GEOLOGICAL SURVEY OF CANADA

OPEN FILE 2430

New focal mechanisms for Eastern Canada

J. Adams

1991

Energy, Mines and Resources Canada	Énergie, Mines et Ressources Canada

Canada

NEW FOCAL MECHANISMS FOR EASTERN CANADA

1986-1989

John Adams

Geophysics Division,
Geological Survey of Canada
1 Observatory Crescent,
OTTAWA K1A 0Y3, CANADA

Geological Survey of Canada Open File 2430

December, 1991

118 Pages

ABSTRACT

Using P-wave polarities, Sv/P amplitude ratios where necessary, and the program FOCMEC, I have determined the focal mechanisms of 20 recent earthquakes (1986-1989) in eastern Canada including the magnitude 6 Saguenay and Ungava earthquakes. The mechanisms confirm that thrust or thrust/strike-slip faulting is dominant in eastern Canada, and in the southeast are in response to roughly east-northeast oriented compression. New evidence is presented that suggests a regime of north-south compression in the Labrador Sea – Ungava region. The type of faulting and the strike of the derived nodal planes provide valuable insights into the seismotectonics of eastern Canada.

RÉSUMÉ

D'après les premiers mouvements de l'onde P, les rapports d'amplitudes Sv/P et le programme FOCMEC, nous avons déterminé les mécanismes au foyer de 20 tremblements de terre récents (1986-1989) du Sud-Est du Canada. Les mécanismes au foyer confirment la prédominance des mouvements de chevauchement ou de décrochement/chevauchement partout dans l'Est du Canada en réponse à une compression sub-horizontale. Des variations locales dans la direction de compression peuvent être utilisées pour définir de petites régions aux contraintes anomales. De plus, l'orientation des plans de faille donne un bon aperçu de la séismo-tectonique des régions de l'Ouest du Québec, de Charlevoix, du Bas-Saint-Laurent et du nord des Appalaches.

INTRODUCTION

In the study of seismotectonics, one of the most valuable tools is being able to determine the focal mechanism of earthquakes. Earthquake focal mechanisms provide information on the nature of faulting, the inferred deviatoric stresses acting, and – with ambiguity because two options are given – the dip and strike of the rupture plane. This open-file continues the documentation of southeastern Canadian focal mechanisms begun by Adams et al. (1988, 1989), and extends the area studied to include some of the larger recent earthquakes in northeastern Canada. As in the previous two reports, a deliberate effort has been made to fully document the data, results, and conclusions in the Appendix, but space precludes including the waveform data used in the analysis (this is archived separately by Geophysics Division). Supporting data, including playouts of the digital data, presently reside in seven large blue ring binders in Adams' office. Future users should contact the Geophysics Division regarding the availibility of the digital event files themselves.

PROCEDURES

Choice of events studied

The 20 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 (December 1987 - August 1988), together with some recent larger earthquakes in eastern Canada. The routine analysis of the smaller southeastern earthquakes post-August 1988 is continuing, and will be published (e.g. Wetmiller et al., 1991). In all, two magnitude 6, two magnitude 5, seven magnitude 4, eight magnitude 3, and one magnitude 2 earthquakes were analysed for this open file.

Determination of hypocentres

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

Sensitivity of mechanisms to hypocentral depth

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

As is fully discussed by Adams et al. (1988), uncertainty in focal depth often 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), Charlevoix Local Telemetered Network CLTN), and Sudbury Local Telemetered Network (SLTN) 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, Weston Observatory of Boston College, and Woodward Clyde Consultants,
- copies of paper records made by F. Revetta at Potsdam College, N.Y.
- teleseismic polarities reported to the National Earthquake Information Center in Golden, Colorado and published in their "Earthquake Data Report".

Seismometer polarities are checked routinely for the Canadian stations, (and confirmed by subsequently checking polarities of teleseismic arrivals) and no Canadian stations with reversed polarity are known during the time period of the events studied. Network operators in the northeastern U.S. provided information on station polarity with their records. Some of their stations operate with reversed polarity, and for some stations the polarity remains uncertain (even where believed known).

