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NEW FOCAL MECHANISMS FOR SOUTHEASTERN CANADIAN EARTHQUAKES

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ABSTRACT

Using P-wave polarities, Sv/P amplitude ratios, and the program FOCMEC, we have determined the focal mechanisms of 21 recent earthquakes in southeastern Canada. The mechanisms show systematic thrust faulting throughout eastern Canada in response to nearly-horizontal compression. Local differences in the direction of compression and the strike of the fault planes provide valuable insights into the seismotectonics of the western Quebec, Charlevoix, Lower St Lawrence, and northern Apalachian regions.

RESUME

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 21 tremblements de terre récents du Sud-Est du Canada. Les mécanismes au foyer montrent systématiquement des mouvements de chevauchement partout dans l'Est du Canada en réponse à une compression quasi-horizontalle. Des variations locales dans la direction de compression et dans l'orientation des plans de faille donnent 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 – the dip and strike of the rupture plane. In this open-file we present the results of focal mechanisms analysed during three student work terms (two by Sharp and one by Stagg). We have made a deliberate effort to fully document our 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 five large ring binders in Adams' office. Future users should contact the Geophysics Division for the digital event files.

PROCEDURES

Choice of events studies

The 21 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 1986 - April 1987), some larger earthquakes in eastern Canada that were close to one or more digital stations from past years were chosen, earthquakes in the Lower St. Lawrence were studied specially for a student work report (Stagg, 1986), and some older earthquakes with a published mechanism were reanalysed. In all, five magnitude 4, fifteen magnitude 3, and one magnitude 2.8 earthquakes were analysed, together with one composite mechanism of microearthquakes.

Determination of hypocentres

For all the earthquakes studied here the epicentres and focal depths have been determined with the standard crustal model and location program used by the Geophysics Division. The crustal model has a 36-km-thick crust of P-velocity 6.2 km/sec overlying a mantle of P-velocity 8.2 km/sec. S-wave velocities are 3.57 and 4.70 km/sec, respectively. This model was derived from monitoring rockbursts in northern Ontario in the 1940's (and largely confirmed by a refraction experiment in the Ottawa Valley in 1982; Mereu et al., 1986), and has been used throughout eastern Canada.

Epicentres routinely determined by the Geophysics Division use all available phases except those that obviously misfit. Hypocentral depths are often assigned to 18 km, being simply the mid-crustal depth. Hypocentres in the present paper were recalculated from the routine hypocentres according to the following guidelines:

1) Lg (Sg) phases at distances beyond about 200 km were not used (because of known problems with the Lg velocity).
2) Pg (and Sg when unambiguously available from digital data) arrivals for stations within about 100 km were fit well, even at the expense of larger residuals on the many distant stations.
3) In a few cases, a single station was chosen to replace a cluster of stations at the same azimuth and distance.

The results of this data selection can be seen by examining the residuals for the earthquake solutions in the Appendix. In general the solutions fit the close-in Pg and Sg phases and the available Pn and Sn phases well. While such recomputations – which normally revised the routinely-determined epicentres by only a few kilometres – do not guarantee that an accurate hypocentre has been found, we believe that they are an improvement on the routinely determined hypocentres (some of which were used directly by Wahlstrom, 1987, for computing take-off angles). The sensitivity of the focal mechanisms to the adopted hypocentral depth is discussed below.

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. For large (M>5) earthquakes that are recorded world-wide, it is possible to use the delay between the direct, downward arrival and the arrival that propagates upwards before being reflected down at the earth's surface (pP-P and sP-P) to determine the depth of the hypocentre. All the earthquakes studied here are too small for this to be done routinely, but for two earthquakes in the Lower St. Lawrence (830117 and 840411) such reflected phases were seen (Fig. 1) and were used to determine depths of 16.5 km and 18.5 km respectively.

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, and is generally unknown. Nevertheless we take the computed depths as an indication of the true depth of the earthquake.

For earthquakes more than two focal depths from a station, depths are often computed if there are several stations within about 100 km, though it is accepted that the computed depth is little more than an indication of whether the earthquake is in the top, middle, or lower part of the upper two-thirds of the crust. Where no station is closer than 150 km, all first-arriving phases are the critically refracted mantle arrivals, there is no way of computing the depth, and the depth is conventionally fixed at 18 km., i.e. at mid-crust.

Earthquake depth affects the determination of focal mechanism in two ways. Firstly, a shallower depth allows the upward-propagating Pg phase to arrive earlier than the downward-propagating Pn phase for a larger epicentral distance, so that the phase polarity may plot in an entirely different place on the focal sphere. This problem is best dealt with by not using such ambiguous arrivals as the primary constraints on the mechanism. Secondly, changing the depth changes the take-off angle for the close-in stations (a shallower depth moves them to the periphery of the focal plot). These changes are seldom as critical as they sound for a number of reasons: a) where there is a station very close to the epicentre, and hence a large angular change might be expected for a small depth change, the depth is probably well-determined by that station's phases. b) for stations more than two focal depths away the angular changes are small anyway. c) Pn take-off angles are fixed at 49° irrespective of earthquake depth.

The effect of focal depth on the mechanisms has been dealt with for the events studied here by recomputing the mechanism for markedly shallower and deeper hypocentres and examining the effect on the mechanism (some examples are shown in the Appendix if the change was significant, but many other trials were made). Our conclusions are similar to those of Wahlstrom (1987, p. 920): even a large uncertainty in hypocentral depth does not 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.

The availability of ECTN digital data is one of the chief reasons that the present analysis is possible. Because the network operates with a central trigger initiated by one (usually the closest) station, it saves all data for all stations, including weak Pn phases on distant stations that would otherwise be lost either through too-late or a too-insensitive single-station triggers. The ability to display P-wave arrivals with varying time and amplitude scales using Seismic Analysis Monitor (SAM), and to filter out the <1 Hz microseismic noise makes the determination of even weak arrivals possible. Of some concern are the few cases where a strong arrival is preceeded by several waves of a weaker arrival that might have been missed without the digital data, and strongly assymetric P-waves where a weak movement in one direction is immediately followed by a strong movement in the opposite direction. 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 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.

Seismometer polarities are checked routinely for the Canadian stations, (and confirmed by subsequently checking polarities of teleseismic arrivals) and only two 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 polarities read in the Appendix were read by two people (Adams/Sharp, Adams/Stagg) 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.

Polarities were assigned either full or half weight. Full weight polarities are those that are unambiguous and should be fit by the final mechanism. Half weight polarities are 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 occassionally useful for deciding between the different possible focal mechanisms.

Determination of amplitude ratios

The ratio of the amplitude of the S-wave to the amplitude of the P-wave at a single station is a function of the radiation pattern of the P and S waves, and hence of the mechanism. While amplitude ratios do not define the mechanism uniquely, they do provide additional constraints to a mechanism. The methods we use are similar to those of Wahlstrom (1987), and we adopted a similar distance cut-off of 100 km.

Amplitude ratios were read from stations within about 100 km of the epicentre. The requirement that the trace be on-scale and that the first few cycles of the S-wave be identified, precluded almost all use of paper records, though some amplitude ratios were measured from playouts. The amplitude ratios given in the Appendix and used by FOCMEC are Log_{10} (Amp. Sv/ Amp. P) and typically range from -0.3 (strong P relative to S) to 2.0 (nearly-nodal P). While polarity data either fits or does not, the degree of fit of the amplitude ratios to the theoretical is more subjective. We have followed Snoke and Wahlstrom in using a range of $\pm$ 0.23 log units from the theoretical ratio to define "acceptable fit", though it should be realized that some ratios that do not fit the mechanism may only just misfit (i.e. by 0.24 log unit) and others may grossly misfit (i.e. by 1.5 log unit, or a factor of 30x).

In contrast to most users of FOCMEC who use the ratio of Sv to P with both amplitudes being the largest attained in the first one-and-a-half cycles, we have chosen to use the amplitude of P taken in the first half cycle. (We have retained the measurement of the S-amplitude as before because the difficulty in identifying the S-wave onset precisely makes the half-wave amplitude estimate less certain.) This choice was made mainly because of our observations of assymetric P-waveforms where a low-amplitude first arrival is followed by a large-amplitude peak in the opposite direction. Computed in the standard way, such waveforms give ratios equal to those generated by arrivals with much stronger beginings, even though the former probably originate much closer to one of the nodal planes. Therefore we consider that our use of the half-wave P-amplitude restores some of the information in the waveform. We have examined the effects of using the half-wave P-amplitude ratios on a few of the events, and as expected find that it makes little difference for well-constrained events. Ideally, the next step in improving our future analytical methods will be to model the first few cycles of the P-wave directly.

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 program we used FOCMEC (Snooke 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 Log_{10} (Amp. Sv/ Amp. P) ratio: i.e. a large ratio (relatively weak P-phase) is represented by a small cross.

FOCMEC performs an equi-angular grid search of the focal sphere to select mechanisms that satisfy the data. The power of this method is that it displays all possible mechanisms that fit the data. In some mechanisms the variation may be rather small, and the mechanism is well-constrained. In others the planes may be undefined but the P, T, or B axes may be relatively well-constrained. In yet other examples, there may be two families of mechanism that fit the data equally well, in which case the mechanism is unresolvable or must be chosen using some qualitative data.

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 214 equivalent full-weight polarities in this report (Table 1) only 4% are misfit; of the 54 ratios used 30% misfit, most of them on just a few mechanisms.

We have tried in the Appendix to provide a full documentation of our data and results. For each event, the Appendix contains: a title page giving a commentary on the mechanism, a listing of the earthquake phase data used to compute the hypocentre, 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. By inspection it is possible to estimate the accuracy of the planes and axes. All focal mechanism plots are equal-area, lower-hemisphere projections. 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.

DISCUSSION

The results of the focal mechanisms are summarized in Table 1 and on Figure 2. 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).

<u>**Western Quebec (WQU) Seismic Zone**</u> 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. Our mechanisms for 850824, 860110, 860530, and perhaps 860813 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. Our mechanisms 860605, 860618, 860806, and perhaps 860720 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, near 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).

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). Our four mechanisms weakly support the involvement of the rift faults parallel to the Ottawa (NW-striking planes on mechanisms 860530, 860110, and 850824) or to the St. Lawrence (NNE-striking planes on mechanism 860813) rivers.

Adams and Basham (in press) have suggested that the second band of seismicity was due to the passage of North America over a hot spot between 140 and 120 million years ago. The younger path of the hot spot 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 hot spot at about 47 mm/yr (Duncan, 1984), a rate quite consistent with the age of the Monteregian Hills, and implying that the Precambrian crust in western Quebec may have been thermally stressed and possibly fractured less than 130 m.y. ago.

Our four mechanisms in this second band all have a NW-striking plane dipping to the southwest. 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.

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 produced for Charlevoix. The 1974 field experiment yielded six mechanisms (Leblanc and Buchbinder, 1977); Hasegawa and Wetmiller (1980) produced a mechanism for the 1979 M5.0 event, and Lamontagne (1987) derived a suite of composite 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.

Our two new mechanisms represent thrust faulting on north to northwest trending planes in response to compression from the northeast. As such, they suggest faulting on planes striking at right angles to the river-parallel rift faults. The published mechanisms have not proved easy to interpret, though they, too, 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 earlier mechanisms, but like our two new mechanisms, at least some of the earthquakes appear to be occurring on NW-trending transverse faults that offset the rift fault system.

Northern Appalachians Seismic Zone 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 were available for the Miramichi mainshock and several clusters of its aftershocks, and for the Trousers Lake earthquake (Wetmiller et al., 1984), for an earthquake near the Quebec-Maine border (Wetmiller, 1975; Yang and Aggarwal, 1981), and for earthquakes in New England. All represent dominantly thrust faulting, most in response to northeast- to east-directed compression.

Our two new mechanisms in New Brunswick represent thrust/strike-slip faulting in response to northeast compression. By comparison to the Miramichi earthquake mechanisms they have a larger strike-slip component and a more northerly compression direction. The earthquake we analysed from the Quebec-Maine Border is only about 20 km northeast of the epicentre of the m_b 4.8 earthquake of 1973, and had a similar mechanism to that event (Yang and Aggarwal, 1981).

Lower St. Lawrence (LSL) Seismic Zone 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 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 (Sharp, 1987) 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.

Reliable estimates of earthquake depth have been obtained for two earthquakes recorded in 1983 and 1984 by the Yellowknife array, 30 degrees to the northwest. Phases interpreted as pP and sP gave hypocentral depths of 19 km and 21 km. Other earthquakes for which approximate depths have been computed from the ECTN network lie mostly between 10 and 20 km. Like the Charlevoix earthquakes, this places them within the Grenville basement (upper crust) and well beneath the onlapping St. Lawrence platform and the overthrust Appalachian sedimentary wedge.

We have derived the first mechanisms for earthquakes in the Lower St Lawrence. Our seven mechanisms for earthquakes under the river all have near-horizontal P-axes and most indicate thrust faulting in response to compression from the east quadrant. One of the mechanism (850816) represents nearly pure strike-slip faulting while the other six represent thrust faulting with minor amounts of strike-slip motion. Significantly, five of the mechanisms have a common plane that strikes parallel to the river and dips to the southeast; the remaining two (800403 and 861109) have NW-trending planes that would be striking at right angles to any river-parallel set. Taken together, the northeast-striking focal planes, the position of the larger earthquakes relative to the coastline, and the distribution of the smaller earthquake epicentres suggest that the river-parallel Paleozoic rift faults are the chief controlling structure for the seismicity.

The only confirmed significant activity on the north shore involves a M4.1 earthquake in 1975 and its aftershocks induced by the filling of the Manic 3 reservoir, and a cluster of M3 events in 1966 spatially associated with the Manic 2 reservoir which was filled in 1965 (Leblanc and Anglin, 1978). The Manic 3 earthquakes lie 50-100 km outside the rift system and, being induced earthquakes, are shallower than earthquakes under the St. Lawrence River. Our re-analysis (mechanism 760000) of the published data (Leblanc and Anglin, 1978) combines data for two composite mechanisms into a single composite mechanism that confirms thrust faulting on NW-trending planes, as proposed by Leblanc and Anglin, and represents a compression direction in agreement with the regional stress field.

CONCLUSIONS

Our analysis shows that with high-quality ECTN data, an analysis package which incorporates Sv/P amplitude ratios into mechanism determinations, and a lot of hard work, 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 systematic thrust faulting throughout eastern Canada in response to nearly-horizontal compression. Local differences in the direction of compression and the strike of the fault planes provide valuable insights into the seismotectonics of the western Quebec, Charlevoix, Lower St Lawrence, and northern Apalachian regions.

Our methods are now applied to current events by researchers in the Geophysics Division, 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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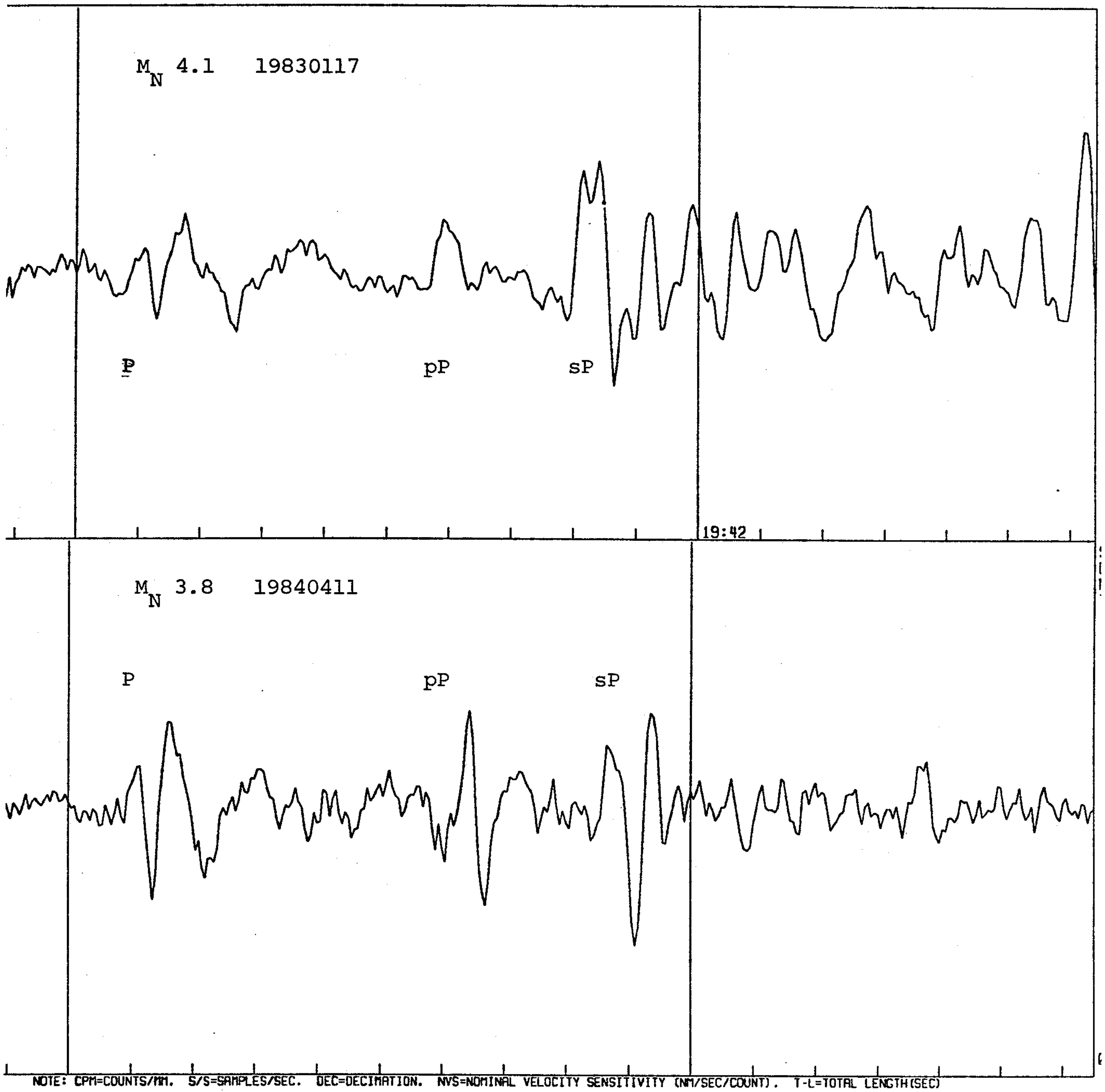


Figure 1. Waveforms created by beam-forming the Yellowknife array signal ($\Delta = 29°$) for two Lower St Lawrence earthquakes: 830117 M4.1 (top) has pP and sP phases with delays from the P phase indicating a depth of about 16.5 km; 840411 M3.8 (bottom) has the same phases for a depth of about 18.5 km.

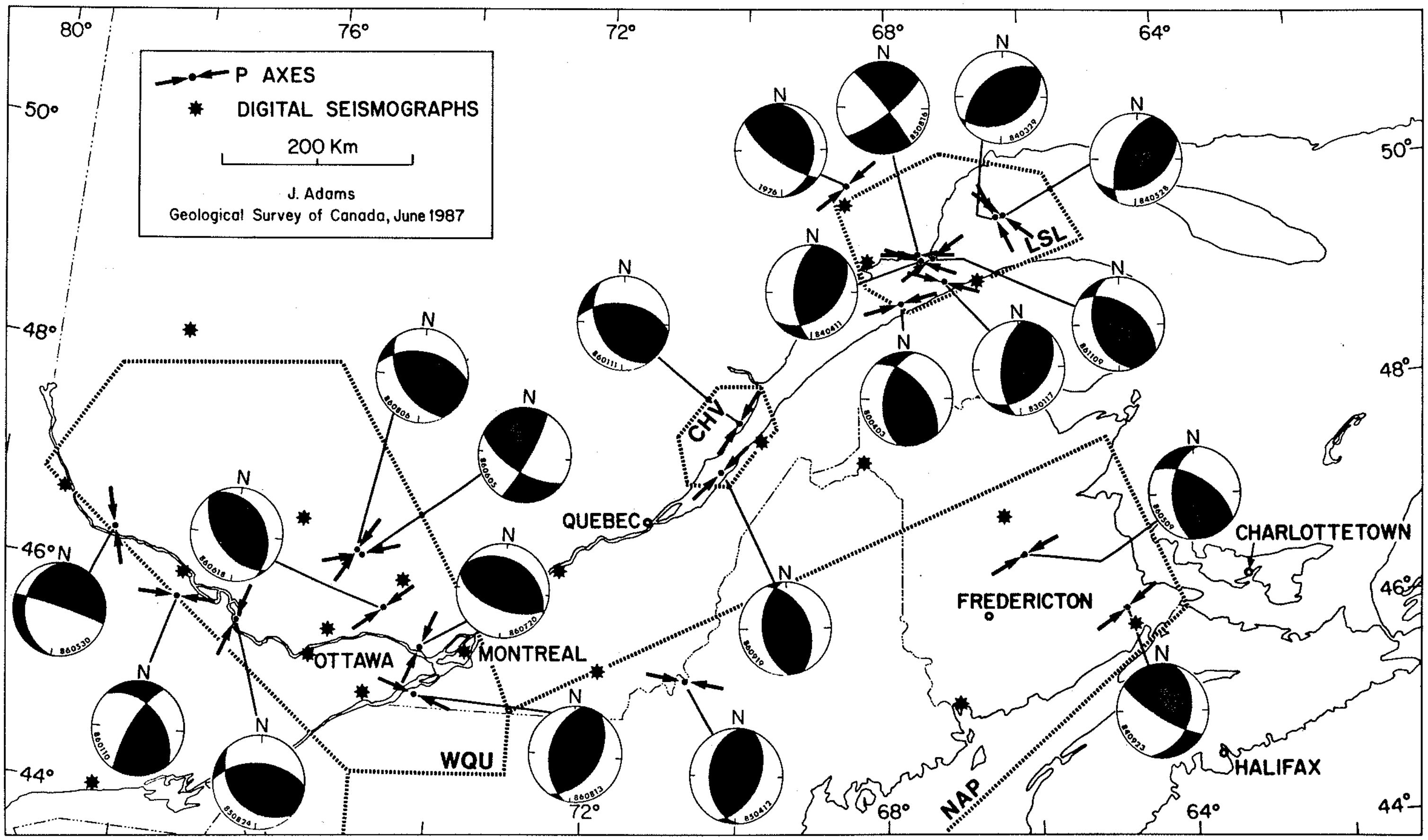


Figure 2 New focal mechanisms for southeastern Canada derived in this report (see Appendix for details). Shown are equal-area lower-hemisphere projections of the focal mechanism with compressional quadrants shaded. Pairs of inward-pointing arrows represent the direction of maximum horizontal compression taken from the earthquake P-axes. Dotted lines enclose the seismic zones of Basham et al. (1982), as discussed in the text.

TABLE 1

NEW EARTHQUAKE MECHANISMS FOR EASTERN CANADA

DATE (YY MM DD)	LAT N	LON W	DEPTH KM	MN	ZONE	PLANES FOR BEST SOLN STRIKE	DIP	RAKE	P TREND PLUNGE	T	B	SCORE POL.	RAT.	QUAL.	STRESS DB NO.
76	49.84	68.62	2	–	LSL	128	71	069	234	009	135	0/20	0/0	A	1059
						358	28	137	23	58	20				
80 04 03	48.71	67.81	18	4.1	LSL	317	56	053	072	170	340	0.5/10	0/0	B	1067
						191	48	132	04	60	30				
83 01 17	48.99	67.21	17	4.1	LSL	189	53	065	296	039	205	0.5/10.5	1/2	A	1060
						047	44	129	04	69	20				
84 03 29	49.61	66.45	18	3.2	LSL	231	50	083	325	100	235	0/7.5	0/1	A	1068
						061	40	098	05	83	05				
84 04 11	49.31	67.51	18	3.8	LSL	187	57	066	293	047	200	1.5/12.5	1/2	A	1061
						046	40	122	09	68	20				
84 05 28	49.61	66.35	18	3.2	LSL	201	57	066	308	062	215	0.5/5.5	0/0	A	1069
						061	40	122	09	68	20				
84 09 23	46.00	64.88	12	3.6	NAP	121	78	054	238	355	130	0/9.5	0/3	A	1062
						015	38	160	24	45	35				
85 04 12	45.37	70.69	7	3.5	NAP	178	41	075	099	343	190	0/16	1/3	A	1177
						018	51	103	05	79	10				
85 08 16	49.26	67.60	18	3.2	LSL	319	85	-014	274	006	120	0/7	1/2	A	1070
						051	76	-175	14	06	75				
85 08 24	45.61	76.68	9	3.1	WQU	272	57	066	018	132	285	0/7	3/4	A	1071
						131	40	122	09	68	20				
86 01 10	45.78	77.34	14	3.4	WQU	317	48	019	272	167	020	0/5.5	1/3	A	1072
						214	76	137	17	40	45				
86 01 11	47.70	70.11	5	4.0	CHV	279	59	060	029	138	295	0/14.5	0/1	A	1063
						146	42	129	09	63	25				
86 05 09	46.54	66.15	11	3.3	NAP	303	62	049	061	162	325	1.5/11.5	1/3	B	1073
						184	48	141	08	54	35				
86 05 30	46.31	78.42	4	3.0	WQU	178	25	-011	163	030	280	0/5.5	0/2	B	1065
						278	85	-115	44	36	25				
86 06 05	46.35	75.09	13	3.2	WQU	118	62	011	073	337	185	1/7.5	0/3	B	1074
						023	80	152	12	27	60				
86 06 18	45.88	74.81	18	3.1	WQU	137	55	084	231	024	140	0/6	1/5	C	1064
						327	35	099	10	79	05				
86 07 20	45.53	74.24	11	2.8	WQU	107	55	084	201	354	110	0/6	1/4	B	1178
						297	35	099	10	79	05				
86 08 06	46.37	75.20	16	3.6	WQU	277	50	057	030	120	300	0.5/8	1/4	B	1066
						143	50	123	00	65	25				
86 08 13	45.10	74.25	10	3.3	WQU	190	46	076	110	020	200	0/15	2/5	A	1075
						030	46	104	00	80	10				
86 09 19	47.30	70.32	22	4.2	CHV	335	46	076	225	165	345	1.5/18	3/5	A	1076
						175	46	104	00	80	10				
86 11 09	49.25	67.39	18	4.2	LSL	304	53	065	052	154	320	2/13	1/2	A	1077
						162	44	120	05	69	20				

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)

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 follows on the next page), 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.

[SAMDEV.LOC]PICKF
C. WONG MAY 1

PIK FILE

\>>>>>>>> NEW FORMAT VERSION AUGUST 1987
\>>>>>>>> 5 CHARACTER STATION ID

The PIK file is the input file to and also the output file (o version newer) from the CANSESS MULTILAYER epicenter location prog (LOC). SAM PIK (or PK4) command generates a PIK file automatically the event. These PIK files can be modified/created by the EPK progr or by the DEC text editor EDT.

It contains four types of records:

1. ESR - earthquake solution record.
2. ECR - earthquake comment record.
3. ODR - observed data record.
4. CDR - calculated data record.

