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Duration Magnitudes for Nahanni Earthquakes Recorded by Field Networks October 1985 January 1986 September 1986

by

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Abstract

Since the two large earthquakes in the Nahanni area, in October and December 1985, three field surveys have been conducted. In the last one, in September 1986, nearly 200 aftershocks were located. Using the permanent Fort Simpson station, magnitudes of only 26 larger events could be determined. Magnitudes of 309 smaller events were calculated using their signal duration on the analog field stations.

Two programs, discussed here, were used in this calculation. One organizes the calibration events. The other one, with an inverse matrix calculation, finds a best-fit magnitude duration equation. For the third Nahanni survey, an equation:

$$MC = -0.42 + 1.72*\log(CL) + 0.01*D$$

where CL is the coda-length and D the hypocentral distance of the events, is proposed to define the relationship between signal duration and magnitude.

The same type of equation was used to find duration magnitudes for the two other surveys. Magnitudes were assigned to 347 events from the October 1985 survey and 239 events from the January 1986 survey. The magnitudes determined will be used to calculate the magnitude-frequency properties of the aftershock activity.

Résumé

A la suite des deux tremblements de terre majeurs de la région de Nahanni, en octobre et décembre 1985, trois levés de terrain furent effectués. Le troisième, réalisé en septembre 1986, permit la localisation de près de 200 répliques sismiques. De ce nombre, la magnitude de 26 répliques parmi les plus importantes a pu être évaluée à partir des sismogrammes de la station permanente de Fort Simpson. La magnitude des autres répliques fut calculée à l'aide des deux programmes commentés dans ce rapport. Le calcul de ces magnitudes est basé sur la durée de la trace sismique laissée par les répliques sur les enregistrements de stations analogiques du levé.

Les deux programmes, inclus dans ce rapport, utilisent des évènements d'étalonnage. Le premier les regroupe. Le second, utilisant la technique de la matrice inverse, détermine la meilleure équation magnitude/longueur de la trace. Pour le troisième levé de Nahanni, l'équation proposée est:

$$MC = -0.42 + 1.72*LOG(CL) + 0.01*D$$

dont les paramètres CL et D sont respectivement la longueur de la trace sismique sur les enregistrements analogiques et la distance hypocentrale.

A la suite d'un procédé semblable, une équation de même type a ensuite été trouvée pour chacun des autres levés. Les magnitudes de 347 répliques, pour le levé d'octobre 1985, et de 239 répliques, pour le levé de janvier 1986, furent calculées. Toutes ces magnitudes serviront à déterminer la récurrence des répliques.

Introduction

This report presents two computer programs for developing a coda-length magnitude relationship for earthquakes recorded by the Nahanni aftershock survey in September 1986. Since the two large earthquakes of October 1985 and December 1985 (M 6.6 and 6.9 respectively) in the Nahanni area, three aftershock surveys have been conducted: in October 1985, in January 1986 and in September 1986. The last one was the best-equipped with 8 analog recorders (smokers) and 6 digital recorders (bakpaks). Nearly 200 events were located during the nine-day period (between September 12th and September 21st) of the survey.

After locating the aftershocks with the temporary array, magnitudes of the larger events were calculated, using the Fort Simpson's seismograph station (FST; the nearest seismograph station, at 160 km to the East). These events had magnitudes (MN) varying between 1.5 and 3.0. For smaller aftershocks, where amplitudes were too small to be seen on the Fort Simpson records, magnitudes could not be calculated in the same manner. Thus, a coda-length scheme was developed to assign consistent magnitudes to the smaller events.

Given magnitude, coda-length and distance for a set of calibration events, it is possible to relate them by the equation:

$$MAGNITUDE = A + B*LOG(LENGTH) + F(DISTANCE)$$

as defined by Tsumura (1967). LENGTH is related to the signal duration (coda-length) and F(DISTANCE) is a function of the distance. The two following programs described here were written to relate combinations of these parameters and to define the best-fit relationship between them. When the type of equation has been chosen, the same type was used to find an equation for the two other surveys.

Theory

Generally, magnitude is determined from the peak vertical S-wave amplitude measured on seismographs. Either Nuttli (1973) or Gutenberg and Richter (1956) magnitudes are used by the Geophysics Division of the Geological Survey of Canada for Canadian earthquakes, depending on the event's location. Because of the proximity of this station to the aftershocks' location, the Fort Simpson's records were used. The events' magnitudes were obtained by the Nuttli (1973) relationship, using the maximum zero-to-peak amplitude of the signal, its period (0.10s) and the magnification of the station (107K).

During the third Nahanni survey, the Fort Simpson's seismograph never recorded earthquakes with magnitude less than 1.5, so, a convenient method defining the magnitude for smaller

events, recorded by the field networks, had to be found. Two common approaches exist to define magnitude for small events. The first one is the calculation of the ground motion by the use of the recorded maximum amplitude but this has been found to be unreliable at short epicentral distances. The second one uses the signal duration. In this report, the signal duration approach is chosen.

This method has several advantages. It is simple and easy to apply. It needs the use of a single seismograph. It can cover a wide range of magnitude without any saturation problem from the recording intrumentation. In turn, the duration values are subjective to assign and may present large variations depending on the noise present, the criteria for assignment and personal errors.

Since 1967, when Tsumura established an empirical formula for estimating magnitude for local earthquakes, the use of signal duration has been investigated by several authors such as, Crosson (1972), Lee et al. (1972), Real and Teng (1973), Herrmann (1975), Bakun and Lindh (1977) and Suteau and Whitcomb (1979). Using the duration magnitude has become a common practice, as evidenced by authors such as Lee and Wetmiller (1978).

In 1967,Tsumura obtained the empirical formula:

$$M = -2.53 + 2.85*\log(T) + 0.0014*D$$

where M is the estimate of the local magnitude, T is the signal duration in seconds and D is the epicentral distance in km. In other studies, duration magnitude (Md) for a given station has been given by the form:

$$Md = a + b*\log(T) + c*D + d*H$$

where H is the focal depth in km.

An equation like:

$$MC = A + B*TIME + C*DISTANCE$$

was chosen to calculate the duration magnitude in this report. To increase the possibilities to find the most relevant relationship for the survey's data, many possible definitions were given to TIME and to DISTANCE. DISTANCE is either the epicentral distance, the hypocentral distance or their logarithms (some definitions don't use the term DISTANCE in their calculation). TIME may be; first; the value of the coda-length; second; the summation of this value and the P-wave travel-time or third; their logarithms. TIME and DISTANCE are measured in seconds and kilometers respectively.

To define the duration magnitude relation, a set of calibration magnitudes must be used. Generally, a minimum of 6 to 10 magnitudes is necessary to correlate, with an acceptable precision, magnitude and signal duration (Lee and Stewart, 1981).

Signal duration is often difficult to estimate consistently. The signal duration used in this report is defined as the time interval between the P-wave arrival time and the time when the trace zero-to-peak amplitude of the signal recorded on a MEQ seismograph is less than 1 mm for the lowest gain level of the chosen analog records. For the analog recorder that was used, an increase in gain of 6 db doubles the amplitude on the record. So, for higher gain levels, the limit width for the end of the signal duration increases consequently. For example, the limit for the end of the signal duration would be 2 mm when the gain level increases from 66 db to 72 db, and so on. FIGURE I shows the diminution of the coda-length with the increase of the gain level.

The programs

The two programs created to find the duration magnitude relationship are named SCODA and FCODA. FCODA follows the use of SCODA. The programs SCODA and FCODA are in the Seismicity Group's MVAX3 computer in the directory [WETMILLER].

After locating the events, the Nuttli magnitudes are determined, using the FST records, for as many aftershocks as possible. The signal duration of the events is measured on the records from a control station with the most continuous period of operation. The records must come from a station located as much as possible in the center of the aftershock zone in order to have the largest possible number of recorded signals. Final values of the measured duration for each event are stored on PIK files (PIK files are the standard-format earthquake data files used by Geophysics Division).

When all the PIK files have been completed with the above parameters, they are merged into one file. This file is then the input file of the SCODA program.

The SCODA program (Appendix I) is a program for changing PIK files into a file having only the parameters needed for the determination of the duration magnitude relationship. It takes, from the PIK file, the date, the origin time, the magnitude and the depth of the events. For the chosen analog station, it takes the measured coda-lengths, the P-wave arrival times and the epicentral distances.

SCODA skips events that do not have a calibration magnitude or a magnitude other than the Nuttli's one, like the local magnitude (Ml). Also, it skips the aftershocks where no signal duration was found at the central station.

The output is shown in Appendix II. Each pair of lines represents one aftershock. On the first line, the comment line, appear the chosen station's name, the date and the time of the event with its magnitude and depth. On the second line, the magnitude, the signal duration, the P-wave arrival time, the origin time, the epicentral distance and the depth are written.

This output file of the SCODA program is, if no mistake is present, the input file of FCODA. The program FCODA (Appendix III) is really the program where the duration magnitude relationship is searched for.

The program FCODA allows the choice of 24 possibilities of equations and calculates for the chosen one the best values of A, B and C. The user can choose between these relationships:

```
MC = A + B*T
MC = A + B*LOG(T)
MC = A + B*T + C*DIST
MC = A + B*T + C*LOG(DIST)
MC = A + B*LOG(T) + C*DIST
MC = A + B*LOG(T) + C*LOG(DIST)
MC = A + B*CL
MC = A + B*LOG(CL)
MC = A + B*CL + C*DIST
MC = A + B*CL + C*LOG(DIST)
MC = A + B*LOG(CL) + C*DIST
MC = A + B*LOG(CL) + C*LOG(DIST)
```

where CL is the coda-length and T is the summation of the coda-length and the P-wave travel-time. The value of T may be calculated by:

$$T = CL + \frac{\text{(hypocentral distance)}}{6.2}$$

for the Nahanni geological conditions. These equations can be used with either the epicentral or the hypocentral distance. When the user has chosen which relationship he prefers, the program find the values of A, B and C having the lowest RMS. Taking every set of 2 or 3 events, the program calculates the solution for that set by an inverse matrix solution. When all combinations have been tried, it finds which solution has the lowest RMS. When the best solution is found, the program writes the A, B and C values, the RMS value,the calibration and the calculated magnitudes for all calibration events.

Application and discussion

The first data set on which these two programs were used, was the third Nahanni survey data set of September 1986. Of the located 184 events, only 26 events were large enough to be seen on FST records for a magnitude calculation. The corresponding magnitude (MN) varied between 2.4 and 3.9 (TABLE I).

A problem arose during the calculation of the magnitude. Because of the uncertain calibration of the FST seismograph and because of MN is poorly defined for small distances, systematic differences were noticed between FST and YKC (Yellowknife, N.W.T.; CSN station) magnitudes. FST magnitudes were always an magnitude unit higher than the YKC ones. A correction was made on FST magnitudes. The average difference between YKC and FST magnitude seemed to be 0.9 (TABLE I), this correction was applied to each FST magnitude value (TABLE I). The Yellowknife's results were not chosen because of the high detection threshold (magnitude MN=2.3) at that station and the small number of events recorded at YKC (6).

The signal duration was measured using the central station, the analog recorder S17. The station S17 had the longest continuous recording and, fortunately, was in the center of the aftershocks zone (FIGURE II). All records had the same gain level, 78db. All coda-length larger than 2 seconds were measured to the point where the half-amplitude was less than 1 mm. A total of 142 coda-lengths was measured and copied in the corresponding PIK files. These coda-lengths varied between 2 and 84 seconds. The other 42 events had coda-lengths less than 2 seconds or were not recorded by the station S17.

All PIK files were run in the SCODA program to find the characteristics of the duration magnitude aftershocks. The 26 calculated magnitudes were plotted as a function of the logarithm of the duration (FIGURE III) and as a function of the duration only (FIGURE IV). On these 26 aftershocks, 6 were dropped because of their anomalous values of magnitude and/or coda-length in respect to the others on one or the other graph. Their magnitudes were generally larger than their coda-lengths seem to indicate. The other 20 were used to calculate the most relevant relationship between their values of magnitude, coda-length and distance.

The 24 possibilities described above were tested. TABLE II shows for these their best values of A, B and C and their corresponding RMS. No significant difference appeared when DIST was either the epicentral distance, the hypocentral distance or their logarithms. The use of the hypocentral distance seemed to give slightly better results than the other distance definitions. The equation chosen for the duration magnitude, with a RMS equal to 0.12, of this survey was:

$$MC = -0.42 + 1.72*LOG(CL) + 0.01*DIST$$

where DIST is the hypocentral distance. Table III gives both calibration and duration magnitudes for the calibration events. A simplier equation may be used for a first order of approximation of the magnitude:

$$MC = -0.39 + 1.79\log(CL)$$

The magnitude of the other events was determined from signal duration measurements using this relationship (APPENDIX IV). In this appendix, where the magnitude equals zero, it means that no calibration or calculated magnitude was found; arbitrarly, the given value was zero. TABLE IV shows the distribution of the magnitude of the aftershocks.

To have a better representation of the aftershock activity, unlocated events were read on the analog records of the central station. All unlocated events (167) with signal duration larger than 2 seconds were found and measured. Their magnitudes were calculated using the equation described above and a mean depth (7 km)(TABLE IV).

When the type of equation has been chosen, SCODA and FCODA were used to find the coefficients of the duration magnitude equation for the other two surveys.

During the first Nahanni survey, in October 1985, 112 aftershocks were located. Of them, 46 were large enough to have Nuttli magnitude from FST and/or YKC (TABLE V). The central station chosen for this survey was SS3 (during all the survey, this station had a gain of 72 db). On the 46 large events, 28 were kept as calibration magnitude events and were used in FCODA. The equation given by the program was:

$$MC = 0.20 + 1.81LOG(CL) + 0.001*DIST$$

APPENDIX VI gives the magnitude values for the survey aftershocks. This equation was used to calculate magnitude values for the unlocated events using a mean depth of 5 km. TABLE VI shows the distribution of the aftershocks magnitudes for the first Nahanni survey.

For the second Nahanni survey, conducted in January 1986, the duration magnitude equation was:

$$MC = -0.40 + 2.43LOG(CL) + 0.002*DIST$$

This equation was obtained using 23 calibration events on 38 large aftershocks (TABLE VII). SS8 was chosen as central station but its gain was not constant over the survey period, so a correction was done for the duration values as explained in FIGURE I. As the lower gain value was 66 db, the limit width, for that value, was 1 mm; for the other increasing gain values, the limit width increased by 1 mm to each 6 db level. For the unlocated aftershocks (158), the depth was 8 km. APPENDIX VII and TABLE VIII gives the list of the survey aftershocks magnitudes and their distribution.

