U.S. DEPARTMENT OF THE INTERIOR

U.S. GEOLOGICAL SURVEY

DETERMINATION OF AMPLITUDE AND DURATION MAGNITUDES AND SITE RESIDUALS FROM SHORT-PERIOD SEISMOGRAPHS IN NORTHERN CALIFORNIA

by Jerry P. Eaton[1]

Open-File Report 91-592

This report is preliminary and has not been reviewed for conformity with U.S. Geological Survey editorial standards or with the North American Stratigraphic Code. Any use of trade, product or firm names is for descriptive purposes only and does not imply endorsement by the U.S. Government.

[1] 345 Middlefield Road
Menlo Park, CA 94025
MS 977

DETERMINATION OF AMPLITUDE AND DURATION MAGNITUDES AND SITE RESIDUALS FROM SHORT-PERIOD SEISMOGRAPHS IN NORTHERN CALIFORNIA

ABSTRACT

Equations for determinig amplitude magnitude (MX) and duration magnitude (MF) that employ all calibrated instruments in the U.S.G.S. short-period telemetered seismic network in northern California (NCSN) were developed and tested against a set of 1276 earthquakes from 1986-1990 that were analyzed on the Caltech-USGS processing system (CUSP). The expressions for decay of amplitude and record duration in these equations are functions of distance alone. Sensitivity corrections for both MX and MF are simply the logarithms of the ratios of the magnification of the reference instrument to that of the instrument actually used. Component corrections were chosen so as to minimize the dependence of instrument site residuals on instrument component. MF site residuals were found to be closely linked to MX site residuals in a manner that suggests both depend primarily on site amplification. Both MX and MF site residuals vary systematically with bedrock lithology: older well consolidated rocks produce negative residuals (smaller amplitudes and shorter durations) and younger unconsolidated rocks produce positive residuals (larger amplitudes and longer durations).

Average station magnitude residuals are virtually independent of distance from the epicenter to at least 800 km; and MX - MF, averaged over 0.5 unit magnitude intervals, is less than 0.05 from M0.5 to M5.5.

Comparison of MX and MBK (M_L, U C Berkeley) for 293 events in both the CUSP data set and the Berkeley catalog shows that calculated MX's are marginally larger than the corresponding MBK's. MX-MBK averages about +0.04.

The characteristics of the standard Wood-Anderson seismograph employed to calculate MX are: free period 0.8 sec, damping constant 0.8, and static magnification 2080.

INTRODUCTION

In the original development of magnitude, Richter (1935) attempted to rank southern California earthquakes crudely according to size on the basis of the instrumental records most widely available to him. Magnitude was defined as "the logarithm of the maximum trace amplitude expressed in thousandths of a millimeter with which the standard short-period torsion seismometer (free period 0.8 sec., static magnification 2800, damping near critical) would register that earthquake at an epicentral distance of 100 kilometers". To permit calculation of magnitudes from Wood-Anderson seismograms recorded at other distances, Richter introduced the concept of the "zero magnitude earthquake" and worked out the relationship between its amplitude and epicentral distance empirically. Then $M = \log A(D) - \log A_0(D)$, where A is the amplitude recorded and A_0 is the amplitude of the zero magnitude earthquake at epicentral distance D.

For large earthquakes, records near the epicenter are off scale or too faintly recorded to read; so their magnitudes are determined from on-scale records at larger epicentral distances. This practice makes the accurate determination of the zero-magni tude-earthquake amplitude curve an extremely critical part of the magnitude calculation process.

The development of the Richter scale and its use for determining earthquake source parameters has been reviewed by Boore (1989).

The introduction of the current generation of more sensitive seismographs has exacerbated old problems and raised new ones in the determination of magnitudes. The most important of these are: 1) with more sensitive seismographs, records are "clipped" out to greater distances than with the Wood-Anderson instruments, 2) the response of a simple high-gain electronic seismograph like that employed in NCSN is proportional to ground velocity from 1 hz to 20 hz, not to ground displacement as is that of the Wood-Anderson (Figure 1), and 3) the Wood-Anderson measures the horizontal compenent of earth motion, while most of the NCSN stations measure the vertical component. The first problem has been ameliorated in NCSN by the installation of low-gain systems, including about twenty three-component ones, with the same spectral response as the usual high-gain system. The second problem is minimized by maintaining accurate records of the spectral response and sensitivities of the network seismographs so that their records, or measurements from them, can be reduced to the equivalent Wood-Anderson records or values (Eaton, 1980, 1986; Bakun and Joyner, 1984; Hutton and Boore, 1987; Uhrhammer and Collins, 1990).

Methods for computing magnitudes from short-period electronic seismographs have developed along two lines. In the first approach, which includes MX, amplitudes corresponding to those of the Wood-Anderson seismograph are derived from the electronic seismograph records and employed in Richter's method to determine magnitude. In the second approach, which includes MF, an independent scale based on record duration, not on maximum amplitude, has been developed and scaled to Richter magnitude empirically. Both methods have been used to calculate magnitudes from NCSN data, but each has had limitations related to range of applicability, availability of required observations, and adequacy of validation by comparison with magnitudes based on Wood-Anderson records.

The goal of the present paper is to evaluate procedures for calculating both MX and MF magnitudes from data that are measured in the analysis of NCSN records: peak amplitudes and associated periods, and earthquake durations. Both types of measurement are made on records from both vertical and horizontal component instruments operating at a wide range of sensitivities: 6db to 72db attenuation (or 86db to 20db electronic amplification).

Our task parallels Richter's determination of the zero-magnitude-earthquake amplitude-versus-distance curve for southern California, but it involves further complications. For both MX and MF, the magnitudes computed for the same earthquake at a number of stations should be independent of epicentral distance, instrument sensitivity, and component of ground motion measured. Moreover, MX and MF computed for a given event should agree throughout the range of magnitudes observed, at least in the average if not for individual events. Thus, we must simultaneously, or iteratively, determine the functional relationship between magnitude, peak amplitude and associated period (for MX), duration (for MF), and distance as well as corrections for instrument component, instrument sensitivity, and recording site.

DATA SET

Prior to 1984 the primary recording of NCSN data was on Develocorder film and backup recording was on analog magnetic tape. Routine analysis was based on Develocorder film, from which event durations could be measured but peak amplitudes could not. Thus, the magnitudes that were routinely reported were duration magnitudes (Lee et al,1972), and the data on which they were based were hand-read event durations. Many large events and several important earthquake sequences, however, were studied from paper playbacks from magnetic tape (Eaton, 1990). These playbacks were calibrated and permitted reading of peak amplitudes and associated periods at stations that were not clipped. Magnitudes reported for these earthquakes were amplitude magnitudes, and the data on which they were based were hand-read peak amplitudes and associated periods from calibrated tape playbacks.

From 1984 onward primary network recording and analysis has been carried out on the digital CUSP system and backup recording has continued on analog magnetic tape. The CUSP system provides an automatic measurement of event duration on low-noise traces, but the version of CUSP used for routine analysis does not support the measurement of peak amplitudes. A revised trace editor for CUSP that does support the measurement of amplitude and associated period was developed by Chris Stephens in mid-1987. The Stephens trace editor has been used to analyze events not captured by the on-line CUSP system, from digitized magnetic tape, from 1986 onward. Such events tend to be concentrated around the perimeter and in the northern part of the northern California network where station coverage is poor and/or telemetry is noisy. Additional moderate and large events that were initially analyzed routinely on the CUSP system have been reanalyzed with the Stephens trace editor so that amplitudes and associated periods could be measured. Finally, the Stephens editor has been used to analyze the first few days of the aftershock sequence of the Oct. 17, 1989 Loma Prieta earthquake, providing data on hundreds of earthquakes in the densest part of the network.

The events processed by the Stephens editor on the CUSP system constitute the principal data source for this study. Their importance lies in the large numbers of amplitude/period and duration measurements available for them and in the large range of distance over which these measurements were made. The 1276-event CUSP data set, BTALL, is plotted in figure 2 and listed in table A2. It contains more than 74,000 duration measurements and 38,000 amplitude/period measurements. The distributions of MX and MF determinations (single station) by magnitude and distance are shown in tables 1 and 2, respectively. The distribution of events in BTALL by magnitude is given in table 3. BTALL has been divided into two subsets on the basis of the number of amplitude/period and duration measurement available per event.

BT10: 755 events, at least 10 observations each of amplitude/period and duration;

BT5: 521 events, fail the test for BT10, but contain at least 5 observations each of amplitude/period and duration.

The 80 large hand-timed events from 1982-1988 constitute a supplemental data set, LHT. It contains about 6300 measurements of amplitude/period but none of duration. Data set LHT is listed in table A3.

DERIVATION OF THE MX EQUATION

The original NCSN procedure for computing amplitude magnitudes was based on that used to compute 1966 Parkfield aftershock magnitudes from calibrated playbacks of the 10-day tape recorder stations (Eaton et al, 1970). The maximum peak to trough amplitude and associated period on a record were read without regard to which wave group they represent, P, S, or surface waves. That amplitude was multiplied by the ratio SWA/SGS, where SWA and SGS are the Wood-Anderson and USGS system magnifications at the measured period, respectively, to reduce it to the equivalent Wood-Anderson amplitude. The equivalent Wood-Anderson amplitude so obtained was then used to compute magnitude on the basis of a slightly modified version of Richter's original zero-magnitude-earthquake amplitude-versus-distance table, $\log A_0$ vs D (Gutenberg and Richter, 1942). A correction of +.25 was added to values computed from vertical components on the basis of the observed ratio of maximum horizontal to vertical peak amplitudes measured from a small set of 3-component records of central California earthquakes available in 1970. Differences in sensitivity among the USGS instruments were taken into account in the calculation of the equivalent Wood-Anderson amplitude.

To adapt the $\log A_0$ vs D (epicentral distance) data for use with small earthquakes recorded at distances that were small compared to focal depth, D was replaced by R (hypocentral distance) on the assumption that the $\log A_0$ vs D table applied to earthquakes with an average focal depth of 8 km. The resulting table was then plotted as $\log A_0$ vs logR. It was found that the plotted data points could be represented quite closely (within 0.1 unit of magnitude) by two straight line segments:

I $\log A_0 = 0.15 - 1.6\log R$ 30 km < R < 200 km

II $\log A_0 = 3.38 - 3.0\log R$ 200 km < R < 600 km

The first few plotted points for R < 30 km did not fit the curve very well, but they were not well established: so curve I was extrapolated to hypocentral distances smaller than 30 km as a means of estimating $\log A_0$.

The procedure for calculating amplitude magnitude outlined above was incorporated in HYPO71 (Lee and Lahr, 1975), where the resulting magnitude was called XMAG. Because it uses a log A_0 versus distance curve based on the Gutenberg-Richter data from southern California, its application to northern California earthquakes is questionable. However, when tested against the primary data set from northern and central California, BTALL, this bi-linear formula for $\log A_0$ versus R yielded magnitude values that depended only slighty on distance; but the dependence was systematic.

Bakun and Joyner (1984) developed a formula for $\log A_0$ that is based on central and northern California earthquakes. Their data set consisted of 957 maximum zero-to-peak Wood-Anderson amplitude readings from 106 central California earthquakes read from "synthetic" Wood-Anderson records from 17 short-period low-gain USGS stations (34 components) and real Wood-Anderson records from 3 UC Berkeley stations (6 components). They adopted the standard Wood-Anderson parameters (T=0.8, h=0.8, and V=2800) for the calculation of synthetic Wood-Anderson records. They inverted their data set to obtain magnitudes for each event, station corrections for each instrument component, and the constants n and K in the expression $\log A_0 = +n\log(R/100) + K(R-100) + 3$. Although in the inversion "the minimum rms error occurs for n about 1, there is a trade-off between n and K, and the minimum is broad". For n between about 0.6 and 1.4 the rms error varies from 0.202 (n about 0.6) to 0.200 (n about 1) to 0.202 (n about 1.4). In this range $K = 0.00301 - 0.005802(n-1)$. n is the goemetrical spreading coefficient and K is the attenuation coefficient.

For their preferred solution (for n=1),
Bakun and Joyner: $\log A_0 = -\log R - 0.00301R - 0.70$.
When tested against the primary data set of this paper, this formula for $\log A_0$ yielded magnitude values that fit the data well from the epicenter to 400 km but became increasingly too large beyond about 450 km.

Hutton and Boore (1987) analyzed nearly 10,000 peak amplitude measurements from Wood-Anderson or simulated Wood-Anderson instruments from 972 earthquakes recorded by the Southern California Seismographic Network to refine the log A_0 equation for that region. They concluded that the form of the Bakun and Joyner equation was appropriate for their data set but that different coefficients were required for southern California than for northern California.
Hutton and Boore: $-\log A_0 = 1.110\log(R/100) + 0.00189(R-100) + 3.0$.
When tested against BTALL, the Hutton and Boore equation underestimated magnitudes between 130 km and 580 km by as much as 0.2 unit.

We have attempted to combine elements of the Bakun and Joyner and bi-linear equations for logA to obtain a more uniformly good fit to our primary data set over the range 0 km to 800 km. Because we have a relationship between n and K corresponding to near-optimum inversion of Bakun and Joyner's data set, as well as the condition that the zero magnitude earthquake have an amplitude of 1 micron (Wood-Anderson record) at 100 km, we can stipulate a value for n and compute the coefficient of R (i.e. K) and the constant in the equation for $\log A_0$. The slope of the $\log A_0$ vs logR curve becomes increasingly more negative with increasing distance, and we can calculate the distance (logR) and the ordinate ($\log A_0$) at which it takes on a prescribed value. Thus, we can specify $\log A_0$ so that it closely fits the Bakun and Joyner curve (and data set) out to the distance at which the slope attains a prescribed value and then continues with that slope toward greater distance.

After testing a number of trial equations based on different spreading coefficients (n) and far-out $\log A_0$ vs logR slopes, we obtained the relationship:

MX: $\log A_0 = -0.82\log R - 0.00405R - 0.955$ $\quad R < 185.3$ km

$\log A_0 = -3.57 - 2.55(\log R - \log 185.3)$ $\quad R > 185.3$ km

This equation for $\log A_0$ fits the primary data set more closely than either the bi-linear equation or the original Bakun and Joyner equation. A still better fit can be obtained if we apply a small correction at distances less than 70 km:

$\delta(\log A_0) = 0.09\sin(0.07(D-25))$ $\quad D < 70$ km.

The slope of the hybrid curve described above, beyond 185 km, is -2.55, which is somewhat smaller than the -3.0 slope of the original Richter curve beyond 200 km.

The bi-linear, Bakun and Joyner, Hutton and Boore, and uncorrected MX equations for $\log A_0$ are compared in figure 3, where differences between the first three and the last are plotted as a function of distance. Differences between tabulated $\log A_0$ values from Richter (1958) and the MX equation are also plotted in figure 3.

The Bakun and Joyner (BJ) and MX equations, both fitted to northern California data, agree within 0.1 magnitude unit from 0 km to 400 km; and the divergence beyond 400 km reflects the lack of observations beyond 400 km in the BJ data set. The Hutton and Boore (HB) and MX equations, fitted to southern California and northern California observations, respectively, agree within 0.1 magnitude unit from 5 km to about 180 km. From 180 km to 600 km the HB equation indicates that $\log A_0$ in southern California exceeds that in northern California (MX) by 0.10 to 0.20 unit.

DERIVATION OF THE MF EQUATION

Duration magnitude was defined for NCSN initially by Lee (Lee et al, 1972). Event durations were measured from the onset of the P waves to the point on the seismogram where the coda amplitude diminished to 1 cm amplitude on the Develocorder film viewer screen with x20 magnification. The instruments employed were the normal high-gain USGS verticals. No corrections were made for different station sensitivities, but traces that appeared abnormally long or abnormally short were not read. A histogram of attenuator settings at network stations showed strong peaks at 12db and 18db (almost equal) with a rapid decrease for lower as well as higher attenuator settings. We conclude that the average sensitivity of the stations for which codas were measured corresponds to an attenuator setting of about 15db.

To calibrate the coda magnitudes against Wood-Anderson magnitudes, Lee et al employed a set of earthquakes in central California for which amplitude magnitudes had been computed: MBK for earthquakes larger than about M2 and XMAG (HYPO71), based on calibrated portable 10-day-tape playbacks, for smaller events. On the basis of a log τ vs log D comparison, where τ is record duration and D is epicentral distance, Lee et al (1972) developed a duration magnitude equation of the same form as that developed by Tsumura (1967) for use in Japan with earthquakes in the magnitude 3 to 5 range.

Tsumura: $M_D = -2.53 + 2.85 \log\tau + 0.0014D$ $\quad 3 < M < 5$

Lee: $M_D = -0.87 + 2.00 \log\tau + 0.0035D$ $\quad 0.5 < M < 5$

HYPO71 employs the Lee equation to compute duration magnitude, called FMAG, in the routine processing of NCSN data.

Several problems have arisen with the application of the original Lee et al equation: 1) it has been found seriously to underestimate magnitudes of events larger than M3.5, 2) as network practice improves, seismic system noise decreases and station gains are turned down to increase dynamic range, which alters the calibration of the network for duration magnitudes, 3) codas measured automatically in the RTP (real time processor) are arbitrarily cut off at about 140 seconds; so rapid estimation of magnitudes from high-gain stations is not possible for earthquakes larger than about M3.5.

Bakun (1984) analyzed a subset of the events employed in the Bakun and Joyner study of M_L to develop a duration magnitude equation that would yield better estimates of magnitudes for earthquakes larger than M3.5. His definition of duration was the same as that of Lee, and he utilized only the normal high-gain vertical-component NCSN instruments.

Bakun: $M_D=0.92+0.602\log^2\tau+0.00268D$

Michaelson (1987) reexamined events of the Bakun and Joyner earthquake list to establish a relationship between total lapse time τl (coda threshold time - origin time) and magnitude. Her lapse time readings were also made on Develocorder film. She used station attenuator settings to correct for variations in station sensitivities, unlike previous investigators; but she still used only the high-gain vertical-component NCSN instruments. Her preferred equation had no term in distance to account for decrease in coda length with distance.

Michaelson: $M'_D=-1.03+2.10\log\tau l+0.00268\tau l+Csen$

where τl is lapse time and Csen is the sensitivity correction.

To permit rapid estimation of magnitudes from RTP data, Hirshhorn et al (1987) developed a duration magnitude equation for use with the low-gain vertical-component NCSN instruments. Duration was measured by the RTP from the onset of P until the average absolute trace amplitude of the coda dropped to 60 mv. The low-gain verticals were operated with an attenuator setting of 42db, as opposed to the 12db to 24db range for the high-gain vertical-component instruments. Except for the constant, which reflects the different sensitivities of the two systems used, their equation is nearly the same as the Tsumura equation.

Hirshhorn: $MZ=-0.72+2.95\log\tau+0.001D$ $3 < M < 6$

Johnson (1979) developed a method for calculating magnitudes from measurements made in the decaying coda of local earthquakes. A routine implemented in CUSP measures r_2, average absolute amplitudes over a 2 second window, from the onset of the earthquake record until r_2 diminishes to 60 millivolts, a level that has been found empirically to produce the same τ as the 10 mm threshold on the Develocorder viewer. The program fits a line to a $\log r_2$ vs $\log t$ plot of the coda data, where t is the time of a "window" minus the P onset time. The coda magnitude that

Johnson defined involves the extrapolation of the measured coda amplitude to the onset time of P and employs a rather elaborate periodic recalibration of the network against a set of Wood-Anderson or simulated Wood-Anderson instruments to maintain the relationship between M_L and coda magnitude. Johnson (1979) used a 5 second averaging window rather than the 2 second window used currently.

Johnson also studied the post-S decay of seismogram amplitudes using $\log r_2$ vs $\log t$ plots. If time is measured from the onset of P, then the coda decay data can be fitted by straight lines with slopes that are insensitive to magnitude. This result is very important for the determination of instrument sensitivity corrections for duration magnitude.

To estimate the effect of instrument sensitivity on duration magnitude we make the following assumptions:

1) duration magnitude can be calculated from an equation of the form of the Lee and Tsumura equations: $M=a+b*\log\tau+f(D,h)$

2) coda amplitude decays with time according to the relationship described by Johnson: $\log B=\log B_0-m*\log t$, where t is measured from the onset of P.

To determine the change in the calculated value of M caused by a change in instrument sensitivity S, for a fixed recording distance, D, and focal depth, h, we note that a change in sensitivity produces a change in record amplitude and, consequently, in the time at which the coda amplitude falls to the threshold at which τ is measured. The change in record amplitude, B, caused by a change in sensitivity from S_1 to S_2 is given by: $\delta(\log B)=\log(S_2/S_1)$. From the equation for M, $\delta M=b*\delta(\log\tau)$. From the equation for B, $\delta(\log t)=-1/m*\delta\log(B)$; and at the cutoff threshold, $t=\tau$. Thus, $\delta M=-b/m*\log(S_2/S_1)$. Noting that b=2 and m=2, approximately, $\delta M=\log(S_1/S_2)$. To preserve a link with the original definition of FMAG, let S_1=CAL15 and S_2=CAL, where CAL15 is the sensitivity factor for a 15db attenuator setting and CAL is the sensitivity factor for the instrument used to measure τ. Then, $\delta M=\log(CAL15/CAL)$, to be added to M.

Because $\delta(\log B)/\delta(\log t)$ is constant in the Johnson equation, the equation for δM should be valid for large changes in sensitivities.

The equation we have developed for computing duration magnitudes from vertical-component NCSN instruments is

$$MF=-0.81+2.22\log\tau+0.0011D+\log(CAL15/CAL)+D'+HF(h)$$

where $D'=0.006(D-40.)$ if $D < 40.0$ km

$D'=0.0006(D-350.0)$ if $D > 350.0$ km

$HF(h)=0.014(h-10.0)$ if $h > 10.0$ km

The D' term was added to reduce systematic MF residuals for $D < 40$ km and for $D > 350$ km, and the HF term was added to reduce a dependence of MX-MF on focal depth.

When applied to our primary data set, BTALL, this equation was found to minimize the dependence of computed magnitude on distance and to produce MF values that tracked the corresponding MX values over the range M0.5 to M5.5.

For a rough comparison of the five duration magnitude equations described above, they were used to calculate duration magnitudes versus duration for a recording distance of 100 km and an attenuation of 15db. For the Michaelson equation elapsed time $\tau 1$ was computed from duration time τ as $\tau 1=\tau+100.0/6.0$. The constant in the Hirshhorn and Lindh equation for the low-gain vertical seismograph (42db Z component) was corrected to the 15db high gain vertical by subtracting 1.35 for the 42db to 15db conversion and 0.07 for the Z component to V component conversion. The computed magnitudes in figure 4 are in reasonable agreement for magnitudes between 2.5 and 3.5, but they diverge seriously outside that range. Similar plots for several recording distances show that the region of agreement increases in magnitude with increasing distance from about 2.0 at 0 km, to about 2.5 at 50 km, to about 3.0 at 100 km, and to about 3.5 at 200 km. At larger distances the differences among the equations become quite large.

MX AND MF EQUATIONS AND THE ITERATIVE PROCEDURE FOR ESTABLISHING AND TESTING THEM

Complete equations for MX and MF include terms for component corrections, sensitivity corrections, and site corrections in addition to those describing the observations and the zero-magnitude-earthquake amplitude and duration as functions of distance and focal depth. Subscript i denotes a unique instrument and subscript j denotes a unique event. A double subscript ij denotes an observation of event j at instrument i; and single subscripts i or j denote constant properties of the instrument or event, respectively. The "station" magnitudes, MX_{ij} and MF_{ij} are calculated by the equations:

$$MX_{ij}=\log(A_{ij}/2)-\log A_0+\log(SWA/SGS_i)_{Tij}+XC_i+XS_i$$

$$MF_{ij}=2.22(\log\tau_{ij}-\log\tau_0)+\log(CAL15/CAL_i)+FC_i+FS_i+HF(h)_j$$

where,

$$-\log A_0=0.955+0.82\log R_{ij}+0.00405R_{ij} \qquad D_{ij} < 185.3 \text{ km}$$

$$=3.57+2.55(\log R_{ij}-\log 185.3) \qquad D_{ij} > 185.3 \text{ km}$$

$$\delta(-\log A_0)=0.09\sin(0.07(D_{ij}-25.0)) \qquad \text{if } D_{ij} < 70.0 \text{ km}$$

and

$$-2.22\log\tau_0=-0.81+0.0011D_{ij}+0.005(D_{ij}-40.) \qquad D_{ij} < 40.0 \text{ km}$$

$$=-0.81+0.0011D_{ij} \qquad 40.0 \text{ km} < D_{ij} < 350.0 \text{ km}$$

$$=-0.81+0.0011D_{ij}+0.0006(D_{ij}-350.0) \qquad D_{ij} > 350.0 \text{ km}$$

$$HF(h)_j=0.014(h_j-10.0) \qquad \text{if } h_j > 10 \text{ km}$$

Variable list

A_{ij}=maximum peak-to-trough amplitude
T_{ij}=period associated with A_{ij}
τ_{ij}=event duration
Cal15=sensitivity factor for 15db attenuator setting
CAL_i=sensitivity factor for attenuator setting $ATTN_i$
SWA=Wood-Anderson magnification at period T_{ij}
SGS_i=USGS system " " " "
R_{ij}=hypocentral distance
D_{ij}=epicentral "
h_j=focal depth

XC_i=MX component correction

FC_i=MF " "

XS_i=MX site correction

FS_i=MF " "

$\log A_0$=zero-magnitude-earthquake Wood-Anderson amplitude

$\log \tau_0$=zero-magnitude-earthquake duration on a vertical component USGS seismograph with 15db attenuator setting

$HF(h)_j$=empirical depth correction for MF

These equations show that the distance correction for MX is far more severe than for MF: A_0 decreases from a relative value of 1 at 20 km to 1/91 at 300 km hypocentral distance, while τ_0 decreases from a relative value of 1 at 20 km to 1/1.4 at 300 km epicentral distance.

Further definitions

MX_j=median(MX_{ij}) event MX

MF_j=median(MF_{ij}) event MF

$RX_{ij}=MX_{ij}-MXj$ station MX residual

$RF_{ij}=MF_{ij}-MF_j$ station MF residual

$DXF_j=MX_j-MF_j$ difference MX_j-MF_j for event j

ARX_i=SUM(RX_{ij})/N average MX residual at site i

ARF_i=SUM(RF_{ij})/N average MF residual at site i

ADXF=SUM(DXF_j)/N average (MX-MF) over entire set of events

Iterative procedures

We have used a two-stage iterative procedure to test and adjust the MX and MF equations against the data of this paper. In the first stage, the expressions for $\log A_0$ and $\log \tau_0$ and for the MX and MF sensitivity corrections, as well as the stipulated values of the component corrections, were assumed to be correct. Values of the site corrections XS_i and FS_i (which are the negative site residuals) were determined by iteration:

1) the initial values of XS_i and FS_i were set equal to zero.

2) the magnitude equations were employed to calculate ARX_{i1} and ARF_{i1}, where the subscript 1 denotes the result of the first

iteration. The site corrections were reset to XS_i=$-ARX_{i1}$ and XF_i=$-ARF_{i1}$.

3) this process was repeated an additional five times to calculate ARX_{ik} and ARF_{ik}, k=2 to 6, with the site corrections being updated between iterations.

4) The final site corrections were calculated as XS_i=$-$SUM ARX_{ik}, FS_i=$-$SUM ARF_{ik}, k=1,6.

In the second stage, the $\log A_0$, $\log \tau_0$, and MF equations as well as the component corrections were modified, if neccessary, to reduce systematic trends in various residuals.

5) the magnitude equations were employed to calculate MX_j, MF_j, RX_{ij}, RF_{ij}, and DXF_j, which were used in the evaluation of the $\log A_0$ and $\log \tau_0$ equations as well as the relationship between MX and MF. The site corrections employed were those determined in step 4.

6) RX_{ij} and RF_{ij} were averaged over non-overlapping 20-km-long distance intervals from 0 to 800 km. Plots of these average residuals versus distance were analyzed to determine how the $\log A_0$ and $\log \tau_0$ equations might be adjusted manually to reduce average residuals.

7) DXF_j was averaged over non-overlapping 0.5-unit magnitude intervals from M0 to M6.5; and a plot of average magnitude difference versus magnitude was analyzed, along with ADFX, to determine how well MF tracked MX across the range of magnitudes sampled by the data. The coefficient of ($\log \tau - \log \tau_0$) and the constant in the MF equation were then adjusted, if neccessary, to improve the agreement between MX and MF.

8) for both MX and MF, the site residuals computed in step 4 ($-XS_i$ and $-FS_i$) were averaged for each component class: V=high-gain verticals (attenuator setting 6db to 36db), Z=low-gain verticals (attenuator setting 42db or 48db), and H=low-gain horizontals (attenuator setting 42db). Assuming a random relationship between site residual and instrument component, we would expect these component averages to be zero. Thus, if the component averages are not zero we suspect that errors in

component corrections have "leaked" into the site residuals. The H-component correction for MX and the V-component correction for MF must be zero to insure that MX and MF conform to the initial definitions of amplitude and duration magnitude. The other component corrections can be modified, however, to minimize the average component site residuals.

The two-stage iterative process was repeated if changes in the magnitude equations were introduced in step 6,7,or 8. When we reached an iteration for which no changes were required, we proceded to evaluate the final (adjusted) equations for MX and MF.

TESTING THE MAGNITUDE EQUATIONS

The 755 events in data set BT10 averaged 44 amplitude/period and 93 duration measurements per event, while the 521 events in BT5 averaged only 10 amplitude/period and 11 duration measurements per event. Therefore, BT10 was used with the iterative procedure described above to determine the constants and the component and site corrections in both the MX and MF equations. Those equations were then applied to the entire CUSP data set, BTALL, as well as to the supplemental LHT data set to determine whether the fundamental requirements of a magnitude computing procedure were satisfied.

To check for possible dependence of calculated magnitude values on distance, we have analyzed the individual station magnitude residuals computed for each event. For the entire data set the MX and MF station residuals were averaged over non-overlapping 20 km intervals from 0 km to 800 km and the standard deviations of both MX and MF residuals in each interval were computed. Plots of average magnitude residuals and the corresponding standard deviations are shown in figure 5. In general, the average magnitude residuals are small and show no systematic trend with distance. The standard deviations average about 0.25 for the MX residuals and show little variation with distance. The standard deviations of the MF residuals average about 0.25 from 0 km to about 200 km, but beyond 200 km they increase gradually to about 0.40 at 600 km and beyond.

A more detailed picture of average magnitude residuals versus distance for the CUSP data set is provided by figure 6, where both average MX and average MF residuals over non-overlapping 5-km intervals from 0 km to 250 km are shown for events with M < 3, M > 3, and all M. The short-distance corrections for both MX (D < 70 km) and MF (D < 40 km) were required to suppress systematic residuals of about 0.1 magnitude unit that appear in the plots if the corrections are omitted.

The positive residuals for both MX and MF for distances greater than about 180 km for events with M < 3 probably result from the contamination of weak signals by noise at those distances. The large negative residuals for MX, but not MF, at distances less than about 50 km for events with M > 3 probably result from skewed sampling of seismograms at distances where most records are clipped and unusable for measuring amplitudes; i.e., unclipped records represent only stations that recorded the event with abnormally small amplitudes.

When displayed as a function of azimuth (figure 7), MX and MF residuals, averaged over non-overlapping 10° intervals, are both near zero and the standard deviations of both are near 0.25 throughout the range 0° to 360°.

To check for possible dependence of the difference between MX and MF values on magnitude and focal depth, we have analyzed the event summary data for data sets BT10, BT5, and BTALL. Small events with, necessarily, few measurements of amplitude/period and duration are much better represented by BT5 (266 events < M2) than BT10 (131 events < M2).

Figure 8 shows average MX-MF differences as well as the corresponding standard deviations of the differences for non-overlapping 0.5 unit intervals from M0 to M6.5. The average MX-MF is small, generally less than 0.05 unit, except for very small and very large magnitude ranges where the number of observations is small. The standard deviations of the differences for BTALL, with the most observations across the whole range of magnitudes, lie between 0.11 and 0.23 and average 0.19.

Average MX-MF is shown as a function of depth in table 4. The difference is 0.05 or less for depths of 0 km to 35 km. For greater depths the difference increases to -0.27 (35 km to 40 km) and -0.37 (40 km to 45 km), but the number of events at those depths is very small.

The MX-MF differences also show a degree of regional dependence (figure 9). Large negative values dominate the onshore region east of Cape Mendocino (40°20'N, 124°20'W) and are common in the Loma Prieta region (37°N, 121°50'W). Large positive values dominate the Long Valley region (37°30'N, 118°40'W), the northern Coast Ranges, the offshore region north of Cape Mendocino, and are present in the Loma Prieta region.

Site residuals for MX and MF are given in Table A4. As indicated above, those residuals are the sums of the site residuals for six consecutive iterations of the magnitude calculations, starting with zero site residuals. The standard deviation, number of observations, and attenuator settings are taken from the sixth site residual list, i.e. they describe the last increment to the site residuals.

By grouping stations according to component, region, or attenuation setting and calculating the averages and other statistics of the site residuals for those groups, we can determine what linkage might exist between the site residuals and the station characteristics studied. Thus, when we group instruments according to component, for which we have already made explicit corrections, table 5, we would hope that the average site residual for all instruments of a given type would be zero. Table 5 shows how well that expectation is met for the high-gain vertical, V, low-gain vertical, Z, and low-gain horizontal, H.

Table 6 groups stations according to network region, as indicated by the first letter of the station names, for the computation of average site residuals. The rather large regional variations in site residual suggest that unequal distribution of components among regions might cross over into the computed component residuals.

Table 7 groups stations according to attenuation; and average site residuals as a function of attenuator setting are plotted in figure 10. For both MX and MF the built-in attenuation correction is +0.301 per 6db step in attenuation. We have an a priori expectation of some correlation between site residuals and attenuator setting: for high-gain stations an attenuator setting was chosen that led to a background noise level of about 50 millivolts at the seismic amplifier output. Thus, noisy sites were set up with high attenuation and quiet sites with low attenuation. Experience shows that average good-to-medium quality sites required either 12db or 18db attenuator settings. Sites requiring 24db or 30db attenuator settings were commonly on thick sediments, near noise sources, or both. The 42db and 48db stations were not set up according to the 50 mv rule. They were mostly on good-to-medium sites and were set up as low-gain instruments.

Returning to average MX site residuals in table 7, note that the average for 12db and 18db is -0.035 and that the average for 42db and 48db is 0.01. The 12db/18db stations and the 42/48db low-gain stations are presumed to be on comparable sites, and the built-in attenuation correction appears to track the data through this range of attenuation very closely although the correction is large.

Among the high-gain sites with attenuations of 6db, 12db, 18db, 24db, and 30db, however, the average residuals suggest that the required attenuation correction is only 0.15 per 6db step, about half of that applied. For MX, however, there is little doubt that the larger correction is required by the procedure used to compute MX; so we must conclude that the discrepancy is a measure of the correlation between site sensitivity and the attenuation required by the normal station set-up procedure to limit noise.

The MF site residuals behave almost the same as the MX site residuals. The difference between the MX and MF residuals is 0.02 or less for settings 6db through 24db, and the average at 42db and 48db is -0.005. Thus, although the basis for computing the built-in MF sensitivity correction is not as clear as for MX, we are led to essentially the same conclusion for the two, that the appropriate sensitivity correction for both is +0.301 per 6db.

Now consider how the MX and MF site residuals might depend on each other. The average MF site residuals for non-overlapping 0.05 unit intervals of MX site residual are plotted against the centers of the MX site residual intervals in figure 11. They define a remarkably straight line with a slope near 1.0 (compare with the reference line). The standard deviations, which average 0.16, increase with increasing site residual. The close correspondence between MX and MF site residuals plus the manner in which both MX and MF depend on record amplitude (i.e. the sensitivity corrections) suggest that the site effect is due primarily to ground amplification, which changes the amplitude and duration in similar fashion. At about one site in 8 the ground amplification is 2.0 or greater.

REGIONAL VARIATIONS IN MX AND MF SITE RESIDUALS AND THEIR DEPENDENCE ON BEDROCK LITHOLOGY

Maps of MX (figure 12) and MF (figure 13) site residuals can be contoured into broad regions of positive and negative values. The maps are quite similar except for a small region southeast of Monterey Bay. The the bedrock lithologies of the individual sites were read from the 1:750,000 Geologic Map of California (Jennings, 1977) and added to the site residual list, Table A4. The 36 rock units so identified were assigned to 23 rock type categories for analysis: units represented by too few sites to warrant individual consideration were assigned to categories containing very similar rocks or to a "miscellaneous" category that was not included in the analysis. For each rock type category, average site residuals, standard deviations of site residuals, and number of sites are given for both MX and MF in table 8. The same material is presented graphically in figure 14. In both table 8 and figure 14, rock type categories are arranged in order of increasing average MX site residual. Rock type categories and rock unit names and corresponding brief descriptions (from Jennings, 1977), are given in table A1.

Among rock types representing many sites, average MX site residuals range from -0.23 for rock type 2 (unit kjfm, Franciciscan Complex melange) to +0.19 for rock type 21 (unit q, Quaternary alluvium, etc.). The determining factors influencing MX site residuals appear to be age and state of consolidation of the bedrock: older, more consolidated (metamorphic and igneous) rocks have negative residuals and younger, less well consolidated (sedimentary and volcanic) rocks have positive residuals. The rock type categories that we have used, which are based on the major lithologic units on the Jennings map, show a remarkably smooth variation in MX site residuals from smallest to largest, with only one exception. Rock type 22 (qvp and qrvp, qg, and qs), has an average MX site residual of 0.37, which is twice that of the next most responsive type, 21 (unit q).

Average MF site residuals generally track the corresponding MX site residuals for rocks of Miocene or greater age. Exceptions to this rule are rock types 11 and 12 (units sch and mx) which consist of undivided pre-Cenozoic metasedimentary, metavolcanic and schistose rocks. For these categories the MF site residuals are nearly 0.15 unit smaller than the MX site residuals. For Quaternary volcanic rocks and Pliocene and younger sedimentary rocks, the average MF site residuals differ from the MX site residuals in a manner that depends on rock type. For Quaternary and recent volcanic flow rocks, the MF site residuals average about 0.15 unit less than the MX site residuals; and for Pliocene, Pliocene and/or Pleistocene, and Quaternary sedimentary rocks the MF site corrections average about 0.15 unit more than the corresponding MX site residuals.

The largest MF site residual, +0.45, is for rock type category 22, which also has the largest MX site residual, 0.37.

The range of site residuals corresponding to individual rock type categories is indicated by the corresponding standard deviations from the averages. For all categories these standard deviations average 0.17 for MX and 0.19 for MF. Thus, although the present results indicate a clear dependence of both MX and MF site residuals on bedrock lithology, the large variations of site residuals on a given rock type limit the usefulness of these results for predicting site response for individual stations. One possible explanation of this variation is related to map scale: the detail with which lithology is portrayed at 1:750,000 scale is inadequate to pick up features that are important to site response, such as degree and depth of weathering, small landslides, sedimentary deposits, etc., and other unmapped small scale local variations in lithology within a larger mapped unit.

The usefulness of the network in predicting ground amplification at the more responsive sites would be enhanced by a closer examination and more detailed description of the geology of those sites. Moreover, selection of sites for network stations normally avoids the more sensitive sites because they are noisy. To extend the range of site conditions studied, a modest effort to determine variations in site response with an array of 6 to 10 movable telemetered stations would be effective.

Since the average site residuals are expressed in units of MX and MF, they can be converted to relative amplitude and duration by means of the magnitude equations; $\log(X/X')=XS$ and $\log(\tau/\tau')=FS/2.3$, where X' and τ' are amplitude and duration for zero site residuals and X and τ are amplitude and duration corresponding to site residuals XS and FS, respectively.

IRREDUCIBLE VARIABILITY OF AMPLITUDES AND DURATIONS

The spatial variability, after corrections for component, site, and sensitivity, of our amplitude/period and duration measurements is reflected in the standard deviations of observations used to calculate MX, MF, site residuals, etc. Standard deviations associated with these quantities for data sets BT10 and BT5 are summarized in table 9.

The events and observing stations on which the foregoing results are based were spread throughout central and northern California; so possible variations related to source region, path, etc., are included in the average values quoted above.

To investigate the dependence of the standard deviations of MX, MF, and the difference MX-MF on the regional distribution of earthquake sources we selected a subset of 40 earthquakes (Cal40) that lie on the Calaveras Fault between Hollister and Calaveras reservoir from data set BT10. Data set CAL40 was further reduced (to CAL18) by eliminating events with fewer than 99 observations each of amplitude/period and duration. A third special group of earthquakes, BT100, was generated from BT10 by selecting events with 100 or more observations each of amplitude/period and duration. These events were widely scattered through central and northern California. The statistics for these groups of earthquakes are summarized in table 10.

From table 10 it is apparent that the standard deviations of station MX and MF values do not decrease when the source region of a set of earthquakes is restricted geographically. The standard deviations of the MX-MF differences, however, are reduced both by restricting the size of the earthquake source region and by increasing the number of amplitude/period and duration observations per event.

To examine the variation in station magnitude residuals more closely we have prepared plots for one group of earthquakes and one individual earthquake that show average MX and MF residuals as a function of distance and as a function of azimuth.

For data set CAL18 (figure 15) there appears to be no systematic variation in residuals with distance or azimuth. Because moderate and large earthquakes on the Calaveras fault commonly have right-lateral strike-slip focal mechanisms with one plane corresponding to the fault, we expect these 18 earthquakes to have very similar focal mechanisms. The lack of a dependence of average station magnitude residuals in figure 15 on azimuth suggests that the double-couple source radiation pattern is not an important cause of the variation in station magnitude residuals.

Individual events generally do not cover all azimuths with a sufficient number of observations to generate stable averages. They do permit us to probe for gross variations of average residuals with distance or azimuth if such exist, however. One event that shows a remarkable pattern of station magnitude residuals originated about 30 km beneath Cape Mendocino (890710KCT, figure 16). The variation in MF residuals is modest. They diminish slowly with increasing distance from about +0.15 at 50 km to about -0.15 at 300 km. The variation in MX residuals is much more striking. They are negative for distances less than 380 km and positive for distances greater than 380 km. The amplitude of the change is about 0.6 magnitude unit. At distances greater than 150 km, MX residuals are negative for azimuths less than 140° and positive for larger azimuths. The amplitude of the change is about 0.5 magnitude unit. The region of positive MX residuals at distances greater than 380 km and azimuths greater than 140° is the central Coast Ranges southeast of San Francisco Bay and east of the San Andreas fault. The large range in station MX values for this event is reflected in the large standard deviation of the MX residuals, 0.38, as compared to the average, 0.23, for data set BT10.

The variations in amplitude/period and duration that account for the irreducible part (0.20 to 0.25) of the standard deviation of station magnitude residuals appear to be a normal feature of earthquake seismograms. We suggest that the primary cause of this variation is strong scattering, both by reflection and refraction, and the consequent multi-pathing and delay of the most energetic part of the advancing wave train. Such a mechanism is suggested by the manner in which the very simple "single wavelet" records of P and S (usually seen on low-gain instruments at short distances) become more complex with increasing distance: i.e., they quickly evolve into wave trains of several, then many, subequal wavelets. Interference between multi-pathed wave trains generated by strong foreward scattering may explain the variability in the recorded amplitudes. To explain the duration of the coda, particularly near the source, requires strong back-scattering (Aki and Chouet, 1975). The eventful nature of the decaying coda suggests that relatively few large scatterers play an important role in coda generation.

DEPENDENCE OF MAXIMUM WAVELET PERIOD ON MAGNITUDE, DISTANCE, AND WAVE TYPE

Data set BTALL contains more than 38,000 measurements of the period of the maximum amplitude wavelet used to compute MX. The maximum amplitude occurred in the P wave train (PMAX) in 21% of the cases and in the S wave train or later (MAX) in 79%. The measurements extended over a magnitude range of about M0.5 to M6.0 and over a distance range of 0 km to nearly 700 km. These period data were analyzed to see how average maximum wavelet period might vary with magnitude, distance, and wave type.

The measured periods were averaged over non-overlapping 20-km intervals for events in 1 unit magnitude ranges for both the MAX (figure 17) and the PMAX (figure 18) data subsets. The period versus distance curves are smooth where observations are numerous and irregular where they are few. For a given magnitude range the average period for MAX is greater than for PMAX; and average periods for both MAX and PMAX increase markedly with increasing magnitude. The average periods also can be seen, generally, to increase with distance where the data are sufficient to establish the curves. Such increases for MAX are evident between 0 km and 200 to 300 km for magnitude ranges 2.5-3.5, 3.5-4.5, and 4.5-5.5. For PMAX such increases can be seen between 0 km and 100 to 150 km for magnitude ranges 1.5-2.5, 2.5-3.5, and 3.5-4.5. This increase in the period of the maximum wavelet with increasing distance indicates that relatively high frequencies that predominate at short distances are dissipated more rapidly than the accompanying lower frequencies.

The PMAX curves for magnitude ranges 2.5-3.5 and 3.5-4.5, however, also show a sharp decrease in average period in the distance range 300 to 400 km. For the magnitude range 3.5-4.5 a steady decrease in period begins at about 150 km. These features appear to be associated with remarkable waves generated by earthquakes near Cape Mendocino that are recorded in the Coast Ranges southeast of San Francisco Bay. They are characterized by abnormally large amplitudes, particularly in P, and by abnormally short wave periods in both P and S. The effect of these waves on magnitude calculations was discussed above for event 890710KCT.

Average periods for both PMAX and MAX were calculated for non-overlapping 0.5 unit magnitude ranges from 0.5-1.0 to 6.0-6.5. When these data are plotted as log average period vs magnitude, in figure 19, the MAX and PMAX observations lie along parallel straight lines with slopes of 0.19 and a vertical separation (log MAX - log PMAX) of 0.13 unit. The standard deviations were slightly less than half the average periods. These relationships indicate that the average period of MAX is 1.35 times the average period of PMAX and that both increase approximately as the fifth root of the standard Wood-Anderson amplitude at 100 km recording distance.

COMPARISON OF MAGNITUDE SCALES

The Wood-Anderson seismograph is characterized by its static magnification, V, its free period, T, and its damping constant h. After some ambiguity in earlier publications, Richter (1958) specified the standard Wood-Anderson parameters precisely as V=2800, T=0.8, and h=0.8. These are the parameters for the Wood-Anderson that have been adopted by most authors for the synthesis of Wood-Anderson records from those of other seismographs (Bakun and Lindh, 1977; Kanamori and Jennings, 1978; Bakun and Joyner, 1984). Comparison of results from synthetic Wood-Andersons based on these parameters with those of real Wood-Andersons has revealed that the static magnification of the Wood-Anderson is substantially less than 2800, perhaps even as small as 2000.

Uhrhammer and Collins (1990) have provided a more complete theory for the Wood-Anderson that accounts for the slight distortion of the torsion/suspension fiber from the linear "torsion" configuration treated by Anderson and Wood (1935) to the "Zolner" configuration, which increases the moment of inertia of the moving system about its axis of rotation and decreases the static magnification of the instrument. On the basis of this theory, Uhrhammer and Collins recalibrated the U C Berkeley Wood-Andersons and found an average static magnification of V=2080. They also indicate that the damping of those instruments is set at 0.7.

For the calculation of MX and the determination of the $\log A_0$ versus distance equation we have chosen the standard Wood-Anderson parameters as V=2080, T=0.8, and h=0.8. V=2080 appears to be a better estimate of the static magnification than 2800 as given by the simpler theory, and h=0.8 appears to be a better approximation to the damping of the original southern California Wood-Andersons than 0.7. Use of 2080 rather than 2800 decreases calculated magnitudes by 0.13 unit, but it does not alter the $\log A_0$ curve, which is constrained to equal zero at 100 km.

Incompatibility of the site corrections applied in calculating MX and MBK may also be a problem. The MX site correction "zero" is based on the average of site residuals for 63 low-gain (-42db) horizontal component seismometers at 40 sites in central and northern California. MBK site corrections for five stations in northern California (Berkeley, Lick, Stanford, San Francisco, and Fresno) were determined originally by Gutenberg and Richter (1942). Unfortunately, only the Wood-Anderson station at Lick (MHC) is still operating at the same site. Presumably, site corrections for the relocated and new stations were chosen for compatibility with MHC, which still retains the 1942 correction.

Thus, differences between MX and MBK might arise from a variety of causes, but principally from a difference in the $\log A_0$ versus distance curves (figure 3) or incompatibility of the site corrections applied to MX and MBK.

For the 293 events common to the CUSP data set and the U C Berkeley catalog, average differences between MX and MBK, standard deviations of the differences, and number of events in the averages are plotted for each 0.5 unit of magnitude from M2 to M6.5 in figure 20. Only events with MBK's based on three or more Wood-Anderson readings were used for comparison with the CUSP data. Across the magnitude range M2.5-M5.5, MX averages +0.04 unit larger than MBK, and the standard deviations of the differences average 0.18. For larger magnitudes MX-MBK averages about -0.14, but only three events lie in that range.