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

Polarities were assigned either full or half weight. Full weight polarities are those that are impulsive, unambiguous, and should be fit by the final mechanism. Half weight polarities are emergent, less strong, may have been read by other analysts, 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 to their position near a nodal plane: these have been denoted 'E'. Although the program FOCMEC (see below) does not use these 'E' polarities, they were occasionally useful for deciding between the different possible focal mechanisms.

Determination of amplitude ratios

The determination of amplitude ratios followed Adams et al. (1988) in using the amplitude of the first half cycle of the P-wave. Since that publication, a paper by Ebel (1989) has demonstrated that much of the energy in the P-coda is generated by scattering very close to the source, and that only the first half cycle of the the P-wave is uncontaminated by scattered energy. Thus the large second peak amplitude for P-waves that are strongly asymmetric (weak up followed by strong down, or vice-versa) is due to off-azimuth scattering and not to the source. Ideally, the next step in improving the analytical method will be to use a modeling program to prepare synthetic waveforms. In addition to my quantitative use of the amplitude ratio, I used the relative amplitude of the Pn onsets as a qualitative guide (Ebel, 1989) to the proximity of the nodal planes derived using the polarity and Sv/P ratio data.

Concern has been expressed that the Sv onset is hard to pick because of contamination by the P-wave coda. Although this is undoubtedly true, the errors in picking the S onset from digital waveforms recorded at less than 100 km (as are used for the Sv/P ratios) are not thought significant. Exceptionally, a nodal Sv arrival might be be overlooked and the amplitude of the next cycle read. The future refurbishment of the Canadian Seismograph Network will see the introduction of many more 3-component seismometers, thus making the picking of the S-wave onset more certain and allowing the use of S polarities and S_H/P ratios for determining focal mechanisms.

Use of the Progam 'FOCMEC'

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

In deciding on the final "best" mechanism I have relied very heavily on the polarity data and placed much less value on the ratio data. Of the 571 equivalent full-weight polarities in this report (Table 1) only 6% are misfit; of the 47 ratios used, half misfit, but half of these are on just two mechanisms. Of the 20 mechanisms, two (#880102 and #880512) are strongly dependent on using ratios and two (#890309 and #890311) are weakly dependent. **Note added in revision:** After the work in this Open File was finished (in the summer of 1990), and while the manuscript was in the internal review process, it was learned that the version of FOCMEC I used may have an error in the ratio calculation code. It is intended to recompute the four mechanisms considered dependent on ratios when the revised code becomes available.

The Appendix provides a full documentation of the data and results.

SUMMARY OF MECHANISMS

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

#860420 is a well-constrained strike-slip/thrust mechanism. An alternative, lower scoring, mechanism has a larger thrust component but the same P-axis direction, and is very similar to the mechanism for #871214. For this earthquake and #871214 a combination of a polarity change within the ECTN and a change in polarity between the eastern and western arctic stations allows the mechanism to be derived with only Canadian data.

#870405 does not give a final mechanism because the data are poorly distributed on the focal sphere. What can be said, however, is that the orientation of the P and T axes are relatively well defined, with the trend of P lying in the southeast octant.

#871206 is a thrust mechanism, well-constrained by polarity data.

#871214 is a well-constrained thrust mechanism. Relative to #860420, and because of the different locations of the two events, the contrasting polarities for SCH and JAQ (SCH is compresional for both events, JAQ dilatational for both) exert a stronger constraint.

#880102 is unusually poorly constrained for a Charlevoix earthquake, because the CLTN was not operating. The thrust mechanism is thought more likely than the lower-scoring strike-slip mechanisms shown in the Appendix.

#880128 is a well-determined strike-slip mechanism for the largest earthquake yet known from the Baie des Chaleurs.

#880226. Like #870405, the data do not give a final mechanism because of a poor distribution on the focal sphere. What can be said, however, is that the orientation of the P and T axes are relatively well defined, with the trend of P lying in the northeast octant.

#880313 is a well-determined thrust mechanism, even if ratios are not used.

#880512 is a fairly-well determined thrust mechanism, although the exact strike of the planes could vary within about $\pm$ 15°.

