ATOMIC WEAPONS RESEARCH ESTABLISHMENT

AWRE REPORT NO. 030/86

# Empirical Amplitude-Distance/Depth Curves for Short-Period P Waves in the Distance Range 20 to 180°

R C Lilwall

Recommended for issue by

A Douglas, Superintendent

Approved by

B L Elphick, Head of Division

ISBN 0 85518178 8

## CONTENTS

SUMMARY

A joint maximum-likelihood estimation technique is used to determine the variation in the amplitude of P waves in the range $\Delta$ = 20 to 180$^{\circ}$ for 5 focal depth intervals. The results which are consistent with those of other workers in the teleseismic distance range 30 to 90$^{\circ}$ should enable PKP observations to be used in magnitude estimation. A complementary set of station terms are also estimated which should be free from the bias introduced by the use of standard least squares estimators on data censored by the presence of station reporting thresholds.

## 1. INTRODUCTION

The size of a seismic disturbance is frequently measured in terms of the short-period (SP) body-wave magnitude $m_b$. This is defined by Gutenberg-Richter (1) by the equation

$$m_b = \mathrm{Log}_{10}(A/T) + B(\Delta,h) \qquad \text{.... (1)}$$

where A is the amplitude in nm of the initial P wave, T its average period and B($\Delta$,h) a distance ($\Delta$) depth (h) normalising term. A and T are measured on narrow band (SP) instruments such that T $\approx$ 1.0 seconds.

Magnitudes published by agencies such as the International Seismological Centre (ISC) and the United States Geological Survey (USGS) are essentially the mean of individual station estimates based on equation (1). The above two agencies use the Gutenberg-Richter B($\Delta$,h) curve with data in the distance ranges 21 to 100$^{\circ}$ and 5 to 100$^{\circ}$ respectively. Clearly the amplitude-distance curves defined by the B($\Delta$,h) values have an important bearing on the accuracy and consistency of $m_b$ estimates. In recent years several workers (eg, Booth et al (2), Veith and Clawson (3), Vanek et al (4), Marshall et al (5)) have published alternative curves for shallow focus sources and distances up to 100$^{\circ}$. Apart from baseline shifts these curves show considerable similarity over the distance range 30 to 90$^{\circ}$. In contrast the Gutenberg-Richter curve deviates by up to 0.3 within this same range.

Data from distances beyond 100$^{\circ}$ are rarely used in magnitude determination. This is mainly because low amplitudes are observed over much of the core-shadow region and where large amplitudes do occur (near the PKP focus $\Delta \approx$ 140 to 150$^{\circ}$) the seismograms exhibit multiple arrivals corresponding to the various core phases. Nevertheless Sweetser and Blandford (6) and Mizoui (7) have emphasised the potential value of PKP data in terms of both consistency of the amplitude readings and its use with stations situated near the focus for low magnitude sources. Both these publications give shallow focus amplitude-distance curves for the PKP distance range. As part of a study on Soviet amplitude observations, Marshall et al (5) also include a figure indicating the general form of the curve including PKP.

The empirical determinations of amplitude-distance curves mentioned above were made using either a simple averaging or least squares technique to determine the variation of amplitude with distance. Neither estimation technique allows for bias resulting from data censoring arising from station thresholds (eg, Ringdal (8)). In addition few workers have attempted to determine a world average curve by using both widely distributed stations and sources. The Veith-Clawson results differ from the other studies in that they are theoretical amplitude predictions based on an earth velocity-Q model. Amplitude data are used only indirectly to estimate the Q structure. Such theoretical studies are however not easily applicable to the core shadow transition or PKP zones.

This report describes the determination of empirical amplitude distance curves for a range of focal depths and over the distance range 20 to 180°. It is hoped the estimated curves will not have the limitations described above and will make it possible for PKP data to be easily used in the determination of the magnitude of sources at all depths.

## 2. THEORY OF METHOD

Consider M seismic sources and a network of N stations. Let the distance range over which amplitudes (=LogA/T) are measured be divided into K intervals. If $a_{ijk}$ is an amplitude reading corresponding to the $i^{th}$ source, $j^{th}$ station and $k^{th}$ distance then let

$$a_{ijk} = b_i + s_j + d_k + \epsilon_{ijk} \qquad .... (2)$$

where $b_i$ is a measure of the source size, $s_j$ a station term, $d_k$ a distance term and $\epsilon_{ijk}$ is a random variable which is approximately normally distributed. The probability density function (PDF) for the $a_{ijk}$ can therefore be written:

$$P(a_{ijk} \mid b_i, s_j, d_k, \sigma) = \frac{1}{\surd(2\pi\sigma)} e^{-0.5 \left[\frac{a_{ijk}-b_i-s_j-d_k}{\sigma}\right]^2} \qquad .... (3)$$

where $\sigma^2$ is the variance of $\epsilon_{ijk}$. Given enough observations $a_{ijk}$ then values of $b_i, s_j$ and $d_k$ can be estimated by least squares as described by Carpenter et al (9) using the equations of condition (2) and the constraints:

$$\sum_{i=1}^{i=N} s_j = \sum_{k=1}^{k=K} d_k = 0.0 \qquad .... (4)$$

A similar result can also be obtained by maximising the likelihood function for the $N_{obs}$ $a_{ijk}$ observations:

$$L\,(b_i, s_j, d_k, \sigma) = \prod^{N_{obs}} \theta \left[\frac{a_{ijk}-b_i-s_j-d_k}{\sigma}\right] \qquad .... (5)$$

where $\theta$ is the normal PDF equation 3. Unfortunately the presence of the station thresholds, below which $a_{ijk}$ is not measured or reported means that the PDF of the observations may differ from equation (3) and its use result in biased estimates. To take account of station thresholds let $G_j$ be the mean threshold for station j and $\gamma_j^2$ be its variance. Assuming the thresholds are normally distributed about $G_j$ then the likelihood for the $N_{obs}$ observed $a_{ijk}$ can be written:

$$L(b_i,s_j,d_k,\sigma) = \prod^{N_{obs}} \frac{\Phi\left(\frac{a_{ijk}-G_j}{\gamma_j}\right)\theta\left(\frac{a_{ijk}-b_i-s_j-d_k}{\sigma}\right)}{\Phi\left(\frac{b_i+s_j+d_k-G_j}{\sqrt{(\sigma^2+\gamma_j^2)}}\right)} \quad .... (6)$$

(eg, Christoffersson et al (10), Christofferson and Ringdal (11)), where the expression to the right of the product sign represents the PDF for an observed $a_{ijk}$ in the presence of thresholds with $\Phi$ the cumulative form of $\theta$, ie

$$\Phi(x) = \int_{-\infty}^{x} \theta(y)dy \quad .... (7)$$

Estimates of $b_i,s_j,d_k$ and $\sigma$ can be obtained by maximising the likelihood (6) again subject to the constraints (4).

The effect of gross errors in the data can be reduced by modifying the PDF in equation (6) by the addition of a small constant term, essentially employing the method of uniform reduction of Jeffreys (12). A value of 0.01 times the peak value of the distribution has been found to be appropriate and results in the progressive reduction of the contribution of data with residuals ($= a_{ijk}-b_i-s_j-d_k$) greater than two to three standard deviations ($\sigma$).

Maximisation of the likelihood function can be achieved by first maximising for the four sets of variables $\sigma$, $b_i$, $s_j$ and $d_k$ numerically in a piecewise interative scheme. Final joint maximisation is then possible using Newton-Raphson iteration. The constraints (4) can be applied by the method of Lagrange multipliers (Edwards (13), Aitchison and Silvey (14)). Final maximisation involves inversion of a matrix for the M+N+K variables ($\simeq$ 700 for the initial analysis described below) and computer storage capacity therefore limits the amount of data which can be used. In practice the joint maximisation has been found to result in only small adjustments (less than 0.02 in the $b_i,s_j$ or $d_k$) from the values obtained from the piecewise analysis and therefore in principle much larger quantities of data can be analysed.

Confidence limits on the maximum-likelihood point estimates can be obtained by exploring the variation of the likelihood around its maxima for each of the variables. Approximate confidence limits can be found more easily however from the results of the Newton-Raphson method which requires the inverted matrix of the second derivations of the likelihood function (6). This matrix approximates the variance matrix for the distributions of the estimates (eg, Edwards (13)).

## 3. DATA AND ANALYSIS

The data used are amplitude (A) and period (T) readings available from the ISC Bulletin tapes for the period 1964-81 inclusive. Station threshold parameters ($G_j$ and $\gamma_j$) are reproduced in table 1. They are estimated using the method of Kelly and Lacoss (15) and are essentially those published in an earlier report (Lilwall and Neary (16)) with some minor modifications and additions.

Some preliminary analyses using data from 1971-1981 were used to highlight any problems in data selection and methodology. For these analyses seismic sources were selected on the basis of magnitude and were restricted to the interval $m_b$5.5 to 6.0. Use of these relatively high magnitudes maximises the number of station observations for each source and also minimises the effect of station thresholds. An upper limit of $m_b$6.0 is used since above this magnitude, the loss of data resulting from instrument saturation/clipping becomes increasingly important (von Seggern and Rivers (17)), an effect not incorporated in the estimation statistics. Unfortunately, the resulting spatial distribution, even for shallow focus sources, is far from uniform. Nearly 75% come from the western Circum-Pacific belt (Alaska to New Zealand). In contrast the Mid-Oceanic Ridge system is poorly represented. Uniform spatial distribution is both desirable and necessary to average out deviations from the assumed model of random source radiation pattern, simple (non azimuthal) station terms and a single amplitude distance curve, all implicitly assumed by the use of equation (2). The imbalance in the source distribution is preserved even when smaller magnitudes are considered. Many studies involving the determination of station terms take little heed of this problem and use large spatially unselected source datasets (eg, Lilwall and Neary (16), Marshall et al (5), Ringdal (18), North (19)). For deep focus sources the situation further deteriorates since the data becomes dominated by sources in the SW Pacific and in some instances results in only marginal separation of the station ($s_j$) and distance terms ($d_k$). Station terms ($s_j$) are therefore not estimated in these cases.

Figures 1 and 2 show the distance terms for a range of source depth intervals. For the four shallower intervals there is sufficient data to compute terms with high precision for $1^{o}$ cells. Even allowing for the amount of scatter expected from the confidence bounds considerable fine structure superimposed on the curves appears to be visible, such as near $50^{o}$, over several of the depth intervals. The relatively smaller number of available sources at greater depths result in rather large confidence limits even when $2^{o}$ cells are used.

In the final analysis the following procedure was used to select the seismic sources so as to achieve a more even spatial distribution. The earth's surface was first divided up into 400 regions of equal area; each region being roughly $10^{o}$ square. Seismic events with $m_b$ between 5.0 and 6.0 were selected subject to a maximum of three per region. In cases where more than the maximum occurs those with the highest acceptable magnitudes were used. For the period 1964-81 this results in about 500 earthquakes and explosions with assigned depths in the intervals 0 to 50 km. Far fewer were selected in the other depth intervals (50-150, 150-250, 300-500 and 500-700 km) and it was necessary to increase the number per region to 5, 5, 10 and 10 per region respectively in order to get sufficient data.

Figure 3A shows the resulting epicentre distribution in the 0 to 50 km depth range. Although only about 50% of the regions contain one or more epicentres, the main seismic belts are evenly represented. Figures 3B to 3E show the epicentres for the other depth ranges using the above selection criteria. These distributions, judged in terms of spatial uniformity and number, rapidly deteriorate for the deeper depth ranges. In view of the problems encountered in the preliminary analysis described above, station terms were therefore only computed for the shallow focus data. These terms were applied to the input data in the determination of distance terms for deeper focus sources.

For all the depth intervals the distance terms were computed at $2^{\circ}$ spacing except near the PKP focus where amplitudes change rapidly and so $1^{\circ}$ spacing was used. This provided ample data to estimate each distance term for all the depth ranges considered and also provided some smoothing when compared with the preliminary results in figures 1 and 2.

Table 2 gives some general statistics on data used to produce the five curves. Figures 4A to 4E show the resulting amplitude-distance terms together with their (approximate) 95% confidence limits. The smooth curves are cubic spline fits to data points computed at $0.5^{\circ}$ intervals. Over most of the distance range (20 to $140^{\circ}$, 150 to $160^{\circ}$) these points are the weighted average of the new distance terms using a running $5^{\circ}$ window. Weights correspond to a cosine taper within the window. In the range 140 to $150^{\circ}$ linear interpolation of the rapidly changing terms was used. Beyond $160^{\circ}$ the distance terms in all of the five depth ranges are poorly constrained by the data. All results were therefore pooled to give average smoothed values in this range. Table 3 gives the smoothed curves interpolated at $0.5^{\circ}$ intervals. To aid their use and for comparison with other results they are all baselined to give zero mean value within the "teleseismic window" $\Delta$ = 30 to $90^{\circ}$. To enable conversion to the baselines of the Gutenberg and Richter (1) and Veith-Clawson (3) curves table 4 gives the mean values of these curves for the same distance interval and for a range of focal depths.

The station terms obtained for the shallow-focus curve are given in table 5. Although in general the distance terms are well constrained by a large quantity of data this is not true for all the station terms. For various reasons (sensitivity, period of operation) individual stations vary considerably in the quantity of data they contribute to the analysis and this is reflected in the confidence limits. To obtain an "improved" set of station terms a much larger data set was assembled. An attempt was made to optimise the spatial distribution by employing rectangular regions as before but the number per region increased from 3 to 12 and the time period extended to the end of 1983. Figure 5 gives the source distribution which like figure 3A shows the major seismic belts uniformly represented. Using this extended data set a final set of station terms were computed using the method described in section 2. Distance terms $d_k$ were not estimated, instead values derived from the smoothed curves in table 3 were applied to the input data. Only the initial piecewise scheme described in section 2 was used, the saving in data storage required by the full Newton Raphson method enabling the large number of sources to be processed. As already mentioned the errors introduced by this are at most 0.02 (logA/T) units in the estimated terms. The "preliminary" estimates of the station terms (table 5), where available, were used as the starting point in the iterations. The final revised terms together with confidence limits are also listed in table 5.

4. DISCUSSION

It is of interest to compare the amplitude distance curves estimated here with those of other studies. Most workers have concentrated on the curves for shallow sources in the range 20 to 100°. Figure 6 compares the shallow focus (0 to 50 km) curves with those obtained by Gutenberg and Richter (1), Booth et al (2), Veith and Clawson (3), Vanek et al (4) and Marshall et al (5). To aid comparisons, all the curves have been baselined to a zero mean in the range $\Delta = 30$ to 90°. With the exception of the Gutenberg and Richter curve, agreement between the baselined curves is impressive. The oscillatory nature of the Gutenberg-Richter curve about the more recent results is well known and these results reaffirm the need for a revised standard for the investigation of small magnitude differences or as a baseline in the determination of station terms. This conclusion is reinforced in figures 7A and 7B which compares the present results with the Gutenberg-Richter curves for the range of depths used. Also shown is the comparison with the Veith-Clawson (3) curves. Apart from the 400 to 600 km depth range agreement with the rebaselined Veith-Clawson curves is excellent with maximum deviations rarely exceeding 0.1 (Log A/T) units. The new empirical curves show more structure in the distance range 20 to 40°, particularly for the three deeper focus curves. It is possible that for deeper foci, especially at shorter distances, they may have a regional bias because of the relatively poor distribution of the sources shown in figures 3C to 3E. The Veith-Clawson curves on the other hand are computed from the depth-velocity model derived from the Herrin et al (20) travel times and a Q structure based on a limited amount of amplitude data from nuclear explosions. Considerable smoothing is involved in the production of this earth model and therefore fine structure is not expected.

Figure 8 compares the new shallow focus empirical curve for PKP amplitudes with those of Mizoui (7) and Sweetser and Blandford (6). Here the curves have been rebaselined to that of the new curves for the distance intervals 110 to 150° and 110 to 170° respectively. Differences between the curves are evident near 110° and between 136° and 140° for the Mizoui curve and near 110° for that of Sweetser and Blandford. The Mizoui and Sweetser-Blandford curves are poorly constrained by the data at these ranges however and the differences may not be real. In figure 9 the surface focus curve is compared with the raw amplitude distance terms published by Marshall et al (5) for Soviet observations. Although the latter is well constrained over most of the PKP range the terms are larger by up to 0.5 units in the region of low amplitudes between 100 and 140°. This anomaly is the direct result of station thresholds which are not allowed for by the least squares estimator employed by Marshall et al (eg, Lilwall (22)). A common difference, visible near the PKP focus in the range $\Delta = 145$ to 150°, probably results from the multiplicity of the PKP branches (PKIKP, PKHKP, PKP2) for which the Log(A/T) data may correspond. The reader is referred to two of the above mentioned papers (6,7) for detailed discussion of the effect of these phases on amplitude measurements in this distance range. The empirical curve here corresponds to the average value resulting from the ISC PKP associations for a world network of stations. The amplitude range for the strongest and weakest phases (PKP2, PKIKP) at these distances probably spans up to 0.4 Log(A/T) units (6) and maximum errors resulting from the use of an overall average curve appear to be ± 0.2 units. A logical extension of this work is a more detailed evaluation of the amplitude variation in terms of travel time near the PKP focus.

The shape of the curve between 95 and 110° requires explanation. In this range the times and amplitudes are those for diffracted P, beyond 110° they correspond to PKP. Diffracted P amplitudes should fall progressively with distance and the observed fall off up to 105° agrees well with theory (Lilwall (22)). The apparent rise between 105 and 110° is not predicted by diffraction theory unless there is a tendency toward longer periods in the Log(A/T) measurements. Examination of period T with distance shows no such trend. Another possible explanation is that the small number of readings contributing to this range (78 for 106 to 110° compared with 1077 for 70 to 74° for instance) have a high proportion of spurious associations.

The final set of station terms are plotted against four other sets of determinations in figures 10A-B. All are well correlated but the North (19) and Ringdal (18) terms have a positive bias. The best correlation is between the preliminary and final sets of corrections given in table 4. This is clearly expected, and confirms that the addition of the extra data and the simplified analysis have not introduced any unforeseen perturbations in the results. The Lilwall and Neary (16) terms were obtained using an estimation method similar to that described in this report with a much larger, but spatially unselected, set of seismic sources. Again the two sets are well correlated but with a slight tendency for the amplitude of some of the negative Lilwall and Neary terms to be greater. A possible explanation of this is the difference in the value of $\sigma$ used in the two studies: a value of 0.35 was assumed in the Lilwall and Neary (16) study and 0.30 (table 2) in this report. Too high a value of $\sigma$ results in overcorrection of the positive bias found in standard estimates especially for stations with high "effective" ($=G_j-S_j$) thresholds. The North (19) and Ringdal (18) terms are both based on a relatively simple averaging procedure with no allowance for station thresholds. That this appears to give an overall positive bias is obvious in figure 10B, but figure 11 reveals that the situation is more subtle. Here the difference in the final and Ringdal terms are plotted against the average "effective" station threshold for the period 1970-80. A correlation coefficient of -0.7 for these points indicates that half the variation of the two variables can be accounted for by an underlying linear relationship. Figure 11 shows that the Ringdal terms exhibit an increasing positive bias with increasing station threshold, exactly as observed from previous investigations on estimation methods used, (Lilwall (21,22)). These considerations suggest that the station terms in table 5 represent a considerable improvement over similar sets hitherto published.

## 5. ACKNOWLEDGMENTS

I would like to thank Mr P D Marshall for useful advice and discussions concerning amplitude measurements and the amplitude-distance curve. Also thanks are due to the station analysts who produce the raw amplitude readings and to the International Seismological Centre in presenting this data in such a useful form.

## REFERENCES


1. B Gutenberg and C F Richter: "Magnitude and Energy of Earthquakes". Annali Geofis, 9, 1 (1956)

2. D C Booth, P D Marshall and J B Young: "Long and Short Period P-wave Amplitudes from Earthquakes in the Range 0 to 114$^{o}$". Geophys J R Astr Soc, 39, 523-537 (1974)

3. K F Veith and G E Clawson: "Magnitude from Short Period P-wave Data". Bull Seism Soc Am, 62, 435-452 (1972)

4. J Vanek, N V Kondorskaya and L V Christosokov: "Earthquake Magnitude in Seismological Practice. PV and PVs Waves". Bulgarian Acad of Sciences, Sofia (1980)

5. P D Marshall, J Bingham and J B Young: "An Analysis of P-wave Amplitudes Recorded by Seismological Stations in the USSR". Geophys J R Astr Soc, 84, 71-79 (1980)

6. E I Sweetser and R B Blandford: "Seismic Distance-Amplitude Relations for Short Period, P, Pdiff, PP and Compressional Core Phases for $\Delta > 90^{o}$". SDAC Report TR-73-9 (1973)

7. M Mizoui: "On the Magnitude Calibration Function for Core Phases with Special Reference to the PKP1-PKP2 Caustic". J Phys Earth, 25, 143-162 (1977)

8. F Ringdal: "Maximum Likelihood Estimation of Seismic Magnitude". Bull Seism Soc Am, 66, 789-802 (1976)

9. E W Carpenter, P D Marshall and A Douglas: "The Amplitude-Distance Curve for Short Period P Waves". Geophys J R Astr Soc, 13, 61-70 (1967)

10. L A Christoffersson, R T Lacoss and M A Chinnery: "Statistical Models for Magnitude Estimation". Lincoln Lab SATS, TR-75-335, 2-5 (1975)

11. L A Christoffersson and F Ringdal: "Optimum Approaches to Magnitude Measurements". In "Identification of Seismic Sources - Earthquake or Underground Explosion". Proc NATO Adv Study Inst, edited by E S Husebye and S Mykkelvert, 575-587, Reidal Publishing Co (1980)

12. H Jeffreys: "The Theory of Probability" 3rd Ed. Oxford University Press (1961)

13. A W F Edwards: "Likelihood". Cambridge University Press (1972)

14. J Aitchison and S D Silvey: "Maximum Likelihood Estimation of Parameters Subject to Restraints". App Math Statist, 29, 813-828 (1958)

REFERENCES (Cont'd)

15. E J Kelly and R T Lacoss: "Estimation of Seismicity and Network Detection Capability". MIT Lincoln Lab, Tech Note 41 (1969)

16. R C Lilwall and J M Neary: "Redetermination of Earthquake Body Wave Magnitudes ($m_b$) Using ISC Bulletin Data". AWRE Report No. O21/85, HMSO, London

17. D von Seggern and D W Rivers: "Comments on the Used Truncated Distribution Theory for Improved Magnitude Estimation". Bull Seism Soc Am, 68, 1543-1546 (1978)

18. F Ringdal: "Study of Magnitudes Seismicity and Earthquake Detectability Using a Global Network". In: The VELA Program A 25 year Review of Basic Research". DARPA edited by Anne Kerr, 611-624 (1985)

19. R G North: "Station Magnitude Bias - Its Determination, Causes and Effects". Lincoln Lab Tech Note 1977-24 (1977)

20. E Herrin et al: "Estimation of Surface Focus Travel Times". Bull Seism Soc Am, 58, 4, 1273-1291 (1968)

21. R C Lilwall: "Some Simulation Studies of Seismic Magnitude Estimators". AWRE Report No. O22/86 (1986)

22 R C Lilwall: "Station Threshold Bias in Estimates of Short Period Amplitude Distance and Station Terms". Geophys J R Astr Soc (Submitted).

# TABLE 1

**Mean (50%) Thresholds ($q_j$) and Standard Deviation ($\gamma_j$) Given as a Function of Time for Stations Used in this Report. (The time periods are given in terms of year and month.)**

