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Teleseismic residual study of the Lassen Volcanic National Park region in California

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INTRODUCTION

To investigate the crust and upper mantle structure under Lassen Peak and the surrounding parts of the Cascade Range in northern California, the U.S. Geological Survey conducted several seismic experiments in 1980. An experiment utilizing the teleseismic compressional-wave traveltime residual method (e.g. Steeples and Iyer, 1976; Ellsworth and Koyanagi, 1977; Reasenberg et al., 1980; Iyer et al., 1981) is described here. Data collected concurrently at the same stations, to study both local seismicity and the attenuation structure of the Lassen region, has been presented elsewhere and will not be discussed here (Monfort, 1980; Monfort, 1982). In this report, we present and discuss the traveltime residuals and qualitatively describe the P-velocity structure that produced these residuals. A three-dimensional inversion of the residuals to model the velocities beneath the array quantitatively is in progress and will be presented in a later paper.

The teleseismic P-wave residual method has been used successfully in many different regions to model low-velocity anomalies associated with magma bodies (Reasenberg et al., 1980; Robinson and Iyer, 1981; Iyer et al., 1981). The long history of mafic and silicic volcanism, historic eruptions of magma at Cinder Cone (Figure 1) and at Lassen Peak (Williams, 1932; Clynne, 1984), a well-developed hydrothermal system (Muffler et al., 1982), and seismicity studies (Klein, 1979; Walter et al., 1984) suggest that a detectable magma chamber may be present beneath the Lassen volcanic center. Estimates from geochemical and gravity data (Eichelberger, 1979; Clynne, 1984; Clynne, 1985) predict that such a chamber may be 10-20 km deep.

Teleseisms are events at a distance, delta, of more than 25° from a station. Rays from a teleseism have subvertical incidence angles (typically 15-30°) at a station (Achauer et al., 1986). If the array dimensions are small compared to the raypath length, the rays from an event to an array of distant stations are subparallel. The incidence angles and relative traveltimes at the array are only weakly dependent on structure near the source and along most of the raypath (Aki et al., 1977). Relative traveltime residuals across the array therefore arise mainly from compressional-wave velocity anomalies in the crust and upper mantle directly beneath the array. Inversions of these traveltime residuals can resolve velocity anomalies to a depth roughly equal to the array length, 35-60 km in this case. The lateral resolution for this type of experiment is limited by the wavelength of teleseisms, about 5-10 km, so that bodies with lateral dimensions smaller than 5 km can not be resolved (Robinson and Iyer, 1981).

For eleven weeks in the summer and early fall of 1980, 14 of the U.S. Geological Survey's portable "five-day recorder" seismic instruments (Criley and Eaton, 1978) and six permanent network stations (Eaton, 1977) continuously recorded in a 35- x 60-km array centered on Lassen Peak (Figure 1, Table 1). Sixty-five large (m_b > 4.6) teleseisms were

recorded (Table 2). Two events came from the northeast, 17 from the southeast, 31 from the southwest, and 15 from the northwest (Figure 2). The PKIKP phase of one of the northwest events was recorded and timed; the P phase of all other events was recorded and timed.

METHOD

The "five-day recorders" each had one vertical and two horizontal 1-Hz seismometers. Seismic signals from these transducers and time signals from both an internal clock and from the WWVB radio station were recorded as FM analog signals on half-inch magnetic tape. The permanent network stations telemetered signals to a central analog recording site, and are described by Eaton (1977). Of the 150 identifiable teleseisms recorded by the Lassen array, 65 were large enough to have clear arrivals at most of the stations. Paper records of these events were produced using the Bell and Howell 3700-B playback system and the Siemens Oscillomink, an ink-jet direct-write multichannel oscillograph (Eaton, 1978). Hypocentral information used is from the U.S. Geological Survey's Preliminary Determination of Epicenters bulletins.

Traveltimes for each event were hand-picked from the paper records at a distinct feature in the first cycle of motion, such as a peak, a trough, or a zero-crossing. The same feature was visually correlated for all stations recording an event. Errors due to variations in waveform across the array and other factors are thought to be less than 0.1 s using this method (Steeples and Iyer, 1976; Berge, 1985). The relative accuracy of each pick was noted by assigning a pick quality subjectively as follows: "a" quality for ±0.05 s uncertainty; "b", ±0.125 s; "c", ±0.25 s; and "x", ±1.0 s. The "x" quality picks were not used in subsequent data analysis.

COMPUTATION OF RESIDUALS

For each event, the traveltime residuals for each station were calculated by DISTAZRES, a computer program which subtracts a theoretical traveltime computed using Herrin's standard earth model (Herrin, 1968a,b) from the observed traveltime between the source and the seismometer (J.R. Evans, written commun., 1983). The absolute residual for the ith station and the jth event is:

$$RA_{ij} = (TA_{ij} - TO_j) - TE_{ij}$$

where TA_{ij} is the observed arrival time, TO_j is the event origin

time, and TE_{ij} is the expected traveltime predicted by the Herrin model (Steeples and Iyer, 1976).

The relative residual is calculated for each absolute residual, in order to eliminate source and most path effects. For each event, the unweighted mean of the absolute residuals for all stations is subtracted from the absolute residual at each station:

$$RR_{ij} = RA_{ij} - \frac{1}{n_j}\sum_k RA_{kj}$$

where RR_{ij} is the relative residual at the ith station for the jth event, n_j is the number of stations reporting for that event, and the summation is over all reporting stations (Steeples and Iyer, 1976). The later the arrival is, the more positive the relative residual will be. Early arrivals will yield negative relative residuals.

To incorporate timing uncertainty information into the relative residuals, weighted relative residuals are calculated using a weighted mean absolute residual. The weighting factor is related to the pick-quality as follows: for an uncertainty of ±0.05 s, the weighting factor, W_i, is 1.0; for ±0.125 s uncertainty, W_i = 0.5; for ±0.25 s uncertainty, W_i = 0.2; and for ±1.0 s uncertainty, W_i = 0.0. The weighted relative residual, RW_{ij}, for the jth event at the ith station is:

$$RW_{ij} = RA_{ij} - \frac{1}{\sum_k W_k}\sum_k W_k RA_{kj}$$

All relative residuals presented in this report are the weighted relative residuals, which are more stable than unweighted relative residuals (e.g. Berge, 1985). Table 3 presents the traveltimes, absolute residuals, relative residuals, and related information for all events. This table represents the primary data set for all subsequent analysis.

To look for effects of station elevations on residuals, we plotted weighted relative residuals (s) versus station elevations (km) for all events (Figure 3). Station "la02", the lowest station, is consistently much earlier than all the other stations. Because this station is located near the approximate juncture of three physiographic provinces, the Great Valley, the Klamath Mountains, and the Cascade Range (U.S. Geological Survey and the California Division of Mines and Geology, 1966), while all other stations are in the Cascade Range province, the crustal thickness and velocity under station "la02" may be different from the rest of the array.

Figure 3 shows the results of a linear regression for the mean relative residuals at all stations (solid line) and at all stations

except "la02" (dashed line). The resulting elevation-correction velocities are 1.96 km/s and 2.77 km/s, respectively. The correlation coefficients for the fits are 0.6840 for all stations, and 0.545 for all stations except "la02". These numbers indicate that for stations within the Cascade Range, the relationship between residuals and station elevations is not a first-order feature. Because subsequent inversions will properly handle the station elevations, no elevation correction is used for any of the residuals.

RESULTS AND DISCUSSION

Plots of teleseismic residuals averaged over events from all azimuths, 0-360°, will show primarily the effects of shallow anomalous bodies, between the surface and a depth equivalent to the station spacing (J.R. Evans, oral commun., 1982; Achauer et al., 1986). Deeper anomalies can be detected by comparing plots of residuals averaged over events from opposite azimuths (Steeples and Iyer, 1976; Evans, 1982). For example, the anomaly pattern evident in a residual plot for southwest events will differ slightly from the anomaly pattern produced by northeast events. The shift in the pattern, from one plot to the other, contains information about the deep structure beneath the array.

Figures 4a-f are contoured map-view plots of the weighted relative residuals averaged over various groups of events. The mean for all events is shown for each station in Figure 4a. This plot is representative of the shallowest resolvable velocity structure, about the top 10-20 km of the crust. To look for deeper affects, Figures 4b-e present mean residuals for all the teleseisms, subdivided into four azimuth groups. The single PKIKP-phase event is plotted separately, in Figure 4f. The primary feature of the residual patterns in Figures 4a-f is the strong regional gradient of the relative residuals. A second feature quite apparent in Figures 4b-e is the shift of the residual pattern with azimuth, particularly within the Lassen Volcanic National Park.

The anomaly defined by the .1 and .2 s contour lines in Figures 4a-f extends in the form of a long lobe from the northeast corner of LVNP near Cinder Cone towards the Lassen Peak-Chaos Crags area. This lobe, which implies low velocities, changes position with azimuth (Figures 4b-e), indicating that the low-velocity region producing the positive traveltime residuals (at stations la06, la07, lcf0, and lrd0 in particular) is not a near-surface feature. This low-velocity feature may be related to the magma source for the Lassen volcanic center; it seems to underly the most recently active vents, Cinder Cone and the Lassen Peak-Chaos Crags area (Williams, 1932; Clynne, 1984; Clynne, 1985).

All of the plots (Figures 4a-f) show a regional gradient pattern similar to the isostatic residual gravity (Roberts et al., 1981) shown in

Figure 5. Figure 6 plots the correlation between residuals and gravity. Stations in the west and southwest part of the array, just outside Lassen Volcanic National Park, have negative traveltime residuals (generally about -.2 to -.8 s) and positive isostatic residual gravity. Stations in the northeast part of the array and stations near Lassen Peak have positive traveltime residuals (about .1 to .4 s) and negative isostatic residual gravity. These patterns suggest that stations la02, la10, la11, and la13 are underlain by relatively fast, dense rocks, while stations la01, la06, la07, la08, la09, lrd0, and lcf0 are underlain by relatively slow, light rocks.

The pattern of anomalies apparent in the isostatic residual gravity is inferred to be produced primarily by crustal features (pers. commun., R.C. Jachens, 1984 and R. Simpson, 1985). Since the gravity and traveltime residual patterns are so similar, it is likely that a major part of the traveltime residuals are also produced by crustal features. In the Lassen region, the crust is about 36-40 km thick (Prodehl, 1979), well within the depth-resolution limits of this experiment.

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TABLE CAPTIONS

Table 1. Station locations for the Lassen teleseismic experiment.

2. Origin times and hypocenters of events use in the 1980 Lassen teleseismic experiment. Latitude and longitude, in degrees and minutes, are positive North and West, respectively. Origin times in hours, minutes, and seconds refer to Coordinated Universal Time (UTC). "*" indicates a less reliable hypocenter solution. Source: U.S. Geological Survey National Earthquake Information Service (NEIS) Preliminary Determinations of Epicenters bulletins for July, August, and September of 1980.

3. The first line for each event shows a six-character abbreviation for the event region, a two-character description of which feature in the seismograms was picked, and the event origin time, location (degrees and minutes, positive North and West), and depth (cf. Table 2). The two-character descriptions of picks are as follows: "pn" indicates that the peak in the nth cycle was timed; "tn" indicates the nth trough; "zn" indicates the nth zero-crossing.

   For each station reporting the event, the next group of columns gives the distance, in degrees between the event and the station ("DELTA"); the azimuth from the station to the event; the picked arrival time (hours, minutes, seconds, UTC); the observed traveltime ("TT-OBS", s); the theoretical traveltime ("TT-THEOR", s; Herrin, 1968a,b); and the absolute residual ("RESIDUAL", s).

   The last group of columns shows the pick quality ("QTY", abcx); residuals relative to the mean, weighted mean ("WT. MEAN"), and median absolute residuals (s); and the ray parameter ("DT/DDEL"; s/degree). The phase picked is P unless otherwise indicated.

TABLE 1: 1980 Lassen Teleseismic Experiment Station Locations

STATION NAME	NORTH LATITUDE	WEST LONGITUDE	ELEVATION
	deg. min.	deg. min.	m
la01	40 33.29	121 11.48	2036
la02	40 28.75	121 52.45	1018
la03	40 23.83	121 22.04	1817
la04	40 24.01	121 26.86	1877
la05	40 28.26	121 18.76	2143
la06	40 29.51	121 25.55	2060
la07	40 31.41	121 28.41	1963
la08	40 34.05	121 24.21	1908
la09	40 36.57	121 18.50	1753
la10	40 22.66	121 32.05	1800
la11	40 25.06	121 38.88	1682
la12	40 27.93	121 31.54	2414
la13	40 30.97	121 40.30	1387
la14	40 38.23	121 36.41	1749
lmz0	40 32.73	121 33.84	1792
lrd0	40 27.78	121 27.85	2292
ls10	40 25.64	121 32.05	2048
lhk0	40 26.12	121 16.67	2060
minb	40 20.70	121 36.30	1495
lcf0	40 29.18	121 31.44	2600

TABLE 2: Events Recorded During the 1980 Lassen Teleseismic Experiment

DATE MO/DAY	ORIGIN TIME HR:MN:S	LAT (+N) DEG	MIN	LONG (+W) DEG	MIN	DEPTH KM	M_b	REGION
7/16	19:56:46.7	-4	27.4	-143	31.3	84.0	6.5	Papua New Guinea
7/17	14:06:30.8	-23	35.9	-179	01.5	564.0	5.0	South of Fiji Islands
7/17	14:19:47.8	-21	07.6	179	09.0	654.0	4.8	Fiji Islands
7/17	19:42:23.2	-12	31.5	-165	55.0	33.0	5.8	Santa Cruz Islands
7/19	11:52:20.6	-28	59.8	69	40.5	110.0	6.1	Chile-Argentina border
7/19	23:46:58.2	-21	53.2	139	01.1	1.0	5.9	Tuamotu Achipelago
7/20	21:20:03.9	-17	51.9	178	37.5	591.0	6.0	Fiji Islands
7/21	00:45:09.9	-6	15.1	-154	26.5	50.0	5.4	Solomon Islands
7/21	16:34:25.6	-12	29.9	-166	27.5	79.0	5.7	Santa Cruz Islands
7/21	21:20:24.7	-12	17.2	-166	30.5	80.0	5.9	Santa Cruz Islands
7/21	22:47:42.5	-12	55.5	-168	43.6	636.0	5.3	Santa Cruz Islands
7/22	07:06:23.0	-20	18.1	-169	36.4	122.0	6.1	Vanuatu Islands
7/23	21:15:15.4	-02	47.5	-101	11.9	54.0	5.5	S. Sumatera (PKIKP)
7/24	15:30:05.6	-22	00.0	-170	08.6	33.0	5.4	Loyalty Islands
7/27	00:28:32.1	-19	39.0	-179	56.0	525.0	5.3	South of Fiji Islands
7/27	09:05:35.0	63	43.1	152	47.4	21.0	4.7	Central Alaska
7/28	17:04:08.3	6	50.5	73	02.6	158.0	4.9	Northern Colombia
7/28	20:13:23.5	-22	07.4	175	43.5	65.0	5.4	Tonga Islands
7/29	03:11:56.3	-13	06.1	-166	20.3	48.0	5.9	Vanuatu Islands
7/30	06:56:16.7	5	16.6	82	39.9	10.0	5.8	South of Panama
7/30	17:15:21.2	-8	58.1	108	20.6	10.0	5.4	N. Easter Is. Cordill.
7/31	01:13:23.9	38	51.4	-141	02.5	16.0	5.0	E. Coast Honshu, Japan
7/31	03:32:57.7	49	47.2	-78	08.3	1.0	5.3	E. Kazakh SSR (blast)
7/31	04:57:34.9	16	24.7	97	06.5	47.0	5.1	Oaxaca, Mexico
8/01	08:16:17.5	12	41.6	87	28.3	78.0	5.2	Coast of Nicaragua
8/01	23:07:14.7	59	37.0	148	56.2	26.0	5.4	Kenai Penin., Alaska
8/02	15:47:26.1	-11	05.2	-165	26.0	33.0	5.7	Santa Cruz Islands
8/04	00:22:50.9	16	15.5	95	42.4	33.0	5.1	Oaxaca, Mexico
8/06	10:45:27.9	45	49.4	-149	07.0	129.0	5.2	Kuril Islands
8/07	19:16:06.5	63	31.1	151	17.6	10.0	5.2	Central Alaska
8/09	05:45: 9.5	15	53.3	88	31.0	22.0	6.1	Honduras
8/12	12:11:44.4	64	42.6	17	15.3	10.0	5.2	Iceland
8/13	04:20:46.7	-21	35.1	179	13.7	655.0	4.8	Fiji Islands
8/13	11:35:02.0	50	11.5	-154	55.2	119.0	4.8	Kuril Islands
8/13	20:46:22.0	8	48.0	39	52.2	10.0	5.1	C. Mid-Atlantic Ridge
8/14	21:07:33.5	34	42.4	-139	36.1	103.0	5.0	S. Coast Honshu, Japan
8/15	21:30:45.7	6	48.7	73	01.3	161.0	5.1	Northern Colombia
8/18	15:07:52.6	-1	56.9	80	01.0	55.0	5.6	Coast of Ecuador
8/18	17:38:11.4*	-29	59.7	178	07.7	33.0	5.3	Kermadec Islands
8/19	21:01:29.0	-3	34.7	-140	02.2	33.0	5.8	West Irian
8/23	01:34:43.5	7	57.1	77	44.3	33.0	5.0	Panama-Colombia border

8/23	04:28:13.6	6	49.4	73	00.8	160.0	4.9	Northern Colombia
8/23	18:28:44.8*	10	57.7	85	36.5	33.0	4.9	Nicaragua
8/24	00:52:46.7	7	55.1	77	50.6	33.0	5.2	Panama-Colombia border
8/24	20:10:04.2	-15	13.3	173	40.4	39.0	6.0	Tonga Islands
8/30	09:42:04.4*	-15	17.2	174	00.4	33.0	4.7	Tonga Islands
8/31	14:12:40.1	-12	29.9	-166	27.7	42.0	5.6	Santa Cruz Islands
9/09	22:20:42.1	33	59.2	-138	56.2	33.0	5.3	S. Coast Honshu, Japan
9/10	07:39:47.2	-18	36.7	-176	06.4	29.0	5.5	Fiji Islands
9/10	12:03:09.6	-18	40.5	-176	16.1	33.0	5.3	Fiji Islands
9/11	10:30:06.7	-25	43.1	-179	27.8	503.0	5.1	South of Fiji Islands
9/14	02:42:39.3	49	58.6	-78	53.3	1.0	6.2	E. Kazakh SSR (blast)
9/15	23:30:27.6	-15	38.7	173	44.2	68.0	5.1	Tonga Islands
9/16	23:33:40.9	-20	36.9	178	46.9	599.0	5.3	Fiji Islands
9/17	05:07:32.7	-15	16.6	173	35.6	33.0	5.6	Tonga Islands
9/18	17:00:21.5	-17	50.7	178	38.0	599.0	5.0	Fiji Islands
9/19	09:49:13.1*	51	34.8	178	13.3	54.0	5.0	Andreanof Is., Aleut.
9/20	11:07:06.5	38	16.4	-130	34.3	22.0	5.2	Sea of Japan
9/20	22:48:51.7	14	55.6	93	07.0	58.0	5.1	Chiapas, Mexico coast
9/26	17:28:15.4	-15	01.7	-167	17.7	116.0	5.9	Vanuatu Islands
9/27	06:25:36.7	18	28.6	68	56.0	159.0	4.9	Mona Passage
9/28	11:06:09.0*	-14	47.2	-167	52.1	23.0	5.3	Vanuatu Islands
9/28	18:25:59.7	-6	18.6	-154	48.5	68.0	6.0	Solomon Islands
9/28	21:36:58.3*	38	44.1	-141	42.2	78.0	4.9	E. Coast Honshu, Japan
9/29	00:31:54.8	-17	24.4	69	52.9	135.0	4.9	Peru-Bolivia border

TABLE 3: Distances, Azimuths, Traveltimes, and Residuals

nwguintl(07/16/80) 19. 56. 46.7 -4. 27.40 -143. 31.30 84.0

STATION	DELTA	AZIMUTH	ARRIVAL TIME (H.M.S)	TT-OBS	TT-THEOR	RESIDUAL
la06	96.713	269.880	20. 10. 11.180	804.480	800.614	3.866
la07	96.676	269.853	20. 10. 10.810	804.110	800.448	3.662
la12	96.636	269.813	20. 10. 10.600	803.900	800.265	3.635
la13	96.525	269.724	20. 10. 10.300	803.600	799.758	3.842

STATION	QTY	MEAN	WT. MEAN	MEDIAN	DT/DDEL
la06	a	0.115	0.138	0.114	4.567
la07	a	-0.089	-0.067	-0.090	4.567
la12	a	-0.117	-0.094	-0.118	4.567
la13	c	0.091	0.114	0.090	4.567

fijiist1(07/17/80) 14. 6. 30.8 -23. 35.90 -179. 1.50 564.0

STATION	DELTA	AZIMUTH	ARRIVAL TIME (H.M.S)	TT-OBS	TT-THEOR	RESIDUAL
la01	84.608	232.773	14. 18. 7.670	696.870	694.165	2.705
la02	84.149	232.306	14. 18. 4.700	693.900	691.934	1.966
la06	84.427	232.615	14. 18. 6.890	696.090	693.289	2.801
la07	84.418	232.580	14. 18. 6.770	695.970	693.243	2.727
la08	84.487	232.625	14. 18. 7.030	696.230	693.578	2.652
la09	84.570	232.688	14. 18. 7.580	696.780	693.981	2.799
la13	84.293	232.443	14. 18. 5.840	695.040	692.638	2.402
la14	84.406	232.479	14. 18. 6.600	695.800	693.187	2.613

STATION	QTY	MEAN	WT. MEAN	MEDIAN	DT/DDEL
la01	a	0.122	0.122	0.027	4.849
la02	a	-0.617	-0.617	-0.713	4.860
la06	a	0.217	0.217	0.122	4.860
la07	a	0.144	0.144	0.049	4.860
la08	a	0.069	0.069	-0.027	4.860
la09	a	0.216	0.216	0.120	4.849
la13	a	-0.181	-0.181	-0.277	4.860
la14	a	0.030	0.030	-0.065	4.860

fijiispl(7/17/80) 14. 19. 47.8 -21. 7.60 179. 9.00 654.0

STATION	DELTA	AZIMUTH	ARRIVAL TIME (H.M.S)		TT-OBS	TT-THEOR	RESIDUAL
la01	81.644	233.118	14. 31.	2.500	674.700	671.959	2.741
la06	81.463	232.958	14. 31.	1.650	673.850	671.054	2.796
la07	81.453	232.920	14. 31.	1.500	673.700	671.004	2.696
la08	81.522	232.965	14. 31.	1.800	674.000	671.351	2.649
la09	81.605	233.028	14. 31.	2.400	674.600	671.767	2.833
la12	81.386	232.889	14. 31.	1.900	674.100	670.668	3.432
la13	81.328	232.779	14. 31.	1.540	673.740	670.375	3.365
la14	81.440	232.810	14. 31.	1.300	673.500	670.942	2.558