#880515 is a well-determined thrust mechanism despite the depth being uncertain. To fit the polarity change between WBO and the upstate New York stations requires a steeper take-off angle towards WBO, either due to the earthquake being deeper (18 km vs 9 km) or to a complex crustal structure.

#880809 is a well-determined thrust mechanism, though the final solution does not fit the OTT ratio.

#880811 is an aftershock of #880809, and has similar polarities as the mainshock, though there are fewer of them and they are less definite. The mechanism is almost the same as for the mainshock.

#881123 is a foreshock to #881125, and despite the large amount of data the mechanism is not as well defined as might be expected. Of the range of west-dipping nodal planes, the more north-striking would fit the weak polarities read on the Arctic stations and would correspond to the northwest dipping plane for the mainshock. Nevertheless, the other mechanism was chosen because it comes closest to making MNQ nodal and fitting the KAO compression.

#881125 is the mechanism for the m_{bLg} 6.5 Saguenay earthquake and is well-constrained from local and teleseismic polarities. There are almost no polarity misfits to the chosen solution. Although this earthquake was anomalously deep, the arrivals on the CLTN are fit as Pg arrivals.

#881126 is an aftershock to #881125. It has a clear polarity change across the CLTN which, when all the first arrivals are taken as Pg, strongly constrains the mechanism. The northeast-dipping plane is similar to one of the mainshock planes.

#890309 is the first of a pair of magnitude 4 earthquakes with nearly identical hypocentres, waveforms, and mechanisms. It is a well-determined thrust mechanism, although the take-off angle towards station A64 had to be increased to avoid conflicting with Pn polarities in New England.

#8903011 is the second of the pair of magnitude 4 earthquakes. Its mechanism is nearly identical to that for #890309.

#890316 is a well-determined thrust mechanism representing thrusting on east-west planes. All stations were at Pn or teleseismic distances and fit the mechanism well.

#891225A is a foreshock to #891225B. Polarities for most stations are similar to those for the mainshock, but a few show clear opposite polarity, indicating a slight change in mechanism. Polarities on stations in southeastern Canada show complex polarity changes that are not understood.

#881225B is the mechanism for the M_S 6.3 Ungava mainshock and is well-constrained from local and teleseismic polarities. The mechanism represents thrust faulting on a east- or northeast-striking plane.

DISCUSSION

The results of the focal mechanisms are summarized in Table 1 and on Figures 1 and 2. Figures 3 and 4 gives the results from Adams et al. (1988) and Adams et al. (1989) for comparison. Full details, including detailed comments on the polarities and ratios used, the assigned depth, the robustness of the solution, and some implications are given in the Appendix. In the following I discuss the mechanisms by seismic zone (mostly after Basham et al. 1982) to highlight similarities and differences between mechanisms in light of our current understanding (e.g., Adams and Basham, 1989).

SOUTHEASTERN CANADA

<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. The three earthquakes (#880515, #880809 and #880811) studied lie along the southwestern edge of the west-northwest band of seismicity along the Ottawa River identified by Adams and Basham (1989). Forsyth (1981) had previously shown that the earthquakes in the 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).

Focal mechanisms have previously been determined for a relatively large number of earthquakes in the zone because of the relatively dense network of digital seismographs and of the diligence of Wahlstrom (1987). Almost all mechanisms have near-horizontal P-axes and represent mainly thrust earthquakes. This evidence for high horizontal compression is confirmed by other evidence for regional stresses in eastern Canada (Hasegawa et al., 1985; Adams, 1987; Adams, 1989).

The mechanism for #880515 is relatively well-determined despite the inconsistancy between the computed focal depth and the implied take-off angle towards WBO. It involves thrusting on NW-striking planes that are nearly parallel to the Ottawa Graben faults shown by Forsyth (1981) extending east-southeast from Ottawa, and as such might represent reactivation of these faults in response to compression from the northeast.

The mechanisms for #880809 and #880811 (a mainshock and its aftershock) are similar, both representing thrusting on either the north- or the northwest-striking plane, though with a larger strike-slip component that #880515. The northwest-striking plane is similar to the nodal planes of #880515, and these earthquakes might similarly represent reactivation of the Ottawa Graben rift faults.