All these magnitudes will be used in a coming study of the sequence's b-value.

The calculated magnitude values may have errors. A discussion of the error values is not an objective of this report. Errors on duration magnitude calculation have been described by Weichert and Horner (1985). The present error values may be less than three times the standard deviation value (0.12), so they may have, generally speaking, a value of 0.40 as higher value.

Conclusion

The duration magnitude relationships for the three Nahanni surveys seem to agree with the equation as described by other authors. Hypocentral distance was chosen for the relationship but no significant difference is apparent if epicentral distance or their logarithms are used.

For the third Nahanni survey, duration magnitudes for 20 calibration events, corrected MN 1.5 to 3.0, were determined with a RMS of 0.12. The relationship was used to calculate the duration magnitude for another 122 located events in the survey, MC 0.2 to 3.2. In addition, duration magnitudes were estimated for 167 unlocated events recorded on the central station, S17.

The same type of equation was used to define the duration magnitude equation for the other two surveys. Both equations had a RMS of 0.12 also. Both were used to calculate magnitude for located and unlocated events, 347 events in October 1985 and 239 events in January 1986.

Unfortunatly, a comparaison between the three equations is not possible because their gain levels and their central stations are not the same.

The programs SCODA and FCODA represent an aspect of the solution for duration magnitude; but they have assumptions. First, it is impossible to know if the equation determined from the calibration events is linearly extrapolated to the lower magnitude located and unlocated events. Also, for the unlocated events, the distance and the depth of these events is assumed, so, resulting in possible errors in their magnitude. So, for all events with magnitude lower than 1.5, their duration magnitude may be more uncertain than the larger events when determined by this relationship.

To appreciate the validity of the values given by the relationship, the user must remember that the parameters (the sensitivity of the recorder, the imposed limit of the coda-length, the number of calibration magnitude events to define the relationship, the use of the located events only and the smallness of the magnitude itself) that he uses must be as relevant as possible.

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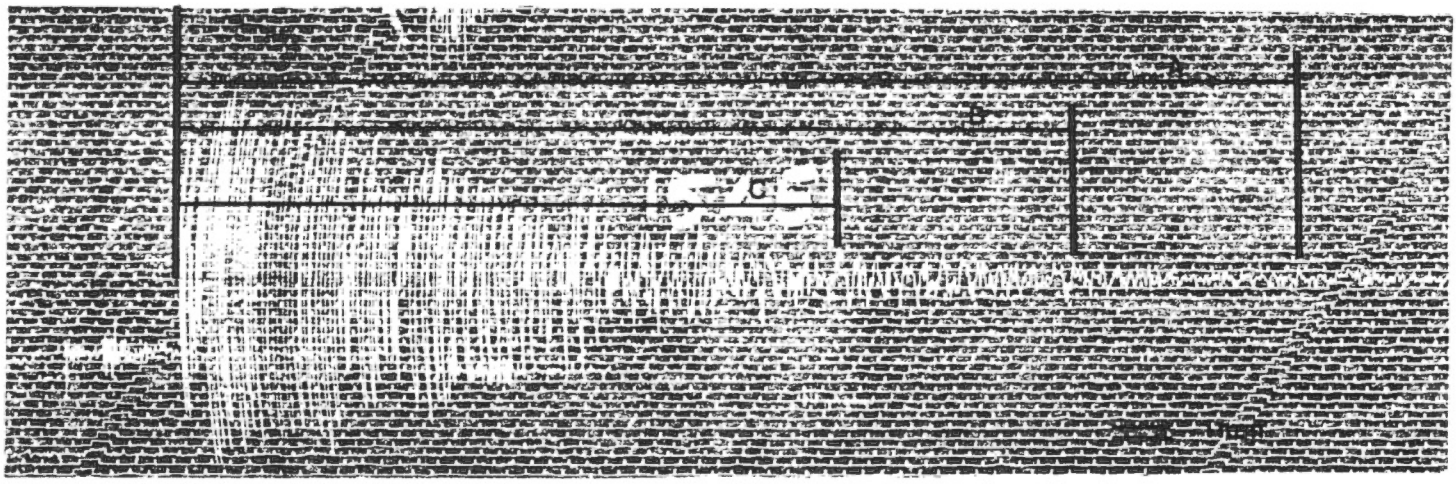
FIGURE I : MEASUREMENT OF THE SIGNAL DURATION



A) If Gain level: 66dB Coda-length: 60s Limit width: 1mm
B) If Gain level: 72dB Coda-length: 47s Limit width: 2mm
C) If Gain level: 78dB Coda-length: 32s Limit width: 3mm

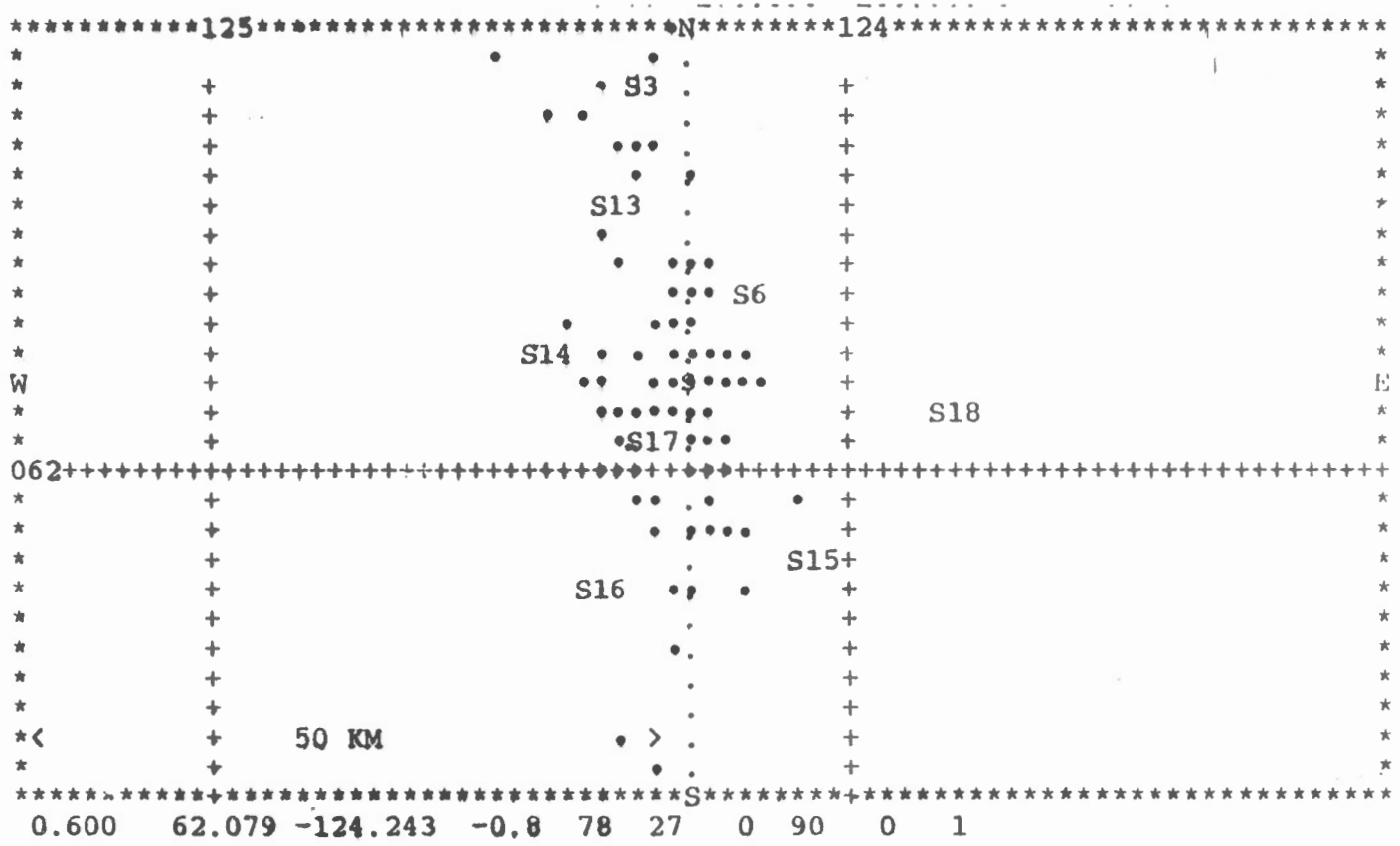


FIGURE II : THE THIRD NAHANNI SURVEY NETWORK

FIGURE III : CORRECTED FST MAGNITUDE VS LOG(CODA-LENGTH(MEQ17))

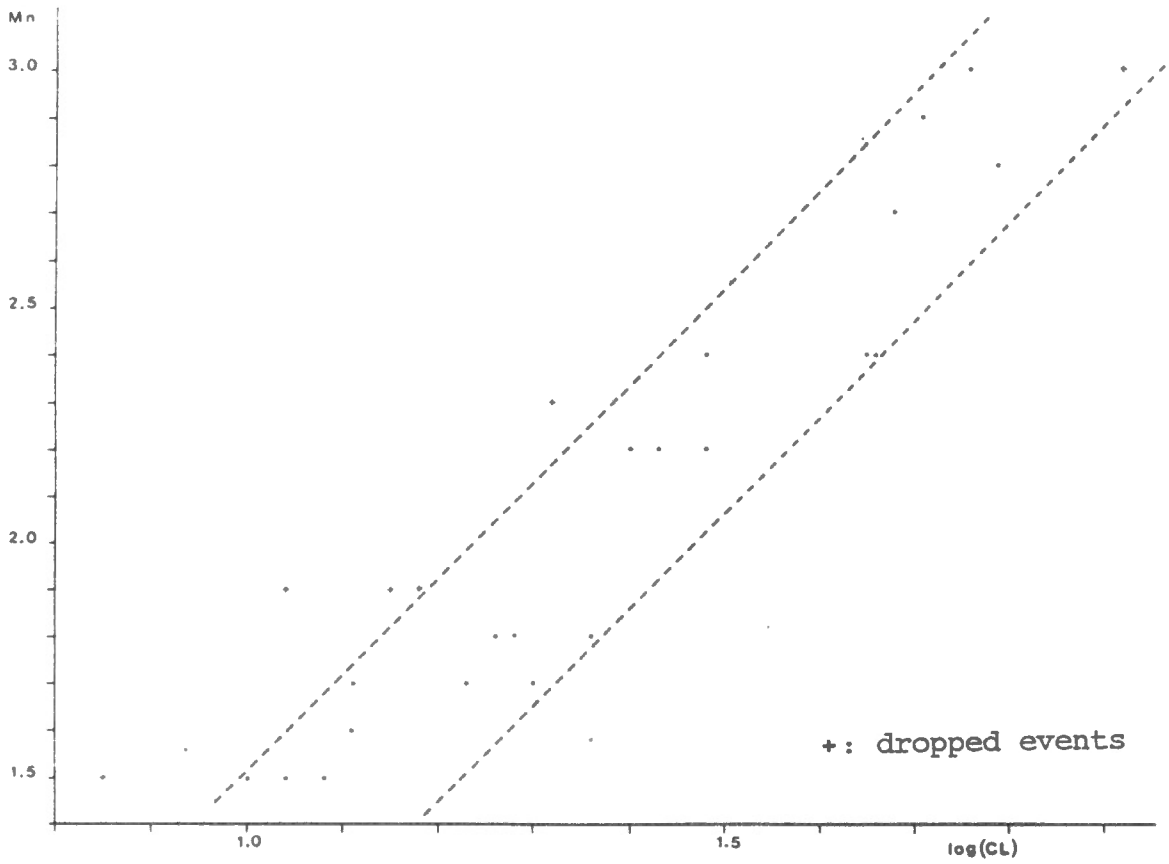


FIGURE IV : CORRECTED FST MAGNITUDE VS CODA-LENGTH(MEQ17)

