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NEW FOCAL MECHANISMS FOR SOUTHEASTERN CANADIAN EARTHQUAKES – VOLUME II

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ABSTRACT

Using P-wave polarities, Sv/P amplitude ratios, and the program FOCMEC, we have determined the focal mechanisms of 19 recent earthquakes in southeastern Canada. The mechanisms show thrust or thrust/strike-slip faulting is dominant in eastern Canada and is in response to nearly-horizontal compression. Local differences in the direction of compression can be used to identify small areas of anomalous stresses. In addition, the strike of the fault planes provides valuable insights into the seismotectonics of the western Quebec, Charlevoix, Lower St Lawrence, and northern Appalachian regions.

RÉSUMÉ

D'après les premiers mouvements de l'onde P, les rapports d'amplitudes Sv/P et le programme FOCMEC, nous avons déterminé les mécanismes au foyer de 19 tremblements de terre récents du Sud-Est du Canada. Les mécanismes au foyer montrent des mouvements de chevauchement ou de décrochement/chevauchement partout dans l'Est du Canada en réponse à une compression sub-horizontale. Des variations locales dans la direction de compression peuvent être utilisées pour définir de petites régions aux contraintes anomales. De plus, l'orientation des plans de faille donne un bon aperçu de la séismo-tectonique des régions de l'Ouest du Québec, de Charlevoix, du Bas-Saint-Laurent et du nord des Appalaches.

INTRODUCTION

In the study of seismotectonics, one of the most valuable tools is being able to determine the focal mechanism of earthquakes. Earthquake focal mechanisms provide information on the nature of faulting, the inferred deviatoric stresses acting, and – with ambiguity because two options are given – the dip and strike of the rupture plane. This open-file continues the documentation of southeastern Canadian focal mechanisms begun by Adams et al. (1988a). As in the previous report, a deliberate effort has been made to fully document the data, results, and conclusions in the Appendix, but space precludes including the waveform data used in the analysis. Supporting data, including playouts of the digital data, reside in six large ring binders in Adams' office. Future users should contact the Geophysics Division for the digital event files.

PROCEDURES

Choice of events studies

The 19 events studied in this paper were selected as follows. An attempt was made to determine focal mechanisms of current earthquakes soon after they happened during the project (May 1987 - April 1988), some larger earthquakes in eastern Canada that were close to one or more digital stations were chosen from past years, and some older earthquakes with a published mechanism were reanalysed. In all, one magnitude 4, eleven magnitude 3, four magnitude 2, and three magnitude 1 earthquakes were analysed.

Determination of hypocentres

For all the earthquakes studied here the epicentres and focal depths have been determined as discussed in Adams et al. (1988a).

Sensitivity of mechanisms to hypocentral depth

It is in general difficult to compute earthquake depth for small local earthquakes in the absence of a very dense seismic network. At close epicentral distances (conventionally within twice the focal depth of the earthquake being studied), the depth can be computed by minimizing the combined residuals on the upward– and downward– propagating rays. While the residuals may suggest that the hypocentre is computationally precise, the accuracy of the hypocentre depends critically on the crustal velocity structure, on the mantle velocities used, and on the crustal thickness; it is generally unknown. Nevertheless we take the computed depths as an indication of the true depth of the earthquake.

As is fully discussed by Adams et al. (1988a), uncertainty in focal depth does not often cause much uncertainty in focal mechanism.

Determination of polarities

Where possible polarities were read from all available records. These included:

- Eastern Canada Telemetered Network (ECTN) digital data (discussed later),
- analogue data from the paper records of the Canadian standard and regional stations,
- playouts of digital or analogue data from stations operated by Lamont Doherty Geological Observatory, Boston College, and Woodward Clyde Consultants,
- copies of paper records from analogue records made by F. Revetta at Potsdam College, N.Y.

Seismometer polarities are checked routinely for the Canadian stations, (and confirmed by subsequently checking polarities of teleseismic arrivals) and only two Canadian stations with reversed polarity are known: GGN from 19840207 till 19861119; and TRQ from 19830928 till 19851023. The polarity of three analogue seismometers near Potsdam were checked by obtaining copies of teleseismic arrivals. Network operators in the northeastern U.S. provided information on station polarity with their records. In general, many of their stations operate with reversed polarity, and for some stations the polarity remains uncertain (even where believed known).

Most of the Canadian polarities used were read by two people (Adams/student) though a few were read by Adams alone. Readings on which the analysts differed were either not used or a consensus was reached and the polarity was used at half-weight.

In every case we have chosen to read the polarity of the **first** arrival, though in a few cases where a weak Pn was followed by a strong phase interpreted to be Pg we have chosen to also read the Pg polarity at half weight. In a few cases where Sv polarities are very clear on the digital records they have been noted but are not used to determine the mechanism.

Polarities were assigned either full or half weight. Full weight polarities are those that are impulsive, unambiguous, and should be fit by the final mechanism. Half weight polarities are emergent, less strong, may have been read by analysts other than the authors, may occur on noisy records, and may occur on stations of dubious polarity. They may be misfit by the final mechanism, especially if they lie near to a nodal plane. In addition to the polarities that have been read, some stations were judged to have unusually weak beginning, possibly due their position near a nodal plane: these have been denoted 'E'. Although the program FOCMEC (see below) does not use these 'E' polarities, they were occasionally useful for deciding between the different possible focal mechanisms.

Determination of amplitude ratios

The determination of amplitude ratios followed Adams et al. (1988a) in using the amplitude of the first half cycle of the P-wave. Since that publication, a draft paper by Ebel (1988) has demonstrated that much of the energy in the P-coda is generated by scattering very close to the source, and that only the first half cycle of the the P-wave is uncontaminated. Thus the large second peak amplitude for P-waves that are strongly asymmetric (weak up followed by strong down, or vice-versa) is due to off-azimuth scattering and not to the source. Ideally, the next step in improving our future analytical methods will be to use a modeling program to prepare synthetic waveforms. In addition to our quantitative use of the amplitude ratio, we used the relative amplitude of the Pn onsets as a qualitative guide to the proximity of the nodal planes derived using the polarity and Sv/P ratio data.

Use of the Progam 'FOCMEC'

For our analysis we used FOCMEC (Snoke et al., 1984), as modified by Wahlstrom in 1985 to accept half-weight polarities. In the Appendix PIK files, + and − represent half-weight C and D polarities, and on the plots the half weight polarities are denoted by small-sized C's and D's. Another change from the original FOCMEC program is that the crosses representing the amplitude ratios are now related inversely to the magnitude of the $\mathrm{Log}_{10}\,(\frac{\mathrm{Amp.\ Sv}}{\mathrm{Amp.\ P}})$ ratio: i.e. a large ratio (relatively weak P-phase) is represented by a small cross.

In deciding on the final "best" mechanism we have relied very heavily on the polarity data and placed much less value on the ratio data. Of the 220 equivalent full-weight polarities in this report (Table 1) only 5% are misfit; of the 55 ratios used 31% misfit, half of them on just two mechanisms. The Appendix provides a full documentation of our data and results.

SUMMARY OF MECHANISMS

The following is a brief summary of the focal mechanisms presented in this paper. Futher details are to be found in the Appendix.

#740609 is a strike-slip/thrust mechanism derived from the polarity data of Leblanc and Buchbinder (1977); it has one plane tightly constrained by a dilatational arrival at the lower left. The P-axis is in the NW quadrant.

#740623 is a thrust mechanism derived from the polarity data of Leblanc and Buchbinder (1977); it has one plane tightly constrained by a compressional arrival at the upper left.

#840119 could be fit nearly as well by a strike-slip mechanism. Nevertheless the thrust solution is preferred. The P-axis is in the N quadrant.

#850325 is a strike-slip/thrust mechanism well-constrained by polarity data, but the accepted solution misfits 4 of the 7 amplitude-ratio data, with the observed P amplitudes being larger than expected.

#861017 is a well-constrained thrust/strike-slip mechanism despite uncertainty in depth.

#870318 is a well-constrained thrust mechanism by polarity data, but the accepted solution misfits 5 of the 6 amplitude-ratio data, with the observed P amplitudes being larger than expected, a result similar to #850325.

#870503 is a typical thrust/strike-slip mechanism from the Lower St. Lawrence, but needs stronger Pn arrivals in the north quadrant for confirmation.

#870521 is a well-constrained strike-slip mechanism only when the ratio information is used.

#870619 is a small event for which the strike-slip mechanism appears well-determined; this may be misleading.

870705 is a well determined thrust mechanism, despite the unknown depth of the earthquake. The earthquake produced no Rg phase on WBO, OTT, or MNT, and might therefore be considered deep; however the phase arrival times fit very poorly for an 18 km depth. The two mechanisms shown in the Appendix (for depths of 1 km and 18 km) are similar but the deeper mechanism has a more steeply-dipping plane.

#870707 is a strike-slip mechanism which is determined from a few polarities, ratios, and qualitative observations of the strength of the P-wave arrivals.

#870723 has many good Pg arrivals, but unusually weak Pn arrivals. Although the chosen 'best solution' involves normal faulting, this is only weakly required by the data (see Appendix).

#870806 has many weak Pn arrivals, and is poorly constrained if amplitude ratios are not used. The P and T axes are relatively well defined.

#870817 gives two well-defined families of solutions, a thrust and a strike-slip, of which the thrust family is very tightly constrained. Both are given, although the thrust mechanism is preferred for reasons discussed below.

#871023 is a well constrained strike-slip mechanism by polarity data, despite all arrivals plotting on the north half of the focal sphere.

#871111 is moderately-well determined thrust mechanism, though polarities to the south, and stronger Pn arrivals on the easternmost ECTN would have been desireable.

#880310 is a well-constrained strike-slip mechanism.

#880424 is a well-determined thrust/strike-slip mechanism that is not sensitive to the exact focal depth.

DISCUSSION

The results of the focal mechanisms are summarized in Table 1 and on Figure 1. Figure 2 gives the results from Adams et al. (1988a) for comparison. Full details, including detailed comments on the polarities and ratios used, the assigned depth, the robustness of the solution, and some implications are given in the Appendix. In the following we discuss the mechanisms by seismic zone (after Basham et al. 1982) to highlight similarities and differences between mechanisms in light of our current understanding (Adams and Basham, in press).

Western Quebec (WQU) Seismic Zone A significant cluster of earthquakes occurs in the Grenville Province of the Canadian Shield, dominantly in western Quebec but extending into eastern Ontario across the Ottawa River. An earthquake with magnitude about 6 occurred at or near Montreal in 1732 (Leblanc, 1981). During this century earthquakes of M6.2 occurred in Timiskaming in 1935 and M5.6 near Cornwall in 1944.

In detail, earthquakes in western Quebec (e.g. Adams and Basham, in press, figure 1) appear to occur in two bands. The first band, trending slightly west of northwest, lies along the Ottawa River and includes the larger historical earthquakes. Mechanisms #870705, #870817, and perhaps #870619 can be associated with this band. The second band, containing more but smaller earthquakes, trends slightly north of northwest and extends from Montreal to the Baskatong Reservoir, about 200 km north of Ottawa. Mechanisms #870521, #870707, #871023, #880310, and perhaps #871111 can be associated with this band. The last decade of monitoring shows the gap between the two bands is reasonably well defined at the northwestern end by an absence of earthquakes; however, towards the St. Lawrence River the two bands merge, and hence the ambiguity in assigning two of the mechanisms.

Focal mechanisms have previously been determined for a relatively large number of earthquakes in the zone because of the relatively dense network of digital seismographs and of the diligence of Wahlstrom (1987). Almost all mechanisms have near-horizontal P-axes and represent mainly thrust earthquakes. This evidence for high horizontal compression is confirmed by other evidence for regional stresses in eastern Canada (Hasegawa et al., 1985; Adams, 1987; Adams, 1988).

The Ottawa River Band

Forsyth (1981) has shown that the earthquakes in the first band, including the larger historical earthquakes, are spatially associated with Paleozoic rift faults along the Ottawa River. The rift faults are part of a large structure that extends from the Ottawa Valley (and from rifts along Lake Champlain) down the St. Lawrence River (Kumarapeli, 1985).

Towards Lake Timiskaming, #870817 occurred close to the epicentre of the 1935, m_b 6.2 Timiskaming Earthquake. The mainshock, immediate aftershocks and subsequent seismicity were studied by Vonk and Adams (1988), who showed that they formed a NW-trend of seismicity under Lac Kipawa, the "Kipawa Seismic Zone". Ebel et al. (1986) concluded that the Timiskaming mainshock involved thrusting on NW- or NE-striking planes, and Vonk and Adams showed that subsequent earthquakes, including data for #870817, were consistent with thrust faulting on moderately-dipping, NW-striking planes.

For both #870817 and a m_N 4.2 earthquake in 1982, Vonk and Adams concluded that the polarity data for each earthquake were insufficient to decide between well-defined families of strike-slip or thrust solutions. However, they pointed out that while the two thrust mechanisms were consistant and represented compression from the northeast, the two strike-slip mechanisms were rather different, one representing compression from the north and the other compression from the northeast, and had only small areas of common polarity.

We show on Figure 1 both the thrust and the strike-slip solutions for #870817, but on the basis of the above discussion prefer the thrust mechanism. Both mechanisms involve a NW-striking plane which correlates with the seismicity trend and also with major lineaments that represent the northwest extension of the Ottawa Valley rift zone.

The mechanism for #870705 is relatively well-determined despite the uncertainty in focal depth. It involves thrusting on NNE-striking planes that are nearly parallel to the St. Lawrence River and might be a continuation of the St. Lawrence Valley rift faults.

#870619 occurred close to GAC and OTT, and although there was some suspicion at the time that it might have been a blast, there was no evident mining operation and the waveform lacked a dominant Rg phase. Like #871111 (discussed later) it lies between the two bands of seismicity and does not have a NW-striking plane.

The Baskatong Band

Adams and Basham (in press) have suggested that the second band of seismicity was due to the passage of North America over a hotspot between 140 and 120 million years ago. The younger path of the hotspot is marked by the Monteregian Hills, a line of early Cretaceous intrusions that lie mostly east-southeast of Montreal. In turn, these lie parallel to, but somewhat offset from, the still younger New England Seamount Chain (Sykes, 1978). The chain represents the movement of the North American plate over a hotspot at about 47 mm/yr (Duncan, 1984), a rate quite consistent with the age of the Monteregian Hills. Passage over the hotspot would have thermally stressed and possibly fractured the Precambrian crust of western Quebec less than 130 m.y. ago.

Three (#870521, #871023, and #880310) of our five mechanisms in the Baskatong band have a NW-striking plane and they generally resemble the adjacent mechanisms derived by Adams et al. (1988a). The remaining two mechanisms (#870707 and #871111) can not be easily related to structures. Mohajer (draft contract report, 1987) has suggested that epicentres in this band lie on several NW- or NE-trending lines. Therefore, we suggest that future mechanisms and a more thorough analysis of epicentral trends may reveal the presence of crustal-scale NW-striking fractures.

Of the western Quebec mechanisms only #870521 has a P-axis aligned more north-south than east-west. This earthquake lies in the anomalous patch defined by Adams (1988), where the local stress field appears to be consistently north-south oriented.

Charlevoix (CHV) Seismic Zone The Charlevoix zone is historically the most active in eastern Canada with at least five earthquakes of magnitude 6 or greater (1663, 1791, 1860, 1870, and 1925). Because of the historical seismicity, Charlevoix is thought to be the most probable site for a future large earthquake in eastern Canada, and so has been intensively monitored by a 6-station local network since the mid 1970's. Most earthquakes are confined to a zone that is about 80 km long by 35 km wide, mainly under the St. Lawrence River (Anglin, 1984). Earthquake focal depths, now well-determined, lie mostly between 5 and 25 km., i.e. within the Precambrian basement. Stereo plots produced by Anglin (1984) demonstrate that most of the microearthquakes are occurring on northeast-striking planes that dip steeply to the southeast. A projection of the hypocentres to the surface along the postulated faults suggests the activity is confined between Paleozoic rift faults mapped on the north shore and a bathymetric feature near the river's south shore.

A number of earthquake focal mechanisms have previously been derived for Charlevoix earthquakes. The 1974 field experiment yielded six mechanisms (Leblanc and Buchbinder, 1977); Hasegawa and Wetmiller (1980) produced a mechanism for the 1979 M5.0 event, Lamontagne (1987) derived a suite of composite mechanisms, and Adams et al. (1988a) derived two mechanisms. No well-determined mechanism is available for the older large earthquakes, although Ebel et al. (1986) suggest that both the 1925 and the 1939 earthquakes involved thrust faulting on either NE or NW striking planes.

Of the four mechanisms we publish, two are new and two represent a reanalysis of the mechanisms of Leblanc and Buchbinder (1977). We obtained the original phase and polarity readings for the six events of Leblanc and Buchbinder (1977) and reanalysed them in the same way as the other earthquakes in this paper. Our computed hypocentres were very similar to those published, which was to be expected because the velocity model has not changed. We found that for the two events reported here (#740609 and #740623) the mechanisms were very similar to those published by Leblanc and Buchbinder (1977), for one other (#740702) the mechanism was reasonably well-determined but not very robust, and that for the remaining three events the mechanism was ambiguous or very poorly-determined. These results quantify the statement by Leblanc and Buchbinder that "these solutions, because of the paucity of data, do not offer the confidence level that one would desire" and allow confidence to be placed in at least the first two mechanisms. We intend to re-examine the data for the other four events in order to determine if robust mechanisms can be resolved.

The two reanalysed mechanisms have a common fault plane striking parallel to the river and dipping to the southeast, but one (#740609) has a larger component of strike-slip movement. A northwest-southeast compression direction (aberrant for the regional stress field) is confirmed for #740623.

One of our two new mechanisms (#870318) represents thrust faulting on northwest striking planes in response to compression from the northeast. As such, it suggests faulting on planes striking at right angles to the river-parallel rift faults. The other mechanism (#850325) has a large strike-slip component and represents compression from the northwest as for event #740623; a simple correlation to river-parallel or river-normal faults is not obvious.

The Charlevoix mechanisms have not proved easy to interpret, though most have P-axes in the east quadrant and represent thrust or combination thrust/strike-slip faulting. A plane that might represent the rift faults is seen on some of the mechanisms, but like our two new mechanisms, at least some of the earthquakes appear to be occurring on NW-striking transverse faults that offset the rift fault system.

<u>**Northern Appalachians Seismic Zone**</u> The northern Appalachian region, which includes most of New Brunswick and which extends into New England, is a zone of relatively uniform seismicity. Previous focal mechanisms are available for the Miramichi mainshock and several clusters of its aftershocks (Wetmiller et al., 1984), for the nearby Trousers Lake earthquake (Wetmiller et al., 1984), for an earthquake near the Quebec-Maine border (Wetmiller, 1975; Yang and Aggarwal, 1981), for a second earthquake nearby (Adams et al., 1988a), for two earthquakes in New Brunswick (Adams et al., 1988a), and for earthquakes in New England (e.g. Ebel and Bouck, 1989). All represent dominantly thrust faulting, most in response to northeast- to east-directed compression.

Event #840119 is an exception to the general trend. Although in Maine, it belongs to the cluster of seismicity around Passamaquoddy Bay on the Maine-New Brunswick border that in 1983/84 generated six magnitude three earthquakes. Our new mechanism is similar to that proposed by Ebel and Bouck (1989), but has a small component of strike-slip movement. Although the two mechanisms differ slightly, they both represent chiefly thrust faulting on east-west planes due to compression from the north.

Event #861017 is a magnitude 4 aftershock to the Miramichi earthquakes of 1982. The mechanism has a larger strike-slip component than the mainshock mechanisms (which were almost pure thrust), but represents the same east-west directed compression.

Event #880424 occurred within 6 km of the similar-sized earthquake on #840923 analysed by Adams et al. (1988a). Although the compression direction inferred is similar, as are the strike of the planes, the mechanisms are in fact rather different because the equivalent planes on the two mechanisms dip in different directions. The paradox might be resolved if the faulting was occurring on a series of faults of similar strike (northerly or northwesterly) but of varied dip direction.

<u>Lower St. Lawrence (LSL) Seismic Zone</u> Similar to the Charlevoix zone, the Lower St. Lawrence earthquakes also lie mainly under the St. Lawrence River, which at this point is an estuary 50 - 100 km wide. Despite the lack of known M>5 earthquakes, the zone has rates of magnitude 3-4 earthquakes similar to those of the more confined Charlevoix zone.

Epicentre maps prepared by Smith (1962, 1966) show scattering of earthquakes extending onto the north and south shore. Relocation of some of the epicentres (Adams et al., 1988b) has affirmed that many actually occurred under the river. Half of the relocated epicentres lie just offshore but parallel to the northern shoreline, and are inferred to be occurring on offshore faults that have controlled the shape of the coastline.

Adams et al. (1988a) derived the first seven mechanisms for earthquakes in the Lower St Lawrence and inferred thrust faulting in response to compression from the east quadrant. Our three additional mechanisms agree with this assessment. Two of the three mechanisms lie west of the upstream end of the Lower St. Lawrence seismic zone as defined by Basham et al. (1982), one (#870617) represents thrust faulting with one plane parallel to the river and dipping to the southeast, while the other (#870503) is more similar to the two mechanisms of Adams et al. (1988a) that have more NW-striking planes that would be striking at right angles to any river-parallel set. The remaining mechanism (#870806) may represent faulting on planes parallel to the coastline, which here trends northerly and is thought to be controlled by offshore faults (Adams et al., 1988b).

<u>Eastern Background (EBG) Seismic Zone</u> Seismicity in the rest of southeastern Canada outside of the recognised seismic zones was assigned to a background seismic zone by Basham et al. (1982). Few large historical earthquakes, and few moderate modern earthquakes have occurred in this area, so the opportunity to derive a focal mechanism for the magnitude 3.4 earthquake in western Lake Ontario was taken (#870723). The mechanism shown on Figure 1 is unusual in that it represents normal faulting, which is rare

for eastern Canada. If correct, the mechanism represents extension in response to north-directed extension with the principal horizontal compression direction (B-axis direction) being east-directed.

The derived mechanism should be considered preliminary because of the difficulty in obtaining unambiguous Pn arrivals to constrain the planes. Most seismograms at distances greater than 200 km were characterized by an extremely weak Pn arrival and then by a very strong second arrival (e.g. on ANT and CKO). Although the arrival times do not fit very well, they are taken to be Pg, and the observed polarities then fit the derived solution. An alternative might be the mantle reflected phase, PmP, in which case their polarity should be inverted and they should plot on the other side of the focal circle. Clearly a re-determination of the mechanism should be attempted when a good crustal structure and waveform modelling programs are available.

CONCLUSIONS

Our analysis shows that with high-quality ECTN data, and an analysis package which incorporates Sv/P amplitude ratios into mechanism determinations, it is possible to determine the focal mechanisms of southeastern Canadian earthquakes (M>3) almost routinely. In particular, uncertainties in focal depth do not introduce significant uncertainties into the analysis.

The mechanisms show thrust or thrust/strike-slip faulting is dominant in eastern Canada and is in response to nearly-horizontal compression. Local differences in the direction of compression identify small areas of anomalous stresses, and the strike of the fault planes provides valuable insights into the seismotectonics of the western Quebec, Charlevoix, Lower St Lawrence, and northern Appalachian regions.

Our methods should now be applied to current events during routine processing, and we foresee a considerable improvement in our understanding of the seismotectonics of southeastern Canada as mechanisms are accumulated over the next few years.

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Figure 1 New focal mechanisms for southeastern Canada derived in this report (see Appendix for details). Shown are equal-area lower-hemisphere projections of the focal mechanism with compressional quadrants shaded. Black and white dots represent the P and T axes respectively. Pairs of inward-pointing arrows on the map represent the direction of maximum horizontal compression taken from the earthquake P-axes. Dotted lines enclose the seismic zones of Basham et al. (1982), as discussed in the text. The mechanism for #870723, marked by white polka-dots, is poorly constrained by the data and should not be considered as reliable as the other solutions.

Figure 2 Focal mechanisms for southeastern Canada derived in the first phase of this project (from Adams et al. 1988a).

APPENDIX

Event files in this appendix are arranged chronologically. We have tried to provide a full documentation of our data and results, so for each file there is summary page giving a commentary on the mechanism, a copy of the "PIK" listing of the earthquake phase data used to compute the hypocentre (a description of the format is given by Adams et al., 1988a), a separate listing of the polarity and ratio data used with comments on its quality, and a figure that demonstrates the robustness of the focal mechanism and the chosen mechanism. All focal mechanism plots are equal-area, lower-hemisphere projections. Full and half-weight polarities are denoted by full-size and half-size C's and D's. Amplitude ratios are denoted by diagonal crosses of size inversely proportional to the amplitude ratio. Labels such as "P0 R1 INC 10" denote the number of polarity errors (full-weight or equivalent half-weight), the number of amplitude ratios misfit by more than 0.23 log unit, and the increment for searching the focal sphere (10° in this case, but usually 5° and not therefore stated).

Most figures in the Appendix show:

- the data
- a solution set that uses only the polarity data
- one or more solutions that use polarity and ratio data, in some cases for alternative depths with and without critical readings
- a "Best Solution" chosen from the preceeding ones which minimises the RMS of the ratio errors, or provides a best qualitative fit to the Pn phase amplitudes, or is a median (non-extreme) solution.

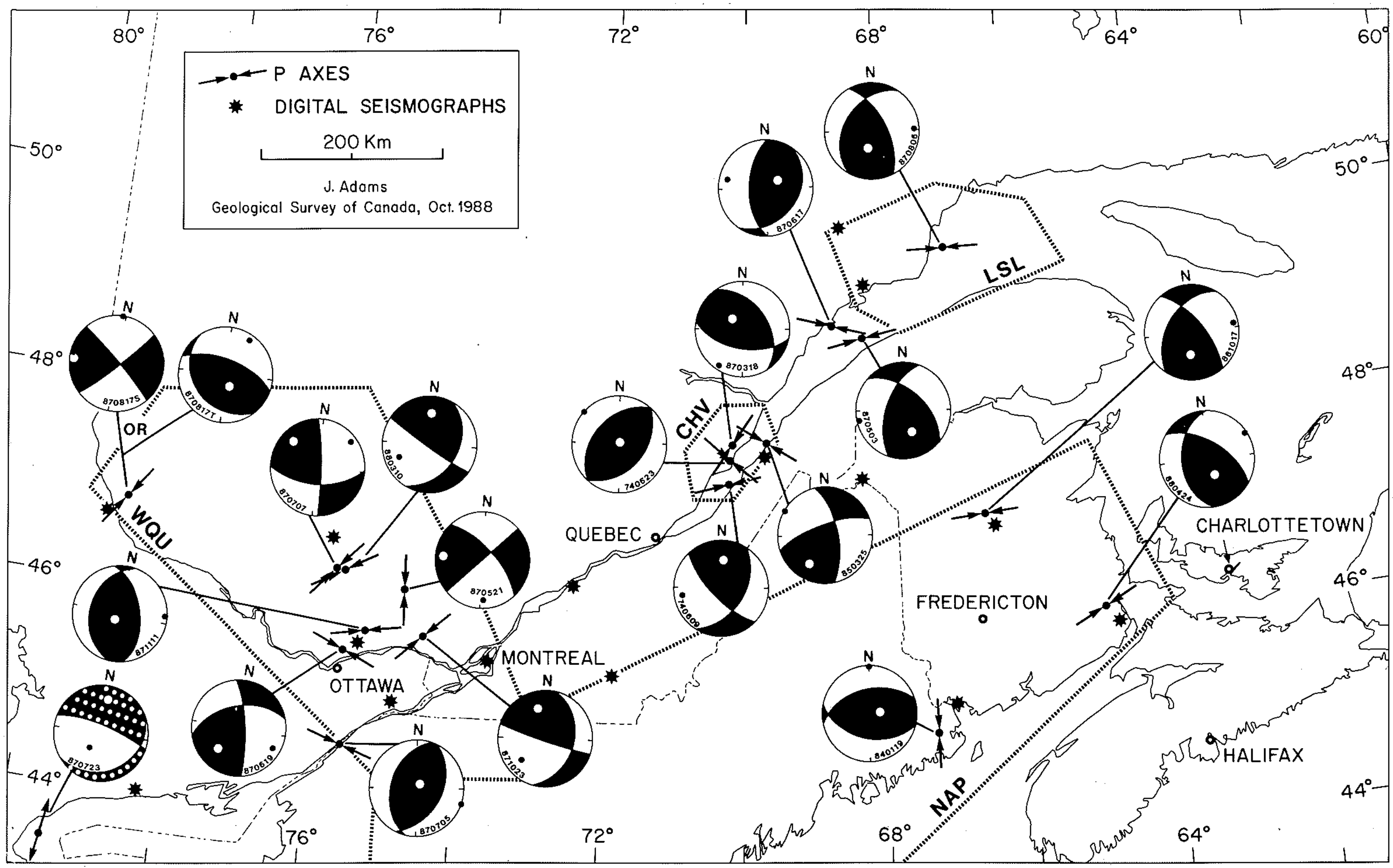

Figure 1 New focal mechanisms for southeastern Canada derived in this report (see Appendix for details). Shown are equal-area lower-hemisphere projections of the focal mechanism with compressional quadrants shaded. Black and white dots represent the P and T axes respectively. Pairs of inward-pointing arrows on the map represent the direction of maximum horizontal compression taken from the earthquake P-axes. Dotted lines enclose the seismic zones of Basham et al. (1982), as discussed in the text. The mechanism for #870723, marked by white polka-dots, is poorly constrained by the data and should not be considered as reliable as the other solutions.