From figure 3 we find that $\log A_0$ from the Richter table is larger than the MX $\log A_0$ between distances of 100 km and about 385 km. The maximum difference is as much as 0.15 (at about 240 km) and the average difference between 100 and 385 km is about 0.08. The center of the distance range over which the Wood-Anderson seismographs write legible records (about 1 mm to 100 mm peak to peak) increases with magnitude. For earthquakes with magnitues of 4.5 to 5.0 that recording range is centered at about 250 km, and a large part of it lies between 100 and 385 km, where the Richter table $\log A_0$ is larger than the MX $\log A_0$. For both larger and smaller earthquakes the Wood-Anderson recording range moves off the hump of the GR-MX curve shown in figure 3. Because larger $\log A_0$ values result in smaller calculated magnitudes, the differences in the two curves described above should lead us to expect computed MX's to be larger than computed MBK's by several hundredths of a unit. Thus the difference between the $\log A_0$ curves appears to be a sufficient cause for the observed MX-MBK differences.

The plot of MF-MBK versus magnitude in figure 20 is very similar to that for MX-MBK. MF-MBK averages about +.04 for $2.5<M<5.5$. There is little variation in the difference, and the average standard deviation is about 0.23 across this range. For the three events larger than M5.5 the average MF-MBK is about +0.26.

The LHT data set contains several events and many stations from southern California; and the site corrections were recalculated for the extended region. For the comparison of MX and MBK for the LHT data set, the number of Wood-Anderson readings underlying the MBK determinations was not always available. For the 71 events in data set LHT for which MBK's were available, the average MX-MBK is about +0.10. For the range M3.5-M5.5 the average difference is about +0.08, in reasonable agreement with the CUSP data set. The large difference (+0.30) for M3.0-M3.5 is based largely on Kettleman Hills aftershocks for which the nearest Wood-Anderson seismograph was about 200 km toward the northwest at MHC.

Average MZ-MBK versus magnitude is also shown in figure 20. The two scales are in good agreement from M3.0 to M4.0, but it appears that MZ increases relative to MBK by about 0.1 unit per unit magnitude across the range M3.0-5.5.

Further relations of interest are those between the northern Californa empirical data on $\log A_0$ vs distance and the Gutenberg-Richter $\log A_0$ table, as well as the $\log A_0$ equations for various regions fitted to local data. To obtain an empirical northern California $\log A_0$ versus distance table based on data set BTALL (0 km to 250 km) and on BTALL plus LHT (250 km to 800 km), MX station magnitude residuals were averaged over non-overlapping intervals whose lengths increased with distance (5 km, 0 km to 250 km; 10 km, 250 km to 500 km; and 20 km, 500 km to 800 km) and added to the MX $\log A_0$ values at the centers of the corresponding intervals. Standard deviations of residuals averaged about 0.25 unit, and numbers of observations per interval ranged from 119 to 1242 for distances of 5 km to 600 km. Standard errors of the means (i.e. the table values) were, therefore, 0.01 to 0.02 unit over this distance range. Beyond 600 km the number of observations per interval dropped to as few as 10.

Plots of $\log A_0$ (northern California) minus $\log A_0$ (reference) for the Gutenberg-Richter table (GR), and for the $\log A_0$ equations from MX (MX.8Z), from Bakun and Joyner (BJ.8Z), and from Hutton and Boore (HB.8Z) are shown in figure 21. Each of the $\log A_0$ equations was evaluated for a focal depth of 8 km. The MX equation also includes the correction for $D < 70$ km. The MX equation clearly is the best fit to the northern California empirical data over the entire 0 km to 800 km range, but the Bakun and Joyner equation fits quite well from 0 km to 400 km and the Hutton and Boore equation fits quite well from 0 km to 150 km. Beyond 400 km, the strong absorption term in the BJ equation becomes dominant, so $\log A_0$ is underestimated and calculated magnitudes are too large. The larger spreading coefficient and smaller absortpion coefficient in the HB equation pushes the problem out to greater distances, but the trend of differences between the northern California $\log A_0$ table and the HB equation beyond 600 km suggests that even the HB absorption coefficient is too large for northern California. Comparison of the northern California data and the Gutenberg-Richter table shows rather large differences that change sign with increasing distance.

DISCUSSION

MX was designed to approximate the Wood-Anderson local magnitude, but with modified input. Maximum peak-to-trough amplitude (and associated period) is chosen without regard to where it occurs on the seismogram: P, S, or surface waves. This choice was made because NCSN instruments are predominantly verticals and because the radiation patterns of P and S for double-couple earthquakes are complementary (where S is maximum P is minimum and vice versa).

MX and MF are based on complementary aspects of earthquake seismograms and both consititute valid estimates of the size of the earthquake. MX is more directly related to the Wood-Anderson local magnitude than MF; and MX can be determined from records that do not support MF determinations, e.g., very small earthquakes and earthquakes followed too soon by additional earthquakes. With present NCSN instrumentation and analysis procedures, however, far more measurements normally are available of duration than of amplitude and associated period. This result stems from the fact that even severely clipped seismograms of large earthquakes near their epicenters permit measurement of duration, whereas unclipped records are required for measurement of amplitudes. Moreover, durations are measured automatically by CUSP and amplitudes are measured interactively, a time-consuming process.

Records from short-period NCSN seismographs of all sensitivities and components can be used directly to compute amplitude magnitude (MX) and duration magnitude (MF). Although MX was designed to approximate M_L as closely as possible and agrees with MBK from M2.5 to M5.5, MX is a primary scale, as is M_L. Because MX can be computed from records of sensitive seismographs at small epicentral distances, it provides an amplitude magnitude for very small earthquakes. MF was designed and scaled to match MX as closely as possible; so it is a secondary scale. MF agrees closely with MX from M0.5 to M5.5.

MX and MF site residuals are closely linked: MF residuals averaged over 0.05 unit intervals of MX residual indicate a near 1 to 1 correspondence between the two residuals. Both MX and MF site residuals depend systematicaly on bedrock lithology: older, more consolidated (metamorphic and igneous) rocks have negative site residuals and younger, less well consolidated (sedimentary and volcanic) rocks have positive residuals.

The average periods associated with the maximum wavelet are functions of magnitude, distance, and wave type. Average periods of MAX are greater than those of PMX, and both increase with magnitude and, generally, with distance.

For the 293 events in BTALL for which MBK's were available the average MX-MBK and average MF-MBK are small (+0.04 for both MX and MF) and show little variation with magnitude. The standard deviations of the magnitude differences are 0.18 for MX and 0.23 for MF. For the 71 events in LHT for which MBK's were available, the average and standard deviaton of the MX-MBK differences are +.10 and 0.20, respectively.

ACKNOWLEDGEMENTS

Robert Uhrhammer and his co-workers at the University of California, Berkeley, Seismographic Station supplied the detailed information on Wood-Anderson amplitudes and magnitudes that made possible the comparison of MX and MF with the corresponding U. C. Berkeley magnitudes. Steve Walters helped with the CUSP analysis of earthquakes to obtain measurements of maximum amplitudes and associated periods. Barry Hirshorn and Alan Lindh provided results from their analysis of duration magnitudes based on RTP readings of low-gain vertical seismographs. Chris Stephens augmented the CUSP trace editor so that the maximum amplitudes and associated periods can be measured by CUSP. Without those measurements this paper would not have been written. Bill Bakun and Dave Boore reviewed the manuscript and made many helpful suggestions on both content and presentation.

REFERENCES

Aki, K., and B. Chouet (1975). Origin of coda waves: source, attenuation and scattering effects, J. Geophys. Res. 80, 3322-3342.

Anderson, J. A., and H. O. Wood,(1925). Description and theory of the torsion seismometer, Bull. Seism. Soc. Am. 15, 1-72.

Bakun, W. H. (1984). Magnitudes and moments of duration, Bull. Seism. Soc. Am. 74, 2335-2356.

Bakun, W. H., and William B. Joyner (1984). The M_L scale in central California, Bull. Seism. Soc. Am. 74, 1827-1843.

Boore, D. M. (1989). The Richter scale; its development and use for determining earthquake source parameters, Teconophysics, 66, 1-14.

Eaton, J. P. (1980). Response arrays and sensitivity coefficients for standard configurations of the U.S.G.S. short-period telemetered seismic system, U.S. Geol. Surv. Open-File Report 80-316.

Eaton, J. P. (1990). The earthquake and its aftershocks from May 2 through September 30, 1983, in Rymer, M. J., and Ellsworth, W. L., eds., 1990, The Coalinga, California, earthquake of May 2, 1983: U. S. Geological Survey Professional Paper 1487.

Eaton, J. P., M. E. O'Neill and J. N. Murdock (1970). Aftershocks of the 1988 Parkfield-Cholame, California, earthquake: a detiled study, Bull. Seism. Soc. Am. 60, 1151-1197.

Gutenberg, B., and C. F. Richter (1942). Earthquake magnitude, intensity, energy, and acceleration, Bull. Seism. Soc. Am. 32, 163-191.

Hirshorn, B., Allan Lindh, and Rex Allen (1987). Real time signal duration magnitudes from low-gain short period siesmometers, U.S. Geol. Surv. Open-File Report 87-630.

Hutton, L K., and D. M. Boore,(1987). The M_L scale in Southern California, Bull. Seism. Soc. Am. 77, 2074-2094.

Jennings, Chas. W., et al (1977). California Geologic Data Map Series, Map NO. 2, Geologic Map of California, Calif. Division of Mines and Geology.

Johnson, C. (1979). A robust method of magnitude estimation suitable for local digital seismic networks, Calif. Inst. of Tech. Ph.D. Thesis, 332 p.

Lee, W. H. K., R. Bennet, and K. Meagher (1972). A method of estimating magnitude of local earthquakes from signal duration, U.S. Geol. Surv. Open-File Rept.

Lee, W. H. K., and J. C. Lahr,(1975). HYPO71 (revised): A computer program for determining hypocenter, magnitude, and first motion pattern of local earthquakes, U. S. Geological Survey Open-File Report 75-311, 113 p.

Michaelson, Caryl A. (1990). Coda duration magnitudes in central California: an empirical approach, Bull. Seism. Soc. Am. 80, 1190-1204.

Richter, C. F. (1935). An instrumental earthquake magnitude scale, Bull. Seism. Soc. Am. 25, 1-32.

Richter, C. F. (1958). Elementary Seismolgy, W. H. Freeman and Co., San Francisco, California, 578 pp.

Tsumura, K. (1967). Determination of earthquake magnitudes from total duration of oscillation, Bull. Earthquake Res. Inst., Tokyo Univ. 15, 7-18.

Uhrhammer, Robert A., and Eric R. Collins (1990). Synthesis of Wood-Anderson seismograms from broadband digital records, Bull. Seism. Soc. Am. 80, 702-717.

FIGURE CAPTIONS

Figure 1. Response of Wood-Anderson and USGS short-period seismograph systems.
WA = Wood-Anderson; GS12 = 12db atten. USGS; GS42 = 42db atten. USGS; GS72 = 72db atten. USGS.

Figure 2. Map of the 1276 events in the CUSP (BTALL) data set.

Figure 3. Differences between zero magnitude earthquake attenuation curves
BL-MX = bi-linear minus MX.
BJ-MX = Bakun and Joyner minus MX.
HB-MX = Hutton and Boore minus MX.
GR-MX = Gutenberg-Richter table minus MX.

Figure 4. Comparison of duration magnitude equations for a distance of 100 km
WL = Lee et al FMAG equation
HL = Hirshorn and Lindh MZ equation
WB = Bakun duration magnitude equation
CM = Michaelson lapse time magnitude equation
MF = MF equation used in this paper

Figure 5. Average magnitude residuals and standard deviation of the residuals versus distance
Top: MX for the CUSP (BTALL) data set
Center: MF for the CUSP (BTALL) data set
Bottom: MX for the LHT data set
The number of observations in each interval is indicated below the plotted point. The error bars indicate +/- 1 standard deviation.

Figure 6. Detailed plot of average MX and MF residuals versus distance
Top, M<3; Center, M>3; Bottom, all M.

Figure 7. Average magnitude residuals and standard deviations of the residuals versus azimuth
Top: MX for the CUSP (BTALL) data set
Center: MF for the CUSP (BTALL) data set

Bottom: MX for the LHT data set

The number of observations in each interval is indicated below the plotted point. The error bars indicate +/- 1 standard deviation.

Figure 8. Average MX-MF differences and standard deviations of the magnitude differences versus magnitude, MX/2+MF/2

Top: Data subset BT10

Center: Data subset BT5

Bottom: Data set BTALL

The number of observations in each interval is indicated below the plotted point. The error bars indicate +/- 1 standard deviation.

Figure 9. Map of earthquakes with MX-FM > 0.19 (circles) and with MX-MF < -0.19 (triangles).

Figure 10. Average site residual versus attenuation for both MX (circles) and MF (crosses)

The long dashed line indicates the actual MX and MF sensitivity corrections applied (0.301/6db atten.) The short dashed line (0.15/6db atten.) approximates the field correction for site sensitivity (as expressed by noise level) required by the standard station set-up procedure. The number of sites with each attenuation setting for MX (left) and MF (right) are shown below the plotted points.

Figure 11. Average MF site residuals versus MX site residuals

Averages of MF site residuals over 0.5 unit interval of MX site residual are plotted at the centers of the MX site residual intervals. The number of MF observations in each interval is indicated below the plotted point. Error bars indicate +/- 1 standard deviation.

Figure 12. Map of MX site residuals

MX site residuals x 10 are plotted at the locations of the corresponding stations. Contour lines separate areas of positive and negative residuals.

Figure 13. Map of MF site residuals

MF site residuals x 10 are plotted at the locations of the corresponding stations. Contour lines separate areas of positive and negative residuals.

Figure 14. Site residuals versus rock type

Average MX and MF site residuals are plotted as a function of rock type category, indicated below the plotted points. Rock types are arranged in order of increasing average MX site residual. Numbers of observations for each rock type are indicated above the plotted points (MX, below and MF, above). Error bars indicate +/- 1 standard deviation.

Figure 15. Average magnitude residuals versus distance and azimuth for data subset CAL18

MX residuals are plotted as squares and MF residuals are plotted as X's. The number of MX residuals in each interval is indicated below the plotted point.

Top: Average MX and MF station residuals versus distance for all azimuths

Center: Average MX and MF station residuals versus azimuth for distance < 150 km

Bottom: Average MX and MF station residuals versus azimuth for distance > 150 km

Figure 16. Average magnitude residuals versus distance and azimuth for event 890710KCT.

Legend the same as for figure 15.

Figure 17. Average period of MAX as a function of distance and magnitude

Periods were averaged over 20 km intervals and plotted at the centers of the intervals. Curves for different magnitude ranges are distinguished by the plotted symbols as indicated by the symbol legend on the plot.

Figure 18. Average period of PMAX as a function of distance and magnitude.

Legend the same as for figure 17.

Figure 19. Average period of MAX and PMAX versus magnitude

Periods were averaged over 0.5 unit magnitude intervals and plotted at the ceter of the magnitude intervals. Number of observations in each interval are indicated on the plot, above the plotted points for MAX and below the plotted points for PMAX.

Figure 20. Comparison of MX, MF, and MZ with MBK

Magnitude differences averaged over 0.5 unit of magnitude are plotted against magnitude. Numbers of observations in each interval are indicated below the plotted points. Error bars indicate +/- 1 standard deviation.

Top: MX-MBK for the LHT data set

Second from top: MX-MBK for the CUSP (BTALL) data set

Third from top: MF-MBK for the CUSP (BTALL) data set

Bottom: MZ-MBK from Hirshorn et al.

Figure 21. Comparison of the empirical northern California $\log A_0$ versus distance table with the MX, BJ, and HB $\log A_0$ equations and with the Gutenberg-Richter $\log A_0$ table.

Top: NC $\log A_0$ - MX $\log A_0$

Second from top: NC $\log A_0$ - GR $\log A_0$ table

Third from top: NC $\log A_0$ - BJ $\log A_0$

Bottom: NC $\log A_0$ - HB $\log A_0$

The $\log A_0$ equations were evaluated for a focal depth of 8 km.

TABLES

AMAG = 0.5MX+0.5MF
MX = median of station MX's
SDMX = standard deviation of station MX's
NX = number of station MX's
MF = median of station MF's
SDMF = standard deviation of station MF's
NF = number of station MF's
MBK = M_L, U C Berkeley
NB = number of observations underlying MBK
MZ = low-gain vertical duration magnitude of Hirshorn
NZ = number of observations underlying MZ

Nomenclature the same as for table A1

INST = station and component
ARX = average MX site residual
SDRX = standard deviation of observations underlying the MX site residual
NRX = number of observations underlying MX site residual
ARF = average MF site residual
SDRF = standard deviation of observations underlying the MF site residual
NRF = number of observations underlying MF site residual
ATN = instrument attenuation setting
ROCK = rock type at station site

Table 1

DISTRIBUTION OF MX OBSERVATIONS BY MAGNITUDE AND DISTANCE

MAG / DIST	0.0–0.5	0.5–1.0	1.0–1.5	1.5–2.0	2.0–2.5	2.5–3.0	3.0–3.5	3.5–4.0	4.0–4.5	4.5–5.0	5.0–5.5	5.5–6.0	6.0–6.5
10	15	225	669	562	219	132	83	14	2	0	0	0	0
30	0	47	697	1438	983	526	474	254	36	8	0	0	0
50	0	4	233	946	1047	688	677	504	142	20	0	0	0
70	0	0	45	473	695	635	502	522	117	21	3	0	0
90	0	0	34	212	560	599	551	365	97	11	0	0	0
110	0	0	5	65	359	585	732	450	114	33	1	0	0
130	0	0	1	35	303	480	647	364	115	27	0	0	0
150	0	0	0	15	160	400	620	527	173	55	11	0	0
170	0	0	0	2	87	293	614	563	253	58	7	0	0
190	0	0	0	1	41	183	698	656	284	66	14	0	0
210	0	0	0	1	32	146	700	683	240	44	2	1	0
230	0	0	0	3	19	115	662	703	242	53	3	1	0
250	0	0	0	1	14	103	404	676	316	51	3	2	0
270	0	0	0	0	6	49	236	474	340	60	1	2	0
290	0	0	0	0	2	26	139	405	250	71	1	2	0
310	0	0	0	0	2	13	95	298	223	117	3	2	0
330	0	0	0	0	0	10	50	189	245	89	5	0	0
350	0	0	0	0	0	1	34	175	220	77	3	0	1
370	0	0	0	0	0	3	27	129	178	49	6	12	3
390	0	0	0	0	0	0	19	116	171	61	8	9	0
410	0	0	0	0	0	0	16	102	130	88	7	6	6
430	0	0	0	0	0	0	16	102	99	108	2	4	6
450	0	0	0	0	0	0	17	85	98	76	18	4	8
470	0	0	0	0	0	0	7	83	79	75	21	9	1
490	0	0	0	0	0	0	7	60	68	99	27	11	6
510	0	0	0	0	0	0	6	65	64	65	29	7	10
530	0	0	0	0	0	0	10	55	25	44	24	7	3
550	0	0	0	0	0	0	1	31	36	29	29	6	3
570	0	0	0	0	0	0	0	24	22	40	41	6	1
590	0	0	0	0	0	0	1	32	25	25	18	15	0
610	0	0	0	0	0	0	0	17	25	44	26	8	1
630	0	0	0	0	0	0	0	3	8	30	21	4	1
650	0	0	0	0	0	0	0	5	5	26	21	0	1
670	0	0	0	0	0	0	0	4	0	20	3	0	1
690	0	0	0	0	0	0	0	3	2	8	0	0	1
710	0	0	0	0	0	0	0	0	2	6	2	0	0
730	0	0	0	0	0	0	0	0	2	6	0	0	0
750	0	0	0	0	0	0	0	0	1	8	0	0	0
770	0	0	0	0	0	0	0	0	5	13	0	0	1
790	0	0	0	0	0	0	0	1	0	6	0	0	0

Table 2

DISTRIBUTION OF MF OBSERVATIONS BY MAGNITUDE AND DISTANCE

MAG / DIST	0.0-0.5	0.5-1.0	1.0-1.5	1.5-2.0	2.0-2.5	2.5-3.0	3.0-3.5	3.5-4.0	4.0-4.5	4.5-5.0	5.0-5.5	5.5-6.0	6.0-6.5
10	15	175	627	951	927	897	1272	985	405	198	30	0	0
30	0	7	391	1239	1507	1522	2113	1984	839	415	106	0	0
50	0	0	55	547	1141	1287	2222	2201	1150	511	72	1	0
70	0	0	9	220	619	989	1745	1986	1007	472	78	2	0
90	0	0	3	78	438	807	1517	1570	865	411	72	3	0
110	0	0	1	14	195	585	1422	1507	778	405	63	6	0
130	0	0	0	7	125	399	1126	1337	768	339	56	7	3
150	0	0	0	5	63	276	884	1249	837	363	76	7	6
170	0	0	0	1	18	176	760	1169	860	359	77	12	3
190	0	0	0	1	13	118	685	1109	852	375	100	16	4
210	0	0	0	0	7	63	551	938	663	319	82	19	3
230	0	0	0	0	2	33	453	943	594	361	67	23	1
250	0	0	0	0	0	24	329	872	676	367	56	36	4
270	0	0	0	0	0	10	159	608	630	355	49	30	5
290	0	0	0	0	0	2	80	419	459	318	40	24	9
310	0	0	0	0	0	3	38	258	360	352	44	21	15
330	0	0	0	0	0	1	30	174	318	275	47	19	22
350	0	0	0	0	0	0	29	115	245	239	49	24	8
370	0	0	0	0	0	0	7	91	190	196	53	36	10
390	0	0	0	0	0	0	3	71	188	178	45	36	9
410	0	0	0	0	0	0	1	40	123	187	35	32	27
430	0	0	0	0	0	0	2	44	107	151	29	31	18
450	0	0	0	0	0	0	4	19	93	124	33	25	22
470	0	0	0	0	0	0	0	27	80	129	43	21	14
490	0	0	0	0	0	0	0	14	50	130	46	27	21
510	0	0	0	0	0	0	2	9	49	95	48	20	17
530	0	0	0	0	0	0	0	20	22	69	37	12	19
550	0	0	0	0	0	0	0	11	22	47	50	31	9
570	0	0	0	0	0	0	0	1	19	42	58	22	14
590	0	0	0	0	0	0	0	2	6	29	33	27	6
610	0	0	0	0	0	0	0	2	1	33	26	22	13
630	0	0	0	0	0	0	0	0	1	29	21	16	9
650	0	0	0	0	0	0	0	1	0	18	9	7	9
670	0	0	0	0	0	0	0	0	0	14	8	3	11
690	0	0	0	0	0	0	0	0	0	9	4	3	15
710	0	0	0	0	0	0	0	0	0	6	9	2	4
730	0	0	0	0	0	0	0	0	0	5	3	5	3
750	0	0	0	0	0	0	0	0	0	8	3	6	4
770	0	0	0	0	0	0	0	0	0	2	0	3	8
790	0	0	0	0	0	0	0	0	0	3	4	3	3

Table 3

DISTRIBUTION OF EVENTS BY MAGNITUDE

MAGNIT	0.0 | 0.5	0.5 | 1.0	1.0 | 1.5	1.5 | 2.0	2.0 | 2.5	2.5 | 3.0	3.0 | 3.5	3.5 | 4.0	4.0 | 4.5	4.5 | 5.0	5.0 | 5.5	5.5 | 6.0	6.0 | 6.5
EVENTS	3	32	119	243	306	197	161	117	59	30	6	2	1

Table 4

MX-MF VERSUS DEPTH

DEPTH	ADXF	SDDXF	N OBS
0 TO 5	-0.02	0.21	443
5 TO 10	-0.01	0.21	297
10 TO 15	0.03	0.19	228
15 TO 20	0.01	0.18	142
20 TO 25	0.03	0.15	110
25 TO 30	0.00	0.20	47
30 TO 35	-0.05	0.16	5
35 TO 40	-0.27	0.00	1
40 TO 45	-0.37	0.14	3

Table 5

COMPONENT CORRECTIONS AND RESIDUALS

COMP	XC	ARX	SDRX	NRX	FC	ARF	SDRF	NRF
V	+0.32	0.00	0.23	390	0.00	-0.01	0.27	397
Z	+0.17	0.01	0.17	32	-0.07	0.01	0.25	29
H	0.00	0.01	0.20	63	-0.30	0.00	0.21	60

Table 6

AVERAGE SITE RESIDUAL VERSUS SUBNET REGION

REG	ARX	SDRX	NRX	ARF	SDRF	NRF
A	-0.13	0.21	18	-0.17	0.21	18
B	-0.04	0.20	41	-0.01	0.23	41
C	-0.02	0.20	46	0.00	0.27	47
G	-0.23	0.16	36	-0.22	0.18	38
H	-0.06	0.24	34	0.01	0.32	34
J	0.05	0.21	46	0.11	0.27	46
K	-0.18	0.22	24	-0.20	0.16	23
L	0.08	0.24	42	-0.01	0.26	41
M	0.20	0.29	42	0.02	0.29	37
N	-0.03	0.15	35	0.02	0.19	35
O	-0.04	0.13	10	-0.03	0.29	10
P	0.10	0.16	89	0.11	0.22	89
T	0.02	0.26	14	-0.05	0.32	14
W	0.00	0.21	13	-0.06	0.33	14

Table 7

AVERAGE SITE RESIDUAL VERSUS ATTENUATOR SETTING

ATN	ARX	SDRX	NRX	ARF	SDRF	NRF	ARX-ARF	ATN
6	-0.26	0.15	30	-0.28	0.18	32	0.02	6
12	-0.12	0.21	131	-0.13	0.23	131	0.01	12
18	0.05	0.22	149	0.04	0.28	150	0.01	18
24	0.18	0.18	92	0.18	0.25	92	0.00	24
30	0.30	0.28	4	0.21	0.29	4	0.09	30
36	0.18	0.37	3	0.26	0.48	3	-0.08	36
42	0.01	0.20	64	-0.01	0.20	64	0.01	42
48	0.01	0.21	26	0.03	0.26	22	-0.02	48
72	0.24	0.12	6	0.37	0.14	6	-0.13	72

Table 8

AVERAGE SITE RESIDUAL VERSUS ROCK TYPE

TYPE	ARX	SDRX	NRX	ARF	SDRF	NRF	ARXF	ROCK
1	-0.28	0.03	4	-0.34	0.18	4	-0.31	gb
2	-0.23	0.10	21	-0.27	0.10	22	-0.25	kjfm
3	-0.22	0.18	6	-0.24	0.08	6	-0.23	kjfs
4	-0.20	0.16	25	-0.26	0.16	25	-0.23	mzv
5	-0.16	0.20	41	-0.17	0.21	41	-0.17	kjf
6	-0.10	0.09	5	-0.05	0.14	5	-0.08	kl
7	-0.07	0.21	60	-0.15	0.20	59	-0.11	grmz
8	-0.07	0.25	23	-0.10	0.25	23	-0.08	um
9	-0.07	0.20	19	-0.07	0.13	18	-0.07	tk
10	-0.04	0.19	8	-0.04	0.14	8	-0.04	e
11	-0.03	0.14	10	-0.15	0.11	10	-0.09	sch
12	-0.01	0.16	8	-0.16	0.13	8	-0.08	mx
13	0.00	0.15	29	0.03	0.19	30	0.02	ku
14	0.01	0.15	6	0.04	0.19	6	0.03	tvp
15	0.03	0.18	29	0.06	0.19	31	0.04	tv
16	0.10	0.18	53	0.09	0.17	53	0.09	m
17	0.13	0.24	14	-0.01	0.26	12	0.06	qrv
18	0.14	0.14	41	0.28	0.19	42	0.21	qpc
19	0.14	0.13	21	0.27	0.20	21	0.20	p
20	0.15	0.27	22	0.04	0.25	23	0.10	qv
21	0.19	0.22	31	0.31	0.34	31	0.25	q
22	0.37	0.20	9	0.45	0.29	9	0.41	qvp

Table 9

STATISTICS OF MAGNITUDE AND SITE RESIDUALS

Quantity	Standard deviations	of observations
MX-MF	0.17 (BT10)	0.23 (BT5)
MX	0.23 (BT10)	0.25 (BT5)
MF	0.26 (BT10)	0.24 (BT5)
SITE RES. (BT10)	0.23 (MX)	0.29 (MF)

Table 10

STATISTICS OF SELECTED GROUPS OF EVENTS

Data set	AV MX-MF	S.D. MX-MF	S.D. Stn MX	S.D. Stn MF	Number Events
BT10	0.00	0.17	0.23	0.26	755
BT100	0.05	0.12	0.22	0.27	91
CAL40	0.06	0.12	0.23	0.26	40
CAL18	0.04	0.03	0.20	0.24	18

Table A1

ROCK TYPE CATEGORIES, UNITS*, AND DESCRIPTIONS

1	gb	Gabbro and dark dioritic rocks, chiefly Mesozoic
2	kjfm	Melange of fragmented and sheared Franciscan Complex rocks
3	kjfs	Blueschist and semi-schist of Franciscan Complex
4	mzv	Undivided Mesozoic volcanic and metavolcanic rocks
4	mv	Undivided pre-Cenozoic metavolcanic rocks
5	kjf	Franciscan Complex: Cretaceous and Jurassic sandstone with smaller amounts of shale, chert, limestone, and conglomerate
5	j	Jurassic shale, sandstone, minor conglomerate, chert, slate, limestone; minor pyroclastic rocks
6	kl	Lower Cretaceous sandstone, shale, and conglomerate
7	grmz	Mesozoic granite, quartz monzanite, granodiorite, and quartz diorite
7	prec	Precambrian conglomerate, shale, sandstone, limestone, dolomite, marble, gneiss, hornfels, and quartzite
8	um	Ultramafic rocks, mostly serpentine, minor peridotite, gabbro, and diabase. Chiefly Mesozoic
9	tk	Tertiary-Cretaceous ssndstone, shale and minor conglomerate in coastal belt of northwestern California
10	e	Eocene shale, sandstone, conglomerate, minor limestone; mostly well consolidated
10	ol	Oligocene ssndstone, shale, conglomerate; mostly well consolidated
11	sch	Schists of various types, mostly Paleozoic or Mesozoic age; some Precambrian
11	pz	Undivided Paleozoic metasedimentary rocks
11	pzv	Undivided Paloezoic metavolcanic rocks
12	mx	Undivided pre-Cenozoic metasedimentary and metavolcanic rocks of great variety
13	ku	Upper Cretaceous sandstone,shale, and conglomerate
13	k	Undivided Cretaceous sandstone, shale, and conglomerate

14	tvp	Tertiary pyroclastic and volcanic mudflow deposits
15	tv	Tertiary volcanic flow rocks, minor pyroclastics
16	m	Miocene sandstone, shale, siltstone, conglomerate and breccia; moderately to well consolidated
16	mc	Miocene continental sandstone, shale, conglomerate, and fanglomerate; moderately to well consolidated
17	qrv	Recent (Holocene) volcanic flow rocks, minor pyroclastic deposits
18	qpc	Pliocene and/or Pleistocene continenetal sandtone, shale, and gravel deposits; mostly loosely consolidated
19	p	Pliocene sandstone, siltstone, shale, and conglomerate; mostly moderately consolidated
20	qv	Quaternary volcanic flow rocks, minor pyroclastic deposits
21	q	Quaternary alluvium, lake, playa, and terrace deposits; unconsolidated and semi-consolidated
22	qvp	Quaternary pyroclastic and volcanic mudflow deposits
22	qg	Quaternary glacial till and moraines
22	qs	Quaternary marine and non-marine sand deposits
22	qrvp	Recent (Holocene) pyroclastic and volcanic mudflow deposits
23	c	Carboniferous shale, sandstone, conglomerate, limestone, dolomite, chert, hornfels, marble, quartzite; in part pyroclastic rocks
23	so	Siluro-Ordovician sandstone, shale, conglomerate, chert, slate, quartzite, hornfels, marble, dolomite, phyllite; some greenstone
23	ti	Tertiary intrusive rocks; mostly shallow (hypabyssal) plugs and dikes

* THE STRATIGRAPHIC NOMENCLATURE AND UNIT AGE ASSIGNMENTS USED IN THIS REPORT MAY NOT NECESSARILY CONFORM TO CURRENT USAGE BY THE U.S. GEOLOGICAL SURVEY

Table A2 LIST OF EVENTS IN DATA SET BTALL

DATE	TIME	LAT	LON	DEPTH	AMAG	CUSPID	MX	SDMX	NX	MF	SDMF	NF	MBK	NB	MZ	NZ
850924	721 29.93	37-28.60	121-41.59	7.21	3.49	55728	3.52	0.20	101	3.46	0.19	243	3.50	5	3.45	3
851026	1430 50.90	36-49.08	121-35.15	7.54	3.57	58258	3.60	0.19	15	3.54	0.36	89	3.40	6	3.55	3
851124	1921 39.31	36- 1.30	120-52.99	10.54	4.50	59768	4.62	0.26	32	4.37	0.27	319	4.50	6	4.60	7
851128	1513 56.88	36-33.14	121- 4.47	11.46	4.65	60069	4.64	0.10	10	4.66	0.30	344	4.60	6	4.84	5
860106	1952 42.23	37- 1.23	121-26.96	10.61	3.53	62906	3.53	0.21	44	3.53	0.21	252	3.66	6	3.20	6
860114	3 7 54.67	36-33.29	121-12.29	5.28	3.47	63492	3.49	0.22	87	3.46	0.17	255	3.42	5	3.68	3
860114	3 9 36.08	36-33.52	121-12.63	5.02	4.68	63490	4.67	0.27	24	4.69	0.35	307	4.77	4	4.78	5
860126	2346 54.31	36-49.55	121-17.34	2.30	3.97	64973	3.98	0.19	70	3.96	0.33	291	3.97	6	3.89	6
860127	1951 33.92	36-48.60	121-15.56	8.42	3.49	65444	3.52	0.21	87	3.45	0.17	255	3.40	6	3.56	3
860227	2355 40.94	38-48.77	122-24.36	1.92	2.45	10086231	2.30	0.18	11	2.60	0.15	13				
860228	1031 36.90	40-34.14	124-40.17	25.06	3.10	10086232	3.20	0.14	10	2.99	0.13	19	3.48	4		
860324	2014 40.21	38-46.49	122-46.04	1.18	2.54	10086296	2.49	0.34	16	2.58	0.23	19				
860328	159 50.70	40-43.71	125-12.16	25.31	2.99	10086303	2.91	0.30	11	3.06	0.30	8				
860329	1624 3.82	37-51.76	122-14.22	10.95	4.04	68978	4.04	0.23	45	4.03	0.30	246	3.99	6	4.10	3
860331	13 5 38.13	37-29.53	121-41.46	3.52	3.55	70756	3.58	0.19	89	3.51	0.24	236	3.41	6	3.22	3
860403	640 39.71	41-12.71	124-26.74	19.24	3.16	10086327	3.07	0.24	9	3.26	0.19	14				
860407	958 25.81	40-32.81	123-31.76	0.00	2.60	10086324	2.67	0.19	16	2.53	0.15	18				
860411	23 2 15.28	38-49.63	122-24.05	1.67	2.20	10086331	2.18	0.19	7	2.23	0.14	11				
860414	1150 50.46	40-24.10	123-33.57	24.51	2.15	10084561	2.24	0.22	6	2.07	0.18	7				
860415	015 52.51	40-10.66	125-24.33	11.99	3.07	10084562	3.24	0.22	14	2.90	0.12	5				
860415	647 5.40	40-17.69	124-24.18	4.41	2.43	10084566	2.48	0.31	11	2.38	0.15	11				
860415	9 7 22.77	40-46.16	124-28.68	25.15	2.14	10084565	2.17	0.18	8	2.10	0.17	5				
860415	925 56.22	36-39.89	121-21.15	1.61	3.57	70367	3.55	0.23	87	3.59	0.25	215	3.61	6	3.77	3
860419	244 0.65	36-27.16	117-50.97	0.02	2.30	10085523	2.27	0.33	7	2.32	0.31	8				
860421	541 34.40	41-15.01	125- 5.57	12.27	2.98	10087295	3.03	0.28	24	2.93	0.24	6				
860421	550 55.80	40-28.08	124-29.41	26.90	2.60	10085524	2.58	0.33	21	2.61	0.20	14				
860426	1735 38.27	40-18.96	124-40.42	22.51	2.52	10085527	2.58	0.18	22	2.46	0.18	8				
860427	1015 1.43	40-14.29	121-13.70	10.24	1.74	10085400	1.70	0.35	8	1.79	0.38	7				
860428	1131 57.87	36-45.73	121-16.14	6.61	1.69	10085401	1.76	0.21	26	1.62	0.37	24				
860428	1733 47.71	37-27.60	121-41.74	6.49	3.50	71301	3.53	0.23	100	3.46	0.23	238	3.51	6	3.36	3
860501	1839 3.28	40-25.51	123-58.03	28.22	2.28	10085417	2.26	0.18	13	2.30	0.18	12				
860505	824 2.78	38-57.02	122-43.29	3.54	1.81	10085425	1.87	0.16	10	1.74	0.27	13				
860505	841 57.21	36-13.43	120-24.39	7.49	1.74	10085426	1.78	0.35	14	1.71	0.23	9				
860508	22 2 38.83	38-48.81	122-24.25	1.73	1.97	10085538	1.91	0.20	10	2.03	0.20	9				
860509	611 39.75	40- 0.99	126- 0.44	1.71	3.05	10086338	3.15	0.27	9	2.96	0.16	6				
860509	2157 39.01	38-47.92	122-24.56	1.78	1.98	10085544	1.87	0.16	17	2.08	0.19	10				
860512	235 38.69	40-33.28	124- 2.45	21.05	2.36	10085550	2.40	0.21	9	2.33	0.13	12				
860512	844 48.86	40-50.35	123-51.91	23.98	2.28	10085551	2.34	0.16	6	2.22	0.17	6				
860513	1120 44.75	40-35.74	124-31.21	25.65	2.70	10085554	2.60	0.31	8	2.80	0.14	8				
860515	832 1.95	37-27.33	121-41.67	6.03	3.30	10089612	3.35	0.23	79	3.26	0.23	180	3.26	4	3.09	3
860528	2155 35.18	38-49.35	122-24.24	1.76	2.09	10085739	2.08	0.24	10	2.10	0.20	5				
860530	636 9.30	38-47.28	122-46.09	1.22	2.05	10085749	2.03	0.30	13	2.07	0.19	12				
860531	847 6.99	36-36.74	121-16.98	4.90	3.48	10089613	3.44	0.20	114	3.52	0.34	220	3.68	6	3.41	5
860531	847 55.63	36-36.73	121-16.72	4.49	4.61	10089646	4.55	0.27	18	4.67	0.39	241	4.65	8	4.73	9
860601	649 3.80	36-36.22	121-16.03	3.57	3.32	10089614	3.31	0.20	38	3.32	0.29	175	2.93	4		
860601	649 34.63	36-36.15	121-16.40	2.69	3.91	10089625	3.80	0.24	18	4.01	0.36	163	3.54	4	3.97	5
860602	2243 2.99	38-54.50	121- 0.76	5.66	1.79	10086075	1.85	0.28	7	1.73	0.46	8				
860603	143 14.37	37-36.19	118-52.19	9.59	1.15	10086076	1.10	0.52	7	1.20	0.50	5				
860605	826 33.85	36-35.73	121-15.68	4.62	1.71	10086082	1.67	0.19	21	1.75	0.27	20				
860606	22 5 51.10	38-49.92	122-23.76	1.17	1.94	10086086	1.87	0.17	10	2.00	0.25	12				
860611	15 8 59.34	36-36.54	121-17.00	5.97	3.79	10089615	3.84	0.17	71	3.75	0.27	253	3.50	4	3.92	7
860612	2156 0.47	38-49.41	122-24.44	2.15	1.99	10086159	1.92	0.12	6	2.07	0.19	8				
860614	652 23.39	40-22.66	124-28.40	24.13	2.47	10086164	2.56	0.24	9	2.38	0.22	9				
860619	3 8 29.44	40-11.35	122- 4.76	24.80	2.19	10086203	2.04	0.87	8	2.35	0.31	8				
860619	1731 21.93	38-50.09	122-23.13	0.21	1.87	10086206	1.80	0.18	6	1.94	0.26	5				
860620	228 14.12	40-21.73	124-27.39	26.79	3.04	10086214	3.06	0.23	17	3.03	0.24	26	3.17	4		
860620	1627 50.24	37-47.91	123- 7.70	7.09	2.27	10086208	2.25	0.26	13	2.29	0.23	16				
860621	1025 37.41	38-55.13	122-29.92	1.75	1.74	10086263	1.71	0.10	5	1.77	0.17	7				
860621	1026 15.08	38-54.94	122-30.16	3.49	2.33	10086257	2.33	0.28	8	2.32	0.21	22				
860621	15 2 34.45	39-42.00	123-33.06	2.53	2.12	10086258	2.18	0.18	10	2.06	0.21	14				
860624	22 8 13.12	38-49.08	122-22.63	0.89	2.05	10086267	1.99	0.23	10	2.12	0.07	8				
860624	2212 54.25	37- 0.04	122-11.25	1.99	1.64	10086268	1.78	0.22	7	1.50	0.27	9				
860625	22 1 13.59	38-47.85	122-24.22	0.92	2.04	10086271	1.89	0.23	9	2.19	0.12	7				
860626	1159 2.91	36- 8.29	120-12.57	12.50	1.76	10086272	1.84	0.21	15	1.67	0.24	8				
860626	1250 32.08	40-17.57	123-42.95	32.45	2.45	10086273	2.41	0.19	9	2.49	0.21	11				
860627	035 13.56	40-19.77	124-30.14	22.63	2.85	10086304	2.87	0.18	14	2.83	0.21	17				
860627	151 24.48	39-41.51	123-33.77	4.14	2.03	10086306	2.18	0.10	6	1.87	0.23	8				

Table A2 (continued)

DATE	TIME	LAT	LON	DEPTH	AMAG	CUSPID	MX	SDMX	NX	MF	SDMF	NF	MBK	NB	MZ	NZ
860627	1432 57.12	37-30.58	118-51.48	0.88	1.29	10086308	1.12	0.45	5	1.46	0.49	7				
860628	1842 2.94	36-12.76	120-15.64	10.45	1.63	10086316	1.74	0.24	9	1.52	0.34	7				
860630	1356 11.81	40-10.39	121-14.03	12.51	2.03	10087298	1.95	0.39	5	2.10	0.72	5				
860703	048 32.25	40-43.97	121-39.84	15.00	1.35	10085619	1.21	0.19	6	1.48	0.26	6				
860703	218 22.37	36-43.80	121-25.92	3.95	1.23	10085620	1.25	0.31	13	1.21	0.36	10				
860704	443 18.04	36-45.36	121-15.11	10.65	1.48	10085626	1.56	0.20	23	1.40	0.26	21				
860704	1955 37.12	41- 2.54	124-30.22	21.40	3.28	10086215	3.16	0.20	15	3.41	0.32	23				
860706	21 6 21.14	40-48.10	124-17.90	22.90	2.35	10085633	2.38	0.28	11	2.32	0.27	7				
860708	040 22.76	36- 4.27	121-49.05	13.14	4.30	76037	4.33	0.25	42	4.27	0.29	245	4.35	5	4.47	6
860709	356 52.69	39-23.19	123-14.87	5.34	1.74	10085823	1.80	0.38	7	1.67	0.26	11				
860709	843 44.68	38-36.01	119-49.12	10.22	2.11	10085654	2.02	0.23	8	2.20	0.31	5				
860709	1829 4.03	41-11.44	121-57.69	5.69	1.40	10085658	1.33	0.44	5	1.47	0.41	5				
860710	424 44.82	40-42.04	124-37.08	15.00	2.81	10086023	2.89	0.37	16	2.74	0.26	13	3.22	2		
860710	6 1 50.37	38-56.91	123- 9.59	3.85	1.88	10085676	2.00	0.24	12	1.75	0.17	12				
860710	1433 49.83	35-10.85	120- 1.63	9.37	1.59	10085678	1.56	0.26	6	1.63	0.15	5				
860710	2052 44.16	40-26.31	124-40.55	26.75	3.09	10086024	3.16	0.21	18	3.02	0.19	20				
860711	2128 55.31	34-30.66	118-28.57	0.65	2.82	10085684	2.77	0.21	9	2.88	0.19	8				
860714	4 1 36.02	39-48.01	123-20.34	0.01	1.94	10085689	2.08	0.20	14	1.80	0.32	10				
860715	1022 8.98	38-47.49	122-46.97	1.30	1.84	10085693	1.81	0.20	11	1.87	0.23	15				
860718	1855 42.30	36- 6.92	117-52.41	4.41	3.29	10086026	3.41	0.29	5	3.17	0.22	11				
860721	1531 4.60	37-34.87	118-29.09	6.43	3.58	10085770	3.40	0.24	5	3.77	0.22	16	3.61	2		
860721	1852 15.15	37-29.78	118-26.22	12.41	2.39	10086030	2.05	0.61	7	2.73	0.92	7				
860722	1943 47.93	39-26.53	123-18.60	3.01	1.61	10085989	1.67	0.29	7	1.55	0.32	5				
860723	2157 59.43	40-44.44	122-18.09	3.50	1.94	10085875	1.70	0.34	7	2.19	0.17	6				
860724	1739 44.81	40-16.76	124-30.95	20.11	3.10	10085879	3.02	0.24	17	3.17	0.22	26				
860726	435 7.86	36-50.51	121-36.33	5.28	2.70	10085887	2.65	0.21	15	2.76	0.22	43	2.33	2		
860726	437 42.25	36-50.71	121-36.34	4.57	2.51	10085990	2.42	0.13	19	2.60	0.28	44				
860726	2226 34.33	38-49.12	122-49.28	1.32	2.54	10085904	2.59	0.31	13	2.49	0.23	28				
860727	7 1 16.84	35-52.97	120-27.06	11.13	2.02	10085908	2.01	0.21	33	2.03	0.21	30				
860727	15 5 3.73	40-14.73	125-29.48	5.87	2.82	10085991	2.92	0.29	12	2.72	0.24	9				
860728	13 0 12.99	36- 8.73	120-16.76	11.25	2.79	10085924	2.78	0.29	32	2.80	0.17	41				
860729	1615 7.80	40- 0.61	123-28.94	2.96	1.95	10085949	2.07	0.29	11	1.83	0.19	11				
860729	1944 3.52	39-19.30	123-15.32	2.01	1.69	10085955	1.73	0.19	6	1.64	0.28	7				
860731	728 4.39	37-27.14	118-24.15	3.73	4.54	10085942	4.51	0.16	7	4.58	0.30	37	4.54	3		
860731	815 38.64	37-29.18	118-23.04	7.84	3.81	10085944	3.81	0.22	7	3.80	0.21	27	3.98	3		
860731	1519 28.07	40-14.77	124-31.93	17.98	3.20	10085939	3.12	0.15	15	3.29	0.23	14	3.44	3		
860801	8 8 18.47	37-34.24	118-28.82	7.89	1.82	10086456	1.56	0.38	13	2.08	0.45	14				
860801	1442 20.03	37-30.48	118-22.92	8.96	1.82	10086457	1.37	0.37	6	2.28	0.59	10				
860801	1443 32.83	37-29.31	118-24.33	8.73	1.38	10086458	1.38	0.34	5	1.39	0.40	5				
860801	1857 3.50	37-29.20	118-25.83	10.52	1.70	10086459	1.65	0.42	10	1.75	0.27	8				
860804	341 41.63	37-25.32	121-46.59	8.20	3.38	84664	3.37	0.23	66	3.39	0.25	200	3.41	2	3.36	3
860805	22 5 45.10	38-49.81	122-24.12	1.75	2.35	10086464	2.28	0.15	12	2.41	0.24	20				
860807	2154 31.03	38-49.98	122-23.62	0.99	2.17	10086467	2.06	0.16	8	2.27	0.23	14				
860808	346 22.77	41- 0.74	123-32.77	23.28	2.31	10086470	2.23	0.32	12	2.39	0.21	9				
860808	11 1 59.06	40-45.12	123-18.31	23.34	2.41	10086474	2.34	0.27	15	2.48	0.18	12				
860808	14 6 14.52	39-23.71	120- 7.78	0.97	2.68	10086475	2.55	0.31	12	2.80	0.33	12				
860808	1714 59.66	39-54.17	120-46.46	25.06	2.49	10086476	2.27	0.16	13	2.72	0.49	11				
860808	1731 39.58	40-51.14	123-43.19	22.72	3.67	10086481	3.58	0.17	14	3.76	0.30	32	3.84	2		
860808	2314 28.19	38-48.72	122-49.04	0.11	2.01	10086477	1.91	0.26	10	2.11	0.30	14				
860829	1913 7.07	38-49.52	122-23.97	1.86	2.39	10086506	2.31	0.18	13	2.48	0.24	18				
860829	2257 52.39	37-34.53	118-29.16	8.40	2.29	10086508	2.04	0.40	8	2.54	0.45	17				
860829	23 3 11.52	40-35.60	124-41.72	28.79	3.03	10086507	2.92	0.24	10	3.14	0.26	10	3.29	2		
860829	2354 15.33	37-28.29	118-22.32	8.85	2.23	10086509	1.96	0.55	8	2.51	0.45	11				
860831	11 6 39.60	41-46.53	125-55.90	15.00	3.37	10086520	3.45	0.27	18	3.28	0.43	10				
860831	1410 41.69	40-28.30	121-36.62	16.72	1.51	10086516	1.49	0.38	7	1.53	0.15	5				
860831	1529 27.82	40-34.17	123-28.24	15.86	2.07	10086517	2.13	0.15	9	2.00	0.08	6				
860831	1927 30.88	40-18.26	124-32.86	21.21	2.75	10086518	2.68	0.24	19	2.81	0.20	20				
860831	2329 35.10	41-53.77	126-29.86	22.29	4.15	10086521	4.30	0.13	24	4.00	0.27	33	4.29	2		
860906	18 4 22.47	40-24.58	123-31.50	32.03	2.57	10086737	2.49	0.23	12	2.65	0.13	13				
860906	2046 5.82	40-29.12	124- 6.37	20.62	2.16	10086738	2.24	0.23	8	2.08	0.13	9				
860907	2342 45.13	36-13.77	120-26.07	0.00	1.50	10086741	1.53	0.33	10	1.48	0.20	6				
860916	2149 29.03	37-57.97	122- 4.62	15.63	1.52	10086783	1.62	0.34	15	1.42	0.40	5				
860917	1843 27.90	37-37.03	118-27.38	4.65	1.72	10086792	1.49	0.54	8	1.96	0.43	6				
860917	1851 13.59	36-53.30	121-19.90	6.26	1.81	10086793	1.88	0.22	22	1.75	0.25	29				
860918	237 39.12	40-20.53	124-19.57	13.98	2.91	10086795	2.97	0.26	14	2.85	0.16	16	3.26	1		
860919	1431 19.44	39-46.86	123- 3.57	0.83	2.05	10086796	2.26	0.24	8	1.85	0.18	8				
860921	1320 51.78	40-18.22	125-30.79	22.00	3.18	10086840	3.23	0.39	12	3.12	0.17	9				

