



BUREAU OF MINERAL RESOURCES, GEOLOGY AND GEOPHYSICS

RECORD

RECORD NO. 1986/22

CADOUX MICROEARTHQUAKE SURVEY 1983

by

V.F. DENT & P.J. GREGSON



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SUMMARY

A microearthquake survey, which consisted of the deployment of 20 portable tape recorders, was conducted near Cadoux, WA during October-December 1983.

Data collected by these instruments have been used to locate thirty one earthquakes from the South West Seismic Zone of Western Australia.

Most of the earthquakes located occurred near Cadoux. Some appear to be part of an aftershock sequence. Others possibly lie on a fracture zone caused by the major Cadoux earthquake of 2 June 1979.

1. INTRODUCTION

In October 1983 the BMR Crustal Studies Group carried out a seismic refraction survey in the Yilgarn Block of Western Australia.

Following this survey, twenty portable tape recording seismograph units were available for deployment in the seismically active Cadoux area. They were operated for a week, with four of them continuing operation for a further five weeks.

Recordings from the larger earthquakes were played back from tape onto chart recordings for analysis.

The purpose of this record is to list the details of station locations, times of earthquake occurrences, arrival times of earthquake phases and hypocentral data for the larger events. This information will be a basis for future detailed interpretation. These earthquakes are the most accurately located in Western Australia.

2. STATIONS AND INSTRUMENTATION

Sixteen seismograph tape recorders were operated in the Cadoux area on a square grid with approximately 4 km spacing from 25 October to 2 November 1983. Four additional tape recorders and the permanent station at Ballidu were evenly spaced on a circle 40 km from Cadoux. These were operated from 27 October to 15 December 1983. Station locations and equipment numbers are listed in Table 1 and shown in Figure 1. In addition, a portable visual Sprengnether (MEQ800) seismograph was operated near the centre of the grid to determine the total number of earthquake occurrences and to facilitate identification of the larger events for play-back.

3. DATA RETRIEVAL

Approximately 200 earthquakes were recorded on the Sprengnether recorder during the week when all recorders were operating. Details of approximate origin time, recording trace amplitude and locality of each earthquake identified from the Sprengnether are listed in Table 2. A further 54 earthquakes are listed for the subsequent five weeks using the Ballidu station as a monitor.

Playback

The data on magnetic tape was played back onto chart paper, partly on a small field play-back unit, and partly on a larger office-based unit. Various chart speeds could be selected and the majority of the events were played back at speeds of 25 or 30 mm per second. Some have been scaled off charts played back at only 6 mm/sec.

Limitations

The accuracy of the earthquake arrival times depended on three main factors.

Playback speed. The faster the playback speed, the more accurately the arrivals could be scaled. For the inner network, where an accuracy of a few

hundredths of a second was desirable, a playback speed of 25 - 30 mm/sec. was generally used. At this speed, a scaling could be made to an accuracy of +/- 0.01 seconds.

Time corrections. Corrections on the clocks were determined in the field at weekly intervals. For the inner network, that means twice; when the stations were set up and when they were closed down a week later. The time corrections were measured to an accuracy of two milliseconds.

Time corrections should also have been recorded on tape during the life of the survey. However from the data played back, they could be measured only in a few instances. The corrections could not be estimated as accurately as those done in the field, and they seemed to show that the clock rates in a number of cases was fairly erratic. This means that it cannot be safely assumed a clock correction can be accurately found by interpolating errors measured at the beginning and end of the survey.

For the purposes of this preliminary study, time corrections have been ignored except in a few cases where there is more confidence in the time correction, i.e. it can be measured from the play-back itself, or residuals indicate that the interpreted clock corrections are probably correct. Known time corrections are shown in Figure 2. Where corrections have been applied to arrival times they are indicated in the Appendix.

Quality of arrivals. Most arrivals at the inner network stations were impulsive, and could be picked with a high degree of confidence. However, it was often much harder to pick arrivals at outer network stations.

Completeness of data

Only 30 of the 200+ events recorded during the survey have been located. These events were selected for playing back on the basis of having larger than average amplitudes on the Sprengnether recorder (see Table 2) and ranged from magnitude ML = 0.6 to 2.1. Due to the limited time available, many locateable events were not played back, and also data sets for some of the earthquakes which have been located are not complete.

4. EARTHQUAKE LOCATIONS

Method

The earthquakes were located using a computer program "FASTHYPO" which was published by Herrmann (1979). Within the BMR, it is known as "FASTO". The program has been modified by V.F.Dent for batch processing, and the output format has been changed to display S-P intervals and time corrections. The outputs are reproduced in the Appendix, and are summarised in Table 3 and plotted in Figure 3.

The crustal model which was used in this program is shown below.

Depth	Velocity
0 - 1 km	5.95 km/sec
1 - 11	6.08
11 - 15	6.17
15 - 30	6.55
30 - 36	6.95
36 - 50	8.10
> 50	8.20

This model can be expected to need revision in the future, depending to a large extent on the results of the seismic refraction survey mentioned above. However, it is unlikely that the changes to the model will have a significant effect on the locations shown in Table 3, because of the extreme proximity of the recording stations to most of the earthquakes located. Conversely, accurately knowing the locations of the events is potentially useful in verifying any adopted model, and identifying any azimuthal variations in velocity.

Comparison of solutions

Different hypocentres can be determined for an earthquake, depending on various parameters. Some of the more important ones are - the location method used, the earth model used, the group of arrival times used, and the weighting assigned to the arrivals used.

Of the earthquakes located in Table 3, three were located by the Mundaring observatory before survey data were available. These events were located using a manual technique - i.e. origin times and hence distances were computed from S-P times, and then plotted on a regional map.

A comparison of these solutions with those determined by "FASTHYPO", using the additional data provided by the survey, is shown below.

Day	Date	WST	⁰ Lat S	⁰ Long E	Depth	
26	26 Oct	0706	30.72	117.08	+/- .05	5 MGO (5 stations)
			30.733	117.124	+/- .004	4.0 FASTHYPO locn.
28	28 Oct	0256	30.71	117.12	+/- .05	5 MGO (4 stations)
			30.741	117.190	+/- .005	4.4 FASTHYPO locn.
36	05 Nov	2034	30.74	116.54	+/- .05	5 MGO (3 stations)
			30.75	116.40	+/- .05	5.8 FASTHYPO locn.

The above data indicated that the solutions are correct within their quoted accuracy for the first two events. There is a larger discrepancy for the third event, but the FASTHYPO location is not a good one for this event, as it falls outside of the network of temporary survey stations.

5. EARTHQUAKE ACTIVITY - CADOUX AREA

Since the large (ML 6.2) Cadoux earthquake of 2 June 1979 (Gregson & Paull, 1979), smaller earthquakes have occurred in a fairly broad area around the town. The level of activity has varied from month to month. The number of earthquakes of magnitude ML > 2 located in the area from August to December 1983 were:

August - 9; September - 17; October - 5; November - 1; December - 1.

This suggests that the survey was recording the tailing-off part of a period of higher than normal activity in the region. Details of earthquakes in the period January - December 1983 are listed in Table 4, and plotted on Figure 4. This figure shows the fairly broad distribution of earthquakes around the town, with a possible trend in a NNE-SSW direction.

The largest earthquake located in this study was also the first earthquake to be recorded (26 Oct, 0706 LT, ML 2.4). Its location is given above, and a significant number of later (and smaller) events located lie very close to this event. This suggests the likelihood that a high proportion of the unlocated events recorded by the survey are also probable aftershocks of this event - particularly in the first few days of the survey, when event numbers were highest.

Of the other events located, there is a possible linear feature, striking at about 135 degrees, and about 4 km. to the east of the above cluster. These events would fall on the Kalajzic Fault (Lewis et al, 1981) or its projection to the south-east.

This linearity also seems to correlate with a linearity which is apparent, but unmentioned, in Fig. 3, Lewis et al. (1981) - Earthquake Epicentres in the Cadoux Area, 1959 -1978.

A less obvious correlation could be the observation that the close cluster of events mentioned above, lies at the projected intersection of the Lone Tree Fault and the Tank Fault (Lewis et al., 1981).

6. CONCLUSIONS

Thirty-one earthquakes in the Cadoux area were located with a relatively high degree of accuracy. These will provide useful data for further studies of the geophysics of the region. Further examination of the data recorded during the survey could provide more hypocentral data, and refinements to the hypocentral data presented here, although the differences may not be significant.

7. ACKNOWLEDGEMENTS

We would like to acknowledge the co-operation of the farmers listed in Table 1 in allowing the operation of the recorders on their properties. We also acknowledge the assistance of Tim Barton and Jim Whatman of the Crustal Studies Group in setting up the recorders; and Jim Whatman for his assistance with the playback of the tapes.

8. REFERENCES

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- HERRMANN, R.B. (1979) - Fasthypo, A Hypocenter Location Program, *Earthquake Notes, Vol. 50, No 2, Apr-Jun 1979.*
- LEWIS, J.D., DAETWYLER, N.A., BUNTING, J.A., & MONCRIEFF, J.S. (1981) - The Cadoux Earthquake, 2 June 1979, *Geological Survey of Western Australia, Report 11.*

TABLE 1
CADOUX MICROEARTHQUAKE SURVEY

STATION DATA

STN CODE	LOCATION	SET NO.	GRID		REFERENCE		LATITUDE S	LONGITUDE E
			mN		mE			
200	Ballidu	00	6 613 958		471 930		30 36'23.4"	116 42'25.8"
201	Konongorring	09	6 568 300		487 080		31 01 30.0	116 51 49.8
202	Koorda (Sth)	05	6 565 680		534 220		31 02 30.0	117 21 30.0
203	Koorda (Nth)	07	6 610 447		549 116		30 38 15.0	117 30 45.2
204	Kalannie	04	6 635 562		515 389		30 24 42.4	117 09 36.8
205	S. Booth	31	6 606 500		508 250		30 40 25.2	117 05 09.0
206	S. Booth	06	6 606 500		511 080		30 40 25.2	117 06 54.0
207	C. Mincherton	33	6 606 790		514 160		30 40 22.8	117 08 49.2
208	J. Kalaizic	02	6 605 880		517 290		30 40 45.0	117 10 45.0
209	C. Mincherton	08	6 603 280		508 380		30 42 10.0	117 05 13.2
210	C. Mincherton	24	6 603 220		511 380		30 42 13.2	117 07 06.0
211	C. Mincherton	27	6 602 880		514 280		30 42 24.0	117 08 55.8
212	F. Menz	29	6 603 620		516 830		30 42 00.0	117 10 30.0
213	C. Booth	30	6 601 200		508 810		30 43 18.0	117 05 28.8
214	H. McCashney	23	6 600 120		511 500		30 43 51.0	117 07 11.4
215	T. Kalaizic	32	6 600 790		514 660		30 43 32.4	117 09 10.8
216	J. Leggo	28	6 600 790		518 040		30 43 32.4	117 11 14.4
217	Shire	03	6 597 190		507 540		30 45 28.2	117 05 05.3
218	Shire	25	6 597 340		511 500		30 45 24.0	117 06 24.0
219	E. Cummings	22	6 597 390		514 470		30 45 22.8	117 09 01.8
220	R. Applegate	01	6 597 310		517 690		30 45 24.0	117 11 00.0
SPR	T. Kalaizic	--	6 601 070		515 390		30 43 22.6	117 09 34.5

