

JTX93

JEMEZ TOMOGRAPHY EXPERIMENT AT VALLES CALDERA, NM

Submitted By

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PASSCAL Data Report 95-004



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JTEX - Jemez Tomography EXperiment at Valles Caldera, New Mexico

The JTEX passive seismic array project carried out a pilot deployment in 1993. In a joint effort, UW-Madison and Los Alamos National Laboratory scientists deployed 22 RefTek instruments (15 from PASSCAL, 7 from JTEX participants) along two profiles in and around Valles Caldera for about 10 weeks. 19 RefTeks were 6-channel instruments and 3 were 3-channel instruments. Broadband sensors (5 Guralp and 1 STS-2) were co-sited with short-period sensors (L4 or L22) at six out of eight sites along a NW-SE profile overlapping that of Roberts et al. [1991]. Short-period sensors (L4) were deployed at the two other NW-SE profile sites and along a new ENE-WSW profile. Station spacing along the profiles averaged about 3 km. In addition, two sets of 3 stations were deployed along the NW-SE profile to form mini-arrays with about 1 to 1.5 km element spacing. Table 1 contains the coordinates and elevations of the passive array stations. The coordinates were determined using a Magellan GPS unit for all but one site; that site location was determined from the USGS topo map. 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 both continuous (20 SPS) and triggered (100 SPS) modes along the NW-SE profile, and in continuous (20 SPS) mode on the ENE-WSW profile and mini-array stations. Table 3 contains the parameter settings used for the various instrument combinations and data streams. The data have been assembled in the form of SEG-Y day volumes, plus one tape of teleseismic event windows (Table 4) and event triggers (mainly regional earthquakes and some blasts). Ratefiles (as well as log and error files) are provided for determining clock corrections. Calibrations were done on alternate days for all the broadband sensors and for the short-period sensors having calibration coils. In addition, a huddle test was carried out at the beginning of the experiment. The resulting information on response, polarity, and timing is provided below.

Clock Corrections and Auxiliary Information

Programs such as clockfix to derive clock corrections from external clock information were made available by the Lamont PASSCAL Instrument Center in the spring of 1994. By this time most of the windowing and construction of event directories from the passive 1993 JTEX experiment had been accomplished. Consequently, ratefiles were constructed from log file information for the 1993 JTEX passive data set and then clock corrections were calculated for the event datafile picks. Instructions provided by PASSCAL in 1994 for determining clock corrections for previously merged data required that the clock correction for each merged file be constructed using the start time of the earliest raw segyfile used as input into "segymerge". In addition, static corrections derived from analysis of huddle test data were applied to event based travel-time picks. The next few paragraphs comment on log and err files, construction of a single rate file per site, construction of event directories, and huddle-test-derived static time corrections.

Log and err files from ref2segy operations are available in directories LOGS and ERRS respectively. A lookup table, stnlog.list, lists for each station the service times when data was retrieved, processed, and yielded log and err files. Columns 1-3 list the day, hour and minute of the service, roughly between the stop acquisition for data retrieval, and start acquisition operations. Columns 4-6 list the sensor#/type, das#, and clock type at the site upon arrival for servicing. So, equipment changes are listed at the next service time. Column 7 lists the resulting log file name. Additional comments may be included in column 8. The lookup table provides sufficient information for reprocessing of clock correction information from the original log and err files.

Rate files were constructed from log files via use of the PASSCAL program clockfix. One ratefile was constructed for each site via consolidation of the appropriate rate files and removal of the extra PASSCAL Correction Format identification lines. The rate files may be found in directory FIX. The three letter station identification forms the first three columns of the ratefile name, followed by ".fix" (Example: ALM.fix). In addition, output from running clockfix with the -debug option is stored in files such as ALM.debug. The association of logfile with station is tabulated in the stnlog.list file.