Table A2 (continued)

DATE	TIME	LAT	LON	DEPTH	AMAG	CUSPID	MX	SDMX	NX	MF	SDMF	NF	MBK	NB	MZ	NZ
860923	1927 56.73	36- 4.94	121-47.79	12.51	3.80	83498	3.85	0.20	64	3.75	0.26	223	3.68	3	3.72	3
860924	2130 44.10	40-44.00	122-17.75	2.74	2.01	10086841	1.82	0.37	7	2.20	0.22	9				
860925	17 9 33.30	40-28.47	124-14.12	26.40	2.43	10086844	2.40	0.31	11	2.47	0.39	13				
860925	1733 34.68	40-28.40	124-13.47	26.60	2.46	10086845	2.60	0.29	14	2.31	0.24	11				
860926	2121 9.42	39-37.29	123-26.06	4.24	1.97	10086847	2.14	0.30	7	1.81	0.19	7				
860926	2152 43.90	40-14.84	124-10.28	8.52	2.62	10086849	2.63	0.15	9	2.62	0.12	11				
860927	7 6 32.71	40-14.75	126- 0.79	22.03	3.38	10086851	3.44	0.28	23	3.32	0.16	10	3.72	3		
860929	2035 22.22	41-11.73	121-54.43	13.24	1.66	10086833	1.63	0.32	6	1.70	0.30	6				
860929	2341 42.15	40-17.98	124-37.25	18.00	2.55	10086835	2.50	0.35	10	2.60	0.12	10				
861002	148 52.78	38-48.04	122-46.54	1.85	1.73	10086855	1.70	0.25	6	1.76	0.29	11				
861002	149 16.30	38-48.23	122-46.44	1.91	2.05	10086885	1.96	0.11	6	2.14	0.31	10				
861002	237 37.18	39-15.95	123- 7.86	3.39	2.13	10086857	2.19	0.31	12	2.08	0.24	12				
861003	949 23.76	38-11.26	118-12.54	6.00	1.95	10086864	1.99	0.38	8	1.91	0.32	5				
861003	1333 55.81	40-15.36	124-54.55	21.90	3.32	10087301	3.27	0.30	12	3.36	0.17	13	3.02	4		
861005	1331 28.40	40-56.56	121-39.44	15.01	1.51	10086871	1.35	0.25	7	1.66	0.17	5				
861005	2318 41.85	38-35.49	122-47.91	1.15	1.69	10086873	1.51	0.18	9	1.86	0.24	7				
861006	1114 13.90	38-48.77	122-48.08	2.05	2.04	10086875	2.08	0.23	21	1.99	0.34	20				
861006	1153 40.16	38-48.85	122-47.71	1.99	1.82	10086876	1.85	0.22	10	1.80	0.19	15				
861006	14 1 56.43	36-16.63	120-23.37	2.70	1.44	10086879	1.44	0.34	5	1.43	0.18	6				
861008	22 4 10.80	37-54.10	120-30.67	3.82	2.55	10086888	2.57	0.24	8	2.54	0.08	9				
861011	517 36.18	37-48.87	121-59.42	2.45	3.93	85579	3.94	0.23	88	3.93	0.30	221	3.94	4	3.91	2
861019	4 7 21.82	39-18.20	122-47.39	0.22	1.98	10086898	1.86	0.24	9	2.10	0.47	6				
861019	4 7 34.10	39-18.60	122-46.94	1.75	2.18	10086920	2.23	0.16	14	2.12	0.33	6				
861019	1548 57.21	38-48.91	122-47.89	3.54	1.87	10086900	1.95	0.19	8	1.80	0.21	14				
861022	357 4.06	40-21.30	125- 7.19	22.00	2.84	10086950	2.81	0.19	10	2.87	0.14	7				
861022	747 15.54	39-31.34	119-37.23	1.72	2.76	10086951	2.82	0.47	17	2.71	0.15	14				
861024	2255 26.68	38-54.71	121- 0.95	5.83	1.41	10086958	1.49	0.11	8	1.33	0.27	5				
861027	2 6 45.16	37-10.70	121-33.68	6.26	3.72	86584	3.76	0.16	99	3.67	0.26	272	3.64	6	3.62	5
861029	2255 1.97	38-49.82	122-24.47	2.16	2.25	10086968	2.19	0.26	12	2.31	0.15	11				
861030	024 46.20	40-31.96	123-53.35	37.54	2.23	10086969	2.10	0.29	8	2.37	0.12	5				
861030	1358 7.61	40-32.66	123-30.01	2.08	2.29	10086970	2.35	0.21	10	2.23	0.28	8				
861102	329 36.87	39-21.56	123-14.42	1.05	2.19	10086993	2.32	0.30	9	2.06	0.15	15				
861102	649 56.56	40-23.46	124-37.45	18.66	2.96	10086994	3.06	0.17	14	2.86	0.19	18				
861103	044 32.24	38-48.89	122-47.75	3.05	1.88	10086998	1.97	0.30	6	1.80	0.28	11				
861103	5 7 22.11	40-45.23	124-58.78	22.10	2.49	10086999	2.57	0.29	13	2.40	0.24	9				
861103	829 13.30	40-23.69	124-35.63	21.21	3.04	10087000	3.02	0.16	18	3.06	0.18	22				
861103	855 28.65	40-23.44	124-36.44	15.68	2.63	10087001	2.71	0.19	15	2.55	0.14	12				
861104	20 3 14.37	39-27.76	122-58.43	0.01	1.85	10087006	1.87	0.25	12	1.84	0.21	5				
861104	2243 14.97	40-38.69	124-46.03	31.89	2.53	10087007	2.52	0.30	16	2.54	0.22	6				
861106	423 0.15	38-33.45	122-27.46	14.58	1.59	10087010	1.83	0.26	11	1.35	0.24	7				
861106	656 24.07	38-49.02	122-49.34	1.57	1.64	10087011	1.51	0.08	7	1.77	0.31	11				
861108	322 2.82	40-57.69	123-30.60	26.96	2.08	10087019	2.13	0.45	7	2.04	0.13	5				
861108	514 43.22	38-49.36	122-47.46	2.15	1.97	10087020	2.01	0.22	12	1.92	0.23	14				
861108	515 43.96	38-49.18	122-47.81	2.14	1.56	10087027	1.55	0.27	5	1.57	0.17	6				
861109	146 40.29	34-43.69	120- 8.26	0.01	2.31	10087304	2.12	0.39	7	2.51	0.26	11				
861110	2017 7.55	40-39.65	124-18.94	23.95	2.46	10087026	2.53	0.25	16	2.40	0.13	12				
861111	2215 7.27	40-32.97	122-12.80	15.17	1.62	10087043	1.47	0.26	7	1.76	0.32	5				
861112	1010 1.96	40-20.55	124-21.26	16.25	2.46	10087044	2.53	0.21	14	2.39	0.16	16				
861114	2127 5.95	38-49.69	122-48.03	2.15	2.68	10087030	2.62	0.19	10	2.75	0.23	22				
861116	439 47.82	40-22.35	124-24.34	17.30	2.73	10087034	2.74	0.19	21	2.73	0.17	22				
861116	457 14.40	34-43.56	120- 8.30	1.27	2.22	10087035	2.11	0.15	6	2.33	0.13	9				
861116	1214 6.42	38-53.44	122-44.79	1.86	1.97	10087036	1.86	0.17	9	2.08	0.47	15				
861117	1828 36.19	40-36.82	124-33.59	19.84	2.16	10087040	2.18	0.65	5	2.14	0.28	7				
861118	019 31.49	38-38.94	121- 0.11	4.98	1.57	10087053	1.77	0.37	5	1.36	0.18	6				
861120	1045 37.32	40-24.95	124-28.36	27.69	2.33	10087058	2.36	0.25	18	2.30	0.31	9				
861120	1227 10.86	40-12.58	124- 8.91	0.00	3.00	10087059	3.07	0.22	16	2.94	0.16	26				
861120	23 4 34.74	40-22.21	124-10.91	20.28	2.41	10087060	2.45	0.21	14	2.37	0.17	18				
861121	2339 42.73	40-22.48	124-23.71	19.82	3.20	10087062	3.14	0.21	10	3.26	0.21	14				
861121	2342 31.00	40-21.99	124-23.91	17.39	2.29	10087063	2.29	0.30	5	2.29	0.26	5				
861122	026 24.63	40-21.44	124-26.75	19.23	2.42	10087066	2.42	0.21	11	2.43	0.16	15				
861122	041 40.04	40-21.59	124-26.60	19.89	2.53	10087067	2.58	0.18	12	2.47	0.13	14				
861122	047 51.38	40-25.53	124-39.78	29.87	2.48	10087068	2.54	0.29	20	2.42	0.22	6				
861122	140 49.00	40-20.92	124-25.46	16.74	2.33	10087069	2.36	0.18	10	2.30	0.28	7				
861122	224 59.48	40-21.30	124-26.71	18.96	2.31	10087070	2.35	0.23	11	2.27	0.17	9				
861122	225 37.50	40-21.04	124-25.28	15.70	2.38	10087082	2.47	0.16	13	2.29	0.16	11				
861122	259 26.29	40-21.05	124-25.25	16.80	2.28	10087071	2.34	0.22	10	2.22	0.15	8				
861122	412 55.03	40-21.57	124-24.74	17.11	2.39	10087075	2.41	0.20	15	2.37	0.11	14				

Table A2 (continued)

DATE	TIME	LAT	LON	DEPTH	AMAG	CUSPID	MX	SDMX	NX	MF	SDMF	NF	MBK	NB	MZ	NZ
861122	435 46.65	40-21.00	124-23.83	16.21	2.77	10087076	2.76	0.20	16	2.77	0.20	21				
861122	541 28.83	40-21.56	124-24.87	18.80	2.18	10087077	2.21	0.28	14	2.14	0.22	9				
861122	546 45.27	40-21.57	124-25.14	18.99	2.25	10087078	2.26	0.22	14	2.24	0.16	9				
861122	958 5.14	40-21.42	124-24.51	18.01	2.51	10087098	2.56	0.18	7	2.47	0.21	9				
861122	1229 30.34	40-32.14	123-26.47	24.96	2.11	10087099	2.11	0.16	10	2.12	0.15	9				
861122	1415 7.73	40-22.66	124-23.24	18.28	2.16	10087100	2.14	0.23	8	2.18	0.11	8				
861122	1534 17.30	40-21.39	124-24.75	17.75	2.39	10087101	2.44	0.23	13	2.33	0.20	13				
861122	1823 23.45	40-21.89	124-24.44	19.54	2.27	10087103	2.22	0.33	10	2.32	0.16	8				
861123	141 58.39	40-20.79	124-25.81	17.96	2.16	10087118	2.33	0.38	6	1.99	0.20	5				
861123	4 6 55.42	40-20.80	124-25.15	16.48	2.19	10087108	2.24	0.26	13	2.15	0.22	10				
861123	557 6.82	34-44.56	120-56.86	7.28	2.50	10087109	2.43	0.19	6	2.56	0.18	5				
861123	721 3.87	40-21.00	124-24.54	15.94	2.34	10087111	2.39	0.26	11	2.28	0.14	11				
861123	741 21.97	40-21.33	124-27.07	22.20	2.42	10087112	2.41	0.25	14	2.43	0.18	14				
861123	1746 40.89	40-20.31	124-25.43	15.79	2.06	10087113	2.15	0.18	9	1.97	0.22	5				
861123	1757 56.43	40-20.27	124-24.94	13.83	1.97	10087114	2.00	0.24	12	1.94	0.19	5				
861125	4 7 39.91	40-21.05	124-27.76	19.46	2.84	10087115	2.81	0.15	14	2.87	0.24	17				
861126	1026 5.44	40-21.25	124-24.77	16.20	2.60	10087122	2.64	0.16	18	2.56	0.15	21				
861130	952 1.43	40-21.08	124-23.93	16.68	2.42	10087235	2.45	0.23	18	2.40	0.20	14				
861130	2152 25.95	38-48.55	122-48.69	1.90	1.70	10087237	1.61	0.46	13	1.79	0.30	14				
861201	149 27.26	40-21.85	124-24.56	19.28	2.86	10087241	2.81	0.17	18	2.91	0.12	23				
861201	850 52.52	41- 1.92	125-34.82	22.14	2.77	10087244	2.82	0.25	15	2.72	0.18	9				
861201	1628 26.93	38-48.05	122-26.80	8.77	1.87	10087246	1.93	0.27	8	1.80	0.19	9				
861202	1745 43.35	40-18.40	124-26.48	6.34	2.32	10087249	2.37	0.26	16	2.28	0.22	12				
861203	947 8.84	40-18.19	125-12.91	18.78	2.63	10087217	2.57	0.20	17	2.68	0.21	7				
861203	1016 42.94	40-25.45	121-54.52	15.27	1.42	10087218	1.47	0.30	12	1.38	0.28	5				
861203	1851 21.55	35-24.69	120-34.64	1.38	1.75	10087219	1.63	0.31	9	1.87	0.28	6				
861204	431 47.72	40-20.72	124-29.18	13.49	2.85	10087223	2.85	0.17	22	2.85	0.15	19				
861204	645 46.28	39-26.95	123-17.09	4.69	2.47	10087224	2.52	0.24	15	2.41	0.46	21				
861204	848 53.53	40-20.90	124-30.29	16.18	2.23	10087225	2.33	0.19	7	2.12	0.24	6				
861204	2139 51.30	39-57.27	120-50.07	5.26	1.82	10087226	1.85	0.36	9	1.79	0.21	7				
861204	2239 33.99	39-56.79	120-49.57	5.07	1.88	10087227	1.96	0.40	10	1.79	0.35	9				
861205	8 8 59.16	38-46.58	122-26.53	6.06	1.59	10087228	1.70	0.19	9	1.47	0.21	6				
861205	8 9 24.70	38-46.68	122-26.36	6.59	1.76	10087238	1.88	0.16	9	1.65	0.18	8				
861205	1359 44.05	38-48.52	122-46.55	2.47	1.86	10087229	1.84	0.20	13	1.87	0.21	14				
861205	2033 27.33	38-49.02	122-48.31	2.29	1.70	10087232	1.71	0.22	8	1.68	0.41	12				
861205	2035 5.34	38-49.30	122-47.96	2.29	1.12	10087253	1.22	0.22	6	1.03	0.26	5				
861207	346 56.83	40-31.06	123-28.10	7.80	1.85	10087259	1.94	0.20	10	1.77	0.26	5				
861207	1031 28.93	40-20.93	124-30.65	18.26	2.34	10087260	2.39	0.36	6	2.29	0.26	6				
861208	1515 17.67	39- 9.48	120-31.31	16.02	1.99	10087262	1.74	0.18	8	2.23	0.33	7				
861208	2339 35.94	39-49.13	124- 0.65	1.21	2.10	10087264	2.18	0.16	13	2.02	0.15	9				
861209	16 8 22.22	38-18.04	122-10.50	7.74	1.68	10087267	1.80	0.21	13	1.57	0.37	9				
861210	516 57.45	39-40.22	121-45.24	5.68	1.68	10087269	1.59	0.23	9	1.77	0.47	7				
861210	1342 14.88	38- 2.75	118-55.83	10.92	1.85	10087271	1.66	0.32	9	2.04	0.46	10				
861211	237 31.33	39-22.60	122-56.36	1.13	1.54	10087274	1.60	0.19	8	1.47	0.20	5				
861211	1418 4.88	37-32.72	121-40.58	1.33	4.00	89901	4.05	0.16	102	3.96	0.25	292	4.06	6	4.23	4
861211	1936 5.37	40-11.36	125- 6.41	0.00	2.44	10087276	2.61	0.23	8	2.27	0.22	5				
861212	1052 58.06	39-22.84	122-52.77	0.01	1.73	10087283	1.85	0.27	10	1.60	0.18	6				
861229	1528 4.75	37-26.59	121-48.26	4.66	4.30	91072	4.39	0.17	67	4.21	0.36	317	4.05	3	4.38	5
870119	8 9 4.15	37- 9.62	121-33.02	5.62	3.82	92832	3.84	0.24	110	3.80	0.22	299	4.02	5	3.71	5
870130	134 44.59	37-43.10	122- 9.66	7.64	3.84	93540	3.97	0.18	72	3.71	0.26	245	3.59	6	3.82	3
870214	726 50.89	36- 9.59	120-21.32	14.70	5.19	10089611	5.24	0.20	8	5.13	0.42	327	5.29	8	5.33	5
870228	1624 28.12	37-26.15	121-41.36	4.93	4.01	10089610	4.07	0.16	79	3.96	0.29	299	3.88	6	3.94	4
870410	451 46.00	37-32.80	121-41.15	2.15	3.55	98314	3.56	0.16	137	3.54	0.33	235	3.42	5	3.16	2
870421	1547 15.35	37-26.21	121-48.00	5.02	3.41	99006	3.41	0.18	99	3.42	0.26	231	3.25	6	3.35	4
870430	1924 22.00	36-50.27	121-17.14	7.89	4.08	99548	4.14	0.24	79	4.01	0.32	313	4.12	6	4.07	9
870707	1830 24.76	37-15.45	121-37.90	4.97	3.79	102839	3.83	0.19	110	3.75	0.33	272	3.63	6	3.80	7
870731	2356 57.90	40-24.52	124-24.43	17.24	5.60	10083966	5.33	0.32	49	5.88	0.48	319	5.56	4		
870801	135 9.07	40-22.57	124-27.91	18.51	2.84	10084702	2.85	0.20	18	2.83	0.15	13				
870801	229 46.91	40-22.72	124-27.22	19.86	2.78	10084817	2.76	0.26	10	2.80	0.17	10	2.80	2		
870801	240 55.81	40-25.92	124-21.55	22.37	2.42	10084878	2.36	0.21	10	2.48	0.22	6	2.91	2		
870801	241 28.07	40-21.80	124-26.94	16.40	2.86	10084820	2.95	0.21	9	2.78	0.18	10				
870801	259 38.17	40-22.56	124-27.02	18.15	2.68	10084823	2.70	0.07	9	2.67	0.16	6				
870801	4 2 39.71	40-21.44	124-28.48	17.26	2.77	10084839	2.81	0.18	16	2.74	0.19	17	2.84	2		
870801	414 57.23	40-21.69	124-27.52	18.70	2.41	10084843	2.45	0.16	6	2.37	0.09	6				
870801	418 18.53	40-22.38	124-28.91	19.35	2.64	10084842	2.66	0.22	12	2.63	0.11	11				
870801	514 40.34	40-23.73	124-21.61	29.38	2.27	10084847	2.30	0.22	13	2.23	0.24	8				
870801	515 20.88	40-21.04	124-27.41	16.81	2.61	10084848	2.64	0.15	12	2.59	0.16	11				

Table A2 (continued)

DATE	TIME	LAT	LON	DEPTH	AMAG	CUSPID	MX	SDMX	NX	MF	SDMF	NF	MBK	NB	MZ	NZ
870801	649 10.00	40-22.30	124-27.63	18.48	2.39	10085016	2.43	0.18	13	2.34	0.13	11				
870801	710 14.56	40-22.28	124-25.43	17.51	2.47	10085018	2.51	0.20	14	2.44	0.16	10				
870801	753 25.57	40-26.78	124-19.49	21.39	2.14	10085020	2.23	0.27	7	2.05	0.20	5				
870801	812 30.36	40-21.13	124-28.93	19.21	2.39	10085021	2.35	0.17	8	2.42	0.21	5				
870801	9 2 13.54	38-18.30	122-13.02	1.83	1.69	10085025	1.61	0.16	11	1.76	0.26	7				
870801	1022 57.49	40-21.80	124-27.95	17.51	2.47	10085024	2.57	0.17	15	2.37	0.20	11				
870801	1057 28.09	40-26.85	124-21.87	19.89	1.97	10085060	2.13	0.22	10	1.81	0.25	5				
870801	1145 56.84	40-24.38	124-23.80	19.59	2.40	10085061	2.44	0.19	11	2.36	0.09	9				
870801	1612 46.18	40-24.38	124-22.82	19.52	2.51	10085066	2.48	0.24	12	2.54	0.13	12				
870801	1948 26.64	40-20.69	124-29.90	21.54	2.41	10085071	2.35	0.17	10	2.46	0.18	7				
870801	2143 8.86	40-21.50	124-27.74	17.76	2.65	10085073	2.69	0.17	14	2.62	0.16	17				
870801	2144 9.32	40-24.74	124-23.26	19.89	2.51	10085204	2.49	0.16	11	2.53	0.12	13				
870802	023 17.43	40-23.33	124-24.46	17.25	2.17	10085179	2.22	0.24	6	2.12	0.13	7				
870802	037 25.89	40-56.26	121-41.01	12.52	1.78	10085180	1.67	0.28	10	1.89	0.17	9				
870802	3 4 18.76	40-19.35	124-29.87	23.03	2.39	10085182	2.29	0.28	18	2.49	0.16	12				
870802	339 1.81	40-21.38	124-26.17	21.59	2.23	10085183	2.15	0.24	7	2.30	0.14	6				
870802	348 17.83	40-20.73	124-28.95	19.79	2.41	10085184	2.51	0.37	9	2.32	0.14	9				
870802	445 40.70	40-19.51	120-35.67	9.80	1.68	10085187	1.72	0.35	11	1.63	0.46	5				
870802	455 56.35	40-18.41	124-25.26	21.97	2.33	10085282	2.34	0.29	10	2.32	0.13	8				
870802	648 45.41	40-23.31	124-24.88	17.26	2.22	10085190	2.31	0.25	7	2.13	0.18	7				
870802	653 29.11	40-21.09	124-27.61	19.15	2.05	10085191	2.13	0.20	7	1.96	0.16	5				
870802	1040 27.37	40-23.04	124-25.11	24.07	2.17	10085207	2.05	0.33	9	2.30	0.15	6				
870802	1048 31.57	40-24.09	124-24.07	17.97	2.02	10085208	2.13	0.13	9	1.90	0.21	6				
870802	2114 10.22	40-22.73	124-25.08	17.65	1.98	10085212	2.10	0.25	6	1.86	0.26	5				
870803	254 23.40	40-21.54	124-26.71	18.03	2.71	10084707	2.79	0.13	10	2.64	0.20	14				
870803	1344 18.99	40-26.88	124-22.70	18.38	2.39	10084709	2.49	0.19	6	2.30	0.44	5				
870805	044 31.29	40-22.39	124-27.58	17.24	2.56	10084728	2.69	0.23	14	2.44	0.15	15				
870805	1 1 16.21	39-44.26	123-30.95	6.59	1.34	10084760	1.50	0.25	5	1.19	0.20	5				
870805	119 28.77	35-45.65	120-58.05	8.63	1.60	10084737	1.59	0.22	10	1.61	0.14	6				
870805	418 14.76	40-22.54	124-27.91	22.44	2.47	10084732	2.46	0.17	11	2.48	0.16	14				
870805	751 47.57	40-24.24	124-24.05	15.76	2.45	10084733	2.51	0.25	11	2.39	0.12	10				
870805	1125 41.24	40-22.17	124-28.35	17.66	2.38	10084734	2.36	0.17	13	2.39	0.17	6				
870805	2038 36.69	40-21.20	124-28.88	18.74	2.53	10084741	2.54	0.20	14	2.53	0.13	13				
870806	1711 50.66	40-22.45	124-28.95	18.29	2.74	10084748	2.81	0.19	14	2.67	0.16	14				
870806	1855 38.57	35-38.74	118-15.08	14.52	2.54	10084757	2.45	0.51	8	2.64	0.32	9				
870806	2047 3.37	40-28.12	121-38.99	15.97	2.08	10084752	1.98	0.28	13	2.18	0.31	11				
870806	2155 12.12	40-20.93	124-28.39	17.83	2.19	10084753	2.24	0.22	9	2.14	0.12	5				
870806	2316 5.06	40-22.15	124-30.70	19.23	2.42	10084755	2.45	0.22	8	2.38	0.15	8				
870806	2337 34.84	40-22.51	124-26.14	17.34	2.54	10084756	2.60	0.15	12	2.48	0.14	11				
870807	1522 33.20	40-21.60	124-30.18	17.46	2.46	10084766	2.49	0.17	17	2.44	0.14	12				
870809	655 5.29	35-46.40	118-22.09	7.54	2.56	10084777	2.58	0.36	11	2.54	0.52	8				
870809	1319 15.20	36-15.92	120- 9.73	7.44	1.81	10084779	1.74	0.31	15	1.89	0.37	10				
870809	1323 34.29	40-21.87	124-28.08	17.50	2.40	10084776	2.47	0.23	14	2.33	0.16	8				
870810	159 35.65	40-22.05	124-28.40	18.47	2.16	10084781	2.10	0.18	9	2.23	0.14	9				
870811	1340 4.42	40-22.96	124-26.99	18.25	2.34	10084788	2.39	0.20	15	2.29	0.11	8				
870812	355 40.01	35-48.52	118- 1.74	15.04	2.74	10084790	2.73	0.29	10	2.75	0.22	6				
870812	821 10.80	34-48.90	120- 7.44	0.01	2.46	10084909	2.37	0.22	9	2.55	0.15	8				
870826	949 46.33	37- 9.06	121- 9.84	2.29	3.59	10084619	3.58	0.26	31	3.60	0.30120		3.78	6	3.41	7
870901	220 34.34	40-48.54	124-58.71	24.86	3.12	10084975	3.05	0.20	20	3.18	0.19	22	2.72	2		
870902	15 4 26.32	40-30.62	124-26.31	23.81	2.42	10084976	2.42	0.33	17	2.42	0.12	7				
870905	17 1 15.12	40-25.41	124-24.23	18.47	3.15	10084981	3.22	0.20	20	3.09	0.19	22	3.06	2		
870906	1431 19.14	41- 5.78	125-15.94	25.54	3.00	10084984	3.07	0.24	19	2.93	0.14	14	3.54	2		
870908	14 0 48.38	40-30.37	124-16.68	19.05	2.75	10084987	2.72	0.15	12	2.78	0.17	14				
870908	2053 59.56	40-30.58	124-17.02	18.03	2.23	10084989	2.23	0.22	12	2.23	0.09	11				
870909	1228 11.35	41- 6.24	122- 9.35	12.52	1.79	10084993	1.58	0.37	14	1.99	0.21	13				
870909	1316 20.18	41- 6.11	122- 9.71	11.97	1.45	10084994	1.50	0.21	6	1.41	0.24	6				
870909	1339 14.74	40-21.73	124-23.99	12.89	2.21	10084995	2.33	0.28	14	2.08	0.18	8				
870909	1351 25.68	40-22.94	124-29.56	19.41	2.55	10084996	2.59	0.19	12	2.52	0.10	12				
870910	14 5 11.65	40-18.02	124-33.91	9.53	2.63	10085002	2.69	0.23	18	2.57	0.14	14				
870911	019 29.29	40- 6.92	123-48.77	21.70	2.06	10085007	2.14	0.26	9	1.98	0.16	9				
870911	10 8 25.00	40-27.45	124-19.86	19.29	2.41	10085008	2.52	0.11	8	2.30	0.13	11				
870912	652 44.10	40-20.06	124- 4.08	21.77	2.87	10085030	2.94	0.20	18	2.80	0.12	22				
870912	944 44.82	40- 9.91	121- 7.13	15.00	1.54	10085260	1.43	0.21	11	1.65	0.34	6				
870912	1247 28.87	40-26.68	125-16.64	22.04	3.15	10085033	3.18	0.25	23	3.11	0.16	23				
870916	0 7 34.58	40-19.67	124-37.25	22.44	3.49	10085040	3.47	0.19	35	3.51	0.31	45	3.39	4		
870918	733 36.82	40-29.97	124-17.44	19.35	2.68	10085050	2.64	0.19	13	2.71	0.24	14				
870925	455 22.23	40-19.46	122- 4.52	13.89	1.48	10085228	1.30	0.28	13	1.65	0.19	6				

Table A2 (continued)

DATE	TIME	LAT	LON	DEPTH	AMAG	CUSPID	MX	SDMX	NX	MF	SDMF	NF	MBK	NB	MZ	NZ
870925	5 0 23.76	40-18.67	122- 3.89	13.31	1.79	10085262	1.73	0.33	14	1.84	0.27	13				
870925	2016 31.02	40-18.82	122- 4.81	16.17	1.81	10085233	1.73	0.32	14	1.88	0.24	13				
871022	348 0.24	37-47.22	121-45.45	10.83	4.63	10085203	4.63	0.27	63	4.63	0.41	343	4.41	6	4.82	5
871028	1952 29.20	36-34.45	121-14.39	6.74	3.33	107751	3.35	0.34	84	3.31	0.32	155	3.34	4	3.24	5
871030	1255 21.81	40-19.91	123-41.24	28.69	2.63	10085447	2.38	0.25	10	2.89	0.11	7				
871031	1740 59.05	38-48.31	122-48.63	2.60	1.33	10085450	1.24	0.28	8	1.43	0.44	8				
871105	1232 20.71	38-47.84	122-47.74	2.06	1.55	10085469	1.48	0.20	13	1.63	0.23	13				
871106	1543 34.78	39-37.74	120-26.22	3.50	2.60	10085474	2.45	0.21	14	2.75	0.20	12				
871106	2347 6.10	36-44.51	121-36.21	0.00	2.14	10085517	2.19	0.26	38	2.10	0.19	38				
871107	4 0 20.56	37-24.61	121-40.19	3.61	2.59	10085477	2.58	0.21	21	2.59	0.20	40	2.48	4		
871107	1225 51.12	40-17.10	121-24.40	9.36	1.76	10085519	1.68	0.19	12	1.83	0.21	11				
871107	15 6 0.82	36-33.93	121-13.76	11.69	4.02	10085478	4.04	0.26	15	4.00	0.29	111	4.04	6	4.12	9
871107	2215 41.79	39-39.40	123-52.50	7.07	3.10	10085489	3.12	0.17	6	3.08	0.24	13	2.99	6		
871107	2316 52.30	38-49.00	122-48.02	3.08	1.94	10085490	2.08	0.32	6	1.80	0.18	6				
871108	0 4 51.48	40-32.08	121-38.52	10.11	0.87	10085500	0.87	0.27	5	0.88	0.36	5				
871108	154 18.51	37-29.15	118-23.05	8.14	1.65	10085496	1.56	0.11	5	1.74	0.42	6				
871108	259 56.80	38-49.46	122-47.45	1.74	1.91	10085502	1.89	0.19	7	1.93	0.25	9				
871108	3 0 56.59	38-49.09	122-47.51	1.93	2.78	10085509	2.87	0.27	17	2.68	0.24	8	2.70	4		
871108	344 17.24	36-15.68	118-13.95	25.22	2.65	10085494	2.32	0.26	17	2.97	0.39	19				
871108	656 44.62	40-54.22	122-11.88	9.95	1.94	10085501	1.74	0.30	16	2.14	0.23	13				
871108	718 39.28	37-34.23	118-50.06	9.86	1.83	10085498	1.71	0.30	7	1.95	0.42	13				
871108	11 9 50.84	37-33.37	118-26.73	8.13	1.76	10085499	1.62	0.25	5	1.91	0.37	7				
871108	2315 40.74	37-34.49	118-27.34	5.88	2.70	10085522	2.57	0.37	9	2.83	0.23	17				
871109	939 13.47	39-35.66	123- 3.84	1.79	2.23	10085510	2.19	0.16	7	2.27	0.15	8				
871109	1950 9.83	36- 1.42	121- 0.87	7.89	1.61	10085512	1.63	0.23	14	1.59	0.28	10				
871109	2117 21.12	37-19.22	122- 6.69	0.03	1.60	10085514	1.57	0.12	10	1.63	0.29	6				
871110	1716 37.66	38-16.87	122-16.07	0.04	1.82	10085577	1.77	0.25	13	1.88	0.24	14				
871112	846 33.04	40-33.23	124-52.93	22.22	2.80	10085580	2.80	0.26	19	2.79	0.14	8				
871113	8 1 56.16	39-24.74	123-16.10	3.50	2.39	10085581	2.49	0.13	10	2.28	0.17	10				
871113	16 8 19.74	39-25.85	122-56.92	3.44	2.51	10085582	2.62	0.22	18	2.41	0.17	22				
871115	516 45.65	41-43.23	126-16.67	1.75	3.35	10085587	3.52	0.19	16	3.17	0.14	7	3.53	4		
871118	1642 32.65	40-22.05	124-40.78	1.75	3.03	10085598	3.11	0.17	9	2.94	0.12	12	3.15	2		
871119	028 34.24	38-25.72	120-36.19	6.00	1.72	10085601	1.83	0.14	5	1.62	0.26	6				
871122	728 19.54	40- 7.91	122-47.65	0.37	2.24	10085607	2.30	0.35	21	2.18	0.14	13				
871123	346 21.51	38-48.82	122-48.99	2.91	2.06	10085792	2.11	0.16	13	2.01	0.21	21				
871123	530 11.32	39-19.52	120-19.47	12.96	1.96	10085793	1.82	0.13	10	2.10	0.16	5				
871125	3 5 46.45	40- 7.95	122-46.79	2.23	2.04	10085799	1.90	0.38	17	2.19	0.11	8				
871126	1548 2.52	40- 7.10	122-47.76	0.01	2.46	10085808	2.52	0.32	23	2.40	0.16	16				
871126	1715 34.19	40- 6.12	122-46.49	0.00	2.19	10085809	2.29	0.20	14	2.09	0.08	8				
871126	20 3 54.35	40- 6.83	122-46.30	3.50	2.13	10085812	2.20	0.25	18	2.07	0.10	10				
871127	735 4.47	39-34.74	123-24.33	2.04	1.55	10085832	1.69	0.12	9	1.40	0.23	5				
871129	1937 43.20	40-25.16	124-21.76	25.38	2.14	10085837	2.19	0.25	11	2.09	0.36	5				
871130	749 28.04	40-21.76	124-26.36	16.76	2.39	10085841	2.47	0.24	6	2.31	0.10	5				
871130	944 22.41	40-27.90	124-14.19	24.04	2.72	10085842	2.76	0.23	17	2.68	0.32	10				
871202	444 8.51	35-28.18	118-12.71	7.23	2.72	10085850	2.76	0.20	8	2.67	0.13	9				
871202	545 16.84	40-29.11	125-58.13	15.00	3.07	10085851	3.11	0.28	9	3.03	0.24	5				
871202	1114 55.56	37- 2.04	121-27.87	6.93	3.51	109392	3.54	0.26	118	3.48	0.25	244	3.67	6	3.35	6
871202	2325 28.31	40- 7.88	122-48.05	0.01	2.42	10085853	2.46	0.32	18	2.37	0.38	13				
871203	0 8 6.57	40- 7.86	122-49.87	5.17	2.30	10085854	2.39	0.30	11	2.21	0.18	9				
871203	024 30.31	40- 6.46	122-50.65	9.95	2.21	10085855	2.27	0.28	10	2.16	0.26	9				
871205	332 56.15	40- 7.50	122-46.56	3.21	2.15	10085862	2.06	0.31	12	2.23	0.08	6				
871205	436 46.68	35-31.25	118-45.08	9.26	2.73	10085864	2.70	0.30	22	2.75	0.31	18				
871206	043 17.35	40-43.20	124- 0.17	23.86	2.64	10085869	2.48	0.13	7	2.80	0.34	7				
871207	8 2 18.05	40-20.69	124-26.44	17.40	3.02	10085964	3.03	0.25	16	3.01	0.21	19	3.28	2		
871207	1118 1.87	40-21.35	124-25.86	17.98	2.58	10085965	2.59	0.19	7	2.57	0.16	11				
871207	1411 49.37	40-13.56	124-23.10	12.79	2.24	10085966	2.37	0.21	10	2.11	0.16	5				
871213	544 3.15	41- 5.27	121-59.23	11.08	1.54	10085978	1.49	0.28	8	1.59	0.14	5				
871214	1812 53.84	37-42.94	122-22.30	1.39	1.60	10085988	1.63	0.14	14	1.57	0.27	6				
871215	2249 48.07	36- 9.73	120-15.98	1.66	1.50	10085986	1.63	0.27	15	1.38	0.21	7				
871218	1932 23.26	36-42.33	121-24.53	1.37	2.90	10086006	2.83	0.48	17	2.97	0.37	71	2.54	4		
871219	947 49.34	39-54.73	122-55.58	2.68	2.33	10086010	2.29	0.23	14	2.37	0.19	13				
871222	253 29.72	36-42.58	120-46.75	1.98	1.83	10086097	1.81	0.21	15	1.86	0.24	13				
871222	4 7 36.26	36-39.24	120-39.73	8.35	1.84	10086099	1.79	0.21	13	1.88	0.23	6				
871222	1540 58.19	40-45.87	121-32.80	3.65	1.42	10086047	1.35	0.38	6	1.50	0.28	7				
871224	0 9 45.41	40- 7.98	121-18.53	13.37	1.30	10086052	1.29	0.22	7	1.31	0.38	5				
871224	1612 6.88	35-29.35	118-36.77	1.75	3.28	10086054	3.29	0.08	8	3.27	0.25	10				
871226	15 0 47.32	38-48.43	122-48.97	2.57	1.62	10086059	1.74	0.26	10	1.49	0.16	13				

Table A2 (continued)

DATE	TIME	LAT	LON	DEPTH	AMAG	CUSPID	MX	SDMX	NX	MF	SDMF	NF	MBK	NB	MZ	NZ
871226	2330 52.99	40-18.82	123-38.65	17.46	2.42	10086061	2.34	0.25	14	2.49	0.16	8				
871228	1640 39.70	38- 1.64	118-52.82	11.81	1.83	10086066	1.82	0.41	11	1.85	0.45	7				
871228	21 9 50.98	38-49.00	122-47.75	3.57	2.49	10086067	2.56	0.16	22	2.43	0.24	30				
871228	2115 11.77	38-32.14	122-19.32	1.47	1.82	10086068	1.80	0.27	10	1.84	0.15	13				
871228	2254 34.45	38-47.75	122-48.02	2.51	1.68	10086069	1.59	0.24	9	1.77	0.19	10				
871229	13 0 4.38	38- 0.87	118-53.38	12.00	2.04	10086070	2.01	0.35	12	2.07	0.42	12				
880102	315 20.76	37- 7.08	121-31.09	7.22	3.42	110408	3.44	0.26	131	3.41	0.28	227	3.54	6	3.25	5
880102	14 4 52.46	39-29.84	121-14.70	15.97	1.32	10086120	1.25	0.24	7	1.39	0.10	5				
880106	1954 34.28	36-23.21	121- 1.22	6.42	1.96	10086135	1.96	0.40	26	1.96	0.42	21				
880106	2249 48.40	36-46.55	120-53.20	6.36	4.34	110574	4.40	0.20	50	4.28	0.34	300	4.47	6	4.26	12
880108	2250 31.07	40- 7.34	119-59.81	1.68	2.85	10086141	2.91	0.29	17	2.78	0.23	16	2.61	2		
880109	031 17.66	38-54.36	121- 1.09	4.65	1.43	10086142	1.69	0.25	6	1.16	0.28	5				
880112	114 0.78	36-45.60	120-53.26	4.30	1.62	10086219	1.60	0.35	19	1.64	0.38	18				
880112	4 8 49.58	36-28.70	121- 6.69	4.17	2.11	10086278	2.08	0.43	15	2.14	0.41	30				
880112	4 9 56.00	36-29.01	121- 6.59	3.25	0.98	10086283	1.00	0.33	10	0.97	0.29	8				
880112	1014 37.93	36-46.89	120-52.88	8.89	1.91	10086279	1.94	0.23	15	1.89	0.29	33				
880112	1545 23.80	38-37.33	122-17.69	1.89	1.43	10086224	1.48	0.20	8	1.38	0.18	7				
880112	1553 31.93	38-35.90	122-16.80	10.13	1.33	10086225	1.45	0.31	6	1.20	0.15	6				
880112	1648 53.09	36-34.20	121-13.53	5.24	1.81	10086280	1.81	0.48	17	1.80	0.37	29				
880113	9 2 6.48	40- 1.32	121-15.54	3.50	1.80	10086226	1.74	0.30	10	1.85	0.44	7				
880113	1644 50.06	37-35.46	118-28.86	7.61	2.04	10086227	1.80	0.27	10	2.29	0.50	10				
880115	950 6.48	38-49.10	122-47.29	2.57	1.59	10086238	1.66	0.20	6	1.53	0.46	12				
880116	1014 40.13	39-18.33	123-12.79	5.45	2.27	10086243	2.35	0.28	7	2.20	0.25	10				
880118	529 35.43	40-24.01	124-21.92	22.54	2.92	10086244	2.91	0.20	11	2.93	0.14	15				
880119	1218 47.78	40-16.30	124-25.67	1.40	2.37	10086247	2.38	0.29	7	2.35	0.21	5				
880121	4 6 44.99	40-17.35	124-23.69	2.85	2.08	10086249	2.19	0.30	8	1.97	0.24	7				
880121	557 43.64	41-47.92	124-36.33	22.66	2.57	10086250	2.67	0.11	5	2.47	0.06	5				
880123	1027 52.90	40-15.05	124-10.15	2.79	1.97	10086428	2.14	0.25	6	1.80	0.22	7				
880126	834 40.36	40-23.68	124-24.63	15.16	2.13	10086436	2.29	0.22	6	1.98	0.11	6				
880126	1254 11.33	41-47.61	124-19.28	11.54	2.68	10086438	2.84	0.22	5	2.53	0.08	5				
880127	952 58.77	34-20.50	119-29.40	7.39	2.31	10086444	2.35	0.14	9	2.26	0.11	8				
880129	621 31.45	39-49.70	123-29.36	0.00	2.23	10086449	2.30	0.18	14	2.17	0.19	13				
880129	2127 44.65	40-23.79	124-26.04	20.66	2.21	10086451	2.33	0.23	6	2.08	0.18	6				
880203	856 49.01	39-48.06	123-11.48	0.01	2.37	10086529	2.57	0.30	13	2.18	0.16	17				
880203	1024 1.05	40-22.52	122- 6.98	12.32	1.62	10086530	1.43	0.36	9	1.82	0.18	6				
880204	838 23.40	40-24.30	124-59.63	25.03	2.66	10086531	2.60	0.31	23	2.73	0.13	9				
880204	2257 22.31	38-49.29	122-23.98	2.20	2.45	10086535	2.38	0.25	47	2.52	0.25	36				
880204	2340 11.00	40-15.07	124-11.30	8.01	2.22	10086537	2.36	0.22	16	2.08	0.18	14				
880205	1547 26.17	40-48.09	123-26.79	24.87	2.05	10086539	2.10	0.27	8	2.01	0.20	5				
880205	1647 12.13	40-43.62	125-16.89	22.05	2.47	10086540	2.55	0.26	13	2.40	0.17	5				
880208	5 0 14.22	40-25.66	124-22.43	17.54	1.86	10086553	2.00	0.26	6	1.71	0.30	5				
880208	14 9 15.08	37-19.41	121-41.14	8.91	3.81	111957	3.81	0.20	115	3.80	0.30	295	3.89	6	3.74	5
880210	2229 35.47	36-50.04	118-19.03	0.01	2.03	10086563	1.90	0.39	6	2.15	0.43	8				
880212	14 0 40.59	35-56.46	119-46.31	16.94	2.04	10086570	1.88	0.21	17	2.20	0.29	7				
880212	2020 9.60	35-37.42	121- 6.14	3.51	1.89	10086582	1.83	0.33	15	1.96	0.29	14				
880213	1159 6.26	40-52.73	125-30.97	22.14	2.87	10086586	3.07	0.29	19	2.66	0.20	8				
880213	1422 5.08	40-30.43	124-18.22	5.38	1.91	10086587	2.03	0.20	6	1.79	0.15	6				
880215	324 12.37	39-30.16	123- 0.09	3.10	1.93	10086604	2.16	0.24	10	1.71	0.21	5				
880215	324 47.13	39-30.66	123- 0.23	2.42	1.80	10086591	1.91	0.24	9	1.69	0.19	10				
880215	1326 10.75	40-24.47	124-25.76	18.92	2.21	10086595	2.31	0.23	9	2.12	0.16	7				
880216	049 39.12	40-14.47	124- 7.58	11.03	2.06	10086605	2.17	0.24	9	1.95	0.20	10				
880216	256 40.44	40-14.08	124- 7.53	9.15	2.27	10086601	2.34	0.20	9	2.20	0.23	10				
880217	1014 44.36	38-47.27	122-45.63	1.83	2.07	10086625	2.08	0.14	13	2.05	0.21	21				
880217	1941 58.30	40-44.82	122-19.10	6.82	1.71	10086626	1.63	0.21	8	1.79	0.20	5				
880218	1648 51.84	40-21.48	124-25.82	11.97	2.37	10086628	2.49	0.23	10	2.25	0.21	11				
880220	839 57.21	36-47.89	121-18.55	11.47	4.77	10086194	4.77	0.25	37	4.76	0.34	368	5.09	8	4.98	12
880220	2320 43.84	40-18.29	124-32.48	8.54	2.32	10086635	2.30	0.18	12	2.33	0.13	10				
880222	743 14.01	35-29.20	119-44.59	18.45	4.33	112690	4.34	0.24	125	4.33	0.25	273	4.34	6	4.62	3
880222	2257 14.40	38-49.27	122-23.40	1.35	2.24	10086668	2.24	0.23	16	2.24	0.24	21				
880224	012 32.26	40-24.78	124-29.31	18.69	2.42	10086674	2.40	0.30	18	2.45	0.12	14				
880224	1540 56.76	41-11.18	122- 7.72	10.97	1.37	10086675	1.23	0.15	6	1.50	0.18	6				
880224	21 5 14.01	40-32.81	125-58.26	22.01	2.89	10086676	2.87	0.20	17	2.90	0.18	6				
880225	5 5 2.55	41-29.22	121-57.32	13.86	1.76	10086684	1.55	0.18	7	1.98	0.56	5				
880225	647 21.09	41-29.37	121-57.89	9.98	1.94	10086693	1.82	0.22	7	2.06	0.32	10				
880225	15 8 38.33	40-28.18	124-13.92	0.00	1.57	10086705	1.56	0.19	7	1.57	0.08	5				
880225	2126 48.57	40-29.86	124-16.74	22.82	2.01	10086708	1.98	0.33	11	2.04	0.15	6				
880228	6 7 10.59	35-57.23	120-33.02	10.07	1.36	10086282	1.45	0.28	14	1.26	0.26	12				

Table A2 (continued)