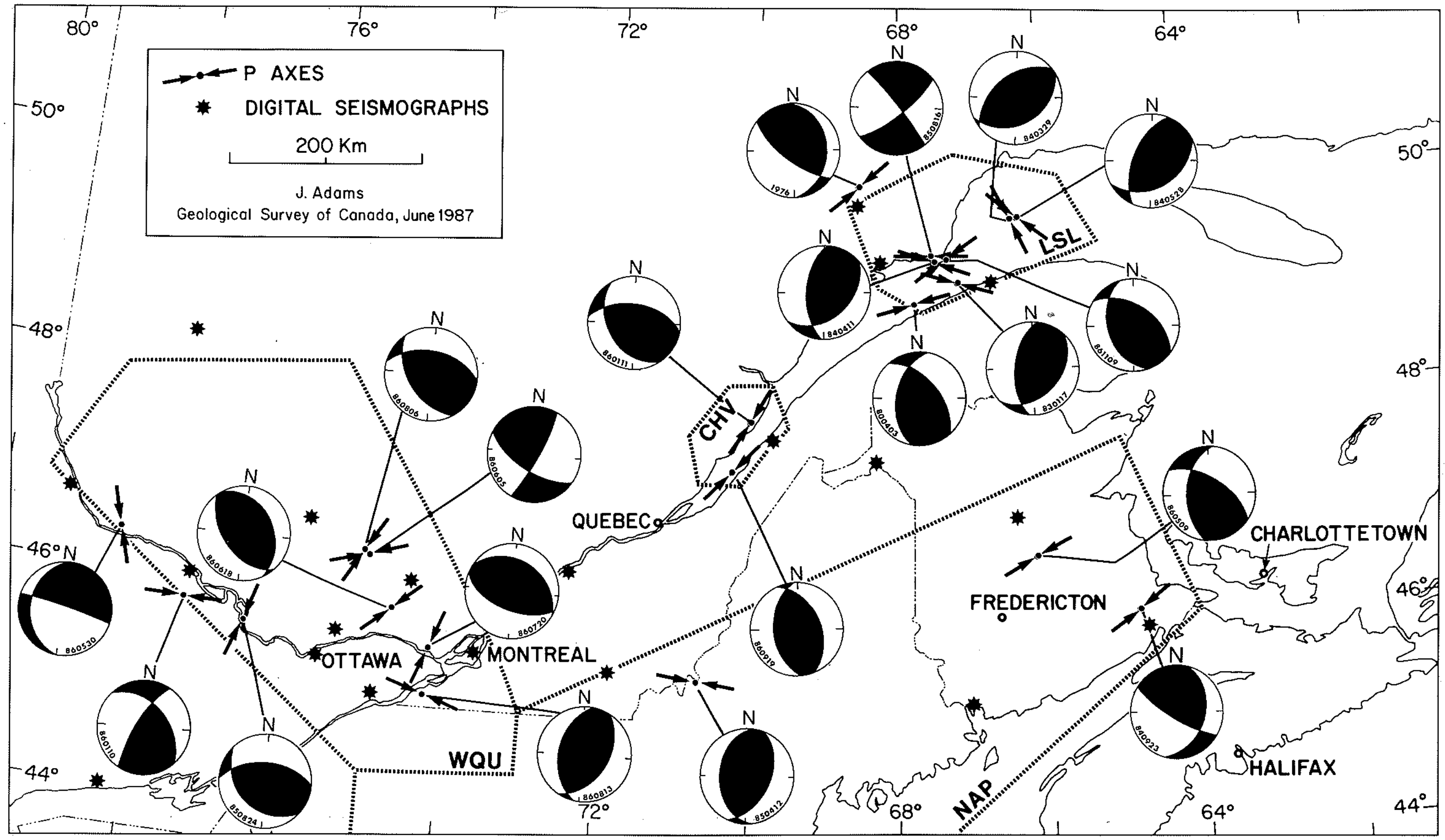

Figure 2 Focal mechanisms for southeastern Canada derived in the first phase of this project (from Adams et al. 1988a).

TABLE 1

NEW EARTHQUAKE MECHANISMS FOR SOUTHEASTERN CANADA -- II

DATE (YY MM DD)	LAT N	LON W	DEPTH KM	MN	ZONE	PLANES FOR BEST SOLN STRIKE	DIP	RAKE	P	T	B	SCORE POL.	RAT.	QUAL.	STRESS DB NO.
									TREND PLUNGE						
74 06 09	47.34	70.24	10	1.8	CHV	137	73	042	255	356	145	0/12	0/0	A	1201
						032	50	157	16	36	50				
74 06 23	47.51	70.22	15	1.5	CHV	040	45	090	130	326	220	0/11	0/0	A	1202
						220	45	090	00	90	00				
84 01 19	44.90	67.33	12	3.5	PMQ	255	47	069	180	090	270	1.5/16.5	0/0	A	1199
						105	47	111	00	75	15				
85 03 25	47.74	69.69	28	2.9	CHV	349	67	020	301	209	035	0.5/13.5	4/7	A	658
						251	71	156	02	30	60				
86 10 17	47.00	66.54	5	4.1	MIR	324	67	046	084	188	345	0/11	0/1	A	1181
						213	48	149	11	48	40				
87 03 18	47.72	70.19	4	3.3	CHV	102	55	060	212	314	120	1/12	5/6	A	1185
						327	45	125	05	65	24				
87 05 03	48.74	68.25	14	3.6	LSL	312	54	037	257	162	350	2/11.5	0/2	A	1183
						198	60	138	04	50	40				
87 05 21	46.20	74.83	16	2.8	WQU	045	90	20	178	272	045	0.5/7	0/3	B	1198
						315	70	−180	14	14	70				
87 06 17	48.87	68.71	14	3.0	LSL	181	61	073	284	056	190	0.5/8	0/2	B	1184
						034	33	118	14	69	15				
87 06 19	45.57	75.63	7	1.8	WQU	348	80	039	114	217	000	0.5/5	1/4	C	1179
						251	52	168	19	34	50				
87 07 05	44.66	75.56	1	2.9	WQU	195	45	83	110	020	200	1/15.5	1/4	A	1200
						025	45	97	00	85	05				
87 07 07	46.35	75.81	7	2.8	WQU	087	60	006	044	306	165	0/6	0/3	B	1180
						354	85	150	17	24	60				
87 07 23	43.47	79.46	10	3.4	ONT	284	76	−074	214	001	100	1/15.5	2/4	B	1213
						056	21	−136	57	29	15				
87 08 06	49.61	66.98	18	3.3	LSL	334	64	056	088	198	350	0/7	0/2	C	1205
						211	41	139	13	57	30				
87 08 17	46.85	78.89	10	3.2	WQU	284	63	072	027	160	292	0/7	0/2	B	1206
						139	32	121	16	67	16				
87 08 17	(alternative)					040	85	004	355	265	094	0/7	0/2		....
						310	86	175	00	06	84				
87 10 23	45.76	74.52	13	3.7	WQU	107	86	050	228	342	110	1/10	1/4	A	1207
						012	40	174	30	36	40				
87 11 11	45.77	75.34	17	3.5	WQU	343	56	078	082	215	350	1/14	2/4	A	1214
						184	36	107	10	76	10				
88 03 10	46.34	75.69	13	3.9	WQU	122	86	050	243	358	125	0/16.5	1/4	A	1210
						027	40	174	29	36	40				
88 04 24	46.03	64.90	4	3.7	NAP	307	59	054	062	165	327	0.5/14	0/1	A	1215
						182	46	134	08	59	30				

NOTES:

MN: earthquake magnitude on the Nuttli scale
ZONE: LSL = Lower St Lawrence, NAP = Northern Appalachians, WQU = Western Quebec, CHV = Charlevoix
SCORE: number misfit/total number for polarity and ratios;
numbers for polarities are equivalent full-weight polarities
QUAL.: subjective estimate of quality of the preferred mechanism
STRESS DB NO.: sequence number in the Canadian Stress Database (Adams, 1987)

Seismic Zone: Charlevoix

Magnitude : 1.8 Mn

Location : 47.343N 70.240W

Date(Y/M/D) : 740609

Time(UT) : 1824

Depth:

closest station: A12 (9 km)
free depth = 10.12 km

Quality of Readings:

Readings made by Leblanc and Buchbinder, assumed to be correct and unambiguous.

Comments:

Well-constrained if all polarities assumed correct.
Represents strike-slip/thrust faulting on NE or NW trending planes.
Differs only slightly from Leblanc and Buchbinder (1977) CJES.

Best Solution:

Strike, Dip, Rake	137 73 042
Strike, Dip, Rake	032 50 157
Trend & Plunge of P	255 16
Trend & Plunge of T	356 36
Trend & Plunge of B	145 50

```
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$      LEBLANC AND BUCHBINDER
$47.342 -70.240  ML=0.6 1824308                                           10.00
A12   7406091824P           -0.50  24335 D                         1  152  28
A12    E  0009KM          106-42    10 -005                          0001157 02ML21MN
A10   7406091824P            0.50  24325 C                         1  128  26
A10    S  0011KM          162-47    10 -028                          0001276 03ML22MN
A14   7406091824P           -1.50  24355 D                              0   0
A14    E  0015KM          081-55    10  022                          0000000 00ML00MN
A54   7406091824P            0.50  24338 D                         1  256  20
A54    NW 0018KM          314-60    10  008                          0000491 00ML19MN
A58   7406091824P            0.50  24340 C                24365    1  256  40
A58    N  0020KM          006-63    10  000               10 -020    0000982 04ML23MN
A16   7406091824P            0.00  24348 D                24376    1  200  60
A16    NE 0022KM          051-65    10  003               10 -006    0001885 07ML26MN
A30   7406091824P            0.50  24341 D                24375    1  256  11
A30    E  0023KM          092-65    10 -023               10  021    0000270 00ML18MN
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A52    NW 0023KM          294-65    10  000               10  009    0000311 03ML18MN
A56   7406091824P            0.20  24349 C                24378    1  200  80
A56    N  0024KM          344-66    10  005               10 -014    0002513 09ML28MN
A76   7406091824P           -0.10  24367 C                24409    1  607  42
A76    N  0033KM          360-72    10  013               10  017    0000435 05ML21MN
A18   7406091824P           -0.20  24369                  24414    2  200  26
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A74   7406091824P            0.20  24368                  24413    1  200  46
A74    NW 0036KM          333-73    10  008               10  009    0001445 12ML27MN
A60   7406091824P            0.50  24370 C                24420    1  512  22
A60    N  0040KM          016-75    10 -004               10  000    0000270 05ML20MN
A62   7406091824P            0.00  24389 D                24448    1  400  30
A62    N  0049KM          021-77    10  004               10  002    0000471 09ML23MN
A64   7406091824P            1.10   0                     24465         0   0
A64    NE 0060KM          026-79                          10 -024    0000000 00ML00MN
A66   7406091824P            0.00  24439 C                24536    1  400  24
A66    NE 0081KM          023-82    10 -012               10 -014    0000377 11ML18MN
A68   7406091824P            0.00   0                                   0   0
A68    NE 0106KM          023-84                                     0000000 00ML00MN
             Z
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19740609 18:24 ML=0.6 47.343N 70.240W 10.12 KM

A12	106.000	-42.000	D
A10	162.000	-47.000	C
A14	081.000	-55.000	D
A54	314.000	-60.000	D
A58	006.000	-63.000	C
A16	051.000	-65.000	D
A30	092.000	-65.000	D
A56	344.000	-66.000	C
A76	360.000	-72.000	C
A60	016.000	-75.000	C
A62	021.000	-77.000	D
A66	023.000	-82.000	C

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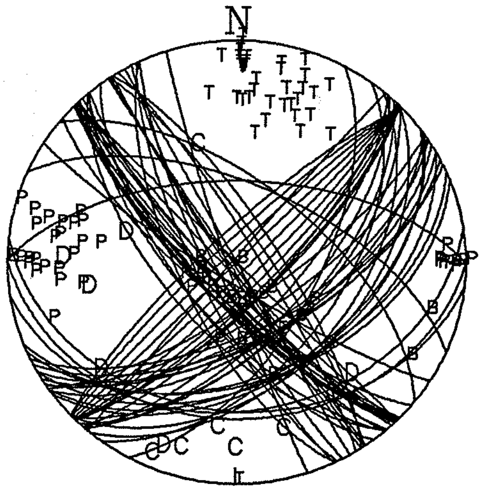

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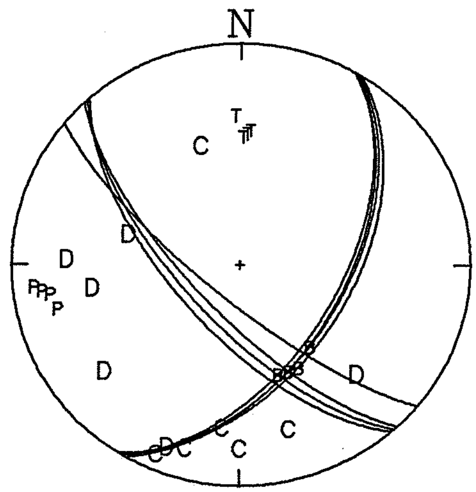

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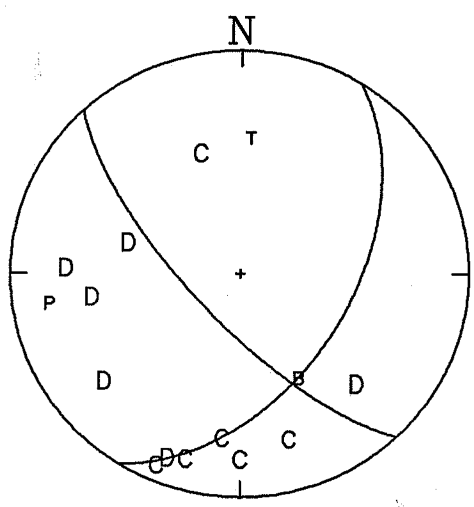

BEST SOLUTION

Seismic Zone:	Charlevoix
Magnitude :	1.5 Mn
Location :	47.513N 70.215W
Date(Y/M/D) :	740623
Time(UT) :	0906

Depth:

closest station: A58 (1km)
free depth = 14.86 km

Quality of Readings:

Readings made by Leblanc and Buchbinder, assumed to be correct and unambiguous

Comments:

Well-constrained if all polarities assumed correct. Represents thrust-faulting on NE-trending planes. Differs only slightly from Leblanc and Buchbinder (1977) CJES.

Best Solution:

Strike, Dip, Rake	040 45 90
Strike, Dip, Rake	220 45 90
Trend & Plunge of P	130 00
Trend & Plunge of T	326 90
Trend & Plunge of B	220 00

```
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$47.513 -70.215  ML=0.5 0906574                                          14.80
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A58   N  0001KM         005 -4     10 -004            10 -013   0000196 **ML05MN
A56  74062309 7P             0.10   7003 C                     1  200  50
A56   NW 0009KM         296-31     10  009                      0001571 03ML22MN
A76  74062309 7P             0.30   7005 C             07033   1  607  90
A76   N  0015KM         352-43     10 -001            10  027   0000932 02ML21MN
A54  74062309 7P             0.40   7007 C             07031   1  256   0
A54   SW 0016KM         247-46     10  009            10 -014   0000000 00ML00MN
A16  74062309 7P             0.20   7008 C             07031   1  200  80
A16   E  0016KM         108-47     10  003            10 -028   0002513 07ML26MN
A14  74062309 7P            -0.40   7023 D             07052   1    0   6
A14   SE 0021KM         142-54     10  031            10  013   0000000 00ML00MN
A60  74062309 7P             0.40   7013               07048   1  512  17
A60   NE 0022KM         025-55     10 -001            10  031   0000209 **ML16MN
A12  74062309 7P            -0.10   0                  07047   1  303  25
A12   S  0023KM         162-56                        10 -040   0000518 02ML20MN
A74  74062309 7P             0.00   7018               07052   1  200   0
A74   NW 0023KM         306-56     10 -003            10  010   0000000 00ML00MN
A52  74062309 7P             0.60   7015 C             07048        0   0
A52   W  0025KM         248-58     10  000            10 -016   0000000 00ML00MN
A18  74062309 7P             0.40   7022 D             07056   1  128  10
A18   E  0026KM         088-60     10  029            10  008   0000491 03ML21MN
A30  74062309 7P             0.40   7025 D             07062   1  128  12
A30   SE 0029KM         134-61     10  028            10  014   0000589 05ML22MN
A62  74062309 7P             0.00   7030 C                          0   0
A62   NE 0031KM         030-63     10  005                      0000000 00ML00MN
A64  74062309 7P             0.00   0                  07100        0   0
A64   NE 0043KM         035-70                        10 -005   0000000 00ML00MN
A66  74062309 7P             0.00   7080               07154   1  400  16
A66   NE 0063KM         028-76     10  009            10 -022   0000251 08ML15MN
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             Z
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19740623 09:06 ML=0.2 47.513N 70.215W 14.86 KM

A58	005.000	-4.000	C
A56	296.000	-31.000	C
A76	352.000	-43.000	C
A54	247.000	-46.000	C
A16	108.000	-47.000	C
A14	142.000	-54.000	D
A52	248.000	-58.000	C
A18	088.000	-60.000	D
A30	134.000	-61.000	D
A62	030.000	-63.000	C
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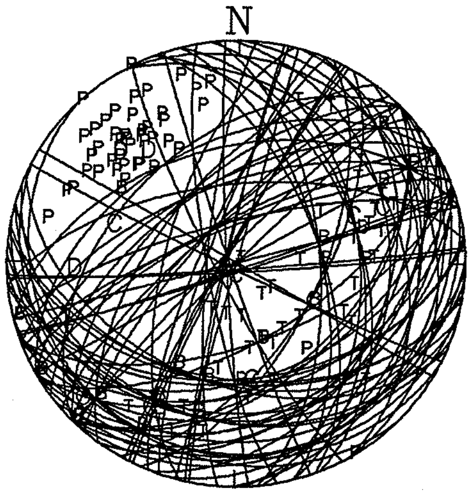

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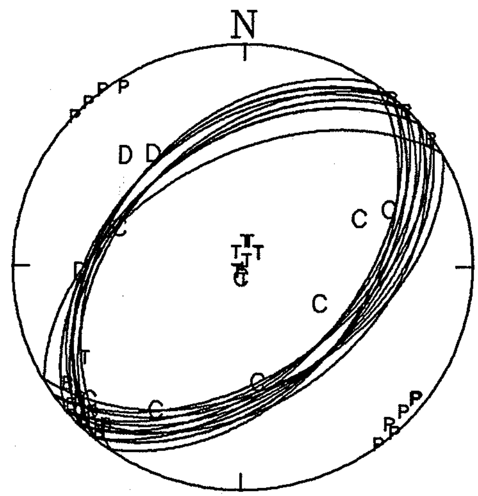

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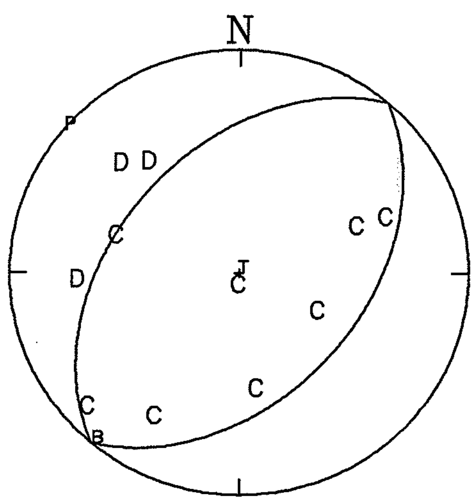

BEST SOLUTION

Seismic Zone: Passamaquoddy Bay

Magnitude : 3.5

Location : 44.90N 67.33W
(West of Eastport,Maine)

Date(Y/M/D) : 1984 01 19

Time(UT) : 0526

Depth:
closest station: PQ1 (1 km)
free depth = 12.05 km

Quality of Readings:
PQ1, PQ0 first motions not readable on develocorder film
EBN not readable because of glitches
LMN, KLN DC-offset problem
Some Weston data reread by adams from develocorder film
Some Weston data are Ebel's readings
Weak readings on LMN, GBN and HAL are unexpected

Comments:
Mechanism originally derived by Ebel: A Case Study of seismicity and Tectonics in New England, US Nuclear Regulatory report CR-4354 p57.
P2 R1, which misfits KAQ, DNH, and (DUX, WFM) or (GLO, ONH), shows both a strike-slip and a thrust family of solutions.
Best solution is chosen from P1.5 R0 and misfits half-weight polarities at ONH, DUX, KAQ.
Best solution is a mechanism somewhat similar to Ebel's which represents thrusting on East-West planes in response to N-S compression.

Best Solution:

Strike, Dip, Rake	255	47	69
Strike, Dip, Rake	105	47	111
Trend & Plunge of P	180	000	
Trend & Plunge of T	090	075	
Trend & Plunge of B	270	015	

```
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044.89 - 67.30 O1MN=3.8 052609.Z19011984   03KM 03KM 0   20 26  4 0.5Z712PQ1
 MAINE                                    MAINE
FELT IN ST ANDREWS, N.B.                  RESSENTI A ST ANDREWS, N.-B.
  45 KM SW FROM ST. GEORGE, N.B.            45 KM SO DE ST-GEORGE, N.-B.
0.326 GGN 261706D 0.08   -2052.32    2052.32 262263 0.17    4344.31
$RATIO=  0.324 GGN 261705D 0.09   -2063.84    2063.84 262263 0.17    4355.84
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PQ1   N  0001KM            020 -4  11 -002                       0000000 00ML00MN
PQ0  8401190526P                   A26125                                            1
PQ0   NW 0015KM            313-50  11  034                       0000000 00ML00MN
EMM  8401190526P                   A26130 -                                            1
EMM   SW 0021KM            216-60  11 -001                       0000000 00ML00MN
GGN  8401190526P              -0.30 A261705D          A262264                        1
GGN   NE 0047KM            058-75  11 -015            11 -035    0000000 00ML00MN
BPM  8401190526P                   A26288             A26423                         1
BPM   W  0119KM            256-83  11  042            11 -030    0000000 00ML00MN
UNB  8401190526P                   A26304 D           B26461  030 073 510            1
UNB   NE 0130KM            025-84  11  035            03  060    0014632 35ML38MN
MIM  8401190526P                   A26320 C           A2648                          1
MIM   W  0140KM            287-84  11  025            11 -045    0000000 00ML00MN
HNME 8401190526P XA263342         XA263300D
HNME  N  0150KM 00 -024 340-84     00 -028                       0000000 00ML00MN
HKM  8401190526P XB263730C                                                            1
HKM   W  0185KM 00 -063 263 49                                   0000000 00ML00MN
LMN  8401190526P XB264327+  -0.30                     X2710                          1
LMN   NE 0225KM 00  014 061 49                        00 -239    0000000 00ML00MN
KLN  8401190526P XB264300E  -0.30                                                    1
KLN   N  0229KM 00 -067 019 49                                   0000000 00ML00MN
CBM  8401190526P XB264360D                                                            1
CBM   N  0235KM 00 -043 345 49                                   0000000 00ML00MN
TRM  8401190526P           C
TRM   W  0243KM           254 49                                 0000000 00ML00MN
JKM  8401190526P           +
JKM   W  0244KM           291 49                                 0000000 00ML00MN
AGM  8401190526P           -
AGM   NW 0276KM           332 49                                 0000000 00ML00MN
EBN  8401190526P XC26517    -0.21                    XB273200 035  45 06             1
EBN   N  0294KM 00  022 346 49                        00  029    0002394 36ML36MN
HAL  8401190526P XC26525 E                            X2734    020 273 220           1
HAL   E  0297KM 00  089 094 49                        00  168    0002532 34ML36MN
BNH  8401190526P'          +
BNH   W  0313KM           265 49                                 0000000 00ML00MN
LPQ  8401190526P XB265703E  -0.21             X2734            021 292 175           1
LPQ   NW 0342KM 00 -026 324 49                00  105            0001793 35ML36MN
WNH  8401190526P           +
WNH   W  0344KM           252 49                                 0000000 00ML00MN
DNH  8401190526P           +
DNH   SW 0347KM           237 49                                 0000000 00ML00MN
SBQ  8401190526P                             XC27371           023 154 24            1
SBQ   W  0366KM           280 49              00 -070            0004257 40ML40MN
GLO  8401190526P           -
GLO   SW 0371KM           229 49                                 0000000 00ML00MN
LMQ  8401190526P XB27008 D                            X2758    020 292 162           1
LMQ   NW 0375KM 00 -034 323 49                        00  388    0001743 36ML36MN
ONH  8401190526P           -
ONH   SW 0380KM           243 49                                 0000000 00ML00MN
DVT  8401190526P           E
DVT   W  0382KM           273 49                                 0000000 00ML00MN
HNH  8401190526P           E



HNH   W  0417KM           253 49                                 0000000 00ML00MN
DUX  8401190526P           +
DUX   SW 0420KM           223 49                                 0000000 00ML00MN
WFM  8401190526P           +
WFM   SW 0420KM           234 49                                 0000000 00ML00MN
GNT  8401190526P XB27076 E                                     021 865 25            1
GNT   NW 0426KM 00  029 294 49                                   0000865 35ML34MN
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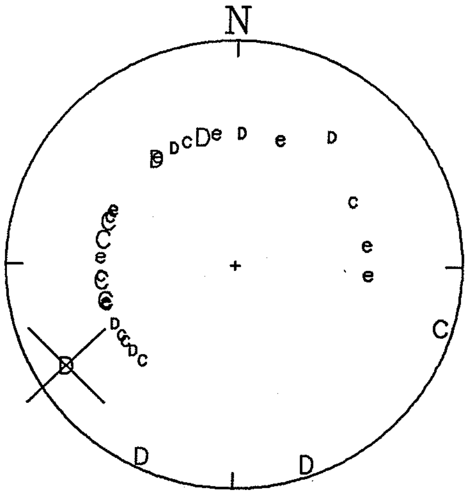
GSQ   N  0447KM 00  093 002 49                                   0000789 34ML34MN
GBN  8401190526P  X2713  E                    X28025           050 113 042           1
GBN   E  0461KM 00  136 081 49                00  438            0000467 36ML32MN
HTQ  8401190526P XB27142                      X28020           038 605 18            1
HTQ   N  0485KM 00 -031 351 49                00 -113            0000492 36ML33MN
MNT  8401190526P                                               030 503 24            1
MNT   W  0499KM           280 49                                 0000999 39ML36MN
TRQ  8401190526P XB27262                      X28273           030 833 205           1
TRQ   W  0583KM 00 -038 287 49                00  309            0000515 37ML34MN
SIC  8401190526P  X27272                      X2825    X2858   030 220 043           1
SIC   N  0589KM 00 -002 004 49                00 -030 00  397    0000409 37ML33MN
MNQ  8401190526P XA273285E                    X283517          050 744 185           1
MNQ   N  0637KM 00 -022 351 49                00 -035            0000312 40ML33MN
GAC  8401190526P XA273347C                    X28384   X2908                         1
GAC   W  0645KM 00 -062 281 49                00  109 00 -186    0000000 00ML00MN
GRQ  8401190526P XA273992C
GRQ   W  0690KM 00  031 289 49                                   0000000 00ML00MN
KAQ  8401190526P  B282936+                   XA301271
KAQ   N  1106KM 03 -094 338 49                00 -265            0000000 00ML00MN
                Z
```

19840119 05:26 MN=3.5 44.895N 67.331W 12.05 KM

EMM	216.000	-60.000	-		Read by Ebel at Weston
GGN	058.000	-75.000	D		Polarity confirmed ok
GGN	058.000	-75.000	R	0.324	
UNB	025.000	-84.000	D		
MIM	287.000	-84.000	C		Read by JA from develocorder
HNME	340.000	-84.000	D		Read by Ebel at Weston
HKM	263.000	49.000	C		Read by JA from develocorder
LMN	061.000	49.000	+		Weak
KLN	019.000	49.000	e		Weak
CBM	345.000	49.000	D		Weston reading
TRM	254.000	49.000	C		Read by JA from develocorder
JKM	291.000	49.000	+		Read by JA from develocorder
AGM	332.000	49.000	-		Read by JA from develocorder
HAL	094.000	49.000	e		Weak
BNH	265.000	49.000	+		Read by JA from develocorder
LPQ	324.000	49.000	e		Weak
WNH	252.000	49.000	+		Read by Ebel at Weston
DNH	237.000	49.000	+		Read by Ebel at Weston
GLO	229.000	49.000	-		Read by Ebel at Weston
LMQ	323.000	49.000	D		
ONH	243.000	49.000	-		Read by Ebel at Weston
DVT	273.000	49.000	e		Read by JA from develocorder
HNH	253.000	49.000	e		Read by JA from develocorder
DUX	223.000	49.000	+		Read by Ebel at Weston
WFM	234.000	49.000	+		Read by Ebel at Weston
GNT	294.000	49.000	e		
GSQ	002.000	49.000	-		
GBN	081.000	49.000	e		
MNQ	351.000	49.000	e		Not strong
GAC	281.000	49.000	C		good
GRQ	289.000	49.000	C		
KAQ	338.000	49.000	+		Not strong



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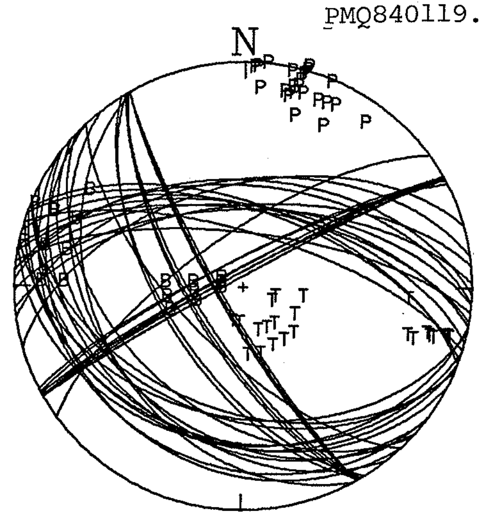
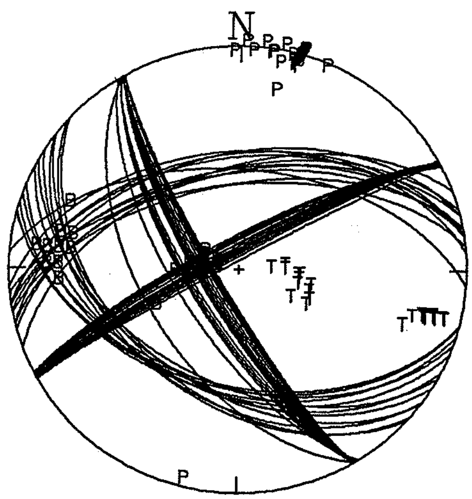
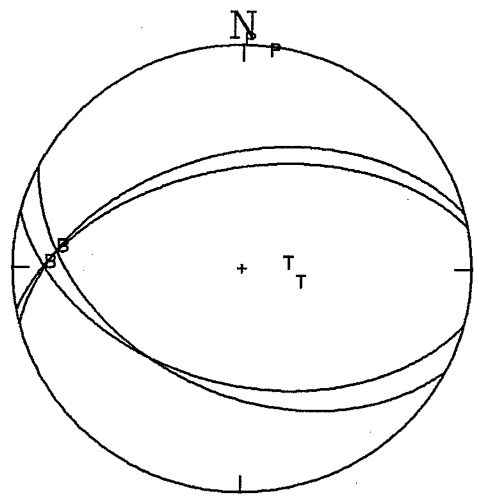


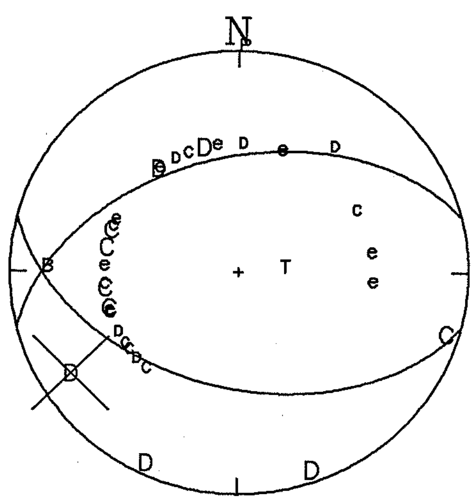
P2 R1 10 DEG INC



P2 R0



P1.5 R0



BEST SOLUTION

Seismic Zone: Charlevoix

Magnitude : 2.9 MN

Location : 47.74 N 69.68 W

Date(Y/M/D) : 1985 03 25

Time(UT) : 2052

Depth:

closest station: A20 (4km)
free depth = 27.7 km (Computed from Charlevoix Array)
This one of the deeper Charlevoix earthquakes.

