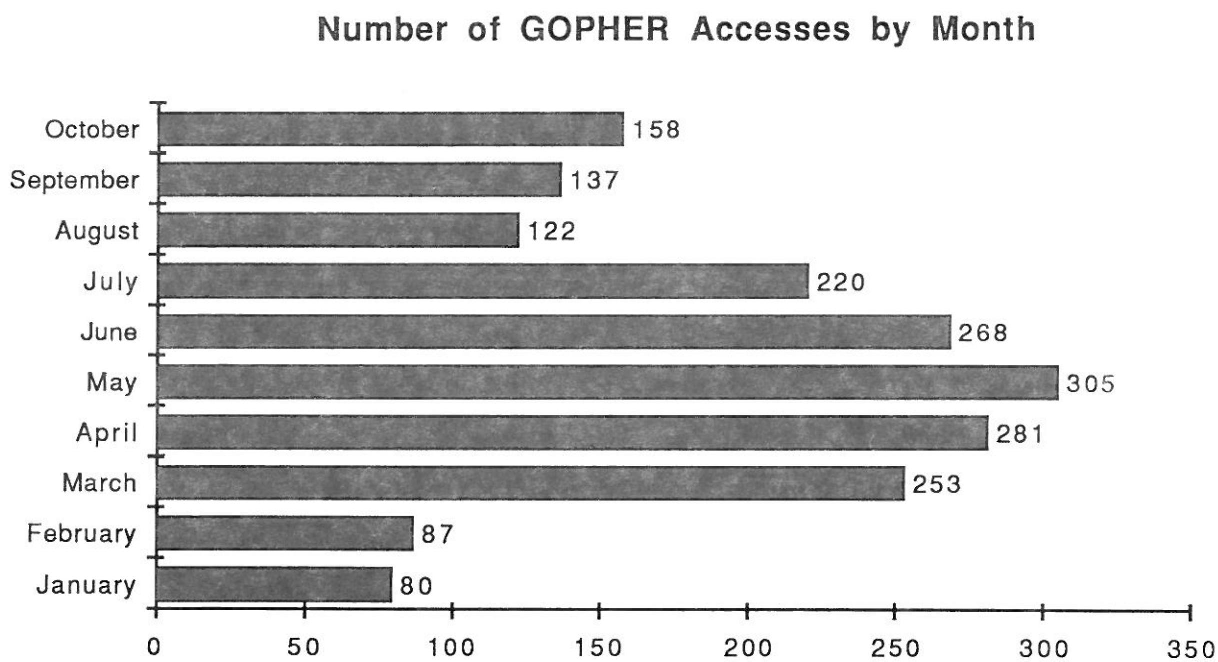
Number of Electronic Bulletin Board Accesses by Month



The Use of the "GOPHER" Quick Access System

The GOPHER system was developed by Dr. Steve Malone and his associates at the University of Washington. This system dials up IRIS GSN stations whenever it receives an alert bulletin from the NEIC in Golden, Colorado. This system has become an essential system to many members of the IRIS community as indicated by the heavy use it has seen during the past year. IRIS members can not only view seismograms shortly after a significant earthquake, they can also transfer the data back to their home institution where the data can be analyzed in greater detail.

The GOPHER system had recovered data for more than 220 seismograms by the end of October, 1990 when this report was prepared. More than 56 Megabytes of data had been recovered from the seven IRIS/GSN stations equipped with dial-up capability by the end of 1990. The following chart shows the activity the GOPHER system saw during the first ten months of 1990. It was used a total of 1911 time during the first 10 months.



Distribution of Software

The IRIS Data Management Systems program assists seismologists by distributing software for data analysis, format conversion, or processing. We hope to expand the software distributed in the coming years but as of now it is limited to the following programs.

PROGRAM	Number Distributed
Format Conversion	4
RDSEED	138
SEEDSNIFF	4
SAC	25
SierraSEIS	25
ZPLOT	16

The IRIS DMS Data Archive

The heart of the DMS program is the archive of an ever growing number of seismograms from the IRIS/GSN, SRO, ASRO, DWWSSN, and CDSN seismographic networks. The following table gives statistics related to the DMC archive as of November 1, 1990.

Statistic	Number	Units
Archive Size	48.25	Gigabytes
Number of Seismograms	164,600	
Size of Summary File	28.6	Megabytes
Number of Stations	49	
Number of Channels	813	
Number of Station-Days	19633	
Number of Days Stored	813	

I.R.I.S. GOPHER UPDATE

Nov 15, 1990

Steve Malone

The *GOPHER SYSTEM* started at the IRIS DMC in the spring of 1989, has been quite successful. Many seismologists have used the trace data available through the *Gopher* interface to study large or interesting earthquakes, sometimes within hours of their occurrence. Currently over 1,100 traces for more than 200 earthquakes exist at the DMC in the *GOPHER* archives and this is increasing at an average rate of about 70 traces per month.