TABLE 2
EARTHQUAKES RECORDED

DATE 1983	UT	TAPE DAY	WST	SPR S-P	SPR AMP	REMARKS
OCT 26	1141	26	1941	0.6	1.0	Cadoux
	1143		1943	0.6	2.0	Cadoux
	1157		1957	0.3	2.0	Cadoux
	1308		2108	0.3	1.5	Cadoux
	1315		2115	0.8	3.0	Cadoux
	1407		2207	0.2	1.5	Cadoux
	1413		2213	0.3	2.5	Cadoux
	1424		2224	0.2	3.5	Cadoux
	1443		2243	1.7	3.0	Cadoux
	1504		2304	-	3.0	Cadoux
	1507		2307	0.4	1.5	Cadoux
	1508		2308	0.2	2.5	Cadoux
	1519		2319	0.7	3.0	Cadoux
	1751	27	0211	-	6.5	Cadoux
	2149		0549	0.3	3.5	Cadoux
	2320		0720	-	5.5	Cadoux
	2349		0759	-	4.0	Cadoux
Oct 27	0141		0941	-	5.0	Cadoux
	0431		1242	-	4.5	Cadoux
	0425		1245	-	3.5	Cadoux
	0736		1536	-	2.5	Cadoux
	1209		2009	-	5.0	Cadoux
	1329		2129	2.1	1.0	Cadoux
	1349		2149	0.6	1.0	Cadoux
	1354		2154	0.6	3.5	Cadoux
	1431		2231	0.5	3.0	Cadoux
	1620	28	0020	-	1.0	Cadoux
	1702		0102	-	1.5	Cadoux
	1712		0112	-	1.0	Cadoux
	1856		0256	0.6	12+	Cadoux
	1856		0256	-	8	Cadoux
	1857		0257	-	2.0	Cadoux
	1858		0258	-	1.5	Cadoux
	1859		0259	-	2.0	Cadoux
	1900		0300	0.6	1.0	Cadoux
	1900		0300	-	0.5	Cadoux
	1900		0300	-	3.0	Cadoux
	1925		0325	-	1.5	Cadoux
	1929		0329	-	1.0	Cadoux
	1933		0333	-	5.5	Cadoux
	1934		0334	-	1.0	Cadoux
	1940		0340	-	2.0	Cadoux
	1940		0340	-	3.0	Cadoux
	1946		0346	-	1.0	Cadoux
	1948		0348	0.3	2.0	Cadoux
	1950		0350	-	2.0	Cadoux
	1951		0351	-	2.0	Cadoux
	1951		0351	-	2.0	Cadoux
	1954		0354	-	1.0	Cadoux
	1955		0355	-	1.0	Cadoux

TABLE 2 (cont.)

DATE 1983	UT	TAPE DAY	WST	SPR S-P	SPR AMP	REMARKS
Oct 27	2000	28	0400	-	0.5	Cadoux
	2004		0404	-	1.0	Cadoux
	2012		0412	-	2.0	Cadoux
	2014		0414	-	2.0	Cadoux
	2016		0416	-	1.0	Cadoux
	2026		0426	-	2.5	Cadoux
	2027		0427	-	1.5	Cadoux
	2029		0429	-	1.0	Cadoux
	2029		0429	-	1.5	Cadoux
	2029		0429	-	0.8	Cadoux
	2033		0433	-	1.0	Cadoux
	2034		0434	-	1.0	Cadoux
	2038		0438	-	1.0	Cadoux
	2038		0438	-	1.0	Cadoux
	2048		0448	-	1.0	Cadoux
	2102		0502	-	2.0	Cadoux
	2107		0507	0.3	2.5	Cadoux
	2107		0507	-	1.0	Cadoux
	2125		0525	-	1.0	Cadoux
	2127		0527	-	2.0	Cadoux
	2133		0533	0.7	4.0	Cadoux
	2139		0539	-	1.0	Cadoux
	2149		0549	0.6	4.5	Cadoux
	2159		0559	-	0.8	Cadoux
	2208		0608	-	2.0	Cadoux
	2210		0610	-	1.5	Cadoux
	2215		0615	-	2.0	Cadoux
	2227		0627	-	2.5	Cadoux
	2230		0630	-	0.8	Cadoux
	2234		0634	-	2.0	Cadoux
	2242		0642	-	1.5	Cadoux
	2302		0702	-	2.0	Cadoux
Oct 28	0004		0804	-	3.0	Cadoux
	0019		0819	-	2.5	Cadoux
	0025		0825	-	3.0	Cadoux
	0027		0827	0.6	0.6	Cadoux
	0034		0834	-	-	Cadoux
	0101		0901	-	1.0	Cadoux
	0103		0903	-	3.0	Cadoux
	0112		0912	-	2.0	Cadoux
	0113		0913	-	3.5	Cadoux
	0122		0922	-	1.5	Cadoux
	0126		0926	0.4	2.5	Cadoux
	0143		0943	-	1.0	Cadoux
	0149		0949	-	2.0	Cadoux
	0159		0959	-	2.0	Cadoux
	0208		1008	-	2.0	Cadoux
	0209		1009	-	2.0	Cadoux
	0230		1016	-	2.0	Cadoux
	0231		1031	-	2.0	Cadoux

TABLE 2 (cont.)

DATE 1983	UT	TAPE DAY	WST	SPR S-P	SPR AMP	REMARKS
Oct 28	0241	28	1041	-	3.0	Cadoux
	0557		1357	0.3	4.5	Cadoux
	0720		1520	-	3.0	Cadoux
	0738		1538	0.3	2.0	Cadoux
	0944		1744	-	1.0	Cadoux
	1049		1849	-	0.8	Cadoux
	1103		1903	-	6.0	Cadoux
	1120		1920	-	2.0	Cadoux
	1121		1921	-	1.5	Cadoux
	1127		1927	0.6	2.0	Cadoux
	1138		1938	-	2.5	Cadoux
	1146		1946	0.6	4.0	Cadoux
	1152		1952	-	1.5	Cadoux
	1218		2018	-	2.0	Cadoux
	1256		2056	-	0.5	Cadoux
	1356		2156	-	2.2	Cadoux
	1421		2221	0.2	1.1	Cadoux
	1459		2259	-	1.0	Cadoux
	1511		2311	-	4.0	Cadoux
	1513		2313	-	3.0	Cadoux
	1541		2341	-	0.8	Cadoux
	1604	29	0004	0.1	2.5	Cadoux
	1614		0014	-	1.5	Cadoux
	1632		0032	-	0.8	Cadoux
	1744		0144	-	1.0	Cadoux
	1745		0145	-	1.0	Cadoux
	1810		0210	-	4.0	Cadoux
	1848		0248	-	1.8	Cadoux
	1920		0320	-	0.9	Cadoux
	1942		0342	0.5	3.0	Cadoux
	2032		0432	-	2.0	Cadoux
	2041		0441	0.2	3.0	Cadoux
	2105		0505	-	7.0	Cadoux
	2211		0611	-	3.0	Cadoux
	2225		0625	12	0.7	???
	2340		0740	-	1.5	Cadoux
Oct 29	0205		1005	-	2.0	Cadoux
	0216		1016	-	2.0	Cadoux
	0216		1016	-	2.0	Cadoux
	0509		1309	-	1.5	Cadoux
	0621		1421	-	2.5	Cadoux
	1036		1836	-	2.0	Cadoux
	1109		1909	-	4.5	Cadoux
	1120		1920	-	2.5	Cadoux
	1635	30	0035	0.6	4.5	Cadoux
	1900		0300	-	5.5	Cadoux
	2132		0532	-	2.5	Cadoux
	2152		0552	-	2.5	Cadoux
Oct 30	0124		0924	-	1.5	Cadoux
	0134		0934	-	2.5	Cadoux

TABLE 2 (cont.)

DATE 1983	UT	TAPE DAY	WST	SPR S-P	SPR AMP	REMARKS
Oct 30	0648	30	1448	-	7+	Cadoux
	1135		1935	-	4.0	Cadoux
	1235		2035	-	5.5	Cadoux
	1749	31	0149	-	2.0	N Ballidu
	1755		0155	-	6.5	Cadoux
	1942		0342	-	4.5	Cadoux
Oct 31	0545		1345	-	5.0	Cadoux
	0626		1426	14.5	1.7	34km ENE Mukinbukin
	1942	32	0342	-	5.0	Cadoux
	1855		0255	-	4.0	Cadoux
Nov 01	1055		1855	-		L.Biddy
	1158		1958	-		L.Biddy
	1212		2012	-		??
				BAL S-P	BAL AMP	
Nov 04	0853	35	1653	-	14	Cadoux
	1014		1814	-	1	Cadoux
	1047		1847	-	1	Cadoux
	1516		2316	-	1	Cadoux
Nov 05	1234	36	2034	-	20	SW Cadoux
	2341	37	0741	-	12	Cadoux
Nov 06	0437		1237	-	2	Cadoux
	1635	38	0035	-	2	Cadoux
Nov 07	1335		2135	14	1.3	??
	1804	39	0204	-	1.6	Cadoux
	1833		0233	-	5	Cadoux
Nov 08	0348		1148	-	1.8	Cadoux
	1552		2352	-	1.5	Cadoux
Nov 09	0032	40	0832	-	2.0	N Ballidu
	0210		1010	-	1.0	Cadoux
	0939		1739	-	0.5	Collie
	1131		1931	-	4.5	Cadoux
	1213		2013	-	4.1	Meckering
	1227		2027	-	3.9	N Ballidu
	1459		2259	-	1.1	Cadoux
Nov 10	0710	41	1510	-	12	Cadoux
Nov 11	0548	42	1348	-	0.5	Collie
Nov 12	0635	43	1435	-	0.8	Cadoux
	1032		1832	-	2.8	Cadoux
	1035		1835	-	1.2	Cadoux
	2205	44	0605	-	6	Cadoux
	2351		0751	-	2.7	Ballidu
Nov 13	0956		1756	-	0.6	Cadoux
	1314		2114	-	1.1	Cadoux
	2346	45	0746	-	0.5	Collie
Nov 14	0635		1435	20	0.9	??
Nov 15	0911	46	1711	-	0.5	Collie
Nov 16	1338	47	2138	-	2.5	Meckering

TABLE 2 (cont.)

DATE 1983	UT	TAPE DAY	WST	BAL S-P	BAL AMP	REMARKS
Nov 18	0125	49	0925	-	1.7	Cadoux
	2316	50	0725	-	6.0	Cadoux
Nov 19	0257		1057	-	0.6	Cadoux
	1302		2102	-	0.9	Cadoux
Nov 21	2216	53	0616	-	5.0	Cadoux
Nov 22	1430		2230	-	3.4	Merredin
Nov 23	0536	54	1336	-	1.8	Cadoux
Nov 25	0423	56	1223	-	17	Cadoux
Nov 28	2138	60	0538	-	1.5	Merredin
Nov 29	0212		1012	-	-	
Dec 02	0006	63	0806	-	1.8	Cadoux
Dec 03	1148	64	1948	-	8	Cadoux
Dec 05	0210	66	1010	-	6	Cadoux
Dec 06	1447	67	2247	-	3.5	Cadoux
Dec 07	2211	69	0611	-	2.0	Cadoux
Dec 12	0230	73	1030	-	1.3	Collie
	0559		1359	-	1.8	Collie
	0718		1518	-	0.5	Cadoux
Dec 13	0742	74	1542	-	1.2	Brookton
	2311	75	0711	-	5	??
Dec 14	0200		1000	-	20+	Cadoux

TABLE 3
EARTHQUAKES LOCATED USING SURVEY DATA

DAY	TIME*	LAT	LONG	DEP	ML	ACC	REMARKS
26	0706	30 43.51	117 06.37	4.0	2.4	B	
27	0720	30 43.71	117 06.59	3.7		A	near event 29/0505
	2009	30 44.04	117 09.12	2.4	0.9	A	
28	0256	30 44.45	117 11.41	4.4	2.1	B	ALSO MGO LOCATED
	0256	30 44.40	117 11.06	1.0		B	
	0533	30 43.56	117 06.55	3.8		A	near event 29/0505
	0550	30 44.13	117 10.12	1.4		A	
	1357	30 44.34	117 10.72	0.7		A	
	1946	30 46.36	117 05.33	4.2	0.6	A	
	2311	30 44.00	117 10.28	0		A	
29	0210	30 43.40	117 09.01	1.5		B	
	0505	30 43.72	117 06.65	3.6	1.5	B	
	1909	30 43.88	117 06.71	3.8		A	near event 26/0706
30	0035	30 43.67	117 06.67	3.9		B	near event 26/0706
	0300	30 42.76	117 06.95	2.2		A	
	1448	30 43.93	117 06.59	3.3	1.2	B	near event 26/0706
	1935	30 43.79	117 06.74	3.8		B	near event 26/0706
	2035	30 43.46	117 07.04	3.1		B	near event 26/0706
31	0149	30 51.70	116 39.68	2.5	0.7	C	70 KM W OF CADOUX
	0155	30 45.10	117 09.29	1.3	0.7	A	
	0342	30 48.11	117 05.88	1.8	1.1	B	
	1345	30 44.17	117 10.04	1.7		A	
32	0255	30 44.79	117 10.95	0		A	
							INNER NETWORK NOW WITHDRAWN
35	1653	30 43.44	117 07.08	7.1	1.5	C	near event 26/0706
36	2034	30 44.90	116 24.18	5.8	1.8	C	120 KM W OF CADOUX
37	0741	30 50.52	117 04.56	5.0	1.2	C	
39	0233	30 42.18	117 07.92	0	1.1	C	
40	1931	30 45.22	117 07.78	6.3		C	
	2013	31 39.19	117 01.66	5.5	1.8	C	MECKERING
	2027	29 51.18	116 17.58	2.3	1.6	C	140 KM NW OF CADOUX
41	1510	30 47.66	117 06.12	13.8	1.4	C	
53	0616	30 46.77	117 05.87	0		C	