Quality of Readings:

Array readings all good, A54 and A10 relatively weak
Good reading from LPQ, LMQ, SLQ
Emergent at HTQ, MNQ, KLN, and western ECTN
GGN reading seems good but does not fit

Comments:

Best solution is P0.5 R4 which misfits GGN polarity and ratios at A20, A64, A16 and A54 (observed ratios have stronger P amplitudes than expected)
Mechanisms which fit strong A20 ratio misfit polarity at other array stations
Mechanism indicates strike-slip/thrust faulting on N-S or NE-SW trending planes
Earthquake lies under the south shore at NE end of seismic zone.

Best Solution:

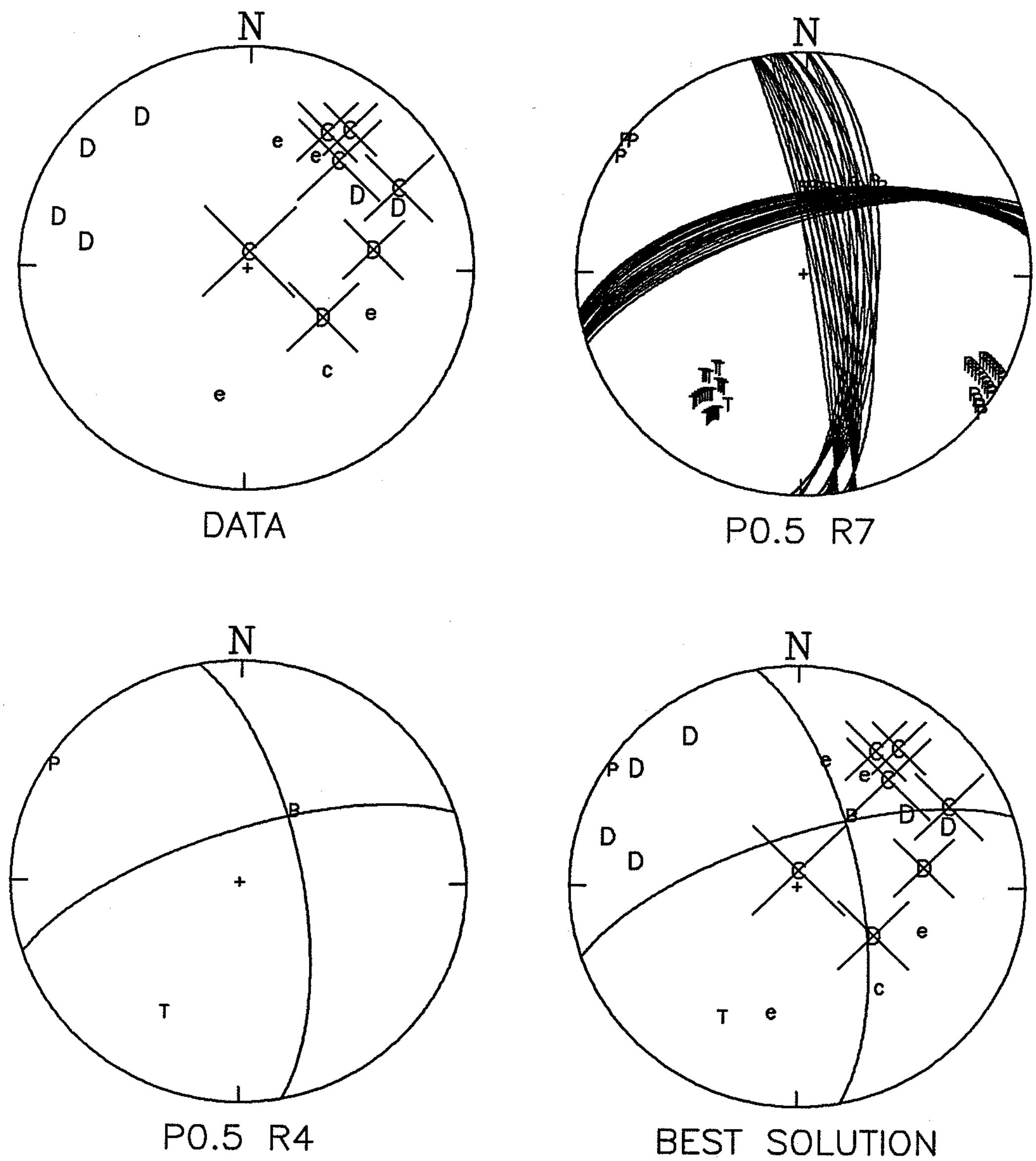
Strike, Dip, Rake	349	67	20
Strike, Dip, Rake	251	71	156
Trend & Plunge of P	301	02	
Trend & Plunge of T	209	30	
Trend & Plunge of B	035	60	

```
+47.737- 69.68501MN=2.9 2052143 25031985 00.0030.006 0.2  7 13 120.07Z227.70    5 1ML=2.6 110  0 0.00
  50 KM NE FROM LA POCATIERE, QUE.         50 KM NE DE LA POCATIERE, QUE.
$RATIO=  0.773 LPQ 522377C 0.09      111.75      111.75 523078 0.08      662.25
$RATIO=  0.965 A10
$RATIO=  0.117 A16
$RATIO= -0.120 A20
$RATIO=  0.480 A64
$RATIO=  0.556 A54
$RATIO=  0.785 A61
A20  8503252052P              0.00  521880C         X522192 000    0    0     0  0
A20   S  0004KM          186 -6    10 -007          00 -027   0000000 00ML00MN
A64   8503252052P             0.00  521986D          522367 000    0    0     0  0
A64   NW 0018KM          303-33    10  011          10 -003   0000000 00ML00MN
A61  8503252052P              0.00  522115D          522607 000    0    0     0  0
A61   W  0031KM          261-47    10  005          10  002   0000000 00ML00MN
A16  8503252052P              0.00  522210C          522767 000    0    0     0  0
A16   SW 0039KM          219-53    10  006          10 -002   0000000 00ML00MN
LPQ  8503252052P             -0.21  522376C          523080 015 101 305     0  0
LPQ   SW 0050KM          209-60    10 -010          10  009   0012649 26ML30MN
SLQ  8503252052P                  XA52235 D
SLQ   E  0051KM          099-61    00 -028                    0000000 00ML00MN
LMQ  8503252052P              0.00 X52240 D                 000    0    0     0  0
LMQ   SW 0053KM          247-61    00  001                    0000000 00ML00MN
A54  8503252052P              0.00  522546C          523362 000    0    0     0  0
A54   SW 0063KM          241-65    10 -003          10 -007   0000000 00ML00MN
A10  8503252052P              0.00  522602C          523465 000    0    0     0  0
A10   SW 0067KM          215-66    10  000          10  004   0000000 00ML00MN
AGM  8503252052P              0.00 X52291 D                 000    0    0     0  0
AGM   SE 0088KM          145-72    00 -021                    0000000 00ML00MN
EBN  8503252052P             -0.21XA523266D         X52461  009 415 265     0  0
EBN   E  0113KM          105-75    00 -065          00 -102   0004458 23ML32MN
CBM  8503252052P              0.00 X52380 D         X52551  0401000 710     0  0
CBM   SE 0148KM          127-78    00 -071          00 -154   0001115 26ML28MN
HTQ  8503252052P  X524215E   0.00                           0101227 280     0  0
HTQ   NE 0188KM 00  018 030 49                                0001434 23ML30MN
HN   8503252052P  X52484     0.00                   X53134  0301000 290     0  0
HN    SE 0218KM 00  275 143 49                      00 -251   0000607 25ML28MN
GSQ  8503252052P  X524820D  -0.21                           020 952 300     0  0
GSQ   NE 0232KM 00  066 055 49                                0000990 27ML30MN
JKM  8503252052P  X52521 E   0.00                   X53192  0401000 390     0  0
JKM   S  0235KM 00  430 191 49                      00 -158   0000613 27ML28MN
KLN  8503252052P  X52520 E  -0.30                           0131202 210     0  0
KLN   E  0270KM 00 -027 110 49                                0000844 26ML31MN
MIM  8503252052P  X525680    0.00                   X528840 0351000 170     0  0
MIM   S  0282KM 00  338 170 49                      00 -527   0000305 26ML27MN
MNQ  8503252052P  X525805E   0.00                   X5344   0171783 295     0  0
MNQ   N  0318KM 00  014 012 49                      00  015   0000612 28ML30MN
GGN  8503252052P XA530368+  -0.30                   X53575  0171810 125     0  0
GGN   SE 0365KM 00 -020 142 49                      00  023   0000255 26ML28MN
EEO  8503252052P            -0.07                           0205000 230     0  0
EEO   W  0722KM         264 49                                0000145 34ML30MN
           Z
```

19850325 20:52 MN=2.9 47.737N 69.685W 27.70 KM

A20	186.000	-6.000	C		Strong
A20	186.000	-6.000	R	-0.120	
A64	303.000	-33.000	D		Strong
A64	303.000	-33.000	R	0.480	
A61	261.000	-47.000	D		Strong
A61	261.000	-47.000	R	0.785	
A16	219.000	-53.000	C		Strong
A16	219.000	-53.000	R	0.117	
LPQ	209.000	-60.000	C		Good
LPQ	209.000	-60.000	R	0.773	Not strong
SLQ	099.000	-61.000	D		Strong
LMQ	247.000	-61.000	D		Very weak
A54	241.000	-65.000	C		Good but weak
A54	241.000	-65.000	R	0.556	
A10	215.000	-66.000	C		Weak
A10	215.000	-66.000	R	0.965	
AGM	145.000	-72.000	D		Weston data
EBN	105.000	-75.000	D		Very weak start
CBM	127.000	-78.000	D		Weston data
HTQ	030.000	49.000	e		
GSQ	055.000	49.000	D		Good
JKM	191.000	49.000	e		
KLN	110.000	49.000	e		
MNQ	012.000	49.000	e		
GGN	142.000	49.000	+		Goes down, polarity was reversed so +

CHV850325.OUT
2-SEP-87 10:42:31



Seismic Zone: Miramichi

Magnitude : 4.1 MN

Location : 47.00N 66.54W
(east side of epicentral area)

Date(Y/M/D) : 861017

Time(UT) : 14.47

Depth:

closest station: KLN (22 km)
free depth = 11 km (for a subset of stations)
mechanisms tried at 5 and 11 km, fixed at 5km for final solution

Quality of Readings:

KLN and EBN appear to have small foreshock before main arrival
UNB is relatively weak
Western ECTN stations appear to be nodal, as do MNQ and JAQ
GBN is nodal

Comments:

Relatively well constrained without KLN ratio
Mechanisms for Z=5 and Z=11 km both have common thrust solutions, which agree with nearly nodal Pn arrivals at MNQ, JAQ and EBN
Best solution has lowest amplitude residual of P0 R0 Z=5
Mechanism represents thrust/strike slip faulting in response to east-directed compression,and is similar to Miramichi Mainstock (M5.7) mechanism.

Best Solution:

Strike, Dip, Rake	324	67	46
Strike, Dip, Rake	213	48	149
Trend & Plunge of P	084	11	
Trend & Plunge of T	188	48	
Trend & Plunge of B	345	40	

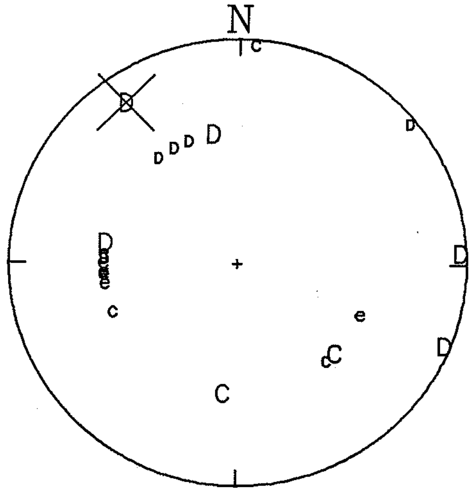
```
+47.005- 66.53501MN=4.1 1447593 17101986 00.0090.014 0.3 23 36 160.62 2 5.00    0 1ML=3.9 120   0 0.00
 25 KM NW FROM MCKENDRICK L., N.B.         25 KM NO DE LAC MCKENDRICK,N.-B.
FELT IN BATHURST,N.B.                     RESSENTI A BATHURST, N.-B.
MAG MC=3.7 (MIT)                           MAG MC=3.7 (MIT)
75 AFTERSHOCKS RECORDED IN THE            75 REPLIQUES ENREGISTREES
NEXT 3 DAYS.                              AU COURS DES 3 JOURS SUIVANTS.
$ON AUGUST 17, AT 14:49 AN AFTERSHOCK      LE 17 AOUT A 14:49 UNE REPLIQUE A ETE
$WAS RECORDED BUT ITS MAGNITUDE COULD      ENREGISTREE SANS QU'IL SOIT POSSIBLE
$NOT BE CALCULATED DUE TO THE              DE CALCULER SA MAGNITUDE A CAUSE
$OVERLAP WITH THE MAIN EVENT.              DE LA SUPERPOSITION AVEC LE
$                                          CHOC PRINCIPAL.
$MANY AFTERSHOCKS DID NOT TRIGGER THE      PLUSIEURS REPLIQUES N'ONT PAS DECLENCHE
$ECTN SYSTEM. THEIR MAGNITUDE WERE         LE SYSTEME RTEC. LEURS MAGNITUDES ONT
$ASSIGNED USING THE GGN ANALOGUE RECORDS ETE CALCULEES AVEC LES ENREGISTREMENTS
$                                          ANALOGIQUES DE GGN.
UNLOCATED AFTERSHOCKS THIS DAY:            REPLIQUES NON LOCALISEES EN CE JOUR
                 OCT 17 15:38 , MN  2.2                       17 OCT 15:38 , MN  2.2
                 OCT 17 16:39 , MN  1.7                       17 OCT 16:39 , MN  1.7
                 OCT 17 19:01 , MN  1.7                       17 OCT 19:01 , MN  1.7
                 OCT 17 21:58 , MN  2.4                       17 OCT 21:58 , MN  2.4
                 OCT 17 22:06 , MN  2.6                       17 OCT 22:06 , MN  2.6
$SLQ AND SIC NOT OPERATING
$RATIO=  0.876 KLN 480369D 0.11  -13008.18   43392.18 48 634 0.11   97728.17
KLN  8610171447P            -0.29 A480344D          A480634 007 1009982    0  0
KLN   SE 0022KM         145-76    16  021           16  044   0895982 32ML53MN
UNB  8610171447P             0.00 A48193 +          A483221 050  74 540    0  0
UNB   S  0118KM         184-87    16  102           16 -004   0009170 34ML35MN
CBM  8610171447P                  A481880D          A483334
CBM   W  0121KM         267-87    16 -004           16  010   0000000 00ML00MN
EBN  8610171447P            -0.22 A482289D          C483920 037 1003045    0  0
EBN   W  0139KM         292-87    16  093           01  071   0051709 41ML44MN
HNME 8610171447P                  A482262-          B483942
HNME  SW 0146KM         230-87    16 -019           04 -072   0000000 00ML00MN
LMN  8610171447P  A482873C  -0.29 B482997           B485145 013 100 688    0  0
LMN   SE 0185KM 16 -050 133 49    04  056           04  009   0033253 37ML44MN
AGM  8610171447P  A482962E
AGM   W  0189KM 16  011 274 49                                0000000 00ML00MN
GGN  8610171447P  A483114C  -0.29                   B485817 027 100 719    0  0
GGN   S  0211KM 16 -127 186 49                      04 -057   0016732 39ML42MN
GSQ  8610171447P  A483357D  -0.22                   C490180 023 100 267    0  0
GSQ   N  0217KM 16  049 349 49                      01  153   0007294 35ML38MN
LPQ  8610171447P  B483836D  -0.22                   C491405 033 100 528    0  0
LPQ   W  0266KM 04 -071 279 49                      01 -005   0010053 40ML41MN
HTQ  8610171447P  B484022-  -0.07                   X491719 020 100 257    0  0
HTQ   NW 0280KM 04 -039 331 49                      00 -063   0008074 38ML41MN
HAL            P         +
HAL   SE 0349KM         138 49                                0000000 00ML00MN
MNQ  8610171447P  A485775-  -0.10                   C495908 017 100  51    0  0
MNQ   N  0426KM 16 -071 338 49                      01  038   0001885 37ML37MN
GBN  8610171447P  B48581 E
GBN   SE 0426KM 04 -029 113 49                                0000000 00ML00MN
GNT  8610171447P  B490066   -0.06          X494879 X500503 050 100 345    0  0
GNT   W  0452KM 04 -095 263 49              00  095 00 -107   0004335 46ML41MN
SBQ  8610171447P  C490262+  -0.07          X494879 X500888 040 100 457    0  0
SBQ   W  0454KM 01  078 248 49              00  058 00  235   0007179 47ML44MN
WNH  8610171447P   490973     0.00          X495684         000   0   0    0  0
WNH   SW 0516KM 04  037 229 49              00 -455           0000000 00ML00MN
DNH  8610171447P  X491398     0.00          X500544         000   0   0    0  0
DNH   SW 0552KM 00  034 220 49              00 -341           0000000 00ML00MN
ONH  8610171447P  X491711     0.00          X501350         000   0   0    0  0




ONH   SW 0570KM 00  124 225 49              00  076           0000000 00ML00MN
MNT  8610171447P  X491663   -0.06          X501035         027 100  55    0  0
MNT   W  0572KM 00  047 256 49              00 -286           0001280 41ML38MN
GLO  8610171447P   491769     0.00          X501446         000   0   0    0  0
GLO   SW 0588KM 04 -034 216 49              00 -207           0000000 00ML00MN
PNH  8610171447P  X492334     0.00                          000   0   0    0  0
PNH   SW 0619KM 00  136 227 49                                0000000 00ML00MN
TRQ  8610171447P  B492132E  -0.09          X502430 X505541 047 100 232    0  0
TRQ   W  0621KM 04 -092 265 49              00  048 00  215   0003101 49ML42MN
WFM  8610171447P  X492419     0.00          X502234         000   0   0    0  0
WFM   SW 0626KM 00  142 221 49              00 -243           0000000 00ML00MN
DUX  8610171447P             0.00          X502669         000   0   0    0  0
DUX   SW 0644KM         213 49              00 -175           0000000 00ML00MN
LOZ  8610171447P  X493500     0.00                  X510600 000   0   0    0  0
LOZ   W  0679KM 00  574 250 49                      00 -354   0000000 00ML00MN
NO   8610171447P  X493900     0.00                          000   0   0    0  0
NO    W  0703KM 00  685 252 49                                0000000 00ML00MN
GAC  8610171448P  B493132E  -0.06
GAC   W  0703KM 04 -090 261 49                                0000000 00ML00MN
PTN  8610171447P  X49415      0.00                  X5110   000   0   0    0  0
PTN   W  0710KM 00  847 251 49                      00 -826   0000000 00ML00MN
GRQ  8610171447P  X493167E  -0.09           504268 X511972 043 100 171    0  0
GRQ   W  0713KM 00 -180 270 49              04 -072 00  053   0002499 49ML42MN
OTT  8610171447P  X493632   -0.06           504566 X512750 073 100 218    0  0
OTT   W  0731KM 00  073 259 49              04 -144 00  338   0001876 50ML41MN
CKO  8610171447P         E
CKO   W  0845KM         266 49                                0000000 00ML00MN
EEO  8610171447P  B500202-  -0.06          C513455 X522711 057 100 142    0  0
EEO   W  0957KM 04 -119 272 49              01 -076 00 -039   0001565 52ML42MN
JAQ  8610171447P  B500877-  -0.07          C514364 X524118 063 100  78    0  0
JAQ   NW 0998KM 04  052 323 49              01 -043 00  214   0000778 50ML40MN
             Z
```

19861017 14:47 MN=4.1 47.005N 66.534W 5.00 KM

KLN	145.000	-76.000	D		?preceeded by weak foreshock
KLN	145.000	-76.000	R	0.876	
UNB	184.000	-87.000	+		hard to read
CBM	267.000	-87.000	D		good but not strong
EBN	292.000	-87.000	D		?preceeded by weak foreshock
HNME	230.000	-87.000	-		very weak
LMN	133.000	49.000	C		very weak but C
AGM	274.000	49.000	e		nodal
GGN	186.000	49.000	C		strong down but polarity was reversed
GSQ	349.000	49.000	D		unusual 2 half cycle waves
LPQ	279.000	49.000	D		weak but D
HTQ	331.000	49.000	-		weak, near nodal
HAL	138.000	49.000	+		weak
MNQ	338.000	49.000	-		weak, near nodal
GBN	113.000	49.000	e		nodal
SBQ	248.000	49.000	+		weak, poor reading
TRQ	265.000	49.000	e		weak, near nodal
GAC	261.000	49.000	e		weak, near nodal
GRQ	270.000	49.000	e		weak, near nodal
CKO	266.000	49.000	e		weak, near nodal
EEO	272.000	49.000	-		weak, near nodal
JAQ	323.000	49.000	-		weak, near nodal



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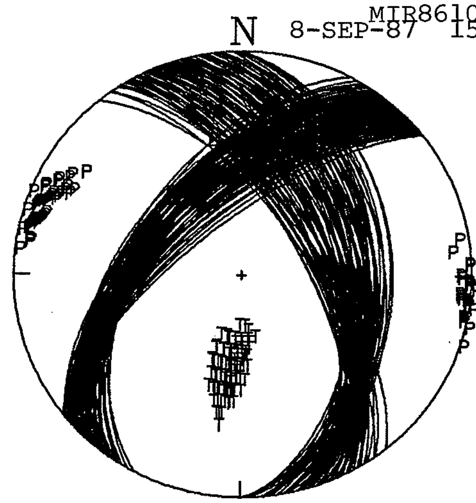
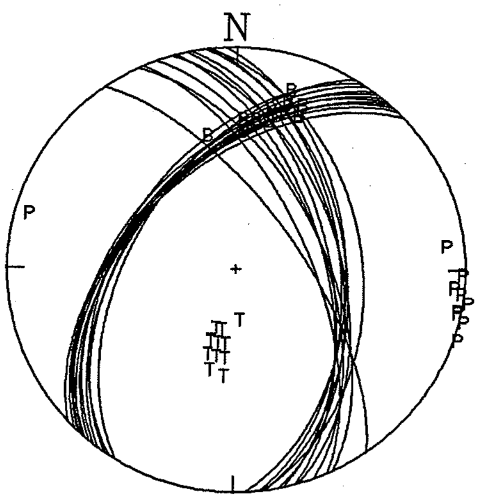
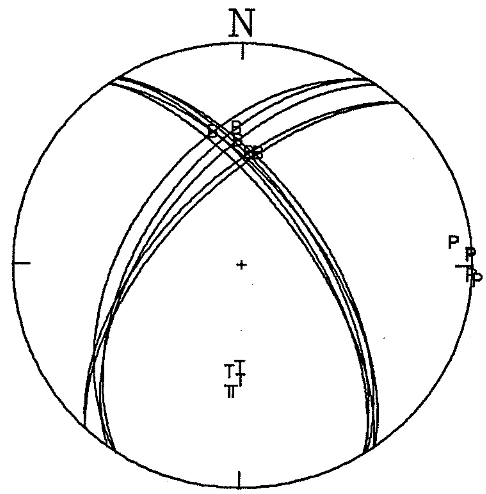


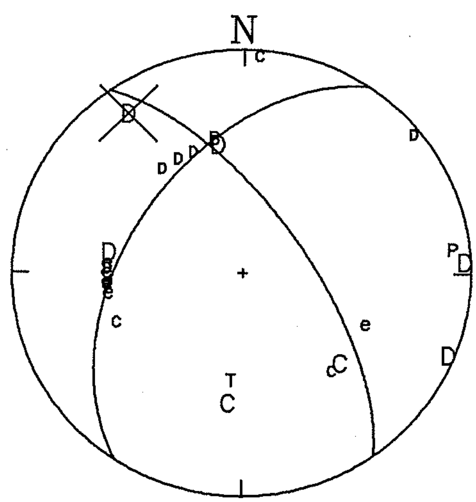
P0 R1



P0 R0 Z=11



P0 R0 Z=5



BEST SOLUTION

Seismic Zone: Charlevoix

Magnitude : MN 3.3

Location : 47.72N 70.19W

Date(Y/M/D) : 870318

Time(UT) : 19:44

Depth:

closest station: A61 (8 km)
free depth = 4.5
(similar mechanism for depth of 8 km)

Quality of Readings:

All array data are strong first arrivals, mostly with strong P relative to S amplitudes
MNQ, KLN, GRQ emergent
GGN strong arrival

Comments: Well defined mechanism from polarity data
Best mechanism is chosen from P1 R5 which minimizes amplitude errors, but almost all ratios are expected to be larger than is the case. The solution misfits SLQ polarity and ratios at A64, A16, A20, LPQ, and A10
An alternative strike-slip solution which misfits A20 will fit all but one ratio, but the correct polarity of A20 was confirmed by the trace from the recent Chinese bomb
The error on the amplitude ratios could be reduced by allowing the relatively weak EBN polarity to be misfit; this mechanism is still very similar to the accepted best solution.
The accepted mechanism represents dominantly thrust faulting on NW trending planes.