STATION	QTY	MEAN	WT. MEAN	MEDIAN	DT/DDEL
la01	a	-0.143	-0.014	-0.027	4.998
la06	a	-0.088	0.041	0.027	5.038
la07	a	-0.188	-0.059	-0.073	5.038
la08	a	-0.235	-0.106	-0.120	4.998
la09	a	-0.050	0.078	0.065	4.998
la12	c	0.548	0.677	0.663	5.038
la13	c	0.481	0.610	0.596	5.038
la14	a	-0.325	-0.197	-0.210	5.038

santact2(07/17/80) 19. 42. 23.2 -12. 31.50 -165. 55.00 33.0

STATION	DELTA	AZIMUTH	ARRIVAL TIME (H.M.S)		TT-OBS	TT-THEOR	RESIDUAL
la01	85.450	249.431	19. 55.	2.740	759.540	753.902	5.638
la02	84.937	248.980	19. 55.	0.640	757.440	751.361	6.079
la04	85.213	249.272	19. 55.	1.000	757.800	752.729	5.071
la06	85.261	249.279	19. 55.	1.800	758.600	752.966	5.634
la08	85.303	249.288	19. 55.	1.960	758.760	753.176	5.584
la10	85.143	249.216	19. 55.	0.400	757.200	752.384	4.816
la14	85.183	249.146	19. 55.	1.240	758.040	752.583	5.457

STATION	QTY	MEAN	WT. MEAN	MEDIAN	DT/DDEL
la01	c	0.201	0.275	0.118	4.940
la02	x	0.641	0.716	0.559	5.000
la04	b	-0.366	-0.292	-0.449	4.940
la06	x	0.197	0.271	0.114	4.940
la08	c	0.146	0.220	0.064	4.940
la10	x	-0.622	-0.547	-0.704	4.940
la14	b	0.019	0.093	-0.064	4.940

chilartl(7/19/80) 11. 52. 20.6 -28. 59.80 69. 40.50 110.0

STATION	DELTA	AZIMUTH	ARRIVAL TIME (H.M.S)	TT-OBS	TT-THEOR	RESIDUAL
la01	84.086	136.416	12. 4. 41.300	740.700	738.079	2.621
la02	84.392	135.931	12. 4. 41.840	741.240	739.609	1.631
la03	84.064	136.281	12. 4. 40.830	740.230	737.972	2.258
la04	84.109	136.225	12. 4. 40.950	740.350	738.195	2.155
la06	84.164	136.247	12. 4. 41.550	740.950	738.468	2.482
la07	84.212	136.216	12. 4. 41.800	741.200	738.708	2.492
la08	84.207	136.268	12. 4. 41.770	741.170	738.682	2.487
la09	84.187	136.338	12. 4. 41.790	741.190	738.584	2.606
la10	84.139	136.163	12. 4. 40.820	740.220	738.343	1.877
la11	84.228	136.086	12. 4. 41.170	740.570	738.788	1.782
la12	84.197	136.175	12. 4. 41.500	740.900	738.637	2.263
la13	84.311	136.076	12. 4. 41.800	741.200	739.205	1.995
la14	84.364	136.130	12. 4. 42.450	741.850	739.469	2.381

STATION	QTY	MEAN	WT. MEAN	MEDIAN	DT/DDEL
la01	a	0.388	0.388	0.358	5.000
la02	a	-0.602	-0.602	-0.632	5.000
la03	a	0.025	0.025	-0.006	5.000
la04	a	-0.078	-0.078	-0.108	5.000
la06	a	0.249	0.249	0.219	5.000
la07	a	0.259	0.259	0.229	5.000
la08	a	0.254	0.254	0.224	5.000
la09	a	0.373	0.373	0.343	5.000
la10	a	-0.356	-0.356	-0.386	5.000
la11	a	-0.451	-0.451	-0.481	5.000
la12	a	0.030	0.030	0.	5.000
la13	a	-0.238	-0.238	-0.268	5.000
la14	a	0.147	0.147	0.117	5.000

tuarchtl(7/19/80) 23. 46. 58.2 -21. 53.20 139. 1.10 1.0

STATION	DELTA	AZIMUTH	ARRIVAL TIME (H.M.S)	TT-OBS	TT-THEOR	RESIDUAL
la01	64.298	198.395	23. 57. 39.100	640.900	636.158	4.742
la02	64.065	197.725	23. 57. 36.800	638.600	634.623	3.977
la03	64.107	198.243	23. 57. 37.600	639.400	634.896	4.504
la04	64.090	198.163	23. 57. 37.200	639.000	634.789	4.211
la06	64.183	198.171	23. 57. 38.280	640.080	635.395	4.685
la07	64.201	198.118	23. 57. 38.550	640.350	635.519	4.831
la08	64.260	198.182	23. 57. 38.720	640.520	635.903	4.617
la10	64.048	198.080	23. 57. 36.720	638.520	634.513	4.007

la11	64.060	197.960	23. 57. 37.000	638.800	634.586	4.214
la13	64.148	197.922	23. 57. 37.650	639.450	635.165	4.285
la14	64.278	197.968	23. 57. 38.820	640.620	636.022	4.598

STATION	QTY	MEAN	WT. MEAN	MEDIAN	DT/DDEL
la01	a	0.358	0.366	0.348	6.580
la02	a	-0.407	-0.399	-0.417	6.580
la03	a	0.120	0.127	0.110	6.580
la04	a	-0.173	-0.165	-0.183	6.580
la06	a	0.301	0.308	0.290	6.580
la07	x	0.447	0.455	0.437	6.580
la08	b	0.233	0.241	0.223	6.580
la10	a	-0.377	-0.370	-0.387	6.580
la11	a	-0.170	-0.163	-0.180	6.580
la13	b	-0.099	-0.092	-0.110	6.580
la14	a	0.214	0.221	0.204	6.580

fijiispl(07/20/80) 21. 20. 3.9 -17. 51.90 178. 37.50 591.0

STATION	DELTA	AZIMUTH	ARRIVAL TIME (H.M.S)	TT-OBS	TT-THEOR	RESIDUAL
la01	78.864	234.889	21. 31. 9.510	665.610	662.831	2.779
la02	78.396	234.399	21. 31. 6.130	662.230	660.346	1.884
la03	78.664	234.786	21. 31. 8.170	664.270	661.768	2.502
la04	78.615	234.726	21. 31. 7.690	663.790	661.512	2.278
la08	78.739	234.731	21. 31. 8.810	664.910	662.169	2.741
la09	78.823	234.794	21. 31. 9.350	665.450	662.611	2.839
la10	78.548	234.666	21. 31. 6.820	662.920	661.157	1.763
la11	78.501	234.576	21. 31. 7.030	663.130	660.904	2.226
la12	78.604	234.658	21. 31. 7.720	663.820	661.454	2.366
la13	78.543	234.542	21. 31. 7.220	663.320	661.129	2.191
la14	78.653	234.570	21. 31. 7.920	664.020	661.713	2.307

STATION	QTY	MEAN	WT. MEAN	MEDIAN	DT/DDEL
la01	b	0.427	0.473	0.473	5.300
la02	a	-0.468	-0.422	-0.423	5.327
la03	b	0.149	0.195	0.195	5.300
la04	a	-0.074	-0.028	-0.029	5.300
la08	b	0.388	0.434	0.434	5.300
la09	b	0.487	0.533	0.532	5.300
la10	b	-0.590	-0.544	-0.544	5.300
la11	b	-0.126	-0.080	-0.081	5.300
la12	a	0.013	0.059	0.059	5.300
la13	a	-0.161	-0.115	-0.115	5.300
la14	b	-0.046	0.000	0.	5.300

solomnt1(07/21/80) 0. 45. 9.9 -6. 15.10 -154. 26.50 50.0

STATION	DELTA	AZIMUTH	ARRIVAL TIME (H.M.S)	TT-OBS	TT-THEOR	RESIDUAL
la02	89.228	261.185	0. 58. 2.900	773.000	769.956	3.044
la03	89.598	261.514	0. 58. 5.230	775.330	771.701	3.629
la04	89.538	261.462	0. 58. 4.780	774.880	771.418	3.462
la08	89.596	261.489	0. 58. 5.460	775.560	771.691	3.869
la09	89.674	261.551	0. 58. 5.900	776.000	772.057	3.943
la10	89.469	261.406	0. 58. 4.750	774.850	771.094	3.755
la11	89.389	261.332	0. 58. 4.180	774.280	770.717	3.563
la12	89.489	261.411	0. 58. 5.540	775.640	771.187	4.453
la13	89.386	261.316	0. 58. 4.980	775.080	770.703	4.377

STATION	QTY	MEAN	WT. MEAN	MEDIAN	DT/DDEL
la02	b	-0.565	-0.595	-0.585	4.720
la03	c	0.020	-0.010	0.	4.700
la04	c	-0.147	-0.177	-0.167	4.700
la08	a	0.260	0.230	0.240	4.700
la09	c	0.334	0.304	0.314	4.700
la10	b	0.146	0.117	0.126	4.720
la11	c	-0.046	-0.076	-0.066	4.720
la12	x	0.844	0.815	0.824	4.720
la13	x	0.768	0.738	0.748	4.720

stcruzt2(07/21/80) 16. 34. 25.6 -12. 29.90 -166. 27.50 79.0

STATION	DELTA	AZIMUTH	ARRIVAL TIME (H.M.S)	TT-OBS	TT-THEOR	RESIDUAL
la01	85.046	249.088	16. 46. 55.300	749.700	746.418	3.282
la03	84.864	248.983	16. 46. 54.840	749.240	745.515	3.725
la04	84.808	248.929	16. 46. 54.340	748.740	745.235	3.505
la06	84.857	248.935	16. 46. 55.300	749.700	745.476	4.224
la07	84.834	248.901	16. 46. 55.560	749.960	745.364	4.596
la08	84.900	248.944	16. 46. 55.360	749.760	745.691	4.069
la09	84.982	249.005	16. 46. 55.780	750.180	746.102	4.078
la12	84.776	248.871	16. 46. 54.500	748.900	745.075	3.825

STATION	QTY	MEAN	WT. MEAN	MEDIAN	DT/DDEL
la01	x	-0.750	-0.712	-0.791	4.937
la03	b	-0.308	-0.269	-0.348	4.980
la04	b	-0.528	-0.489	-0.568	4.980
la06	c	0.191	0.230	0.150	4.980
la07	b	0.563	0.602	0.522	4.980
la08	c	0.037	0.075	-0.004	4.980
la09	c	0.045	0.084	0.004	4.980
la12	x	-0.208	-0.169	-0.249	4.980

santcrt1(07/21/80) 21. 20. 24.7 -12. 17.20 -166. 30.50 80.0

STATION	DELTA	AZIMUTH	ARRIVAL TIME (H.M.S)	TT-OBS	TT-THEOR	RESIDUAL
la01	84.866	249.208	21. 32. 56.020	751.320	745.410	5.910
la03	84.685	249.103	21. 32. 54.790	750.090	744.506	5.584
la04	84.629	249.049	21. 32. 54.350	749.650	744.226	5.424
la06	84.677	249.056	21. 32. 55.070	750.370	744.467	5.903
la07	84.654	249.021	21. 32. 54.870	750.170	744.354	5.816
la08	84.720	249.064	21. 32. 55.160	750.460	744.680	5.780
la09	84.802	249.125	21. 32. 55.710	751.010	745.092	5.918
la11	84.492	248.913	21. 32. 53.700	749.000	743.546	5.454
la12	84.596	248.991	21. 32. 54.410	749.710	744.066	5.644
la13	84.511	248.888	21. 32. 53.920	749.220	743.639	5.581
la14	84.600	248.921	21. 32. 54.560	749.860	744.085	5.775

STATION	QTY	MEAN	WT. MEAN	MEDIAN	DT/DDEL
la01	c	0.202	0.224	0.135	4.980
la03	a	-0.124	-0.102	-0.191	4.980
la04	a	-0.284	-0.262	-0.351	4.980
la06	a	0.195	0.217	0.128	4.980
la07	b	0.108	0.130	0.041	4.980
la08	a	0.072	0.094	0.005	4.980
la09	a	0.210	0.232	0.143	4.980
la11	a	-0.254	-0.232	-0.321	5.016
la12	a	-0.064	-0.042	-0.131	4.980
la13	a	-0.127	-0.105	-0.194	4.980
la14	a	0.067	0.089	0.	4.980

stcruzp1(07/21/80) 22. 47. 42.5 -12. 55.50 -168. 43.60 636.0

STATION	DELTA	AZIMUTH	ARRIVAL TIME (H.M.S)	TT-OBS	TT-THEOR	RESIDUAL
la01	83.734	247.247	22. 59. 9.540	687.040	683.768	3.272
la03	83.549	247.143	22. 59. 8.300	685.800	682.869	2.931
la04	83.494	247.088	22. 59. 7.810	685.310	682.599	2.711
la06	83.545	247.093	22. 59. 8.680	686.180	682.848	3.332
la07	83.523	247.058	22. 59. 8.440	685.940	682.745	3.195
la08	83.590	247.101	22. 59. 8.800	686.300	683.067	3.233
la09	83.673	247.161	22. 59. 9.260	686.760	683.471	3.289
la11	83.360	246.950	22. 59. 7.250	684.750	681.942	2.808
la12	83.464	247.028	22. 59. 7.990	685.490	682.455	3.035
la13	83.382	246.923	22. 59. 7.390	684.890	682.049	2.841
la14	83.474	246.955	22. 59. 8.130	685.630	682.505	3.125

STATION	QTY	MEAN	WT. MEAN	MEDIAN	DT/DDEL
la01	a	0.202	0.191	0.147	4.866
la03	a	-0.139	-0.150	-0.194	4.866
la04	a	-0.359	-0.370	-0.415	4.906
la06	a	0.262	0.251	0.207	4.866
la07	a	0.125	0.114	0.070	4.866
la08	a	0.163	0.152	0.108	4.866
la09	a	0.219	0.208	0.163	4.866
la11	a	-0.262	-0.273	-0.317	4.906
la12	a	-0.035	-0.046	-0.090	4.906
la13	b	-0.230	-0.241	-0.285	4.906
la14	a	0.055	0.044	0.	4.906

vanuisz1(07/22/80) 7. 6. 23.0 -20. 18.10 -169. 36.40 122.0

STATION	DELTA	AZIMUTH	ARRIVAL TIME (H.M.S)	TT-OBS	TT-THEOR	RESIDUAL
la01	88.248	241.388	7. 19. 3.880	760.880	756.987	3.893
la02	87.756	240.940	7. 19. 0.670	757.670	754.643	3.027
la03	88.055	241.277	7. 19. 2.620	759.620	756.067	3.553
la04	88.003	241.224	7. 19. 2.190	759.190	755.818	3.372
la06	88.061	241.235	7. 19. 3.000	760.000	756.097	3.903
la07	88.045	241.203	7. 19. 2.860	759.860	756.018	3.842
la08	88.113	241.248	7. 19. 3.190	760.190	756.341	3.849
la09	88.196	241.309	7. 19. 3.630	760.630	756.740	3.890
la10	87.934	241.167	7. 19. 1.640	758.640	755.491	3.149
la11	87.877	241.091	7. 19. 1.610	758.610	755.220	3.390
la12	87.982	241.170	7. 19. 2.400	759.400	755.719	3.681
la13	87.909	241.072	7. 19. 1.790	758.790	755.371	3.419
la14	88.010	241.111	7. 19. 2.500	759.500	755.855	3.645

STATION	QTY	MEAN	WT. MEAN	MEDIAN	DT/DDEL
la01	a	0.307	0.307	0.248	4.760
la02	a	-0.558	-0.558	-0.617	4.762
la03	a	-0.033	-0.033	-0.092	4.760
la04	a	-0.213	-0.213	-0.273	4.760
la06	a	0.317	0.317	0.258	4.760
la07	a	0.256	0.256	0.197	4.760
la08	a	0.263	0.263	0.204	4.760
la09	a	0.305	0.305	0.246	4.760
la10	a	-0.436	-0.436	-0.495	4.762
la11	a	-0.195	-0.195	-0.255	4.762
la12	a	0.095	0.095	0.036	4.762
la13	a	-0.167	-0.167	-0.226	4.762
la14	a	0.059	0.059	0.	4.760

ssumatt1(07/23/80) 21. 15. 15.4 -2. 47.50 -101. 11.90 54.0 (PKIKP)

STATION	DELTA	AZIMUTH	ARRIVAL TIME (H.M.S)	TT-OBS	TT-THEOR	RESIDUAL
la02	126.004	302.521	21. 34. 14.330	1138.930	1135.820	3.110
la03	126.374	302.951	21. 34. 15.880	1140.480	1136.524	3.956
la04	126.321	302.876	21. 34. 15.600	1140.200	1136.423	3.777
la05	126.369	303.048	21. 34. 15.950	1140.550	1136.515	4.036
la06	126.285	302.953	21. 34. 15.900	1140.500	1136.355	4.145
la07	126.238	302.928	21. 34. 15.780	1140.380	1136.265	4.115
la08	126.258	303.021	21. 34. 15.940	1140.540	1136.304	4.236
la09	126.296	303.138	21. 34. 16.050	1140.650	1136.376	4.274
la10	126.278	302.780	21. 34. 15.060	1139.660	1136.341	3.319
la11	126.183	302.697	21. 34. 15.290	1139.890	1136.161	3.729
la12	126.236	302.842	21. 34. 15.800	1140.400	1136.261	4.139
la13	126.115	302.735	21. 34. 15.120	1139.720	1136.030	3.690
la14	126.091	302.870	21. 34. 15.280	1139.880	1135.985	3.895

STATION	QTY	MEAN	WT. MEAN	MEDIAN	DT/DDEL
la02	a	-0.769	-0.747	-0.846	1.907
la03	a	0.077	0.099	0.	1.902
la04	a	-0.102	-0.080	-0.179	1.902
la05	a	0.157	0.179	0.080	1.902
la06	b	0.266	0.288	0.189	1.903
la07	a	0.237	0.259	0.160	1.904
la08	a	0.357	0.379	0.280	1.903
la09	a	0.395	0.417	0.318	1.903
la10	a	-0.559	-0.537	-0.636	1.903
la11	a	-0.149	-0.127	-0.226	1.904
la12	b	0.261	0.283	0.184	1.904
la13	a	-0.189	-0.167	-0.266	1.905
la14	a	0.017	0.039	-0.060	1.905

loyalit1(07/24/80) 15. 30. 5.6 -22. 0. -170. 8.60 33.0

STATION	DELTA	AZIMUTH	ARRIVAL TIME (H.M.S)	TT-OBS	TT-THEOR	RESIDUAL
la02	88.593	239.388	15. 42. 57.300	771.700	769.103	2.597
la03	88.885	239.721	15. 42. 59.190	773.590	770.487	3.103
la04	88.833	239.669	15. 42. 58.790	773.190	770.243	2.947
la05	88.958	239.756	15. 42. 59.680	774.080	770.834	3.246
la06	88.894	239.681	15. 42. 59.530	773.930	770.531	3.399
la08	88.947	239.695	15. 42. 59.660	774.060	770.781	3.279
la09	89.030	239.756	15. 43. 0.250	774.650	771.177	3.473
la11	88.710	239.537	15. 42. 58.190	772.590	769.660	2.930
la13	88.744	239.520	15. 42. 58.500	772.900	769.823	3.077

STATION	QTY	MEAN	WT. MEAN	MEDIAN	DT/DDEL
la02	a	-0.520	-0.524	-0.506	4.740
la03	a	-0.014	-0.018	0.	4.740
la04	a	-0.170	-0.174	-0.156	4.740
la05	a	0.129	0.125	0.143	4.740
la06	a	0.283	0.279	0.297	4.740
la08	a	0.162	0.158	0.176	4.740
la09	a	0.356	0.352	0.370	4.720
la11	a	-0.186	-0.190	-0.173	4.740
la13	c	-0.039	-0.043	-0.025	4.740

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STATION	DELTA	AZIMUTH	ARRIVAL TIME (H.M.S)	TT-OBS	TT-THEOR	RESIDUAL
la01	81.100	234.750	0. 39. 54.980	682.880	680.176	2.704
la02	80.632	234.269	0. 39. 51.700	679.600	677.767	1.833
la03	80.899	234.644	0. 39. 53.680	681.580	679.146	2.434
la04	80.851	234.586	0. 39. 53.210	681.110	678.896	2.214
la05	80.976	234.673	0. 39. 54.200	682.100	679.541	2.559
la06	80.918	234.590	0. 39. 53.960	681.860	679.240	2.620
la08	80.975	234.596	0. 39. 54.370	682.270	679.538	2.732
la09	81.059	234.659	0. 39. 54.840	682.740	679.965	2.775
la10	80.784	234.527	0. 39. 52.660	680.560	678.551	2.009
la11	80.737	234.440	0. 39. 52.590	680.490	678.306	2.184
la13	80.779	234.410	0. 39. 52.780	680.680	678.526	2.154

STATION	QTY	MEAN	WT. MEAN	MEDIAN	DT/DDEL
la01	a	0.321	0.321	0.270	5.110
la02	a	-0.551	-0.551	-0.602	5.160
la03	a	0.051	0.051	0.	5.160
la04	a	-0.170	-0.170	-0.221	5.160
la05	a	0.175	0.175	0.124	5.160
la06	a	0.236	0.236	0.185	5.160
la08	a	0.349	0.349	0.298	5.160
la09	a	0.391	0.391	0.340	5.110
la10	a	-0.375	-0.375	-0.426	5.160
la11	a	-0.199	-0.199	-0.250	5.160
la13	a	-0.229	-0.229	-0.280	5.160

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STATION	DELTA	AZIMUTH	ARRIVAL TIME (H.M.S)	TT-OBS	TT-THEOR	RESIDUAL
la01	29.676	331.891	9. 11. 43.160	368.160	363.688	4.472
la02	29.499	332.322	9. 11. 40.870	365.870	362.116	3.754
la03	29.752	332.114	9. 11. 43.500	368.500	364.365	4.135
la04	29.721	332.155	9. 11. 43.200	368.200	364.086	4.114
la05	29.706	332.025	9. 11. 43.140	368.140	363.959	4.181
la07	29.602	332.068	9. 11. 42.340	367.340	363.035	4.305
la08	29.589	331.994	9. 11. 42.280	367.280	362.912	4.368
la09	29.586	331.908	9. 11. 42.240	367.240	362.886	4.354
la10	29.710	332.220	9. 11. 42.800	367.800	363.988	3.811
la11	29.634	332.249	9. 11. 42.380	367.380	363.314	4.066
la13	29.538	332.181	9. 11. 41.410	366.410	362.465	3.945
la14	29.455	332.046	9. 11. 40.870	365.870	361.719	4.151

STATION	QTY	MEAN	WT. MEAN	MEDIAN	DT/DDEL
la01	a	0.308	0.246	0.320	8.895
la02	c	-0.410	-0.472	-0.397	8.920
la03	a	-0.028	-0.091	-0.016	8.895
la04	a	-0.050	-0.112	-0.037	8.895
la05	b	0.017	-0.045	0.030	8.895
la07	x	0.141	0.079	0.153	8.895
la08	a	0.204	0.141	0.216	8.895
la09	b	0.190	0.127	0.202	8.895
la10	x	-0.352	-0.415	-0.340	8.895
la11	x	-0.098	-0.160	-0.085	8.895
la13	c	-0.218	-0.281	-0.206	8.895
la14	a	-0.012	-0.075	0.	8.920

ncolumt1(07/28/80) 17. 4. 8.3 6. 50.50 73. 2.60 158.0

STATION	DELTA	AZIMUTH	ARRIVAL TIME (H.M.S)	TT-OBS	TT-THEOR	RESIDUAL
la01	54.448	114.618	17. 13. 22.440	554.140	550.334	3.806
la02	54.891	113.975	17. 13. 24.440	556.140	553.518	2.622
la03	54.505	114.362	17. 13. 22.800	554.500	550.744	3.756
la04	54.562	114.294	17. 13. 22.840	554.540	551.154	3.386
la05	54.497	114.457	17. 13. 22.740	554.440	550.690	3.750
la06	54.584	114.372	17. 13. 23.140	554.840	551.316	3.524
la07	54.631	114.351	17. 13. 23.640	555.340	551.647	3.693
la08	54.600	114.441	17. 13. 23.540	555.240	551.429	3.811
la09	54.552	114.551	17. 13. 23.140	554.840	551.081	3.760

la10	54.613	114.204	17. 13. 22.980	554.680	551.520	3.160
la11	54.709	114.131	17. 13. 23.480	555.180	552.207	2.973
la13	54.765	114.174	17. 13. 23.940	555.640	552.614	3.026
la14	54.770	114.309	17. 13. 24.360	556.060	552.647	3.413