The Lamont PASSCAL Instrument Center suggested the possible use of windowing scripts written by Ken Duecker and Randy Palmer to construct event directories. These scripts were modified for the particular experimental design of the JTEX93 experiment and used to a) construct a lookup table of field equipment/service information, b) coordinate merging of segy files based on predicted IASPEI model times and QED/PDE event information, c) convert event segy files to SAC files and write specified IASPEI phases to SAC headers (T1-T9). This data report includes 152 event directories (see jtex93_events directory) with a total of 1.4 Gbytes of event data (SAC file only). The event directory names such as alaska.231 contain a five letter/number description followed by a three digit date. The file event.pdelist provides a lookup table of event directory

names and PDE information. A table of clock corrections for each event/station pair, `clkcor.evtsta`, may be found in the `FIX` directory (see `log/err` file information). Scripts used to generate the rate files described earlier and the `clkcor.evtsta` list may be found in `FIX/scripts` and a brief description of the scripts in `FIX/scripts/README`. The scripts are partially documented. However, auxiliary files such as `STA.segy` with lists of `segyfiles` used to merge, and scripts `evt_clock.csh`, `merge_ev` provide enough background information to evaluate the construction of the `clkcor.evtsta` table and its use to correct traces within the event directories. Neither event directory traces nor day volumed `segy` data are time corrected, corrected for huddle test derived static time corrections, or corrected for trace polarity reversal.

Some triggered-stream data was collected during part of the JTEX93 passive experiment (days 195-245). Due to lack of access to the main field area during most of the month of September (elk hunting season) triggered data was not recorded past day 245. The stations that recorded triggered data (directory `TRIG_DAT` - 247 Mb) are indicated below.

Trigger Data DAS#/STA:

Days ###-### DAS#/STA pairs programmed to record triggered data

195-199 575/ALM 586/RDT 596/CLJ 597/SAM 598/MHK

200-201 575/ALM 585/CAC 586/RDT 596/CLJ 597/SAM 598/MHK

201-205 575/ALM 585/CAC 586/RDT 596/CLJ 597/SAM 598/MHK 6148/PNY

206-214 575/ALM 585/CAC 586/RDT 596/CLJ 597/SAM 598/MHK

215-245 241/RBM 575/ALM 585/CAC 586/RDT 596/CLJ 597/SAM 598/MHK

Nine Omega clocks were installed for the 1993 JTEX passive experiment. Four Omega clocks were replaced with GPS clocks. Service visits to station RCS indicated a locked Omega clock, and log file entries indicated a 5 ms clock correction. However, further discussions with RefTek and Lamont PASSCAL Instrument Center led to the conclusion that the clock at RCS never locked. Hence, no clock corrections are meaningful for this site. GPS and Omega clocks were swapped due to non-locking Omega clocks at several sites listed below.

RBM: installed day 200 with Omega, never locked, swapped to GPS on day 214.

JAC: installed day 201 with Omega, never locked, swapped to GPS on day 215.

STF: installed day 196 with GPS, swapped to Omega on day 215.

AM2: installed day 197 with Omega, lock problems, swapped to GPS on day 217.

AM3: installed day 197 with Omega, never locked, swapped to GPS on day 217.

Static corrections were derived from analysis of huddle test data by Peter Roberts at the Los Alamos National Laboratory. The analysis was similar to the SAC module "transfer" in that spectral domain field data was divided by huddle test data recorded by the same geophone, and then multiplied by huddle test data recorded by a reference geophone. This analysis provided an estimate of static corrections for the A-02 DAS units (three stations) and for 2-Hz geophones (L-22, and 2-cycle L-4s) within the frequency range of interest (≤ 2 Hz). Static corrections (add to trace start time) are listed below by station.

VTO (A-02 DAS): -78 ms
 PNY (A-02 DAS): -76 ms
 CDA (A-02 DAS): -78 ms before day 211
 MK2 (A-02 DAS): -78 ms after day 211
 SAM (L-22 geophone): +122 ms
 CLJ (L-22 geophone): +120 ms
 CAC (2-Hz L4 geophone): +120 ms
 MK3 (2-Hz L4 geophone): +120 ms