DATE	TIME	LAT	LON	DEPTH	AMAG	CUSPID	MX	SDMX	NX	MF	SDMF	NF	MBK	NB	MZ	NZ
880301	255 34.24	40-29.10	124-18.57	19.96	2.22	10086720	2.22	0.37	18	2.22	0.19	9				
880301	1716 31.64	40-24.52	124-26.37	19.38	2.57	10086721	2.58	0.35	16	2.55	0.15	16				
880304	1730 11.27	41-19.73	122- 9.60	12.80	1.52	10086730	1.40	0.16	6	1.64	0.24	6				
880306	3 4 44.01	41-42.00	125-33.27	12.03	2.96	10086753	3.04	0.31	20	2.88	0.27	8				
880306	726 52.99	39-21.86	122-49.95	1.16	1.62	10086754	1.84	0.31	12	1.40	0.28	5				
880306	1452 12.71	40-32.36	123-27.72	8.41	2.71	10086756	2.61	0.19	13	2.81	0.35	11				
880311	1834 31.69	38-48.67	122-47.09	3.55	3.03	10086803	3.13	0.21	11	2.92	0.32	50	2.84	4		
880311	1854 23.85	38-44.60	119-54.02	3.50	2.09	10086804	1.93	0.27	24	2.25	0.28	17				
880313	648 32.88	41-12.33	124-14.96	7.33	2.27	10086806	2.32	0.44	9	2.23	0.12	9				
880315	1235 49.24	41- 3.08	124-54.28	3.63	2.63	10086810	2.67	0.36	22	2.58	0.16	7				
880316	618 50.56	36-33.28	121-12.26	5.02	3.28	10086503	3.36	0.24	7	3.20	0.35	120	3.18	4		
880316	620 38.24	36-33.51	121-12.79	4.80	1.67	10086816	1.68	0.28	21	1.65	0.27	21				
880319	0 8 7.15	38-15.98	122-16.04	0.00	1.70	10086826	1.61	0.31	10	1.80	0.43	5				
880320	2159 3.95	35-41.88	118- 0.69	13.90	2.30	10086924	2.31	0.28	9	2.29	0.35	7				
880321	3 3 16.73	40-24.40	125-26.01	22.11	4.01	10086488	4.11	0.21	24	3.90	0.25	85	3.99	4		
880321	313 51.05	40-27.31	125-14.74	10.13	2.91	10086927	3.00	0.23	32	2.82	0.16	23				
880321	419 3.90	40-27.67	121-32.02	4.87	1.09	10086943	0.81	0.24	6	1.36	0.38	5				
880321	425 11.75	40-27.60	121-31.87	4.85	1.11	10086492	0.97	0.22	7	1.26	0.24	8				
880322	1019 29.09	41-10.39	124-16.68	8.59	2.40	10086973	2.60	0.42	10	2.20	0.17	7				
880322	2335 8.97	36-49.50	121-35.09	4.58	2.91	10086974	2.87	0.39	23	2.95	0.33	77	2.96	4		
880322	2352 36.89	40-26.64	124-30.15	27.54	2.60	10086975	2.70	0.32	22	2.50	0.48	16				
880323	019 8.19	40-27.42	124-30.71	28.10	2.66	10086976	2.70	0.26	19	2.63	0.11	16				
880324	549 2.73	40-27.18	124-14.30	0.01	1.92	10086981	1.93	0.25	6	1.90	0.21	6				
880325	2226 55.60	41-36.98	125- 8.80	1.76	2.63	10086986	2.64	0.31	17	2.62	0.21	7				
880331	1110 36.31	40- 4.89	123- 3.09	46.23	2.28	10087084	2.05	0.28	41	2.50	0.16	17				
880331	1146 49.51	40-23.55	123- 5.51	44.35	2.32	10087085	2.22	0.25	10	2.43	0.21	6				
880403	1127 43.13	40-37.15	124-39.99	28.93	2.38	10087090	2.46	0.23	23	2.31	0.23	7	2.52	2		
880404	1843 47.08	37- 2.68	122- 7.88	0.01	1.55	10087093	1.63	0.41	11	1.46	0.11	6				
880404	2042 0.20	36-17.40	120-25.60	11.59	3.88	10086623	3.90	0.28	132	3.86	0.25	280	3.56	6	3.71	5
880404	2045 48.03	36-17.47	120-25.11	11.70	3.69	115142	3.66	0.29	122	3.72	0.28	235	3.68	6	3.51	3
880405	1444 26.04	40-26.42	125-20.55	22.14	2.68	10087135	2.64	0.22	21	2.72	0.27	9				
880406	5 3 8.30	40-26.32	125-21.12	22.14	2.71	10087138	2.76	0.24	25	2.66	0.12	8				
880408	1354 27.91	40-26.93	124-14.19	0.01	1.61	10087141	1.66	0.15	6	1.57	0.11	5				
880408	1753 20.94	38-48.49	122-46.95	1.04	1.88	10087142	1.84	0.23	11	1.92	0.17	13				
880409	210 57.52	40-22.85	123-34.63	24.31	1.99	10087143	1.92	0.24	8	2.05	0.24	6				
880413	239 26.46	35- 2.40	119- 9.45	4.68	2.26	10087158	2.17	0.23	9	2.34	0.14	10				
880413	1056 32.07	40-35.57	123-56.28	24.49	1.86	10087151	1.80	0.40	11	1.92	0.20	6				
880413	1340 36.37	39-43.98	123-33.30	1.75	1.55	10087152	1.65	0.28	13	1.46	0.22	8				
880415	2031 32.13	38-26.04	120-36.48	3.71	1.67	10087163	1.89	0.43	10	1.45	0.22	5				
880416	518 55.13	40-19.49	124-29.94	26.41	2.48	10087164	2.48	0.24	29	2.48	0.16	9				
880417	22 2 38.98	42-12.09	125-52.17	1.74	3.28	10087170	3.50	0.13	8	3.06	0.47	7	3.51	2		
880417	2248 22.01	39-56.38	123-34.57	2.10	2.06	10087171	2.14	0.19	22	1.98	0.17	13				
880418	2129 38.98	40-27.00	124-14.05	0.00	1.86	10087177	1.90	0.23	9	1.82	0.16	6				
880418	2333 47.74	40-27.50	124-13.68	0.01	1.86	10087178	1.97	0.17	8	1.75	0.16	7				
880419	211 43.52	40-25.23	125- 9.89	22.03	2.78	10087180	2.79	0.22	35	2.77	0.17	11				
880419	844 14.59	40-29.30	124-16.02	23.27	4.14	10086854	4.21	0.23	53	4.07	0.22	190	4.09	8		
880422	234 45.44	39-43.51	122- 5.16	24.35	1.66	10087192	1.62	0.19	11	1.70	0.49	5				
880422	2040 4.06	36- 5.86	120-10.02	2.04	1.51	10087196	1.59	0.24	13	1.42	0.28	5				
880427	1556 35.38	40-24.57	121-57.60	13.80	1.67	10087210	1.62	0.21	17	1.71	0.25	13				
880428	2259 30.72	38-32.82	122-40.80	2.63	2.19	10087212	2.19	0.22	28	2.19	0.17	31				
880430	2234 15.46	40-23.10	124-13.78	23.73	2.21	10087286	2.33	0.28	10	2.10	0.14	7				
880501	528 50.99	40-46.42	124-25.73	18.79	2.50	10087287	2.42	0.23	9	2.58	0.23	7				
880502	1819 34.06	38-16.06	122-15.63	0.01	1.81	10087291	1.78	0.21	9	1.84	0.36	8				
880504	021 27.57	36-43.30	120-45.58	1.75	3.27	10087048	3.23	0.28	49	3.30	0.18	105	3.09	4		
880506	944 12.18	41-13.89	123-30.70	29.89	2.23	10087316	2.13	0.37	12	2.32	0.20	8				
880506	18 4 42.72	40-20.68	124-34.30	23.74	2.75	10087321	2.67	0.30	26	2.83	0.15	22				
880507	1922 15.33	40-28.09	125-28.80	22.04	2.67	10087324	2.73	0.23	29	2.61	0.14	7				
880508	2354 59.05	40-18.74	124-30.62	23.47	2.61	10087326	2.62	0.28	27	2.61	0.10	19				
880512	530 53.68	40-26.39	124-22.17	16.24	2.02	10087338	2.19	0.26	10	1.85	0.25	7				
880512	830 51.62	37-34.00	118-51.67	11.24	3.25	10087341	3.31	0.29	16	3.19	0.25	32				
880513	052 31.47	40-15.37	124-15.88	10.29	3.37	10087344	3.42	0.21	30	3.33	0.29	49	3.27	4		
880513	1754 37.65	39-40.29	120-59.35	17.22	1.93	10087345	1.69	0.27	11	2.16	0.32	10				
880513	23 0 33.89	40-25.05	124-25.28	20.41	2.08	10087346	2.15	0.11	7	2.00	0.27	7				
880513	2356 9.39	39-44.02	123-13.50	0.01	1.69	10087348	1.86	0.18	20	1.52	0.11	10				
880514	922 23.99	39-38.80	120-23.30	1.28	2.18	10087349	1.97	0.29	15	2.39	0.17	8				
880518	349 41.06	41-16.25	124-13.84	0.38	2.50	10087355	2.64	0.20	6	2.37	0.12	10				
880520	2120 44.56	40-30.18	124-28.14	23.39	1.91	10087398	1.86	0.19	5	1.95	0.30	5				

Table A2 (continued)

DATE	TIME	LAT	LON	DEPTH	AMAG	CUSPID	MX	SDMX	NX	MF	SDMF	NF	MBK	NB	MZ	NZ
880602	422 32.14	39-24.97	121-29.06	4.65	1.27	10087441	1.17	0.29	10	1.37	0.25	5				
880602	1513 46.24	38-47.63	122-49.03	1.65	2.83	10087444	2.74	0.11	5	2.92	0.26	49	2.79	4		
880603	543 43.93	39-26.80	120-26.60	9.89	1.82	10087446	1.71	0.19	11	1.94	0.16	5				
880604	2055 6.24	40-47.90	124-20.59	22.31	2.08	10087456	2.17	0.27	11	2.00	0.15	5				
880605	158 52.21	35- 8.20	119-15.95	15.39	1.99	10087460	1.86	0.23	8	2.11	0.13	8				
880606	120 14.01	36-21.73	120-59.86	3.56	1.46	10087461	1.39	0.31	15	1.52	0.26	13				
880607	1551 27.08	36-32.84	121- 9.68	8.12	2.56	10087465	2.56	0.26	27	2.56	0.21	68	2.51	2		
880608	2320 17.23	38-54.68	121- 1.19	5.93	1.34	10087468	1.75	0.29	7	0.93	0.32	5				
880609	839 34.29	40-32.51	124-27.18	26.87	2.27	10087469	2.37	0.26	13	2.17	0.21	8				
880611	2336 55.83	39-26.56	120-27.69	9.33	1.91	10087487	1.74	0.12	9	2.08	0.63	5				
880613	145 36.57	37-23.24	121-44.44	8.33	5.11	10087352	5.13	0.44	20	5.09	0.41	383	5.14	3	5.35	11
880613	156 39.81	37-21.25	121-42.35	8.58	1.86	10087489	1.96	0.31	34	1.77	0.31	40				
880613	1731 16.84	40-13.80	124-10.19	4.09	2.76	10087491	2.84	0.14	16	2.69	0.15	21				
880614	1956 12.82	38-16.38	122-15.64	0.01	1.64	10087496	1.53	0.19	13	1.74	0.37	5				
880614	2040 30.41	38-16.24	122-16.06	0.00	1.93	10087497	1.93	0.18	20	1.92	0.28	14				
880616	1152 54.27	40-27.07	124-21.62	20.29	2.45	10087505	2.45	0.24	11	2.45	0.21	15				
880616	13 1 39.15	41-44.98	125-26.81	1.75	3.05	10087506	3.16	0.30	17	2.94	0.28	14				
880616	13 3 57.54	36-39.67	121-19.96	2.49	1.31	10087509	1.31	0.27	13	1.30	0.25	17				
880619	1319 3.05	40-27.50	121-33.39	4.85	0.37	10087544	0.31	0.10	5	0.44	0.24	5				
880619	2011 27.35	38-47.52	121-12.06	11.94	1.24	10087548	1.32	0.17	6	1.17	0.24	5				
880620	1526 37.93	37- 7.54	121-31.33	8.12	3.87	119292	3.92	0.24	124	3.83	0.26	317	4.08	6	3.70	10
880626	754 25.08	37-27.99	121-47.79	6.00	3.44	10087474	3.46	0.21	173	3.43	0.24	248	3.22	4	3.42	5
880627	1843 22.19	37- 6.50	121-54.69	12.78	4.81	10139668	4.73	0.33	40	4.88	0.38	363	4.95	2	5.08	9
880701	1951 9.29	40-38.87	124-41.35	25.49	3.15	10087641	3.27	0.29	26	3.04	0.22	33	3.41	2		
880702	1542 19.13	40-17.96	124-35.12	22.02	2.30	10087644	2.25	0.29	17	2.36	0.13	11				
880704	252 54.10	40-18.05	124-35.81	21.55	2.95	10087646	2.89	0.22	33	3.00	0.21	21				
880704	1731 51.29	37-32.29	118-52.21	4.30	0.73	10087648	0.62	0.20	9	0.84	0.31	6				
880705	1020 12.71	37- 3.51	118-21.46	1.16	1.54	10087649	1.37	0.12	7	1.71	0.47	7				
880706	2123 32.64	40-39.56	123-21.09	28.40	2.44	10087656	2.43	0.32	11	2.44	0.12	13				
880707	1212 41.36	40-42.76	124-22.71	0.00	2.45	10087657	2.59	0.21	16	2.31	0.15	9				
880707	2237 46.66	40-42.54	124-21.07	4.55	1.96	10087663	2.11	0.22	9	1.81	0.13	5				
880709	725 58.36	41- 1.07	123-24.96	22.85	2.34	10087686	2.20	0.29	17	2.48	0.19	10				
880709	854 1.45	40-26.37	124-35.54	23.53	2.50	10087687	2.40	0.25	12	2.59	0.16	7				
880710	1152 34.49	40-23.12	124-36.41	23.97	2.75	10087695	2.90	0.33	25	2.61	0.37	18				
880710	1753 50.62	40-16.47	121-25.89	5.52	1.26	10087697	1.36	0.21	6	1.16	0.15	7				
880710	1940 44.69	40-17.13	121-25.49	8.92	1.32	10087702	1.25	0.25	7	1.39	0.15	9				
880714	457 19.82	40-31.39	125-51.10	18.01	3.02	10087719	3.19	0.25	30	2.85	0.17	13				
880715	0 6 4.65	40-45.18	122-19.21	6.02	1.75	10087720	1.66	0.18	8	1.85	0.30	6				
880716	1717 11.88	38-49.72	122-46.07	2.81	2.10	10087725	2.12	0.19	23	2.07	0.22	29				
880717	1416 35.34	40-55.65	122-21.45	10.25	1.43	10087727	1.34	0.22	7	1.52	0.19	5				
880717	2128 49.05	39-14.41	122-44.06	3.70	1.86	10087732	1.92	0.32	8	1.81	0.12	5				
880720	543 54.04	40-42.46	124-21.32	0.01	2.01	10087739	2.10	0.32	10	1.93	0.17	7				
880721	855 14.55	39-26.65	120-26.68	7.42	2.11	10087749	2.03	0.30	17	2.20	0.23	11				
880722	715 49.48	40-45.40	124-14.86	11.08	2.04	10087753	2.13	0.29	10	1.95	0.17	7				
880723	2326 26.25	37-11.56	121-33.85	10.71	1.43	10087519	1.58	0.28	24	1.27	0.27	13				
880724	028 50.73	35-57.73	120-33.07	4.52	0.99	10087522	0.93	0.26	12	1.05	0.19	8				
880724	2 7 42.19	37-36.44	118-53.94	4.10	0.65	10087523	0.52	0.20	6	0.78	0.19	5				
880725	2156 41.41	38-49.49	122-23.65	1.45	1.72	10087768	1.56	0.24	22	1.87	0.17	7				
880726	326 55.72	36-33.24	121-10.91	3.48	4.46	10087527	4.46	0.14	17	4.46	0.36	285	4.59	8	4.56	11
880726	348 35.75	36-33.62	121-10.74	3.40	3.47	10087528	3.40	0.23	13	3.53	0.22	172	3.34	6		
880726	843 45.96	36-33.23	121-10.81	3.80	1.04	10087564	1.13	0.36	9	0.95	0.22	7				
880726	921 29.88	37- 9.90	121-33.58	6.91	0.84	10087579	1.01	0.28	13	0.68	0.17	5				
880726	921 52.42	36-34.11	121-10.43	4.82	0.95	10087566	0.96	0.39	8	0.94	0.15	7				
880726	922 25.20	36-33.58	121-10.86	4.81	0.80	10087578	0.91	0.18	7	0.70	0.25	6				
880726	950 7.48	36-33.92	121-10.47	4.42	1.00	10087567	0.97	0.27	9	1.03	0.24	8				
880726	1043 9.20	36-33.86	121-11.02	4.58	1.01	10087568	1.07	0.40	6	0.94	0.17	6				
880726	1047 44.95	36-33.40	121-10.80	4.25	0.86	10087569	0.92	0.25	5	0.81	0.26	6				
880726	1057 36.15	36-33.88	121-11.01	3.84	1.47	10087570	1.54	0.21	14	1.40	0.33	17				
880726	1059 16.97	36-33.36	121-11.91	3.50	1.02	10087571	1.00	0.40	12	1.03	0.26	9				
880726	1248 25.21	36-33.81	121-10.61	4.28	1.11	10087572	1.19	0.32	8	1.02	0.46	9				
880726	1256 9.53	36-34.09	121-10.42	4.31	1.31	10087573	1.24	0.33	10	1.38	0.42	12				
880726	13 7 20.67	36-32.95	121-11.01	3.00	0.65	10087530	0.75	0.52	5	0.54	0.39	5				
880726	1322 16.55	36-33.37	121-11.25	3.69	0.74	10087532	0.68	0.35	5	0.79	0.39	6				
880726	1338 48.55	36-33.45	121-11.15	3.86	2.27	10087634	2.23	0.17	11	2.30	0.28	54				
880726	1341 56.13	36-33.67	121-11.02	4.75	1.12	10087635	1.08	0.40	11	1.17	0.46	9				
880726	1342 56.03	36-34.31	121-10.78	4.76	1.30	10087636	1.24	0.41	10	1.35	0.53	10				
880727	937 29.46	36-33.82	121-10.28	4.17	1.14	10087583	1.25	0.31	11	1.04	0.37	11				

Table A2 (continued)

DATE	TIME	LAT	LON	DEPTH	AMAG	CUSPID	MX	SDMX	NX	MF	SDMF	NF	MBK	NB	MZ	NZ
880727	938 47.47	36-33.62	121-11.11	4.56	1.06	10087593	1.23	0.38	11	0.90	0.24	9				
880727	10 9 15.21	36-53.45	121-19.02	6.28	1.04	10087584	1.13	0.28	15	0.94	0.20	8				
880727	1011 27.50	36-33.46	121-10.92	4.61	2.53	10087585	2.43	0.17	21	2.63	0.24	84				
880727	1032 20.09	36-33.68	121-10.88	4.73	1.22	10087587	1.31	0.32	7	1.14	0.22	11				
880727	1032 52.74	36-33.56	121-10.83	4.54	0.83	10087596	0.87	0.22	8	0.78	0.09	7				
880727	1038 16.13	36-33.42	121-10.93	4.59	2.05	10087589	2.04	0.19	6	2.06	0.28	48				
880727	1054 47.65	36-33.43	121-11.04	4.02	2.59	10087590	2.59	0.18	21	2.60	0.23	104				
880727	1055 59.53	36-33.73	121-11.12	4.26	1.14	10087597	1.29	0.40	9	1.00	0.33	8				
880727	11 4 48.46	36-33.53	121-10.94	4.39	0.87	10087591	0.95	0.29	8	0.78	0.09	7				
880727	15 7 49.81	37-22.64	121-43.54	8.46	1.86	10087534	1.91	0.31	61	1.82	0.30	49				
880727	1657 26.53	36-33.40	121-10.82	4.21	1.73	10087577	1.82	0.23	14	1.63	0.35	22				
880727	1657 40.10	36-33.49	121-10.71	3.32	3.63	10087576	3.56	0.20	28	3.70	0.34	194	3.57	4		
880802	423 27.96	40-17.48	124-30.43	22.29	1.79	10087806	1.85	0.18	15	1.73	0.14	5				
880802	1227 34.76	35-55.30	121-30.96	7.28	1.44	10087805	1.36	0.32	34	1.53	0.25	6				
880803	1434 18.37	40-41.58	124-12.29	1.29	1.78	10087837	1.81	0.23	15	1.75	0.23	7				
880805	151 49.87	40-59.29	124-10.38	20.43	2.07	10087842	1.99	0.24	9	2.16	0.26	8				
880805	937 55.96	36-36.22	121- 8.32	4.35	0.88	10087675	0.96	0.24	8	0.81	0.19	5				
880805	1156 43.77	37-28.47	121-47.83	6.17	2.46	10087681	2.53	0.25	22	2.39	0.25	118				
880805	1158 29.79	37-28.48	121-47.82	6.25	1.61	10087711	1.76	0.27	11	1.45	0.32	28				
880810	1824 52.41	36-25.67	117-51.05	16.20	4.29	10087712	4.46	0.21	53	4.13	0.30	119	4.63	2		
880810	1827 2.82	36-26.44	117-49.56	19.38	3.92	10087713	3.99	0.39	17	3.85	0.21	49	4.27	2		
880811	8 0 56.30	41-47.33	125- 1.36	3.13	3.48	10087923	3.44	0.28	14	3.52	0.43	40	3.43	2		
880811	1810 49.81	40-28.29	124-19.12	20.63	1.77	10087867	1.73	0.32	7	1.81	0.24	6				
880812	819 27.77	40-21.20	124-25.98	16.35	1.94	10087868	1.98	0.18	22	1.90	0.14	7				
880812	1937 11.26	40-40.93	125-17.63	22.19	4.31	10087714	4.31	0.22	17	4.31	0.27	117	4.40	6		
880815	1432 26.63	36-33.27	121-11.81	3.44	1.27	10087881	1.27	0.18	17	1.27	0.39	14				
880821	10 6 45.40	36- 9.59	120-17.40	1.96	2.10	10087896	2.06	0.26	15	2.15	0.27	29				
880901	1511 45.52	40-35.64	123-36.82	24.22	2.16	10087943	2.27	0.23	9	2.06	0.13	8				
880903	310 39.88	40-50.54	125- 9.85	22.10	2.57	10087949	2.62	0.28	11	2.51	0.17	7				
880903	1814 18.44	35-24.22	119-57.00	10.70	1.88	10087951	1.94	0.26	6	1.81	0.20	5				
880904	148 27.44	40-30.86	123-30.75	0.01	1.79	10087953	1.90	0.32	11	1.69	0.22	5				
880904	9 1 32.84	40-13.66	123-28.26	0.00	2.49	10087954	2.52	0.23	12	2.45	0.14	15				
880906	2 6 46.91	39-34.25	123-33.92	1.81	1.90	10087965	2.00	0.23	14	1.81	0.14	11				
880906	328 20.56	41-23.29	124-58.59	25.26	2.87	10087966	2.83	0.28	21	2.91	0.23	14				
880906	1947 22.83	40-44.46	124-10.92	17.07	2.97	10087972	2.92	0.20	24	3.02	0.18	27				
880907	1759 48.09	40- 7.71	122-47.91	3.85	2.08	10087974	2.21	0.26	8	1.94	0.17	5				
880909	913 16.55	40-30.22	124- 8.21	19.94	1.77	10087977	1.87	0.23	13	1.68	0.28	9				
880911	132 52.01	40-32.89	124-13.71	20.22	2.16	10087981	2.16	0.31	12	2.16	0.19	9				
880915	16 7 52.36	37-16.52	121-36.92	6.44	3.09	10087994	3.04	0.18	18	3.15	0.31	66	3.31	4		
880916	2212 49.85	37- 1.34	122- 9.53	0.01	1.74	10088009	1.86	0.31	12	1.62	0.31	8				
880917	948 51.94	40-22.58	125-32.50	22.22	3.01	10088011	3.01	0.21	32	3.01	0.12	15				
880918	419 42.29	40-23.65	124-21.96	22.37	2.15	10088030	2.22	0.22	7	2.08	0.20	6				
880921	610 10.33	40-26.58	125-41.54	21.99	2.70	10088020	2.78	0.21	15	2.61	0.21	5				
880921	743 23.32	40-36.53	123-42.90	26.94	2.35	10088022	2.39	0.14	9	2.31	0.19	10				
880921	2048 52.22	40-48.48	125- 3.05	22.14	2.89	10088024	2.88	0.20	26	2.90	0.25	17				
880921	2339 38.09	40-17.40	124-21.64	0.13	2.30	10088026	2.27	0.27	17	2.33	0.24	12				
880923	1140 18.78	40-23.47	125-54.17	22.07	2.87	10088070	2.91	0.26	19	2.83	0.19	5				
880924	1339 34.68	40-17.30	124-21.59	6.46	2.03	10088076	2.10	0.23	18	1.96	0.21	10				
880926	0 8 22.91	40-27.41	121-33.68	2.22	0.37	10088102	0.20	0.13	5	0.55	0.12	5				
880926	013 25.46	40-26.90	121-33.52	5.85	0.67	10088103	0.73	0.11	6	0.61	0.15	5				
880927	111 52.87	41-53.43	121-54.74	0.00	2.38	10088108	2.14	0.14	7	2.62	0.28	5				
880928	3 0 20.35	40-26.20	125-51.73	22.02	2.91	10088113	2.87	0.38	13	2.95	0.28	6				
880928	1319 25.70	40-24.84	124-24.40	21.15	2.14	10088117	2.22	0.18	13	2.05	0.22	8				
880929	1334 30.05	41-32.20	121-40.38	0.01	1.78	10088118	1.50	0.28	9	2.06	0.54	6				
880929	2036 19.72	36- 7.08	117-51.53	9.58	2.32	10088134	2.35	0.37	10	2.28	0.22	7				
880930	035 55.00	41-36.59	121-35.47	0.31	2.12	10088099	2.02	0.20	11	2.21	0.35	7				
880930	752 1.89	41-32.89	121-38.98	0.95	1.73	10088132	1.44	0.20	9	2.03	0.56	6				
881001	213 6.06	41-34.41	121-33.75	1.12	1.62	10088138	1.38	0.28	7	1.85	0.55	5				
881001	1450 42.79	40-21.22	124-14.50	28.87	2.21	10088140	2.30	0.28	14	2.11	0.24	8				
881002	520 47.86	39-51.43	120-50.89	6.00	1.99	10088156	1.79	0.36	6	2.19	0.36	6				
881004	1543 41.52	36-14.09	120-50.22	7.14	1.93	10088161	1.97	0.46	14	1.89	0.41	18				
881004	1729 34.47	36- 8.80	120- 3.97	11.20	2.80	10088163	2.74	0.33	14	2.87	0.23	39	2.76	2		
881004	1737 40.32	36- 8.89	120- 6.99	0.01	2.18	10088164	2.17	0.20	7	2.19	0.17	16				
881006	317 53.28	39-49.46	123-53.96	1.12	2.11	10088178	2.13	0.18	15	2.09	0.19	11				
881007	2347 41.73	36- 5.43	117-52.70	8.01	2.18	10088187	2.29	0.23	6	2.07	0.18	9				
881008	631 32.85	36-55.79	121-41.56	11.65	1.13	10087997	1.23	0.21	34	1.03	0.20	17				
881008	632 10.99	38-48.69	122-46.25	3.74	0.98	10088001	0.98	0.13	5	0.98	0.09	5				

Table A2 (continued)

DATE	TIME	LAT	LON	DEPTH	AMAG	CUSPID	MX	SDMX	NX	MF	SDMF	NF	MBK	NB	MZ	NZ
881110	5 8 2.83	37-22.46	121-43.81	9.56	4.53	10088153	4.47	0.22	26	4.60	0.36	358	3.59	8	4.80	9
881111	859 52.33	41-35.29	121-35.72	1.94	1.00	10088495	0.72	0.32	9	1.28	0.26	6				
881111	9 9 2.60	41-36.26	121-35.15	1.03	0.77	10088498	0.57	0.22	9	0.97	0.17	5				
881112	2029 41.34	41-35.97	121-36.18	2.76	1.20	10088502	1.00	0.20	7	1.39	0.26	6				
881114	1344 58.74	41-35.01	121-35.86	0.08	0.69	10088512	0.49	0.28	8	0.89	0.33	5				
881114	1858 5.70	37-22.03	122-16.80	10.45	2.76	10088172	2.86	0.13	14	2.65	0.23	94	2.94	4		
881114	1921 47.05	37-22.09	122-16.69	11.00	3.41	10088173	3.51	0.16	19	3.31	0.19	153	3.60	6		
881114	1925 20.27	37-22.32	122-16.22	5.98	1.34	10088174	1.38	0.21	8	1.30	0.17	6				
881114	1952 58.01	37-22.15	122-16.62	10.64	3.19	10088176	3.33	0.15	17	3.05	0.21	145	3.35	4		
881115	947 42.21	37-25.50	120- 0.22	18.67	1.97	10088517	1.69	0.44	7	2.25	0.25	5				
881115	1843 10.93	38-20.59	118-26.44	0.01	1.98	10088529	1.91	0.39	13	2.05	0.33	9				
881118	532 4.71	40-32.20	124-54.97	25.57	2.65	10088547	2.70	0.26	17	2.60	0.20	10				
881118	2139 29.94	37-53.51	120-31.48	3.85	1.89	10088551	2.13	0.25	6	1.65	0.17	5				
881120	1832 50.43	40-36.83	123-56.09	21.97	2.17	10088557	2.27	0.17	7	2.07	0.32	6				
881121	439 36.82	36- 3.52	117-48.57	4.16	1.99	10088250	1.79	0.19	5	2.19	0.23	6				
881121	530 6.68	37-41.06	118-51.05	9.11	0.89	10088252	0.87	0.18	8	0.92	0.23	5				
881121	536 30.96	36-55.12	121- 0.07	4.37	2.70	10088253	2.86	0.27	27	2.53	0.23	117	2.57	2		
881121	538 20.68	36-55.21	121- 0.07	3.69	2.34	10088259	2.50	0.20	15	2.18	0.21	65				
881121	558 9.28	37-36.06	118-50.62	10.48	0.90	10088255	0.86	0.27	6	0.95	0.32	6				
881121	611 31.19	37-41.17	118-50.96	10.55	1.37	10088256	1.31	0.09	8	1.43	0.34	12				
881121	754 46.28	37-41.12	118-51.02	9.61	1.37	10088258	1.35	0.21	9	1.38	0.31	12				
881122	145 42.03	36-40.17	121-18.85	3.50	2.17	10088286	2.18	0.23	17	2.15	0.20	55				
881122	245 57.49	37-37.98	118-52.38	10.23	1.30	10088289	1.20	0.46	7	1.40	0.28	7				
881123	1753 48.85	40-28.24	121-32.01	4.38	0.48	10088568	0.37	0.24	5	0.59	0.41	5				
881124	312 15.73	40-16.60	124-31.40	18.03	2.37	10088569	2.47	0.27	8	2.27	0.17	6				
881126	4 9 20.86	40-28.50	121-32.14	4.79	0.63	10088573	0.60	0.23	6	0.67	0.45	5				
881127	9 6 49.31	40-28.87	124-26.76	26.24	2.48	10088580	2.60	0.23	17	2.36	0.24	11				
881128	1227 23.49	40-31.50	124-27.30	15.58	2.24	10088585	2.22	0.29	18	2.26	0.14	9				
881130	041 22.99	39-11.39	119-52.59	3.00	2.23	10088594	2.12	0.19	10	2.34	0.18	6				
881201	1821 48.20	40-27.29	124-19.41	23.42	1.90	10088604	1.98	0.18	7	1.82	0.33	5				
881201	2041 27.68	39-10.42	122- 4.72	13.93	1.62	10088605	1.63	0.37	12	1.61	0.10	5				
881201	2359 19.54	40-25.29	121-28.53	7.84	0.65	10088607	0.63	0.28	6	0.66	0.12	5				
881202	439 18.42	38-48.30	122-48.18	3.35	2.51	10088608	2.57	0.23	20	2.45	0.24	33				
881202	1548 20.20	35-49.20	117-33.61	12.35	1.72	10088612	1.53	0.20	7	1.91	0.24	6				
881204	1633 43.25	36- 5.75	120- 0.66	12.19	3.18	10088617	3.21	0.27	27	3.16	0.25	86	2.94	1		
881205	1347 8.11	36- 0.39	120-35.87	5.13	1.50	10088629	1.46	0.27	23	1.53	0.21	15				
881205	2313 45.63	38-14.70	122-15.88	0.01	1.86	10088638	1.93	0.21	12	1.80	0.37	9				
881207	3 2 59.47	40-18.48	124-37.59	16.78	3.86	10088327	3.78	0.25	30	3.95	0.24	115	3.87	5		
881207	430 48.40	39-21.07	122-54.89	0.00	1.80	10088647	1.88	0.28	13	1.73	0.23	12				
881208	116 57.56	36- 6.29	121-33.98	7.43	2.80	10088652	2.81	0.30	48	2.80	0.22	42	2.62	4		
881208	439 26.23	35-59.67	120-35.54	5.38	1.28	10088653	1.28	0.32	13	1.27	0.13	6				
881210	2029 53.81	37-19.73	115-26.33	0.01	4.98	10088370	5.18	0.12	7	4.79	0.34	99	4.99	5		
881212	2123 13.93	40-31.62	124-19.03	28.57	2.27	10088677	2.29	0.33	17	2.25	0.19	7				
881214	458 44.55	41-35.40	121-35.25	1.55	0.74	10088682	0.54	0.26	6	0.94	0.20	6				
881214	538 18.45	41-35.37	121-35.74	0.01	1.19	10088685	0.80	0.20	5	1.57	0.31	6				
881215	1921 13.21	35-46.11	121-31.07	11.35	3.80	10088371	3.83	0.27	31	3.77	0.31	137	3.44	4		
881216	553 8.73	34-10.44	116-54.54	1.75	5.04	10088532	5.09	0.25	13	5.00	0.36	173	5.28	4		
881222	2221 13.64	36-12.60	120-22.38	13.89	3.64	10088530	3.58	0.27	27	3.70	0.24	166	3.27	4		
881223	026 59.27	35-19.98	118-30.82	9.27	1.55	10088746	1.54	0.14	11	1.57	0.37	8				
881224	1617 14.71	35-44.34	118- 2.71	13.79	1.63	10088750	1.53	0.27	8	1.74	0.34	9				
881227	1126 0.32	40-38.39	124-59.34	22.11	2.69	10088760	2.66	0.26	13	2.72	0.24	10				
881229	311 56.87	41-35.14	121-36.96	1.40	0.76	10088766	0.59	0.23	6	0.94	0.36	6				
881230	1836 17.51	36- 0.80	117-34.27	1.75	1.87	10088774	1.70	0.15	9	2.05	0.24	5				
881230	2354 24.09	37-17.33	121-39.23	7.81	4.25	129428	4.27	0.21	101	4.22	0.29	344	4.28	4	4.29	11
881231	045 22.56	35-57.83	120-32.33	2.30	0.95	10088775	0.98	0.21	14	0.92	0.13	5				
890124	721 24.05	40-17.55	123-35.85	50.69	3.67	130401	3.45	0.25	46	3.90	0.26	86	3.56	4		
890309	14 4 53.29	37-17.16	115-11.32	2.37	5.19	10089554	5.24	0.22	139	5.14	0.40	197	4.97	4		
890329	929 49.05	34-55.24	118-59.25	14.53	4.22	133648	4.31	0.22	54	4.14	0.19	235	4.16	4		
890403	1746 34.21	37-25.57	121-46.75	11.24	4.86	10089455	4.78	0.41	21	4.95	0.41	375	4.32	5	5.00	12
890407	20 7 31.72	33-34.41	117-56.22	18.01	4.76	10089510	4.74	0.17	53	4.78	0.32	165	4.72	6		
890409	2058 29.42	37-25.67	121-47.05	8.73	3.33	10089512	3.34	0.23	51	3.32	0.21	210	3.26	5		
890412	639 38.22	37-48.17	121-44.65	13.15	3.41	10089530	3.41	0.28	50	3.41	0.17	213	3.49	5		
890414	645 54.83	36-33.00	121-12.15	5.38	3.39	10089533	3.40	0.16	47	3.38	0.21	250	3.35	4		
890417	1624 32.36	38-46.69	122-45.86	1.48	3.28	10089534	3.32	0.26	33	3.24	0.27	144	3.25	6		
890420	1245 57.08	38-16.60	118- 2.75	0.01	4.10	10089552	4.22	0.20	184	3.98	0.31	149	4.33	6		
890420	2344 32.95	37-15.56	121-37.91	4.32	2.93	10089553	2.89	0.23	37	2.96	0.19	168	3.07	4		
890504	337 43.92	40-27.44	127-11.54	22.03	4.50	10089598	4.63	0.30	227	4.36	0.25	195	4.61	8		

Table A2 (continued)

DATE	TIME	LAT	LON	DEPTH	AMAG	CUSPID	MX	SDMX	NX	MF	SDMF	NF	MBK	NB	MZ	NZ
881008	1144 13.72	40-23.44	124-38.81	28.41	2.27	10088192	2.34	0.23	14	2.19	0.28	5				
881008	2137 15.27	36- 5.72	117-52.91	4.11	2.50	10088196	2.59	0.36	6	2.40	0.28	8				
881010	1311 25.45	41- 5.03	126-17.43	22.00	3.16	10088199	3.26	0.30	15	3.05	0.15	13				
881010	1431 37.22	38-47.75	122-46.56	2.32	1.92	10088202	1.89	0.22	9	1.96	0.36	19				
881010	1531 10.32	38-48.52	122-47.38	2.65	1.87	10088203	1.93	0.22	12	1.81	0.23	17				
881012	1247 30.72	37-21.96	121-43.71	4.74	3.44	125341	3.44	0.17	143	3.43	0.21	251	3.44	4	3.49	5
881014	223 7.17	40-25.75	125- 9.42	25.00	3.05	10088212	2.99	0.22	21	3.10	0.19	25				
881014	745 18.89	39-28.80	123- 1.30	1.67	2.26	10088214	2.39	0.18	12	2.12	0.18	17				
881014	2337 55.67	40-50.78	121-17.03	16.98	1.59	10088332	1.30	0.34	13	1.89	0.41	6				
881015	1848 10.85	40-31.12	123-49.75	23.01	2.13	10088221	2.14	0.27	9	2.12	0.20	9				
881016	1548 16.55	37-26.45	121-40.39	10.02	2.41	10088223	2.55	0.19	13	2.27	0.21	39				
881017	955 8.01	36-40.52	121-21.85	1.88	1.59	10088226	1.50	0.16	16	1.68	0.36	19				
881017	1913 32.47	38-49.91	122-23.38	0.80	1.75	10088337	1.72	0.21	8	1.78	0.19	9				
881018	535 41.65	37-48.01	118-13.12	15.88	1.42	10088231	1.44	0.12	5	1.41	0.27	5				
881018	22 3 7.03	38-12.38	118-12.34	1.72	2.44	10088243	2.34	0.34	8	2.54	0.29	14				
881018	2229 51.64	40-25.16	125-21.62	22.06	3.35	10088040	3.37	0.30	27	3.33	0.25	32				
881019	1344 45.82	34-56.43	118-45.02	6.55	3.92	10088029	4.01	0.23	35	3.84	0.27	113	4.21	6		
881019	14 4 21.38	34-55.97	118-45.04	8.20	3.19	10088058	3.22	0.13	9	3.17	0.20	51				
881019	1447 33.22	38-48.89	122-48.03	4.03	1.54	10088060	1.56	0.25	10	1.52	0.29	17				
881019	1534 27.83	40-21.64	121-19.90	3.87	1.14	10088242	1.18	0.12	7	1.11	0.18	6				
881019	16 8 23.53	37-14.56	118-26.39	11.78	4.25	10088031	4.42	0.21	27	4.08	0.26	191	4.33	6		
881019	1811 53.62	35-59.48	120-52.36	6.23	1.52	10088262	1.55	0.32	16	1.48	0.17	8				
881019	1849 19.51	40-36.67	119-49.87	1.59	2.43	10088268	2.38	0.20	9	2.48	0.17	9				
881019	2236 17.12	36-44.43	121-35.68	0.01	2.26	10088263	2.22	0.30	27	2.29	0.30	51				
881020	836 9.50	39-33.43	122-40.58	4.98	2.19	10088272	2.28	0.24	18	2.09	0.18	15				
881020	1358 57.21	37- 2.44	121-27.99	6.88	2.35	10088266	2.42	0.20	13	2.28	0.22	57				
881020	14 3 18.07	36-28.58	121- 6.49	4.71	2.02	10088267	2.04	0.23	6	2.00	0.28	30				
881020	19 1 40.28	36-18.72	120-54.57	5.66	1.49	10088277	1.43	0.35	9	1.55	0.52	7				
881020	2158 49.92	38-49.75	122-23.14	0.01	2.03	10088275	1.92	0.23	9	2.13	0.19	16				
881021	19 5 8.25	41-57.02	127- 8.82	22.32	3.68	10088280	3.91	0.22	25	3.44	0.14	7				
881021	2131 22.67	37-53.55	120-30.30	11.20	2.35	10088281	2.38	0.20	16	2.33	0.21	15				
881021	2153 50.26	38-49.62	122-23.77	1.57	2.42	10088282	2.34	0.17	42	2.50	0.21	39				
881021	22 6 36.48	39-19.39	122-48.78	0.01	2.17	10088340	2.22	0.24	15	2.12	0.20	17				
881022	111 19.13	40- 7.41	123-51.17	22.31	2.13	10088293	2.16	0.28	14	2.11	0.20	15				
881022	7 6 32.77	37-24.68	121-40.53	4.70	2.45	10088378	2.66	0.27	11	2.23	0.23	65				
881022	1548 35.91	40-21.32	124-27.81	15.25	2.75	10088295	2.80	0.17	18	2.70	0.21	24				
881023	1120 49.25	35-46.23	120-21.47	7.21	3.31	10088052	3.47	0.17	12	3.14	0.19	127				
881023	1556 56.07	40-17.16	124-30.59	23.10	2.31	10088301	2.47	0.33	14	2.15	0.32	7				
881024	247 34.87	39-36.64	123-29.35	1.26	1.91	10088306	1.97	0.29	8	1.85	0.14	9				
881025	029 21.85	35-59.90	120-34.62	4.93	0.99	10088316	1.01	0.24	9	0.98	0.21	5				
881025	452 19.11	36-40.33	121-21.48	1.77	1.96	10088054	1.93	0.11	7	1.98	0.27	41				
881025	1050 47.11	37-31.08	122- 5.72	10.67	2.90	10088056	2.87	0.21	18	2.94	0.21	143				
881025	1112 54.99	37-31.08	122- 5.86	11.62	2.76	10088062	2.80	0.21	18	2.72	0.23	134	2.92	4		
881025	1442 54.16	36- 1.82	120-37.55	4.76	1.26	10088061	1.21	0.26	25	1.30	0.19	11				
881025	1443 24.62	38-41.85	123-28.39	6.62	3.94	10088053	4.13	0.23	10	3.76	0.29	189	3.82	8		
881025	1836 3.12	36-31.02	120-59.37	5.79	1.59	10088318	1.49	0.32	19	1.69	0.36	20				
881025	2156 15.98	38-49.54	122-23.70	1.83	2.38	10088320	2.28	0.18	12	2.48	0.19	23				
881025	2248 23.21	36- 4.78	121- 2.77	10.20	2.16	10088319	2.20	0.33	25	2.12	0.20	26				
881026	558 56.71	36-27.29	120-12.23	16.55	2.03	10088341	1.90	0.33	12	2.17	0.08	6				
881026	1414 27.18	38-21.53	118-24.86	3.50	3.90	10088065	4.09	0.30	15	3.72	0.22	51	4.01	4		
881026	1554 44.34	40-16.27	121-13.81	13.96	1.46	10088345	1.52	0.10	6	1.40	0.16	7				
881028	20 1 25.89	40-24.24	123-44.04	27.84	2.06	10088352	2.12	0.25	10	2.01	0.24	10				
881031	544 32.36	38-47.09	122-45.33	2.15	1.72	10088372	1.64	0.27	13	1.81	0.30	14				
881031	1026 35.85	40- 3.68	123-42.35	21.73	2.02	10088373	2.06	0.16	14	1.97	0.22	13				
881031	11 5 27.67	40-32.58	126-50.85	22.03	3.22	10088374	3.31	0.24	11	3.12	0.17	7				
881031	1431 11.17	40-27.55	121-33.27	3.51	0.90	10088376	0.81	0.13	8	0.98	0.17	6				
881031	1742 56.55	40-24.46	124-30.16	27.82	2.67	10088377	2.75	0.24	30	2.59	0.16	23				
881102	1250 38.50	40-22.30	124-27.96	17.71	3.88	10088137	3.87	0.22	31	3.89	0.23	120	3.81	8		
881102	1921 3.34	41-34.11	121-32.95	0.15	0.95	10088419	0.68	0.22	5	1.23	0.30	5				
881103	2028 29.63	40-32.71	127-17.38	5.90	3.39	10088402	3.60	0.22	12	3.19	0.24	5				
881104	8 2 32.03	41-29.42	121-57.84	10.92	1.62	10088425	1.48	0.28	11	1.75	0.23	10				
881104	1118 9.26	40-38.84	123-19.93	31.97	2.01	10088404	1.92	0.35	7	2.10	0.18	5				
881104	1354 50.33	35-50.06	117-44.19	10.24	1.46	10088429	1.31	0.19	9	1.60	0.37	6				
881104	1618 53.93	40-31.99	124-50.51	25.68	3.04	10088145	3.11	0.26	17	2.98	0.19	25	3.24	4		
881106	1141 37.31	39-11.89	123-30.21	0.24	1.58	10088457	1.62	0.30	9	1.53	0.15	6				
881107	555 3.19	40-18.75	121-18.74	3.50	1.07	10088466	0.94	0.29	5	1.20	0.14	5				
881107	2130 34.56	42-10.27	121-53.20	6.74	2.41	10088471	2.29	0.21	7	2.52	0.33	11				

Table A2 (continued)