STATION	QTY	MEAN	WT. MEAN	MEDIAN	DT/DDEL
la01	b	0.258	0.268	0.113	7.217
la02	x	-0.926	-0.916	-1.070	7.177
la03	b	0.208	0.217	0.063	7.177
la04	a	-0.162	-0.153	-0.307	7.177
la05	a	0.202	0.211	0.057	7.217
la06	b	-0.024	-0.015	-0.169	7.177
la07	c	0.145	0.154	0.	7.177
la08	a	0.263	0.272	0.118	7.177
la09	a	0.211	0.221	0.067	7.177
la10	b	-0.389	-0.379	-0.533	7.177
la11	a	-0.575	-0.566	-0.720	7.177
la13	x	-0.522	-0.513	-0.667	7.177
la14	b	-0.135	-0.126	-0.280	7.177

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STATION	DELTA	AZIMUTH	ARRIVAL TIME (H.M.S)	TT-OBS	TT-THEOR	RESIDUAL
la01	80.361	229.998	20. 25. 30.820	727.320	723.833	3.487
la02	79.914	229.508	20. 25. 27.620	724.120	721.437	2.683
la03	80.156	229.890	20. 25. 29.420	725.920	722.739	3.181
la04	80.112	229.831	20. 25. 29.060	725.560	722.498	3.062
la05	80.236	229.921	20. 25. 29.950	726.450	723.165	3.285
la07	80.176	229.796	20. 25. 30.050	726.550	722.843	3.707
la08	80.245	229.841	20. 25. 30.200	726.700	723.214	3.486
la09	80.328	229.906	20. 25. 30.710	727.210	723.656	3.554
la10	80.047	229.771	20. 25. 28.590	725.090	722.150	2.940
la11	80.006	229.682	20. 25. 28.380	724.880	721.932	2.948
la13	80.056	229.652	20. 25. 29.000	725.500	722.200	3.300
la14	80.172	229.683	20. 25. 29.660	726.160	722.821	3.339

STATION	QTY	MEAN	WT. MEAN	MEDIAN	DT/DDEL
la01	a	0.244	0.281	0.202	5.360
la02	a	-0.560	-0.524	-0.603	5.408
la03	a	-0.062	-0.025	-0.104	5.360
la04	a	-0.181	-0.144	-0.223	5.360
la05	a	0.042	0.079	0.	5.360
la07	c	0.464	0.500	0.421	5.360
la08	a	0.243	0.280	0.201	5.360
la09	a	0.311	0.348	0.269	5.360
la10	a	-0.303	-0.266	-0.345	5.360
la11	a	-0.295	-0.259	-0.338	5.360
la13	x	0.057	0.093	0.015	5.360
la14	a	0.096	0.132	0.053	5.360

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STATION	DELTA	AZIMUTH	ARRIVAL TIME (H.M.S)	TT-OBS	TT-THEOR	RESIDUAL
la01	85.542	248.730	3. 24. 32.150	755.850	752.438	3.412
la02	85.030	248.278	3. 24. 28.780	752.480	749.909	2.571
la03	85.360	248.624	3. 24. 30.910	754.610	751.538	3.072
la04	85.304	248.570	3. 24. 30.460	754.160	751.261	2.899
la05	85.425	248.655	3. 24. 31.360	755.060	751.863	3.197
la07	85.330	248.543	3. 24. 31.160	754.860	751.393	3.467
la08	85.396	248.587	3. 24. 31.320	755.020	751.718	3.302
la09	85.479	248.647	3. 24. 31.820	755.520	752.127	3.393
la10	85.234	248.514	3. 24. 29.900	753.600	750.917	2.683
la11	85.168	248.434	3. 24. 29.840	753.540	750.590	2.950
la12	85.272	248.512	3. 24. 30.560	754.260	751.106	3.154
la13	85.187	248.411	3. 24. 30.190	753.890	750.686	3.204
la14	85.277	248.445	3. 24. 30.750	754.450	751.132	3.318

STATION	QTY	MEAN	WT. MEAN	MEDIAN	DT/DDEL
la01	a	0.316	0.237	0.236	4.920
la02	c	-0.526	-0.604	-0.605	4.940
la03	a	-0.024	-0.103	-0.104	4.940
la04	b	-0.198	-0.276	-0.277	4.940
la05	a	0.101	0.022	0.021	4.940
la07	x	0.370	0.292	0.291	4.940
la08	b	0.206	0.127	0.126	4.940
la09	a	0.297	0.218	0.217	4.940
la10	c	-0.413	-0.492	-0.493	4.940
la11	a	-0.146	-0.225	-0.226	4.940
la12	c	0.058	-0.021	-0.021	4.940
la13	c	0.108	0.029	0.029	4.940
la14	a	0.222	0.143	0.142	4.940

spanampl(07/30/80) 6. 56. 16.7 5. 16.60 82. 39.90 10.0

STATION	DELTA	AZIMUTH	ARRIVAL TIME (H.M.S)	TT-OBS	TT-THEOR	RESIDUAL
la01	49.250	125.039	7. 5. 9.150	532.450	527.975	4.475
la02	49.635	124.290	7. 5. 10.530	533.830	530.909	2.921
la03	49.270	124.747	7. 5. 9.050	532.350	528.127	4.223
la04	49.322	124.668	7. 5. 9.140	532.440	528.525	3.915
la05	49.278	124.855	7. 5. 9.120	532.420	528.187	4.233
la07	49.409	124.728	7. 5. 10.050	533.350	529.183	4.167
la08	49.390	124.831	7. 5. 10.000	533.300	529.040	4.260

la09	49.354	124.957	7.	5.	9.800	533.100	528.770	4.330
la10	49.364	124.564	7.	5.	9.200	532.500	528.842	3.658
la11	49.458	124.476	7.	5.	9.750	533.050	529.561	3.489
la12	49.408	124.634	7.	5.	9.960	533.260	529.181	4.079
la13	49.529	124.521	7.	5.	10.320	533.620	530.099	3.521
la14	49.557	124.672	7.	5.	10.880	534.180	530.312	3.868

STATION	QTY	MEAN	WT. MEAN	MEDIAN	DT/DDEL
la01	a	0.542	0.542	0.397	7.627
la02	a	-1.012	-1.012	-1.157	7.600
la03	a	0.289	0.289	0.144	7.627
la04	a	-0.019	-0.019	-0.164	7.627
la05	a	0.299	0.299	0.154	7.627
la07	a	0.233	0.233	0.088	7.627
la08	a	0.326	0.326	0.181	7.627
la09	a	0.396	0.396	0.251	7.627
la10	a	-0.276	-0.276	-0.421	7.627
la11	a	-0.445	-0.445	-0.590	7.627
la12	a	0.145	0.145	0.	7.627
la13	a	-0.413	-0.413	-0.558	7.600
la14	a	-0.065	-0.065	-0.210	7.600

easterz1(07/30/80) 17. 15. 21.2 -8. 58.10 108. 20.60 10.0

STATION	DELTA	AZIMUTH	ARRIVAL TIME (H.M.S)	TT-OBS	TT-THEOR	RESIDUAL
la01	50.683	163.504	17. 24. 25.810	544.610	538.837	5.773
la03	50.571	163.247	17. 24. 24.810	543.610	537.991	5.619
la04	50.591	163.148	17. 24. 24.610	543.410	538.146	5.264
la05	50.629	163.333	17. 24. 25.190	543.990	538.432	5.558
la06	50.674	163.197	17. 24. 24.800	543.600	538.769	4.831
la07	50.715	163.145	17. 24. 25.800	544.600	539.075	5.525
la08	50.741	163.242	17. 24. 25.960	544.760	539.276	5.484
la09	50.761	163.371	17. 24. 26.130	544.930	539.422	5.508
la10	50.589	163.035	17. 24. 24.390	543.190	538.129	5.061
la11	50.653	162.903	17. 24. 24.740	543.540	538.607	4.933
la13	50.752	162.897	17. 24. 25.600	544.400	539.354	5.046
la14	50.853	163.006	17. 24. 26.590	545.390	540.115	5.275

STATION	QTY	MEAN	WT. MEAN	MEDIAN	DT/DDEL
la01	a	0.405	0.398	0.289	7.520
la03	a	0.251	0.244	0.135	7.520
la04	a	-0.104	-0.111	-0.220	7.520
la05	a	0.190	0.183	0.074	7.520
la06	x	-0.537	-0.544	-0.653	7.520
la07	b	0.157	0.149	0.040	7.520
la08	a	0.116	0.109	0.	7.520
la09	a	0.141	0.133	0.024	7.520
la10	b	-0.306	-0.314	-0.423	7.520
la11	a	-0.435	-0.443	-0.552	7.520
la13	a	-0.322	-0.330	-0.439	7.520
la14	a	-0.093	-0.100	-0.209	7.520

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STATION	DELTA	AZIMUTH	ARRIVAL TIME (H.M.S)	TT-OBS	TT-THEOR	RESIDUAL
la01	71.080	305.135	1. 24. 44.500	680.600	676.868	3.732
la02	70.697	304.818	1. 24. 40.950	677.050	674.526	2.524
la03	71.061	305.092	1. 24. 43.900	680.000	676.751	3.249
la04	71.009	305.051	1. 24. 43.480	679.580	676.435	3.145
la05	71.052	305.098	1. 24. 44.030	680.130	676.700	3.430
la07	70.922	305.003	1. 24. 43.300	679.400	675.904	3.496
la08	70.940	305.026	1. 24. 43.600	679.700	676.017	3.683
la09	70.975	305.061	1. 24. 43.800	679.900	676.232	3.668
la10	70.967	305.015	1. 24. 42.950	679.050	676.183	2.867
la11	70.873	304.947	1. 24. 42.680	678.780	675.607	3.173
la12	70.922	304.994	1. 24. 43.220	679.320	675.908	3.412
la14	70.773	304.905	1. 24. 42.260	678.360	674.996	3.364

STATION	QTY	MEAN	WT. MEAN	MEDIAN	DT/DDEL
la01	a	0.420	0.425	0.344	6.079
la02	a	-0.788	-0.783	-0.864	6.119
la03	a	-0.063	-0.058	-0.139	6.079
la04	a	-0.167	-0.162	-0.243	6.079
la05	a	0.118	0.122	0.042	6.079
la07	a	0.184	0.189	0.108	6.119
la08	a	0.371	0.376	0.295	6.119
la09	a	0.356	0.360	0.280	6.119
la10	a	-0.445	-0.441	-0.521	6.119
la11	a	-0.139	-0.135	-0.215	6.119
la12	b	0.100	0.105	0.024	6.119
la14	a	0.052	0.056	-0.024	6.119

ussrblt1(07/31/80) 3. 32. 57.7 49. 47.20 -78. 8.30 1.0

STATION	DELTA	AZIMUTH	ARRIVAL TIME (H.M.S)	TT-OBS	TT-THEOR	RESIDUAL
la01	88.445	347.606	3. 45. 54.790	777.090	773.206	3.884
la02	88.405	347.179	3. 45. 53.490	775.790	773.016	2.774
la03	88.570	347.497	3. 45. 54.970	777.270	773.800	3.470
la04	88.553	347.447	3. 45. 54.880	777.180	773.723	3.457
la05	88.507	347.531	3. 45. 54.860	777.160	773.501	3.659
la07	88.429	347.430	3. 45. 54.550	776.850	773.130	3.720
la08	88.397	347.473	3. 45. 54.500	776.800	772.981	3.819
la09	88.372	347.533	3. 45. 54.400	776.700	772.861	3.839
la10	88.561	347.392	3. 45. 54.590	776.890	773.759	3.131
la11	88.503	347.321	3. 45. 54.590	776.890	773.483	3.407
la14	88.296	347.345	3. 45. 53.650	775.950	772.497	3.453

STATION	QTY	MEAN	WT. MEAN	MEDIAN	DT/DDEL
la01	a	0.374	0.347	0.414	4.761
la02	b	-0.736	-0.763	-0.696	4.761
la03	a	-0.041	-0.067	0.	4.759
la04	a	-0.053	-0.080	-0.013	4.759
la05	a	0.149	0.123	0.190	4.759
la07	b	0.209	0.183	0.250	4.761
la08	a	0.309	0.282	0.349	4.761
la09	a	0.329	0.303	0.370	4.761
la10	a	-0.379	-0.406	-0.339	4.759
la11	a	-0.103	-0.129	-0.063	4.759
la14	a	-0.057	-0.084	-0.017	4.761

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STATION	DELTA	AZIMUTH	ARRIVAL TIME (H.M.S)	TT-OBS	TT-THEOR	RESIDUAL
la01	31.844	132.073	5. 3. 59.750	384.850	379.826	5.024
la02	32.184	130.988	5. 4. 1.030	386.130	382.808	3.322
la03	31.839	131.626	5. 3. 59.500	384.600	379.782	4.818
la04	31.887	131.512	5. 3. 59.550	384.650	380.202	4.448
la05	31.857	131.794	5. 3. 59.640	384.740	379.939	4.801
la07	31.983	131.622	5. 4. 0.620	385.720	381.049	4.671
la08	31.973	131.777	5. 4. 0.600	385.700	380.956	4.744
la09	31.947	131.966	5. 4. 0.460	385.560	380.729	4.831
la10	31.922	131.359	5. 3. 59.500	384.600	380.507	4.093
la11	32.013	131.241	5. 4. 0.070	385.170	381.312	3.858
la12	31.975	131.477	5. 4. 0.400	385.500	380.973	4.527
la14	32.135	131.564	5. 4. 1.560	386.660	382.378	4.282

STATION	QTY	MEAN	WT. MEAN	MEDIAN	DT/DDEL
la01	a	0.572	0.575	0.425	8.780
la02	a	-1.129	-1.126	-1.276	8.780
la03	a	0.367	0.370	0.220	8.780
la04	a	-0.004	-0.001	-0.151	8.780
la05	a	0.349	0.353	0.202	8.780
la07	a	0.219	0.222	0.072	8.780
la08	a	0.292	0.295	0.145	8.780
la09	a	0.380	0.383	0.233	8.780
la10	a	-0.358	-0.355	-0.505	8.780
la11	a	-0.593	-0.590	-0.740	8.780
la12	b	0.075	0.078	-0.072	8.780
la14	a	-0.170	-0.166	-0.317	8.780

nicargp2(08/01/80) 8. 16. 17.5 12. 41.60 87. 28.30 78.0

STATION	DELTA	AZIMUTH	ARRIVAL TIME (H.M.S)	TT-OBS	TT-THEOR	RESIDUAL
la01	40.548	123.556	8. 23. 52.800	455.300	451.047	4.253
la02	40.942	122.711	8. 23. 54.400	456.900	454.291	2.609
la03	40.573	123.203	8. 23. 52.850	455.350	451.256	4.094
la04	40.626	123.115	8. 23. 53.020	455.520	451.692	3.828
la05	40.579	123.337	8. 23. 52.920	455.420	451.302	4.118
la07	40.710	123.205	8. 23. 53.840	456.340	452.381	3.959
la08	40.689	123.327	8. 23. 53.830	456.330	452.213	4.117
la09	40.652	123.476	8. 23. 53.060	455.560	451.906	3.654
la10	40.669	122.995	8. 23. 53.040	455.540	452.046	3.494
la11	40.764	122.905	8. 23. 53.560	456.060	452.825	3.235
la12	40.712	123.090	8. 23. 53.800	456.300	452.395	3.905
la14	40.857	123.165	8. 23. 54.790	457.290	453.591	3.699

STATION	QTY	MEAN	WT. MEAN	MEDIAN	DT/DDEL
la01	a	0.506	0.506	0.386	8.220
la02	a	-1.138	-1.138	-1.257	8.220
la03	a	0.347	0.347	0.227	8.220
la04	a	0.081	0.081	-0.039	8.220
la05	a	0.371	0.371	0.251	8.220
la07	a	0.211	0.211	0.092	8.220
la08	a	0.370	0.370	0.250	8.220
la09	a	-0.093	-0.093	-0.212	8.220
la10	a	-0.253	-0.253	-0.373	8.220
la11	a	-0.512	-0.512	-0.631	8.220
la12	a	0.158	0.158	0.039	8.220
la14	a	-0.048	-0.048	-0.168	8.220

kenaiptl(8/01/80) 23. 7. 14.7 59. 37.00 148. 56.20 26.0

STATION	DELTA	AZIMUTH	ARRIVAL TIME (H.M.S)	TT-OBS	TT-THEOR	RESIDUAL
la01	25.775	327.029	23. 12. 47.630	332.930	328.039	4.891
la02	25.557	327.583	23. 12. 44.750	330.050	326.043	4.007
la03	25.834	327.325	23. 12. 47.880	333.180	328.585	4.595
la04	25.799	327.376	23. 12. 47.450	332.750	328.259	4.491
la05	25.795	327.205	23. 12. 47.600	332.900	328.223	4.677
la06	25.731	327.259	23. 12. 47.000	332.300	327.634	4.666
la07	25.684	327.256	23. 12. 46.700	332.000	327.210	4.790
la08	25.676	327.158	23. 12. 46.550	331.850	327.136	4.714
la09	25.680	327.046	23. 12. 46.750	332.050	327.174	4.876
la10	25.782	327.461	23. 12. 47.100	332.400	328.106	4.294
la11	25.702	327.495	23. 12. 46.540	331.840	327.368	4.471
la12	25.712	327.357	23. 12. 46.800	332.100	327.460	4.640
la14	25.534	327.219	23. 12. 45.180	330.480	325.830	4.650

STATION	QTY	MEAN	WT. MEAN	MEDIAN	DT/DDEL
la01	a	0.294	0.255	0.241	9.171
la02	c	-0.590	-0.629	-0.643	9.171
la03	a	-0.002	-0.041	-0.055	9.171
la04	a	-0.106	-0.144	-0.158	9.171
la05	a	0.080	0.041	0.027	9.171
la06	a	0.069	0.030	0.016	9.171
la07	a	0.193	0.154	0.140	9.171
la08	a	0.117	0.078	0.064	9.171
la09	a	0.279	0.240	0.226	9.171
la10	a	-0.303	-0.342	-0.356	9.171
la11	a	-0.125	-0.164	-0.178	9.171
la12	a	0.043	0.004	-0.010	9.171
la14	a	0.053	0.014	0.	9.171

stcruzz1(8/02/80) 15. 47. 26.1 -11. 5.20 -165. 26.00 33.0

STATION	DELTA	AZIMUTH	ARRIVAL TIME (H.M.S)	TT-OBS	TT-THEOR	RESIDUAL
la01	84.822	250.805	16. 0. 0.200	754.100	750.789	3.311
la02	84.306	250.353	15. 59. 56.710	750.610	748.204	2.406
la03	84.643	250.701	15. 59. 59.040	752.940	749.896	3.044
la04	84.587	250.647	15. 59. 58.550	752.450	749.611	2.839
la05	84.707	250.731	15. 59. 59.500	753.400	750.215	3.185
la06	84.633	250.653	15. 59. 59.300	753.200	749.842	3.358
la07	84.609	250.618	15. 59. 59.110	753.010	749.723	3.287
la08	84.674	250.661	15. 59. 59.450	753.350	750.047	3.303

la09	84.756	250.722	15. 59. 59.960	753.860	750.458	3.401
la10	84.517	250.591	15. 59. 57.910	751.810	749.262	2.548
la11	84.448	250.511	15. 59. 57.900	751.800	748.918	2.882
la12	84.552	250.588	15. 59. 58.610	752.510	749.439	3.071
la14	84.551	250.519	15. 59. 58.720	752.620	749.433	3.187

STATION	QTY	MEAN	WT. MEAN	MEDIAN	DT/DDEL
la01	a	0.247	0.247	0.125	5.000
la02	a	-0.657	-0.657	-0.779	5.026
la03	a	-0.019	-0.019	-0.141	5.000
la04	a	-0.225	-0.225	-0.347	5.000
la05	a	0.122	0.122	0.	5.000
la06	a	0.295	0.295	0.173	5.000
la07	a	0.224	0.224	0.102	5.000
la08	a	0.239	0.239	0.117	5.000
la09	a	0.338	0.338	0.216	5.000
la10	a	-0.516	-0.516	-0.638	5.000
la11	a	-0.181	-0.181	-0.303	5.026
la12	a	0.008	0.008	-0.114	5.000
la14	a	0.124	0.124	0.002	5.000

oaxacaz1(8/04/80) 0. 22. 50.9 16. 15.50 95. 42.40 33.0

STATION	DELTA	AZIMUTH	ARRIVAL TIME (H.M.S)	TT-OBS	TT-THEOR	RESIDUAL
la01	32.771	130.224	0. 29. 24.600	393.700	389.493	4.207
la02	33.123	129.179	0. 29. 25.950	395.050	392.570	2.480
la03	32.772	129.789	0. 29. 24.370	393.470	389.507	3.963
la04	32.821	129.679	0. 29. 24.540	393.640	389.936	3.704
la05	32.787	129.953	0. 29. 24.550	393.650	389.640	4.010
la06	32.867	129.819	0. 29. 25.090	394.190	390.336	3.854
la07	32.915	129.790	0. 29. 25.550	394.650	390.758	3.892
la08	32.902	129.940	0. 29. 25.500	394.600	390.646	3.954
la09	32.874	130.124	0. 29. 25.380	394.480	390.397	4.083
la10	32.858	129.531	0. 29. 24.520	393.620	390.256	3.364
la11	32.950	129.420	0. 29. 25.070	394.170	391.065	3.105
la12	32.909	129.648	0. 29. 25.350	394.450	390.701	3.749
la13	33.027	129.504	0. 29. 25.800	394.900	391.733	3.167
la14	33.066	129.738	0. 29. 26.470	395.570	392.074	3.496