Charlevoix (CHV) Seismic Zone The Charlevoix zone is monitored by a 6-station local network, the CLTN. 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 in northeast-striking slabs that dip steeply to the southeast. A projection of the hypocentres to the surface along the postulated faults suggests the activity is confined between Paleozoic rift faults mapped on the north shore and a bathymetric feature near the river's south shore.

A number of earthquake focal mechanisms have previously been derived for Charlevoix earthquakes (Adams et al., 1988, 1989; Hasegawa and Wetmiller, 1980; Lamontagne, 1987; Leblanc and Buchbinder, 1977). Of the five new mechanisms published here, three represent magnitude 3 earthquakes of size and location typical of the continuing activity, and two represent an unusual pair of magnitude 4 earthquakes studied in detail by Wetmiller and Adams (1990).

#871206 and #880102 are rather similar thrust mechanisms with NW-striking nodal planes and a northeast-trending P axis. They are similar to mechanisms #870318, #860111 and #860619 derived in earlier compilations (Adams et al., 1988, 1989). #880313 is shallower than the other two, and unlike most shallow southeastern Canadian focal mechanisms (but like some of the deeper Charlevoix mechanisms) has a northwest-trending P axis.

#890309 and #890311 are an unusual pair of events, unusual for their size (magnitude 4.3 and 4.4), their very similar waveforms on the CLTN, and their consequent similar mechanism (Wetmiller and Adams, 1990). They represent thrust faulting on north-south striking planes in response to east-west compression.

The Charlevoix mechanisms have not proved easy to interpret, though most have P-axes in the east quadrant (Adams, 1989) and represent thrust or combination thrust/strike-slip faulting. A plane that might represent the rift faults is seen on some of the mechanisms, but like two of my new mechanisms, at least some of the earthquakes appear to be occurring on NW-striking transverse faults that offset the rift fault system.

It is fair to say that although many focal mechanisms have now been derived for the Charlevoix seismic zone, little effort has yet been put into integrating the hypocentres, nodal planes, and compression directions into a holistic pattern with the known distribution of small earthquakes, the mapped surface faults, and the two supposed nucleation regions of the largest earthquakes (e.g., see work by Anglin, 1984; Lamontagne, 1987; Stevens, 1980; Wetmiller and Adams, 1990).

Saguenay Earthquakes Three mechanisms in this paper represent the foreshock to the m_{bLg} 6.5 Saguenay earthquake, the mainshock, and the largest aftershock (#881123, #881125, and #881126, respectively). The mainshock was the largest earthquake in southeastern Canada since the 1935 Timiskaming earthquake and had a larger m_{bLg} than that earthquake. The earthquakes occurred within the previously-defined Eastern Background seismic zone of Basham et al. (1982), but now appear to be associated with the Saguenay Graben. The following is taken from North et al. (1989):

"The epicenter ..... lies between the Saguenay Graben and the St. Lawrence valley and is 75 km from the outer boundary of the Charlevoix zone which has been a source of several large (magnitude up to 7) earthquakes over the last four hundred years, most recently in 1925. The Saguenay Graben, whose ESE-WNW trending faults extend some 20 km north and south from its geographical expression in the Saguenay Fjord, has not been considered to be seismically active and no events of magnitude greater than 3 had been located within 50 km of the November 1988 epicenter.

"The aftershock zone is bigger than one might expect for a magnitude 6 event, so it seems likely that post-seismic stress redistribution outside the actual rupture may have triggered many of the aftershocks shown ......, including, possibly, even the largest aftershock. In interpreting the distribution of aftershocks we have placed most emphasis on the sectional views ... which are aligned perpendicular to the main shock nodal planes .... and upon the events occurring in the first 35 hours. In ... section normal to the east-dipping nodal plane there is a distinct linear trend of events which includes the main shock and is aligned roughly parallel to the 67° dip of this plane. We believe that this zone may be the best indication of the mainshock rupture plane in the aftershock data, though the evidence is clearly not conclusive.