The ESR (if it exists) has to be the first record in the file. It is an output record from the previous LOC. Some of its fields can b to modify the LOC parameters for the next run. The ECR records come the ESR, they have to be before the first ODR. There is one ODR for station with picked information. This is an input record, LOC progr not modified any field on this record. The CDR contains only the ca results for this station. If it exists, it is always right after it corresponding ODR. You can have as many ECR, ODR or sets of ODR & C you want. However, the current EPK program can handle total of 100 at most, and the LOC program is dimensioned only 100 for all the ph picked. If you have any deficulties with the above limitations, ple me know. The detail layout of these records starts on the next pag

EARTHQUAKE SOLUTION RECORD (ESR)

(solution record is defined as having "+" or "-" on col.1 and "M" ON

CLOUNS		ENTRY	FORMAT	DEFINITION
1-1	+	A1		PRIME SOLUTION BY EPB
	-			PRIME SOLUTION BY OTHER AGENCY
	0			SUPPLEMENTARY SOLUTION
2-7	45.233	F6.3		NORTH LATITIDE, DEGREES
8-15	-123.300	F8.3		LONGITUDE, DEGREES
16-16		A1		HYPOCENTRE QUALITY INDICATOR.
	O			POOR QUALITY SOLUTION
	F			GOOD QUALITY SOLUTION
17-17		I1(A1)		OBSERVED DATA FORMAT INDICATOR,
	BLANK			PRE-1979 DATA FORMAT USED
	1			1979 DATA FORMAT USED.
18-19		A2		PRIME MAGNITUDE TYPE
	ML			RICHTER
	MLE			EBEL
	MN			NUTTLI (DEFAULT)
	MLG			H. & K.
	MB			BODY-WAVE
	MS			SURFACE WAVE
	MC			CODA LENGTH
20-20	BLANK			
21-23	3.1	F3.1		AVERAGE MAGNITUDE VALUE (MN)
24-24	BLANK			
25-26	18	I2		ORIGIN TIME HOUR, U.T.
27-28	23	I2		ORIGIN TIME MINUTE
29-31	323	I3		ORIGIN TIME SECOND*10 (OR F3.1 IN SECOND)
32-32	BLANK			
33-34	12	I2		DAY
35-36	03	I2		MONTH
37-40	1979	I4		YEAR
41-41	BLANK			
42-42	2	I1		STANDARD DEVIATION ORIGIN TIME, SECONDS

```
43-47 0.122   F5.3   STD IN LATITUDE, DEGREES

48-52 0.333   F5.3   STD IN LOGITUDE, DEGREES

53-53  BLANK

54-56 0.3     F3.1   STD IN MAGNITUDE FOR EPB
      XXX     A3     AGENCY CODE FOR EXTERNAL MAG, DEPENDS ON COL.

57-59 34      I3     NUMBER OF STAIONS USED FOR HYPOCENTER

60-62 14      I3     NUMBER OF PHASES USED FOR THIS HOPOCENTER.

63-65 14      I3     NUMBER OF AMPLITUDE USED FOR MAGNITUDE.

66-69 0.33    F4.2   RMS OF HYPOCENTER SOLUTION, SECONDS.

70-70         A1     SUOLUTION TYPE INDICATOR
      BLANK          FIXED DEPTH.
      Z              FREE DEPTH
      X              NO ACTION FOR THE WHOLE FILE
      N              ASSIGNED HYPOCENTER AND TIME
      H              ASSIGNED HYPOCENTER,
                       BUT CALCULATED ORIGIN TIME.

71-71         I1     AGENCY CODE
      1              USGS
      2              EPB
      3              PGC
      4              SEA     UNIVERSITY OF WASHINGTON
      5              NEIS    NATIONAL EARTHQUAKE INFORMATION CENTER
      6              ISC     INTERNATIONAL SEISMOLOGICAL CENTER
      7              LDGO    LAMONT-DOHERTY GEOLOGICAL OBSERVATORY
      8              WES     WESTON GEOPHYSICAL OBSERVATORY
      9              UAGI    UNIV. OF ALASKA, GEOPHYSICAL INSTITUTE

72-76 18.33   F5.2   FOCAL DEPTH, KM
                     IF AND ONLY IF COL.=Z, FREE DEPTH SOLUTION

77-80 3.0     F4.1   STD IN DEPTH, KM ( OR I4 FORMAT IN 100-METERS)

81-82   03      I2     MODEL NUMBER

83-85   ML=          AVERAGE ML

86-88   1.3   F3.1   RICHTER MAGNITUDE

89-91   008   I3     NUMBER OF STATIONS USED TO CALCULATE AVERAGE M

92-92   1     I1     MULTILAYER HYPO SIMULATION FLAG, 0-OFF, 1-ON.

93-93           A1                                ! FL001
        F              FELT                       ! FL001
        N," "          NOT FELT                   ! FL001

94-95   10      I2     NB. OF ASSOCIATED EVENTS   ! FL001

96-96           A1                                ! FL001
        E," "          EARTHQUAKE
        B              BLAST

        R              ROCKBURST
        P              POSSIBLE ROCKBURST

97-100  3.56    F4.2   S VELOCITY USED BY SINGLE LAYER MODEL   ! FL00

<     FORMAT(A1,F6.3,F8.3,2A1,A2,1X,F3.1,1X,I2.2,I2.2,I3.3,1X,2I2.2,
<     &                '19',I2.2,1X,I1,2F5.3,1X,A3,             ! FOR AG
<     &                '19',I2.2,1X,I1,2F5.3,1X,F3.1,           ! FOR ST
<     &                3I3.3,F4.2,A1,I1,F5.2,I4,T81,I2,'MC=',F3.1,I3,I1
<     &            A1,I2,A1,F4.2)
```

EARTHQUAKE COMMENT CARDS (ECR)

COLUMNS	ENTRY	FORMAT DEFINITION
1-40	40A1	EARTHQUAKE DESCRIPTION IN ENGLISH
41-80	40A1	EARTHQUAKE DESCRIPTION IN FRANCH

OBSERVED DATA RECORD (ODR)

COLUMNS		ENTRY	FORMAT DEFINITION	
1-5	OTT	A5	STATION CODE	! FL001
6-7	79	I2	YEAR	! FL001
8-9	12	I2	MONTH	! FL001
10-11	23	I2	DAY	! FL001
12-13	12	I2	HOUR, U. T.	! FL001
14-15	14	I2	MINUTE OF 1ST RECORDED P PHASE,NOT NECESSARY @	
16-16		A1	INSTRUMENT CODE	! FL001
	P		SHORT PERIOD INSTRUMENT READ	
	L		LONG PERIOD INSTRUMENT READ,AMP. & 1ST MOTION	
17-17	BLANK			! FL0
18-18		A1	PN WEIGHT	! FL0
	" "		USED IN CALCULATION	
	X		NOT USED IN CALCULATION	
19-19		A1	PN QUALITY DESIGNATOR	! FL0
	A		SHARP CLEAR BEGINNING (+- 0.25 SEC.)	
	B," "		GOOD BEGINNING (+- 1.0 SEC.)	
	C		WEAK POOR BEGINNING (+- 4.0 SEC. OR MORE)	
	X		PHASE NOT USED IN SOLUTION, LARGE RESIDUAL.	
	0		PHASE NOT READ	
20-21	14	I2	MUNITE OF PN ARRIVAL	! FL0
22-25	2341	F4.2	SECOND OF PN ARRIVAL	! FL0
26-28	CNM ??	3A1	FIRST MOTION OF PN ARRIVAL	! FL0
29-33	+0.03	F5.0??	TIME CORRECTION	! FL0
34-34		A1	PG WEIGHT	! FL0
	" "		USED IN CALCULATION	
	X		NOT USED IN CALCULATION	
35-35	A,B..	A1	PG QUALITY DESIGNATOR, SEE 16	! FL0
36-37	14	I2	MINUTE OF PG ARRIVAL	! FL0
38-41	264	F4.2	SECOND OF PG ARRIVAL	! FL0
42-44	DSE	3A1	FIST MOTION OF PG ARRIVAL	! FL0
45-45		A1	SN WEIGHT	! FL0

```
         " "              USED IN CALCULATION
         X                NOT USED IN CALCULATION

46-46 A,B...  A1      SN QUALITY DESIGNATOR, SEE 16          ! FL0

47-48 14      I2      MINUTE OF SN ARRIVAL                   ! FL0

49-52 52      F4.2    SECOND OF SN ARRIVAL                   ! FL0

53-53           A1      LG WEIGHT                              ! FL0
         " "            USED IN CALCULATION
         X              NOT USED IN CALCULATION

54-54 A,B...  A1      LG QUALITY DESIGNATOR, SEE 16          ! FL0

55-56 14      I2      MINUTE OF LG ARRIVAL                   ! FL0

57-60 589     F4.2    SECOND OF LG ARRIVAL                   ! FL0

61-61   BLANK                                                  ! FL0

62-64 031     F3.2    PERIOD OF MAX. TRACE AMPLITUDE, SECOND   ! FL0

65-68 150     F4.0    MAGNIFICATION OF INSTRUMENT AT GIVEN PERIOD, I

69-72 125     F4.1    TRACE AMPLITUDE( ONE-HALF MAX. PEAK-TO-PEAK) I

73-73   BLANK                                                  ! FL0

74-77         I4      DURATION IN SECONDS.                   ! FL0

78-79   BLANK                                                  ! FL0

80-80                 I1      MAGNITUDE CODE
      BLANK           AMPLITUDE SUITABLE FOR NUTTLI OR RICHTER SCALE
      1               AMPLITUDE SUITABLE FOR RICHTER ONLY, CORDILLER
      2               AMPLITUDE SUITABLE FOR EBEL
      3               AMPLITUDE UNRELIABLE, NOT USED FOR MAGNITUDE
      4               AMPLITUDE SUITABLE FOR HUEM & KISCO
      5               AMPLITUDE SUITABLE FOR MS SCALE ONLY
      8               SN AMPLITUDE READ,
                      USE RICHTER SCALE ONLY BEYOND 600 KM IF REQUIR

81-83   BLANK                                                  ! FL0

84-85   15    I2      MINUTE OF THE MAX. AMPLITUDE           ! FL0

86-89 155     F4.2    SECONDS OF THE MAX. AMPLITUDE          ! FL0

<     FORMAT(A5,5I2,A1,1X,2A1,I2,F4.2,A3,F5.0,2A1,I2,F4.2,A3,2A1
<     &               I2,F4.2,2A1,I2,F4.2,1X,F3.2,F4.0,F4.1,1X,I4,2X,I
<     &               3X,I2,F4,2)
```

CALCULATED DATA RECORD (CDR)

```
COLUMNS      ENTRY   FORMAT  DEFINITION
=======      =====   ======  ==========

1-5    OTT       A3      STATION CODE                          ! FL001

6-6    BLANK

7-8    NW        A2      QUADRANT OF STATION

9-9    BLANK

10-13 1305       I4      EPICENTRAL DISTANCE, KM

14-15 KM         A2      RECORD FLAG

16-16 BLANK

17-18 28         F2.1    PN WEIGHT USED FOR CALCULATIONS ! FL001

19-19 BLANK

20-23 0107       F4.2    PN RESIDUAL, SECOND                   ! FL001

24-24 BLANK,# A1         LARGE RESIDUAL FLAG                   ! FL001

25-27 235        I3      AZIMUTH TO STATION, DEGREES

28-30 049        I3      EMERGENT ANGLE
                         PN POSITIVE
                         PG NEGATIVE

31-34 BLANKS

35-36 14         F2.1    PG WEIGHT                             ! FL001

37-37 BLANK

38-41 -091       F4.2    PG RESIDUAL, SECOND                   ! FL001

42-42 BLANK,# A1         LARGE RESIDUAL FLAG                   ! FL001

43-45 BLANKS

46-47 07         F2.1    SN WEIGHT                             ! FL001

48-48 BLANK

49-52 0024       F4.2    SN RESIDUAL, SECOND                   ! FL001

53-53 BLANK,# A1         LARGE RESIDUAL FLAG                   ! FL001
```

54-55	07	F2.1	SG WEIGHT	! FL001
56-56	BLANK			
57-60	-434	F4.2	SG RESIDUAL, SECOND	! FL001
61-61	BLANK,#	A1	LARGE RESIDUAL FLAG	! FL001
62-63	BLANKS			
64-70	0001356	I7	GROUND VELOCITY, NM/SEC	
71-71	BLANK			
72-73	35	F2.1	RICHTER OR SURFACE WAVE MAGNITUDE	
74-75	ML,MS	A2	MAGNITUDE DESIGNATOR	
76-77	34	F2.1	NUTTLI MAGNITUDE	
78-79	MN	A2	MAGNITUDE DESIGNATOR	

```
<     FORMAT(A5,1X,A2,1X,I4.4,'KM',1X,F2.1,1X,F4.2,A1,2I3.3,  >
<     &              4X,F2.1,1X,F4.2,A1,3X,F2.1,1X,F4.2,A1,F2.1,1X,
<     &         F4.2,A1,2X,I7.7,1X,2(F2.1,A2)) >
```

Seismic Zone: Lower St. Lawrence

Magnitude : –

Location : 49.84N 68.62W (Manic 3 reservoir)

Date : 1976 September and November

Time : –

Depth:

average depth of earthquakes = 1.5 km

Quality of Readings:

readings taken from Fig. 10 in LeBlanc and Anglin, BSSA 68:1469-1485

Comments:

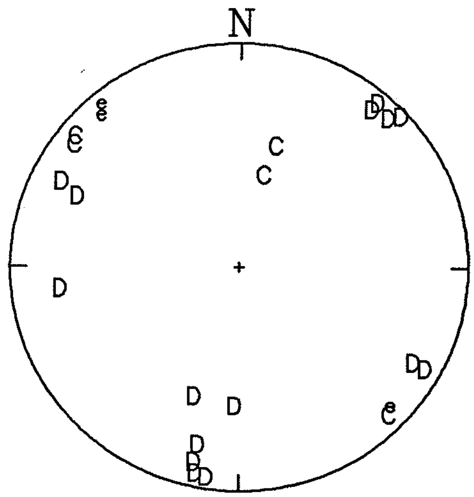
induced earthquakes following Mn 4.1 mainshock on 751023
composite mechanism reanalysed from LeBlanc and Anglin's data from 2 left and 2 right bank microearthquakes
moderately-well constrained solution suggesting single mechanism could account for all readings
no amplitude data available
"best solution" chosen as the least extreme of the P0 solutions
P axis in NE quadrant

Best Solution:

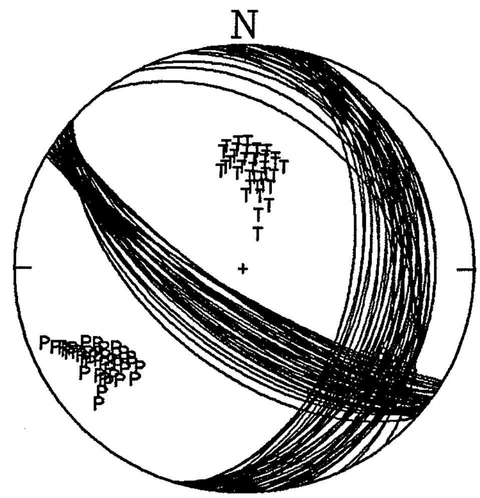
Strike, Dip, Rake	128	71	69
Strike, Dip, Rake	358	28	137
Trend & Plunge of P	234	23	
Trend & Plunge of T	009	58	
Trend & Plunge of B	135	20	

MNQ	INDUCED	ACTIVITY	
XYZ	002.000	128.000	D
XYZ	009.000	96.000	D
XYZ	012.000	97.000	D
XYZ	019.000	129.000	D
XYZ	083.000	112.000	D
XYZ	127.000	100.000	C
XYZ	129.000	98.000	C
XYZ	224.000	98.000	D
XYZ	226.000	93.000	D
XYZ	313.000	100.000	e
XYZ	315.000	98.000	C
XYZ	013.000	102.000	D
XYZ	013.000	110.000	D
XYZ	114.000	113.000	D
XYZ	116.000	104.000	D
XYZ	138.000	100.000	e
XYZ	140.000	96.000	e
XYZ	194.000	145.000	C
XYZ	196.000	133.000	C
XYZ	219.000	100.000	D
XYZ	219.000	96.000	D
XYZ	299.000	104.000	D
XYZ	299.000	98.000	D

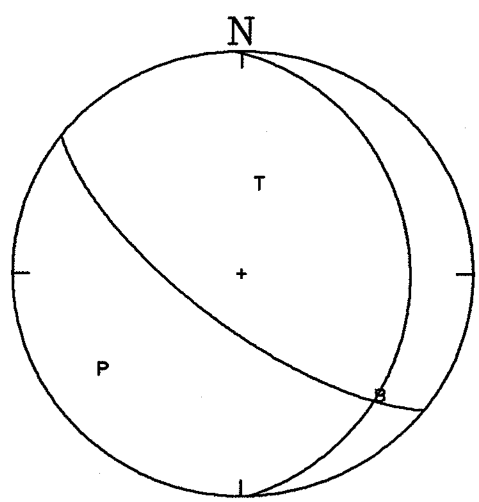
FMMANIC.OUT
16-JUL-86 12:27:30



DATA



P0



BEST SOLUTION

Seismic Zone: LOWER ST. LAWRENCE

Magnitude : 4.1

Location : 48.71N 67.81W

Date(Y/M/D) : 1980/04/03

Time(UT) : 16:57

Depth:

closest station: A20 (179 KM from epicentre)
free depth = 16.6 KM
pegged at 18.0 KM for this mechanism

Quality of Readings:

- good P arrivals on A20, A64, SIC, and MNQ
- UNB reading from analog; polarity dubious
- weak P arrivals on LMQ, A10, GNT and CHQ
- OTT, GAC, and QCQ very emergent

Comments:

Best solution chosen from P(0.5); all solutions misfit UNB. Solution chosen is one that best fits SIC and MNQ.

Mechanism represents thrust faulting in response to NE compression.

No constraint on depth.

Best Solution:

Strike, Dip, Rake	317	56	53
Strike, Dip, Rake	191	48	132
Trend & Plunge of P	72	4	
Trend & Plunge of T	170	60	
Trend & Plunge of B	340	30	

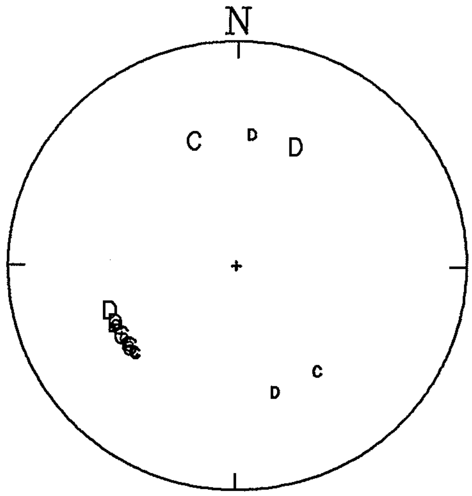
```
+48.707- 67.812F1MN=4.1 1657251 03041980 00.0130.028 0.4 31 41 190.66 218.00    0 1ML=4.0  90
$048.67 - 67.98 F MN=4.1 165724. 03041980    11KM 11KM 0    15 17 04 0.6 800
$FELT(IV) AT MATANE, BAIE-DES-SABLES        RESSENTI(IV) A MATANE,
$AND ST-MOISE                               BAIE-DES-SABLES ET ST-MOISE
$(III) AT VAL-BRILLANT  AND METIS BEACH     (III)  A  VAL-BRILLANT  ET METIS BEACH
$(II) AT ST-HILARION (GASPE)                (II) A ST-HILARION (GASPE)
$NOT FELT AT MONT-JOLI, LAC-HUMQUI          NON RESSENTI A  MONT-JOLI, LAC-HUMQUI
$AND ST-THARCISIUS                          ET ST-THARCISIUS
$ 180 KM SW FROM SEPT-ILES, QUE.            180 KM SO DE SEPT-ILES, QUE.
$ FOCAL MECHANISM COMPILED BY ADAMS/STAGG
A208004031657P A575246C                                581585                        1
A20    SW 0179KM23 -018  232 49                       06  039       0000000 00ML00MN
SIC8004031657P A5753  D                                                               1
SIC    NE 0181KM23  008  025 49                                     0000000 00ML00MN
A648004031657P A575265C                                581609                        1
A64    SW 0183KM23 -051  238 49                       06 -054       0000000 00ML00MN
CBM8004031657P  57549                                          020 200 274           1
CBM    S  0199KM06 -025  187 49                                     0004304 31ML36MN
A608004031657P  575498                                 582144                        1
A60    SW 0204KM06 -076  237 49                       06 -104       0000000 00ML00MN
D3A8004031657P  57558                                                                1
D3A    SW 0207KM06 -030  210 49                                     0000000 00ML00MN
MNQ8004031657P A575705C                               B582293 017 100 205           583321
MNQ    N  0215KM23 -005  341 49                       06 -262       0007577 34ML39MN
D5A8004031657P  57572                                                                1
D5A    SW 0218KM06 -025  211 49                                     0000000 00ML00MN
POC8004031657P  57585 +                  5821                                        1
POC    SW 0224KM06  037  229 49          06 -158                    0000000 00ML00MN
LMQ8004031657P  57580 +                  X5801                                       1
LMQ    SW 0227KM06 -062  236 49          00 ****$                   0000000 00ML00MN
A548004031657P  580021                                                               1
A54    SW 0239KM06  021  235 49                                     0000000 00ML00MN
A108004031657P  580020+                                                              1
A10    SW 0241KM06 -004  228 49                                     0000000 00ML00MN
HN 8004031657P  58048                                                                1
HN     S  0284KM06 -067  183 49                                     0000000 00ML00MN
UNB8004031657P C58077 -                                        04    79 240          1
UNB    S  0319KM01 -211  163 49                                     0004772 40ML39MN
CHQ8004031657P  58115 +                               X5855    02   173 350          1
CHQ    SW 0331KM06  032  234 49                       00 -286       0006356 39ML41MN
QCQ8004031657P X58165 E
QCQ    SW 0337KM00  454  232 49                                     0000000 00ML00MN
JKM8004031657P  58179                                                                1
JKM    SW 0386KM06 -009  209 49                                     0000000 00ML00MN
PQ08004031657P  58204                                                                1
PQ0    S  0415KM06 -105  176 49                                     0000000 00ML00MN
GNT8004031657P B582382+                  5905         X592299 027 100 177           593220
GNT    SW 0431KM06  037  234 49          06 -174      00 -306       0004119 43ML41MN
EMM8004031657P  58237                                                                1
EMM    S  0443KM06 -119  177 49                                     0000000 00ML00MN
TRM8004031657P  58348                                          020 200 171           1
TRM    S  0529KM06 -058  202 49                                     0002686 42ML41MN
DVT8004031657P                                                 030 200 284           1
DVT    SW 0533KM         220 49                                     0002974 44ML41MN
HAL8004031657P  58385 +                  X59285                02    85 140          1
HAL    SE 0556KM06 -016  143 49          00 -480                    0005174 45ML44MN
MNT8004031657P C583911                   C593458      X595918 023 100 122           000513
MNT    SW 0567KM01 -093  233 49          01 -113      00 -496       0003333 44ML42MN
PNY8004031657P  58453                                                                1
PNY    SW 0615KM06 -053  228 49                                     0000000 00ML00MN


MIQ8004031657P A585295D                  C595827      X602402 057 100 230           003998
MIQ    W  0667KM23  075  250 49          01  135      00 -800       0002535 49ML42MN
GAC8004031657P B585169E                               X602834 020 1002033           003658
GAC    SW 0670KM06 -087  243 49                       00 -455       0063869 59ML56MN
SCH8004031657P  58538 -                  C6002        X60325   03   105 120          1
SCH    N  0684KM06 -052  006 49          01  138      00 -431       0002394 47ML42MN
OTT8004031657P X594765E
OTT    SW 0704KM00 5087$ 241 49                                     0000000 00ML00MN
FHO8004031657P A590122D                  C601325      X604636 037 100 155           005969
FHO    SW 0733KM23  091  244 49          01  218      00 -431       0002632 49ML43MN
WES8004031657P  59035                                                                1
WES    SW 0755KM06  063  203 49                                     0000000 00ML00MN
UCT8004031657P                                                 050 200 378           1
UCT    SW 0840KM         206 49                                     0002375 51ML43MN
LDQ8004031657P                                         613124
LDQ    NW 0878KM         314 49                        06  000      0000000 00ML00MN
PBQ8004031657P                                         C6202   04    93  40          1
PBQ    NW 0999KM         321 49                        01 -303      0000676 48ML39MN
SUD8004031657P                           6110          X6206   04   104  40          1
SUD    W  1020KM         261 49          06 -198       00 -481      0000604 47ML39MN
LHC8004031657P                                                 05    67  16          1
LHC    W  1580KM         277 49                                     0000300 50ML39MN
FRB8004031657P X60525                    X6328         X6509   06    79  13          1
FRB    N  1678KM00 -292  359 49          00 -390       00 -606      0000172 49ML37MN
PWM8004031657P                                                 15     5  02          1
PWM    W  2043KM         285 47                                     0000168 49ML38MN
BLC8004031657P                                                 13    50  20          1
BLC    NW 2421KM         326 39                                     0000193 51ML40MN
                  Z
```

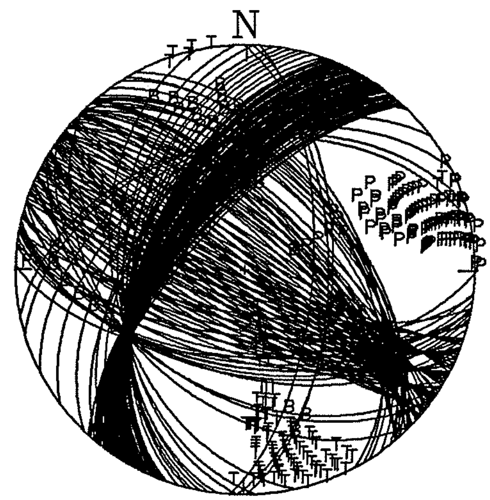
19800403 16:57 MN=4.1 48.707N 67.812W 18.00 KM

A20	232.000	49.000	C	strong P; read from digital playout
SIC	025.000	49.000	D	strong P; analog reading
A64	238.000	49.000	C	strong P; read from digital playout
MNQ	341.000	49.000	C	
POC	229.000	49.000	+	analog reading
LMQ	236.000	49.000	+	weak P arrival; analog reading
A10	228.000	49.000	+	weak P arrival; read from digital playout
UNB	163.000	49.000	−	dubious polarity; analog reading
CHQ	234.000	49.000	+	analog reading
QCQ	232.000	49.000	e	very emergent; analog reading
GNT	234.000	49.000	+	
HAL	143.000	49.000	+	analog reading; poor P
MIQ	250.000	49.000	D	distinctive P arrival
GAC	243.000	49.000	e	emergent
SCH	006.000	49.000	−	very weak P; analog reading
OTT	241.000	49.000	e	
FHO	244.000	49.000	D	

lsl800403.out
6–NOV–86 18:15:45



DATA



P1

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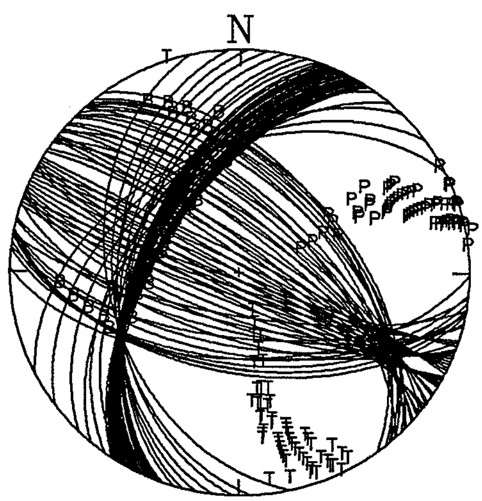
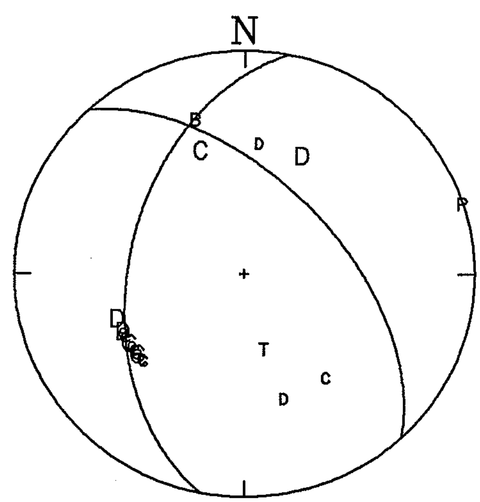
6–NOV–86 21:12:02



P 0.5



BEST SOLUTION

Seismic Zone: Lower St.Lawrence

Magnitude : 4.1

Location : 48.99N 67.21W

Date(Y/M/D) : 1983/01/17

Time(UT) : 19.35

Depth:

closest station: GSQ, 11 km SE of epicentre
free depth = 21.5 km
pP-P from YKA = 16.6 km
sP-P from YKA = 16.8 km
for focal mechanism depth is pegged at 17 km

Quality of Readings:

many near-nodal arrivals on digital records,
some of these clearly C or D
note YKA C, weak; pP down therefore +, weak; sP strong
doesn't fit WBO +

Comments:

best solution is (P0.5 R1), same as (P 0.5 R2)
misfits WBO polarity and GSQ ratio
similar mechanism to LSL840411
P axis similarly in NW quadrant
well-constrained thrust mechanism with one plane
parallel to St Lawrence River and dipping SE

Best Solution:

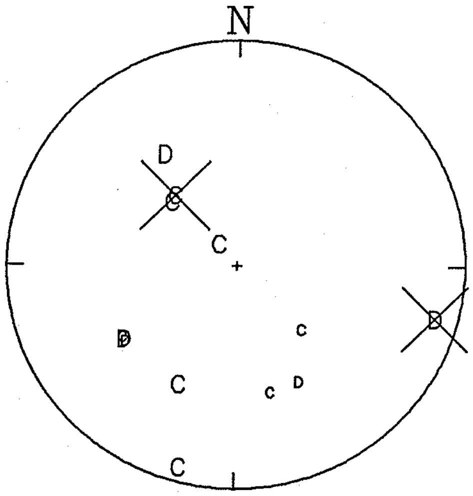
Strike, Dip, Rake	189	53	65
Strike, Dip, Rake	47	44	129
Trend & Plunge of P	296	04	
Trend & Plunge of T	039	69	
Trend & Plunge of B	205	20	

```
+48.992- 67.214F1MN=4.1 1935531 17011983 00.0150.027 0.2 17 22 220.58 217.00    0 1ML=3.8 100   0 0.00
$ NO T.C. ON SIC.
MAG (NEIS) 4.5MB (2 OBS)                   MAG (NEIS) 4.5MB (2 OBS)
NEAR LES MECHINS, QUEBEC.                  PRES DE LES MECHINS, QUEBEC.
FELT.  MAXIMUM INTENSITY IV.               RESSENTI.  INTENSITE MAXIMALE DE IV.
PERCEPTIBLE TO 60 KM.                      PERCEPTIBLE JUSQU'A 60 KM.
QUESTIONNAIRES SENT TO POST-               QUESTIONNAIRES ENVOYES AUX MAITRES
MASTERS.                                   DE POSTE.
$ DEPTH PHASES ON YKA: P=50.78 SEC, PP=55.42, SP=57.65
$ APPROXIMATE DEPTHS:                     16.6       16.8 KM
$ DEPTH PEGGED AT 17 KM
$FOCAL MECHANISM DETERMINED BY ADAMS/SHARP
$RATIO=  0.538 GSQ       0.00  15309.59  52887.16
$RATIO=  0.616 HTQ     -12.18  -1035.14   4213.62
  20 KM N  FROM GROSSES-ROCHES, QUE.       20 KM N   DE GROSSES-ROCHES, QUE.
GSQ   8301171935P                    A355717C            B355934 008 1.0 065          1
GSQ    SE 0011KM          139-34     21  065             05  034   0510509 28ML48MN
HTQ   8301171935P                    A360825D            B361970 010 020 107          1
HTQ    W  0089KM          285-79     21  046             05  113   0033615 31ML39MN
SIC   8301171935P                    X36147 C                                         1
SIC    N  0136KM          015-83     00 -055                       0000000 00ML00MN
EBN   8301171935P  A362145C                      B364384         015 102 153          1
EBN    SW 0187KM 21 -029 205 49                  05  092           0006283 31ML37MN
MNQ   8301171935P  A362365D                              B36498  020 022 109          1
MNQ    NW 0205KM 21 -040 327 49                          05 -105   0015565 37ML41MN
CBM   8301171935P  X362740                       X365270                              1
CBM    S  0239KM 00 -073 197 49                  00 -136           0000000 00ML00MN
KLN   8301171935P  B362781+                      C365640 X37008  014 050 115          1
KLN    S  0247KM 05 -134 165 49                  01  055 00 -177   0010322 36ML41MN
LPQ   8301171935P  B363270                       X37015  X370910 020 030 145          1
LPQ    SW 0278KM 05 -013 230 49                  00 -076 00 -195   0015184 41ML43MN
LMQ   8301171935P  B36326 D          X36356      X37010                               1
LMQ    SW 0282KM 05 -074 236 49      00 -306     00 -216           0000000 00ML00MN
HN    8301171935P  B363720                                                            1
HN     S  0320KM 05 -086 191 49                                    0000000 00ML00MN
UNB   8301171935P                                        B372810                      1
UNB    S  0341KM            172 49                       05 -077   0000000 00ML00MN
LMN   8301171935P  B364509-                              X37426  038 048 105          1
LMN    SE 0394KM 05 -193 152 49                          00 -096   0003617 42ML40MN
GGN   8301171935P  B365052                       X37344          020 089 120          1
GGN    S  0432KM 05 -114 176 49                  00 -071           0004236 41ML41MN
MIM   8301171935P  X365130                       X373550                              1
MIM    S  0439KM 00 -126 199 49                  00 -119           0000000 00ML00MN
PQ0   8301171935P  X365190                                                            1
PQ0    S  0446KM 00 -148 183 49                                    0000000 00ML00MN
PQ1   8301171935P  X365305                                                            1
PQ1    S  0455KM 00 -140 181 49                                    0000000 00ML00MN
GNT   8301171935P  B365810-                              X38071  056 055 202          1
GNT    SW 0485KM 05 -006 235 49                          00 -211   0004121 47ML42MN
SBQ   8301171935P  B370510                               X38249  050 079 222          1
SBQ    SW 0538KM 05  053 223 49                          00  105   0003531 47ML42MN
BNH   8301171935P  X370865                                                            1
BNH    SW 0579KM 00 -093 214 49                                    0000000 00ML00MN
MNT   8301171935P  X37115                        X381262 X38410  040 161 225          1
MNT    SW 0621KM 00 -324 234 49                  00 -277 00 -625   0002195 47ML41MN
SCH   8301171935P  X37189                        X38210  X38520  040 094 230          1
SCH    N  0650KM 00  066 002 49                  00 -049 00 -319   0003843 50ML44MN
GAC   8301171935P  B372650                               X39102  050 158 220          1
GAC    SW 0724KM 05 -071 243 49                          00 -569   0001750 48ML41MN
RS    8301171935P  B372950                                                            1


RS     SW 0746KM 05 -045 231 49                                    0000000 00ML00MN
WBO   8301171935P  B373100+                      X38447  X39216  058 163 226          1
WBO    SW 0757KM 05 -026 237 49                  00  050 00 -358   0001502 49ML41MN
OTT   8301171935P                                        X39200                       1
OTT    SW 0758KM            241 49                       00 -561   0000000 00ML00MN
VDQ   8301171935P                                        X39327  045 174 205          1
VDQ    W  0798KM            268 49                       00 -397   0001645 49ML41MN
CKO   8301171935P  C37398                                X39454  045 269 234          1
CKO    W  0840KM 01 -162 250 49                          00 -309   0001215 48ML40MN
PBQ   8301171935P  X38006                        X39345  X40303  050 079 124          1
PBQ    NW 1003KM 00 -075 318 49                  00 -219 00 -399   0001972 53ML44MN
KAO   8301171935P  X38116                        X40070  X41020  060 097 079          1
KAO    W  1113KM 00 -308 278 49                  00  704 00 -287   0000853 51ML41MN
GTO   8301171935P  X38582                        X41062  X42337  060 115 057          1
GTO    W  1434KM 00  434 281 49                  00 -211 00 -112   0000519 52ML41MN
LHC   8301171935P  X3908                                 X431750 060 053 021          1
LHC    W  1620KM 00 -855 276 49                          00 -947   0000415 52ML40MN
FRB   8301171935P  X39204                        X41555  X43250  060 079 027          1
FRB    N  1647KM 00  059 358 49                  00  192 00 -950   0000358 52ML40MN
RSO   8301171935P  X394750                                                            1
RSO    W  1905KM 00 -268 286 50                                    0000000 00ML00MN
FCC   8301171935P                                X43192  X452800 100 038 014          1
FCC    NW 2056KM            312 47               00 -148 00 -116   0000231 52ML40MN
IGL   8301171935P  X40470                                X47040  070 064 014          1
IGL    N  2407KM 00  480 346 39                          00 -351   0000196 52ML40MN
BLC   8301171935P  X404732
BLC    NW 2420KM 00  396 326 39                                    0000000 00ML00MN
YKA   8301171935P  X415078C
YKA    NW 3240KM 00 -187 315 33                                    0000000 00ML00MN
              Z
```