Best Solution:

Strike, Dip, Rake	102	55	060
Strike, Dip, Rake	327	45	125
Trend & Plunge of P	212	05	
Trend & Plunge of T	314	65	
Trend & Plunge of B	120	24	

```
+47.719- 70.192F1MN=3.3 1944484 18031987 00.0010.002 0.2  8 12 120.04Z2 4.48    7 1ML=3.1 1313 0 0.00
CHARLEVOIX REGION, QUE.                  REGION DE CHARLEVOIX, QUE.
FELT AT LA MALBAIE, QUEBEC CITY,         RESSENTI A LA MALBAIE, QUEBEC,
BAIE-SAINT-PAUL, CLERMONT,               BAIE-SAINT-PAUL, CLERMONT,
SAINT-HILARION, SAINT-IRENEE             SAINT-HILARION, SAINT-IRENEE
$ ADD AMERICAN STATIONS...AND DATA
$ SOLUTION FROM STATIONS WITHIN 60 KM
NEAR LA MALBAIE                          PRES DE LA MALBAIE
$RATIO=  0.571 LPQ 455583D 0.09     -571.57    1282.44 45 111 0.12     2126.56
$RATIO=  0.05  A10
$RATIO=  1.41  A16
$RATIO=  0.54  A20
$RATIO=  0.02  A64
$RATIO=  0.48  A54
A61  8703181944P             0.00 A444999C                   000   0    0     0  0
A61   E  0008KM         110-60    10  002                      0000000 00ML00MN
LMQ  8703181944P             0.00 B44519 D                   000   0    0     0  0
LMQ   SW 0022KM         208-77    03 -011                      0000000 00ML00MN
A64  8703181944P             0.00 A445263D           A445571 000   0    0     0  0
A64   NE 0026KM         062-79    10  000            10 -001    0000000 00ML00MN
A16  8703181944P             0.00 A445351C           A445726 000   0    0     0  0
A16   SE 0031KM         154-81    10  000            10  000    0000000 00ML00MN
A54  8703181944P             0.00 A445386D           A445798 000   0    0     0  0
A54   SW 0034KM         210-81    10 -006            10  002    0000000 00ML00MN
A20  8703181944P             0.00 A445461D           X445901 000   0    0     0  0
A20   E  0038KM         092-82    10  003            00 -007    0000000 00ML00MN
LPQ  8703181944P            -0.22 A445584D           A450110 010 100 651      0  0
LPQ   S  0044KM         162-83    10  000            10 -003    0040904 28ML42MN
A10  8703181944P             0.00 A445706D           X450371 000   0    0     0  0
A10   S  0053KM         180-84    10  009            00  046    0000000 00ML00MN
SLQ  8703181944P             0.00 045035 +                   000   0    0     0  0
SLQ   E  0089KM         093-86    00  068                      0000000 00ML00MN
JOQ  8703181944P             0.00 04506              04520   000   0    0     0  0
JOQ   NW 0110KM         315-87    00 -013            00  083    0000000 00ML00MN
EBN  8703181944P            -0.22 0451279+           0453043 013 100  52      0  0
EBN   E  0150KM         100-87    00  000            00 -013    0002513 25ML31MN
HTQ  8703181944P  0452130   -0.07 0452374            0454561 017 100  81      0  0
HTQ   NE 0211KM 00 -010 038 49    00  233            00 -014   ·0002994 30ML34MN
LAP  8703181944P  045215     0.00                    04547   000   0    0     0  0
LAP   SW 0219KM 00 -081 229 49                       00 -040    0000000 00ML00MN
GNT  8703181944P  0452289D  -0.06                    0455053 017 100  43      0  0
GNT   SW 0224KM 00 -008 229 49                       00  202    0001589 28ML32MN
DES  8703181944P  04521      0.00                    045505  000   0    0     0  0
DES   SW 0225KM 00 -206 227 49                       00  179    0000000 00ML00MN
GSQ  8703181944P  0452789   -0.22                    0460176 033 100  88      0  0
GSQ   NE 0265KM 00 -020 059 49                       00  443    0001676 32ML33MN
SBQ  8703181944P  0453082   -0.07                    0460957 020 100  33      0  0
SBQ   SW 0292KM 00 -051 208 49                       00  648    0001037 30ML32MN
KLN  8703181944P  0453142E  -0.29                    0461310 013 100  10      0  1
KLN   E  0305KM 00 -170 107 49                       00  706    0000483 25ML29MN
MNQ  8703181944P  0453665E  -0.10 0454048            0461762 017 100  69      0  0
MNQ   N  0330KM 00  068 018 49    00  451            00  648    0002550 35ML37MN
TRQ  8703181944P  0454005   -0.09 0454404    0461986 0463042 017 100  31      0  0
TRQ   SW 0372KM 00 -102 245 49    00  296    00 -020 00 1035$  0001146 33ML34MN
GGN  8703181944P  0454215C  -0.29            0462222 0463759 040 100  13      0  1
GGN   SE 0388KM 00 -109 137 49               00 -147 00 1389$  0001204 30ML27MN
GRQ  8703181944P  0455169E  -0.09            0463602 0465036 040 100  64      0  0
GRQ   W  0447KM 00  143 256 49               00 -006 00 1427$  0001005 39ML35MN
LMN  8703181944P  0455208   -0.29                            000   0    0     0  0
LMN   SE 0461KM 00 -002 115 49                                 0000000 00ML00MN



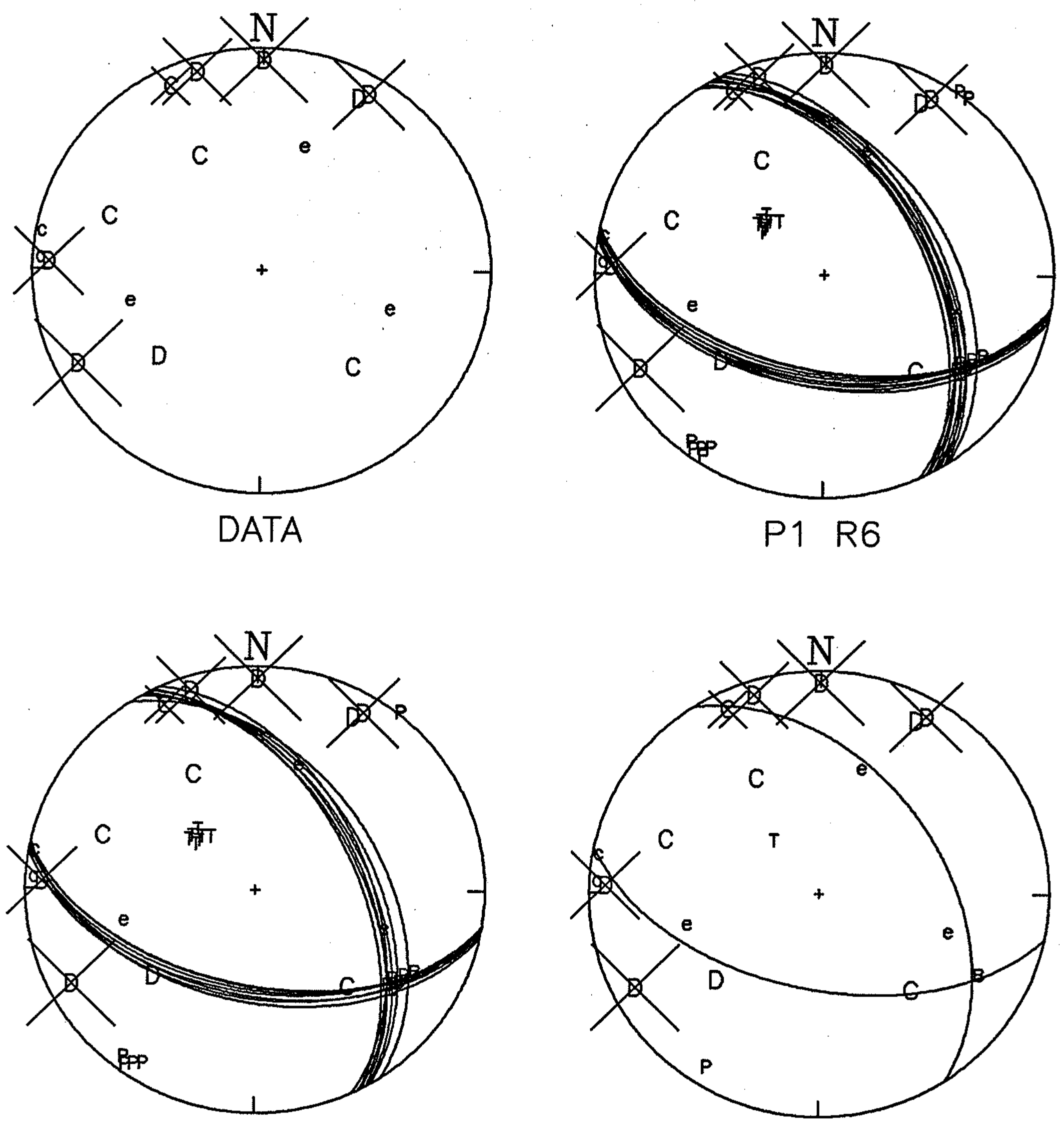
GAC  8703181944P            -0.06                    0465364 000   0    0     0  0
GAC   SW 0462KM         243 49                       00 1444$  0000000 00ML00MN
OTT  8703181944P            -0.06                    0470315 030 100  27      0  0
OTT   SW 0496KM         241 49                       00 1670$  0000565 36ML33MN
CKO  8703181944P            -0.06            0470273 0472728 030 100  19      0  0
CKO   W  0586KM         254 49               00 -277 00 2177$  0000398 36ML33MN
EEO  8703181944P  0461767   -0.06            0472488 0475354 023 100  10      0  0
EEO   W  0684KM 00 -140 263 49               00 -150 00 2715$  0000273 36ML32MN
WEO  8703181944P            -0.07                    0481632 017 100   8      0  3
WEO   SW 0757KM         240 49                       00 3447$  0000296 37ML34MN
JAQ  8703181944P  0462886C  -0.07            0474622 0482646 033 100  12      0  0
JAQ   NW 0781KM 00 -209 332 49               00 -089 00 3934$  0000228 39ML33MN
             Z
```

19870318 19:44 MN=3.3 47.719N 70.192W 4.48 KM

A61	110.000	-60.000	C		strong - analog playout
LMQ	208.000	-77.000	D		analog
A64	062.000	-79.000	D		strong - analog playout
A64	062.000	-79.000	R	0.02	P strong
A16	154.000	-81.000	C		strong - analog playout
A16	154.000	-81.000	R	1.41	S strong
A54	210.000	-81.000	D		strong - analog playout
A54	210.000	-81.000	R	0.48	
A20	092.000	-82.000	D		strong, polarity checked by bomb
A20	092.000	-82.000	R	0.54	
LPQ	162.000	-83.000	D		strong
LPQ	162.000	-83.000	R	0.571	
A10	180.000	-84.000	D		strong - analog playout
A10	180.000	-84.000	R	0.05	S very weak
SLQ	093.000	-86.000	+		very emergent
EBN	100.000	-87.000	+		not strong
GNT	229.000	49.000	D		noisy background
KLN	107.000	49.000	e		
MNQ	018.000	49.000	e		
GGN	137.000	49.000	C		
GRQ	256.000	49.000	e		
JAQ	332.000	49.000	C		

CHV870318.DAT
6-AUG-87 08:26:48

CHV870318.OUT
10-AUG-87 08:32:27



Seismic Zone: Lower St. Lawrence

Magnitude : 3.6

Location : 48.74N 68.25W

Date(Y/M/D) : 870503

Time(UT) : 00:21

Depth:

closest station: HTQ (52 km)
free depth = 13.9 km

Quality of Readings:

Nodal plane passes close to Charlevoix array stations
New Brunswick stations weak arrivals
Eastern ECTN give weak arrivals
JBQ and SCH probably nodal

Comments:

Best solution is P2 R0 and misfits A61, KLN, HAL, EEO all of which are weak arrivals.
Position of planes preclude many strong Pn arrivals.
Mechanism represents thrust faulting in response to east-west compression.

Best Solution:

Strike, Dip, Rake	312	54	37
Strike, Dip, Rake	198	60	138
Trend & Plunge of P	257	04	
Trend & Plunge of T	162	50	
Trend & Plunge of B	350	40	

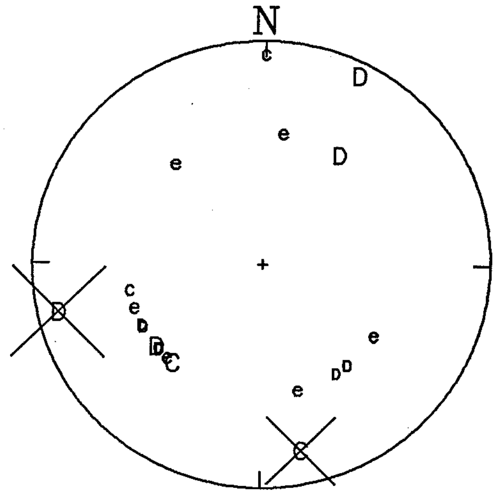
```
+48.737- 68.24601MN=3.6 0021538 03051987 00.0070.016 0.2 21 32 150.52Z213.93  13 1ML=3.4  90
LOWER ST.LAWRENCE REGION, QUE.          REGION DU BAS SAINT-LAURENT
NEAR LES BOULES, ON THE                 PRES DE LES BOULES, SUR LA RIVE SUD
SOUTH SHORE
$ MNQ, JAQ DEAD
$ SUO, SZO TRIGGERED ON LG, PN LOST
$ ADD REGIONAL WHEN AVAILABLE
$ KLN, LMN NO SG REALLY DEFINED
$ SG: OFTEN NOT WELL-DEFINED
$ SN: NOT ALWAYS STRONG
$RATIO=  0.547 HTQ 220267C 0.13      970.78     1210.22 22 897 0.10      3422.78
$RATIO= -0.131 GSQ 220776D 0.15     -846.77     1683.23 221811 0.13        625.81
HTQ8705030021P           -0.07 A220269C             A220895 010 1001599    0  0
HTQ   N  0052KM         348-74 14  008              14 -003     0100468 33ML39MN
GSQ8705030021P           -0.22 A220776D             B221799 013 100 255    0  0
GSQ   E  0086KM         076-80 14 -035              03 -045     0012325 28ML34MN
SLQ8705030022P                 A22160 D             X2226
SLQ   SW 0132KM         206-83 14  071              00 -506     0000000 00ML00MN
EBN8705030021P B221799   -0.22 A221729+             A223379 013 100 247    0  0
EBN   S  0142KM03  044  180-83 14  020              14 -023     0011938 31ML38MN
A208705030022P        +
A20   SW 0157KM         224 49                                  0000000 00ML00MN
A648705030022P        D
A64   SW 0159KM         231 49                                  0000000 00ML00MN
A618705030022P        +
A61   SW 0180KM         230 49                                  0000000 00ML00MN
A16          P        E
A16   SW 0193KM         224 49                                  0000000 00ML00MN
SIC8705030022P A22236 D                   A22461
SIC   NE 0194KM14 -005  034 49            14  038               0000000 00ML00MN
LPQ8705030021P A222518C  -0.22            C224801   X224909 013 100 212    0  0
LPQ   SW 0204KM14  011  221 49            01  000   00 -215     0010246 33ML39MN
LMQ8705030022P A222450-
LMQ   SW 0204KM14 -039  230 49                                  0000000 00ML00MN
A548705030022P        -
A54   SW 0215KM         229 49                                  0000000 00ML00MN
KLN8705030021P B223061-  -0.29                      X230049 010 100  38    0  0
KLN   SE 0253KM03 -061  146 49                      00 -472     0002388 28ML35MN
GNT8705030021P A225081   -0.06                      X234725 033 100  83    0  0
GNT   SW 0408KM14  101  231 49                      00 -096     0001580 39ML36MN
LMN8705030021P A225016+  -0.29            X232904           007 100   4    0  3
LMN   SE 0413KM14 -056  140 49            00 -368               0000359 26ML30MN
GGN8705030021P A225074E  -0.29            C233499    235160 040 100  36    0  3
GGN   S  0417KM14 -041  164 49            01  150   03  055     0000565 35ML32MN
SBQ8705030021P X225888   -0.07            X234532   X240243 027 100  80    0  0
SBQ   SW 0467KM00  186  218 49            00  146   00 -228     0001862 40ML38MN
MNT8705030021P B230683   -0.06            B240019   X242203 013 100  16    0  0
MNT   SW 0544KM03  041  231 49            03 -007   00 -431     0000773 35ML35MN
TRQ8705030021P A230680-  -0.09            B240345   X242374 037 100  48    0  0
TRQ   SW 0552KM14 -067  242 49            03  135   00 -483     0000815 40ML36MN
HAL8705030022P A23114 D
HAL   SE 0578KM14  084  140 49                                  0000000 00ML00MN
GRQ8705030021P B231420E  -0.09            X241785   X244654 033 100  39    0  0
GRQ   W  0619KM03 -141  250 49            00  155   00 -085     0000743 42ML36MN
GBN8705030022P B231750E
GBN   SE 0631KM03  048  123 49                                  0000000 00ML00MN
GAC8705030021P A231813-  -0.06            X242388   X244873 000   0   0    0  0
GAC   SW 0643KM14 -039  241 49            00  247   00 -544     0000000 00ML00MN
WBO8705030021P C232310   -0.06            C242774   X245902 040 100  30    0  0
WBO   SW 0678KM01  034  235 49            01 -104   00 -487     0000471 41ML35MN


SCH8705030022P B23235 E                   X24285    X25000
SCH   N  0685KM03 -004  008 49            00 -169   00 -566     0000000 00ML00MN
JBQ          P X23327 E
JBQ   NW 0747KM00  149  319 49                                  0000000 00ML00MN
CKO8705030021P B233118E  -0.06            X244650   X252891 033 100  25    0  0
CKO   W  0759KM03 -147  250 49            00  045   00  232     0000476 41ML36MN
EEO8705030021P B234162+  -0.06            X250560   X254883 033 100  20    0  0
EEO   W  0845KM03 -157  258 49            00  116   00 -191     0000381 42ML35MN
SUO8705030022P                                      X263090 047 100  10             263738
SUO   W  0994KM         260 49                      00 -143     0000134 41ML32MN
SZO8705030022P                            X254185   X263613 037 100   7             265188
SZO   W  1028KM         261 49            00 -141   00 -577     0000119 40ML32MN
             Z
```

19870503 00:21 MN=3.6 48.737N 68.246W 13.93 KM

HTQ	348.000	-74.000	C		strong Pg
HTQ	348.000	-74.000	R	0.547	
GSQ	076.000	-80.000	D		strong Pg
GSQ	076.000	-80.000	R	-0.131	
SLQ	206.000	-83.000	D		analog reading, not very strong
EBN	180.000	-83.000	+		weak, followed by possible Pn
A20	224.000	49.000	+		weak
A64	231.000	49.000	D		weak
A61	230.000	49.000	+		weak
A16	224.000	49.000	e		emergent
SIC	034.000	49.000	D		analog reading, strong
LPQ	221.000	49.000	C		weak
LMQ	230.000	49.000	-		analog
A54	229.000	49.000	-		weak
KLN	146.000	49.000	-		weak
LMN	140.000	49.000	+		weak
GGN	164.000	49.000	e		
TRQ	242.000	49.000	-		weak
HAL	140.000	49.000	-		apparently strong
GRQ	250.000	49.000	e		weak
GBN	123.000	49.000	e		emergent
GAC	241.000	49.000	-		weak
SCH	008.000	49.000	e		emergent
JBQ	319.000	49.000	e		emergent
CKO	250.000	49.000	e		
EEO	258.000	49.000	+		weak

LSL870503.OUT
26-JUN-87 08:56:49



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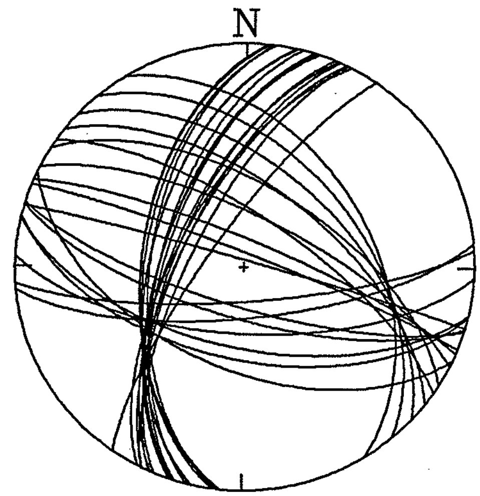

P2 R2 10 DEG INC

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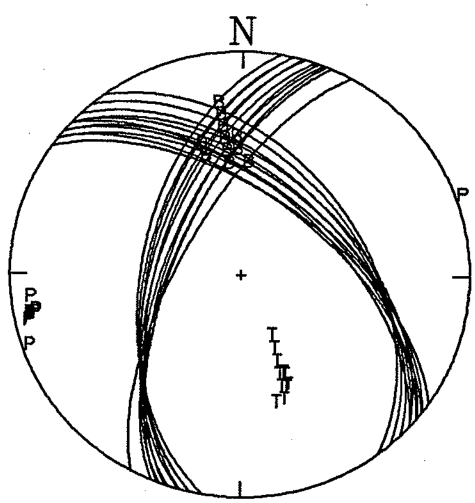
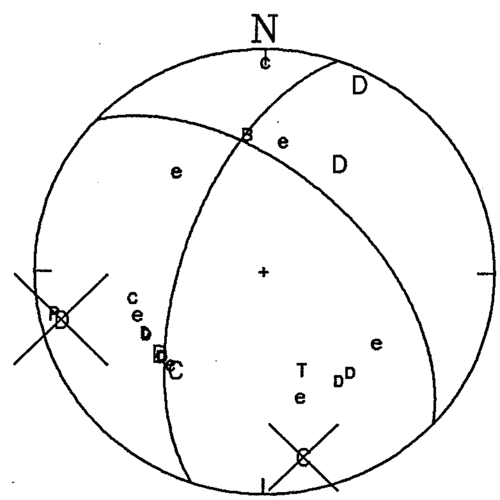


P2 R0



BEST SOLUTION

Seismic Zone: Western Quebec

Magnitude : 2.8 MN

Location : 46.20N 74.83W
(La Conception,Quebec)

Date(Y/M/D) : 870521

Time(UT) : 1455

Depth:
closest station: TRQ (22km)
free depth = 16.3km

Quality of Readings:
TRQ Sv is up (+Sv)
GRQ Sv is up (CSv)
OTT,MNT too noisy for polarity readings
CKO,WBO weak
PTN,LOZ, NO from F. Revetta

Comments:
Mechanism is poorly constrained without use of ratio data. All solutions misfit WBO.
Best solution is chosen from P0.5 R0 to have lowest residual. Despite appearances it fits GAC ratio well, even though P arrival is stronger than might be expected from such a nodal arrival.
Solution represents strike-slip faulting in response to N-S compression.

Best Solution:

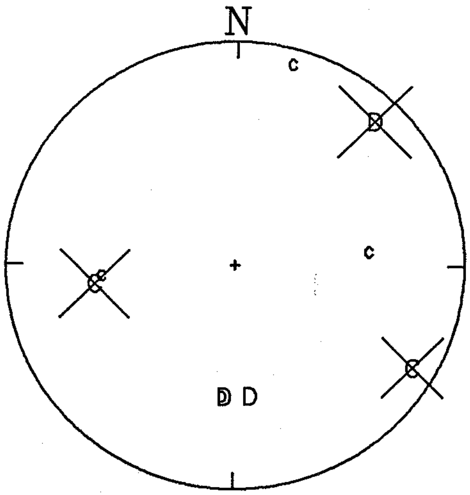
Strike, Dip, Rake	045	90	20
Strike, Dip, Rake	315	70	-180
Trend & Plunge of P	178	14	
Trend & Plunge of T	272	14	
Trend & Plunge of B	045	70	

```
+46.197- 74.83301MN=2.8 1455284 21051987 00.0070.009 0.2 -7 14  50.27Z216.32  11 1ML=2.1   50
WESTERN QUEBEC REGION, QUE.                 REGION DE L'OUEST DU QUEBEC, QUE.
WEST OF SAINT-JOVITE                        OUEST DE SAINT-JOVITE
$ TRQ SPIKY
$RATIO=  0.537 TRQ 553313C 0.06      155.44      424.44 553608 0.04     1467
$RATIO=  0.428 GAC 554103D 0.19     -649.82      964.18 554976 0.29     1739.18
$RATIO=  0.763 GRQ 554366C 0.16       24.38       73.62 555457 0.09      141.38
TRQ8705211455P               -0.09 A553312C        A553608 013 100 457           3   553625
TRQ   E  0022KM             082-52 13   012        13 -019     0022088 19ML37MN
GAC8705211455P               -0.06 A554103D        A554976
GAC   SW 0074KM             223-77 13   025        13 -005     0000000 00ML00MN
GRQ8705211455P               -0.09 A554366C        A555457 007 100  35                              55
GRQ   NW 0091KM             300-79 13   016        13  005     0003142 20ML29MN
OTT8705211455P               -0.06                 B560063 010 100  37               560534
OTT   SW 0113KM             218-81                 03  023     0002325 21ML29MN
MNT8705211455P               -0.06                 X560252
MNT   SE 0122KM             129-81                 00 -037     0000000 00ML00MN
WBO8705211455P A555127+      -0.06 B555164         B560630 017 100  30               560948
WBO   S  0137KM13   011     195-82 03   080        03 -098     0001109 21ML27MN
LOZ          P
LOZ   S  0176KM             173 49                             0000000 00ML00MN
PTN          P
PTN   S  0181KM             184 49                             0000000 00ML00MN
GNT8705211455P B555827+      -0.06
GNT   E  0191KM03   062     084 49                             0000000 00ML00MN
CKO8705211455P A555897+      -0.06 B560067-        B562394 010 100  19               562553
CKO   W  0204KM13  -028     265 49 03  -080        03 -182     0001194 23ML30MN
EEO8705211455P X561581       -0.06                 X565804 013 100   4               570355
EEO   W  0330KM00   115     280 49                 00 -297     0000193 22ML26MN
LPQ          P
LPQ   E  0390KM             069 49                             0000000 00ML00MN
             Z
```

19870521 14:55 MN=2.8 46.197N 74.833W 16.33 KM

TRQ	082.000	-52.000	C		strong, Sv up (+)
TRQ	082.000	-52.000	R	0.537	
GAC	223.000	-77.000	D		strong
GAC	223.000	-77.000	R	0.428	
GRQ	300.000	-79.000	C		strong, Sv up (C)
GRQ	300.000	-79.000	R	0.763	
WBO	195.000	-82.000	+		weak
NO	185.000	49.000	-		goes east (dil)
LOZ	173.000	49.000	D		goes up, was reversed
PTN	184.000	49.000	D		down
GNT	084.000	49.000	+		weak
CKO	265.000	49.000	+		weak, followed by strong arrival

WQU870521.OUT
13-OCT-87 14:40:28



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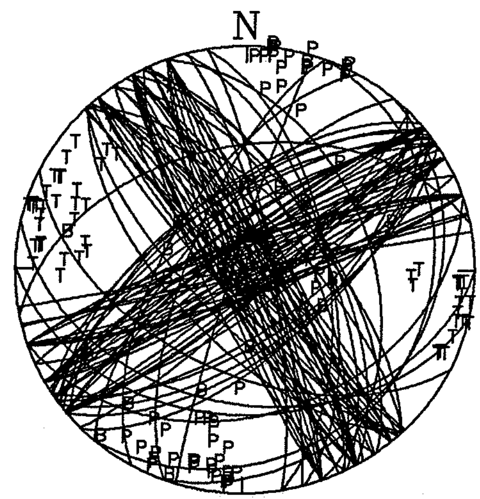
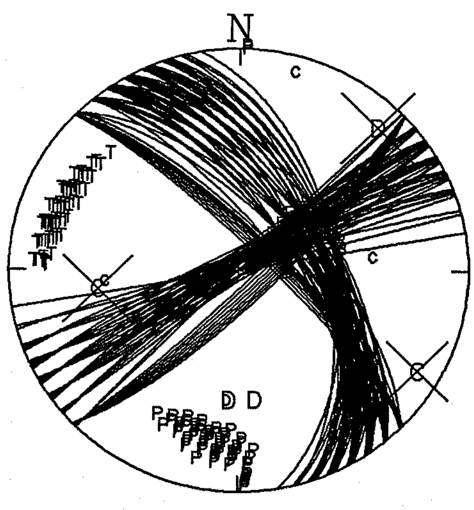
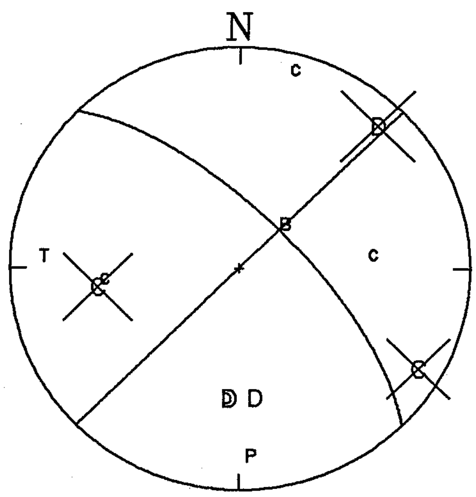


P0.5 R3 20 DEG INC



P0.5 R0



BEST SOLUTION

Seismic Zone: Lower St. Lawrence

Magnitude : 3.0

Location : 48.87N 68.71W
(offshore from Betsiamites, Que.)

Date(Y/M/D) : 870617

Time(UT) : 19:39

Depth:
closest station: HTQ (43 km)
free depth = 13.6 km

Quality of Readings:
Charlevoix array includes weak Pg and emergent Pn arrivals
SIC onset strong
MNQ and JAQ weak onsets
New Brunswick arrivals emergent
GSQ ratio used despite distance being greater than 100 km

Comments:
Best solution chosen from P0.5 R0
Solutions fit nodal arrival at Charlevoix array, New Brunswick and MNQ and JAQ
Well-constrained thrust mechanism with P axis to ESE
Epicentre is further upstream than most LSL earthquakes

Best Solution:

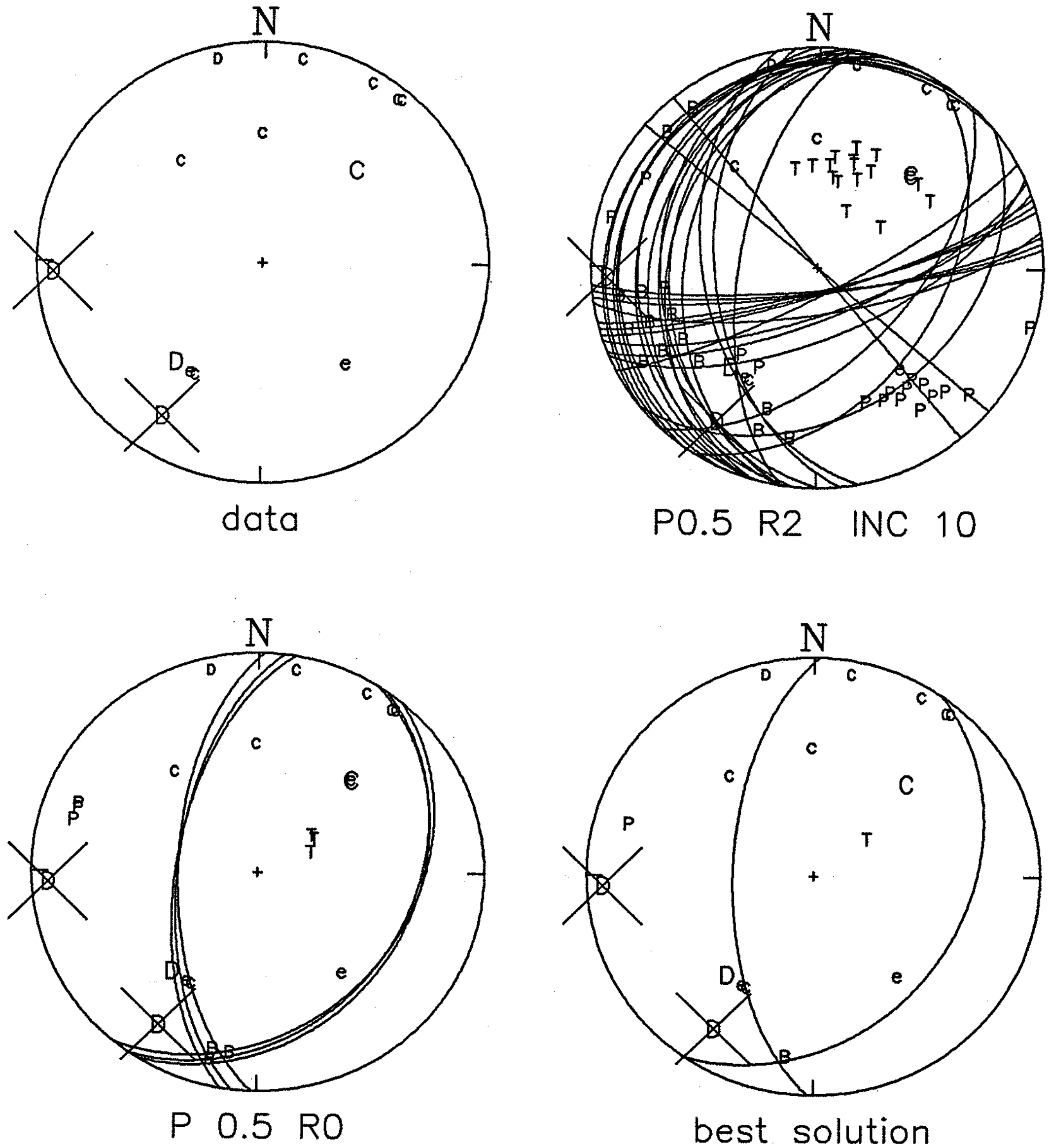
Strike, Dip, Rake	181	61	73
Strike, Dip, Rake	34	33	118
Trend & Plunge of P	284	14	
Trend & Plunge of T	056	69	
Trend & Plunge of B	190	15	

```
+48.868- 68.708F1MN=3.0 1939205 17061987 00.0100.022 0.2 15 22  20.51 213.58   0 1ML=2.2  20  0 0.00
LOWER ST.LAWRENCE REGION, QUE.          REGION DU BAS SAINT-LAURENT, QUE.
$ NEAR BETSIAMITES
$ SOLUTION PEGGED AT FREE DEPTH AND LOCATION OBTAINED BY DATA SUBSET
$ MNQ VERY NEAR NODAL, NEEDS FILTERS 5 - 19 HZ
$ GNT NOISY
$ EEO NOISY, WBO FULL OF SPIKES
$RATIO=  0.218 GSQ 393950D 0.20     -84.44     154.56 395414 0.07     139.44
$RATIO=  0.371 HTQ 392818D 0.09    -585.36     713.64 393317 0.17    1375.36
HTQ  8706171939P           -0.07 A392818D            A393316 007 100 116        3   393367
HTQ   NE 0043KM          032-71   12  030            12 -005   0010412 20ML36MN
GSQ  8706171939P           -0.22 A393950D            B395414 010 100  62            395704
GSQ   E  0117KM          087-82   12 -035            03  024   0003896 23ML31MN
SLQ  8706171939P                  A39426 +           B39583
SLQ   S  0136KM          190-83   12  003            03 -046   0000000 00ML00MN
A64  8706171939P XB39440          A39436 +
A64   SW 0145KM 00 -047 218-84    12 -051                      0000000 00ML00MN
A20  8706171939P XB394457         A39442 +
A20   SW 0148KM 00 -027 210-84    12 -041                      0000000 00ML00MN
EBN  8706171939P           -0.22 A394694-            B400565 013 100  23            400590
EBN   S  0160KM          167-84   12  019            03 -020   0001112 21ML28MN
A61  8706171939P XB39472          A39467 +
A61   SW 0166KM 00  015 219 49    12 -077                      0000000 00ML00MN
A16  8706171939P  A39491 E       XB39495
A16   SW 0183KM 12 -001 212 49    00 -074                      0000000 00ML00MN
MNQ  8706171939P  A394958+  -0.10                    B401193
MNQ   N  0185KM 12  007 359 49                       03 -082   0000000 00ML00MN
LMQ  8706171939P  A39509 D                           B40131
LMQ   SW 0190KM 12  095 220 49                       03 -080   0000000 00ML00MN
JOQ  8706171939P  X3950                              X4014
JOQ   W  0194KM 00 -040 256 49                       00 -107   0000000 00ML00MN
LPQ  8706171939P  A395197+  -0.22                    X401390 030 100 110        3   401569
LPQ   SW 0196KM 12  113 210 49                       00 -183   0002304 30ML33MN
SIC  8706171939P         E
SIC   NE 0204KM         044 49                                 0000000 00ML00MN
SIC  8706171939P  A39515 C                  B40145
SIC   NE 0204KM 12 -009 044 49              03 -008            0000000 00ML00MN
KLN  8706171939P  B400118E  -0.29 X400539   X403013         013 100   8        3   403872
KLN   SE 0285KM 03 -068 141 49    00 -153   00 -214            0000387 23ML28MN
GGN  8706171939P  X402406   -0.29
GGN   S  0441KM 00  321 160 49                                 0000000 00ML00MN
LMN  8706171939P  B402097   -0.29
LMN   SE 0447KM 03 -057 137 49                                 0000000 00ML00MN
TRQ  8706171939P  X403175   -0.09           X412610
TRQ   SW 0530KM 00  024 238 49              00  196            0000000 00ML00MN
JAQ  8706171939P  A405628+  -0.07
JAQ   NW 0735KM 12 -019 321 49                                 0000000 00ML00MN
            Z
```