* WESTERN STANDARD TIME (GMT + 8 HRS)

ACCURACY

A +/- 0.3 KM OR LESS
 B +/- 0.3 TO +/- 1.0 KM
 C MORE THAN +/- 1.0 KM

TABLE 4
EARTHQUAKES IN CADOUX-MECKERING AREA 1983

DATE 1983	ORIGIN UT	LAT S	LONG E	DEP KM	MAG	LOCALITY	N A
JAN	05 124909.7	30.71	117.14	10G	2.4 ML	6 KM NNE CADOUX	5 A
	07 164522.6	30.83	117.10	10G	3.2 ML	7 KM S CADOUX	4 A
	07 202124.9	30.83	117.10	10G	2.2 ML	7 KM S CADOUX	3 B
	07 215540.5	30.83	117.10	10G	2.3 ML	7 KM S CADOUX	3 A
	07 233053.5	30.83	117.10	10G	2.0 ML	7 KM S CADOUX	3 A
	09 190832.0	30.85	117.06	10G	2.0 ML	11 KM SSW CADOUX	3 A
	15 004533.8	30.71	117.14	10G	2.7 ML	6 KM NNE CADOUX	5 B
	26 034902.9	30.73	117.13	10G	2.4 ML	4 KM N CADOUX	3 B
	26 061615.4	30.73	117.13	10G	4.8 ML	4 KM N CADOUX	9 A
	26 062605.4	30.73	117.13	10G	2.3 ML	4 KM N CADOUX	3 B
	28 071457.8	30.71	117.12	10G	2.1 ML	6 KM N CADOUX	3 A
	30 045000.0	30.72	117.11	10G	3.7 ML	5 KM N CADOUX	5 A
FEB	09 003728.7	30.71	117.14	10G	2.0 ML	6 KM NNE CADOUX	3 A
	10 164355.7	30.71	117.14	10G	2.5 ML	6 KM NNE CADOUX	4 A
MAR	18 031340.8	30.65	117.13	10G	2.2 ML	12 KM N CADOUX	4 A
	19 151450.0	30.75	117.10	10G	2.0 ML	3 KM NW CADOUX	3 A
	27 081414.4	30.72	117.17	10G	2.1 ML	7 KM NE CADOUX	3 A
APR	11 081304.0	30.88	117.11	10G	2.3 ML	12 KM S CADOUX	4 A
	16 185039.6	31.73	117.00	10G	2.4 ML	10 KM SSW MECKERING	4 B
	26 061155.2	30.71	117.18	10G	2.0 ML	8 KM NE CADOUX	4 A
	26 071307.2	31.69	117.03	10G	2.1 ML	5 KM SSE MECKERING	4 A
	26 071318.5	31.69	117.03	10G	2.2 ML	5 KM SSE MECKERING	4 A
MAY	08 153350.5	31.17	117.26	10G	2.0 ML	10 KM W WYALKATCKEM	3 A
	27 175915.5	30.73	117.16	10G	2.1 ML	8 KM NNE CADOUX	3 B
	31 213058.0	31.25	118.15	10G	2.2 ML	27 KM N MERREDIN	3 B
JUN	11 230347.5	31.24	116.57	10G	2.0 ML	8 KM ENE BOLGART	3 A
	16 045457.3	30.70	117.11	10G	2.2 ML	7 KM N CADOUX	3 A
	16 072221.3	30.71	117.14	10G	2.2 ML	6 KM NNE CADOUX	3 A
	21 083651.1	30.69	117.17	10G	2.2 ML	10 KM NNE CADOUX	3 A
	25 033317.3	30.71	117.14	10G	2.0 ML	6 KM NNE CADOUX	3 A
	29 003331.4	31.35	118.32	10G	2.1 ML	16 KM NNE MERREDIN	3 B
JUL	01 171814.3	31.59	116.95	10G	2.0 ML	7 KM ENE MECKERING	5 A
	02 133056.0	31.28	118.26	5	2.6 ML	22 KM N MERREDIN	4 A
	03 043152.6	31.28	118.26	5	2.5 ML	22 KM N MERREDIN	4 A
	10 174322.1	31.27	118.27	10G	2.2 ML	24 KM N MERREDIN	4 A
	10 185120.1	31.27	118.27	10G	2.5 ML	24 KM N MERREDIN	4 A
	16 222938.7	31.93	117.14	10G	2.1 ML	BALKULING	4 A
	22 024130.9	30.71	117.09	10G	2.6 ML	7 KM NNW CADOUX	4 A
	30 060457.0	31.93	117.14	10G	2.2 ML	6 KM NNE BALKULING	4 A
	30 16505407	31.93	117.14	10G	2.0 ML	6 KM NNE BALKULING	4 A
AUG	04 025525.3	31.28	118.26	10G	3.0 ML	22 KM N MERREDIN	5 B
	07 003836.5	30.75	117.11	10G	2.7 ML	4 KM NNW CADOUX	4 A
	07 102926.9	30.72	117.14	10G	2.0 ML	6 KM NNE CADOUX	3 A
	08 060327.4	30.80	117.13	10G	2.6 ML	3 KM S CADOUX	5 A
	08 071141.5	31.32	118.33	10G	2.0 ML	20 KM NNE MERREDIN	3 B
	13 094134.0	30.29	117.80	10G	2.0 ML	18 KM NNW BEACON	4 B
	15 170410.1	30.81	117.07	10G	2.0 ML	7 KM SW CADOUX	3 A
	15 173646.6	30.76	117.10	10G	3.4 ML	2 KM W CADOUX, FELT MMIV	4 A
	17 201635.5	31.77	116.90	10G	2.6 ML	18 KM NE YORK	6 A
	18 213020.9	30.64	117.13	10G	2.0 ML	14 KM N CADOUX	3 A

TABLE 4 (cont.)

DATE 1983	ORIGIN UT	LAT S	LONG E	DEP KM	MAG	LOCALITY	N A
AUG	21 180436.4	30.88	117.14	10G	2.3 ML	12 KM SSE CADOUX	3 A
	28 133836.0	31.29	118.31	10G	2.1 ML	21 KM N MERREDIN	3 B
	28 190333.7	30.75	117.11	10G	2.2 ML	4 KM NNW CADOUX	3 B
	29 171954.5	30.82	117.08	10G	2.6 ML	7 KM SW CADOUX	4 A
SEP	02 183534.2	30.67	117.14	10G	2.4 ML	10 KM N CADOUX	6 A
	04 031258.3	30.87	117.15	10G	2.5 ML	11 KM SSE CADOUX	3 A
	04 114751.4	30.87	117.15	10G	2.6 ML	11 KM SSE CADOUX	5 A
	04 115600.1	30.87	117.15	10G	2.5 ML	11 KM SSE CADOUX	4 A
	04 121259.0	30.87	117.15	10G	3.1 ML	11 KM SSE CADOUX	6 A
	04 121357.9	30.87	117.15	10G	2.6 ML	11 KM SSE CADOUX	5 A
	04 192744.1	30.74	117.12	10G	2.4 ML	3 KM N CADOUX	3 A
	04 192838.1	30.74	117.12	10G	2.2 ML	3 KM N CADOUX	3 A
	05 182344.8	30.70	117.14	10G	2.5 ML	7 KM N CADOUX	4 A
	07 035118.3	30.67	117.18	10G	2.1 ML	12 KM NNE CADOUX	4 A
	12 070314.6	30.80	117.13	10G	2.2 ML	3 KM S CADOUX	3 A
	13 115116.8	30.67	117.14	10G	2.4 ML	10 KM N CADOUX	3 A
	14 163801.8	30.67	117.14	10G	2.2 ML	10 KM N CADOUX	3 A
	15 071343.5	30.77	117.07	10G	2.4 ML	5 KM W CADOUX	4 A
	16 141338.1	30.75	117.13	10G	2.4 ML	2 KM NNE CADOUX	4 A
	17 144745.1	30.67	117.11	10G	2.3 ML	11 KM NNW CADOUX	4 A
	19 120332.0	30.76	117.10	10G	2.5 ML	2 KM NW CADOUX	4 A
OCT	19 013717.0	30.80	117.13	10G	2.3 ML	4KM S CADOUX	3 A
	20 182718.5	30.80	117.09	10G	2.4 ML	6KM SW CADOUX	4 A
	25 145540.9	30.72	117.08	10G	2.0 ML	6KM NW CADOUX	3 A
	25 230602.3	30.72	117.08	10G	2.4 ML	6KM NW CADOUX	5 A
	27 185622.2	30.71	117.12	10G	2.1 ML	6KM N CADOUX	4 A
NOV	05 123417.4	30.74	116.54	10G	1.8 ML	21KM SW CADOUX	3 A
DEC	14 020033.5	30.80	117.09	10F	2.3 ML	6KM SW CADOUX	3 B
	20 192305.4	30.61	116.78	5G	2.0 ML	7KM E BALLIDU	3 A
	26 192643.1	30.62	116.76	5G	1.8 ML	2KM S BALLIDU	3 A
	27 062534.6	30.60	116.76	5G	2.2 ML	BALLIDU	3 A
	27 085315.8	30.60	116.76	5G	2.0 ML	BALLIDU	3 A

FOOTNOTES:

DEP = Depth of earthquake in kilometres

G = Nominal depth

R = Restrained depth

MAG = Magnitude

ML = Richter magnitude

N = Number of stations that recorded the earthquake

A = Accuracy of location

A = +/- 0.05 degree

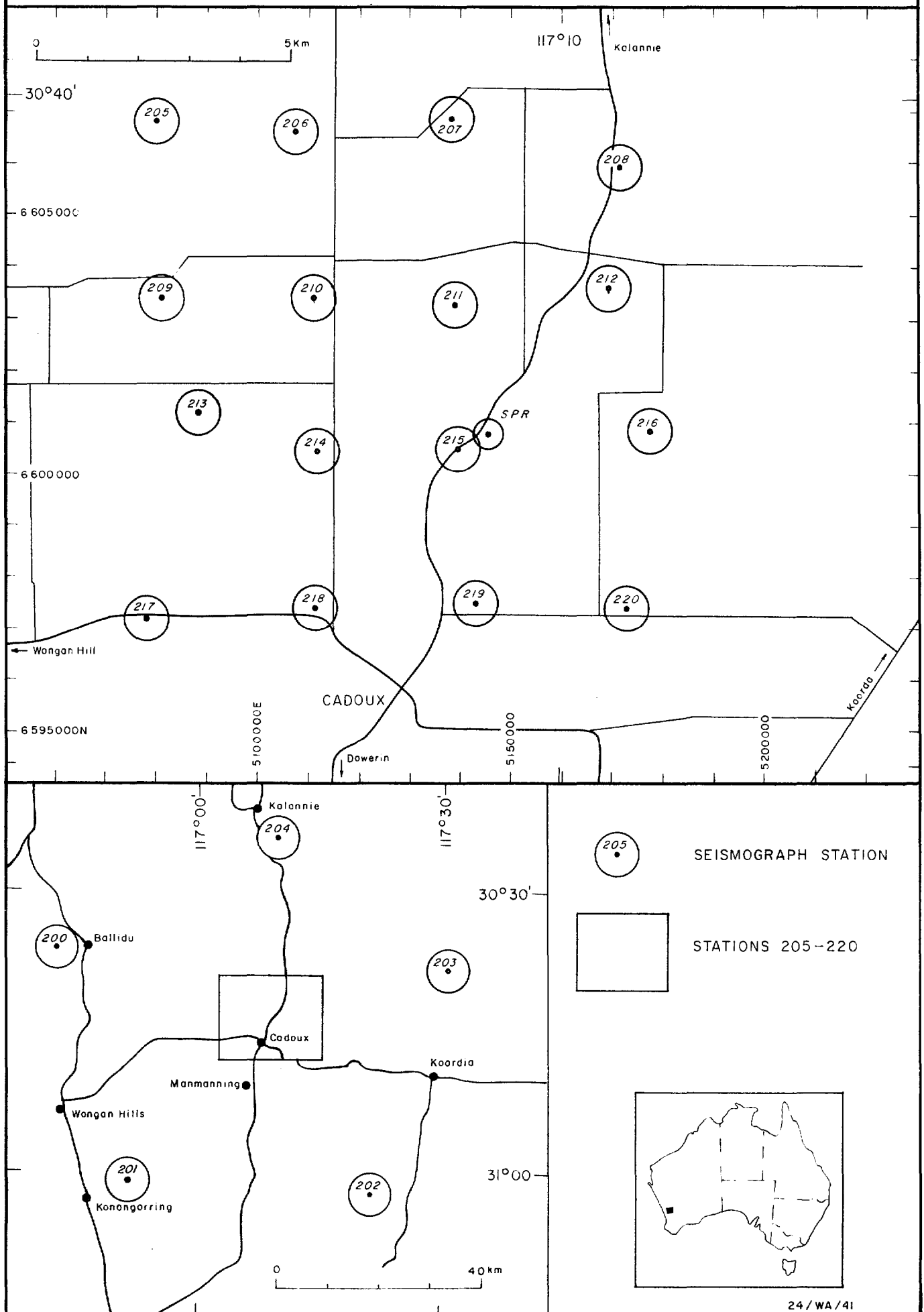
B = +/- 0.10 degree

C = +/- 0.20 degree

D = +/- 0.50 degree

UT = Universal Time. Western Standard Time = UT + 8 hrs
 Western Standard Summer Time = UT + 9 hrs

Fig.1 CADOUX MICROEARTHQUAKES STATION LOCATIONS



24 / WA / 41

Fig.2 SEISMOGRAPH CLOCK CORRECTIONS

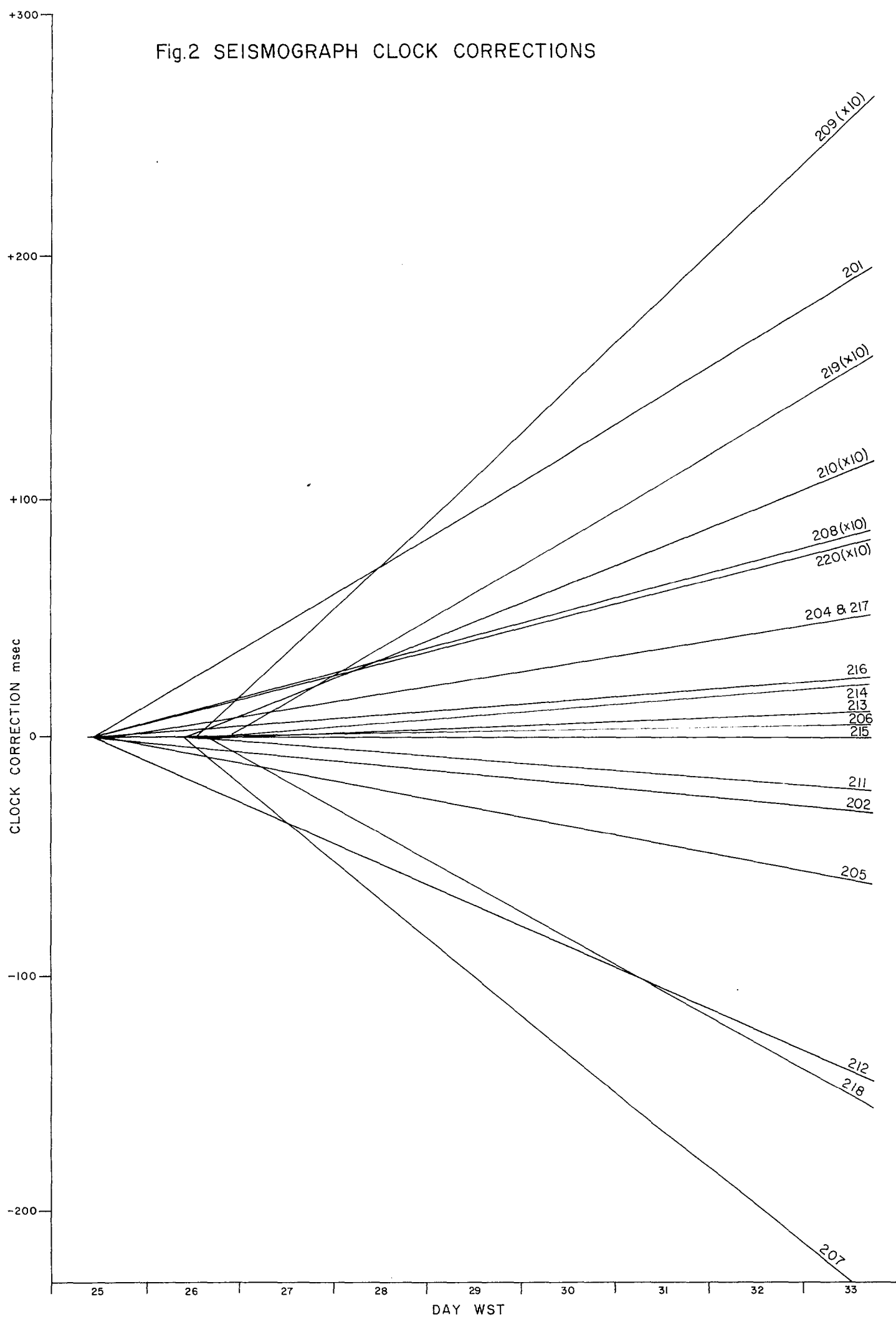


Fig.3 EARTHQUAKE EPICENTRES LOCATED DURING THE SURVEY

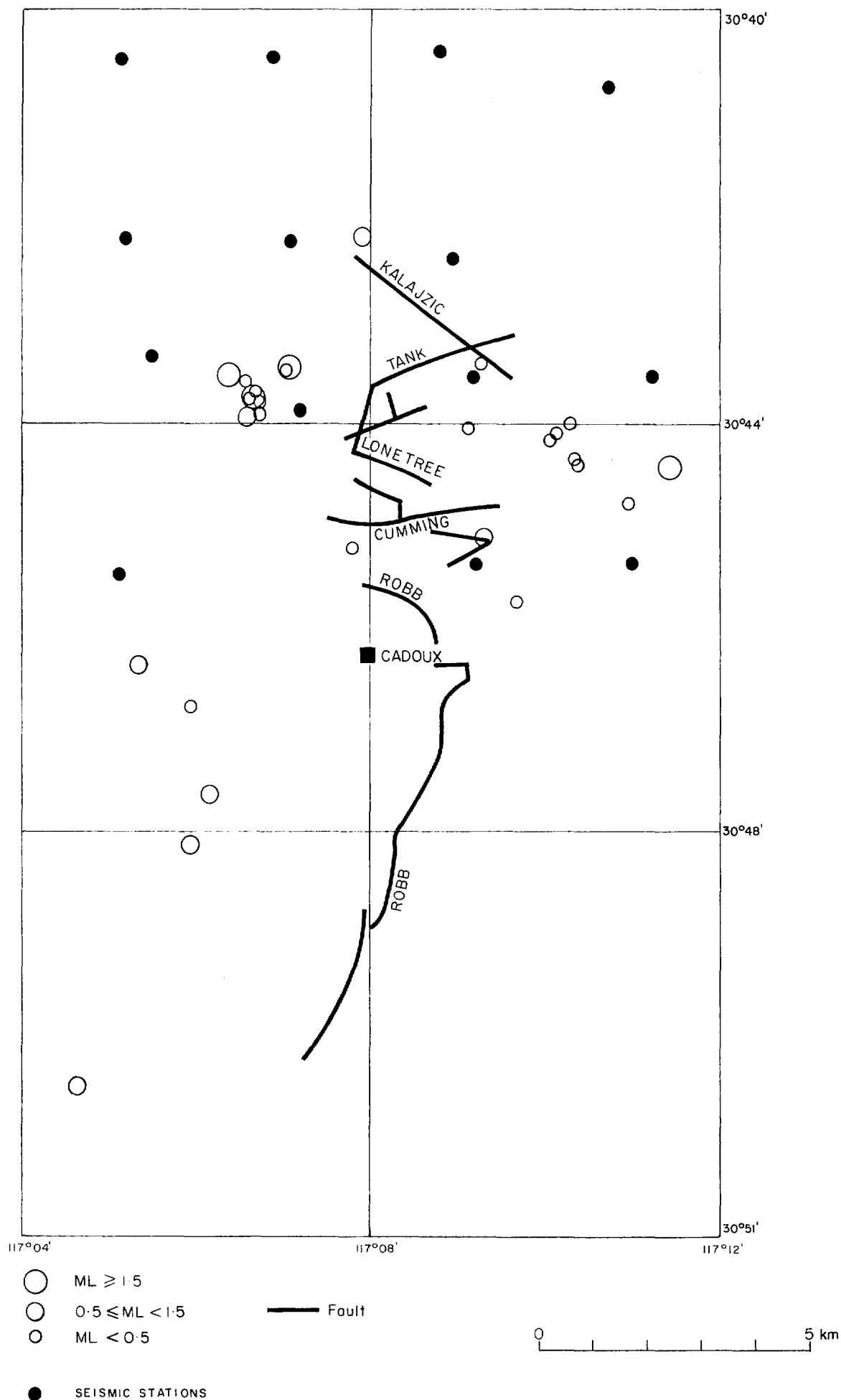
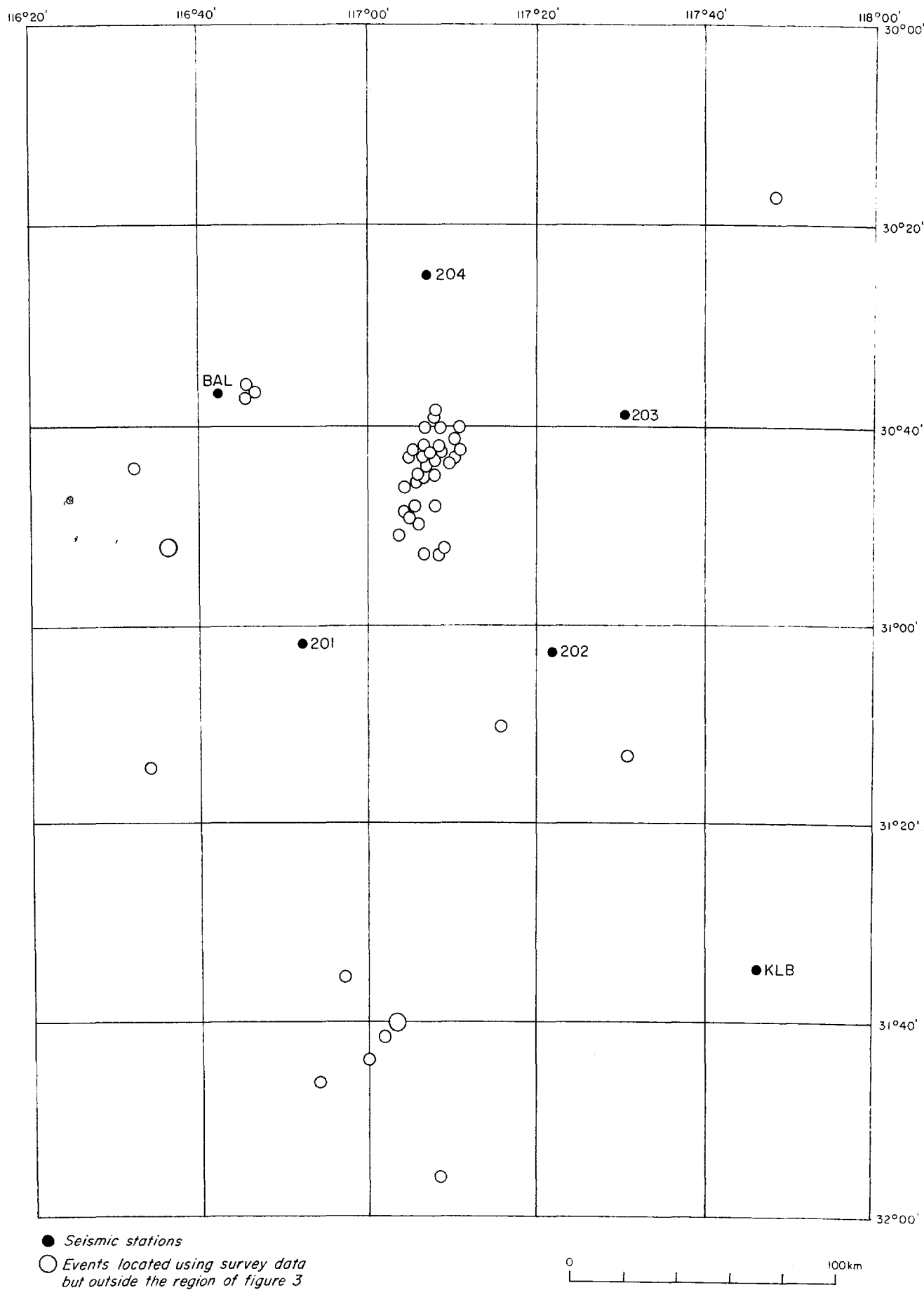