STATION	QTY	MEAN	WT. MEAN	MEDIAN	DT/DDEL
la01	a	0.562	0.566	0.406	8.746
la02	a	-1.165	-1.161	-1.322	8.720
la03	a	0.318	0.322	0.162	8.746
la04	a	0.059	0.063	-0.097	8.746
la05	a	0.365	0.369	0.208	8.746
la06	a	0.209	0.213	0.053	8.746
la07	a	0.248	0.252	0.091	8.746
la08	a	0.309	0.313	0.153	8.746
la09	a	0.439	0.442	0.282	8.746
la10	a	-0.281	-0.277	-0.437	8.746
la11	a	-0.540	-0.536	-0.696	8.746
la12	b	0.104	0.108	-0.053	8.746
la13	a	-0.478	-0.474	-0.634	8.720
la14	a	-0.149	-0.145	-0.305	8.720

kuriliz1(08/06/80) 10. 45. 27.9 45. 49.40 -149. 7.00 129.0

STATION	DELTA	AZIMUTH	ARRIVAL TIME (H.M.S)	TT-OBS	TT-THEOR	RESIDUAL
la01	62.236	307.791	10. 55. 39.000	611.100	607.336	3.764
la02	61.871	307.549	10. 55. 35.310	607.410	604.890	2.520
la03	62.227	307.786	10. 55. 38.500	610.600	607.272	3.328
la05	62.215	307.777	10. 55. 38.580	610.680	607.190	3.490
la06	62.134	307.723	10. 55. 38.040	610.140	606.650	3.490
la07	62.086	307.691	10. 55. 37.780	609.880	606.329	3.551
la08	62.101	307.700	10. 55. 37.960	610.060	606.431	3.629
la10	62.138	307.727	10. 55. 37.760	609.860	606.679	3.181
la13	61.970	307.615	10. 55. 36.680	608.780	605.559	3.221
la14	61.936	307.589	10. 55. 36.610	608.710	605.327	3.383
lhk0	62.257	307.806	10. 55. 38.860	610.960	607.477	3.484

STATION	QTY	MEAN	WT. MEAN	MEDIAN	DT/DDEL
la01	a	0.397	0.397	0.280	6.677
la02	a	-0.848	-0.848	-0.964	6.700
la03	a	-0.039	-0.039	-0.156	6.677
la05	a	0.122	0.122	0.006	6.677
la06	a	0.123	0.123	0.007	6.677
la07	a	0.184	0.184	0.068	6.677
la08	a	0.262	0.262	0.146	6.677
la10	a	-0.186	-0.186	-0.302	6.677
la13	a	-0.146	-0.146	-0.263	6.700
la14	a	0.016	0.016	-0.101	6.700
lhk0	a	0.116	0.116	0.	6.677

cAlaskt1(08/07/80) 19. 16. 6.5 63. 31.10 151. 17.60 10.0

STATION	DELTA	AZIMUTH	ARRIVAL TIME (H.M.S)	TT-OBS	TT-THEOR	RESIDUAL
la01	29.022	332.388	19. 22. 10.190	363.690	359.333	4.357
la02	28.849	332.845	19. 22. 7.880	361.380	357.799	3.581
la03	29.099	332.619	19. 22. 10.610	364.110	360.026	4.084
la04	29.069	332.663	19. 22. 10.250	363.750	359.751	3.999
la05	29.053	332.527	19. 22. 10.230	363.730	359.614	4.116
la06	28.995	332.575	19. 22. 9.900	363.400	359.094	4.306
la07	28.950	332.576	19. 22. 9.620	363.120	358.695	4.425
la08	28.936	332.499	19. 22. 9.310	362.810	358.567	4.243
la09	28.932	332.409	19. 22. 9.300	362.800	358.534	4.266
la10	29.058	332.731	19. 22. 9.900	363.400	359.659	3.741
la11	28.983	332.764	19. 22. 9.500	363.000	358.987	4.013
la12	28.983	332.654	19. 22. 9.600	363.100	358.990	4.110
la13	28.887	332.696	19. 22. 8.640	362.140	358.135	4.005
la14	28.802	332.558	19. 22. 7.950	361.450	357.382	4.068

STATION	QTY	MEAN	WT. MEAN	MEDIAN	DT/DDEL
la01	a	0.263	0.277	0.260	8.920
la02	a	-0.513	-0.499	-0.516	8.900
la03	a	-0.010	0.004	-0.013	8.920
la04	a	-0.095	-0.081	-0.098	8.920
la05	a	0.023	0.037	0.020	8.920
la06	a	0.212	0.226	0.209	8.900
la07	b	0.331	0.345	0.328	8.900
la08	a	0.149	0.163	0.146	8.900
la09	a	0.172	0.186	0.169	8.900
la10	a	-0.353	-0.339	-0.356	8.920
la11	a	-0.081	-0.067	-0.084	8.900
la12	c	0.016	0.030	0.013	8.900
la13	a	-0.089	-0.075	-0.092	8.900
la14	a	-0.026	-0.012	-0.029	8.900

hondurtl(08/09/80) 5. 45. 9.5 15. 53.30 88. 31.00 22.0

STATION	DELTA	AZIMUTH	ARRIVAL TIME (H.M.S)	TT-OBS	TT-THEOR	RESIDUAL
la01	37.498	121.415	5. 52. 24.870	435.370	431.607	3.763
la02	37.906	120.543	5. 52. 26.700	437.200	435.052	2.148
la03	37.531	121.035	5. 52. 25.080	435.580	431.888	3.692
la04	37.586	120.946	5. 52. 25.200	435.700	432.345	3.355
la05	37.534	121.181	5. 52. 25.020	435.520	431.908	3.612
la06	37.618	121.073	5. 52. 25.560	436.060	432.624	3.436
la08	37.643	121.183	5. 52. 26.000	436.500	432.831	3.669
la10	37.631	120.821	5. 52. 25.160	435.660	432.727	2.933
la12	37.670	120.928	5. 52. 28.020	438.520	433.061	5.459
ls10	37.656	120.876	5. 52. 27.020	437.520	432.942	4.578
lhk0	37.493	121.181	5. 52. 24.910	435.410	431.560	3.850

STATION	QTY	MEAN	WT. MEAN	MEDIAN	DT/DDEL
la01	a	0.242	0.197	0.151	8.480
la02	x	-1.372	-1.417	-1.464	8.454
la03	a	0.172	0.127	0.080	8.454
la04	a	-0.166	-0.211	-0.258	8.454
la05	a	0.092	0.047	0.	8.454
la06	a	-0.084	-0.129	-0.176	8.454
la08	x	0.149	0.104	0.057	8.454
la10	b	-0.588	-0.633	-0.679	8.454
la12	x	1.939	1.894	1.847	8.454
ls10	x	1.057	1.012	0.966	8.454
lhk0	a	0.330	0.285	0.238	8.480

icelndt3(08/12/80) 12. 11. 44.4 64. 42.60 17. 15.30 10.0

STATION	DELTA	AZIMUTH	ARRIVAL TIME (H.M.S)	TT-OBS	TT-THEOR	RESIDUAL
la01	59.601	28.906	12. 21. 55.830	611.430	603.128	8.302
la02	59.918	28.708	12. 21. 57.000	612.600	605.305	7.295
la03	59.804	28.816	12. 21. 57.000	612.600	604.520	8.080
la04	59.831	28.796	12. 21. 56.900	612.500	604.705	7.795
la06	59.743	28.828	12. 21. 56.760	612.360	604.099	8.261
la07	59.732	28.824	12. 21. 56.700	612.300	604.029	8.271
la08	59.668	28.855	12. 21. 56.420	612.020	603.588	8.432
la09	59.596	28.891	12. 21. 55.380	610.980	603.095	7.885
la10	59.882	28.768	12. 21. 57.000	612.600	605.059	7.541
la11	59.889	28.750	12. 21. 57.140	612.740	605.105	7.635
la13	59.812	28.771	12. 21. 56.600	612.200	604.573	7.627

STATION	QTY	MEAN	WT. MEAN	MEDIAN	DT/DDEL
la01	c	0.275	0.275	0.132	6.867
la02	c	-0.733	-0.733	-0.876	6.867
la03	c	0.052	0.052	-0.091	6.867
la04	c	-0.232	-0.232	-0.375	6.867
la06	c	0.234	0.234	0.091	6.867
la07	x	0.244	0.244	0.101	6.867
la08	c	0.405	0.405	0.262	6.867
la09	x	-0.143	-0.143	-0.286	6.867
la10	x	-0.486	-0.486	-0.629	6.867
la11	x	-0.393	-0.393	-0.536	6.867
la13	x	-0.400	-0.400	-0.543	6.867

fijiist1(08/13/80) 4. 20. 46.7 -21. 35.10 179. 13.70 655.0

STATION	DELTA	AZIMUTH	ARRIVAL TIME (H.M.S)	TT-OBS	TT-THEOR	RESIDUAL
la01	82.037	232.873	4. 32. 3.620	676.920	673.844	3.076
la02	81.577	232.394	4. 32. 0.500	673.800	671.547	2.253
la03	81.835	232.765	4. 32. 2.350	675.650	672.834	2.816
la04	81.788	232.708	4. 32. 1.900	675.200	672.599	2.601
la05	81.912	232.796	4. 32. 2.790	676.090	673.223	2.867
la06	81.856	232.713	4. 32. 2.700	676.000	672.943	3.057
la07	81.847	232.675	4. 32. 2.750	676.050	672.894	3.156
la08	81.916	232.720	4. 32. 3.000	676.300	673.239	3.061
la09	81.999	232.784	4. 32. 3.500	676.800	673.654	3.146
la10	81.721	232.649	4. 32. 1.380	674.680	672.268	2.412
la11	81.677	232.563	4. 32. 1.410	674.710	672.044	2.666
la12	81.780	232.645	4. 32. 2.100	675.400	672.560	2.840
la13	81.722	232.535	4. 32. 1.900	675.200	672.272	2.928
la14	81.835	232.567	4. 32. 2.490	675.790	672.835	2.955
lhk0	81.912	232.825	4. 32. 1.940	675.240	673.221	2.019

STATION	QTY	MEAN	WT. MEAN	MEDIAN	DT/DDEL
la01	a	0.231	0.238	0.179	4.976
la02	a	-0.593	-0.586	-0.645	4.998
la03	b	-0.029	-0.022	-0.082	4.998
la04	a	-0.244	-0.237	-0.297	4.998
la05	a	0.022	0.029	-0.031	4.998
la06	a	0.212	0.219	0.160	4.998
la07	a	0.311	0.318	0.258	4.998
la08	a	0.216	0.222	0.163	4.998
la09	c	0.300	0.307	0.248	4.998
la10	a	-0.434	-0.427	-0.486	4.998
la11	c	-0.180	-0.173	-0.232	4.998
la12	a	-0.005	0.002	-0.058	4.998
la13	a	0.083	0.090	0.031	4.998
la14	a	0.110	0.117	0.057	4.998
lhk0	x	-0.827	-0.820	-0.879	4.998

kurilip1(08/13/80) 11. 35. 2.0 50. 11.50 -154. 55.20 119.0

STATION	DELTA	AZIMUTH	ARRIVAL TIME (H.M.S)	TT-OBS	TT-THEOR	RESIDUAL
la01	56.751	310.163	11. 44. 36.300	574.300	570.774	3.526
la02	56.402	309.980	11. 44. 32.550	570.550	568.303	2.247
la04	56.702	310.157	11. 44. 35.250	573.250	570.422	2.828
la05	56.735	310.165	11. 44. 35.820	573.820	570.656	3.164
la06	56.655	310.118	11. 44. 35.400	573.400	570.096	3.304
la07	56.607	310.087	11. 44. 35.090	573.090	569.756	3.334
la08	56.620	310.087	11. 44. 35.220	573.220	569.844	3.376
la09	56.648	310.097	11. 44. 35.550	573.550	570.044	3.505
la10	56.666	310.141	11. 44. 34.830	572.830	570.168	2.662
la11	56.573	310.084	11. 44. 34.460	572.460	569.517	2.943
la13	56.496	310.026	11. 44. 33.940	571.940	568.972	2.968
lhk0	56.778	310.194	11. 44. 36.210	574.210	570.962	3.248

STATION	QTY	MEAN	WT. MEAN	MEDIAN	DT/DDEL
la01	a	0.434	0.354	0.320	7.060
la02	c	-0.845	-0.924	-0.959	7.085
la04	b	-0.265	-0.344	-0.378	7.060
la05	a	0.072	-0.008	-0.042	7.060
la06	a	0.212	0.133	0.098	7.060
la07	b	0.242	0.163	0.129	7.060
la08	a	0.284	0.204	0.170	7.060
la09	a	0.413	0.334	0.300	7.060
la10	a	-0.430	-0.510	-0.544	7.060
la11	a	-0.149	-0.229	-0.263	7.060
la13	c	-0.125	-0.204	-0.238	7.085
lhk0	b	0.156	0.076	0.042	7.060

midatlz1(08/13/80) 20. 46. 22.0 8. 48.00 39. 52.20 10.0

STATION	DELTA	AZIMUTH	ARRIVAL TIME (H.M.S)	TT-OBS	TT-THEOR	RESIDUAL
la01	77.757	88.874	20. 58. 25.410	723.410	716.718	6.692
la02	78.279	88.418	20. 58. 27.170	725.170	719.621	5.549
la03	77.894	88.726	20. 58. 25.890	723.890	717.486	6.404
la04	77.955	88.675	20. 58. 25.840	723.840	717.827	6.013
la05	77.851	88.777	20. 58. 25.750	723.750	717.244	6.506
la06	77.937	88.709	20. 58. 26.400	724.400	717.723	6.677
la08	77.918	88.740	20. 58. 26.210	724.210	717.619	6.591
la09	77.845	88.810	20. 58. 25.910	723.910	717.209	6.701
la10	78.022	88.615	20. 58. 26.090	724.090	718.198	5.892
la13	78.123	88.556	20. 58. 26.890	724.890	718.760	6.130
lhk0	77.825	88.792	20. 58. 25.720	723.720	717.100	6.620

STATION	QTY	MEAN	WT. MEAN	MEDIAN	DT/DDEL
la01	a	0.349	0.323	0.186	5.580
la02	b	-0.794	-0.820	-0.957	5.540
la03	a	0.061	0.035	-0.102	5.580
la04	a	-0.331	-0.356	-0.494	5.580
la05	a	0.163	0.137	0.	5.580
la06	a	0.334	0.308	0.171	5.580
la08	a	0.248	0.222	0.085	5.580
la09	a	0.358	0.332	0.195	5.580
la10	a	-0.451	-0.477	-0.614	5.540
la13	a	-0.214	-0.239	-0.376	5.540
lhk0	b	0.277	0.251	0.114	5.580

hjapanz1(08/14/80) 21. 7. 33.5 34. 42.40 -139. 36.10 103.0

STATION	DELTA	AZIMUTH	ARRIVAL TIME (H.M.S)	TT-OBS	TT-THEOR	RESIDUAL
la01	74.536	302.456	21. 19. 4.230	690.730	687.057	3.673
la02	74.136	302.110	21. 19. 0.800	687.300	684.732	2.568
la03	74.507	302.399	21. 19. 3.660	690.160	686.890	3.270
la04	74.454	302.356	21. 19. 3.190	689.690	686.579	3.111
la05	74.503	302.411	21. 19. 3.790	690.290	686.865	3.425
la06	74.419	302.346	21. 19. 3.400	689.900	686.376	3.524
la07	74.371	302.313	21. 19. 3.110	689.610	686.099	3.511
la08	74.393	302.340	21. 19. 3.290	689.790	686.224	3.566
la09	74.432	302.381	21. 19. 3.650	690.150	686.450	3.700
la10	74.410	302.315	21. 19. 2.660	689.160	686.324	2.836
la11	74.315	302.245	21. 19. 1.820	688.320	685.772	2.548
la13	74.248	302.209	21. 19. 1.990	688.490	685.378	3.112

STATION	QTY	MEAN	WT. MEAN	MEDIAN	DT/DDEL
la01	b	0.436	0.425	0.326	5.778
la02	a	-0.669	-0.680	-0.779	5.820
la03	a	0.033	0.022	-0.077	5.778
la04	a	-0.126	-0.138	-0.237	5.820
la05	a	0.188	0.177	0.077	5.778
la06	a	0.287	0.276	0.176	5.820
la07	a	0.274	0.263	0.164	5.820
la08	a	0.329	0.317	0.218	5.820
la09	a	0.463	0.452	0.353	5.820
la10	a	-0.401	-0.413	-0.512	5.820
la11	b	-0.689	-0.701	-0.800	5.820
la13	a	-0.125	-0.137	-0.236	5.820

n.coluz1(08/15/80) 21. 30. 45.7 6. 48.70 73. 1.30 161.0

STATION	DELTA	AZIMUTH	ARRIVAL TIME (H.M.S)	TT-OBS	TT-THEOR	RESIDUAL
la01	54.484	114.624	21. 39. 59.350	553.650	550.293	3.357
la02	54.928	113.982	21. 40. 1.350	555.650	553.474	2.176
la03	54.541	114.369	21. 39. 59.620	553.920	550.701	3.219
la04	54.598	114.301	21. 39. 59.760	554.060	551.111	2.949
la05	54.534	114.464	21. 39. 59.690	553.990	550.647	3.343
la06	54.621	114.379	21. 40. 0.170	554.470	551.273	3.197
la07	54.667	114.358	21. 40. 0.460	554.760	551.604	3.156
la08	54.636	114.447	21. 40. 0.420	554.720	551.386	3.334
la09	54.588	114.558	21. 40. 0.080	554.380	551.038	3.342
la10	54.649	114.211	21. 39. 59.900	554.200	551.477	2.723
la13	54.802	114.181	21. 40. 0.890	555.190	552.571	2.619

STATION	QTY	MEAN	WT. MEAN	MEDIAN	DT/DDEL
la01	a	0.320	0.257	0.161	7.216
la02	c	-0.862	-0.925	-1.021	7.176
la03	a	0.181	0.118	0.022	7.176
la04	a	-0.089	-0.152	-0.248	7.176
la05	a	0.305	0.242	0.146	7.176
la06	b	0.159	0.096	0.	7.176
la07	a	0.118	0.055	-0.041	7.176
la08	a	0.296	0.233	0.137	7.176
la09	a	0.305	0.242	0.145	7.176
la10	a	-0.315	-0.378	-0.474	7.176
la13	a	-0.418	-0.481	-0.578	7.176

ecuadoz1(08/18/80) 15. 7. 52.6 -1. 56.90 80. 1.00 55.0

STATION	DELTA	AZIMUTH	ARRIVAL TIME (H.M.S)	TT-OBS	TT-THEOR	RESIDUAL
la01	56.542	127.939	15. 17. 33.150	580.550	576.030	4.520
la02	56.909	127.249	15. 17. 34.280	581.680	578.623	3.057
la03	56.552	127.688	15. 17. 32.920	580.320	576.098	4.222
la04	56.602	127.613	15. 17. 33.000	580.400	576.454	3.946
la05	56.564	127.779	15. 17. 33.100	580.500	576.184	4.316
la07	56.693	127.653	15. 17. 33.910	581.310	577.097	4.213
la08	56.678	127.742	15. 17. 33.910	581.310	576.989	4.321
la09	56.646	127.855	15. 17. 33.800	581.200	576.765	4.435
la11	56.734	127.432	15. 17. 33.490	580.890	577.388	3.502
la13	56.808	127.460	15. 17. 34.200	581.600	577.913	3.687
lmz0	56.761	127.578	15. 17. 34.200	581.600	577.579	4.021
lrd0	56.650	127.630	15. 17. 33.600	581.000	576.796	4.204
ls10	56.671	127.545	15. 17. 33.380	580.780	576.942	3.838
lhk0	56.521	127.794	15. 17. 33.000	580.400	575.880	4.520
minb	56.664	127.435	15. 17. 33.600	581.000	576.891	4.109

STATION	QTY	MEAN	WT. MEAN	MEDIAN	DT/DDEL
la01	a	0.439	0.369	0.297	7.076
la02	b	-1.024	-1.093	-1.165	7.076
la03	a	0.141	0.072	0.	7.076
la04	a	-0.135	-0.205	-0.277	7.076
la05	a	0.236	0.166	0.094	7.076
la07	b	0.132	0.062	-0.009	7.076
la08	a	0.241	0.171	0.099	7.076
la09	a	0.354	0.284	0.212	7.076
la11	a	-0.579	-0.649	-0.720	7.076
la13	x	-0.394	-0.463	-0.535	7.076
lmz0	x	-0.060	-0.129	-0.201	7.076
lrd0	x	0.123	0.054	-0.018	7.076
ls10	c	-0.243	-0.312	-0.384	7.076
lhk0	a	0.439	0.369	0.297	7.076
minb	x	0.028	-0.042	-0.114	7.076

kermadz1(08/18/80) 17. 38. 11.4 -29. 59.70 178. 7.70 33.0

STATION	DELTA	AZIMUTH	ARRIVAL TIME (H.M.S)	TT-OBS	TT-THEOR	RESIDUAL
la01	87.794	226.684	17. 51. 0.040	768.640	765.295	3.345
la04	87.546	226.518	17. 50. 58.320	766.920	764.103	2.817
la07	87.617	226.497	17. 50. 58.990	767.590	764.442	3.148
la08	87.686	226.542	17. 50. 59.390	767.990	764.773	3.217
la09	87.767	226.605	17. 50. 59.850	768.450	765.164	3.286
la11	87.447	226.383	17. 50. 57.880	766.480	763.628	2.852

STATION	QTY	MEAN	WT. MEAN	MEDIAN	DT/DDEL
la01	a	0.234	0.194	0.162	4.800
la04	a	-0.294	-0.334	-0.366	4.800
la07	b	0.037	-0.003	-0.035	4.800
la08	a	0.106	0.066	0.035	4.800
la09	a	0.175	0.135	0.103	4.800
la11	c	-0.259	-0.299	-0.331	4.820

wIrianp1(08/19/80) 21. 1. 29.0 -3. 34.70 -140. 2.20 33.0

STATION	DELTA	AZIMUTH	ARRIVAL TIME (H.M.S)	TT-OBS	TT-THEOR	RESIDUAL
la01	98.982	272.979	21. 15. 8.550	819.550	817.102	2.448
la02	98.466	272.522	21. 15. 6.700	817.700	814.741	2.959
la04	98.795	272.788	21. 15. 7.150	818.150	816.244	1.906
la05	98.894	272.887	21. 15. 7.960	818.960	816.699	2.261
la07	98.769	272.790	21. 15. 7.490	818.490	816.127	2.363
la08	98.820	272.843	21. 15. 7.760	818.760	816.361	2.399
la09	98.890	272.911	21. 15. 8.110	819.110	816.682	2.428
la11	98.641	272.660	21. 15. 6.590	817.590	815.542	2.048
la13	98.618	272.660	21. 15. 6.290	817.290	815.438	1.852

STATION	QTY	MEAN	WT. MEAN	MEDIAN	DT/DDEL
la01	a	0.235	0.241	0.136	4.574
la02	x	0.746	0.752	0.647	4.560
la04	a	-0.307	-0.302	-0.406	4.574
la05	a	0.048	0.054	-0.051	4.574
la07	c	0.150	0.156	0.051	4.574
la08	b	0.186	0.192	0.087	4.574
la09	b	0.215	0.220	0.116	4.574
la11	a	-0.165	-0.159	-0.264	4.574
la13	c	-0.361	-0.356	-0.460	4.574

pancolz2(08/23/80) 1. 34. 43.5 7. 57.10 77. 44.30 33.0

STATION	DELTA	AZIMUTH	ARRIVAL TIME (H.M.S)	TT-OBS	TT-THEOR	RESIDUAL
la01	50.440	117.919	1. 43. 41.490	537.990	533.881	4.109
la03	50.486	117.638	1. 43. 41.900	538.400	534.224	4.176
la04	50.542	117.565	1. 43. 41.790	538.290	534.643	3.647
la05	50.483	117.743	1. 43. 41.800	538.300	534.204	4.096
la08	50.589	117.728	1. 43. 42.520	539.020	535.001	4.019
la09	50.545	117.848	1. 43. 42.190	538.690	534.667	4.023
la10	50.590	117.468	1. 43. 41.860	538.360	535.005	3.355
la11	50.685	117.390	1. 43. 42.400	538.900	535.722	3.178
la12	50.625	117.539	1. 43. 42.500	539.000	535.266	3.734
la13	50.747	117.440	1. 43. 43.550	540.050	536.183	3.867