"While most intraplate earthquakes are shallow, the well-constrained 29 km depth of the Saguenay earthquake, together with similar or greater depths for recent events in Sweden and Brazil (Chen, 1989) and experience in the Charlevoix seismic zone where low magnitude seismicity occurs from near the surface to 27 km depth (Anglin and Buchbinder, 1981), indicates that deep crustal events are unusual but not unprecedented. This would appear to support the contention of Chen and Molnar (1983) that the seismogenic zone in tectonically old intraplate regions spans the entire crust. Although the 1988 events took place in a region of little previous seismicity, their close proximity to the Saguenay Graben is not inconsistent with recent models (e.g. Johnston, 1989) which indicate that larger earthquakes in stable continental interiors take place in crust which has previously been weakened by rifting processes."

I interpret recent work using Synthetic Aperture Radar (SAR) images by Lamontagne et al. (1990) to suggest that the southern boundary of the Saguenay Graben is at least 10 km to the south of the southmost mapped graben faults, which are along Lake Kenogami. From their images, a lineament – the Lac Ha! Ha! lineament – which appears to represent the southern boundary of the graben is seen to lie within about 4-8 km of the mainshock epicentre. The mainshock then would lie less than 10% of the graben width from the southern boundary of the graben. The Lac Ha! Ha! lineament trends 295°, about 30° anticlockwise from the northwest-striking nodal plane of the mainshock.

Haddon (1992) has modelled the strong ground motion resulting from the Saguenay mainshock and concludes that the rupture occurred on a long, narrow fault plane striking 333°, dipping 51° to the northeast, and with a rake of 73°. The rupture propagated unidirectionally towards the south-southeast. Because of the extreme directivity shown on stations to the southeast of this long narrow rupture, the alternative nodal plane is precluded. Haddon's rupture plane is approximately the nodal plane (strike 326°, dip 67°, and rake 55°) chosen on geological grounds. Of the other Saguenay mechanisms published here, both the foreshock (which occurred deeper than but very close to the mainshock) and the aftershock (which occurred 7 km northwest of the mainshock, and hence not on the rupture surface defined by Haddon, 1992) could have occurred on the same north-northeast striking plane as the mainshock if an alternative, lower-scoring mechanism were chosen. The differences, however may reflect real variations in their fault planes rather than uncertainties in their mechanisms. A further mechanism, for a M3.6 aftershock on 890119, is given by Lamontagne et al. (1990). This aftershock occurred about 15 km ESE of the mainshock and neither nodal plane is similar to the mainshock rupture plane.

<u>Northern Appalachians (NAP) Seismic Zone</u> The northern Appalachian region, which includes most of New Brunswick and which extends into New England, is a zone of relatively uniform seismicity. Previous focal mechanisms are listed by Adams et al. (1989). Almost all the hypocentres are shallower than 10 km, and all previous events represented dominantly thrust faulting, most in response to northeast- to east-directed compression.

Event #880424 is the largest earthquake yet to occur in the Baie des Chaleurs and gives a pure strike-slip mechanism with NNE- and WNW-striking nodal planes. Although thrust fault mechanisms with appreciable amounts of strike-slip are common in southeastern Canada, pure strike-slip mechanisms are rare (as are normal faulting mechanisms). The surface geology of the epicentre is poorly known, but in any event may not be relevant, because the earthquakes might have occurred under the overthrust sheet that comprises the New Brunswich Appalachians.

<u>Eastern Background (EBG) Seismic Zone</u> Seismicity in the rest of southeastern Canada outside of the recognised seismic zones was assigned to a background seismic zone by Basham et al. (1982). Few large historical earthquakes, and few moderate modern

earthquakes have occurred in this area (the Saguenay earthquake here being assigned to the Saguenay Graben structure), so the opportunity to derive two focal mechanisms was taken.

The magnitude 3.1 earthquake near Quebec City (#880512) gives a typical mechanism for southeastern Canada in that it represents thrust faulting on northwest-striking planes in response to compression from the northeast. Note, however that although this earthquake occurred close to the rift faults of the Iapetus margin, the nodal planes are transverse to their trend. Similar nodal planes have also been found at Charlevoix, 60 km northeast along the St. Lawrence River, and there attributed to reactivation of orthogonal faults offsetting the main normal faults (see the preceeding section on Charlevoix).