Polarity Information

Testing of short-period sensor polarity was done by several different methods (a) huddle test information b) event directory trace comparison (c) testing of sensors by J. Coakley, USGS, in 1995. These tests yield mostly consistent information that is summarized by sensor type. Polarities from sensor testing (c) when flipped (normal to reversed and reversed to normal) are consistent with the other estimates. Three-component L4C sensors, L4C3D, borrowed from the USGS were deployed at stations RCN, RCS, ALM, MK2, AM2, MHK, AM3, STF, RDT, and AM4. The polarity of these stations were normal by all methods (VNE +) except for stations STF and RCN. Huddle test information indicates a reversed polarity for the east component at STF (STF E -). Both huddle test and event directory evaluation indicate that all three sensor components at RCN were reversed (VNE -). The L22 sensors, deployed at SAM and CLJ, had reversed polarity for the horizontal components (V+, NE-). The L4 (2-Hz) sensors, also borrowed from the USGS, deployed at CAC and MK3 are reversed (VNE -). Huddle test information indicates that L4 sensors borrowed from the Los Alamos National Lab and deployed at VTO and CDA were reversed (VNE -). L4 sensors borrowed from UCSB (Bill Prothero) have normal polarity (VNE +).

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.
- 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 1993 Site Locations*

SITE	LAT. north	LONG. west	HAE(m)	avgd.	PDOP	SAT. #'s : SQ			
CAC	35° 59.134'	106° 40.602'	2460	50					
PNY	35° 57.702'	106° 39.095'	2356	50	4.1	01 : 9	09 : 9	23 : 9	28 : 9
SAM	35° 56.114'	106° 36.653'	2975	50	4.3	03 : 9	16 : 8	20 : 9	24 : 1
ALM	35° 54.930'	106° 34.868'	2822	50	4.8	16 : 9	17 : 9	20 : 9	24 : 6
AM2	35° 54.636'	106° 36.005'	2535	50	3.9	12 : 9	13 : 9	20 : 9	24 : 9
AM3	35° 55.076'	106° 35.434'	2709	50	7.2	16 : 5	17 : 9	20 : 8	26 : 9
AM4	35° 55.681'	106° 35.772'	2632	50	9.1	03 : 9	17 : 9	23 : 7	26 : 9
RDT	35° 53.672'	106° 33.248'	2914	50	3.6	03 : 9	16 : 8	22 : 9	23 : 9
MHK	35° 52.765'	106° 31.867'	2987	50	2.7	12 : 7	13 : 4	16 : 9	20 : 9
MK2	35° 52.756'	106° 32.387'	2986	50	3.9	02 : 1	09 : 9	13 : 9	24 : 9
MK3	35° 53.241'	106° 32.187'	3034	50	2.8	09 : 7	13 : 9	20 : 9	24 : 9
MK4	35° 53.755'	106° 31.308'	3050	50	2.3	07 : 3	19 : 9	20 : 9	24 : 9
CLJ	35° 51.325'	106° 29.647'	2555	50	3.5	07 : 8	09 : 9	16 : 9	24 : 9
RBM	35° 49.706'	106° 28.109'	N/R	30					
STF	35° 57.619'	106° 25.436'	2934	50	4.4	17 : 9	21 : 2	03 : 9	26 : 9
VTO	35° 56.427'	106° 27.171'	2688	50	3.2	16 : 9	17 : 9	23 : 9	26 : 9
CDA	35° 55.519'	106° 29.289'	2602	20	5.0	03 : 8	16 : 9	20 : 9	26 : 9
JAC	35° 54.884'	106° 31.117'	2532	50	4.1	12 : 4	16 : 9	20 : 6	24 : 9
RCN	35° 52.789'	106° 35.242'	2515	50	7.1	01 : 9	17 : 9	21 : 9	28 : 9
RCS	35° 51.897'	106° 36.809'	2343	50	3.6	12 : 4	16 : 9	20 : 4	24 : 9
LKT	35° 50.887'	106° 39.133'	2654	50	4.2	03 : 9	16 : 9	17 : 9	24 : 9
ROK	35° 50.104'	106° 40.815'	2451	50	2.5	09 : 8	13 : 9	20 : 5	24 : 9