19870617 19:39 MN=3.0 48.868N 68.708W 13.58 KM

HTQ	032.000	-71.000	D		strong
HTQ	032.000	-71.000	R	0.371	
GSQ	087.000	-82.000	D		strong
GSQ	087.000	-82.000	R	0.218	
SLQ	190.000	-83.000	+		up but nearly nodal
A64	218.000	-84.000	+		weak, assumed to be Pg
A20	210.000	-84.000	+		weak, assumed to be Pg
EBN	167.000	-84.000	-		not strong
A61	219.000	-85.000	+		weak, assumed to be Pg
A16	212.000	49.000	e		emergent Pn or Pg
MNQ	359.000	49.000	+		very emergent
LMQ	220.000	49.000	D		not strong
LPQ	210.000	49.000	+		
SIC	044.000	49.000	C		strong
KLN	141.000	49.000	e		emergent
JAQ	321.000	49.000	+		very weak

LSL870617.OUT
24-JUL-87 09:35:05



K

Seismic Zone: Western Quebec

Magnitude : 1.8

Location : 45.57N 75.63W

Date(Y/M/D) : 870619

Time(UT) : 19:40

Depth:

closest station: GAC (19 km)
free depth = 7.1 km

Quality of Readings:

GAC, OTT, WBO good
TRQ, GRQ weak first arrival
CKO two phases read: weak Pg followed by strong Pn
TRQ and OTT amplitude ratios read from screen

Comments:

A small event for which the mechanism seems well determined; this may be misleading.
Best solution is P0.5 R1; misfits TRQ polarity, barely misfits OTT ratio.
Mechanism is strike-slip representing compression from the south-east.

Best Solution:

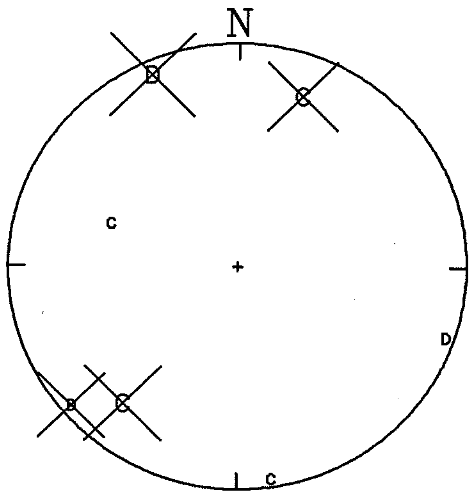
Strike, Dip, Rake	348 80 39
Strike, Dip, Rake	251 52 168
Trend & Plunge of P	114 19
Trend & Plunge of T	217 34
Trend & Plunge of B	000 50

```
+45.573- 75.627F1MN=1.8 1940551 19061987 00.0040.010 0.1  6 13  40.16Z2 7.08  16 1ML=1.2  50
WESTERN QUEBEC REGION                    REGION DE L'OUEST DU QUEBEC
NORTH OF GATINEAU                        NORD DE GATINEAU
$RATIO=  0.082 WBO 410642D 0.15     -16.77      16.77 411466 0.11       20.23
$RATIO=  0.318 GAC 415842C 0.14     212.86     212.86 41  77 0.23      442.86
$RATIO=  0.6   TRQ
$RATIO=  0.5   OTT
GAC8706191941P          -0.06 A405842C             A410071
GAC   NE 0019KM        039-68 14  004              14 -002     0000000 00ML00MN
OTT8706191941P          -0.06 A405868C             B410242 040 100 314              410367
OTT   S  0021KM        200-70 14 -007              04  101     0004932 17ML30MN
WBO8706191941P          -0.06 A410644D             B411467 007 100   4              411542
WBO   SE 0069KM        156-83 14  001              04 -004     0000359 09ML17MN
TRQ8706191941P          -0.09 A411305-             B412602 010 100   4              413124
TRQ   NE 0110KM        049-85 14  003              04 -011     0000251 11ML19MN
GRQ8706191941P          -0.09 A411395+             B412872 017 100   5              413383
GRQ   N  0116KM        351-86 14 -005              04  085     0000185 13ML18MN
CKO8706191941P B412039+ -0.06 B411885-             C413960 013 100   2              414007
CKO   W  0149KM04  012 289-86 04 -044              01  253     0000097 10ML17MN
              Z
```

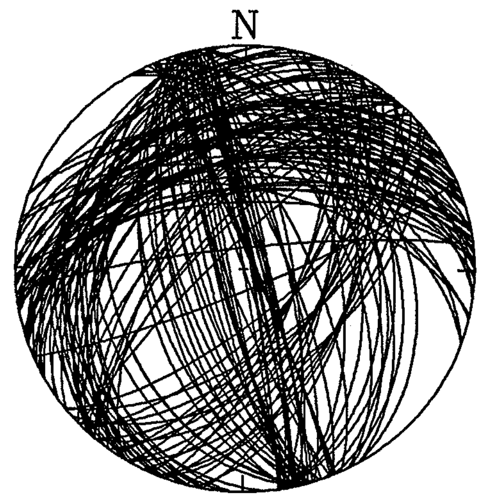
19870619 19:40 MN=1.8 45.573N 75.627W 7.08 KM

GAC	039.000	-68.000	C		strong
GAC	039.000	-68.000	R	0.318	
OTT	200.000	-70.000	C		strong
OTT	200.000	-70.000	R	0.5	
WBO	156.000	-83.000	D		strong
WBO	156.000	-83.000	R	0.082	
TRQ	049.000	-85.000	-		weak
TRQ	049.000	-85.000	R	0.6	
GRQ	351.000	-86.000	+		weak
CKO	289.000	-86.000	-		Pg
CKO	289.000	49.000	+		later arriving Pn

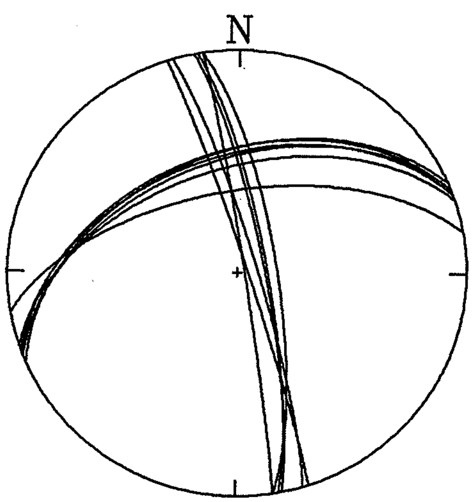
WQU870619.OTT
23-JUN-87 05:32:17



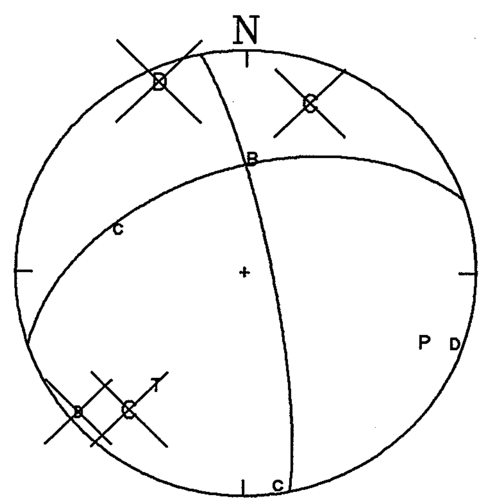
DATA



P0.5 R4 INC 10



P0.5 R1



BEST SOLUTION

Seismic Zone: Western Quebec

Magnitude : 2.9 MN

Location : 44.66N 75.56W
(under St. Lawrence River
SW of Prescott, ONT.)

Date(Y/M/D) : 870705

Time(UT) : 0237

Depth:

closest station: WBO (44 km)
free depth = 0.7 km, very shallow

When pegged at 18 km Pn residuals very large.
Free depth with all good phases 2.2 km
0.7 km depth is from a selected subset of close stations.
Focal mechanism determined for 0.7 and 18 km depth.

Quality of Readings:

Woodward Clyde data read from playouts; WMNY clear, ILNY goes down before up.
TRQ taken as Pg, waveform resembles GAC, OTT.
PTN goes down on analog, up on digital playouts; Revetta's record accepted as correct.
Many emergent arrivals in US from this small earthquake.

Comments:

Depth not well-determined but probably shallow.
For depth of 0.7km (Z=1 on figure) mechanism is well constrained thrust fault without using ratio data.
For the 18km deep hypocentre, mechanism is constrained by changed emergent angles for NO, PTN, WBO but is a similar thrust mechanism.
Best solution is chosen from P1 R2 (Z=1) set as having lowest residual. It misfits NO and OSWG polarities and (slightly) CHAU and OTT ratios.

Best Solution:

Strike, Dip, Rake	195	45	83
Strike, Dip, Rake	025	45	97
Trend & Plunge of P	110	00	
Trend & Plunge of T	020	85	
Trend & Plunge of B	200	05	

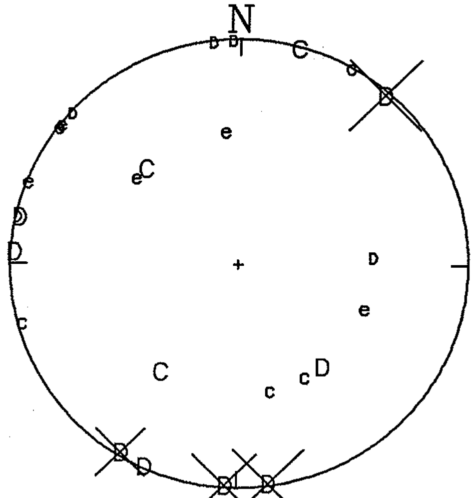
```
+44.658- 75.54501MN=2.9 0237094 05071987 00.0040.011 0.0 23 36  50.37Z2 2.25  15 1ML=2.4  50  0 0.00
NEAR PRESCOTT, ONT.                     PRES DE PRESCOTT, ONT.
FELT NEAR PRESCOTT BY FEW PEOPLE        RESSENTI PRES DE PRESCOTT
                                         PAR QUELQUES PERSONNES
FELT AT 7 MILES SOUTH OF                RESSENTI A 7 MILLES AU SUD DE
 KEMPTVILLE, ONT.                        KEMPTVILLE, ONT.
NOT FELT AT OSGOODE, ONT.               PAS RESSENTI A OSGOODE, ONT.
ALSO FELT AT OGDENSBURG, N.Y.           AUSSI RESSENTI A OGDENSBURG, N.-Y.
NOISE, FIGURINES KNOCKEDOVER            BRUITS, STATUETTES RENVERSEES
$ MIKE MORALIS: (613)342-4441
$ PN ARRIVALS NOISY
$ NO WENT EAST SO +, NOT A STRONG FIRST HALF WAVE
$ LOZ WENT UP, WAS REVERSED POLARITY
$ SOLUTION FROM STATIONS WITHIN 150 KM
$ MNT PG FOLLOWED 0.6 SEC BY STRONG PHASE
$ TRQ P FITS BEST AS PG FOR THIS SHALLOW DEPTH
$ TRQ P WAVEFORM RESEMBLES GAC AND OTT WHICH ARE CLEARLY PG'S
$ WOODWARD CLYDE DATA, RICHARD QUITMEYER 201-785-0700
$ FOLLOWING EPICENTRE FROM A SELECTED SUBSET OF DATA
$44.662- 75.56301MN=2.9 0237095 05071987 00.0040.009 0.0 10 17  10.19Z2 0.68  16 1ML=2.4  10  0 0.00
$ OLD FREE WAS
$44.652- 75.52201MN=2.9 0237094 05071987 00.0150.032 0.1 20 31  50.96Z2 3.86  36 1ML=2.4  50  0 0.00
$RATIO=  1.105 WBO 371676D 0.09     -52.97      52.97 372227 0.06      674.03
$RATIO=  0.478 OTT 372293D 0.15     -49.13     142.87 373307 0.07      147.87
$RATIO=  0.68  GAC
$RATIO=  0.464 CHAU
WBO  8707050237P              -0.06 A371676D          A372225 007 100  99       3   372315
WBO   NE 0044KM          029-86     18  020           18  049   0008886 20ML35MN
NO   8707050237P                    B37169 +          C37211
NO    E  0044KM          072-86     05  034           01 -069   0000000 00ML00MN
PTN  8707050237P                    B371718D          B372275
PTN   E  0046KM          102-86     05  036           05  050   0000000 00ML00MN
CHAU 8707050237P                    A372194D          B373130
CHAU  SW 0077KM          221-87     18  013           05  039   0000000 00ML00MN
LOZ  8707050237P                    B37223 D          B3731
LOZ   E  0077KM          093-87     05  046           05  004   0000000 00ML00MN
OTT  8707050237P              -0.06 A372293D          B373307 017 100 110               373354
OTT   N  0083KM          351-87     18  003           05  030   0004066 24ML29MN
KGN  8707050237P
KGN   SW 0089KM          238-88                                 0000000 00ML00MN
GAC  8707050237P              -0.06 A372802D          A374215
GAC   N  0116KM          003-88     18 -026           18  003   0000000 00ML00MN
GNF  8707050237P                    B373078E          X374691
GNF   SE 0134KM          128-88     05 -021           00  004   0000000 00ML00MN
WNY  8707050237P                    B373166-          X374886
WNY   E  0137KM          102-88     05  006           00  094   0000000 00ML00MN
BVNY 8707050237P                    B373180-          B374820
BVNY  S  0137KM          174-88     05  018           05  024   0000000 00ML00MN
NWC  8707050237P                    X373234E          X374968
NWC   SE 0144KM          129-88     00 -025           00  003   0000000 00ML00MN
OSWG 8707050237P                    B37329 +          B375010
OSWG  SW 0145KM          209-88     05  009           05  009   0000000 00ML00MN
ILNY 8707050237P                    B373258-          B375060
ILNY  SE 0147KM          132-88     05 -050           05  010   0000000 00ML00MN
WMNY 8707050237P                    B373380C          B375210
WMNY  S  0150KM          195-88     05  017           05  066   0000000 00ML00MN
PNY  8707050237P                    X373432           X375355
PNY   E  0159KM          082-88     00 -075           00 -041   0000000 00ML00MN
PGY  8707050237P                    X373504           X375478
PGY   SE 0160KM          131-88     00 -019           00  055   0000000 00ML00MN


WEST 8707050237P                    B373640-
WEST  S  0166KM          178-88     05  014                     0000000 00ML00MN
MIV  8707050237P                    X373668E          X375756
MIV   E  0173KM          111-88     00 -072           00 -043   0000000 00ML00MN
MNT  8707050237P              -0.06 B373851           X375847 007 100  11               380282
MNT   NE 0178KM          058-88     05  026           00 -094   0000987 19ML28MN
TRQ  8707050237P              -0.09 A373949D          X380219 020 100  35               380425
TRQ   NE 0190KM          024-88     18 -076           00 -069   0001100 25ML29MN
SONY 8707050237P  B374100C
SONY  SW 0199KM 05 -007 215 49                                  0000000 00ML00MN
GLOV 8707050237P  B374090+                            B380430
GLOV  SE 0200KM 05 -030 150 49                        05 -111   0000000 00ML00MN
MDV  8707050237P  X374103E                            X380530
MDV   E  0202KM 00 -047 110 49                        00 -083   0000000 00ML00MN
FLET 8707050237P  X374161-                            X380623
FLET  E  0206KM 00 -033 087 49                        00 -086   0000000 00ML00MN
CKO  8707050237P  A374275C  -0.06                     X380723
CKO   NW 0211KM 18  015 316 49                        00 -131   0000000 00ML00MN
GRQ  8707050237P  A374338E  -0.09                     X380872 017 100  23               381093
GRQ   N  0218KM 18 -015 354 49                        00 -191   0000850 24ML29MN
CPNY 8707050237P  B374480+                            B381070
CPNY  S  0224KM 05  065 166 49                        05 -141   0000000 00ML00MN
WEO  8707050237P  X374576   -0.07                     X381424
WEO   W  0237KM 00  000 254 49                        00 -157   0000000 00ML00MN
STWA 8707050237P  B374700D                           XB381096
STWA  SE 0241KM 05  077 141 49                        00 -603   0000000 00ML00MN
SBQ  8707050237P  X375419   -0.07                     X382982 030 100  20               383389
SBQ   E  0296KM 00  113 073 49                        00 -272   0000419 27ML28MN
EEO  8707050237P  B380035E  -0.06                     X384506
EEO   NW 0353KM 05  043 310 49                        00 -322   0000000 00ML00MN
           Z
```

19870705 02:37 MN=2.9 44.659N 75.484W 18.00 KM

NO	071.000	-64.000	+		went east so +
PTN	103.000	-65.000	D		down on analog; up on digital
WBO	023.000	-65.000	D		strong
WBO	023.000	-65.000	R	1.105	
LOZ	093.000	-75.000	D		went up, had reversed polarity
CHAU	224.000	-76.000	D		strong
CHAU	224.000	-76.000	R	0.464	
OTT	347.000	-77.000	D		strong
OTT	347.000	-77.000	R	0.478	
GAC	000.000	-80.000	D		ok
GAC	000.000	-80.000	R	0.68	
GNF	129.000	-81.000	e		read from Lamont playout
WNY	102.000	-81.000	-		read from Lamont playout
BVNY	176.000	-82.000	-		read from WCC playouts, nearly nodal
NWC	130.000	-82.000	e		read from Lamont playout
ILNY	133.000	-82.000	-		read from WCC playouts
OSWG	211.000	-82.000	+		read from WCC playouts
WMNY	197.000	-82.000	C		read from WCC playouts
WEST	180.000	-83.000	-		read from WCC playouts
MIV	112.000	-83.000	e		read from Lamont playout
TRQ	022.000	-84.000	D		taken as Pg waveform, similar to GAC
GLOV	152.000	49.000	+		read from WCC playouts, weak
MDV	111.000	49.000	e		read from Lamont playout
FLET	087.000	49.000	-		read from Lamont playout
SONY	217.000	49.000	C		read from WCC playouts
CKO	315.000	49.000	C		quite strong
GRQ	352.000	49.000	e		emergent
CPNY	168.000	49.000	+		read from WCC playouts
STWA	142.000	49.000	D		read from WCC playouts
EEO	309.000	49.000	e		emergent

WQU870705.OUT
14-OCT-87



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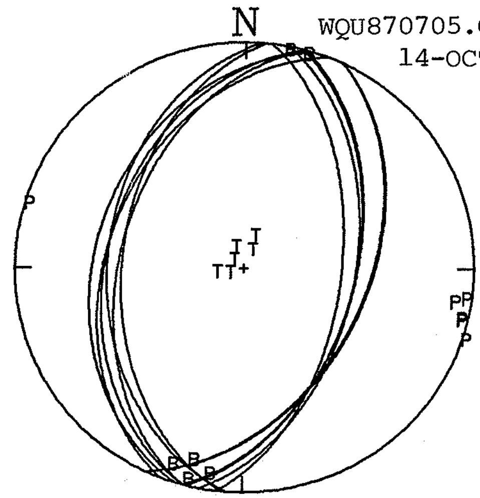
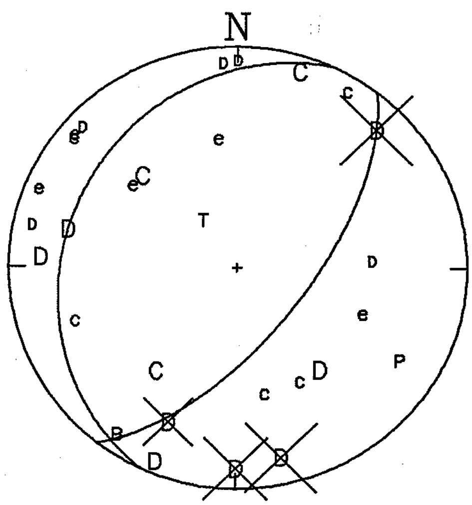
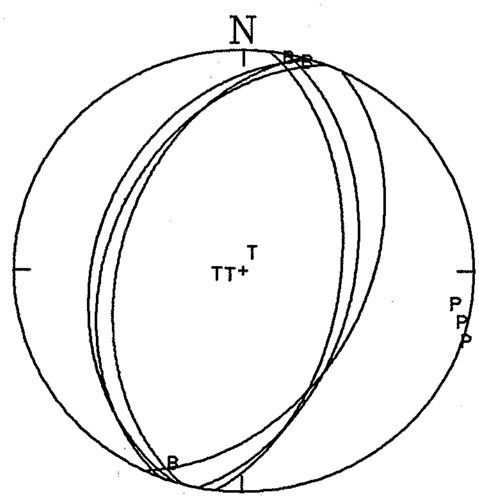


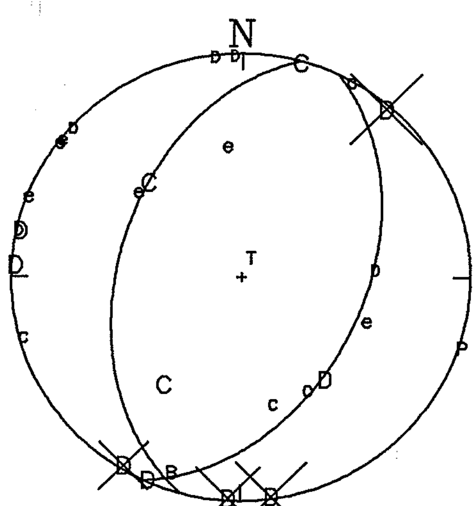
P1 R4 (Z=1)



P1 R2 (Z=18 km)



P1 R2 (Z=1)



BEST SOLUTION

Seismic Zone: WESTERN QUEBEC

Magnitude : 2.8 MN

Location : 46.35N -75.81W
(east of Maniwaki)

Date(Y/M/D) : 870707

Time(UT) : 0954

Depth:
closest station: GRQ, (29 KM)
free depth = 6.6 KM

Quality of Readings:
Pn readings weak, stations noisy
OTT emergent but probably -
CKO SV is up
GRQ nearly nodal

Comments:
Poor distribution of polarity data, need PN arrivals to confirm mechanism
Relatively well constrained by amplitude ratio data
Best solution chosen to fit strong CKO dil.
Mechanism represents strike-slip/thrust faulting in response to NE compression

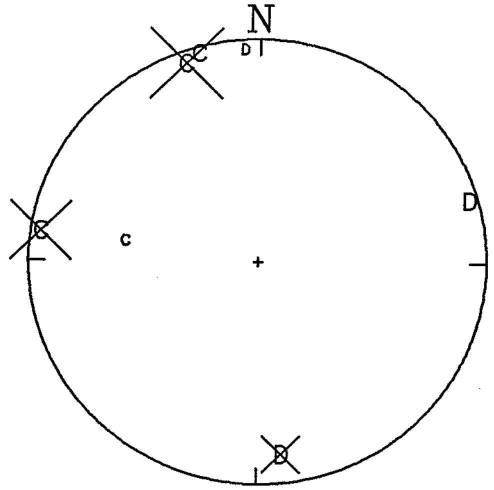
Best Solution:

Strike, Dip, Rake	87	60	6
Strike, Dip, Rake	354	85	150
Trend & Plunge of P	44	17	
Trend & Plunge of T	306	24	
Trend & Plunge of B	165	60	

```
+46.349- 75.81501MN=2.8 0954270 07071987 00.0060.013 0.2  8 15  80.26Z2 6.64  47 1ML=2.3  90
WESTERN QUEBEC REGION                        REGION DE L'OUEST DU QUEBEC
EAST OF MANIWAKI, QUE.                       EST DE MANIWAKI, QUE.
FELT AT MANIWAKI, BLUE SEA LAKE,             RESSENTI A MANIWAKI, LAC BLUE SEA,
SAINTE-FAMILLE, DELLEAGE, BLUECHETTE         SAINTE-FAMILLE, DELLEAGE, BLUECHETTE
$RATIO=  0.437 GAC 543970C 0.16      263.59     575.41 544847 0.18      721.41
$RATIO=  1.42  GRQ
$RATIO=  0.771 TRQ 544240C 0.12       19.77      20.23 545374 0.14      116.77
GRQ8707070954P          -0.09 A543192D          A543550 007 100 316            543598
GRQ    N  0029KM       353-76 16  000           16  005      0028364 20ML39MN
GAC8707070954P          -0.06 A543970C          A544847
GAC    S  0076KM       160-84 16  023           16 -010      0000000 00ML00MN
TRQ8707070954P          -0.09 B544240C          B545374 010 100  37            545464
TRQ    E  0098KM       098-85 04 -060           04 -095      0002325 20ML28MN
OTT8707070954P          -0.06 B544443-          B545764 013 100  53            545878
OTT    S  0106KM       176-85 04  013           04  066      0002562 22ML29MN
CKO8707070954P          -0.06 A544848D          B550437 013 100  64            550473
CKO    W  0132KM       253-86 16  000           04  015      0003093 25ML31MN
WBO8707070954P          -0.06 B545199C          B551049
WBO    S  0156KM       164-87 04 -025           04 -027      0000000 00ML00MN
MNT8707070954P          -0.06                   C552050 013 100  19            552218
MNT    SE 0194KM       118 49                   01 -108      0000918 22ML29MN
EEO8707070954P B550506+ -0.06                   B553612 013 100  12            553970
EEO    W  0252KM04  025 279 49                  04 -168      0000580 23ML29MN
GNT8707070954P          -0.06                   X553762
GNT    E  0265KM       088 49                   00 -377      0000000 00ML00MN
WEO8707070954P          -0.07                   X555814
WEO    SW 0328KM       219 49                   00 -088      0000000 00ML00MN
SUO8707070956P                                  X561501 017 100   3            561986
SUO    W  0400KM       273 49                   00 -400      0000111 24ML25MN
SWO8707070956P                                  X561631 013 100   3            561922
SWO    W  0400KM       278 49                   00 -282      0000145 24ML26MN
SZO8707070956P                                  X562406 020 100   4            563133
SZO    W  0437KM       273 49                   00 -546      0000126 26ML26MN
LPQ8707070954P X553346  -0.22                   X562988
LPQ    E  0457KM00  361 074 49                  00 -527      0000000 00ML00MN
                Z
```

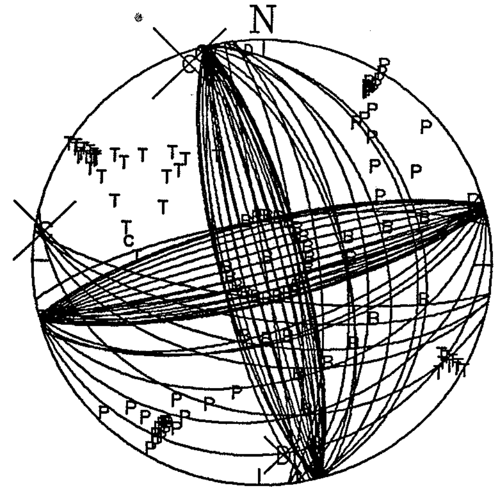
19870707 09:54 MN=2.8 46.349N 75.815W 6.64 KM

GRQ	353.000	-76.000	D		definite D but weak
GRQ	353.000	-76.000	R	1.42	
GAC	160.000	-84.000	C		strong C
GAC	160.000	-84.000	R	0.437	
TRQ	098.000	-85.000	C		strong C
TRQ	098.000	-85.000	R	0.771	
OTT	176.000	-85.000	-		weak, noisy trace
CKO	253.000	-86.000	D		strong D
WBO	164.000	-87.000	C		good
EEO	279.000	49.000	+		weak