Basham et al. (1982) extended the eastern background zone northwestwards to include an area of seismicity around James Bay. An attempt was made to derive a mechanism (#870405) for a magnitude 3.6 earthquake to the west of James Bay, but the data were insufficient to constrain the nodal planes (indeed, even the type of faulting – thrust, strike-slip, or normal – is not determinable). However the result does provide some information on the deviatoric stresses acting, because the P and T axes are constrained to lie in octants of the focal sphere.

NORTHEASTERN CANADA

For the first time in this series, earthquakes from the northeastern parts of Canada are included. Partly, this represents a change in emphasis (with the mechanisms of the smaller southeastern earthquakes now being performed on a routine basis by Wetmiller and colleagues), partly the realization that there were many magnitude $4\frac{1}{2}$ to 5 earthquakes in the Canadian Arctic for which it might be possible to derive focal mechanisms and so add to knowledge of the stress field and seismotectonics of the region, and partly to the occurrence of three large earthquakes in the Ungava region. The earthquakes are discussed using the seismic zones of Basham et al. (1982), as for the southeastern earthquakes but moving from southeast to northwest.

Labrador Seismic Zone The seismicity of the Labrador Sea includes six earthquakes in the magnitude 5.0 to 5.6 range since 1934. The most recent moderate earthquake was

m_N 4.7 in 1986, which though 200 km offshore, was felt in Nain, Labrador. There are older reports of felt earthquakes from fishing villages along the Labrador coast as early as 1809 (Staveley and Adams, 1985). Currently, epicentres for these older events are assigned to the locations at which they were felt. However, 25 years of monitoring by the Canadian Network has provided no evidence that significant earthquakes are occurring onshore in this region. These older events likely occurred offshore, and may have been larger than hitherto thought (Basham and Adams, 1983).

The Labrador Sea was produced by rifting in the middle Cretaceous and seafloor spreading between 95 and 50 m.y. ago. Srivastava and Tapscott (1986) have identified a central ridge and associated fracture zones from seismic and gravity profiles and linear magnetic anomalies. Adams and Simmons (1991) systematically relocated earthquake epicentres in the Labrador Sea and showed that the seismicity in the central Labrador Sea can be associated with the extinct ridge and fracture zones, even though the spreading ridge has been extinct for 50 m.y. A separate trend of seismicity occurs at the continental margin off Labrador. In general terms, they associated those earthquakes with the reactivation of pre-existing faults beneath the rifted continental margin.

The Labrador seismic zone of Basham et al. (1982) was drawn to include both the seismicity along the Labrador margin and that in the middle of the Labrador Sea. Basham et al. (1983) recognized that the two seismicity zones could be separated, and defined separate Labrador Ridge (LRX) and Labrador Slope (LSX) seismic zones.

Both the earthquakes studied here occurred in the LSX zone, along the Labrador continental margin. However they differ in that good Lg waves propagated from #860420, and so it must have occurred on or near continental-thickness crust while Lg waves did not propagate from #871214, so it probably occurred on oceanic or thinned continental crust.

#860420 is considered to represent a combination of thrust/strike-slip faulting on a north-south or an east-west plane, though an alternative solution has a larger component of thrust faulting with both planes striking northeast.

#871214 represents thrust faulting on northeast-striking planes, and has a mechanism very similar to the alternative mechanism for #860420, even though the earthquakes are 200 km apart. Significantly, the P axes for both earthquakes are in the northwest quadrant and represent compression parallel to the Labrador margin. The only other mechanism from the margin (Hashizume, 1977) is from the southernmost part of the margin and is very different in that the planes strike parallel to the margin and the compression direction is from the northeast, a direction consistant with much of the rest of the craton.

Other evidence leads me to suspect that the northwest compression directions for the central Labrador margin earthquakes are not just due to local anomalies. Firstly, the earthquake mechanisms from the Ungava area (see below) and Baffin Island (Adams and Basham, 1989, Hasegawa and Adams, 1990) have the largest horizontal compression direction (P axis for thrust earthquakes and B axis for normal earthquakes) in the north to northwest octant. Secondly, work by J. S. Bell on breakouts from the central and northern Labrador Margin (Bell, 1989, p. 96-97; see also Adams, 1987) suggests anomalous orientations in that they trend to the north of northeast.