STATION THRESHOLD DATA AS FUNCTION OF TIME

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| AAE | 6401-7012 | 1.52 | 0.28 | | | | | | | | | |
| AAI | 8006-8312 | 2.12 | 0.22 | | | | | | | | | |
| ABQ | 7401-7712 | -.05 | 0.17 | | | | | | | | | |
| ABU | 6401-7712 | 2.20 | 0.30 | 7801-8312 | 2.24 | 0.20 | | | | | | |
| ACO | 7001-7712 | 1.58 | 0.33 | 7801-8312 | 1.52 | 0.31 | | | | | | |
| AD- | 6401-6912 | 2.11 | 0.27 | | | | | | | | | |
| ADE | 7401-7712 | 2.01 | 0.21 | 7801-8312 | 2.20 | 0.27 | | | | | | |
| ADK | 7001-7712 | 1.89 | 0.29 | | | | | | | | | |
| AFI | 7001-8112 | 1.98 | 0.34 | | | | | | | | | |
| AFR | 7001-7712 | 2.00 | 0.33 | 7801-8312 | 1.90 | 0.22 | | | | | | |
| AGM | 7001-8112 | 1.48 | 0.34 | | | | | | | | | |
| AKU | 7801-8312 | 1.49 | 0.19 | | | | | | | | | |
| ALE | 6401-6912 | 1.53 | 0.24 | 7001-7309 | 1.13 | 0.14 | 7310-7712 | 0.72 | 0.18 | 7801-8312 | 0.81 | 0.23 |
| ALM | 7801-8312 | -.12 | 0.11 | | | | | | | | | |
| ALQ | 6401-6912 | 0.68 | 0.22 | 7001-7312 | 1.02 | 0.19 | 7401-7712 | 0.93 | 0.23 | 7801-8312 | 0.37 | 0.14 |
| AMN | 7001-8112 | 1.98 | 0.23 | | | | | | | | | |
| ANG | 6401-6912 | 2.22 | 0.10 | 7001-8112 | 2.41 | 0.25 | | | | | | |
| ANP | 6401-6912 | 2.21 | 0.27 | 7801-8312 | 2.42 | 0.23 | | | | | | |
| ANR | 7801-8112 | 1.59 | 0.16 | | | | | | | | | |
| APA | 7801-8112 | 1.80 | 0.29 | | | | | | | | | |
| APT | 7401-7712 | 1.50 | 0.30 | | | | | | | | | |
| ARE | 6401-7012 | 1.43 | 0.22 | 7101-7712 | 1.66 | 0.27 | 7801-8312 | 1.55 | 0.15 | | | |
| ARU | 7801-8112 | 1.62 | 0.20 | | | | | | | | | |
| ASH | 7801-8112 | 2.19 | 0.33 | | | | | | | | | |
| ASP | 7001-7312 | 1.41 | 0.30 | 7401-7712 | 1.40 | 0.32 | 7801-8112 | 1.77 | 0.22 | | | |
| ATL | 6401-7012 | 2.21 | 0.55 | | | | | | | | | |
| AVF | 7701-7712 | 0.98 | 0.21 | 7801-8312 | 0.95 | 0.21 | | | | | | |
| BAG | 6401-6912 | 1.88 | 0.31 | 7001-7312 | 1.89 | 0.24 | 7401-7712 | 1.86 | 0.19 | 7801-8312 | 2.00 | 0.20 |
| BDT | 7801-7904 | 1.60 | 0.34 | 7905-8312 | 1.58 | 0.24 | | | | | | |
| BDW | 7801-7902 | 0.71 | 0.25 | 7903-8312 | 0.65 | 0.26 | | | | | | |
| BER | 7001-7312 | 1.53 | 0.17 | | | | | | | | | |
| BHA | 6401-6912 | 0.55 | 0.20 | 7001-7312 | 0.61 | 0.15 | 7401-7712 | 0.71 | 0.05 | | | |
| BHG | 8108-8312 | 1.88 | 0.24 | | | | | | | | | |
| BHO | 8105-8312 | 1.15 | 0.39 | | | | | | | | | |
| BHP | 6401-7512 | 2.00 | 0.20 | | | | | | | | | |
| BJI | 7001-8112 | 1.24 | 0.19 | | | | | | | | | |
| BKR | 7801-8112 | 1.42 | 0.21 | | | | | | | | | |
| BKS | 6401-6912 | 1.92 | 0.26 | 7001-7312 | 1.58 | 0.19 | 7401-7712 | 1.60 | 0.23 | 7801-8312 | 1.61 | 0.21 |
| BLA | 6401-7712 | 2.00 | 0.36 | 7801-8312 | 1.91 | 0.29 | | | | | | |
| BLC | 6401-7012 | 1.90 | 0.12 | 7101-7405 | 2.00 | 0.26 | 7406-7706 | 1.20 | 0.26 | | | |
| BMN | 7801-8212 | 0.63 | 0.26 | | | | | | | | | |
| BMO | 6401-6912 | 0.04 | 0.17 | 7001-7312 | 0.08 | 0.17 | 7401-7712 | 0.16 | 0.22 | | | |
| BNG | 6401-7012 | 0.76 | 0.33 | 7001-7312 | 0.51 | 0.17 | 7401-7712 | 0.62 | 0.17 | 7801-8312 | 0.78 | 0.13 |
| BNH | 7001-8112 | 1.20 | 0.26 | | | | | | | | | |
| BNS | 6401-6912 | 1.62 | 0.19 | 7001-7312 | 1.63 | 0.25 | 7401-7712 | 1.63 | 0.25 | | | |
| BOD | 7801-8112 | 1.08 | 0.14 | | | | | | | | | |
| BOZ | 6401-6912 | 0.93 | 0.22 | | | | | | | | | |
| BPT | 7001-8112 | 1.27 | 0.28 | | | | | | | | | |
| BRA | 7001-8112 | 2.13 | 0.30 | | | | | | | | | |
| BRG | 7001-7312 | 0.88 | 0.13 | 7401-7712 | 0.89 | 0.13 | 7801-8312 | 0.94 | 0.09 | | | |
| BSF | 7401-7712 | 1.11 | 0.18 | 7801-8312 | 1.14 | 0.21 | | | | | | |
| BSI | 7909-8312 | 2.01 | 0.27 | | | | | | | | | |
| BUB | 7001-8112 | 1.58 | 0.19 | | | | | | | | | |
| BUD | 7401-7712 | 1.74 | 0.32 | 7801-8312 | 1.76 | 0.24 | | | | | | |
| BUH | 6401-7012 | 1.57 | 0.26 | | | | | | | | | |
| BUL | 6401-6912 | 0.68 | 0.16 | 7001-7312 | 0.74 | 0.11 | 7401-7712 | 0.81 | 0.11 | 7801-8312 | 0.67 | 0.09 |
| CAF | 8101-8312 | 0.90 | 0.19 | | | | | | | | | |
| CAN | 6401-6912 | 1.50 | 0.26 | 7001-7312 | 1.65 | 0.27 | | | | | | |
| CAR | 6401-6912 | 1.50 | 0.16 | 7001-7312 | 1.54 | 0.11 | 7401-7712 | 1.65 | 0.16 | 7801-8312 | 1.69 | 0.18 |
| CBM | 7401-7712 | 1.31 | 0.26 | 7801-8312 | 1.26 | 0.26 | | | | | | |
| CDF | 7401-7712 | 1.07 | 0.20 | 7801-8312 | 1.00 | 0.21 | | | | | | |
| CER | 7801-8201 | 1.62 | 0.25 | | | | | | | | | |
| CGP | 8012-8312 | 1.83 | 0.28 | | | | | | | | | |
| CHG | 6401-6712 | 0.75 | 0.19 | 7401-7712 | 0.69 | 0.19 | 7801-8312 | 1.09 | 0.17 | | | |
| CHTO | 8201-8312 | 0.73 | 0.21 | | | | | | | | | |
| CIR | 6401-6912 | 0.54 | 0.16 | 7001-7312 | 0.62 | 0.12 | 7401-7712 | 0.75 | 0.06 | 7801-8301 | 0.63 | 0.05 |
| CLK | 6401-6912 | 0.56 | 0.16 | 7001-7312 | 0.64 | 0.11 | 7401-7712 | 0.78 | 0.07 | 7801-8303 | 0.71 | 0.06 |
| CLL | 6401-6912 | 1.57 | 0.23 | 7001-7312 | 1.21 | 0.12 | 7401-7712 | 1.16 | 0.11 | 7801-8312 | 1.17 | 0.13 |
| CMC | 6401-6912 | 1.85 | 0.19 | | | | | | | | | |
| CNG | 7901-8312 | 1.71 | 0.22 | | | | | | | | | |
| CNN | 6401-6912 | 1.80 | 0.24 | | | | | | | | | |
| COB | 7801-8312 | 2.23 | 0.15 | | | | | | | | | |
| COL | 6401-6912 | 0.83 | 0.21 | 7001-7312 | 0.95 | 0.14 | 7401-7712 | 0.97 | 0.14 | 7801-8312 | 0.90 | 0.12 |
| COP | 6401-6912 | 1.89 | 0.13 | 7001-7312 | 1.81 | 0.18 | 7401-7712 | 1.91 | 0.18 | 7801-8312 | 1.90 | 0.18 |
| CPO | 6401-6912 | 0.49 | 0.21 | 7001-7312 | 0.75 | 0.15 | 7401-7712 | 0.71 | 0.16 | | | |
| CRO | 7001-8112 | 1.28 | 0.26 | | | | | | | | | |
| CRT | 6401-7012 | 2.45 | 0.10 | | | | | | | | | |
| CTA | 7801-8206 | 1.32 | 0.26 | 8207-8312 | 1.32 | 0.26 | | | | | | |
| CUM | 7001-8112 | 2.12 | 0.18 | | | | | | | | | |
| CVF | 7401-7712 | 1.47 | 0.25 | 7801-8312 | 1.43 | 0.30 | | | | | | |
| CWF | 7001-8112 | 1.27 | 0.27 | | | | | | | | | |
| CYP | 8301-8312 | 2.74 | 0.12 | | | | | | | | | |
| DAG | 7401-7712 | 0.97 | 0.20 | 7801-8312 | 0.94 | 0.17 | | | | | | |
| DAL | 7803-7904 | 0.50 | 0.20 | | | | | | | | | |
| DAR | 7001-7312 | 1.63 | 0.19 | | | | | | | | | |
| DAV | 6401-7012 | 2.69 | 0.55 | | | | | | | | | |
| DBN | 6401-6912 | 2.80 | 0.18 | | | | | | | | | |
| DCN | 7801-7903 | 1.83 | 0.28 | 7904-8312 | 1.84 | 0.27 | | | | | | |
| DDK | 7001-8006 | 1.68 | 0.18 | 8007-8312 | 1.71 | 0.21 | | | | | | |
| DIX | 7401-8112 | 0.81 | 0.21 | | | | | | | | | |
| DKM | 7801-8112 | 1.72 | 0.21 | | | | | | | | | |
| DLE | 7801-8005 | 1.77 | 0.27 | 8006-8312 | 1.76 | 0.24 | | | | | | |
| DMN | 8301-8312 | 1.22 | 0.22 | | | | | | | | | |
| DMU | 7801-7903 | 1.78 | 0.27 | 7904-8312 | 1.80 | 0.28 | | | | | | |

# TABLE 1 (Cont'd)

STATION THRESHOLD DATA AS FUNCTION OF TIME

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DOM | 6401-6912 | 2.15 | 0.25 | | | | | | | | | | | | |
| DUG | 6401-6810 | 0.31 | 0.22 | 6811-7312 | 0.98 | 0.30 | 7401-7712 | 1.12 | 0.26 | | | | | | |
| EAB | 7401-7712 | 1.55 | 0.28 | 7801-8208 | 1.58 | 0.26 | | | | | | | | | |
| EAU | 7401-7712 | 1.55 | 0.28 | 7801-8209 | 1.69 | 0.27 | | | | | | | | | |
| EBH | 7401-7712 | 1.51 | 0.31 | 7801-8209 | 1.63 | 0.26 | | | | | | | | | |
| EBL | 7401-7712 | 1.38 | 0.27 | 7801-8209 | 1.56 | 0.28 | | | | | | | | | |
| ECB | 8102-8312 | 1.88 | 0.29 | | | | | | | | | | | | |
| ECP | 7801-8005 | 2.57 | 0.52 | 8006-8312 | 2.06 | 0.36 | | | | | | | | | |
| ECT | 7001-8112 | 1.21 | 0.29 | | | | | | | | | | | | |
| EDI | 7401-7712 | 1.46 | 0.25 | 7801-8208 | 1.59 | 0.22 | | | | | | | | | |
| EDM | 6401-6912 | 1.80 | 0.20 | 7001-7312 | 1.59 | 0.12 | 7401-7712 | 1.69 | 0.15 | 7801-8312 | 1.69 | 0.14 | | | |
| EDU | 7001-8112 | 1.57 | 0.30 | | | | | | | | | | | | |
| EGL | 7401-7712 | 1.42 | 0.28 | 7801-8112 | 1.59 | 0.27 | | | | | | | | | |
| EKA | 6401-6912 | 1.05 | 0.26 | 7001-7312 | 1.39 | 0.22 | 7401-8001 | 1.17 | 0.20 | 8002-8312 | 0.91 | 0.27 | | | |
| ELO | 7401-7712 | 1.53 | 0.30 | 7801-8209 | 1.58 | 0.27 | | | | | | | | | |
| ELT | 7801-8112 | 1.30 | 0.22 | | | | | | | | | | | | |
| EMM | 7801-8112 | 1.50 | 0.25 | | | | | | | | | | | | |
| ENN | 8201-8312 | 1.22 | 0.21 | | | | | | | | | | | | |
| EPF | 7801-8312 | 1.11 | 0.25 | | | | | | | | | | | | |
| ESK | 6401-6912 | 1.53 | 0.19 | 7401-7712 | 2.05 | 0.30 | 7801-8312 | 1.91 | 0.24 | | | | | | |
| ETA | 8202-8312 | 2.11 | 0.36 | | | | | | | | | | | | |
| EUR | 6401-6912 | 0.54 | 0.22 | 7001-7312 | 0.72 | 0.36 | 7401-7712 | 0.60 | 0.35 | 7801-8203 | 0.71 | 0.37 | 8301-8312 | 0.71 | 0.37 |
| FAV | 6401-7012 | 1.32 | 0.26 | | | | | | | | | | | | |
| FBA | 7801-7805 | 1.16 | 0.29 | 7806-8312 | 1.23 | 0.30 | | | | | | | | | |
| FBC | 6401-6912 | 1.65 | 0.11 | 7001-7312 | 1.76 | 0.14 | | | | | | | | | |
| FCC | 6401-6912 | 1.71 | 0.10 | 7001-7312 | 1.73 | 0.09 | 7401-7712 | 1.81 | 0.17 | 7801-8312 | 1.83 | 0.28 | | | |
| FDA | 7001-8112 | 1.03 | 0.18 | | | | | | | | | | | | |
| FEL | 6401-6912 | 2.07 | 0.27 | | | | | | | | | | | | |
| FFC | 7001-7309 | 1.60 | 0.07 | 7310-7712 | 0.99 | 0.26 | 7801-8312 | 1.07 | 0.25 | | | | | | |
| FLN | 7401-7712 | 1.36 | 0.24 | 7801-8312 | 1.32 | 0.25 | | | | | | | | | |
| FLO | 6701-7312 | 1.35 | 0.23 | | | | | | | | | | | | |
| FRB | 7401-7712 | 1.82 | 0.19 | 7801-8312 | 1.81 | 0.16 | | | | | | | | | |
| FRF | 8107-8312 | 1.40 | 0.29 | | | | | | | | | | | | |
| FRT | 7801-8112 | 1.92 | 0.22 | | | | | | | | | | | | |
| FRU | 7801-8112 | 1.54 | 0.12 | | | | | | | | | | | | |
| FSJ | 6401-6912 | 2.14 | 0.39 | 7001-7312 | 1.55 | 0.13 | 7401-8112 | 1.64 | 0.28 | | | | | | |
| FUR | 6401-6912 | 1.52 | 0.42 | 7001-7312 | 1.54 | 0.31 | 7401-7908 | 1.41 | 0.25 | 7909-8012 | 2.10 | 0.25 | 8101-8312 | 1.84 | 0.24 |
| FVM | 7501-7505 | 1.00 | 0.20 | 7805-8112 | 2.20 | 0.20 | 8205-8312 | 1.29 | 0.24 | | | | | | |
| GAR | 7801-8112 | 1.59 | 0.29 | | | | | | | | | | | | |
| GBA | 6401-6912 | 1.26 | 0.20 | 7401-7712 | 1.18 | 0.19 | 7801-7912 | 0.80 | 0.30 | 8001-8312 | 0.55 | 0.24 | | | |
| GDH | 6401-6912 | 1.67 | 0.25 | 7001-7312 | 1.43 | 0.34 | 7401-7712 | 1.49 | 0.36 | 7801-8312 | 1.49 | 0.27 | | | |
| GEO | 6401-6912 | 2.14 | 0.35 | | | | | | | | | | | | |
| GIL | 6401-6912 | 0.88 | 0.23 | 7001-7312 | 0.89 | 0.25 | 7401-8112 | 1.11 | 0.28 | | | | | | |
| GLD | 8202-8312 | 1.59 | 0.23 | | | | | | | | | | | | |
| GOL | 6401-6912 | 0.56 | 0.23 | 7001-7312 | 0.83 | 0.27 | 7401-7712 | 0.93 | 0.24 | 7801-8312 | 0.94 | 0.28 | | | |
| GRE | 6401-6912 | 1.76 | 0.24 | 7001-8112 | 1.95 | 0.24 | | | | | | | | | |
| GRF | 6901-7312 | 1.53 | 0.19 | 7401-7712 | 1.47 | 0.23 | 7801-8312 | 1.28 | 0.26 | | | | | | |
| GRM | 6901-7312 | 1.46 | 0.22 | 7401-7712 | 1.61 | 0.17 | 7801-8312 | 1.86 | 0.31 | | | | | | |
| GRR | 7401-7712 | 1.33 | 0.22 | 7801-8312 | 1.31 | 0.24 | | | | | | | | | |
| GRS | 7801-8112 | 1.54 | 0.05 | | | | | | | | | | | | |
| GUA | 7001-7312 | 2.30 | 0.20 | 7401-7712 | 2.17 | 0.22 | 7801-8312 | 2.22 | 0.17 | | | | | | |
| GUMO | 7001-7712 | 2.29 | 0.20 | 7801-8312 | 2.39 | 0.22 | | | | | | | | | |
| GWC | 6401-6912 | 1.81 | 0.11 | 7001-7312 | 2.00 | 0.19 | | | | | | | | | |
| HAU | 7401-7712 | 1.18 | 0.18 | 7801-8312 | 1.04 | 0.20 | | | | | | | | | |
| HDM | 7401-7712 | 1.34 | 0.27 | 7801-8112 | 1.54 | 0.32 | | | | | | | | | |
| HFS | 7001-7312 | 0.58 | 0.24 | 7401-7712 | 0.68 | 0.22 | 7801-8312 | 0.72 | 0.23 | | | | | | |
| HNH | 7001-8112 | 1.54 | 0.32 | | | | | | | | | | | | |
| HNR | 6401-8112 | 2.12 | 0.32 | | | | | | | | | | | | |
| HOF | 7001-8012 | 2.07 | 0.30 | 8101-8312 | 1.79 | 0.25 | | | | | | | | | |
| HYB | 6401-6912 | 1.38 | 0.15 | 7001-7312 | 1.55 | 0.21 | 7401-7712 | 1.54 | 0.21 | 7801-8312 | 1.45 | 0.18 | | | |
| ILT | 7801-8112 | 1.36 | 0.19 | | | | | | | | | | | | |
| IMA | 7001-8002 | 0.79 | 0.29 | 8003-8312 | 0.95 | 0.31 | | | | | | | | | |
| INK | 6901-7312 | 1.58 | 0.12 | 7401-7712 | 1.53 | 0.10 | 7801-8312 | 1.55 | 0.12 | | | | | | |
| IPM | 7801-7904 | 1.55 | 0.15 | 7905-8312 | 1.54 | 0.15 | | | | | | | | | |
| IRK | 7801-8112 | 1.24 | 0.19 | | | | | | | | | | | | |
| ISQ | 7801-8112 | 1.98 | 0.19 | | | | | | | | | | | | |
| JAS | 6401-7012 | 1.70 | 0.32 | | | | | | | | | | | | |
| JAY | 7801-7906 | 1.81 | 0.15 | 7907-8312 | 1.78 | 0.16 | | | | | | | | | |
| JCT | 6401-7312 | 1.04 | 0.18 | 7401-7712 | 1.17 | 0.30 | 7801-8003 | 0.99 | 0.20 | 8004-8312 | 0.98 | 0.18 | | | |
| JER | 6401-6912 | 1.68 | 0.30 | | | | | | | | | | | | |
| JOS | 7001-7712 | 1.30 | 0.23 | 7801-8312 | 1.28 | 0.21 | | | | | | | | | |
| KBA | 8203-8312 | 1.22 | 0.20 | | | | | | | | | | | | |
| KBL | 6401-6912 | 1.22 | 0.28 | 7001-7312 | 1.01 | 0.17 | | | | | | | | | |
| KBS | 6401-6912 | 1.31 | 0.19 | 7001-7312 | 1.45 | 0.15 | 7401-7712 | 1.64 | 0.21 | 7801-8312 | 1.54 | 0.19 | | | |
| KEV | 6401-6912 | 1.22 | 0.16 | 7001-7312 | 1.26 | 0.14 | 7401-7712 | 1.18 | 0.13 | 7801-8312 | 1.21 | 0.12 | | | |
| KGM | 7801-7904 | 2.18 | 0.17 | 7905-8312 | 2.20 | 0.20 | | | | | | | | | |
| KHC | 6401-6912 | 1.26 | 0.20 | 7001-7312 | 1.15 | 0.16 | 7401-7712 | 1.01 | 0.16 | 7801-8312 | 1.15 | 0.30 | | | |
| KHE | 7801-8112 | 1.71 | 0.24 | | | | | | | | | | | | |
| KIP | 6401-6912 | 2.13 | 0.25 | | | | | | | | | | | | |
| KIR | 7401-7712 | 1.81 | 0.11 | 7801-8312 | 1.85 | 0.11 | | | | | | | | | |
| KJF | 7001-7312 | 1.12 | 0.14 | 7401-7712 | 1.08 | 0.10 | 7801-8312 | 1.21 | 0.12 | | | | | | |
| KJN | 6401-6912 | 1.03 | 0.17 | 7001-7312 | 1.02 | 0.14 | | | | | | | | | |
| KKM | 7801-7904 | 1.93 | 0.19 | 7905-8312 | 1.88 | 0.15 | | | | | | | | | |
| KLG | 6401-6912 | 1.41 | 0.30 | 7001-7312 | 2.05 | 0.31 | 7401-7712 | 2.32 | 0.28 | 7801-8312 | 2.06 | 0.37 | | | |
| KMU | 7001-8112 | 1.88 | 0.14 | | | | | | | | | | | | |
| KNA | 7401-7712 | 2.31 | 0.29 | 7801-8312 | 1.96 | 0.28 | | | | | | | | | |
| KOD | 6401-6912 | 1.35 | 0.21 | 7001-7312 | 1.61 | 0.17 | 7401-7712 | 1.56 | 0.20 | 7801-8312 | 1.91 | 0.22 | | | |
| KON | 6401-6912 | 1.34 | 0.18 | 7001-7312 | 1.37 | 0.16 | 7401-7712 | 1.38 | 0.17 | 7801-8312 | 1.49 | 0.19 | | | |
| KRA | 6401-6912 | 1.42 | 0.16 | 7001-7312 | 1.54 | 0.18 | 7401-7712 | 1.49 | 0.14 | 7801-8312 | 1.49 | 0.09 | | | |
| KRI | 7801-7809 | 0.66 | 0.05 | 7810-8312 | 0.66 | 0.05 | | | | | | | | | |
| KRK | 6401-6912 | 1.62 | 0.16 | | | | | | | | | | | | |
| KRL | 6401-6912 | 2.37 | 0.22 | | | | | | | | | | | | |
| KRP | 7001-7312 | 1.79 | 0.17 | 7401-7712 | 1.97 | 0.19 | 7801-8312 | 1.91 | 0.19 | | | | | | |
| KRR | 6401-6912 | 0.55 | 0.16 | 7001-7312 | 0.62 | 0.14 | 7401-7712 | 0.75 | 0.06 | | | | | | |

## TABLE 1 (Cont'd)

STATION THRESHOLD DATA AS FUNCTION OF TIME

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| KSP | 8110-8312 | 1.43 | 0.11 | | | | | | | | | | | | |
| KSR | 7801-8112 | 1.22 | 0.21 | | | | | | | | | | | | |
| KTG | 6401-6912 | 1.56 | 0.28 | 7001-7312 | 1.33 | 0.35 | 7401-7712 | 1.10 | 0.28 | 7801-8112 | 1.21 | 0.22 | | | |
| LAO | 6401-6912 | 0.40 | 0.27 | 7001-7312 | 0.03 | 0.24 | 7401-7712 | -.08 | 0.13 | | | | | | |
| LBF | 7401-7712 | 0.91 | 0.19 | 7801-8312 | 0.95 | 0.23 | | | | | | | | | |
| LDF | 8209-8312 | 1.26 | 0.23 | | | | | | | | | | | | |
| LD3 | 7001-8112 | 1.17 | 0.28 | | | | | | | | | | | | |
| LEM | 7801-8312 | 1.46 | 0.16 | | | | | | | | | | | | |
| LFF | 7401-7712 | 1.27 | 0.20 | 7801-8312 | 1.28 | 0.23 | | | | | | | | | |
| LF1 | 6401-7012 | 0.14 | 0.12 | | | | | | | | | | | | |
| LF2 | 6401-7012 | 0.06 | 0.16 | | | | | | | | | | | | |
| LF3 | 6401-7012 | 0.19 | 0.15 | | | | | | | | | | | | |
| LF4 | 6401-7012 | 0.22 | 0.15 | | | | | | | | | | | | |
| LGP | 7801-7903 | 2.20 | 0.11 | 7904-8312 | 2.27 | 0.18 | | | | | | | | | |
| LHC | 7401-7712 | 1.79 | 0.08 | 7801-8312 | 1.96 | 0.16 | | | | | | | | | |
| LHN | 6401-6912 | 1.35 | 0.19 | | | | | | | | | | | | |
| LIS | 6401-7012 | 2.52 | 0.23 | | | | | | | | | | | | |
| LJU | 6401-6912 | 1.59 | 0.20 | 7001-7312 | 1.68 | 0.22 | 7401-8112 | 1.74 | 0.19 | | | | | | |
| LLS | 8104-8312 | 1.55 | 0.28 | | | | | | | | | | | | |
| LMR | 7401-7712 | 1.45 | 0.26 | 7801-8312 | 1.26 | 0.32 | | | | | | | | | |
| LON | 6401-6912 | 1.16 | 0.30 | 7001-7312 | 1.18 | 0.23 | 7401-8112 | 1.13 | 0.14 | | | | | | |
| LOR | 7001-7312 | 1.46 | 0.40 | 7401-7712 | 1.01 | 0.21 | 7801-8312 | 0.92 | 0.22 | | | | | | |
| LPA | 6401-6912 | 1.93 | 0.21 | | | | | | | | | | | | |
| LPB | 6401-6912 | 1.19 | 0.25 | 7401-7712 | 1.41 | 0.22 | 7801-8312 | 1.42 | 0.24 | | | | | | |
| LPF | 7401-7712 | 1.21 | 0.21 | 7801-8312 | 1.29 | 0.24 | | | | | | | | | |
| LPO | 7401-7712 | 1.26 | 0.22 | 7801-8312 | 1.18 | 0.24 | | | | | | | | | |
| LPS | 6401-6912 | 1.35 | 0.21 | 7001-7312 | 1.21 | 0.16 | 7401-7712 | 1.33 | 0.19 | 7801-8312 | 1.59 | 0.15 | | | |
| LRG | 7401-7712 | 1.45 | 0.25 | 7801-8312 | 1.55 | 0.31 | | | | | | | | | |
| LSF | 7401-7712 | 1.22 | 0.21 | 7801-8312 | 1.13 | 0.23 | | | | | | | | | |
| LZH | 8101-8312 | 1.73 | 0.18 | | | | | | | | | | | | |
| MAIO | 7001-7712 | 1.10 | 0.17 | 7801-8011 | 1.04 | 0.15 | | | | | | | | | |
| MAT | 7401-7712 | 1.42 | 0.31 | 7801-8312 | 1.26 | 0.20 | | | | | | | | | |
| MAW | 6401-7012 | 1.53 | 0.39 | 7801-8312 | 1.58 | 0.33 | | | | | | | | | |
| MBC | 6401-6912 | 1.30 | 0.18 | 7001-7309 | 1.43 | 0.14 | 7310-7712 | 0.70 | 0.22 | 7801-8312 | 0.66 | 0.25 | | | |
| MBL | 7401-7712 | 2.00 | 0.30 | 7801-8112 | 1.95 | 0.36 | | | | | | | | | |
| MEK | 7401-7712 | 2.43 | 0.44 | 7801-8312 | 1.74 | 0.28 | | | | | | | | | |
| MFF | 7401-7712 | 1.23 | J.19 | 7801-8312 | 1.26 | 0.27 | | | | | | | | | |
| MHC | 6401-6912 | 2.04 | 0.28 | | | | | | | | | | | | |
| MHI | 8110-8312 | 1.89 | 0.21 | | | | | | | | | | | | |
| MIM | 7401-8112 | 1.26 | 0.26 | | | | | | | | | | | | |
| MIR | 7801-8112 | 1.77 | 0.22 | | | | | | | | | | | | |
| MJZ | 7001-7312 | 2.15 | 0.13 | | | | | | | | | | | | |
| MMK | 8201-8312 | 1.53 | 0.25 | | | | | | | | | | | | |
| MNG | 7001-7312 | 1.68 | 0.17 | 7401-7712 | 1.64 | 0.26 | | | | | | | | | |
| MNT | 7001-7312 | 1.81 | 0.17 | 7401-7712 | 1.91 | 0.21 | 7801-8312 | 1.71 | 0.19 | | | | | | |
| MOS | 7801-8112 | 1.93 | 0.20 | | | | | | | | | | | | |
| MOX | 6401-6912 | 1.21 | 0.20 | 7001-7312 | 1.03 | 0.13 | 7401-7712 | 1.08 | 0.13 | 7801-8312 | 1.22 | 0.13 | | | |
| MOY | 7801-8112 | 1.33 | 0.14 | | | | | | | | | | | | |
| MSO | 7001-8112 | 1.15 | 0.32 | | | | | | | | | | | | |
| MSZ | 7001-7312 | 1.72 | 0.17 | 7401-7712 | 2.08 | 0.24 | | | | | | | | | |
| MTD | 7001-7312 | 0.71 | 0.10 | 7401-7712 | 0.84 | 0.09 | 7801-8312 | 0.66 | 0.05 | | | | | | |
| MUD | 8208-8312 | 1.53 | 0.31 | | | | | | | | | | | | |
| MUN | 6401-6912 | 1.68 | 0.24 | 7001-7312 | 1.87 | 0.24 | 7401-7712 | 2.08 | 0.31 | 7801-8312 | 2.16 | 0.41 | | | |
| MWI | 6401-7612 | 2.05 | 0.12 | | | | | | | | | | | | |
| MZF | 7001-7712 | 0.90 | 0.25 | 7801-8312 | 1.01 | 0.21 | | | | | | | | | |
| NAE | 7001-8112 | 2.04 | 0.24 | | | | | | | | | | | | |
| NAI | 6401-6912 | 1.50 | 0.25 | 7001-7312 | 0.91 | 0.05 | 7401-7712 | 1.43 | 0.19 | 7801-8312 | 1.45 | 0.18 | | | |
| NAO | 7001-7312 | 0.16 | 0.22 | 7401-7712 | 0.17 | 0.28 | 7801-8312 | 0.42 | 0.31 | | | | | | |
| NAU | 7801-8003 | 1.56 | 0.27 | 8004-8312 | 1.72 | 0.32 | | | | | | | | | |
| NBO | 7001-7712 | 0.25 | 0.28 | 7801-8312 | 0.17 | 0.24 | | | | | | | | | |
| NB2 | 7801-8312 | 0.21 | 0.26 | | | | | | | | | | | | |
| NCS | 6401-6912 | 1.26 | 0.16 | | | | | | | | | | | | |
| NOI | 6401-6912 | 1.65 | 0.24 | 7001-7312 | 1.88 | 0.28 | 7401-7712 | 1.79 | 0.24 | 7801-8312 | 1.83 | 0.31 | | | |
| NEW | 6401-6912 | 1.28 | 0.21 | 7001-7312 | 1.17 | 0.21 | 7401-7712 | 1.43 | 0.31 | 7801-8312 | 1.44 | 0.34 | | | |
| NIE | 6401-6912 | 1.20 | 0.19 | 7001-7312 | 1.04 | 0.14 | 7401-7712 | 0.97 | 0.05 | 7801-8312 | 1.20 | 0.10 | | | |
| NNA | 7001-7712 | 1.54 | 0.16 | 7801-8212 | 1.58 | 0.17 | | | | | | | | | |
| NOR | 6401-6912 | 1.02 | 0.19 | 7001-7312 | 0.88 | 0.16 | | | | | | | | | |
| NP- | 6401-6912 | 0.79 | 0.26 | | | | | | | | | | | | |
| NRI | 7801-8112 | 0.94 | 0.16 | | | | | | | | | | | | |
| NSC | 7001-8112 | 1.60 | 0.29 | | | | | | | | | | | | |
| NUR | 6401-6912 | 1.19 | 0.18 | 7001-7312 | 1.26 | 0.15 | 7401-7712 | 1.11 | 0.11 | 8001-8312 | 1.18 | 0.12 | | | |
| NVL | 7801-8112 | 1.70 | 0.31 | | | | | | | | | | | | |
| NVS | 7801-8112 | 1.52 | 0.29 | | | | | | | | | | | | |
| NWAO | 7401-7712 | 1.91 | 0.32 | 7801-8312 | 1.63 | 0.33 | | | | | | | | | |
| OBN | 7801-8112 | 1.48 | 0.20 | | | | | | | | | | | | |
| OGA | 8010-8312 | 1.52 | 0.24 | | | | | | | | | | | | |
| OIC | 7001-7312 | 1.29 | 0.24 | 7401-8112 | 1.67 | 0.33 | | | | | | | | | |
| OIS | 6401-6912 | 1.67 | 0.34 | 7001-7312 | 1.70 | 0.27 | | | | | | | | | |
| OTP | 7001-8112 | 2.10 | 0.25 | | | | | | | | | | | | |
| OTT | 6701-7309 | 2.10 | 0.16 | 7310-7712 | 1.39 | 0.16 | 7801-8312 | 1.46 | 0.19 | | | | | | |
| PAE | 7001-7712 | 1.84 | 0.31 | 7801-8312 | 1.79 | 0.24 | | | | | | | | | |
| PAS | 7801-8312 | 2.21 | 0.27 | | | | | | | | | | | | |
| PBJ | 6401-7012 | 1.71 | 0.18 | | | | | | | | | | | | |
| PCO | 7001-8112 | 1.95 | 0.29 | | | | | | | | | | | | |
| PCT | 7801-8312 | 1.40 | 0.29 | | | | | | | | | | | | |
| PEL | 8105-8312 | 1.67 | 0.16 | | | | | | | | | | | | |
| PET | 7801-8112 | 1.75 | 0.23 | | | | | | | | | | | | |
| PHC | 7001-8112 | 2.50 | 0.32 | | | | | | | | | | | | |
| PLV | 6401-7012 | 2.37 | 0.19 | | | | | | | | | | | | |
| PME | 8203-8312 | 1.31 | 0.31 | | | | | | | | | | | | |
| PMG | 6401-6912 | 1.45 | 0.18 | 7001-7312 | 1.62 | 0.17 | 7401-7712 | 1.79 | 0.20 | 7801-8312 | 1.96 | 0.23 | | | |
| PMO | 7001-7712 | 1.76 | 0.31 | 7801-8312 | 1.72 | 0.28 | | | | | | | | | |
| PMR | 6401-6912 | 1.04 | 0.22 | 7001-7312 | 1.06 | 0.26 | 7401-7712 | 1.22 | 0.34 | 7801-8112 | 1.15 | 0.28 | 8201-8312 | 1.46 | 0.33 |
| PNS | 6401-7012 | 1.02 | 0.28 | 7101-8112 | 1.43 | 0.35 | | | | | | | | | |