STATION	QTY	MEAN	WT. MEAN	MEDIAN	DT/DDEL
la01	a	0.279	0.283	0.090	7.560
la03	a	0.346	0.350	0.157	7.560
la04	a	-0.183	-0.180	-0.372	7.506
la05	a	0.266	0.270	0.078	7.560
la08	a	0.189	0.192	0.	7.506
la09	a	0.193	0.197	0.004	7.506
la10	a	-0.475	-0.471	-0.664	7.506
la11	a	-0.652	-0.649	-0.841	7.506
la12	x	-0.096	-0.092	-0.285	7.506
la13	c	0.037	0.041	-0.151	7.506

n.coluz2(08/23/80) 4. 28. 13.6 6. 49.40 73. 0.80 160.0

STATION	DELTA	AZIMUTH	ARRIVAL TIME (H.M.S)	TT-OBS	TT-THEOR	RESIDUAL
la01	54.482	114.607	4. 37. 27.380	553.780	550.376	3.404
la02	54.925	113.965	4. 37. 29.350	555.750	553.558	2.192
la03	54.539	114.351	4. 37. 27.780	554.180	550.785	3.395
la04	54.596	114.284	4. 37. 27.820	554.220	551.195	3.025
la05	54.531	114.447	4. 37. 27.720	554.120	550.731	3.389
la07	54.664	114.341	4. 37. 29.600	556.000	551.688	4.312
la08	54.634	114.430	4. 37. 28.510	554.910	551.469	3.441
la09	54.585	114.540	4. 37. 28.100	554.500	551.121	3.379
la10	54.647	114.194	4. 37. 27.900	554.300	551.561	2.739
la11	54.742	114.121	4. 37. 28.490	554.890	552.248	2.642
la13	54.799	114.164	4. 37. 29.350	555.750	552.655	3.095

STATION	QTY	MEAN	WT. MEAN	MEDIAN	DT/DDEL
la01	a	0.334	0.284	0.167	7.216
la02	b	-0.878	-0.929	-1.046	7.176
la03	b	0.325	0.274	0.158	7.176
la04	b	-0.045	-0.096	-0.212	7.176
la05	a	0.319	0.268	0.152	7.176
la07	x	1.242	1.191	1.075	7.176
la08	a	0.370	0.320	0.203	7.176
la09	b	0.309	0.258	0.142	7.176
la10	a	-0.331	-0.382	-0.498	7.176
la11	b	-0.428	-0.478	-0.595	7.176
la13	c	0.025	-0.025	-0.142	7.176

nicargz2(08/23/80) 18. 28. 44.8 10. 57.70 85. 36.50 33.0

STATION	DELTA	AZIMUTH	ARRIVAL TIME (H.M.S)	TT-OBS	TT-THEOR	RESIDUAL
la01	43.041	123.155	18. 36. 44.880	480.080	476.067	4.013
la02	43.438	122.346	18. 36. 46.600	481.800	479.272	2.528
la03	43.068	122.822	18. 36. 45.000	480.200	476.284	3.916
la04	43.121	122.737	18. 36. 45.160	480.360	476.713	3.647
la05	43.073	122.948	18. 36. 45.040	480.240	476.324	3.916
la08	43.184	122.935	18. 36. 45.900	481.100	477.217	3.883
la09	43.146	123.076	18. 36. 45.660	480.860	476.910	3.950
la10	43.165	122.623	18. 36. 45.150	480.350	477.064	3.286
la11	43.259	122.536	18. 36. 45.700	480.900	477.830	3.070
la12	43.207	122.711	18. 36. 45.950	481.150	477.403	3.747
la13	43.328	122.598	18. 36. 46.840	482.040	478.380	3.660

STATION	QTY	MEAN	WT. MEAN	MEDIAN	DT/DDEL
la01	c	0.229	0.262	0.114	8.074
la02	x	-1.256	-1.223	-1.371	8.074
la03	a	0.132	0.165	0.017	8.074
la04	a	-0.137	-0.104	-0.253	8.074
la05	a	0.132	0.165	0.016	8.074
la08	a	0.100	0.133	-0.016	8.074
la09	b	0.166	0.199	0.050	8.074
la10	a	-0.498	-0.465	-0.614	8.074
la11	x	-0.713	-0.680	-0.829	8.074
la12	x	-0.036	-0.003	-0.152	8.074
la13	b	-0.124	-0.091	-0.240	8.074

pancoltl(08/24/80) 0. 52. 46.7 7. 55.10 77. 50.60 33.0

STATION	DELTA	AZIMUTH	ARRIVAL TIME (H.M.S)	TT-OBS	TT-THEOR	RESIDUAL
la01	50.394	118.047	1. 1. 44.100	537.400	533.531	3.870
la02	50.820	117.351	1. 1. 46.000	539.300	536.732	2.568
la03	50.439	117.766	1. 1. 44.300	537.600	533.870	3.730
la04	50.495	117.693	1. 1. 44.490	537.790	534.291	3.499
la05	50.437	117.871	1. 1. 44.380	537.680	533.851	3.829
la08	50.543	117.856	1. 1. 45.270	538.570	534.652	3.918
la09	50.498	117.976	1. 1. 44.870	538.170	534.319	3.851
la10	50.543	117.595	1. 1. 44.520	537.820	534.653	3.167
la11	50.638	117.518	1. 1. 45.020	538.320	535.370	2.950
la12	50.578	117.667	1. 1. 47.000	540.300	534.915	5.385
la13	50.700	117.567	1. 1. 46.170	539.470	535.831	3.639
lhk0	50.396	117.878	1. 1. 44.280	537.580	533.548	4.032

STATION	QTY	MEAN	WT. MEAN	MEDIAN	DT/DDEL
la01	a	0.230	0.184	0.041	7.560
la02	x	-1.071	-1.117	-1.261	7.506
la03	x	0.090	0.044	-0.099	7.560
la04	a	-0.141	-0.187	-0.330	7.560
la05	a	0.189	0.143	0.	7.560
la08	a	0.278	0.232	0.089	7.506
la09	a	0.212	0.166	0.022	7.560
la10	a	-0.472	-0.518	-0.661	7.506
la11	c	-0.689	-0.735	-0.878	7.506
la12	x	1.746	1.700	1.557	7.506
la13	a	-0.001	-0.047	-0.190	7.506
lhk0	b	0.393	0.347	0.204	7.560

tongaip2(08/24/80) 20. 10. 4.2 -15. 13.30 173. 40.40 39.0

STATION	DELTA	AZIMUTH	ARRIVAL TIME (H.M.S)	TT-OBS	TT-THEOR	RESIDUAL
la01	73.800	232.878	20. 21. 37.260	693.060	689.939	3.121
la02	73.341	232.360	20. 21. 33.760	689.560	687.239	2.321
la03	73.598	232.777	20. 21. 35.760	691.560	688.754	2.806
la04	73.551	232.713	20. 21. 35.350	691.150	688.479	2.671
la05	73.676	232.802	20. 21. 36.420	692.220	689.210	3.010
la08	73.679	232.709	20. 21. 36.580	692.380	689.229	3.151
la09	73.762	232.773	20. 21. 37.660	693.460	689.716	3.744
la10	73.485	232.651	20. 21. 34.800	690.600	688.090	2.510
la11	73.440	232.552	20. 21. 34.640	690.440	687.826	2.614
la12	73.543	232.637	20. 21. 36.750	692.550	688.433	4.117
lmz0	73.569	232.588	20. 21. 37.070	692.870	688.581	4.289
lrd0	73.579	232.686	20. 21. 37.270	693.070	688.643	4.427
ls10	73.515	232.639	20. 21. 36.440	692.240	688.267	3.973

STATION	QTY	MEAN	WT. MEAN	MEDIAN	DT/DDEL
la01	x	-0.148	0.163	0.112	5.860
la02	x	-0.949	-0.638	-0.689	5.901
la03	a	-0.464	-0.153	-0.204	5.860
la04	a	-0.598	-0.287	-0.338	5.860
la05	a	-0.260	0.051	0.	5.860
la08	x	-0.119	0.192	0.141	5.860
la09	c	0.474	0.785	0.734	5.860
la10	x	-0.760	-0.449	-0.500	5.901
la11	x	-0.655	-0.344	-0.396	5.901
la12	c	0.847	1.158	1.107	5.860
lmz0	x	1.019	1.330	1.279	5.860
lrd0	x	1.158	1.469	1.417	5.860
ls10	x	0.703	1.014	0.963	5.860

tongaipl(08/30/80) 9. 42. 4.4 -15. 17.20 174. 0.40 33.0

STATION	DELTA	AZIMUTH	ARRIVAL TIME (H.M.S)	TT-OBS	TT-THEOR	RESIDUAL
la01	74.053	233.095	9. 53. 39.980	695.580	692.250	3.330
la02	73.593	232.579	9. 53. 36.400	692.000	689.553	2.447
la03	73.851	232.994	9. 53. 37.440	693.040	691.068	1.972
la04	73.804	232.931	9. 53. 37.840	693.440	690.791	2.649
la05	73.929	233.020	9. 53. 38.940	694.540	691.523	3.017
la09	74.015	232.991	9. 53. 39.960	695.560	692.026	3.534
la12	73.796	232.855	9. 53. 38.100	693.700	690.744	2.956
la13	73.738	232.729	9. 53. 37.440	693.040	690.404	2.636
la14	73.851	232.752	9. 53. 38.400	694.000	691.063	2.937

STATION	QTY	MEAN	WT. MEAN	MEDIAN	DT/DDEL
la01	b	0.394	0.321	0.497	5.840
la02	b	-0.488	-0.561	-0.385	5.860
la03	x	-0.963	-1.036	-0.861	5.860
la04	c	-0.287	-0.360	-0.184	5.860
la05	b	0.081	0.008	0.184	5.860
la09	b	0.598	0.525	0.701	5.840
la12	x	0.021	-0.053	0.123	5.860
la13	c	-0.299	-0.372	-0.196	5.860
la14	x	0.002	-0.071	0.105	5.860

stcruzpl(08/31/80) 14. 12. 40.1 -12. 29.90 -166. 27.70 42.0

STATION	DELTA	AZIMUTH	ARRIVAL TIME (H.M.S)	TT-OBS	TT-THEOR	RESIDUAL
la01	85.044	249.085	14. 25. 13.520	753.420	750.673	2.747
la02	84.531	248.633	14. 25. 11.100	751.000	748.114	2.886
la03	84.862	248.980	14. 25. 12.380	752.280	749.768	2.512
la04	84.806	248.926	14. 25. 11.780	751.680	749.487	2.193
la05	84.927	249.011	14. 25. 12.780	752.680	750.095	2.585
la07	84.832	248.899	14. 25. 12.400	752.300	749.617	2.683
la08	84.897	248.942	14. 25. 12.700	752.600	749.944	2.656
la09	84.980	249.002	14. 25. 13.240	753.140	750.358	2.782
la10	84.736	248.870	14. 25. 11.380	751.280	749.139	2.141
la11	84.669	248.790	14. 25. 11.300	751.200	748.806	2.394
la12	84.774	248.868	14. 25. 11.830	751.730	749.327	2.403
la13	84.688	248.766	14. 25. 11.460	751.360	748.900	2.460

STATION	QTY	MEAN	WT. MEAN	MEDIAN	DT/DDEL
la01	a	0.242	0.212	0.234	4.940
la02	x	0.381	0.352	0.374	4.996
la03	a	0.007	-0.022	0.	4.996
la04	a	-0.312	-0.341	-0.319	4.996
la05	a	0.080	0.051	0.073	4.996
la07	c	0.178	0.149	0.171	4.996
la08	a	0.150	0.121	0.143	4.996
la09	a	0.277	0.248	0.270	4.996
la10	c	-0.364	-0.393	-0.371	4.996
la11	a	-0.111	-0.140	-0.118	4.996
la12	b	-0.102	-0.131	-0.109	4.996
la13	c	-0.045	-0.074	-0.052	4.996

honshut1(09/09/80) 22. 20. 42.1 33. 59.20 -138. 56.20 33.0

STATION	DELTA	AZIMUTH	ARRIVAL TIME (H.M.S)	TT-OBS	TT-THEOR	RESIDUAL
la01	75.415	302.236	22. 32. 29.390	707.290	700.155	7.135
la02	75.014	301.884	22. 32. 25.910	703.810	697.845	5.965
la03	75.386	302.175	22. 32. 28.750	706.650	699.984	6.666
la04	75.332	302.131	22. 32. 28.250	706.150	699.676	6.474
la05	75.382	302.188	22. 32. 28.850	706.750	699.961	6.789
la07	75.250	302.090	22. 32. 28.150	706.050	699.202	6.848
la08	75.272	302.118	22. 32. 28.400	706.300	699.328	6.972
la09	75.311	302.160	22. 32. 28.700	706.600	699.553	7.047
la11	75.193	302.019	22. 32. 27.460	705.360	698.875	6.485
la12	75.247	302.075	22. 32. 28.090	705.990	699.185	6.805
la14	75.104	301.992	22. 32. 27.130	705.030	698.359	6.671

STATION	QTY	MEAN	WT. MEAN	MEDIAN	DT/DDEL
la01	a	0.421	0.364	0.346	5.760
la02	b	-0.749	-0.806	-0.824	5.760
la03	a	-0.048	-0.105	-0.123	5.760
la04	a	-0.240	-0.297	-0.314	5.760
la05	a	0.075	0.018	0.	5.760
la07	b	0.134	0.076	0.059	5.760
la08	a	0.258	0.201	0.183	5.760
la09	a	0.333	0.276	0.258	5.760
la11	c	-0.230	-0.287	-0.304	5.760
la12	b	0.090	0.033	0.016	5.760
la14	b	-0.044	-0.101	-0.118	5.760

fijiisz1(09/10/80) 7. 39. 47.2 -18. 36.70 -176. 6.40 29.0

STATION	DELTA	AZIMUTH	ARRIVAL TIME (H.M.S)	TT-OBS	TT-THEOR	RESIDUAL
la01	82.765	238.157	7. 52. 11.680	744.480	740.905	3.575
la02	82.283	237.688	7. 52. 8.200	741.000	738.403	2.597
la03	82.567	238.052	7. 52. 10.300	743.100	739.883	3.217
la04	82.517	237.995	7. 52. 9.810	742.610	739.622	2.988
la05	82.642	238.082	7. 52. 10.780	743.580	740.269	3.311
la07	82.566	237.964	7. 52. 10.400	743.200	739.874	3.326
la08	82.634	238.008	7. 52. 10.900	743.700	740.229	3.471
la09	82.718	238.070	7. 52. 11.400	744.200	740.662	3.538
la10	82.449	237.937	7. 52. 9.280	742.080	739.268	2.812
la11	82.397	237.853	7. 52. 9.190	741.990	738.994	2.996
la12	82.501	237.933	7. 52. 10.010	742.810	739.540	3.270

STATION	QTY	MEAN	WT. MEAN	MEDIAN	DT/DDEL
la01	a	0.384	0.395	0.305	5.180
la02	a	-0.594	-0.584	-0.674	5.220
la03	a	0.026	0.036	-0.053	5.180
la04	a	-0.203	-0.192	-0.282	5.180
la05	a	0.120	0.131	0.041	5.180
la07	b	0.135	0.146	0.056	5.180
la08	a	0.280	0.291	0.201	5.180
la09	a	0.347	0.357	0.268	5.180
la10	a	-0.379	-0.368	-0.458	5.220
la11	a	-0.195	-0.185	-0.275	5.220
la12	b	0.079	0.090	0.	5.180

fijiisz1(09/10/80) 12. 3. 9.6 -18. 40.50 -176. 16.10 33.0

STATION	DELTA	AZIMUTH	ARRIVAL TIME (H.M.S)	TT-OBS	TT-THEOR	RESIDUAL
la01	82.706	238.001	12. 15. 33.820	744.220	740.040	4.180
la02	82.225	237.531	12. 15. 30.320	740.720	737.539	3.181
la03	82.509	237.895	12. 15. 32.420	742.820	739.018	3.802
la04	82.458	237.839	12. 15. 31.960	742.360	738.755	3.605
la05	82.583	237.925	12. 15. 33.020	743.420	739.404	4.016
la07	82.507	237.807	12. 15. 32.730	743.130	739.010	4.120
la08	82.576	237.851	12. 15. 33.020	743.420	739.365	4.055
la09	82.660	237.913	12. 15. 33.500	743.900	739.799	4.101
la11	82.338	237.697	12. 15. 31.380	741.780	738.128	3.652
la12	82.443	237.777	12. 15. 32.180	742.580	738.674	3.906

STATION	QTY	MEAN	WT. MEAN	MEDIAN	DT/DDEL
la01	a	0.318	0.316	0.219	5.180
la02	b	-0.681	-0.683	-0.781	5.220
la03	a	-0.059	-0.061	-0.159	5.180
la04	a	-0.257	-0.259	-0.356	5.220
la05	a	0.154	0.152	0.055	5.180
la07	c	0.258	0.256	0.158	5.180
la08	b	0.193	0.191	0.093	5.180
la09	a	0.239	0.237	0.140	5.180
la11	a	-0.210	-0.212	-0.310	5.220
la12	b	0.045	0.043	-0.055	5.220

sfijiipl(09/11/80) 10. 30. 6.7 -25. 43.10 -179. 27.80 503.0

STATION	DELTA	AZIMUTH	ARRIVAL TIME (H.M.S)	TT-OBS	TT-THEOR	RESIDUAL
la01	85.932	231.076	10. 41. 54.920	708.220	706.031	2.189
la02	85.481	230.614	10. 41. 52.000	705.300	703.864	1.436
la03	85.729	230.965	10. 41. 53.660	706.960	705.055	1.905
la04	85.683	230.910	10. 41. 53.270	706.570	704.835	1.735
la05	85.807	230.998	10. 41. 54.120	707.420	705.433	1.987
la07	85.745	230.885	10. 41. 53.870	707.170	705.135	2.035
la08	85.814	230.930	10. 41. 54.390	707.690	705.467	2.223
la09	85.897	230.993	10. 41. 54.820	708.120	705.864	2.256
la11	85.575	230.772	10. 41. 52.710	706.010	704.319	1.691
la12	85.678	230.853	10. 41. 53.310	706.610	704.811	1.799
la13	85.624	230.750	10. 41. 52.960	706.260	704.551	1.709
la14	85.738	230.787	10. 41. 53.890	707.190	705.101	2.089
lmz0	85.706	230.822	10. 41. 53.670	706.970	704.945	2.025
lrd0	85.713	230.895	10. 41. 53.780	707.080	704.978	2.102
ls10	85.649	230.849	10. 41. 53.090	706.390	704.671	1.719
lhk0	85.806	231.024	10. 41. 54.120	707.420	705.425	1.995
minb	85.555	230.806	10. 41. 52.870	706.170	704.221	1.949
lcf0	85.692	230.853	10. 41. 53.700	707.000	704.879	2.121

STATION	QTY	MEAN	WT. MEAN	MEDIAN	DT/DDEL
la01	a	0.245	0.254	0.198	4.800
la02	a	-0.508	-0.499	-0.555	4.819
la03	a	-0.038	-0.030	-0.086	4.800
la04	a	-0.209	-0.200	-0.256	4.800
la05	a	0.043	0.052	-0.004	4.800
la07	c	0.092	0.100	0.044	4.800
la08	a	0.280	0.288	0.232	4.800
la09	a	0.313	0.321	0.265	4.800
la11	x	-0.252	-0.244	-0.300	4.800
la12	b	-0.145	-0.136	-0.192	4.800
la13	a	-0.234	-0.225	-0.281	4.800
la14	x	0.145	0.154	0.098	4.800
lmz0	x	0.082	0.090	0.034	4.800
lrd0	c	0.158	0.167	0.111	4.800
ls10	c	-0.225	-0.216	-0.272	4.800
lhk0	a	0.052	0.060	0.004	4.800
minb	x	0.006	0.014	-0.042	4.800
lcf0	c	0.177	0.186	0.130	4.800

ussrblt1(09/14/80) 2. 42. 39.3 49. 58.60 -78. 53.30 1.0

STATION	DELTA	AZIMUTH	ARRIVAL TIME (H.M.S)	TT-OBS	TT-THEOR	RESIDUAL
la01	88.136	347.186	2. 55. 35.290	775.990	771.737	4.253
la02	88.092	346.762	2. 55. 33.900	774.600	771.529	3.071
la03	88.260	347.078	2. 55. 35.490	776.190	772.326	3.864
la04	88.243	347.028	2. 55. 35.370	776.070	772.246	3.824
la05	88.197	347.111	2. 55. 35.230	775.930	772.028	3.902
la07	88.119	347.011	2. 55. 34.880	775.580	771.654	3.926
la08	88.088	347.054	2. 55. 34.990	775.690	771.507	4.183
la09	88.063	347.113	2. 55. 34.910	775.610	771.389	4.221
la10	88.250	346.974	2. 55. 35.020	775.720	772.280	3.440
la11	88.192	346.903	2. 55. 35.080	775.780	772.001	3.779
la12	88.166	346.979	2. 55. 35.120	775.820	771.880	3.940
la13	88.092	346.887	2. 55. 34.460	775.160	771.525	3.635
la14	87.985	346.927	2. 55. 34.150	774.850	771.017	3.833

STATION	QTY	MEAN	WT. MEAN	MEDIAN	DT/DDEL
la01	a	0.417	0.409	0.389	4.761
la02	a	-0.765	-0.773	-0.793	4.761
la03	a	0.028	0.020	0.	4.761
la04	a	-0.013	-0.021	-0.041	4.761
la05	a	0.066	0.058	0.038	4.761
la07	a	0.090	0.082	0.062	4.761
la08	a	0.347	0.339	0.319	4.761
la09	a	0.385	0.377	0.357	4.761
la10	a	-0.396	-0.404	-0.424	4.761
la11	a	-0.057	-0.065	-0.085	4.761
la12	a	0.104	0.096	0.076	4.761
la13	b	-0.202	-0.210	-0.230	4.761
la14	a	-0.004	-0.012	-0.032	4.800

tongait1(09/15/80) 23. 30. 27.6 -15. 38.70 173. 44.20 68.0

STATION	DELTA	AZIMUTH	ARRIVAL TIME (H.M.S)	TT-OBS	TT-THEOR	RESIDUAL
la01	74.166	232.652	23. 42. 0.280	692.680	688.808	3.872
la02	73.707	232.135	23. 41. 56.630	689.030	686.127	2.903
la03	73.964	232.550	23. 41. 58.700	691.100	687.628	3.472
la04	73.917	232.487	23. 41. 58.250	690.650	687.354	3.296
la05	74.042	232.576	23. 41. 59.260	691.660	688.084	3.576
la07	73.976	232.439	23. 41. 59.100	691.500	687.702	3.798
la08	74.045	232.483	23. 41. 59.460	691.860	688.105	3.755
la09	74.128	232.548	23. 42. 0.110	692.510	688.589	3.921
la12	73.909	232.411	23. 41. 58.500	690.900	687.310	3.590
la14	73.965	232.309	23. 41. 58.890	691.290	687.637	3.653

