

JTX94

JEMEZ TOMOGRAPHY EXPERIMENT AT VALLES CALDERA, NM

Submitted By

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PASSCAL Data Report 96-011



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JTEX 1994 - Jemez Tomography EXperiment at Valles Caldera, New Mexico

The JTEX passive seismic array project carried out its main deployment in 1994. In a joint effort, UW-Madison and Los Alamos National Laboratory scientists deployed 50 RefTek instruments in an array in and around Valles Caldera for a maximum of about 13 weeks. Station spacing averaged about 3 km in the array center and increased substantially towards the perimeter. In addition, one set of 6 stations was deployed in the form of a mini-array with about 1 km element spacing. Table 1 contains the coordinates, elevations, operation period, site condition, and sensor type (BB vs. SP) of the passive array stations. The coordinates were determined using Magellan GPS units. As a check, we converted all the GPS measurements to UTM and plotted them to compare with where we thought sites were just from topography. If the topography was clear and there was a conflict between GPS and our observed map location, we used the map location. At most locations, the two methods agreed to within the expected GPS errors. Table 2 contains details of the instrumentation at each site and the history of significant equipment changes.

Broadband sensors were housed in plastic garbage cans (sliced off at the bottom) that were almost completely buried and were packed with foam insulation. The sensors were placed on paving stones set in plaster of paris. Short-period sensors were buried at soil sites, but at two sites (PNY and ROK) they were placed on bedrock at the surface and sheltered to the degree possible.

Data Collection and Processing

Data were recorded in continuous mode at 20 SPS. Table 3 contains the parameter settings used for the various instrument combinations. The data have been assembled in the form of SEGY day volumes, plus teleseismic event windows (Table 4). Ratefiles (as well as log and error files) are provided for determining clock corrections. Timing corrections for the windowed data were done with perl scripts (provided). Calibrations were done at 5-day intervals for all the broadband sensors and for the short-period sensors having calibration coils.

See README file included with the archive tape containing log, err, ratefiles, and scripts for additional information on clock correction and event processing scripts.

Known problems

Station AR6 apparently was installed poorly, as waveforms from it are ~90% unusable. Also, there was a timing error at VTO for the first 3 weeks of its installation (from 6/21 to 7/11). The antenna was not securely installed initially, and the site was mauled by cow.

Related publications and abstracts:

- Lutter, W. J., P. M. Roberts, C. H. Thurber, L. K. Steck, M. C. Fehler, D. G. Stafford, W. S. Baldrige, and T. A. Zeichert, Teleseismic P-wave image of crust and upper mantle structure beneath the Valles caldera, New Mexico: Initial results from the 1993 JTEX passive array, **Geophys. Res. Lett.**, **22**, 505-508, 1995.
- Lutter, W., C. Thurber, P. Roberts, M. Fehler, L. Steck, Teleseismic P wave image of crustal structure beneath Valles caldera, New Mexico: Initial results from the 1993 JTEX passive array, **EOS, Trans. Am. Geophys. Un. Suppl.**, **75**, 242, 1994.
- Roberts, P. M., K. Aki, and M. C. Fehler, A Low-velocity zone in the basement beneath the Valles Caldera, New Mexico, **J. Geophys. Res.**, **96**, 21583-21596, 1991.
- Roberts, P. M., R. A. Benites, M. Fehler, C. Thurber, W. Lutter, L. Steck, D. Stafford, and T. Zeichert, Teleseismic waveform anomalies observed during the passive 1993 Jemez Tomography experiment, **Seismol. Res. Lett.**, **65**, 16, 1994.
- Roberts, P., W. Lutter, M. Fehler, C. Thurber, L. Steck, D. Stafford, and T. Zeichert, Teleseismic P-wave delays observed during the 1993 passive JTEX deployment, **EOS, Trans. Am. Geophys. Un.**, **74**, 424, 1993.
- Steck, L., W. Lutter, M. Fehler, C. Thurber, S. Baldrige, P. Roberts, R. Sessions, and D. Stafford, Crust and upper mantle structure at Valles Caldera, New Mexico from 3-D teleseismic tomography, **EOS, Trans. Am. Geophys. Un. Suppl.**, **76**, F351, 1995.
- Steck, L., W. Lutter, M. Fehler, C. Thurber, P. Roberts, T. Zeichert, and D. Stafford, Observations of teleseismic P- and S-wave polarization anomalies during the 1993 passive JTEX deployment, **EOS, Trans. Am. Geophys. Un.**, **74**, 425, 1993.
- Steck, L., W. Lutter, M. Fehler, C. Thurber, C. Weiland, S. Baldrige, and P. Roberts, Comparison of crustal structures beneath Valles Caldera, New Mexico and Long Valley, California, **1995 IUGG Meeting**, Boulder, CO, July 1995.
- Thurber, C., M. Fehler, W. Lutter, P. Roberts, L. Steck, D. Stafford, T. Zeichert, and S. Baldrige, The 1993 JTEX passive array experiment in Valles caldera, New Mexico, **EOS, Trans. Am. Geophys. Un.**, **74**, 425, 1993.