*Datum used: WGS84

Table 2 Station equipment and history

Station info	clock & sensors	Significant changes
CAC DAS #585 L-4 #301 STS2 (UW)	GPS STS-2	Installed 7/19 Removed 9/30
PNY DAS #6148 (3-ch) & #192 L-4 #'s v5319, n6410, e6408	GPS L-4 only	Installed 7/19 Removed 9/30
SAM DAS #597 L-22 #550 GUR #T3183	GPS Guralp ESP	Installed 7/15 Removed 9/29
ALM DAS #575 L-4 #354 GUR #T3180	GPS Guralp ESP	Installed 7/16 Removed 9/29
RDT DAS #586 L-4 #361 GUR #T3186	GPS L-4 only, Guralp ESP on 8/13	Installed 7/16 8/13, install Guralp, swap GPS, 8/27, new CPU Removed 9/29
MHK DAS # 598 L-4 #358 GUR #T3182	GPS Guralp ESP	Installed 7/14 Removed 9/29
CLJ DAS #596 L-22 #449 GUR #T3185	GPS Guralp ESP	Installed 7/15 Removed 9/30
RBM DAS #241, #537 & #536 L-4 #'s v5318, n5326, e6406	Ω , changed to GPS 8/2. L-4 only	Installed 7/19 8/2, swap DAS to #537 with GPS clock Removed 10/1
MK2 DAS #537 & #6146 (3-ch) L-4 #355	GPS L-4 only	Installed 7/14 Removed 9/21
MK3 DAS #536 L-4 #300	GPS L-4 only	Installed 7/14 7/30, swap GPS, swap DAS to #6146 (3-ch) Removed 9/21

Station info	clock & sensors	Significant changes
AM2 DAS #195 L-4 #357	Ω , changed to GPS 8/5. L-4 only	Installed 7/16 Removed 9/22
AM3 DAS #108 L-4 #359	Ω , changed to GPS 8/5. L-4 only	Installed 7/16 8/5, swap Ω to GPS Removed 9/22
AM4 DAS #394 L-4 #362	Ω L-4 only	Installed 7/16 Removed 9/22
STF DAS #451 & #241 L-4 #360	GPS, changed to Ω 8/3. L-4 only	Installed 7/15 8/3, inst. DAS #241 with Ω Removed 9/23
VTO DAS #6142 (3-ch) L-4 #256	GPS L-4 only	Installed 7/15 Removed 9/23
CDA DAS #6146 (3-ch) & #451 L-4 #999	GPS L-4 only	Installed 7/15 8/3, inst. DAS #451 Removed 9/23
JAC DAS #393 L-4 #'s v6403, n5323, e5325	Ω , changed to GPS 8/3. L-4 only	Installed 7/20 8/3, swap Ω to GPS Removed 9/23
RCN DAS # 147 L-4 #299 (224)	Ω L-4 only	Installed 7/20 Removed 9/21
RCS DAS #229 L-4 #353	Ω L-4 only	Installed 7/20 Complete loss of timing Removed 9/21
LKT DAS #192 L-4 #'s v6402, n6411, e6407	Ω L-4 only	Installed 7/19 Removed 9/17
ROK DAS #576 L-4 #'s v6404, n5328, e5324	pulse time, changed to GPS on 8/16 L-4 only	Installed 8/12 8/16, install GPS Removed 9/17

Table 3. Parameter information

Main Menu	Sub Menu	Sub-sub Menu	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 [†] , 32 w BB L-4	1 Guralp	1 STS-2
Stream	Select Strm	Str1=L4, Str2=BB	1	2	2
	Stream 1 or 2	Name	C20SL4	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	3600 s	(s)	(s)
Stream	Select Strm		3		
	Stream 3	Name	E100SL4		
	Stream 3	Channel #	1-3		
	Stream 3	Samp Rate	100		
	Stream 3	Data Form	16		
	Stream 3	Trig Type	EVT		
	Stream 3	Trig Prms-Trig Chls	1		
	Stream 3	Trig Prms-Pretr Len	15 s		
	Stream 3	Trig Prms-Recrd Len	60 s		
	Stream 3	Trig Prms-STA Lngth	2 s		
	Stream 3	Trig Prms-LTA Lngth	30 s		
Stream 3	Trig Prms-Trig Rat	5.0			
Calibration	Strt Time		10hr 10 min	(s)	(s)
	Rep Int		2 day	(s)	(s)
	# of Ints		90	(s)	(s)
	Recrd Len		5 s	(s)	(s)
	Step Func		ON	ON	ON
	ON	Interval	5 s	90 s	200 s
		Step Size	6 s	91 s	201 s
		Amplitude	1.0	0.1	8.0
		Step Output	coil	(s)	(s)

[†] Set to 128 at beginning of deployment, changed later to 512.