STATION THRESHOLD DATA AS FUNCTION OF TIME

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| PNT | 7001-7309 | 1.40 | 0.12 | 7310-7712 | 1.19 | 0.17 | 7801-8312 | 1.21 | 0.16 | | | |
| POO | 6401-6712 | 1.33 | 0.20 | 6801-7312 | 1.56 | 0.20 | 7401-7712 | 1.61 | 0.19 | 7801-8312 | 1.63 | 0.18 |
| PPI | 7801-8312 | 1.63 | 0.18 | | | | | | | | | |
| PPN | 7001-7312 | 1.57 | 0.25 | 7401-7712 | 1.61 | 0.27 | 7801-8312 | 1.62 | 0.22 | | | |
| PPR | 7907-8312 | 1.80 | 0.20 | | | | | | | | | |
| PPT | 7001-7312 | 1.84 | 0.29 | 7401-7712 | 1.89 | 0.28 | 7801-8312 | 1.89 | 0.22 | | | |
| PRA | 6401-7112 | 2.36 | 0.21 | 7201-7312 | 1.54 | 0.12 | 7401-7712 | 1.52 | 0.09 | 7801-8312 | 1.57 | 0.18 |
| PRE | 6401-6912 | 1.15 | 0.23 | 7001-7312 | 0.86 | 0.12 | 7401-7712 | 0.88 | 0.06 | 7801-8112 | 1.30 | 0.23 |
| PRU | 6401-6912 | 1.24 | 0.14 | 7001-7312 | 1.27 | 0.12 | 7401-7712 | 1.39 | 0.21 | 7801-8312 | 1.40 | 0.20 |
| PRZ | 7801-8112 | 1.59 | 0.23 | | | | | | | | | |
| PSI | 7801-8312 | 1.29 | 0.15 | | | | | | | | | |
| PSZ | 7001-8112 | 1.64 | 0.31 | | | | | | | | | |
| PTO | 6401-6912 | 2.07 | 0.31 | | | | | | | | | |
| PUL | 7801-8112 | 1.94 | 0.21 | | | | | | | | | |
| QUE | 6401-6912 | 1.65 | 0.39 | 7001-7312 | 1.30 | 0.21 | | | | | | |
| RAB | 6401-7106 | 1.72 | 0.18 | 7107-7312 | 1.84 | 0.26 | | | | | | |
| RCD | 6401-6912 | 1.64 | 0.19 | | | | | | | | | |
| RES | 6401-6912 | 1.50 | 0.15 | 7001-7309 | 1.54 | 0.15 | 7310-7712 | 0.72 | 0.18 | 7801-8112 | 0.68 | 0.12 |
| RIV | 6401-6912 | 2.06 | 0.23 | 7001-7312 | 2.01 | 0.24 | 7401-7712 | 1.92 | 0.24 | | | |
| RJF | 7401-7712 | 1.28 | 0.24 | 7801-8312 | 1.08 | 0.21 | | | | | | |
| RKT | 7401-7712 | 1.85 | 0.30 | 7801-8312 | 1.80 | 0.21 | | | | | | |
| ROL | 7001-7312 | 1.30 | 0.24 | | | | | | | | | |
| RUV | 7401-7712 | 1.72 | 0.29 | 7801-8312 | 1.72 | 0.25 | | | | | | |
| SAM | 7801-8112 | 2.26 | 0.23 | | | | | | | | | |
| SBA | 8001-8312 | 1.37 | 0.17 | | | | | | | | | |
| SCH | 7001-7312 | 1.93 | 0.17 | 7401-7712 | 1.92 | 0.21 | 7801-8312 | 1.61 | 0.26 | | | |
| SCO | 8208-8312 | 1.35 | 0.35 | | | | | | | | | |
| SDB | 6401-7012 | 1.19 | 0.17 | | | | | | | | | |
| SDV | 7801-8312 | 1.81 | 0.16 | | | | | | | | | |
| SEO | 6401-6912 | 1.47 | 0.21 | | | | | | | | | |
| SES | 6701-7312 | 1.65 | 0.16 | 7401-7712 | 1.75 | 0.15 | 7801-8312 | 1.82 | 0.18 | | | |
| SEY | 7801-8112 | 1.47 | 0.17 | | | | | | | | | |
| SFA | 6701-7312 | 2.12 | 0.13 | 7401-7712 | 2.09 | 0.22 | | | | | | |
| SHK | 6401-6912 | 1.63 | 0.26 | 7001-7312 | 1.78 | 0.22 | 7401-7712 | 1.88 | 0.17 | 7801-8112 | 2.04 | 0.16 |
| SHL | 6401-6708 | 1.22 | 0.23 | 6709-6912 | 1.50 | 0.17 | 7001-7312 | 1.75 | 0.11 | | | |
| SJG | 6401-6912 | 1.43 | 0.26 | 7001-7712 | 1.56 | 0.22 | 7801-8312 | 1.56 | 0.21 | | | |
| SKI | 7001-8112 | 2.27 | 0.22 | | | | | | | | | |
| SLE | 8201-8312 | 1.50 | 0.25 | | | | | | | | | |
| SLL | 7801-8312 | 0.55 | 0.18 | | | | | | | | | |
| SLR | 8106-8312 | 1.75 | 0.37 | | | | | | | | | |
| SMF | 7401-7712 | 0.99 | 0.21 | 7801-8312 | 1.02 | 0.22 | | | | | | |
| SNA | 6401-7012 | 1.47 | 0.29 | | | | | | | | | |
| SOC | 7801-8112 | 2.12 | 0.29 | | | | | | | | | |
| SOP | 7001-7712 | 1.62 | 0.25 | 7801-8112 | 1.43 | 0.23 | | | | | | |
| SPA | 6401-6912 | 1.95 | 0.36 | 7001-7312 | 1.73 | 0.36 | 7401-7712 | 1.22 | 0.30 | 7801-8312 | 1.08 | 0.28 |
| SPF | 7401-8112 | 1.39 | 0.24 | | | | | | | | | |
| SPO | 6401-6912 | 1.70 | 0.25 | | | | | | | | | |
| SSC | 7401-7712 | 1.31 | 0.25 | 7801-8312 | 1.25 | 0.22 | | | | | | |
| SSE | 7001-7910 | 1.54 | 0.27 | 7911-8312 | 1.67 | 0.29 | | | | | | |
| SSF | 7401-7712 | 0.93 | 0.18 | 7801-8312 | 0.96 | 0.22 | | | | | | |
| STJ | 7001-8112 | 2.33 | 0.24 | | | | | | | | | |
| STU | 6401-6912 | 1.68 | 0.28 | 7001-7312 | 1.86 | 0.22 | 7401-7712 | 1.82 | 0.22 | | | |
| SUD | 6401-7012 | 1.97 | 0.16 | | | | | | | | | |
| SUF | 8101-8312 | 0.66 | 0.15 | | | | | | | | | |
| SUR | 8005-8312 | 1.61 | 0.23 | | | | | | | | | |
| SVE | 7801-8112 | 1.66 | 0.21 | | | | | | | | | |
| SVI | 6401-6912 | 1.93 | 0.16 | | | | | | | | | |
| SVT | 6401-6912 | 1.72 | 0.14 | 7001-8112 | 2.23 | 0.17 | | | | | | |
| TAC | 6401-7012 | 2.91 | 0.39 | | | | | | | | | |
| TAN | 6901-7312 | 2.05 | 0.19 | | | | | | | | | |
| TAS | 7801-8112 | 1.74 | 0.12 | | | | | | | | | |
| TCF | 7401-7712 | 0.97 | 0.20 | 7801-8312 | 1.01 | 0.24 | | | | | | |
| TFO | 6401-6912 | -.01 | 0.20 | | | | | | | | | |
| ILG | 6401-6912 | 0.93 | 0.35 | | | | | | | | | |
| TMA | 8206-8312 | 1.64 | 0.24 | | | | | | | | | |
| TMT | 7001-8112 | 1.42 | 0.26 | | | | | | | | | |
| TOL | 7001-8112 | 2.00 | 0.33 | | | | | | | | | |
| TOO | 6401-6912 | 1.86 | 0.31 | 7801-8312 | 1.69 | 0.20 | | | | | | |
| TOV | 7001-7712 | 1.75 | 0.22 | 7801-8312 | 1.76 | 0.22 | | | | | | |
| TPT | 7001-7312 | 1.68 | 0.25 | 7401-7712 | 1.68 | 0.28 | 7801-8312 | 1.67 | 0.24 | | | |
| TRM | 7001-8112 | 1.50 | 0.30 | | | | | | | | | |
| TRN | 6401-6912 | 1.55 | 0.19 | 7001-7312 | 1.56 | 0.15 | 7401-7712 | 1.57 | 0.15 | 7801-8112 | 1.67 | 0.18 |
| TRO | 6401-6912 | 1.41 | 0.20 | 7001-7312 | 1.44 | 0.20 | | | | | | |
| TRT | 7801-8312 | 1.94 | 0.21 | | | | | | | | | |
| TSI | 7801-8112 | 2.49 | 0.23 | | | | | | | | | |
| TSK | 6401-6912 | 1.48 | 0.35 | 7001-8112 | 1.38 | 0.27 | | | | | | |
| TUC | 6401-6912 | 1.06 | 0.20 | 7001-7312 | 1.16 | 0.13 | 7401-7712 | 1.11 | 0.26 | | | |
| TUL | 6907-7312 | 1.24 | 0.30 | 7401-7712 | 1.09 | 0.27 | 7801-8312 | 1.11 | 0.26 | | | |
| TVO | 7001-7312 | 1.78 | 0.25 | 7401-7712 | 1.87 | 0.25 | 7801-8312 | 1.89 | 0.23 | | | |
| UAV | 7001-8112 | 2.08 | 0.21 | | | | | | | | | |
| UBO | 6401-6912 | 0.17 | 0.20 | 7001-7312 | 0.31 | 0.29 | | | | | | |
| UCT | 7401-7712 | 1.35 | 0.26 | 7801-8112 | 1.42 | 0.23 | | | | | | |
| UPP | 7604-7712 | 1.83 | 0.11 | 7801-8312 | 1.82 | 0.09 | | | | | | |
| UZH | 7801-8112 | 1.17 | 0.18 | | | | | | | | | |
| VAH | 7001-7312 | 1.64 | 0.25 | 7401-7712 | 1.67 | 0.31 | 7801-8312 | 1.63 | 0.24 | | | |
| VAL | 6401-6912 | 2.30 | 0.29 | 7001-7312 | 2.17 | 0.28 | 7401-7712 | 2.07 | 0.23 | 7801-8312 | 2.09 | 0.29 |
| VAO | 7806-7812 | 1.00 | 0.20 | | | | | | | | | |
| VIC | 7001-8112 | 1.56 | 0.24 | | | | | | | | | |
| VIE | 7001-7312 | 2.17 | 0.19 | 7401-7712 | 2.09 | 0.31 | | | | | | |
| VKA | 7001-8112 | 1.85 | 0.22 | | | | | | | | | |
| VLA | 7801-8112 | 2.21 | 0.29 | | | | | | | | | |
| WBN | 8006-8312 | 1.80 | 0.31 | | | | | | | | | |
| WES | 7001-8112 | 2.54 | 0.37 | | | | | | | | | |
| WET | 8010-8312 | 1.45 | 0.22 | | | | | | | | | |
| WGL | 7001-8112 | 1.56 | 0.19 | | | | | | | | | |
| WIN | 6401-6904 | 1.32 | 0.27 | 6905-7312 | 0.88 | 0.10 | 7401-7712 | 0.87 | 0.06 | | | |
| WLO | 7001-8112 | 1.93 | 0.33 | | | | | | | | | |
| WMO | 6401-6912 | 0.23 | 0.14 | | | | | | | | | |
| WOL | 7001-8112 | 1.53 | 0.17 | | | | | | | | | |
| WRA | 7801-8312 | 0.65 | 0.34 | | | | | | | | | |
| WTS | 8101-8312 | 1.31 | 0.23 | | | | | | | | | |
| YAK | 7801-8112 | 1.86 | 0.24 | | | | | | | | | |
| YKC | 6901-7309 | 1.75 | 0.15 | 7310-7712 | 1.15 | 0.20 | 7801-8312 | 1.13 | 0.19 | | | |
| YSS | 7801-8112 | 1.56 | 0.22 | | | | | | | | | |
| ZAK | 7801-8112 | 0.81 | 0.19 | | | | | | | | | |
| ZLP | 7001-8112 | 0.95 | 0.19 | | | | | | | | | |
| ZOBO | 7001-8112 | 0.95 | 0.20 | 8301-8312 | 0.54 | 0.18 | | | | | | |
| ZUL | 7401-7712 | 1.38 | 0.20 | 7801-8312 | 1.55 | 0.19 | | | | | | |

## TABLE 2

Statistics of Data Used in the Determination of Amplitude Distance Curves and Station Terms

| Depth Range km | Number of Sources | Number of Readings | Standard Deviation $\sigma$ |
|---|---|---|---|
| 0-50 | 500 | 20604 | 0.30 |
| 50-150 | 245 | 10431 | 0.33 |
| 150-250 | 152 | 6956 | 0.34 |
| 300-500 | 111 | 4991 | 0.34 |
| 500-700 | 132 | 6456 | 0.32 |
| 0-700 | 1663 | 74500 | 0.31 |
| (Station terms only) | | | |

| DELTA | 25 | 100 | 200 | 400 | 600 |
|---|---|---|---|---|---|
| 20.0 | -0.53 | -0.52 | -0.49 | -0.43 | -0.23 |
| 20.5 | -0.50 | -0.47 | -0.44 | -0.37 | -0.19 |
| 21.0 | -0.48 | -0.42 | -0.39 | -0.33 | -0.16 |
| 21.5 | -0.47 | -0.38 | -0.35 | -0.29 | -0.15 |
| 22.0 | -0.46 | -0.36 | -0.33 | -0.27 | -0.15 |
| 22.5 | -0.45 | -0.35 | -0.32 | -0.24 | -0.14 |
| 23.0 | -0.43 | -0.33 | -0.32 | -0.22 | -0.14 |
| 23.5 | -0.41 | -0.32 | -0.31 | -0.19 | -0.13 |
| 24.0 | -0.39 | -0.30 | -0.30 | -0.17 | -0.12 |
| 24.5 | -0.36 | -0.28 | -0.28 | -0.15 | -0.11 |
| 25.0 | -0.33 | -0.25 | -0.25 | -0.13 | -0.10 |
| 25.5 | -0.30 | -0.22 | -0.23 | -0.12 | -0.10 |
| 26.0 | -0.27 | -0.20 | -0.21 | -0.11 | -0.09 |
| 26.5 | -0.23 | -0.18 | -0.18 | -0.10 | -0.09 |
| 27.0 | -0.20 | -0.15 | -0.15 | -0.10 | -0.10 |
| 27.5 | -0.17 | -0.13 | -0.13 | -0.10 | -0.11 |
| 28.0 | -0.14 | -0.11 | -0.10 | -0.11 | -0.12 |
| 28.5 | -0.11 | -0.10 | -0.08 | -0.11 | -0.14 |
| 29.0 | -0.09 | -0.09 | -0.06 | -0.12 | -0.16 |
| 29.5 | -0.08 | -0.08 | -0.05 | -0.13 | -0.18 |
| 30.0 | -0.07 | -0.08 | -0.05 | -0.14 | -0.21 |
| 30.5 | -0.06 | -0.08 | -0.06 | -0.15 | -0.23 |
| 31.0 | -0.06 | -0.09 | -0.07 | -0.16 | -0.25 |
| 31.5 | -0.06 | -0.09 | -0.08 | -0.18 | -0.27 |
| 32.0 | -0.07 | -0.09 | -0.10 | -0.19 | -0.28 |
| 32.5 | -0.08 | -0.10 | -0.12 | -0.21 | -0.29 |
| 33.0 | -0.09 | -0.10 | -0.15 | -0.22 | -0.28 |
| 33.5 | -0.10 | -0.11 | -0.17 | -0.22 | -0.28 |
| 34.0 | -0.10 | -0.11 | -0.19 | -0.22 | -0.26 |
| 34.5 | -0.11 | -0.12 | -0.21 | -0.21 | -0.25 |
| 35.0 | -0.12 | -0.12 | -0.23 | -0.20 | -0.22 |
| 35.5 | -0.12 | -0.13 | -0.24 | -0.18 | -0.20 |
| 36.0 | -0.13 | -0.13 | -0.25 | -0.16 | -0.17 |
| 36.5 | -0.12 | -0.14 | -0.25 | -0.13 | -0.14 |
| 37.0 | -0.12 | -0.14 | -0.25 | -0.12 | -0.12 |
| 37.5 | -0.11 | -0.15 | -0.24 | -0.11 | -0.09 |
| 38.0 | -0.11 | -0.15 | -0.23 | -0.11 | -0.07 |
| 38.5 | -0.10 | -0.15 | -0.22 | -0.12 | -0.06 |
| 39.0 | -0.09 | -0.16 | -0.20 | -0.13 | -0.05 |
| 39.5 | -0.09 | -0.16 | -0.18 | -0.16 | -0.04 |
| 40.0 | -0.08 | -0.16 | -0.16 | -0.18 | -0.04 |
| 40.5 | -0.08 | -0.17 | -0.15 | -0.20 | -0.04 |
| 41.0 | -0.08 | -0.17 | -0.13 | -0.22 | -0.05 |
| 41.5 | -0.08 | -0.17 | -0.12 | -0.23 | -0.06 |
| 42.0 | -0.08 | -0.17 | -0.11 | -0.24 | -0.07 |
| 42.5 | -0.08 | -0.17 | -0.10 | -0.24 | -0.08 |
| 43.0 | -0.09 | -0.17 | -0.09 | -0.23 | -0.08 |
| 43.5 | -0.09 | -0.17 | -0.09 | -0.22 | -0.09 |
| 44.0 | -0.09 | -0.16 | -0.09 | -0.21 | -0.09 |
| 44.5 | -0.09 | -0.16 | -0.09 | -0.20 | -0.09 |
| 45.0 | -0.09 | -0.16 | -0.09 | -0.19 | -0.09 |
| 45.5 | -0.09 | -0.15 | -0.09 | -0.18 | -0.09 |
| 46.0 | -0.09 | -0.15 | -0.09 | -0.17 | -0.09 |
| 46.5 | -0.09 | -0.14 | -0.09 | -0.16 | -0.09 |
| 47.0 | -0.09 | -0.14 | -0.08 | -0.15 | -0.09 |

| DELTA | 25 | 100 | 200 | 400 | 600 |
|---|---|---|---|---|---|
| 47.5 | -0.10 | -0.13 | -0.08 | -0.14 | -0.09 |
| 48.0 | -0.10 | -0.13 | -0.07 | -0.13 | -0.09 |
| 48.5 | -0.10 | -0.12 | -0.06 | -0.12 | -0.09 |
| 49.0 | -0.10 | -0.11 | -0.05 | -0.11 | -0.08 |
| 49.5 | -0.09 | -0.10 | -0.05 | -0.11 | -0.08 |
| 50.0 | -0.09 | -0.09 | -0.04 | -0.10 | -0.06 |
| 50.5 | -0.09 | -0.08 | -0.04 | -0.10 | -0.05 |
| 51.0 | -0.08 | -0.08 | -0.03 | -0.10 | -0.04 |
| 51.5 | -0.08 | -0.07 | -0.03 | -0.09 | -0.03 |
| 52.0 | -0.07 | -0.07 | -0.02 | -0.09 | -0.01 |
| 52.5 | -0.06 | -0.07 | -0.02 | -0.09 | -0.01 |
| 53.0 | -0.05 | -0.07 | -0.02 | -0.08 | 0.0 |
| 53.5 | -0.04 | -0.07 | -0.01 | -0.07 | 0.0 |
| 54.0 | -0.04 | -0.06 | -0.01 | -0.06 | -0.01 |
| 54.5 | -0.03 | -0.06 | 0.0 | -0.05 | -0.01 |
| 55.0 | -0.02 | -0.06 | 0.0 | -0.04 | -0.02 |
| 55.5 | -0.02 | -0.05 | 0.0 | -0.02 | -0.03 |
| 56.0 | -0.01 | -0.04 | 0.01 | -0.01 | -0.03 |
| 56.5 | -0.01 | -0.03 | 0.01 | 0.0 | -0.03 |
| 57.0 | 0.0 | -0.01 | 0.01 | 0.01 | -0.03 |
| 57.5 | 0.0 | 0.0 | 0.01 | 0.01 | -0.04 |
| 58.0 | 0.0 | 0.01 | 0.01 | 0.02 | -0.04 |
| 58.5 | 0.0 | 0.02 | 0.0 | 0.02 | -0.04 |
| 59.0 | 0.01 | 0.03 | 0.0 | 0.02 | -0.04 |
| 59.5 | 0.01 | 0.04 | 0.0 | 0.02 | -0.04 |
| 60.0 | 0.01 | 0.05 | -0.01 | 0.02 | -0.04 |
| 60.5 | 0.01 | 0.05 | -0.01 | 0.02 | -0.04 |
| 61.0 | 0.01 | 0.05 | -0.01 | 0.02 | -0.03 |
| 61.5 | 0.02 | 0.04 | -0.02 | 0.02 | -0.03 |
| 62.0 | 0.02 | 0.04 | -0.02 | 0.02 | -0.02 |
| 62.5 | 0.02 | 0.04 | -0.02 | 0.03 | -0.02 |
| 63.0 | 0.02 | 0.03 | -0.02 | 0.03 | -0.01 |
| 63.5 | 0.02 | 0.03 | -0.02 | 0.03 | -0.01 |
| 64.0 | 0.02 | 0.03 | -0.02 | 0.04 | 0.0 |
| 64.5 | 0.03 | 0.04 | -0.01 | 0.04 | 0.0 |
| 65.0 | 0.03 | 0.04 | 0.0 | 0.04 | 0.0 |
| 65.5 | 0.03 | 0.04 | 0.01 | 0.04 | 0.0 |
| 66.0 | 0.03 | 0.05 | 0.02 | 0.04 | 0.0 |
| 66.5 | 0.04 | 0.06 | 0.03 | 0.04 | 0.0 |
| 67.0 | 0.04 | 0.06 | 0.05 | 0.04 | -0.01 |
| 67.5 | 0.04 | 0.07 | 0.06 | 0.04 | -0.01 |
| 68.0 | 0.05 | 0.07 | 0.06 | 0.04 | -0.01 |
| 68.5 | 0.05 | 0.07 | 0.07 | 0.04 | -0.01 |
| 69.0 | 0.05 | 0.08 | 0.07 | 0.05 | -0.01 |
| 69.5 | 0.05 | 0.08 | 0.07 | 0.05 | -0.01 |
| 70.0 | 0.05 | 0.08 | 0.07 | 0.06 | 0.0 |
| 70.5 | 0.05 | 0.08 | 0.07 | 0.07 | 0.0 |
| 71.0 | 0.05 | 0.08 | 0.07 | 0.07 | 0.0 |
| 71.5 | 0.05 | 0.08 | 0.07 | 0.08 | 0.0 |
| 72.0 | 0.05 | 0.08 | 0.07 | 0.08 | 0.01 |
| 72.5 | 0.05 | 0.08 | 0.07 | 0.09 | 0.01 |
| 73.0 | 0.05 | 0.08 | 0.07 | 0.10 | 0.01 |
| 73.5 | 0.05 | 0.08 | 0.07 | 0.10 | 0.02 |
| 74.0 | 0.05 | 0.08 | 0.07 | 0.11 | 0.03 |
| 74.5 | 0.05 | 0.08 | 0.07 | 0.11 | 0.04 |