19830117 19:35 MN=4.1 48.992N 67.214W 17.00 KM

GSQ	139.000	-34.000	C		C followed by strong up
GSQ	139.000	-34.000	R	0.5384	on first half cycle
HTQ	285.000	-79.000	D		strong
HTQ	285.000	-79.000	R	0.6161	
SIC	015.000	-83.000	C		analog record
EBN	205.000	49.000	C		near-nodal but C
MNQ	327.000	49.000	D		near-nodal but D
KLN	165.000	49.000	+		near-nodal but +
LMQ	236.000	49.000	D		analog record
LMN	152.000	49.000	-		near-nodal but -
GNT	235.000	49.000	-		
WBO	237.000	49.000	+		near-nodal (emergent)
YKA	315.000	33.000	C		good but not strong
YKA	315.000	-33.000	+		pP goes down
WRA	321.000	10.000	C		from ISC



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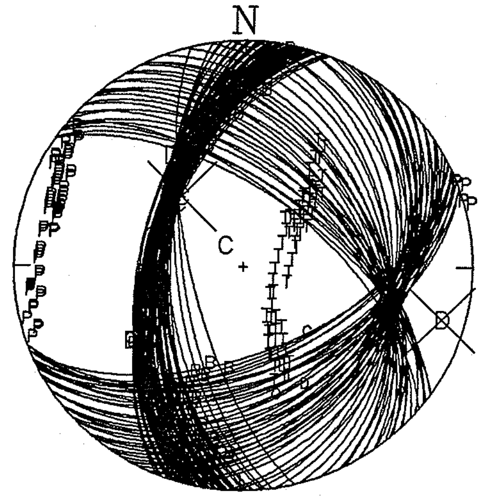
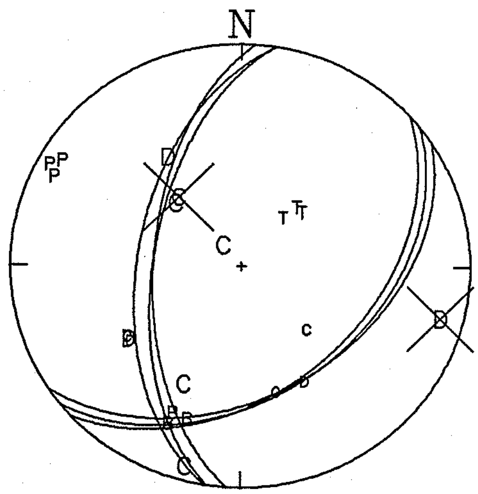
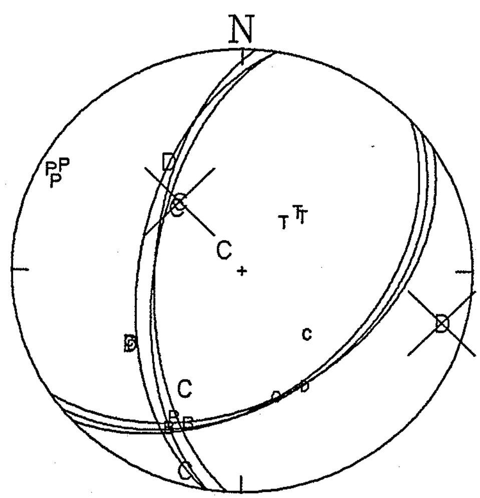


P1 R2

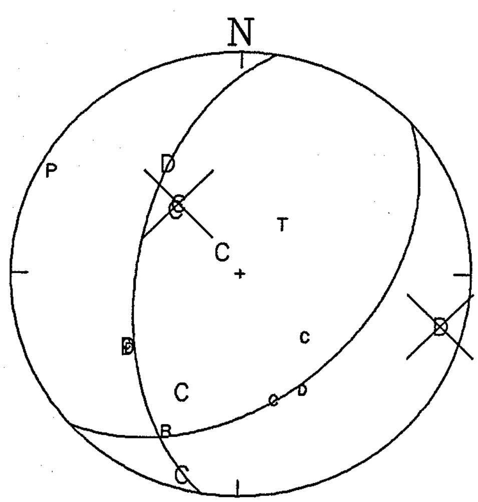
LSL830117.DATT
30–JUN–88 06:40:08



P0.5 R2



P0.5 R 1



BEST SOLUTION

Seismic Zone: LOWER ST. LAWRENCE (SEPT ILES)

Magnitude : 3.2

Location : 49.61N 66.45W

Date(Y/M/D) : 1984/03/29

Time(UT) : 22:52

Depth:

closest station: SIC (67 KM)
free depth = 14.00 KM
pegged at 18.00 km for this mechanism

Quality of Readings:

- GSQ strong down
- P arrival on HTQ very nodal
- very weak Pn on LMN
- first motion on GGN unreadable
- dubious dilatation on SCH

Comments:

Best solution chosen from data set P0 R0;
All solutions very similar; strike of nodal planes could be in error by +/- 20 degrees

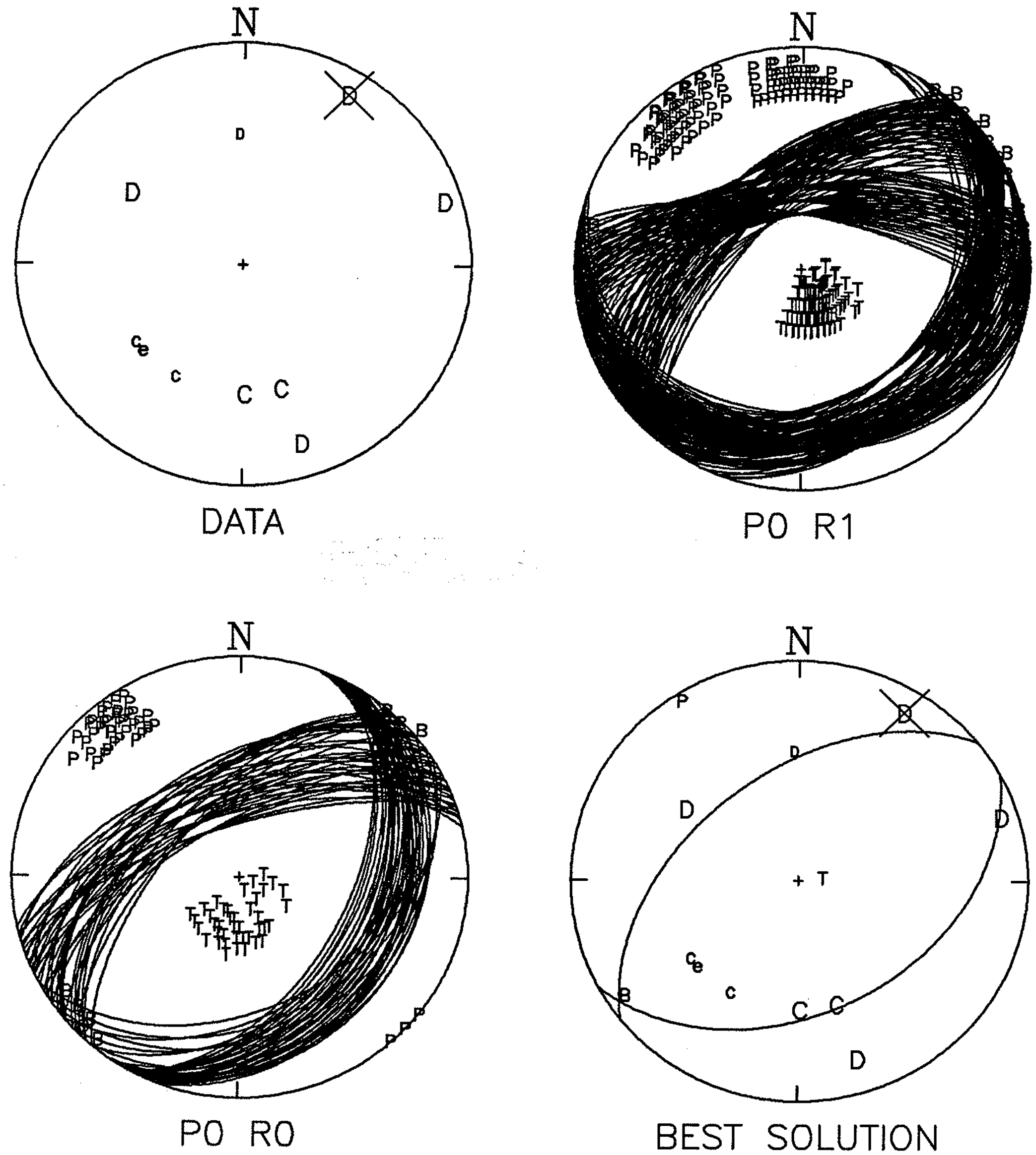
Best Solution:

Strike, Dip, Rake	231	50	83
Strike, Dip, Rake	61	40	98
Trend & Plunge of P	325	5	
Trend & Plunge of T	100	83	
Trend & Plunge of B	235	5	

```
+49.609- 66.456F1MN=3.2 2252496 29031984 00.0060.018 0.3 11 21  80.33 218.00    0 1ML=2.7  80
  70 KM S  FROM SEPT-ILES, QUE.          70 KM S  DE SEPT-ILES, QUE.
$ FOCAL MECHANISM DETERMINED BY ADAMS/STAGG
$RATIO=  1.092 GSQ 530495D 0.13   -37.13    60.87 531622 0.09   459.13
SIC8403292253P                 A53004 D                                        1
SIC   N  0066KM         342-74 19 -027                         0000000 00ML00MN
GSQ8403292253P           -0.21 A530496D            B531625 012  64 145         1
GSQ   SW 0092KM         211-78 19 -003             05  010     0011863 28ML34MN
HTQ8403292253P                 A531341D            B533195 010 179 130         1
HTQ   W  0148KM         252-82 19 -031             05  048     0004563 26ML34MN
MNQ8403292253P A531969D                            B53445  010 138 150         1
MNQ   NW 0195KM19  046  303 49                     05 -012     0006830 30ML37MN
EBN8403292253P C53304 +  -0.21           X54015            010 752 120         1
EBN   SW 0273KM01  154  210 49           00  370               0001003 26ML31MN
KLN8403292253P A533325C  -0.30           C54045            0071191  80         1
KLN   S  0308KM19  002  179 49           01 -084               0000603 23ML30MN
LPQ8403292253P C534047E  -0.21                     X54289  020 620 135         1
LPQ   SW 0364KM01  046  228 49                     00 -314     0000684 31ML32MN
LMQ8403292253P B53410 +                  B54186    B5432   020 292 092         1
LMQ   SW 0366KM05  093  233 49           05  109   05 -038     0000990 33ML34MN
LMN8403292253P B534878C  -0.30           C54335    C5451   0082583  45         1
LMN   S  0436KM05 -008  163 49           01  087   01 -119     0000137 23ML26MN
GGN8403292253P C5357     -0.30           C54465                                1
GGN   S  0500KM01  035  183 49           01  029               0000000 00ML00MN
SCH8403292253P B54068 -                  C55050    X55270                      1
SCH   N  0580KM05  060  358 49           01  191   00 -531     0000000 00ML00MN
             Z
```

```
     19840329 22:52 MN=3.2 49.609N  66.456W   18.00 KM
SIC 342.000 -74.000 D
GSQ 211.000 -78.000 D           strong P arrival
GSQ 211.000 -78.000 R  1.092
HTQ 252.000 -82.000 D           P very nodal
MNQ 303.000  49.000 D
EBN 210.000  49.000 +
KLN 179.000  49.000 C
LPQ 228.000  49.000 e           very emergent
LMQ 233.000  49.000 +
LMN 163.000  49.000 C           very weak P
SCH 358.000  49.000 -           dubious dilatation
```

LSL840329.OUT;11
28-OCT-86 20:54:33



Seismic Zone: Lower St. Lawrence

Magnitude : 3.8

Location : 49.31N 67.51W

Date(Y/M/D) : 1984/04/11

Time(UT) : 19.07

Depth:

closest station: GSQ, 55 km from epicentre
free depth = 19.4 km
pP-P depth (from YKA) = 18.2 km
sP-P depth (from YKA) = 19.0 km
for focal mechanism depth is pegged at 18.5 km

Quality of Readings:

many near-nodal arrivals on digital records
some of these clearly C or D
note YKA P C, pP down so inverted to +
doesn't fit GGN D
note GGN trace is C but polarity was reversed

Comments:

similar mechanism to ls1830117
P axis in NW quadrant
well-constrained thrust mechanism
best solution is (P1.5 R1)

Best Solution:

Strike, Dip, Rake	187	57	66
Strike, Dip, Rake	046	40	122
Trend & Plunge of P	293	9	
Trend & Plunge of T	047	68	
Trend & Plunge of B	200	20	

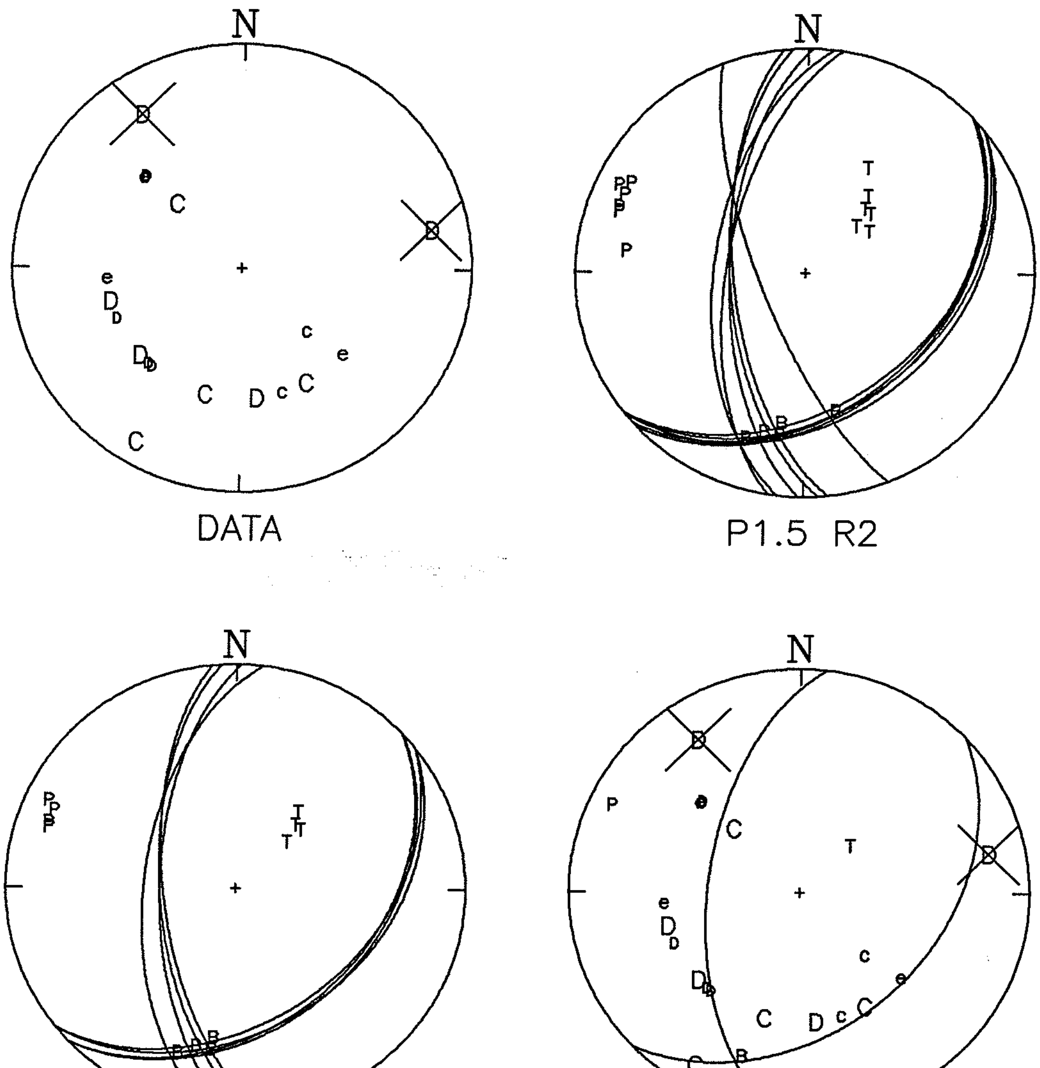
```
+49.314- 67.514F1MN=3.8 1907416 11041984 00.0180.025 0.2 24 41 211.00Z218.50    0 1ML=3.8 100
FELT AT BAIE-COMEAU, QUE.                 RESSENTI A BAIE-COMEAU, QUE.
$PAPER CHANGE AT SXO
$ ECTN PN'S FROM SAM
  50 KM NW FROM GROSSES-ROCHES, QUE.       50 KM NO DE GROSSES-ROCHES, QUE.
$FOCAL MECHANISM DETERMINED BY ADAMS/SHARP
GSQ8404111907P           -0.21  A075113D             B07573   020   9 225         1
GSQ   SE 0055KM          147-70 16 -010              04 -080      0078540 35ML39MN
HTQ8404111907P                  A075389D             B08023   010  47 230         1
HTQ   W  0066KM          258-73 16  120              04  152      0030748 29ML36MN
SIC8404111907P                  A07596 C
                                                                                  1
SIC   NE 0111KM          030-79 16 -019                           0000000 00ML00MN
EBN8404111907P A081493C  -0.21                       B08389   015 102 185         1
EBN   S  0213KM16  137   195 49                      04 -291      0007597 33ML38MN
                                                                                  1
A208404111907P         +
A20   SW 0241KM          223 49                                   0000000 00ML00MN
                                                                                  1
A168404111907P         -
A16   SW 0276KM          223 49                                   0000000 00ML00MN
LMQ8404111907P A08230 D
                                                                                  1
LMQ   SW 0286KM16  069   228 49                                   0000000 00ML00MN
LPQ8404111907P A082353-  -0.21                       X08598   030  42 180         1
LPQ   SW 0287KM16  093   221 49                      00 -272      0008976 40ML41MN
KLN8404111907P A082270+  -0.30  X08316     C08531    C0901    021 152 150         1
KLN   S  0288KM16 -008   162 49 00  308    01  004   01 -179      0002953 34ML37MN
UNB8404111907P X0831                                 B0931    040 074 156         1
UNB   S  0380KM00 -270   170 49                      04  270      0003311 41ML39MN
QCQ8404111907P                  X0842                X0932    040 029 058         1
QCQ   SW 0398KM          226-86 00 -393              00 -126      0003142 42ML39MN
LMN8404111907P A084039C  -0.30                       C0943    030 107  85         1
LMN   SE 0436KM16 -043   151 49                      01 -118      0001664 39ML37MN
GGN8404111907P A084505D  -0.30             C0932     X0953    030 253 215         1
GGN   S  0470KM16  014   173 49            01  034   00 -062      0001780 41ML38MN
SBQ8404111907P C085713
                                                                                  1
SBQ   SW 0550KM01  265   219 49                                   0000000 00ML00MN
HAL8404111907P X09011                      B09596    B10256   030 205 082         1
HAL   SE 0600KM00  060   149 49            04  052   04 -419      0000838 41ML36MN
SCH8404111907P B09028                      B10065    X1034    040 120 153         1
SCH   N  0615KM04  042   004 49            04  415   00  001      0002003 47ML40MN
MNT8404111907P B090465                                        017 539 175         1
MNT   SW 0627KM04  089   230 49                                   0001200 41ML38MN
GBN8404111907P B09040                                B10360   040 141 039         1
GBN   SE 0628KM04  007   132 49                      04 -166      0000434 40ML34MN
TRQ8404111907P A090388                                        038 134 165         1
TRQ   SW 0630KM16 -037   240 49                                   0002036 47ML41MN
GRQ8404111907P A091062-                                       037 113 160         1
GRQ   SW 0692KM16 -116   247 49                                   0002404 48ML42MN
CBK8404111907P B09123                      B1022     B1057                        1
CBK   E  0698KM04 -024   090 49            04  190   04 -037      0000000 00ML00MN
JAQ8404111907P X092020-                    C1034              025 377 165         1
JAQ   NW 0757KM00  050   314 49            01  142                0001100 44ML39MN
LTQ          P
LTQ   NW 0769KM          313 49                                   0000000 00ML00MN
VDQ8404111907P A092074                     C10365    C11181   038 187 180         1
VDQ   W  0778KM16 -151   265 49            01 -053   01 -159      0001592 48ML41MN
EEO8404111907P A093744D                    C11036    X1154    05012801230         1
EEO   W  0912KM16 -119   255 49            01 -201   00 -328      0001208 50ML41MN
KAO8404111907P C09580                      B11405    X12445   050 126 039         1
KAO   W  1086KM01 -183   276 49            04 -210   00 -152      0000389 47ML37MN
GTO8404111907P X10425                      B12511    B14165   060 099 023         1
GTO   W  1406KM00  366   279 49            04  046   04  095      0000243 48ML37MN


FRB8404111907P X1103                       X1339     X1510    060 081 008         1
FRB   N  1611KM00 -075   358 49            00  488   00 -285      0000103 46ML34MN
YKA          P A13385 C
YKA   NW 3200KM16  071   315 33                                   0000000 00ML00MN
             Z
```

19840411 19:07 MN=3.8 49.314N 67.514W 18.50 KM

GSQ	147.000	-70.000	D		
GSQ	147.000	-70.000	R	0.688	
HTQ	258.000	-73.000	D		
HTQ	258.000	-73.000	R	0.767	
SIC	030.000	-79.000	C		from analog record
EBN	195.000	49.000	C		near-nodal but C
A20	223.000	49.000	+		
A16	223.000	49.000	-		
LMQ	228.000	49.000	D		from analog record
KLN	162.000	49.000	+		followed by strong D
LPQ	221.000	49.000	-		
LMN	151.000	49.000	C		near nodal but C
GGN	173.000	49.000	D		trace gives C, but polarity reversed
GBN	131.000	49.000	e		
GRQ	247.000	49.000	-		poor reading
JAQ	314.000	49.000	-		near-nodal
LTQ	313.000	49.000	e		analog, C may be preceded by -
VDQ	265.000	49.000	e		
EEO	255.000	49.000	D		
YKA	315.000	33.000	C		
YKpP	315.000	-33.000	+		down on record, so inverted to +

LSL840411.OUT
9-JUL-86 19:47:45



Seismic Zone: Lower St. Lawrence

Magnitude : 3.2

Location : 49.61N 66.35W (Sept-Iles, Que)

Date(Y/M/D) : 1984/05/28

Time(UT) : 21:04

Depth:

closest station: SIC, 69 KM from epicentre
free depth = 18.7 KM
pegged at 18.0 KM

Quality of Readings:

- only first arrival readable on SIC
- Pg of GSQ very weak 'C'
- Pn on HTQ v. weak -, nodal arrival; Pg on HTQ strong, read as -
- MNQ v. emergent
- LPQ emergent, preceeded by weak signal
- EBN emergent, possibly -

Comments:

- All solutions misfit weak MNQ(+)
- Acceptable solutions for P0.5 R0 neglect one family of solutions which place nodal HTQ Pn at centre of compression field
- Best solution chosen from acceptable solutions
- Mechanism represents thrust faulting in response to SE compression on ENE striking fault planes

Best Solution:

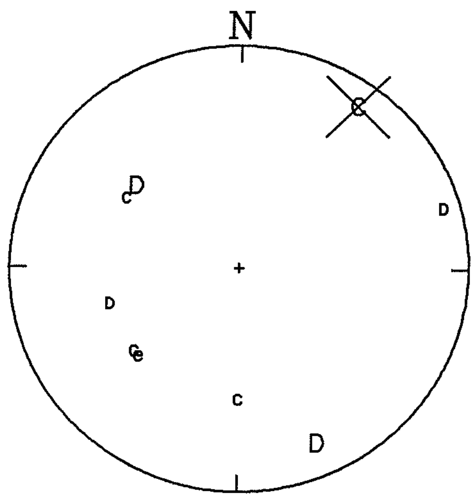
Strike, Dip, Rake	201	57	66
Strike, Dip, Rake	061	40	122
Trend & Plunge of P	308	09	
Trend & Plunge of T	062	68	
Trend & Plunge of B	215	20	

```
+49.606- 66.350F1MN=3.2 2104525 28051984 00.0110.034 0.2 10 16  90.41 218.00  14 1ML=2.9  70
  70 KM SE FROM SEPT-ILES, QUE.          70 KM SE DE SEPT-ILES, QUE.
$ FOCAL MECHANISM DETERMINED BY ADAMS/STAGG
$RATIO=  0.719 GSQ 050869D 0.10    -73.25    88.75 052045 0.06    383.75
SIC8405282105P                 A05044 D                                        1
SIC    NW 0069KM        336-74 15  032                          0000000 00ML00MN
GSQ8405282105P           -0.21 A050870C            A052045 010 212 380         1
GSQ    SW 0096KM        215-78 15  015             15  027      0011262 27ML34MN
HTQ8405282105P A051690   -0.07 A051726-  A05357            020 349 290         1
HTQ    W  0155KM15 -031 254 49 15 -061   15  027                0002610 27ML32MN
MNQ8405282105P A052295+  -0.10            05459            017 234 315         1
MNQ    NW 0202KM15 -001 302 49           04  046                0004975 31ML36MN
EBN8405282105P  053357   -0.21           X06048            0201760 380         1
EBN    SW 0277KM04  144 211 49           00  346                0000678 27ML30MN
KLN8405282105P  053608+  -0.30                             0102240 220         1
KLN    S  0307KM04  007 180 49                                  0000617 25ML30MN
A208405282105P        +                                                        1
A20    SW 0325KM        231 49                                  0000000 00ML00MN
LPQ8405282105P  054360E  -0.21                             0201280 260         1
LPQ    SW 0370KM04  009 228 49                                  0000638 31ML32MN
LMQ8405282105P  05436             0622      0635      020 292 073         1
LMQ    SW 0372KM04 -001 234 49           04  045   04 -196      0000785 32ML33MN
CBK8405282105P                            0712     X0741   030 184 022         1
CBK    E  0615KM        094 49           04 -118   00 -390      0000250 36ML31MN
JAQ8405282105P  063560D  -0.07           X075044           0114364 190         1
JAQ    NW 0798KM04 -002 309 49           00 -179                0000249 35ML33MN
             Z
```