STATION	QTY	MEAN	WT. MEAN	MEDIAN	DT/DDEL
la01	b	0.312	0.335	0.282	5.826
la02	a	-0.657	-0.633	-0.687	5.860
la03	a	-0.088	-0.065	-0.118	5.860
la04	a	-0.264	-0.240	-0.294	5.860
la05	a	0.016	0.040	-0.014	5.826
la07	x	0.238	0.262	0.208	5.860
la08	a	0.195	0.218	0.165	5.826
la09	a	0.361	0.385	0.331	5.826
la12	c	0.030	0.053	0.	5.860
la14	a	0.093	0.117	0.063	5.860

fijiist1(09/16/80) 23. 33. 40.9 -20. 36.90 178. 46.90 599.0

STATION	DELTA	AZIMUTH	ARRIVAL TIME (H.M.S)	TT-OBS	TT-THEOR	RESIDUAL
la01	81.033	233.189	23. 44. 57.890	676.990	673.412	3.578
la03	80.831	233.083	23. 44. 56.530	675.630	672.380	3.250
la04	80.784	233.025	23. 44. 56.140	675.240	672.139	3.101
la05	80.909	233.113	23. 44. 57.000	676.100	672.778	3.322
la07	80.842	232.990	23. 44. 56.870	675.970	672.438	3.532
la08	80.911	233.035	23. 44. 57.200	676.300	672.791	3.509
la09	80.994	233.098	23. 44. 57.750	676.850	673.217	3.633
la12	80.776	232.960	23. 44. 56.500	675.600	672.096	3.504
la13	80.717	232.848	23. 44. 56.100	675.200	671.798	3.402
la14	80.830	232.879	23. 44. 56.880	675.980	672.373	3.607
lmz0	80.800	232.922	23. 44. 56.650	675.750	672.223	3.527
lrd0	80.812	233.005	23. 44. 56.600	675.700	672.280	3.420
ls10	80.747	232.959	23. 44. 56.000	675.100	671.952	3.148
lhk0	80.909	233.142	23. 44. 57.120	676.220	672.777	3.443

STATION	QTY	MEAN	WT. MEAN	MEDIAN	DT/DDEL
la01	a	0.130	0.145	0.072	5.061
la03	a	-0.198	-0.184	-0.257	5.120
la04	a	-0.346	-0.332	-0.405	5.120
la05	b	-0.126	-0.111	-0.184	5.120
la07	c	0.085	0.099	0.026	5.120
la08	a	0.061	0.076	0.003	5.120
la09	a	0.185	0.200	0.127	5.120
la12	b	0.056	0.070	-0.003	5.120
la13	x	-0.046	-0.031	-0.104	5.120
la14	b	0.159	0.174	0.101	5.120
lmz0	x	0.079	0.093	0.020	5.120
lrd0	x	-0.028	-0.014	-0.087	5.120
ls10	x	-0.300	-0.285	-0.358	5.120
lhk0	a	-0.005	0.009	-0.064	5.120

tongaipl(09/17/80) 5. 7. 32.7 -15. 16.60 173. 35.60 33.0

STATION	DELTA	AZIMUTH	ARRIVAL TIME (H.M.S)	TT-OBS	TT-THEOR	RESIDUAL
la01	73.794	232.779	5. 19. 6.530	693.830	690.734	3.096
la02	73.335	232.262	5. 19. 3.000	690.300	688.036	2.264
la03	73.592	232.678	5. 19. 4.990	692.290	689.549	2.741
la04	73.545	232.615	5. 19. 4.520	691.820	689.273	2.547
la05	73.670	232.704	5. 19. 5.580	692.880	690.005	2.875
la06	73.614	232.610	5. 19. 5.500	692.800	689.677	3.123
la07	73.604	232.566	5. 19. 6.110	693.410	689.620	3.790
la08	73.673	232.610	5. 19. 5.750	693.050	690.025	3.025
la09	73.756	232.675	5. 19. 6.380	693.680	690.512	3.168
la12	73.538	232.538	5. 19. 5.580	692.880	689.229	3.651
la13	73.480	232.412	5. 19. 4.130	691.430	688.891	2.539
la14	73.593	232.435	5. 19. 5.160	692.460	689.553	2.907
lmz0	73.563	232.490	5. 19. 4.900	692.200	689.378	2.822
lrd0	73.573	232.587	5. 19. 5.820	693.120	689.438	3.682
lsl0	73.509	232.541	5. 19. 4.220	691.520	689.063	2.457
lhk0	73.670	232.739	5. 19. 5.680	692.980	690.002	2.978
minb	73.416	232.505	5. 19. 3.900	691.200	688.514	2.686

STATION	QTY	MEAN	WT. MEAN	MEDIAN	DT/DDEL
la01	b	0.149	0.192	0.190	5.860
la02	a	-0.683	-0.640	-0.643	5.906
la03	a	-0.206	-0.163	-0.165	5.860
la04	a	-0.401	-0.358	-0.360	5.860
la05	a	-0.072	-0.029	-0.032	5.860
la06	a	0.176	0.219	0.216	5.860
la07	c	0.842	0.885	0.883	5.860
la08	a	0.077	0.121	0.118	5.860
la09	a	0.221	0.264	0.261	5.860
la12	b	0.704	0.747	0.744	5.860
la13	c	-0.409	-0.365	-0.368	5.906
la14	c	-0.041	0.002	0.	5.860
lmz0	c	-0.125	-0.082	-0.085	5.860
lrd0	x	0.734	0.777	0.775	5.860
lsl0	x	-0.490	-0.447	-0.449	5.860
lhk0	a	0.030	0.073	0.071	5.860
minb	c	-0.261	-0.218	-0.221	5.906

fijiist1(09/18/80) 17. 0. 21.5 -17. 50.70 178. 38.00 599.0

STATION	DELTA	AZIMUTH	ARRIVAL TIME (H.M.S)	TT-OBS	TT-THEOR	RESIDUAL
la02	78.386	234.418	17. 11. 22.620	661.120	659.617	1.503
la03	78.654	234.805	17. 11. 24.690	663.190	661.039	2.151
la04	78.605	234.746	17. 11. 24.280	662.780	660.783	1.997
la05	78.730	234.833	17. 11. 25.270	663.770	661.445	2.325
la06	78.672	234.747	17. 11. 25.210	663.710	661.135	2.575
la07	78.660	234.706	17. 11. 24.790	663.290	661.075	2.215
la08	78.729	234.751	17. 11. 25.410	663.910	661.440	2.470
la09	78.813	234.814	17. 11. 25.910	664.410	661.882	2.528
la12	78.594	234.677	17. 11. 24.520	663.020	660.725	2.295
la14	78.643	234.590	17. 11. 24.690	663.190	660.984	2.206
lhk0	78.732	234.864	17. 11. 25.300	663.800	661.452	2.348

STATION	QTY	MEAN	WT. MEAN	MEDIAN	DT/DDEL
la02	b	-0.737	-0.781	-0.807	5.321
la03	a	-0.089	-0.134	-0.159	5.300
la04	a	-0.243	-0.287	-0.313	5.300
la05	a	0.085	0.040	0.015	5.300
la06	a	0.335	0.291	0.265	5.300
la07	x	-0.024	-0.069	-0.094	5.300
la08	a	0.230	0.186	0.160	5.300
la09	a	0.288	0.244	0.218	5.300
la12	c	0.055	0.011	-0.015	5.300
la14	c	-0.034	-0.078	-0.104	5.300
lhk0	a	0.108	0.064	0.038	5.300

aleutnz1(09/19/80) 9. 49. 13.1 51. 34.80 178. 13.30 54.0

STATION	DELTA	AZIMUTH	ARRIVAL TIME (H.M.S)	TT-OBS	TT-THEOR	RESIDUAL
la01	40.109	305.650	9. 56. 46.820	453.720	449.788	3.932
la02	39.730	305.644	9. 56. 42.410	449.310	446.645	2.665
la03	40.092	305.781	9. 56. 46.230	453.130	449.646	3.484
la04	40.040	305.769	9. 56. 45.620	452.520	449.220	3.300
la05	40.082	305.716	9. 56. 46.340	453.240	449.570	3.670
la06	40.000	305.683	9. 56. 45.700	452.600	448.890	3.710
la07	39.952	305.647	9. 56. 45.280	452.180	448.492	3.688
la08	39.970	305.612	9. 56. 45.560	452.460	448.639	3.821
la09	40.004	305.583	9. 56. 45.980	452.880	448.925	3.955
la10	40.000	305.781	9. 56. 45.110	452.010	448.885	3.125
la12	39.954	305.697	9. 56. 45.170	452.070	448.504	3.566

STATION	QTY	MEAN	WT. MEAN	MEDIAN	DT/DDEL
la01	a	0.395	0.397	0.263	8.274
la02	a	-0.873	-0.871	-1.005	8.300
la03	a	-0.054	-0.052	-0.186	8.274
la04	a	-0.238	-0.236	-0.370	8.274
la05	a	0.132	0.134	0.	8.274
la06	a	0.172	0.175	0.040	8.274
la07	a	0.151	0.153	0.019	8.300
la08	a	0.283	0.286	0.151	8.300
la09	a	0.417	0.419	0.285	8.274
la10	a	-0.413	-0.411	-0.545	8.300
la12	c	0.028	0.031	-0.104	8.300

japanspl(09/20/80) 11. 7. 6.5 38. 16.40 -130. 34.30 22.0

STATION	DELTA	AZIMUTH	ARRIVAL TIME (H.M.S)	TT-OBS	TT-THEOR	RESIDUAL
la01	77.772	310.101	11. 19. 4.780	718.280	715.032	3.248
la02	77.421	309.745	11. 19. 1.530	715.030	713.073	1.957
la03	77.770	310.032	11. 19. 4.320	717.820	715.024	2.796
la04	77.721	309.988	11. 19. 3.820	717.320	714.751	2.569
la05	77.755	310.049	11. 19. 4.260	717.760	714.938	2.823
la06	77.675	309.985	11. 19. 4.300	717.800	714.494	3.306
la07	77.627	309.954	11. 19. 3.730	717.230	714.225	3.005
la08	77.640	309.984	11. 19. 3.860	717.360	714.296	3.064
la09	77.668	310.029	11. 19. 4.120	717.620	714.455	3.165
la10	77.685	309.945	11. 19. 3.390	716.890	714.549	2.341
lmz0	77.560	309.901	11. 19. 3.300	716.800	713.851	2.949
lhk0	77.798	310.074	11. 19. 4.620	718.120	715.179	2.941

STATION	QTY	MEAN	WT. MEAN	MEDIAN	DT/DDEL
la01	a	0.401	0.371	0.304	5.580
la02	b	-0.890	-0.921	-0.988	5.600
la03	a	-0.051	-0.082	-0.149	5.580
la04	b	-0.278	-0.309	-0.376	5.580
la05	a	-0.024	-0.055	-0.122	5.580
la06	a	0.459	0.428	0.361	5.580
la07	b	0.158	0.127	0.060	5.580
la08	b	0.217	0.186	0.119	5.580
la09	a	0.318	0.287	0.220	5.580
la10	a	-0.506	-0.537	-0.604	5.580
lmz0	c	0.102	0.071	0.004	5.580
lhk0	b	0.094	0.063	-0.004	5.580

mexicopl(09/20/80) 22. 48. 51.7 14. 55.60 93. 7.00 58.0

STATION	DELTA	AZIMUTH	ARRIVAL TIME (H.M.S)	TT-OBS	TT-THEOR	RESIDUAL
la01	35.347	128.150	22. 55. 45.890	414.190	409.230	4.960
la02	35.712	127.179	22. 55. 47.360	415.660	412.367	3.293
la03	35.356	127.745	22. 55. 45.800	414.100	409.308	4.792
la04	35.406	127.644	22. 55. 45.900	414.200	409.741	4.459
la05	35.368	127.899	22. 55. 45.810	414.110	409.413	4.697
la06	35.449	127.774	22. 55. 45.900	414.200	410.109	4.091
la07	35.497	127.747	22. 55. 46.890	415.190	410.522	4.668
la08	35.482	127.887	22. 55. 46.800	415.100	410.391	4.709
la09	35.450	128.058	22. 55. 46.680	414.980	410.122	4.858
la12	35.493	127.615	22. 55. 46.730	415.030	410.488	4.542
la13	35.612	127.482	22. 55. 47.100	415.400	411.508	3.892
la14	35.647	127.699	22. 55. 47.740	416.040	411.804	4.236
lmz0	35.565	127.654	22. 55. 47.120	415.420	411.104	4.316
lrd0	35.454	127.692	22. 55. 46.400	414.700	410.156	4.544
ls10	35.475	127.562	22. 55. 46.320	414.620	410.333	4.287
lhk0	35.325	127.905	22. 55. 45.700	414.000	409.045	4.955

STATION	QTY	MEAN	WT. MEAN	MEDIAN	DT/DDEL
la01	a	0.504	0.454	0.417	8.594
la02	b	-1.164	-1.213	-1.250	8.560
la03	a	0.336	0.286	0.249	8.594
la04	a	0.003	-0.047	-0.084	8.594
la05	a	0.241	0.191	0.154	8.594
la06	b	-0.365	-0.415	-0.452	8.594
la07	a	0.212	0.162	0.125	8.594
la08	c	0.252	0.203	0.166	8.594
la09	a	0.401	0.352	0.315	8.594
la12	c	0.086	0.036	-0.001	8.594
la13	a	-0.564	-0.614	-0.651	8.560
la14	a	-0.221	-0.270	-0.307	8.560
lmz0	b	-0.140	-0.190	-0.227	8.560
lrd0	c	0.088	0.038	0.001	8.594
ls10	b	-0.169	-0.219	-0.256	8.594
lhk0	a	0.499	0.449	0.412	8.594

vanuatpl(09/26/80) 17. 28. 15.4 -15. 1.70 -167. 17.70 116.0

STATION	DELTA	AZIMUTH	ARRIVAL TIME (H.M.S)	TT-OBS	TT-THEOR	RESIDUAL
la01	86.184	246.695	17. 40. 46.000	750.600	747.753	2.847
la02	85.676	246.243	17. 40. 42.600	747.200	745.272	1.928
la03	85.998	246.587	17. 40. 44.790	749.390	746.849	2.541
la04	85.943	246.534	17. 40. 44.720	749.320	746.579	2.741
la05	86.065	246.619	17. 40. 45.280	749.880	747.178	2.702
la06	85.994	246.542	17. 40. 45.100	749.700	746.832	2.868
la07	85.974	246.508	17. 40. 44.850	749.450	746.731	2.719
la08	86.040	246.552	17. 40. 45.280	749.880	747.055	2.825
la09	86.123	246.613	17. 40. 45.840	750.440	747.460	2.980
la12	85.914	246.477	17. 40. 44.400	749.000	746.439	2.561
la14	85.926	246.412	17. 40. 44.520	749.120	746.497	2.623

STATION	QTY	MEAN	WT. MEAN	MEDIAN	DT/DDEL
la01	a	0.106	0.085	0.117	4.867
la02	x	-0.813	-0.834	-0.802	4.900
la03	a	-0.200	-0.221	-0.189	4.900
la04	a	0.000	-0.021	0.011	4.900
la05	a	-0.039	-0.060	-0.028	4.867
la06	b	0.127	0.106	0.137	4.900
la07	c	-0.022	-0.043	-0.011	4.900
la08	a	0.084	0.063	0.095	4.867
la09	a	0.239	0.218	0.250	4.867
la12	c	-0.180	-0.201	-0.169	4.900
la14	b	-0.118	-0.139	-0.107	4.900

monapstl(09/27/80) 6. 25. 36.7 18. 28.60 68. 56.00 159.0

STATION	DELTA	AZIMUTH	ARRIVAL TIME (H.M.S)	TT-OBS	TT-THEOR	RESIDUAL
la01	49.710	100.288	6. 34. 14.690	517.990	515.318	2.672
la02	50.210	99.708	6. 34. 18.410	521.710	519.072	2.638
la03	49.814	100.023	6. 34. 15.610	518.910	516.103	2.807
la04	49.875	99.965	6. 34. 15.400	518.700	516.561	2.139
la05	49.786	100.126	6. 34. 15.320	518.620	515.891	2.729
la06	49.875	100.057	6. 34. 15.920	519.220	516.557	2.663
la07	49.916	100.047	6. 34. 16.300	519.600	516.867	2.733
la08	49.871	100.137	6. 34. 16.000	519.300	516.531	2.769
la09	49.807	100.244	6. 34. 15.430	518.730	516.050	2.680
la10	49.937	99.881	6. 34. 16.100	519.400	517.021	2.379
la11	50.029	99.828	6. 34. 17.000	520.300	517.716	2.584
la12	49.945	99.960	6. 34. 16.750	520.050	517.086	2.964
la13	50.064	99.891	6. 34. 17.290	520.590	517.976	2.614
la14	50.036	100.040	6. 34. 17.090	520.390	517.768	2.622
lmz0	49.988	99.997	6. 34. 16.800	520.100	517.407	2.693

STATION	QTY	MEAN	WT. MEAN	MEDIAN	DT/DDEL
la01	b	-0.013	-0.018	-0.008	7.516
la02	x	-0.047	-0.052	-0.042	7.513
la03	a	0.122	0.117	0.128	7.516
la04	x	-0.546	-0.551	-0.540	7.516
la05	a	0.044	0.039	0.049	7.516
la06	b	-0.022	-0.027	-0.017	7.516
la07	c	0.047	0.042	0.053	7.516
la08	b	0.084	0.079	0.090	7.516
la09	a	-0.006	-0.011	0.	7.516
la10	b	-0.306	-0.311	-0.300	7.516
la11	c	-0.101	-0.106	-0.096	7.513
la12	c	0.278	0.273	0.284	7.516
la13	c	-0.071	-0.076	-0.066	7.513
la14	b	-0.063	-0.068	-0.057	7.513
lmz0	c	0.008	0.003	0.014	7.516

vanuatp1(09/28/80) 11. 6. 9.0 -14. 47.20 -167. 52.10 23.0

STATION	DELTA	AZIMUTH	ARRIVAL TIME (H.M.S)	TT-OBS	TT-THEOR	RESIDUAL
la01	85.617	246.485	11. 18. 48.620	759.620	756.135	3.485
la02	85.110	246.032	11. 18. 45.250	756.250	753.633	2.617
la03	85.431	246.379	11. 18. 47.330	758.330	755.218	3.112
la04	85.376	246.325	11. 18. 47.210	758.210	754.946	3.264
la05	85.498	246.410	11. 18. 47.830	758.830	755.553	3.277
la06	85.428	246.333	11. 18. 47.630	758.630	755.203	3.427
la07	85.407	246.298	11. 18. 47.420	758.420	755.102	3.318
la08	85.474	246.342	11. 18. 47.820	758.820	755.430	3.390
la09	85.557	246.403	11. 18. 48.300	759.300	755.840	3.460
la10	85.306	246.268	11. 18. 46.800	757.800	754.603	3.197
la11	85.243	246.189	11. 18. 46.210	757.210	754.289	2.921
la13	85.266	246.166	11. 18. 46.570	757.570	754.404	3.166
la14	85.360	246.200	11. 18. 47.120	758.120	754.868	3.252

STATION	QTY	MEAN	WT. MEAN	MEDIAN	DT/DDEL
la01	a	0.263	0.245	0.222	4.920
la02	b	-0.605	-0.623	-0.646	4.940
la03	a	-0.110	-0.128	-0.152	4.940
la04	a	0.042	0.024	0.	4.940
la05	a	0.055	0.037	0.014	4.940
la06	a	0.205	0.187	0.163	4.940
la07	c	0.096	0.078	0.055	4.940
la08	b	0.168	0.150	0.126	4.940
la09	a	0.238	0.220	0.196	4.920
la10	a	-0.025	-0.043	-0.066	4.940
la11	a	-0.301	-0.319	-0.343	4.940
la13	c	-0.056	-0.074	-0.098	4.940
la14	a	0.030	0.012	-0.012	4.940

solomopl(09/28/80) 18. 25. 59.7 -6. 18.60 -154. 48.50 68.0

STATION	DELTA	AZIMUTH	ARRIVAL TIME (H.M.S)	TT-OBS	TT-THEOR	RESIDUAL
la01	89.515	261.345	18. 38. 52.700	773.000	769.218	3.782
la02	88.989	260.903	18. 38. 49.240	769.540	766.742	2.798
la03	89.359	261.233	18. 38. 51.680	771.980	768.481	3.499
la04	89.299	261.181	18. 38. 50.600	770.900	768.198	2.702
la05	89.411	261.267	18. 38. 52.020	772.320	768.728	3.592
la06	89.329	261.194	18. 38. 51.840	772.140	768.341	3.799
la11	89.150	261.051	18. 38. 50.500	770.800	767.499	3.301
la12	89.250	261.129	18. 38. 51.140	771.440	767.968	3.472
la13	89.148	261.034	18. 38. 50.400	770.700	767.487	3.213
la14	89.215	261.074	18. 38. 50.800	771.100	767.805	3.295
lmz0	89.233	261.103	18. 38. 51.200	771.500	767.890	3.610
lrd0	89.296	261.169	18. 38. 52.900	773.200	768.185	5.015
ls10	89.238	261.124	18. 38. 52.220	772.520	767.910	4.610
lhk0	89.432	261.290	18. 38. 52.200	772.500	768.826	3.674

STATION	QTY	MEAN	WT. MEAN	MEDIAN	DT/DDEL
la01	c	0.391	0.278	0.297	4.700
la02	c	-0.594	-0.707	-0.688	4.740
la03	a	0.108	-0.006	0.014	4.706
la04	c	-0.689	-0.803	-0.783	4.706
la05	a	0.201	0.087	0.107	4.706
la06	a	0.407	0.294	0.313	4.706
la11	b	-0.091	-0.204	-0.185	4.706
la12	c	0.080	-0.033	-0.014	4.706
la13	x	-0.179	-0.292	-0.273	4.706
la14	b	-0.097	-0.210	-0.191	4.706
lmz0	x	0.218	0.105	0.124	4.706
lrd0	x	1.624	1.511	1.530	4.706
ls10	x	1.218	1.105	1.124	4.706
lhk0	b	0.283	0.169	0.189	4.706

honshut2(09/28/80) 21. 36. 58.3 38. 44.10 -141. 42.20 78.0

STATION	DELTA	AZIMUTH	ARRIVAL TIME (H.M.S)	TT-OBS	TT-THEOR	RESIDUAL
la01	70.739	304.703	21. 48. 8.800	670.500	667.280	3.220
la02	70.353	304.388	21. 48. 5.160	666.860	664.921	1.939
la03	70.719	304.661	21. 48. 8.240	669.940	667.153	2.787
la04	70.666	304.621	21. 48. 8.200	669.900	666.835	3.065
la05	70.711	304.667	21. 48. 8.200	669.900	667.106	2.794
la06	70.628	304.605	21. 48. 7.860	669.560	666.601	2.959
la07	70.580	304.573	21. 48. 7.600	669.300	666.309	2.991
la12	70.580	304.564	21. 48. 7.300	669.000	666.310	2.690
la13	70.460	304.477	21. 48. 6.440	668.140	665.574	2.566
la14	70.432	304.473	21. 48. 6.560	668.260	665.404	2.856

STATION	QTY	MEAN	WT. MEAN	MEDIAN	DT/DDEL
la01	a	0.316	0.288	0.313	6.098
la02	x	-0.965	-0.993	-0.968	6.138
la03	a	-0.118	-0.145	-0.120	6.098
la04	b	0.161	0.133	0.158	6.098
la05	a	-0.111	-0.138	-0.114	6.098
la06	c	0.054	0.027	0.051	6.098
la07	c	0.086	0.059	0.083	6.098
la12	x	-0.215	-0.242	-0.217	6.098
la13	c	-0.339	-0.366	-0.341	6.138
la14	c	-0.049	-0.076	-0.051	6.138

perbolpl(09/29/80) 0. 31. 54.8 -17. 24.40 69. 52.90 135.0

STATION	DELTA	AZIMUTH	ARRIVAL TIME (H.M.S)	TT-OBS	TT-THEOR	RESIDUAL
la02	75.155	128.897	0. 43. 24.150	689.350	687.075	2.275
la03	74.803	129.273	0. 43. 22.910	688.110	685.051	3.059
la04	74.852	129.211	0. 43. 22.750	687.950	685.336	2.614
la05	74.817	129.331	0. 43. 23.110	688.310	685.134	3.176
la06	74.897	129.247	0. 43. 23.610	688.810	685.595	3.215
la07	74.946	129.217	0. 43. 23.860	689.060	685.872	3.188
la11	74.982	129.059	0. 43. 23.500	688.700	686.083	2.617
la12	74.940	129.164	0. 43. 23.870	689.070	685.839	3.231
la13	75.058	129.061	0. 43. 24.180	689.380	686.519	2.861
la14	75.096	129.137	0. 43. 24.700	689.900	686.737	3.163

STATION	QTY	MEAN	WT. MEAN	MEDIAN	DT/DDEL
1a02	a	-0.669	-0.637	-0.836	5.740
1a03	b	0.115	0.147	-0.052	5.760
1a04	a	-0.329	-0.298	-0.497	5.760
1a05	a	0.232	0.264	0.065	5.760
1a06	a	0.271	0.303	0.104	5.760
1a07	c	0.244	0.275	0.077	5.760
1a11	x	-0.326	-0.295	-0.494	5.760
1a12	x	0.287	0.319	0.120	5.760
1a13	c	-0.083	-0.052	-0.250	5.740
1a14	a	0.219	0.251	0.052	5.740

FIGURE CAPTIONS

Figure 1. Lassen teleseismic stations (Table 1). Inset gives map location. Stations are indicated by squares. Lassen Volcanic National Park and the northern shore of Lake Almanor are shown, as well as several volcanic and geothermal features indicated by small dots. Lassen Peak is outlined by its 9000-ft contour, Chaos Crags by the 8000-ft contour.