In the fall of 1990 a revision of the *GOPHER SYSTEM* was undertaken to repair some deficiencies, add features, and make the whole system more robust and versatile. The *GOPHER SYSTEM* consists of two quite independent parts, the user interface (*Gopher-View*), and the data up-loading routines previously called *Gopher-Guts* and now called *Gopher-Badger*. *Gopher-View* works very much as it has previously with some bugs fixed, and a few enhancements and features added. The *Gopher-View Users Manual* is included below. *Gopher-Badger* is a thoroughly revised version of the previous *Gopher-Guts* routines. The basic design of this system has been changed. The programs and scripts used to up-load trace data from dial-up GSN stations has been redesigned and mostly recoded to improve performance, increase reliability, make it easier to install and to include provisions for a distributed system. An overview of *Gopher-Badger* follows the user interface manual.

GOPHER VIEW-2 Users Manual

Nov 15, 1990

GOPHER is an IRIS Data Management Center (DMC) system to present selected trace data to the seismological community for recent large earthquakes in a timely manner. *Gopher-View 2* is a modification of the previous system to fix a few bugs, add a few features, and incorporate suggestions made by users. The following is a description of the user interface to the system as it is running at the DMC in Austin, Tx. A separate document describes the new *Gopher-Badger* system to up-load data from the IRIS GSN station to the DMC computer. Questions, comments or requests for changes to *GOPHER* should be sent via E-mail to: *steve@geophys.washington.edu*, or by regular US mail to: Steve Malone, Geophysics AK-50, University of Washington, Seattle WA 98195.

PURPOSE

IRIS GSN seismic stations record broad-band high-dynamic range seismic data continuously and store these data on magnetic tape. After quality control these tapes are shipped to the DMC in Austin, Texas where the data are stored in SEED format in a mass-storage system. The whole process to acquire all the data for one earthquake may take several months. In the mean time there typically is interest in large or significant earthquake for which the SEED data are in transit and not yet available. The *GOPHER* project makes available to the community selected sections of trace data from IRIS GSN stations which can be accessed by dial-up telephone within a day of the occurrence of a significant earthquake. These data can be easily reviewed by interested researchers from their home institution via connections over the NSF-Internet or dial-up login session to the DMC. Selected portions of these data may be down-loaded to a researcher's own computer via *ftp* over the Internet or *Xmodem* over dial-up lines. Currently trace data from six stations within the US and one in Japan are routinely up-loaded for large earthquakes. We plan to add additional stations including several in Europe in the near future. There are two main parts of the *GOPHER SYSTEM*, the user interface, called *Gopher-view* and the central part which up-loads data from GSN stations of the system, now called *Gopher-Badger*. The normal user does not access this latter part of *Gopher* and thus it is not described in this document.

ACCESS TO GOPHER

Interactive access to *GOPHER* may be gained over the Internet with *rlogin irisdmc.ig.utexas.edu -l gopher* from any UNIX machine on the Internet. A more generic way of accessto the IRIS DMC over the Internet is *telnet irisdmc.ig.utexas.edu.* The Internet address of irisdmc is 128.83.149.25. Dial-up access is also available at (512)471-6496 which has a multispeed Telebit T2500 modem. The user interface for *Gopher-view* is through an open password login account called *gopher* (with password: *guts*). A short information login message should then be displayed.

LOGIN PROCESS

The first thing *Gopher-View* does is to try and determine what type of terminal you are using. If you came in through the Internet then your terminal type is probably passed OK as an environment variable and need not be explicitly set. If the TERM environment is not set or is set to an unknown terminal type, you will be prompted for a terminal type which is a code describing the type of terminal you are using. The default is a vt100, a common ASCII type of terminal. If you want trace data displayed your terminal must be able to emulate a Tectronics 4014 or 4010 graphics terminal, or be an X-Windows server running xterm. A graphics window will be opened later at trace display time. If you are coming in from an X-windows server using xterm you will be prompted for the host-name of your terminal. You will probably need to type in the Internet number of your X-server. If you type a valid host-name or Internet number, then a new xterm window will be opened on your screen for all subsequent interactions.

Every user is required to set up an account and identify themselves the first time they log in (after a period of several months of inactivity your account will be removed). You should type your whole name at the prompt and not use any punctuation in abbreviations. Besides you name, you will be requested for other information the first time you login. Your first name will be used as your identifier. If, after the first time you identify yourself, you see that someone else with the same first name has already set up an account, you may try again using a modified version of a first name. If the information displayed for your account is incorrect you will be given a chance to remove this account and set it up again. Please do not remove the accounts of other users. A temporary directory will be set up for you which will contain all the data you may request later in your requested format. If data is already in this directory (perhaps from a previous session) you will be asked if you want it removed.

Gopher-View Main Menu

The main *Gopher-View* menu will be presented after successfully logging in and identifying yourself. You will also return to this menu after finishing with a subsection.

The main menu choices are the following:

1) Review event list and select one of interest by paging through the catalog.

2) Review station and component information for the selected event.

3) Review trace data using SAC and a standard set of display parameters. You must be on a graphics terminal (Tek-4014 emulator, or X-window server).

4) Define data extraction format type, (ie. SAC-BINARY, AH-BINARY...), generate a data extraction list, and place the desired data in the desired format in your private sub-directory.

5) Set up and get specific information on how to down-load the data to your own machine. Do an *ftp* down load directly.

6) Get general documentation or detailed information about *GOPHER* and its menu choices.

7) Get specific station information including channel response information from the DMC station data base.