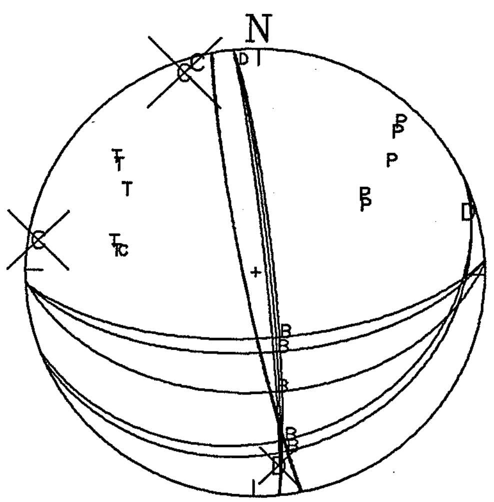


DATA

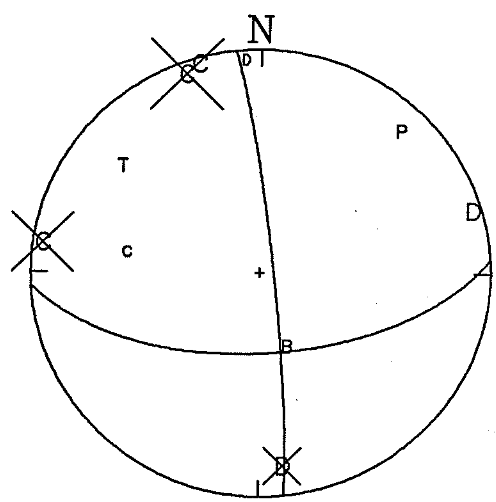
WQU870707.DAT
14–JUL–87 10:08:57



P0 R3 (15 DEG INC)



P0 R0



BEST SOLUTION

Seismic Zone: EASTERN BACKGROUND

Magnitude : 3.4 MN

Location : 43.47N 79.46W
(Lake Ontario, south of Mississagua)

Date(Y/M/D) : 87 07 23

Time(UT) : 0932

Depth:
closest station: EFO (43 km)
free depth = 10.58 km
depth pegged at 10 km for mechanism

Quality of Readings:
Strong Pg arrivals except on WEO
All Pn arrivals very weak (eg SLTN, most ECTN)
ANT represents 4 stations near Cleveland operated by Weston, all with similar arrivals.
Strong second arrivals fit as Pg (e.g. ANT, CKO, KGN)
Strong arrival on OSHA (Ontario Hydro Oshawa station) contrasts with WEO

Comments:
P1 R4 misfits MNQ and ONTR polarities but has fairly well defined P and T axis fields
P1.5 R2 misfits MNQ, ONTR and variously TRQ or PHEL
P1 R2 misfits MNQ and ONTR and various ratios
P1 R2 subset includes only solutions which fit or nearly-fit SANY, WEO, and MEDY ratios
'Best solution' is chosen from P1 R2 subset; misfits only OSHA ratio and comes close to fitting ONTR polarity
The mechanism does not explain the very weak Pn arrivals to north and south, but does fit strong Pg's on CKO and ANT
Mechanism represents strike-slip/normal faulting on the gently-dipping plane and normal faulting on the nearly vertical plane.
The small component of normal faulting is unusual and is only weakly required by the data (see south dipping planes on P1.5 R2)
This mechanism is not well-determined

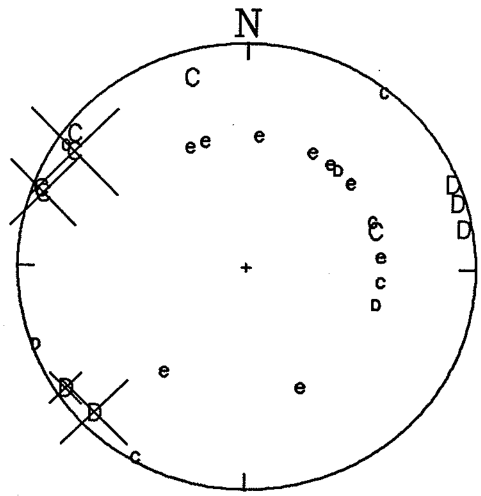
Best Solution:

Strike, Dip, Rake	284	76	-074
Strike, Dip, Rake	056	21	-136
Trend & Plunge of P	214	57	
Trend & Plunge of T	001	29	
Trend & Plunge of B	100	15	

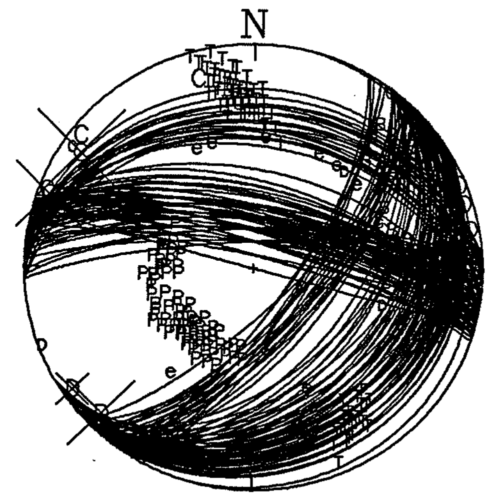
```
+43.440- 79.408F1MN=3.4 0932291 23071987 00.0160.027 0.1 27 36 120.90 225.00   0 1ML=3.3  90  0 0.00
$43.451- 79.422O1MN=3.4 0932290 23071987 00.0100.019 0.1 27 36 120.61 220.00   0 1ML=3.3  90  0 0.00
$43.462- 79.437F1MN=3.4 0932288 23071987 00.0060.011 0.1 27 36 120.38 215.00   0 1ML=3.3  90  0 0.00
$43.473- 79.453F1MN=3.4 0932286 23071987 00.0040.008 0.1 27 36 120.26 210.00   0 1ML=3.3  90  0 0.00
$43.483- 79.470F1MN=3.4 0932284 23071987 00.0060.010 0.1 27 36 120.35 2 5.00   0 1ML=3.3  90  0 0.00
$43.493- 79.485F1MN=3.4 0932281 23071987 00.0090.015 0.1 27 36 120.51 2 0.00   0 1ML=3.3  90  0 0.00
LAKE ONTARIO                          LAC ONTARIO
20 KM SOUTH OF TORONTO                20 KM AU SUD DE TORONTO
FELT AT TORONTO, BURLINGTON,          RESSENTI A TORONTO, BURLINGTON,
STONEY CREEK(NEAR HAMILTON),          STONEY CREEK(PRES DE HAMILTON),
BRANTFORD, GUELPH,                    BRANTFORD, GUELPH,
ST.CATHARINES,                        ST.CATHARINES,
FELT STRONGLY AT MISSISSAUGA          RESSENTI FORTEMENT A MISSISSAUGA
(WALLS MOVING SIDEWAY,                (DEPLACEMENT LATERAL DES MURS,
RATTLED DISHES)                       VIBRATIONS DE VAISSELLE)
ONTARIO                               ONTARIO
HEARD LIKE RUMBLING OF TRUCK          ENTENDU COMME LE GRONDEMENT D'UN CAMION
NOT FELT AT WELLAND (ONT.)            PAS RESSENTI A WELLAND (ONT.)
NOT FELT AT BUFFALO (N.Y.)            PAS RESSENTI A BUFFALO (N.-Y.)
$ CKO STRONG SECOND P ARRIVAL IS COMPRESSION
$RATIO=  0.6   OSHA
$RATIO=  1.57  WEO
$RATIO=  0.62  MEDY
$RATIO=  0.03  SANY
TNT  8707230932P              0.00                        000   0   0    0  0
TNT   N  0025KM          001-44                              0000000 00ML00MN
EFO  8707230932P             -0.10 A32363 C               000   0   0    0  0
EFO   S  0040KM          169-57    19 -045                   0000000 00ML00MN
SANY 8707230932P              0.00 A323828C       B324473 000   0   0    0  0
SANY  SE 0053KM          124-64    19 -024        05 -073    0000000 00ML00MN
OSHAW8707230932P             10.00 B32302 D       B32378  000   0   0    0  0
OSHAW NE 0068KM          041-69    05 -062        05 -166    0000000 00ML00MN
MEDY 8707230932P              0.00 A324371C       B325396 000   0   0    0  0
MEDY  E  0087KM          109-73    19 -006        05 -062    0000000 00ML00MN
WEO  8707230932P             -0.07 A324576D       A325876 000   0   0    0  0
WEO   NE 0105KM          052-76    19 -085        19 -070    0000000 00ML00MN
ATNY 8707230932P                   A324772C       B330123
ATNY  SE 0113KM          128-76    19 -002        05 -024    0000000 00ML00MN
DHN  8707230932P              0.00 B324886+       B330377 000   0   0    0  0
DHN   SE 0120KM          124-77    05 -005        05  025    0000000 00ML00MN
LDN  8707230932P              0.00 B325260D       B330960 000   0   0    0  0
LDN   W  0151KM          253-80    05 -118        05 -236    0000000 00ML00MN
LILH 8707230932P                   A325451C      XB331359
LILH  E  0157KM          111-80    19 -017        00  005    0000000 00ML00MN
ELF  8707230932P              0.00XB325340D      XB331094 000   0   0    0  0
ELF   W  0157KM          261-80    00 -136        00 -273    0000000 00ML00MN
ONTR 8707230932P  B325679+
ONTR  E  0171KM 05  182 095 49                               0000000 00ML00MN
DLA  8707230932P  B325591     0.00                B331615 000   0   0    0  0
DLA   W  0174KM 05  062 249 49                    05 -216    0000000 00ML00MN
PHEL 8707230932P  B325971-
PHEL  E  0196KM 05  177 105 49                               0000000 00ML00MN
ANT  8707230932P  B330419C    0.00                        000   0   0    0  0
ANT   SW 0231KM 05  199 218 49                               0000000 00ML00MN
FRD  8707230932P  B330459     0.00                        000   0   0    0  0
FRD   SW 0235KM 05  181 217 49                               0000000 00ML00MN
CHAU 8707230932P  A330875C                        X334300
CHAU  E  0272KM 19  155 072 49                    00 -251    0000000 00ML00MN
LCNA 8707230932P  B331000E
LCNA  E  0282KM 05  146 084 49                               0000000 00ML00MN


SCP  8707230932P XB33185 E
SCP   SE 0320KM 00  532 156 49                               0000000 00ML00MN
CKO  8707230932P  B331468E  -0.06XB331810         X335565 023 100  70    0  0
CKO   NE 0324KM 05  107 028 49    00 -340         00 -442    0001912 34ML35MN
BVNY 8707230932P XB331935
BVNY  E  0328KM 00  528 089 49                               0000000 00ML00MN
SUO  8707230932P  X331906     0.00 X332187       XB340328 020 100  27    0  0
SUO   N  0353KM 00  195 340 49    00 -426         00 -488    0000848 31ML33MN
EEO  8707230932P  C331923E  -0.06 X332087         X340683 020 100  49    0  0
EEO   N  0357KM 01  154 004 49    00 -599         00 -254    0001539 34ML35MN
OTT  8707230932P            -0.06           B335772XB340919 017 100  42    0  0
OTT   NE 0366KM         052 49                  05  220 00 -260    0001552 34ML35MN
SZO  8707230932P  B332052E    0.00 X332498       XB340837 027 100  30    0  0
SZO   NW 0372KM 05  108 334 49    00 -423         00 -512    0000698 33ML32MN
WBO  8707230932P  B332061   -0.06 X332574   B335938XB341071 017 100  25    0  0
WBO   NE 0373KM 05  098 061 49    00 -372       05  226 00 -319    0000924 32ML33MN
SWO  8707230932P XB332296E    0.00 X332644       XB341301 013 100  11    0  0
SWO   N  0387KM 00  167 342 49    00 -520         00 -471    0000532 29ML31MN
GAC  8707230932P  B332347E  -0.06 X333217         X341615 000   0   0    0  0
GAC   NE 0401KM 05  044 050 49    00 -178         00 -553    0000000 00ML00MN
NWC  8707230932P  B328914     0.00                        000   0   0    0  0
NWC   E  0427KM 05  304 082 49                               0000000 00ML00MN
GRQ  8707230932P  B333023E  -0.09                 X343136 027 100  33    0  0
GRQ   NE 0450KM 05  122 037 49                    00 -396    0000768 36ML34MN
TRQ  8707230932P  B333507+  -0.09 X334571         X344341 013 100  13    0  0
TRQ   NE 0493KM 05  072 049 49    00 -307         00 -402    0000628 33ML34MN
PNY  8707230932P  B329598     0.00                        000   0   0    0  0
PNY   E  0493KM 05  173 070 49                               0000000 00ML00MN
CVL  8707230932P  X3357       0.00                        000   0   0    0  0
CVL   S  0612KM 00  833 172 49                               0000000 00ML00MN
SBQ  8707230932P            -0.07                 X352082 030 100  15    0  0
SBQ   E  0634KM         068 49                    00 -598    0000314 38ML33MN
BLA  8707230932P  B34004      0.00                        000   0   0    0  0
BLA   S  0697KM 05  125 187 49                               0000000 00ML00MN
MNQ  8707230932P  X345191-  -0.10                 X374110 053 100  14    0  0
MNQ   NE 1128KM 00  009 042 49                    00 -423    0000166 44ML34MN
JAQ  8707230932P  X350108   -0.07                 X375049 037 100   9    0  0
JAQ   N  1184KM 00  247 012 49                    00 ****$   0000153 43ML34MN
                Z
```

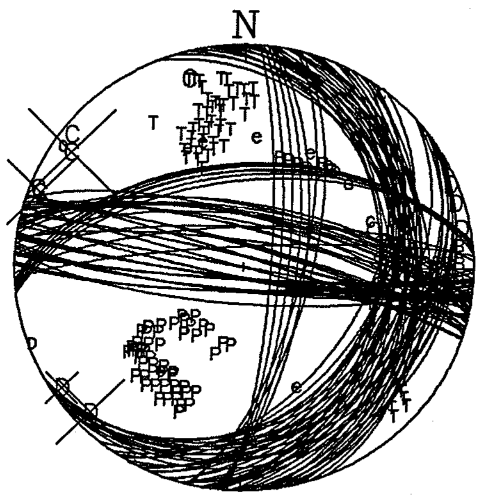
```
     19870723 09:32 MN=3.4 43.467N  79.460W   10.00 KM
EFO 164.000 -77.000 C             strong
SANY124.000 -80.000 C             very strong P
SANY124.000 -80.000 R  0.03
OSHA045.000 -82.000 D             stronger P than WEO
OSHA045.000 -82.000 R  0.6
MEDY110.000 -84.000 C             strong P
MEDY110.000 -84.000 R  0.62
WEO 055.000 -85.000 D             extremely weak beginning
WEO 055.000 -85.000 R  1.57
ATNY128.000 -85.000 C             WCC network
DHN 124.000 -85.000 +             relatively weak
LDN 252.000 -86.000 D             UWO network
ELF 259.000 -86.000 D             UWO network
LILH111.000 -86.000 C             WWC network; taken as Pg
DLA 247.000 -87.000 D             UWO network
ONTR096.000  49.000 +             WCC network
PHEL106.000  49.000 -             WCC network
ANTg217.000 -88.000 +             strong Pg as second arrival
ANTn217.000  49.000 e             extremely weak Pn
KGNg069.000 -88.000 -             strong Pg as 2nd arrival
KGNn069.000  49.000 +             ok
CHAU073.000  49.000 C             WCC network
LCNA085.000  49.000 e             WCC network
CKOg029.000 -88.000 +             strong Pg as second arrival
CKOn029.000  49.000 e             v weak
SCP 156.000  49.000 e
EEO 005.000  49.000 e             v weak
SZO 335.000  49.000 e             v weak
SWO 342.000  49.000 e             v weak
GAC 050.000  49.000 e             weak; second arrival may be +
GRQ 038.000  49.000 e             v weak
TRQ 050.000  49.000 +             weak
MNQ 042.000  49.000 -             poor
```



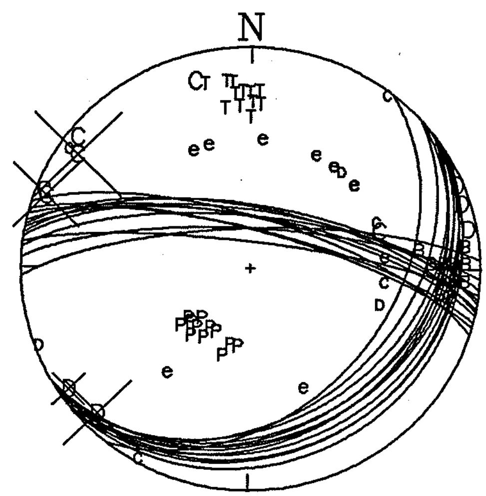
DATA 870723



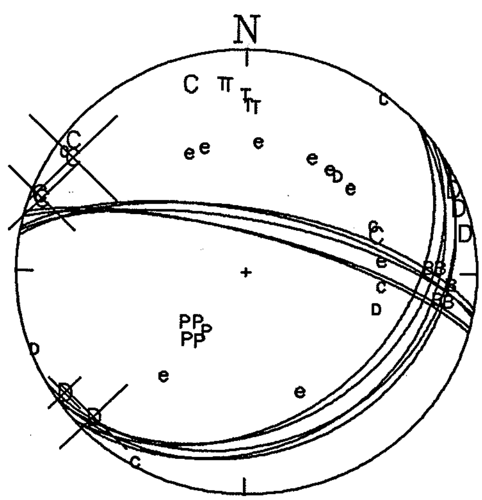
P1 R4



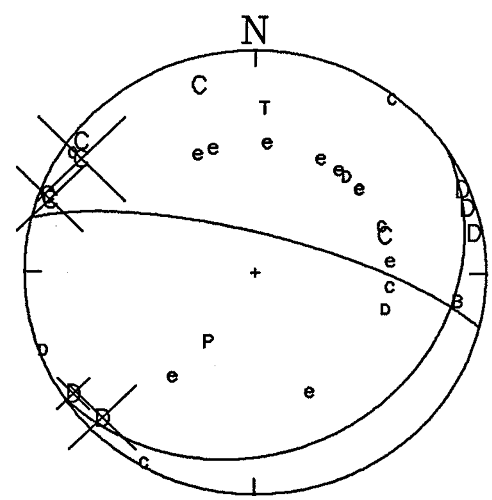
P1.5 R2



P1 R2



P1 R2 subset



BEST SOLUTION

Seismic Zone: LOWER ST LAWRENCE

Magnitude : 3.3 MN

Location : 49.608N 66.983W
(east of Pointe-aux-Anglais)

Date(Y/M/D) : 870806

Time(UT) : 0844

Depth:
closest station: SIC (65 km)
free depth = 18.5 km

Quality of Readings:
All Pn arrivals with exception of MNQ are weak
CHV array all data emergent

Comments:
Poorly-constrained planes if amplitude ratios not used, though T and P axes are delineated
Mechanism not sensitive to exact depth
Use the "Best Solution" extreme caution !!

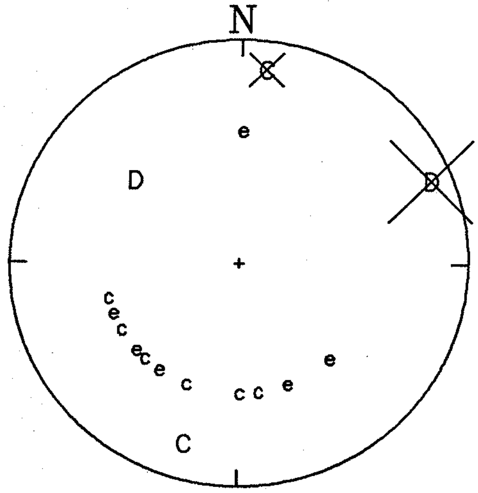
Best Solution:

Strike, Dip, Rake	334	64	56
Strike, Dip, Rake	211	41	139
Trend & Plunge of P	087	13	
Trend & Plunge of T	198	57	
Trend & Plunge of B	350	30	

```
+49.608- 66.983F1MN=3.3 0844137 06081987 00.0110.030 0.2 14 17 110.47Z218.48  17 1ML=3.1  70  0 3.65
LOWER ST.LAWRENCE, QUE.                  BAS-SAINT-LAURENT, QUE.
NEAR POINTE-AUX-ANGLAIS                  PRES DE POINTE-AUX-ANGLAIS
AFTERSHOCK AT 08:47 MN=2.2               REPLIQUE A 08:47 MN=2.2
$RATIO=  1.510 GSQ 442681C 0.12      27.85      51.15 443661 0.09     901.15
$RATIO=  0.119 HTQ 443185D 0.20    -142.18     172.82 444530 0.13     187.18
SIC  8708060844P             0.00 A44249 C                   000   0   0    0  0
SIC   N  0065KM         016-73    13  023                      0000000 00ML00MN
GSQ  8708060844P            -0.22 A442682C           A443660 017 100 376    0  0
GSQ   S  0078KM         187-76    13 -002            13  024   0013897 29ML34MN
HTQ  8708060844P            -0.07 A443183D   X444813 B444530 013 100 119    0  0
HTQ   SW 0112KM         246-80    13 -034    00  063 03 -042   0005752 26ML33MN
MNQ  8708060844P XA443924D  -0.10                    B445904 017 100 275    0  0
MNQ   NW 0165KM 00 -036 309 49                       03 -119   0010164 32ML38MN
EBN  8708060844P  A445184+  -0.22           XB451905 B452477 013 100  22    0  0
EBN   S  0256KM 13  097 202 49               00  079 03 -114   0001063 26ML31MN
SLQ  8708060844P  B44525 E   0.00           XB45210 XB4526   030 307 170    0  0
SLQ   SW 0263KM 03  105 215 49               00  156 00 -151   0001160 30ML32MN
KLN  8708060844P  A445758+  -0.29                            000   0   0    0  0
KLN   S  0311KM 13 -004 171 49                                 0000000 00ML00MN
LMQ  8708060844P  B45020 E   0.00           XB4535           000   0   0    0  0
LMQ   SW 0337KM 03  150 228 49               00 -021           0000000 00ML00MN
LPQ  8708060844P  A450066+  -0.22            X453723 X454478 033 100  59    0  0
LPQ   SW 0337KM 13 -007 223 49               00  175 00 -378   0001123 34ML33MN
LMN  8708060844P  A451374E  -0.29           XB455977         013 100   2    0  3
LMN   S  0449KM 13 -067 158 49               00  048           0000097 24ML25MN
GGN  8708060844P  A452040+  -0.29           XB460948XB463557 033 100   9    0  3
GGN   S  0500KM 13 -021 179 49               00 -062 00  146   0000171 31ML28MN
SCH  8708060844P  B4530  E   0.00                   XB4655   030 137  27    0  0
SCH   N  0580KM 03 -021 001 49                       00 -141   0000413 36ML33MN
GBN  8708060844P         E
GBN   SE 0623KM         137 49                                 0000000 00ML00MN
TRQ  8708060844P  B454223+  -0.09           XB464838XB472244 043 100  16    0  0
TRQ   SW 0680KM 03 -022 239 49               00  002 00 -186   0000234 38ML32MN
GRQ  8708060844P  X455103E  -0.09           XB470107 X473582 033 100  11    0  0
GRQ   SW 0740KM 00  124 247 49               00 -008 00 -546   0000209 38ML32MN
JAQ  8708060844P  B455297   -0.07           XB470641XB474613 023 100   9    0  0
JAQ   NW 0763KM 03  042 311 49               00  042 00 -149   0000246 37ML33MN
GAC  8708060844P            -0.06            X471029 X474399 000   0   0    0  0
GAC   SW 0772KM         239 49               00  256 00 -600   0000000 00ML00MN
EEO  8708060844P XA461360+  -0.06                    X483863 053 100  18    0  0
EEO   W  0958KM 00 -270 254 49                       00 -355   0000213 43ML34MN
             Z
```

```
    19870806 08:44 MN=3.3 49.608N  66.983W   18.48 KM
SIC 016.000 -73.000 C           Analog, strong
GSQ 187.000 -76.000 C           Clear, but weak
GSQ 187.000 -76.000 R  1.510
HTQ 246.000 -80.000 D           Clear
HTQ 246.000 -80.000 R  0.119    Relatively weak S
MNQ 309.000  49.000 D           Not strong
EBN 202.000  49.000 +           very weak
SLQ 215.000  49.000 e           polarity unnreadable
KLN 171.000  49.000 +           OK
LMQ 228.000  49.000 e
LPQ 223.000  49.000 +           weak
LMN 158.000  49.000 e
GGN 179.000  49.000 +           weak
SCH 001.000  49.000 e
GBN 137.000  49.000 e
TRQ 239.000  49.000 +           weak
GRQ 247.000  49.000 e
EEO 254.000  49.000 +
```

LSL870806



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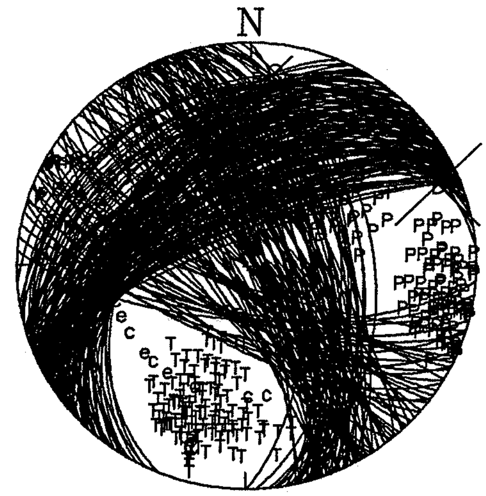
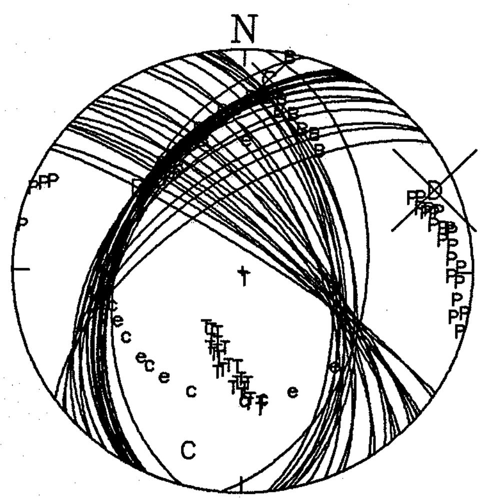
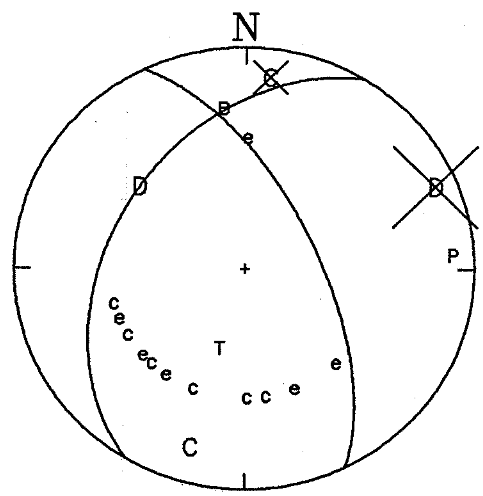


PO R2 INC 10



PO RO



BEST SOLUTION

Seismic Zone: Western Quebec (Kipawa)

Magnitude : 3.2 Mn

Location : 46.848N 78.886W (near L. Kipawa)

Date(Y/M/D) : 870817

Time(UT) : 0132

Depth:

closest station: EEO (27 km)
free depth = 14 km
pegged at 10 km for mechanism
(mechanism is not sensitive to depth changes)

Quality of Readings:

EEO very strong P.
SLTN P onsets all similar.
GAC, WBO and TRQ all weak +
WEO, JAQ, MNQ, too weak to read, all possibly -
CKO very nodal; assumed log ratio of 2 to force planes through CKO

Comments:

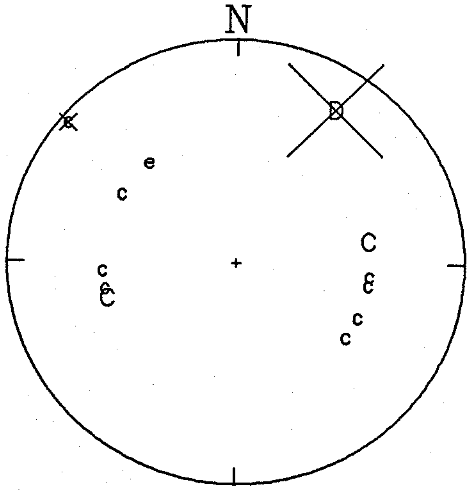
Mechanism is calculated at 10 km, the probable depth of these earthquakes - see Vonk and Adams (1988).
Not well constrained by polarity data
Many of the thrust or strike-slip mechanisms P0 R2 and P0 R1 have either EEO or CKO ratios in error by a factor of 10.
P0R0 INC2 finds acceptable thrust mechanisms missed by P0R1 INC10. Both the thrust and the strike-slip mechanisms are acceptable according to the criteria adopted, so both alternative "best solution"s are given.
On the basis of work in Vonk and Adams (1988) on the seismicity of the Kipawa seismic zone, the thrust mechanism is more consistant with the other earthquake data, and is therefore selected. It represents thrust faulting on NW-trending planes in response to compression from the NE.
Needs waveform modelling to confirm mechanism.
Epicentre is near the site of the 1935 Timiskaming earthquake (M 6.2).