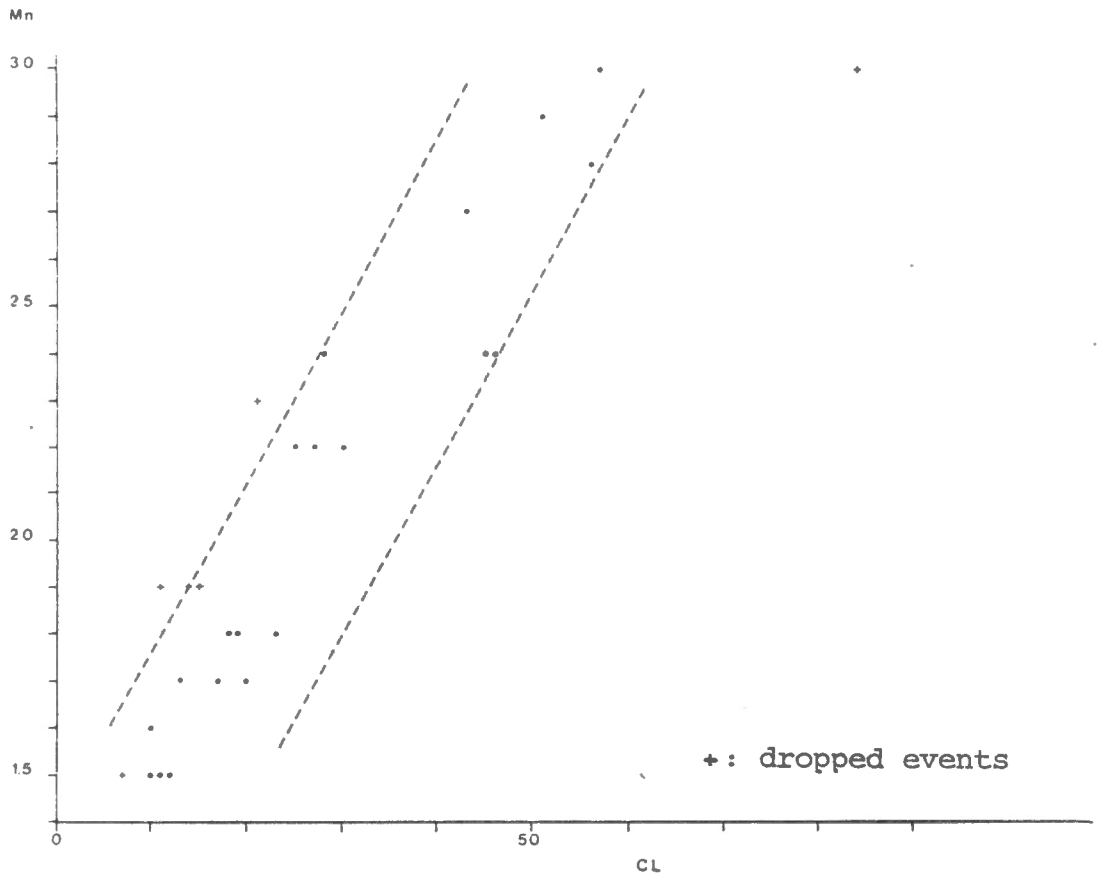


TABLE I : THE CALIBRATION MAGNITUDE EVENTS
FOR THE THIRD NAHANNI SURVEY

EVENTS	DURATION (MEQ 17) (78db)	MAGNITUDE (FROM FST) (MN)	MAGNITUDE (FROM YKC) (MN)	MAGNITUDE (FROM FST) (MN) (CORRECTED)
19860913.0134	23	2.7		1.8
19860913.0612	7	2.4		1.5*
19860914.0304	48	3.6	2.7	2.7
19860916.0419	61	3.7	2.8	2.8
19860916.1110	46	3.3	2.5	2.4
19860916.1800	18	2.7		1.8
19860917.0242	12	2.4		1.5
19860917.0717	45	3.3	2.3	2.4
19860917.0815	10	2.4		1.5
19860918.0301	25	3.1		2.2
19860918.0619	13	2.5		1.6
19860918.0723	51	3.8	2.7	2.9
19860918.1102	20	2.6		1.7
19860918.1241	17	2.6		1.7
19860918.2103	14	2.8		1.9*
19860918.2138	15	2.8		1.9*
19860918.2326	13	2.6		1.7
19860919.1250	28	3.3		2.4
19860919.1351	11	2.8		1.9*
19860919.1947	84	3.9	3.1	3.0*
19860920.0741	27	3.1		2.2
19860920.1601	19	2.7		1.8
19860921.0921	57	3.9		3.0
19860921.0925	21	3.2		2.3*
19860921.1439	11	2.4		1.5
19860921.1751	30	3.1		2.2

0.9 : mean difference between FST and YKC
* : dropped events

TABLE II : EQUATIONS, COEFFICIENTS AND RMS
FOR THE THIRD NAHANNI SURVEY SOLUTION

TYPE OF EQUATIONS

TYPE 1	MC = A + B*T
TYPE 2	MC = A + B*LOG(T)
TYPE 3	MC = A + B*T + C*DIST
TYPE 4	MC = A + B*T + C*LOG(DIST)
TYPE 5	MC = A + B*LOG(T) + C*DIST
TYPE 6	MC = A + B*LOG(T) + C*LOG(DIST)
TYPE 7	MC = A + B*CL
TYPE 8	MC = A + B*LOG(CL)
TYPE 9	MC = A + B*CL + C*DIST
TYPE 10	MC = A + B*CL + C*LOG(DIST)
TYPE 11	MC = A + B*LOG(CL) + C*DIST
TYPE 12	MC = A + B*LOG(CL) + C*LOG(DIST)

TYPE	A	B	C	RMS
		EPICENTRAL DISTANCE		
1	1.27	0.03	-	0.14
2	-0.73	1.96	-	0.13
3	1.16	0.03	0.00	0.14
4	1.25	0.02	0.07	0.14
5	-0.65	1.87	0.00	0.12
6	-0.71	1.82	0.18	0.12
7	1.26	0.03	-	0.15
8	-0.39	1.79	-	0.14
9	1.19	0.03	0.00	0.14
10	1.17	0.03	0.18	0.14
11	-0.36	1.69	0.01	0.12
12	-0.63	1.82	0.21	0.13
		HYPOCENTRAL DISTANCE		
1	same as above			
2	same as above			
3	1.30	0.02	0.00	0.14
4	1.22	0.02	0.08	0.14
5	-0.68	1.88	0.00	0.12
6	-0.85	1.84	0.26	0.12
7	same as above			
8	same as above			
9	1.17	0.03	0.00	0.14
10	1.10	0.03	0.21	0.13
11	-0.42	1.72	0.01	0.12*
12	-0.73	1.65	0.45	0.12

* : chosen values

TABLE III : MN MAGNITUDE VS MC MAGNITUDE
FOR THE THIRD NAHANNI SURVEY

EVENTS	CALIBRATION (MN)	CALCULATED (MC)
19860913.0134	1.8	2.0
19860913.0612*	1.5	1.1
19860914.0304	2.7	2.6
19860916.0419	2.8	2.7
19860916.1110	2.4	2.6
19860916.1800	1.8	1.8
19860917.0242	1.5	1.5
19860917.0717	2.4	2.5
19860917.0815	1.5	1.4
19860918.0301	2.2	2.0
19860918.0619	1.6	1.6
19860918.0723	2.9	2.7
19860918.1102	1.7	1.9
19860918.1241	1.7	1.8
19860918.2103*	1.9	1.7
19860918.2138*	1.9	1.7
19860918.2326	1.7	1.5
19860919.1250	2.4	2.2
19860919.1351*	1.9	1.4
19860919.1947*	3.0	3.2
19860920.0741	2.2	2.1
19860920.1601	1.8	1.8
19860921.0921	3.0	3.0
19860921.0925*	2.3	2.2
19860921.1439	1.5	1.4
19860921.1751	2.2	2.2

* : dropped events

TABLE IV : CALCULATED-MAGNITUDE EVENTS
FOR THE THIRD NAHANNI SURVEY

	LOCATED	UNLOCATED
Magnitude lower than 0.5 :	22	116
Magnitude between 0.5 and 1.0 :	54	40
Magnitude between 1.0 and 1.5 :	32	11
Magnitude between 1.5 and 2.0 :	19	
Magnitude between 2.0 and 2.5 :	9	
Magnitude between 2.5 and 3.0 :	6	
Magnitude between 3.0 and 3.5 :	0	
Magnitude between 3.5 and 4.0 :	0	
Magnitude greater than 4.0 :	0	

The intervals are defined as, $A < x < B$

TABLE V : THE CALIBRATION MAGNITUDE EVENTS
FOR THE FIRST NAHANNI SURVEY

EVENTS	DURATION (MEQ 3) (72db)	MAGNITUDE (FROM FST) (MN)	MAGNITUDE (FROM YKC) (MN)	MAGNITUDE (FROM FST) (MN) (CORRECTED)
198510132045	29	3.8	2.7	2.8
198510132057			3.6	*
198510132313	11	3.1		2.1
198510140438			3.7	*
198510140616	20	3.4		2.4
198510140619	16	3.5		2.5
198510140642	57	4.5	3.6	3.5
198510140655	25	3.6	2.6	2.6
198510141010	32	4.0	3.2	3.0
198510141024	24	3.5		2.5
198510141051	23	3.5	2.6	2.5
198510141751	16	3.3	2.7	2.3
198510142222	30	3.9	2.9	2.9
198510142320			4.1	*
198510150015			2.9	*
198510150508	70	4.6	3.5	3.6*
198510150656	22	3.6	2.7	2.6
198510150714	60	4.3	3.3	3.3*
198510150739	24	3.8	2.8	2.8
198510150835	20	3.5		2.5
198510151158	31	4.0	3.2	3.0
198510151341			3.8	*
198510151406	24	3.6	2.7	2.6
198510151415	27	3.6	2.8	2.6
198510151419	23	3.9	2.7	2.9
198510151514	18	3.6		2.6
198510151600	21	3.8	2.8	2.8
198510151700		4.3	3.2	3.3*
198510152155	22	3.8	3.2	2.8
198510152320	26	3.9	2.8	2.9
198510160203	24	3.8		2.8
198510160552	19	3.6		2.6
198510160725	14	3.3		2.3
198510161142	16	3.5		2.5
198510161845			4.8	*
198510162109			3.0	*
198510162127	18	2.9		1.9*
198510162220	48	4.3	3.0	3.3
198510170038	38	3.9		2.9
198510170052	20	2.9		1.9*
198510170135	25	3.7		2.7
198510170739	35	3.4		2.4*
198510170830	35	3.5		2.5*
198510170959	37	3.5		2.5*
198510171007	37	3.6		2.6*
198510171023	36	3.5		2.5*
198510171142	47	4.0	2.9	3.0*

1.0 : mean difference between FST and YKC
* : dropped events

TABLE VI : CALCULATED-MAGNITUDE EVENTS
FOR THE FIRST NAHANNI SURVEY

	LOCATED	UNLOCATED
Magnitude lower than 0.5	0	0
Magnitude between 0.5 and 1.0	9	49
Magnitude between 1.0 and 1.5	23	111
Magnitude between 1.5 and 2.0	6	48
Magnitude between 2.0 and 2.5	18	41
Magnitude between 2.5 and 3.0	19	11
Magnitude between 3.0 and 3.5	4	1
Magnitude between 3.5 and 4.0	5	
Magnitude greater than 4.0	2	

The intervals are defined as, $A < x < B$

TABLE VII : THE CALIBRATION MAGNITUDE EVENTS
FOR THE SECOND NAHANNI SURVEY

EVENTS	DURATION (MEQ 8) (66db)	MAGNITUDE (FROM FST) (MN)	MAGNITUDE (FROM YKC) (MN)	MAGNITUDE (FROM FST) (MN) (CORRECTED)
198601032123	58	4.0	3.0	3.1*
198601040102	17	3.5	2.9	2.6
198601040112	24	3.7	2.7	2.8
198601040128	16	3.2		2.3
198601040139	24	3.8	2.8	2.9
198601040819			3.5	*
198601041609	42	4.5	3.3	3.6
198601041834	29	4.0	3.2	3.1
198601042207	24	3.9	2.9	3.0
198601042243	90		3.9	*
198601050304	20	3.7	2.7	2.8
198601050503	20	3.7		2.8
198601050544	27	3.7	2.9	2.8*
198601051025	90		3.9	*
198601051429	70	4.5	3.5	3.6*
198601052228	36	4.0	3.2	3.1*
198601060222	43	4.4	3.3	3.5
198601060353	20	3.7	2.7	2.8
198601061338	20	3.7	2.7	2.8
198601061552	33	4.4	3.3	3.5
198601062209	61		3.6	*
198601062327	36	4.5	3.4	3.6
198601070651	20	4.3	2.9	3.4*
198601071118	21	3.6	2.7	2.7
198601071137	20	3.8	2.9	2.9
198601071225	144		4.6	*
198601072244	20	3.9		3.0
198601072339			3.7	*
198601072343	54	4.6	3.5	3.7*
198601080125	14	3.4	2.7	2.5
198601080238	20	3.4	2.8	2.5*
198601080306	22	4.0	3.2	3.1
198601080335	10	3.0		2.1
198601080558	14	3.3	2.6	2.4
198601080709	24	3.8	3.0	2.9
198601081346	12	3.4	2.7	2.5*
198601081441	34	4.3	3.1	3.2
198601081551	18		2.7	*

0.9 : mean difference between FST and YKC
* : dropped events

TABLE VIII : CALCULATED-MAGNITUDE EVENTS
FOR THE SECOND NAHANNI SURVEY

	LOCATED	UNLOCATED
Magnitude lower than 0.5	7	24
Magnitude between 0.5 and 1.0	10	45
Magnitude between 1.0 and 1.5	19	40
Magnitude between 1.5 and 2.0	8	17
Magnitude between 2.0 and 2.5	7	20
Magnitude between 2.5 and 3.0	14	9
Magnitude between 3.0 and 3.5	8	1
Magnitude between 3.5 and 4.0	7	2
Magnitude greater than 4.0	1	

The intervals are defined as, $A < x < B$

APPENDIX I : THE SCODA PROGRAM

```
**********
*
*          PROGRAM SCODA
*
**********
*
*       M. PLOUFFE - DECEMBER 1986
*
*    SCODA  READS EARTHQUAKE SOLUTION FILES AND EXTRACTS INFORMATION
*    SUCH AS P ARRIVAL TIMES, EPICENTRAL DISTANCES, DEPTHS AND
*    MAGNITUDES FOR USE IN THE PROGRAM FCODA.
*
*
         PROGRAM SCODA
         CHARACTER*2 MONTH,DAY,HOUR,MIN
         CHARACTER*3 MN,CL,STNID
         CHARACTER*4 YEAR,DIST,STN1,STN2
         CHARACTER ORIGIN*5, CREADAT*8
         CHARACTER*6 MAG,PARR,DEPTH
         CHARACTER*40 INFILE,OUTFILE
         CHARACTER*138 CARD
         NUM=1
         WRITE (*,9)
9        FORMAT(///,'  PROGRAM SCODA READS PIK FILES ',/,
     1             '  AND EXTRACTS THE APPROPRIATE DATA ',/,
     2             '  FOR THE PROGRAM FCODA. ',//
     3 ' **NOTE** COMMENTS SHOULD BE ADDED AS REQUIRED.',//)
**********
*
*        ENTER THE INPUT FILENAME AND CREATE THE OUTPUT FILE
*
**********
999      WRITE (*,10)
10       FORMAT(/,'  ENTER INPUT FILENAME : ',$)
         READ (5,15) INFILE
15       FORMAT(A40)
         OPEN (UNIT=3,FILE=INFILE,STATUS='OLD',IOSTAT=IST)
         IF (IST .NE. 0) THEN
           WRITE (*,*) ' INPUT FILE DOES NOT EXIST, PRETTY PLEASE TRY AGAIN'
           GO TO 999
         END IF
         WRITE (*,11)
11       FORMAT(/,'  ENTER OUTPUT FILENAME : ',$)
         READ (5,15) OUTFILE
         OPEN (UNIT=12,FILE=OUTFILE,STATUS='NEW',
     1   CARRIAGECONTROL='LIST',RECL=81,IOSTAT=IST)
**********
*
*        ENTER CENTRAL STATIONS WHERE THE CODA LENGTHS WERE
*        MEASURED       FIRST NAME: DIGITAL STATION NAME
*                       SECOND NAME: ANALOG STATION NAME
*
**********
         WRITE (*,12)
12       FORMAT(/,'  ENTER CENTRAL STATION : ',$)
         READ (5,20) STN1
20       FORMAT(A4)
         WRITE (*,13)
13       FORMAT(/,'  ENTER OTHER NAME : ',$)
```

```
      READ (5,20) STN2
*********************
*
*     THE COMMENTS LINE
*
*********************
25    READ (3,30,END=300) CARD
30    FORMAT(A138)
40    IF (CARD(1:1) .EQ. '+' .OR. CARD(1:1) .EQ. '-') THEN
50      IF (CARD(18:19) .EQ. 'ML' .OR. CARD(18:19) .EQ. 'MC' .OR.
     1    CARD(21:23) .EQ. '0.0') THEN
60        READ (3,30,END=300) CARD
          IF (CARD(1:1) .NE. '+' .AND. CARD(1:1) .NE. '-') THEN
            GO TO 60
          END IF
          GO TO 50
        END IF
        YEAR=CARD(37:40)
        MONTH=CARD(35:36)
        DAY=CARD(33:34)
        HOUR=CARD(25:26)
        MIN=CARD(27:28)
        MN=CARD(21:23)
        ORIGIN=CARD(27:31)
        MAG=CARD(18:23)
        DEPTH=CARD(72:76)
*********************
*
*     THE INFORMATION LINE
*
*********************
      ELSE IF (CARD(14:14) .EQ. 'P' .AND. CARD(1:3) .EQ. STN1
     1  .OR. CARD(1:3) .EQ. STN2) THEN
        IF (CARD(73:75) .EQ. '   ') GO TO 290
        PARR=CARD(33:38)
        CL=CARD(73:75)
        STNID=CARD(1:3)
        WRITE (12,100) STN1,YEAR,MONTH,DAY,HOUR,MIN,MAG,DEPTH
100     FORMAT('$',A4,5X,A4,2A2,1X,A2,':',A2,4X,A6,4X,
     1  'DEPTH:',A6)
        READ (3,30,END=290) CARD
        IF (CARD(1:3) .EQ. STNID .AND. CARD(14:15) .EQ. 'KM') THEN
          DIST=CARD(10:13)
          WRITE (12,101) MN,CL,PARR,ORIGIN,DIST,DEPTH
101       FORMAT(1X,A3,1X,A3,1X,A6,1X,A5,1X,A4,1X,A6)
        ELSE
          WRITE (5,102) DAY,HOUR,MIN
102       FORMAT(/,' ***ERROR ON RECORD:',A2,1X,A2,':',A2)
          GO TO 40
        END IF
      END IF
290   GO TO 25
300   CONTINUE
      STOP
      END
```