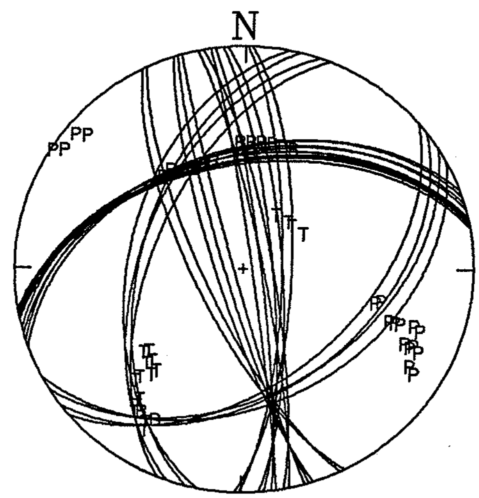
19840528 21:04 MN=3.2 49.606N 66.350W 18.68 KM

SIC	336.000	-74.000	D		analog reading
GSQ	215.000	-78.000	C		very weak C
GSQ	215.000	-78.000	R	0.719	
HTQ	254.000	49.000	-		Pn very weak, nodal
HTQ	253.000	-82.000	-		Pg strong (-)
MNQ	302.000	49.000	+		very emergent
KLN	180.000	49.000	+		very weak Pn
A20	231.000	49.000	+		from analog
LPQ	228.000	49.000	e		
JAQ	309.000	49.000	D		

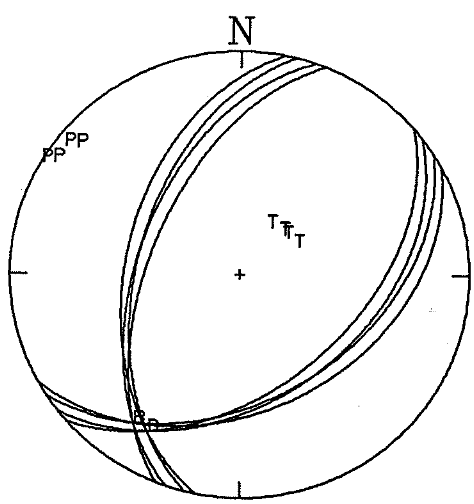
LSL840528.OUT
19-SEP-86 13:42:22



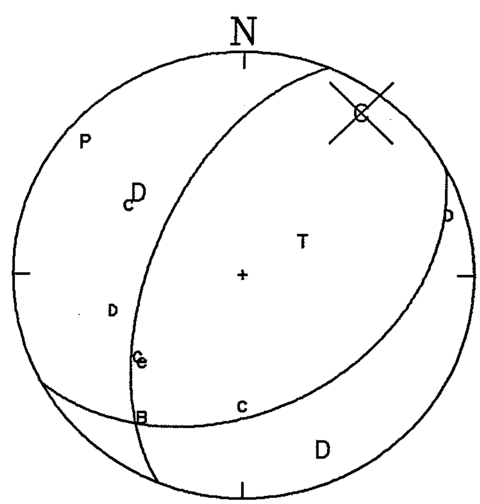
DATA



P0.5 R0



ACCEPTABLE SOLUTIONS



BEST SOLUTION

Seismic Zone: Northern Appalachian

Magnitude : 3.6

Location : 46.00N 64.88W
(near Moncton)

Date(Y/M/D) : 84/09/23

Time(UT) : 08:56

Depth:

closest station: LMN, 18 km from epicentre
free depth = 12.06 km
pegged at 12.0 km for mechanism

Quality of Readings:

EEO, GRQ, GAC, TRQ, LMQ, LPQ probably near-nodal
KLN P taken as Pg
GGN Pn arrival weak
lacks polarities in NE and S quadrants

Comments:

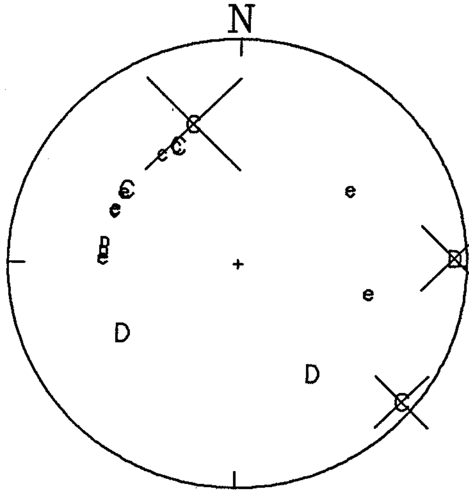
moderately well-constrained solution
mechanism is not sensitive to exact depth of earthquake
including ratios confirms near-nodal Pn arrivals
deleting KLN does not affect solution
KLN as Pn does not affect solution
"best solution" is lowest residual of (P0 R0) set
mechanism is strike slip/thrust in response to
NE compression

Best Solution:

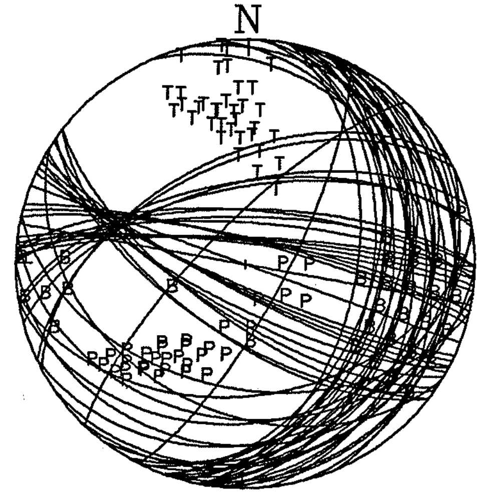
Strike, Dip, Rake	121	78	54
Strike, Dip, Rake	015	38	160
Trend & Plunge of P	238	24	
Trend & Plunge of T	355	45	
Trend & Plunge of B	130	35	

```
+46.001- 64.87901MN=3.6 0856312 23091984 00.0090.019 0.3 20 27 190.44 212.00    0 1ML=3.7 130
FELT IN MONCTON, N.B.                           RESSENTI A MONCTON, N.-B.
MANY AWAKENED                                   PLUSIEURS REVEILLES
 15 KM N  FROM CALEDONIA MT., N.B.       15 KM N  DE MT. CALEDONIA, N.-B.
$FOCAL MECHANISM DETERMINED BY ADAMS/SHARP
LMN8409230856P          -0.30 A563505C                A563724                      1
LMN    S  0018KM        162-55 17  002                17 -034       0000000 00ML00MN
UNB8409230856P                56542 D                  57107   010 031 050         1
UNB    W  0136KM        268-84 04  089                04  115       0010134 29ML36MN
KLN8409230856P          -0.30 A565603C                B571430 011 038 148          1
KLN    NW 0148KM        310-84 17  047                04  107       0022247 33ML41MN
GGN8409230856P A565959D -0.30                         B572275 010 053 150          1
GGN    SW 0181KM17 -032  238 49                       04  051       0017783 33ML41MN
HAL8409230856P A57006 D                               X5720                        1
HAL    SE 0182KM17  077  146 49                       00 -240       0000000 00ML00MN
GBN8409230856P         E                              X5743                        1
GBN    E  0270KM         103 49                       00 -408       0000000 00ML00MN
EBN8409230856P A571475C  -0.21            B574710    X58019  020 107 117          1
EBN    NW 0304KM17 -017  304 49           04 -007    00  513       0003435 35ML38MN
GSQ8409230856P A572231C  -0.21            B57595     X58169  030 127 131          1
GSQ    NW 0364KM17  008  333 49           04 -040    00  342       0002160 38ML37MN
SLQ8409230856P  57221 E                   X58010                                   1
SLQ    NW 0366KM04 -012  302 49           00  093                   0000000 00ML00MN
LPQ8409230856P B572890+  -0.21            X581280    X58332  031 148 136          1
LPQ    NW 0420KM04 -014  293 49           00  099    00  400       0001862 39ML37MN
HTQ8409230856P A573115+                              X58364  025 223 096          1
HTQ    NW 0443KM17 -043  325 49                      00  110       0001082 37ML35MN
LMQ8409230856P  57323 E                   X58190     X5844   020 184 138          1
LMQ    NW 0450KM04 -026  294 49           00  089    00  652       0002356 39ML39MN
QCQ8409230856P                            X5830      X58575  040 029 020          1
QCQ    W  0500KM         282 49           00  145    00  620       0001083 40ML36MN
SBQ8409230856P B57442                     B58400     X59084  025 244 242          1
SBQ    W  0553KM04 -091  265 49           04  000    00  207       0002493 43ML41MN
GNT8409230856P B57485                     X58452     X59203  035 481 198          1
GNT    W  0580KM04  016  277 49           00 -041    00  651       0000739 40ML36MN
MNQ8409230856P B57478 +                   X58450     X59150  030 243 137          1
MNQ    NW 0581KM04 -074  332 49           00 -096    00  086       0001181 41ML38MN
CBK8409230856P         E                  B58515                                   1
CBK    NE 0614KM         056 49           04 -139                   0000000 00ML00MN
MNT8409230856P                            X59100     X59473  030 936 160          1
MNT    W  0683KM         268 49           00  252    00  476       0000358 39ML34MN
TRQ8409230856P B580881+
TRQ    W  0748KM04 -015  275 49                                     0000000 00ML00MN
GAC8409230856P B58183 E                   X59409             060 863 186          1
GAC    W  0824KM04  023  272 49           00  341                   0000226 42ML33MN
GRQ8409230856P B582097-
GRQ    W  0849KM04 -013  279 49                                     0000000 00ML00MN
MUN8409230856P C5832                      X6001              040 108 008        8 1
MUN    E  0943KM01 -064  075 49           00 -191                   0000116 39ML31MN
SCH8409230856P C58363                     X60075     X6113   060 086 028          1
SCH    N  0991KM01 -216  353 49           00 -556    00  422       0000341 46ML36MN
VDQ8409230856P X58400                     X6019      X61214  060 062 013          1
VDQ    W  1023KM00 -243  289 49           00 -099    00  345       0000220 44ML34MN
EEO8409230856P X5852                      X60372     X6142   050 161 032          1
EEO    W  1095KM00  086  279 49           00  202    00  408       0000250 45ML35MN
JAQ8409230856P X5859                      X6049              050 204 018          1
JAQ    NW 1164KM00 -064  322 49           00 -102                   0000111 42ML32MN
KAO8409230856P X5921                      X6131      X6258   060 147 007          1
KAO    NW 1373KM00 -402  293 49           00 -329    00  220       0000050 41ML30MN
               Z
```

```
     19840923 08:56 MN=3.6 46.000N  64.879W   12.06 KM
LMN 162.000 -55.000 C        strong C
LMN 162.000 -55.000 R-0.170  P larger than S
UNB 268.000 -84.000 D
UNB 268.000 -84.000 R 0.620  from analog record
KLN 310.000 -84.000 C        near-nodal but C
KLN 310.000 -84.000 R 0.996  assumed to be Pg
GGN 238.000  49.000 D      trace gives C, but polarity reversed
HAL 146.000  49.000 D        from analog record; strong D
GBN 103.000  49.000 e        very emergent
EBN 304.000  49.000 C        good C
GSQ 333.000  49.000 C        C but weak
SLQ 302.000  49.000 e        analog record dubious; possibly + followe
LPQ 293.000  49.000 +
HTQ 325.000  49.000 +        trace needs filtering
LMQ 294.000  49.000 e        from analog record
MNQ 332.000  49.000 +
CBK 056.000  49.000 e        from analog record; emergent
TRQ 275.000  49.000 -        spiky; trace gives +, but polarity revers
GAC 272.000  49.000 e        possibly -
GRQ 279.000  49.000 -        spiky
```

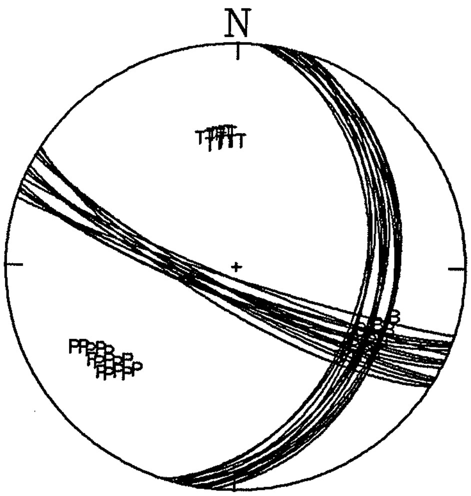


DATA

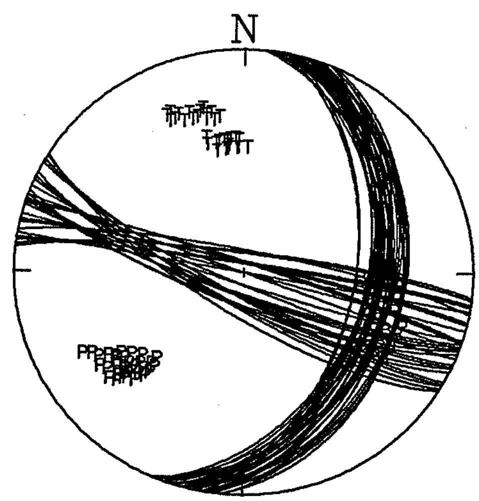


P0 R3 10 DEG INC

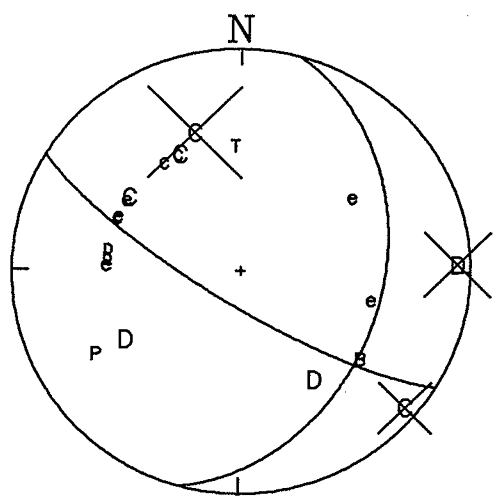
MON840923.OUT;15
23-JUL-86 15:54:30



P0 R0



P0 R0 (without KLN)



BEST SOLUTION

Seismic Zone: Northern Appalachians

Magnitude : 3.5

Location : 45.37N 70.69W
(near Coburn Gore, Maine)

Date(Y/M/D) : 1985 04 12

Time(UT) : 05:27

Depth:

closest station: JKM, 47 km from epicentre
free depth = 7.95 KM
pegged at 7.5 km

Quality of Readings:

SBQ ratio does not fit solution
HN originally read as C - not used
BNH and MIM are have weak P phases
DVT pol reversed - up on trace, therefore D
JKM and BNH ratios done by hand from photocopies of trace

Comments:

4 km south of Canada-US border. Mechanism represents thrust faulting on north-south planes. In general area of Mb 4.8 Quebec-Maine Border earthquakes of 15 June 1973

Best Solution:

Strike, Dip, Rake	178	41	075
Strike, Dip, Rake	018	51	103
Trend & Plunge of P	099	05	
Trend & Plunge of T	343	79	
Trend & Plunge of B	190	10	

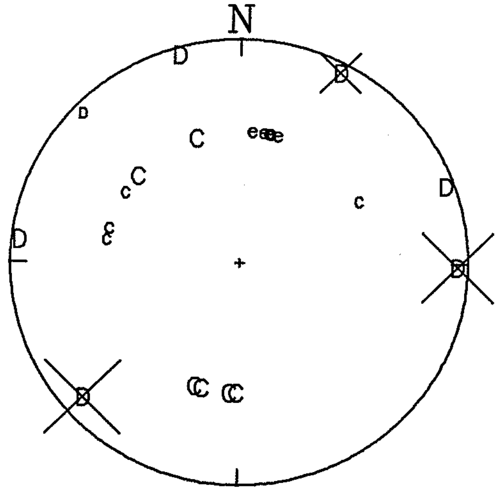
```
+45.373- 70.691F1MN=3.5 0527306 12041985 00.0060.008 0.2 36 45 110.49 2 7.50    0 1ML=3.1   90
045.330- 70.620F1MB=3.5 0527310 12041985 1 13KM 13KM 0.0  8  8  00.90 5 5.00    0 0  =0.0   00
NOT REPORTED FELT IN CANADA                    NON REPORTE RESSENTI AU CANADA
FELT (III) AT STRATTON MAINE                   RESSENTI (III) A STATTON MAINE.
 100 KM E  FROM SHERBROOKE, QUE.               100 KM E  DE SHERBROOKE, QUE.
$RATIO=  0.337 JKM
$RATIO=  0.461 SBQ 274630D 0.09     -166.77      228.23 275730 0.08       482.23
$RATIO=  1.333 BNH
JKM8504120527P              0.00  273834D              X274292 000    0    0      0  0
JKM    NE 0047KM          048-80 10  000               00 -109        0000000 00ML00MN
SBQ8504120527P              0.00  274628D               27573  009 108 300      0  0
SBQ    W   0097KM         271-85 10 -002               10 -054        0019393 29ML37MN
BNH8504120527P              0.00  274680D               275782 000    0    0      0  0
BNH    SW 0098KM          207-85 10  034               10 -029        0000000 00ML00MN
HKM8504120527P                    274978-               280320
HKM    SE 0115KM          134-85 10  056               10  029        0000000 00ML00MN
DVT8504120527P              0.00  275130D                      000    0    0      0  0
DVT    W   0125KM         249-86 10  045                              0000000 00ML00MN
TRM8504120527P              0.00  275200D               280612 000    0    0      0  0
TRM    S   0128KM         164-86 10  059               10 -057        0000000 00ML00MN
MIM8504120527P              0.00  275214D               280682 000    0    0      0  0
MIM    E   0130KM         096-86 10  044               10 -038        0000000 00ML00MN
DES8504120527P  27575       0.00            X2819              000    0    0      0  0
DES    NW 0165KM10 -012   310 49            00  140                   0000000 00ML00MN
LAP8504120527P X27565       0.00             28185             000    0    0      0  0
LAP    NW 0170KM00 -171   312 49            10 -011                   0000000 00ML00MN
GNT8504120527P  275802C     0.00             2819              015 163 225      0  0
GNT    NW 0171KM10 -025   311 49            10  026                   0005782 30ML36MN
PAR8504120527P X27580       0.00             28200             000    0    0      0  0
PAR    NW 0176KM00 -094   309 49            10  011                   0000000 00ML00MN
WNH8504120527P  275874C                      281979
WNH    S   0176KM10 -025  199 49            10 -019                   0000000 00ML00MN
A108504120527P X280402E     0.00                               000    0    0      0  0
A10    N   0212KM00  073  010 49                                      0000000 00ML00MN
HNH8504120527P  280524      0.00            X283124            000    0    0      0  0
HNH    SW 0225KM10  038   215 49            00  102                   0000000 00ML00MN
LPQ8504120527P  280560+    -0.21            X2833              017 392 260      0  0
LPQ    N   0225KM10  047  013 49            00  248                   0002451 29ML34MN
HN 8504120527P  280492      0.00                       X283490 000    0    0      0  0
HN     NE 0228KM10 -034   066 49                       00  037        0000000 00ML00MN
AGM8504120527P  28050       0.00            X283332            000    0    0      0  0
AGM    NE 0230KM10 -046   034 49            00  204                   0000000 00ML00MN
MNT8504120527P  280605      0.00            X28331             017 237 280      0  0
MNT    W   0230KM10  054  275 49            00  175                   0004367 32ML37MN
A548504120527P X280598E     0.00                               000    0    0      0  0
A54    N   0233KM00  010  005 49                                      0000000 00ML00MN
A168504120527P X280687E     0.00                               000    0    0      0  0
A16    N   0239KM00  029  012 49                                      0000000 00ML00MN
ONH8504120527P  280730C                     X283481
ONH    S   0242KM10  035  196 49            00  094                   0000000 00ML00MN
LMQ8504120527P  280735      0.00                       X28373  010 427 350      0  0
LMQ    N   0244KM10  015  006 49                       00 -160        0005150 31ML38MN
DNH8504120527P  276835C                      283579
DNH    S   0251KM10  032  184 49            10  005                   0000000 00ML00MN
EMM8504120527P  28090       0.00                               000    0    0      0  0
EMM    E   0262KM10 -039  104 49                                      0000000 00ML00MN
A618504120527P X280977E     0.00                               000    0    0      0  0
A61    N   0262KM00  030  010 49                                      0000000 00ML00MN
CBM8504120527P  280986      0.00                               000    0    0      0  0
CBM    NE 0264KM10  022   048 49                                      0000000 00ML00MN
```

```
A208504120527P X281091E     0.00                               000    0    0      0  0
A20    N   0271KM00  045  016 49                                      0000000 00ML00MN
BVT8504120527P  281098      0.00                               000    0    0      0  0
BVT    SW 0271KM10  044   215 49                                      0000000 00ML00MN
IVT8504120527P  281212      0.00                               000    0    0      0  0
IVT    SW 0279KM10  064   223 49                                      0000000 00ML00MN
A648504120527P X281107E     0.00                               000    0    0      0  0
A64    N   0280KM00 -051  012 49                                      0000000 00ML00MN
EBN8504120527P  281380     -0.21            X2850              015 606 210      0  0
EBN    NE 0299KM10 -035   038 49            00  372                   0001452 30ML34MN
GLO8504120527P  277456C
GLO    S   0304KM10  006  181 49                                      0000000 00ML00MN
GGN8504120527P  28143      -0.30            X2850              015 347 220      0  0
GGN    E   0305KM10 -067  094 49            00  236                   0002656 33ML37MN
RS 8504120527P  28155       0.00                               000    0    0      0  0
RS     W   0317KM10 -059  255 49                                      0000000 00ML00MN
WBO8504120527P  28216       0.00            X2903              0151042 260      0  0
WBO    W   0363KM10 -009  265 49            00  340                   0001045 32ML34MN
DUX8504120527P  278174C
DUX    S   0367KM10 -050  181 49                                      0000000 00ML00MN
KLN8504120527P  28229 +    -0.30                       X2914   000    0    0      0  0
KLN    NE 0372KM10 -025   062 49                       00 -115        0000000 00ML00MN
GAC8504120527P  282321      0.00            X290366    X291513 000    0    0      0  0
GAC    W   0376KM10 -008  277 49            00  128    00 -081        0000000 00ML00MN
LMN8504120527P X283355     -0.30            X292237    X294250 000    0    0      0  0
LMN    E   0462KM00 -061  081 49            00  125    00  204        0000000 00ML00MN
GSQ8504120527P X283663
GSQ    NE 0478KM00  079   033 49                                      0000000 00ML00MN
CKO8504120527P  284129+     0.00             29355     X2956   027 723 190      0  0
CKO    W   0531KM10 -095  280 49            10  005    00 -345        0000612 37ML34MN
VDQ8504120527P  28547 +     0.00            X29585     X3027   040 455 125      0  0
VDQ    NW 0640KM10 -084   302 49            00 -015    00 -297        0000432 40ML34MN
[illegible]
```

19850412 05:27 MN=3.5 45.373N 70.691W 7.50 KM

JKM	048.000	-80.000	D		US data
JKM	048.000	-80.000	R	0.337	Ratio measured from analog playout
SBQ	271.000	-85.000	D		
SBQ	271.000	-85.000	R	0.461	
BNH	207.000	-85.000	D		US data; clear D, but weak
BNH	207.000	-85.000	R	1.333	Ratio measured from analog playout
HKM	134.000	-85.000	-		US data
DVT	249.000	-86.000	D		US data;polarity reversed - up on tra
TRM	164.000	-86.000	D		US data
MIM	096.000	-86.000	D		US data; clear D, but weak
GNT	311.000	49.000	C		
WNH	199.000	49.000	C		US data
A10	010.000	49.000	e		Charlevoix array
LPQ	013.000	49.000	+		
A54	005.000	49.000	e		Charlevoix array
A16	012.000	49.000	e		Charlevoix array
ONH	196.000	49.000	C		US data
DNH	184.000	49.000	C		US data
A61	010.000	49.000	e		Charlevoix array
A20	016.000	49.000	e		Charlevoix array
A64	012.000	49.000	e		Charlevoix array
GLO	181.000	49.000	C		US data
DUX	181.000	49.000	C		US data
KLN	062.000	49.000	+		
CKO	280.000	49.000	+		
VDQ	302.000	49.000	+		
EEO	285.000	49.000	+		
JBQ	341.000	49.000	C		

NAP850412.OUT



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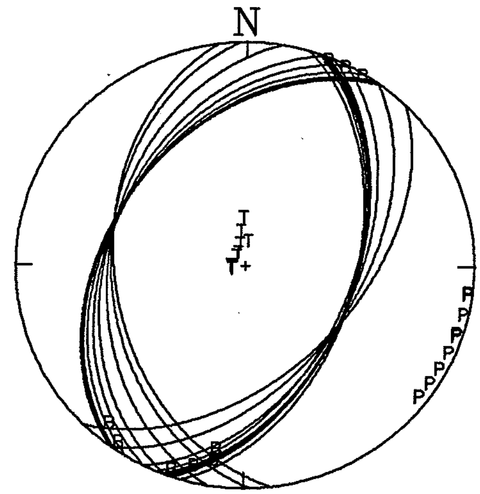
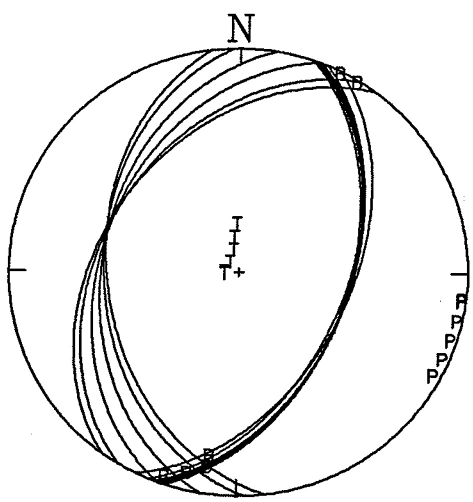
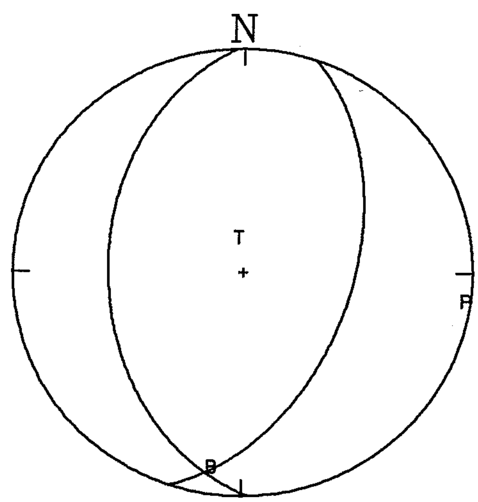


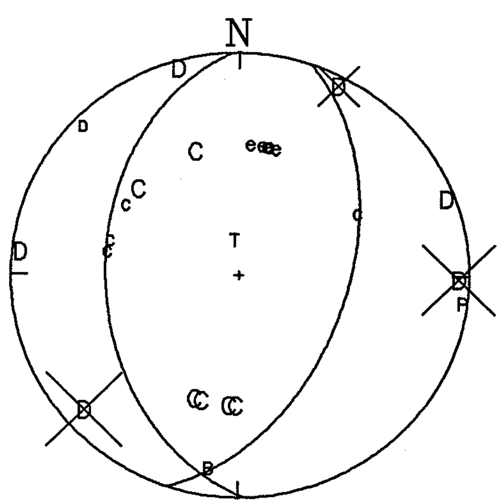
P0 R3



P0 R2



P0 R1



BEST SOLUTION

Seismic Zone: LOWER ST. LAWRENCE

Magnitude : 3.2

Location : 49.26N 67.60W

Date(Y/M/D) : 1985/08/16

Time(UT) : 22:48

Depth:

closest station: GSQ (54 KM from epicentre)
free depth = 20 KM
pegged at 18 KM for this mechanism

Quality of Readings:

- MNQ, LPQ nearly nodal
- good P arrivals on GSQ and HTQ
- TRQ very emergent
- first motions on Charlevoix array data unreadable from hardcopy digital playouts

Comments:

Best solution chosen from P0 R1 which misfits HTQ ratio badly, but best fits nearly nodal MNQ and LPQ and array data.

Mechanism is strike slip in response to EW compression.