DATE	TIME	LAT	LON	DEPTH	AMAG	CUSPID	MX	SDMX	NX	MF	SDMF	NF	MBK	NB	MZ	NZ
890504	1127 41.78	37-33.98	118-51.44	8.78	3.32	10089599	3.38	0.23	146	3.25	0.21	82				
890509	1855 40.24	37-22.76	122-11.37	3.84	3.20	10089603	3.26	0.23	96	3.13	0.17	189	3.00	4		
890511	047 0.32	36-55.00	121-42.15	13.52	3.15	10089604	3.15	0.23	84	3.14	0.22	193	3.06	4		
890515	1310 1.29	37- 7.88	115-51.92	12.18	4.52	10089623	4.66	0.22	140	4.38	0.36	106	4.58	5		
890515	1539 37.42	36-40.65	121-21.92	1.36	3.49	10089624	3.50	0.22	128	3.47	0.35	237	3.51	4		
890516	1943 46.37	36- 7.77	120-14.21	10.46	2.56	10089626	2.59	0.25	99	2.53	0.17	90				
890516	2138 9.26	36- 8.12	120-13.98	11.55	2.86	10089648	2.86	0.23	128	2.85	0.32	120	2.74	2		
890519	1047 22.84	36-47.67	121-33.80	5.27	3.09	10089647	3.10	0.19	148	3.07	0.23	192	2.92	4		
890523	1658 32.45	41-11.33	121-58.23	12.74	3.78	10089651	3.86	0.20	73	3.69	0.24	87	3.76	6		
890523	17 2 1.04	41-11.35	121-58.27	12.68	3.93	10089652	4.01	0.20	34	3.86	0.28	63	4.03	6		
890525	1240 9.79	35-50.44	120-26.41	6.92	3.97	10089653	3.94	0.18	87	3.99	0.27	227	3.77	6		
890603	1237 18.28	40-25.66	126- 9.76	22.21	3.82	10089687	3.87	0.25	155	3.76	0.25	87	4.29	4		
890604	852 46.36	36-51.37	121-37.12	5.30	2.19	10089688	2.17	0.21	88	2.21	0.17	93	1.89	2		
890612	1657 20.30	33-59.73	118-12.43	12.00	4.51	10089983	4.59	0.16	158	4.42	0.28	187	4.51	4		
890614	2149 43.57	41- 2.52	124-10.00	21.96	3.70	138186	3.68	0.15	38	3.72	0.25	53	3.77	2		
890616	7 0 46.29	34-48.71	121- 3.26	8.02	3.60	138280	3.58	0.22	132	3.61	0.25	134	3.07	2		
890621	059 17.09	37-36.56	119- 3.24	4.73	3.38	10089754	3.48	0.28	145	3.29	0.22	87	3.37	6		
890621	128 53.09	37-22.78	121-44.27	9.82	3.26	10089755	3.25	0.19	106	3.26	0.15	211	3.30	6		
890622	112 2.79	38- 3.56	121-53.52	19.61	2.54	10089779	2.48	0.24	127	2.60	0.18	111	2.54	2		
890622	113 24.90	38- 3.47	121-53.55	19.75	4.07	10089768	3.95	0.20	129	4.19	0.32	294	4.26	4		
890625	042 20.85	40-27.82	124-38.30	28.18	3.52	138923	3.56	0.28	153	3.47	0.27	65	3.92	3		
890625	936 27.45	38- 1.13	122-19.92	8.02	2.98	138927	3.01	0.21	154	2.96	0.17	165	2.99	4		
890626	23 9 6.49	37- 7.92	121-31.57	7.98	2.65	10089808	2.67	0.21	107	2.62	0.18	139	2.61	4		
890628	16 0 40.91	40-38.59	122- 7.51	14.46	3.40	139060	3.40	0.26	55	3.40	0.29	80	3.09	2		
890701	055 23.78	40-22.82	124-57.05	25.03	3.56	139199	3.57	0.19	54	3.55	0.29	52	3.56	3		
890707	1056 9.96	38- 0.74	122-15.53	10.91	2.97	10089812	3.00	0.20	126	2.94	0.18	173	2.99	4		
890709	1338 44.49	37-24.24	121-45.97	6.88	3.84	10089813	3.86	0.16	130	3.82	0.22	313	3.92	5		
890710	235 58.50	40-21.08	124-14.35	30.33	3.67	10089816	3.78	0.38	181	3.57	0.26	76	3.53	4		
890711	413 33.64	37-25.48	118-37.89	11.31	4.58	10089837	4.75	0.26	151	4.42	0.34	343	4.64	8		
890713	1441 44.48	40-27.14	125-57.33	22.28	3.76	139941	3.74	0.23	138	3.79	0.18	75	3.81	5		
890715	1344 11.73	40-37.04	122-26.58	27.91	3.10	140066	2.93	0.26	49	3.27	0.18	51	2.85	3		
890718	11 7 21.82	36-54.66	121-20.87	9.62	3.75	10089838	3.80	0.20	153	3.71	0.19	310	3.81	6		
890720	558 43.68	36-54.55	121-20.64	10.01	3.34	140395	3.37	0.20	179	3.32	0.23	253	3.29	4		
890724	237 49.90	36-47.74	121-33.60	6.27	3.36	10089849	3.39	0.16	162	3.32	0.18	242	3.17	4		
890724	3 8 0.05	36-47.96	121-33.89	6.60	3.27	10089850	3.30	0.18	152	3.23	0.17	224	3.17	4		
890724	948 27.91	36-47.57	121-33.26	3.53	1.53	10089851	1.54	0.24	69	1.51	0.23	43				
890802	217 31.98	37-35.88	119- 2.81	6.98	3.13	10089862	3.18	0.30	121	3.09	0.23	63				
890802	1325 35.61	37- 9.78	121-33.55	2.81	2.62	10089863	2.61	0.19	114	2.62	0.20	132	2.61	2		
890808	813 27.25	37- 7.70	121-56.68	13.51	4.94	10089897	4.82	0.21	37	5.06	0.36	401	5.12	4		
890808	844 9.57	37- 7.58	121-56.44	12.43	4.22	10089900	4.27	0.17	126	4.16	0.20	368	4.08	4		
890808	1553 27.99	37- 8.46	121-58.25	14.25	4.34	10089898	4.40	0.17	92	4.28	0.28	378	4.40	8		
890808	2315 5.78	39-29.51	122-56.70	8.12	4.05	10089899	4.01	0.19	113	4.09	0.29	195	4.08	8		
890816	1128 46.96	40-36.69	124-19.56	23.92	3.31	10089968	3.31	0.28	127	3.31	0.25	74	3.71	2		
890825	1520 14.02	36-34.13	121-13.20	6.00	3.26	10089982	3.27	0.26	159	3.24	0.19	215	2.83	4		
890914	1156 16.49	40-21.33	125- 7.44	25.00	4.00	10090025	4.01	0.23	208	3.98	0.29	164	3.83	7		
890919	2319 35.99	38-47.97	122-46.51	1.67	3.42	10090046	3.47	0.31	128	3.37	0.25	155	3.62	6		
890919	2321 3.61	38-47.10	122-46.38	2.24	3.72	10090057	3.78	0.25	107	3.66	0.31	168	3.81	4		
890921	1148 14.31	39-19.11	120-35.28	14.01	4.10	10090047	4.21	0.27	235	3.99	0.28	273	4.02	6		
890921	1741 18.11	40 18.27	124 41.92	17.91	4.97	10090055	4.91	0.18	140	5.03	0.39	310	4.94	7		
890921	2128 47.95	36 13.87	120 22.17	8.04	3.00	10090108	2.97	0.24	130	3.03	0.30	138	2.76	4		
890922	6 9 40.87	37 35.55	119 0.18	9.24	3.05	10090058	3.07	0.30	122	3.03	0.34	43				
890923	815 18.94	40 29.85	124 52.82	25.60	3.82	10090061	3.84	0.21	138	3.80	0.20	121	3.82	6		
890923	2244 15.33	40 46.40	124 15.85	22.36	3.77	10090062	3.76	0.26	116	3.78	0.27	81				
890930	921 3.13	36 29.40	120 32.54	9.77	3.89	10090088	3.86	0.26	144	3.92	0.25	316	4.00	6		
891001	1842 59.61	40 20.00	124 33.11	21.48	2.11	10090187	2.14	0.35	13	2.07	0.25	6				
891003	1253 36.51	40 33.78	124 44.24	17.34	3.56	144933	3.40	0.26	136	3.71	0.26	74				
891009	1444 52.48	41 8.30	123 28.10	29.74	2.06	10090204	1.97	0.25	7	2.16	0.35	5				
891010	2120 18.53	36 6.60	118 3.86	5.16	2.21	10090207	2.16	0.32	11	2.27	0.19	11				
891013	1346 23.47	40 49.10	123 18.50	15.77	2.04	10090208	1.91	0.22	19	2.17	0.19	6				
891018	0 9 55.88	37 0.98	121 45.88	7.78	4.10	10090511	3.79	0.21	12	4.40	0.30	10	3.88	3		
891018	011 45.40	37 8.86	122 0.68	6.31	4.02	10090512	3.63	0.17	6	4.41	0.47	7				
891018	015 10.60	36 59.02	121 49.67	12.27	3.78	10090504	3.68	0.15	28	3.88	0.37	40	3.95	3		
891018	016 14.33	37 8.96	122 0.28	7.57	3.10	10090506	2.95	0.33	13	3.25	0.62	10				
891018	016 34.70	37 9.15	122 0.31	8.24	3.02	10090507	3.07	0.23	14	2.98	0.45	9				
891018	016 54.55	37 4.69	121 56.38	3.96	4.07	10090508	3.98	0.17	22	4.16	0.53	31	4.02	5		
891018	017 32.70	37 9.43	122 1.82	10.34	3.87	10090498	3.80	0.23	5	3.94	0.32	11	3.87	5		
891018	019 1.33	37 8.12	121 58.13	1.68	3.09	10090500	3.12	0.24	8	3.07	0.41	8				

Table A2 (continued)

DATE	TIME	LAT	LON	DEPTH	AMAG	CUSPID	MX	SDMX	NX	MF	SDMF	NF	MBK	NB	MZ	NZ
891018	019 17.04	37 8.52	122 0.03	10.34	4.01	10090501	3.93	0.21	22	4.10	0.32	41	3.94	5		
891018	022 30.13	37 2.27	121 51.72	5.71	2.94	10090494	2.86	0.23	14	3.02	0.14	7				
891018	022 56.08	36 55.79	121 41.80	3.59	3.22	10090495	3.04	0.26	20	3.40	0.33	32				
891018	023 37.29	37 1.38	121 47.03	2.98	4.05	10090484	3.97	0.19	25	4.12	0.36	75	3.79	5		
891018	024 35.48	37 9.31	122 0.44	7.54	3.43	10090485	3.35	0.22	22	3.51	0.25	35	3.50	5		
891018	025 4.49	37 1.76	121 48.19	7.11	4.76	10090486	4.53	0.21	11	4.99	0.45	64	4.56	3		
891018	027 11.20	37 5.18	121 58.16	2.39	3.78	10090488	3.64	0.22	22	3.93	0.32	32	3.28	5		
891018	033 36.42	37 7.11	122 1.55	5.48	3.41	10090669	3.47	0.14	29	3.35	0.33	71	3.23	3		
891018	034 29.33	37 8.04	121 58.36	6.94	2.19	10090670	2.02	0.19	15	2.35	0.42	20				
891018	034 58.05	37 8.97	121 59.48	6.33	2.64	10090671	2.64	0.32	14	2.63	0.28	30				
891018	035 25.60	37 11.12	122 3.22	11.18	3.80	10090673	3.84	0.18	27	3.75	0.42	59	3.86	3		
891018	036 47.09	36 58.88	121 46.29	1.11	2.85	10090677	2.83	0.25	9	2.87	0.33	11				
891018	037 13.05	37 2.64	121 56.00	13.45	3.15	10090678	3.19	0.22	22	3.12	0.30	41	3.09	3		
891018	038 27.94	37 9.09	122 0.48	10.17	4.50	10090722	4.54	0.17	9	4.46	0.39	87	4.04	2		
891018	039 58.33	37 8.21	121 58.90	8.58	2.96	10090723	2.89	0.20	18	3.02	0.26	18	3.12	3		
891018	040 57.06	37 7.73	121 58.60	6.00	3.37	10090724	3.27	0.29	20	3.47	0.26	47				
891018	045 38.46	36 55.86	121 41.80	6.00	4.05	10090732	3.94	0.16	27	4.16	0.36	83	3.91	3		
891018	046 59.11	36 49.81	121 31.86	1.79	2.60	10090734	2.46	0.09	6	2.73	0.28	8				
891018	047 24.30	37 8.64	122 0.64	5.80	2.34	10090735	2.52	0.11	10	2.16	0.33	11				
891018	047 58.48	36 49.06	121 30.35	0.01	2.96	10090736	2.79	0.31	14	3.14	0.27	29				
891018	048 0.99	37 11.16	122 4.07	13.96	2.66	10090765	2.55	0.21	12	2.78	0.26	24				
891018	048 26.53	37 8.83	122 2.06	11.57	2.79	10090737	2.83	0.22	21	2.76	0.24	26				
891018	048 45.34	37 11.23	122 4.06	10.04	2.46	10090738	2.57	0.22	11	2.35	0.57	12				
891018	049 25.40	37 9.65	121 59.67	6.53	1.88	10090739	1.83	0.23	7	1.92	0.26	16				
891018	049 38.22	37 5.90	122 0.34	14.10	2.43	10090740	2.44	0.15	8	2.43	0.20	13				
891018	053 17.75	37 4.91	121 56.30	6.90	2.39	10090743	2.28	0.21	19	2.50	0.27	51				
891018	055 58.84	36 58.18	121 43.69	10.77	2.56	10090767	2.52	0.23	14	2.60	0.29	36				
891018	056 58.97	36 55.95	121 38.71	13.47	2.79	10090768	2.61	0.25	19	2.97	0.27	43				
891018	058 1.00	37 8.11	121 58.29	2.51	2.49	10090770	2.32	0.25	13	2.65	0.35	29				
891018	058 27.02	37 10.15	121 59.86	5.66	2.25	10090771	2.13	0.25	10	2.37	0.37	22				
891018	058 41.80	37 8.33	121 59.30	9.97	2.71	10090786	2.72	0.22	13	2.71	0.17	14				
891018	058 56.06	37 6.29	121 59.63	12.15	3.80	10090773	3.85	0.21	23	3.75	0.28	51	3.86	3		
891018	1 0 19.99	37 9.36	121 59.60	7.55	1.80	10090775	1.95	0.18	6	1.66	0.15	6				
891018	1 0 52.69	37 8.90	121 58.61	8.71	2.60	10090777	2.49	0.30	8	2.71	0.29	22				
891018	1 1 14.29	37 6.04	121 52.72	0.00	2.14	10090778	2.02	0.13	5	2.25	0.24	7				
891018	1 1 27.11	36 56.47	121 44.55	12.69	3.76	10090779	3.71	0.24	13	3.81	0.29	66	3.08	3		
891018	1 3 59.20	37 5.73	121 51.82	4.03	3.90	10090782	3.86	0.18	24	3.93	0.37	83	3.73	5		
891018	1 5 33.72	37 7.30	122 0.93	11.57	3.07	10090783	2.94	0.23	16	3.19	0.27	38	3.14	5		
891018	1 7 39.59	36 57.32	121 43.47	6.97	2.83	10090317	2.72	0.25	14	2.93	0.28	58				
891018	1 8 8.85	37 10.97	122 3.63	13.05	3.73	10090361	3.60	0.18	15	3.87	0.43	83	3.59	3		
891018	1 9 11.75	37 4.36	121 50.44	1.09	2.41	10090796	2.32	0.25	6	2.51	0.20	6				
891018	1 9 35.07	37 5.30	121 55.28	3.49	2.63	10090797	2.54	0.24	14	2.72	0.23	25				
891018	113 0.93	37 9.69	121 59.24	6.93	1.98	10090799	1.88	0.20	8	2.08	0.30	16				
891018	113 26.47	36 56.74	121 42.51	5.70	2.58	10090800	2.51	0.28	22	2.65	0.25	48				
891018	113 59.96	36 57.49	121 45.09	11.61	2.25	10090801	2.30	0.34	13	2.21	0.31	30				
891018	114 30.59	37 7.56	122 1.60	14.46	2.26	10090802	2.35	0.19	14	2.17	0.29	36				
891018	116 19.40	37 9.85	122 0.31	7.01	3.73	10090803	3.73	0.25	26	3.73	0.29	86	3.49	5		
891018	117 25.83	37 9.78	121 59.59	6.60	2.44	10090804	2.44	0.24	15	2.45	0.31	19				
891018	119 10.49	37 10.06	122 3.98	12.38	2.31	10090808	2.35	0.36	17	2.26	0.27	29				
891018	119 30.11	37 9.29	122 1.99	10.57	2.67	10090809	2.76	0.20	6	2.58	0.30	29				
891018	119 59.68	37 5.88	121 57.90	23.11	2.71	10090810	2.54	0.25	11	2.88	0.23	15				
891018	120 59.43	37 7.52	121 58.38	7.70	2.17	10090811	2.24	0.18	8	2.10	0.27	22				
891018	121 18.45	36 56.92	121 45.31	11.68	3.98	10090815	3.93	0.13	21	4.04	0.38	95	3.85	4		
891018	122 44.76	37 5.26	121 57.11	10.21	3.29	10090813	3.24	0.21	22	3.33	0.31	65	3.28	4		
891018	123 52.67	37 9.39	121 59.83	6.35	2.32	10090814	2.12	0.14	12	2.53	0.28	26				
891018	124 58.10	36 47.94	121 31.19	0.01	3.62	10090318	3.44	0.38	15	3.80	0.34	82	3.60	6		
891018	126 14.98	37 3.94	121 55.62	10.26	2.28	10090821	2.39	0.21	11	2.18	0.37	21				
891018	126 32.35	37 2.23	121 56.15	11.63	3.16	10090822	3.17	0.18	28	3.16	0.33	53				
891018	128 6.87	37 6.09	121 52.22	1.16	2.02	10090823	1.82	0.13	11	2.22	0.33	23				
891018	128 24.13	36 57.43	121 43.52	10.82	2.96	10090824	2.81	0.31	26	3.11	0.37	49				
891018	129 42.06	37 2.44	121 48.69	3.47	2.57	10090826	2.28	0.18	14	2.85	0.23	23				
891018	130 50.57	37 5.86	121 56.08	1.95	2.06	10090827	2.23	0.14	7	1.89	0.22	21				
891018	130 59.33	37 2.46	121 55.07	10.97	3.42	10090828	3.40	0.24	24	3.43	0.34	69	3.23	4		
891018	131 51.32	37 7.29	122 0.60	13.30	2.27	10090829	2.30	0.19	9	2.24	0.25	19				
891018	134 45.99	37 3.06	121 56.90	13.44	3.18	10090319	3.27	0.29	18	3.08	0.29	71	3.01	4		
891018	136 12.31	37 6.93	121 59.09	11.08	2.62	10090320	2.54	0.23	20	2.69	0.25	55				
891018	138 24.75	37 6.02	121 53.28	1.95	1.99	10090322	1.61	0.22	7	2.38	0.33	15				

Table A2 (continued)

DATE	TIME	LAT	LON	DEPTH	AMAG	CUSPID	MX	SDMX	NX	MF	SDMF	NF	MBK	NB	MZ	NZ
891018	138 54.77	36 58.06	121 42.81	7.32	2.18	10090323	1.96	0.19	13	2.40	0.39	24				
891018	143 37.60	37 8.17	121 58.45	8.89	2.94	10090324	2.86	0.27	18	3.03	0.32	72	2.75	4		
891018	145 41.97	36 58.22	121 45.81	13.34	2.07	10090363	2.23	0.21	12	1.91	0.35	27				
891018	145 57.14	37 0.44	121 48.63	11.36	3.71	10090325	3.64	0.22	11	3.77	0.38	99	3.51	5		
891018	150 31.00	37 7.41	121 58.52	8.64	2.87	10090326	2.75	0.24	18	3.00	0.36	59	2.48	4		
891018	151 0.23	36 57.12	121 44.36	11.80	3.43	10090327	3.39	0.24	13	3.47	0.32	52	3.39	4		
891018	154 33.58	37 0.24	121 44.76	5.73	2.82	10090834	2.79	0.35	22	2.85	0.35	54				
891018	155 38.74	36 55.79	121 39.81	7.69	2.83	10090835	2.75	0.21	16	2.91	0.22	52				
891018	157 34.29	37 10.61	122 3.33	12.09	1.86	10090836	2.06	0.26	10	1.66	0.31	16				
891018	157 50.12	37 9.27	121 59.26	6.34	1.62	10090850	1.58	0.36	5	1.67	0.26	18				
891018	158 15.74	36 54.00	121 38.69	2.66	2.76	10090837	2.76	0.14	15	2.76	0.21	15				
891018	158 30.15	36 59.64	121 51.38	16.52	3.44	10090838	3.44	0.16	22	3.45	0.21	16	3.28	3		
891018	159 24.72	37 7.03	121 58.48	12.50	2.71	10090840	2.60	0.21	19	2.82	0.28	42				
891018	2 0 11.28	37 4.91	121 55.33	0.79	2.44	10090841	2.40	0.22	14	2.48	0.23	52				
891018	2 0 36.06	37 5.74	121 55.78	1.88	2.64	10090842	2.59	0.16	15	2.70	0.31	46				
891018	2 1 37.01	37 8.99	122 0.98	9.33	1.67	10090843	1.84	0.23	7	1.51	0.41	10				
891018	2 2 10.35	37 9.41	121 58.96	7.70	1.70	10090844	1.58	0.22	5	1.82	0.37	18				
891018	2 2 35.87	36 55.83	121 41.37	6.31	2.17	10090845	2.03	0.29	9	2.31	0.23	21				
891018	2 4 11.41	36 58.36	121 47.15	13.77	1.84	10090846	1.88	0.16	13	1.79	0.31	16				
891018	2 4 37.24	37 5.59	121 56.24	3.98	2.34	10090847	2.28	0.25	17	2.39	0.28	41				
891018	2 5 38.63	37 6.20	121 55.96	2.14	2.60	10090848	2.53	0.24	17	2.66	0.20	54				
891018	2 6 14.10	37 1.79	121 46.88	6.55	1.72	10090849	1.63	0.19	5	1.80	0.25	11				
891018	2 7 55.37	37 8.01	121 58.68	2.34	2.32	10090853	2.15	0.20	9	2.48	0.30	27				
891018	2 8 53.65	36 56.51	121 44.34	11.72	3.56	10090854	3.61	0.27	26	3.51	0.26	79	3.45	5		
891018	210 1.43	36 59.35	121 44.57	3.83	2.27	10090855	2.34	0.25	11	2.20	0.34	15				
891018	210 29.03	37 6.83	122 4.17	6.95	2.19	10090856	2.08	0.32	8	2.30	0.37	21				
891018	212 33.20	37 0.08	121 45.39	8.09	3.33	10090857	3.27	0.18	28	3.39	0.23	79	3.19	4		
891018	213 38.06	37 5.78	121 52.80	1.68	2.88	10090858	2.81	0.18	20	2.94	0.30	57	2.51	4		
891018	214 59.23	36 57.88	121 45.47	7.38	2.62	10090859	2.51	0.21	22	2.72	0.22	49	2.54	2		
891018	215 49.19	36 59.39	121 47.01	1.65	4.45	10090144	4.46	0.14	29	4.43	0.34	164	4.41	5		
891018	217 25.41	37 7.19	121 59.14	9.07	3.00	10090860	2.83	0.21	21	3.18	0.26	16				
891018	218 32.61	37 6.52	121 56.30	2.13	2.78	10090861	2.73	0.29	20	2.83	0.26	58				
891018	219 28.06	37 9.62	121 59.95	7.17	2.23	10090862	2.21	0.19	7	2.24	0.22	17				
891018	226 5.96	37 0.96	121 47.97	6.15	4.09	10090186	4.18	0.13	29	3.99	0.30	257	4.17	5		
891018	230 5.26	37 7.33	122 0.55	11.62	2.36	10090343	2.42	0.24	15	2.29	0.25	32				
891018	230 29.46	37 9.64	122 1.06	7.78	3.28	10090364	3.32	0.30	14	3.24	0.29	82	3.29	4		
891018	234 4.11	37 3.25	121 50.18	3.47	3.16	10090345	2.84	0.22	11	3.48	0.38	59	3.05	4		
891018	236 1.78	37 8.72	121 59.35	9.70	3.30	10090346	3.30	0.30	17	3.29	0.27	90	3.25	5		
891018	248 27.16	37 2.82	121 57.09	14.76	3.13	10090347	3.14	0.37	14	3.12	0.34	63	2.87	4		
891018	248 51.78	37 9.85	121 59.91	7.02	2.53	10090373	2.47	0.30	7	2.58	0.22	13				
891018	249 48.94	37 6.99	121 59.11	7.82	2.91	10090407	2.80	0.17	15	3.02	0.16	9				
891018	256 34.81	36 58.12	121 45.25	12.35	2.82	10090408	2.82	0.28	17	2.83	0.20	63				
891018	3 2 42.87	37 5.88	121 53.41	1.85	3.61	10090411	3.54	0.22	14	3.68	0.32	44	3.67	6		
891018	3 9 58.04	37 3.19	121 55.14	11.59	3.19	10090409	3.12	0.28	17	3.26	0.38	61	3.15	4		
891018	316 19.34	37 5.75	121 51.40	1.75	2.94	10090410	2.86	0.16	15	3.03	0.37	55	2.69	4		
891018	321 47.43	37 5.32	121 51.66	1.71	3.94	10090443	3.87	0.12	12	4.01	0.43	97	3.89	6		
891018	323 7.06	37 10.10	121 58.86	2.53	2.78	10090456	2.63	0.20	17	2.94	0.48	23				
891018	327 46.02	36 56.34	121 44.62	12.98	3.08	10090445	3.17	0.30	16	2.99	0.27	68	2.89	4		
891018	330 11.23	37 6.92	122 1.03	14.38	4.13	10090146	4.08	0.15	30	4.18	0.33	182				
891018	330 34.85	37 15.37	122 4.70	3.59	2.77	10090446	2.65	0.23	14	2.89	0.36	62	2.50	4		
891018	335 45.06	37 5.90	121 53.17	1.84	3.67	10090447	3.63	0.21	16	3.70	0.35	99	3.80	6		
891018	414 47.84	37 6.84	122 0.11	14.04	3.52	10090448	3.51	0.36	11	3.52	0.40	97	3.42	5		
891018	415 50.62	37 4.08	121 56.55	13.13	2.14	10090457	2.09	0.27	14	2.19	0.36	14				
891018	418 15.97	37 9.76	122 3.95	12.82	3.12	10090213	3.12	0.45	11	3.13	0.34	55	3.12	4		
891018	425 11.28	37 9.41	122 0.20	8.98	3.34	10090451	3.35	0.12	16	3.32	0.34	90	3.44	6		
891018	425 46.53	37 1.54	121 48.15	8.54	3.73	10090458	3.68	0.37	18	3.79	0.34	64	3.72	6		
891018	426 36.46	36 58.46	121 46.83	12.20	3.46	10090473	3.36	0.25	11	3.56	0.30	62	3.16	4		
891018	428 14.54	36 57.34	121 47.02	12.68	3.56	10090454	3.59	0.15	12	3.52	0.33	88	3.51	4		
891018	450 26.64	37 9.08	122 1.69	10.34	4.31	10090130	4.42	0.15	21	4.21	0.34	180	4.21	6		
891018	5 9 33.58	37 2.12	121 49.90	12.02	3.13	10090450	3.25	0.23	8	3.02	0.15	21	3.03	4		
891018	518 34.37	37 1.69	121 52.55	13.56	4.19	10090129	4.18	0.16	30	4.20	0.33	161	4.25	6		
891018	537 42.87	37 7.57	122 0.07	11.71	2.19	10090478	2.24	0.29	13	2.14	0.29	31				
891018	538 2.00	37 7.11	122 3.91	14.45	3.13	10090459	3.19	0.27	11	3.07	0.33	54	3.15	4		
891018	549 40.29	37 2.44	121 49.93	1.76	2.61	10090460	2.52	0.24	21	2.71	0.26	37				
891018	559 12.91	37 5.87	121 53.18	1.69	2.49	10090461	2.53	0.27	12	2.46	0.27	35				
891018	559 28.75	37 6.59	121 52.58	0.94	2.76	10090479	2.74	0.18	10	2.77	0.35	12				
891018	617 58.87	37 10.25	121 59.06	2.50	2.27	10090462	2.22	0.19	11	2.32	0.09	21				

Table A2 (continued)

DATE	TIME	LAT	LON	DEPTH	AMAG	CUSPID	MX	SDMX	NX	MF	SDMF	NF	MBK	NB	MZ	NZ
891018	752 31.36	37 10.99	122 4.38	13.18	2.68	10090463	2.75	0.30	13	2.62	0.17	42	2.86	4		
891018	841 3.11	37 1.14	121 50.07	11.22	2.91	10090465	2.93	0.33	35	2.90	0.25	79	2.97	4		
891018	849 14.25	37 8.29	121 59.08	6.93	1.62	10090466	1.64	0.25	29	1.61	0.21	29				
891018	854 58.62	37 7.25	121 56.18	1.13	2.14	10090467	2.13	0.23	47	2.16	0.26	52				
891018	1012 27.43	36 57.29	121 45.08	14.32	2.00	10090482	2.12	0.27	56	1.88	0.32	49				
891018	1012 42.96	37 0.48	121 45.22	11.29	1.76	10090483	1.88	0.20	12	1.63	0.23	11				
891018	1048 13.90	37 5.89	121 52.48	1.99	3.00	10090469	3.03	0.19	33	2.97	0.19	86	2.94	4		
891018	1114 50.14	36 50.80	121 35.82	5.45	3.01	10090470	2.91	0.23	16	3.10	0.33	68	2.93	4		
891018	1115 26.61	37 10.20	121 59.13	2.55	2.58	10090496	2.45	0.34	5	2.72	0.41	26				
891018	1332 30.13	36 57.08	121 43.01	7.71	1.65	10090561	1.66	0.24	27	1.64	0.17	26				
891018	1332 57.06	37 1.43	121 50.16	10.54	2.66	10090539	2.66	0.20	24	2.67	0.18	47				
891018	1343 20.25	37 15.21	122 4.82	1.81	2.54	10090540	2.43	0.12	17	2.64	0.32	32	2.57	4		
891018	1343 46.64	37 5.71	121 56.57	2.16	1.96	10090562	1.89	0.27	9	2.04	0.24	10				
891018	1349 48.14	36 58.28	121 40.98	4.28	1.40	10090941	1.43	0.23	30	1.36	0.21	20				
891018	1353 28.25	37 3.52	121 52.96	8.02	1.45	10090945	1.49	0.21	27	1.41	0.17	19				
891018	1353 45.01	36 58.61	121 47.57	8.30	1.38	10090946	1.40	0.23	17	1.36	0.80	10				
891018	1354 16.62	36 58.16	121 43.36	10.62	1.02	10090947	1.15	0.24	10	0.89	0.14	8				
891018	1355 38.32	36 55.40	121 41.77	5.57	1.40	10090944	1.46	0.22	31	1.34	0.19	19				
891018	1357 18.10	37 2.69	121 49.25	3.99	1.30	10090960	1.22	0.19	9	1.39	0.28	14				
891018	1357 23.46	37 10.69	122 3.62	14.93	1.40	10090967	1.51	0.23	22	1.29	0.23	6				
891018	14 0 21.33	37 6.51	121 53.68	1.21	1.00	10090961	0.97	0.16	8	1.03	0.14	5				
891018	14 4 57.54	36 58.19	121 47.81	12.10	2.46	10090981	2.50	0.25	59	2.42	0.23	62				
891018	14 9 6.37	37 8.29	121 58.06	8.43	1.35	10090963	1.43	0.22	10	1.27	0.22	12				
891018	14 9 33.33	37 1.98	121 51.19	10.78	1.21	10090972	1.21	0.24	5	1.21	0.12	7				
891018	1411 47.82	37 1.02	121 49.86	11.04	1.09	10090964	1.16	0.27	11	1.01	0.24	6				
891018	1412 54.26	37 6.00	121 53.90	1.78	0.99	10090979	0.97	0.18	10	1.00	0.21	6				
891018	1414 57.91	36 57.96	121 46.41	12.03	1.55	10090965	1.61	0.25	55	1.49	0.20	23				
891018	1416 6.06	36 56.30	121 44.70	12.48	1.54	10090982	1.63	0.25	50	1.45	0.26	21				
891018	1417 20.69	36 58.56	121 38.86	2.70	2.14	10090983	2.11	0.24	57	2.17	0.28	47				
891018	1425 0.29	37 9.32	122 0.51	7.81	2.62	10090987	2.61	0.69	7	2.62	0.34	33				
891018	1426 53.51	37 3.80	121 56.32	11.44	1.30	10090988	1.16	0.23	5	1.44	0.25	6				
891018	1427 23.76	36 54.53	121 40.94	11.89	2.04	10090989	2.03	0.31	14	2.05	0.11	29				
891018	1428 51.14	37 7.62	122 1.43	14.33	1.29	10090990	1.42	0.09	10	1.17	0.12	8				
891018	1429 42.22	36 56.11	121 42.03	9.24	1.41	10090991	1.40	0.29	14	1.41	0.20	14				
891018	1432 11.03	37 8.98	121 57.77	14.35	1.18	10090997	1.50	0.22	6	0.86	0.71	5				
891018	1432 11.45	36 57.86	121 50.46	9.60	1.86	10090998	1.95	0.22	38	1.76	0.29	36				
891018	1432 37.15	36 57.78	121 44.96	8.61	1.92	10090999	1.98	0.24	34	1.87	0.32	31				
891018	1433 36.27	36 57.59	121 46.27	9.74	1.21	10091000	1.25	0.23	21	1.17	0.23	9				
891018	1436 7.43	36 56.24	121 47.29	19.20	1.41	10090995	1.49	0.33	18	1.34	0.16	13				
891018	1437 2.10	36 59.36	121 49.56	15.14	1.36	10091001	1.44	0.25	22	1.29	0.22	15				
891018	1439 37.32	36 59.10	121 46.39	6.41	1.53	10090996	1.65	0.20	14	1.40	0.13	15				
891018	1441 30.40	37 3.68	121 55.34	8.55	1.70	10091003	1.73	0.23	65	1.66	0.21	33				
891018	1442 34.99	37 5.66	121 59.28	12.84	1.36	10091012	1.49	0.27	26	1.24	0.11	12				
891018	1443 5.30	36 56.25	121 43.61	12.64	1.31	10091006	1.35	0.24	43	1.27	0.24	16				
891018	1444 18.23	37 2.68	121 55.82	13.27	1.56	10091007	1.62	0.19	58	1.51	0.22	16				
891018	1444 53.74	37 7.64	122 1.95	15.59	1.50	10091008	1.59	0.22	42	1.40	0.19	20				
891018	1446 14.56	36 58.06	121 43.66	9.64	1.43	10091009	1.46	0.20	20	1.40	0.32	11				
891018	1451 29.95	36 59.85	121 50.49	14.04	1.12	10091005	1.11	0.25	26	1.13	0.28	5				
891018	1452 53.96	36 56.73	121 44.56	12.50	1.65	10091014	1.73	0.25	62	1.58	0.24	36				
891018	1453 14.65	36 59.30	121 50.14	13.35	2.01	10091016	1.65	0.31	11	2.37	0.23	28				
891018	1453 17.79	37 10.39	121 58.50	2.34	2.30	10091015	2.22	0.27	17	2.37	0.18	30				
891018	1456 11.13	37 0.08	121 51.13	14.10	1.49	10091018	1.35	0.20	35	1.63	0.21	15				
891018	1458 42.86	37 40.48	121 51.71	2.38	1.55	10091031	1.54	0.22	22	1.56	0.15	9				
891018	15 0 42.47	37 9.40	122 0.96	8.69	2.41	10091032	2.43	0.30	73	2.39	0.17	72				
891018	15 3 29.29	37 9.18	121 59.99	7.33	1.13	10091033	1.23	0.23	27	1.03	0.15	12				
891018	15 5 35.25	36 54.20	121 40.70	10.55	0.95	10091034	0.98	0.23	17	0.92	0.23	6				
891018	15 8 18.00	37 2.12	121 52.26	9.72	1.98	10091035	2.05	0.22	70	1.92	0.36	50				
891018	1511 14.53	36 55.67	121 41.36	6.92	1.53	10091036	1.60	0.18	9	1.46	0.15	19				
891018	1513 22.18	37 5.95	121 53.22	1.79	1.24	10091044	1.27	0.24	9	1.21	0.19	7				
891018	1520 26.33	37 6.39	121 54.66	2.26	1.02	10091038	1.06	0.29	12	0.97	0.26	5				
891018	1521 58.16	37 8.23	121 58.59	9.80	1.12	10091039	1.23	0.18	9	1.01	0.14	8				
891018	1525 6.53	37 10.48	122 3.20	10.14	1.53	10091046	1.51	0.41	13	1.55	0.23	14				
891018	1526 48.65	36 57.27	121 46.44	15.34	1.44	10091041	1.45	0.25	19	1.42	0.20	11				
891018	1530 49.66	37 6.63	121 51.59	2.53	1.01	10091047	0.99	0.37	7	1.03	0.07	5				
891018	1532 30.69	37 6.97	121 54.45	1.20	1.04	10091048	1.21	0.19	9	0.86	0.11	5				
891018	1533 14.91	36 48.01	121 33.17	4.82	2.68	10091058	2.66	0.22	63	2.70	0.20	69	2.68	4		
891018	1533 50.12	37 5.81	121 56.95	7.38	1.19	10091059	1.39	0.26	13	1.00	0.18	5				

Table A2 (continued)

DATE	TIME	LAT	LON	DEPTH	AMAG	CUSPID	MX	SDMX	NX	MF	SDMF	NF	MBK	NB	MZ	NZ
891018	1534 12.32	36 58.22	121 45.19	11.24	1.95	10091060	2.01	0.21	30	1.88	0.19	26				
891018	1536 27.20	37 5.46	121 51.96	0.79	1.89	10091049	1.89	0.19	59	1.89	0.23	41				
891018	1540 13.24	37 6.22	121 55.26	1.86	0.94	10091050	0.94	0.32	17	0.93	0.07	5				
891018	1540 48.37	37 6.34	121 55.34	6.76	1.01	10091064	1.03	0.33	15	0.99	0.10	6				
891018	1544 37.85	37 8.04	121 58.75	8.17	1.58	10091051	1.58	0.25	44	1.57	0.18	20				
891018	1547 53.13	36 59.25	121 47.21	11.55	1.65	10091066	1.68	0.25	61	1.62	0.23	31				
891018	1550 14.31	37 10.35	121 58.91	2.29	1.20	10091053	1.24	0.23	26	1.16	0.10	13				
891018	1551 6.84	37 2.64	121 56.89	13.50	1.45	10091067	1.58	0.24	39	1.32	0.22	16				
891018	1553 59.60	37 2.15	121 48.68	3.62	1.32	10091054	1.35	0.22	21	1.29	0.09	11				
891018	1555 38.83	37 9.13	121 59.31	0.00	1.22	10091055	1.19	0.23	9	1.26	0.18	6				
891018	1555 56.36	36 58.90	121 43.62	2.90	1.42	10091068	1.51	0.16	12	1.34	0.20	12				
891018	1557 5.07	37 17.48	122 11.09	2.90	1.15	10091069	1.04	0.33	17	1.27	0.17	6				
891018	16 0 41.53	37 3.14	121 53.62	9.48	2.02	10091056	2.07	0.17	22	1.97	0.21	33				
891018	16 3 54.17	37 1.40	121 48.15	2.19	1.87	10091057	1.64	0.26	10	2.10	0.13	25				
891018	16 7 26.28	36 58.38	121 48.50	12.22	1.78	10091070	1.92	0.23	66	1.64	0.19	35				
891018	16 7 50.25	37 6.06	121 55.37	4.09	1.19	10091074	1.30	0.23	28	1.08	0.09	6				
891018	16 8 53.57	37 8.34	121 59.44	7.67	1.50	10091075	1.49	0.26	54	1.51	0.19	21				
891018	1610 27.30	36 57.47	121 43.74	4.59	1.87	10091071	1.80	0.22	60	1.93	0.22	37				
891018	1612 22.96	36 55.59	121 43.14	11.29	1.27	10091072	1.35	0.29	19	1.19	0.43	7				
891018	1614 46.88	37 1.65	121 50.66	4.47	1.59	10091089	1.72	0.26	34	1.46	0.15	24				
891018	1616 4.30	36 59.44	121 43.51	2.79	1.68	10091073	1.71	0.20	55	1.65	0.14	29				
891018	1616 47.51	36 57.35	121 48.83	8.95	1.42	10091090	1.43	0.25	14	1.42	0.19	12				
891018	1618 43.22	37 2.93	121 56.55	13.57	1.57	10091092	1.66	0.22	35	1.47	0.16	17				
891018	1619 48.24	37 5.96	121 55.78	0.98	1.09	10091093	1.19	0.25	21	0.99	0.20	7				
891018	1625 56.65	37 3.10	121 49.69	3.50	1.21	10091076	1.16	0.21	19	1.26	0.13	12				
891018	1626 16.43	37 10.81	122 4.51	11.01	2.04	10091082	2.01	0.27	53	2.06	0.24	46				
891018	1628 47.68	37 6.28	121 53.50	0.01	1.61	10091077	1.59	0.21	43	1.63	0.21	29				
891018	1629 28.60	38 20.33	122 38.10	0.02	2.01	10091084	1.94	0.24	14	2.07	0.25	7				
891018	1630 25.35	37 10.12	121 59.18	2.47	1.40	10091085	1.42	0.23	30	1.37	0.12	19				
891018	1632 44.17	37 6.16	121 58.03	8.02	1.17	10091078	1.21	0.22	27	1.12	0.17	14				
891018	1632 57.23	37 8.66	122 2.05	9.24	1.25	10091086	1.37	0.31	20	1.12	0.18	10				
891018	1638 18.52	37 3.20	121 56.20	10.93	1.46	10091079	1.62	0.23	30	1.30	0.23	19				
891018	1638 31.24	36 59.23	121 43.48	3.50	2.06	10091096	2.10	0.19	38	2.02	0.21	32				
891018	1644 54.86	37 40.48	121 51.14	7.26	1.83	10091099	1.79	0.22	18	1.88	0.24	15				
891018	1645 10.98	37 1.63	121 49.10	1.89	1.95	10091081	1.95	0.22	33	1.94	0.23	19				
891018	17 1 6.31	37 6.76	121 59.31	11.81	1.86	10091114	1.87	0.16	62	1.85	0.24	34				
891018	17 1 25.58	37 8.89	122 0.86	11.29	2.38	10091117	2.43	0.24	48	2.34	0.32	41				
891018	17 3 28.50	37 7.38	121 59.87	12.08	2.18	10091115	2.21	0.23	75	2.14	0.23	46				
891018	17 6 51.29	37 4.58	121 55.46	5.48	1.03	10091116	0.97	0.17	20	1.09	0.19	6				
891019	516 17.18	36 56.48	121 41.42	6.36	3.25	10090152	3.19	0.24	10	3.32	0.16	66	3.04	4		
891019	845 49.41	36 57.55	121 51.37	9.45	4.02	10090202	4.09	0.24	6	3.96	0.34	98	3.93	6		
891019	953 49.79	36 55.45	121 41.73	9.51	4.46	10090128	4.49	0.13	26	4.43	0.29	305	4.39	6		
891019	1017 41.38	36 56.25	121 50.02	11.01	3.02	10090127	2.98	0.26	13	3.06	0.34	38				
891019	1129 26.48	36 56.61	121 50.87	9.57	3.17	10090546	3.17	0.17	21	3.17	0.28	89	3.02	4		
891019	1130 8.75	36 56.72	121 50.80	9.17	2.56	10090569	2.61	0.23	6	2.52	0.42	16				
891019	1225 3.88	36 55.14	121 41.18	11.36	2.01	10090571	2.01	0.18	27	2.01	0.20	38				
891019	1225 32.99	36 55.04	121 41.23	9.26	3.91	10090547	3.93	0.16	15	3.88	0.29	109	3.83	6		
891019	1231 19.29	36 56.99	121 39.28	5.19	1.80	10090572	1.86	0.22	18	1.75	0.20	26				
891019	1231 39.83	36 55.94	121 49.50	9.20	3.17	10090548	3.24	0.23	21	3.10	0.27	79	3.04	4		
891019	23 3 57.23	36 56.86	121 44.29	13.45	1.18	10091118	1.28	0.22	28	1.09	0.23	13				
891019	23 6 25.61	37 6.73	121 59.66	11.35	1.16	10091119	1.18	0.30	21	1.14	0.12	10				
891020	018 20.28	37 5.02	121 55.96	9.37	3.95	10090135	3.99	0.17	36	3.91	0.23	215	4.14	5		
891020	3 3 14.38	36 23.04	120 36.90	14.09	2.43	20091735	2.34	0.26	142	2.51	0.20	55				
891021	049 42.95	37 2.05	121 52.43	12.44	4.32	10090141	4.43	0.17	28	4.21	0.23	360	4.41	5		
891021	2214 56.33	37 2.89	121 54.89	12.95	4.61	10090142	4.67	0.15	21	4.55	0.31	377	4.46	5		
891025	127 26.09	37 3.95	121 50.06	10.01	4.28	10090134	4.22	0.14	9	4.35	0.31	222	4.56	5		
891025	13 0 41.76	36 53.10	121 39.04	3.53	3.77	10090136	3.74	0.18	58	3.81	0.30	230	3.96	4		
891030	1117 13.21	37 3.23	121 49.31	10.42	3.68	10090149	3.67	0.25	21	3.69	0.16	128	3.85	6		
891102	550 10.57	37 3.08	121 49.07	9.63	4.45	10090165	4.42	0.15	16	4.48	0.34	227	4.54	5		
891103	1933 27.63	38 31.13	119 42.45	4.03	3.11	10090577	3.03	0.36	72	3.18	0.25	64	3.31	2		
891104	716 4.63	37 46.05	122 10.91	9.21	3.70	10090169	3.71	0.24	16	3.69	0.26	105	3.58	6		
891105	130 41.72	37 3.47	121 55.68	12.64	3.94	146790	3.98	0.20	129	3.90	0.25	323	3.97	5		
891105	1337 33.70	37 2.69	121 54.42	12.22	4.10	10090172	4.21	0.21	24	3.99	0.26	226	4.17	6		
891106	2337 24.25	37 38.03	122 29.72	6.07	3.02	10090174	3.03	0.23	6	3.00	0.13	79	3.10	4		
891107	2342 11.95	37 0.54	121 48.41	15.98	1.53	10090176	1.57	0.27	30	1.50	0.24	22				
891107	2342 37.27	37 12.77	122 2.42	9.66	4.20	10090177	4.31	0.20	71	4.10	0.29	353	4.15	5		
891111	1923 22.73	40 20.71	124 27.06	17.86	4.28	10090183	4.24	0.24	200	4.32	0.32	226	4.31	5		

Table A2 (continued)

DATE	TIME	LAT	LON	DEPTH	AMAG	CUSPID	MX	SDMX	NX	MF	SDMF	NF	MBK	NB	MZ	NZ
891113	2342 12.41	36 54.27	121 39.99	11.99	1.88	10090416	1.89	0.29	49	1.88	0.20	46				
891114	1733 49.91	36 47.99	121 33.67	5.60	3.16	10090185	3.17	0.23	134	3.15	0.30	159	3.26	3		
891116	459 28.77	37 10.40	122 3.41	12.38	3.03	10090418	3.04	0.16	15	3.02	0.19	70	3.19	4		
891118	2146 19.77	36 33.87	121 17.37	3.77	1.56	10090429	1.53	0.32	29	1.60	0.35	21				
891201	1116 49.88	36 39.98	121 21.47	2.46	3.59	10090272	3.58	0.21	73	3.60	0.29	273	3.50	4		
891201	1126 22.11	36 39.81	121 21.14	2.91	3.49	10090271	3.43	0.21	59	3.54	0.31	225	3.07	4		
891201	1237 43.02	36 39.96	121 21.43	2.48	4.29	10090270	4.27	0.17	39	4.30	0.32	371	4.36	6		
891202	20 2 0.32	37 12.88	122 2.69	9.53	3.66	10090309	3.74	0.19	72	3.58	0.25	260	3.85	4		
891210	8 1 51.78	37 7.08	121 58.65	12.20	2.14	10090366	2.19	0.21	19	2.09	0.19	64				
891211	18 6 11.51	36 55.59	121 32.70	6.12	2.33	10090377	2.30	0.23	95	2.37	0.20	87				
891212	352 0.92	37 7.52	121 59.78	11.21	3.38	10090365	3.38	0.21	142	3.38	0.19	230	3.64	3		
891217	2058 36.55	37 2.08	121 56.20	16.08	3.46	10090442	3.52	0.25	182	3.39	0.21	241	3.67	3		
891218	17 7 30.32	36 40.52	121 22.10	1.86	3.92	10090441	3.93	0.25	48	3.91	0.28	325	3.77	5		
891223	1637 45.68	36 26.72	120 27.54	11.75	4.05	10090558	4.01	0.34	133	4.09	0.32	339	4.15	6		
891227	1610 1.19	37 10.68	122 4.22	12.84	3.33	10090476	3.36	0.21	135	3.29	0.23	201				
891228	941 9.23	34 11.83	117 20.30	12.04	4.17	10090489	4.32	0.18	171	4.01	0.23	113	4.35	6		
900106	535 50.91	40 22.98	125 14.42	22.06	4.31	10090557	4.29	0.17	189	4.32	0.37	204	4.34	8		
900111	122 9.06	35 13.21	118 12.73	0.01	3.83	10090576	3.98	0.21	162	3.68	0.28	111	4.20	6		
900112	910 22.88	36 24.33	120 48.94	11.50	4.25	10090563	4.23	0.22	114	4.27	0.26	347	4.26	6		
900115	529 3.99	37 56.81	118 16.78	8.47	4.77	10090564	4.87	0.22	77	4.67	0.39	327	4.81	6		
900116	20 8 21.47	40 12.07	124 24.14	15.92	5.60	10090568	5.44	0.25	66	5.77	0.44	322	5.37	4		
900118	1145 26.45	41 10.84	123 46.65	27.66	5.11	10090570	5.00	0.20	133	5.21	0.38	294	4.91	4		
900119	1213 4.17	37 38.09	119 3.15	3.35	3.54	10090574	3.72	0.21	251	3.36	0.33	149	3.67	6		
900122	6 1 10.56	37 18.61	122 8.26	5.46	2.96	10090573	2.98	0.21	144	2.94	0.22	162	2.98	4		
900125	1351 24.60	36 39.77	121 20.91	1.77	2.97	10090647	2.92	0.16	175	3.01	0.26	164	2.81	4		
900125	14 4 31.30	36 39.93	121 21.22	1.83	3.79	10090648	3.80	0.23	191	3.78	0.27	299	3.88	5		
900126	247 46.24	36 40.33	121 21.76	1.66	3.15	10090655	3.13	0.18	161	3.17	0.29	189	2.91	4		
900127	5 7 21.83	36 50.32	121 35.40	2.47	2.95	10090653	2.89	0.20	135	3.01	0.31	136	2.77	4		
900127	2121 53.19	36 40.02	121 21.32	1.53	3.36	10090659	3.29	0.24	63	3.44	0.22	182	3.41	4		
900127	2142 55.22	36 40.17	121 21.54	1.58	3.33	10090660	3.30	0.18	61	3.36	0.20	197	3.05	4		
900127	22 6 8.54	38 47.10	122 45.37	1.81	3.69	10090661	3.73	0.27	150	3.66	0.30	194	3.52	8		
900131	1312 12.80	37 10.34	121 57.29	2.08	2.75	10090676	2.73	0.22	116	2.77	0.23	120	2.70	4		
900131	1312 49.33	37 10.31	121 57.24	2.00	2.76	10090680	2.69	0.25	33	2.83	0.27	94	2.71	4		
900206	1814 6.98	34 56.84	121 6.94	8.93	4.08	10090715	4.10	0.24	58	4.05	0.29	190	4.22	6		
900207	1058 32.75	36 51.42	121 37.34	5.83	2.98	10090716	2.96	0.20	71	3.01	0.30	145	2.94	4		
900207	1412 14.71	36 56.30	121 41.86	7.29	4.11	10090717	4.07	0.27	141	4.16	0.34	348	4.09	7		
900208	947 31.77	36 39.93	121 21.08	1.59	3.60	10090728	3.59	0.22	64	3.60	0.24	247	3.31	4		
900212	148 17.31	36 51.11	121 36.89	6.49	3.68	10090745	3.70	0.19	193	3.65	0.24	297	3.77	6		
900214	311 2.41	37 37.61	118 55.72	10.50	3.49	10090866	3.62	0.29	102	3.37	0.39	68	3.31	3		
900216	1048 33.39	36 52.12	121 37.72	5.65	3.23	10090864	3.22	0.25	65	3.23	0.26	194	3.31	2		
900228	2343 39.76	34 8.86	117 45.56	18.01	6.13	10090831	6.00	0.27	59	6.26	0.54	377	6.21	8		
900307	716 36.05	37 28.34	118 36.55	11.86	4.01	10090867	4.16	0.20	211	3.86	0.24	215	4.08	4		
900308	340 12.68	38 17.65	118 54.85	4.41	3.72	10090931	3.88	0.24	209	3.55	0.26	143	3.63	2		
900313	318 2.54	36 49.78	121 25.69	10.83	3.41	10090932	3.43	0.19	155	3.40	0.27	231	3.26	4		
900323	1350 18.57	36 51.14	121 37.35	8.68	3.60	10090980	3.63	0.22	73	3.57	0.22	288	3.68	6		
900324	816 44.38	38 20.33	118 19.21	0.01	4.53	10090984	4.65	0.30	68	4.41	0.36	285	4.69	6		
900327	1921 31.79	40 17.85	124 35.92	9.76	3.42	10091017	3.41	0.20	43	3.44	0.37	51	3.24	5		
900328	6 8 25.12	36 50.71	121 34.92	4.50	3.62	10091019	3.67	0.19	188	3.57	0.23	282	3.60	4		
900406	2241 27.12	37 51.83	122 1.79	6.89	4.12	10091105	4.11	0.24	131	4.12	0.31	329	3.95	8		
900406	2243 36.90	37 51.97	122 0.03	0.01	3.21	10091113	3.08	0.44	5	3.35	0.33	70	3.21	4		
900407	238 3.60	37 51.45	122 2.40	2.04	2.47	10091102	2.48	0.43	15	2.45	0.22	78				
900407	239 18.18	37 52.57	122 0.26	7.92	4.89	10091101	4.78	0.28	54	4.99	0.49	403	4.41	7		
900407	241 12.36	37 51.70	122 1.40	2.12	3.79	10091103	3.72	0.29	14	3.85	0.41	39	3.72	2		
900407	251 12.17	37 52.25	122 0.24	0.92	3.79	10091100	3.79	0.24	60	3.80	0.33	243	3.56	5		
900407	259 33.92	37 52.15	121 59.92	0.83	3.34	10091106	3.32	0.25	13	3.36	0.26	112	3.23	5		
900407	445 9.19	37 52.38	121 59.41	0.13	2.82	10091107	2.86	0.24	14	2.78	0.32	60				
900407	446 8.01	37 52.41	121 59.52	0.52	3.42	10091111	3.47	0.14	6	3.38	0.26	103	3.24	4		
900407	20 8 59.32	36 53.34	121 38.57	3.61	3.79	10091109	3.74	0.24	9	3.83	0.24	128	3.97	6		
900417	2232 30.20	34 7.94	117 47.50	12.02	4.73	20091167	4.80	0.15	49	4.66	0.40	168	4.76	4		
900418	1337 56.87	36 54.40	121 39.81	5.75	4.35	20091168	4.10	0.16	12	4.60	0.49	105	4.28	4		
900418	1338 10.20	36 54.72	121 39.87	6.26	4.61	20091171	4.50	0.16	30	4.73	0.32	34	4.53	6		
900418	1341 38.62	36 54.99	121 40.20	4.84	4.53	20091172	4.31	0.25	42	4.75	0.38	370	4.83	6		
900418	1353 51.30	36 55.11	121 40.20	3.93	5.41	20091154	5.22	0.23	16	5.60	0.49	388	5.30	6		
900418	1452 23.37	36 54.24	121 39.61	10.03	4.24	20091173	4.21	0.25	46	4.26	0.32	323	4.05	4		
900418	1528 16.16	36 55.70	121 40.86	9.02	4.26	20091174	4.24	0.21	123	4.27	0.33	330	4.38	8		
900418	1536 51.10	36 56.01	121 41.30	9.67	3.91	20091176	3.92	0.16	49	3.90	0.23	290	3.99	6		
900418	1546 3.37	36 56.77	121 41.69	7.25	4.98	20091155	5.11	0.20	25	4.85	0.28	405	5.07	8		