APPENDIX II : THE SCODA PROGRAM'S OUTPUT FILE

```
$S17       19860913 01:34    MN=1.8    DEPTH: 8.13
 1.8 023 342560 34236 0006  8.13
$S17       19860914 03:04    MN=2.7    DEPTH: 7.36
 2.7 048 041080 04072 0019  7.36
$S17       19860916 04:19    MN=2.8    DEPTH: 9.65
 2.8 061 194205 19399 0007  9.65
$S17       19860916 11:10    MN=2.4    DEPTH: 9.76
 2.4 046 101009 10053 0025  9.76
$S17       19860916 18:00    MN=1.8    DEPTH: 8.42
 1.8 018 000850 00065 0007  8.42
$S17       19860917 02:42    MN=1.5    DEPTH: 7.26
 1.5 012 425554 42538 0006  7.26
$S17       19860917 07:17    MN=2.4    DEPTH: 5.38
 2.4 045 175299 17511 0007  5.38
$S17       19860917 08:15    MN=1.5    DEPTH: 7.58
 1.5 010 153740 15351 0010  7.58
$S17       19860918 03:01    MN=2.2    DEPTH: 8.42
 2.2 025 014285 01411 0003  8.42
$S17       19860918 06:19    MN=1.6    DEPTH:14.68
 1.6 013 192984 19265 0011 14.68
$S17       19860918 07:23    MN=2.9    DEPTH:10.79
 2.9 051 232941 23244 0027 10.79
$S17       19860918 11:02    MN=1.7    DEPTH: 7.52
 1.7 020 025629 02546 0005  7.52
$S17       19860918 12:41    MN=1.7    DEPTH: 7.39
 1.7 017 415107 41494 0005  7.39
$S17       19860918 23:26    MN=1.7    DEPTH: 6.52
 1.7 013 261471 26133 0004  6.52
$S17       19860919 12:50    MN=2.4    DEPTH: 9.88
 2.4 028 505828 50548 0016  9.88
$S17       19860920 07:41    MN=2.2    DEPTH: 8.53
 2.2 027 414875 41467 0007  8.53
$S17       19860920 16:01    MN=1.8    DEPTH: 6.36
 1.8 019 010485 01034 0005  6.36
$S17       19860921 09:21    MN=3.0    DEPTH:10.00
 3.0 057 212068 21111 0057 10.00
$S17       19860921 14:39    MN=1.5    DEPTH: 7.83
 1.5 011 393265 39308 0006  7.83
$S17       19860921 17:51    MN=2.2    DEPTH: 7.39
 2.2 030 512105 51190 0009  7.39
```

APPENDIX III : THE FCODA PROGRAM

```
**********************
*
*         PROGRAM FCODA
*
**********************
*
*
*
*       M.PLOUFFE - DECEMBER 1986
*
*
*       PROGRAM FCODA FINDS THE COEFFICIENTS OF THE
*       RELATIONSHIP BETWEEN MAGNITUDE, TIME AND THE EPICENTRAL/
*       HYPOCENTRAL DISTANCE FOR EARTHQUAKES;
*       WHERE THE RELATIONSHIP IS OF THE FORM:
*            MN = A + B*TIME + C*DISTANCE
*       WHERE DISTANCE IS THE EPICENTRAL/HYPOCENTRAL DISTANCE
*                         OR THEIR LOGARITHMS
*             TIME IS THE CODA LENGTH(CL),
*                         THE TIME(CL + P ARRIVAL TIME - ORIGIN TIME)
*                         OR THEIR LOGARITHMS
*
       PROGRAM FCODA
       INTEGER S,W,Y
       DOUBLE PRECISION DI,DIS,DISTE,ORIGIN,PARR
       DOUBLE PRECISION DET,RM,RMI,RM2
       DOUBLE PRECISION A,B,C,RMS
       DOUBLE PRECISION CL(100),T(100)
       DOUBLE PRECISION DEPTH(100),DIST(100),DISTA(100)
       DOUBLE PRECISION MN(100),MNCAL(100)
       DOUBLE PRECISION D1(2,2),D2(3,3),D(100,3),SOL(50000,3)
       CHARACTER*1 Z,ZZ
       CHARACTER*40 INFILE,OUTFILE
       CHARACTER*138 CARD
**********************
*
*       ENTERING OF THE INPUT AND OUTPUT FILES
*
**********************
       WRITE (*,9)
9      FORMAT(///,' PROGRAM FCODA CALCULATES THE RELATIONSHIP ',/,
     1            ' BETWEEN MAGNITUDE, DISTANCE AND TIME.',/,
     2            ' IT FINDS THE COEFFICIENTS A,B,C FOR',/,
     3            ' EQUATIONS LIKE:',/,
     4            '     MN = A + B*TIME + C*DISTANCE',//)
999    WRITE (*,10)
10     FORMAT(/,' ENTER INPUT FILENAME : ',$)
       READ (5,15) INFILE
15     FORMAT(A40)
       OPEN (UNIT=11, FILE=INFILE, STATUS='OLD', IOSTAT=IST)
       IF (IST .NE. 0) THEN
         WRITE (*,*) 'INPUT FILE DOES NOT EXIST, PLEASE TRY AGAIN'
         GO TO 999
       END IF
       WRITE (*,11)
11     FORMAT(/,' ENTER OUTPUT FILENAME : ',$)
       READ (5,15) OUTFILE
       OPEN (UNIT=12, FILE=OUTFILE, STATUS='NEW',
     1 CARRIAGECONTROL='LIST', RECL=81, IOSTAT=IST)
```

```
      I = 1
********************
*
*       READING OF THE INPUT FILE AND CALCULATION OF THE DATA
*
********************
18      READ (11,20,END=200) CARD
20      FORMAT(A138)
        IF (CARD(1:1) .EQ. '$') THEN
          GO TO 18
        ELSE IF (CARD(1:1) .NE. '$') THEN
          READ (CARD,25,ERR=21) MN(I),ICL,IPARR,IORIG,IDIST,DEPTH(I)
25        FORMAT(F4.1,I4,I7,I6,I5,F7.2)
          DI = IDIST
          GO TO 27
21        READ (CARD,26) MN(I),ICL,IPARR,IORIG,DISTE,DEPTH(I)
26        FORMAT(F4.1,I4,I7,I6,F5.2,F7.2)
          DI = DISTE
27        CL(I) = ICL
          PARR = IPARR
          ORIGIN = IORIG
          T(I) = CL(I) + (PARR/100.) - (ORIGIN/10.)
          D(I,1) = 1.00
          IF (DEPTH(I) .LT. 0.000000) DEPTH(I) = 0.000000
          DIST(I) = DI
          I = I + 1
        END IF
        GO TO 18
200     CONTINUE
        S = I - 1
********************
*
*       CHOICE OF THE DISTANCE
*
********************
55      CONTINUE
        WRITE (*,12)
12      FORMAT(/,' WHAT DISTANCE WOULD YOU LIKE? ',/,
     1          ' EPICENTRAL : 01',/,
     2          ' HYPOCENTRAL: 02',/
     3          ' STOP       : 00  :',$)
        READ (5,13) Y
13      FORMAT(I3)
        IF (Y .EQ. 0) GO TO 400
        IF (Y .EQ. 1) THEN
          DO I=1,S
             DISTA(I) = DIST(I)
          END DO
          GO TO 56
        ELSE IF (Y .EQ. 2) THEN
          DO I=1,S
             DIS = DIST(I)**2 + DEPTH(I)**2
             DISTA(I) = DSQRT(DIS)
          END DO
          GO TO 56
        END IF
********************
*
*       CHOICE OF THE EQUATION
*
********************
56      WRITE (*,14)
14      FORMAT(/,' WHAT EQUATION WOULD YOU LIKE? ',/,
     1         ' MC = A + B*T                      : 01',/,
     2         ' MC = A + B*LOG(T)                 : 02',/,
     3         ' MC = A + B*T + C*DIST             : 03',/,
```

```
4       ' MC = A + B*T + C*LOG(DIST)        : 04',/,
5       ' MC = A + B*LOG(T) + C*DIST        : 05',/,
6       ' MC = A + B*LOG(T) + C*LOG(DIST)   : 06',/,
7       ' MC = A + B*CL                     : 07',/,
8       ' MC = A + B*LOG(CL)                : 08',/,
9       ' MC = A + B*CL + C*DIST            : 09',/,
1       ' MC = A + B*CL + C*LOG(DIST)       : 10',/,
2       ' MC = A + B*LOG(CL) + C*DIST       : 11',/,
3       ' MC = A + B*LOG(CL) + C*LOG(DIST)  : 12',/,
4       ' STOP                              : 00  :',$)
  READ (5,13) W
  IF (W .EQ. 0) GO TO 400
  IF (W .EQ. 1) THEN
    DO I=1,S
       D(I,2) = T(I)
       D(I,3) = 0.0
    END DO
    GO TO 50
  ELSE IF (W .EQ. 2) THEN
    DO I=1,S
       D(I,2) = DLOG10(T(I))
       D(I,3) = 0.0
    END DO
    GO TO 50
  ELSE IF (W .EQ. 3) THEN
    DO I=1,S
       D(I,2) = T(I)
       D(I,3) = DISTA(I)
    END DO
    GO TO 50
  ELSE IF (W .EQ. 4) THEN
    DO I=1,S
       D(I,2) = T(I)
       D(I,3) = DLOG10(DISTA(I))
    END DO
    GO TO 50
  ELSE IF (W .EQ. 5) THEN
    DO I=1,S
       D(I,2) = DLOG10(T(I))
       D(I,3) = DISTA(I)
    END DO
    GO TO 50
  ELSE IF (W .EQ. 6) THEN
    DO I=1,S
       D(I,2) = DLOG10(T(I))
       D(I,3) = DLOG10(DISTA(I))
    END DO
    GO TO 50
  ELSE IF (W .EQ. 7) THEN
    DO I=1,S
       D(I,2) = CL(I)
       D(I,3) = 0.0
    END DO
    GO TO 50
  ELSE IF (W .EQ. 8) THEN
    DO I=1,S
       D(I,2) = DLOG10(CL(I))
       D(I,3) = 0.0
    END DO
    GO TO 50
  ELSE IF (W .EQ. 9) THEN
    DO I=1,S
       D(I,2) = CL(I)
       D(I,3) = DISTA(I)
    END DO
    GO TO 50
```

```
      ELSE IF (W .EQ. 10) THEN
        DO I=1,S
           D(I,2) = CL(I)
           D(I,3) = DLOG10(DISTA(I))
        END DO
        GO TO 50
      ELSE IF (W .EQ. 11) THEN
        DO I=1,S
           D(I,2) = DLOG10(CL(I))
           D(I,3) = DISTA(I)
        END DO
        GO TO 50
      ELSE IF (W .EQ. 12) THEN
        DO I=1,S
           D(I,2) = DLOG10(CL(I))
           D(I,3) = DLOG10(DISTA(I))
        END DO
        GO TO 50
      END IF
*********************
*
*     CALCULATION OF THE SOLUTIONS
*
*********************
50    N = 0
      IF (W .EQ. 1 .OR. W .EQ. 2 .OR. W .EQ. 7 .OR. W .EQ. 8) THEN
        DO I=1,S-1
           DO J=I+1,S
              DET = D(J,2) - D(I,2)
              IF (DABS(DET) .LT. 0.0000001) GO TO 29
              D1(1,1) = D(J,2)/DET
              D1(2,1) = -D(J,1)/DET
              D1(1,2) = -D(I,2)/DET
              D1(2,2) = D(I,1)/DET
              N = N + 1
              SOL(N,1) = MN(I)*D1(1,1) + MN(J)*D1(1,2)
              SOL(N,2) = MN(I)*D1(2,1) + MN(J)*D1(2,2)
29            CONTINUE
           END DO
        END DO
      ELSE
        DO I=1,S-2
           DO J=I+1,S-1
              DO K=J+1,S
                 DET = D(J,2)*D(K,3) - D(J,3)*D(K,2)
     1                 - D(I,2)*D(K,3) + D(I,2)*D(J,3)
     2                 + D(I,3)*D(K,2) - D(I,3)*D(J,2)
                 IF (DABS(DET) .LT. 0.0000001) GO TO 30
                 D2(1,1) = (D(J,2)*D(K,3) - D(J,3)*D(K,2))/DET
                 D2(2,1) = -(D(K,3) - D(J,3))/DET
                 D2(3,1) = (D(K,2) - D(J,2))/DET
                 D2(1,2) = -(D(I,2)*D(K,3) - D(I,3)*D(K,2))/DET
                 D2(2,2) = (D(K,3) - D(I,3))/DET
                 D2(3,2) = -(D(K,2) - D(I,2))/DET
                 D2(1,3) = (D(I,2)*D(J,3) - D(I,3)*D(J,2))/DET
                 D2(2,3) = -(D(J,3) - D(I,3))/DET
                 D2(3,3) = (D(J,2) - D(I,2))/DET
                 N = N+1
                 SOL(N,1)=MN(I)*D2(1,1) + MN(J)*D2(1,2) + MN(K)*D2(1,3)
                 SOL(N,2)=MN(I)*D2(2,1) + MN(J)*D2(2,2) + MN(K)*D2(2,3)
                 SOL(N,3)=MN(I)*D2(3,1) + MN(J)*D2(3,2) + MN(K)*D2(3,3)
30               CONTINUE
              END DO
           END DO
        END DO
       END IF
```

```
**********
*
*     CALCULATION OF THE RMS
*
**********
      RMS = 10000000.
      DO M=1,N
         RM2 = 0.
         IF (W .EQ. 1 .OR. W .EQ. 2 .OR. W .EQ. 7 .OR. W .EQ. 8) THEN
           DO I=1,S
              RM = (SOL(M,1) + SOL(M,2)*D(I,2)) - MN(I)
              RM2 = RM2 + RM**2
           END DO
           GO TO 19
         ELSE
           DO I=1,S
              RM = (SOL(M,1)+SOL(M,2)*D(I,2)+SOL(M,3)*D(I,3)) - MN(I)
              RM2 = RM2 + RM**2
           END DO
         END IF
19       RMI = DSQRT(RM2/S)
         IF (RMI .LT. RMS) THEN
           IF (W.EQ.1 .OR. W.EQ.2 .OR. W.EQ.7 .OR. W.EQ.8) THEN
             SOL(M,3) = 0.00
           END IF
           RMS = RMI
           A = SOL(M,1)
           B = SOL(M,2)
           C = SOL(M,3)
         END IF
      END DO
**********
*
*     WRITING OF THE RESULTS
*
**********
      IF (W .EQ. 1) WRITE (*,60)
      IF (W .EQ. 2) WRITE (*,61)
      IF (W .EQ. 3) WRITE (*,62)
      IF (W .EQ. 4) WRITE (*,63)
      IF (W .EQ. 5) WRITE (*,64)
      IF (W .EQ. 6) WRITE (*,65)
      IF (W .EQ. 7) WRITE (*,66)
      IF (W .EQ. 8) WRITE (*,67)
      IF (W .EQ. 9) WRITE (*,68)
      IF (W .EQ. 10) WRITE (*,69)
      IF (W .EQ. 11) WRITE (*,80)
      IF (W .EQ. 12) WRITE (*,81)
60    FORMAT(//,'  MC = A + B*T ',/)
61    FORMAT(//,'  MC = A + B*LOG(T) ',/)
62    FORMAT(//,'  MC = A + B*T + C*DIST ',/)
63    FORMAT(//,'  MC = A + B*T + C*LOG(DIST) ',/)
64    FORMAT(//,'  MC = A + B*LOG(T) + C*DIST ',/)
65    FORMAT(//,'  MC = A + B*LOG(T) + C*LOG(DIST) ',/)
66    FORMAT(//,'  MC = A + B*CL ',/)
67    FORMAT(//,'  MC = A + B*LOG(CL) ',/)
68    FORMAT(//,'  MC = A + B*CL + C*DIST ',/)
69    FORMAT(//,'  MC = A + B*CL + C*LOG(DIST) ',/)
80    FORMAT(//,'  MC = A + B*LOG(CL) + C*DIST ',/)
81    FORMAT(//,'  MC = A + B*LOG(CL) + C*LOG(DIST) ',/)
      WRITE (*,45) A,B,C,RMS
45    FORMAT(/,' BEST VALUE OF A :',F20.2,/,
     1         ' BEST VALUE OF B :',F20.2,/,
     2         ' BEST VALUE OF C :',F20.2,/,
     3         ' RMS VALUE       :',F20.2,/)
      DO I=1,S
```

```
      MNCAL(I) = A + B*D(I,2) + C*D(I,3)
    END DO
    WRITE (*,70)
70  FORMAT(/,' WOULD YOU LIKE TO HAVE THE CALCULATED ',/,
   1       ' MAGNITUDES ON THE SCREEN? (Y/N)',$)
    READ (5,72) ZZ
    IF (ZZ .EQ. 'Y') THEN
      DO I=1,S
        WRITE (*,47) MN(I),MNCAL(I)
47      FORMAT(' OBSERVED MAGNITUDE : ',F4.1,'   CALCULATED
   1 MAGNITUDE : ',F4.1)
      END DO
    END IF
    WRITE (*,71)
71  FORMAT(/,' WOULD YOU LIKE TO WRITE ',/,
   1       ' THESE IN THE OUTFILE? (Y/N)',$)
    READ (5,72) Z
72  FORMAT(A1)
    IF (Z .EQ. 'Y') THEN
      IF (W .EQ. 1) WRITE (12,60)
      IF (W .EQ. 2) WRITE (12,61)
      IF (W .EQ. 3) WRITE (12,62)
      IF (W .EQ. 4) WRITE (12,63)
      IF (W .EQ. 5) WRITE (12,64)
      IF (W .EQ. 6) WRITE (12,65)
      IF (W .EQ. 7) WRITE (12,66)
      IF (W .EQ. 8) WRITE (12,67)
      IF (W .EQ. 9) WRITE (12,68)
      IF (W .EQ. 10) WRITE (12,69)
      IF (W .EQ. 11) WRITE (12,80)
      IF (W .EQ. 12) WRITE (12,81)
      IF (Y .EQ. 1) WRITE (12,82)
      IF (Y .EQ. 2) WRITE (12,83)
82    FORMAT(/,'   DIST = EPICENTRAL DISTANCE')
83    FORMAT(/,'   DIST = HYPOCENTRAL DISTANCE')
      WRITE (12,45) A,B,C,RMS
      DO I=1,S
        WRITE (12,47) MN(I),MNCAL(I)
      END DO
    END IF
    GO TO 55
400 CONTINUE
    STOP
    END
```