8) Simple search of trace data-base by station.

9) or q) Exit *Gopher-View* with a chance to send requests, complaints, or information to the DMC staff.

Any one of these menu items may be chosen by typing its number and <return>. At any time typing a 'q' <return> will back out of the current menu selection or exit *Gopher-View*. The typical sequence to review and extract data would be the following:

After logging in one might review the current catalog with menu choice #1. The catalog is divided up by quarters so that any one list is not too long. You will be given the chance to type the number of the event in which you are interested. This will now be the event of interest until changed by another use of menu choice #1. You may see information about which components of which stations recorded this event by using menu choice #2. Menu choice #3 will start the program *SAC* (Seismic Analysis Code) and use a fixed script to display sections of data for the current event. You will have the choice of seeing the vertical channel of all stations on one display and/or you may display all three components of each station on individual displays. You must type a 'y' or 'n' at each choice. You must be on a graphics device for using menu choice #3 After reviewing all the data available for an earthquake you might use menu choice #4 to select which traces and the format for the data you want to retrieve. You may only retrieve complete traces. You might then use menu choice #5 to explain exactly what to do to down load the selected data to your machine.

Data Formats

The seismic trace data is stored in a subdirectory whose name is a ten digit number corresponding to the origin time of the earthquake (ie: 8902231422 for 14:22 UTC on Feb 23, 1989). Each trace data file within this subdirectory has a name constructed from the seismic station code, component code and data rate (ie: pas.z.lp for Pasadena vertical long-period). Thus each significant earthquake will have its own subdirectory containing the trace data from all reachable IRIS GSN stations. This trace data is in SAC binary format. Master catalog ASCII files contain the event name (Origin date-time) and the NEIC alert message (location, magnitude...) for each event. This catalog is used to review what data are available in main menu choice #1.

The trace data files can be converted from SAC-BINARY to several other formats in preparation for down-loading to a user's own computer. These formats are: SAC-ASCII (best for use to machines running SAC like VAXes but which do not use the IEEE binary data representation, AH-BINARY (for machines running the XDR version of the Lamont 'AH' seismic display software), and AH-ASCII (for similar machines but for some reason binary transfer does not work well or AH-XDR is not being used).

Documentation and Software

Menu choice #6 gives more detailed information about each major menu choice as well as an on-line version of this document. A companion document to this, the *Gopher View-2 Users Manual* is the *Gopher-Badger Overview* document which gives a summary of the system and the *Gopher-Badger Programmers Manual and Installation Guide* which gives all the details of the data acquisition part of *GOPHER-SYSTEM* and how to set it up and coordinate it with the DMC in Austin. Source for all *Gopher* documents can be obtained through anonymous ftp on *irisdmc* in the directory *pub/manuals*.

Limitations

The *GOPHER-SYSTEM* is not intended to be used for the review and extraction of large data volumes; but, rather as a simple way of accessing limited amounts of important data in a timely manner. The large research project should use the complete data set that will be available from SEED format archives some months after recording. Station calibration, data quality, station outage, or other such information will typically not be available from the *GOPHER-SYSTEM*.

Gopher-Badger Overview

Nov. 15, 1990

Gopher-Badger is an IRIS developed software system running on Sun Microsystem computers to acquire selected seismic trace data from IRIS GSN stations over dial-up phone lines and store these data in an archive with associated information for use by the *Gopher-View* interface system. The *Gopher-Badger* software package results from a redesign and recoding of the *Gopher-Guts* system which has been running at the IRIS Data Management Center since the spring of 1989. Problems and deficiencies in the older system inspired this redesign. It is hoped that *Gopher-Badger* can be used in a distributed data collection system which will be useful to more than just the IRIS *Gopher* project.

Conceptually *Gopher-Badger* divides the data collection duties into two fairly independent parts. The first part (*Badger*) produces request files describing the traces to be up-loaded from GSN stations while the second part (*Gopher*) uses such request files to actually place calls to the stations and retrieve the data. The input request files to the *Gopher* part are spooled so that the dial-out line is used for only one GSN station at a time. In a distributed version of the system, the *Gopher* part can be running on more than one computers, each with its own spool of request files, all generated by one *Badger* for one or more earthquakes or by several *Badgers* running on different computers for different earthquakes. *Badger* need not even run on the same machine as a *Gopher*. At the IRIS DMC an alert message from the NEIC causes *Badger* to generate request files that are spooled to both a local *Gopher* to call some GSN stations and also are spooled to *Gophers* running on remote computers for them to retrieve data from GSN stations close to those computers. If the remote *Gophers* do not send back the requested data within a given period of time then *Badger* can 'badger' its local *Gopher* to make the call instead. The distinction between *Badger* and *Gopher* are not strictly by software module, but rather by function, in some cases within the same program. The following is a brief description of the major software modules divided roughly by their function. For a detailed description of each module, their associated parameters, the event request file format and the procedures for installing *Gopher-Badger* the reader should refer to the *Gopher-Badger Programmers Manual and Installation Guide*.