Boothia-Ungava Seismic Zone Basham et al. (1977) recognized an arcuate band of seismicity that extends southward from the Boothia Peninsula, across northern Hudson Bay, the Ungava Peninsula, and eastward through Hudson Strait, connecting with the northern end of the Labrador Sea. With the centre of postglacial uplift over Foxe Basin and a high differential rate of uplift on northeastern Baffin Island, they speculated that the Baffin Island-Foxe Basin block is responding independently to postglacial uplift (see also Hasegawa and Basham, 1989), and may be decoupled from the rest of the Shield to the southwest along the arc of seismicity. The correlation with geology is best at the north end where the seismicity lies along the Boothia Uplift from Somerset and Prince of Wales Islands northward, meeting the Sverdrup Basin in the region of Grinnell Peninsula on the northwest tip of Devon Island (Wetmiller and Forsyth, 1982). The Boothia Uplift, which has been geologically active from the Paleozoic to the Cretaceous (Okulitch et al., 1986), was most recently active in a Cretaceous-Tertiary rifting episode in which north-south normal faults followed structural trends established earlier (Kerr, 1977; 1980). The Boothia Uplift continues to be seismically active at present, though Hashizume's (1974) focal mechanism of a M5.0 at 21 km depth on Southampton Island represents thrust faulting in response to northeast compression rather than extension.

In the Ungava part of the zone, the largest earthquake known to Basham et al. (1982) was a 1959 earthquake assigned to the magnitude 5.8-6.2 class, and partly on this basis they chose the M_x as 6.5. The 1959 earthquake is now known to have a magnitude of m_{bLg} 4.8 (unpublished work by H. Penney, COOP student to J. Adams, 1990). Despite the persistant moderate-magnitude seismicity (the detection threshold is M3.5), the 1989 occurrence of a m_{bLg} 5.7 earthquake at Payne Bay, and nine months later a m_{bLg} 5.0 foreshock and M_S 6.3 mainshock in the centre of the Ungava Peninsula was unexpected.

The following brief summary of the Ungava events is taken from an abstract by Adams et al. (1990a):

"The M_S=6.2 (m_b=6.2 (NEIS) m_{bLg}=6.1 (GSC)) Ungava Earthquake of Dec 25 occurred at 1424:34 UT at 60.02°N 73.63°W ±20 km. It was preceded by a m_{bLg}=5.1 (GSC) foreshock 10 hours earlier (04:25:52 UT). The foreshock and mainshock were within 10 km of each other, and their relative locations will be established once the paper seismograms can be read. There were 5 earthquakes of M>3 between the foreshock and the mainshock, and at least 8 M>3 aftershocks in the two weeks after the mainshock, the largest being m_{bLg}=4.4. Temperatures (-35°C), short daylight (<3 hr/day), and remoteness have precluded an immediate field aftershock study.

"The earthquakes occurred within an east-west seismicity band that crosses the Canadian Shield well south of the boundary between the Superior and Churchill provinces. The previous largest earthquake in the band was the m_b=5.1 (NEIS), m_{bLg}=5.7 (GSC) Payne Bay Earthquake of 16 March 1989 (200 km east of the Ungava Earthquake), itself the largest in northern Quebec for over 50 yr."

It was suspected soon after the event that the Ungava earthquakes were shallow (probably less than 5 km, on the basis of depth phases), and indeed the surface rupture found in 1990 and aftershocks recorded then suggest a hypocentral depth of 3 km or less.

In the summer of 1990 surface faulting from the Ungava earthquake was found (Adams et al., 1990b; 1991a; 1991b). This was the first time in eastern North America that an historical earthquake was confirmed to have produced surface faulting. The rupture is centered at 60.12°N, 73.60°W and extends 8.5 km along an average trend of 038° (concave to the northwest). The sense of displacement on the fault is reverse faulting with the southeast side upthrown. The maximum throw is 1.8 m and tapers to less than 0.3 m at each end. In summer 1991, the rupture was studied in considerably more detail than possible during the brief 1990 visits. The main surface rupture was found to extend 2 km farther north than reported earlier (for a total of 10 km), and many previously undocumented secondary ruptures were identified, including tensional and strike-slip dislocations. The secondary features showed consistent evidence of a significant left-lateral strike-slip component to the reverse faulting.