Fig.4 EARTHQUAKE EPICENTRES IN THE CADOUX-MECKERING AREA, 1983



24/H50/15

APPENDIX

PHASE ARRIVALS AND HYPOCENTRAL DETERMINATIONS

EXPLANATION OF TABLE

COL 1 station code
COL 2 distance station to epicentre in km
COL 3 S minus P interval in seconds
COL 4 time correction used
COL 5 corrected P time used in computation
COL 6 computed P travel time
COL 7 computed P residual
COL 8 weight assigned to P arrival (0=MAX, 4= ZERO)
COL 9 corrected S time used in computation
COL 10 computed S residual
COL 11 weight assigned to S arrival
RMS root mean square of residuals

NEXT LINE : LATITUDE IN DECIMAL DEGREES, WITH ERROR IN DECIMAL
DEGREES AND KILOMETRES : LATITUDE IN DECIMAL MINUTES

NEXT LINE : SAME INFORMATION FOR LONGITUDE

NEXT LINE : DEPTH AND ERROR IN KILOMETRES : ORIGIN TIME AND ERROR
IN SECONDS

FOR COMPUTING PURPOSES, STATIONS 201-220 ARE REPRESENTED AS K01-K20

EVENT 26 OCT 0706 LT ML 2.4

STA	DIST	S-P	T/C	P-SEC	TPCAL	P-RES	WT	S-SEC	S-RES	WT
K20	7.5	0.00	0.00	2.84	1.41	-.05	0	0.00	0.00	0
K17	4.1	0.00	0.00	2.43	.95	.01	0	0.00	0.00	0
K16	7.0	0.00	0.00	2.87	1.34	.06	0	0.00	0.00	0
K08	8.1	0.00	0.00	2.96	1.50	-.01	0	0.00	0.00	0
K06	5.8	0.00	0.00	2.63	1.16	-.01	0	0.00	0.00	0
BAL	37.0	4.80	0.00	8.20	6.15	.58	4	13.00	.87	4
KLB	110.3	12.70	0.00	20.10	18.20	.43	4	32.80	-.19	4
MUN	159.3	18.70	0.00	27.30	25.87	-.05	4	46.00	-.29	4
NWAO	245.5	29.00	0.00	39.00	36.69	.83	4	68.00	2.98	4
MEK	475.3	47.00	0.00	67.00	65.01	.51	4	114.0	-.08	4

ERROR ELLIPSE X= .12 KM Y= .37 KM THETA = 169.35

RMS= .04

-30.725 +- .001 N .1 KM 43.51

117.106 +- .004 E .4 KM 6.37

4.00 +- 1.86 KM 1.47+- .19 SEC

EVENT 27 OCT 0720 LT

STA	DIST	S-P	T/C	P-SEC	TPCAL	P-RES	WT	S-SEC	S-RES	WT
K20	7.1	.98	0.00	30.12	1.33	-.05	0	31.10	-.04	3
K19	4.7	.66	.14	29.86	.99	.02	1	30.52	-.05	3
K17	3.9	0.00	0.00	29.74	.90	-.00	1	0.00	0.00	0
K16	6.7	.93	0.00	30.17	1.27	.05	0	31.10	.05	3
K15	3.7	.60	0.00	29.74	.88	.02	0	30.34	-.02	3
K14	.9	0.00	0.00	29.44	.64	-.04	0	0.00	0.00	0
K13	1.8	.44	0.00	29.61	.69	.08	0	30.05	.02	3
K11	4.2	0.00	0.00	29.77	.92	-.00	0	0.00	0.00	0
K10	2.9	0.00	.12	29.60	.78	-.03	1	0.00	0.00	0
K09	3.5	0.00	.27	30.10	.85	.41	4	0.00	0.00	0
K08	8.1	1.05	.19	30.36	1.48	.03	1	31.41	-.00	3
K05	6.5	.89	0.00	30.04	1.23	-.04	0	30.93	-.06	3

ERROR ELLIPSE X= .11 KM Y= .14 KM THETA = 128.27

RMS= .05

-30.729 +- .001 N .1 KM 43.71

117.110 +- .001 E .1 KM 6.59

3.74 +- .28 KM 28.85+- .04 SEC

EVENT 27 OCT 2009 LT

STA	DIST	S-P	T/C	P-SEC	TPCAL	P-RES	WT	S-SEC	S-RES	WT
K20	3.7	.96	0.00	58.51	.62	-.16	1	59.47	.34	3
K19	2.6	0.00	.39	58.57	.44	.09	1	0.00	0.00	0
K17	6.5	0.00	0.00	59.09	1.09	-.05	1	0.00	0.00	0
K16	3.1	.53	0.00	58.47	.52	-.10	1	59.00	.05	3
K15	.8	.17	0.00	58.12	.14	-.07	1	58.29	.00	3
K14	2.9	.80	0.00	58.46	.48	-.07	1	59.26	.38	3
K13	5.5	.83	0.00	58.91	.92	-.06	1	59.74	.10	3
K11	3.0	0.00	0.00	58.53	.50	-.01	1	0.00	0.00	0
K10	4.4	0.00	0.00	58.65	.75	-.14	1	0.00	0.00	0
K08	6.4	0.00	.21	59.21	1.08	.08	1	0.00	0.00	0
K07	6.7	.61	-.06	59.43	1.13	.26	1	60.04	.04	3
K06	7.4	0.00	0.00	59.22	1.24	-.07	1	0.00	0.00	0
K05	8.8	1.11	0.00	59.50	1.48	-.03	1	60.61	.00	3

ERROR ELLIPSE X= .24 KM Y= .28 KM THETA = 130.50

RMS= .14

-30.733 +- .002 N .3 KM 43.99

117.153 +- .003 E .3 KM 9.17

.09 +- 4.97 KM 58.04+- .05 SEC

EVENT 28 OCT 0256 LT ML 2.1

STA	DIST	S-P	T/C	P-SEC	TPCAL	P-RES	WT	S-SEC	S-RES	WT
K20	1.9	0.00	-.06	21.37	.79	-.08	0	0.00	0.00	0
K19	3.8	0.00	.33	21.67	.96	.05	1	0.00	0.00	0
K17	9.3	0.00	0.00	22.40	1.70	.04	0	0.00	0.00	0
K16	1.7	0.00	0.00	21.51	.78	.07	0	0.00	0.00	0
K15	3.6	1.00	0.00	21.46	.94	-.14	0	22.46	.17	3
K14	6.2	1.37	0.00	21.83	1.25	-.08	0	23.20	.37	3
K13	8.8	0.00	0.00	22.27	1.63	-.02	0	0.00	0.00	0
K11	5.2	0.00	0.00	21.69	1.13	-.10	0	0.00	0.00	0
K10	7.5	0.00	.24	22.10	1.43	.01	1	0.00	0.00	0
K09	9.9	0.00	.57	22.53	1.79	.08	2	0.00	0.00	0
K08	6.9	0.00	.28	22.12	1.36	.11	1	0.00	0.00	0
K07	8.4	.96	-.06	22.28	1.57	.05	0	23.24	-.14	3
K06	9.9	0.00	0.00	22.43	1.79	-.02	0	0.00	0.00	0
K05	11.7	1.09	0.00	22.81	2.07	.08	0	23.90	-.34	3
K04	36.7	4.01	0.00	26.89	6.11	.12	4	30.90	-.34	4
K03	30.2	3.92	0.00	26.78	5.04	1.08	4	30.70	1.31	4
K02	36.5	0.00	0.00	27.30	6.07	.57	4	0.00	0.00	0
K01	42.4	4.70	0.00	28.10	7.03	.41	4	32.80	-.04	4

ERROR ELLIPSE X= .36 KM Y= .48 KM THETA = 9.99

RMS= .11

-30.741 +- .003 N .4 KM 44.45

117.190 +- .005 E .5 KM 11.41

4.38 +- .69 KM 20.66+- .11 SEC

EVENT 28 OCT 0256 LT (2ND EVENT)

STA	DIST	S-P	T/C	P-SEC	TPCAL	P-RES	WT	S-SEC	S-RES	WT
K20	2.1	.36	-.06	56.88	.39	-.08	1	57.24	-.01	3
K19	2.6	0.00	.44	57.18	.48	.13	1	0.00	0.00	0
K16	2.0	0.00	0.00	57.00	.38	.04	1	0.00	0.00	0
K15	2.3	.34	0.00	56.98	.43	-.02	1	57.32	.00	3
K14	4.7	.62	0.00	57.28	.81	-.10	1	57.90	-.07	3
K13	7.3	1.00	0.00	57.78	1.24	-.03	1	58.78	.06	3
K11	4.3	57.79	0.00	0.00	.74	0.00	0	57.79	-.06	3
K10	6.2	0.00	.29	57.69	1.06	.06	1	0.00	0.00	0
K05	10.5	0.00	0.00	58.37	1.77	.03	1	0.00	0.00	0

ERROR ELLIPSE X= .21 KM Y= .29 KM THETA = 155.67
RMS= .08
-30.740 +- .002 N .2 KM 44.40
117.173 +- .003 E .3 KM 10.36
1.03 +- .89 KM 56.57+- .06 SEC

EVENT 28 OCT 0533 LT

STA	DIST	S-P	T/C	P-SEC	TPCAL	P-RES	WT	S-SEC	S-RES	WT
K20	7.3	1.04	0.00	49.00	1.36	-.05	0	50.04	-.00	3
K19	4.9	0.00	.35	48.79	1.03	.07	1	0.00	0.00	0
K17	4.1	0.00	0.00	48.52	.93	-.10	0	0.00	0.00	0
K16	6.8	.85	0.00	49.05	1.28	.08	0	49.90	-.01	3
K15	3.8	.65	0.00	48.55	.89	-.03	0	49.20	-.03	3
K14	1.1	.61	0.00	48.29	.65	-.05	0	48.90	.08	3
K13	1.6	.52	0.00	48.38	.68	.01	0	48.90	.03	3
K11	4.1	.72	0.00	48.59	.92	-.02	0	49.31	.03	3
K10	2.6	.60	.25	48.49	.76	.04	1	49.09	.08	3
K09	3.2	0.00	.61	48.63	.82	.12	1	0.00	0.00	0
K08	8.0	0.00	.29	49.23	1.47	.08	1	0.00	0.00	0
K07	6.7	49.87	-.07	-.07	1.28	0.00	0	49.80	-.11	0
K06	5.8	0.00	0.00	48.82	1.15	-.02	1	0.00	0.00	0
K05	6.2	.81	0.00	48.89	1.20	.00	1	49.70	-.06	3