Table 1 JTEX 1994 Site Locations (datum used: WGS84)

STA	LAT	LCN	ELEV(M)	INSTL/REMOV	SITE	BB/SP
alm	35.9150	-106.5804	2671.	6/24 - 9/24	soil	SP
ant	35.9654	-106.5602	2605.	7/07 - 9/24	soil	SP
ar1	35.9044	-106.4918	2674.	6/20 - 9/23	soil	BB
ar2	35.9100	-106.4934	2671.	6/20 - 9/23	soil	BB
ar3	35.9100	-106.5047	2692.	6/21 - 9/23	rock	BB
ar4	35.9156	-106.4992	2677.	6/23 - 9/23	rocky soil	BB
ar5	35.9148	-106.4844	2680.	6/23 - 9/23	rocky soil	BB
ar6	35.8988	-106.4844	2671.	6/20 - 9/24	rocky soil	BB
bin	35.9882	-106.5975	2610.	7/07 - 9/24	soil	SP
cac	35.9848	-106.6766	2604.	6/09 - 9/21	rocky soil	BB
caj	35.8290	-106.5654	2537.	7/08 - 9/23	soil	SP
cap	35.7848	-106.4156	2540.	6/10 - 9/22	tuff	SP->BB
oda	35.9254	-106.4876	2799.	6/16 - 9/23	rocky soil	BB
clj	35.8558	-106.4931	2613.	7/07 - 9/23	tuff	BB
cto	35.9984	-106.4276	3091.	6/22 - 9/23	rock	BB
elk	35.8386	-106.5418	2668.	7/07 - 9/23	soil	BB
erl	35.8886	-106.3472	2500.	8/05 - 9/21	rocky soil	SP
gar	35.9868	-106.5084	2768.	6/24 - 9/24	rocky soil	BB
hrs	35.8566	-106.5953	2470.	7/08 - 9/23	soil	SP
jac	35.9141	-106.5178	2707.	6/16 - 9/23	rocky soil	BB
lac	35.8829	-106.3626	2602.	6/12 - 8/02	tuff	SP
lkt	35.8482	-106.6521	2610.	7/06 - 9/25	tuff	SP->BB
med	35.9006	-106.4576	2890.	7/08 - 9/24	soil	SP
mhk	35.8793	-106.5305	3030.	7/06 - 9/22	rocky soil	SP
mim	36.0410	-106.7398	2896.	6/08 - 9/21	soil	BB
mus	35.9228	-106.6403	2655.	6/11 - 9/19	rocky soil	BB
oso	36.0313	-106.4007	3311.	6/13 - 9/21	soil	BB
pip	35.9227	-106.3903	2896.	6/13 - 9/21	rock	BB
pns	36.0019	-106.7153	2622.	6/08 - 9/21	tuff	SP
pny	35.9619	-106.6516	2671.	7/06 - 9/25	tuff	SP
rbm	35.8280	-106.4678	2851.	6/30 - 9/21	soil	BB
rcn	35.8799	-106.5868	2604.	6/17 - 9/24	rocky soil	BB
rcs	35.8645	-106.6125	2439.	6/28 - 9/24	tuff	BB
rdb	35.8907	-106.6015	2915.	7/11 - 9/22	rocky soil	BB
rdt	35.8944	-106.5533	2921.	6/17 - 9/22	rock	BB
rok	35.8351	-106.6796	2515.	6/08 - 9/25	tuff	SP
sam	35.9355	-106.6108	2948.	6/24 - 9/24	rocky soil	SP
slc	35.9354	-106.5469	2678.	6/27 - 9/24	soil	BB
spd	35.8136	-106.4315	2659.	6/10 - 9/19	soil	BSP
stf	35.9581	-106.4226	3006.	6/22 - 9/19	rocky soil	BB
top	35.8611	-106.5580	3262.	7/06 - 9/22	rocky soil	BSP
tqr	35.9603	-106.4830	2640.	6/24 - 9/24	soil	BSP
trk	35.9747	-106.4464	3046.	6/23 - 9/23	soil	BB
vag	35.8798	-106.4540	2662.	6/23 - 9/24	rocky soil	BSP
vpo	35.9196	-106.4298	2756.	6/21 - 9/24	soil	BB
vsr	35.9516	-106.5173	2633.	6/24 - 9/24	rocky soil	BSP
vto	35.9405	-106.4521	2692.	6/21 - 9/24	soil	BB
vul	36.0197	-106.4877	3061.	6/13 - 9/21	soil	BB
wac	35.8972	-106.6359	2570.	6/09 - 9/19	soil	BB
wsk	35.7884	-106.5966	2598.	7/15 - 9/19	soil	BB