APPENDIX IV : THE CALIBRATION AND DURATION MAGNITUDES
FOR THE THIRD NAHANNI SURVEY

1	19860912.0053	POSITION=+62.166-124.231	MN=0.0	DEPTH= 0.01
2	19860912.0524	POSITION=+62.047-124.229	MN=0.0	DEPTH= 4.67
3	19860912.0528	POSITION=+62.280-124.445	MN=0.0	DEPTH= 0.01
4	19860912.0654	POSITION=+62.089-124.229	MN=0.0	DEPTH= 3.77
5	19860912.0700	POSITION=+62.069-124.234	MN=0.0	DEPTH= 2.84
6	19860912.0816	POSITION=+62.181-124.360	MN=0.0	DEPTH= 3.60
7	19860912.1912	POSITION=+62.005-124.369	MN=0.0	DEPTH= 2.00
8	19860912.2016	POSITION=+62.241-124.318	MN=0.0	DEPTH= 6.78
9	19860912.2027	POSITION=+62.062-124.238	MN=0.0	DEPTH= 2.87
10	19860912.2124	POSITION=+62.011-124.199	MN=0.0	DEPTH= 8.24
11	19860913.0028	POSITION=+61.947-124.232	MC=0.9	DEPTH= 6.52
12	19860913.0039	POSITION=+62.080-124.252	MC=1.0	DEPTH= 4.63
13	19860913.0110	POSITION=+62.016-124.176	MC=0.5	DEPTH= 4.36
14	19860913.0134	POSITION=+62.058-124.199	MN=1.8	DEPTH= 8.13
15	19860913.0152	POSITION=+62.080-124.255	MN=0.0	DEPTH= 4.48
16	19860913.0224	POSITION=+62.074-124.212	MN=0.0	DEPTH= 6.27
17	19860913.0241	POSITION=+62.145-124.244	MN=0.0	DEPTH= 4.28
18	19860913.0331	POSITION=+62.035-124.358	MC=0.5	DEPTH= 7.73
19	19860913.0340	POSITION=+62.139-124.248	MN=0.0	DEPTH= 2.89
20	19860913.0357	POSITION=+62.057-124.200	MC=0.2	DEPTH= 6.44
21	19860913.0429	POSITION=+62.164-124.336	MN=0.0	DEPTH= 4.06
22	19860913.0446	POSITION=+61.906-124.241	MN=0.0	DEPTH= 6.56
23	19860913.0448	POSITION=+62.080-124.255	MN=0.0	DEPTH= 6.34
24	19860913.0506	POSITION=+62.107-124.239	MC=0.2	DEPTH= 4.80
25	19860913.0513	POSITION=+62.096-124.267	MC=0.5	DEPTH= 6.28
26	19860913.0550	POSITION=+62.052-124.364	MN=0.0	DEPTH= 2.23
27	19860913.0557	POSITION=+62.075-124.235	MC=0.7	DEPTH= 7.79
28	19860913.0605	POSITION=+62.079-124.220	MN=0.0	DEPTH= 5.76
29	19860913.0611	POSITION=+62.089-124.170	MC=1.3	DEPTH= 0.00
30	19860913.0612	POSITION=+62.075-124.212	MN=1.5	DEPTH= 7.45
31	19860913.0620	POSITION=+61.984-124.310	MC=0.7	DEPTH= 7.54
32	19860913.0622	POSITION=+62.079-124.227	MC=0.2	DEPTH= 4.43
33	19860913.0641	POSITION=+62.036-124.210	MC=0.7	DEPTH= 6.24
34	19860913.0648	POSITION=+62.103-124.259	MN=0.0	DEPTH= 5.49
35	19860913.0708	POSITION=+61.977-124.302	MC=0.5	DEPTH= 7.51
36	19860913.0737	POSITION=+62.006-124.328	MC=1.2	DEPTH= 3.39
37	19860913.0743	POSITION=+62.056-124.288	MN=0.0	DEPTH= 3.72
38	19860913.0747	POSITION=+62.085-124.252	MC=0.7	DEPTH= 4.34
39	19860913.0748	POSITION=+62.101-124.263	MN=0.0	DEPTH= 5.86
40	19860913.0749	POSITION=+62.092-124.309	MN=0.0	DEPTH= 5.24
41	19860913.0841	POSITION=+62.057-124.231	MC=0.5	DEPTH= 5.55
42	19860913.0918	POSITION=+62.129-124.205	MC=0.9	DEPTH= 8.04
43	19860913.0928	POSITION=+62.255-124.299	MC=1.9	DEPTH= 7.69
44	19860913.1019	POSITION=+61.954-124.152	MC=1.9	DEPTH=10.19
45	19860913.1050	POSITION=+61.978-124.191	MC=0.9	DEPTH= 7.23
46	19860913.1253	POSITION=+62.336-124.264	MN=0.0	DEPTH=10.00
47	19860913.1309	POSITION=+62.114-124.229	MC=1.3	DEPTH= 7.81
48	19860913.1416	POSITION=+61.956-124.152	MC=0.9	DEPTH=10.00
49	19860913.1419	POSITION=+62.040-124.227	MC=1.2	DEPTH= 4.70
50	19860913.1445	POSITION=+62.126-124.227	MC=1.1	DEPTH= 7.56
51	19860913.1458	POSITION=+62.052-124.247	MC=0.5	DEPTH= 5.21
52	19860913.2025	POSITION=+61.957-124.206	MC=1.3	DEPTH= 7.35
53	19860913.2145	POSITION=+62.124-124.250	MN=0.0	DEPTH= 2.15
54	19860913.2234	POSITION=+62.063-124.177	MC=2.2	DEPTH=10.00
55	19860913.2234	POSITION=+62.089-124.145	MN=0.0	DEPTH=10.00
56	19860913.2251	POSITION=+62.241-124.242	MN=0.0	DEPTH= 4.87
57	19860913.2341	POSITION=+62.150-124.232	MN=0.0	DEPTH= 5.15
58	19860913.2358	POSITION=+62.112-124.244	MN=0.0	DEPTH= 5.83
59	19860914.0031	POSITION=+62.306-124.367	MN=0.0	DEPTH=11.64