ERROR ELLIPSE X= .16 KM Y= .17 KM THETA = 155.08
RMS= .07
-30.726 +- .001 N .2 KM 43.56
117.109 +- .002 E .2 KM 6.55
3.80 +- .34 KM 47.69+- .05 SEC

EVENT 28 OCT 0550 LT

STA	DIST	S-P	T/C	P-SEC	TPCAL	P-RES	WT	S-SEC	S-RES	WT
K20	2.7	0.00	0.00	.75	.50	-.12	1	0.00	0.00	0
K19	2.8	0.00	.42	.99	.52	.10	1	0.00	0.00	0
K17	7.7	0.00	0.00	1.66	1.30	-.01	1	0.00	0.00	0
K16	2.0	0.00	0.00	.89	.40	.12	1	0.00	0.00	0
K15	1.7	.33	0.00	.67	.37	-.07	1	1.00	-.01	3
K14	4.3	.59	0.00	1.05	.75	-.07	1	1.64	-.03	3
K13	6.9	1.00	0.00	1.54	1.17	.00	1	2.54	.14	3
K11	3.6	.43	0.00	1.02	.65	.00	1	1.45	-.05	3
K10	5.6	0.00	.30	1.44	.97	.11	1	0.00	0.00	0
K06	8.3	1.00	0.00	1.65	1.41	-.12	1	2.65	-.15	3
K05	9.9	1.28	0.00	2.09	1.67	.05	1	3.37	.10	3

ERROR ELLIPSE X= .22 KM Y= .30 KM THETA = 149.11

RMS= .10

-30.736 +- .002 N .2 KM 44.13

117.169 +- .003 E .3 KM 10.12

1.37 +- .73 KM .37+- .06 SEC

EVENT 28 OCT 1357 LT

STA	DIST	S-P	T/C	P-SEC	TPCAL	P-RES	WT	S-SEC	S-RES	WT
K20	2.2	.35	-.08	17.07	.39	-.13	1	17.42	-.06	3
K19	2.7	.36	.53	17.42	.48	.14	1	17.78	.15	3
K17	7.9	.97	0.00	18.09	1.33	-.04	1	19.06	-.05	3
K16	1.9	0.00	0.00	17.31	.35	.16	1	0.00	0.00	0
K15	2.2	.31	0.00	17.09	.39	-.10	1	17.40	-.08	3
K14	4.6	.56	0.00	17.48	.79	-.11	1	18.04	-.13	3
K13	7.3	.97	0.00	18.03	1.23	-.00	1	19.00	.07	3
K11	4.1	.58	0.00	17.47	.70	-.03	1	18.05	.03	3
K10	6.1	0.00	.30	17.82	1.03	-.01	1	0.00	0.00	0
K09	8.4	1.12	.85	18.43	1.42	.21	1	19.55	.29	3
K06	8.8	1.00	0.00	18.23	1.48	-.05	1	19.23	-.14	3
K05	10.4	1.31	0.00	18.51	1.75	-.05	1	19.82	-.02	3

ERROR ELLIPSE X= .24 KM Y= .30 KM THETA = 164.61

RMS= .12

-30.739 +- .002 N .2 KM 44.32

117.172 +- .003 E .3 KM 10.34

.71 +- 1.46 KM 16.80+- .08 SEC

EVENT 28 OCT 1946 LT ML 0.6

STA	DIST	S-P	T/C	P-SEC	TPCAL	P-RES	WT	S-SEC	S-RES	WT
K20	8.4	1.14	0.00	2.10	1.55	-.07	0	3.24	-.06	3
K19	5.6	0.00	.49	1.91	1.16	.12	1	0.00	0.00	0
K17	1.7	0.00	0.00	1.38	.75	.01	0	0.00	0.00	0
K16	10.0	1.30	0.00	2.44	1.79	.02	0	3.74	.01	3
K15	7.6	1.08	0.00	2.05	1.44	-.01	0	3.13	.01	3
K14	5.4	.96	0.00	1.70	1.13	-.05	0	2.66	.08	3
K13	5.7	.89	0.00	1.71	1.17	-.08	0	2.60	-.05	3
K11	9.0	1.20	0.00	2.23	1.64	-.03	0	3.43	-.04	3
K10	8.1	1.12	.34	2.20	1.51	.07	1	3.32	.09	3
K09	7.8	0.00	.83	2.15	1.46	.07	1	0.00	0.00	0
K07	12.2	1.58	0.00	2.82	2.13	.07	0	4.40	.08	5
K06	11.3	0.00	0.00	2.58	1.99	-.03	0	0.00	0.00	0
K05	11.0	1.41	0.00	2.57	1.95	-.00	0	3.98	-.02	3
K03	39.7	5.01	0.00	7.69	6.59	.48	4	12.70	.67	4
K02	37.9	4.29	0.00	6.91	6.30	-.01	4	11.20	-.34	4
K01	34.2	0.00	0.00	6.33	5.68	.02	4	0.00	0.00	0
BAL	37.9	4.90	0.00	7.10	6.29	.18	4	12.00	.48	4

ERROR ELLIPSE X= .16 KM Y= .26 KM THETA = 119.50

RMS= .06

-30.773 +- .002 N .2 KM 46.36

117.089 +- .002 E .2 KM 5.33

4.20 +- .34 KM .62+- .05 SEC

EVENT 28 OCT 2311 LT

STA	DIST	S-P	T/C	P-SEC	TPCAL	P-RES	WT	S-SEC	S-RES	WT
K20	2.8	.39	-.08	55.39	.47	-.09	1	55.78	-.04	3
K17	8.0	1.05	0.00	56.42	1.34	.07	1	57.47	.14	3
K16	1.6	0.00	0.00	55.41	.27	.13	1	0.00	0.00	0
K15	1.8	.20	0.00	55.26	.30	-.05	1	55.46	-.07	3
K14	4.5	.60	0.00	55.75	.75	-.01	1	56.35	.04	3
K13	7.0	1.00	0.00	56.26	1.18	.07	1	57.26	.20	3
K11	3.5	.49	0.00	55.56	.60	-.04	1	56.05	.01	4
K10	5.6	.69	0.00	55.71	.95	-.25	1	56.40	-.25	3
K06	8.2	1.08	0.00	56.42	1.38	.03	1	57.50	.09	3
K05	9.9	1.25	0.00	56.75	1.67	.07	1	58.00	.10	3

ERROR ELLIPSE X= .22 KM Y= .31 KM THETA = 128.97

RMS= .13

-30.733 +- .003 N .3 KM 44.00

117.171 +- .003 E .3 KM 10.28

.00 +- .02 KM 55.01+- .04 SEC

EVENT 29 OCT 0210 LT

STA	DIST	S-P	T/C	P-SEC	TPCAL	P-RES	WT	S-SEC	S-RES	WT
K20	4.7	.66	0.00	47.88	.82	-.09	0	48.54	-.04	2
K19	3.7	0.00	.55	47.99	.66	.17	1	0.00	0.00	0
K17	6.8	.91	0.00	48.29	1.17	-.03	0	49.20	.03	2
K16	3.2	.35	0.00	47.82	.59	.07	0	48.17	-.01	2
K15	.4	0.00	0.00	47.40	.26	-.01	0	0.00	0.00	0
K14	2.8	.36	0.00	47.64	.52	-.03	0	48.00	-.06	2
K13	5.1	.71	0.00	48.00	.89	-.04	0	48.71	.02	2
K11	1.8	0.00	0.00	47.50	.40	-.05	0	0.00	0.00	0
K10	3.5	0.00	.37	47.85	.64	.06	1	0.00	0.00	0
K09	5.9	.98	.92	48.24	1.02	.07	2	49.22	.30	3
K08	5.5	0.00	.38	48.14	.96	.03	1	0.00	0.00	0
K07	5.6	.76	0.00	48.14	.97	.02	0	48.90	.07	2
K06	6.3	.88	0.00	48.12	1.08	-.11	0	49.00	-.02	2
K05	7.8	0.00	0.00	48.44	1.33	-.04	0	0.00	0.00	0

ERROR ELLIPSE X= .14 KM Y= .15 KM THETA = 119.49

RMS= .08

-30.723 +- .001 N .1 KM 43.40

117.150 +- .002 E .1 KM 9.01

1.50 +- .50 KM 47.15+- .04 SEC

EVENT 29 OCT 0505 LT ML 1.5

STA	DIST	S-P	T/C	P-SEC	TPCAL	P-RES	WT	S-SEC	S-RES	WT
K20	7.0	.90	0.00	31.90	1.30	-.13	1	32.80	-.18	3
K19	4.6	0.00	.60	31.85	.96	.16	3	0.00	0.00	0
K17	3.9	0.00	0.00	31.57	.88	-.04	1	0.00	0.00	0
K16	6.6	1.03	0.00	32.03	1.25	.06	1	33.06	.17	1
K15	3.7	.37	0.00	31.55	.85	-.02	1	31.92	-.27	3
K13	1.9	0.00	0.00	31.47	.66	.08	1	0.00	0.00	0
K11	4.1	0.00	0.00	31.60	.90	-.03	1	0.00	0.00	0
K10	2.9	0.00	.35	31.57	.75	.09	3	0.00	0.00	0
K09	3.5	0.00	.95	31.69	.83	.13	1	0.00	0.00	0
K08	8.1	0.00	.37	32.23	1.46	.04	3	0.00	0.00	0
K06	6.1	0.00	0.00	31.83	1.17	-.07	1	0.00	0.00	0
K05	6.5	.78	0.00	31.97	1.23	.02	1	32.75	-.10	1

ERROR ELLIPSE X= .24 KM Y= .40 KM THETA = 124.40

RMS= .12

-30.729 +- .003 N .4 KM 43.72

117.111 +- .003 E .3 KM 6.65

3.56 +- 1.06 KM 30.73+- .12 SEC

EVENT 29 OCT 1909 LT

STA	DIST	S-P	T/C	P-SEC	TPCAL	P-RES	WT	S-SEC	S-RES	WT
K20	6.8	1.00	0.00	5.96	1.27	-.03	1	6.96	.04	3
K19	4.4	.76	.36	5.53	.93	-.12	1	6.29	-.04	3
K17	3.8	0.00	0.00	5.63	.85	.05	1	0.00	0.00	0
K16	6.6	.97	0.00	6.05	1.23	.09	1	7.02	.16	3
K15	3.6	.54	0.00	5.57	.83	.01	1	6.11	-.06	3
K14	.7	.46	0.00	5.30	.59	-.02	1	5.76	.01	3
K13	2.1	.49	0.00	5.41	.68	.01	1	5.90	.00	3
K11	4.2	.58	0.00	5.62	.91	-.01	1	6.20	-.10	3
K10	3.1	0.00	.47	5.64	.78	.13	1	0.00	0.00	0
K08	8.2	0.00	.44	6.21	1.48	.00	1	0.00	0.00	0
K07	7.2	0.00	-.12	6.03	1.32	-.02	1	0.00	0.00	0
K06	6.4	0.00	0.00	5.87	1.21	-.07	1	0.00	0.00	0
K05	6.8	.86	0.00	5.99	1.27	-.00	1	6.85	-.07	3

ERROR ELLIPSE X= .16 KM Y= .21 KM THETA = 131.37

RMS= .07

-30.731 +- .002 N .2 KM 43.88

117.112 +- .002 E .2 KM 6.71

3.51 +- .35 KM 4.73+- .05 SEC

EVENT 30 OCT 0035 LT

STA	DIST	S-P	T/C	P-SEC	TPCAL	P-RES	WT	S-SEC	S-RES	WT
K20	2.7	0.00	0.00	.75	.50	-.12	1	0.00	0.00	0
K19	2.8	0.00	.42	.99	.52	.10	1	0.00	0.00	0
K17	7.7	0.00	0.00	1.66	1.30	-.01	1	0.00	0.00	0
K16	2.0	0.00	0.00	.89	.40	.12	1	0.00	0.00	0
K15	1.7	.33	0.00	.67	.37	-.07	1	1.00	-.01	3
K14	4.3	.59	0.00	1.05	.75	-.07	1	1.64	-.03	3
K13	6.9	1.00	0.00	1.54	1.17	.00	1	2.54	.14	3
K11	3.6	.43	0.00	1.02	.65	.00	1	1.45	-.05	3
K10	5.6	0.00	.30	1.44	.97	.11	1	0.00	0.00	0
K06	8.3	1.00	0.00	1.65	1.41	-.12	1	2.65	-.15	3
K05	9.9	1.28	0.00	2.09	1.67	.05	1	3.37	.10	3