Summary

When an NEIC alert message is received describing a significant earthquake the program, *Event_select* determines which stations to request trace data from, and the time window to request. This information is written to request files, one per station, which are sent to a *Spooler* routine. *Spooler* sends the files, in the order they were received, to *Call_station*, which calls a station and up-loads the trace data specified in the request file. The trace data is formatted and placed in an event directory (which was created by *Event_select*). The program *Event_summary* is then run to create a summary file that lists the trace data that is available.

Spooler and *Call_station* may be installed on other systems, and *Event_select* may mail request files to those systems. The remote systems would then up-load trace data from the selected stations and send it back to the original system.

Badger

Event_select. This program takes an NEIC event message as input and creates a number of request files, one per selected station, which define requests for trace data from IRIS stations. It also sets up an event directory where the trace data is to be stored. *Event_select* takes the location and magnitude of the event and determines which stations (if any) to request data from, based on the epicentral distance and the magnitude. It also determines which streams to request data from and calculates the time windows for each stream. It then writes request files (one per station) which are sent to the *Spooler* routine. For stations whose data is up-loaded by a remote system, the request files are mailed to those systems. *Event_select* makes an entry into various log files for each event.

Spooler, Call_station. These routine are conceptually part of both *Badger* and *Gopher* since they both manage the queue of request files and follow up on requests sent to other machines. The submission of a request file starts the *Spooler* process which has a locking mechanism preventing it from being run more than once at a time. It continuously cycles through the list of request files in its spool directory passing them in sequence to *Call_station* which may defer processing a file until later or decide to process a request submitted previously to another machine, but which has not resulted in obtaining any data. These types of actions keep track of data requests and can 'badger' local or remote *Gophers* into getting the requested data one way or another.

Event_summary. This program does the final processing for an event. After trace data are placed into the proper event directory it generates a summary file that lists what data are available and interesting parameters about the data. It also checks to see that all of the requested data is present and notifies the operator if there seem to be problems.

Gopher

Spooler. The *Spooler* acts as the first part of *Gopher* for any request file requiring local and immediate action. These would be request files for which the local machine is to be used for calling a station and that call is to be made immediately by submitting the request file to the *Call_station* routine. If *Call_station* processes a request without errors, the request file is moved to a directory that contains old request files. If there was an error while processing the request (like the station phone line was busy), and it needs to be processed later, the request is moved back in the queue. The Spooler keeps submitting request files to *Call_station* until there are no requests left. It then stops until there are new requests.

Call_station. This program takes a request file and uses information contained in it to call a station and up-load trace data from the station. It may up-load the data in SAC ASCII or SEED KERMIT format. The data may then be reformatted, or left as is. A log file is created that lists the files uploaded and any errors that may have occurred. The trace data are placed in the local event directory, if the request was made locally, or are moved to a remote system if the request came from that system. *Call_station* uses the *Mlink* program and a script that it generates to actually control the dial-out modem and engage in an interactive session with an IRIS GSN station.

Request_get. This program provides a way for a local *Gopher* system to receive request files from a remote *Badger*. It reads a request message data stream, usually from sendmail, generates a request file from the data stream, and sends the request file to the *Spooler*. The program would normally be run on a remote system to convert request file mail messages to request files, which are processed and the trace data files sent back to the original systems using the Internet.

Request File Format

A request file may be generated by any number of ways including processes separate from the current IRIS *GOPHER SYSTEM*. At the IRIS DMC it is always generated by the *Event-select* program and then submitted directly to a local *Spooler* or to a remote system via mail and that system's *Request_get* program. The request file name is based on the station name and the event name.

The request file information includes:

- station name
- time to call the station
- list of streams and time windows of trace data
- the event header information
- destination of trace files (host and event directory name)
- information about if and how the data are to be formatted
- A count for how many times to keep trying to dial the station

BREQ_FAST

FAST BATCH REQUESTS FOR DMC DATA

by Tim Ahern

During the last month a new method of accessing the IRIS Data Management Center's Archive has been made available. For more than six months access to the archive has been limited to the RETRIEVE program that is available through the Electronic Bulletin Board. The RETRIEVE program requires that you manually enter the station channel time windows for the seismic data that you are interested in. With the release of the Batch REQuest FAST (BREQ_FAST) program users can now generate requests for data from the IRIS DMC from their own programs.

The BREQ_FAST program relies on receiving large requests for data either by electronic mail or by transfer of the batch file on tape in simple ascii files.

This facility has been used in the past month to service five large requests for data and appears to be quite stable at this time. Users simply need to provide specific address information and identify the seismograms they wish to receive in the BREQ_FAST file they send to the IRIS DMC.

The format of the file is as follows:

```
.NAME
.INST
.MAIL
.EMAIL
.PHONE
.FAX
.MEDIA:
.ALTERNATE MEDIA:
.ALTERNATE MEDIA:
.END
START OF REQUEST
line 1
line 2
.
.
.
line n
END OF REQUEST
```

The format of each line is as follows:

	STARTING TIME	ENDING TIME
STA	YY MM DD HH MM SS.T	YY MM DD HH MM SS.T #_CH CH1 CH2 CHn

where

STA is the station
YY is the year of the start or end of the time window
MM is the month
HH is the hour
MM is the minute
SS.T is the second and tenths of seconds
#_CH is the number of channel designators in the immediately following list
CHn is a channel designator that can contain wildcards

Individual lines in the request can not exceed 100 characters.