Table 4. Teleseismic event list

DAY	HR:MN	EVENT_DIR	SEC	LAT	LONG	Z	MAG	DAY	HR:MN	EVENT_DIR	SEC	LAT	LONG	Z	MAG
197	12:55	nicar.197	36.1	10.810	-86.270	26	4.8	241	9:57	banda.241	54.9	-7.005	129.560	14	7.5
197	22:45	chil2.197	42.4	-41.441	-87.367	10	5.0	244	0:41	japan.244	23.3	31.712	141.611	46	5.4
198	1:35	chile.198	39.7	-30.000	-71.591	52	5.5	244	3:35	japa3.244	27.3	31.859	141.641	44	5.1
200	19:35	ejapa.200	4.3	34.465	141.339	46	5.2	244	9:04	mexic.244	21.4	14.752	-93.676	50	4.7
201	7:38	tonga.201	19.4	-16.807	-172.595	31	5.2	244	10:58	pacoc.244	57.1	-41.227	-90.979	10	4.9
201	13:26	bonin.201	4.6	27.374	139.990	46	5.5	244	11:48	indon.244	38.4	-4.331	102.567	71	5.8
202	22:06	guate.202	29.7	13.349	-90.771	10	5.1	244	14:03	indo2.244	19.1	2.986	96.122	34	5.9
203	4:57	colom.203	7.0	6.470	-71.210	20	6.1	244	14:36	indo3.244	27.6	2.888	96.203	47	5.3
203	6:16	epacr.203	9.4	-54.439	-119.333	10	5.6	246	3:16	mexic.246	7.3	14.428	-92.732	63	5.3
203	12:15	maria.203	36.1	21.760	144.261	12	7.5	246	12:01	alask.246	11.1	56.125	-158.172	61	4.7
205	2:01	phil1.205	56.7	5.070	127.714	11	6.5	246	12:35	mexi2.246	0.2	14.523	-92.713	27	5.8
205	10:26	aleut.205	56.6	51.509	-176.879	33	5.2	246	12:54	mexi3.246	21.9	14.502	-92.745	44	4.9
209	5:51	koman.209	10.7	10.198	-104.102	21	5.0	247	4:35	ascen.247	1.3	-0.059	-16.587	10	5.1
209	11:47	koman.209	36.3	54.952	165.682	33	4.7	247	8:30	fijis.247	56.6	-16.166	-176.732	38	8.5
209	17:16	kuril.209	40.9	46.361	150.971	86	5.0	247	8:49	mexic.247	42.3	14.475	-92.854	57	4.9
210	4:24	kerma.210	39.4	-28.734	-176.641	35	5.1	247	11:38	afgha.247	38.9	36.429	70.812	19	5.5
210	8:41	guate.210	49.7	13.400	-90.764	77	4.8	247	21:39	savus.247	33.8	-9.571	122.528	33	5.8
210	20:16	mexic.210	58.7	17.522	-100.422	36	5.0	248	21:18	camer.248	50.0	12.832	-88.945	61	4.7
213	3:18	leew2.213	46.6	18.218	-63.705	10	5.4	249	6:27	colom.249	36.2	2.516	-79.105	33	4.7
213	15:32	guate.213	56.9	14.722	-90.977	23	7.4	249	18:19	mexic.249	59.4	14.386	-93.275	36	4.6
213	19:32	puert.213	28.5	17.399	-65.717	25	5.0	250	2:48	kerma.250	50.8	-31.635	-179.440	10	5.9
215	6:15	sever.215	55.3	-35.409	-70.921	11	0.0	250	20:10	japan.250	26.7	42.828	142.174	14	5.4
215	10:43	seve2.215	27.8	85.294	91.440	10	4.8	252	3:32	tonga.252	54.0	-21.494	-174.545	39	4.9
215	12:43	egypt.215	5.3	28.729	34.553	10	5.9	252	9:45	alask.252	14.0	60.248	-153.226	12	7.4
216	11:31	indon.216	18.0	-1.629	99.615	32	5.9	252	13:32	fijis.252	16.2	-18.145	-178.448	60	1.4