Table 2 Station equipment and changes

NO CHANGES:

ALM	das	536	sensor	14:256	clock	gps
ANT	das	A02:537	sensor	14:6969	clock	gps-ext
CDA	das	A08:099	sensor	guru:3184	clock	omega
CLJ	das	A08g:647	sensor	guru:3105	clock	gps-int
CTO	das	A08g:642	sensor	lanlguru:4109	clock	gps-int
GAR	das	A08:479	sensor	guru:398	clock	gps-ext
JAC	das	A08:372	sensor	guru:3181	clock	omega
ERL	das	A08G:651	sensor	s13:2996	clock	gps-int
LAC	das	A08:084	sensor	s13:2996	clock	omega
MHK	das	A02:480	sensor	ucla_14:5602	clock	omega
MIM	das	A08:356	sensor	guru:3146	clock	omega
MUS	das	A08:097	sensor	guru:3144	clock	omega
OSO	das	A08:393	sensor	guru:3145	clock	omega
PIP	das	A08:391	sensor	guru:3183	clock	omega
RDB	das	A08:617	sensor	guru:320	clock	gps-ext
REM	das	A08:618	sensor	sts2:2	clock	gps-ext
RCN	das	A08:358	sensor	guru:3110	clock	omega
RCS	das	A08g:648	sensor	guru:337	clock	gps-int
RDT	das	A08:477	sensor	guru:319	clock	omega
SAM	das	A02:552	sensor	uwl4:1123	clock	omega
SLC	das	A08g:235	sensor	guru:3186	clock	gps-ext
STF	das	A08:114	sensor	lanlguru:4108	clock	omega
TOP	das	A08g:645	sensor	s13:2954	clock	gps-int
TRK	das	A08g:643	sensor	guru:3175	clock	gps-int
VUL	das	A08:472	sensor	guru:3154	clock	omega
WAC	das	A08:146	sensor	guru:3147	clock	omega
WSK	das	A08:555	sensor	guru:3102	clock	gps-ext
AR2	das	A08:377	sensor	guru:3125	clock	omega
AR6	das	A08:488	sensor	guru:3178	clock	omega

SENSOR CHANGE ONLY:

BIN das 563 sensor 14:6971???paul davis clock gps
223:16:30 sensor s13:2986

LKT das A08g:644 sensor ucla_14:6972 clock gps-int
200:00:00 sensor guru:3187 (use 3176 based on packing list)

MED das A02:403 sensor 122:475L clock omega
203:18:30 sensor ees4_14:39

AR4 das A08:478 sensor guru:321 clock omega
174:15:45 guru:3101 (voltages floating on 321)

DAS CHANGE ONLY:

HRS das 241 sensor s13:2966 clock gps
192:21:30 das 484 (A02 to A08)

FNS das 370 sensor s13:2989 clock omega
179:18:20 das 149 (A02 to A08)

PNY das A08g:649 sensor ees3_14:78 clock gps-int
199:21:00 das 378 (needed A08 elsewhere)

ROK das 378 sensor s13:2964 clock omega
178:19:00 das 381 (A02 to A08)

SPD das 476 sensor s13:2951 clock omega
181:17:30 das 341 (A02 to A08)
181:22:30 das 484 day 000 problem
182:18:45 das 261 32K monitor cnt problem

VPO das 553 sensor guru:3152 clock omega
217:14:00 das 84

VSR das 403 sensor s13:2300 clock omega
182:21:15 das 119 (A02 to A08)
214:15:00 das 370 (A08 to A02) clock omega

AR5 das A08:555 sensor guru:3100 clock gps-ext
193:17:00 das 339 (dead das-comm failure)

DAS AND CLOCK CHANGE ONLY:

CAC das A08:488 sensor guru:T3155 clock omega
161:21:00 das A08:376 clock gps-ext (omega not locking)

ELK das 339 sensor guru:3182 clock gps
189:17 das 341
208:20 das 229 clock omega

VTO das 229 sensor guru:3180 clock omega
200:21:30 das 649 clock internal GPS

AR1 das 339 sensor guru:3153 clock omega
172:21:30 das 650 clock gps (omega didnt lock)

AR3 das 651 sensor guru:3104 clock gps
214:17:30 das 119 clock omega (GPS cable chewed, couldnt fix in field)

DAS AND SENSOR CHANGE ONLY:

CAJ das 476 sensor 122:458 clock gps-ext
208:18:00 sensor 14:38
236:18:20 das 341

CAP das 241 sensor s13:2986 clock omega
181:18:30 das 550 (A02 to A08)
210:16:30 sensor guru:3156

TQR das 486 sensor s13:2984 clock omega
188:18:15 das 375 (A02 to A08)
217:15:30 das 486 (lightning strike)
224:17:45 sensor 14:622 (s13 to 14, s13 fried)
245:19:30 das 474 (site dead - das swap; A02 to A08)
255:17:20 das 486 (A08 to A02)

DAS, SENSOR, AND CLOCK CHANGE:

VAG das A02:480 sensor s13:2992 clock omega
182:21:45 das A08g:646 clock gps-int
236:14:30 s13_north:2969 (from 2971)

Table 3. Parameter information

Main Menu	Sub Menu	Sub-sub Menu	S-13/L-4	Guralp	STS-2
Station	OP Mode		CP/SC	same=(s)	(s)
	Xck-Setup	Latitude	N35 52	(s)	(s)
	Xck-Setup	Longitude	W106 30	(s)	(s)
	Xck-Setup	Leap Secs	18	(s)	(s)
Channel	Select Chan		1-3	4-6	4-6
	Chan # Def Chan # Def	Preamp Sens Mod	512 S-13/L-4	1 Guralp	1 STS-2
Stream	Select Strm	Str1=SP, Str2=BB	1	2	2
	Stream 1 or 2	Name	C20SS13/L4	C20SGUR	C20STS
	Stream 1 or 2	Channel #	1-3	4-6	4-6
	Stream 1 or 2	Samp Rate	20	(s)	(s)
	Stream 1 or 2	Data Form	16	32	32
	Stream 1 or 2	Trig Type	Con	(s)	(s)
	Stream 1 or 2	Trig Prms-Recrd Len	1800 s	(s)	(s)
Calibration	Strt Time		10hr 10 min	(s)	(s)
	Rep Int		5 day	(s)	(s)
	# of Ints		150	(s)	(s)
	Recrd Len		40 s/20 s	(s)	(s)
	Step Func		ON	ON	ON
	ON	Interval	10 s/5 s	90 s	200 s
		Step Size	11 s/6 s	91 s	201 s
		Amplitude	0.5/1.0	0.1	8.0
	Step Output	coil	(s)	(s)	