2. Epicenters of the 65 large events used in this report. The array is indicated by the rectangle in the center of the plot. Circles are drawn at delta = 30^{o}, 60^{o}, 90^{o}, and 100^{o} from the array. Teleseisms are shown as x's; the PKIKP event is plotted as a dot. See also Table 2.

3. Weighted relative residuals (s) versus station elevations (km) for all events. Linear regressions to fit the mean relative residual averaged over all events (cf. Figure 4a) for all stations (solid line) and for all stations except "1a02" (dashed line) are shown. Labels include the corresponding predicted elevation-correction velocities.

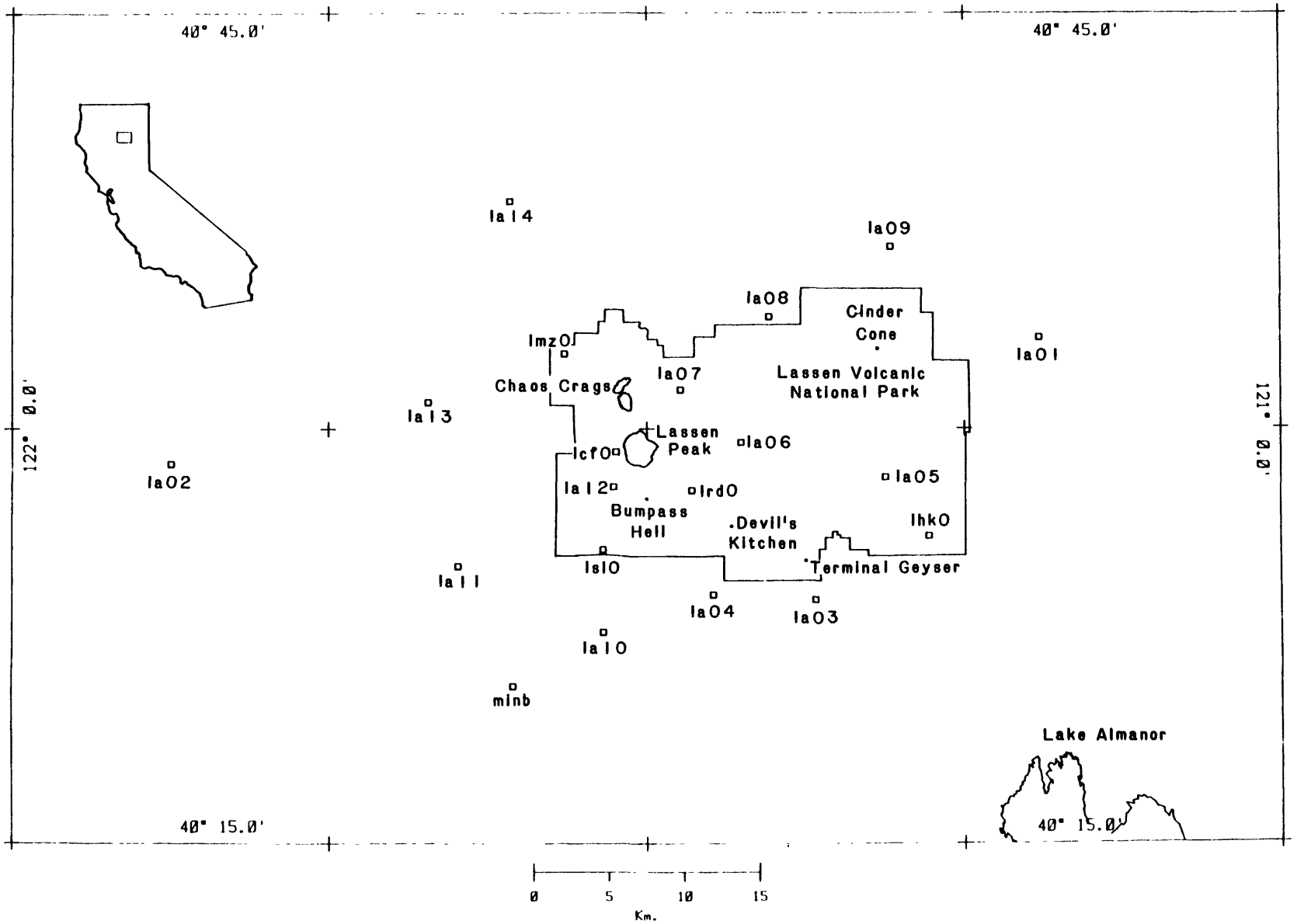
4. Hand-contoured, average weighted relative residuals for various groups of events. Contour interval 0.1 s. Values (s) at each reporting station are shown. See Figure 1 for station names and labels of geothermal and volcanic features indicated by small dots. Arrows indicate the mean direction of rays from the events to the array.

   (a) Relative residuals averaged over all 65 events.
   (b) Relative residuals averaged over 2 northeast events.
   (c) Relative residuals averaged over 17 southeast events.
   (d) Relative residuals averaged over 31 southwest events.
   (e) Relative residuals averaged over 14 northwest teleseisms.
   (f) Relative residuals averaged over one northwest PKIKP event.

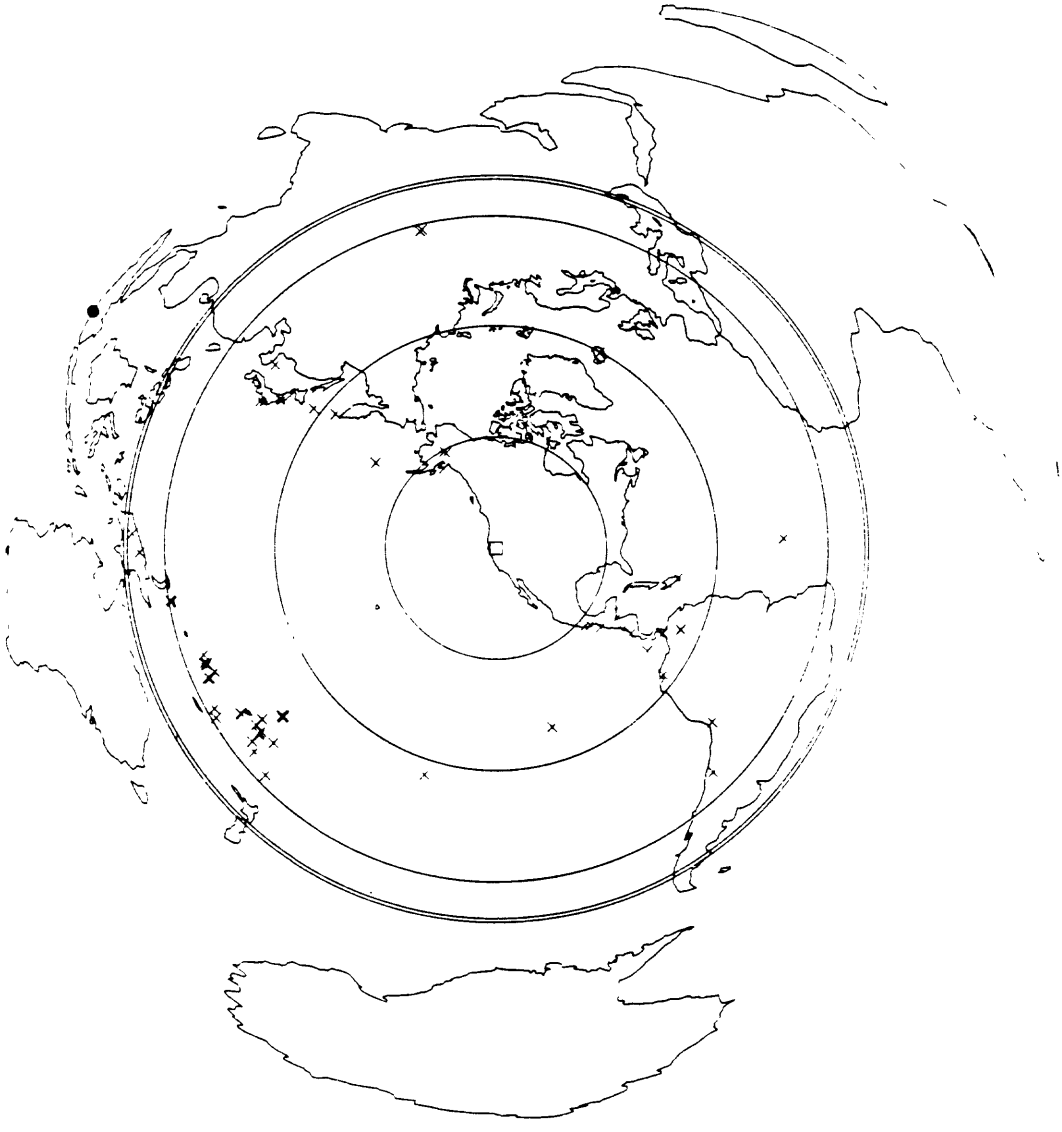
5. Map of isostatic residual gravity for the Lassen Volcanic National Park region. From: Roberts et al., 1981. Contour interval 10 mgal. Reduction density 2.67 g/cm^3. See Figure 1 for labels of teleseismic stations and geothermal and volcanic features indicated by small dots.

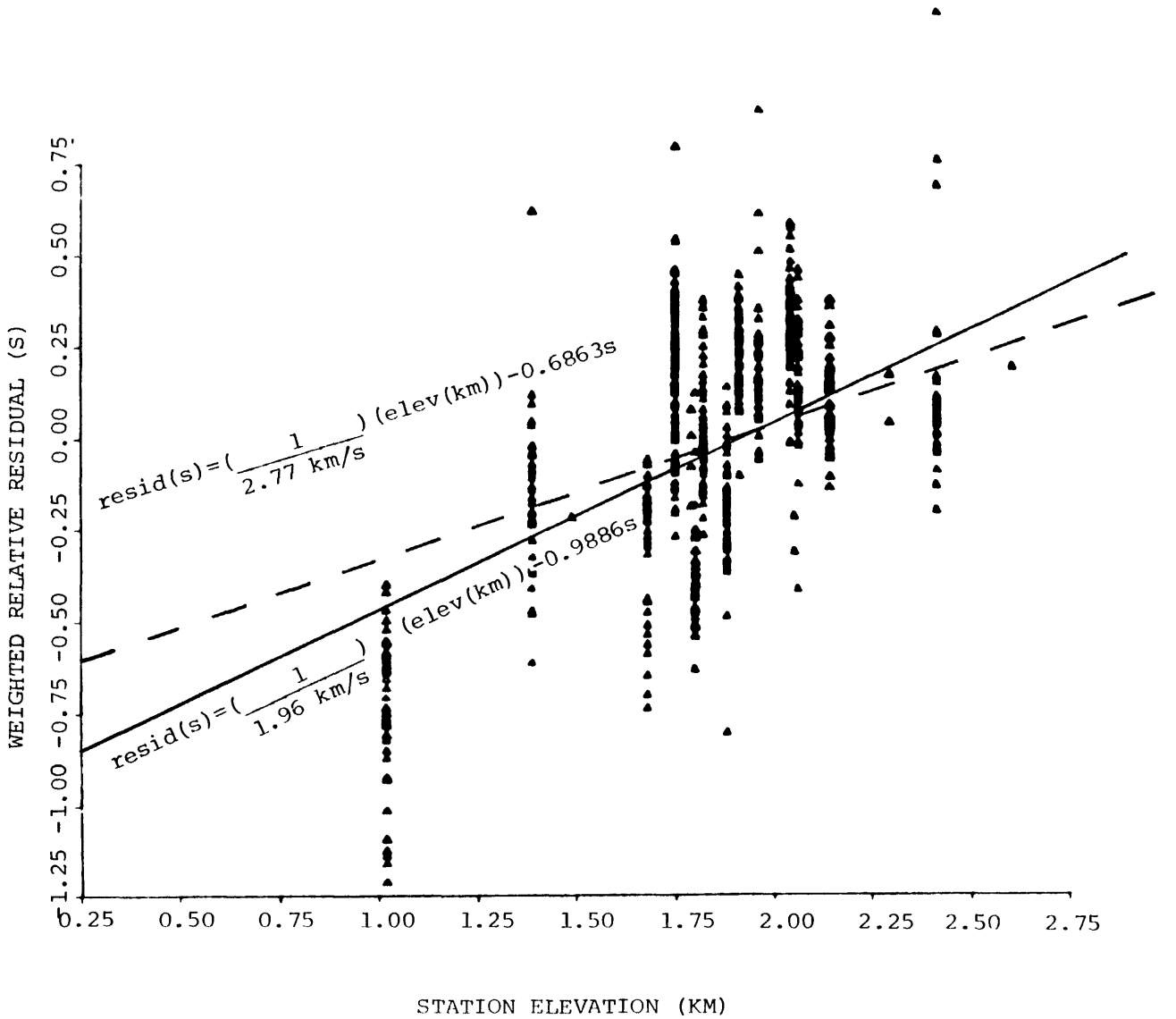
6. Correlation between mean relative residuals (Table 3, Figure 4a) and isostatic residual gravity (Figure 5). The points have been fit with a line having a slope of -0.170 s/mgal and an intercept at -0.4719 s. The correlation coefficient for the linear regression is -0.8119.

LASSEN TELESEISMIC STATIONS

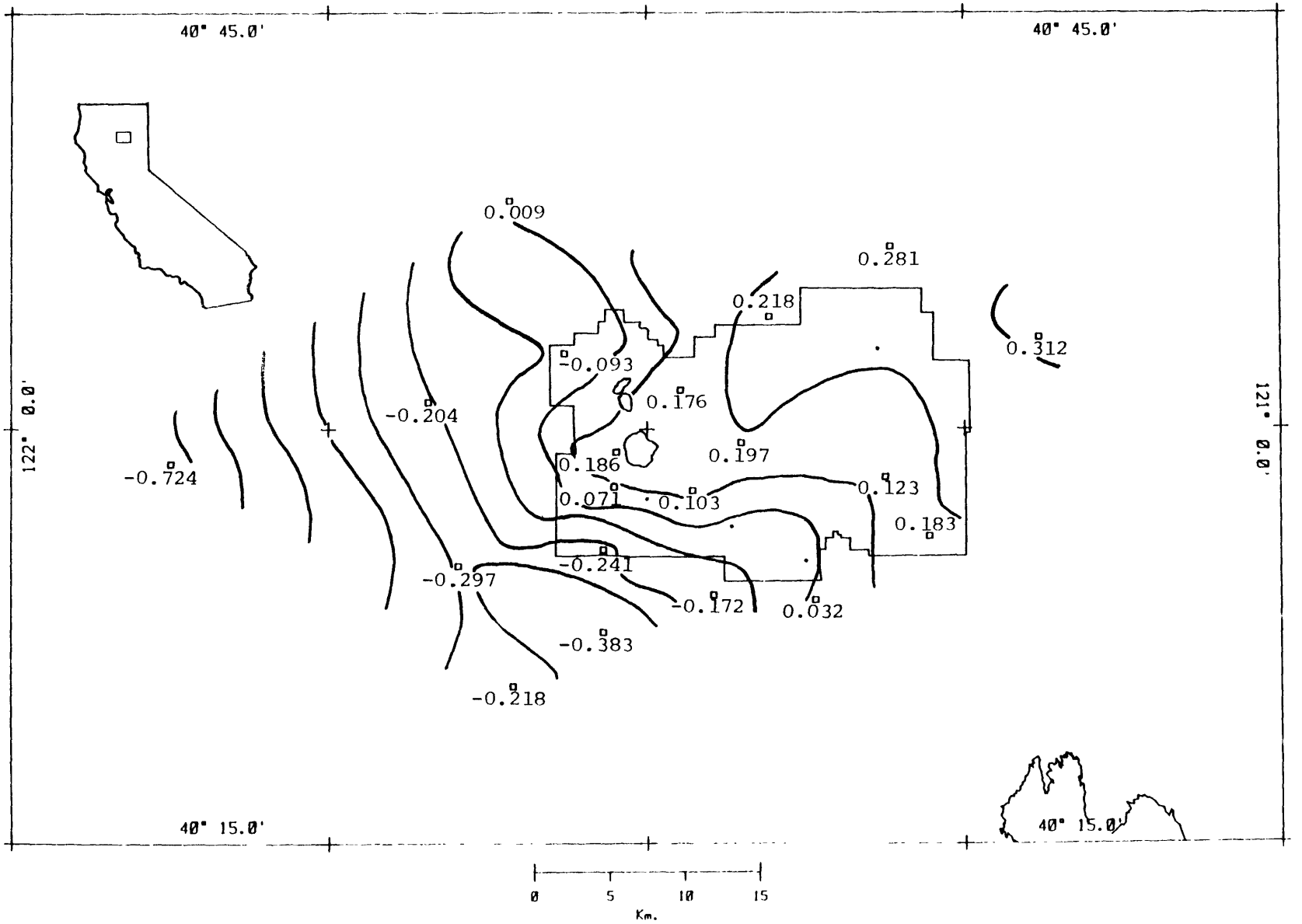


Epicenters of events recorded by the
Lassen teleseismic array

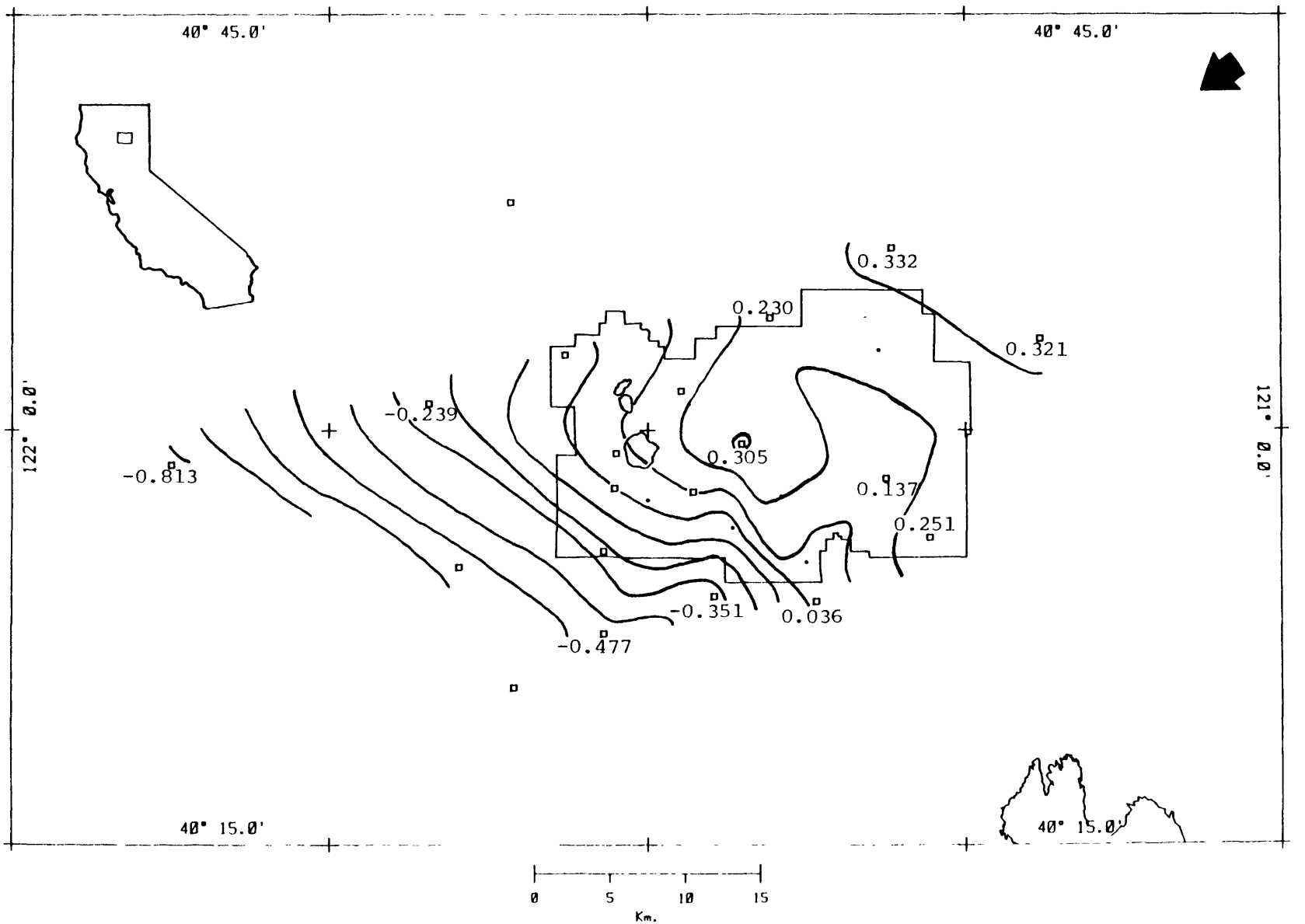



WEIGHTED RELATIVE RESIDUAL (S)
-1.25
-1.00
-0.75
-0.50
-0.25
0.00
0.25
0.50
0.75
0.25
0.50
0.75
1.00
1.25
1.50
1.75
2.00
2.25
2.50
2.75
STATION ELEVATION (KM)
resid(s)=(1/2.77 km/s)(elev(km))-0.6863s
resid(s)=(1/1.96 km/s)(elev(km))-0.9886s