Valid selections for media at the present time, in the order of preference are:

Electronic (FTP)
EXABYTE
DAT (DDS format only)
1/2" tape - 6250
1/2" tape - 1600
1/2" tape - 3200
1/2" tape - 800
1/4" Cartridge - QIC150
1/4" Cartridge - QIC24
1/4" Cartridge - QIC11

Please be sure to specify your first, second and third choices for the output media.

An example of a valid short BREQ_FAST file

```
.NAME Joe Seismologist
.INST Podunk University
.MAIL 101 Fast Lane, Middletown, KS 89432
.EMAIL joe@podunk.edu
.PHONE 555 555-1212
.FAX  555 555-1213
.MEDIA DAT
.ALTERNATE MEDIA 1/2" tape - 6250
.ALTERNATE MEDIA EXABYTE
.END

BCAO  89 1 2  0 18 26.99 89 1 2  0 20 26.99 1 SH?
GRFO  89 1 2  0 18 10.48 89 1 2  0 20 10.48 1 SHZ
TOL   89 1 2  0 18 25.40 89 1 2  0 20 25.40 2 B?? SHZ
ANTO  89 1 2  2 10 36.67 89 1 2  2 12 36.67 1 SH?
GRFO  89 1 2  2 10 37.12 89 1 2  2 12 37.12 1 SH?
TOL   89 1 2  2 10 49.78 89 1 2  2 12 49.78 3 BH? SHZ L??
SCP   89 1 2 14 45  8.94 89 1 2 14 47  8.94 1 SHZ
ZOBO  89 1 2 14 45 22.62 89 1 2 14 47 22.62 1 SHZ
NNA   89 1 3  4 59 49.07 89 1 3  5  1 49.07 1 BHZ
ZOBO  89 1 3  5  0  2.53 89 1 3  5  2  2.53 1 SHZ
BDF   89 1 4  2 42 13.41 89 1 4  2 44 13.41 1 SHZ
NNA   89 1 4  2 41 57.57 89 1 4  2 43 57.57 1 BHZ
ZOBO  89 1 4  2 42  3.57 89 1 4  2 44  3.57 1 SHZ
AFI   89 1 6  5 45 52.96 89 1 6  5 47 52.96 2 BHZ SHZ
```

The wildcarding needs further explanation. For those familiar with the RETRIEVE method of generating data requests you can be reassured, they are identical.

The Channel list in the batch file supports limited wildcarding. It is similar to but not the equivalent of UNIX filename wildcarding. Only the "?" wildcard character is supported. It means match any single character. For instance "BH?" means match any Broadband High Gain Channel when entered into the Channel field.

The Channel list can contain multiple entries such as

3 LHZ BH? S??.

As an example a #_ch of 1 and a channel list of L?? (1 L??)

would result in three characters in each of the channel names in the DMC archive being compared to L??. Since the "?" means match any character it should be clear that "L??" is the same as "L".

The DMC archive stores data for channels using the SEED channel naming convention documented in the SEED Reference Manual, appendix A.

Briefly the channel names are three characters in length. The first character is the Band Code, the second the Source code and the third the Orientation Code. Refer to the SEED reference manual or the RETRIEVE manual for a more complete description of the SEED channel naming convention.

One of the major benefits of the BREQ_FAST method is that you can specify time windows for various stations that have travel time corrections applied to the windows.

Once you have generated your BREQ_FAST file you can simply mail it via email to

BREQ_FAST@irisdmc.ig.utexas.edu (128.83.149.25)

If you decide to send the request via physical media such as 1/2" magnetic tape please indicate how the file can be recovered on a SUN workstation. You could use UNIX utilities such as tar, dd, cpio or cp but you must clearly indicate what the blocking size, recording density and any other relevant information is. On the tape label, please indicate how the DMC staff can reach you in case difficulties are encountered in reading your tape.

When the IRIS DMC receives your request, programs will be run that will compare what you requested with what data are actually in the IRIS archive, recover the data from the mass storage system, generate the output SEED volume, and send it to you in the manner you requested. The only exception to this is that if you request electronic transfer and the file is too large, an alternate media will be used.

Status of SIERRASEIS and the SIERRASEIS Maintenance Center

David Okaya
Center for Computatial Seismology
Earth Sciences Division, LBL
November 10, 1990

SIERRASEIS

(1) SIERRASEIS is currently distributed to IRIS users as version 1.3. This version has many of the previous bugs fixed and is successfully used for seismic reflection processing at a few different universities (Arizona, USC, LBL, UCSB, for example). Difficulties in processing and with peripheral accessing are still being encountered at different sites.

(2) Version 1.4 has been recently frozen by Sierra and will be available within a few months. Apparently, the documentation team currently has the product.

(3) Version 2.0 is promised by Sierra to be released this spring. V2.0 will have the dynamic header capability and will be quite different in structure from the v1.X series. The expected version will be quite flexible but will require more understanding of the package in order to be properly used. The programmers working on v2.0 are very open to suggestions regarding additional functionality.