Best Solution:

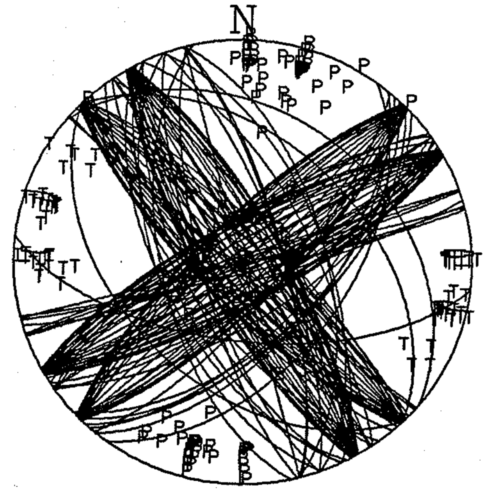
Strike, Dip, Rake	284	63	072
Strike, Dip, Rake	139	32	121
Trend & Plunge of P	027	16	
Trend & Plunge of T	160	67	
Trend & Plunge of B	292	16	

```
+46.848- 78.886F1MN=3.2 0132106 17081987 00.0090.011 0.2 11 15 110.37 210.00    0 1ML=2.7  90 00.00
$ FOLLOWING SOLUTION IS WITH FREE DEPTH
$46.818- 78.895F1MN=3.2 0132109 17081987 00.0180.011 0.2 11 15 110.33Z214.41  21 1ML=2.7  90 00.00
WESTERN QUEBEC REGION                         REGION DE L'OUEST DU QUEBEC
NE OF TEMISCAMING                             NO DE TEMISCAMING
$RATIO= -0.198 EEO 321574D 0.08   -3280.78     3280.78 321904 0.07     2080.78
$RATIO=  2.0   CKO
EEO  8708170132P            -0.06 A321574D          A321903 007 100 264           322013
EEO   SW 0027KM        212-70     13  037           13  021   0023697 19ML38MN
CKO  8708170132P            -0.06 A323393+          A325171 010 100  51           325284
CKO   SE 0146KM        130-86     13 -031           13  012   0003204 24ML32MN
SWO  8708170132P XA323646+                          B325523 010 100  72           325746
SWO   W  0162KM 00 -051 266 49                      03 -086   0004524 26ML34MN
SUO  8708170132P  A323759C                          B325676 017 100  56           325803
SUO   W  0170KM 13 -033 254 49                      03 -155   0002070 26ML31MN
SZO  8708170132P XA324167+                         XB330648 010 100  73           330764
SZO   W  0205KM 00 -055 258 49                      00 -167   0004587 29ML36MN
GRQ  8708170132P  A324610+  -0.09                   B331495 013 100  54           331662
GRQ   E  0233KM 13  038 096 49                      03 -111   0002610 29ML34MN
GAC  8708170132P  A325234+  -0.06                  XB332948
GAC   SE 0292KM 13 -052 115 49                      00 -306   0000000 00ML00MN
WEO  8708170132P XC325707   -0.07                   X333719
WEO   S  0317KM 00  113 173 49                      00 -240   0000000 00ML00MN
TRQ  8708170132P  B325899+  -0.09            X333646XB334255 020 100  22          334782
TRQ   E  0340KM 03  022 100 49               00  203 00 -335   0000691 30ML31MN
WBO  8708170132P  C330019+  -0.06                  XB334586 023 100  18           334752
WBO   SE 0347KM 01  057 125 49                      00 -221   0000492 30ML30MN
KAO  8708170132P  C33045 E
KAO   NW 0394KM 01 -079 319 49                                0000000 00ML00MN
EFO  8708170132P  X33100
EFO   S  0419KM 00  171 185 49                                0000000 00ML00MN
GNT  8708170132P            -0.06                  XB342927 023 100  21           343438
GNT   E  0502KM          094 49                     00 -211   0000574 35ML33MN
LMQ  8708170132P XB33395 C
LMQ   E  0653KM 00  260 080 49                                0000000 00ML00MN
LPQ  8708170132P            -0.22                  XB351540 053 100  18           352645
LPQ   E  0676KM          082 49                     00 -491   0000213 39ML31MN
GTO  8708170132P  A33401 +                   XB34455
GTO   NW 0680KM 13 -008 301 49                00 -124         0000000 00ML00MN
JAQ  8708170132P  A335599   -0.07            XB351141XB355039 037 100  11         355611
JAQ   N  0806KM 13  038 015 49                00 -220 00 -617   0000187 39ML32MN
MNQ  8708170132P XC340342   -0.10                  XB360401 033 100   7           361320
MNQ   NE 0849KM 00  248 057 49                      00 -469   0000133 37ML31MN
               Z
```

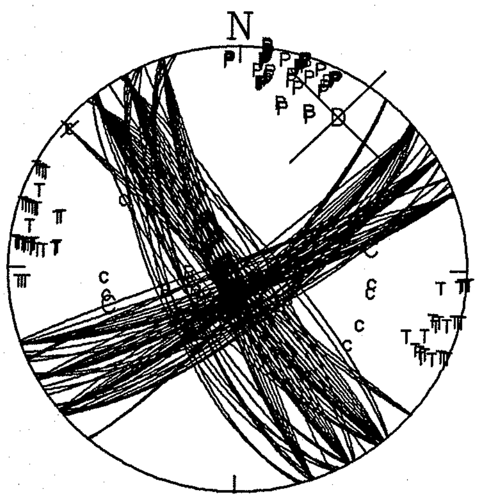
```
    19870817 01:32 MN=3.2 46.818N  78.895W   10.00 KM
EEO 215.000 -70.000 D               Strong P
EEO 215.000 -70.000 R -0.198
CKO 129.000 -86.000 +               Very weak
CKO 129.000 -86.000 R  2.0          Assumed ratio because nodal
SWO 267.000  49.000 +               Not strong
SUO 255.000  49.000 C               OK
SZO 259.000  49.000 +               Not strong
GRQ 095.000  49.000 +               Not strong
GAC 114.000  49.000 +               OK
TRQ 100.000  49.000 +               Poor
WBO 124.000  49.000 +               Noisy signal
KAO 319.000  49.000 e               Emergent
LMQ 080.000  49.000 C               Good
GTO 301.000  49.000 +               OK
```



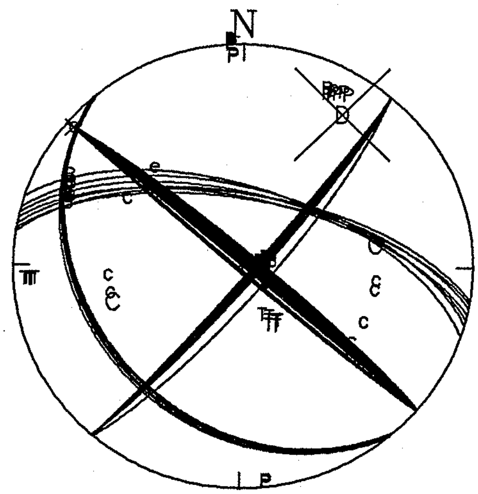
DATA 870817



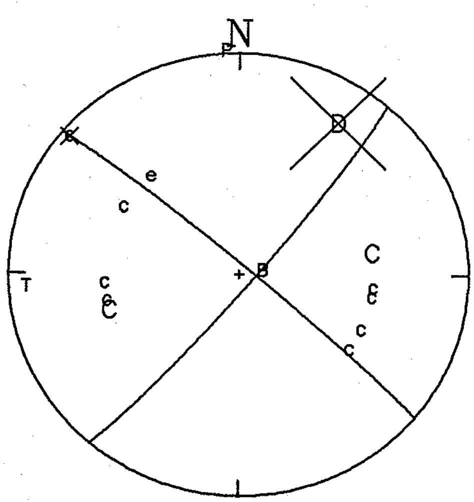
PO R2 15 DEG INC



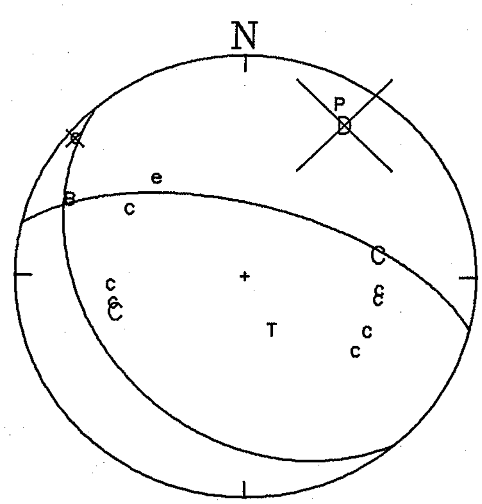
PO R1 INC 10



PO RO INC 2



BEST S-SLIP 870817



BEST THRUST 870817

Seismic Zone:		Western Quebec
Magnitude	:	3.7 Mn
Location	:	45.757N 74.522W (near Kilmar, Quebec)
Date(Y/M/D)	:	871023
Time(UT)	:	1231

Depth:

closest station: TRQ (52 km)
free depth = 13.0 km
(Not very reliable as TRQ Pg not available)

Quality of Readings:

TRQ and GRQ too spiky to read polarities.
MNT ratio not very reliable due to noisy signal.
CKO 2nd arrival (Pg) goes down, fits the best solution.

Comments:

Appears well constrained despite poor distribution of data.
Mechanism represents strike-slip faulting in response to NE compression.

Best Solution:

Strike, Dip, Rake	107	86	50
Strike, Dip, Rake	012	40	174
Trend & Plunge of P	228	30	
Trend & Plunge of T	342	36	
Trend & Plunge of B	110	40	

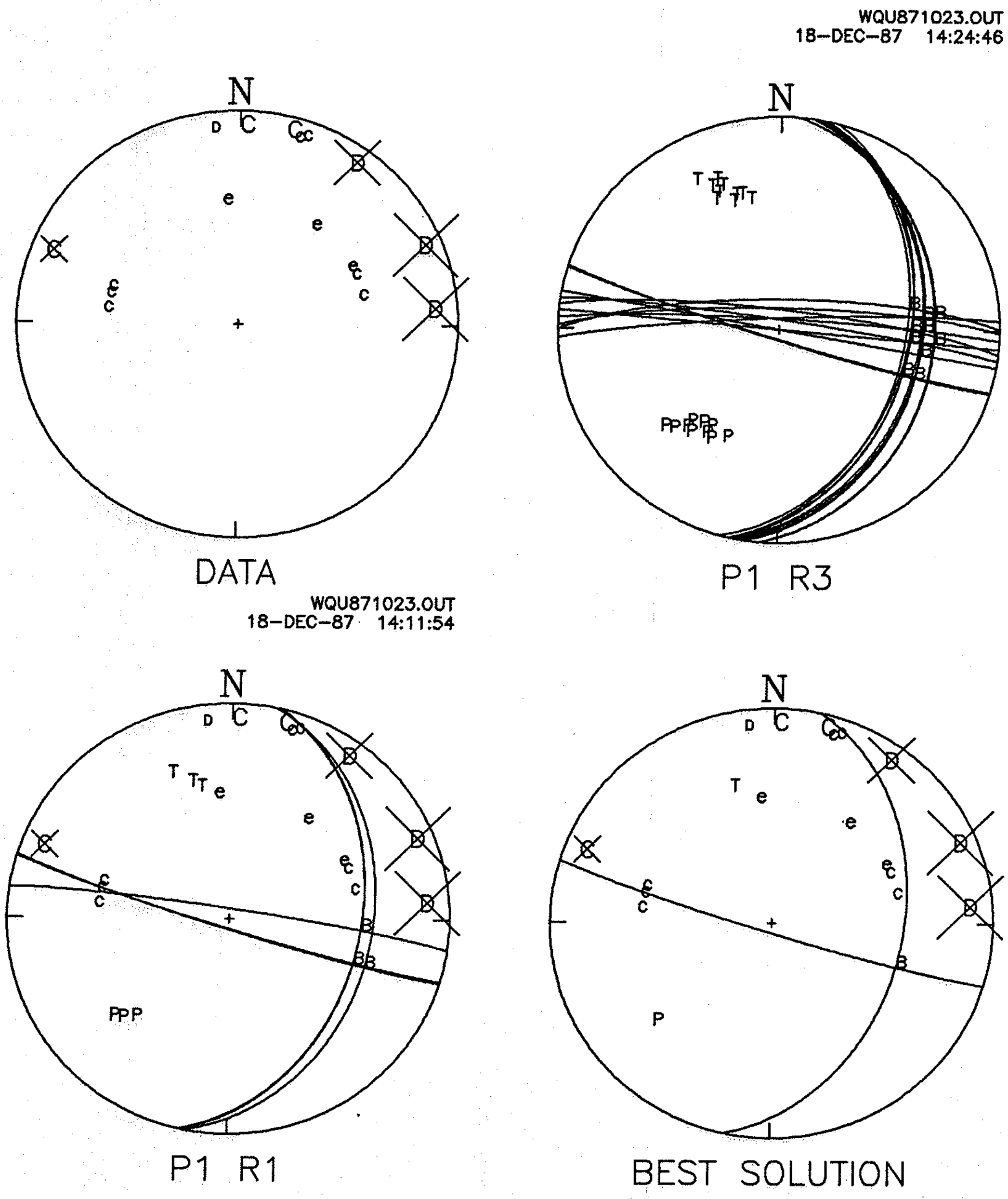
```
+45.766- 74.52901MN=3.7 1231021 23101987 00.0100.016 0.2 28 38 120.58Z213.05  23 1ML=3.3  80  0 0.00
WESTERN QUEBEC                          OUEST DU QUEBEC
NEAR KILMAR, QUE.                       PRES DE KILMAR, QUE.
15 KM NE OF HAWKESBURY                  15 KM NE DE HAWKESBURY
FELT AT SAINTE-ADELE, VAL-DAVID         RESSENTI A SAINTE-ADELE, VAL-DAVID,
AND LACHUTE, QUE.                       ET LACHUTE, QUE.
ALSO FELT AT HAWKESBURY, ONT.           AUSSI RESSENTI A HAWKESBURY, ONT.
CTRZ 8710231231P  X313502
$RATIO=  1.7   MNT
$RATIO=  1.129 WBO 311914D 0.16     -59.55      96.55 313150 0.17     801.45
$RATIO=  0.583 GAC 311533D 0.19   -7851.18   16836.82 312435 0.15   30068.82
$RATIO=  0.60  OTT

TRQ  8710231231P             -0.09 X311168           B311770
TRQ   N  0051KM         358-75    00  091           05  068   0000000 00ML00MN
GAC  8710231231P             -0.06 A311534D          B312444
GAC   W  0074KM         265-79    20  093           05  108   0000000 00ML00MN
MNT  8710231231P             -0.06 B311443C          B312342 007 100 187                312458
MNT   E  0077KM         112-79    05 -033           05 -057   0016785 26ML35MN
MSNY 8710231231P                   X31240 +          X31390
MSNY  S  0089KM         197-81    00  725           00 1153$  0000000 00ML00MN
OTT  8710231231P             -0.06 A311914D          B313145 010 100 276                313566
OTT   SW 0102KM         246-82    20  038           05  053   0017342 29ML37MN
WBO  8710231231P             -0.06 A311915D          A313151 010 100 456                313534
WBO   SW 0103KM         215-82    20  011           20  010   0028651 31ML39MN
BGR  8710231231P                   B31190 -          B31310
BGR   S  0105KM         173-82    05 -024           05 -081   0000000 00ML00MN
NO   8710231231P                   B31210 +          B31345
NO    S  0117KM         199-83    05 -009           05 -052   0000000 00ML00MN
LOZ  8710231231P                   B31220 C          B31380
LOZ   S  0128KM         182-83    05 -086           05 -009   0000000 00ML00MN
PNY  8710231231P                   B312214
PNY   SE 0129KM         143-83    05 -092                     0000000 00ML00MN
PTN  8710231231P                   B31240 C          B31400
PTN   S  0137KM         195-84    05 -044           05 -084   0000000 00ML00MN
GRQ  8710231231P             -0.09 B312554           B314161 010 100 297                314447
GRQ   NW 0139KM         313-84    05  075           05  023   0018661 31ML39MN
WNY  8710231231P  B312736
WNY   S  0162KM 05 -083 161 49                                0000000 00ML00MN
FLET 8710231231P  B312857
FLET  SE 0170KM 05 -057 133 49                                0000000 00ML00MN
HBVT 8710231231P  B313186
HBVT  SE 0194KM 05 -033 143 49                                0000000 00ML00MN
NWC  8710231231P  B313509
NWC   S  0216KM 05  038 172 49                                0000000 00ML00MN
MDV  8710231231P  B313552
MDV   SE 0224KM 05 -015 151 49                                0000000 00ML00MN
CKO  8710231231P             -0.06 A313833D
CKO   W  0228KM         277-86    20 -079                     0000000 00ML00MN
CKO  8710231231P  A313624+  -0.06 A313833    X320013XB320542 020 100 157                320978
CKO   W  0228KM 20 -008 277 49    20 -079    00 -145 00 -087  0004932 33ML37MN
PGY  8710231231P  B313722
PGY   S  0232KM 05  051 170 49                                0000000 00ML00MN
WEO  8710231231P XA315834   -0.07 X315832          XC324141 010 100 187         3      324709
WEO   SW 0361KM 00  586 239 49    00 -214           00 -193   0011750 40ML44MN
EEO  8710231231P  B315362+  -0.06                  XB324280 017 100  63                324664
EEO   W  0364KM 05  070 287 49                      00 -150   0002328 36ML37MN
A54  8710231231P XB315427                           X323914
A54   NE 0367KM 00  103 058 49                      00 -598   0000000 00ML00MN
A11  8710231231P  X315042                           X323984


A11   NE 0371KM 00 -323 062 49                      00 -633   0000000 00ML00MN
LPQ  8710231231P  B315710E  -0.22 X320109          XC325024 027 100 139                325128
LPQ   NE 0388KM 05  108 062 49    00 -400           00 -104   0003235 40ML39MN
A16  8710231231P  B315762                           X324538
A16   NE 0395KM 05  108 060 49                      00 -741   0000000 00ML00MN
A61  8710231231P XB315802                           X324764
A61   NE 0401KM 00  062 056 49                      00 -704   0000000 00ML00MN
A64  8710231231P XB320047                           X325702
A64   NE 0422KM 00  059 055 49                      00 -340   0000000 00ML00MN
A21  8710231231P XB320162                           X325417
A21   NE 0428KM 00  099 058 49                      00 -801   0000000 00ML00MN
SUO  8710231232P                                    X331924 037 100 709          3      332643
SUO   W  0506KM         280 49                      00 -476   0012040 50ML47MN
SWO  8710231232P  B321172+                   X330365XB332464 023 100 378         3      332699
SWO   W  0511KM 05  101 284 49               00  203 00 -060  0010326 48ML46MN
EBN  8710231231P  B321309+  -0.22                  XA332220 017 100  24                333196
EBN   NE 0517KM 05  135 066 49                      00 -516   0000887 36ML36MN
SZO  8710231232P  X322398                    X331173 X333002 030 100 358         3      333446
SZO   W  0544KM 00  920 280 49               00  300 00 -458  0007498 48ML45MN
KLN  8710231231P  B322590+  -0.29           XA332776XA340173 030 100  14                340934
KLN   E  0640KM 05 -086 076 49               00 -166 00  000  0000293 37ML32MN
GSQ  8710231231P  B323065   -0.22            X333381XB340666 027 100  26                341107
GSQ   NE 0661KM 05  138 055 49               00 -002 00 -091  0000605 40ML36MN
MNQ  8710231231P  A323173E  -0.10           XC333956XB341046 043 100  68                341328
MNQ   NE 0682KM 20  005 037 49               00  143 00 -275  0000994 45ML38MN
JAQ  8710231231P  B325773E  -0.07           XC342354 X350915 030 100  20                351313
JAQ   N  0899KM 05 -037 355 49               00 -071 00 -484  0000419 43ML36MN
             Z
```

19871023 12:31 MN=3.7 45.766N 74.529W 13.05 KM

GAC	265.000	-79.000	D		Spiky but OK
GAC	265.000	-79.000	R	0.583	
MNT	112.000	-79.000	C		Noisy
MNT	112.000	-79.000	R	1.7	Not too reliable, but weak P
MSNY	197.000	-81.000	+		LDGO
OTT	246.000	-82.000	D		OK
OTT	246.000	-82.000	R	0.60	
WBO	215.000	-82.000	D		Very weak
WBO	215.000	-82.000	R	1.129	
BGR	173.000	-82.000	-		LDGO
NO	199.000	-83.000	+		Goes down, i.e. W, i.e. +
LOZ	182.000	-83.000	C		Goes down, but polarity reversed+
PTN	195.000	-84.000	C		LDGO
CKO	277.000	49.000	+		Weak, strong 2nd arrival D
EEO	287.000	49.000	+		Weak
LPQ	062.000	49.000	e		
SWO	284.000	49.000	+		
EBN	066.000	49.000	+		Weak
KLN	076.000	49.000	+		OK
MNQ	037.000	49.000	e		
JAQ	355.000	49.000	e		


WQU871023.OUT
18-DEC-87 14:24:46
N
DATA
N
P1 R3
WQU871023.OUT
18-DEC-87 14:11:54
N
P1 R1
N
BEST SOLUTION

Seismic Zone: Western Quebec

Magnitude : 3.5 MN

Location : 45.769 N 75.336 W
(Blanche, Que)

Date(Y/M/D) : 87 11 11

Time(UT) : 07 58 33

Depth:
closest station: GAC (13 km)
free depth = 17 km

Quality of Readings:
Coverage to the south is poor
Many stations are emergent or nodal, difficult to get definitive polarities e.g. LPQ, KLN, GGN, GSQ,
Charlevoix and Sudbury networks both have weak arrivals
GNT dead
GAC ratio determined but could not be used because take-off angle near the critical discontinuity
Nodal arrivals at GRQ and CKO-Pn

Comments:
Moderately-well defined thrust mechanism in response to east-west compression
P1.5 solutions misfit A64 polarity, PTN or BGR polarity and JAQ
P1 solutions all fit JAQ
Best solution chosen from P1 R2 as the solution which most nearly makes CKO-Pn nodal; this fits PTN for which the polarity is confirmed correct, but misfits BGR which has unconfirmed polarity. Solution misfits OTT and TRQ ratios about equally

Best Solution:

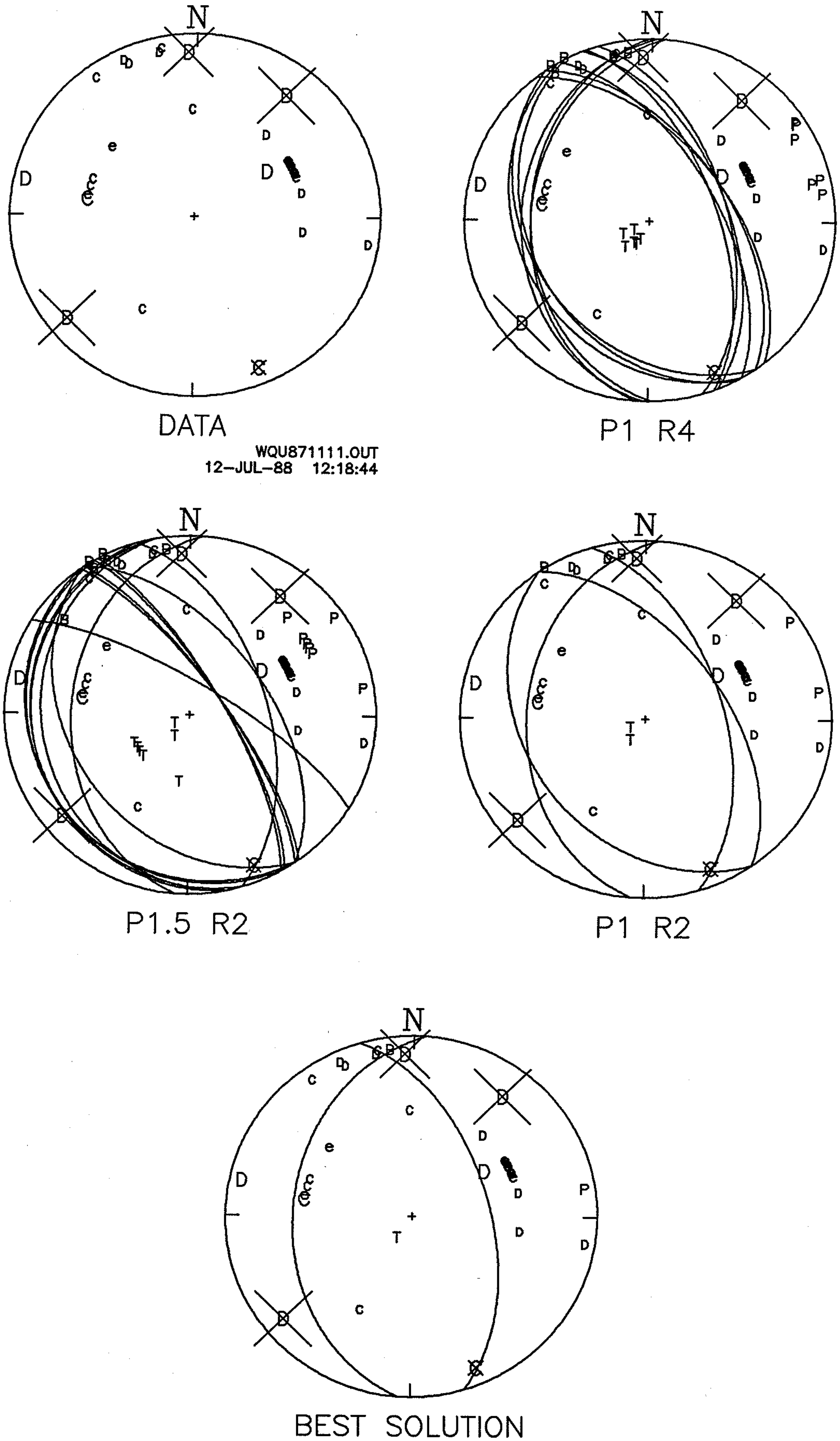
Strike, Dip, Rake	343	56	078
Strike, Dip, Rake	184	36	107
Trend & Plunge of P	082	10	
Trend & Plunge of T	215	76	
Trend & Plunge of B	350	10	

```
+45.769- 75.336F1MN=3.5 0758331 11111987 00.0080.011 0.2 20 29 240.43Z217.15  10 1ML=3.5 190F 0 0.00
$ FELT                                   OUEST DU QUEBEC
$IN BUCKINGHAM ,QUE.                     RESSENTI
$VIBRATIONS LASTED 4-5 SEC.              A BUCKINGHAM, QUE
$ONE ALARM SYSTEM WENT ON                LES VIBRATIONS ONT DURE 4-5 SEC.
$NOTHING FELL DOWN THE SHELVES           UN SYSTEME D'ALARME A ETE DECLENCHE
$FELT MORE INTENSELY AT LA BLANCHE,QUE   RIEN N'EST TOMBE DES ETAGERES
$                                        RESSENTI PLUS FORTEMENT A LA BLANCHE
$REPORTED FELT IN STITTSVILLE, ONT.      RAPPORTE RESSENTI A STITTSVILLE, ONT.
$AFTERSHOCKS AT 08:00 (MAG. 3.2),        REPLIQUES A 08:00 (MAG 3.2),
$ 08:40 (MAG <2 ), 08:49 (MAG< 2 ),      08:40 (MAG <2 ), 08:49 (MAG < 2 ),
$AND 16:27 (MAG (ML) 1.1                 ET 16:27 (MAG (ML) 1.1 .
$ SOURCE POLICE OF BUCKINGHAM, QUE.
$ THE OTTAWA CITIZEN REPORTED IT FELT IN STITTSVILLE
$ THE 08:40 AND 08:49 DID NOT TRIGGER ECTN
$ FROM THE GAC ANALOGUE RECORDS THESE AFTERSHOCKS WERE SMALL
$ THE 16:27 EVENT ONLY HAS TWO STATIONS (OTT AND GAC).
$CANNOT USE GAC RATIO 1.156 583713D 0.18   -3784.44   23164.44 583952 0.30   54156.44
$RATIO=  0.508 TRQ 584631D 0.15     -840.58     2307.42 585575 0.16     2707.42
$RATIO=  0.509 OTT 584208D 0.20     -977.92     2826.08 584823 0.21     3157.92
$RATIO=  0.771 WBO 584727D 0.21     -225.61      475.39 585717 0.14     1330.39
$RATIO=  1.982 GRQ 594969C 0.12        7.11       33.11 59 161 0.10      683.11
GAC   8711110758P              -0.06 A583712D          A583946
GAC     SW 0013KM          237-38     16  043          16  019   0000000 00ML00MN
OTT   8711110758P              -0.06 A584203D          A584816 023 1001167              584844
OTT     SW 0051KM          216-71     16  014          16 -015   0031880 32ML34MN
TRQ   8711110758P              -0.09 A584628D          B585574 010 100 380              585909
TRQ     NE 0079KM          050-78     16  003          04 -010   0023876 29ML36MN
WBO   8711110758P              -0.06 A584729D          B585720 007 100 223              585820
WBO     S  0086KM          177-79     16  003          04 -043   0020016 27ML36MN
MSNY  8711110758P                    B58490 -          B59000
MSNY    SE 0093KM          156-80     04  056          04  028   0000000 00ML00MN
GRQ   8711110758P              -0.09 A584970C          B590136 013 100 284              590186
GRQ     NW 0102KM          337-80     16 -015          04 -074   0013726 29ML36MN
NO    8711110758P                    XB58515 -        XB59045
NO      S  0113KM          167-81     00 -010          00 -070   0000000 00ML00MN
BGR   8711110758P                    XB58540 +        XB58595
BGR     SE 0129KM          144-82     00 -011          00 ****$  0000000 00ML00MN
PTN   8711110758P                    XB58550 +        XB59110
PTN     S  0136KM          168-83     00 -021          00 -048   0000000 00ML00MN
MNT   8711110758P              -0.06 A585464D          B591132 017 100 265              591312
MNT     E  0137KM          102-83     16 -079          04 -050   0009794 31ML36MN
LOZ   8711110758P                    XB58555 -        XB59120
LOZ     SE 0141KM          155-83     00 -052          00 -089   0000000 00ML00MN
CKO   8711110758P              -0.06 B585921-          B591791 010 100 117              591920
CKO     W  0166KM          279-84     04 -092          04 -207   0007351 29ML37MN
CKO   8711110758P  B585854C  -0.06
CKO     W  0166KM 04 -072 279 49                                 0000000 00ML00MN
KGN   8711110758P              +
KGN     SW 0194KM          208 49                                0000000 00ML00MN
SBQ   8711110758P XB591302-  -0.07 X591677             B594818 020 100  78              594898
SBQ     E  0270KM 00  111 098 49    00 -003            04 -074   0002450 32ML35MN
EEO   8711110758P  A591589+  -0.06 X592163             B595835 027 100 113              000119
EEO     W  0304KM 16 -026 290 49    00 -075            04 -027   0002630 35ML36MN
WEO   8711110758P XB591808   -0.07                    XB595722
WEO     SW 0309KM 00  139 232 49                       00 -268   0000000 00ML00MN
A54   8711110759P  X593063E        X593714             X602878 030 100  87              003312
A54     NE 0421KM 00  028 062 49    00 -401            00 -249   0001822 39ML37MN
A11   8711110759P  X593762E                      X602982         032 100  84              003720
A11     NE 0427KM 00  659 066 49                 00 1578$        0001649 39ML37MN


SUO   8711110758P  C593435E                      XB601793XB603270 030 100  46           003945
SUO     W  0444KM 01  121 281 49                  00  020 00 -501  0000963 37ML35MN
LPQ   8711110758P  A593414E  -0.22                      XB603380 030 100  66           003420
LPQ     NE 0444KM 16  079 065 49                          00 -413  0001382 39ML36MN
A16   8711110759P  X594107                                X603547 025 100  50           003913
A16     NE 0450KM 00  731 063 49                          00 -372  0001257 38ML36MN
SWO   8711110758P  B593357+                      XB601859XB603245 047 100  81           004215
SWO     W  0450KM 04 -025 286 49                  00 -032 00 -679  0001083 40ML35MN
A61   8711110759P  X593463E        X594167                X603802 015 100  28           004362
A61     NE 0455KM 00  024 060 49   00 -483                00 -253  0001173 35ML36MN
A64   8711110759P  X593715+        X594483                X604246 030 100  52           004857
A64     NE 0475KM 00  034 059 49   00 -490                00 -371  0001089 38ML36MN
SZO   8711110758P XB593788E                      XB602417XB604311 023 100  29           005012
SZO     W  0482KM 00  012 281 49                  00 -162 00 -520  0000792 36ML35MN
A21   8711110759P  X593846E                               X604439 027 100  78           005128
A21     NE 0482KM 00  072 061 49                          00 -392  0001815 40ML38MN
EBN   8711110758P  B595016E  -0.22               XC604798XB611200 023 100  21           011427
EBN     E  0575KM 04  086 068 49                  00  222 00 -254  0000574 37ML34MN
HTQ   8711110758P  X601466   -0.07                       XC613193 053 100  69           014456
HTQ     NE 0647KM 00 1676$051 49                          00 -257  0000818 44ML37MN
GGN   8711110758P  X600212   -0.29               XC610802XB613782 040 100  11
GGN     E  0670KM 00  119 093 49                  00  203 00 -336  0000173 36ML30MN
KAO   8711110758P XB6001  E
KAO     NW 0676KM 00 -032 310 49                                   0000000 00ML00MN
KLN   8711110758P  A600466-  -0.29               XB611167          027 100   8           011850
KLN     E  0701KM 16 -006 077 49                  00 -093          0000186 35ML31MN
GSQ   8711110758P  B600645E  -0.22                      XC614804 043 100  31           015560
GSQ     NE 0713KM 04  030 058 49                          00 -513  0000453 42ML35MN
MNQ   8711110758P  B600690-  -0.10               XB611963XB615268 043 100  35           015972
MNQ     NE 0720KM 04 -003 040 49                  00  303 00 -241  0000511 42ML36MN
LMN   8711110758P  B601898                       XC614025
LMN     E  0818KM 04  022 086 49                  00  293          0000000 00ML00MN
JAQ   8711110758P  B602955+  -0.07
JAQ     N  0895KM 04  141 358 49                                   0000000 00ML00MN
SCH   8711110758P  X61058
SCH     NE 1176KM 00  344 028 49                                   0000000 00ML00MN
                 Z
```