217	1:20	guerr.217	48.5	17.405	-98.235	62	5.0	252	15:09	kuril.252	28.6	44.042	150.288	49	5.1
217	12:42	fijis.217	43.5	-18.104	-178.333	61	6.5	253	10:50	mexi2.253	19.7	16.683	-98.737	10	4.9
218	8:18	chile.218	19.0	-33.215	-69.973	10	9.5	253	17:28	mexi2.253	8.6	14.429	-92.805	62	5.3
218	18:31	tonga.218	3.3	-17.549	-174.811	24	4.5	253	18:58	mexi3.253	57.0	14.415	-92.764	63	5.5
219	0:00	taiwa.219	37.0	26.585	125.612	15	5.6	253	19:12	mexi4.253	54.6	14.717	-92.645	34	6.2
219	6:11	mexic.219	52.1	18.065	-105.677	23	5.1	253	19:45	mexi5.253	6.7	14.311	-92.971	72	4.7
219	17:53	fijis.219	24.2	-23.866	179.846	52	3.6	253	22:37	mexi8.253	24.7	14.463	-92.698	71	4.7
219	19:42	hokka.219	41.9	41.985	139.839	14	6.2	253	23:23	mexi9.253	36.1	14.324	-93.030	52	4.8
220	8:34	maril.220	24.9	12.982	144.801	59	7.1	254	3:27	mexi4.254	42.1	14.370	-92.549	33	4.8
220	12:45	kamch.220	43.3	51.176	158.506	34	4.9	254	4:55	japan.254	33.4	42.003	142.581	58	5.7
220	15:11	panam.220	24.1	7.367	-80.551	41	4.5	254	5:23	mexi5.254	18.9	14.391	-92.983	33	4.9
220	15:25	colom.220	53.9	6.773	-72.960	16	6.4	254	6:14	nperu.254	27.7	-4.689	-76.318	12	1.5
221	2:38	mexic.221	1.5	8.385	-103.089	33	4.7	254	8:01	chile.254	54.0	-32.510	-71.565	29	5.4
221	12:42	afgh2.221	48.1	36.379	70.868	21	5.6	254	18:56	venez.254	53.1	10.865	-62.655	12	4.4
222	0:51	newze.222	53.2	-45.277	166.927	28	6.2	254	19:29	mexi6.254	42.7	14.375	-92.312	33	5.6
222	7:37	virgi.222	55.5	19.354	-64.886	37	4.5	254	23:29	kerm2.254	3.7	-28.392	-176.674	39	5.3
222	8:53	maris.222	18.5	12.998	144.848	43	5.4	255	3:22	guate.255	38.5	13.826	-90.429	68	5.4
223	1:36	ascen.223	47.7	-2.425	-12.362	10	5.0	259	0:59	kuril.259	26.4	44.533	149.036	33	5.8
223	14:17	maril.223	37.7	13.178	145.651	22	5.9	259	6:51	fijis.259	34.1	-25.348	179.849	50	2.5
224	4:43	atlan.224	3.3	26.645	-49.809	10	4.9	259	17:57	alask.259	15.3	67.856	-163.348	40	4.8
224	9:48	kuril.224	11.9	48.224	154.670	35	4.9	260	11:35	kamch.260	6.2	52.941	158.722	94	5.1
224	18:49	aleut.224	5.4	51.999	-176.071	46	5.1	261	0:34	tonga.261	20.7	-15.177	-173.673	41	5.0
225	8:14	tonga.225	25.9	-16.651	-173.569	47	4.9	261	2:18	honsh.261	35.6	36.116	140.863	43	5.2
225	11:02	newze.225	20.3	-35.989	178.510	95	5.8	261	15:48	costa.261	34.0	12.573	-88.069	31	4.9
227	3:10	atlan.227	21.2	0.711	-25.956	15	5.3	262	4:37	japan.262	3.1	43.108	139.154	19	4.9
227	14:43	atlan.227	13.9	52.871	157.574	14	9.4	262	5:01	mexi2.262	15.5	14.480	-93.162	33	5.1