| DELTA | 25 | 100 | 200 | 400 | 600 |
|---|---|---|---|---|---|
| 75.0 | 0.05 | 0.07 | 0.07 | 0.11 | 0.05 |
| 75.5 | 0.05 | 0.07 | 0.07 | 0.11 | 0.06 |
| 76.0 | 0.05 | 0.07 | 0.07 | 0.11 | 0.07 |
| 76.5 | 0.05 | 0.07 | 0.07 | 0.11 | 0.09 |
| 77.0 | 0.05 | 0.07 | 0.07 | 0.11 | 0.10 |
| 77.5 | 0.05 | 0.07 | 0.08 | 0.10 | 0.11 |
| 78.0 | 0.05 | 0.07 | 0.08 | 0.10 | 0.12 |
| 78.5 | 0.05 | 0.07 | 0.08 | 0.10 | 0.13 |
| 79.0 | 0.06 | 0.08 | 0.09 | 0.10 | 0.14 |
| 79.5 | 0.06 | 0.08 | 0.10 | 0.11 | 0.14 |
| 80.0 | 0.07 | 0.08 | 0.11 | 0.11 | 0.14 |
| 80.5 | 0.08 | 0.09 | 0.12 | 0.12 | 0.15 |
| 81.0 | 0.08 | 0.09 | 0.13 | 0.13 | 0.15 |
| 81.5 | 0.09 | 0.09 | 0.13 | 0.15 | 0.15 |
| 82.0 | 0.09 | 0.09 | 0.14 | 0.16 | 0.16 |
| 82.5 | 0.09 | 0.10 | 0.14 | 0.18 | 0.16 |
| 83.0 | 0.09 | 0.10 | 0.15 | 0.19 | 0.17 |
| 83.5 | 0.09 | 0.11 | 0.15 | 0.21 | 0.18 |
| 84.0 | 0.09 | 0.12 | 0.15 | 0.22 | 0.19 |
| 84.5 | 0.09 | 0.13 | 0.15 | 0.23 | 0.21 |
| 85.0 | 0.10 | 0.14 | 0.16 | 0.24 | 0.22 |
| 85.5 | 0.11 | 0.15 | 0.16 | 0.26 | 0.23 |
| 86.0 | 0.12 | 0.17 | 0.17 | 0.27 | 0.25 |
| 86.5 | 0.13 | 0.19 | 0.18 | 0.28 | 0.26 |
| 87.0 | 0.14 | 0.22 | 0.19 | 0.29 | 0.28 |
| 87.5 | 0.16 | 0.24 | 0.21 | 0.30 | 0.30 |
| 88.0 | 0.18 | 0.26 | 0.23 | 0.32 | 0.32 |
| 88.5 | 0.20 | 0.29 | 0.25 | 0.33 | 0.34 |
| 89.0 | 0.22 | 0.31 | 0.27 | 0.35 | 0.36 |
| 89.5 | 0.24 | 0.34 | 0.30 | 0.37 | 0.38 |
| 90.0 | 0.26 | 0.37 | 0.32 | 0.39 | 0.40 |
| 90.5 | 0.28 | 0.39 | 0.34 | 0.41 | 0.43 |
| 91.0 | 0.31 | 0.42 | 0.37 | 0.44 | 0.46 |
| 91.5 | 0.33 | 0.45 | 0.39 | 0.47 | 0.49 |
| 92.0 | 0.36 | 0.47 | 0.42 | 0.50 | 0.52 |
| 92.5 | 0.38 | 0.50 | 0.45 | 0.53 | 0.55 |
| 93.0 | 0.42 | 0.53 | 0.48 | 0.57 | 0.58 |
| 93.5 | 0.45 | 0.56 | 0.52 | 0.60 | 0.62 |
| 94.0 | 0.49 | 0.60 | 0.55 | 0.64 | 0.65 |
| 94.5 | 0.52 | 0.63 | 0.59 | 0.68 | 0.69 |
| 95.0 | 0.56 | 0.67 | 0.62 | 0.71 | 0.72 |
| 95.5 | 0.60 | 0.70 | 0.66 | 0.75 | 0.76 |
| 96.0 | 0.64 | 0.74 | 0.70 | 0.79 | 0.79 |
| 96.5 | 0.68 | 0.78 | 0.73 | 0.82 | 0.83 |
| 97.0 | 0.71 | 0.81 | 0.77 | 0.86 | 0.87 |
| 97.5 | 0.75 | 0.35 | 0.80 | 0.90 | 0.90 |
| 98.0 | 0.79 | 0.89 | 0.84 | 0.94 | 0.94 |
| 98.5 | 0.82 | 0.93 | 0.88 | 0.97 | 0.97 |
| 99.0 | 0.85 | 0.96 | 0.91 | 1.01 | 1.01 |
| 99.5 | 0.88 | 1.00 | 0.95 | 1.04 | 1.04 |
| 100.0 | 0.91 | 1.04 | 0.99 | 1.08 | 1.08 |
| 100.5 | 0.94 | 1.08 | 1.03 | 1.11 | 1.11 |
| 101.0 | 0.97 | 1.12 | 1.07 | 1.15 | 1.14 |
| 101.5 | 1.00 | 1.16 | 1.11 | 1.19 | 1.18 |
| 102.0 | 1.02 | 1.19 | 1.15 | 1.23 | 1.21 |

TABLE 3

Smoothed Amplitude Distance Curves for Five Depths. (Note that baselines of the curves are arbitrary but here have been set so that the mean values in the distance range 30 to 90° are zero.)

| DELTA | 25 | 100 | 200 | 400 | 600 |
|---|---|---|---|---|---|
| 102.5 | 1.05 | 1.22 | 1.18 | 1.28 | 1.25 |
| 103.0 | 1.07 | 1.25 | 1.22 | 1.33 | 1.29 |
| 103.5 | 1.10 | 1.28 | 1.25 | 1.39 | 1.32 |
| 104.0 | 1.12 | 1.31 | 1.28 | 1.45 | 1.35 |
| 104.5 | 1.14 | 1.33 | 1.31 | 1.51 | 1.38 |
| 105.0 | 1.16 | 1.35 | 1.34 | 1.57 | 1.41 |
| 105.5 | 1.19 | 1.36 | 1.36 | 1.60 | 1.43 |
| 106.0 | 1.21 | 1.37 | 1.37 | 1.62 | 1.44 |
| 106.5 | 1.23 | 1.37 | 1.39 | 1.63 | 1.45 |
| 107.0 | 1.25 | 1.37 | 1.40 | 1.62 | 1.45 |
| 107.5 | 1.27 | 1.37 | 1.41 | 1.60 | 1.44 |
| 108.0 | 1.29 | 1.36 | 1.42 | 1.57 | 1.43 |
| 108.5 | 1.30 | 1.35 | 1.43 | 1.54 | 1.41 |
| 109.0 | 1.31 | 1.33 | 1.43 | 1.50 | 1.39 |
| 109.5 | 1.31 | 1.31 | 1.43 | 1.46 | 1.36 |
| 110.0 | 1.31 | 1.30 | 1.43 | 1.41 | 1.32 |
| 110.5 | 1.31 | 1.28 | 1.42 | 1.37 | 1.29 |
| 111.0 | 1.30 | 1.26 | 1.40 | 1.32 | 1.25 |
| 111.5 | 1.29 | 1.24 | 1.38 | 1.28 | 1.21 |
| 112.0 | 1.28 | 1.21 | 1.35 | 1.23 | 1.17 |
| 112.5 | 1.26 | 1.19 | 1.32 | 1.19 | 1.13 |
| 113.0 | 1.25 | 1.16 | 1.27 | 1.15 | 1.08 |
| 113.5 | 1.23 | 1.14 | 1.22 | 1.11 | 1.04 |
| 114.0 | 1.21 | 1.12 | 1.17 | 1.07 | 0.99 |
| 114.5 | 1.18 | 1.09 | 1.11 | 1.03 | 0.94 |
| 115.0 | 1.16 | 1.07 | 1.06 | 1.00 | 0.89 |
| 115.5 | 1.13 | 1.04 | 1.02 | 0.96 | 0.85 |
| 116.0 | 1.11 | 1.01 | 0.98 | 0.93 | 0.81 |
| 116.5 | 1.08 | 0.99 | 0.94 | 0.90 | 0.78 |
| 117.0 | 1.05 | 0.96 | 0.91 | 0.87 | 0.75 |
| 117.5 | 1.02 | 0.93 | 0.88 | 0.84 | 0.73 |
| 118.0 | 0.99 | 0.90 | 0.86 | 0.82 | 0.70 |
| 118.5 | 0.97 | 0.88 | 0.83 | 0.79 | 0.69 |
| 119.0 | 0.94 | 0.85 | 0.81 | 0.77 | 0.67 |
| 119.5 | 0.91 | 0.82 | 0.79 | 0.74 | 0.66 |
| 120.0 | 0.88 | 0.80 | 0.77 | 0.72 | 0.65 |
| 120.5 | 0.86 | 0.78 | 0.75 | 0.69 | 0.64 |
| 121.0 | 0.83 | 0.76 | 0.73 | 0.67 | 0.64 |
| 121.5 | 0.81 | 0.74 | 0.71 | 0.65 | 0.63 |
| 122.0 | 0.78 | 0.72 | 0.68 | 0.64 | 0.62 |
| 122.5 | 0.76 | 0.71 | 0.66 | 0.62 | 0.62 |
| 123.0 | 0.75 | 0.69 | 0.63 | 0.62 | 0.61 |
| 123.5 | 0.73 | 0.68 | 0.61 | 0.62 | 0.61 |
| 124.0 | 0.72 | 0.67 | 0.59 | 0.63 | 0.61 |
| 124.5 | 0.70 | 0.66 | 0.57 | 0.64 | 0.61 |
| 125.0 | 0.70 | 0.65 | 0.56 | 0.65 | 0.61 |
| 125.5 | 0.69 | 0.64 | 0.55 | 0.66 | 0.61 |
| 126.0 | 0.68 | 0.63 | 0.55 | 0.68 | 0.61 |
| 126.5 | 0.68 | 0.62 | 0.55 | 0.69 | 0.61 |
| 127.0 | 0.68 | 0.61 | 0.56 | 0.70 | 0.61 |
| 127.5 | 0.68 | 0.61 | 0.57 | 0.71 | 0.62 |
| 128.0 | 0.67 | 0.61 | 0.58 | 0.72 | 0.63 |
| 128.5 | 0.67 | 0.60 | 0.59 | 0.72 | 0.64 |
| 129.0 | 0.67 | 0.61 | 0.60 | 0.73 | 0.65 |
| 129.5 | 0.67 | 0.61 | 0.60 | 0.73 | 0.66 |
| 130.0 | 0.67 | 0.62 | 0.61 | 0.74 | 0.67 |
| 130.5 | 0.67 | 0.63 | 0.61 | 0.74 | 0.68 |
| 131.0 | 0.67 | 0.64 | 0.62 | 0.75 | 0.69 |
| 131.5 | 0.67 | 0.66 | 0.62 | 0.76 | 0.70 |
| 132.0 | 0.68 | 0.68 | 0.63 | 0.77 | 0.71 |
| 132.5 | 0.69 | 0.70 | 0.64 | 0.79 | 0.71 |
| 133.0 | 0.71 | 0.72 | 0.65 | 0.81 | 0.72 |
| 133.5 | 0.73 | 0.75 | 0.67 | 0.83 | 0.73 |
| 134.0 | 0.75 | 0.77 | 0.69 | 0.85 | 0.75 |
| 134.5 | 0.77 | 0.79 | 0.72 | 0.88 | 0.77 |
| 135.0 | 0.79 | 0.82 | 0.75 | 0.90 | 0.79 |
| 135.5 | 0.80 | 0.84 | 0.78 | 0.92 | 0.81 |
| 136.0 | 0.81 | 0.86 | 0.81 | 0.93 | 0.83 |
| 136.5 | 0.82 | 0.87 | 0.84 | 0.96 | 0.85 |
| 137.0 | 0.81 | 0.87 | 0.85 | 0.98 | 0.86 |
| 137.5 | 0.80 | 0.87 | 0.86 | 0.98 | 0.85 |
| 138.0 | 0.79 | 0.85 | 0.85 | 0.96 | 0.83 |
| 138.5 | 0.78 | 0.82 | 0.83 | 0.93 | 0.80 |
| 139.0 | 0.77 | 0.79 | 0.81 | 0.90 | 0.74 |
| 139.5 | 0.76 | 0.75 | 0.79 | 0.88 | 0.67 |
| 140.0 | 0.77 | 0.71 | 0.77 | 0.89 | 0.64 |
| 140.5 | 0.77 | 0.67 | 0.75 | 0.91 | 0.65 |
| 141.0 | 0.78 | 0.62 | 0.73 | 0.91 | 0.63 |
| 141.5 | 0.76 | 0.57 | 0.69 | 0.87 | 0.53 |
| 142.0 | 0.72 | 0.52 | 0.63 | 0.77 | 0.35 |
| 142.5 | 0.65 | 0.45 | 0.54 | 0.58 | 0.15 |
| 143.0 | 0.53 | 0.35 | 0.41 | 0.33 | -0.04 |
| 143.5 | 0.36 | 0.22 | 0.25 | 0.10 | -0.19 |
| 144.0 | 0.13 | 0.06 | 0.09 | -0.05 | -0.26 |
| 144.5 | -0.09 | -0.10 | -0.05 | -0.11 | -0.26 |
| 145.0 | -0.21 | -0.21 | -0.14 | -0.09 | -0.19 |
| 145.5 | -0.23 | -0.26 | -0.16 | -0.02 | -0.09 |
| 146.0 | -0.18 | -0.25 | -0.12 | 0.07 | 0.03 |
| 146.5 | -0.10 | -0.19 | -0.04 | 0.14 | 0.16 |
| 147.0 | -0.03 | -0.12 | 0.08 | 0.20 | 0.27 |
| 147.5 | 0.02 | -0.05 | 0.19 | 0.26 | 0.36 |
| 148.0 | 0.05 | 0.01 | 0.30 | 0.33 | 0.42 |
| 148.5 | 0.05 | 0.05 | 0.37 | 0.40 | 0.44 |
| 149.0 | 0.05 | 0.07 | 0.41 | 0.45 | 0.42 |
| 149.5 | 0.06 | 0.08 | 0.41 | 0.49 | 0.41 |
| 150.0 | 0.08 | 0.09 | 0.39 | 0.51 | 0.41 |
| 150.5 | 0.11 | 0.11 | 0.36 | 0.53 | 0.42 |
| 151.0 | 0.15 | 0.13 | 0.33 | 0.55 | 0.46 |
| 151.5 | 0.18 | 0.17 | 0.32 | 0.56 | 0.49 |
| 152.0 | 0.22 | 0.22 | 0.33 | 0.59 | 0.53 |
| 152.5 | 0.27 | 0.28 | 0.37 | 0.62 | 0.54 |
| 153.0 | 0.32 | 0.34 | 0.41 | 0.65 | 0.55 |
| 153.5 | 0.37 | 0.39 | 0.46 | 0.68 | 0.56 |
| 154.0 | 0.42 | 0.45 | 0.50 | 0.71 | 0.58 |
| 154.5 | 0.46 | 0.49 | 0.54 | 0.74 | 0.59 |
| 155.0 | 0.50 | 0.53 | 0.57 | 0.75 | 0.60 |
| 155.5 | 0.53 | 0.56 | 0.59 | 0.76 | 0.61 |
| 156.0 | 0.55 | 0.58 | 0.6: | 0.76 | 0.62 |
| 156.5 | 0.56 | 0.59 | 0.62 | 0.76 | 0.64 |
| 157.0 | 0.57 | 0.59 | 0.62 | 0.76 | 0.65 |
| 157.5 | 0.58 | 0.59 | 0.61 | 0.75 | 0.66 |
| 158.0 | 0.58 | 0.58 | 0.60 | 0.73 | 0.66 |
| 158.5 | 0.57 | 0.56 | 0.59 | 0.72 | 0.67 |
| 159.0 | 0.56 | 0.55 | 0.58 | 0.70 | 0.66 |
| 159.5 | 0.56 | 0.53 | 0.56 | 0.67 | 0.65 |
| 160.0 | 0.55 | 0.52 | 0.55 | 0.65 | 0.62 |
| 160.5 | 0.54 | 0.51 | 0.54 | 0.62 | 0.60 |
| 161.0 | 0.53 | 0.50 | 0.53 | 0.60 | 0.57 |
| 161.5 | 0.52 | 0.50 | 0.53 | 0.59 | 0.55 |
| 162.0 | 0.51 | 0.50 | 0.52 | 0.58 | 0.54 |
| 162.5 | 0.51 | 0.50 | 0.52 | 0.57 | 0.53 |
| 163.0 | 0.50 | 0.50 | 0.52 | 0.56 | 0.52 |
| 163.5 | 0.49 | 0.49 | 0.51 | 0.56 | 0.51 |
| 164.0 | 0.48 | 0.48 | 0.50 | 0.55 | 0.50 |
| 164.5 | 0.47 | 0.46 | 0.49 | 0.54 | 0.49 |
| 165.0 | 0.46 | 0.46 | 0.48 | 0.53 | 0.48 |
| 165.5 | 0.45 | 0.45 | 0.47 | 0.51 | 0.46 |
| 166.0 | 0.44 | 0.44 | 0.46 | 0.50 | 0.45 |
| 166.5 | 0.43 | 0.42 | 0.45 | 0.49 | 0.44 |
| 167.0 | 0.42 | 0.42 | 0.44 | 0.49 | 0.44 |
| 167.5 | 0.41 | 0.41 | 0.43 | 0.48 | 0.43 |
| 168.0 | 0.40 | 0.40 | 0.43 | 0.47 | 0.42 |
| 168.5 | 0.40 | 0.40 | 0.42 | 0.47 | 0.42 |
| 169.0 | 0.40 | 0.40 | 0.42 | 0.47 | 0.42 |
| 169.5 | 0.40 | 0.40 | 0.42 | 0.47 | 0.42 |
| 170.0 | 0.40 | 0.40 | 0.42 | 0.47 | 0.42 |
| 170.5 | 0.40 | 0.39 | 0.42 | 0.46 | 0.41 |
| 171.0 | 0.39 | 0.39 | 0.41 | 0.46 | 0.41 |
| 171.5 | 0.39 | 0.39 | 0.41 | 0.46 | 0.41 |
| 172.0 | 0.39 | 0.39 | 0.41 | 0.46 | 0.41 |
| 172.5 | 0.39 | 0.39 | 0.41 | 0.46 | 0.41 |
| 173.0 | 0.39 | 0.38 | 0.41 | 0.45 | 0.40 |
| 173.5 | 0.38 | 0.38 | 0.40 | 0.45 | 0.40 |
| 174.0 | 0.38 | 0.38 | 0.40 | 0.45 | 0.40 |
| 174.5 | 0.38 | 0.38 | 0.40 | 0.45 | 0.40 |
| 175.0 | 0.38 | 0.38 | 0.40 | 0.45 | 0.40 |
| 175.5 | 0.38 | 0.38 | 0.40 | 0.45 | 0.40 |
| 176.0 | 0.38 | 0.38 | 0.40 | 0.45 | 0.40 |
| 176.5 | 0.38 | 0.38 | 0.40 | 0.45 | 0.40 |
| 177.0 | 0.38 | 0.38 | 0.40 | 0.45 | 0.40 |
| 177.5 | 0.38 | 0.38 | 0.40 | 0.45 | 0.40 |
| 178.0 | 0.38 | 0.38 | 0.40 | 0.45 | 0.40 |
| 178.5 | 0.38 | 0.38 | 0.40 | 0.45 | 0.40 |
| 179.0 | 0.38 | 0.38 | 0.40 | 0.45 | 0.40 |
| 179.5 | 0.38 | 0.38 | 0.40 | 0.45 | 0.40 |
| 180.0 | 0.38 | 0.38 | 0.40 | 0.45 | 0.40 |

TABLE 3 (Cont'd)

TABLE 4

Mean Baselines of the Gutenberg-Richter (G-R) and Veith-Clawson (V-C) in the Distance Range 30 to 90° as a Function of Depth

| Depth km | G-R | V-C |
|---|---|---|
| 0.0 | 3.80 | 3.75 |
| 10.0 | 3.80 | 3.69 |
| 20.0 | 3.73 | 3.63 |
| 30.0 | 3.73 | 3.58 |
| 40.0 | 3.73 | 3.53 |
| 50.0 | 3.73 | 3.51 |
| 60.0 | 3.73 | 3.49 |
| 80.0 | 3.64 | 3.45 |
| 100.0 | 3.64 | 3.42 |
| 120.0 | 3.64 | 3.38 |
| 140.0 | 3.49 | 3.34 |
| 180.0 | 3.49 | 3.27 |
| 220.0 | 3.34 | 3.20 |
| 260.0 | 3.32 | 3.15 |
| 300.0 | 3.32 | 3.09 |
| 350.0 | 3.26 | 3.04 |
| 400.0 | 3.24 | 2.99 |
| 450.0 | 3.25 | 2.94 |
| 500.0 | 3.25 | 2.88 |
| 550.0 | 3.24 | 2.83 |
| 600.0 | 3.24 | 2.77 |
| 650.0 | 3.18 | 2.72 |
| 700.0 | 3.17 | 2.67 |
| 750.0 | 3.17 | 2.65 |
| 800.0 | 3.17 | 2.62 |

| STATION CODE | PRELIMINARY RESULTS TERM | +OR- | NOBS | FINAL RESULTS TERM | +OR- | NOBS |
|---|---|---|---|---|---|---|
| AAE | 0.09 | 0.06 | 44 | 0.10 | 0.04 | 118 |
| AAI | | | | -0.04 | 0.06 | 48 |
| ABQ | -0.20 | 0.07 | 29 | -0.19 | 0.04 | 81 |
| ABU | 0.03 | 0.05 | 93 | 0.10 | 0.03 | 265 |
| ACO | | | | 0.09 | 0.06 | 40 |
| AD- | | | | 0.07 | 0.11 | 12 |
| ADE | 0.39 | 0.05 | 70 | 0.33 | 0.03 | 217 |
| ADK | | | | 0.04 | 0.06 | 52 |
| AFI | | | | -0.04 | 0.08 | 35 |
| AFR | -0.06 | 0.05 | 63 | -0.10 | 0.03 | 199 |
| AGM | | | | 0.11 | 0.09 | 16 |
| AKU | -0.18 | 0.05 | 57 | -0.11 | 0.02 | 252 |
| ALE | -0.10 | 0.02 | 192 | -0.11 | 0.01 | 627 |
| ALM | -1.64 | 0.08 | 22 | -1.61 | 0.04 | 105 |
| ALQ | -0.17 | 0.02 | 202 | -0.19 | 0.01 | 678 |
| AMN | | | | -0.05 | 0.05 | 55 |
| ANG | 0.49 | 0.09 | 26 | 0.34 | 0.05 | 72 |
| ANP | 0.37 | 0.06 | 45 | 0.22 | 0.03 | 151 |
| ANR | 0.45 | 0.06 | 35 | 0.53 | 0.04 | 87 |
| APA | | | | -0.07 | 0.06 | 42 |
| APT | -0.14 | 0.08 | 21 | -0.18 | 0.05 | 48 |
| ARE | -0.06 | 0.06 | 39 | -0.11 | 0.04 | 108 |
| ARU | 0.35 | 0.07 | 31 | 0.38 | 0.04 | 78 |
| ASH | | | | 0.52 | 0.06 | 37 |
| ASP | -0.05 | 0.04 | 99 | -0.10 | 0.02 | 267 |
| ATL | | | | -0.02 | 0.06 | 43 |
| AVF | -0.14 | 0.05 | 58 | -0.10 | 0.02 | 275 |
| BAG | 0.07 | 0.06 | 45 | 0.02 | 0.03 | 147 |
| BDT | -0.12 | 0.05 | 56 | -0.02 | 0.02 | 261 |
| BDW | -0.13 | 0.05 | 44 | -0.24 | 0.02 | 261 |
| BER | | | | -0.12 | 0.11 | 12 |
| BHA | -0.33 | 0.03 | 157 | -0.32 | 0.02 | 425 |
| BHG | | | | 0.07 | 0.05 | 63 |
| BHO | | | | 0.02 | 0.04 | 95 |
| BHP | | | | 0.07 | 0.06 | 53 |
| BJI | | | | -0.13 | 0.06 | 39 |
| BKR | 0.48 | 0.07 | 25 | 0.42 | 0.04 | 64 |
| BKS | -0.01 | 0.04 | 111 | 0.05 | 0.02 | 393 |
| BLA | -0.05 | 0.06 | 51 | 0.01 | 0.04 | 151 |
| BLC | 0.03 | 0.05 | 59 | 0.06 | 0.03 | 154 |
| BMN | -0.10 | 0.05 | 46 | -0.18 | 0.03 | 173 |
| BMO | -0.23 | 0.02 | 242 | -0.24 | 0.01 | 622 |
| BNG | -0.15 | 0.03 | 244 | -0.10 | 0.01 | 908 |
| BNH | | | | -0.28 | 0.06 | 36 |
| BNS | 0.12 | 0.03 | 149 | 0.06 | 0.02 | 374 |
| BOD | 0.13 | 0.06 | 32 | 0.07 | 0.04 | 91 |
| BOZ | -0.05 | 0.06 | 40 | -0.14 | 0.04 | 103 |
| BPT | | | | -0.31 | 0.07 | 27 |
| BRA | | | | -0.03 | 0.07 | 38 |
| BRG | 0.02 | 0.03 | 184 | -0.02 | 0.01 | 623 |
| BSF | -0.02 | 0.04 | 94 | -0.04 | 0.02 | 376 |
| BSI | | | | 0.04 | 0.06 | 46 |
| BUB | 0.12 | 0.07 | 31 | 0.11 | 0.04 | 84 |
| BUD | -0.11 | 0.06 | 48 | -0.14 | 0.03 | 160 |
| BUH | -0.49 | 0.11 | 25 | -0.26 | 0.07 | 51 |
| BUL | -0.16 | 0.02 | 364 | -0.17 | 0.01 | 1157 |
| CAF | | | | -0.11 | 0.03 | 152 |
| CAN | -0.34 | 0.0[illegible] | 35 | -0.25 | 0.03 | 152 |
| CAR | -0.05 | 0.04 | 151 | -0.12 | 0.02 | 431 |
| CBM | 0.02 | 0.08 | 25 | -0.16 | 0.05 | 76 |
| CDF | -0.09 | 0.04 | 85 | -0.14 | 0.02 | 346 |
| CER | -0.36 | 0.11 | 20 | -0.15 | 0.05 | 60 |
| CGP | | | | -0.13 | 0.07 | 36 |
| CHG | -0.12 | 0.04 | 85 | -0.16 | 0.02 | 334 |
| CHTO | | | | -0.12 | 0.05 | 40 |
| CIR | -0.36 | 0.03 | 213 | -0.38 | 0.01 | 601 |
| CLK | -0.44 | 0.03 | 213 | -0.43 | 0.02 | 596 |
| CLL | 0.11 | 0.02 | 234 | 0.07 | 0.01 | 776 |
| CMC | -0.01 | 0.09 | 21 | 0.0 | 0.05 | 64 |
| CNG | | | | -0.07 | 0.06 | 56 |
| CNN | | | | 0.21 | 0.05 | 54 |
| COB | | | | 0.45 | 0.10 | 15 |
| COL | 0.08 | 0.02 | 229 | 0.04 | 0.01 | 707 |
| COP | 0.16 | 0.03 | 151 | 0.14 | 0.02 | 472 |
| CPO | -0.14 | 0.03 | 181 | -0.12 | 0.02 | 479 |
| CRO | | | | 0.20 | 0.06 | 42 |
| CRT | | | | 1.07 | 0.09 | 19 |
| CTA | | | | -0.12 | 0.03 | 127 |
| CUM | | | | -0.19 | 0.06 | 55 |
| CVF | -0.10 | 0.05 | 52 | -0.11 | 0.03 | 184 |
| CWF | -0.25 | 0.07 | 26 | -0.40 | 0.04 | 73 |
| CYP | | | | 1.51 | 0.04 | 82 |
| DAG | -0.09 | 0.03 | 150 | -0.10 | 0.02 | 566 |
| DAL | | | | -1.52 | 0.17 | 13 |
| DAR | | | | -0.04 | 0.07 | 31 |
| DAV | | | | 0.28 | 0.08 | 27 |
| DBN | | | | 0.68 | 0.07 | 35 |
| DCN | 0.28 | 0.06 | 36 | 0.23 | 0.03 | 179 |
| DDK | 0.28 | 0.07 | 23 | 0.11 | 0.04 | 105 |
| DIX | -0.17 | 0.04 | 89 | -0.19 | 0.02 | 235 |
| DKM | 0.16 | 0.06 | 32 | 0.10 | 0.04 | 72 |
| DLE | 0.26 | 0.07 | 28 | 0.18 | 0.03 | 161 |
| DMN | | | | 0.12 | 0.05 | 69 |
| DMU | 0.16 | 0.06 | 38 | 0.18 | 0.03 | 183 |
| DOM | | | | -0.01 | 0.07 | 30 |
| DUG | -0.08 | 0.03 | 122 | -0.10 | 0.02 | 305 |
| EAB | -0.20 | 0.05 | 70 | -0.22 | 0.03 | 201 |
| EAU | 0.01 | 0.05 | 66 | -0.02 | 0.03 | 199 |
| EBH | -0.11 | 0.04 | 74 | -0.12 | 0.03 | 213 |
| EBL | -0.06 | 0.04 | 75 | -0.11 | 0.03 | 213 |
| ECB | | | | 0.03 | 0.05 | 66 |
| ECP | | | | 0.14 | 0.04 | 118 |
| ECT | | | | -0.41 | 0.07 | 38 |
| EDI | -0.11 | 0.05 | 62 | -0.16 | 0.03 | 168 |
| EDM | 0.38 | 0.03 | 134 | 0.34 | 0.02 | 396 |
| EDU | 0.04 | 0.05 | 58 | 0.0 | 0.03 | 153 |
| EGL | -0.09 | 0.04 | 73 | -0.10 | 0.03 | 191 |
| EKA | -0.19 | 0.03 | 194 | -0.16 | 0.01 | 682 |
| ELO | -0.15 | 0.05 | 54 | -0.16 | 0.03 | 163 |
| ELT | 0.17 | 0.06 | 39 | 0.18 | 0.04 | 89 |
| EMM | | | | -0.04 | 0.06 | 43 |
| ENN | | | | -0.05 | 0.03 | 145 |