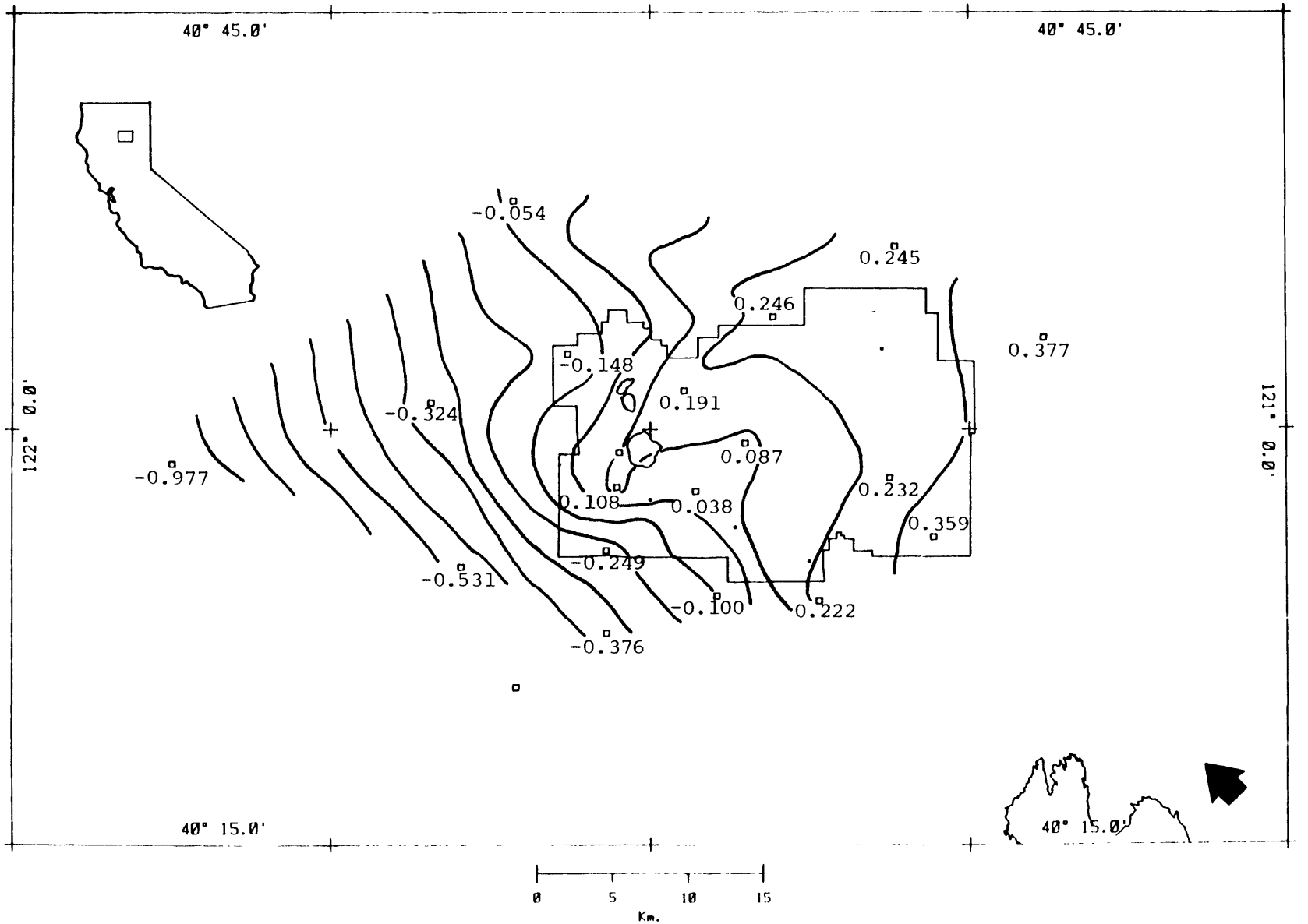
Teleseismic P-wave Traveltime Residuals-- All 65 Events



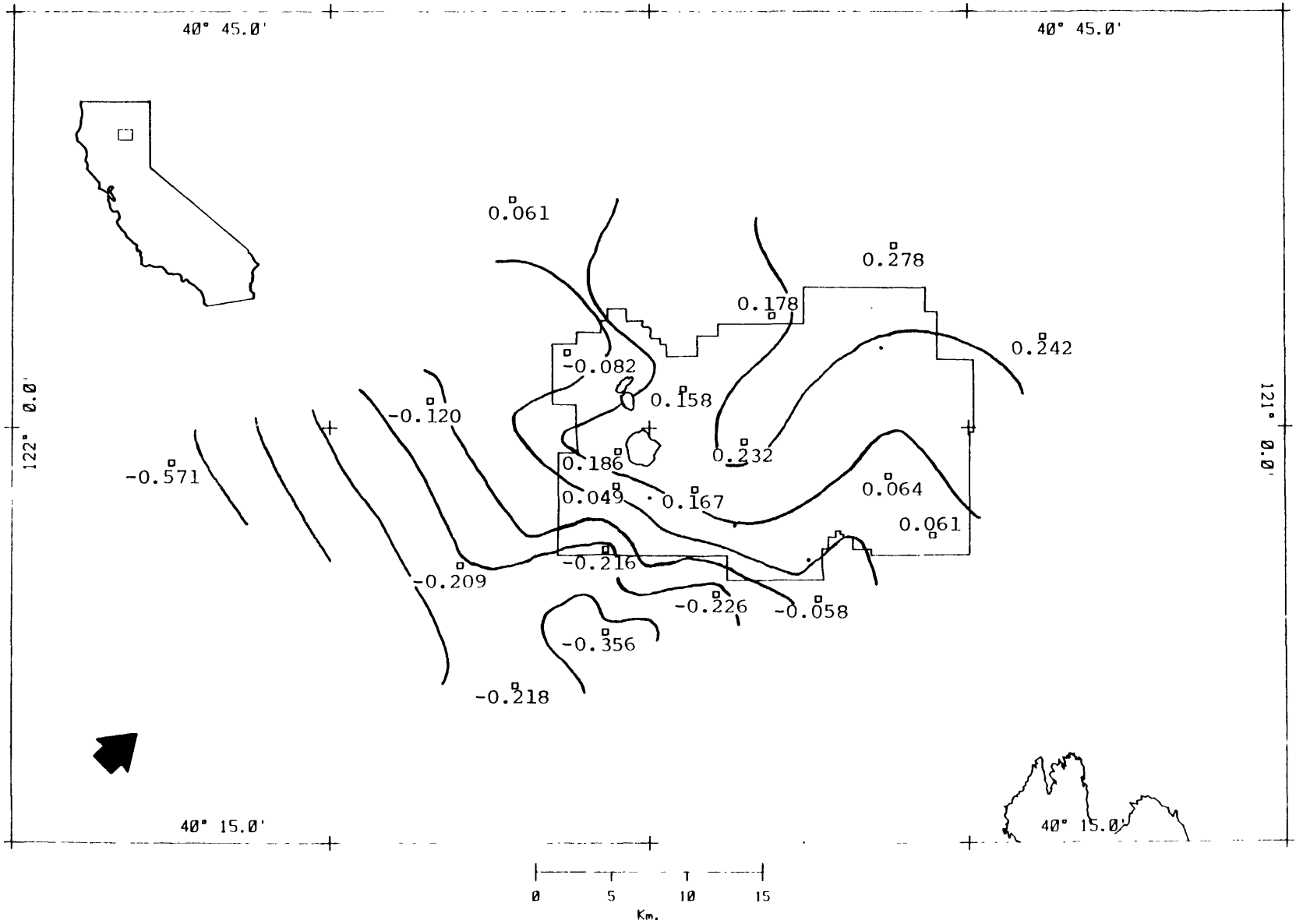
Teleseismic P-wave Traveltime Residuals-- 2 Northeast Events



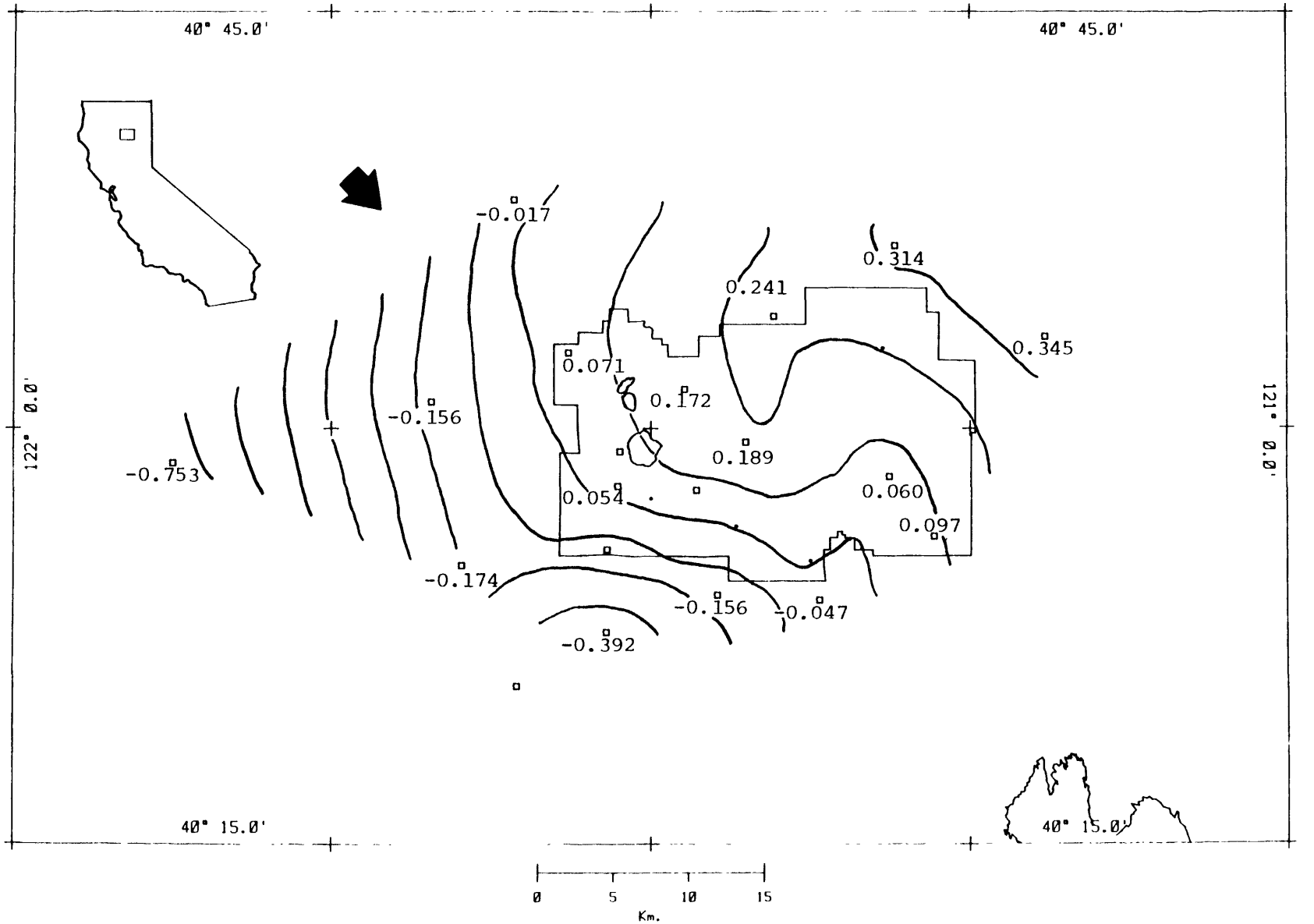
Teleseismic P-wave Traveltime Residuals-- 17 Southeast Events



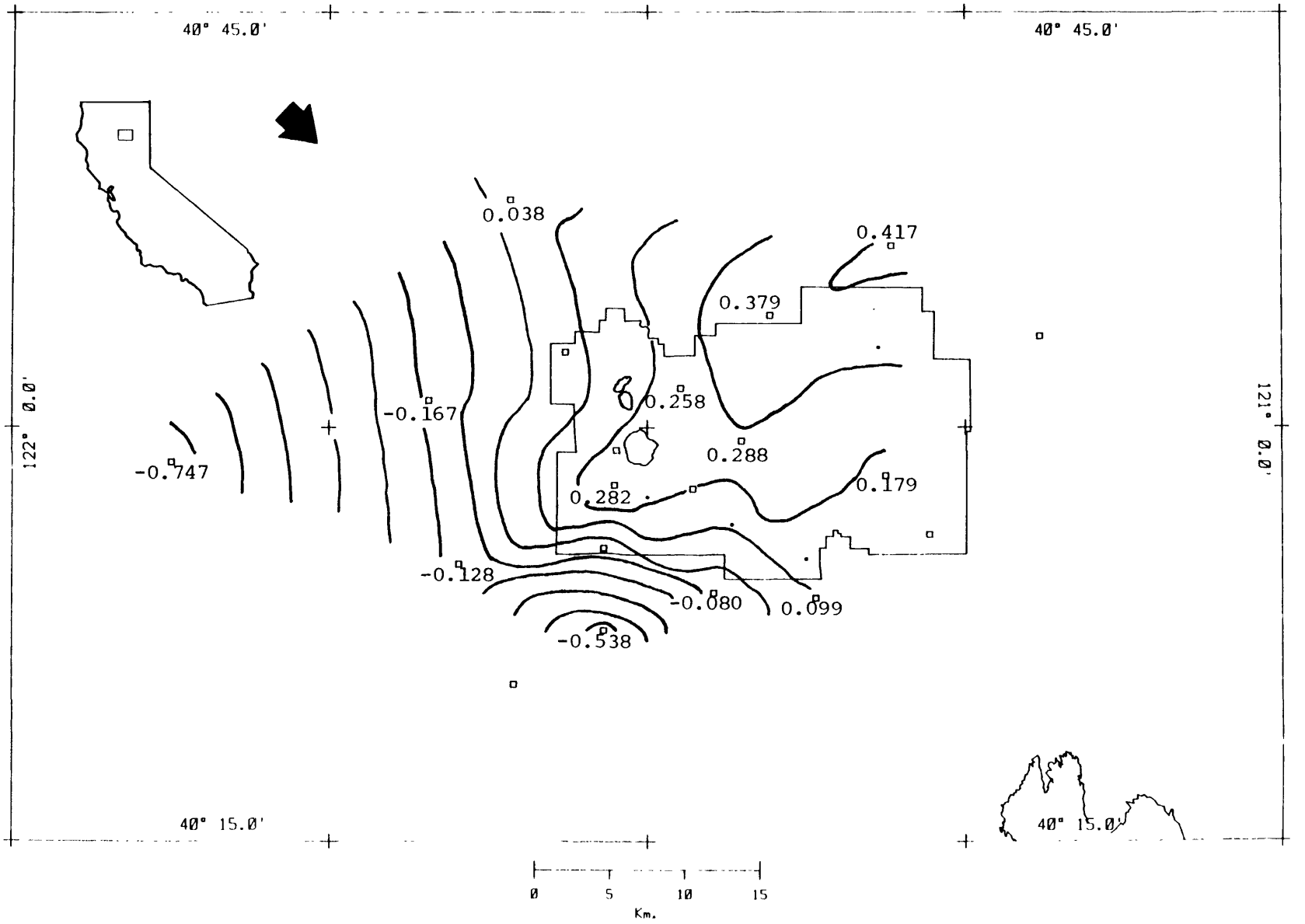
Teleseismic P-wave Traveltime Residuals-- 31 Southwest Events



Teleseismic P-wave Traveltime Residuals-- 14 Northwest Events



Teleseismic P-wave Traveltime Residuals-- 1 Northwest PKIKP Event



Isostatic Residual Gravity (mgal)

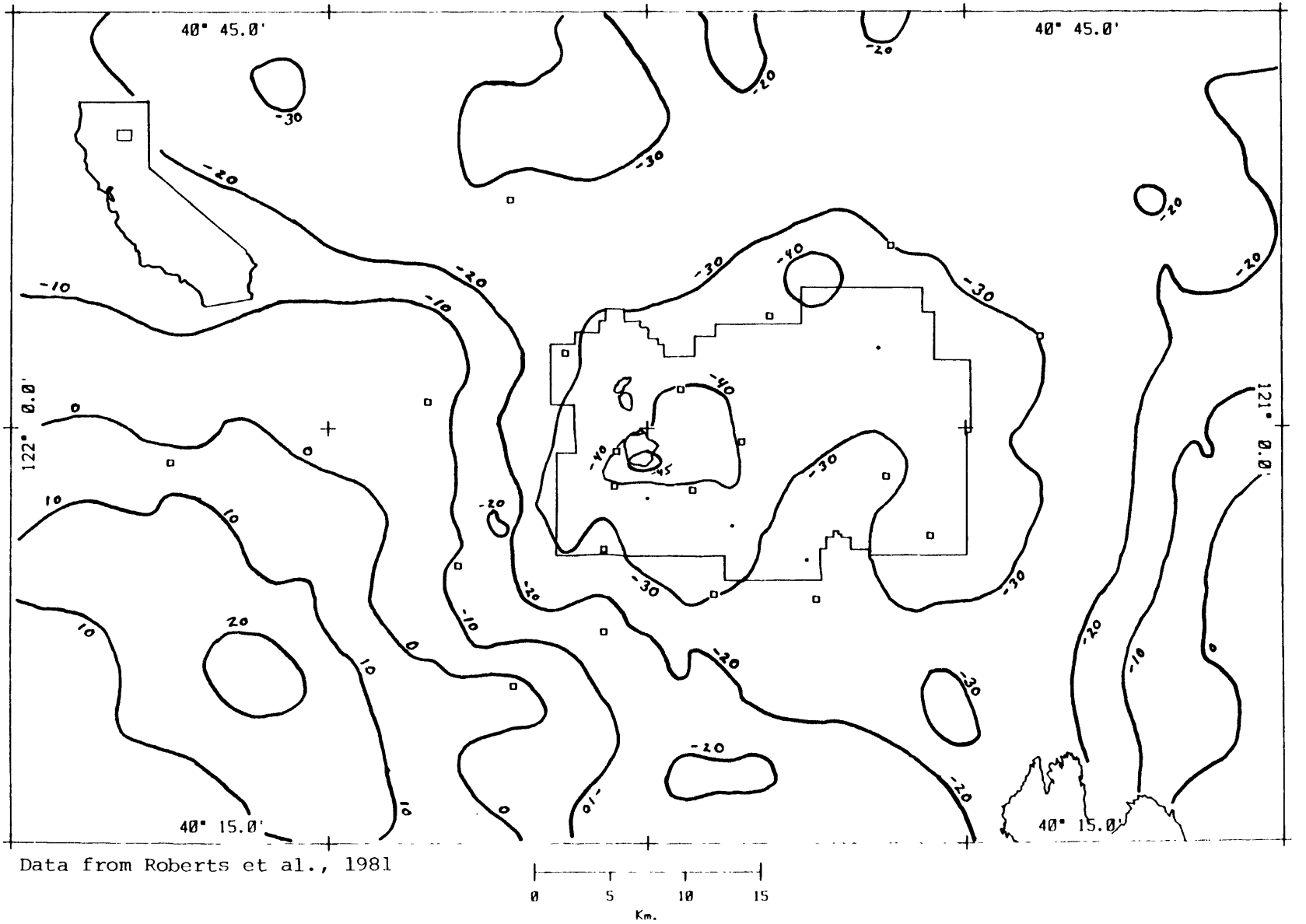
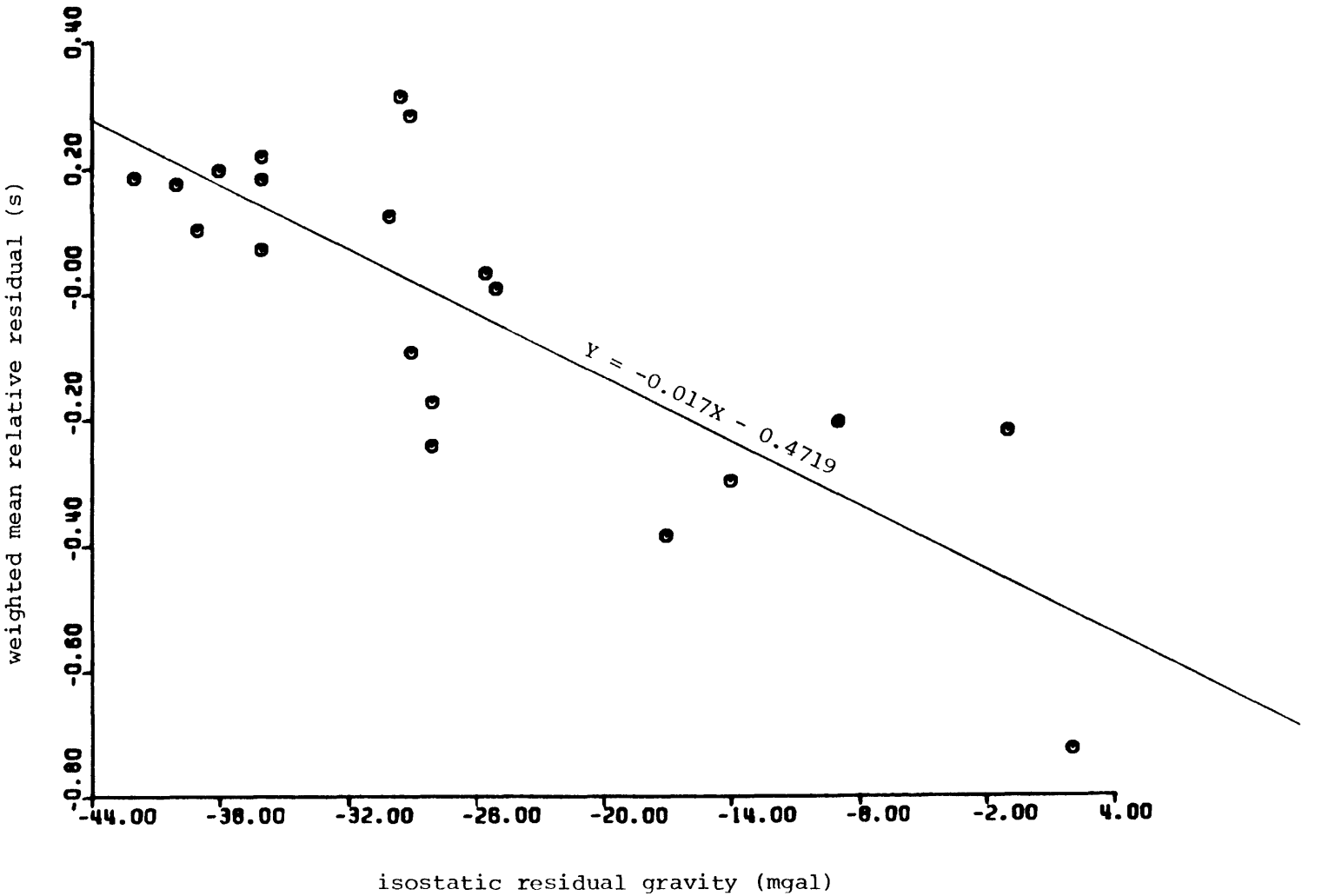


Figure 6


weighted mean relative residual (s)
0.40
0.20
-0.00
-0.20
-0.40
-0.60
-0.80
Y = -0.017X - 0.4719
-44.00
-38.00
-32.00
-26.00
-20.00
-14.00
-8.00
-2.00
4.00
isostatic residual gravity (mgal)