228	4:33	maris.228	48.4	12.966	144.972	18	5.6	262	5:47	mexi3.262	10.8	14.337	-93.352	33	4.7
228	14:44	aleut.228	58.9	51.479	178.696	33	5.2	262	14:10	mexic.262	56.1	14.362	-93.325	18	5.7
229	10:16	puert.229	8.2	17.369	-65.767	27	4.8	262	16:33	mexi4.262	8.3	14.356	-93.428	33	4.8
230	12:19	kuril.230	49.3	44.379	149.232	20	4.8	262	19:38	tonga.262	38.2	-15.431	-173.324	70	4.8
231	8:03	maril.231	22.8	13.169	145.531	61	5.5	262	23:15	tong2.262	47.4	-24.234	-174.682	33	5.0
231	8:11	aleut.231	53.6	51.579	-171.217	33	5.3	263	1:22	mexic.263	49.5	14.330	-93.372	33	4.9
231	15:21	phil2.231	38.2	7.197	126.807	31	5.4	263	7:06	mexi2.263	31.5	14.289	-92.743	33	4.8
231	15:33	domin.231	5.5	18.431	-70.329	23	5.2	263	10:17	atlan.263	42.0	0.750	-29.354	10	5.8
232	5:06	guine.232	53.8	-5.997	142.743	15	6.0	263	11:26	samoa.263	52.9	-14.598	-175.158	33	5.3
232	11:52	maria.232	4:6	21.686	143.064	28	8.5	263	19:54	maria.263	5.3	21.277	146.230	33	5.4
232	18:57	tonga.232	10.7	-25.991	-175.261	22	5.5	264	7:35	aleut.264	35.9	51.926	-178.081	85	4.8
233	9:42	fijis.233	35.9	-21.278	-178.023	42	7.5	264	13:09	ascen.264	8.5	0.356	-16.394	10	5.4
234	10:02	guate.234	11.2	14.238	-90.701	10	8.5	265	12:37	solom.265	3.5	-6.470	154.901	28	6.1
235	12:07	japan.235	40.1	36.401	141.994	35	5.1	266	7:08	sfiji.266	19.1	-23.707	-179.930	52	5.4
235	13:15	japa2.235	11.5	41.802	139.548	20	5.0	268	0:07	hokka.268	1.1	42.399	139.092	22	5.0
235	21:02	samoa.235	59.8	-15.582	-172.859	33	5.1	268	11:33	tonga.268	14.6	-15.971	-173.803	11	6.5
236	0:46	nicar.236	17.7	12.157	-86.455	16	6.4	269	3:31	carol.269	14.6	9.997	138.222	10	6.1
237	5:25	chile.237	32.2	-44.718	-79.958	10	5.6	269	12:14	colom.269	59.2	6.817	-72.994	16	3.4
238	1:43	indon.238	10.4	-8.672	-110.358	66	5.3	270	4:43	japan.270	55.6	30.678	132.121	38	5.5
238	11:46	alask.238	17.2	59.972	-140.964	84	0.8	270	13:37	atlan.270	32.9	-53.651	-51.621	33	6.2
238	11:52	alas2.238	18.3	59.963	-141.002	84	0.9	272	11:16	sulaw.272	3.5	0.494	121.528	97	6.1
238	11:59	mexic.238	48.4	17.581	-100.768	71	4.5	272	22:25	india.272	48.6	18.066	76.451	76	0.3
239	1:45	mexic.239	26.3	17.670	-100.809	54	4.7	273	7:15	kamch.273	49.9	51.403	158.744	49	4.8
240	2:54	maria.240	10.5	18.666	145.594	21	3.4	273	17:04	indi2.273	45.8	11.815	92.529	23	5.4
240	20:14	india.240	45.8	6.571	94.668	13	3.5	273	18:27	mexic.273	50.8	15.417	-94.698	19	5.8

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