Table A2 (continued)

DATE	TIME	LAT	LON	DEPTH	AMAG	CUSPID	MX	SDMX	NX	MF	SDMF	NF	MBK	NB	MZ	NZ
900418	1548 25.15	36 56.18	121 40.93	7.02	3.31	20091156	3.25	0.24	29	3.38	0.39	17				
900418	1550 15.57	36 56.52	121 41.34	6.81	2.33	20091158	2.25	0.19	24	2.42	0.34	41				
900418	1551 15.59	36 55.42	121 39.93	7.38	1.44	20091159	1.36	0.24	18	1.51	0.44	12				
900418	16 1 40.21	36 52.52	121 37.43	5.34	1.17	20091182	1.23	0.23	19	1.12	0.29	9				
900418	16 2 27.73	36 56.16	121 40.99	8.91	1.44	20091183	1.46	0.22	39	1.41	0.23	18				
900418	16 3 39.21	36 54.86	121 40.56	8.00	2.65	20091178	2.71	0.25	58	2.59	0.21	84				
900418	16 5 55.26	36 54.64	121 40.30	7.62	1.73	20091180	1.72	0.21	55	1.75	0.19	52				
900418	16 6 28.16	36 55.59	121 41.13	8.28	3.67	20091177	3.70	0.19	163	3.64	0.23	293	3.70	6		
900418	1619 12.89	36 55.41	121 41.23	8.46	3.96	20091179	4.00	0.15	155	3.92	0.26	339	3.94	6		
900418	2236 36.02	36 53.89	121 39.21	8.79	0.92	20091181	1.06	0.23	21	0.78	0.43	5				
900419	1654 3.08	38 33.83	119 44.76	3.49	3.49	20091191	3.56	0.27	208	3.42	0.29	137	3.57	6		
900422	2 0 15.36	36 53.27	121 38.82	4.10	3.64	20091192	3.59	0.23	74	3.69	0.27	277	3.80	6		
900422	14 2 3.91	36 34.43	121 14.51	9.62	3.30	20091193	3.28	0.25	117	3.31	0.25	197	3.26	6		
900422	14 3 39.09	36 34.62	121 14.62	7.00	1.55	20091195	1.53	0.27	22	1.57	0.35	14				
900428	441 7.68	37 52.35	121 59.47	0.01	2.73	20091188	2.71	0.24	80	2.74	0.24	87	2.57	4		
900428	441 47.48	37 52.95	121 59.54	0.90	4.51	20091186	4.51	0.18	70	4.52	0.36	348	4.31	6		
900428	447 41.90	37 52.10	122 0.85	6.41	4.43	20091187	4.38	0.17	69	4.47	0.37	352	4.23	8		
900428	545 4.51	37 51.34	122 2.71	6.82	3.56	20091189	3.57	0.26	59	3.54	0.27	228	3.45	6		
900501	443 4.45	38 49.93	122 48.54	0.92	3.47	20091207	3.58	0.26	100	3.35	0.30	153				
900507	757 0.71	37 37.76	118 57.14	11.57	3.11	20091220	2.89	0.35	17	3.34	0.28	21				
900507	759 54.45	37 37.77	118 56.63	9.37	3.34	20091221	2.72	0.37	19	3.96	0.76	16				
900507	941 3.21	37 37.82	118 56.32	10.33	3.58	20091217	3.73	0.23	98	3.44	0.29	117				
900516	1149 26.73	36 37.98	121 18.90	5.53	2.97	20091344	2.81	0.21	89	3.13	0.48	140				
900516	1149 55.55	36 38.03	121 18.56	4.05	2.43	20091345	2.41	0.21	21	2.44	0.16	15				
900516	1150 20.66	36 38.00	121 18.53	3.61	2.11	20091346	2.11	0.26	27	2.10	0.26	21				
900516	1718 14.61	36 15.93	120 20.50	10.71	3.45	20091347	3.41	0.24	128	3.49	0.25	223				
900517	1849 48.69	37 22.41	121 43.70	9.53	3.59	20091356	3.60	0.20	54	3.58	0.20	228				
900518	3 0 49.75	36 38.35	121 18.84	6.39	1.78	20091357	1.84	0.38	6	1.72	0.39	19				
900518	3 1 6.58	36 37.88	121 19.09	3.99	3.16	20091367	3.10	0.21	57	3.22	0.25	139				
900518	3 2 39.16	36 38.06	121 18.97	5.94	2.87	20091368	2.86	0.21	52	2.89	0.20	128				
900519	1755 58.63	36 16.97	120 23.20	13.16	3.60	20091358	3.55	0.30	55	3.65	0.23	234				
900519	2048 57.91	36 44.86	121 25.87	10.64	3.26	20091360	3.23	0.28	61	3.29	0.23	146				
900521	1049 16.16	37 29.99	118 26.27	5.34	3.59	20091359	3.82	0.21	38	3.35	0.26	46				
900609	0 4 17.54	38 49.29	122 46.32	2.04	3.65	20091518	3.73	0.28	78	3.58	0.28	171				
900611	138 14.52	37 17.23	121 39.34	6.39	3.04	20091514	2.97	0.24	39	3.12	0.22	172				
900611	9 7 26.29	38 21.69	122 25.13	7.50	3.52	20091513	3.53	0.22	74	3.51	0.22	220				
900618	1453 31.09	36 42.04	121 23.98	1.25	3.48	20091600	3.48	0.17	57	3.48	0.22	202				
900627	17 4 52.09	36 38.64	121 17.61	3.52	3.22	20091646	3.17	0.17	64	3.28	0.22	185				
900701	036 41.44	37 24.49	121 46.12	5.49	4.04	20091676	4.03	0.17	156	4.04	0.31	332				
900705	5 5 29.49	40 27.69	121 33.74	6.92	2.72	20091733	2.71	0.25	35	2.72	0.25	31				
900713	627 7.91	33 57.14	120 10.02	0.00	3.66	20091772	3.72	0.22	178	3.59	0.21	111				
900717	339 35.58	36 55.44	121 41.84	12.87	3.53	20091791	3.44	0.25	78	3.63	0.36	205				
900717	340 11.68	36 55.45	121 41.76	10.74	3.00	20091800	2.96	0.25	26	3.04	0.29	24				
900802	1 0 43.94	35 39.97	120 15.71	7.28	3.17	20091928	3.14	0.17	37	3.20	0.29	128				
900803	10 2 49.86	36 22.31	118 7.96	6.73	3.62	20091948	3.68	0.27	110	3.55	0.27	102				
900805	652 13.32	36 52.19	121 37.88	8.26	4.13	20091962	4.10	0.27	111	4.16	0.31	335				
900807	1839 48.03	36 51.65	121 18.78	7.65	3.67	20091966	3.71	0.22	60	3.64	0.21	266				
900809	2115 51.33	36 51.05	121 35.76	3.51	2.46	20091988	2.42	0.37	7	2.50	0.21	53				
900818	1428 59.45	40 25.32	125 8.72	24.29	3.64	20092077	3.60	0.24	57	3.67	0.31	104				
900820	1649 8.69	36 52.06	121 38.43	10.58	3.17	20092075	3.19	0.28	53	3.16	0.19	153				
900820	20 6 6.18	37 24.27	118 34.11	12.45	3.44	20092076	3.50	0.23	47	3.39	0.22	48				
900822	2124 5.40	37 11.53	122 4.79	11.81	3.68	20092078	3.79	0.19	41	3.57	0.19	133				
900825	1739 8.19	36 39.45	121 20.49	2.47	3.63	20092117	3.66	0.17	63	3.59	0.27	272				
900828	1824 1.65	37 31.19	118 53.16	4.96	3.31	20092123	3.38	0.30	61	3.24	0.28	50				
900831	2015 42.52	40 26.28	125 25.20	22.03	3.67	163494	3.64	0.23	91	3.70	0.34	66				
900901	912 52.16	36 45.83	121 31.43	8.70	2.77	20092158	2.76	0.24	76	2.78	0.22	120				
900902	8 8 24.20	36 38.75	121 19.53	4.07	3.52	20092159	3.54	0.18	174	3.50	0.26	249				
900902	1715 40.76	36 38.58	121 19.34	4.15	3.30	20092160	3.31	0.21	93	3.29	0.23	217				
900908	1248 22.09	36 39.31	121 20.41	3.50	3.97	20092173	4.00	0.26	144	3.94	0.30	324				
900908	1252 2.51	36 39.24	121 20.17	3.50	3.68	20092174	3.66	0.22	56	3.70	0.22	249				
900908	13 5 46.11	36 39.65	121 20.84	3.55	3.02	20092175	3.04	0.25	51	3.00	0.24	128				
900908	1418 48.51	36 39.23	121 20.19	3.50	2.63	20092184	2.61	0.21	33	2.66	0.23	100				
900908	1420 17.67	36 39.32	121 20.41	3.51	3.87	20092176	3.89	0.16	85	3.85	0.24	321				
900910	143 14.00	36 52.74	121 38.52	7.02	3.53	20092198	3.57	0.19	66	3.49	0.24	266				
900910	653 4.12	35 58.99	120 34.14	2.23	3.27	20092209	3.18	0.23	44	3.36	0.32	145				
900911	713 31.44	36 38.44	121 19.44	5.99	3.95	20092201	3.96	0.24	51	3.95	0.27	323				
900917	16 0 48.41	36 37.85	121 18.65	5.36	2.88	20092248	2.83	0.22	117	2.92	0.27	137				
900923	1335 47.11	37 21.93	122 11.65	6.90	3.14	20092290	3.17	0.19	48	3.10	0.17	172				

900926	253	55.48	37	22.06	122	11.65	6.61	3.48	20092324	3.52	0.17	89	3.43	0.20209
900926	414	11.49	40	24.02	125	30.85	22.50	4.56	20092326	4.54	0.21114	4.58	0.42210

Table A3 LIST OF EVENTS IN DATA SET LHT

DATE	TIME	LAT	LON	DEPTH	AMAG	CUSPID	MX	SDMX	NX	MF	SDMF	NF	MBK	NB	MZ	NZ
820411	249 37.75	41-11.00	121-55.86	7.80	3.62	0	3.62	0.17	18	0.00	0.00	0	3.40			
820529	1302 23.86	38-47.85	122-49.33	4.85	4.30	0	4.30	0.22	95	0.00	0.00	0	4.0			
820615	2352 29.86	38-55.51	121-13.08	6.05	2.22	0	2.22	0.26	27	0.00	0.00	0				
820615	2349 20.26	33-33.05	116-40.30	15.58	5.06	0	5.06	0.21	213	0.00	0.00	0	4.80			
820621	643 37.68	41-10.68	121-56.63	7.38	4.30	0	4.30	0.19	194	0.00	0.00	0	4.3			
820625	358 23.27	35-57.21	120-32.84	8.83	4.24	0	4.24	0.18	196	0.00	0.00	0	4.0			
820627	0520 01.87	35-57.25	120-32.80	6.02	3.53	0	3.53	0.19	225	0.00	0.00	0	3.3			
820805	1400 00.09	37-05.05	116-00.39	-.64	5.64	0	5.64	0.28	106	0.00	0.00	0	5.70			
820810	212 8.45	36-35.23	121-13.92	3.23	3.97	0	3.97	0.18	30	0.00	0.00	0	4.5			
820811	0746 42.96	36-37.60	121-18.02	9.23	4.83	0	4.83	0.25	99	0.00	0.00	0	4.6			
820818	0843 49.50	37-01.34	121-44.66	11.77	4.35	0	4.35	0.30	85	0.00	0.00	0	4.5			
820824	2233 36.40	37-26.91	121-48.21	3.83	4.06	0	4.06	0.20	90	0.00	0.00	0	3.9			
820828	1 3 11.07	37-50.53	121-47.28	10.78	3.67	0	3.67	0.24	176	0.00	0.00	0	3.8			
820831	311 7.81	36-38.58	121-18.90	4.54	4.13	0	4.13	0.20	139	0.00	0.00	0	4.0			
820903	1858 23.14	39-37.55	122-31.99	0.49	4.11	0	4.11	0.22	212	0.00	0.00	0	4.0			
820909	3 1 4.94	39-18.28	122-47.38	5.31	2.70	0	2.70	0.31	90	0.00	0.00	0				
820909	1126 1.23	40-49.20	125- 4.55	21.50	3.25	0	3.25	0.23	55	0.00	0.00	0				
820912	651 32.35	40-21.17	123- 7.96	51.64	3.16	0	3.16	0.27	97	0.00	0.00	0				
820916	1534 56.29	39-36.82	123- 3.81	0.06	2.77	0	2.77	0.26	62	0.00	0.00	0				
820920	956 32.39	40-20.49	124-19.67	32.99	2.66	0	2.66	0.33	39	0.00	0.00	0				
820920	8 1 32.57	39-45.29	122- 3.88	22.28	2.87	0	2.87	0.26	89	0.00	0.00	0				
820923	2042 50.60	34-52.19	120-21.76	4.77	4.00	0	4.00	0.23	213	0.00	0.00	0	3.5			
820924	8 5 55.36	36-39.42	121-19.62	1.60	4.03	0	4.03	0.20	138	0.00	0.00	0	4.0			
820924	0740 24.16	37-50.65	118-09.48	9.41	5.50	0	5.50	0.23	61	0.00	0.00	0	5.5			
821015	1058 39.12	32-50.50	125-49.27	0.52	5.59	0	5.59	0.24	131	0.00	0.00	0				
821025	2226 03.67	36-19.31	120-30.44	10.95	5.44	0	5.44	0.22	32	0.00	0.00	0	5.4			
830509	249 11.55	36-14.74	120-17.97	12.04	5.33	0	5.33	0.30	34	0.00	0.00	0	5.2			
830522	839 21.74	36- 9.03	120-12.09	10.48	4.32	0	4.32	0.25	164	0.00	0.00	0	4.0			
830524	9 2 17.70	36-15.24	120-19.00	8.86	4.77	0	4.77	0.20	101	0.00	0.00	0	4.6			
830611	3 9 52.21	36-15.33	120-27.01	2.40	5.24	0	5.24	0.19	59	0.00	0.00	0	5.1			
830612	131 27.54	36- 7.55	120-17.71	14.49	4.07	0	4.07	0.24	169	0.00	0.00	0	4.0			
830709	740 51.30	36-15.04	120-24.01	9.02	5.43	0	5.43	0.18	45	0.00	0.00	0	5.3			
830721	123 32.97	36- 9.17	121-32.64	5.24	3.89	0	3.89	0.23	149	0.00	0.00	0	3.9			
830722	343 1.01	36-13.31	120-24.37	7.89	5.08	0	5.08	0.17	64	0.00	0.00	0	5.0			
830722	239 54.07	36-14.44	120-24.53	7.37	6.10	0	6.10	0.30	5	0.00	0.00	0	6.0			
830725	2231 39.57	36-13.76	120-23.87	8.42	5.36	0	5.36	0.19	54	0.00	0.00	0	5.1			
830829	1010 30.90	35-50.17	121-20.70	6.57	5.25	0	5.25	0.21	57	0.00	0.00	0	5.2			
830909	916 13.47	36-13.91	120-15.90	6.69	5.33	0	5.33	0.29	38	0.00	0.00	0	5.4			
831021	2244 13.28	35-54.33	118-19.53	4.00	4.96	0	4.96	0.28	169	0.00	0.00	0	4.54			
831220	1041 5.21	40-25.44	125-31.35	15.00	5.49	0	5.49	0.20	65	0.00	0.00	0	5.6			
840123	540 19.88	36-22.13	121-52.74	7.73	4.95	0	4.95	0.31	40	0.00	0.00	0	5.1	8		
840123	659 50.84	36-22.17	121-52.65	7.27	4.19	0	4.19	0.27	122	0.00	0.00	0	4.5	6		
840210	723 24.82	36-23.25	121-52.90	9.45	4.06	0	4.06	0.23	139	0.00	0.00	0	4.1	4		
840210	1233 5.82	37-38.50	125-28.92	5.00	3.69	0	3.69	0.32	297	0.00	0.00	0	3.9	2		
840217	12 3 55.90	38-50.89	119-42.27	23.90	4.51	0	4.51	0.23	132	0.00	0.00	0	4.3	6		
840219	943 9.35	36-17.10	120-19.47	10.70	4.38	0	4.38	0.17	157	0.00	0.00	0	4.1	6		
840327	336 35.29	37-43.48	122- 8.41	3.27	4.52	0	4.52	0.22	97	0.00	0.00	0	4.3	6		
840424	2115 18.78	37-18.56	120-40.68	8.42	6.20	0	6.20	0.19	14	0.00	0.00	0	6.2	6		
840620	1928 6.10	34-58.18	120-44.31	7.29	4.47	0	4.47	0.25	88	0.00	0.00	0	4.3	6		
850803	1357 10.53	36- 8.33	120- 9.64	12.08	3.99	0	3.99	0.31	21	0.00	0.00	0	3.8	5		
850804	1129 14.97	36- 8.48	120- 9.60	12.08	4.57	0	4.57	0.39	9	0.00	0.00	0	4.7	7		
850804	12 1 55.76	36- 8.69	120- 9.16	11.81	5.62	0	5.62	0.26	7	0.00	0.00	0	5.6	7		
850804	12 8 41.26	36- 6.68	120- 4.74	11.07	4.15	0	4.15	0.08	14	0.00	0.00	0	4.0	5		
850804	13 9 18.98	36- 8.92	120- 8.92	11.42	3.55	0	3.55	0.20	28	0.00	0.00	0	3.3	5		
850804	1318 37.94	36- 7.48	120- 5.83	12.38	3.46	0	3.46	0.12	27	0.00	0.00	0	3.3	5		
850804	1515 39.18	36- 2.82	120- 3.91	11.37	4.27	0	4.27	0.03	3	0.00	0.00	0	4.1	5		
850805	1445 37.78	36- 7.56	120- 5.28	8.87	4.16	0	4.16	0.00	1	0.00	0.00	0	4.3	5		
850805	1522 24.28	36- 7.32	120- 4.93	10.75	3.52	0	3.52	0.17	47	0.00	0.00	0	3.7	5		
850807	016 3.32	36- 0.97	120- 8.83	17.03	4.39	0	4.39	0.10	9	0.00	0.00	0	4.3	5		
850807	028 12.51	36- 0.59	120- 9.58	16.07	3.46	0	3.46	0.21	43	0.00	0.00	0	3.2	5		
850809	847 9.34	36- 6.30	120- 0.34	12.20	3.51	0	3.51	0.15	23	0.00	0.00	0	3.0	4		
850809	1115 32.98	36- 6.05	119-59.76	12.57	3.39	0	3.39	0.14	58	0.00	0.00	0	3.0	4		

Table A3 (continued)

DATE	TIME	LAT	LON	DEPTH	AMAG	CUSPID	MX	SDMX	NX	MF	SDMF	NF	MBK	NB	MZ	NZ
850809	1242 18.92	36- 5.91	120- 7.84	8.56	3.75	0	3.75	0.12	28	0.00	0.00	0	3.4	4		
850831	1325 51.36	36- 1.28	119-59.34	11.10	3.38	0	3.38	0.15	55	0.00	0.00	0	3.1	5		
850908	1217 17.20	36- 1.08	120- 8.26	16.69	3.39	0	3.39	0.18	51	0.00	0.00	0	3.1	4		
850914	3 2 44.57	36-11.68	120-18.88	10.15	3.49	0	3.49	0.18	29	0.00	0.00	0	3.1	2		
851124	1921 38.62	36- 1.16	120-53.12	11.27	4.64	0	4.64	0.22	83	0.00	0.00	0	4.5	6		
860126	1920 51.21	36-48.53	121-16.10	4.85	5.70	0	5.70	0.15	11	0.00	0.00	0	5.5	8		
860331	1155 39.95	37-28.08	121-41.70	7.33	5.77	0	5.77	0.32	19	0.00	0.00	0	5.7	6		
860708	040 22.89	36- 3.68	121-50.52	11.73	4.36	0	4.36	0.21	90	0.00	0.00	0	4.4	5		
860708	920 44.45	33-59.96	116-36.60	11.31	6.32	0	6.32	0.20	40	0.00	0.00	0	5.61			
860720	1429 45.44	37-33.67	118-26.47	6.38	5.86	0	5.86	0.13	12	0.00	0.00	0	5.9	7		
860721	1442 26.08	37-31.91	118-26.67	9.11	6.28	0	6.28	0.08	4	0.00	0.00	0	6.4	7		
860731	722 39.88	37-27.61	118-21.15	7.57	5.91	0	5.91	0.13	15	0.00	0.00	0	5.8	7		
870103	1354 18.01	38-44.89	121-37.90	11.42	1.79	0	1.79	0.30	26	0.00	0.00	0				
870214	726 50.32	36- 9.56	120-21.53	14.57	5.23	0	5.23	0.21	28	0.00	0.00	0	5.3	10		
870409	2034 9.05	40-56.32	123-29.14	26.25	4.16	0	4.16	0.15	42	0.00	0.00	0	4.1	6		
870731	2356 57.99	40-25.33	124-26.61	16.40	5.46	0	5.46	0.23	79	0.00	0.00	0	5.6	4		
880220	839 57.43	36-47.97	121-18.35	8.88	4.74	0	4.74	0.30	39	0.00	0.00	0	5.1	10		
880222	743 12.79	35-29.84	119-42.13	19.12	4.27	0	4.27	0.27	68	0.00	0.00	0	4.3	6		

Table A4

NORTHERN CALIFORNIA NETWORK STATION SITE RESIDUALS

INST	ARX	SDRX	NRX	ARF	SDRF	NRF	ATN	ROCK	INST	ARX	SDRX	NRX	ARF	SDRF	NRF	ATN	ROCK
AARV	0.18	0.25	71	0.06	0.29	109	24	grmz	CADV	0.00	0.23	101	-0.11	0.28	264	18	um
AASV	-0.28	0.44	54	-0.14	0.47	142	18	qpc	CAIV	0.05	0.26	48	-0.11	0.25	237	18	kjfs
ABJV	-0.13	0.25	80	-0.28	0.22	114	18	grmz	CALE	-0.24	0.27	259	-0.25	0.27	157	42	kjfm
ABRV	0.10	0.25	27	0.18	0.43	51	24	q	CALN	-0.21	0.23	265	-0.25	0.23	170	42	kjfm
ADWV	-0.18	0.24	76	-0.19	0.34	167	12	mzv	CALV	-0.33	0.26	103	-0.25	0.35	367	12	kjfm
AFDV	-0.30	0.31	63	-0.37	0.34	144	06	mx	CALZ	-0.22	0.22	245	-0.18	0.28	146	48	kjfm
AFHV	0.17	0.20	40	0.09	0.30	94	24	tvp	CAOE	-0.20	0.23	217	-0.34	0.24	144	42	kjf
AFRV	0.15	0.32	49	0.26	0.36	116	24	qpc	CAON	-0.19	0.21	243	-0.29	0.20	174	42	kjf
AHRV	-0.29	0.22	73	-0.29	0.30	193	06	mzv	CAOV	-0.27	0.21	92	-0.19	0.24	366	12	kjf
ALAV	-0.27	0.28	68	-0.36	0.25	154	12	mzv	CAOZ	-0.21	0.22	245	-0.18	0.22	140	48	kjf
ALNV	0.04	0.23	48	0.02	0.26	100	24	qpc	CBRN	-0.15	0.13	17	-0.23	0.60	4	42	m
AODV	-0.19	0.27	86	-0.24	0.24	179	12	grmz	CBRV	-0.07	0.23	40	-0.09	0.37	196	18	m
AOHV	-0.01	0.27	92	-0.17	0.19	133	18	grmz	CBSV	0.17	0.18	35	0.35	0.27	246	18	ku
APRV	-0.40	0.23	57	-0.29	0.31	153	06	grmz	CBWV	0.07	0.19	43	0.17	0.27	229	18	m
ARJV	-0.23	0.24	92	-0.28	0.21	191	12	gb	CCOV	-0.08	0.25	102	-0.05	0.35	285	12	ku
ARRV	-0.45	0.31	68	-0.52	0.30	111	12	grmz	CCYV	-0.24	0.21	69	-0.32	0.22	291	18	kjf
ASMV	0.05	0.23	58	-0.10	0.20	122	18	pz	CDAV	0.08	0.17	29	0.17	0.21	177	18	m
AVRV	-0.34	0.26	72	-0.39	0.32	170	06	mzv	CDOV	0.31	0.16	41	0.38	0.30	167	24	qpc
BAPV	0.17	0.37	30	0.00	0.32	216	18	mx	CDUN	0.27	0.20	59	0.35	0.41	74	42	qpc
BAVE	-0.17	0.23	181	-0.30	0.23	115	42	kjf	CDUV	0.47	0.17	15	0.72	0.33	173	24	qpc
BAVN	-0.11	0.22	177	-0.27	0.23	117	42	kjf	CDVE	-0.11	0.20	134	-0.19	0.23	114	42	ku
BAVV	-0.27	0.21	60	-0.22	0.24	246	12	kjf	CDVN	-0.10	0.20	137	-0.16	0.25	112	42	ku
BAVZ	-0.16	0.21	178	-0.16	0.30	99	48	kjf	CDVV	-0.40	0.23	61	-0.40	0.25	209	12	ku
BBGV	0.21	0.53	34	0.39	0.58	222	18	ku	CDVZ	-0.11	0.24	151	-0.11	0.24	106	42	ku
BBNV	0.04	0.16	26	0.30	0.33	162	06	p	CLCV	0.20	0.21	63	0.13	0.25	290	18	k
BCGV	-0.07	0.16	53	-0.01	0.18	233	18	grmz	CMCV	0.15	0.13	31	0.22	0.21	209	24	ti
BCWV	0.05	0.20	69	-0.17	0.18	293	18	mx	CMHV	-0.08	0.21	107	-0.08	0.20	343	18	m
BEHV	0.14	0.26	51	0.19	0.37	202	18	grmz	CMJV	-0.12	0.18	95	-0.15	0.28	336	12	m
BEMV	0.05	0.18	62	-0.01	0.19	268	12	kjf	CMLV	-0.24	0.19	74	-0.33	0.22	289	18	kjfm
BHRV	0.13	0.17	46	0.30	0.26	237	18	q	CMMV	-0.29	0.20	74	-0.33	0.27	289	12	kjfm
BJCV	-0.20	0.22	74	-0.28	0.27	358	06	grmz	CMNV	-0.04	0.17	50	0.05	0.30	224	12	qpc
BJOV	-0.14	0.27	51	-0.21	0.30	241	12	grmz	CMOV	0.02	0.20	44	0.09	0.31	181	18	ku
BLRV	0.07	0.25	56	0.33	0.34	233	12	grmz	CMPV	-0.11	0.21	46	-0.19	0.20	265	18	kl
BMSV	0.05	0.28	43	0.00	0.33	226	12	ku	CMRV	-0.13	0.13	25	-0.15	0.29	147	12	kjfm
BPCN	0.15	0.20	219	0.17	0.23	216	42	grmz	COSV	-0.12	0.22	76	-0.25	0.24	289	18	kjfm
BPCV	0.16	0.20	96	0.20	0.26	364	12	grmz	CPLV	-0.09	0.25	87	-0.28	0.35	272	18	k
BPFN	0.12	0.25	191	0.07	0.36	147	42	kjf	CRAV	0.18	0.10	2	0.32	0.42	37	18	qpc
BPFV	-0.03	0.22	52	-0.10	0.26	227	12	kjf	CRPV	0.29	0.32	44	0.29	0.28	229	24	um
BPIV	-0.22	0.24	79	-0.30	0.24	276	06	tv	CSAV	0.04	0.18	14	0.39	0.31	119	24	q
BPRV	0.13	0.24	84	-0.03	0.30	309	18	mx	CSCV	-0.03	0.22	109	0.11	0.28	356	18	kl
BRMV	0.21	0.27	20	0.26	0.29	160	18	qpc	CSHV	0.06	0.20	44	-0.05	0.19	202	24	um
BRVV	-0.02	0.16	52	0.15	0.27	207	18	mc	CSPV	0.31	0.18	45	0.26	0.24	217	24	qpc
BSCE	-0.23	0.17	123	-0.06	0.21	114	42	grmz	CSTV	0.03	0.21	45	0.16	0.37	211	12	qpc
BSCN	-0.27	0.18	124	-0.11	0.25	113	42	grmz	CSVV	0.24	0.18	5	0.34	0.10	23	24	qpc
BSCV	-0.17	0.22	52	-0.18	0.38	206	12	grmz	CVAV	0.15	0.22	33	0.09	0.34	169	18	m
BSCZ	-0.18	0.16	112	0.07	0.20	94	48	grmz	CVLV	0.17	0.42	42	0.35	0.60	200	12	qpc
BSGE	-0.09	0.31	214	-0.14	0.34	156	42	sch	GACV	-0.46	0.18	54	-0.42	0.29	116	12	mzv
BSGN	-0.09	0.30	222	-0.14	0.23	177	42	sch	GARV	0.02	0.22	58	0.30	0.38	176	12	qpc
BSGV	-0.06	0.27	90	-0.14	0.26	318	18	sch	GAXV	-0.28	0.18	53	-0.48	0.41	120	12	kjfm
BSGZ	-0.07	0.31	196	-0.02	0.29	139	48	sch	GBDV	-0.06	0.18	77	-0.01	0.25	89	18	kjf
BSLV	0.38	0.21	91	0.57	0.29	260	24	qpc	GBGV	-0.14	0.16	54	-0.09	0.25	112	18	qv
BSMV	0.10	0.22	80	-0.04	0.21	318	18	mx	GBMV	-0.34	0.16	35	-0.24	0.36	70	18	um
BSRE	0.10	0.21	224	0.08	0.26	242	42	grmz	GCBV	-0.23	0.28	98	-0.17	0.28	137	12	tk
BSRN	-0.02	0.29	195	0.04	0.33	227	42	grmz	GCMV	0.06	0.00	1	-0.24	0.21	4	12	qv
BSRV	-0.04	0.25	93	-0.09	0.35	365	12	grmz	GCRV	-0.44	0.19	44	-0.46	0.21	120	12	kjf
BSRZ	0.07	0.28	225	0.14	0.40	215	48	grmz	GCSV	-0.15	0.20	38	-0.11	0.20	45	18	tk
BVLV	-0.08	0.20	55	0.06	0.25	256	06	mc	GCVV	-0.20	0.28	60	-0.24	0.29	128	12	kjfm
BVYV	-0.38	0.18	50	-0.20	0.27	240	06	grmz	GCWV	-0.28	0.17	59	-0.27	0.29	80	12	kjf
CACV	0.32	0.04	3	0.47	0.26	32	18	qpc	GDCV	-0.07	0.23	57	-0.17	0.27	122	12	kjfs

Table A4 (continued)

INST	ARX	SDRX	NRX	ARF	SDRF	NRF	ATN	ROCK	INST	ARX	SDRX	NRX	ARF	SDRF	NRF	ATN	ROCK
GDXV	-0.57	0.20	38	-0.55	0.31	110	12	mzv	JBLN	-0.20	0.26	267	-0.21	0.25	221	42	grmz
GGLV	-0.10	0.11	4	0.01	0.22	8	12	qv	JBLV	-0.12	0.23	87	-0.14	0.26	358	18	grmz
GGPV	-0.25	0.16	34	-0.22	0.24	101	18	mzv	JBMV	-0.22	0.21	92	-0.06	0.29	340	12	mzv
GGPZ	-0.18	0.22	35	-0.20	0.51	17	48	mzv	JBZV	0.44	0.20	32	0.63	0.33	264	18	p
GGUV	-0.16	0.23	75	-0.30	0.27	83	18	tk	JCBV	0.10	0.24	79	0.00	0.24	317	12	um
GHCV	-0.21	0.23	57	-0.31	0.25	136	12	kjfm	JECV	-0.16	0.23	40	-0.05	0.26	302	12	m
GHGV	-0.51	0.16	43	-0.46	0.46	63	12	kjf	JEGV	0.28	0.25	69	0.14	0.26	255	24	grmz
GHLV	-0.48	0.18	76	-0.47	0.34	136	06	kjf	JELV	0.33	0.19	7	0.69	0.24	87	24	q
GHMV	-0.43	0.20	49	-0.31	0.37	86	12	kjf	JHLV	-0.49	0.47	101	-0.29	0.47	312	18	um
GHVV	-0.28	0.19	49	-0.32	0.34	68	18	kjf	JHPV	0.10	0.19	75	0.16	0.22	318	18	e
GMCV	-0.30	0.24	61	-0.42	0.29	107	12	kjfm	JLPF	0.36	0.31	29	0.39	0.25	23	72	um
GMKV	-0.10	0.17	76	-0.01	0.31	154	12	qv	JLPZ	0.19	0.67	3	-0.34	0.61	33	60	um
GMMV	-0.24	0.14	3	-0.04	0.47	5	12	kjfm	JLTV	0.01	0.14	3	0.24	0.30	55	18	um
GMOV	-0.42	0.22	53	-0.44	0.35	111	06	mzv	JLXV	-0.06	0.36	80	-0.11	0.27	353	18	kjf
GNAV	0.12	0.27	129	0.08	0.31	193	18	tk	JMGV	-0.13	0.19	56	-0.12	0.21	253	18	mzv
GPMV	-0.14	0.25	64	-0.27	0.32	119	18	mzv	JMPF	0.05	0.25	127	0.34	0.31	22	72	q
GRTV	-0.16	0.20	68	-0.14	0.28	143	12	qv	JMPG	0.33	0.22	146	0.46	0.24	33	72	q
GSGV	0.12	0.28	39	0.07	0.43	85	12	qv	JMPH	0.32	0.20	144	0.52	0.26	29	72	q
GSMV	-0.25	0.00	1	-0.21	0.41	4	12	kjfm	JNAF	0.21	0.27	54	0.38	0.22	28	72	kjf
GSNV	-0.13	0.25	92	-0.24	0.35	160	12	um	JNAZ	0.01	0.24	65	0.08	0.25	81	36	kjf
GSSV	-0.16	0.23	82	-0.30	0.21	173	12	um	JPLV	0.37	0.26	38	0.69	0.34	272	18	q
GTSV	-0.36	0.21	60	-0.29	0.31	94	12	kjf	JPPV	0.00	0.22	75	0.24	0.23	346	12	p
GWKV	-0.32	0.19	27	-0.12	0.34	61	12	j	JPRV	0.35	0.20	40	0.25	0.22	231	24	qs
GWRV	-0.21	0.25	48	-0.18	0.32	59	18	tk	JPSV	0.14	0.21	95	0.19	0.22	318	18	p
HAZV	-0.29	0.19	36	-0.18	0.23	284	18	gb	JRGV	0.24	0.32	48	0.36	0.33	267	18	p
HBTN	-0.16	0.23	122	0.06	0.23	150	42	ol	JRRV	-0.17	0.24	50	-0.22	0.25	244	12	kjf
HBTV	-0.26	0.23	33	-0.04	0.19	189	24	ol	JSAV	0.02	0.23	47	-0.18	0.39	199	18	kjfm
HCAV	-0.06	0.23	46	-0.04	0.26	247	12	tv	JSCV	-0.06	0.18	64	-0.04	0.22	308	18	mzv
HCBV	0.14	0.19	76	0.24	0.23	340	18	m	JSFE	-0.17	0.48	265	-0.09	0.45	191	24	tv
HCOV	0.31	0.13	14	0.53	0.29	171	18	q	JSFN	0.07	0.22	265	0.10	0.25	202	42	tv
HCOZ	0.25	0.15	65	0.53	0.29	68	48	q	JSFV	0.16	0.20	103	0.21	0.22	298	24	tv
HCPV	0.00	0.00	0	0.09	0.12	30	18	ku	JSFZ	0.08	0.19	263	0.25	0.23	174	48	tv
HCRV	-0.28	0.20	79	-0.28	0.23	269	12	mzv	JSGV	0.08	0.16	68	0.23	0.27	326	18	qpc
HDLV	-0.18	0.22	91	-0.22	0.23	371	12	grmz	JSJV	0.44	0.21	81	0.53	0.24	329	24	kjf
HERV	0.14	0.14	11	0.54	0.24	90	24	q	JSMV	0.08	0.33	46	0.06	0.49	301	18	ol
HFEV	-0.04	0.24	97	-0.07	0.22	254	18	ku	JSSV	-0.07	0.23	92	-0.09	0.19	366	18	kjf
HFHV	0.16	0.18	37	0.61	0.30	217	18	qpc	JSTV	-0.04	0.18	96	-0.02	0.24	380	12	um
HFPV	-0.49	0.17	96	-0.39	0.22	297	06	grmz	JTGV	0.24	0.37	41	0.41	0.31	220	18	p
HGSV	-0.18	0.23	52	-0.25	0.21	241	12	kjf	JTRV	-0.30	0.24	11	-0.29	0.17	38	18	kjf
HGWV	-0.23	0.21	55	-0.27	0.26	247	12	m	JUCV	-0.04	0.23	89	-0.08	0.25	360	12	m
HJGV	-0.44	0.21	81	-0.30	0.28	308	12	grmz	JUMF	0.17	0.31	42	0.10	0.24	23	72	um
HJSV	-0.16	0.29	72	-0.08	0.31	242	12	ku	JUMZ	-0.07	0.30	66	-0.10	0.30	74	36	um
HKRV	0.29	0.16	25	0.53	0.64	164	24	q	KBBV	-0.06	0.26	71	-0.02	0.32	148	12	kjf
HLTV	-0.37	0.28	65	-0.19	0.31	230	12	tv	KBNV	-0.33	0.16	112	-0.34	0.21	97	12	kjf
HMOV	-0.01	0.21	95	-0.24	0.23	323	18	grmz	KBRV	-0.25	0.22	75	-0.36	0.22	112	12	kjf
HORV	0.11	0.25	54	0.54	0.35	250	18	p	KBSV	-0.14	0.24	100	-0.11	0.30	161	12	kjf
HPHV	0.60	0.15	10	0.80	0.35	179	36	q	KCPV	-0.01	0.19	99	0.03	0.20	125	18	tk
HPLE	-0.23	0.25	138	-0.30	0.17	111	42	kjfm	KCPZ	0.10	0.28	3	0.25	0.00	1	48	tk
HPLN	-0.27	0.22	127	-0.43	0.20	107	42	kjfm	KCRV	-0.23	0.22	52	-0.27	0.21	107	12	kjf
HPLV	-0.23	0.22	60	-0.31	0.20	209	18	kjfm	KCTV	0.00	0.18	42	-0.01	0.28	152	18	tk
HPLZ	-0.26	0.22	133	-0.30	0.28	90	48	kjfm	KFPV	-0.31	0.19	94	-0.30	0.21	131	12	kjf
HPRV	0.15	0.24	74	0.43	0.30	328	18	p	KGMV	-0.18	0.26	105	-0.28	0.25	111	18	grmz
HQRE	-0.05	0.22	149	-0.11	0.21	140	42	tv	KIPV	-0.41	0.20	122	-0.31	0.23	173	06	tk
HQRN	0.00	0.22	153	-0.11	0.21	146	42	tv	KKPV	-0.27	0.21	124	-0.25	0.24	163	12	kjf
HQRV	-0.15	0.24	88	-0.17	0.27	225	18	tv	KMPE	0.30	0.31	110	0.08	0.22	100	42	tk
HQRZ	-0.07	0.20	155	-0.03	0.21	134	48	tv	KMPN	0.36	0.34	74	0.11	0.26	66	42	tk
HSFV	0.02	0.20	67	0.18	0.26	233	18	m	KMPV	-0.04	0.18	49	-0.08	0.26	158	18	tk
HSLV	0.23	0.29	33	0.19	0.19	191	18	ku	KOMV	-0.42	0.23	96	-0.43	0.35	100	06	grmz
HSPV	-0.01	0.22	102	0.03	0.23	367	12	ku	KPPV	-0.35	0.23	73	-0.30	0.25	81	12	kjfs
JALV	-0.02	0.22	104	-0.06	0.25	379	18	mzv	KRKV	-0.41	0.22	62	-0.25	0.28	86	12	kjfm
JBCV	-0.27	0.26	98	-0.14	0.36	355	18	e	KRMV	-0.24	0.28	39	-0.28	0.33	29	18	um
JBGV	0.15	0.31	46	0.30	0.32	256	24	p	KRPV	-0.46	0.25	62	-0.23	0.34	85	12	kjfs
JBLE	-0.22	0.23	273	-0.23	0.23	218	42	grmz	KSMV	-0.21	0.24	28	-0.06	0.27	109	12	tk

Table A4 (continued)

INST	ARX	SDRX	NRX	ARF	SDRF	NRF	ATN	ROCK	INST	ARX	SDRX	NRX	ARF	SDRF	NRF	ATN	ROCK
KSPV	-0.37	0.21	109	-0.22	0.28	144	12	tk	MLRV	-0.17	0.25	60	-0.27	0.26	182	06	grmz
KSXV	-0.33	0.23	87	-0.44	0.34	83	06	um	MMIN	-0.04	0.33	107	-0.12	0.22	29	42	mx
KSXZ	-0.04	0.25	12	-0.17	0.14	4	42	um	MMIV	-0.02	0.20	23	-0.26	0.23	118	06	mx
LASV	-0.12	0.21	18	-0.36	0.29	19	18	qrv	MMLV	0.73	0.16	22	0.56	0.25	75	24	qv
LBFV	0.05	0.23	44	-0.06	0.33	60	12	qv	MMPV	0.27	0.21	55	-0.03	0.25	148	18	grmz
LBKV	-0.27	0.23	82	-0.32	0.20	114	06	um	MMTV	0.26	0.22	29	-0.09	0.31	46	24	grmz
LBMV	-0.06	0.29	40	-0.18	0.24	28	18	pzv	MNHV	-0.24	0.22	70	-0.25	0.35	215	06	j
LBPV	-0.55	0.32	40	-0.62	0.29	53	12	um	MNPN	-0.06	0.31	36	-0.18	0.29	36	42	grmz
LCAV	-0.10	0.26	50	-0.28	0.20	40	18	pzv	MNPV	-0.20	0.48	17	-0.25	0.27	68	12	grmz
LCFV	0.24	0.28	35	0.14	0.31	52	18	qv	MOGV	0.56	0.27	34	0.74	0.44	80	24	qvp
LCMV	0.22	0.25	38	0.20	0.31	73	18	tv	MOYV	-0.18	0.28	69	-0.25	0.18	155	18	mzv
LCSV	0.43	0.16	10	0.41	0.28	9	24	tv	MRCV	0.35	0.18	25	0.03	0.42	62	24	pz
LDBV	0.21	0.43	44	0.16	0.29	69	18	qv	MRFV	-0.14	0.28	92	-0.29	0.25	167	18	pz
LGBV	0.17	0.22	44	0.23	0.32	67	12	qv	MRSV	0.22	0.26	14	0.11	0.33	51	12	mzv
LGHV	-0.11	0.23	12	-0.23	0.26	16	18	qrv	MSKV	0.43	0.20	13	0.27	0.29	28	30	qv
LGMV	0.06	0.18	22	0.00	0.24	38	12	qv	MSLN	0.58	0.17	20	0.29	0.30	20	42	grmz
LGPV	-0.29	0.25	86	-0.35	0.17	130	06	grmz	MSLV	0.19	0.20	42	-0.06	0.25	120	18	grmz
LGRV	-0.06	0.20	21	-0.33	0.31	26	18	qrv	MSTV	-0.25	0.25	60	-0.33	0.32	170	12	mv
LHCV	0.28	0.27	29	0.11	0.32	30	24	qrv	MTCZ	0.33	0.25	50	0.27	0.27	49	42	qg
LHEV	0.05	0.22	43	-0.09	0.28	50	18	qv	MTUV	0.21	0.34	63	-0.07	0.26	126	18	grmz
LHHV	0.23	0.23	16	0.17	0.25	33	18	qrv	MWBV	0.28	0.34	45	0.20	0.33	135	12	grmz
LHKV	0.17	0.25	70	0.12	0.31	101	12	tv	MYLV	0.16	0.25	26	0.29	0.33	97	18	qpc
LHOV	-0.17	0.31	10	-0.24	0.13	8	18	grmz	NADN	0.08	0.22	78	0.14	0.29	43	42	qpc
LMDE	-0.21	0.20	11	-0.02	0.10	2	42	qrv	NADV	0.09	0.22	40	0.32	0.37	146	18	qpc
LMDN	-0.08	0.18	5	-0.09	0.07	2	42	qrv	NAPV	0.13	0.18	52	0.31	0.38	160	18	tv
LMDV	-0.12	0.20	16	-0.27	0.22	17	18	qrv	NBPN	-0.07	0.23	109	-0.03	0.31	65	42	ku
LMEV	0.58	0.11	7	0.11	0.25	25	24	qrv	NBPV	-0.07	0.19	65	0.15	0.34	185	12	ku
LMHV	0.41	0.19	19	0.16	0.42	29	24	qrv	NBRV	0.15	0.17	50	0.16	0.34	159	24	tv
LMPV	0.26	0.21	39	0.34	0.30	66	12	qg	NCFV	-0.03	0.29	40	-0.02	0.23	161	18	p
LMZV	0.31	0.22	25	0.27	0.20	27	18	qrvp	NCPV	0.00	0.21	60	0.19	0.30	129	18	ku
LOMV	0.23	0.00	1	-0.13	0.16	4	12	tv	NDHV	0.02	0.19	35	0.43	0.35	122	12	qpc
LPDV	0.10	0.22	32	0.08	0.39	46	18	q	NFIV	-0.07	0.21	15	-0.26	0.31	94	24	grmz
LRDN	0.26	0.22	11	0.23	0.29	8	12	tv	NFRV	-0.02	0.28	54	-0.13	0.27	173	12	tk
LRDV	0.33	0.27	51	0.28	0.32	119	12	tv	NGVV	-0.05	0.16	51	0.01	0.29	182	18	tv
LRRE	0.07	0.14	6	0.09	0.00	1	30	qv	NHBV	-0.13	0.30	26	-0.12	0.22	46	18	tk
LRRV	0.33	0.21	48	0.21	0.28	78	18	qv	NHMV	0.08	0.23	29	0.45	0.42	184	18	qpc
LRSV	0.31	0.14	4	0.37	0.54	11	24	qrv	NIMV	-0.17	0.16	60	-0.11	0.33	141	12	kl
LRSZ	0.33	0.22	5	0.28	0.43	5	42	qrv	NLHV	0.01	0.21	23	0.07	0.27	158	18	kl
LSFV	-0.09	0.30	21	-0.28	0.28	31	18	pzv	NLNV	-0.03	0.27	61	-0.13	0.20	201	18	kjfm
LSHV	-0.31	0.24	84	-0.42	0.34	115	06	tv	NMCV	-0.21	0.29	48	-0.28	0.31	139	12	kjfs
LSLV	-0.07	0.30	103	-0.20	0.28	126	12	qv	NMHN	-0.14	0.25	113	-0.14	0.32	41	42	tvp
LSMV	0.21	0.23	50	0.09	0.31	82	18	tv	NMHV	-0.21	0.16	76	-0.24	0.26	200	12	tvp
LSSV	0.20	0.21	18	0.13	0.25	25	18	qrv	NMTV	-0.37	0.24	75	-0.14	0.35	196	06	um
LTCN	0.12	0.24	46	0.23	0.22	20	42	tvp	NMWV	0.03	0.17	65	0.10	0.29	180	18	tv
LTCV	0.11	0.23	52	0.22	0.22	80	18	tvp	NOLV	0.51	0.19	29	0.20	0.48	191	18	q
LTNV	-0.12	0.00	1	-0.41	0.29	3	12	qv	NPRV	0.07	0.19	43	-0.11	0.21	128	30	grmz
LWHV	-0.28	0.35	43	-0.25	0.35	88	06	e	NPVV	-0.21	0.17	59	-0.15	0.28	122	18	kl
MATV	0.03	0.40	40	-0.23	0.26	119	18	grmz	NRRV	-0.11	0.18	53	0.07	0.38	167	12	ku
MBOV	-0.29	0.26	46	-0.43	0.25	166	12	mzv	NSHV	-0.09	0.20	81	-0.05	0.36	228	12	tv
MCDV	0.56	0.29	24	0.83	0.49	100	18	qvp	NSPV	-0.03	0.16	62	0.01	0.30	204	12	tv
MCMV	0.55	0.25	36	0.25	0.35	148	18	so	NTAV	-0.32	0.49	34	-0.37	0.26	166	18	kjfm
MCRV	0.56	0.12	21	0.81	0.36	65	18	q	NTBV	0.09	0.21	43	-0.07	0.19	178	18	p
MCSV	0.42	0.17	36	0.25	0.24	146	18	qv	NTYV	0.07	0.17	63	0.14	0.27	195	18	tv
MCUV	-0.24	0.26	49	-0.30	0.28	176	06	mzv	NVAV	-0.06	0.19	39	0.05	0.34	132	18	ku
MDCV	0.11	0.21	45	-0.24	0.20	139	12	qrv	NVEN	0.02	0.20	156	0.04	0.22	81	42	tv
MDPV	0.30	0.29	57	0.03	0.27	117	24	qv	NVEV	0.01	0.17	58	0.03	0.22	160	24	tv
MEMV	0.57	0.19	26	0.33	0.28	132	18	qv	NWRV	0.04	0.22	23	0.04	0.34	112	24	p
MFBV	0.59	0.30	58	0.89	0.39	142	24	qvp	OBHV	0.07	0.34	69	-0.07	0.34	106	18	mzv
MGPV	0.60	0.32	37	0.58	0.48	154	18	q	OCHV	0.05	0.23	75	0.27	0.41	121	12	tv
MHDV	-0.09	0.31	56	-0.22	0.23	187	12	grmz	OCMV	0.14	0.38	42	0.23	0.47	71	18	tv
MHDZ	0.00	0.24	13	0.00	0.00	0	48	grmz	OGOV	0.03	0.32	55	0.07	0.37	122	12	tvp
MLCV	0.39	0.29	49	0.09	0.24	127	24	qg	OHCV	-0.25	0.25	69	-0.38	0.32	119	12	mzv
MLMV	0.53	0.21	25	0.46	0.29	106	18	qv	ORAV	-0.14	0.28	86	-0.33	0.26	120	12	grmz