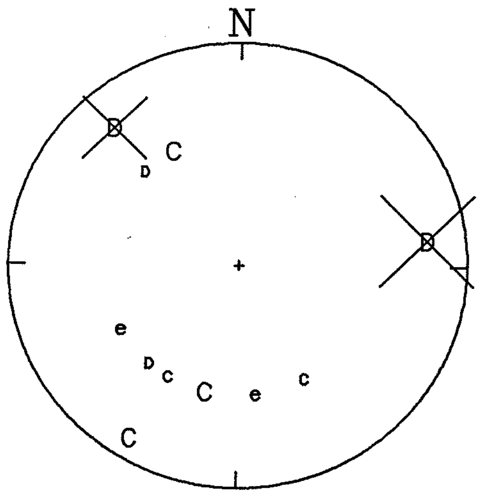
Best Solution:

Strike, Dip, Rake	319	85	-14
Strike, Dip, Rake	51	76	-175
Trend & Plunge of P	274	14	
Trend & Plunge of T	6	6	
Trend & Plunge of B	120	75	

```
+49.263- 67.60101MN=3.2 2248366 16081985 00.0070.008 0.2 20 29 150.45 218.00    0 1ML=2.7   70
$ 60 KM NW FROM GROSSES-ROCHES, QUE.       60 KM NO DE GROSSES-ROCHES, QUE.
$ FOCAL MECHANISM COMPILED BY ADAMS/STAGG
$RATIO= -0.164 HTQ 484665D 0.13 -1121.99  2157.01 485407 0.08    769.01
$RATIO=  0.705 GSQ 484619D 0.11  -118.81   246.19 485262 0.10    601.81
GSQ8508162248P             -0.21 A484621D        A485261 020 100 407          1
GSQ    SE 0054KM          138-71 21   013        21 -024      0012786 27ML31MN
HTQ8508162248P             -0.07 A484668D        A485408 007 100  70          1
HTQ    W  0058KM          262-72 21   008        21  022      0006283 20ML28MN
SIC8508162248P                   A48565 C
SIC    NE 0119KM          031-80 21   045
                                                              0000000 00ML00MN
MNQ8508162248P A490196C  -0.10                    492160 007 100 105          1
MNQ    NW 0165KM21 -063  330 49                  05 -156      0009425 28ML38MN
EBN8508162248P C490986C  -0.21                   B493391 017 100  52          1
EBN    S  0206KM01  213  194 49                  05 -090      0001922 27ML32MN
SLQ8508162248P C49095 +                          C49355
SLQ    SW 0206KM01  196  211 49                  01  087      0000000 00ML00MN
A208508162248P X491206                           C494155                      1
A20    SW 0232KM00  137  223 49                  01 -035      0000000 00ML00MN
A648508162248P X491214                           C49424                       1
A64    SW 0233KM00  137  227 49                  01  033      0000000 00ML00MN
A168508162248P X491661                           X4950                        1
A16    SW 0268KM00  156  223 49                  00 -190      0000000 00ML00MN
LMQ8508162248P  49175                            X49482
LMQ    SW 0278KM05  120  228 49                  00 -646      0000000 00ML00MN
LPQ8508162248P C491798-  -0.21                   C495435 027 100  73          1
LPQ    SW 0279KM01  138  221 49                  01 -078      0001699 32ML34MN
KLN8508162248P X491879   -0.30                           010 100   9          1
KLN    S  0284KM00  138  161 49                               0000565 24ML29MN
A548508162248P X491950                           C495750                      1
A54    SW 0290KM00  177  227 49                  01 -045      0000000 00ML00MN
A108508162248P X492026                           C50000                       1
A10    SW 0296KM00  181  222 49                  01  032      0000000 00ML00MN
LMN8508162248P B493678+  -0.2                    C503961
LMN    SE 0434KM05  124  150 49                  01  106      0000000 00ML00MN
GGN8508162248P C494024E  -0.30                           020 100   6          1
GGN    S  0465KM01  089  172 49                               0000188 29ML28MN
SCH8508162248P C49575
SCH    N  0621KM01 -064  005 49                               0000000 00ML00MN
TRQ8508162248P X500058E                 X510148  C513180 023 100   9          1
TRQ    SW 0622KM00  231  240 49         00  255  01  092      0000246 35ML31MN
GRQ8508162248P                                   X514372 037 100  27               515394
GRQ    W  0684KM         248 49                  00 -465      0000459 41ML35MN
GAC8508162248P                                   X515378 040 100  16          1
GAC    SW 0713KM         239 49                  00 -280      0000251 39ML32MN
WBO8508162248P                                   X520338 043 100  11          1
WBO    SW 0751KM         234 49                  00 -360      0000161 38ML31MN
JAQ8508162248P C501583-                  512809  X520626 027 100  13          1
JAQ    NW 0756KM01  117  315 49         05  056  00 -237      0000303 39ML34MN
VDQ8508162248P C501591                            521173 040 100  13          1
VDQ    W  0771KM01 -054  265 49                  05 -103      0000204 39ML32MN
CKO8508162248P                          C514289  X522519 047 100   9               522618
CKO    W  0824KM         248 49         01  094  00 -245      0000120 38ML30MN
EEO8508162248P C503172                           X524623 033 100   8          1
EEO    W  0905KM01 -101  256 49                  00 -391      0000152 39ML32MN
              Z
```

```
     19850816 22:48 MN=3.2 49.263N  67.601W   18.00 KM
GSQ 138.000 -71.000 D          good P arrival
GSQ 138.000 -71.000 R  0.705
HTQ 262.000 -72.000 D          good P arrival
HTQ 262.000 -72.000 R -0.164
SIC 031.000 -80.000 C
MNQ 330.000  49.000 C          nearly nodal
EBN 194.000  49.000 C
SLQ 211.000  49.000 +
LPQ 221.000  49.000 -          nearly nodal
LMN 150.000  49.000 +
GGN 172.000  49.000 e          very emergent
TRQ 240.000  49.000 e          very emergent
JAQ 315.000  49.000 -
```

LSL850816.OUT
27–OCT–86   18:38:13



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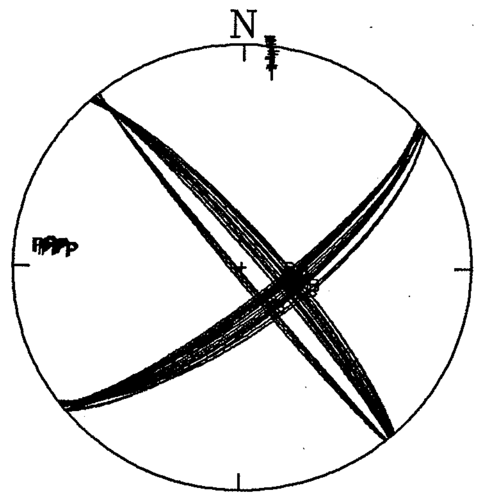
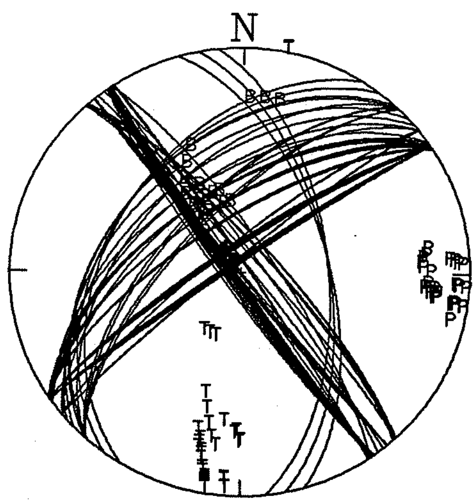
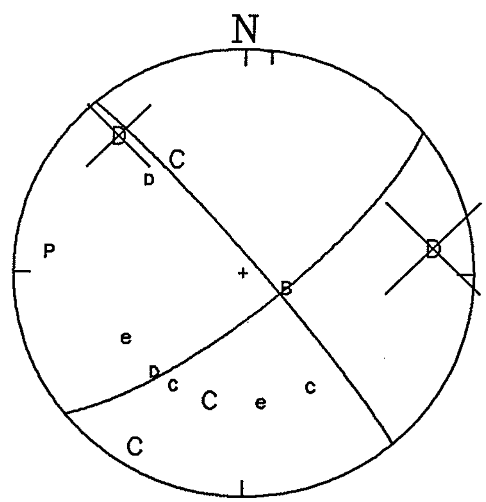


P0 R1



P1 R0



BEST SOLUTION

Seismic Zone: Western Quebec

Magnitude : 3.1

Location : 45.61N 76.68W
Near Renfrew

Date(Y/M/D) : 1985/08/24

Time(UT) : 06:04

Depth:

closest station: CKO, 73km from epicentre
free depth = 9.07 km
pegged at 9.0 km
very similar solutions for depths of 4 and 18 km

Quality of Readings:

- TRQ, GAC, CKO good readings
- GNT sharp arrival doesn't fit predicted times
- P arrival on WEO may be preceeded by weak signal
- first motion on VDQ emergent possibly +
- first arrival on WBO fits Pg time, followed by stronger later arrival which fits as Pn; first motion apparently a down

Comments:

- P0 R3 misfits GAC, GRQ, and OTT
- misfit on GAC and GRQ ratio due to asymmetric pulse and choice of P(0.5) amplitude; if P(1.5) were used the fit would be good
- best solution chosen from P0 R3 set; misfits GAC and GRQ as above, misfits OTT least
- mechanism represents thrust faulting in response to NNE compression on SE and E striking fault planes
- SE plane is parallel to Ottawa River and possibly on a Ottawa-Bonnechere rift fault

Best Solution:

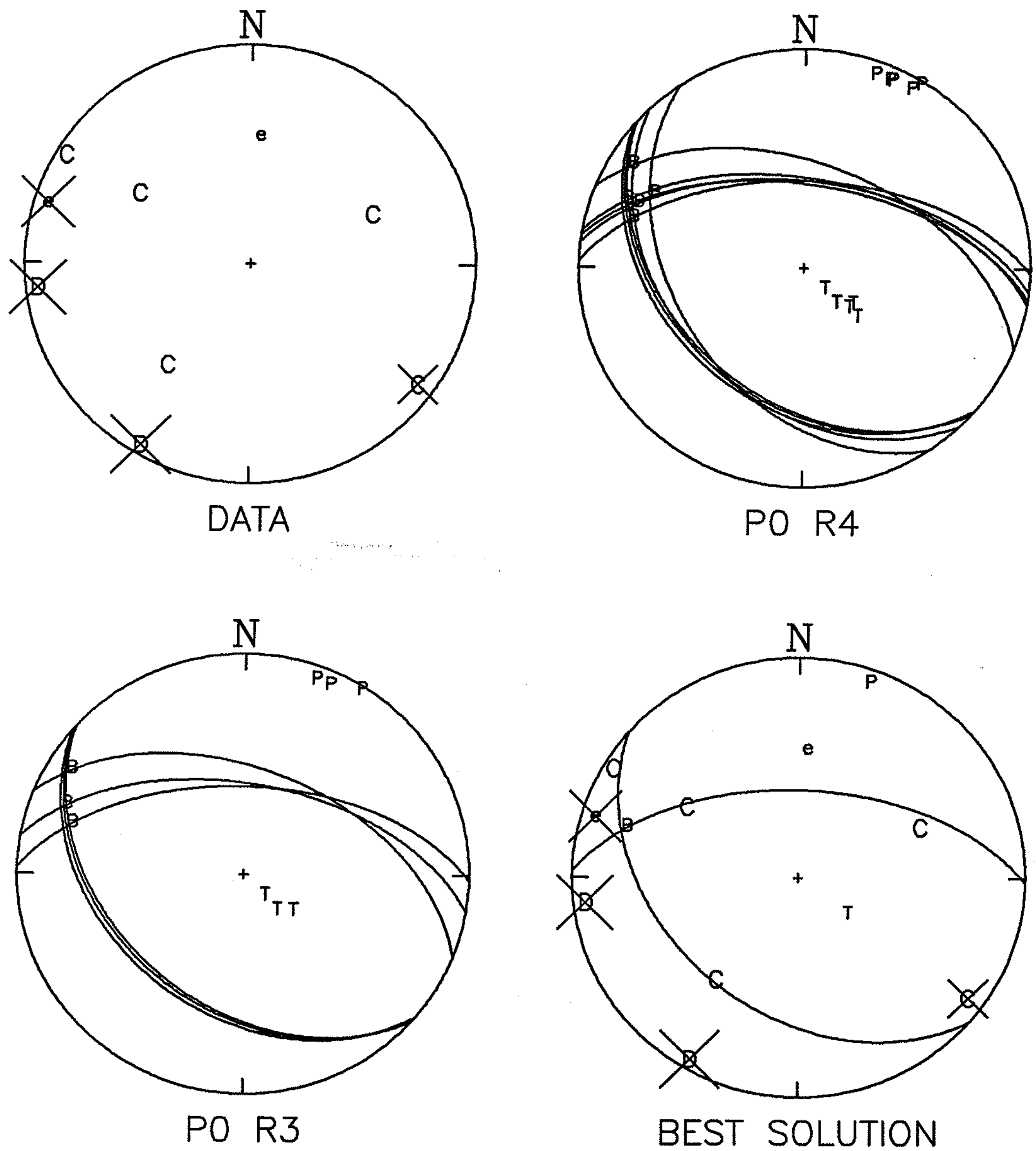
Strike, Dip, Rake	272	57	66
Strike, Dip, Rake	131	40	122
Trend & Plunge of P	018	09	
Trend & Plunge of T	132	68	
Trend & Plunge of B	285	20	

```
+45.615- 76.684F1MN=3.1 0604022 24081985 00.0270.024 0.3 11 20 131.07 218.00   0 1ML=2.6 133
FELT IN RENFREW,ONT.                    RESSENTI A RENFREW,ONT.                   0007 850824.060401
  70 KM SE FROM CHALK RIVER, ONT.        70 KM SE DE CHALK RIVER, ONT.            0007 850824.060402
$ FOCAL MECHANISM DETERMINED BY ADAMS/STAGG
$RATIO=  0.797 GRQ 042256D 0.21    -27.95      95.05 043821 0.13    175.05
$RATIO=  1.362 CKO 041368C 0.12     14.94      69.94 042258 0.08    343.94
$RATIO=  0.896 GAC 041707D 0.21   -384.14    1159.14 042844 0.26   3022.86
$RATIO=  1.000 OTT 041481E                           042490
CKO8508240604P                 A041368C            A042259 010 100  61        1  0007 850824.060421
CKO   NW 0073KM         306-75 13 -071             13 -074      0003833 21ML28MN
OTT8508240604P                  041481E            A042490 007 100  57        1  0007 850824.060423
OTT    E  0080KM        108-76 03 -061             13 -022      0005116 21ML30MN
GAC8508240604P                 A041708D            A042845 020 100  38        1  0007 850824.060425
GAC    E  0095KM        084-78 13 -070             13 -077      0001194 20ML25MN
GRQ8508240604P                 A042256D            B043825 007 100  57        1  0007 850824.060427
GRQ   NE 0127KM         030-81 13 -046             03 -006      0005116 24ML33MN
WBO8508240604P A042401         B042267C            A043780 017 100 107        1  0007 850824.060429
WBO   SE 0130KM13  058  121-81 03 -075             13 -121      0003955 27ML32MN
TRQ8508240604P A043022C                            A045230 007 100  25        1  0007 850824.060431
TRQ   NE 0179KM13  040  067 49                     13  206      0002244 23ML32MN
EEO8508240604P B043546C                             050187 023 100  47        1  0007 850824.060433
EEO   NW 0217KM03  098  303 49                     03  351      0001284 28ML31MN
WEO8508240604P A043616C                            C050413 007 100  91        1  0007 850824.060435
WEO   SW 0222KM13  108  218 49                     01  472      0008168 31ML39MN
MNT8508240604P X043908                              050848 013 100  31        1  0007 850824.060437
MNT    E  0239KM00  190  092 49                    03  541      0001498 27ML32MN
VDQ8508240604P  044772                             X052561 013 100   8        1  0007 850824.060439
VDQ    N  0307KM03  228  342 49                    00  813      0000387 24ML28MN
GNT8508240604P                 X045460             X053521 020 100  20        1  0007 850824.060443
GNT    E  0344KM        074 49 00  463             00  982      0000628 30ML31MN
SUD8508240604P X045230                             X05365  023 100 013        1  0007 850824.060441
SUD    W  0345KM00  225  287 49                    00 1098$     0000355 28ML29MN
LPQ8508240604P           -0.21                     X063138 037 100  23        1  0007 850824.060445
LPQ   NE 0547KM         067 49                     00 2257$     0000391 36ML32MN
JAQ8508240604P B060048E
JAQ    N  0914KM03  101  004 49                                 0000000 00ML00MN
             Z
```

19850824 06:04 MN=3.1 45.610N 76.683W 9.00 KM

CKO	306.000	-82.000	C		strong P,S
CKO	306.000	-82.000	R	1.362	
OTT	107.000	-83.000	e		emergent
OTT	107.000	-83.000	R	1.000	ratio from digital playout
GAC	083.000	-84.000	D		strong P,S
GAC	083.000	-84.000	R	0.896	
GRQ	030.000	-85.000	D		Sg dubious
GRQ	030.000	-85.000	R	0.797	
WBO	121.000	-85.000	C		weak Pg followed by strong Pn
TRQ	067.000	49.000	C		strong P,S
EEO	303.000	49.000	C		
WEO	218.000	49.000	C		strong but preceeded by weak signal
JAQ	004.000	49.000	e		emergent

WQU850824.OUT
22-SEP-86 12:26:30



Seismic Zone: Western Quebec

Magnitude : 3.4

Location : 45.78N 77.34W (Pembroke,Ont)

Date(Y/M/D) : 1986/01/10

Time(UT) : 09:59

Depth:

closest station: CKO, 26 KM from epicentre
free depth = 14.32 KM
pegged at 14.00 KM

Quality of Readings:

- very strong Pg on CKO
- Pg on TRQ very weak (-); nodal (ratio from Sn/Pn)
- WEO and VDQ very emergent
- first motion on EEO and OTT weak dilatations

Comments:

- solutions found by forcing them to fit TRQ nodal arrival (P0 R1)
- acceptable solutions chosen from P0 R1 by deleting nodal planes near strong CKO arrival
- all solutions misfit OTT ratio (which was taken at 134 KM); best solution misfits it least
- mechanism represents strike slip/thrust in response to E-W compression

Best Solution:

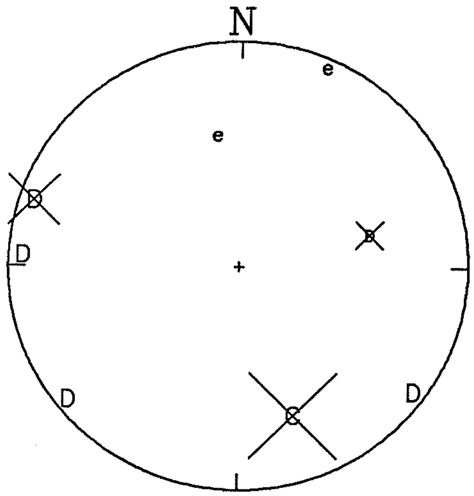
Strike, Dip, Rake	317	48	19
Strike, Dip, Rake	214	76	137
Trend & Plunge of P	272	17	
Trend & Plunge of T	167	40	
Trend & Plunge of B	020	45	

```
+45.777- 77.338F1MN=3.4 0959473 10011986 00.0140.012 0.3  9 20  70.40 214.00   0 1ML=2.9  80
$ FOCAL MECHANISM DETERMINED BY ADAMS/STAGG
$RATIO=  0.025 CKO 595255C 0.10  1241.96  1653.04 595570 0.06  1317.04
CKO8601100959P          -0.06 A595256C          A595570 010 100 755
CKO    N  0026KM        340-60 15  045          15  011     0047438 23ML41MN
OTT8601100959P          -0.06  600912D          B602557 013 100 144
OTT    E  0134KM        108-83 04  007          04  055     0006960 28ML35MN
GAC8601100959P          -0.06 A601082D          A602845
GAC    E  0145KM        093-83 15 -005          15  025     0000000 00ML00MN
GRQ8601100959P          -0.09 A601112D           602831
GRQ    NE 0147KM        051-84 15 -006          04 -040     0000000 00ML00MN
EEO8601100959P          -0.06 A601355D           603459 010 100  81
EEO    NW 0165KM        306-84 15 -050          04  087     0005089 27ML35MN
WEO8601100959P          -0.07 C602164E           604717 013 100 187
WEO    SW 0212KM        203-85 01  000          04  028     0009038 33ML39MN
TRQ8601100959P A602092-  -0.09 A602274          B604714 023 100  55
TRQ    E  0221KM15  032  076 49 15 -043          04 -238     0001503 28ML32MN
VDQ8601100959P C602943E  -0.07 C603280           610453 013 100  21
VDQ    N  0277KM01  210  350 49 01  066          04 -056     0001015 27ML32MN
SUD8601100959P C603146                           610924
SUD    W  0291KM01  253  287 49                  04  037     0000000 00ML00MN
MNT8601100959P                X603571            X610764 027 100  39
MNT    E  0291KM         095-86 00  133          00 -140     0000908 30ML32MN
GNT8601100959P                X604742            X613357 027 100  22
GNT    E  0390KM         079-87 00 -281          00 -301     0000512 32ML31MN
              Z
```

19860110 09:59 MN=3.4 45.777N 77.338W 14.00 KM

CKO	340.000	-60.000	C		strong readings
CKO	340.000	-60.000	R	0.025	
OTT	108.000	-83.000	D		weak down; Pg poor
OTT	108.000	-83.000	R	1.058	taken at 134 km
GAC	093.000	-83.000	D		Pg good
GRQ	051.000	-84.000	D		
EEO	306.000	-84.000	D		weak down
WEO	203.000	-85.000	e		very emergent
TRQ	076.000	49.000	-		very weak Pg; nodal
TRQ	076.000	49.000	R	1.7	from Sn/Pn
VDQ	350.000	49.000	e		very emergent

WQU860110.OUT
19-SEP-86 15:59:18



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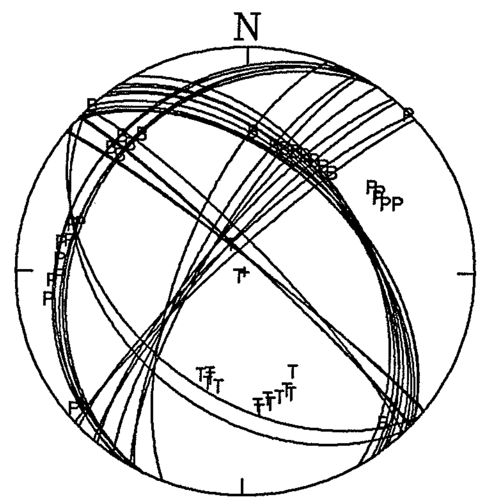
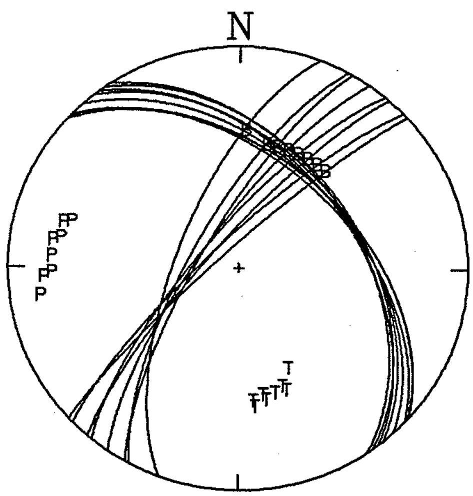
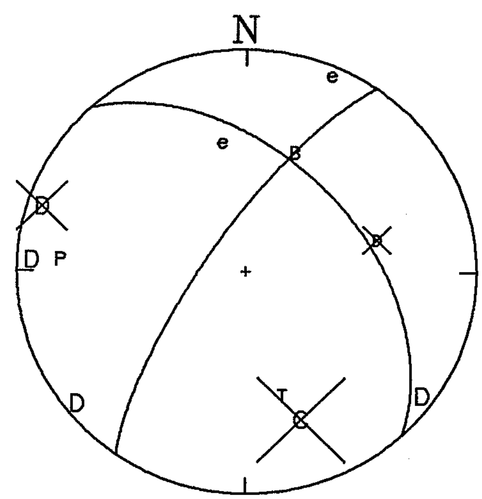


P0 R1



ACCEPTABLE SOLUTIONS



BEST SOLUTION

Seismic Zone: Charlevoix

Magnitude : 4.0

Location : 47.70N 70.11W

Date(Y/M/D) : 1986/01/11

Time(UT) : 13:30

Depth:

closest station: A61, 2 km from epicentre
free depth = 4.7 km (from 6 array stations)

Quality of Readings:

notably emergent Pn's in NE and SW quadrant
amplitude ratios not used from array stations

Comments:

best solution has lowest residual of (P0 R0) set
P0 R1 is also well constrained
P axis is in NE quadrant
represents thrust faulting on NW-trending planes
mechanism differs from most previous CHV earthquake mechanisms

Best Solution:

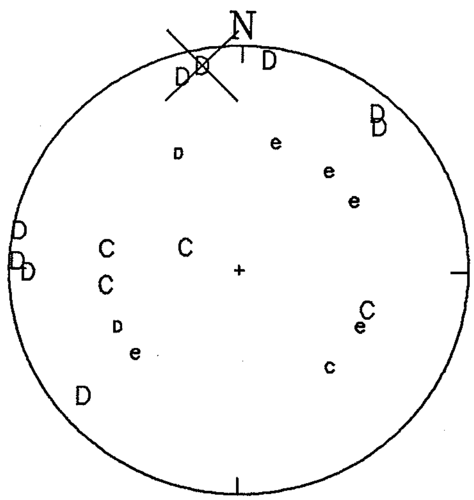
Strike, Dip, Rake	279	59	60
Strike, Dip, Rake	146	42	129
Trend & Plunge of P	029	9	
Trend & Plunge of T	138	63	
Trend & Plunge of B	295	25	

```
+47.700- 70.115F1MN=4.0 1330282 11011986 00.0040.005 0.3   7 11 130.09Z2 4.74   10 1ML=3.9 120
$47.70 - 70.11 F1MN=4.0 133028.Z11011986 0 0.00 0.00 0.3   7 11 13 0.1Z2 5LMQ 123
FELT                                             RESSENTI
  25 KM NE FROM LA MALBAIE, QUE.                   25 KM NE DE LA MALBAIE, QUE.
$QCQ NOT READ HERE
$FOREShOCK ON LPQ AT 8601101432
$FOCAL MECHANISM DETERMINED BY ADAMS/SHARP
$RATIO LPQ  -10               -1931       5532
A618601111330P                     302910C               X302983                        1
A61    SE 0002KM              113-21 10 -001             00  007      0000000 00ML00MN
A648601111330P                     303185D               X303473                        1
A64    NE 0022KM              050-77 10  000             00  020      0000000 00ML00MN
LMQ8601111330P                    X30320 D                                              1
LMQ    SW 0023KM              223-77 00 -007                          0000000 00ML00MN
A168601111330P                     303248D               X303528                        1
A16    S  0027KM              163-79 10 -017             00 -064      0000000 00ML00MN
A208601111330P                     303343D                303740                        1
A20    E  0032KM              089-81 10  000             10  012      0000000 00ML00MN
A548601111330P                     303391D                303828                        1
A54    SW 0035KM              220-81 10 -005             10  009      0000000 00ML00MN
LPQ8601111330P                 -0.21  303504D             303985 010 1005058            1
LPQ    S  0041KM              169-82 10 -002             10 -009      0317804 36ML51MN
A108601111330P                     303653D                304271                        1
A10    S  0051KM              187-84 10  005             10  015      0000000 00ML00MN
SLQ          P          D
SLQ    E  0083KM              092-86                                  0000000 00ML00MN
EBN8601111330P                 -0.21 0305172D            0310917 027 100 603            1
EBN    E  0143KM              100-87 00  012             00  051      0014032 35ML38MN
LAP8601111330P X31020                                    X3130                          1
LAP    SW 0222KM00 -043       230 49                     00 -050      0000000 00ML00MN
GNT8601111330P 0310320E                                  0313088 020 100 332            1
GNT    SW 0227KM00  016       230 49                     00 -099      0010430 37ML40MN
DES8601111330P X31030                                    X31310                         1
DES    SW 0228KM00 -016       229 49                     00 -117      0000000 00ML00MN
PAR8601111330P X31045                                    X31325                         1
PAR    SW 0234KM00  066       231 49                     00 -121      0000000 00ML00MN
GSQ8601111330P 0310838E  -0.21                           0313970 060 100 605            1
GSQ    NE 0260KM00  108       058 49                     00 -158      0006336 40ML39MN
SBQ8601111330P 0311415                                   0314946 020 100 172            1
SBQ    SW 0293KM00  302       209 49                     00 -094      0005404 37ML39MN
KLN8601111330P 0311085C  -0.30 0311888                   0315527 013 100 056            1
KLN    E  0299KM00 -128       107 49 00  211             00  296      0002707 32ML36MN
MNT8601111330P 0312388                          0315835  0320518 020 100 139            1
MNT    SW 0364KM00  419       229 49                     00  048  00 -490      0004367 39ML40MN
SIC          P          E
SIC    NE 0370KM              041 49                                  0000000 00ML00MN
GGN8601111330P 0312124+  -0.30                  0320194  0        023 100 193            1
GGN    SE 0383KM00 -108       137 49            00 -031                0005272 41ML41MN
LMN8601111330P 0313004E  -0.30                           0        043 100 044            1
LMN    SE 0455KM00 -106       115 49                                  0000643 37ML33MN
GAC8601111330P 0313355-                                  0323605 033 100 291            1
GAC    SW 0467KM00  131       244 49                     00 -287      0005541 46ML43MN
OTT8601111330P 0                                         0324380 040 100 325            1
OTT    SW 0500KM              241 49                     00 -460      0005105 47ML43MN
VDQ8601111330P 0314476C          0320137        0324654  0330922 037 100 142            1
VDQ    W  0590KM00 -253       279 49 00 -199    00  050  00 -423      0002411 45ML41MN
CKO8601111330P X314519                          X324530
CKO    W  0591KM00 -221       254 49            00 -093                0000000 00ML00MN
EEO8601111330P 0315689C  -0.07                  0330766  0333628 030 100 091            1
EEO    W  0689KM00 -261       263 49            00  036  00 -511      0001906 46ML41MN



JAQ8601111330P 0320956-                         0332726  0340236 040 100 064            1
JAQ    NW 0786KM00 -163       332 49            00 -048  00 -598      0001005 46ML39MN
SCH8601111330P          E
SCH    N  0826KM              015 49                                  0000000 00ML00MN
ELO8601111330P                                  X3402    X3457                          1
ELO    W  0964KM              266 49            00 -373  00 -138      0000000 00ML00MN
                 Z
```

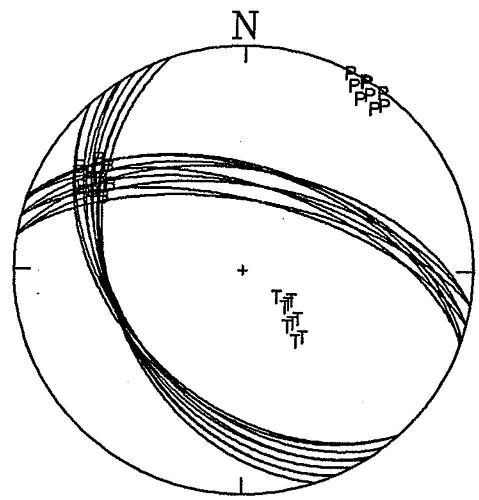
19860111 13:30 MN=4.0 47.700N 70.115W 4.74 KM

A61	113.000	-21.000	C		Charlevoix analog array
A64	050.000	-77.000	D		Charlevoix analog array
LMQ	223.000	-77.000	D		from analog record
A16	163.000	-79.000	D		Charlevoix analog array
A20	089.000	-81.000	D		Charlevoix analog array
A54	220.000	-81.000	D		Charlevoix analog array
LPQ	169.000	-82.000	D		
LPQ	169.000	-82.000	R	0.4571	
A10	187.000	-84.000	D		Charlevoix analog array
SLQ	092.000	-86.000	D		from analog record
EBN	100.000	-87.000	D		
GNT	230.000	49.000	e		near-nodal (emergent)
GSQ	058.000	49.000	e		near-nodal (emergent)
KLN	107.000	49.000	C		
SIC	041.000	49.000	e		near-nodal (emergent)
GGN	137.000	49.000	+		
LMN	115.000	49.000	e		possibly -
GAC	244.000	49.000	-		emergent but -
VDQ	279.000	49.000	C		
EEO	263.000	49.000	C		
JAQ	332.000	49.000	-		
SCH	015.000	49.000	e		near-nodal (emergent)

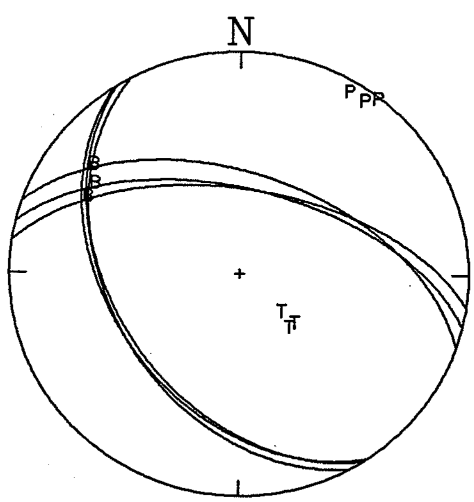
CHV860111B.OUT
14-JUL-86 14:01:11



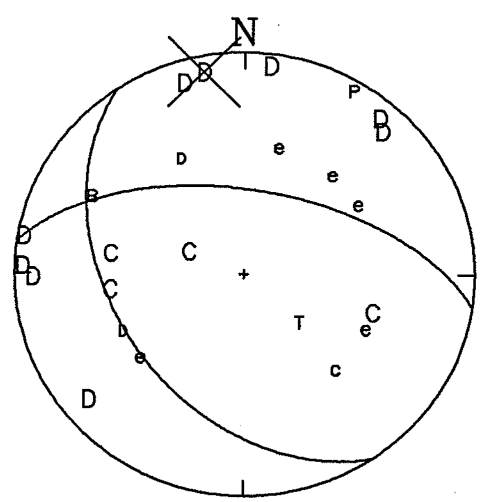
DATA



PO R1



PO RO



BEST SOLUTION

Seismic Zone: NORTHERN APPALACHIAN

Magnitude : 3.3

Location : 46.54N 66.15W
(Near Doaktown NB)

Date(Y/M/D) : 1986/05/09

Time(UT) : 09:04

Depth:
closest station: KLN (38 KM from epicentre)
free depth = 10.7 KM
pegged at 11.0 KM

Quality of Readings:
- KLN, UNB, strong P arrival
- LMN and EBN nearly nodal
- P arrivals on CBM, AGM, EMM, and PQ1 not strong
- HTQ and MNQ emergent

Comments:
Best solution chosen from P1.5 R1 which best fits nearly nodal LPQ and EBN. Solution misfits KLN ratio and poor AGM, CBM, and nearly nodal LPQ polarities.