19871111 07:58 MN=3.5 45.769N 75.336W 17.15 KM

GAC	237.000	-38.000	D		not strong
OTT	216.000	-71.000	D		good
OTT	216.000	-71.000	R	0.509	
TRQ	050.000	-78.000	D		strong
TRQ	050.000	-78.000	R	0.508	
WBO	177.000	-79.000	D		strong
WBO	177.000	-79.000	R	0.771	
MSNY	156.000	-80.000	-		Revetta - 'not clear'
GRQ	337.000	-80.000	C		very weak
GRQ	337.000	-80.000	R	1.982	
NO	167.000	-81.000	-		goes west therefore -
BGR	144.000	-82.000	+		Revetta - 'good'
PTN	168.000	-83.000	+		Revetta - 'certain'
MNT	102.000	-83.000	D		good
LOZ	155.000	-83.000	-		Revetta: up, but polarity reversed
CKO	279.000	-84.000	-		strong second arrival
CKO	279.000	49.000	C		very weak
KGN	208.000	49.000	+		ok
SBQ	098.000	49.000	-		not clear on noisy signal
EEO	290.000	49.000	+		v weak, nearly nodal
A54	062.000	49.000	e		could be -
A11	066.000	49.000	e		
SUO	281.000	49.000	e		
LPQ	065.000	49.000	e		v weak, possibly -
SWO	286.000	49.000	+		v weak
A61	060.000	49.000	e		
A64	059.000	49.000	+		ok
SZO	281.000	49.000	e		
A21	061.000	49.000	e		
EBN	068.000	49.000	e		emergent on noisy trace
KAO	310.000	49.000	e		
KLN	077.000	49.000	-		not very convincing
GSQ	058.000	49.000	e		
MNQ	040.000	49.000	-		weak
JAQ	358.000	49.000	+		ok



N
DATA
WQU871111.OUT
12-JUL-88 12:18:44
P1 R4
P1.5 R2
P1 R2
BEST SOLUTION

Seismic Zone: Western Quebec

Magnitude : 3.9 MN

Location : 46.335 N 75.686 W
(East of Maniwaki)

Date(Y/M/D) : 88 03 10

Time(UT) : 14 42 55

Depth:
closest station: GRQ (33 km.)
free depth = 13.3 km.

Quality of Readings:
Coverage of stations is poor to the southwest
EEO Pg reading is a fairly good dilatation, but was not used
KAO + is good, secondary phase P + 2.0 sec. (dilatation) may be a depth phase
GTO might be an e, 1.5 sec. earlier

Comments:
P0 R4 - is fairly well constrained
P0 R1 - misfits GRQ ratio, but is considered the best solution
Solution represents sinistral slip on a NW striking vertical plane or dextral slip on the NNE striking plane in response to NE directed compression.

Best Solution:

Strike, Dip, Rake	122	86	050
Strike, Dip, Rake	027	40	174
Trend & Plunge of P	243	29	
Trend & Plunge of T	358	36	
Trend & Plunge of B	125	40	

19880310 14:42 MN=3.9 46.335N 75.687W 13.35 KM

GRQ	336.000	-68.000	C		Strong
GRQ	336.000	-68.000	R	0.519	
GAC	167.000	-79.000	C		Strong
GAC	167.000	-79.000	R	0.264	
TRQ	098.000	-81.000	D		Strong
TRQ	098.000	-81.000	R	0.032	
OTT	181.000	-83.000	C		Strong
OTT	181.000	-83.000	R	0.917	
CKO	255.000	-85.000	D		Good
WBO	168.000	-85.000	C		weak but definite
MNT	119.000	49.000	+		poor
BGR	148.000	49.000	D		Strong
PTN	164.000	49.000	D		Very strong
LOZ	155.000	49.000	D		Strong ; trace goes up but polarity was reversed
DPQ	079.000	49.000	C		very weak ; nodal
EEO	279.000	49.000	e		very weak ; emergent
SUO	273.000	49.000	-		analog
SWO	278.000	49.000	-		weak ; digital
LMQ	070.000	49.000	+		
LPQ	073.000	49.000	+		
A64	067.000	49.000	+		
SLQ	071.000	49.000	+		
KAO	307.000	49.000	+		analog
MNQ	045.000	49.000	C		Good
KLN	082.000	49.000	+		weak but clear under filtering
GTO	298.000	49.000	-		
SCH	030.000	49.000	+		weak

```
+46.335- 75.686F1MN=3.9 1442556 10031988 00.0040.007 0.4 20 26 230.30Z213.31  10 1ML=3.9 180F 0 0.00
                                          OUEST DU QUEBEC
FELT MODERATELY (IV) IN MANIWAKI,         RESSENTI MODEREMENT (IV) A MANIWAKI,
STE.FAMILLE D'AUMOND,                     SAINTE-FAMILLE D'AUMOND,
STE.THERESE-DE-LA-GATINEAU,               SAINTE-THERESE-DE-LA-GATINEAU,
LAC-DES-TRENTE-ET-UN-MILLE, QUE.          LAC-DES-TRENTE-ET-UN-MILLE, QUE.
FELT MIDLY (III) IN                       RESSENTI LEGEREMENT (III) A
LAC-DES-BOIS-FRANCS, LAC CAYAMANT         LAC-DES-BOIS-FRANCS, LAC CAYAMANT
NOTRE-DAME-DU-LAUS, VAL-BARETTE,          NOTRE-DAME-DU-LAUS, VAL-BARETTE,
MONT-LAURIER, GRAND REMOUS,               MONT-LAURIER, GRAND REMOUS,
AND VAL-LIMOGES, QUE.                     ET VAL-LIMOGES, QUE.
ALSO FELT VERY LOCALLY IN OTTAWA          AUSSI RESSENTI TRES LOCALEMENT A OTTAWA
WESTERN QUEBEC
$ CALL FROM JOHN CARR, OTTAWA, (613) 729-6032
$ 3 STORY APT. BUILDING, TOP FLOOR OFF SHILLINGTON/FISHER BED SHOOK MILDLY
$ METEO STATION IN MANIWAKI FELT IT LIKE FURNACE EXPLOSION (HEARD NOISE)
$ MANY PHONE CALLS FROM MANIWAKI
$RATIO=  0.519 GRQ 430169C 0.17     2343.09    5300.91 43 584 0.09     7732.91
$RATIO=  0.264 GAC 430776C 0.19     1857.02    1857.02 431472 0:22     3410.98
$RATIO=  0.032 TRQ 431025D 0.16     -382.79    1034.21 431683 0.13      412.21
$RATIO=  0.917 OTT 431278C 0.13       91.10     270.10 432393 0.15      751.90
GRQ  8803101443P            -0.09 A430170C           A430581 007 1001836          430650
GRQ   NW 0033KM        336-68     13  024            13  010    0164799 30ML47MN
GAC  8803101443P            -0.06 A430775C           A431590
GAC   S  0072KM        167-80     13  027            13 -029    0000000 00ML00MN
TRQ  8803101443P            -0.09 A431025D           A432042 013 100 765          432221
TRQ   E  0088KM        098-81     13  016            13 -027    0036974 33ML39MN
OTT  8803101443P            -0.06 A431276C           A432563 017 1001059          432617
OTT   S  0105KM        181-83     13  009            13  043    0039141 35ML40MN
CKO  8803101443P            -0.06 A431834D           A433520 020 1001005          433788
CKO   W  0141KM        255-85     13 -024            13 -026    0031573 37ML42MN
WBO  8803101443P            -0.06 A431993C           B433793 010 100 297          434205
WBO   S  0152KM        168-85     13 -031            03 -042    0018661 32ML40MN
NO   8803101443P XB43246
NO    S  0181KM 00  071 163 49                                  0000000 00ML00MN
MNT  8803101443P  A432464+  -0.06                   XB434614 013 100 314          434831
MNT   SE 0185KM 13  021 119 49                       00 -147    0015176 34ML40MN
BGR  8803101443P XB43267 D
BGR   SE 0196KM 00  093 148 49                                  0000000 00ML00MN
PTN  8803101443P  B43275 D
PTN   S  0203KM 03  086 164 49                                  0000000 00ML00MN
LOZ  8803101443P XB43280 D
LOZ   SE 0209KM 00  061 155 49                                  0000000 00ML00MN
DPQ  8803101443P  A432980C  -0.06                   XA435773 017 100 284          435869
DPQ   E  0227KM 13  028 079 49                       00 -155    0010497 36ML40MN
EEO  8803101443P  B433488E  -0.06XB433644           XA440702 013 100 139          441073
EEO   W  0262KM 03  098 279 49     00 -161           00 -225    0006718 34ML39MN
SBQ  8803101443P XC434340   -0.07                   XB442062 033 100 165          442275
SBQ   E  0311KM 00  359 109 49                       00 -223    0003142 37ML37MN
WEO  8803101443P  C434277   -0.07                   XC442820 010 100 293          444080
WEO   SW 0333KM 01  026 220 49                       00 -087    0018410 41ML46MN
SUO  8803101443P XB43563 -
SUO   W  0410KM 00  452 273 49                                  0000000 00ML00MN
SWO  8803101443P  B43527 -
SWO   W  0410KM 03  084 278 49                                  0000000 00ML00MN
A54  8803101443P  X431376   +45.0                    X440647 022 100 130
A54   E  0421KM 00  558 071 49                       00 -212    0003713 41ML40MN
LMQ  8803101443P XB43542 +
LMQ   E  0430KM 00 -008 070 49                                  0000000 00ML00MN
A11  8803101443P  X430921   +45.0                    X441011 023 100 079


A11   E  0431KM 00 -020 074 49                       00 -137    0002158 39ML38MN
LPQ  8803101443P  C435656+  -0.22XC440325           XC445928 027 100 137          450111
LPQ   E  0447KM 01 -004 073 49     00 -478           00 -195    0003188 42ML40MN
A16  8803101443P  X431875   +45.0                    X441524 023 100 79
A16   E  0451KM 00  699 072 49                       00 -166    0021581 50ML48MN
A61  8803101443P  X431136   +45.0                    X441585 023 100 085
A61   E  0452KM 00 -056 068 49                       00 -133    0002322 40ML39MN
EFO  8803101443P  X4410
EFO   SW 0461KM 00 1197$220 49                                  0000000 00ML00MN
A64  8803101443P  X431347+  +45.0                    X441879 035 100 66
A64   NE 0471KM 00 -073 067 49                       00 -367    0011848 49ML46MN
A21  8803101443P  X431493   +45.0                    X442305 025 100 121
A21   E  0481KM 00 -051 069 49                       00 -229    0003041 42ML40MN
SLQ  8803101443P XB44121 +
SLQ   E  0529KM 00  575 071 49                                  0000000 00ML00MN
EBN  8803101443P  B441341   -0.22           XC451174 X453713 047 100  64          454553
EBN   E  0581KM 03  050 075 49               00  155 00 -151    0000856 41ML36MN
KAO  8803101443P  B44172 +                   X4518    X4543
KAO   NW 0615KM 03  036 307 49               00  078 00 -496    0000000 00ML00MN
HTQ  8803101443P            -0.07                    XC454803 027 100  34          455150
HTQ   NE 0632KM         057 49                       00 -481    0000791 41ML36MN
MNQ  8803101443P  B442598C  -0.10                    XC460535 020 100  14          462300
MNQ   NE 0693KM 03 -043 045 49                       00 -438    0000440 38ML35MN
GGN  8803101443P            -0.29                    X460769 067 100  43          462261
GGN   E  0703KM         098 49                       00 -522    0000403 42ML34MN
GSQ  8803101443P  A442753   -0.22           XC453941 X461357 047 100  46          462561
GSQ   NE 0706KM 13 -057 063 49               00  271 00  008    0000615 43ML36MN
KLN  8803101443P  A442954+  -0.29           XA453977 X461181 033 100  22          461811
KLN   E  0716KM 13  007 082 49               00  074 00 -472    0000419 40ML35MN
JAQ  8803101443P  B444255   -0.07           XC460071XB464409 033 100  30          464895
JAQ   N  0831KM 03 -074 360 49               00 -260 00 -448    0000571 44ML37MN
GTO  8803101443P XB44561 -
GTO   NW 0922KM 00  185 298 49                                  0000000 00ML00MN
SCH  8803101443P  B45197 +
SCH   NE 1134KM 03 -046 030 49                                  0000000 00ML00MN
           Z
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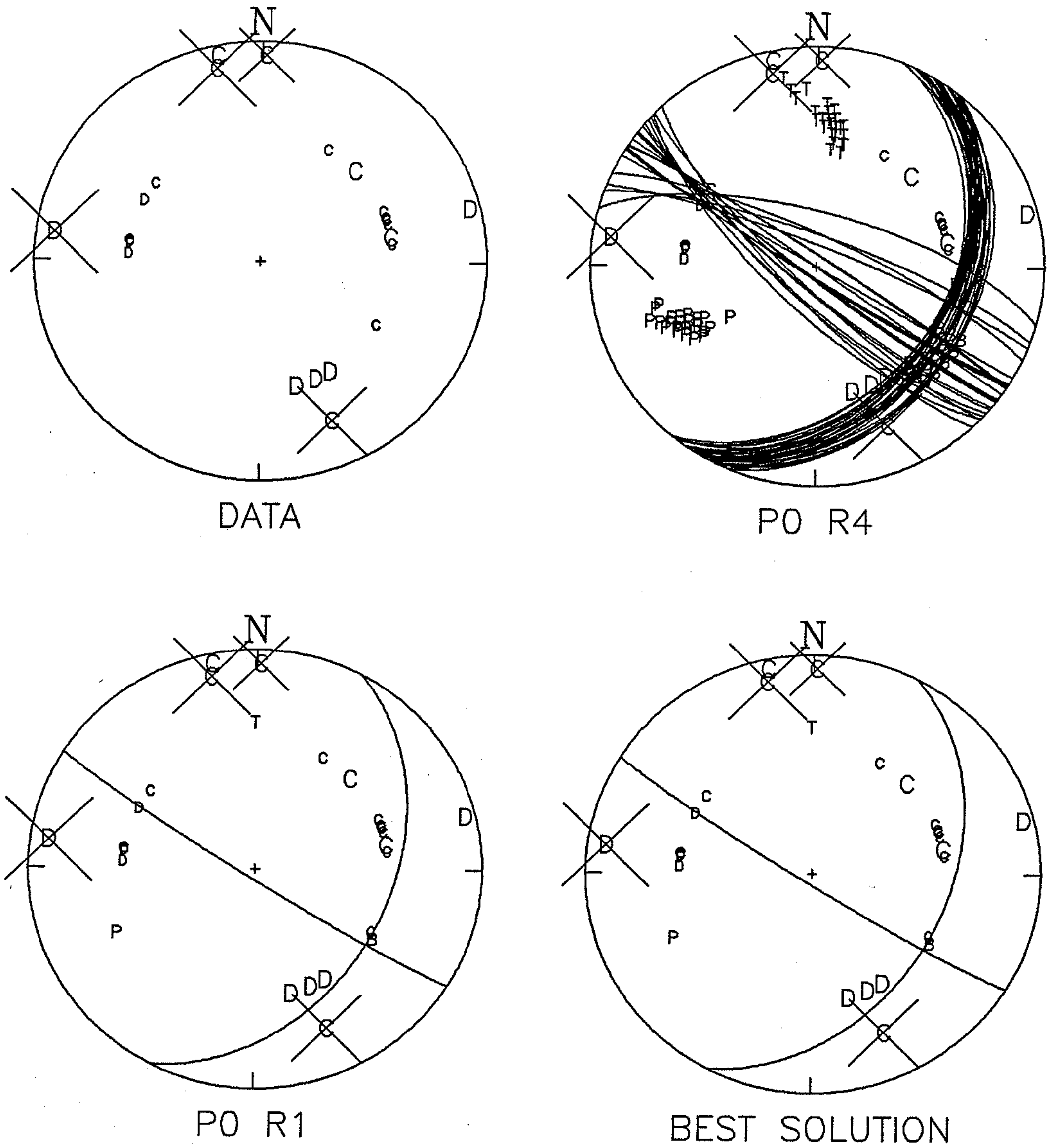
WQU880310.OUT
29-MAR-88 12:00:32



Seismic Zone: NORTHERN APPALACHIANS

Magnitude : 3.7 MN

Location : 46.03 N 64.90 W
(Near Lower Turtle Creek, and about 12 km SW of Moncton, N.B.)

Date(Y/M/D) : 88 04 24

Time(UT) : 01 45

Depth:

closest station: LMN (21km)
free depth = 10.5 km
depth from Rg phase on KLN: between 3 and 5 km: since when filtered 1 to 3 Hz gives Amp Rg = 1.5 * Amp SV; therefore not shallower than 3 km (Langston, 1987, JGR), and presence of Rg places greatest depth about 5 km

Quality of Readings:

ECTN data suggests 2 nodes, between LPQ and EBN, and NW of GSQ
western ECTN are very nodal, as is GBN and KLN
GGN is taken as Pg but would be nodal if Pn

Comments:

Solutions for depths Z=10 and Z=4 are quite similar and are run at 3 deg increments
All solutions misfit HTQ polarity
P0.5 R0 restricts the number of mechanisms somewhat
Best solution is chosen from P0.5 R0 as the mechanism that best fits the nodal KLN and GBN arrivals and results in a strong arrival as observed on UNB
Best solution represents thrust faulting on N- or NW-trending planes in response to NE compression
Earthquake is near the MN 3.6 on 840923. That earthquake was located about 6 km to the NE and may have also been shallow, though it gave a free depth of 12 km. It had a strike-slip mechanism, in response to the same NE compression

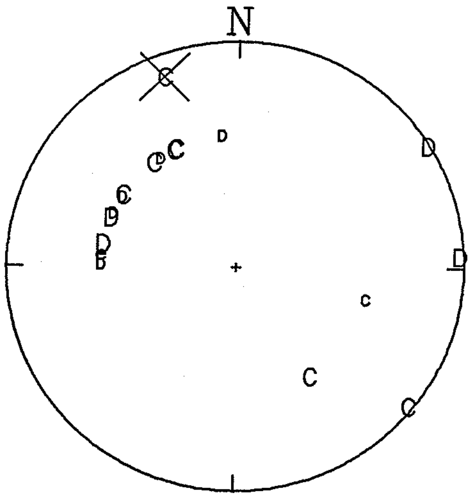
Best Solution:

Strike, Dip, Rake	307	59	054
Strike, Dip, Rake	182	46	134
Trend & Plunge of P	062	08	
Trend & Plunge of T	165	59	
Trend & Plunge of B	327	30	

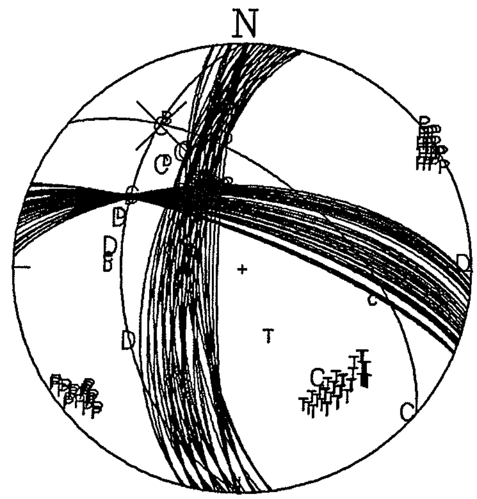
```
+46.031- 64.905F1MN=3.7 0114519 24041988 00.0150.025 0.4 19 22 150.00N2 4.00   0 1ML=3.8 100  0 0.00
$ ABOVE LOCATION IS OBTAINED BY GIVING LMN READINGS WEIGHT OF 5*A
$ CONVENTIONAL LOCATION PEGGED AT 4 KM FOLLOWS:
$46.028- 64.901F1MN=3.7 0114518 24041988 00.0150.025 0.4 19 22 150.60 2 4.00   0 1ML=3.8 100  0 0.00
$ CONVENTIONAL LOCATION WITH FREE DEPTH FOLLOWS:
$45.996- 64.930F1MN=3.7 0114522 24041988 00.0150.019 0.4 19 22 150.44Z210.47  14 1ML=3.8 100  0 0.00
FELT
                                             RESSENTI
IN MONCTON AND HILLSBOROUGH, N.B.            A MONCTON ET HILLSBOROUGH, N.-B.
SOUTHEAST N.B.                               SUD-EST DU N.-B.
$RATIO=  1.107 LMN 145613C 0.07    1833.91     4036.09 145823 0.12   23456.09
LMN  8804240114P             -0.29 A145610C
LMN   S  0021KM          159-79    13  040             A145823 013 1003664            145835
UNB  8804240114P                   A15139 D            13 -006   0177089 28ML46MN
UNB   W  0134KM          267-88    13  037             B1529
KLN  8804240114P XA151850    -0.29 A151570C            03 -046   0000000 00ML00MN
KLN   NW 0145KM 00  147 309-88     13  019             A153426 010 100 404            153614
GGN  8804240114P             -0.29XA151975D            13  157   0025384 33ML41MN
GGN   SW 0181KM          237-89    00 -163             B154124 030 100 356            154595
HAL  8804240114P  A15217 C                             03 -165   0007456 34ML37MN
HAL   SE 0186KM 13 -007 146 49                        XB15433
GBN  8804240114P  A15327 +                             00 -072   0000000 00ML00MN
GBN   E  0273KM 13  031 104 49                        XB1606
EBN  8804240114P  A153534C  -0.22                      00 -243   0000000 00ML00MN
EBN   NW 0301KM 13 -065 303 49                        XC161924 030 100 176            162224
GSQ  8804240114P  A154355C  -0.22                      00  288   0003686 37ML38MN
GSQ   NW 0361KM 13  015 333 49                 XB162335          037 100 119          162392
SLQ  8804240114P  B15427 -                      00  189            0002021 38ML37MN
SLQ   NW 0362KM 03 -059 302 49
LPQ  8804240114P  B154989D  -0.22                                  0000000 00ML00MN
LPQ   W  0417KM 03 -027 292 49                        XB165060 050 100 191            165855
HTQ  8804240114P  A155218-  -0.07                      00  169   0002400 42ML38MN
HTQ   NW 0439KM 13 -048 325 49                 XA163786          010 100  20          163860
LMQ  8804240114P  B15538 -                      00  013            0001257 33ML36MN
LMQ   NW 0447KM 03  014 294 49                 XB1638   XB16575  040 127 310
SBQ  8804240114P  B160583   -0.07               00 -151 00  033    0003834 44ML41MN
SBQ   W  0552KM 03 -063 265 49                 XB170014 X172517  037 100 942          172770
MNQ  8804240114P  A160906C  -0.10               00 -166 00 -135    0015997 53ML49MN
MNQ   NW 0577KM 13 -059 332 49                  X170809          017 100  21          170932
DPQ  8804240114P  A161285D  -0.06               00  075            0000776 37ML36MN
DPQ   W  0610KM 13 -074 280 49                 XB171301 X174400  030 100  26          175004
MNT  8804240114P            -0.06               00 -123 00  108    0000545 40ML35MN
MNT   W  0681KM          268 49                 X172963 X180027  033 100  18          181233
TRQ  8804240114P  B162911E  -0.09               00  041 00 -239    0000343 39ML33MN
TRQ   W  0746KM 03 -115 275 49                  X174145          033 100  20          174391
WBO  8804240114P XB164352   -0.06               00 -185            0000381 40ML35MN
WBO   W  0818KM 00  459 266 49                          X184236  050 100  31
GAC  8804240114P  A163911-  -0.06                        00  120    0000390 43ML35MN
GAC   W  0822KM 13 -024 271 49                 XA175793 X183833
GRQ  8804240114P XA164086   -0.09               00 -126 00 -381    0000000 00ML00MN
GRQ   W  0846KM 00 -151 278 49                 XB180365          027 100  12          181833
SCH  8804240114P  B16595 -                      00 -078            0000279 40ML34MN
SCH   N  0987KM 03 -004 353 49
EEO  8804240114P  X170993   -0.06                                  0000000 00ML00MN
EEO   W  1092KM 00 -245 279 49
JAQ  8804240114P  B171924C  -0.07                                  0000000 00ML00MN
JAQ   NW 1161KM 03 -148 322 49                 XC190883          0131000  29          191576
             Z                                  00 -253            0000140 38ML33MN
```

19880424 01:14 MN=3.7 46.031N 64.905W 4.00 KM

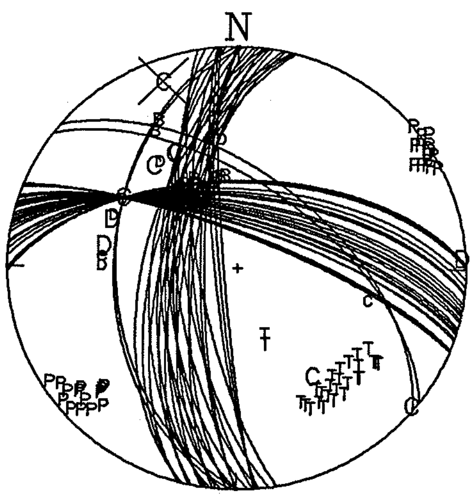
LMN	159.000	-79.000	C		moderately strong
LMN	159.000	-79.000	R	1.107	very strong Sv is up
UNB	267.000	-88.000	D		analog, good
KLN	309.000	-88.000	C		very weak; nodal
GGN	237.000	-89.000	D		not strong
HAL	146.000	49.000	C		analog, good
GBN	104.000	49.000	+		very emergent; nodal
EBN	303.000	49.000	C		good
GSQ	333.000	49.000	C		good, nodal
SLQ	302.000	49.000	-		analog
LPQ	292.000	49.000	D		very weak; nodal
HTQ	325.000	49.000	-		apparently down
LMQ	294.000	49.000	-		analog, very weak
MNQ	332.000	49.000	C		ok
DPQ	280.000	49.000	D		weak
TRQ	275.000	49.000	e		very weak beginning
GAC	271.000	49.000	-		very weak beginning
SCH	353.000	49.000	-		analog, ok
JAQ	322.000	49.000	C		ok



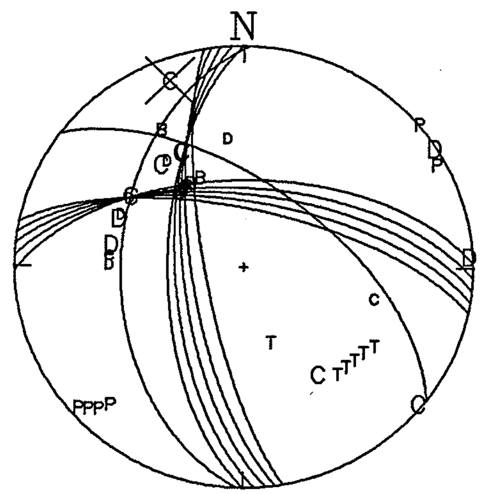
DATA 880424



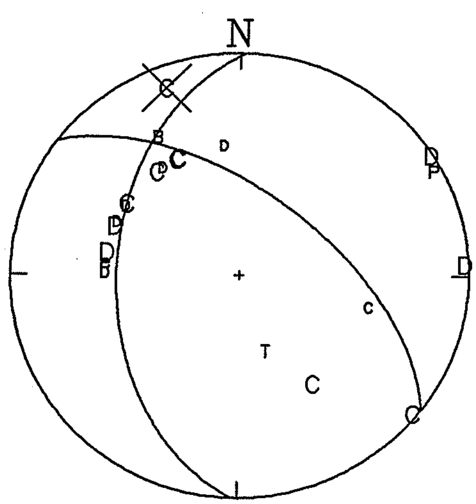
P0.5 R0 Z=10



P0.5 R1 Z=4



P0.5 R0 INC 3



BEST SOLUTION