TABLE 5

Estimated Station Terms, Standard Deviations and Number of Observations.
(The preliminary results are determined jointly with the shallow focus (0 to 50 km) curve. The final results are for much larger data set and assume the smoothed amplitude distance curves in table 3.)

| STATION CODE | PRELIMINARY RESULTS TERM | +OR- | NOBS | FINAL RESULTS TERM | +OR- | NOBS |
|---|---|---|---|---|---|---|
| EPF | 0.12 | 0.06 | 42 | -0.08 | 0.03 | 203 |
| ESK | 0.01 | 0.06 | 47 | -0.03 | 0.03 | 179 |
| ETA | | | | 0.14 | 0.05 | 67 |
| EUR | -0.49 | 0.03 | 228 | -0.46 | 0.02 | 676 |
| FAV | | | | -0.16 | 0.09 | 14 |
| FBA | 0.13 | 0.07 | 25 | -0.01 | 0.03 | 169 |
| FBC | 0.16 | 0.07 | 29 | 0.13 | 0.04 | 92 |
| FCC | 0.10 | 0.05 | 66 | 0.07 | 0.03 | 219 |
| FDA | | | | -0.44 | 0.13 | 11 |
| FEL | | | | 0.03 | 0.11 | 12 |
| FFC | 0.05 | 0.03 | 178 | 0.02 | 0.01 | 612 |
| FLN | 0.11 | 0.04 | 76 | 0.04 | 0.02 | 311 |
| FLO | | | | 0.33 | 0.04 | 57 |
| FRB | 0.08 | 0.06 | 40 | 0.06 | 0.03 | 147 |
| FRF | | | | -0.06 | 0.03 | 135 |
| FRT | | | | -0.12 | 0.06 | 48 |
| FRU | 0.34 | 0.06 | 35 | 0.41 | 0.04 | 73 |
| FSJ | -0.02 | 0.05 | 52 | -0.09 | 0.03 | 135 |
| FUR | 0.06 | 0.03 | 233 | 0.08 | 0.02 | 674 |
| FVM | | | | 0.02 | 0.04 | 102 |
| GAR | 0.16 | 0.07 | 32 | 0.27 | 0.04 | 71 |
| GBA | -0.19 | 0.04 | 106 | -0.22 | 0.02 | 474 |
| GDH | -0.14 | 0.03 | 149 | -0.19 | 0.02 | 509 |
| GEO | | | | -0.06 | 0.05 | 58 |
| GIL | 0.05 | 0.03 | 132 | 0.01 | 0.02 | 338 |
| GLD | | | | 0.12 | 0.05 | 62 |
| GOL | -0.25 | 0.03 | 143 | -0.29 | 0.02 | 471 |
| GRE | -0.11 | 0.07 | 29 | -0.28 | 0.05 | 81 |
| GRF | 0.19 | 0.03 | 146 | 0.14 | 0.02 | 466 |
| GRM | -0.07 | 0.05 | 70 | -0.06 | 0.03 | 209 |
| GRR | 0.11 | 0.04 | 61 | 0.02 | 0.02 | 290 |
| GRS | | | | 0.08 | 0.07 | 28 |
| GUA | 0.36 | 0.06 | 40 | 0.29 | 0.03 | 167 |
| GUMO | | | | 0.39 | 0.05 | 69 |
| GWC | 0.22 | 0.07 | 27 | 0.17 | 0.04 | 85 |
| HAU | -0.03 | 0.04 | 93 | -0.07 | 0.02 | 357 |
| HDM | -0.15 | 0.07 | 30 | -0.24 | 0.04 | 77 |
| HFS | 0.11 | 0.03 | 184 | 0.05 | 0.01 | 659 |
| HNH | | | | -0.05 | 0.08 | 21 |
| HNR | -0.17 | 0.10 | 21 | -0.02 | 0.07 | 48 |
| HOF | 0.26 | 0.06 | 50 | 0.19 | 0.03 | 180 |
| HYB | 0.12 | 0.03 | 148 | 0.13 | 0.02 | 541 |
| ILT | 0.17 | 0.06 | 31 | 0.17 | 0.04 | 84 |
| IMA | | | | -0.13 | 0.07 | 27 |
| INK | 0.12 | 0.03 | 135 | 0.07 | 0.02 | 397 |
| IPM | -0.11 | 0.07 | 36 | -0.16 | 0.03 | 182 |
| IRK | 0.04 | 0.06 | 34 | 0.03 | 0.04 | 89 |
| ISQ | | | | 0.13 | 0.09 | 18 |
| JAS | | | | 0.01 | 0.07 | 23 |
| JAY | | | | -0.20 | 0.06 | 51 |
| JCT | -0.07 | 0.05 | 52 | -0.03 | 0.02 | 290 |
| JER | | | | 0.07 | 0.08 | 24 |
| JOS | -0.03 | 0.05 | 75 | -0.11 | 0.02 | 289 |
| KBA | | | | -0.02 | 0.04 | 87 |
| KBL | | | | -0.05 | 0.07 | 29 |
| KBS | -0.07 | 0.05 | 51 | -0.08 | 0.03 | 190 |

| STATION CODE | PRELIMINARY RESULTS TERM | +OR- | NOBS | FINAL RESULTS TERM | +OR- | NOBS |
|---|---|---|---|---|---|---|
| KEV | -0.06 | 0.02 | 229 | -0.08 | 0.01 | 765 |
| KGM | | | | 0.06 | 0.05 | 84 |
| KHC | 0.0 | 0.02 | 253 | -0.05 | 0.01 | 709 |
| KHE | 0.46 | 0.07 | 24 | 0.38 | 0.04 | 76 |
| KIP | | | | 0.07 | 0.06 | 50 |
| KIR | 0.50 | 0.04 | 100 | 0.51 | 0.02 | 357 |
| KJF | 0.05 | 0.03 | 194 | 0.09 | 0.01 | 722 |
| KJN | 0.05 | 0.03 | 106 | 0.06 | 0.02 | 299 |
| KKM | | | | -0.05 | 0.05 | 83 |
| KLG | -0.22 | 0.08 | 39 | -0.12 | 0.03 | 163 |
| KMU | -0.01 | 0.11 | 21 | -0.07 | 0.06 | 52 |
| KNA | | | | 0.10 | 0.05 | 50 |
| KOD | -0.08 | 0.04 | 119 | -0.07 | 0.02 | 346 |
| KON | -0.02 | 0.04 | 84 | -0.07 | 0.02 | 229 |
| KRA | 0.08 | 0.03 | 190 | 0.11 | 0.02 | 591 |
| KRI | -0.40 | 0.04 | 75 | -0.34 | 0.02 | 370 |
| KRK | | | | -0.02 | 0.06 | 49 |
| KRL | 0.40 | 0.09 | 22 | 0.32 | 0.06 | 50 |
| KRP | 0.13 | 0.07 | 26 | 0.20 | 0.04 | 75 |
| KRR | -0.31 | 0.03 | 152 | -0.29 | 0.02 | 426 |
| KSP | | | | 0.09 | 0.03 | 119 |
| KSR | -0.34 | 0.07 | 33 | -0.37 | 0.05 | 80 |
| KTG | -0.13 | 0.03 | 186 | -0.15 | 0.02 | 525 |
| LAO | 0.04 | 0.04 | 94 | -0.01 | 0.02 | 256 |
| LBF | -0.02 | 0.04 | 83 | -0.10 | 0.02 | 333 |
| LDF | | | | 0.01 | 0.04 | 77 |
| LD3 | 0.11 | 0.08 | 20 | -0.02 | 0.05 | 63 |
| LEM | -0.20 | 0.08 | 33 | -0.16 | 0.04 | 138 |
| LFF | 0.06 | 0.04 | 78 | 0.07 | 0.02 | 310 |
| LF1 | | | | -0.24 | 0.08 | 17 |
| LF2 | | | | -0.53 | 0.09 | 30 |
| LF3 | | | | -0.12 | 0.09 | 16 |
| LF4 | | | | -0.34 | 0.07 | 34 |
| LGP | | | | 0.23 | 0.06 | 50 |
| LHC | 0.08 | 0.06 | 51 | 0.13 | 0.03 | 194 |
| LHN | | | | -0.02 | 0.05 | 44 |
| LIS | | | | 0.26 | 0.10 | 22 |
| LJU | 0.20 | 0.03 | 150 | 0.23 | 0.02 | 386 |
| LLS | | | | 0.16 | 0.03 | 163 |
| LMR | -0.07 | 0.04 | 68 | -0.08 | 0.02 | 267 |
| LON | -0.34 | 0.03 | 182 | -0.34 | 0.02 | 462 |
| LOR | 0.02 | 0.03 | 152 | -0.02 | 0.02 | 537 |
| LPA | 0.29 | 0.08 | 27 | 0.30 | 0.05 | 69 |
| LPB | 0.13 | 0.03 | 152 | 0.11 | 0.02 | 546 |
| LPF | 0.09 | 0.04 | 68 | 0.03 | 0.02 | 291 |
| LPO | -0.01 | 0.04 | 76 | -0.03 | 0.02 | 295 |
| LPS | 0.03 | 0.04 | 91 | -0.01 | 0.02 | 251 |
| LRG | -0.01 | 0.04 | 67 | -0.05 | 0.02 | 262 |
| LSF | 0.01 | 0.04 | 61 | -0.05 | 0.02 | 263 |
| LZH | | | | 0.32 | 0.05 | 50 |
| MAIO | | | | -0.17 | 0.04 | 60 |
| MAT | 0.03 | 0.03 | 107 | -0.06 | 0.02 | 348 |
| MAW | | | | -0.15 | 0.04 | 93 |
| MBC | 0.14 | 0.02 | 224 | 0.11 | 0.01 | 777 |
| MBL | -0.17 | 0.09 | 20 | -0.12 | 0.05 | 57 |
| MEK | | | | -0.07 | 0.04 | 77 |

TABLE 5 (Cont'd)

| STATION CODE | PRELIMINARY RESULTS TERM | +OR- | NOBS | FINAL RESULTS TERM | +OR- | NOBS |
|---|---|---|---|---|---|---|
| MFF | 0.07 | 0.04 | 81 | 0.03 | 0.02 | 309 |
| MHC | | | | -0.05 | 0.09 | 21 |
| MHI | | | | 0.02 | 0.06 | 44 |
| MIM | -0.29 | 0.08 | 25 | -0.25 | 0.04 | 70 |
| MIR | | | | 0.10 | 0.06 | 37 |
| MJZ | | | | 0.65 | 0.09 | 16 |
| MMK | | | | 0.11 | 0.04 | 109 |
| MNG | | | | -0.03 | 0.06 | 38 |
| MNT | -0.02 | 0.06 | 42 | 0.06 | 0.03 | 172 |
| MOS | | | | 0.44 | 0.06 | 41 |
| MOX | 0.03 | 0.02 | 308 | 0.01 | 0.01 | 949 |
| MOY | 0.09 | 0.07 | 27 | 0.11 | 0.04 | 79 |
| MSO | -0.01 | 0.03 | 120 | -0.03 | 0.02 | 310 |
| MSZ | | | | 0.33 | 0.07 | 29 |
| MTD | -0.26 | 0.03 | 159 | -0.27 | 0.01 | 571 |
| MUD | | | | -0.07 | 0.04 | 73 |
| MUN | -0.02 | 0.05 | 56 | 0.02 | 0.03 | 184 |
| MWI | | | | 0.0 | 0.08 | 35 |
| MZF | -0.02 | 0.05 | 50 | -0.06 | 0.02 | 214 |
| NAE | | | | -0.06 | 0.07 | 30 |
| NAI | -0.07 | 0.03 | 148 | -0.08 | 0.02 | 450 |
| NAO | 0.0 | 0.04 | 83 | -0.04 | 0.02 | 238 |
| NAU | | | | -0.25 | 0.07 | 28 |
| NBO | | | | -0.07 | 0.07 | 18 |
| NB2 | -0.13 | 0.05 | 51 | -0.07 | 0.02 | 342 |
| NCS | | | | -0.05 | 0.08 | 19 |
| NDI | 0.14 | 0.04 | 111 | 0.11 | 0.02 | 407 |
| NEW | -0.06 | 0.05 | 75 | -0.07 | 0.02 | 255 |
| NIE | -0.04 | 0.03 | 117 | -0.02 | 0.02 | 415 |
| NNA | -0.06 | 0.07 | 42 | -0.03 | 0.04 | 123 |
| NOR | -0.14 | 0.04 | 108 | -0.17 | 0.02 | 298 |
| NP- | -0.12 | 0.06 | 36 | -0.07 | 0.04 | 92 |
| NRI | | | | 0.08 | 0.05 | 46 |
| NSC | | | | -0.09 | 0.11 | 11 |
| NUR | 0.02 | 0.02 | 253 | 0.01 | 0.01 | 850 |
| NVL | 0.22 | 0.08 | 20 | 0.10 | 0.05 | 56 |
| NVS | 0.20 | 0.06 | 28 | 0.21 | 0.04 | 75 |
| NWAO | | | | -0.12 | 0.04 | 77 |
| OBN | 0.33 | 0.06 | 37 | 0.41 | 0.04 | 99 |
| OGA | | | | 0.11 | 0.03 | 151 |
| OIC | -0.45 | 0.07 | 38 | -0.47 | 0.04 | 103 |
| OIS | | | | -0.11 | 0.06 | 37 |
| OTP | | | | -0.03 | 0.06 | 53 |
| OTT | -0.08 | 0.04 | 90 | -0.06 | 0.02 | 321 |
| PAE | -0.06 | 0.05 | 73 | -0.14 | 0.03 | 223 |
| PAS | | | | 0.09 | 0.05 | 67 |
| PBJ | | | | -0.14 | 0.10 | 14 |
| PCO | | | | 0.45 | 0.11 | 10 |
| PCT | -0.41 | 0.07 | 42 | -0.37 | 0.03 | 198 |
| PEL | | | | -0.18 | 0.09 | 23 |
| PET | 0.23 | 0.09 | 20 | 0.20 | 0.05 | 47 |
| PHC | | | | -0.06 | 0.06 | 42 |
| PLV | | | | 0.26 | 0.08 | 24 |
| PME | | | | -0.02 | 0.05 | 67 |
| PMG | 0.0 | 0.04 | 125 | 0.0 | 0.02 | 358 |
| PMO | -0.10 | 0.04 | 86 | -0.10 | 0.02 | 334 |

| STATION CODE | PRELIMINARY RESULTS TERM | +OR- | NOBS | FINAL RESULTS TERM | +OR- | NOBS |
|---|---|---|---|---|---|---|
| PMR | 0.0 | 0.02 | 221 | -0.02 | 0.01 | 621 |
| PNS | 0.02 | 0.05 | 64 | 0.02 | 0.03 | 185 |
| PNT | 0.07 | 0.03 | 127 | 0.03 | 0.02 | 447 |
| POO | -0.11 | 0.04 | 114 | -0.14 | 0.02 | 300 |
| PPI | -0.12 | 0.08 | 21 | -0.23 | 0.04 | 124 |
| PPN | -0.19 | 0.05 | 79 | -0.25 | 0.03 | 241 |
| PPR | | | | -0.15 | 0.06 | 56 |
| PPT | 0.04 | 0.05 | 69 | 0.0 | 0.02 | 246 |
| PRA | 0.06 | 0.04 | 83 | 0.0 | 0.02 | 292 |
| PRE | -0.13 | 0.03 | 228 | -0.16 | 0.02 | 631 |
| PRU | -0.02 | 0.02 | 223 | -0.04 | 0.01 | 633 |
| PRZ | 0.36 | 0.08 | 30 | 0.33 | 0.04 | 71 |
| PSI | -0.23 | 0.06 | 49 | -0.14 | 0.02 | 235 |
| PSZ | | | | -0.14 | 0.07 | 41 |
| PTO | | | | 0.02 | 0.06 | 42 |
| PUL | 0.27 | 0.09 | 20 | 0.27 | 0.05 | 56 |
| QUE | -0.08 | 0.09 | 20 | -0.01 | 0.05 | 62 |
| RAB | -0.12 | 0.07 | 40 | -0.02 | 0.04 | 137 |
| RCD | | | | 0.30 | 0.06 | 37 |
| RES | -0.03 | 0.03 | 197 | -0.05 | 0.02 | 481 |
| RIV | 0.19 | 0.05 | 58 | 0.17 | 0.03 | 182 |
| RJF | 0.01 | 0.04 | 69 | -0.03 | 0.02 | 301 |
| RKT | -0.30 | 0.08 | 24 | -0.28 | 0.04 | 103 |
| ROL | 0.19 | 0.10 | 20 | 0.27 | 0.06 | 42 |
| RUV | -0.15 | 0.05 | 75 | -0.10 | 0.02 | 298 |
| SAM | | | | 0.52 | 0.11 | 11 |
| SBA | | | | -0.03 | 0.05 | 49 |
| SCH | -0.01 | 0.05 | 61 | 0.04 | 0.03 | 206 |
| SCO | | | | -0.23 | 0.04 | 80 |
| SDB | | | | -0.18 | 0.09 | 23 |
| SDV | | | | -0.05 | 0.05 | 82 |
| SEO | | | | 0.0 | 0.09 | 15 |
| SES | 0.32 | 0.05 | 67 | 0.30 | 0.02 | 230 |
| SEY | 0.16 | 0.07 | 27 | 0.18 | 0.04 | 81 |
| SFA | | | | -0.06 | 0.07 | 40 |
| SHK | -0.04 | 0.06 | 45 | 0.08 | 0.03 | 142 |
| SHL | 0.01 | 0.06 | 38 | -0.04 | 0.04 | 105 |
| SJG | 0.04 | 0.04 | 94 | 0.01 | 0.02 | 284 |
| SKI | | | | -0.04 | 0.08 | 33 |
| SLE | | | | 0.12 | 0.03 | 119 |
| SLL | | | | -0.25 | 0.10 | 15 |
| SLR | | | | 0.17 | 0.03 | 143 |
| SMF | | | | -0.07 | 0.02 | 281 |
| SNA | | | | 0.04 | 0.05 | 62 |
| SOC | | | | 0.13 | 0.08 | 24 |
| SOP | -0.05 | 0.05 | 59 | -0.08 | 0.03 | 153 |
| SPA | 0.16 | 0.03 | 151 | 0.12 | 0.02 | 555 |
| SPF | 0.07 | 0.05 | 58 | 0.01 | 0.03 | 128 |
| SPO | | | | -0.08 | 0.07 | 28 |
| SSC | 0.09 | 0.04 | 79 | 0.03 | 0.02 | 243 |
| SSE | | | | -0.05 | 0.05 | 80 |
| SSF | -0.01 | 0.03 | 97 | -0.04 | 0.02 | 368 |
| STJ | | | | 0.16 | 0.07 | 33 |
| STU | 0.12 | 0.04 | 136 | 0.12 | 0.02 | 367 |
| SUD | | | | 0.14 | 0.08 | 23 |
| SUF | 0.14 | 0.08 | 21 | 0.01 | 0.02 | 243 |

TABLE 5 (Cont'd)

| STATION | PRELIMINARY RESULTS | | | FINAL RESULTS | | |
|---|---|---|---|---|---|---|
| CODE | TERM | +OR- | NOBS | TERM | +OR- | NOBS |
| SUR | | | | -0.06 | 0.04 | 89 |
| SVE | | | | 0.38 | 0.04 | 62 |
| SVI | | | | -0.13 | 0.08 | 30 |
| SVT | | | | -0.09 | 0.06 | 59 |
| TAC | | | | 0.29 | 0.11 | 18 |
| TAN | 0.26 | 0.08 | 25 | 0.36 | 0.05 | 70 |
| TAS | 0.37 | 0.07 | 29 | 0.40 | 0.04 | 74 |
| TCF | -0.03 | 0.04 | 78 | -0.08 | 0.02 | 338 |
| TFO | -0.17 | 0.03 | 130 | -0.23 | 0.02 | 346 |
| ILG | | | | 0.02 | 0.07 | 35 |
| TMA | | | | 0.38 | 0.04 | 91 |
| TMT | | | | -0.18 | 0.06 | 46 |
| TOL | 0.25 | 0.04 | 103 | 0.25 | 0.02 | 283 |
| TOO | -0.02 | 0.07 | 34 | -0.06 | 0.03 | 114 |
| TOV | | | | -0.26 | 0.07 | 55 |
| TPT | -0.09 | 0.04 | 93 | -0.08 | 0.02 | 343 |
| TRM | | | | -0.14 | 0.12 | 12 |
| TRN | -0.05 | 0.03 | 187 | -0.04 | 0.02 | 480 |
| TRO | -0.03 | 0.08 | 21 | -0.03 | 0.05 | 62 |
| TRT | | | | -0.03 | 0.04 | 99 |
| TSI | | | | 0.16 | 0.09 | 26 |
| TSK | -0.22 | 0.05 | 77 | -0.28 | 0.03 | 191 |
| TUC | -0.14 | 0.04 | 104 | -0.23 | 0.02 | 267 |
| TUL | 0.26 | 0.02 | 220 | 0.23 | 0.01 | 719 |
| TVO | 0.08 | 0.04 | 77 | -0.03 | 0.03 | 231 |
| UAV | | | | 0.05 | 0.06 | 57 |
| UBO | -0.02 | 0.03 | 170 | -0.03 | 0.02 | 468 |
| UCT | -0.04 | 0.07 | 30 | -0.20 | 0.04 | 81 |
| UPP | 0.44 | 0.04 | 89 | 0.42 | 0.02 | 332 |
| UZH | 0.17 | 0.07 | 28 | 0.15 | 0.04 | 73 |
| VAH | -0.14 | 0.04 | 87 | -0.13 | 0.02 | 317 |
| VAL | 0.23 | 0.04 | 98 | 0.16 | 0.02 | 347 |
| VAO | | | | 0.16 | 0.24 | 4 |
| VIC | -0.18 | 0.08 | 30 | -0.14 | 0.05 | 75 |
| VIE | 0.19 | 0.06 | 48 | 0.15 | 0.04 | 122 |
| VKA | | | | 0.26 | 0.08 | 25 |
| VLA | | | | 0.19 | 0.08 | 19 |
| WBN | | | | -0.26 | 0.08 | 26 |
| WES | | | | 0.73 | 0.07 | 40 |
| WET | | | | -0.03 | 0.03 | 147 |
| WGL | | | | -0.19 | 0.08 | 24 |
| WIN | -0.18 | 0.03 | 147 | -0.27 | 0.02 | 378 |
| WLO | | | | 0.51 | 0.12 | 15 |
| WMO | -0.07 | 0.03 | 112 | -0.13 | 0.02 | 317 |
| WOL | 0.12 | 0.05 | 65 | 0.08 | 0.03 | 169 |
| WRA | -0.22 | 0.04 | 90 | -0.18 | 0.02 | 414 |
| WTS | | | | 0.05 | 0.03 | 163 |
| YAK | 0.49 | 0.08 | 20 | 0.44 | 0.05 | 63 |
| YKC | 0.0 | 0.04 | 100 | -0.01 | 0.02 | 396 |
| YSS | 0.22 | 0.08 | 22 | 0.28 | 0.05 | 59 |
| ZAK | 0.07 | 0.05 | 43 | 0.08 | 0.03 | 111 |
| ZLP | | | | -0.58 | 0.10 | 22 |
| ZOBO | | | | -0.52 | 0.04 | 115 |
| ZUL | 0.29 | 0.03 | 157 | 0.28 | 0.02 | 507 |

TABLE 5 (Cont'd)

