TOMO 3

TOMOG3D, Cerro Prieto

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PASSCAL Data Report 02-002

IRIS **D**ATA **M**ANAGEMENT **S**YSTEM

TOMOG3D (Cerro Prieto)
PASSCAL Experiment 9704   02-002

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Overview

Cerro Prieto was microseismic monitoring project located near the Cerro Prieto geothermal field in the Salton trough, northern Baja California, Mexico. Objectives of the study included studying the seismicity of the Cerro Prieto and Imperial faults, as well as acquiring data for a joint inversion for hypocenter and 1-D or 3-D velocity structure.

Acquisition

Sixteen short-period stations recorded triggered events at 200 samples per second from March 17 through May 17, 1997. Triggering was based on a short-term amplitude average (STA) over 0.5-1 seconds versus a long-term average (LTA) over 30-50 seconds; the trigger ratio (STA/LTA) varied from 2 to 4. Record length was 45 seconds. The number of events with four or more associated station triggers totaled 485.

The network included three-channel REF TEK A07 recorders with 24-bit A/D convertors and primarily Mark Products L22 sensors having a 2 Hz corner frequency (plus one Guralp CMG-40T sensor with a 0.0333 Hz corner frequency). The stations and their instrumentation, channel orientations, and locations are summarized in the following table.

Site	DAS#	Sensor#	Model	Chan/dip/azi	Time span	Latitude	Longitude	Elev
ES03	7359	473	L22	1/90/0:2/0/0:3:0/90	1997:079-136	32.32209	-115.26847	-31.0
ES04	7432	477	L22	1/90/0:2/0/0:3:0/90	1997:076-136	32.34537	-115.19821	-31.0
ES07	7335	1501	L22	1/90/0:2/0/0:3:0/90	1997:077-136	32.37339	-115.32405	-25.0
ES08	7356	781	L22	1/90/0:2/0/0:3:0/90	1997:076-079	32.37443	-115.22913	-26.0
		464	L22	1/90/0:2/0/0:3:0/90	1997:080-093			
		480	L22	1/90/0:2/0/0:3:0/90	1997:093-137			

```
ES11  7349 468   L22    1/90/0:2/0/0:3:0/90    1997:093-114    32.39888  -115.29561 -26.0
ES16  7320 512   L22    1/90/0:2/0/0:3:0/90    1997:077-137    32.42936  -115.29464 -31.0
ES18  7449 1496  L22    1/90/0:2/0/0:3:0/90    1997:076-077    32.42574  -115.23012 -28.0
      7348 1496  L22    1/90/0:2/0/0:3:0/90    1997:080-137
ES21  7361 1494  L22    1/90/0:2/0/0:3:0/90    1997:079-136    32.43647  -115.33643 -30.0
ES23  7443 465   L22    1/90/0:2/0/0:3:0/90    1997:077-136    32.45906  -115.22820 -31.0
ES25  7442 490   L22    1/90/0:2/0/0:3:0/90    1997:077-119    32.45340  -115.16113 -19.0
           781   L22    1/90/0:2/0/0:3:0/90    1997:120-136
M201  7349 468   L22    1/90/0:2/0/0:3:0/90    1997:114-137    32.40981  -115.17375 -21.0
M206  7347 4300  CMG40T 1/90/0:2/0/0:3:0/90    1997:079-132    32.43399  -115.13580 -19.0
NVL   7349 480   L22    1/90/0:2/0/0:3:0/90    1997:087-092    32.39873  -115.21191 -21.0
QKP   7447 1493  L22    1/90/0:2/0/0:3:0/90    1997:078-136    32.30538  -115.33291   7.0
TLX   7454 501   L22    1/90/0:2/0/0:3:0/90    1997:077-136    32.47310  -115.14587 -18.0
VEX   7344 472   L22    1/90/0:2/0/0:3:0/90    1997:077-136    32.36295  -115.10533 -25.0
```

Channel orientations are described according to SEED convention where dip is measured in degrees down from horizontal; azimuth is expressed as degrees from geographic north.

Response files describing the sensor and digital acquisition system filters are included in the response_file directory on tape. The following station response cascades refer to these file names.