Table A4 (continued)

INST	ARX	SDRX	NRX	ARF	SDRF	NRF	ATN	ROCK
ORDV	-0.12	0.25	52	-0.33	0.24	77	18	mzv
OSTV	0.06	0.23	50	0.19	0.35	85	18	q
OSUV	-0.04	0.25	67	0.36	0.39	136	12	qvp
OWYV	-0.19	0.25	62	-0.31	0.25	79	18	mzv
PABV	0.25	0.15	39	0.14	0.23	112	24	m
PADV	0.27	0.20	47	0.25	0.26	178	18	m
PAGV	0.08	0.18	67	0.05	0.24	139	24	qpc
PANV	0.33	0.17	46	0.27	0.26	140	24	m
PAPV	-0.10	0.20	47	-0.26	0.16	200	12	kjf
PARV	0.16	0.19	42	0.26	0.29	198	18	p
PBIV	0.41	0.17	51	0.31	0.25	129	24	ku
PBMV	-0.02	0.19	31	-0.29	0.20	71	24	grmz
PBPV	0.16	0.17	44	0.02	0.23	90	24	m
PBWV	-0.02	0.27	57	0.17	0.25	207	24	p
PCAV	0.11	0.23	72	0.04	0.24	146	24	ku
PCBV	-0.07	0.16	56	-0.30	0.22	131	24	ku
PCGV	-0.21	0.12	11	-0.39	0.24	22	18	mzv
PCRV	0.00	0.19	52	-0.04	0.18	163	24	ku
PDRV	0.14	0.21	50	0.29	0.25	199	18	ku
PGHV	-0.28	0.13	84	-0.32	0.26	113	24	gb
PGHZ	-0.31	0.15	78	-0.60	0.30	16	48	gb
PHAV	0.07	0.16	80	0.28	0.25	165	24	qpc
PHBV	0.31	0.19	39	0.57	0.35	149	24	q
PHCV	0.11	0.16	52	-0.07	0.20	146	24	kjf
PHFE	-0.12	0.18	109	-0.16	0.31	36	42	q
PHFN	-0.12	0.15	118	-0.17	0.34	39	42	q
PHFV	-0.05	0.16	64	-0.12	0.29	100	24	q
PHFZ	-0.14	0.18	89	-0.14	0.32	19	48	q
PHOE	0.29	0.17	186	0.35	0.34	123	42	qpc
PHON	0.21	0.14	184	0.30	0.31	118	42	qpc
PHOV	0.30	0.14	99	0.40	0.25	206	24	qpc
PHOZ	0.23	0.15	165	0.34	0.33	75	48	qpc
PHPE	0.41	0.21	187	0.33	0.26	161	42	m
PHPN	0.38	0.21	194	0.31	0.27	161	42	m
PHPV	0.25	0.19	86	0.18	0.21	230	24	m
PHPZ	0.22	0.18	122	0.22	0.32	61	48	m
PHRN	-0.13	0.20	174	-0.04	0.28	108	42	kjf
PHRV	0.33	0.49	47	0.26	0.50	220	12	kjf
PHSV	0.18	0.17	63	0.16	0.19	204	24	m
PIRV	0.22	0.22	42	0.27	0.23	98	24	qpc
PJLE	0.03	0.20	151	0.03	0.22	122	42	m
PJLN	-0.04	0.22	139	0.01	0.29	100	42	m
PJLV	0.12	0.15	70	0.08	0.18	211	18	m
PJLZ	0.03	0.20	165	0.09	0.27	91	48	m
PKEV	0.23	0.14	52	0.30	0.29	163	24	p
PKYV	0.34	0.21	52	0.19	0.23	128	24	um
PLOV	0.34	0.14	43	0.34	0.28	243	18	p
PMCE	0.03	0.17	141	0.19	0.33	73	42	qpc
PMCN	-0.02	0.35	144	-0.02	0.46	78	42	qpc
PMCV	0.21	0.11	60	0.39	0.27	155	24	qpc
PMCZ	0.11	0.16	141	0.26	0.30	67	48	qpc
PMGV	0.01	0.18	77	-0.28	0.23	120	24	grmz
PMGZ	0.03	0.21	38	-0.20	0.41	7	48	grmz
PMLV	0.27	0.13	32	0.15	0.21	81	24	m
PMME	0.07	0.17	163	0.08	0.30	103	42	m
PMMN	0.08	0.17	166	0.10	0.29	105	42	m
PMMV	0.03	0.14	74	0.02	0.25	169	24	m
PMMZ	-0.04	0.15	100	0.05	0.30	29	48	m
PMPN	-0.09	0.31	105	0.09	0.31	63	42	um
PMPV	-0.02	0.18	58	0.10	0.26	194	24	um
PMRV	0.02	0.18	65	-0.01	0.22	133	24	ku
POPV	0.05	0.20	56	0.02	0.24	84	24	ku

INST	ARX	SDRX	NRX	ARF	SDRF	NRF	ATN	ROCK
PPBV	0.18	0.14	56	0.04	0.20	114	24	m
PPBZ	0.13	0.19	71	-0.09	0.40	22	42	m
PPCE	-0.07	0.20	163	-0.11	0.28	91	42	m
PPCN	0.04	0.25	172	0.01	0.37	99	42	m
PPCV	0.06	0.22	76	0.03	0.17	159	24	m
PPCZ	0.03	0.18	78	0.16	0.29	31	48	m
PPFV	0.19	0.11	17	0.31	0.35	29	24	qpc
PPGV	0.21	0.17	25	0.48	0.31	71	24	qpc
PPRV	0.21	0.15	18	0.16	0.21	65	24	qpc
PPTV	0.27	0.17	63	0.34	0.19	221	24	p
PRCN	0.03	0.18	141	0.15	0.24	129	42	ku
PRCV	-0.07	0.22	46	0.03	0.23	173	24	ku
PSAV	0.34	0.17	53	0.61	0.33	217	24	p
PSCV	0.08	0.13	51	0.32	0.30	111	24	qpc
PSHV	0.09	0.20	14	0.36	0.37	35	24	qpc
PSMV	0.31	0.25	73	0.26	0.21	196	24	m
PSRV	-0.01	0.15	80	-0.06	0.29	141	24	m
PSTV	-0.02	0.18	72	-0.09	0.18	175	24	m
PTAV	-0.05	0.15	48	-0.18	0.21	115	18	mzv
PTFE	-0.01	0.15	23	0.10	0.17	16	42	p
PTFN	0.03	0.13	24	0.11	0.13	18	42	p
PTFV	0.03	0.14	14	0.04	0.20	30	24	p
PTQV	-0.03	0.15	27	-0.17	0.28	59	24	m
PTRV	0.13	0.16	54	0.12	0.24	136	24	qpc
PVCE	0.32	0.19	157	0.34	0.22	124	42	m
PVCN	0.32	0.16	158	0.29	0.28	133	42	m
PVCV	0.30	0.18	65	0.24	0.20	195	24	m
PVCZ	0.28	0.17	95	0.33	0.30	56	48	m
PWKV	0.02	0.29	70	0.31	0.40	175	24	qpc
PWMV	0.14	0.28	40	0.48	0.46	159	24	q
SCCV	0.15	0.20	48	0.07	0.29	119	18	m
SEFV	0.15	0.16	21	-0.03	0.33	50	18	e
SLCV	-0.04	0.19	13	0.03	0.37	52	12	e
SLPV	-0.10	0.21	28	-0.15	0.41	69	18	m
TARV	-0.03	0.32	16	-0.30	0.47	45	12	qpc
TBHV	-0.12	0.19	51	-0.10	0.28	139	12	e
TBMV	-0.15	0.24	47	-0.36	0.38	110	06	q
TCGV	0.14	0.18	47	0.17	0.29	119	18	m
TFTV	-0.41	0.26	4	-0.58	0.42	24	18	grmz
THCV	-0.11	0.15	5	-0.34	0.25	14	24	grmz
TMAV	-0.10	0.28	34	-0.29	0.32	75	18	prec
TMCV	0.02	0.20	34	0.05	0.24	83	12	m
TPLV	0.31	0.33	18	0.16	0.44	49	24	m
TPMV	-0.08	0.18	48	-0.13	0.36	112	12	e
TRPV	0.23	0.25	42	0.12	0.34	89	18	e
TSIV	0.16	0.22	40	0.39	0.38	101	24	q
TTRV	0.64	0.25	29	0.58	0.35	92	30	m
TYGV	-0.17	0.24	56	-0.08	0.33	147	12	m
WASV	-0.12	0.28	28	-0.24	0.34	64	12	grmz
WBMV	0.17	0.26	4	0.01	0.40	3	12	q
WBSV	0.14	0.34	28	-0.12	0.48	73	12	grmz
WCHV	-0.15	0.22	32	-0.26	0.28	65	12	mx
WJPV	0.01	0.21	36	-0.21	0.31	71	12	grmz
WLHV	0.04	0.28	41	-0.03	0.35	95	12	grmz
WMFV	0.17	0.03	2	0.17	0.38	6	06	tv
WOFV	-0.20	0.26	50	-0.40	0.35	104	06	grmz
WORV	-0.06	0.31	25	-0.37	0.39	47	12	q
WRCV	-0.14	0.25	23	0.01	0.35	57	06	qv
WSHV	-0.14	0.32	27	-0.13	0.35	71	06	q
WSNV	0.35	0.28	8	0.54	0.39	29	12	q
WTOV	0.37	0.29	14	0.67	0.42	56	12	q
WVPV	-0.28	0.35	29	-0.48	0.37	63	06	qv

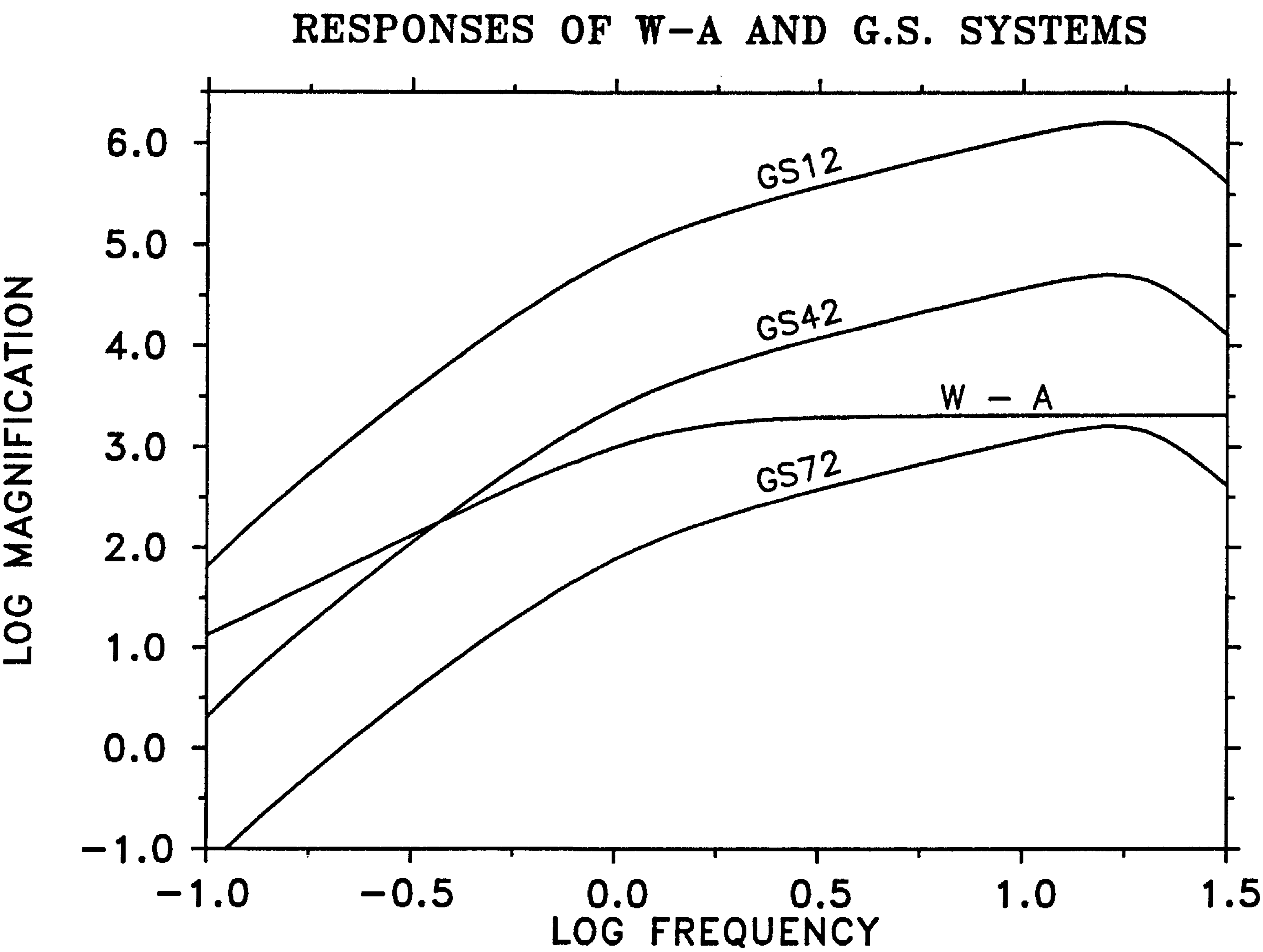
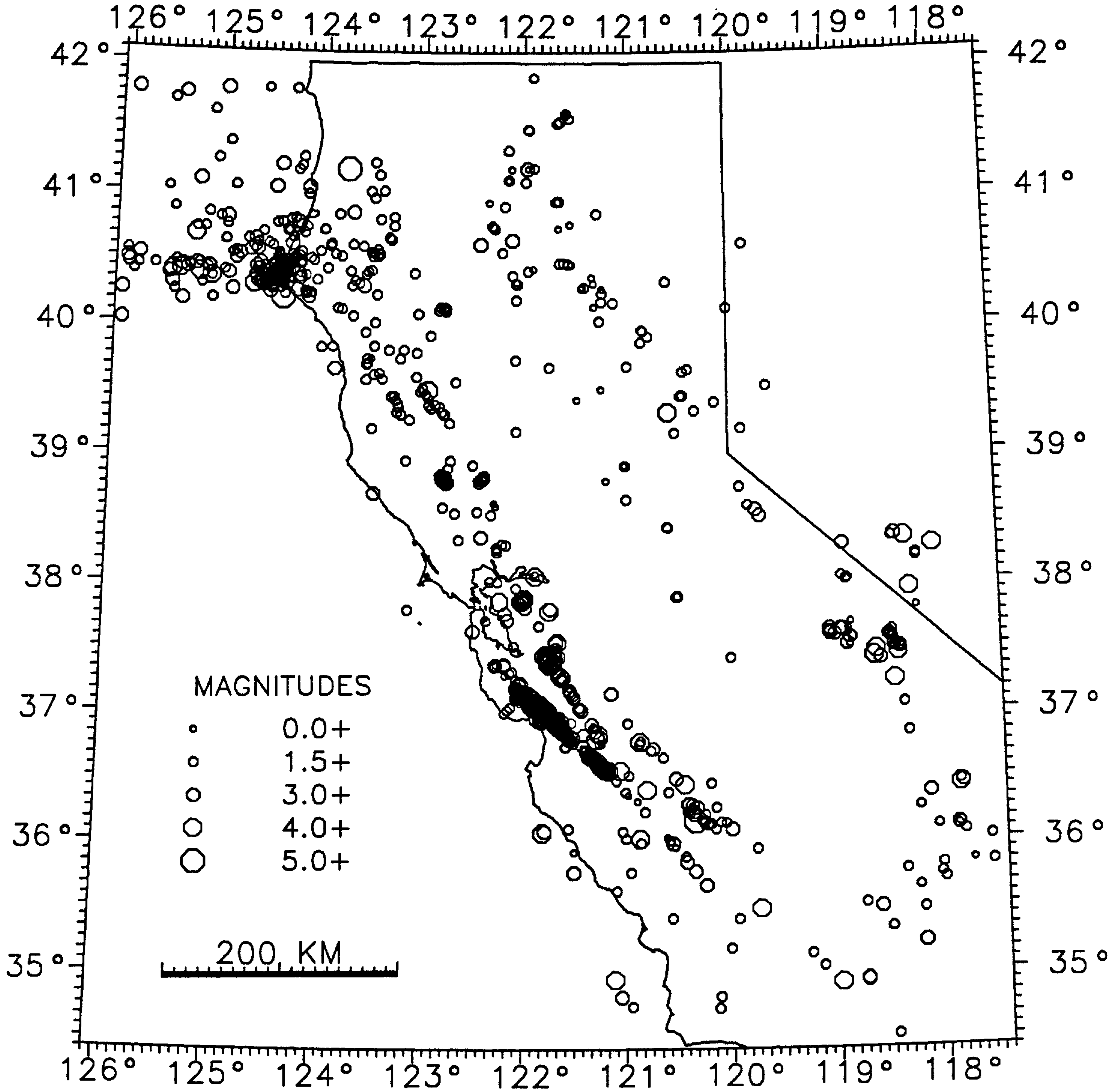

RESPONSES OF W-A AND G.S. SYSTEMS
GS12
GS42
W - A
GS72
6.0
5.0
4.0
3.0
2.0
1.0
0.0
-1.0
LOG MAGNIFICATION
-1.0
-0.5
0.0
0.5
1.0
1.5
LOG FREQUENCY

Figure 1



126° 125° 124° 123° 122° 121° 120° 119° 118°
42° 41° 40° 39° 38° 37° 36° 35°
MAGNITUDES
0.0+
1.5+
3.0+
4.0+
5.0+
200 KM

Figure 2

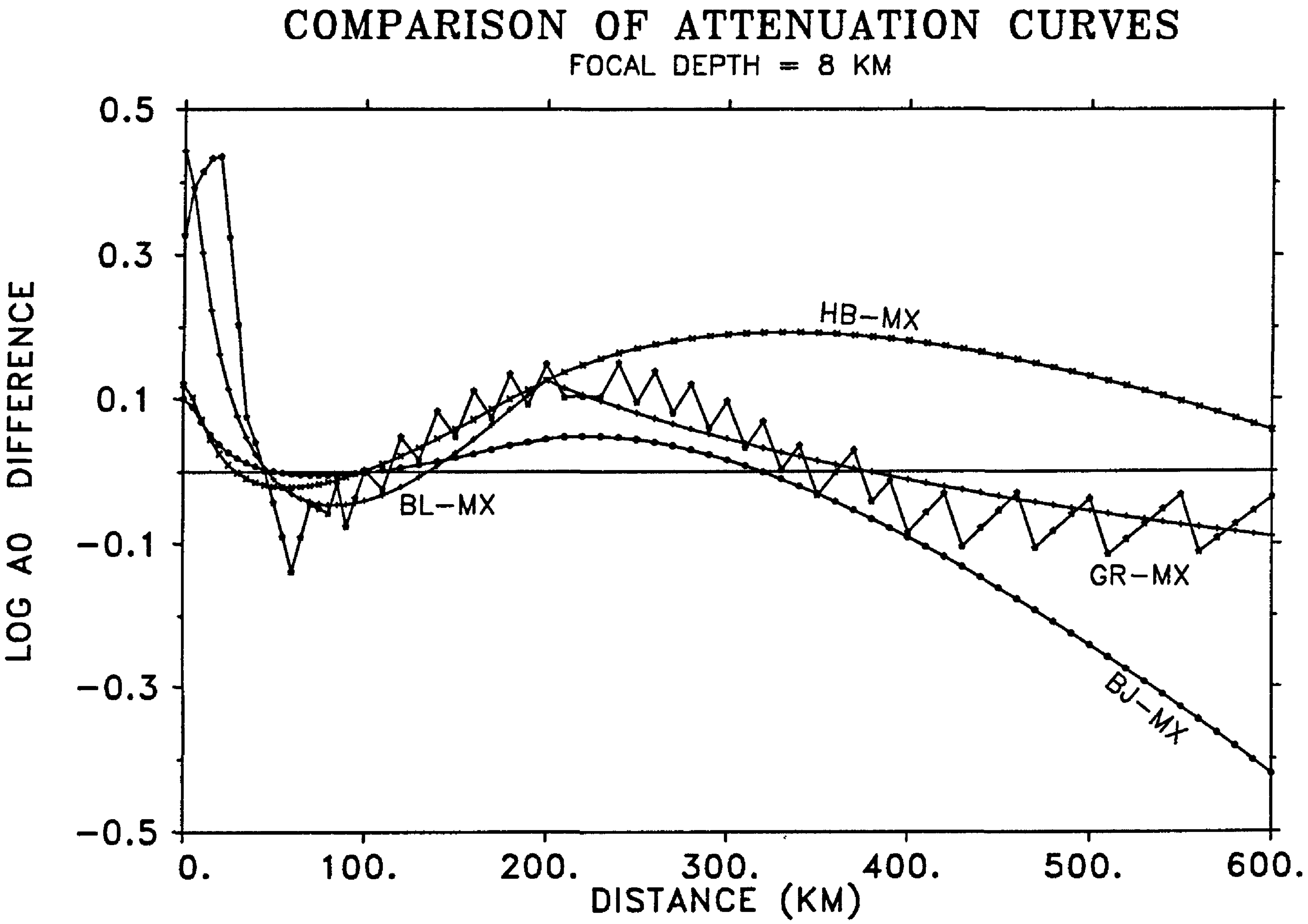

COMPARISON OF ATTENUATION CURVES
FOCAL DEPTH = 8 KM
LOG AO DIFFERENCE
DISTANCE (KM)
0.5
0.3
0.1
-0.1
-0.3
-0.5
0.
100.
200.
300.
400.
500.
600.
HB-MX
BL-MX
GR-MX
BJ-MX

Figure 3

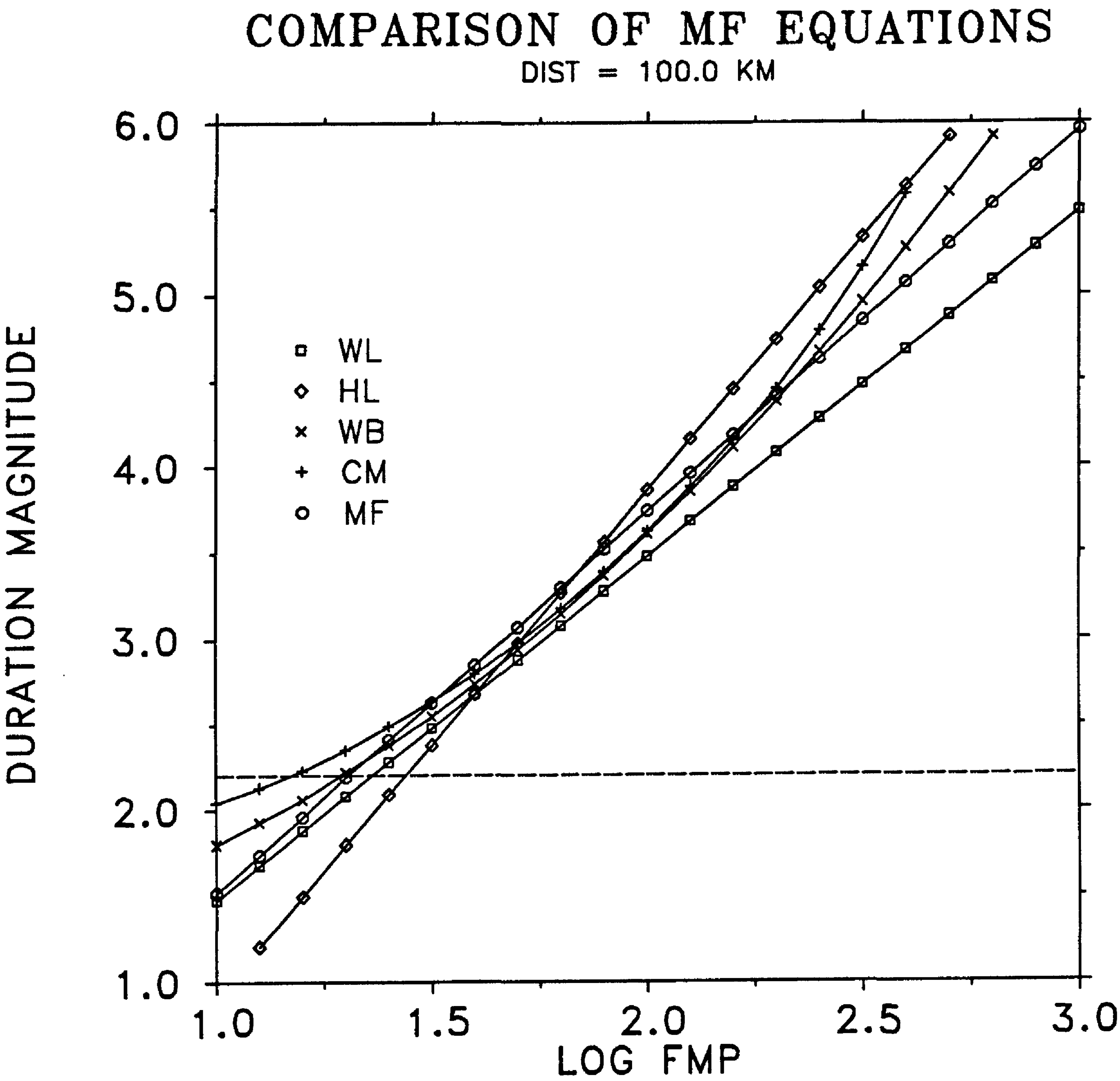

COMPARISON OF MF EQUATIONS
DIST = 100.0 KM
DURATION MAGNITUDE
6.0
5.0
4.0
3.0
2.0
1.0
WL
HL
WB
CM
MF
1.0
1.5
2.0
2.5
3.0
LOG FMP

Figure 4

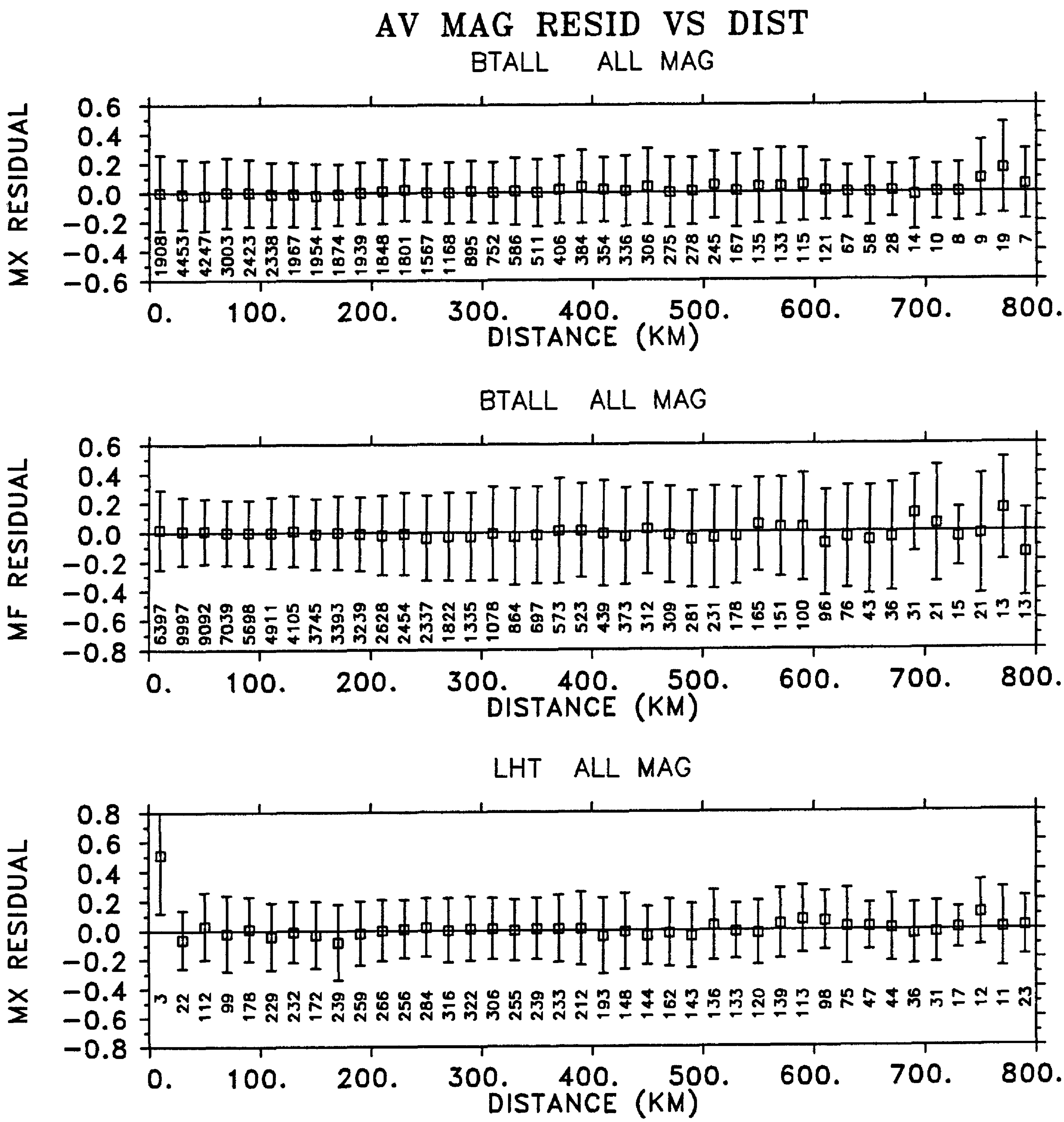

AV MAG RESID VS DIST
BTALL ALL MAG
MX RESIDUAL
0.6
0.4
0.2
0.0
−0.2
−0.4
−0.6
1908 4453 4247 3003 2423 2338 1967 1954 1874 1939 1848 1801 1567 1168 895 752 586 511 406 384 354 336 306 275 278 245 167 135 133 115 121 67 58 28 14 10 8 9 19 7
0. 100. 200. 300. 400. 500. 600. 700. 800.
DISTANCE (KM)
BTALL ALL MAG
MF RESIDUAL
0.6
0.4
0.2
0.0
−0.2
−0.4
−0.6
−0.8
6397 9997 9092 7039 5698 4911 4105 3745 3393 3239 2628 2454 2337 1822 1335 1078 864 697 573 523 439 373 312 309 281 231 178 165 151 100 96 76 43 36 31 21 15 21 13 13
0. 100. 200. 300. 400. 500. 600. 700. 800.
DISTANCE (KM)
LHT ALL MAG
MX RESIDUAL
0.8
0.6
0.4
0.2
0.0
−0.2
−0.4
−0.6
−0.8
3 22 112 99 178 229 232 172 239 259 266 256 284 316 322 306 255 239 233 212 193 148 144 162 143 136 133 120 139 113 98 75 47 44 36 31 17 12 11 23
0. 100. 200. 300. 400. 500. 600. 700. 800.
DISTANCE (KM)

Figure 5

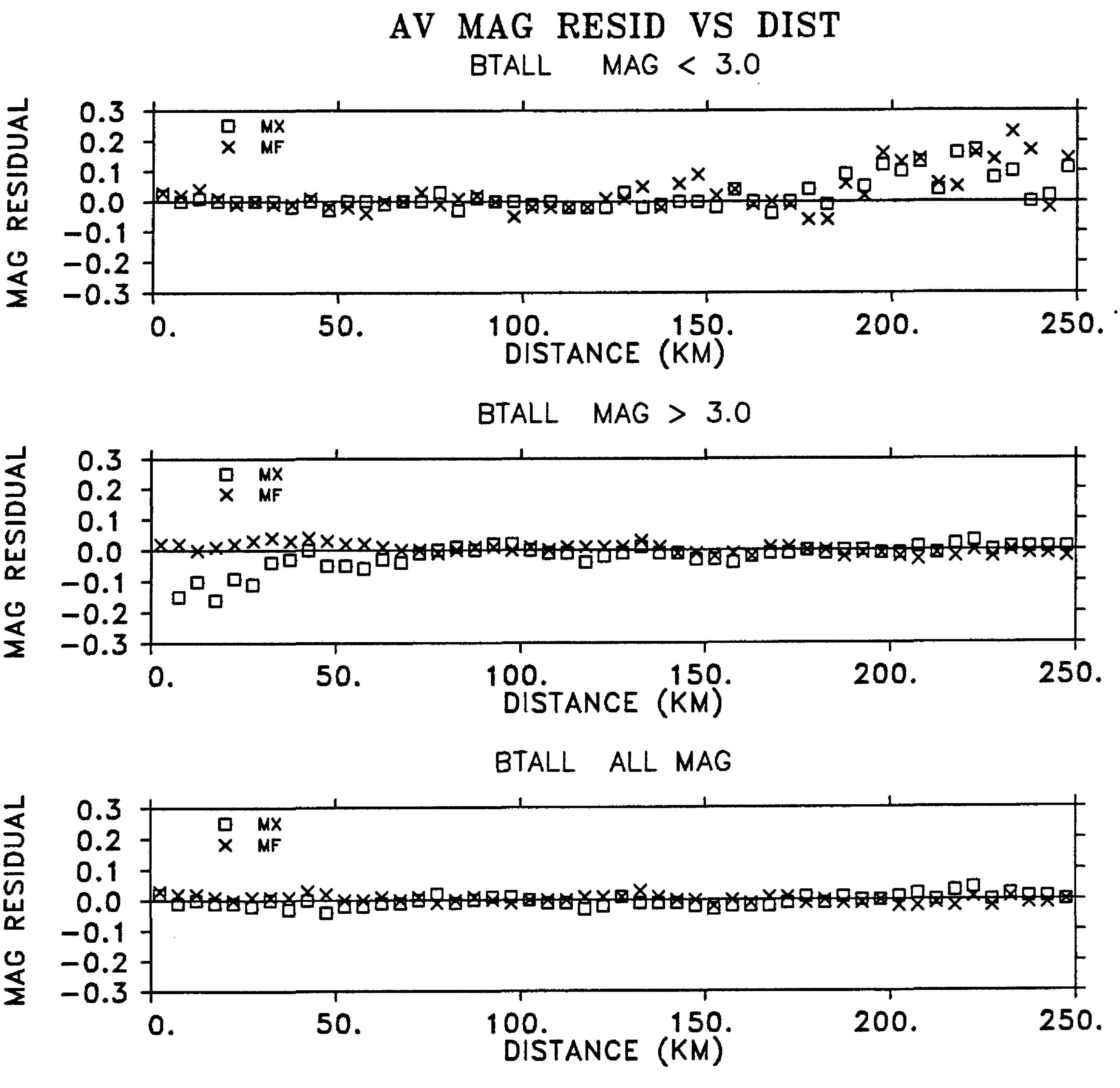

AV MAG RESID VS DIST
BTALL MAG < 3.0
BTALL MAG > 3.0
BTALL ALL MAG
MX
MF
MAG RESIDUAL
DISTANCE (KM)
0.3
0.2
0.1
0.0
−0.1
−0.2
−0.3
0.
50.
100.
150.
200.
250.

Figure 6

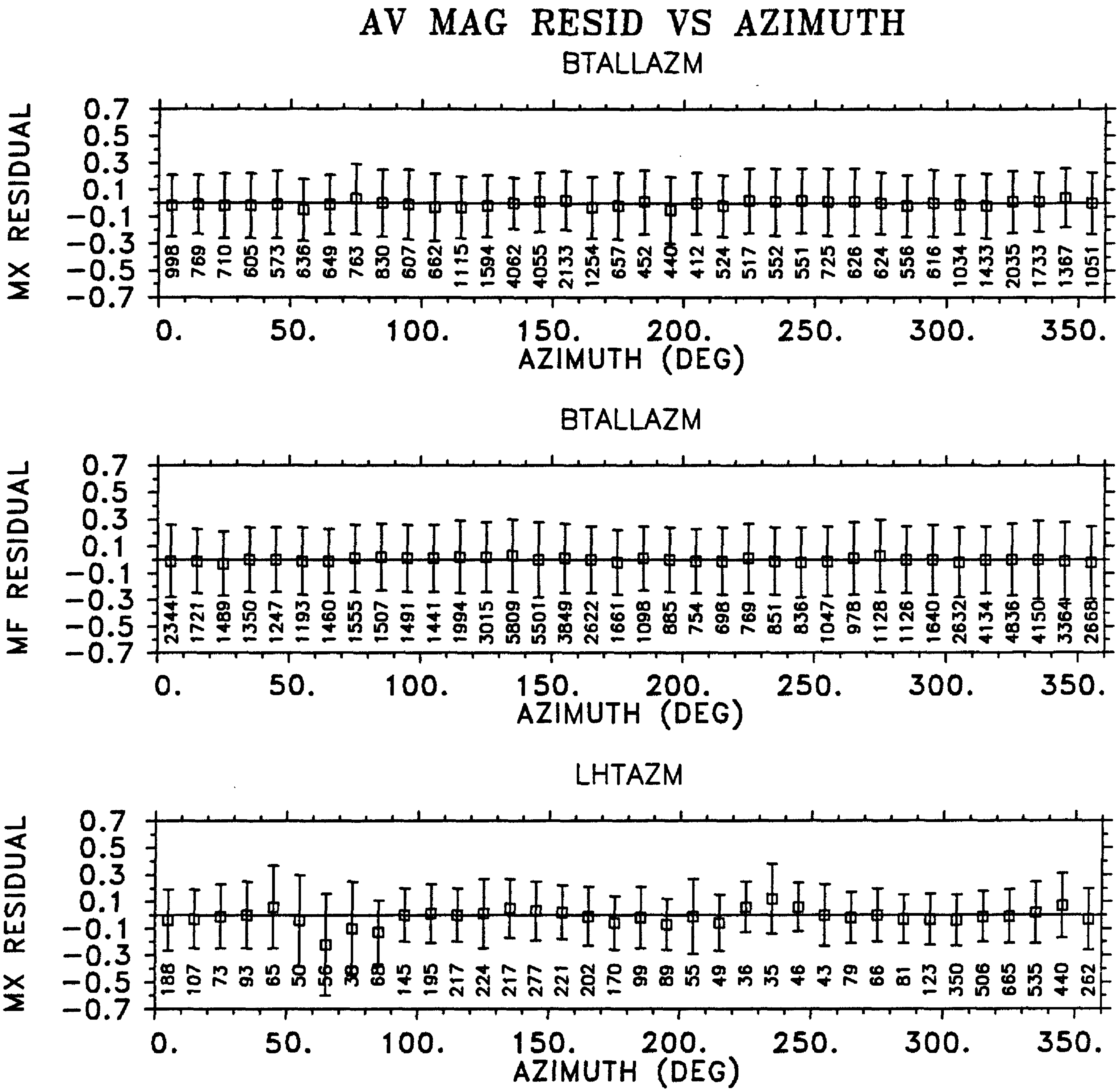

AV MAG RESID VS AZIMUTH
BTALLAZM
MX RESIDUAL
AZIMUTH (DEG)
BTALLAZM
MF RESIDUAL
AZIMUTH (DEG)
LHTAZM
MX RESIDUAL
AZIMUTH (DEG)

Figure 7

AV(MX - MF) VS MAGNITUDE

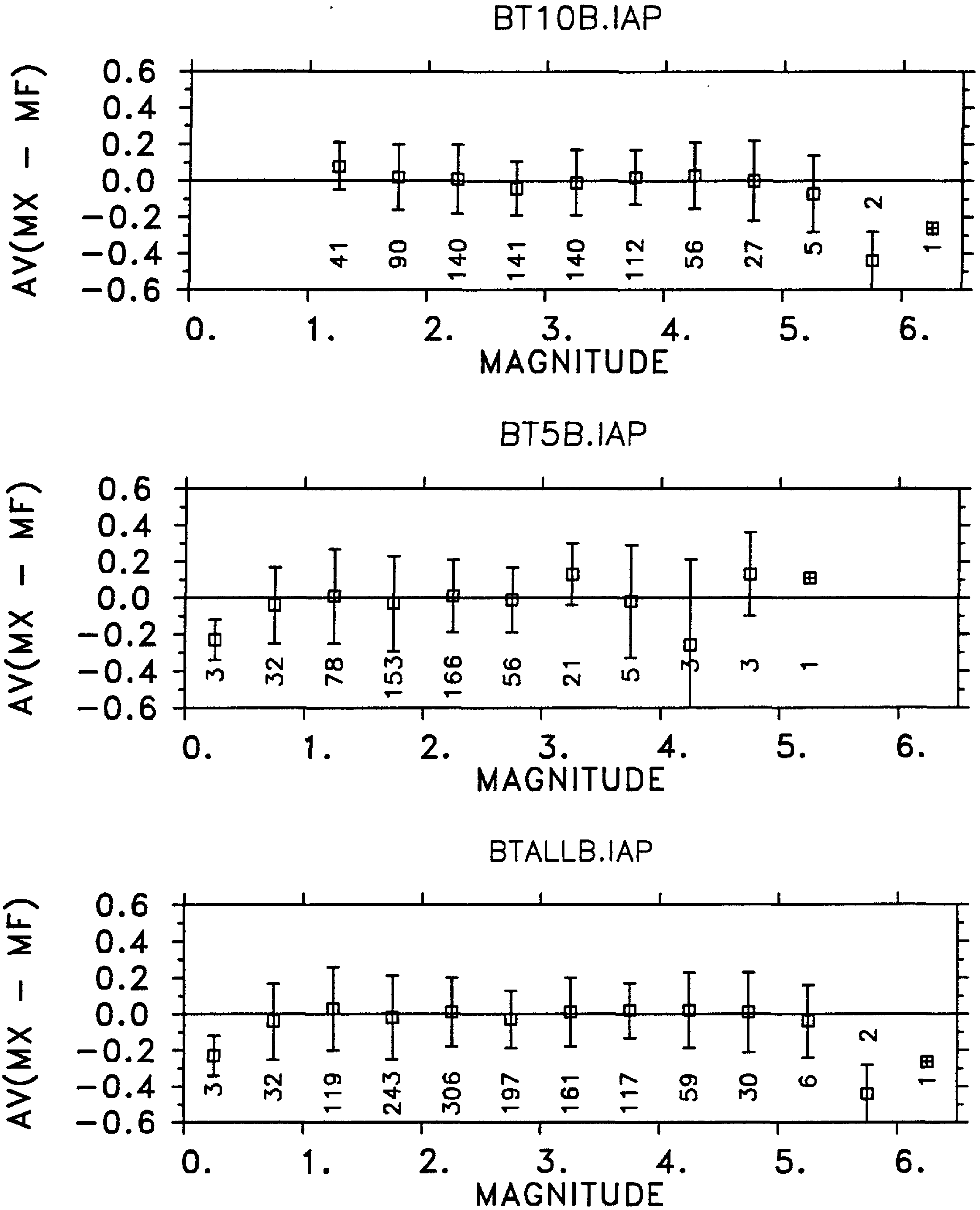


Figure 8

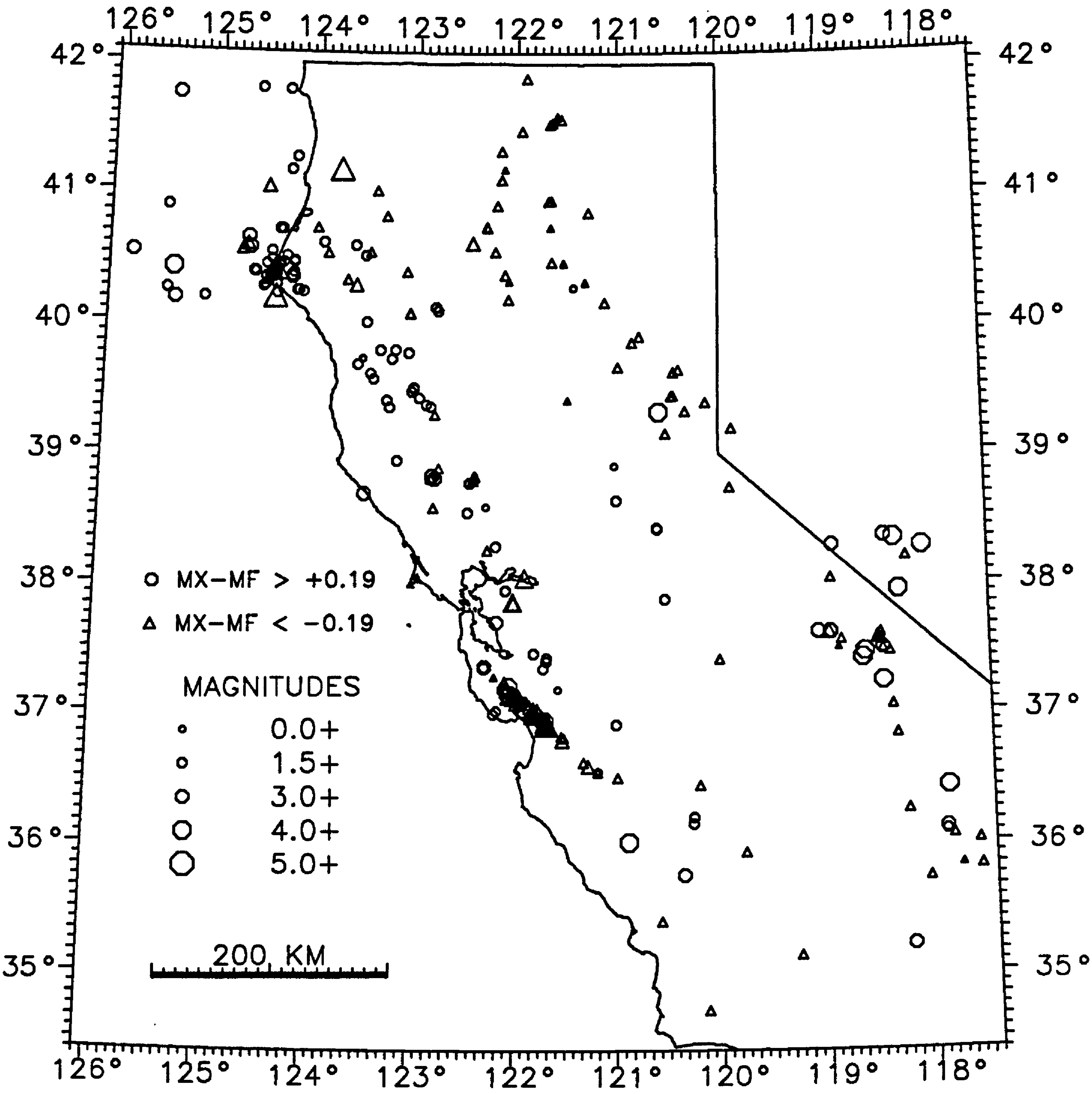

126° 125° 124° 123° 122° 121° 120° 119° 118°
42° 41° 40° 39° 38° 37° 36° 35°
MX-MF > +0.19
MX-MF < -0.19
MAGNITUDES
0.0+
1.5+
3.0+
4.0+
5.0+
200 KM