60	19860914.0108	POSITION=+62.051-124.244	MC=1.0	DEPTH= 5.40
61	19860914.0122	POSITION=+62.049-124.228	MC=0.7	DEPTH= 2.25
62	19860914.0157	POSITION=+62.111-124.245	MN=0.0	DEPTH= 4.31
63	19860914.0304	POSITION=+61.867-124.244	MN=2.7	DEPTH= 7.36
64	19860914.0419	POSITION=+62.114-124.256	MN=0.0	DEPTH= 7.25
65	19860914.0422	POSITION=+62.101-124.229	MC=0.9	DEPTH= 4.17
66	19860914.0453	POSITION=+62.098-124.239	MC=0.5	DEPTH= 5.13
67	19860914.0623	POSITION=+61.910-124.234	MC=1.0	DEPTH=10.36
68	19860914.1406	POSITION=+62.321-124.290	MC=1.7	DEPTH= 6.50
69	19860914.1525	POSITION=+62.055-124.380	MC=1.6	DEPTH= 6.69
70	19860914.1635	POSITION=+61.902-124.256	MC=2.0	DEPTH= 5.81
71	19860914.1722	POSITION=+62.037-124.281	MC=1.2	DEPTH=10.21
72	19860914.1737	POSITION=+62.250-124.328	MC=1.0	DEPTH= 9.78
73	19860916.0021	POSITION=+62.225-124.322	MC=1.0	DEPTH= 6.04
74	19860916.0127	POSITION=+62.077-124.222	MC=0.5	DEPTH= 6.18
75	19860916.0145	POSITION=+62.081-124.223	MN=0.0	DEPTH= 3.38
76	19860916.0224	POSITION=+62.094-124.243	MC=0.7	DEPTH= 5.03
77	19860916.0318	POSITION=+62.101-124.206	MC=0.2	DEPTH= 7.86
78	19860916.0322	POSITION=+62.030-124.210	MN=0.0	DEPTH= 4.46
79	19860916.0348	POSITION=+62.044-124.223	MC=0.5	DEPTH= 5.67
80	19860916.0419	POSITION=+62.061-124.188	MN=2.8	DEPTH= 9.65
81	19860916.0500	POSITION=+62.097-124.311	MN=0.0	DEPTH= 7.16
82	19860916.0544	POSITION=+61.949-124.293	MN=0.0	DEPTH= 7.89
83	19860916.0706	POSITION=+62.072-124.262	MC=0.2	DEPTH= 9.86
84	19860916.0709	POSITION=+62.014-124.224	MC=0.9	DEPTH= 6.37
85	19860916.0745	POSITION=+61.969-124.313	MC=1.7	DEPTH= 8.16
86	19860916.0810	POSITION=+61.978-124.204	MC=1.2	DEPTH= 7.25
87	19860916.0849	POSITION=+62.120-124.273	MC=1.0	DEPTH= 4.03
88	19860916.1110	POSITION=+62.257-124.275	MN=2.4	DEPTH= 9.76
89	19860916.1149	POSITION=+62.072-124.251	MN=0.0	DEPTH= 6.01
90	19860916.1238	POSITION=+62.080-124.200	MC=0.5	DEPTH= 8.00
91	19860916.1311	POSITION=+62.062-124.229	MC=0.9	DEPTH= 5.40
92	19860916.1324	POSITION=+62.101-124.236	MC=0.5	DEPTH= 9.76
93	19860916.1545	POSITION=+61.969-124.304	MC=2.8	DEPTH= 9.05
94	19860916.1800	POSITION=+61.968-124.300	MN=1.8	DEPTH= 8.42
95	19860916.2053	POSITION=+61.901-124.133	MN=0.0	DEPTH= 7.75
96	19860916.2125	POSITION=+62.068-124.263	MC=0.9	DEPTH= 7.87
97	19860916.2203	POSITION=+62.045-124.252	MC=1.1	DEPTH= 6.27
98	19860916.2318	POSITION=+62.145-124.230	MC=1.3	DEPTH=10.52
99	19860916.2352	POSITION=+61.970-124.071	MC=0.8	DEPTH=11.01
100	19860917.0029	POSITION=+62.049-124.285	MN=0.0	DEPTH= 6.99
101	19860917.0052	POSITION=+62.123-124.425	MC=0.6	DEPTH=14.03
102	19860917.0155	POSITION=+62.011-124.211	MC=0.2	DEPTH= 7.68
103	19860917.0222	POSITION=+62.077-124.256	MN=0.0	DEPTH= 7.11
104	19860917.0227	POSITION=+62.079-124.256	MC=1.1	DEPTH= 7.20
105	19860917.0242	POSITION=+62.080-124.252	MN=1.5	DEPTH= 7.26
106	19860917.0252	POSITION=+62.103-124.253	MC=0.7	DEPTH= 2.00
107	19860917.0320	POSITION=+61.990-124.318	MC=1.0	DEPTH= 7.76
108	19860917.0336	POSITION=+61.990-124.311	MC=0.8	DEPTH= 0.25
109	19860917.0403	POSITION=+61.952-124.286	MC=1.4	DEPTH= 9.49
110	19860917.0448	POSITION=+62.048-124.259	MC=1.1	DEPTH= 6.47
111	19860917.0619	POSITION=+61.969-124.296	MC=0.2	DEPTH= 4.73
112	19860917.0654	POSITION=+62.066-124.256	MC=0.9	DEPTH= 6.99
113	19860917.0717	POSITION=+62.088-124.233	MN=2.4	DEPTH= 5.38
114	19860917.0815	POSITION=+62.070-124.130	MN=1.5	DEPTH= 7.58
115	19860917.1108	POSITION=+62.131-124.250	MC=0.8	DEPTH= 7.75
116	19860917.1423	POSITION=+61.795-124.327	MC=1.6	DEPTH= 5.34
117	19860917.2321	POSITION=+62.066-124.255	MC=1.2	DEPTH= 8.72
118	19860918.0259	POSITION=+62.049-124.236	MC=1.0	DEPTH= 5.80
119	19860918.0301	POSITION=+62.060-124.281	MN=2.2	DEPTH= 8.42
120	19860918.0304	POSITION=+62.060-124.242	MC=1.5	DEPTH= 6.15
121	19860918.0619	POSITION=+62.101-124.165	MN=1.6	DEPTH=14.68
122	19860918.0715	POSITION=+62.062-124.258	MC=1.1	DEPTH= 6.45
123	19860918.0723	POSITION=+62.272-124.385	MN=2.9	DEPTH=10.79
124	19860918.0752	POSITION=+62.098-124.245	MC=1.1	DEPTH= 1.22
125	19860918.0832	POSITION=+62.044-124.242	MC=1.2	DEPTH= 7.21

126	19860918.1102	POSITION=+62.070-124.252	MN=1.7	DEPTH= 7.52
127	19860918.1140	POSITION=+62.071-124.243	MC=0.9	DEPTH= 6.33
128	19860918.1241	POSITION=+62.068-124.261	MN=1.7	DEPTH= 7.39
129	19860918.1317	POSITION=+62.072-124.237	MC=0.7	DEPTH= 7.27
130	19860918.1341	POSITION=+62.081-124.369	MC=1.3	DEPTH= 5.48
131	19860918.1355	POSITION=+62.075-124.248	MN=0.0	DEPTH= 5.17
132	19860918.1356	POSITION=+62.068-124.234	MC=1.3	DEPTH= 7.11
133	19860918.1422	POSITION=+62.063-124.142	MC=0.7	DEPTH= 6.30
134	19860918.1439	POSITION=+62.009-124.217	MC=0.9	DEPTH= 6.43
135	19860918.1445	POSITION=+62.015-124.239	MC=0.9	DEPTH=13.10
136	19860918.1520	POSITION=+62.070-124.245	MC=0.9	DEPTH= 7.17
137	19860918.1536	POSITION=+62.080-124.250	MC=0.9	DEPTH= 7.58
138	19860918.2006	POSITION=+62.030-124.242	MC=0.7	DEPTH= 9.73
139	19860918.2103	POSITION=+61.970-124.273	MN=1.9	DEPTH= 8.27
140	19860918.2138	POSITION=+62.058-124.255	MN=1.9	DEPTH= 6.72
141	19860918.2323	POSITION=+62.072-124.254	MC=0.5	DEPTH= 5.80
142	19860918.2324	POSITION=+62.068-124.254	MC=0.7	DEPTH= 6.91
143	19860918.2326	POSITION=+62.059-124.252	MN=1.7	DEPTH= 6.52
144	19860919.0012	POSITION=+62.025-124.215	MC=0.7	DEPTH= 4.96
145	19860919.0133	POSITION=+61.988-124.168	MC=1.3	DEPTH= 9.65
146	19860919.0338	POSITION=+62.042-124.202	MC=1.0	DEPTH=10.96
147	19860919.0451	POSITION=+62.108-124.256	MC=1.6	DEPTH= 8.23
148	19860919.0539	POSITION=+62.038-124.301	MC=1.0	DEPTH= 7.07
149	19860919.1049	POSITION=+61.942-124.280	MC=0.9	DEPTH= 9.96
150	19860919.1250	POSITION=+62.170-124.219	MN=2.4	DEPTH= 9.88
151	19860919.1316	POSITION=+61.959-124.155	MC=0.9	DEPTH= 7.43
152	19860919.1351	POSITION=+62.058-124.249	MN=1.9	DEPTH= 5.53
153	19860919.1415	POSITION=+62.062-124.385	MC=1.5	DEPTH= 7.44
154	19860919.1830	POSITION=+62.025-124.343	MC=0.7	DEPTH= 7.53
155	19860919.1947	POSITION=+61.776-124.279	MN=3.0	DEPTH=10.00
156	19860919.2212	POSITION=+62.013-124.202	MC=1.3	DEPTH= 6.64
157	19860920.0040	POSITION=+62.160-124.245	MC=1.3	DEPTH= 6.42
158	19860920.0119	POSITION=+62.164-124.195	MC=0.8	DEPTH=12.37
159	19860920.0152	POSITION=+62.045-124.356	MC=1.2	DEPTH= 4.95
160	19860920.0416	POSITION=+62.257-124.341	MC=1.6	DEPTH= 9.15
161	19860920.0611	POSITION=+62.043-124.219	MC=1.0	DEPTH= 8.79
162	19860920.0741	POSITION=+61.969-124.296	MN=2.2	DEPTH= 8.53
163	19860920.1601	POSITION=+62.062-124.247	MN=1.8	DEPTH= 6.36
164	19860920.1805	POSITION=+62.059-124.366	MC=2.1	DEPTH=10.01
165	19860920.1923	POSITION=+61.985-124.299	MC=0.7	DEPTH= 8.55
166	19860920.2148	POSITION=+62.063-124.172	MN=0.0	DEPTH=10.03
167	19860920.2148	POSITION=+62.046-124.206	MC=0.9	DEPTH=10.84
168	19860921.0055	POSITION=+61.944-124.179	MC=1.2	DEPTH=10.09
169	19860921.0143	POSITION=+61.987-124.321	MC=0.9	DEPTH=10.30
170	19860921.0250	POSITION=+61.973-124.305	MC=0.5	DEPTH= 8.48
171	19860921.0250	POSITION=+62.019-124.201	MC=0.7	DEPTH= 4.90
172	19860921.0545	POSITION=+62.066-124.245	MC=0.7	DEPTH= 6.41
173	19860921.0559	POSITION=+62.090-124.232	MC=0.7	DEPTH= 9.48
174	19860921.0613	POSITION=+62.065-124.239	MC=1.1	DEPTH= 6.63
175	19860921.0700	POSITION=+62.054-124.346	MC=0.7	DEPTH= 6.89
176	19860921.0921	POSITION=+62.482-124.834	MN=3.0	DEPTH=10.00
177	19860921.0925	POSITION=+62.320-124.545	MN=2.3	DEPTH= 1.81
178	19860921.1004	POSITION=+62.036-124.317	MC=1.1	DEPTH= 6.66
179	19860921.1242	POSITION=+62.006-124.204	MC=0.7	DEPTH= 6.04
180	19860921.1304	POSITION=+62.052-124.224	MC=0.7	DEPTH=10.68
181	19860921.1416	POSITION=+62.028-124.180	MC=0.2	DEPTH= 0.00
182	19860921.1433	POSITION=+62.015-124.189	MC=0.5	DEPTH= 8.74
183	19860921.1439	POSITION=+62.010-124.207	MN=1.5	DEPTH= 7.83
184	19860921.1751	POSITION=+62.108-124.252	MN=2.2	DEPTH= 7.39

APPENDIX V : THE USER'S GUIDE

After the data file has been created, run SCODA by typing:

```
RUN [WETMILLER]SCODA
```

The program will prompt the user with a series of questions, shown below by the character '>'.

```
>ENTER INPUT FILENAME :
```

The input file (A40) is the created file with the merged PIK files.

```
>ENTER OUTPUT FILENAME :
```

This file (A40) will be the input file for FCODA.

```
>ENTER CENTRAL STATION :
```

Enter the chosen analog station whose records have been taken to measure the coda-lengths.

```
>ENTER SECOND NAME :
```

Sometimes, the arrival times were taken on the digital records only. So, only the digital station is indicated in the PIK file. In those times, the coda-lengths are written on the digital station lines. Therefore, it is important to enter the name of the digital station. If all the signal duration are written on the analog station lines in the PIK files, re-enter the name of the analog station.

When the pik file of a particular event is not written as required, the program will write:

```
>***ERROR ON RECORD:
```

When it happens, the program writes the date and the time of the event.

When the output file has been checked, run the program FCODA by typing:

```
RUN [WETMILLER]FCODA
```

The user will enter the input and the output files as in SCODA.

```
>WHAT DISTANCE WOULD YOU LIKE?
 EPICENTRAL : 01
 HYPOCENTRAL: 02
 STOP       : 00  :

>WHAT EQUATION WOULD YOU LIKE?
 MC = A + B*T                    : 01
```

```
MC = A + B*LOG(T)                  : 02
MC = A + B*T + C*DIST              : 03
MC = A + B*T + C*LOG(DIST)         : 04
MC = A + B*LOG(T) + C*DIST         : 05
MC = A + B*LOG(T) + C*LOG(DIST)    : 06
MC = A + B*CL                      : 07
MC = A + B*LOG(CL)                 : 08
MC = A + B*CL + C*DIST             : 09
MC = A + B*CL + C*LOG(DIST)        : 10
MC = A + B*LOG(CL) + C*DIST        : 11
MC = A + B*LOG(CL) + C*(LOG(DIST): 12
STOP                               : 00   :
```

After the user chose a possible solution, the program responds with the best values of A, B and C and their corresponding RMS.

```
>WOULD YOU LIKE TO HAVE THE CALCULATED
 MAGNITUDES ON THE SCREEN? (Y/N)

>WOULD YOU LIKE TO WRITE
 THESE IN THE OUTFILE? (Y/N)
```

After that the program will return to the choice of the distance. It will always return these four questions until the user wants to stop it.