Station M206 has the following response cascade:

Stage	Filename	Description
1	response_files/cmg40t_vel	sensor
2	response_files/RT72A07_200	A/D; input 102,400 sps
3	response_files/crystal.1	decimate by 8
4	response_files/crystal.2	decimate by 2
5	response_files/crystal.2	decimate by 2
6	response_files/crystal.2	decimate by 2
7	response_files/crystal.2	decimate by 2
8	response_files/crystal.2	decimate by 2
9	response_files/crystal.3	decimate by 2

All other stations have the response cascade:

```
Stage  Filename                    Description
-----  --------------------------  ---------------------
1      response_files/l22_vel          sensor
2      response_files/RT72A07_200    A/D; input 102,400 sps
3      response_files/crystal.1    decimate by 8
4      response_files/crystal.2    decimate by 2
5      response_files/crystal.2    decimate by 2
6      response_files/crystal.2    decimate by 2
7      response_files/crystal.2    decimate by 2
8      response_files/crystal.2    decimate by 2
9      response_files/crystal.3    decimate by 2
```

Station Timing

All traces have been corrected to GPS time with the exception of station QKP from April 4 through May 13, 1997 (Julian days 094-133). The QKP clock did not lock with the GPS constellation during this time.

Data Organization

The Cerro Prieto assembled data set was prepared at the PASSCAL Instrument Center by Mary Templeton and submitted on a tape containing seven individual UNIX tar files:

```
File #  Directory    Description
------  ---------    -----------
 1      Report.txt   This document.
                     (8 KB untarred)

 2      events       associated PASSCAL SEGY traces in event-network
                     directories; names are as follows:

                     97.136/97.136.04.46.02/01/ES21..97.136.04.46.03.7361.1

                     where 97.136 is the year and Julian day, 97.136.04.46.02
                     is the event trigger time, 01 is the data stream number,
```

and ES21..97.136.04.46.03.7361.1   is the SEGY trace for
station ES21, REF TEK serial number 7361, channel 1.
The events subdirectory also contains an associated.log
file that lists the pathnames of traces belonging to each
event.   This file is useful for viewing the events with
viewer such as the PASSCAL pql program.
(312.91   MB untarred)

3   log_files   files containing state of health, timing, and acquisition
                        information.   Files are named as follows:

                        ES16.1997.119_137.7320.log

                        where ES16 is the station, 7320 is the REF TEK serial
                        number, and 1997.119_137   is the year and Julian day time
                        span described by this file. These files were written by
                        the ref2segy program.
                        (17.00   MB untarred)

4   response_files   sensor poles and zeros and REF TEK A/D and fir filters
                        described in the Acquisition section.
                        (10 KB untarred)

5   time_correction_files
                        PASSCAL Clock Files (PCF) containing time corrections
                        applied to the SEGY traces.   These files were written
                        by the refrate program and are named as follows:

                        ES08.1997.119_137.7356.log.pcf

                        where ES08.1997.119_137.7356.log   is the log file used
                        as input to the refrate program.
                        (2.63 MB untarred)

6   timing_err_files

> timing error files created by ref2segy named in the same
> manner as the log files. These files reflect timing gaps
> and overlaps for continuous data, but for triggered data,
> they indicate mainly the segmented nature of recording.
> (485.22 MB untarred)

7   unassoc_traces   traces that had fewer than four associated station triggers.

> Traces are in network-day directories named as follows:
>
> R076.01/ES25_97.076.23.56.32.7442.1
>
> where R076.01 contains data for Julian day 076, data stream 1,
> and ES25_97.076.23.56.32.7442.1   is the SEGY trace file for
> station ES25, REF TEK serial number 7442, channel 1, beginning
> at 97.076.23.56.32.
> (7231.34 MB untarred)

To read a specific file from tape, use the UNIX mt command to position the tape drive to the desired file and use the tar command to extract the directory or file.

SEGY Header Information

The PASSCAL SEGY trace headers include the station name, location, sensor serial number, and SEED channel name in addition to the standard values describing trace start time, trigger time, sampling, and REF TEK serial number.

Station locations are expressed in seconds of latitude and longitude (1 degree is 3600 seconds); elevation is in meters. These locations are averages of the GPS positions reported in the log files. Elevations at Cerro Prieto are below sea level, however, the elevations have a larger uncertainty than the latitude and longitude. Earthquake times and locations are unknown.

There is no PASSCAL SEGY header value for sensor model type, however, traces recorded using L22 sensors have SEED channel names of EP{ZNE}, while the CMG-40T has the channel names EH{ZNE}. Channels 1, 2 and 3 are named Z, N, and E respectively.

The PASSCAL SEGY format is described on the IRIS PASSCAL website at
http://www.passcal.nmt.edu/NMT_pages/Software/segy.shtml.