ERROR ELLIPSE X= .22 KM Y= .30 KM THETA = 149.11

RMS= .10

-30.736 +- .002 N .2 KM 44.13

117.169 +- .003 E .3 KM 10.12

1.37 +- .73 KM .37+- .06 SEC

EVENT 30 OCT 1448 LT ML 1.2

STA	DIST	S-P	T/C	P-SEC	TPCAL	P-RES	WT	S-SEC	S-RES	WT
K20	6.9	0.00	0.00	43.84	1.27	-.13	0	0.00	0.00	0
K19	4.4	0.00	.90	43.75	.91	.13	1	0.00	0.00	0
K17	3.6	0.00	0.00	43.49	.81	-.02	0	0.00	0.00	0
K16	6.7	.87	0.00	44.03	1.24	.08	0	44.90	.04	3
K15	3.8	.72	0.00	43.46	.83	-.08	0	44.18	.03	0
K14	.9	0.00	0.00	43.21	.56	-.06	0	0.00	0.00	0
K13	2.0	0.00	0.00	43.33	.64	-.01	0	0.00	0.00	0
K11	4.4	0.00	0.00	43.58	.91	-.03	0	0.00	0.00	0
K10	3.3	0.00	.59	43.57	.77	.10	1	0.00	0.00	0
K09	3.8	1.15	1.50	43.68	.83	.14	2	44.83	.68	4
K08	8.4	0.00	.53	44.17	1.50	-.03	1	0.00	0.00	0
K07	7.3	.93	0.00	44.12	1.33	.09	0	45.05	.04	3
K06	6.5	.70	0.00	43.81	1.21	-.10	0	44.51	-.29	3
K05	6.8	.87	0.00	44.00	1.26	.04	0	44.87	-.01	3
K04	35.9	0.00	0.00	48.40	5.96	-.26	4	0.00	0.00	0
K03	36.5	4.51	0.00	49.19	6.04	.44	4	53.70	.53	4
K02	40.6	0.00	0.00	49.44	6.73	.01	4	0.00	0.00	0
K01	38.9	0.00	0.00	49.35	6.45	.20	4	0.00	0.00	0
BAL	37.6	4.80	0.00	49.20	6.23	.27	4	54.00	.50	4
KLB	109.5	13.00	0.00	61.00	18.06	.23	4	74.00	.01	4

ERROR ELLIPSE X= .18 KM Y= .22 KM THETA = 128.53
 RMS= .09
 -30.732 +- .002 N .2 KM 43.93
 117.110 +- .002 E .2 KM 6.59
 3.29 +- .48 KM 42.70+- .06 SEC

EVENT 30 OCT 1935 LT

STA	DIST	S-P	T/C	P-SEC	TPCAL	P-RES	WT	S-SEC	S-RES	WT
K20	6.8	1.00	-.13	55.61	1.29	-.17	1	56.61	-.12	3
K19	4.4	0.00	.94	55.68	.96	.23	3	0.00	0.00	0
K17	3.9	0.00	0.00	55.41	.90	.02	1	0.00	0.00	0
K16	6.5	1.00	0.00	55.87	1.24	.14	1	56.87	.22	3
K15	3.6	.53	0.00	55.36	.86	.01	1	55.89	-.08	3
K14	.7	.43	0.00	55.08	.63	-.04	1	55.51	-.08	3
K13	2.0	0.00	0.00	55.22	.71	.02	1	0.00	0.00	0
K11	4.1	.65	0.00	55.38	.92	-.03	1	56.03	-.05	3
K10	3.0	.53	.62	55.46	.79	.18	3	55.99	.13	3
K09	3.7	.66	1.56	55.41	.88	.04	3	56.07	.06	3
K08	8.1	.92	.57	56.02	1.48	.05	3	56.94	-.11	3
K06	6.3	0.00	0.00	55.68	1.21	-.02	1	0.00	0.00	0
K05	6.7	.81	0.00	55.72	1.27	-.04	1	56.53	-.15	3

ERROR ELLIPSE X= .22 KM Y= .29 KM THETA = 123.68
 RMS= .11
 -30.730 +- .002 N .3 KM 43.79
 117.112 +- .003 E .2 KM 6.74
 3.77 +- .50 KM 54.49+- .07 SEC

EVENT 30 OCT 2035 LT

STA	DIST	S-P	T/C	P-SEC	TPCAL	P-RES	WT	S-SEC	S-RES	WT
K20	6.8	1.00	-.13	42.02	1.23	-.28	1	43.02	-.19	3
K19	4.6	0.00	1.02	42.17	.92	.18	1	0.00	0.00	0
K17	4.7	0.00	0.00	42.15	.93	.15	1	0.00	0.00	0
K16	6.1	1.00	0.00	42.30	1.13	.10	1	43.30	.27	3
K15	3.1	.59	0.00	41.76	.73	-.04	1	42.35	.02	3
K14	.7	.52	0.00	41.48	.53	-.12	1	42.00	.01	3
K13	2.3	.50	0.00	41.65	.64	-.06	1	42.15	-.03	3
K11	3.4	.67	0.00	41.77	.76	-.06	1	42.44	.05	3
K10	2.3	0.00	.65	41.85	.64	.14	1	0.00	0.00	0
K09	3.6	0.00	1.58	41.86	.79	.00	1	0.00	0.00	0
K08	7.4	0.00	.55	42.39	1.32	-.01	1	0.00	0.00	0
K07	6.3	.77	0.00	42.33	1.16	.10	1	43.10	.02	3
K06	5.6	0.00	0.00	42.00	1.07	-.14	1	0.00	0.00	0
K05	6.3	.75	0.00	42.25	1.16	.02	1	43.00	-.08	3

ERROR ELLIPSE X= .27 KM Y= .34 KM THETA = 128.38

RMS= .14

-30.724 +- .003 N .3 KM 43.46

117.117 +- .003 E .3 KM 7.04

3.13 +- .67 KM 41.07+- .08 SEC

EVENT 31 OCT 0149 LT 70 KM WEST OF CADOUX

STA	DIST	S-P	T/C	P-SEC	TPCAL	P-RES	WT	S-SEC	S-RES	WT
K20	46.8	5.49	0.00	26.61	7.77	-.27	0	32.10	-.47	3
K19	44.1	0.00	1.00	26.52	7.33	.09	1	0.00	0.00	0
K17	38.6	4.81	0.00	25.19	6.42	-.34	0	30.00	-.23	3
K16	48.2	0.00	0.00	27.21	7.99	.11	0	0.00	0.00	0
K15	45.4	5.30	0.00	26.46	7.53	-.17	0	31.76	-.39	3
K14	42.5	0.00	0.00	25.90	7.06	-.26	0	0.00	0.00	0
K13	40.6	4.99	0.00	25.61	6.74	-.23	0	30.60	-.18	3
K11	45.8	0.00	0.00	26.85	7.60	.15	0	0.00	0.00	0
K10	43.5	0.00	.65	26.22	7.23	-.11	1	0.00	0.00	0
K09	41.1	0.00	1.66	25.70	6.83	-.23	1	0.00	0.00	0
K08	49.4	6.00	.60	27.70	8.20	.40	2	33.70	.39	3
K06	44.7	0.00	0.00	26.28	7.43	-.25	0	0.00	0.00	0
K05	42.5	4.85	0.00	25.95	7.06	-.21	0	30.80	-.53	3
K03	78.0	0.00	0.00	32.64	12.90	.64	4	0.00	0.00	0
K02	63.5	7.56	0.00	30.00	10.51	.38	4	37.56	.25	4
K01	25.2	0.00	0.00	23.14	4.22	-.18	4	0.00	0.00	0
BAL	28.9	3.10	0.00	23.50	4.82	-.42	4	26.60	-.85	4

ERROR ELLIPSE X= 1.41 KM Y= 3.65 KM THETA = 68.90

RMS= .27

-30.862 +- .031 N 3.4 KM 51.70

116.661 +- .022 E 1.9 KM 39.68

2.48 +- 1.65 KM 19.10+- .26 SEC

EVENT 31 OCT 0155 LT ML 0.7

STA	DIST	S-P	T/C	P-SEC	TPCAL	P-RES	WT	S-SEC	S-RES	WT
K20	2.5	0.00	0.00	6.01	.47	-.11	0	0.00	0.00	0
K19	.7	0.00	1.00	6.02	.24	.14	1	0.00	0.00	0
K17	6.1	0.00	0.00	6.70	1.04	.01	0	0.00	0.00	0
K16	4.0	0.00	0.00	6.44	.71	.09	0	0.00	0.00	0
K15	2.9	.40	0.00	6.11	.53	-.06	0	6.51	-.05	3
K14	3.8	.52	0.00	6.21	.67	-.11	0	6.73	-.08	3
K13	6.4	.84	0.00	6.70	1.10	-.04	0	7.54	-.01	3
K11	5.0	0.00	0.00	6.45	.87	-.06	0	0.00	0.00	0
K10	6.2	.70	.65	6.78	1.06	.07	1	7.48	-.00	3
K09	8.0	0.00	1.66	7.10	1.36	.10	1	0.00	0.00	0
K08	8.3	0.00	.60	7.08	1.41	.03	1	0.00	0.00	0
K07	8.8	1.10	-.15	7.19	1.48	.06	0	8.29	.08	3
K06	9.3	0.00	0.00	7.18	1.57	-.04	0	0.00	0.00	0
K05	10.5	1.28	0.00	7.44	1.77	.03	0	8.72	.01	3

ERROR ELLIPSE X= .20 KM Y= .26 KM THETA = 89.23

RMS= .08

-30.752 +- .002 N	.3 KM	45.10
117.155 +- .002 E	.2 KM	9.29
1.27 +- .63 KM		5.65+- .05 SEC

EVENT 31 OCT 0342 LT ML 1.1

STA	DIST	S-P	T/C	P-SEC	TPCAL	P-RES	WT	S-SEC	S-RES	WT
K20	8.9	0.00	0.00	9.08	1.52	-.12	0	0.00	0.00	0
K19	6.8	.80	1.03	9.04	1.17	.19	3	9.84	.13	3
K17	5.0	0.00	0.00	8.57	.89	-.00	0	0.00	0.00	0
K16	11.5	1.37	0.00	9.69	1.93	.08	0	11.06	.03	2
K15	9.7	1.18	0.00	9.32	1.64	-.01	0	10.50	-.03	2
K14	8.1	0.00	0.00	8.98	1.39	-.09	0	0.00	0.00	0
K13	8.9	1.09	0.00	9.21	1.52	.01	0	10.30	-.01	2
K11	11.5	0.00	0.00	9.57	1.93	-.04	0	0.00	0.00	0
K10	11.1	0.00	.66	9.68	1.86	.13	2	0.00	0.00	0
K09	11.1	0.00	1.69	9.69	1.86	.14	3	0.00	0.00	0
K07	15.0	1.80	-.16	10.20	2.50	.02	0	12.00	-.01	2
K06	14.3	0.00	0.00	10.06	2.40	-.02	0	0.00	0.00	0
K05	14.3	1.63	0.00	10.12	2.39	.04	0	11.75	-.08	2
K04	43.8	5.99	0.00	14.81	7.23	-.11	4	20.80	.59	4
K03	40.3	4.60	0.00	14.90	6.67	.54	4	19.50	.26	4
K01	32.0	0.00	0.00	13.54	5.31	.55	4	0.00	0.00	0
BAL	40.2	5.00	0.00	14.90	6.66	.56	4	19.90	.69	4
KLB	103.4	11.80	0.00	25.70	17.05	.97	4	37.50	.29	4