APPENDIX VI : THE CALIBRATION AND DURATION MAGNITUDES
FOR THE FIRST NAHANNI SURVEY

1	19851013.2045	POSITION=+62.295-124.287	MN=2.8	DEPTH= 5.93
2	19851013.2057	POSITION=+62.173-124.057	MN=3.6	DEPTH= 9.00
3	19851013.2252	POSITION=+62.182-124.228	ML=0.5	DEPTH= 9.78
4	19851013.2253	POSITION=+62.288-124.242	MC=1.1	DEPTH= 3.19
5	19851013.2305	POSITION=+62.241-124.395	MC=2.1	DEPTH= 5.23
6	19851013.2313	POSITION=+62.268-124.286	MN=2.1	DEPTH=10.83
7	19851013.2324	POSITION=+62.159-124.256	ML=0.4	DEPTH= 4.63
8	19851013.2333	POSITION=+62.200-124.347	ML=-.0	DEPTH= 1.00
9	19851013.2345	POSITION=+62.331-124.335	MC=1.6	DEPTH= 4.11
10	19851014.0003	POSITION=+62.306-124.284	MC=1.1	DEPTH= 5.65
11	19851014.0009	POSITION=+62.289-124.192	ML=0.3	DEPTH= 2.46
12	19851014.0013	POSITION=+62.285-124.362	MC=0.8	DEPTH= 5.61
13	19851014.0020	POSITION=+62.242-124.396	MC=1.5	DEPTH= 3.60
14	19851014.0031	POSITION=+62.311-124.275	ML=0.3	DEPTH= 3.47
15	19851014.0040	POSITION=+62.236-124.261	ML=0.8	DEPTH= 5.23
16	19851014.0041	POSITION=+62.232-124.407	MC=0.8	DEPTH= 5.53
17	19851014.0106	POSITION=+62.235-124.130	ML=1.3	DEPTH= 3.75
18	19851014.0116	POSITION=+62.162-124.345	MC=2.0	DEPTH= 7.50
19	19851014.0129	POSITION=+62.300-124.246	MC=1.5	DEPTH= 3.01
20	19851014.0155	POSITION=+62.389-124.120	MC=0.7	DEPTH= 1.00
21	19851014.0201	POSITION=+62.198-124.381	ML=0.6	DEPTH=12.50
22	19851014.0250	POSITION=+62.128-124.053	ML=0.7	DEPTH= 9.52
23	19851014.0259	POSITION=+62.258-124.289	MC=1.1	DEPTH= 2.96
24	19851014.0310	POSITION=+62.167-124.396	ML=0.6	DEPTH= 1.00
25	19851014.0313	POSITION=+62.211-124.255	ML=1.2	DEPTH= 9.98
26	19851014.0318	POSITION=+62.214-124.230	MC=1.3	DEPTH= 8.87
27	19851014.0326	POSITION=+62.312-124.331	MC=1.1	DEPTH= 3.67
28	19851014.0354	POSITION=+62.324-124.175	ML=0.2	DEPTH= 1.00
29	19851014.0422	POSITION=+62.302-124.242	MC=1.3	DEPTH= 3.92
30	19851014.0438	POSITION=+62.261-124.132	MN=3.7	DEPTH=19.75
31	19851014.0458	POSITION=+62.226-124.348	MC=0.8	DEPTH= 6.15
32	19851014.0510	POSITION=+62.257-124.222	MC=0.8	DEPTH= -.81
33	19851014.0513	POSITION=+62.327-124.266	MC=1.1	DEPTH= 1.00
34	19851014.0544	POSITION=+62.246-124.212	ML=0.0	DEPTH= 2.90
35	19851014.0616	POSITION=+62.265-124.216	MN=2.4	DEPTH= 6.00
36	19851014.0619	POSITION=+62.243-124.254	MN=2.5	DEPTH= 6.00
37	19851014.0642	POSITION=+62.108-124.213	MN=3.5	DEPTH=16.25
38	19851014.0655	POSITION=+62.298-124.275	MN=2.6	DEPTH= 5.62
39	19851014.1010	POSITION=+62.091-124.236	MN=3.1	DEPTH=14.85
40	19851014.1024	POSITION=+62.075-123.737	MN=2.5	DEPTH= 5.00
41	19851014.1051	POSITION=+62.337-124.270	MN=2.5	DEPTH= 6.00
42	19851014.1751	POSITION=+62.084-124.382	MN=2.3	DEPTH=11.44
43	19851014.2222	POSITION=+62.141-124.260	MN=2.9	DEPTH= 7.34
44	19851014.2320	POSITION=+62.105-124.256	MN=4.1	DEPTH=12.56
45	19851015.0015	POSITION=+62.334-124.247	MN=2.9	DEPTH= 4.54
46	19851015.0118	POSITION=+62.206-124.273	ML=1.5	DEPTH= 1.00
47	19851015.0141	POSITION=+62.332-124.290	MC=1.1	DEPTH= 5.38
48	19851015.0206	POSITION=+62.100-124.360	MC=1.1	DEPTH= 4.53
49	19851015.0229	POSITION=+62.260-124.284	MC=0.8	DEPTH= 2.85
50	19851015.0239	POSITION=+62.326-124.357	MC=0.7	DEPTH= 3.93
51	19851015.0250	POSITION=+62.325-124.298	MC=1.1	DEPTH= 5.91
52	19851015.0253	POSITION=+62.244-124.189	ML=0.0	DEPTH= 3.02
53	19851015.0258	POSITION=+62.253-124.199	ML=0.0	DEPTH= 3.18
54	19851015.0310	POSITION=+62.141-124.310	MC=1.3	DEPTH= 8.68
55	19851015.0508	POSITION=+62.327-124.326	MN=3.6	DEPTH= 5.42
56	19851015.0656	POSITION=+62.248-124.227	MN=2.6	DEPTH= 6.17
57	19851015.0714	POSITION=+62.588-124.270	MN=3.3	DEPTH= 6.00
58	19851015.0739	POSITION=+62.256-124.280	MN=2.8	DEPTH= 6.00
59	19851015.0835	POSITION=+62.391-124.272	MN=2.5	DEPTH= 6.00

60	19851015.1158	POSITION=+61.939-124.180	MN=3.0	DEPTH=12.00
61	19851015.1341	POSITION=+62.380-124.368	MN=3.8	DEPTH= 6.00
62	19851015.1406	POSITION=+62.358-124.405	MN=2.6	DEPTH= 6.00
63	19851015.1415	POSITION=+62.222-124.191	MN=2.6	DEPTH= 6.00
64	19851015.1419	POSITION=+62.169-124.423	MN=2.9	DEPTH= 8.40
65	19851015.1514	POSITION=+62.301-124.301	MN=2.6	DEPTH= 5.11
66	19851015.1600	POSITION=+62.131-124.247	MN=2.8	DEPTH=11.72
67	19851015.1700	POSITION=+62.260-124.387	MN=3.3	DEPTH=12.10
68	19851015.2155	POSITION=+61.994-124.136	MN=2.8	DEPTH=11.13
69	19851015.2320	POSITION=+62.243-124.191	MN=2.9	DEPTH= 3.93
70	19851016.0203	POSITION=+62.231-124.202	MN=2.8	DEPTH=15.51
71	19851016.0552	POSITION=+62.334-124.340	MN=2.6	DEPTH= 6.48
72	19851016.0725	POSITION=+62.150-124.250	MN=2.3	DEPTH=10.34
73	19851016.1142	POSITION=+62.388-124.368	MN=2.5	DEPTH= 2.75
74	19851016.1845	POSITION=+62.157-124.330	MN=4.8	DEPTH= 5.65
75	19851016.2109	POSITION=+63.081-126.595	MN=3.0	DEPTH= 5.00
76	19851016.2118	POSITION=+62.115-124.198	ML=0.2	DEPTH= 6.79
77	19851016.2120	POSITION=+62.097-124.203	ML=0.4	DEPTH= 6.52
78	19851016.2127	POSITION=+62.203-124.314	MN=1.9	DEPTH= 3.04
79	19851016.2133	POSITION=+62.196-124.185	ML=1.6	DEPTH= 5.84
80	19851016.2208	POSITION=+62.340-124.242	MC=2.1	DEPTH= 1.00
81	19851016.2220	POSITION=+62.316-124.239	MN=3.3	DEPTH= 6.04
82	19851016.2235	POSITION=+62.198-124.360	MC=1.1	DEPTH= 4.28
83	19851016.2247	POSITION=+62.294-124.200	MC=1.1	DEPTH= 3.48
84	19851016.2316	POSITION=+62.150-124.306	ML=0.2	DEPTH= 7.78
85	19851016.2320	POSITION=+62.118-124.169	ML=0.5	DEPTH= 6.99
86	19851016.2328	POSITION=+62.350-124.348	MC=2.3	DEPTH= 2.31
87	19851016.2338	POSITION=+62.217-124.188	MC=1.3	DEPTH= 3.85
88	19851016.2352	POSITION=+62.158-124.335	ML=0.5	DEPTH=11.44
89	19851017.0024	POSITION=+62.294-124.195	MC=1.3	DEPTH= 3.20
90	19851017.0028	POSITION=+62.110-124.196	ML=0.4	DEPTH= 6.78
91	19851017.0031	POSITION=+62.193-124.232	MC=1.9	DEPTH= 6.00
92	19851017.0035	POSITION=+62.227-124.244	MC=1.3	DEPTH= 5.47
93	19851017.0038	POSITION=+62.247-124.193	MN=2.9	DEPTH= 3.03
94	19851017.0051	POSITION=+62.339-124.152	MC=1.5	DEPTH= 1.40
95	19851017.0052	POSITION=+62.307-124.340	MN=1.9	DEPTH= 6.55
96	19851017.0105	POSITION=+62.167-124.349	MC=1.1	DEPTH= 6.47
97	19851017.0109	POSITION=+62.330-124.264	MC=2.3	DEPTH= 4.64
98	19851017.0131	POSITION=+62.327-124.355	MC=1.8	DEPTH= 3.01
99	19851017.0134	POSITION=+62.126-124.219	ML=0.1	DEPTH= 7.01
100	19851017.0135	POSITION=+62.053-124.141	MN=2.7	DEPTH= 9.90
101	19851017.0159	POSITION=+62.237-124.407	MC=0.8	DEPTH= 5.04
102	19851017.0214	POSITION=+62.260-124.270	MC=1.1	DEPTH= 3.64
103	19851017.0220	POSITION=+62.250-124.261	MC=1.1	DEPTH= 3.85
104	19851017.0227	POSITION=+62.218-124.193	MC=0.8	DEPTH= 5.31
105	19851017.0245	POSITION=+62.172-124.396	MC=1.1	DEPTH=10.56
106	19851017.0259	POSITION=+62.244-124.189	MC=2.1	DEPTH= 2.84
107	19851017.0739	POSITION=+62.143-123.939	MN=2.4	DEPTH= 9.21
108	19851017.0830	POSITION=+62.113-124.177	MN=2.5	DEPTH= 8.81
109	19851017.0959	POSITION=+62.115-124.282	MN=2.5	DEPTH=12.65
110	19851017.1007	POSITION=+62.383-124.239	MN=2.6	DEPTH= 5.92
111	19851017.1023	POSITION=+62.242-124.191	MN=2.5	DEPTH= 4.83
112	19851017.1142	POSITION=+62.400-124.305	MN=3.0	DEPTH= 4.41

APPENDIX VII : THE CALIBRATION AND DURATION MAGNITUDES
FOR THE SECOND NAHANNI SURVEY

1	19860103.2123	POSITION=+62.003-124.313	MN=3.1	DEPTH=10.30
2	19860103.2243	POSITION=+61.989-124.180	MC=0.8	DEPTH= 5.42
3	19860103.2249	POSITION=+62.130-124.246	MN=0.0	DEPTH= 6.98
4	19860103.2250	POSITION=+62.107-124.247	MC=1.9	DEPTH= 5.53
5	19860104.0030	POSITION=+62.035-124.277	MC=1.1	DEPTH= 6.94
6	19860104.0033	POSITION=+62.052-124.188	MC=0.3	DEPTH= 7.71
7	19860104.0102	POSITION=+62.062-124.224	MN=2.6	DEPTH= 6.94
8	19860104.0112	POSITION=+61.947-124.050	MN=2.8	DEPTH=14.46
9	19860104.0128	POSITION=+62.022-124.157	MN=2.3	DEPTH= 7.35
10	19860104.0139	POSITION=+62.043-124.177	MN=2.9	DEPTH= 9.24
11	19860104.0159	POSITION=+62.044-124.108	MC=0.8	DEPTH= 8.65
12	19860104.0315	POSITION=+62.052-124.195	MC=1.3	DEPTH= 7.42
13	19860104.0323	POSITION=+62.028-124.163	MN=0.0	DEPTH= 7.94
14	19860104.0347	POSITION=+61.973-124.141	MN=0.0	DEPTH= 5.00
15	19860104.0458	POSITION=+62.054-124.199	MC=1.9	DEPTH= 8.08
16	19860104.0517	POSITION=+62.095-124.285	MN=0.0	DEPTH=18.00
17	19860104.0628	POSITION=+62.079-124.253	MN=0.0	DEPTH= 4.65
18	19860104.0712	POSITION=+62.153-124.221	MN=0.0	DEPTH= 6.87
19	19860104.0715	POSITION=+62.090-124.147	MN=0.0	DEPTH= 6.54
20	19860104.0743	POSITION=+62.106-124.243	MN=0.0	DEPTH= 7.12
21	19860104.0819	POSITION=+62.059-124.176	MN=3.5	DEPTH= 8.84
22	19860104.1609	POSITION=+62.049-124.232	MN=3.6	DEPTH= 6.76
23	19860104.1834	POSITION=+61.941-124.279	MN=3.1	DEPTH= 8.89
24	19860104.2056	POSITION=+62.275-124.204	MN=0.0	DEPTH= 6.75
25	19860104.2150	POSITION=+62.233-124.257	MN=0.0	DEPTH= 6.25
26	19860104.2207	POSITION=+62.004-124.212	MN=3.0	DEPTH= 7.02
27	19860104.2243	POSITION=+62.114-124.223	MN=3.9	DEPTH= 7.07
28	19860104.2329	POSITION=+62.297-124.229	MN=0.0	DEPTH= 6.64
29	19860104.2333	POSITION=+62.283-124.344	MN=0.0	DEPTH= 6.24
30	19860105.0032	POSITION=+62.166-124.187	MN=0.0	DEPTH= 5.41
31	19860105.0143	POSITION=+62.278-124.189	MN=0.0	DEPTH= 4.60
32	19860105.0222	POSITION=+62.249-124.299	MN=0.0	DEPTH= 4.79
33	19860105.0304	POSITION=+62.040-124.203	MN=2.8	DEPTH= 8.67
34	19860105.0503	POSITION=+62.298-124.313	MN=2.8	DEPTH= 5.62
35	19860105.0544	POSITION=+62.035-124.217	MN=2.8	DEPTH=14.27
36	19860105.0656	POSITION=+62.041-124.331	ML=0.0	DEPTH=10.00
37	19860105.1025	POSITION=+62.272-124.305	MN=3.9	DEPTH= 0.00
38	19860105.1359	POSITION=+61.986-124.375	MN=0.0	DEPTH=10.00
39	19860105.1429	POSITION=+62.034-124.211	MN=3.6	DEPTH= 9.55
40	19860105.2228	POSITION=+62.093-124.241	MN=3.1	DEPTH= 4.59
41	19860105.2344	POSITION=+62.024-124.191	MN=0.0	DEPTH= 5.77
42	19860105.2352	POSITION=+62.043-124.239	MN=0.0	DEPTH= 6.53
43	19860106.0030	POSITION=+62.063-124.208	MN=0.0	DEPTH= 6.80
44	19860106.0155	POSITION=+62.156-124.181	MC=1.9	DEPTH= 7.00
45	19860106.0158	POSITION=+62.058-124.193	MN=0.0	DEPTH= 5.98
46	19860106.0222	POSITION=+62.101-124.360	MN=3.5	DEPTH=12.67
47	19860106.0239	POSITION=+62.236-124.221	MC=1.1	DEPTH= 7.27
48	19860106.0300	POSITION=+62.018-124.201	MN=0.0	DEPTH= 7.95
49	19860106.0353	POSITION=+61.979-124.089	MN=2.8	DEPTH=13.33
50	19860106.0411	POSITION=+62.141-124.174	MN=0.0	DEPTH= 5.23
51	19860106.0438	POSITION=+62.132-124.249	MN=0.0	DEPTH= 7.18
52	19860106.1338	POSITION=+61.926-124.216	MN=2.8	DEPTH= 8.78
53	19860106.1552	POSITION=+62.218-124.426	MN=3.5	DEPTH=10.00
54	19860106.2209	POSITION=+61.945-124.214	MN=3.6	DEPTH=14.96
55	19860106.2319	POSITION=+62.042-124.258	MC=1.5	DEPTH= 7.53
56	19860106.2327	POSITION=+61.989-124.317	MN=3.6	DEPTH=12.24
57	19860106.2345	POSITION=+62.065-124.321	MN=0.0	DEPTH= 9.49
58	19860107.0004	POSITION=+62.019-124.212	MN=0.0	DEPTH= 6.19
59	19860107.0015	POSITION=+61.985-124.193	MC=0.8	DEPTH=10.30