250	13:56	ch321.250	25.1	38.424	90.195	33	5.1
250	19:45	ku221.250	54.5	45.375	150.990	33	5.1
251	05:22	va183.251	6.9	-11.801	164.861	33	5.1
251	08:50	mo266.251	39.8	0.554	126.107	33	5.6
251	13:33	iq353.251	31.2	27.816	61.693	33	5.0
252	01:06	sa169.252	52.4	-16.847	-172.689	33	5.1
252	02:27	ng202.252	29.7	-4.114	142.118	127	5.1
253	04:54	ph259.253	9.7	7.540	126.518	75	5.6
254	01:14	sa173.254	5.1	-18.911	-175.938	33	5.3
254	01:32	br299.254	2.7	19.453	99.540	33	5.1
254	12:01	va186.254	13.2	-15.999	166.668	33	5.4
254	14:52	al006.254	52.4	51.958	178.133	98	5.0
254	15:49	so190.254	53.7	-5.212	153.288	33	5.2
255	06:29	ar135.255	56.3	-31.130	-71.645	53	5.8
255	11:27	mo265.255	13.5	1.120	122.948	33	5.2
255	11:30	jv282.255	14.2	-8.916	106.493	33	5.6
255	12:23	ca040.255	43.2	38.819	-119.652	14	5.3
255	22:43	sa169.255	52.8	-15.534	-172.975	33	5.5
255	22:49	sa169.255	8.5	-15.530	-172.941	33	5.4
255	23:34	sa169.255	54.3	-15.153	-172.984	33	5.0
256	03:09	va184.256	26.8	-12.913	167.612	33	5.5
256	04:28	jp238.256	1.0	29.263	129.858	37	5.8
256	10:01	cu099.256	34.8	7.082	-76.714	33	5.8
256	12:22	va189.256	12.8	-22.281	174.671	33	5.5
257	02:04	va184.257	50.3	-12.757	167.523	33	5.0
257	02:41	so192.257	1.0	-5.327	150.554	177	5.4
257	05:02	ar135.257	12.2	-31.241	-71.622	38	5.0
257	11:45	sa173.257	17.6	-16.490	-173.020	33	5.2
257	13:18	ph259.257	50.5	5.833	125.638	33	5.3
257	20:19	fj181.257	4.4	-17.631	-178.539	500	5.2
258	07:07	tw244.258	8.6	23.643	121.754	53	5.0
258	19:48	al012.258	22.3	54.342	-161.869	40	5.2
258	23:47	fa156.258	30.4	-57.757	-8.749	10	5.2
259	06:20	tw243.259	18.3	22.546	118.743	12	6.5
259	08:15	jv274.259	58.9	-5.368	102.821	33	5.2
260	04:56	me397.260	26.5	36.488	9.142	10	5.1
260	12:22	ar135.260	14.8	-32.186	-71.671	28	5.5
260	12:33	ar134.260	49.3	-32.300	-72.005	33	5.1
262	13:09	jv280.262	4.9	-7.486	128.505	150	5.3
262	18:03	jv281.262	23.8	-7.668	130.096	33	5.0
262	19:35	al007.262	26.1	52.176	-174.723	64	5.2
263	05:51	iq347.263	46.8	32.639	48.709	33	5.0
263	08:45	ph259.263	24.2	7.429	126.709	33	5.4
263	14:09	sa173.263	12.7	-18.347	-174.699	33	5.4
264	06:09	mo267.264	18.4	1.035	127.054	155	5.3
264	19:31	va186.264	28.3	-16.528	167.318	33	5.0
265	01:56	ku225.265	18.2	42.484	148.294	34	5.2
265	14:24	ar135.265	34.1	-32.215	-71.856	27	5.5
266	02:37	ku229.266	55.4	37.132	142.169	26	5.3
266	02:52	cu092.266	21.1	18.434	-61.540	31	5.0
266	07:59	ng203.266	39.1	-3.331	148.464	33	5.5
266	11:08	jv282.266	3.0	-9.459	112.937	72	5.0
266	19:15	ch325.266	44.4	36.067	100.109	33	5.2
267	03:25	va186.267	37.6	-14.426	166.549	33	5.0
267	17:55	me386.267	0.9	40.948	4.694	33	5.2