(4) An attempt was made this past spring to reserve a SIERRASEIS training session for IRIS members. Our choices were to use one of three sessions scheduled by Sierra or to ask Sierra to create a special training session. Inqueries regarding interest and scheduling were sent to all IRIS sites using SIERRASEIS. Given the approximately five returned responses, no one session had sufficient attendance to warrant an IRIS-only session. As a result, people who were interested in training were asked to attend a Sierra-scheduled session which most fit into their own schedules. Tim Ahern was recently able to coordinate five different users to attend the same session.

(5) The SMC has negotiated with Sierra to have a joint IRIS-SIERRA open house-beer hour during one evening at the AGU meeting in San Francisco this December. The meeting has two purposes: to introduce IRIS users of SIERRASEIS to Sierra staff members with whom we directly interact (the on-line help/programmer staff: Julie Zweig and Mustafa Sagiroglu), and to allow the Sierra employees to see what types of seismological work we are doing with their software. The meeting room will have poster space with the idea that we will each put up a plot or two which illustrates the types of seismological data we are trying to process using SIERRA-SEIS. The aim of the open house is to nurture better communication between IRIS users and the Sierra staff. The reception will be held at the Miyako Hotel on Monday, Dec 3, between 5-10 p.m. While the reception is aimed at SIERRASEIS users, SIERRA indicates the reception is open to all members of the IRIS community.

****

*(6) The upcoming versions (v1.4 and v2.0) will run under SUN OS 4.1. Craig Nicholson at UCSB passes on the following caution about OS 4.1:

The SUN FORTRAN v1.3 compiler has a bug related to direct file access. The SUN FORTRAN v1.3.1 update fixed the bug for small files, but still has a problem with large (>5 Byte) files; i.e., SIERRASEIS data files. SUN FORTRAN v1.3.1 + SUN patch #100098-02 works for all file sizes.

If you have SUN OS 4.1 and FORTRAN v1.3/v1.3.1, you MUST have the patch in order to recompile SIERRASEIS correctly. SUN OS 4.1 and FORTRAN v1.2 is OK; so is SUN OS 4.0.1c and FORTRAN v1.2.

****

(7) Exabytes work within SIERRASEIS but with some modification to tape reading subroutines. UCSB has dealt with getting Exabytes to function within v1.3. SUN OS 4.1 is supposed to contain functional variable record drivers for the Exabytes; however, the UCSB folks indicate that they have limited functionality. The SUN OS 4.1 driver requires exact specification of input limits within a SIERRASEIS job: if the exabyte reads infinitely until hitting EOT (double

EOF's), it will hang. By specifying exact end limits, the exabyte will stop before hitting EOT. DELTA drivers apparently do not have this problem.

(8) SUN tape drives (manufactured by Hewlett-Packard) can be used for processing data on magnetic tapes. USC uses two drives for tape-to-tape processing. The quality of the drives is not what one would desire, however. We're exploring the feasibility of using a Storage Tek drive which will handle both tape-to-tape processing and long tape record input (i.e., field tapes for demuxing).

SMC at Center for Computational Seismology, Lawrence Berkeley Laboratory

(1) SMC is in place at the Center for Computational Seismology, LBL, under the guidance of Tom McEvilly and David Okaya. SMC involves three people who are available for consultation on SIERRASEIS software/hardware issues and for user help: Eleni Karageorgi and Tom Daley at LBL, and D. Okaya at LBL/USC. LBL has donated the use of a SUN-4 SparcStation through which email to the SMC can be sent and which houses the archive version of IRIS-SEIS. IRIS-SEIS software will be available through the SparcStation via anonymous ftp and via media transfer (magnetic tape).

(2) Email correspondence can be sent to "smc" at "gk1.lbl.gov". Eleni, Tom, and David will all receive copies of each mail message so that a response can be returned as soon as is possible. These messages and responses will be compiled at the SMC. Suggestions will be accepted on the best mechanism for broad dissemination of this info.

(3) IRIS-SEIS software is now ready for distribution (see below). IRIS-SEIS documentation (installation manual and user's guide) is in the final printing stage at LBL. Each site with a valid SIERRASEIS license can obtain the software and initially will receive one copy of the documentation (due to an initial limited printing run). Additional copies of the manual will be subsequently available to members within the IRIS community by contacting the SMC.

(4) Contacts at SMC:

Eleni Karageorgi	(415)486-7314	smc@gk1.lbl.gov
Tom Daley	(415)486-7316	smc@gk1.lbl.gov
David Okaya	(415)486-7313	smc@gk1.lbl.gov
[" "]	(213)740-7452	okaya@coda.usc.edu]

IRIS-SEIS

(1) The IRIS-SEIS version compatible with SIERRASEIS v1.3 is ready for distribution. The version contains 30 new processors which provide seismogram manipulation capability not provided within SIERRASEIS [see back issues of IRIS newsletter]. Eleven stand-alone utility programs and several utility subroutines for programming are also provided. A development environment is provided which allows one or more than one persons to create new algorithms.

(2) Software can be obtained by mid-November, as soon as the documentation (installation and user's guide) is available. Although SIERRASEIS v1.4 is scheduled for release within a few months, we feel it's in the best interests of the user community to distribute IRIS-SEIS as soon as possible.

The expected steps for release are:

*documentation manual mailed by SMC to each IRIS site w/ valid SIERRASEIS licence. Included will be a software request form.