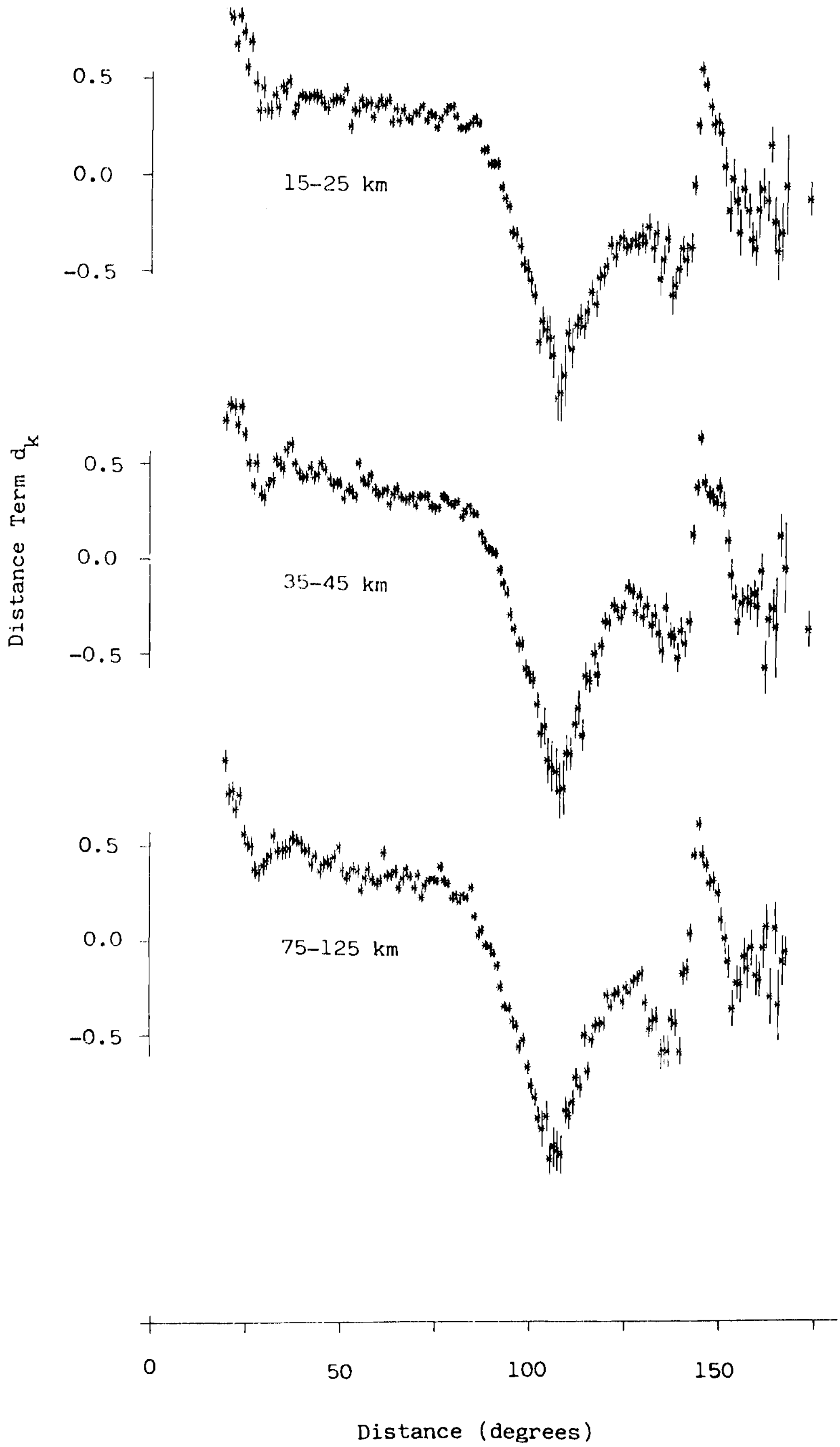
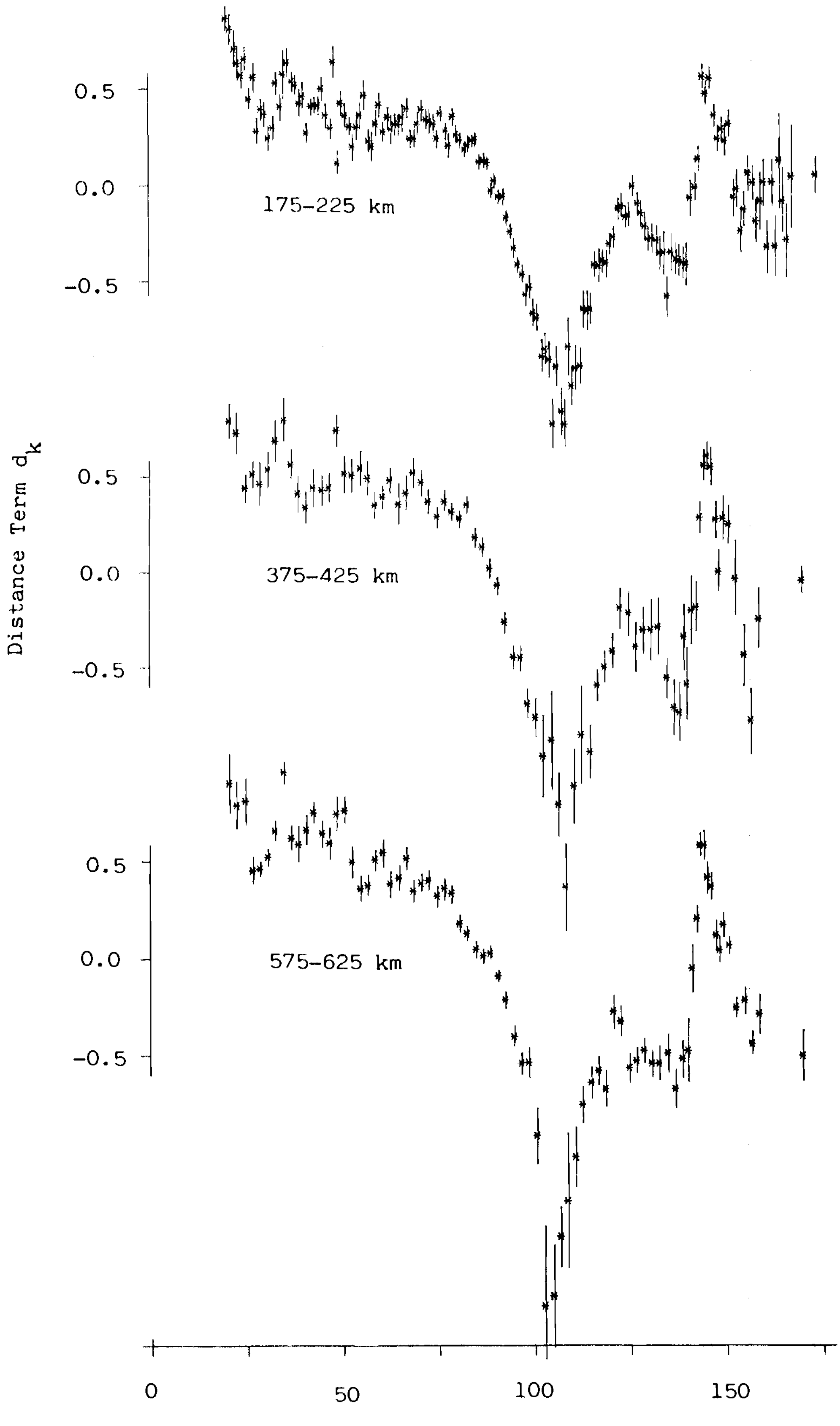



FIGURE 1. PRELIMINARY AMPLITUDE DISTANCE TERMS ESTIMATED FOR EARTHQUAKES IN THE FOCAL DEPTH RANGES 15 TO 25 KM, 35 TO 45 KM AND 75 TO 125 KM. (Vertical lines through points represent standard confidence bounds.)




<u>FIGURE 2. PRELIMINARY AMPLITUDE DISTANCE TERMS ESTIMATED FOR SEISMIC SOURCES IN THE FOCAL DEPTH RANGES 175 TO 225 KM, 375 TO 425 KM AND 575 TO 625 KM.</u> (Vertical lines through points represent <u>standard</u> confidence bounds.)

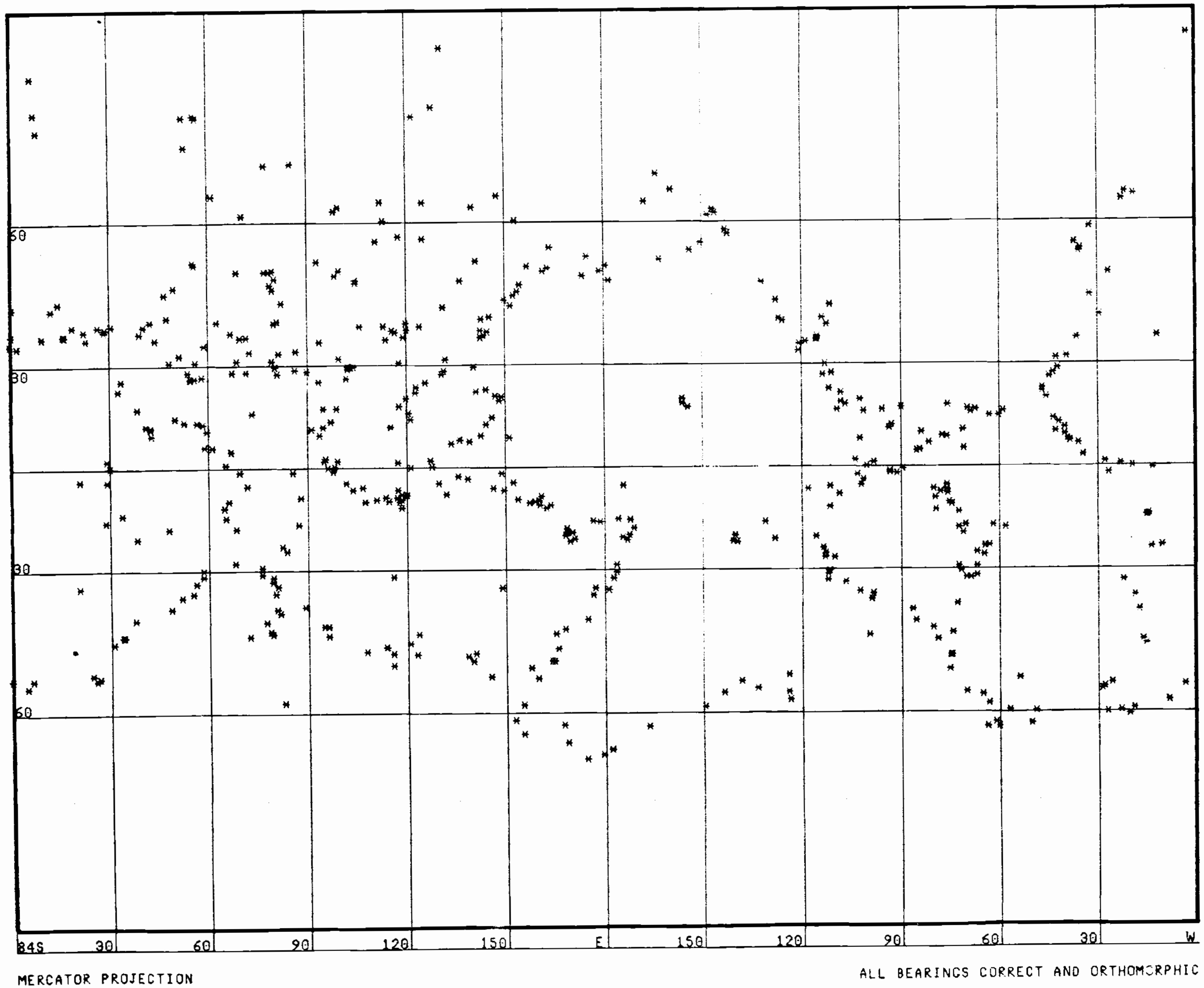



FIGURE 3A. DISTRIBUTION OF SEISMIC SOURCES USED FOR THE 0 TO 50 KM DEPTH RANGE. (Note that exact locations have been randomly perturbed to help separate closely spaced epicentres.)

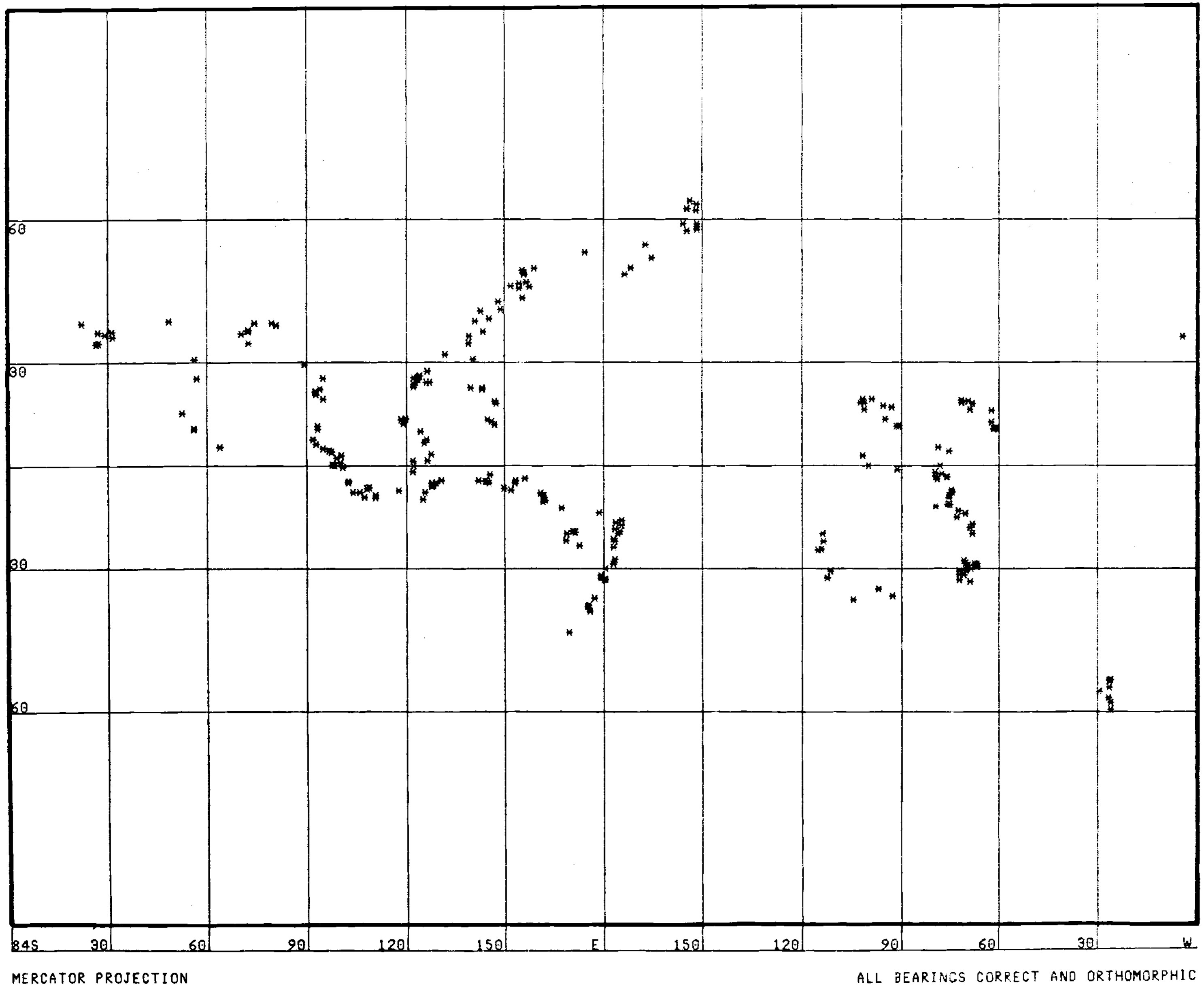



FIGURE 3B. DISTRIBUTION OF EARTHQUAKES USED FOR THE 50 TO 150 KM DEPTH RANGE

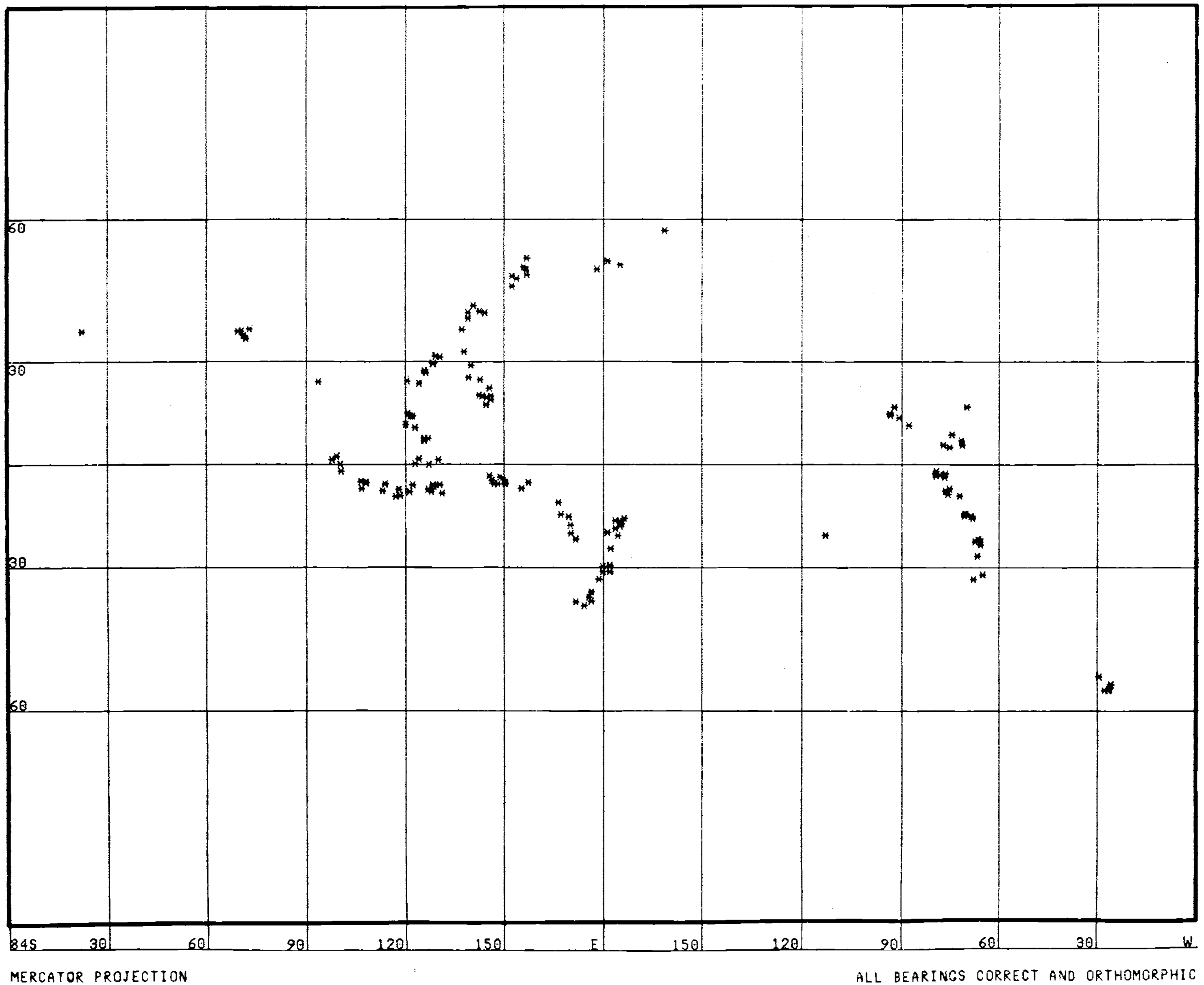



FIGURE 3C. DISTRIBUTION OF EARTHQUAKES USED FOR THE 150 TO 250 KM DEPTH RANGE

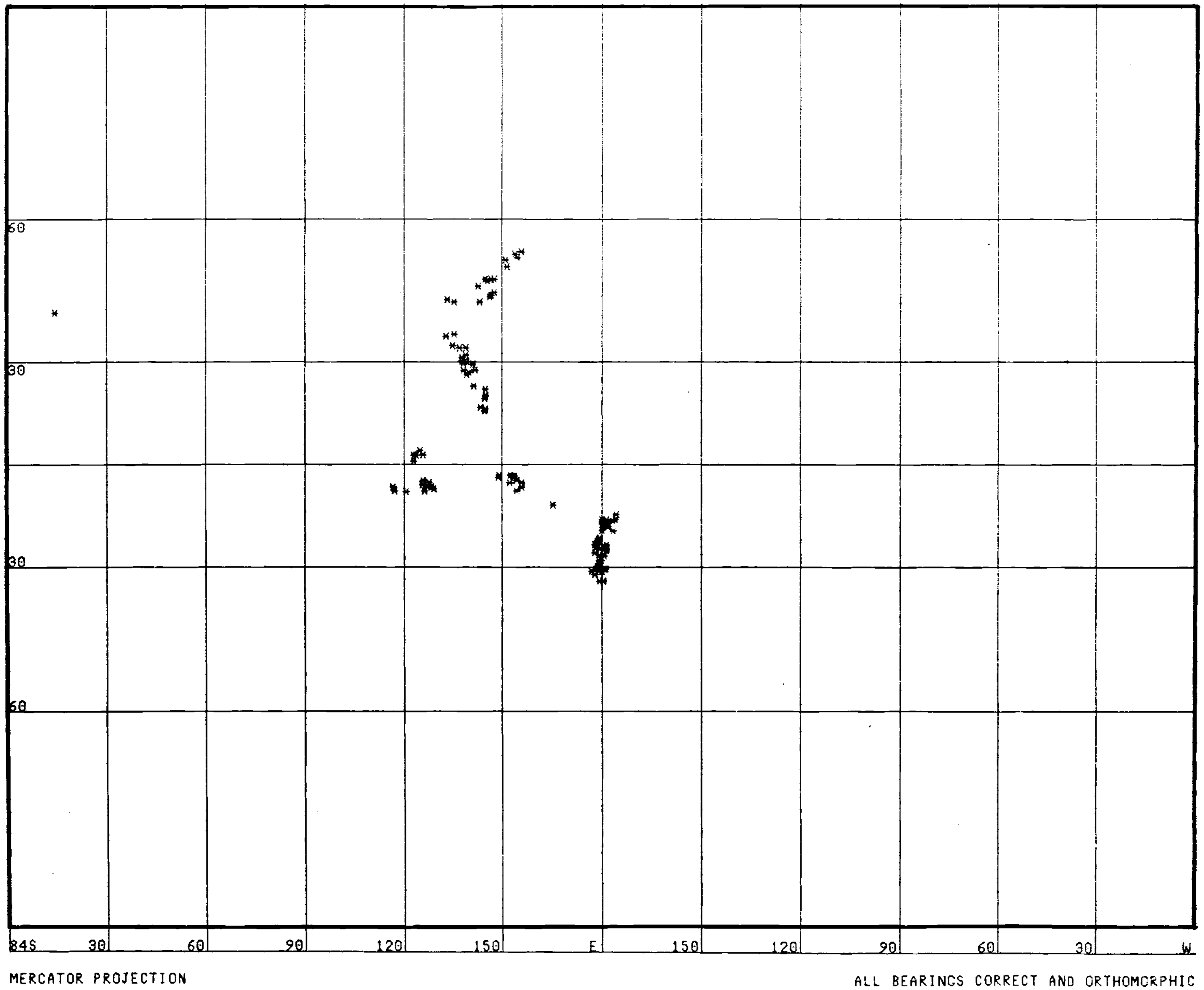
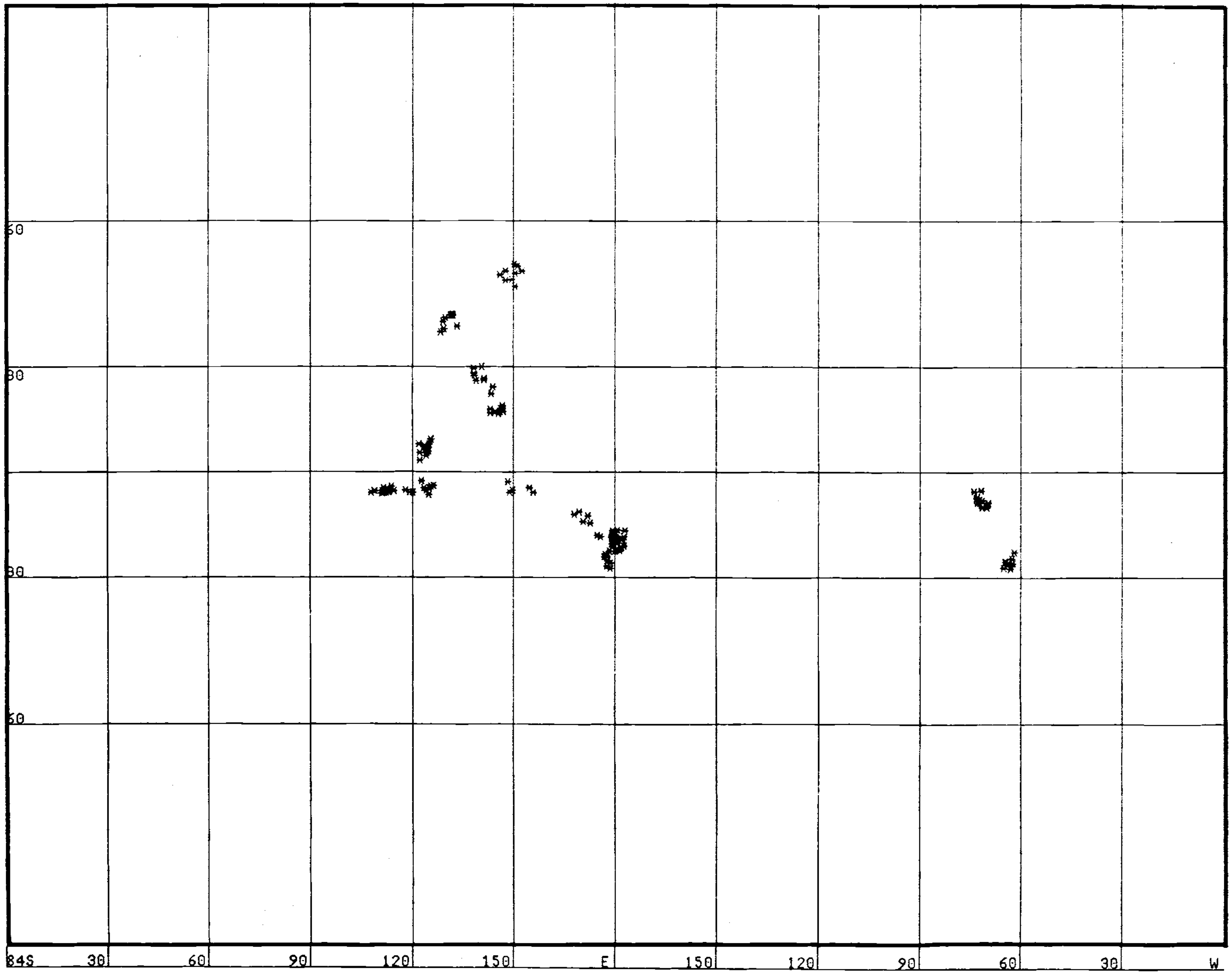