Figure 9

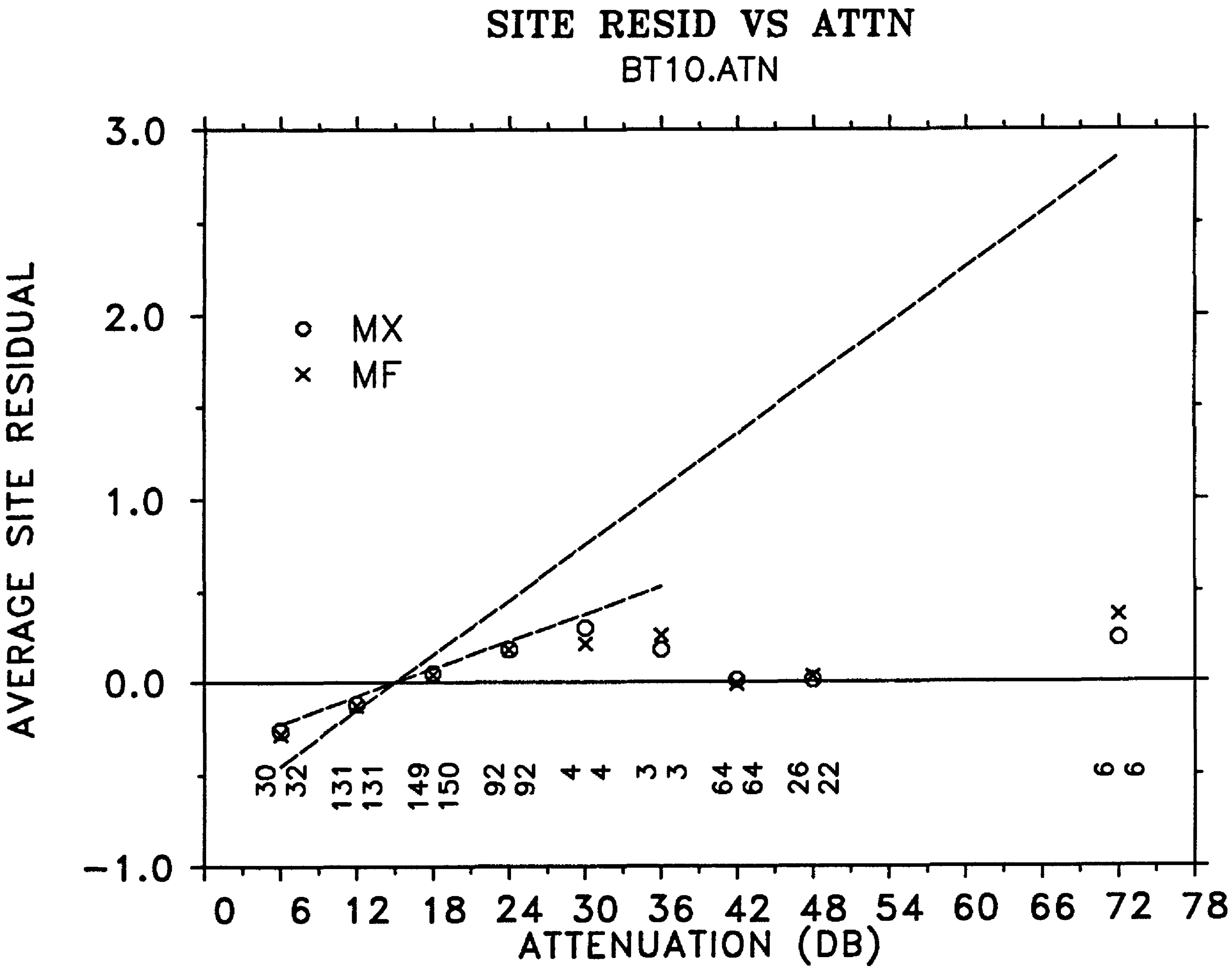

SITE RESID VS ATTN
BT10.ATN
MX
MF
AVERAGE SITE RESIDUAL
ATTENUATION (DB)
3.0
2.0
1.0
0.0
−1.0
0 6 12 18 24 30 36 42 48 54 60 66 72 78
30 32 131 131 149 150 92 92 4 4 3 3 64 64 26 22 6 6

Figure 10

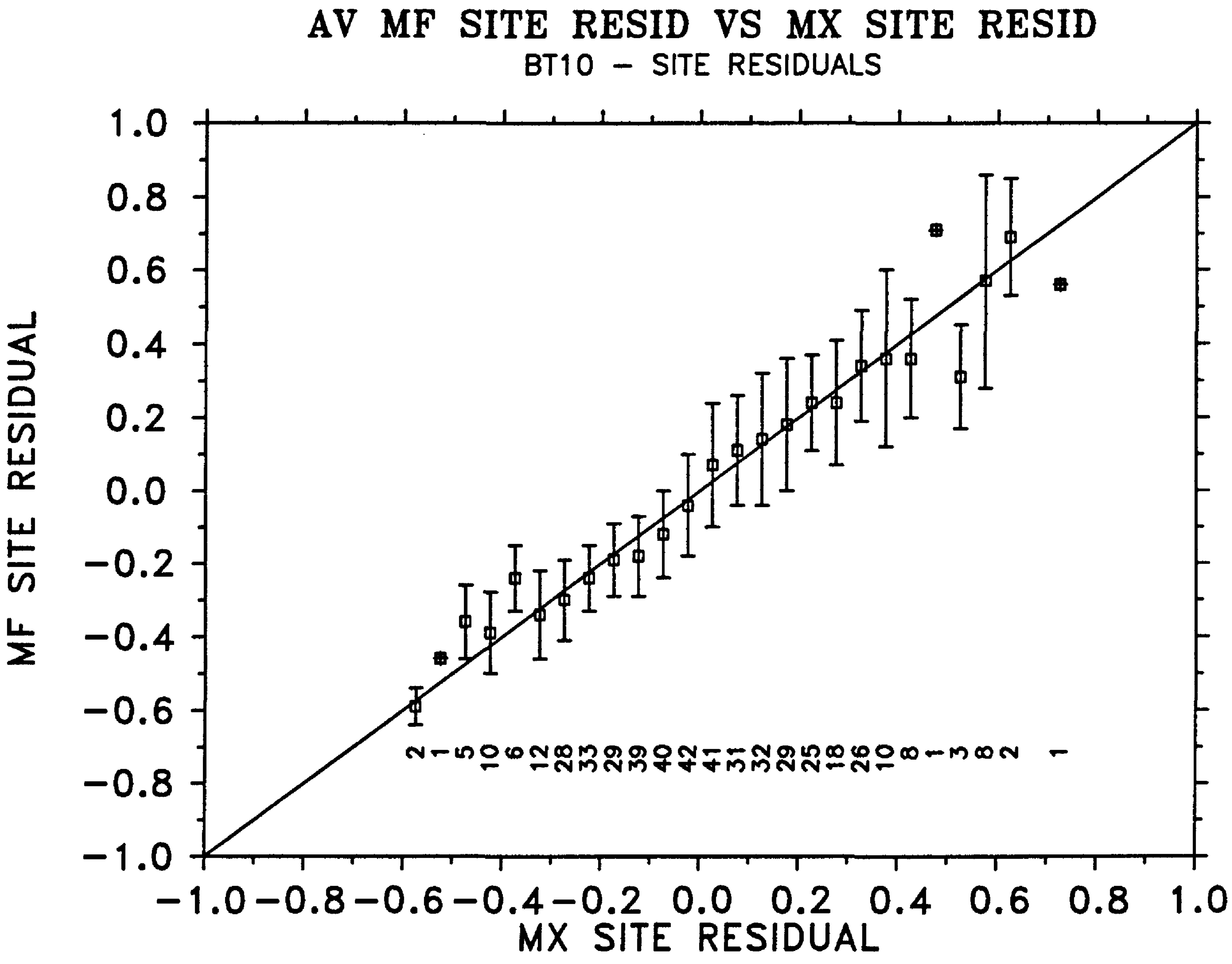

AV MF SITE RESID VS MX SITE RESID
BT10 – SITE RESIDUALS
MF SITE RESIDUAL
MX SITE RESIDUAL
1.0
0.8
0.6
0.4
0.2
0.0
−0.2
−0.4
−0.6
−0.8
−1.0
−1.0 −0.8 −0.6 −0.4 −0.2 0.0 0.2 0.4 0.6 0.8 1.0
2 1 5 10 6 12 28 33 29 39 40 42 41 31 32 29 25 18 26 10 8 1 3 8 2 1

Figure 11

MX SITE RESIDUALS IN TENTHS

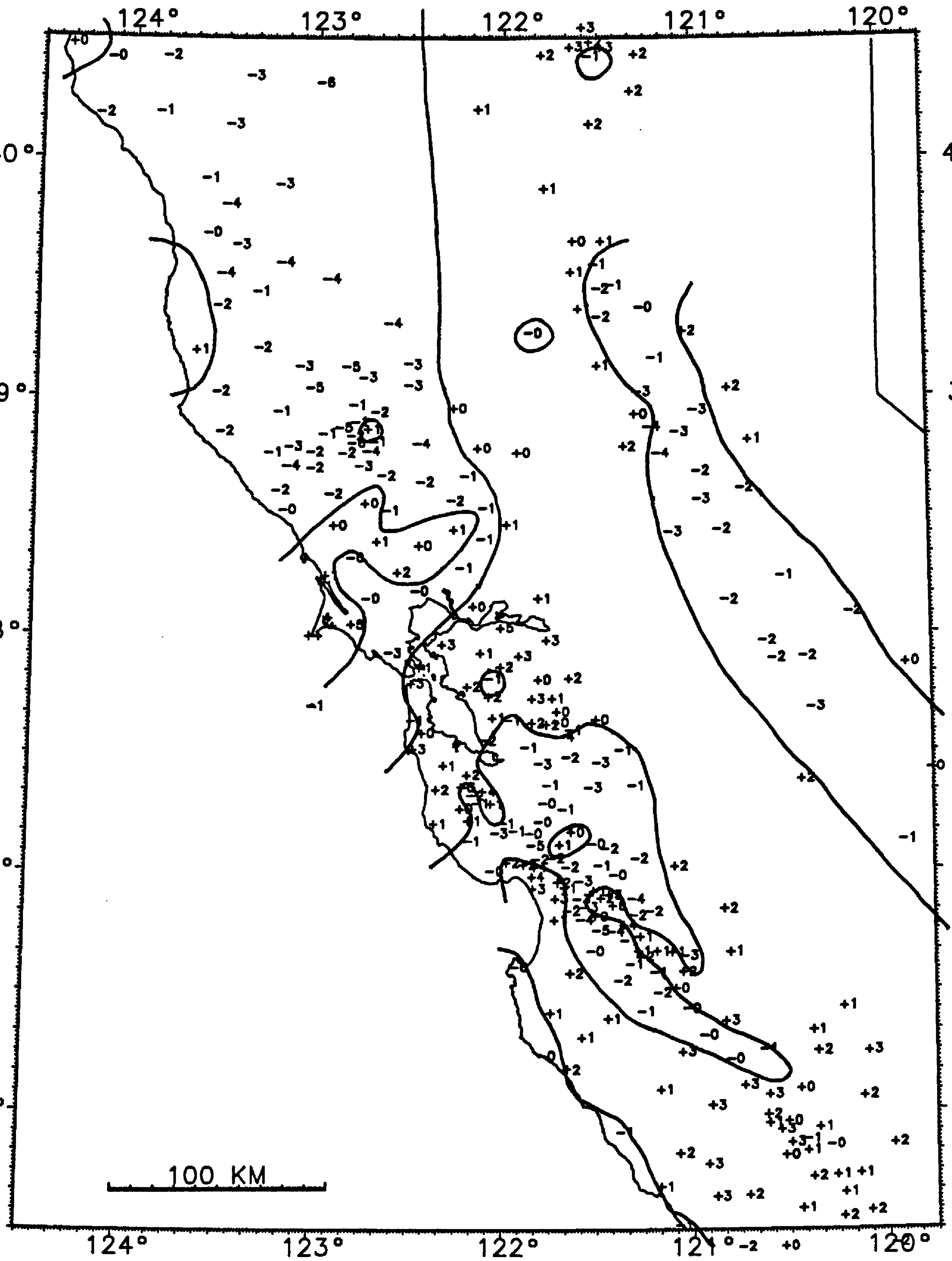


Figure 12

MF SITE RESIDUALS IN TENTHS

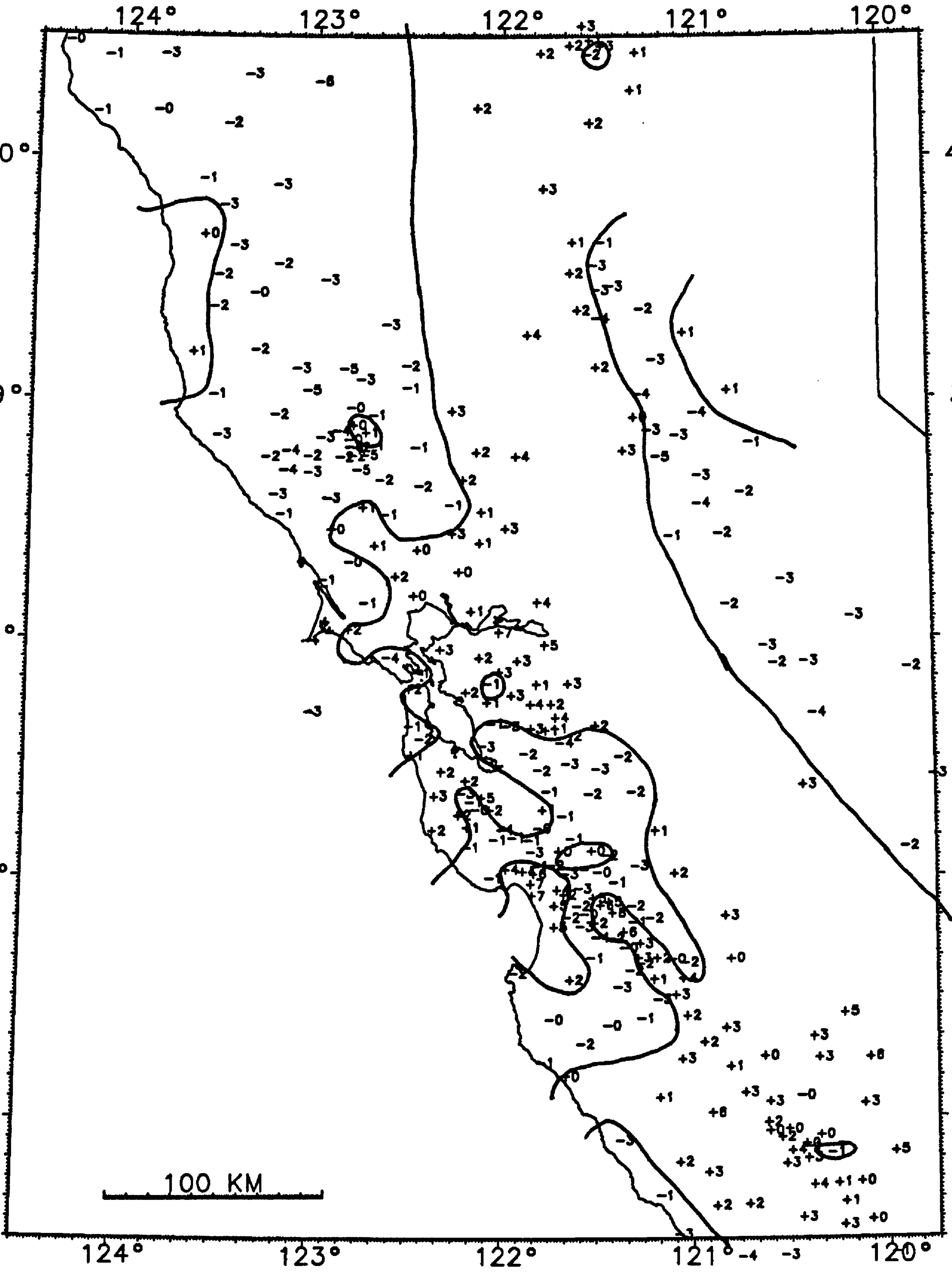


Figure 13

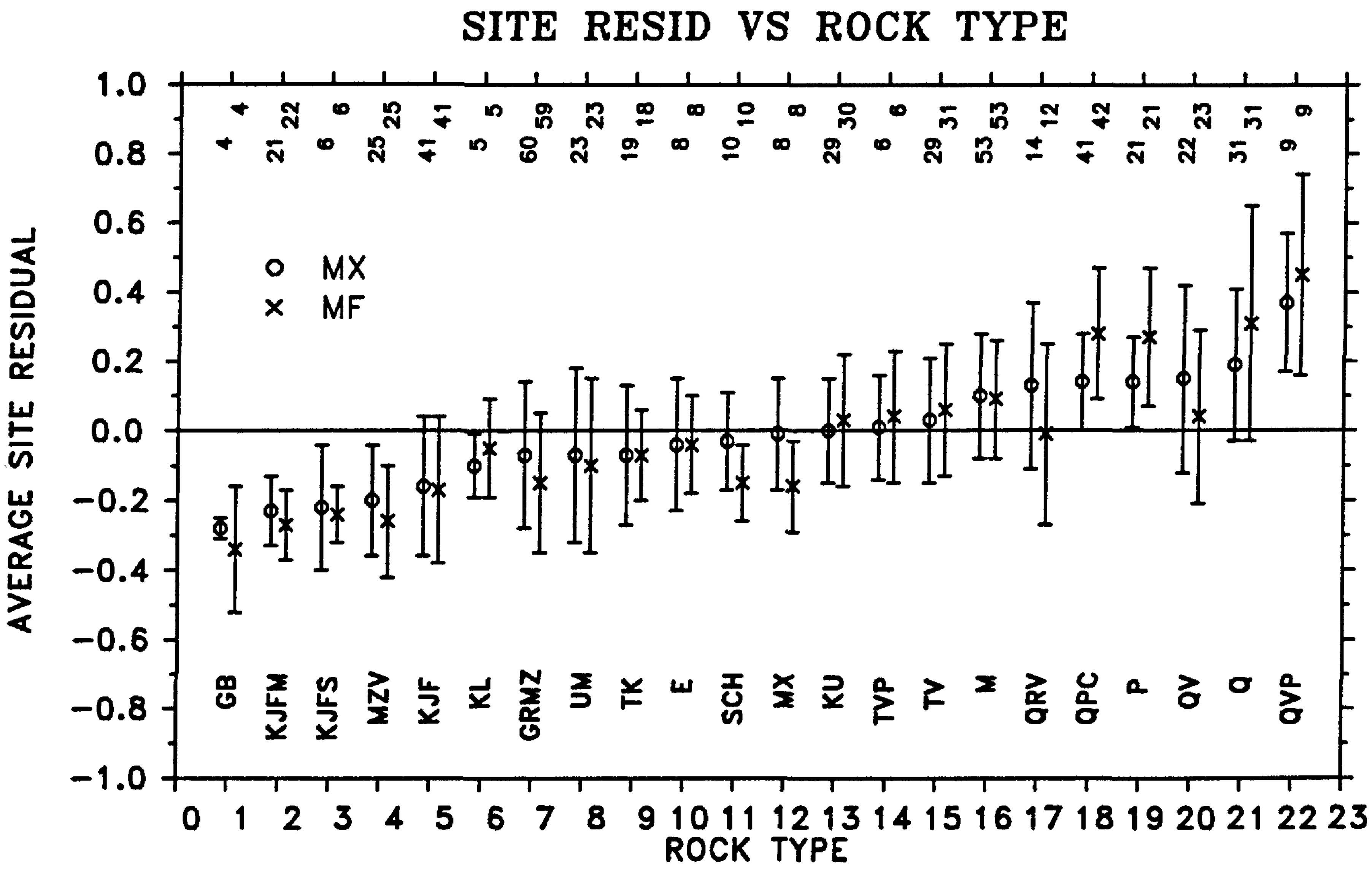

SITE RESID VS ROCK TYPE
AVERAGE SITE RESIDUAL
ROCK TYPE
MX
MF
GB
KJFM
KJFS
MZV
KJF
KL
GRMZ
UM
TK
E
SCH
MX
KU
TVP
TV
M
QRV
QPC
P
QV
Q
QVP

Figure 14

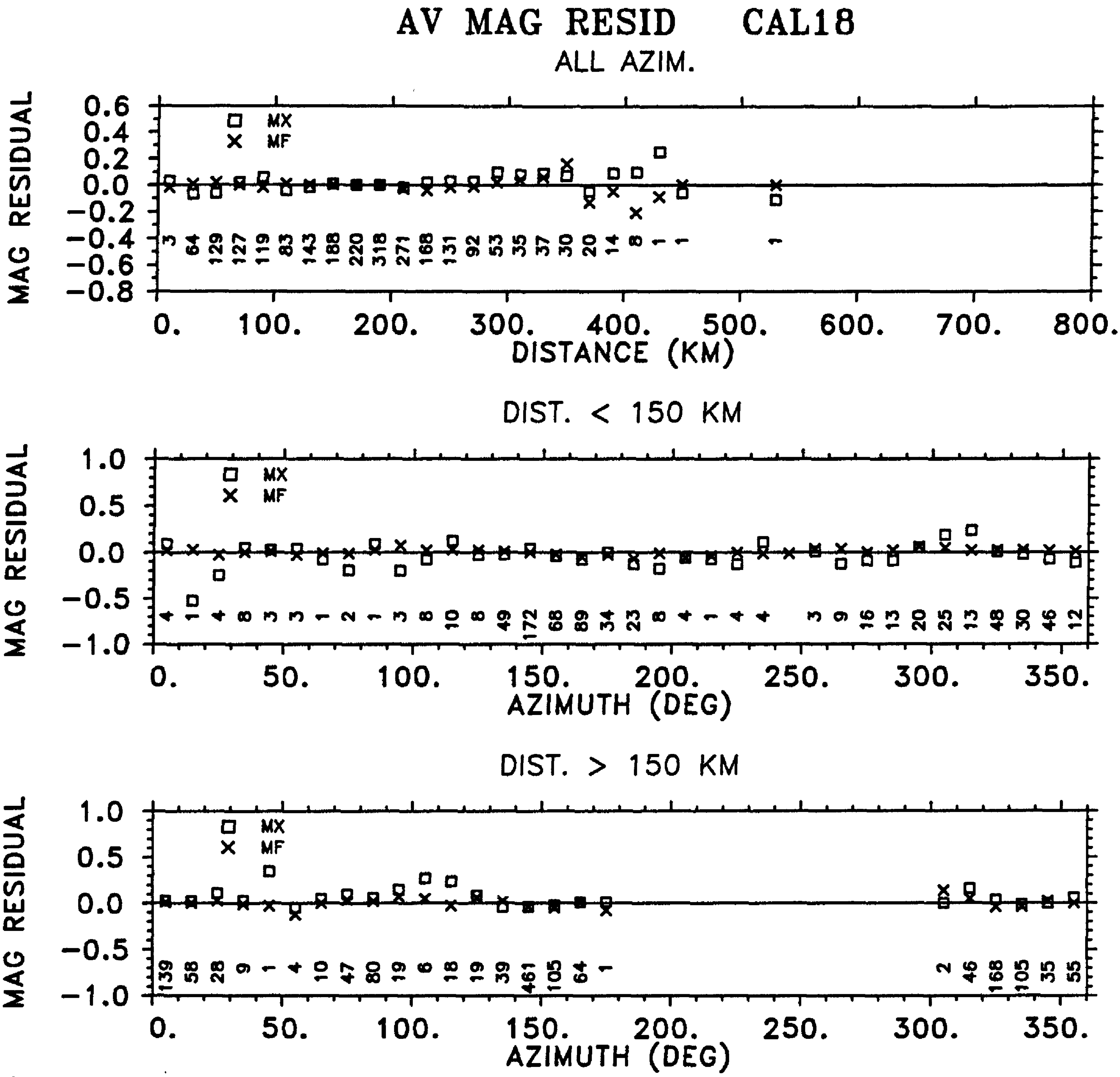

AV MAG RESID CAL18
ALL AZIM.
MAG RESIDUAL
MX
MF
DISTANCE (KM)
DIST. < 150 KM
AZIMUTH (DEG)
DIST. > 150 KM

Figure 15

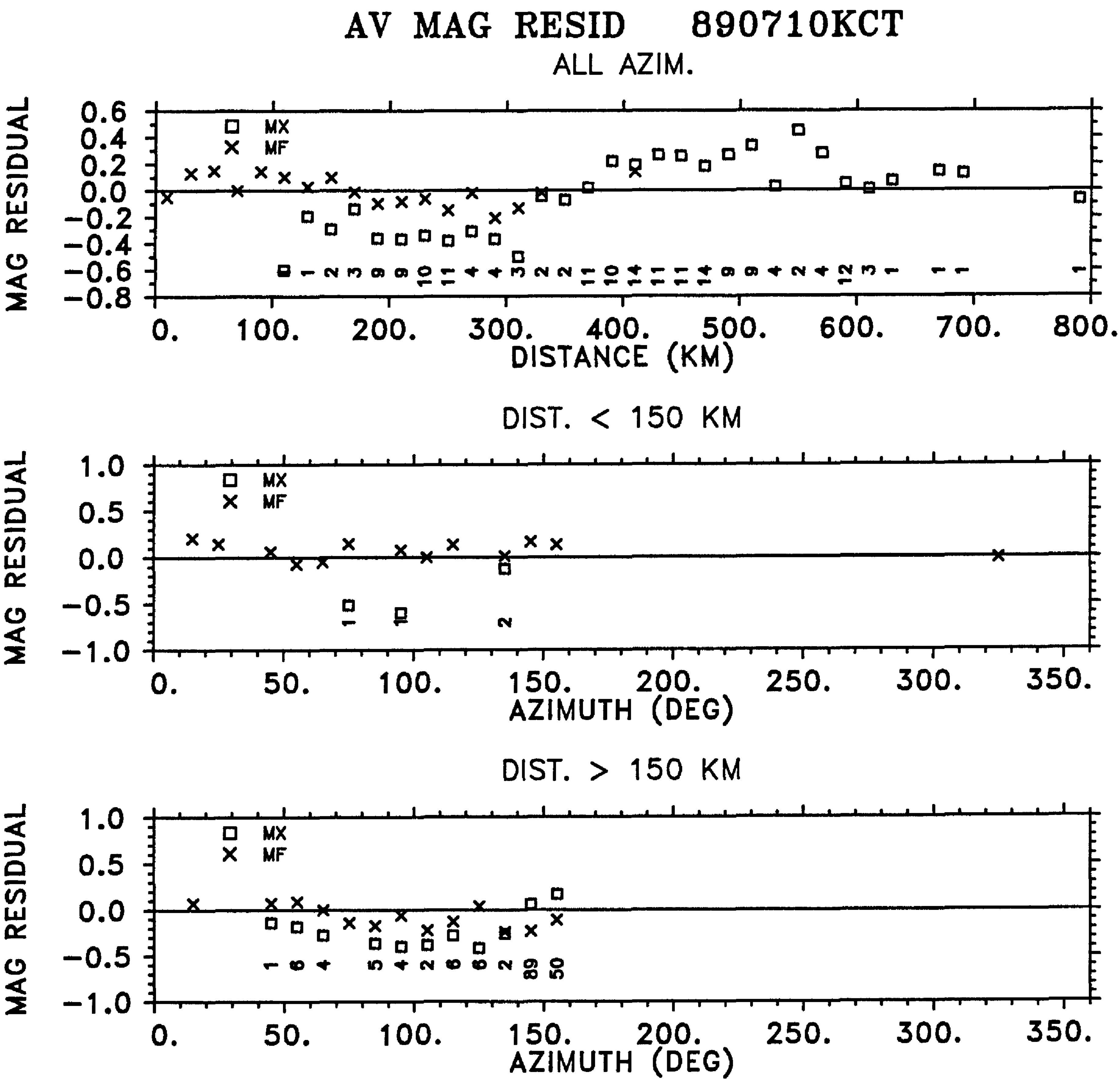

AV MAG RESID 890710KCT
ALL AZIM.
MAG RESIDUAL
MX
MF
DISTANCE (KM)
DIST. < 150 KM
MAG RESIDUAL
MX
MF
AZIMUTH (DEG)
DIST. > 150 KM
MAG RESIDUAL
MX
MF
AZIMUTH (DEG)

Figure 16

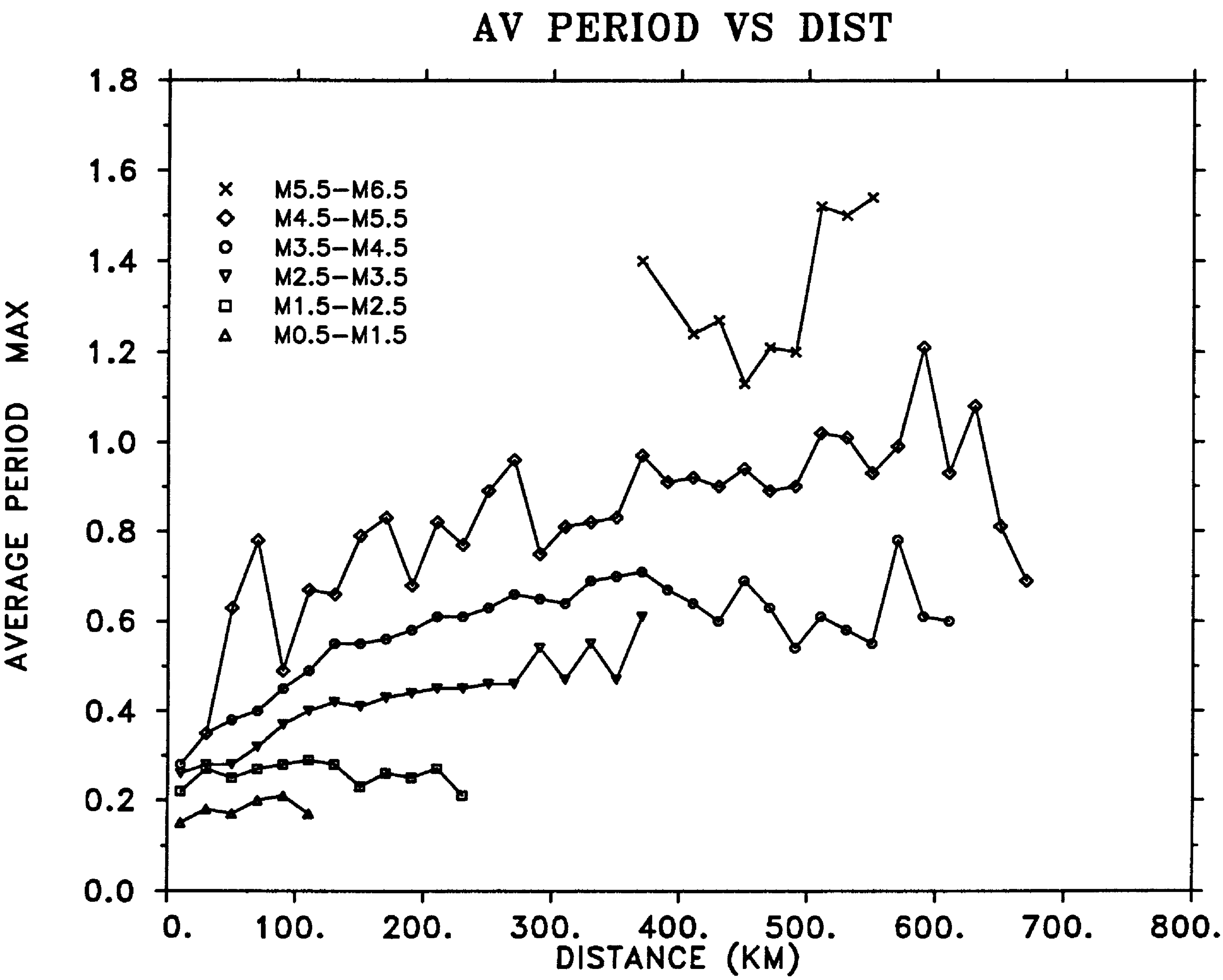
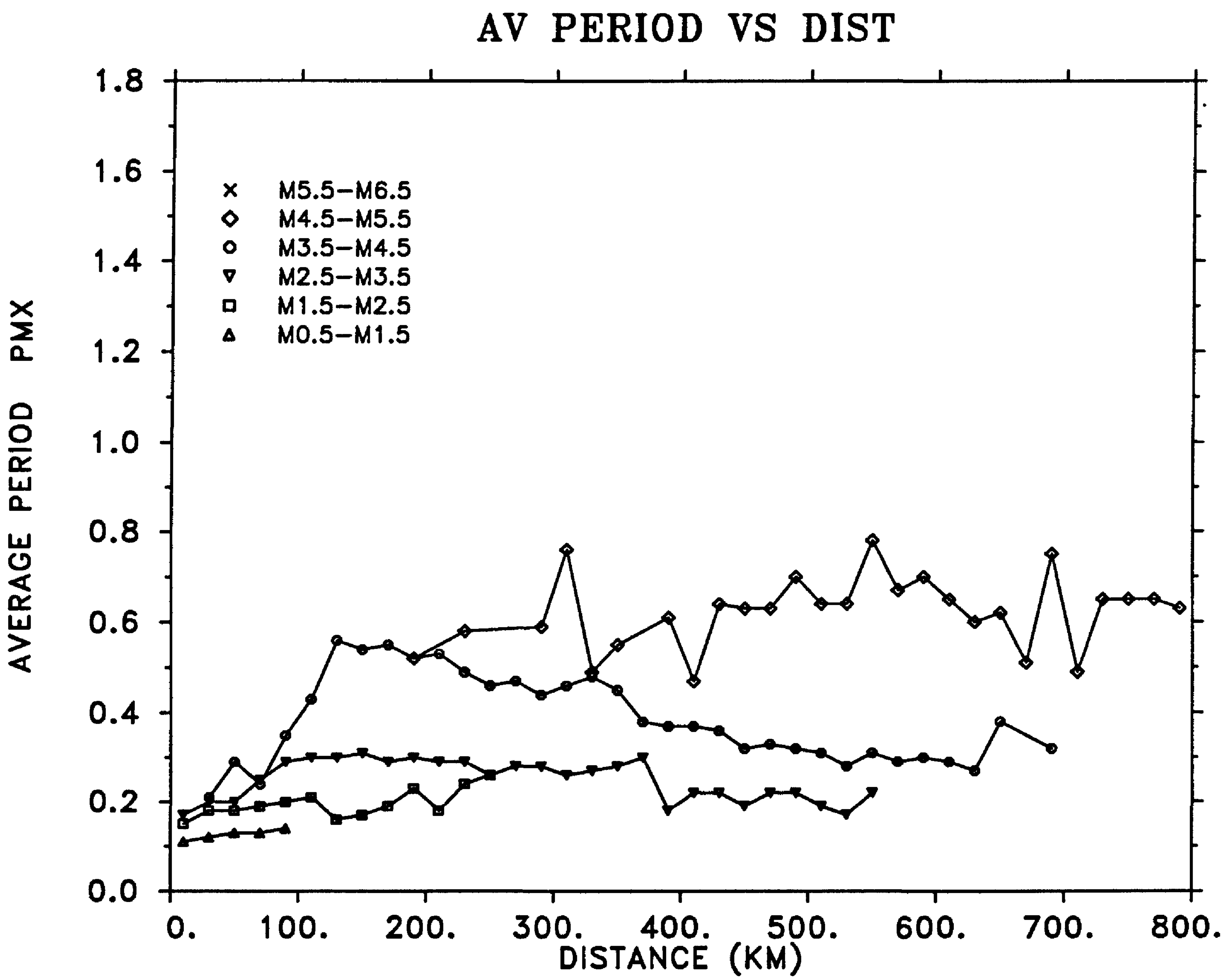

AV PERIOD VS DIST
AVERAGE PERIOD MAX
DISTANCE (KM)
M5.5–M6.5
M4.5–M5.5
M3.5–M4.5
M2.5–M3.5
M1.5–M2.5
M0.5–M1.5
0.0
0.2
0.4
0.6
0.8
1.0
1.2
1.4
1.6
1.8
0.
100.
200.
300.
400.
500.
600.
700.
800.

Figure 17



AV PERIOD VS DIST
AVERAGE PERIOD PMX
DISTANCE (KM)
M5.5–M6.5
M4.5–M5.5
M3.5–M4.5
M2.5–M3.5
M1.5–M2.5
M0.5–M1.5
0.0
0.2
0.4
0.6
0.8
1.0
1.2
1.4
1.6
1.8
0.
100.
200.
300.
400.
500.
600.
700.
800.

Figure 18

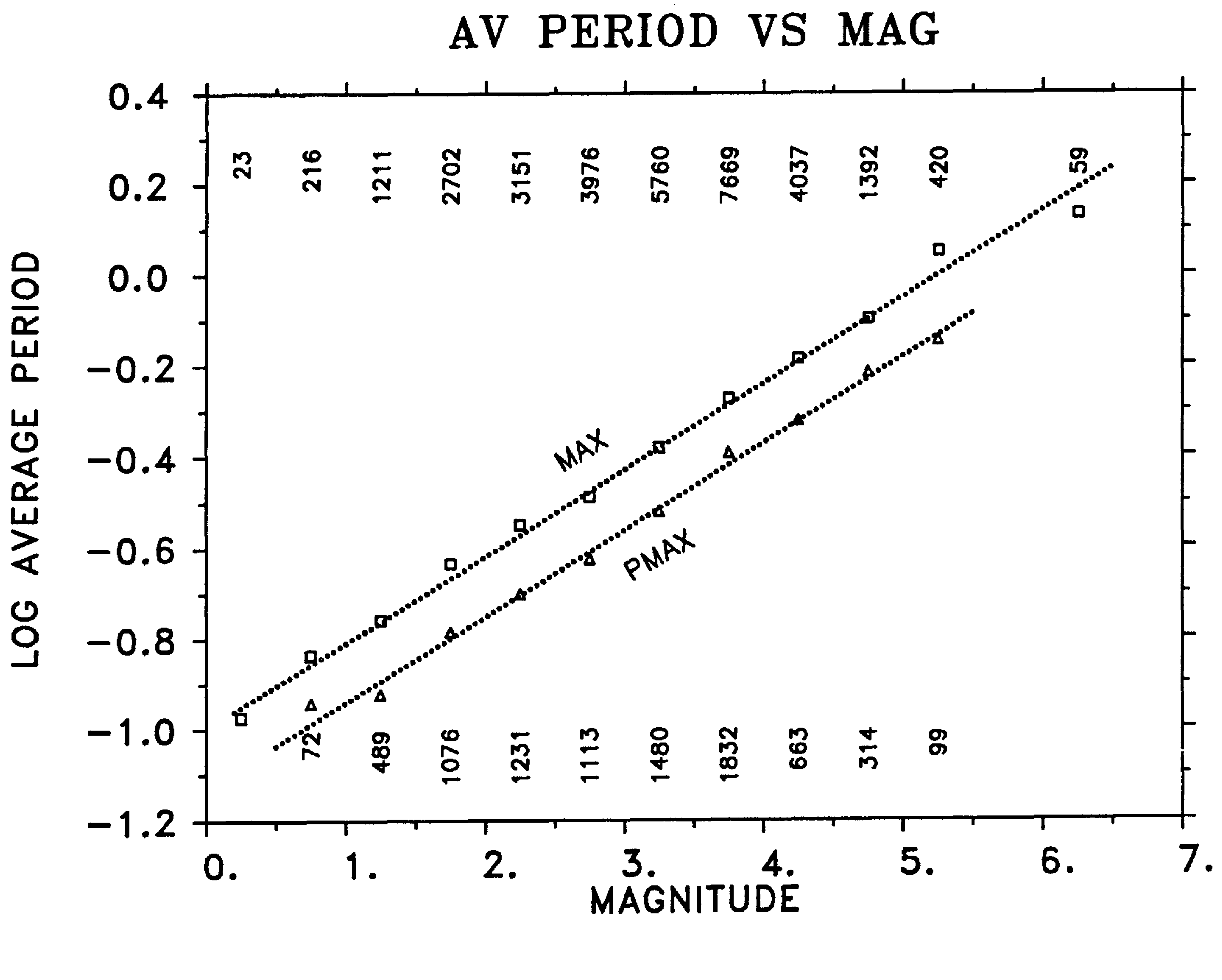

AV PERIOD VS MAG
LOG AVERAGE PERIOD
MAGNITUDE
0.4
0.2
0.0
−0.2
−0.4
−0.6
−0.8
−1.0
−1.2
0.
1.
2.
3.
4.
5.
6.
7.
23
216
1211
2702
3151
3976
5760
7669
4037
1392
420
59
MAX
PMAX
72
489
1076
1231
1113
1480
1832
663
314
99

Figure 19

COMPARISON OF MX, MF, AND MZ WITH MB

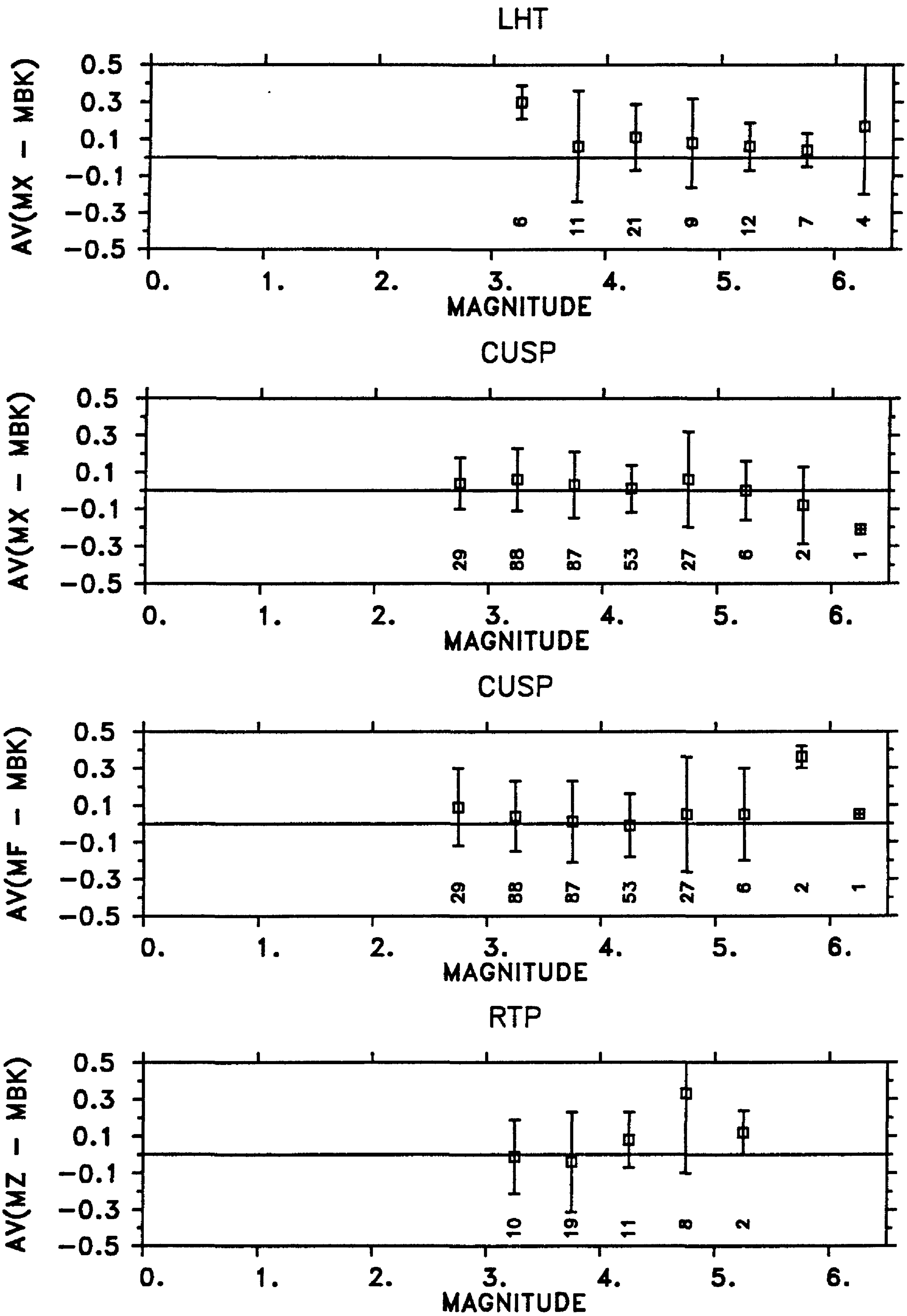


Figure 20

LOG A0 DIFFERENCE VERSUS DISTANCE

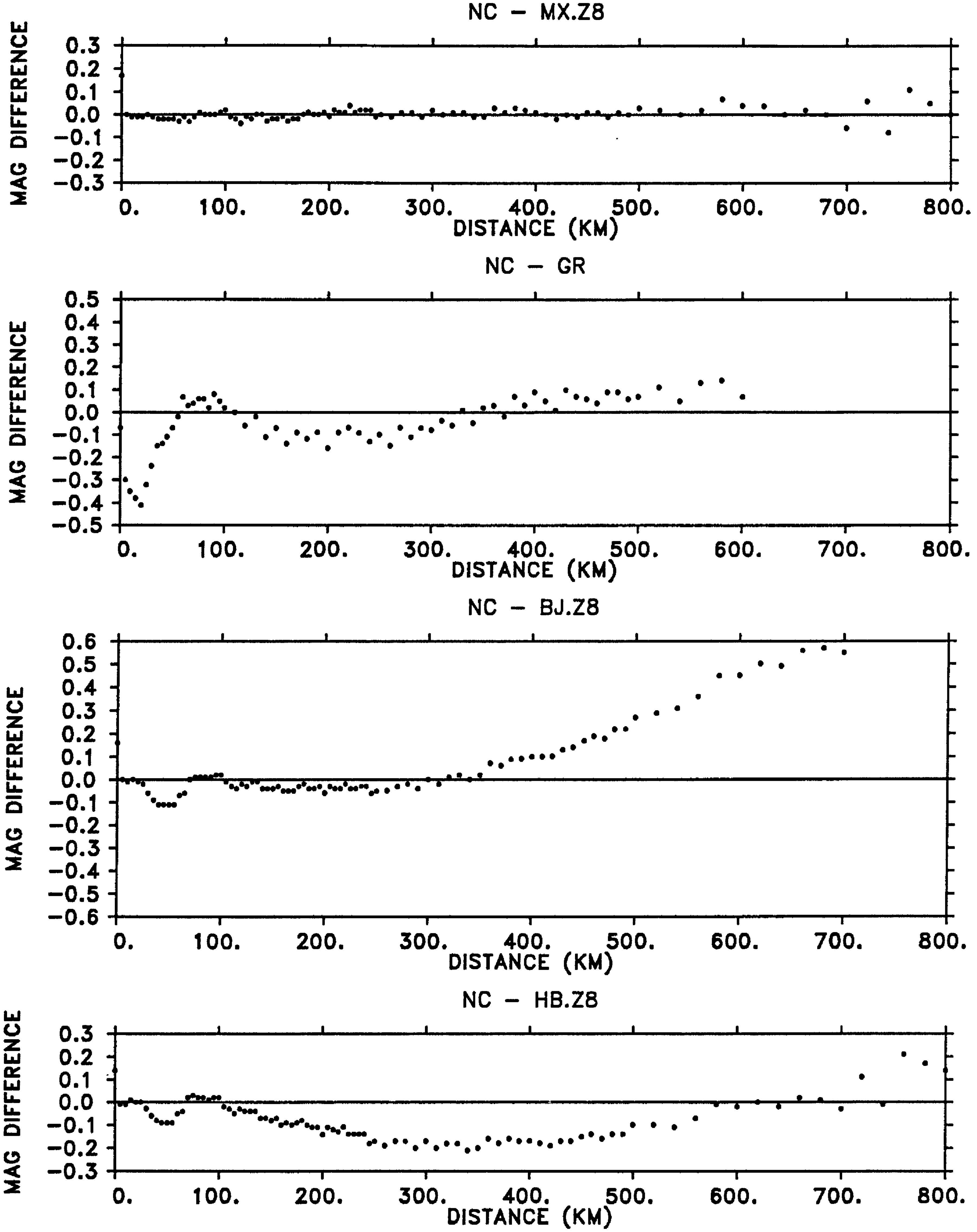


Figure 21