*Users who wish to obtain IRIS-SEIS need to return request form indicating desired transfer medium.

*SMC will create for each user a tar tape on appropriate medium (mag tape, exabyte, etc.).

*Installation will be by each user (using installation documentation); SMC will be available for Q&A help.

*Alternatively, software can be obtained from LBL using anonymous ftp.

The IRIS-SEIS package (software and code) is free to all IRIS members who have valid SIERRASEIS licenses. IRIS-SEIS is a software shell around SIERRASEIS; it does not function as a stand-alone product.

(3) Since this release is the first ever release of IRIS-SEIS, David Okaya is offering to help any site install IRIS-SEIS. One condition prevails - that the installation can be performed remotely from either LBL or USC. A remote installation can be performed provided (a) telnet or rlogin log-on connection can be established and (b) either a SIERRA account or another account is made available which has sufficient file/directory permissions to create directories and recompile executables.

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November, 1990

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Please forward additions, changes, or deletions to okaya@geo.lbl.gov

NEIC EVENT CD-ROMS UTILITY FOR SUN WORKSTATIONS

The IRIS Data Management Systems Program supported the development of a utility for SUN workstations, allowing NEIC EVENT CD-ROMS to be read directly on SUN workstations and converted to SAC formatted traces. This utility was written by Alan Jones at SUNY Binghamton with the cooperation of Francis Wu.

This utility is available through the IRIS DMC in Austin, Texas. If you would like to receive a copy of this utility please send a note to the DMC using the Electronic Bulletin Board "note" utility.

Since sponsering this development it has come to our attention that other programs exist that read Event CD-ROMS on SUN workstations. Any parties interested in distributing this type of software through the IRIS Data Management System should contact Tim Ahern through the IRIS DMC. Contact can be made by calling (512) 471-0404 or sending mail to tim@iris.edu.

The evt2sac manual written by Alan Jones is reproduced on the following pages.

evt2sac – convert seismic data on CD_ROM to SAC format

evt2sac [*profile*]

evt2sac extracts seismic data from CD-ROMs distributed by the National Earthquake Information Center (NEIC) of the United States Geological Survey (USGS) and converts it to a form compatible with the Lawrence Livermore National Laboratory Seismic Analysis Code (SAC).

profile is the name of a file containing information defining which event to use and other information for personalizing the request. See the FILES section for information on the profile.

If no *profile* is provided, evt2sac looks for a file named evt2sac.pro.

The user can specify the time of the event of interest and also specify range and lag time to extract only records of interest. In addition, it is possible to specify that the program extract data around the arrival time of a phase. For example, one could specify that the data should extend from one minute before the arrival of the P wave and run until five minutes after the arrival of the S wave. The phases supported are P, S, pP, sS, PP, SS and surface waves. When specifying surface waves, the user can provide a surface wave group velocity window.

It is possible to mark the arrivals of phases of interest so that they appear on a SAC plot.

None.

If a profile is not specified when evt2sac is invoked, a file called evt2sac.pro is used for the profile.

An example of a profile is:

# This profile is for Taiwan event of May 20, 1986 #	
year:	1986
month:	5
day:	20
path:	/mnt
minimum range:	10
maximum range:	30
minimum minutes:	3
maximum minutes:	60

This profile will cause evt2sac to use the CD-ROM event file with name "8614000.evt" (The Julian day of May 20 is 140) and extract records from stations greater than 10 degrees from the event and no more than 30 degrees. Also, only records, or portions thereof, between 3 minutes and 60 minutes (after the event time) will be used.

The program runs through all the stations and produces files in the form:

prefix,sta,'.',period [ ] ,direction,suffix

where:

prefix:	user-specified
sta:	station name
period:	's' (short), 'l' (long), or 'i' (intermediate)
filenumber:	'00', '01', ...
	If filenumber is '00', it is omitted
direction:	n (north), e (east), z (vertical)
suffix:	user-specifed

For example, the short period, vertical trace from CHTO will have the following file name if no prefix or suffix are specified:

chto.sz

If more than one short period record is created due to breaks in the data, one could have the files:

chto.sz
chto.01.sz
chto.02.sz
....

There are two other files of interest generated:

prefix.hdr
prefix.dat

where *prefix* is the same as the prefix of the *.evt file. The *prefix.hdr* file is a copy of the header of the *.evt file and *.dat contains information on each station such as the instrument response.

PROFILECOMMANDS

The allowed commands, and their defaults, which can be used in the profile are:

COMMAND	DEFAULT	COMMENT
#whatever		Comment
PATH:		Set to path of CD-ROM reader
YEAR:	1980	Year of event
MONTH:	1	Month of event
DAY:	1	Day of event
MAXIMUM RANGE:	180	Maximum range in degrees of arc
MINIMUM RANGE:	0	Minimum range in degrees of arc
MAXIMUM MINUTES:	360	Maximum time in minutes
MINIMUM MINUTES:	0	Minimum time in minutes
MINUTES BEFORE:	0	Time, in minutes, trace is to begin before the arrival of the phase specified in the INITIAL PHASE command.
MINUTES AFTER:	0	Time, in minutes, trace is to end after arrival of the phase specified in the FINAL PHASE command.
INITIAL PHASE:		The allowed phases are 'P', 'S', 'pP', 'sS', 'PP', 'SS' and 'surface'. (You do not put the quotation marks in the file.)
FINAL PHASE:		Same as INITIAL PHASE.
SURFACE WAVE VELOCITY 1:	4.2	Surface wave velocity to define beginning of window in km/sec.
SURFACE WAVE VELOCITY 2:	4.2	Surface wave velocity to define end of window in km/sec.
SAC FILE NAME PREFIX:		Add this to beginning of SAC file name
SAC FILE NAME SUFFIX:		Append this to the end of the SAC file name
EVENT NUMBER:	0	If you know which event in the specified *.evt file, you can avoid the interactive question concerning which event with which you wish to work. If EVENT NUMBER is not specified or is set to zero, the program will prompt you for the event number.
MARK PHASE:		Mark a given arrival based on the J-B travel time curves. The same phases are allowed as with the initial and final phases. If "surface" is specified, the SURFACE WAVE VELOCITY 1 is used to mark the trace.
KZTIME DEFAULT		The default is to set KZTIME to the time of the event and to set 'O' to 0. If "SET KZTIME TO START OF TRACE" is specified, the KZTIME is set to the time of the beginning of the trace and 'O' set to a negative number equal to the time before the trace that the event occurred.

NOTE: When determining which records to use and which portions of records to use, ALL conditions must be met. That is, if the phases are specified and they are outside the window specified by the range or the time limits, no traces will be extracted.

When a command takes a parameter, the command ends with a colon. The parameter must be placed at least one character after the colon.

EXAMPLES:

Following is an example of a profile which specifies that we only want traces from 30 seconds before the arrival of the P wave until 3 minutes after the arrival of the S wave.

Two Seismological "Discussion Groups" on the BITNET

Francis T. Wu, SUNY Binghamton
wu@sunquakes.geol.binghamton.edu

Two seismological "discussion groups" have been established on the BITNET for some time. These are

1. seism-l@bingvmb
2. seismd-l@bingvmb

The BITNET discussion group operates basically as a message-forwarding agent. Each time a message is sent to one of the addresses above, the message is copied to receipients listed in a subscriber file. The "listserv" on the computer does the copying and sending. Currently the files are maintained at SUNY Binghamton on the bingvmb machine.

The first group, "seism-l", was created mainly to disseminate the QED information from USGS. Two types of mailing are being sent out. The first is a preliminary report of individual earthquake that are considered to be significant by NEIS (USGS); this information comes a few hours after the occurrence of the earthquake and includes the hypocentral location (if the depth can be determined), the origin time, the (body wave) magnitude, and arrival times (usually for teleseisms) from a number of world-wide stations.

The second type of mailing on seism-l is the daily event list. This report comes usually about six to ten days after the event. These include events greater than 5.0, but also some lesser ones. The events listed in these reports are about 1/4 to 1/3 of the events listed in the monthly PDE's that are now coming to us from USGS about 6 months after the event.

The second discussion group, "seismd-l", was created to be a message board where individuals might wish to start a discussion on a topic related to seismology, or to announce to the seismological community the availablity of software, hardware, assistantships, faculty or post-doctoral positions, and so on. If the topic of discussion raised is of general interest, we can carry on the ensuing discussion on seismd-l. Otherwise, it can be used as a place to solicit interested participants. The participants may then organize their own mailing list. This facility has been used relatively infrequently, perhaps as it should be, since most of us don't want to be bothered about too much stuff in our mail box. But the facility is here and the seismological community is welcome to develop ways to use it.

Right now there are about 150 "subscribers" of these lists. And the list is dynamic, in that the number flucuates. Users can sign on and off by themselves. For machines on the bitnet you can issue the command:

tell listserv at bingvmb subscribe seism-l firstname lastname etc or
tell listserv at bingvmb unsubscribe seism-l

If you are on internet you can send a message to listserv@bingvmb.bitnet with the message

subscribe seism-l firstname lastname etc

or

unsubscribe seism-l

There are other commands you can use that are common to all the BITNET discussion groups and you can find out from your local computer center.

Please do note that if you want to send a message to somebody on the subscribers list, please address him/her directly instead of sending the mail to seism-l or seismd-l. In the latter case, everybody on the list will get a copy, and most subscribers dislike junk e-mail intensely.

Your comments and suggestions will be welcome.

E-mail Directory

Rick Williams

Last modified 17 November 1990

To get the most recent version of this list, use ftp to rockytop.gg.utk.edu (ftp 128.169.201.150). Login as user ftp or anonymous using your surname as the password. The file is in the dist subdirectory, and is named email.list. If FTP does not work for you, send an E-mail message to rick@rockytop.gg.utk.edu.

An astrisk (*) before a name means that I was unable to send mail to the address given, but others may be able to use it. A carat (^) before a name means that individual is a member of the anisotropy interest group assembled by Joe Dellinger; contact Joe for details. The letter (j) before a name indicates a Japanese seismologist from the list compiled by Kiyoshi Suyehiro with additions by Kazuki Koketsu.

The letter (o) before a name means the address is old, and did not work the last time I tried it. Users are requested to let me know when they find an old or invalid address in this list, particularly when it is their own.

who,where,date,user@host.domain

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