A second acceptable solution from P1.5 R1 was not chosen as it badly misfit JAQ polarity and LMN ratio.

Mechanism represents thrust faulting in response to NE compression.

Best Solution:

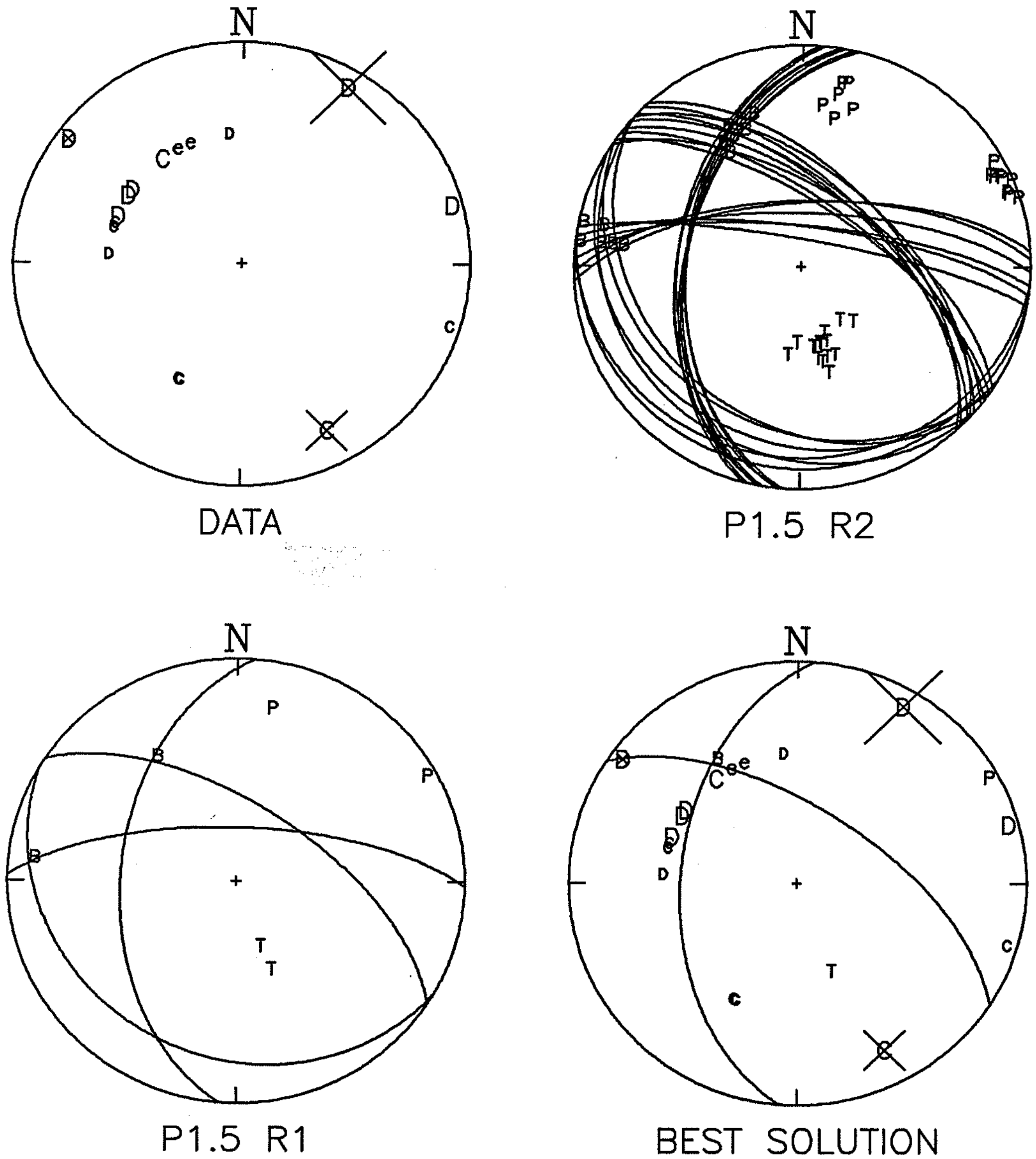
Strike, Dip, Rake	303	62	49
Strike, Dip, Rake	184	48	141
Trend & Plunge of P	61	8	
Trend & Plunge of T	162	54	
Trend & Plunge of B	325	35	

```
+46.539- 66.146F1MN=3.3 0904331 09051986 00.0060.009 0.2 23 37  80.33 211.00   0 1ML=2.9  90
FOCAL MECHANISM COMPILED BY ADAMS/STAGG
$RATIO=  1.333 KLN 043971C 0.12      85.18    117.82 044434 0.10  1832.82
$RATIO=  2.175 LMN 055432D 0.14      -1.60      9.40 05 991 0.10   239.60
$RATIO=  0.362 UNB 04459 D
KLN8605090904P             -0.29 A043972C              044432 013 100 326            044443
KLN    NW 0038KM           333-73 21 -009             05 -021      0015756 23ML37MN
UNB8605090904P                    04460 D              04541  035 073 244
UNB    SW 0075KM           210-81 05  057             05 -039      0006000 28ML30MN
LMN8605090904P             -0.29  045433D              050992 013 100 128            051012
LMN    SE 0129KM           126-84 05  010             05  036      0006187 27ML34MN
HN 8605090904P                   A045712D             A047480
HN     W  0148KM           254-85 21  007             21  013      0000000 00ML00MN
CBM8605090904P                   A045824+             A047728
CBM    W  0157KM           287-85 21 -028             21  004      0000000 00ML00MN
GGN8605090904P  045992      -0.30                      051990 030 100 186            052136
GGN    S  0166KM05 -021    199 49                     05 -019      0003896 31ML34MN
EBN8605090904P  050253D     -0.22                      052773 017 100  89            052839
EBN    NW 0190KM05 -040    304 49                     05  115      0003289 29ML34MN
PQ18605090904P C046502+                               C048900
PQ1    SW 0204KM01  059    207 49                     01 -128      0000000 00ML00MN
EMM8605090904P C046814+                               X049310
EMM    SW 0226KM01  096    208 49                     00 -352      0000000 00ML00MN
AGM8605090904P C046642+                               X049278
AGM    W  0228KM01 -095    286 49                     00 -424      0000000 00ML00MN
SLQ8605090904P A05106 D                    X0533      X0546
SLQ    NW 0251KM21  038    301 49          00 -471    00  247      0000000 00ML00MN
MIM8605090904P C047154                                X053476
MIM    SW 0267KM01 -058    238 49                     00 ****$     0000000 00ML00MN
HAL8605090904P  05160                                 X05525
HAL    SE 0291KM05  099    136 49                     00 -207      0000000 00ML00MN
LPQ8605090904P  051689+     -0.22                     X060484 023 100  48            060751
LPQ    W  0308KM05 -040    288 49                     00  529      0001311 32ML33MN
LMQ8605090904P A05204 D                    B05565
LMQ    W  0337KM21 -031    291 49          05  046                 0000000 00ML00MN
HTQ8605090904P C052061E     -0.07                             027 100  24            061815
HTQ    NW 0340KM01 -046    331 49                                  0000559 30ML31MN
SIC8605090904P  05287 -                     06120      06282
SIC    N  0407KM05 -048    354 49          05  118    05  112      0000000 00ML00MN
SBQ8605090904P              -0.07          C062358    C064202 030 100  43            065039
SBQ    W  0466KM           256 49          01 -001    01 -186      0000901 37ML35MN
MNQ8605090904P  053822E     -0.10           062746            007 100   3            063022
MNQ    NW 0485KM05 -064    337 49          05 -016                 0000269 26ML30MN
TRQ8605090904P  055796      -0.09
TRQ    W  0648KM05 -080    270 49                                  0000000 00ML00MN
GRQ8605090904P C060991-                    C072376
GRQ    W  0745KM01 -050    274 49          01  102                 0000000 00ML00MN
EEO8605090904P C063844      -0.06
EEO    W  0990KM01 -198    275 49                                  0000000 00ML00MN
JAQ8605090904P B064849C     -0.07
JAQ    NW 1058KM05 -016    323 49                                  0000000 00ML00MN
              Z
```

19860509 09:04 MN=3.3 46.539N 66.146W 11.00 KM

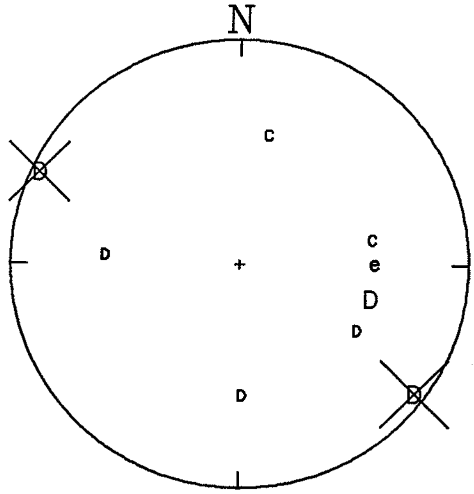
KLN	333.000	-73.000	C		strong P
KLN	333.000	-73.000	R	1.333	
UNB	210.000	-81.000	D		strong P; analog reading
UNB	210.000	-81.000	R	0.362	
LMN	126.000	-84.000	D		nearly nodal; weak P
LMN	126.000	-84.000	R	2.175	
HN	254.000	-85.000	D		read from hardcopy digital playout
CBM	287.000	-85.000	+		poor P; read from hardcopy digital play
EBN	304.000	49.000	D		nearly nodal; good P
PQ1	207.000	49.000	+		poor P; read from hardcopy digital play
EMM	208.000	49.000	+		poor P; read from hardcopy digital play
AGM	286.000	49.000	+		poor P; read from hardcopy digital play
SLQ	301.000	49.000	D		
LPQ	288.000	49.000	+		weak P
LMQ	291.000	49.000	D		
HTQ	331.000	49.000	e		emergent
SIC	354.000	49.000	-		analog reading
MNQ	337.000	49.000	e		emergent
GRQ	274.000	49.000	-		polarity dubious
JAQ	323.000	49.000	C		clearly up

NAP860509.OUT
4-NOV-86 19:28:37



```
+46.307- 78.41901MN=3.0 0829339 30051986 00.0320.026 0.3 10 21  80.90 2 4.00    0 1ML=2.5  80
$FOCAL MECHANISM DETERMINED BY ADAMS/SHARP
EEO8605300829P                 A294439D            A295221 007 100 163           295293
EEO   NW 0062KM         307-85 12  030             12  068     0014631 24ML32MN
CKO8605300829P                 A294718D            A295776 013 100  59           295915
CKO   SE 0083KM         115-86 12 -014             12  060     0002852 21ML27MN
GRQ8605300829P A300536+        A300565C            A303041 010 100  20           303222
GRQ   E  0200KM12 -017  079 49 12 -052             12  051     0001257 23ML30MN
SUO8605300829P A300425-                   302805           010 100 023
SUO   W  0200KM12 -128  274 49           03 -083               0001445 23ML31MN
OTT8605300829P X301266                   C303738           047 100  22           303778
OTT   SE 0233KM00  302  115 49           01  133               0000294 25ML25MN
GAC8605300829P A301053D        C301358   B303857
GAC   E  0238KM12  038  105 49 01  126   03  162               0000000 00ML00MN
WEO8605300829P B301303-                  C304243           010 100  39           304546
WEO   S  0254KM03  081  179 49           01  188               0002450 28ML35MN
WBO8605300829P A301749-        A302040-   304637           023 100  23           305351
WBO   SE 0285KM12  155  120 49 12  043   03 -066               0000628 28ML30MN
TRQ8605300829P A301671E        A302004+            X305352 010 100   7           305703
TRQ   E  0298KM12 -090  090 49 12 -204             00 -400     0000440 23ML29MN
JAQ8605300829P A312623+
JAQ   N  0856KM12  059  012 49                                 0000000 00ML00MN
             Z
```

```
     19860530 08:29 MN=3.0 46.307N  78.419W    4.00 KM
EEO 307.000 -85.000 D        SV polarity up
EEO 307.000 -85.000 R 0.538
CKO 115.000 -86.000 D        good reading
CKO 115.000 -86.000 R 0.783
GRQ 079.000  49.000 +        C, preceded by + ?
SUO 274.000  49.000 -
GAC 105.000  49.000 D
WEO 179.000  49.000 -        poor
WBO 120.000  49.000 -        followed by strong D
TRQ 090.000  49.000 e        possibly -
JAQ 012.000  49.000 +
```



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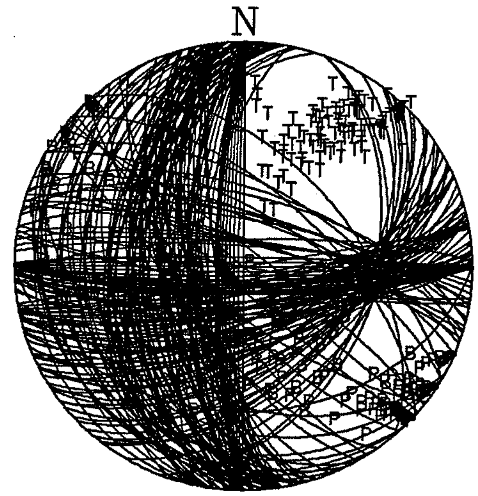
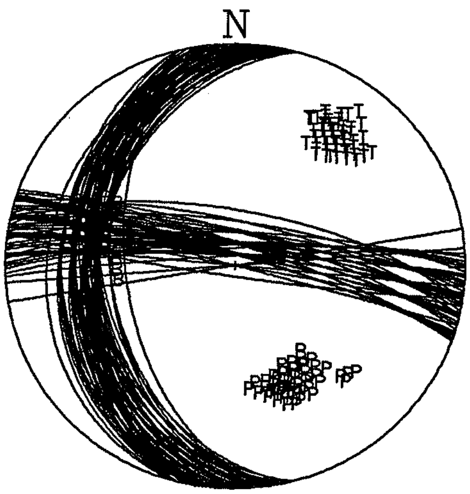
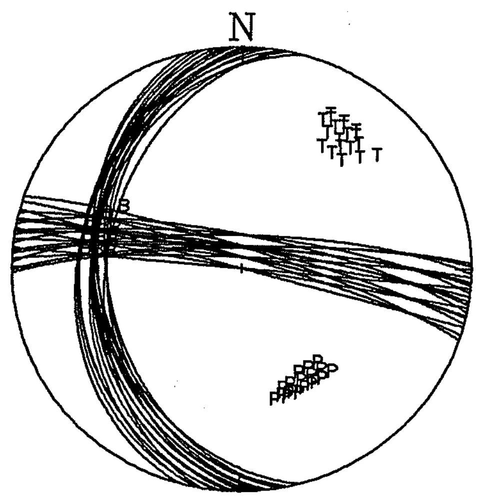


P0 R2 10 DEG INC

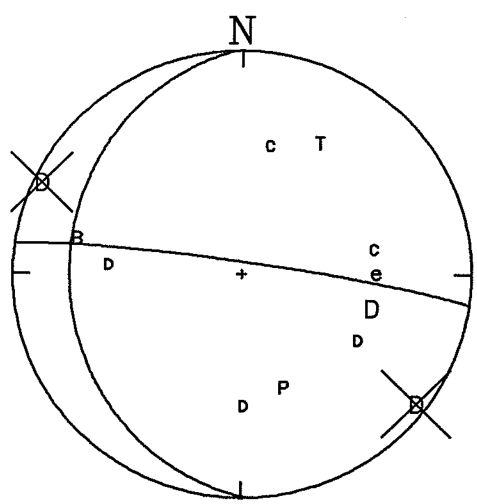
WQU860530.OUT
29-JUL-86 14:04:38



P0 R0 Z=4KM



P0 R0 Z=16KM



BEST SOLUTION

Seismic Zone: Western Quebec

Magnitude : 3.2

Location : 46.35N 75.09W
(Near Nominingue, QUE)

Date(Y/M/D) : 1986 06 05

Time(UT) : 12:13

Depth:

closest station: TRQ
free depth = 12.94 km, pegged at 13.0 km

Quality of Readings:

TRQ near-nodal very weak, but definitely C
OTT, MNT, JAQ emergent
CKO both weak Pn and strong Pg read
GNT read as +; could be filtered to -
MNQ read as +, but not good
EEO dead
SUO Pn not saved

Comments:

P0.5 R1 badly misfits nodal GAC
P1 R1 misfits GNT, MNQ, and GAC ratio
reduced set has ratio error on GAC < 0.7
and is similar to P1 R0
more weight given to ratios than poor Pn
arrivals at GNT and MNQ for this solution
better Pn readings necessary for a more
convincing solution

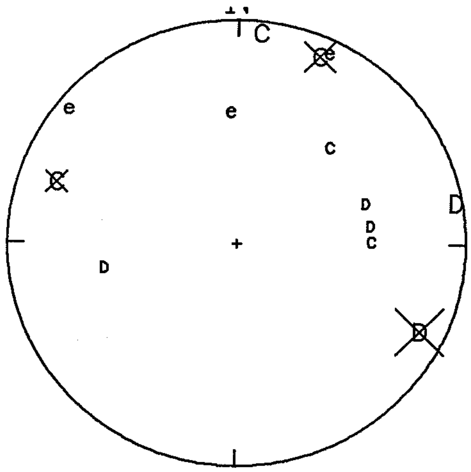
Best Solution:

Strike, Dip, Rake	118	62	11
Strike, Dip, Rake	23	80	152
Trend & Plunge of P	73	12	
Trend & Plunge of T	337	27	
Trend & Plunge of B	185	60	

```
+46.348- 75.085F1MN=3.2 1213216 05061986 00.0060.007 0.2 11 20 100.28 213.00   0 1ML=2.8 100
$RATIO=  1.838 TRQ 132908+ 0.08       18.65     457.65 133419 0.07     1284.65
$RATIO=  0.912 GRQ 133271D 0.10      -91.38      91.38 134039 0.07      745.38
$RATIO=  1.528 GAC 133478C 0.25      139.68     322.32 134376 0.22     4715.32
TRQ8606051213P                 A132909C             A133419 013 100 474
TRQ   E  0043KM         109-72 15  015              15 -012     0022909 26ML39MN
GRQ8606051213P                 A133272D             B134040 017 100 214
GRQ   NW 0066KM         296-78 15  020              04 -013     0007909 26ML30MN
GAC8606051213P                 A133478C             A134377 027 100 219            134467
GAC   SW 0078KM         203-80 15  041              15  002     0005096 27ML29MN
OTT8606051213P                 B134088E              135436 017 100  53            140019
OTT   SW 0117KM         205-83 04  028              04 -020     0001959 23ML28MN
MNT8606051213P                  134468E              140223 007 100  50            140623
MNT   SE 0148KM         129-84 04 -083              04 -087     0004488 24ML34MN
WBO8606051213P                 A134591C              140396 013 100 138            140700
WBO   S  0151KM         186-84 15 -009              04  000     0006670 29ML35MN
CKO8606051213P B135073-        A135136D             C1413   013 100  62            141385
CKO   W  0187KM04  005  259 49 15 -049              01 -111     0002997 27ML33MN
GNT8606051213P B135349+                   X141830   C141949 027 100  90            141998
GNT   E  0209KM04  015  089 49            00  147   01 -077     0002094 30ML33MN
SBQ8606051213P                                      X143143 037 100 110            143691
SBQ   SE 0268KM         113 49                      00 -536     0001868 33ML34MN
LPQ8606051213P        -                             X151411 033 100  41            151598
LPQ   E  0403KM         072 49                      00 -039     0000781 35ML33MN
MNQ8606051213P A144826+                             X162099 030 100  13            162964
MNQ   NE 0659KM15 -004  043 49                      00 -535     0000272 37ML32MN
KLN8606051213P B145057-
KLN   E  0670KM04  096  082 49                                  0000000 00ML00MN
JAQ8606051213P B150983E
JAQ   N  0831KM04  058  357 49                                  0000000 00ML00MN
             Z
```

19860605 12:13 MN=3.2 46.348N 75.085W 13.00 KM

TRQ	109.000	-72.000	C		weak C followed by strong D
TRQ	109.000	-72.000	R	1.838	
GRQ	296.000	-78.000	D		strong D
GRQ	296.000	-78.000	R	0.912	
GAC	203.000	-80.000	C		weak C
GAC	203.000	-80.000	R	1.528	
OTT	205.000	-83.000	e		emergent
WBO	186.000	-84.000	C		
MNT	129.000	-84.000	e		noisy trace
CKO	259.000	49.000	-		weak Pn
CKO	259.000	-87.000	D		strong Pg
GNT	089.000	49.000	+		
LPQ	072.000	49.000	-		
MNQ	043.000	49.000	+		
KLN	082.000	49.000	-		
JAQ	357.000	49.000	e		



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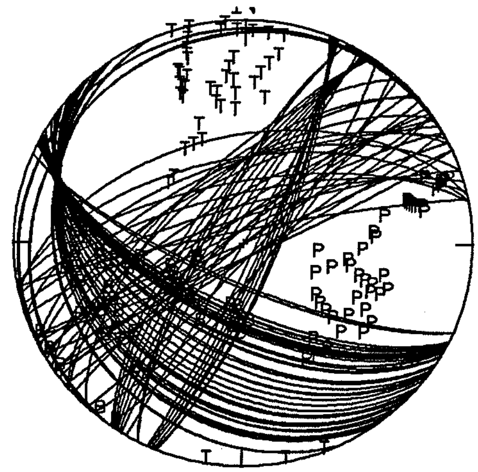
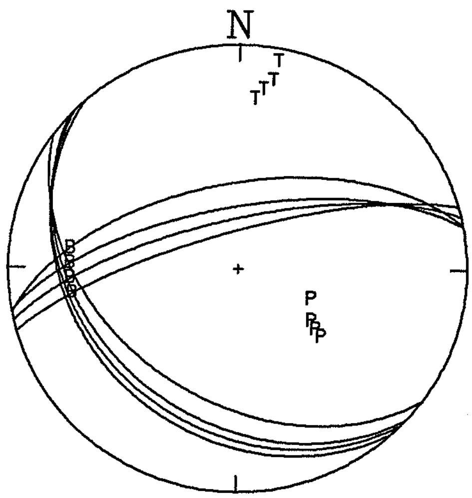
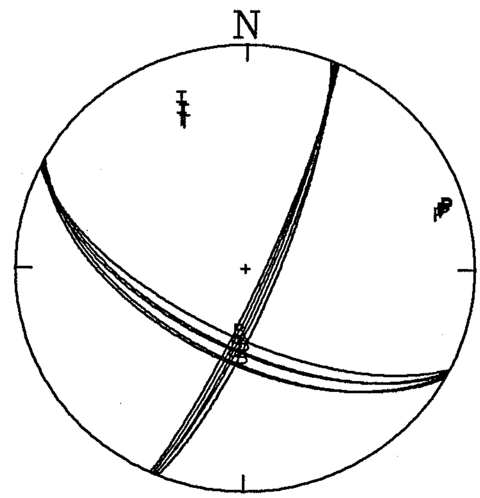


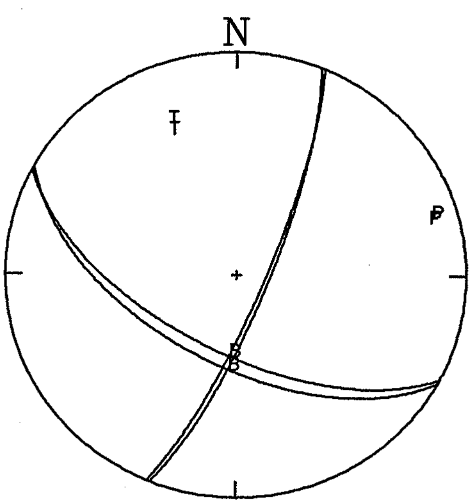
P1 R1



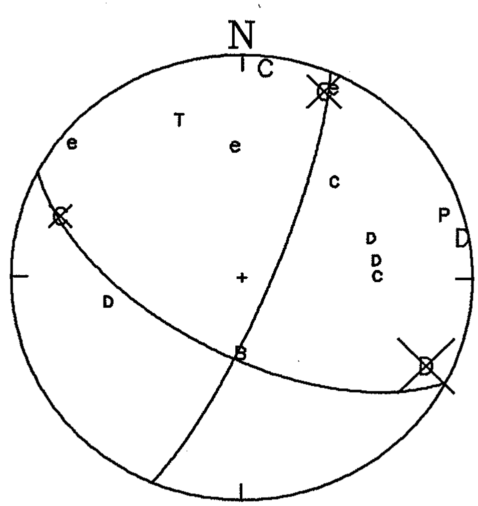
P0.5 R1



P1 R1; R Misfit < 0.7



P1 R0



BEST SOLUTION

Seismic Zone: Western Quebec

Magnitude : 3.1

Location : 45.88N 74.81W
(Notre Dame de la Paix, QUE)

Date(Y/M/D) : 1986/06/18

Time(UT) : 04:12

Depth:
closest station: TRQ, 43 km from epicentre
free depth = 18.4 km
depth used for solution = 18.4 km
(similar mechanism is obtained for depth of 4 km)

Quality of Readings:
GRQ near-nodal but definately C
Pn arrivals very weak
Pn lost at SUO

Comments:
poor distribution of data on focal sphere
well-constrained solution when amplitude ratios are used
"accepted solutions" (P0 R1) exclude 4 strike-slip solutions
rejected because predicted amplitudes at GRQ (lower left)
were grossly in error
"best solution" has lowest amplitude residual on WBO
(upper left)
similar solution obtained when depth is pegged at 4 km
solution agrees with regional NE compression

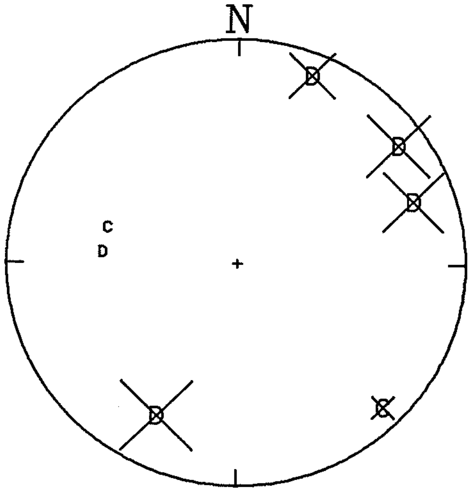
Best Solution:

Strike, Dip, Rake	137	55	84
Strike, Dip, Rake	327	35	99
Trend & Plunge of P	231	10	
Trend & Plunge of T	024	79	
Trend & Plunge of B	140	5	

```
+45.876- 74.806F1MN=3.1 0412023 18061986 00.0050.010 0.3 10 16 120.24Z218.40  22 1ML=2.7 120
$RATIO=  0.466 TRQ 121002D 0.17  -436.97   595.03 121551 0.15  1276.97
$RATIO=  0.788 GAC 121201D 0.23 -2749.64  3406.36 121877 0.23 16861.64
$FOCAL MECHANISM DETERMINED BY ADAMS/SHARP
TRQ8606180412P           -0.09
TRQ   NE 0043KM         027-66                                 0000000 00ML00MN
TRQ8606180412P             -87 A121002D              121551 020 100 383           121652
TRQ   NE 0043KM         027-66 18  001              05 -010     0012032 25ML37MN
GAC8606180412P             -62 A121203D              121875
GAC   W  0056KM         250-71 18  020              05 -004     0000000 00ML00MN
OTT8606180412P             -56  121691D              122745 037 100 120           123234
OTT   SW 0089KM         233-77 05 -009              05 -034     0002038 25ML26MN
MNT8606180412P             -60                       123098 007 100  16           123305
MNT   SE 0101KM         114-79                      05 -020     0001436 17ML26MN
WBO8606180412P             -62 A121921D              123267 010 100 117           123478
WBO   S  0104KM         201-79 18 -019              05  071     0007351 25ML33MN
GRQ8606180412P             -87 A122116C              123485 017 100 110           123851
GRQ   NW 0115KM         315-80 18 -001              05 -016     0004066 26ML31MN
GNT8606180412P  123283     -61           X125634            010 100  21           125664
GNT   E  0196KM05  092  073 49           00  253                0001319 23ML30MN
CKO8606180412P  123267-    -62           X125864            013 100  45           125940
CKO   W  0206KM05 -043  275 49           00  274                0002175 27ML33MN
DVT8606180412P X12375                               X13029
DVT   SE 0230KM00  145  115 49                      00 -404     0000000 00ML00MN
SBQ8606180412P             -69                      X130708 020 100  20           131315
SBQ   E  0231KM         103 49                      00 -031     0000628 25ML28MN
HNH8606180412P X12565                               X13265
HNH   SE 0313KM00 1034$ 140 49                      00 -365     0000000 00ML00MN
BNH8606180412P X125375                              X13232
BNH   SE 0314KM00  741  116 49                      00 -731     0000000 00ML00MN
BVT8606180412P X12581                               X13310
BVT   SE 0332KM00  966  147 49                      00 -435     0000000 00ML00MN
EEO8606180412P C125003+    -60                       133686 020 100  17           134057
EEO   W  0340KM01  052  286 49                      05 -086     0000534 29ML30MN
WEO8606180412P X125703     -66                       134095 010 100  37           134248
WEO   SW 0349KM00  640  235 49                      05  061     0002325 33ML37MN
LPQ8606180412P X130274    -216                      X135182 030 100  34           135211
LPQ   NE 0402KM00  551  064 49                      00 -345     0000712 34ML33MN
SUO8606180412P X125906                              X141314 023 100 009
SUO   W  0483KM00 -780  279 49                      00 -451     0000246 31ML29MN
HTQ8606180412P             -70                              043 100  18           145389
HTQ   NE 0608KM         050 49                                  0000263 38ML31MN
             Z
```

19860618 04:12 MN=3.1 45.876N 74.806W 18.40 KM

TRQ	027.000	-66.000	D		good reading
TRQ	027.000	-66.000	R	0.466	
GAC	250.000	-71.000	D		good reading
GAC	250.000	-71.000	R	0.788	
OTT	233.000	-77.000	D		good reading
OTT	233.000	-77.000	R	0.6990	
WBO	201.000	-79.000	D		good reading
WBO	201.000	-79.000	R	1.1795	
GRQ	315.000	-80.000	C		weak C followed by strong D
GRQ	315.000	-80.000	R	1.8533	
CKO	275.000	49.000	-		near-nodal (emergent)
EEO	286.000	49.000	+		near nodal (emergent probably +)



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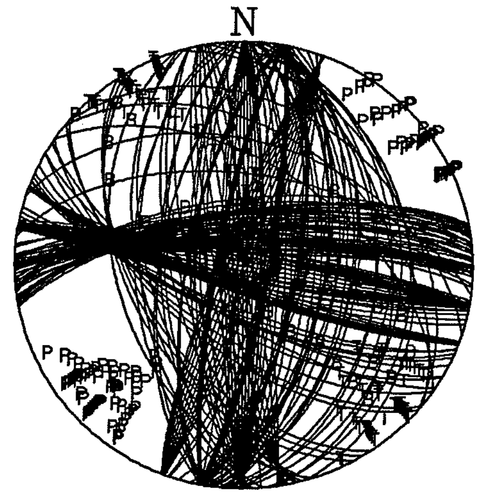

P0 R5 10 DEG INC

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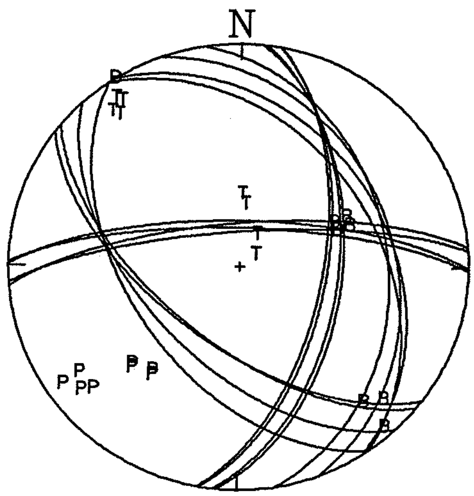
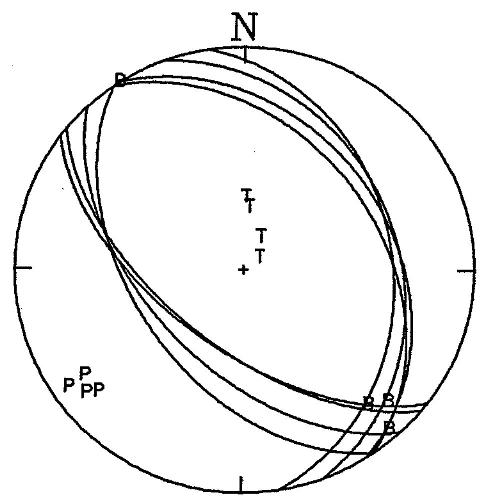
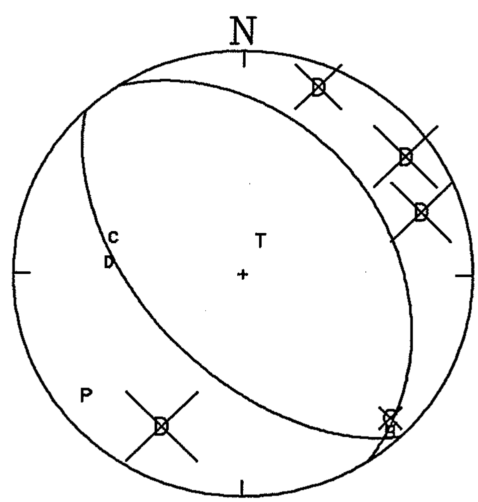
15-JUL-86 19:24:40



P0 R1



ACCEPTABLE SOLUTIONS



BEST SOLUTION

Seismic Zone: Western Quebec

Magnitude : 2.8

Location : 45.53N 74.24W
(Lachute, Quebec)

Date(Y/M/D) : 1986 07 20

Time(UT) : 13:15

Depth:

closest station: MNT, 46 km from epicentre
free depth = 11.14 km
depth pegged at 11 km

Quality of Readings:

TRQ, GRQ, and JAQ all spikey traces
EEO and MNQ too weak to read
MNT strong P, strong S; Sv polarity down
OTT weak P following long period noise; ratio computed by hand
PTN and LOZ from F. Revetta; LOZ had reversed polarity
NOR E-W goes E; correct polarity, therefore D
CKO might be +

Comments:

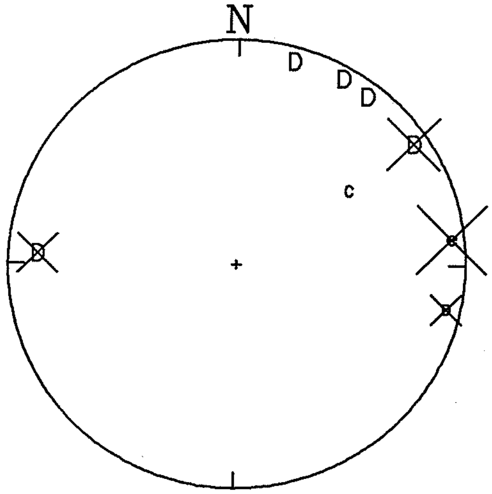
Poor data set
Most of P0 R1 set badly misfit near-nodal GAC (Misfit > 1.0)
Solution B=075/10 misfits GAC ratio by 0.8
Best Solution is P0 R1 and just misfits WBO ratio
Mechanism represents thrust faulting in response to NNE compression
TXTFOCAL confirms SV=D on MNT
Alternate TXTFOCAL solution STR:106; DIP:62; RAKE:84 is very similar
Impulsive Pn arrivals from US data required for a more convincing solution

Best Solution:

Strike, Dip, Rake	107	55	84
Strike, Dip, Rake	297	35	99
Trend & Plunge of P	201	10	
Trend & Plunge of T	354	79	
Trend & Plunge of B	110	05	

```
+45.523- 74.236F1MN=2.8 1315133 20071986 00.0040.003 0.2 12 22  70.16 211.00    0 1ML=2.3  70
NOT REPORTED FELT                       PAS RAPPORTE COMME AYANT ETE RESSENTI
  45 KM W  FROM MONTREAL, QUE.           45 KM O  DE MONTREAL, QUE.
$RATIO=  1.346 MNT 152133D 0.09      -59.58      63.42 152732 0.13     1321.58
$RATIO=  0.982 WBO 152972D 0.17      -38.53      64.47 154228 0.10      369.47
$RATIO=  0.53  OTT
$RATIO=  1.610 GAC 152949- 0.22      -47.51     151.49 154124 0.13     1933.51
MNT8607201315P                       DSV
MNT   E  0048KM          093-76                                 0000000 00ML00MN
MNT8607201315P            -0.06 A152134D            A152732 013 100 250    0  0
MNT   E  0048KM          093-76 16 -004             16  008     0012083 24ML37MN
GAC8607201315P            -0.06 A152949-             154124 000   0   0    0  0
GAC   W  0099KM          282-83 16 -001             04 -010     0000000 00ML00MN
WBO8607201315P            -0.06 A152974D             154229 007 100  53    0  0
WBO   SW 0100KM          235-83 16  004             04  061     0004757 22ML31MN
NO 8607201315P                  A15302 D            A15424
NO    SW 0103KM          217-83 16  007             16 -006     0000000 00ML00MN
LOZ8607201315P                  B15302 D            C154220
LOZ   S  0104KM          195-83 04 -006             01 -049     0000000 00ML00MN
OTT8607201315P            -0.06 A153244E            A154621 010 100  10    0  0
OTT   W  0117KM          263-84 16  009             16 -006     0000628 16ML23MN
PTN8607201315P                  B15324 D            C15467
PTN   SW 0121KM          209-84 04 -057             01 -072     0000000 00ML00MN
GNT8607201315P  153997+   -0.06          160068             010 100  18    0  0
GNT   NE 0172KM04 -090   056 49         04 -049                 0001131 21ML29MN
DVT8607201315P X154125     0.00                     X16019  000   0   0    0  0
DVT   E  0174KM00  019   110 49                     00 -027     0000000 00ML00MN
SBQ8607201315P C154259    -0.07                     X160196 023 100  29    0  0
SBQ   E  0181KM01  054   094 49                     00 -242     0000792 23ML28MN
HNH8607201315P X15518      0.00                     X16199  000   0   0    0  0
HNH   SE 0255KM00  091   142 49                     00 -487     0000000 00ML00MN
CKO8607201315P  155057    -0.06          161969             013 100  12    0  0
CKO   W  0256KM04 -049   283 49         04  072                 0000580 23ML29MN
BNH8607201315P X15515      0.00                     X16202  000   0   0    0  0
BNH   SE 0258KM00  021   113 49                     00 -542     0000000 00ML00MN
BVT8607201315P X15540      0.00                     X16240  000   0   0    0  0
BVT   SE 0275KM00  059   151 49                     00 -652     0000000 00ML00MN
JKM8607201315P X155750     0.00         X159350             000   0   0    0  0
JKM   E  0312KM00 -042   086 49         00  253                 0000000 00ML00MN
WEO8607201315P            -0.07 X160987             X165617 010 100  31    0  3
WEO   SW 0368KM          244-87 00 -295             00 -039     0001948 33ML37MN
LPQ8607201315P            -0.22 X161178
LPQ   NE 0383KM          057-87 00 -357                         0000000 00ML00MN
EEO8607201315P  160840    -0.06         X165102             030 100   9    0  0
EEO   W  0394KM04  039   290 49         00  249                 0000188 28ML27MN
MNQ8607201315P C164433    -0.10         C175258     X182450 020 100   3    0  0
MNQ   NE 0690KM01  019   034 49         01  104     00 -233     0000094 31ML28MN
             Z
```

```
     19860720 13:15 MN=2.8 45.523N  74.236W   11.00 KM
MNT 093.000 -76.000 D          good reading, strong SV
MNT 093.000 -76.000 R  1.346
GAC 282.000 -83.000 -          noisy trace
GAC 282.000 -83.000 R  1.610
WBO 235.000 -83.000 D          good reading
WBO 235.000 -83.000 R  0.982
NO  217.000 -83.000 D          US data; E-W goes E therefore D
LOZ 195.000 -83.000 D          US data; polarity reversed: up on trac
OTT 263.000 -84.000 e          weak Pn arrival
OTT 263.000 -84.000 R  0.53    computed using "value" in SAM
PTN 209.000 -84.000 D          US data
GNT 056.000  49.000 +
```



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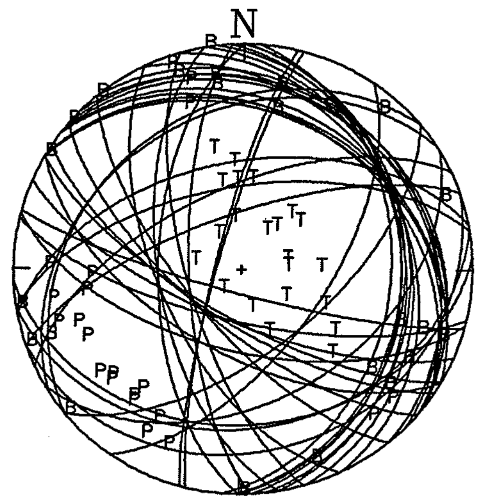
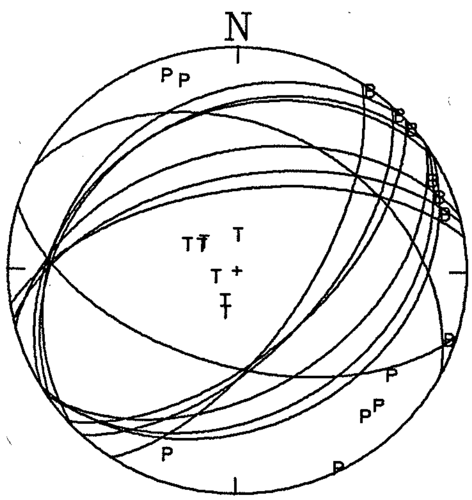
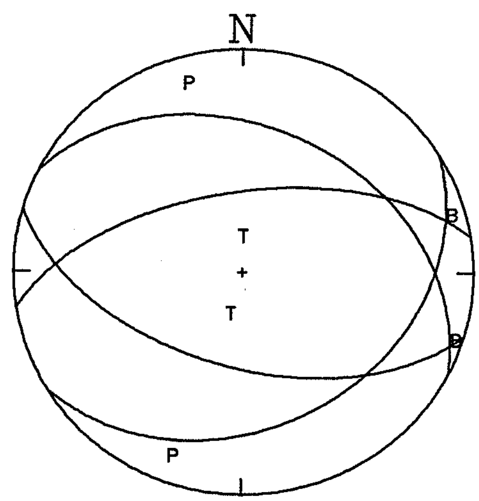


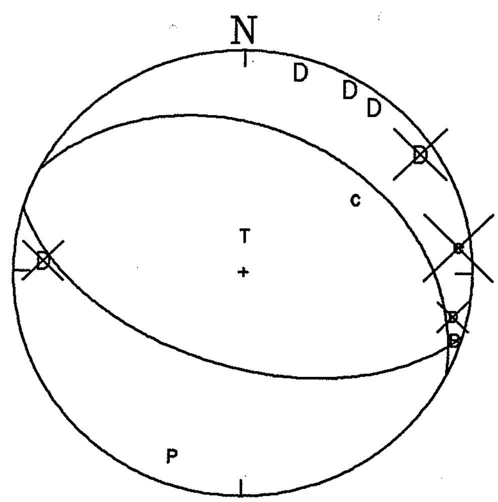
P0 R2 10 DEG INC



P0 R1



P0 R1 MISFIT < 1.0



BEST SOLUTION

Seismic Zone: Western Quebec

Magnitude : 3.6

Location : 46.37N 75.20W
(Nominingue, QUE)

Date(Y/M/D) : 1986/08/06

Time(UT) : 11:18

Depth:

closest station: TRQ, 53 km from epicentre
free depth =18.3 km (see phases weighted as on next sheet)
=16.0 km (computed from closest four stations)
foreshock free depth = 14 km
for mechanism pegged at 16 km

Quality of Readings:

very emergent Pn's in NE and SW quadrants
Sg on OTT much weaker than later phase
JAQ dubious

Comments:

P0 R4 same as P0 R2; rejected because misfits amplitude-ratios on both TRQ and GRQ and doesn't explain emergent Pn's
P1 R0 misfits two of JAQ, EEO, CKO; doesn't explain emergent Pn's
"best solution" is selected from P 0.5 R1
doesn't fit JAQ
ratio at TRQ in error by only 0.27 log units

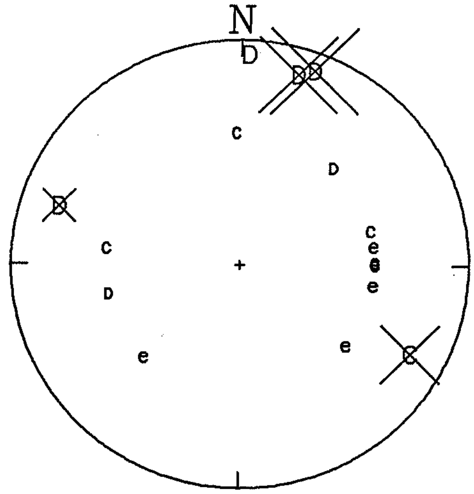
Best Solution:

Strike, Dip, Rake	277	50	57
Strike, Dip, Rake	143	50	123
Trend & Plunge of P	030	00	
Trend & Plunge of T	120	65	
Trend & Plunge of B	300	25	

```
+46.370- 75.205F1MN=3.6 1119362 06081986 00.0060.007 0.3 15 29 170.38 216.00   0 1ML=3.2 120
$RATIO=  1.562 TRQ 194533D 0.08   -40.45    65.45 195199 0.06  1475.55
$FOCAL MECHANISM DETERMINED BY ADAMS/SHARP
TRQ8608061119P           -0.09 A194533D            A195198 007 100 281           195262
TRQ   E  0053KM         108-72 16  006             16  014     0025223 26ML34MN
GRQ8608061119P           -0.09 A194609C            A195311 010 100 785           195347
GRQ   NW 0057KM         298-73 16  021             16  021     0049323 31ML37MN
GAC8608061119P           -0.06 A194942D            A195856 020 100 363           200078
GAC   S  0077KM         196-77 16  040             16  018     0011404 29ML33MN
OTT8608061119P           -0.06 A195525D            B200874 053 100 781           201298
OTT   S  0116KM         200-81 16  011             00 -026     0009259 34ML35MN
WBO8608061119P           -0.06 A200066D   201848           037 100 529           202084
WBO   S  0152KM         182-83 16 -037   04 -048               0008983 35ML37MN
MNT8608061119P  200061E  -0.06                      202028 010 100  67           202147
MNT   SE 0156KM04 -068  128 49                     04 -004     0004210 26ML34MN
CKO8608061119P A200348D  -0.06  200443              202517 023 100 272           202576
CKO   W  0178KM16 -052  257 49 04 -077             04 -132     0007431 33ML37MN
GNT8608061119P A200894+  -0.06                      203546 027 100 373           203697
GNT   E  0218KM16  011  089 49                     04 -210     0008680 37ML39MN
SBQ8608061119P X202322   -0.07                     X205115 017 100  64           205369
SBQ   E  0278KM00  711  112 49                     00 -303     0002365 32ML35MN
EEO8608061119P  201907+  -0.06                     C210068 013 100  69           210275
EEO   W  0299KM04  039  277 49                     01  060     0003335 33ML37MN
WEO8608061119P X202938E  -0.07  203279             C211842 013 100 110           212590
WEO   SW 0361KM00  308  225 49 04 -184             01  083     0005317 38ML41MN
EBN8608061119P  204847+  -0.22           C214263   X220397 023 100  29           221636
EBN   E  0544KM04 -030  075 49           01  011   00 -502     0000792 37ML35MN
MNQ8608061119P  210246-  -0.10           C220782   X223789 043 100  53           224149
MNQ   NE 0664KM04 -080  043 49           01 -005   00 -445     0000774 43ML37MN
GGN8608061119P        E  -0.29                     X223737 033 100  13           224733
GGN   E  0667KM         099 49                     00 -610     0000248 37ML32MN
KLN8608061119P C210481E  -0.29           C221213   X224523 027 100  14           225422
KLN   E  0679KM01 -047  082 49           01  087   00 -151     0000326 38ML33MN
LMN8608061119P C211976E  -0.29           X223895   X232666 053 100  13           232758
LMN   E  0806KM01 -097  090 49           00  073   00  441     0000154 39ML31MN
JAQ8608061119P C212176+  -0.07           C224050   X232396 030 100  27           232699
JAQ   N  0828KM01 -151  358 49           01 -230   00 -439     0000565 43ML37MN
             Z
```

19860806 11:19 MN=3.6 46.370N 75.205W 16.00 KM

TRQ	108.000	-72.000	D		relatively weak Pn
TRQ	108.000	-72.000	R	1.562	
GRQ	298.000	-73.000	C		
GRQ	298.000	-73.000	R	0.816	
GAC	196.000	-77.000	D		
GAC	196.000	-77.000	R	0.287	
OTT	200.000	-81.000	D		
OTT	200.000	-81.000	R	0.019	
WBO	182.000	-83.000	D		good reading; assumed to be Pg
MNT	128.000	49.000	e		cannot read
CKO	257.000	49.000	-		very weak but certainly down (near nodal)
GNT	089.000	49.000	+		weak
EEO	277.000	49.000	+		very weak (near nodal)
WEO	225.000	49.000	e		very weak
EBN	075.000	49.000	+		very weak (near nodal)
MNQ	043.000	49.000	-		very weak (nodal)
GGN	099.000	49.000	e		emergent
KLN	082.000	49.000	e		emergent
LMN	090.000	49.000	e		emergent
JAQ	358.000	49.000	+		dubious



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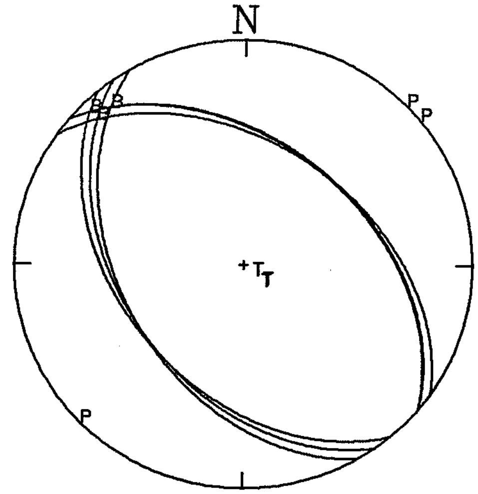

P0 R2

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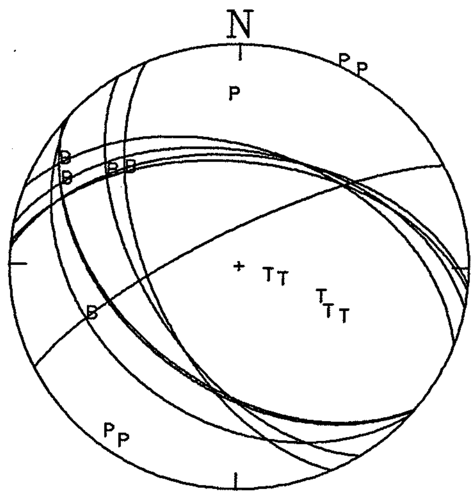
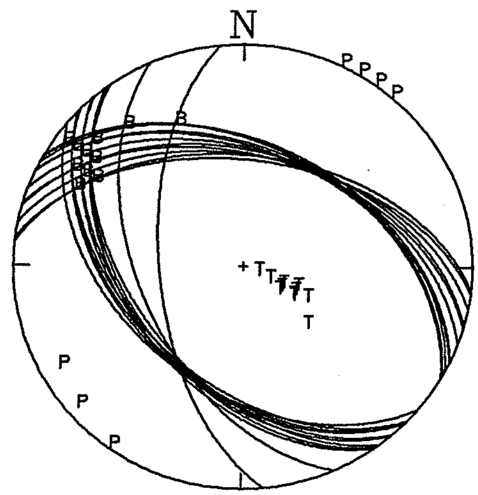
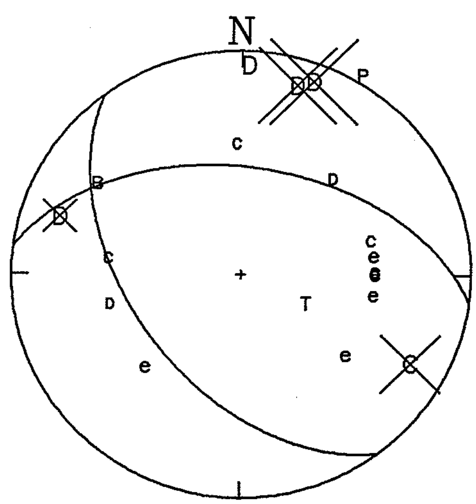
11-AUG-86 15:56:16



P1 R0



P 0.5 R1



BEST SOLUTION

Seismic Zone: WESTERN QUEBEC

Magnitude : 3.3

Location : 45.10N 74.25W
(Huntington, QUE)

Date(Y/M/D) : 1986/08/13

Time(UT) : 04:55

Depth:

closest station: 50 KM from MSNY (MS)
free depth = 9.8 KM
pegged at 10 KM
U.S. solution gives depth of 18KM

Quality of Readings:

- GAC, TRQ, ALX questionable first motions
- very weak dilatation followed by strong compression on both GAC and ALX
- TRQ nearly nodal; very weak down
- GRQ very emergent
- NO {NOR} is E-W component, moved east therefore D. Polarity confirmed correct

Comments:

Best solution chosen from P0 R2, with all solutions misfitting PTN and WBO ratios. WBO P waveform is asymmetrical; ratio is too large by comparison with MS. This mechanism is well determined because of the compression at LOZ and is chosen over the others because it best fits the near nodal arrival on TRQ and GRQ.

Mechanism represents thrust faulting in response to northwest compression.