60	19860107.0038	POSITION=+62.013-124.191	MN=0.0	DEPTH= 8.02
61	19860107.0048	POSITION=+62.072-124.230	MC=0.8	DEPTH= 8.44
62	19860107.0101	POSITION=+61.974-124.276	MN=0.0	DEPTH=12.92
63	19860107.0127	POSITION=+62.193-124.222	MN=0.0	DEPTH= 9.38
64	19860107.0137	POSITION=+62.148-124.221	MN=0.0	DEPTH= 7.08
65	19860107.0217	POSITION=+62.066-124.243	MN=0.0	DEPTH= 9.12
66	19860107.0244	POSITION=+62.066-124.213	MN=0.0	DEPTH= 7.26
67	19860107.0246	POSITION=+62.090-124.230	MN=0.0	DEPTH= 6.72
68	19860107.0313	POSITION=+62.032-124.216	MN=0.0	DEPTH= 6.64
69	19860107.0315	POSITION=+61.969-124.190	MC=1.1	DEPTH=10.69
70	19860107.0319	POSITION=+62.089-124.237	MC=0.4	DEPTH= 6.92
71	19860107.0348	POSITION=+62.048-124.222	MN=0.0	DEPTH= 6.46
72	19860107.0355	POSITION=+62.034-124.214	MC=1.1	DEPTH= 8.03
73	19860107.0402	POSITION=+62.062-123.983	MN=0.0	DEPTH= 6.07
74	19860107.0449	POSITION=+62.131-124.229	MN=0.0	DEPTH= 7.57
75	19860107.0459	POSITION=+62.113-124.229	MN=0.0	DEPTH= 7.50
76	19860107.0515	POSITION=+62.054-124.245	MN=0.0	DEPTH= 5.66
77	19860107.0516	POSITION=+62.069-124.214	MN=0.0	DEPTH= 7.53
78	19860107.0523	POSITION=+61.989-124.172	MC=2.0	DEPTH=11.21
79	19860107.0545	POSITION=+62.038-124.174	MC=0.8	DEPTH= 6.97
80	19860107.0554	POSITION=+62.168-124.218	MC=0.4	DEPTH= 8.04
81	19860107.0621	POSITION=+62.037-124.227	MN=0.0	DEPTH= 7.96
82	19860107.0622	POSITION=+62.037-124.200	MC=0.4	DEPTH= 7.67
83	19860107.0651	POSITION=+62.165-124.227	MN=3.4	DEPTH= 8.84
84	19860107.0703	POSITION=+62.167-124.224	MN=0.0	DEPTH= 6.73
85	19860107.0704	POSITION=+62.123-124.227	MN=0.0	DEPTH= 7.69
86	19860107.0749	POSITION=+61.917-124.157	MN=0.0	DEPTH= 8.77
87	19860107.0800	POSITION=+62.019-124.157	MN=0.0	DEPTH= 9.01
88	19860107.0817	POSITION=+62.088-124.183	MC=0.8	DEPTH= 7.69
89	19860107.0840	POSITION=+61.954-124.288	MN=0.0	DEPTH= 9.10
90	19860107.0849	POSITION=+62.138-124.172	MN=0.0	DEPTH= 5.88
91	19860107.0853	POSITION=+62.055-124.231	MN=0.0	DEPTH= 7.72
92	19860107.0857	POSITION=+62.056-124.226	MN=0.0	DEPTH= 6.71
93	19860107.0909	POSITION=+62.080-124.225	MN=0.0	DEPTH= 7.78
94	19860107.0917	POSITION=+62.010-124.187	MN=0.0	DEPTH= 7.89
95	19860107.0923	POSITION=+62.000-124.294	MN=0.0	DEPTH=13.28
96	19860107.0930	POSITION=+62.054-124.235	MC=1.1	DEPTH= 8.52
97	19860107.0944	POSITION=+62.046-124.124	MN=0.0	DEPTH= 6.49
98	19860107.0949	POSITION=+62.025-124.215	MN=0.0	DEPTH= 8.03
99	19860107.0951	POSITION=+62.050-124.227	MC=2.1	DEPTH= 9.79
100	19860107.1000	POSITION=+62.192-124.221	MN=0.0	DEPTH= 3.18
101	19860107.1021	POSITION=+62.130-124.258	MN=0.0	DEPTH= 8.75
102	19860107.1031	POSITION=+62.180-124.237	MN=0.0	DEPTH= 6.69
103	19860107.1045	POSITION=+62.048-124.226	MN=0.0	DEPTH= 7.95
104	19860107.1047	POSITION=+62.215-124.129	MC=1.7	DEPTH= 3.33
105	19860107.1118	POSITION=+62.025-124.184	MN=2.7	DEPTH= 8.53
106	19860107.1137	POSITION=+62.024-124.189	MN=2.9	DEPTH= 9.52
107	19860107.1225	POSITION=+62.021-124.234	MN=4.6	DEPTH=10.21
108	19860107.1320	POSITION=+62.109-124.228	MN=0.0	DEPTH= 6.17
109	19860107.1441	POSITION=+61.984-124.315	MC=1.8	DEPTH=10.52
110	19860107.1614	POSITION=+62.117-124.254	MN=0.0	DEPTH= 8.84
111	19860107.1935	POSITION=+62.122-124.192	MN=0.0	DEPTH= 1.92
112	19860107.1959	POSITION=+62.112-124.259	MC=0.8	DEPTH= 6.73
113	19860107.2023	POSITION=+61.915-124.184	MN=0.0	DEPTH= 8.95
114	19860107.2031	POSITION=+62.080-124.233	MC=1.1	DEPTH= 7.43
115	19860107.2034	POSITION=+62.053-124.244	MC=1.3	DEPTH= 7.60
116	19860107.2059	POSITION=+62.129-124.225	MN=0.0	DEPTH= 7.01
117	19860107.2108	POSITION=+62.134-124.227	MN=0.0	DEPTH= 7.49
118	19860107.2116	POSITION=+62.130-124.156	MC=1.5	DEPTH= 7.27
119	19860107.2129	POSITION=+62.182-124.315	MN=0.0	DEPTH= 9.81
120	19860107.2131	POSITION=+62.054-124.225	MN=0.0	DEPTH= 6.21
121	19860107.2138	POSITION=+62.054-124.211	MC=1.1	DEPTH= 8.74
122	19860107.2211	POSITION=+62.038-124.158	MC=0.4	DEPTH= 9.75
123	19860107.2217	POSITION=+62.015-124.173	MC=1.9	DEPTH=10.59
124	19860107.2228	POSITION=+62.032-124.266	MC=1.5	DEPTH=11.97
125	19860107.2244	POSITION=+62.029-124.207	MN=3.0	DEPTH=13.60

126	19860107.2339	POSITION=+62.153-124.215	MN=3.7	DEPTH= 7.79
127	19860107.2343	POSITION=+62.042-124.250	MN=3.7	DEPTH= 9.24
128	19860107.2357	POSITION=+62.210-124.398	MN=0.0	DEPTH=11.12
129	19860108.0014	POSITION=+62.150-124.176	MN=0.0	DEPTH= 5.73
130	19860108.0018	POSITION=+61.962-124.250	MN=0.0	DEPTH=12.93
131	19860108.0028	POSITION=+61.921-124.214	MC=1.3	DEPTH=13.63
132	19860108.0034	POSITION=+62.039-124.206	MC=1.3	DEPTH= 8.36
133	19860108.0042	POSITION=+62.134-124.223	MC=1.1	DEPTH= 5.81
134	19860108.0109	POSITION=+62.207-124.205	MN=0.0	DEPTH= 7.92
135	19860108.0118	POSITION=+62.050-124.203	MN=0.0	DEPTH= 7.80
136	19860108.0125	POSITION=+62.056-124.210	MN=2.5	DEPTH=10.47
137	19860108.0138	POSITION=+62.193-124.395	MN=0.0	DEPTH= 6.73
138	19860108.0141	POSITION=+62.024-124.166	MC=0.8	DEPTH= 9.49
139	19860108.0146	POSITION=+62.084-124.246	MN=0.0	DEPTH= 6.40
140	19860108.0155	POSITION=+62.001-124.183	MN=0.0	DEPTH= 8.94
141	19860108.0156	POSITION=+62.036-124.216	MN=0.0	DEPTH= 7.33
142	19860108.0159	POSITION=+62.046-124.151	MN=0.0	DEPTH= 7.56
143	19860108.0202	POSITION=+61.956-124.250	MN=0.0	DEPTH=12.25
144	19860108.0214	POSITION=+61.983-124.235	MC=1.5	DEPTH=14.28
145	19860108.0221	POSITION=+62.046-124.234	MN=0.0	DEPTH= 5.86
146	19860108.0232	POSITION=+62.034-124.215	MN=0.0	DEPTH= 7.92
147	19860108.0238	POSITION=+61.991-124.352	MN=2.5	DEPTH=12.39
148	19860108.0254	POSITION=+62.025-124.245	MN=0.0	DEPTH= 7.17
149	19860108.0300	POSITION=+62.043-124.209	MN=0.0	DEPTH= 7.70
150	19860108.0306	POSITION=+62.009-124.143	MN=3.1	DEPTH=11.37
151	19860108.0332	POSITION=+61.989-124.348	MN=0.0	DEPTH=13.30
152	19860108.0335	POSITION=+62.216-124.057	MN=2.1	DEPTH= 4.69
153	19860108.0344	POSITION=+62.111-124.242	MN=0.0	DEPTH= 5.23
154	19860108.0345	POSITION=+62.052-124.192	MN=0.0	DEPTH= 7.57
155	19860108.0415	POSITION=+62.042-124.217	MN=0.0	DEPTH= 6.57
156	19860108.0421	POSITION=+62.241-124.276	MN=0.0	DEPTH= 4.94
157	19860108.0432	POSITION=+62.050-124.223	MN=0.0	DEPTH= 7.18
158	19860108.0443	POSITION=+62.069-124.319	MN=0.0	DEPTH= 8.16
159	19860108.0506	POSITION=+62.155-124.223	MC=0.4	DEPTH= 6.22
160	19860108.0518	POSITION=+62.164-124.235	MN=0.0	DEPTH= 6.53
161	19860108.0521	POSITION=+62.030-124.348	MC=0.8	DEPTH=10.30
162	19860108.0524	POSITION=+61.984-124.315	MC=0.8	DEPTH= 9.43
163	19860108.0542	POSITION=+62.102-124.215	MN=0.0	DEPTH= 8.11
164	19860108.0548	POSITION=+62.079-124.205	MN=0.0	DEPTH= 9.39
165	19860108.0557	POSITION=+62.052-124.232	MN=0.0	DEPTH=10.97
166	19860108.0558	POSITION=+62.127-124.225	MN=2.4	DEPTH= 9.16
167	19860108.0620	POSITION=+61.979-124.074	MN=0.0	DEPTH=12.34
168	19860108.0646	POSITION=+62.023-124.157	MC=1.1	DEPTH= 9.33
169	19860108.0703	POSITION=+62.130-124.212	MN=0.0	DEPTH=10.71
170	19860108.0709	POSITION=+61.964-124.275	MN=2.9	DEPTH= 8.88
171	19860108.0727	POSITION=+62.076-124.186	MN=0.0	DEPTH= 7.91
172	19860108.0740	POSITION=+62.160-124.208	MN=0.0	DEPTH= 6.22
173	19860108.0747	POSITION=+62.160-124.203	MN=0.0	DEPTH= 8.75
174	19860108.0827	POSITION=+62.167-124.215	MN=0.0	DEPTH= 5.61
175	19860108.0836	POSITION=+62.059-124.259	MN=0.0	DEPTH= 7.77
176	19860108.0922	POSITION=+62.161-124.254	MC=1.1	DEPTH=10.87
177	19860108.0940	POSITION=+62.024-124.395	MN=0.0	DEPTH= 4.63
178	19860108.1004	POSITION=+61.980-124.153	MN=0.0	DEPTH= 9.03
179	19860108.1036	POSITION=+62.071-124.204	MN=0.0	DEPTH= 8.57
180	19860108.1122	POSITION=+62.041-124.166	MC=1.1	DEPTH=10.08
181	19860108.1245	POSITION=+62.054-124.230	MN=0.0	DEPTH= 7.39
182	19860108.1254	POSITION=+62.149-124.217	MC=1.8	DEPTH= 7.13
183	19860108.1346	POSITION=+62.096-124.229	MN=2.5	DEPTH= 6.29
184	19860108.1441	POSITION=+61.934-124.178	MN=3.2	DEPTH=16.83
185	19860108.1551	POSITION=+62.047-124.216	MN=2.7	DEPTH= 8.74
186	19860108.1646	POSITION=+62.134-124.238	MN=0.0	DEPTH= 7.08
187	19860108.1651	POSITION=+62.202-124.284	MC=0.4	DEPTH= 9.06