ERROR ELLIPSE X= .22 KM Y= .30 KM THETA = 106.83

RMS= .07

-30.802 +- .003 N	.3 KM	48.11
117.098 +- .003 E	.2 KM	5.88
1.78 +- 1.20 KM		7.68+- .06 SEC

EVENT 31 OCT 1345 LT

STA	DIST	S-P	T/C	P-SEC	TPCAL	P-RES	WT	S-SEC	S-RES	WT
K20	2.7	0.00	0.00	35.36	.53	-.14	1	0.00	0.00	0
K19	2.7	0.00	1.12	35.66	.53	.16	1	0.00	0.00	0
K17	7.5	0.00	0.00	36.25	1.29	-.01	1	0.00	0.00	0
K16	2.1	0.00	0.00	35.49	.44	.07	1	0.00	0.00	0
K15	1.7	.30	0.00	35.34	.40	-.03	1	35.64	-.02	3
K14	4.2	.50	0.00	35.66	.75	-.06	1	36.16	-.10	3
K13	6.8	.85	0.00	36.20	1.16	.06	1	37.05	.06	3
K11	3.6	0.00	0.00	35.62	.67	-.02	1	0.00	0.00	0
K10	5.6	0.00	.50	35.89	.97	-.05	1	0.00	0.00	0
K09	7.9	0.00	1.80	36.41	1.34	.09	1	0.00	0.00	0
K08	6.4	0.00	.65	36.18	1.11	.10	1	0.00	0.00	0
K07	7.2	0.00	-.17	36.15	1.24	-.06	1	0.00	0.00	0
K06	8.3	0.00	0.00	36.39	1.41	.01	1	0.00	0.00	0
K05	9.9	1.50	0.00	36.50	1.67	-.15	1	38.00	.13	3

ERROR ELLIPSE X= .26 KM Y= .27 KM THETA = 132.59

RMS= .10

-30.736 +- .002 N	.3 KM	44.17	
117.167 +- .003 E	.3 KM	10.04	
1.66 +- .68 KM		34.97+-	.06 SEC

EVENT 01 NOV 0355 LT

STA	DIST	S-P	T/C	P-SEC	TPCAL	P-RES	WT	S-SEC	S-RES	WT
K20	1.1	.25	0.00	57.62	.19	-.08	1	57.87	.03	3
K19	3.0	.30	1.30	58.16	.50	.15	1	58.46	.08	3
K17	8.6	0.00	0.00	58.91	1.44	-.04	1	0.00	0.00	0
K16	2.4	0.00	0.00	58.00	.40	.09	1	0.00	0.00	0
K15	3.5	.37	0.00	58.01	.58	-.08	1	58.38	-.14	3
K14	5.7	.66	0.00	58.36	.96	-.11	1	59.02	-.15	3
K13	8.4	1.22	0.00	58.86	1.41	-.06	1	60.08	.13	3
K11	5.3	0.00	0.00	58.32	.89	-.08	1	0.00	0.00	0
K10	7.3	0.00	.85	58.83	1.23	.09	1	0.00	0.00	0
K09	9.6	0.00	2.10	59.20	1.62	.07	1	0.00	0.00	0
K07	8.8	1.00	-.22	59.00	1.47	.02	1	60.00	-.06	3
K06	10.0	0.00	0.00	59.15	1.68	-.04	1	0.00	0.00	0
K05	11.7	1.53	0.00	59.52	1.96	.05	1	61.05	.14	3

ERROR ELLIPSE X= .19 KM Y= .29 KM THETA = 172.22

RMS= .10

-30.747 +- .002 N	.2 KM	44.79	
117.183 +- .003 E	.3 KM	10.95	
.00 +- .01 KM		57.51+-	.04 SEC

EVENT 05 NOV 2034 LT ML 1.8 120 KM WEST OF CADOUX

STA	DIST	S-P	T/C	P-SEC	TPCAL	P-RES	WT	S-SEC	S-RES	WT
BAL	30.9	2.70	0.00	21.00	5.12	-.58	1	23.70	-1.62	2
K02	86.7	11.03	0.00	29.97	14.29	-.78	1	41.00	-.21	2
K03	95.9	12.98	0.00	32.12	15.82	-.15	1	45.10	1.25	2
K04	75.7	10.02	0.00	28.48	12.49	-.46	1	38.50	.41	2
KLB	146.3	16.10	0.00	40.90	24.08	.37	1	57.00	-1.15	2
MUN	135.9	16.40	0.00	39.20	22.39	.36	1	55.60	.37	3

ERROR ELLIPSE X= 1.91 KM Y= 5.01 KM THETA = 32.61

RMS= .87

-30.748+-	.028 N	3.144 KM	-44.90
116.403+-	.050 E	4.347 KM	24.18
5.85+-	14.41 KM	16.45+-	.67 SEC

EVENT 06 NOV 0741 LT ML 1.2

STA	DIST	S-P	T/C	P-SEC	TPCAL	P-RES	WT	S-SEC	S-RES	WT
BAL	41.5	5.10	0.00	45.80	6.90	.58	1	50.90	.63	3
K02	32.8	4.74	0.00	43.26	5.47	-.53	1	48.00	.20	3
K03	43.7	6.20	0.00	46.00	7.25	.42	1	52.20	1.31	3
K04	48.2	6.63	0.00	46.07	7.99	-.25	1	52.70	.53	3
KLB	100.7	12.00	0.00	56.00	16.64	1.03	1	68.00	.85	3
MUN	147.1	17.70	0.00	63.30	24.26	.72	1	81.00	.66	3

ERROR ELLIPSE X= 1.58 KM Y= 2.32 KM THETA = 150.16

RMS= .83

-30.840 +-	.016 N	1.8 KM	50.41
117.081 +-	.025 E	2.2 KM	4.84
.00 +-	13.38 KM	38.33+-	.71 SEC

EVENT 08 NOV 0233 LT ML 1.1

STA	DIST	S-P	T/C	P-SEC	TPCAL	P-RES	WT	S-SEC	S-RES	WT
BAL	38.4	4.90	0.00	9.20	6.38	-.06	1	14.10	.17	2
K02	42.5	5.00	0.00	9.59	7.06	-.36	1	14.59	-.53	2
K03	33.8	4.00	0.00	8.77	5.62	.26	1	12.77	.15	2
K04	32.5	3.00	0.00	7.92	5.41	-.37	1	10.92	-1.33	3

ERROR ELLIPSE X= 1.17 KM Y= 1.58 KM THETA = 121.28

RMS= .57

-30.702 +-	.013 N	1.5 KM	42.12
117.132 +-	.015 E	1.3 KM	7.94
3.86 +-	15.23 KM	2.89+-	.70 SEC

EVENT 09 NOV 1931 LT

STA	DIST	S-P	T/C	P-SEC	TPCAL	P-RES	WT	S-SEC	S-RES	WT
BAL	40.1	4.80	0.00	19.40	6.70	.02	1	24.20	-.08	3
K04	38.2	0.00	0.00	18.97	6.38	-.09	1	0.00	0.00	0
KLB	106.6	43.00	0.00	0.00	17.59	0.00	0	43.00	-.14	3
MUN	157.6	17.50	0.00	38.50	25.46	.36	1	56.00	-.77	3

ERROR ELLIPSE X= 1.73 KM Y= 2.51 KM THETA = 131.41

RMS= .49

-30.754 +- .020 N 2.2 KM 45.22
117.130 +- .024 E 2.1 KM 7.78
6.33 +- 6.76 KM 12.68+- .25 SEC

EVENT 09 NOV 2013 LT ML 1.8 MECKERING

STA	DIST	S-P	T/C	P-SEC	TPCAL	P-RES	WT	S-SEC	S-RES	WT
BAL	119.8	14.20	0.00	34.50	19.77	.13	1	48.70	-.14	3
K02	73.8	9.03	0.00	26.97	12.20	.17	1	36.00	.27	3
K03	120.5	14.10	0.00	34.90	19.89	.40	1	49.00	-.06	3
K04	138.7	15.20	0.00	38.30	22.88	.81	3	53.50	-.74	5
KLB	63.0	8.10	0.00	25.20	10.43	.17	1	33.30	.64	3
MUN	78.4	9.60	0.00	27.90	12.97	.33	1	37.50	.43	3

ERROR ELLIPSE X= .77 KM Y= 1.20 KM THETA = 54.32

RMS= .38

-31.653 +- .010 N 1.1 KM 39.19
117.028 +- .011 E .9 KM 1.66
.00 +- 10.10 KM 14.60+- .42 SEC

EVENT 09 NOV 2027 LT ML 1.6 140 KM NW OF CADOUX

STA	DIST	S-P	T/C	P-SEC	TPCAL	P-RES	WT	S-SEC	S-RES	WT
BAL	91.4	10.70	0.00	25.50	15.06	.08	1	36.20	-.24	3
K02	161.6	19.32	0.00	36.68	26.32	.01	1	56.00	.06	3
K03	137.7	16.50	0.00	33.00	22.67	-.03	1	49.50	-.12	3
K04	98.1	12.03	0.00	26.47	16.17	-.06	1	38.50	.14	3

ERROR ELLIPSE X= .90 KM Y= 1.15 KM THETA = 144.91

RMS= .13

-29.853 +- .009 N 1.0 KM 51.17
116.293 +- .012 E 1.1 KM 17.59
2.34 +- 1.18 KM 10.36+- .17 SEC

EVENT 10 NOV 1510 LT ML 1.4

STA	DIST	S-P	T/C	P-SEC	TPCAL	P-RES	WT	S-SEC	S-RES	WT
BAL	40.1	5.20	0.00	21.10	6.96	-.04	1	26.30	.06	3
K04	42.9	0.00	0.00	21.58	7.40	-.00	1	0.00	0.00	0
KLB	103.9	11.80	0.00	31.20	16.84	.18	1	43.00	-.35	3
MUN	152.4	18.00	0.00	38.20	24.15	-.13	1	56.20	.19	3

ERROR ELLIPSE X= .83 KM Y= 1.69 KM THETA = 107.05

RMS= .22

-30.794 +-	.015 N	1.6 KM	47.66		
117.102 +-	.011 E	.9 KM	6.12		
13.75 +-	2.67 KM		14.18+-	.10 SEC	

EVENT NOV 22 0616 LT

STA	DIST	S-P	T/C	P-SEC	TPCAL	P-RES	WT	S-SEC	S-RES	WT
BAL	39.5	4.90	0.00	36.00	6.57	-.25	1	40.90	-.17	3
K02	37.4	4.34	0.00	35.46	6.24	-.45	1	39.80	-.68	3
KLB	106.3	12.60	0.00	47.40	17.54	.18	1	60.00	-.05	3
MUN	156.2	18.70	0.00	54.80	25.33	-.21	1	73.50	-.05	3

ERROR ELLIPSE X= .99 KM Y= 6.83 KM THETA = 131.10

RMS= .45

-30.779 +-	.047 N	5.2 KM	46.77		
117.098 +-	.053 E	4.6 KM	5.87		
.00 +-	10.01 KM		29.68+-	.56 SEC	

EVENT 04 NOV 1653 LT

STA	DIST	S-P	T/C	P-SEC	TPCAL	P-RES	WT	S-SEC	S-RES	WT
BAL	38.0	4.50	0.00	6.50	6.37	.14	1	11.00	-.02	2
K02	41.0	0.00	0.00	6.65	6.86	-.20	1	0.00	0.00	0
K03	35.5	4.02	0.00	6.28	5.97	.31	1	10.30	-.04	2
K04	35.0	0.00	0.00	5.53	5.89	-.35	1	0.00	0.00	0
KLB	109.9	12.70	0.00	18.40	18.14	.27	1	31.10	-.31	2
MUN	159.9	18.10	0.00	26.20	25.77	.43	3	44.30	-.34	3

ERROR ELLIPSE X= .69 KM Y= 1.39 KM THETA = 98.47

RMS= .33

-30.724 +-	.012 N	1.4 KM	43.46		
117.118 +-	.008 E	.7 KM	7.09		
7.04 +-	3.24 KM		-.00+-	.11 SEC	