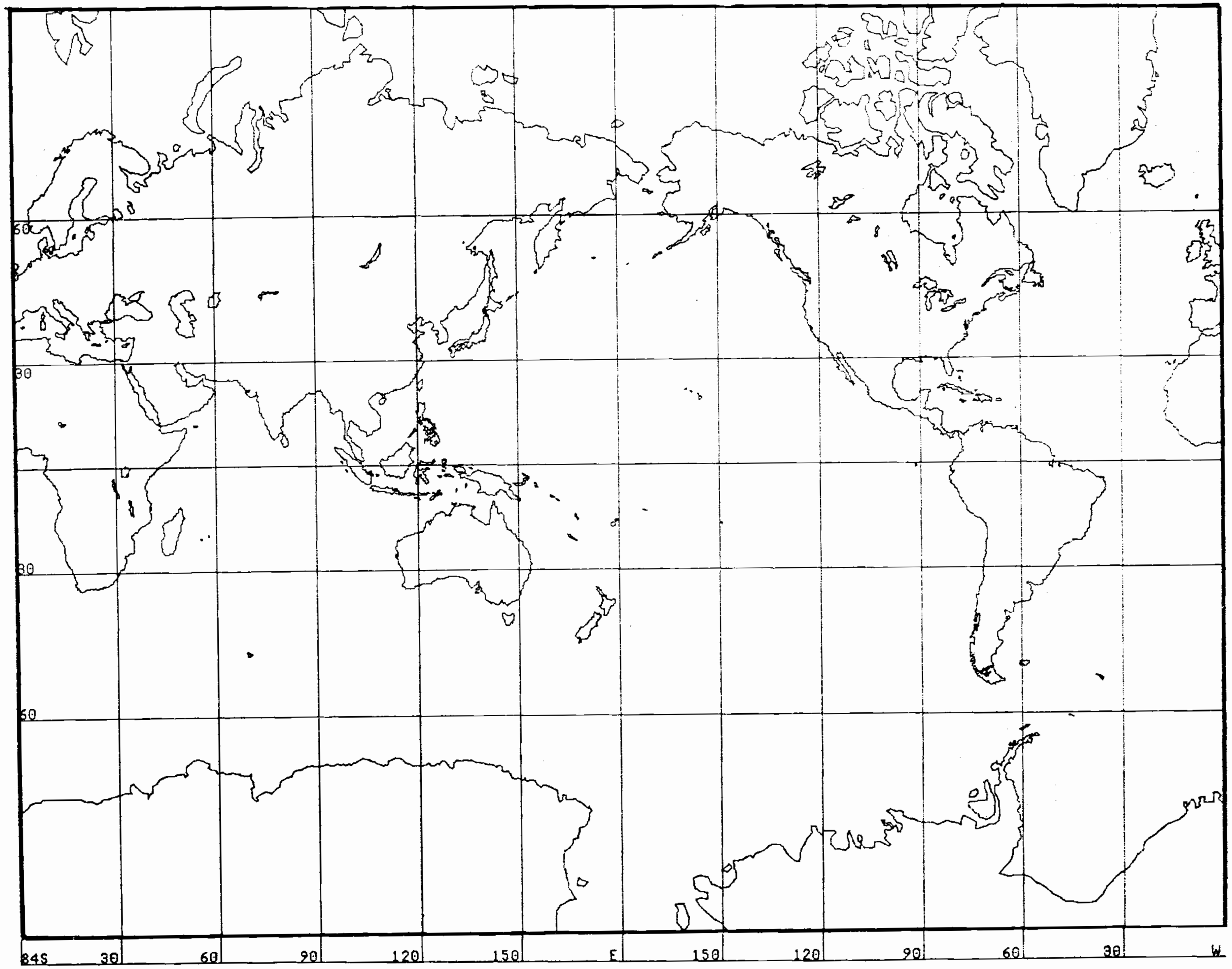

FIGURE 3D. DISTRIBUTION OF EARTHQUAKES USED FOR THE 300-500 KM DEPTH RANGE




MERCATOR PROJECTION

ALL BEARINGS CORRECT AND ORTHOMORPHIC

FIGURE 3E. DISTRIBUTION OF EARTHQUAKES USED FOR THE 500 TO 700 KM DEPTH RANGE




MERCATOR PROJECTION

ALL BEARINCS CORRECT AND ORTHOMCRPHIC

FIGURE 3F. COASTLINE MAP FOR FIGURES 3A TO 3E

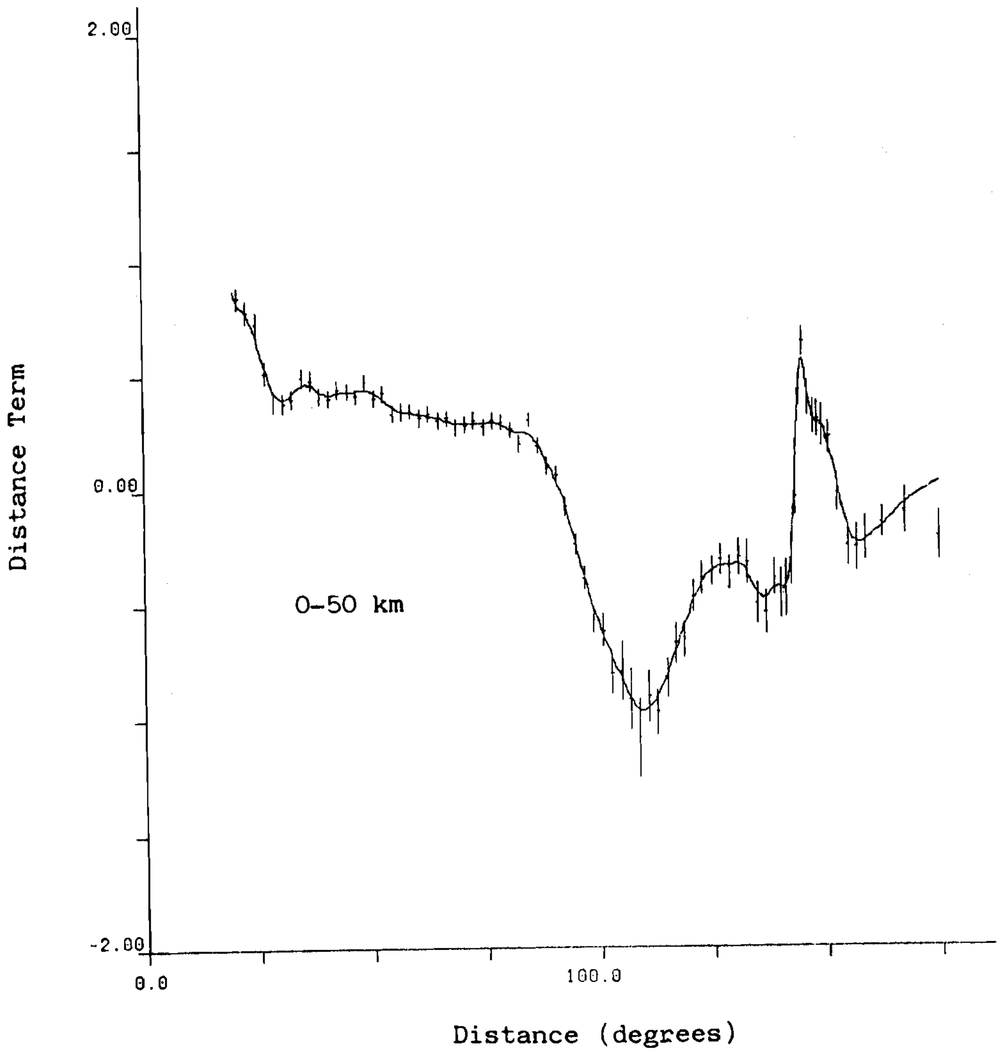



FIGURE 4A. EMPIRICAL AMPLITUDE DISTANCE CURVE FOR SHALLOW FOCUS (0 TO 50 KM) SOURCES. (Vertical lines through the unsmoothed estimates are 95% confidence limits.)

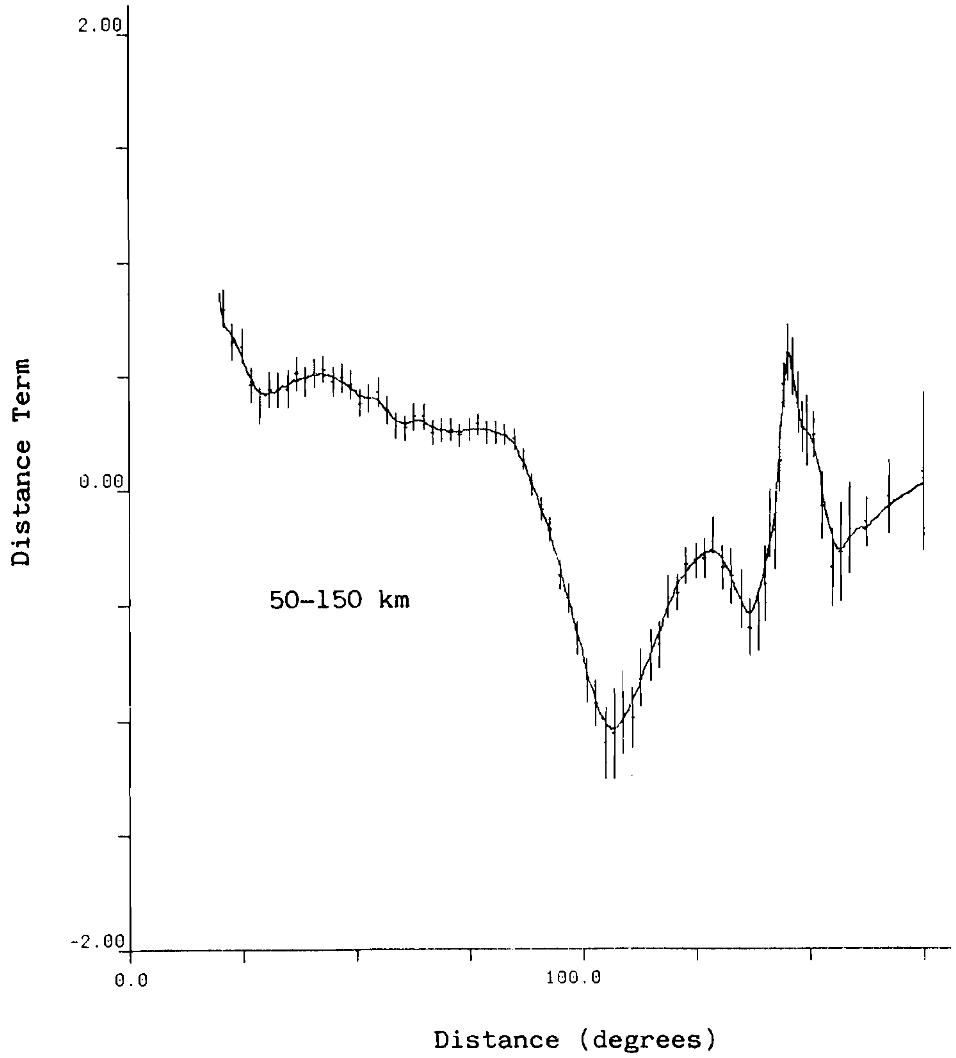



FIGURE 4B. EMPIRICAL AMPLITUDE DISTANCE CURVE FOR EARTHQUAKES IN DEPTH DEPTH RANGE 50 TO 150 KM. (Vertical lines through the unsmoothed estimates are 95% confidence limits.)

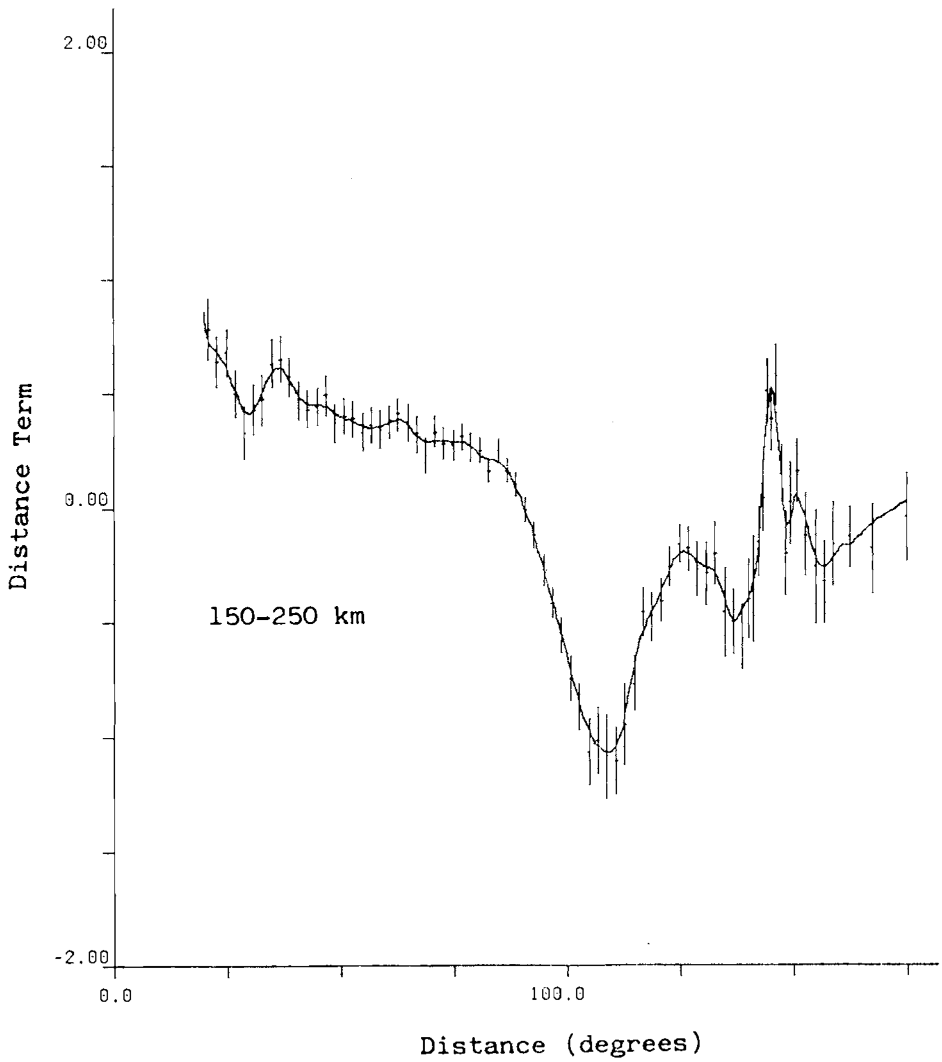



FIGURE 4C. EMPIRICAL AMPLITUDE DISTANCE CURVE FOR EARTHQUAKES IN THE DEPTH RANGE 150 TO 250 KM. (Vertical lines through unsmoothed estimates are 95% confidence limits.)

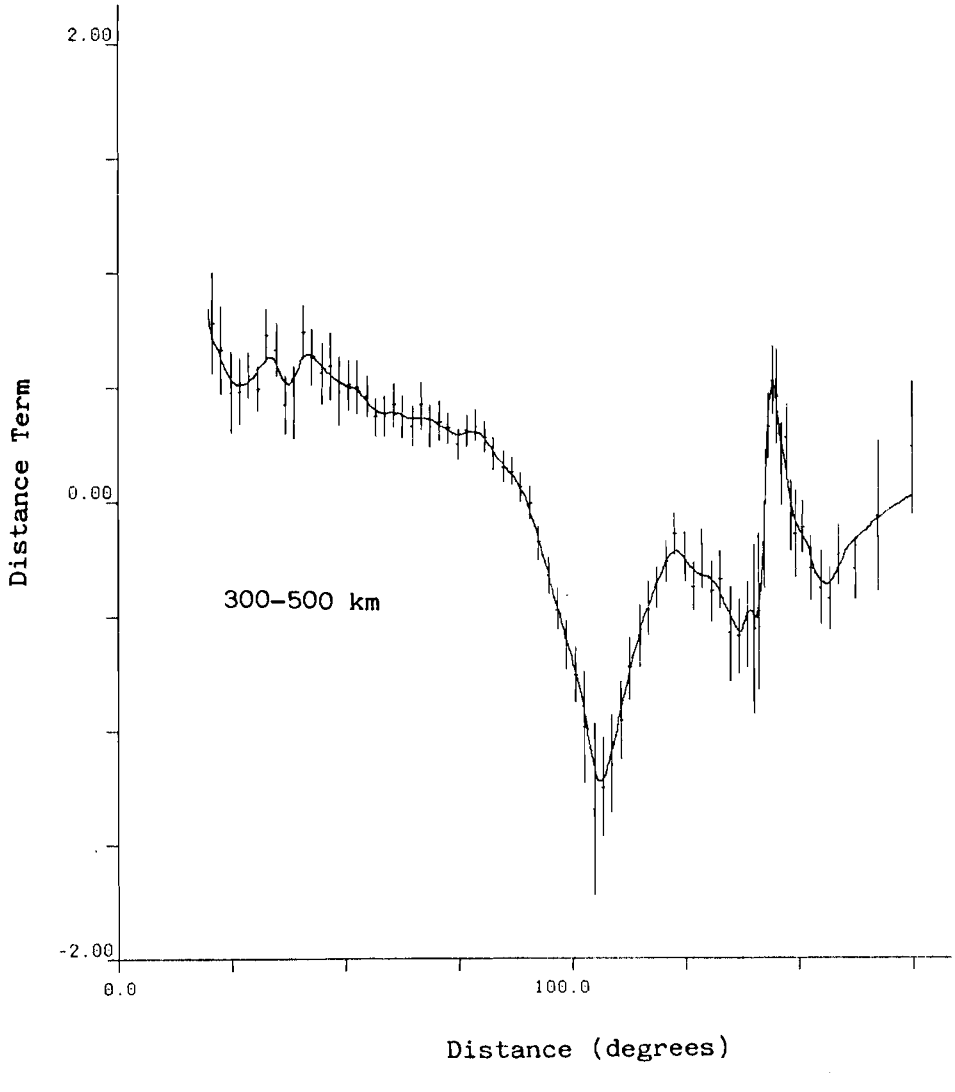



FIGURE 4D. EMPIRICAL AMPLITUDE DISTANCE CURVE FOR EARTHQUAKES IN THE DEPTH RANGE 300 TO 500 KM. (Vertical lines through unsmoothed estimates are 95% confidence limits.)

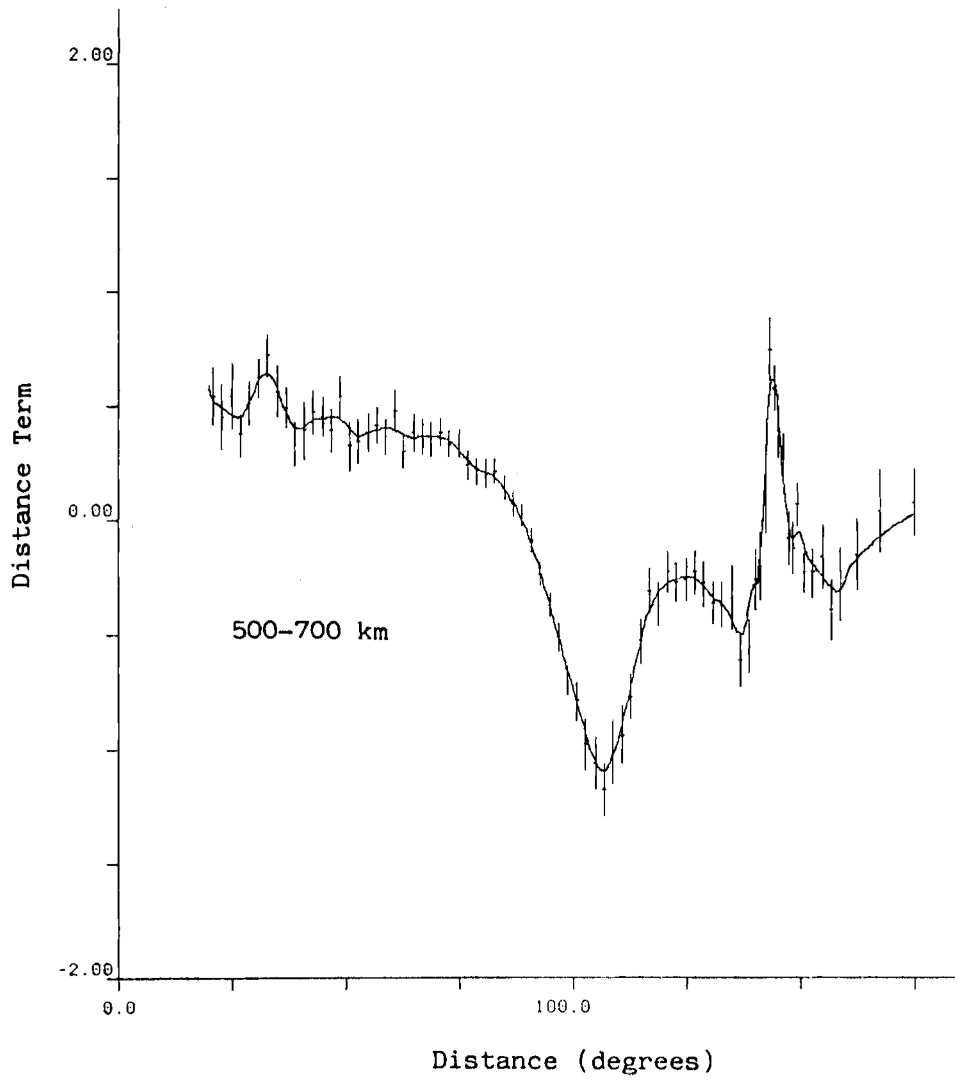



FIGURE 4E. EMPIRICAL AMPLITUDE DISTANCE CURVE FOR EARTHQUAKES IN THE DEPTH RANGE 500 TO 700 KM. (Vertical lines through unsmoothed estimates are 95% confidence limits.)

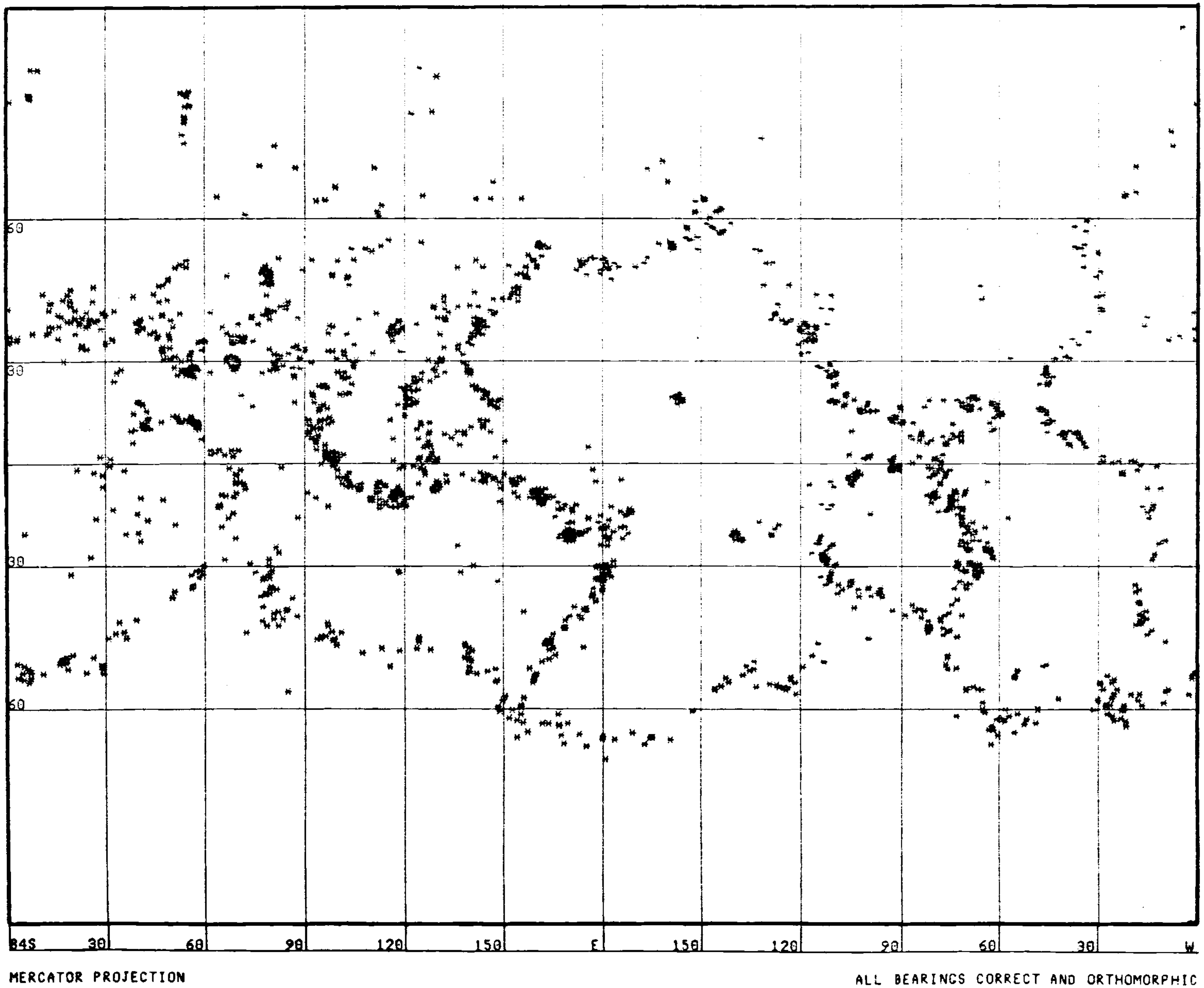



FIGURE 5. DISTRIBUTION OF SEISMIC SOURCES USED TO ESTIMATE THE FINAL SET OF STATION TERMS

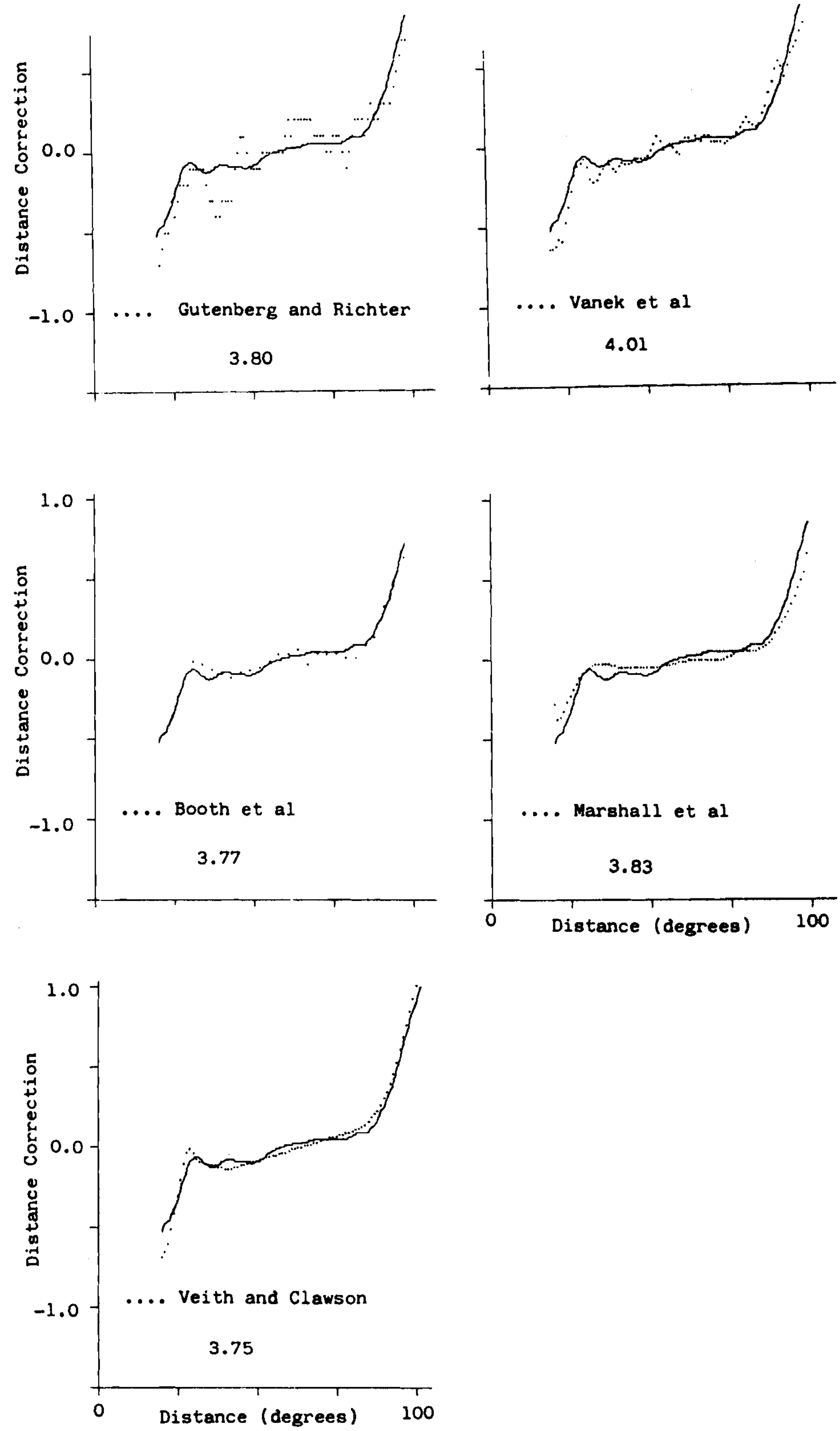



FIGURE 6. SHALLOW FOCUS EMPIRICAL AMPLITUDE CORRECTION FACTORS (CONTINUOUS CURVE) COMPARED WITH OTHER PUBLISHED VALUES (DOTS) IN THE DISTANCE RANGE 20 TO 100°. (Published curves are baselined to zero in the 30 to 90° distance range using the baseline factor given under the respective authors' name(s).)