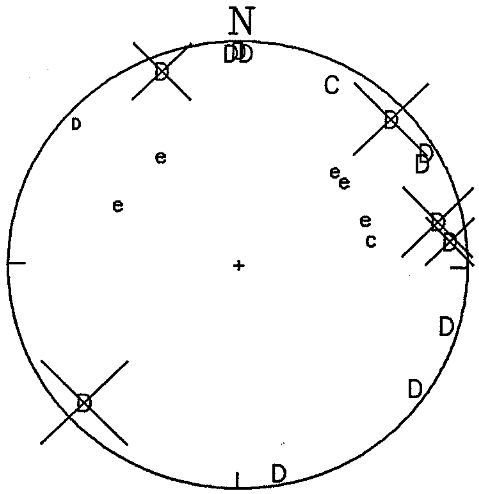
Best Solution:

Strike, Dip, Rake	190	46	076
Strike, Dip, Rake	030	46	104
Trend & Plunge of P	110	00	
Trend & Plunge of T	020	80	
Trend & Plunge of B	200	10	

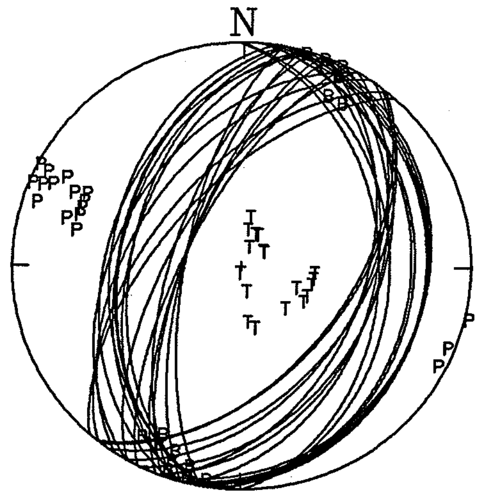
```
+45.098- 74.249F1MN=3.3 0455184 13081986 00.0050.006 0.2 18 35 100.37 210.00   0 1ML=2.8  90
FOCAL MECHANISM DETERMINED FOR THIS EVENT
$RATIO=  0.069 MNT 552942D 0.16   -482.46    865.54 553768 0.08    565.54
$RATIO=  1.125 WBO 553181D 0.17    -98.81    298.19 554175 0.12   1319.19
$RATIO=  0.851 WNY
$RATIO=  0.42  PTN
$RATIO=  0.5   MS
MS 8608130455P               A552709D             A553320
MS     W  0050KM      257-78 14  052              14  062         0000000 00ML00MN
LOZ8608130455P               A552810C
LOZ    SW 0059KM      206-79 14  000                              0000000 00ML00MN
MNT8608130455P         -0.06 A552945D             A553770 007 100  97               553820
MNT    NE 0066KM      047-80 14  015              14  041         0008707 22ML31MN
NO 8608130455P                      D
NO     SW 0070KM      240-81                                      0000000 00ML00MN
WBO8608130455P         -0.06 A553185D             A554169 007 100 163               554220
WBO    W  0082KM      263-82 14  012              14  018         0014631 26ML34MN
PTN8608130455P               A553190D             B554228
PTN    SW 0082KM      225-82 14  010              03  062         0000000 00ML00MN
WNY          P               A553233D             B554279
WNY    S  0084KM      158-82 14  020              03  055         0000000 00ML00MN
GAC8608130455P         -0.06 A553748D             A555106
GAC    NW 0118KM      305-84 14 -001              14 -044         0000000 00ML00MN
OTT8608130455P         -0.06 A553760D              555196 020 100 187               555620
OTT    W  0120KM      286-84 14 -026              03 -019         0005875 28ML33MN
HB 8608130455P               B553829-             B555350
HB     SE 0124KM      131-84 03 -025              03  011         0000000 00ML00MN
CSR8608130455P               A553830D             B555352
CSR    S  0126KM      177-84 14 -042              03 -017         0000000 00ML00MN
SKT8608130455P               A553845D             B555367
SKT    S  0126KM      181-84 14 -041              03 -026         0000000 00ML00MN
TRQ8608130455P         -0.09 A553847D             B555409 020 100 221               555685
TRQ    N  0127KM      349-84 14 -063              03 -019         0006943 30ML34MN
GNF8608130455P               A553930D             B555520
GNF    S  0131KM      179-85 14 -037              03 -013         0000000 00ML00MN
MDV8608130455P C554155                             555950
MDV    SE 0149KM01 -154  145 49                   03 -065         0000000 00ML00MN
ALX8608130455P               B554349D             B560286
ALX    SW 0159KM      238-85 03 -054              03 -006         0000000 00ML00MN
SBQ8608130455P A554806+  -0.07          X560979   X561158 013 100  56               561170
SBQ    E  0185KM14  044  079 49         00  059   00  118         0002707 26ML33MN
GNT8608130455P  554973E  -0.06                    B561497 023 100  66               561554
GNT    NE 0203KM03 -001  045 49                   03 -039         0001803 28ML32MN
GRQ8608130455P  555106E  -0.09 C555139            B561659 017 100  92               562208
GRQ    NW 0209KM03  045  324 49 01 -091           03 -062         0003400 30ML35MN
WEO8608130455P X561167   -0.07
WEO    W  0349KM00  405  251 49                                   0000000 00ML00MN
LPQ8608130455P X561604E  -0.22                    X570934 030 100  32               571441
LPQ    NE 0411KM00  068  051 49                   00 -456         0000670 35ML33MN
EEO8608130455P X561544E  -0.06          X565886           013 100   8               570233
EEO    NW 0412KM00  013  296 49         00  134                   0000387 29ML30MN
HTQ8608130455P X564739   -0.07                    X581408 033 100  12               581768
HTQ    NE 0636KM00  480  042 49                   00 -255         0000228 37ML31MN
KLN8608130455P X564412E  -0.29
KLN    E  0641KM00  071  070 49                                   0000000 00ML00MN
MNQ          P X565426
MNQ    NE 0730KM00  019  032 49                                   0000000 00ML00MN
JAQ8608130455P X572399   -0.07
JAQ    N  0975KM00  006  354 49                                   0000000 00ML00MN
             Z
```

19860813 04:55 MN=3.3 45.098N 74.249W 10.00 KM

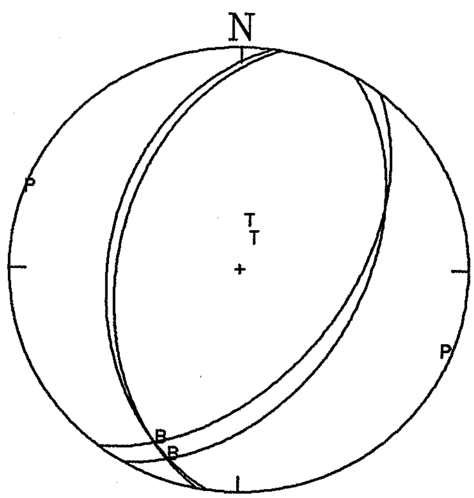
MS	257.000	-78.000	D		very strong first motion
MS	257.000	-78.000	R	0.5	read manually from digital playout
LOZ	206.000	-79.000	C		first motion down; station reversed
MNT	047.000	-80.000	D		strong dilatation
MNT	047.000	-80.000	R	0.069	
NO	240.000	-81.000	D		
WBO	263.000	-82.000	D		
WBO	263.000	-82.000	R	1.125	
PTN	225.000	-82.000	D		very strong first motion
PTN	225.000	-82.000	R	0.42	read manually from digital playout
WNY	158.000	-82.000	D		strong first motion
WNY	158.000	-82.000	R	0.851	read manually from digital playout
GAC	305.000	-84.000	D		weak down followed by strong up
OTT	286.000	-84.000	D		
HB	131.000	-84.000	-		weak dilatation
CSR	177.000	-84.000	D		strong first motion
SKT	181.000	-84.000	D		weak down (nodal)
TRQ	349.000	-84.000	D		strong first motion
GNF	179.000	-85.000	D		strong first motion
ALX	238.000	-85.000	D		very weak down followed by strong up
SBQ	079.000	49.000	+		
GNT	045.000	49.000	e		
GRQ	324.000	49.000	e		very noisy
LPQ	051.000	49.000	e		
EEO	296.000	49.000	e		
KLN	070.000	49.000	e		



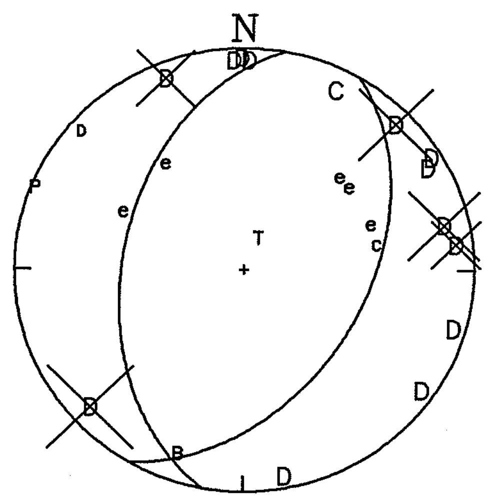
DATA



PO R3



PO R2



BEST SOLUTION

Seismic Zone: CHARLEVOIX

Magnitude : 4.2

Location : 47.30N 70.32W

Date(Y/M/D) : 1986/09/19

Time(UT) : 15:53

Depth:

closest station: A10 (11 KM from epicentre)
free depth = 21.60 KM

Quality of Readings:

- P arrivals and polarities on array data very good but not able to get a ratio on A61; A16 dead
- TRQ, GSQ, and LPQ very nodal
- P arrival on LPQ is a very weak down half cycle followed by strong down half cycle;
- LPQ ratio for first half cycle of P is 2.0 (used in solution) compared with ratio of 1.0 for first 1.5 cycles
- polarity on GGN is reversed; GGN as down does not fit the solution (encountered same problem with two other LSL focal mechanisms); situation under investigation

Comments:

Best solution chosen from P(1.5) R3. Solution misfits polarities on GGN and TRQ, and misfits ratios slightly on A10 and LPQ, and rather badly on A20. Ratio on A20 may be in error because of difficulty reading digital playout. Ratio on LPQ and polarity on GGN not reliable for the reasons stated above.

Mechanism represents thrust faulting in response to NE compression.

Best Solution:

Strike, Dip, Rake	335	46	076
Strike, Dip, Rake	175	46	104
Trend & Plunge of P	255	00	
Trend & Plunge of T	165	80	
Trend & Plunge of B	345	10	

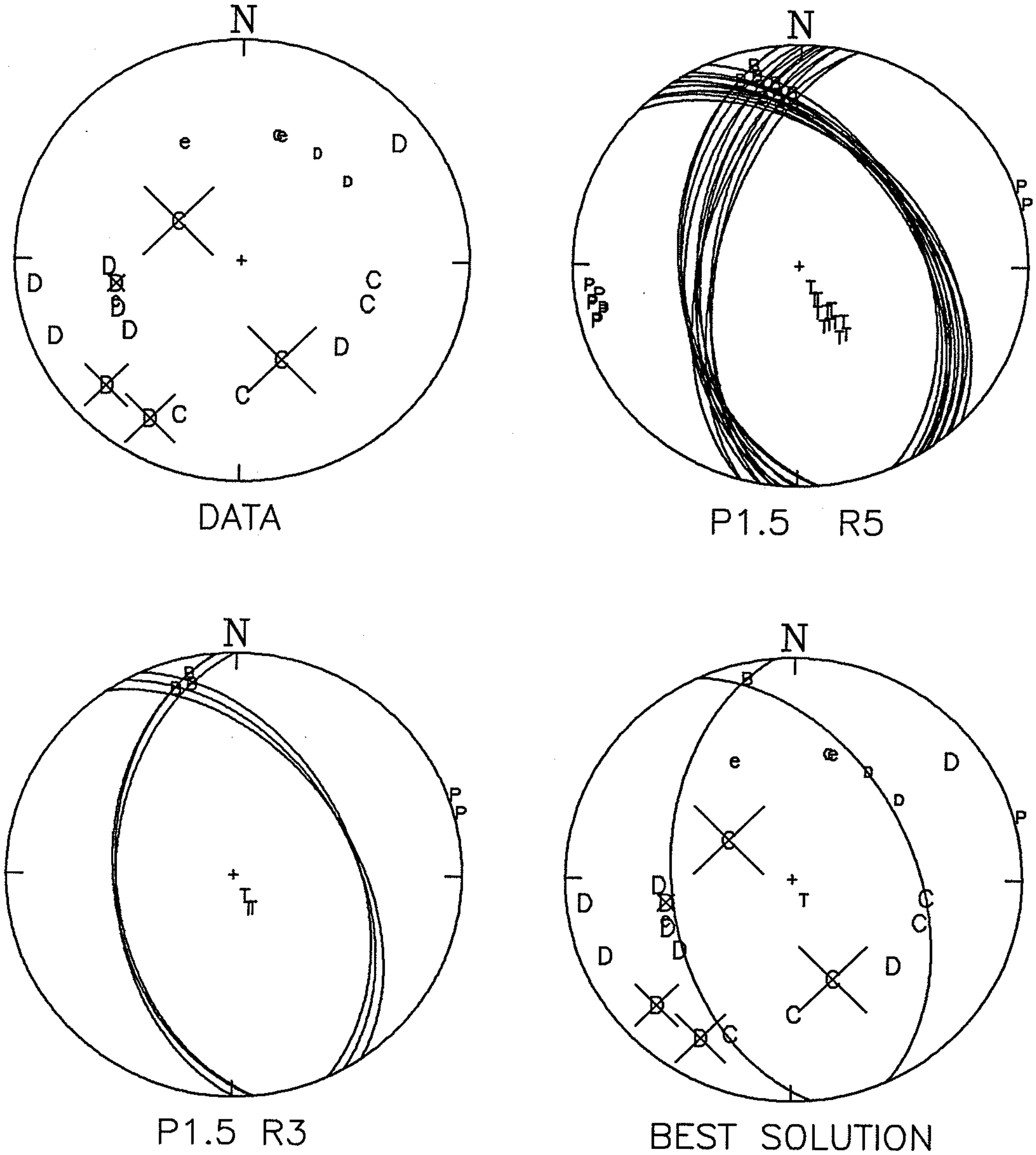
```
+47.301- 70.32001MN=4.2 1553011 19091986 00.0050.007 0.2  7  9 160.09 221.60    0 1ML=4.1 150
$FELT AT LPQ AND LMQ; FELT IN CHARLEVOIX COUNTY
$LARGEST CHARLEVOIX EVENT SINCE JAN 11,1986 M 4.
$FELT IN BAIE-ST-PAUL, ILE-AUX-COUDRES,
$ST-JOSEPH-DE-LA-RIVE, ST-HILARION, ST-IRENEE AND LA MALBAIE, QUE.
$WIDELY FELT IN THE QUEBEC CITY AREA (IV).
$NEAR QUEBEC CITY, IN CHARLEBOURG,
$BOISCHATEL, STE-BRIGITTE DE LAVAL
$AND ST-ROMUALD, QUE., PEOPLE
$REPORTED VIBRATING WINDOWS, RATTLING PLATES.
$$JACK TOMAS SENDING ME(JANET) FELT INFO
$MAGNITUDE (MIT) 4.2 MB                    MAGNITUDE (MIT) 4.2 MB
$  25 KM W  FROM LA POCATIERE, QUE.        25 KM O  DE LA POCATIERE, QUE.
$ A FOCAL MECHANISM HAS BEEN COMPILED FOR THIS EVENT
$RATIO=  0.503 A10
$RATIO=  0.560 A54
$RATIO=  1.069 A64
$RATIO=  1.268 A20
$RATIO=  2.013 LPQ
$UXB8609191553P X542189                      X552179                                   1
A108609191553P                   530499C               X530765                       1
A10   SE 0011KM          122-27 10 -006                00 -031         0000000 00ML00MN
A548609191553P                   530585C                                             1
A54   N   0019KM         338-40 10  007                                0000000 00ML00MN
LPQ8609191553P            -0.21  530667D                531034 020  102887           1
LPQ   E   0024KM         079-47 10  013                10 -003         0906978 38ML53MN
LMQ8609191553P                   53068 C                                             1
LMQ   N   0028KM         359-51 10  000                                0000000 00ML00MN
A618609191553P                   530947C                                             1
A61   N   0047KM         021-64 10 -001                                0000000 00ML00MN
A208609191553P                   531236D               X532170                       1
A20   NE 0066KM          046-71 10  011                00  126         0000000 00ML00MN
A648609191553P                   531227D                532085                       1
A64   NE 0067KM          029-71 10 -018                10  003         0000000 00ML00MN
QCQ8609191553P                   053164 D
QCQ   SW 0093KM          232-76 00 -011                                0000000 00ML00MN
SLQ8609191553P                   053188 D
SLQ   NE 0107KM          067-78 00  009                                0000000 00ML00MN
EBN8609191553P            -0.22  0532657D              0534518 020  1001042          1
EBN   E   0158KM         083-81 00 -049                00 -084         0032735 38ML43MN
GNT8609191553P 0532989D  -0.06                         0535364 013 100 577           1
GNT   SW 0188KM00  044   237 49                        00 -059         0027888 37ML43MN
SBQ8609191553P 0533803    -0.07                        0541111 020 100 88            1
SBQ   SW 0247KM00  137   211 49                        00  045         0027646 42ML45MN
HTQ8609191553P 0533851-   -0.07             0540615            023 100 358           1
HTQ   NE 0254KM00  095   034 49             00  161                    0009780 38ML41MN
GSQ8609191553P 0534468-   -0.22             0541752    0542418 030 100 404           1
GSQ   NE 0298KM00  161   052 49             00  347    00 -091         0008461 41ML41MN
KLN8609191553P 0534398C   -0.29             0541643    0543033 017 100 204           1
KLN   E   0304KM00  009  098 49             00  101    00  345         0007540 38ML41MN
MNT8609191553P 0534801    -0.06             0542100    0542964 023 100 455           1
MNT   SW 0324KM00  204   233 49             00  178    00 -236         0012430 42ML44MN
TRQ8609191553P 0534897+   -0.09                        0543644 020 100 461           1
TRQ   W   0345KM00  025  251 49                        00 -167         0014483 44ML45MN
GGN8609191553P 0535154D   -0.29             0542914    0544365 033 100 306           1
GGN   SE 0363KM00  053   131 49             00  129    00  036         0005826 42ML41MN
MNQ8609191553P 0535315E   -0.1                         0544612 017 100 102           1
MNQ   N   0377KM00  056  017 49                        00 -093         0003770 38ML40MN
WNH8609191553P X535539                                                               1
WNH   S   0391KM00  126  193 49                                        0000000 00ML00MN


GRQ8609191553P 0535828    -0.09             0544411    0545747 030 100 742           1
GRQ   W   0429KM00 -058  262 49             00  241    00 -403         0015540 49ML47MN
GAC8609191553P 0540060D   -0.06                        0550104                       1
GAC   W   0434KM00  115  248 49                        00 -188         0000000 00ML00MN
LMN8609191553P 0540209C   -0.29             0544914    0551412 013 100  26           1
LMN   E   0452KM00  016  109 49             00  225    00  587         0001257 35ML36MN
ONH8609191553P X540563                      X544956                                  1
ONH   S   0457KM00  346  192 49             00  203                    0000000 00ML00MN
WBO8609191553P 0540444    -0.06             0545237    0550662 030 100 27            1
WBO   SW 0460KM00  177   238 49             00  402    00 -368         0005655 45ML43MN
OTT8609191553P 0540735    -0.06                        0550690 033 100 256           1
OTT   SW 0466KM00  396   245 49                        00 -507         0004874 45ML42MN
DNH8609191553P X540472                      X545194                                  1
DNH   S   0467KM00  135  186 49             00  232                    0000000 00ML00MN
PNH8609191553P X540732                                                               1
PNH   S   0489KM00  118  198 49                                        0000000 00ML00MN
GLO8609191553P X541125                                                               1
GLO   S   0519KM00  149  184 49                                        0000000 00ML00MN
WFM8609191553P X541180                      X550552                                  1
WFM   S   0530KM00  077  190 49             00  252                    0000000 00ML00MN
DUX8609191553P X541957                                                               1
DUX   S   0583KM00  205  184 49                                        0000000 00ML00MN
EEO8609191553P 0542697D   -0.06             0553437    0560693 023 100 139           1
EEO   W   0670KM00 -129  267 49             00  135    00 -207         0003797 48ML44MN
JAQ8609191553P 0544647E   -0.07             0560444    0564471 037 100  95           1
JAQ   NW 0818KM00  011   334 49             00 -013    00 -581         0001613 48ML41MN
SCH8609191553P 054525 +                     05617      05702
SCH   N   0873KM00 -040  015 49             00  094    00 -361         0000000 00ML00MN
             Z
```

19860919 15:53 MN=4.2 47.301N 70.320W 21.60 KM

A10	122.000	-27.000	C		good first motion
A10	122.000	-27.000	R	0.503	read from hardcopy digital playout
A54	338.000	-40.000	C		good first motion
A54	338.000	-40.000	R	0.560	read from hardcopy digital playout
LPQ	079.000	-47.000	D		first down half cycle followed by 10X stronger down
LPQ	079.000	-47.000	R	2.013	from first half cycle
LMQ	359.000	-51.000	C		strong P arrival; analog reading
A61	021.000	-64.000	C		good first motion
A20	046.000	-71.000	D		good first motion
A20	046.000	-71.000	R	1.268	read from hardcopy digital playout
A64	029.000	-71.000	D		good first motion
A64	029.000	-71.000	R	1.069	read from hardcopy digital playout
QCQ	232.000	-76.000	D		analog reading
SLQ	067.000	-78.000	D		analog reading
EBN	083.000	-81.000	D		definite down but weak
GNT	237.000	49.000	D		weak down followed by strong up
HTQ	034.000	49.000	-		weak first motion
GSQ	052.000	49.000	-		very nodal
KLN	098.000	49.000	C		
TRQ	251.000	49.000	+		nodal; preceeded by weak down
GGN	131.000	49.000	D		polarity reversed; weak up followed by strong down
MNQ	017.000	49.000	e		emergent
GAC	248.000	49.000	D		
LMN	109.000	49.000	C		strong first motion
EEO	267.000	49.000	D		
JAQ	334.000	49.000	e		emergent
SCH	015.000	49.000	+		very weak first motion; analog reading

CHV860919.OUT
18-NOV-86 16:40:41



Seismic Zone: LOWER ST. LAWRENCE

Magnitude : 4.2

Location : 49.25N 67.39W

Date(Y/M/D) : 1986/11/09

Time(UT) : 19:57

Depth:

closest station: GSQ (44 KM from epicenter)
free depth = 18.4 KM
pegged at 18 KM

Quality of Readings:

- Sg on HTQ weak compared to Pg
- GGN has strong upwards P arrival but, due polarity was reversed according to teleseism polarities; entered as D but then does not fit this mechanism; it has previously misfit other mechanisms in the same way.
- most close stations have good P arrivals
- P arrivals on TRQ, GRQ, and JAQ very weak
- Charlevoix array: A20 reading strong; others emergent
- SIC not operating at this time

Comments:

Best solution chosen from set P2 R1. Solution misfits HTQ ratio due to a weak S phase, and as well misfits polarities on GGN, LPQ, and GRQ for reasons given above.

P2 R1 also gives solution with B axis at 95,10 which has large residuals on HTQ and does not fit weak Pn arrivals near 225 azimuth, therefore it is discarded.

When all ratios are forced to fit, the polarity on GSQ misfits every solution.

Mechanism represents thrust fauling on NW plane in response to NE compression.

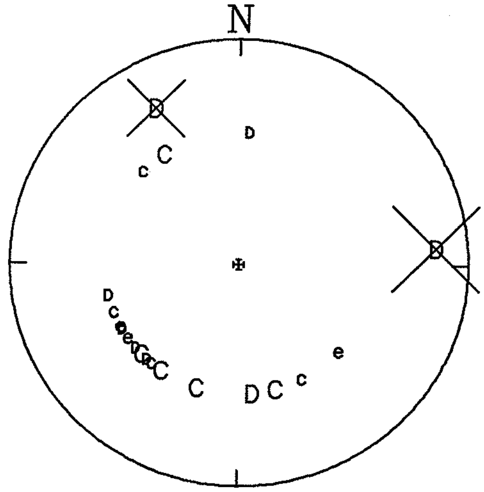
Best Solution:

Strike, Dip, Rake	304	53	065
Strike, Dip, Rake	162	44	120
Trend & Plunge of P	052	05	
Trend & Plunge of T	154	69	
Trend & Plunge of B	320	20	

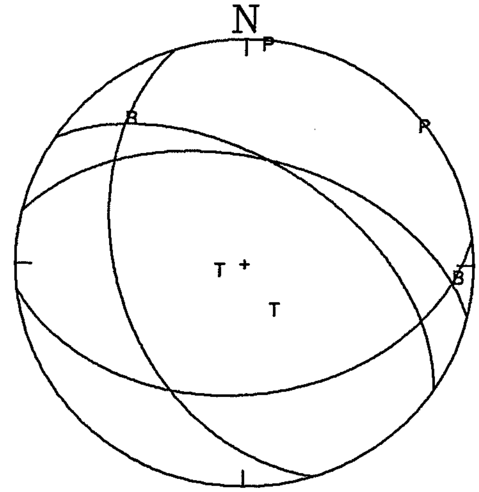
```
+49.250- 67.392F1MN=4.2 1957191 09111986 00.0100.014 0.2 23 43 130.58 218.00    0 1ML=4.2   80
$FOCAL MECHANISM DETERMINED BY ADAMS/STAGG
$RATIO=  0.021 HTQ 573152D 0.27 -4275.19 13388.80 574043 0.16  4488.81
$RATIO=  0.851 GSQ 572710D 0.21  -956.08  1768.92 573215 0.09  6783.08
GSQ8611091957P           -0.22 A572709D             C573215                       573279
GSQ    SE 0044KM        152-67 21  003              01 -056     0000000 00ML00MN
HTQ8611091957P           -0.07 A573153D             A574044 020 1001823           574492
HTQ    W  0073KM        265-75 21  013              21  006     0057271 36ML40MN
MNQ8611091957P A574656C  -0.10 X575115    C580705                                 581529
MNQ    NW 0174KM21  034 326 49 00  367    01  085               0000000 00ML00MN
EBN8611091957P A575110C  -0.22            B581401           037 1001173           581484
EBN    S  0209KM21  056 198 49            05  036               0019919 41ML43MN
SLQ8611091957P  57515 C
SLQ    SW 0213KM05  063 215 49                                  0000000 00ML00MN
A208611091957P        C
A20    SW 0242KM        226 49                                  0000000 00ML00MN
KLN8611091957P B575862C  -0.29                      B584023 020 100 308           584258
KLN    S  0278KM05 -050 164 49                      05  263     0009676 39ML41MN
LPQ8611091957P A580012-  -0.22 C580542    C582957   X583752 027 100 715           584567
LPQ    SW 0288KM21 -007 223 49 01 -047    01 -091   00 -265     0016639 43ML44MN
LMQ8611091957P  57597 -
LMQ    SW 0288KM05 -035 230 49                                  0000000 00ML00MN
LMN8611091957P B581592+  -0.29            B585911   B591754 023 100  93           592006
LMN    SE 0425KM05 -111 152 49            05 -071   05 -113     0002541 40ML39MN
GGN8611091957P A582103D  -0.29            C590895   X593204 040 100 244           593308
GGN    S  0462KM21 -038 174 49            01  147   00  323     0003833 45ML41MN
GNT8611091957P B582548   -0.06            B591507   X593433 043 100 406           593611
GNT    SW 0492KM05  053 231 49            05  127   00 -287     0005932 48ML43MN
SBQ8611091957P B583283+  -0.07            B592752   B595160 040 100 247           595942
SBQ    SW 0550KM05  075 220 49            05  129   05 -189     0003880 47ML42MN
GBN8611091957P  58405 E
GBN    SE 0617KM05  046 132 49                                  0000000 00ML00MN
SCH8611091957P  58415 -                    5942
SCH    N  0621KM05  083 004 49            05  073               0000000 00ML00MN
MNT8611091957P B584110   -0.06            B594196   C601225 030 100 123           001459
MNT    SW 0629KM05 -049 231 49            05 -088   01 -315     0002576 47ML42MN
TRQ8611091957P B584076E  -0.09            B594467   X601277 037 100 279           002003
TRQ    SW 0634KM05 -159 241 49            05  052   00 -416     0004738 50ML44MN
GRQ8611091957P B584791+  -0.09            C595765   X602910
GRQ    W  0698KM05 -214 248 49            01  007   00 -564     0000000 00ML00MN
GAC8611091957P B585257-  -0.06
GAC    SW 0726KM05 -086 240 49                                  0000000 00ML00MN
OTT8611091957P B585937   -0.06                              043 100 183
OTT    SW 0761KM05  161 239 49                                  0002674 50ML43MN
WBO8611091957P B585751E  -0.06            C601133           047 100 151           010175
WBO    SW 0762KM05 -034 235 49            01  012               0002019 49ML42MN
JAQ8611091957P A585823+  -0.07
JAQ    NW 0768KM21 -042 314 49                                  0000000 00ML00MN
CKO8611091957P C590427   -0.06
CKO    W  0838KM01 -284 248 49                                  0000000 00ML00MN
EEO8611091957P B591457-  -0.06            C604441   X604555 033 100  32           010150
EEO    W  0919KM05 -246 256 49            01 -026   00 ****$    0000609 45ML38MN
             Z
```

19861109 19:57 MN=4.2 49.250N 67.392W 18.00 KM

GSQ	152.000	-67.000	D		good Pg
GSQ	152.000	-67.000	R	0.851	
HTQ	265.000	-75.000	D		good Pg; weak Sg
HTQ	265.000	-75.000	R	0.021	
MNQ	326.000	49.000	C		good P arrival
EBN	198.000	49.000	C		strong P arrival
SLQ	215.000	49.000	C		strong up; analog reading
A20	226.000	49.000	C		polarity read from hardcopy trace
KLN	164.000	49.000	C		good P arrival
LPQ	223.000	49.000	-		very slight up before stronger down
LMQ	230.000	49.000	-		weak down folllowed by strong up; analog reading
LMN	152.000	49.000	+		good P arrival
GGN	174.000	49.000	D		trace goes up, but polarity reversed
SBQ	220.000	49.000	+		nearly nodal
GBN	132.000	49.000	e		emergent; analog reading
SCH	004.000	49.000	-		analog reading; weak P arrival
TRQ	241.000	49.000	e		very emergent
GRQ	248.000	49.000	+		weak P arrival
GAC	240.000	49.000	-		weak P arrival
WBO	235.000	49.000	e		
JAQ	314.000	49.000	+		weak P arrival
EEO	256.000	49.000	-		

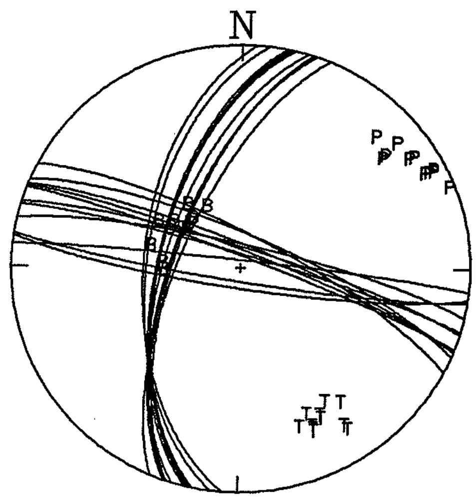


DATA

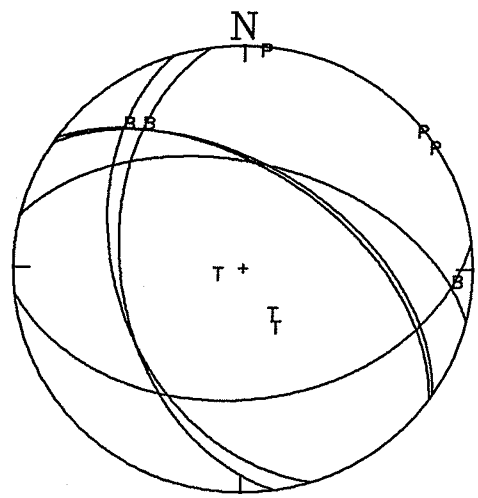


P2 R1

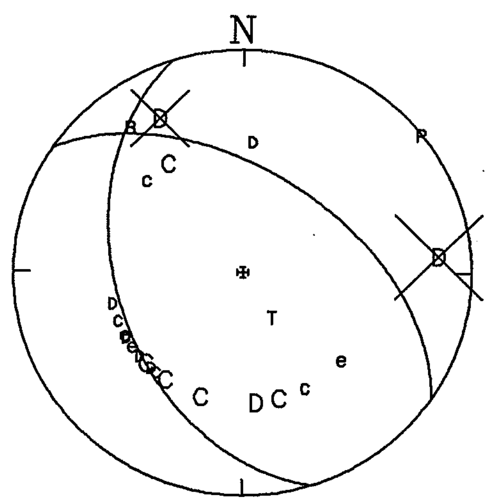
LSL861109.OUT
27–NOV–86 15:14:15



P5 R0



P2 R2



BEST SOLUTION

Seismic Zone: Western Quebec

Magnitude : 3.0

Location : 46.31N 78.42W
(near Mattawa ONT)

Date(Y/M/D) : 1986/05/30

Time(UT) : 08:29

Depth:
closest station: EEO, 62 km from epicentre
free depth = 3.9 km
pegged at 4.0 km
(also tried at 16 km)

Quality of Readings:
TRQ, GRQ, WBO, GAC(?) have strong phases interpreted as Pg
Pn weak on TRQ and GRQ
WBO read as - followed by strong C
EEO SV strong up

Comments:
moderately well-constrained mechanism
mechanism is not dependant on exact depth
polarity of Pg phases on TRQ(+), GRQ(+), WBO(-) fit mechanism derived without them
strike-slip mechanism, with possibility of normal faulting component
P axis is in SE quadrant, orthogonal to regional trend
best solution has lowest amplitude residual for Z = 4 km
Mechanisms produced by TXTFOCAL in substantial agreement, but without any normal component. EEO SV fitted well

Best Solution:

Strike, Dip, Rake	191	35	-7
Strike, Dip, Rake	287	86	-125
Trend & Plunge of P	166	39	
Trend & Plunge of T	46	32	
Trend & Plunge of B	290	35	