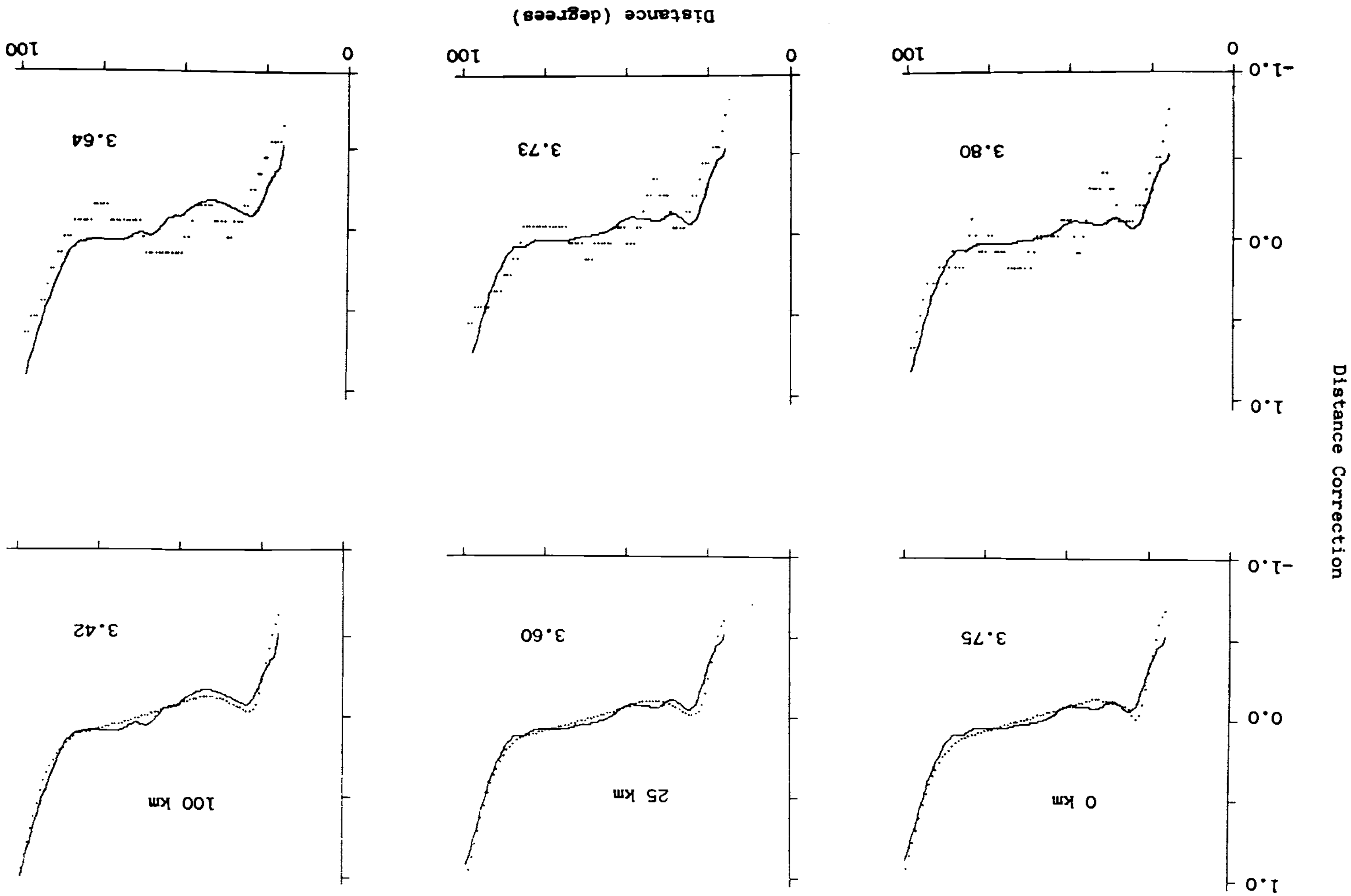



FIGURE 7A. AMPLITUDE DISTANCE CORRECTION FACTORS CORRESPONDING TO DEPTHS OF 0, 25 AND 100 KM COMPARED WITH THOSE OF GUTENBERG AND RICHTER (1) (BOTTOM) AND VEITH AND CLAWSON (3) (TOP). (Baseline normalisation factors for 30 to 90$^{\circ}$ range applied to the latter are given below the curves.)

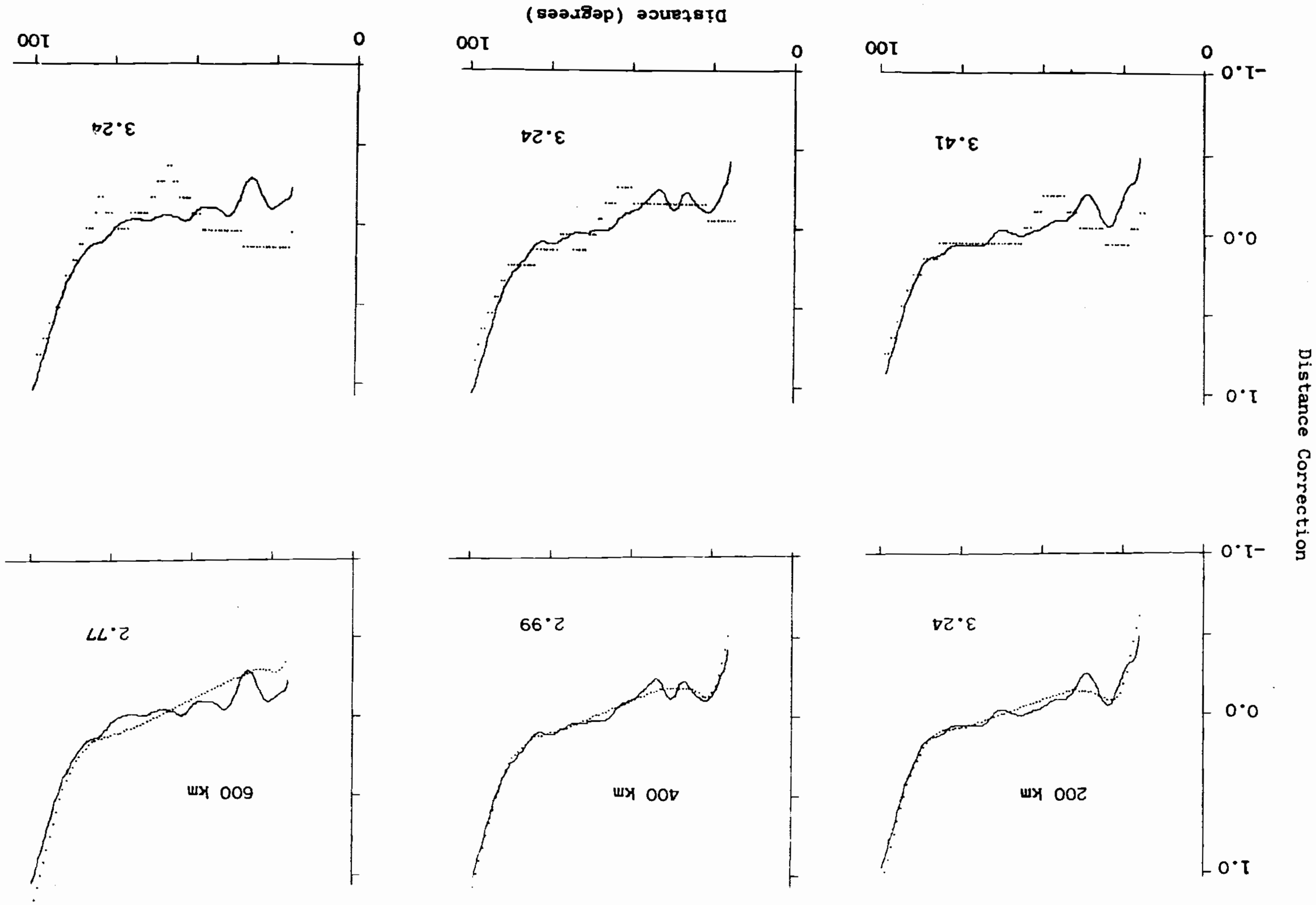



FIGURE 7B. DISTANCE CORRECTION FACTORS CORRESPONDING TO DEPTHS OF 200, 400, AND 600 KM COMPARED WITH THOSE OF GUTENBERG AND RICHTER (1) (BOTTOM) AND VEITH AND CLAWSON (3) (TOP). (Baseline normalisation factors used for the 30 to 90$^{\circ}$ range applied to the latter are given below the curves.)

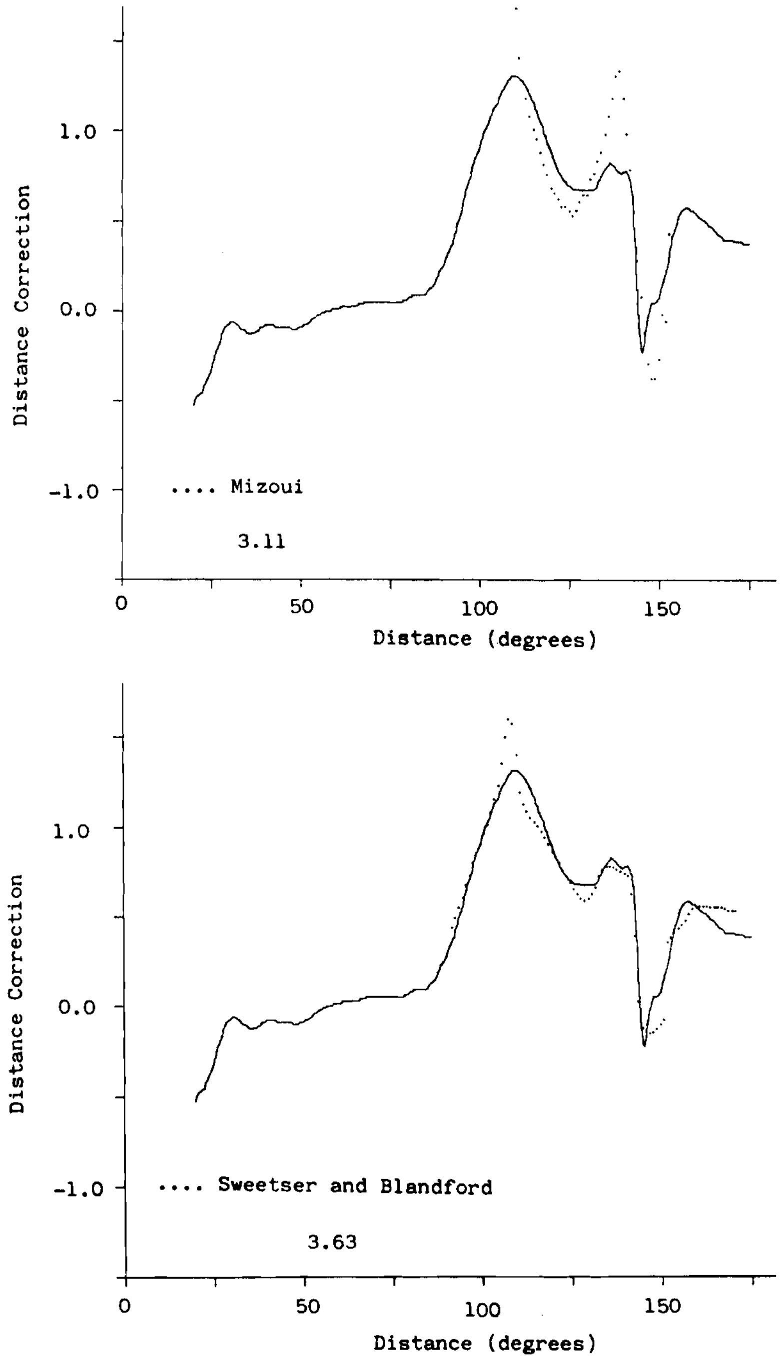



FIGURE 8. PKP SHALLOW FOCUS (0 TO 50 KM) DISTANCE CORRECTION FACTORS COMPARED WITH THOSE OF MIZOUI (7) (TOP) AND SWEETSER AND BLANDFORD (6) (BOTTOM). (Normalisation factors applied to the latter given under authors' name(s).

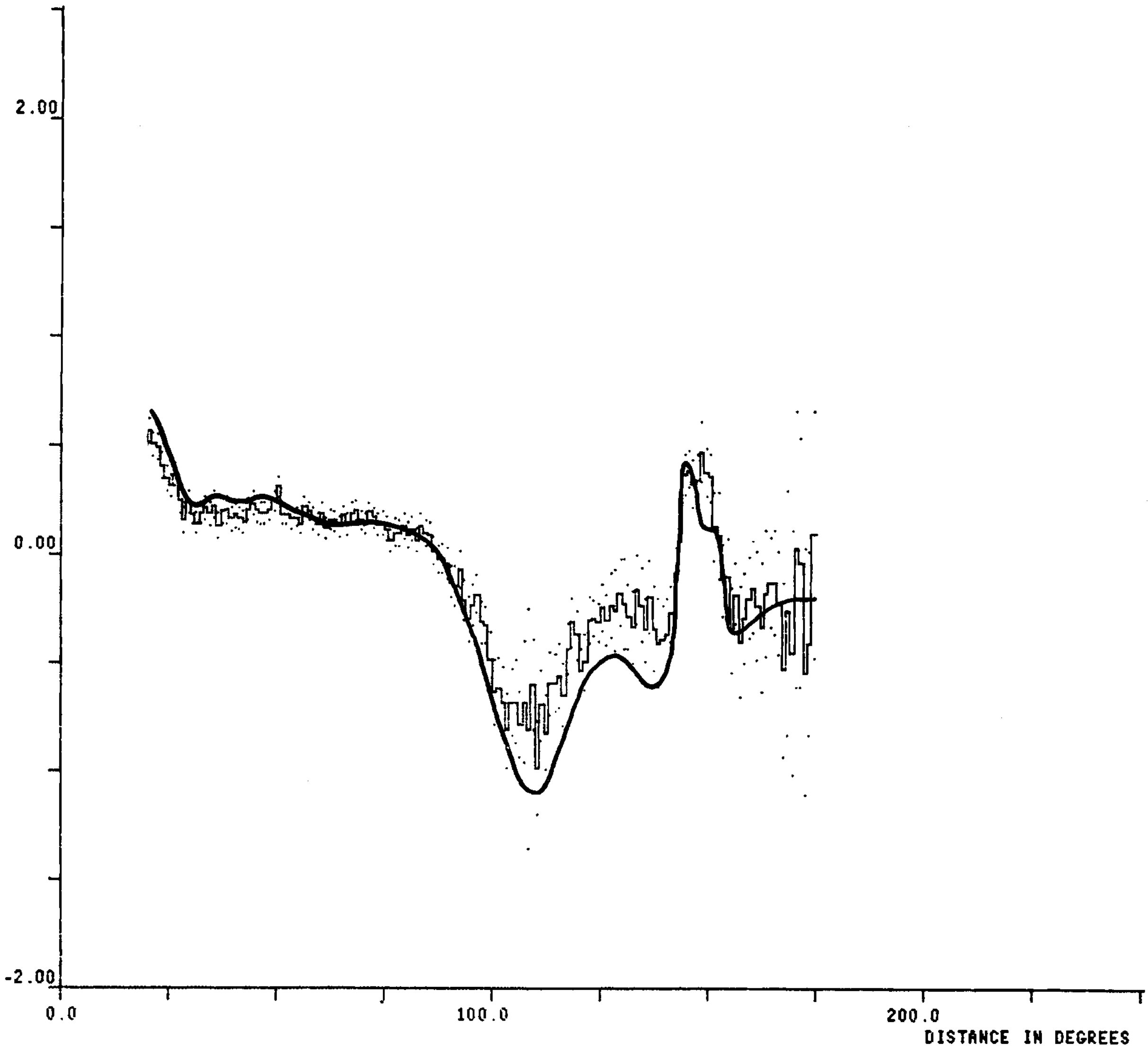



FIGURE 9. SMOOTHED SURFACE FOCUS AMPLITUDE DISTANCE CURVE COMPARED WITH THE UNSMOOTHED VALUES PUBLISHED BY MARSHALL ET AL (5). (Both curves have same baseline in the range 30 to 90$^{o}$ and to aid comparison with the results as presented by Marshall et al are given in the form of distance terms.)

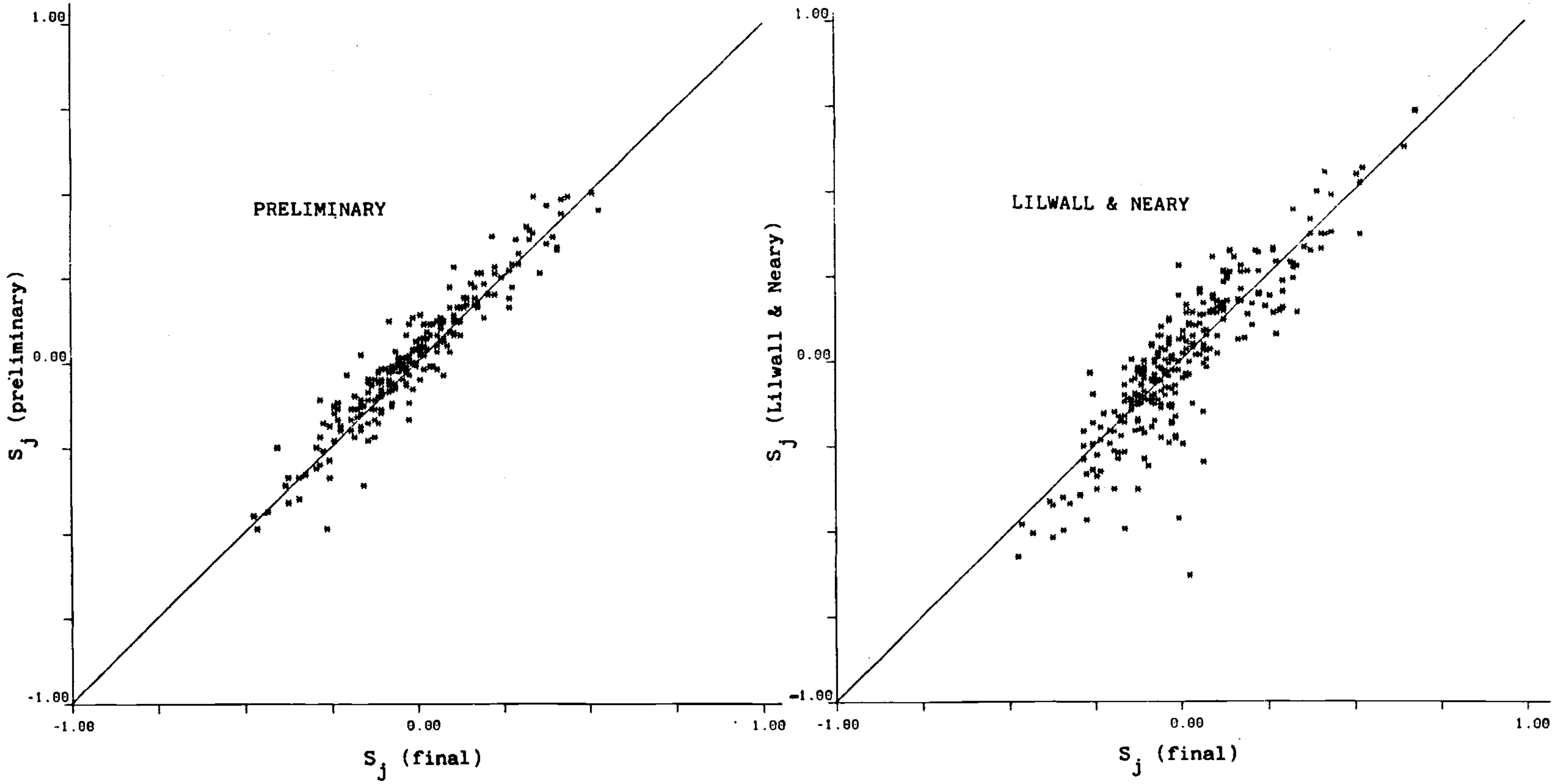



FIGURE 10A. FINAL SET OF STATION TERMS PLOTTED AGAINST THE PRELIMINARY SET (TABLE 5) AND THOSE OF LILWALL AND NEARY (16). (Straight line is through origin with unit gradient.)

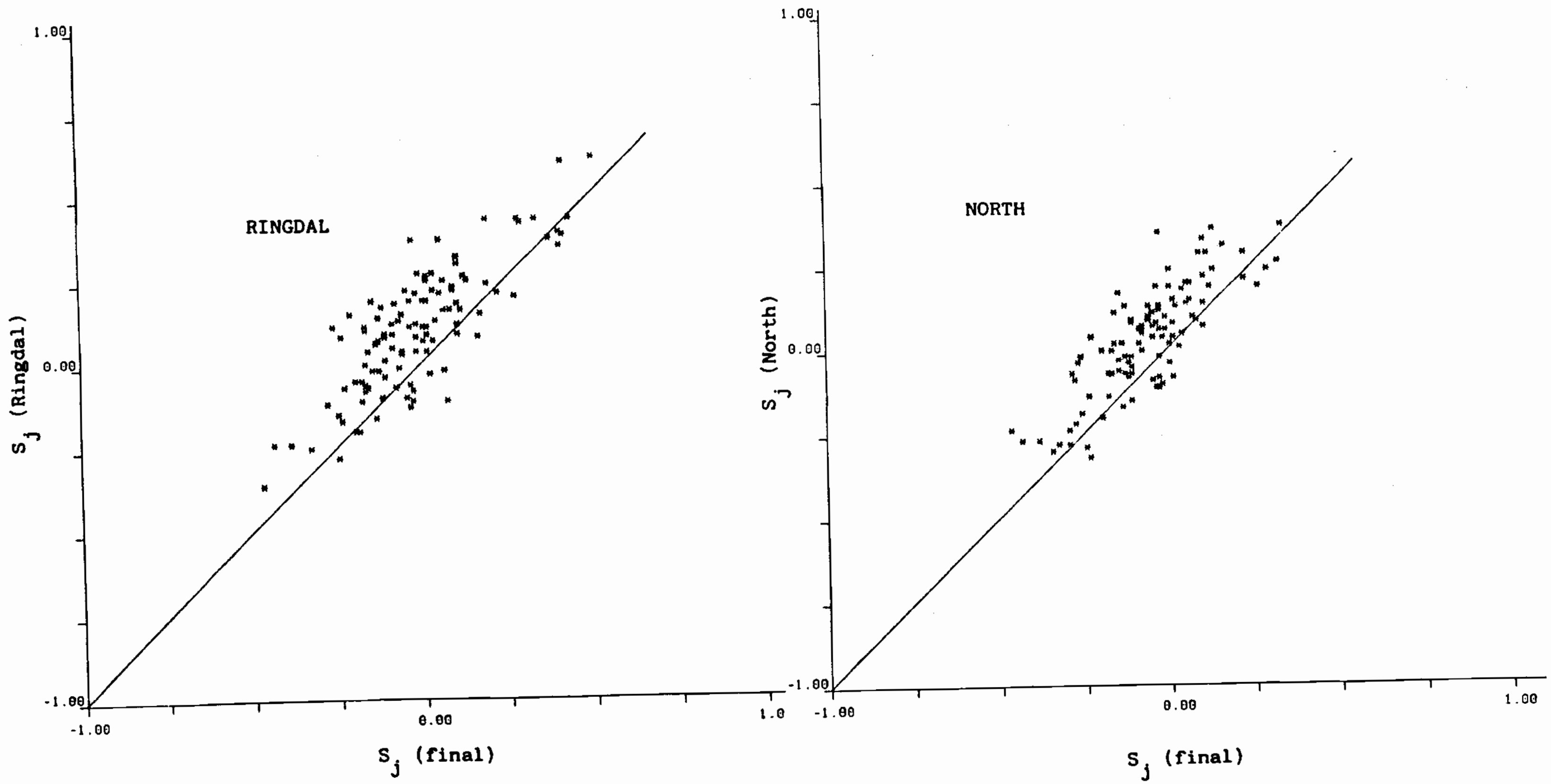



FIGURE 10B. FINAL SET OF STATION TERMS PLOTTED AGAINST THOSE OF RINGDAL (18) AND NORTH (19). (Straight line is through origin with unit gradient.)

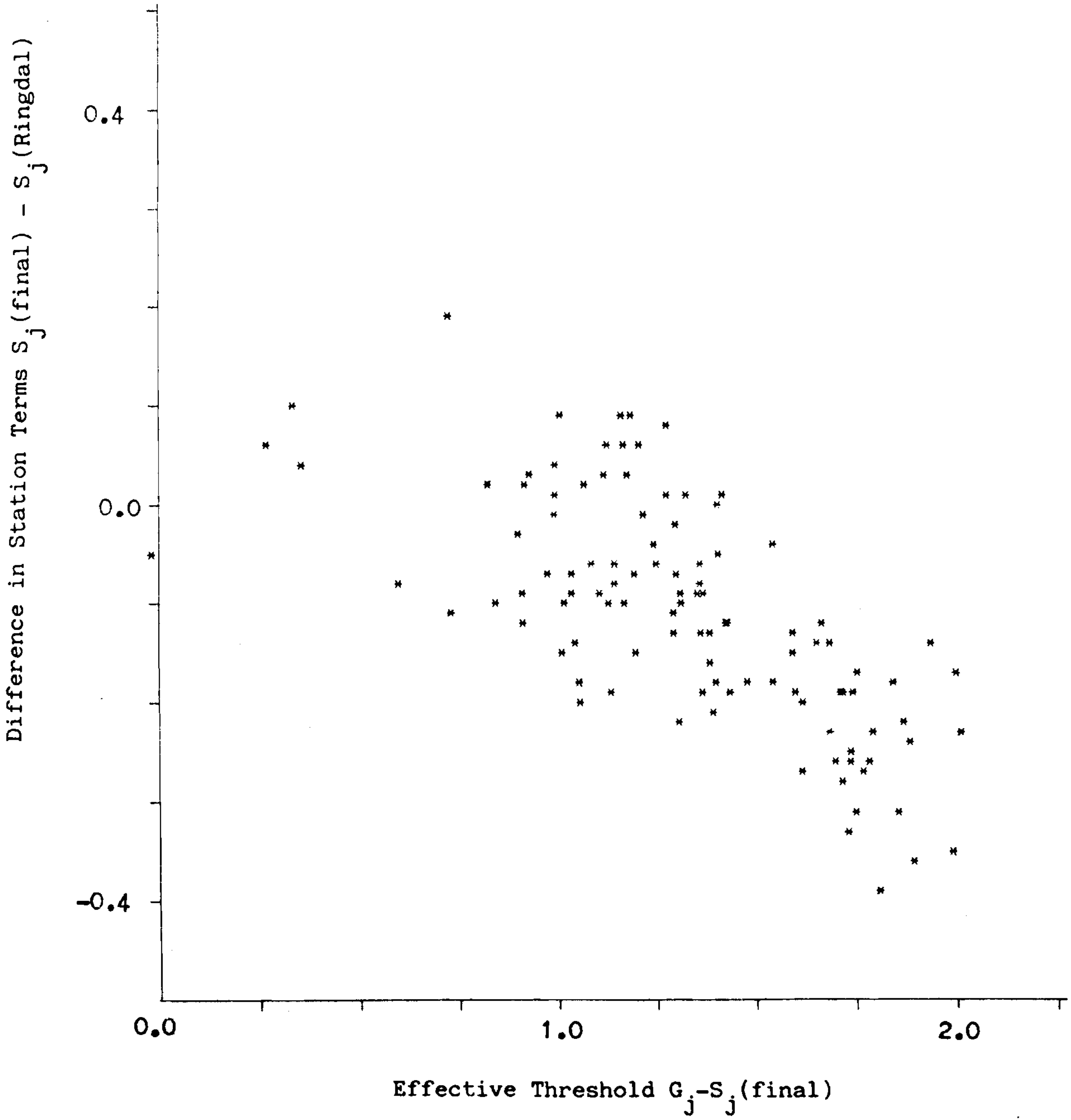



FIGURE 11. PLOT OF THE DIFFERENCE IN THE FINAL AND RINGDAL (18) STATION TERMS AGAINST THE AVERAGE (EFFECTIVE) STATION THRESHOLD DURING 1970-1980