None of the focal mechanisms (e.g. the short-period P-nodal solution #891225B and U.S.G.S. and Harvard mechanisms) yet proposed for the mainshock are fully consistant with the observed faulting. My current interpretation is that the rupture started on the south-dipping, east-west striking plane identified on #891225B and propagated to the east and north onto the NNE-trending rupture, increasing its strike-slip component as the strike of the rupture rotated anti-clockwise. Preliminary analysis by A. Bent (pers. comm., 1991) suggests that the mainshock may consist of a thrust sub-event followed by a strike-slip sub-event; her analysis is consistant with the scenario above. The foreshock has a southwest-dipping plane striking 30° clockwise from the mainshock south-dipping plane. It could represent the earlier event in the anti-clockwise rotation sequence. Alternatively, the rupture might have begun in a more complex manner and have involved conjugate north-dipping and south-dipping faulting.

The mechanisms derived for the Ungava mainshock (#891225B) and its foreshock (#891225A) are similar, both representing thrust faulting on roughly east-west striking planes in response to north-south compression. Remarkably, the mechanism for the Payne Bay earthquake (#890316) is almost identical, despite the epicentre being 200 km to the east. Thus these three large earthquakes provide the first good evidence for north-south compression in the southeastern Arctic. For earthquakes as shallow as the Ungava foreshock and mainshock, the near-surface orientation of maximum horizontal compression might well be strongly influenced by shallow crustal stresses induced by deglacial flexure (Hasegawa et al., 1985; Adams, 1989) resulting from the removal of ice load from the Foxe Basin to the north and from central Quebec to the south (Hasegawa and Basham, 1989). However, the Payne Bay earthquake was at a depth of about 11 km (H. S. Hasegawa, pers. comm., 1990), a depth at which the flexural effects should be considerably smaller, both because the hypocentre is closer to the neutral surface in the lithosphere and because the magnitude of the flexural stress ($\approx$10 MPa) is small with respect to the magnitudes of the absolute stresses and perhaps also to their deviatoric components.

Adams et al. (1992) describe in a preliminary way the geological controls on the surface faulting. They conclude that the rupture was confined to a NNE-striking granitic unit within a layered paragneiss/granite unit. Despite the presence of Cretaceous faulting in Hudson Strait (Sanford and Grant, 1990), they saw no evidence for Phanerozoic reactivation of the Archaean structure. Nevertheless such evidence might be cryptic and not easy to recognize. The hidden nature of such past deformation is suggested by the evidence cited by Gross (1968, p. 37) for Cretaceous faulting near Schefferville.

Sverdrup Seismic Zone An attempt was made to derive a mechanism (#880226) for a magnitude 4.6 earthquake in southeastern Ellesmere Island in the extreme southeastern margin of the Sverdrup Basin seismic activity (Basham et al., 1982; Adams and Basham, 1989). To the northeast of this earthquake the rest of Ellesmere Island is virtually aseismic, so this earthquake provided an opportunity to derive stress and seismotectonic data for the extreme northeastern part of the Canadian craton. Unfortunately the data were insufficient to constrain the nodal planes (or even the type of faulting). However the result does provide some information on the deviatoric stresses acting, because the regions within which the P and T axes must lie are each constrained to an octant. This "mechanism" therefore indicates compression along the northeast-southwest direction (or extension along the northwest-southeast direction). In this regard it is consistant with the orientation of oilwell breakouts and focal mechanism P-axes farther to the west (Adams, 1987; Adams and Bell, 1991).

CONCLUSIONS

The mechanisms presented here confirm that with the current ECTN network it is possible to determine the focal mechanisms of southeastern Canadian earthquakes (M>3) almost routinely. For northeastern earthquakes, $M \geq 4\frac{3}{4}$, routine mechanisms (not using Sv/P ratios) may be possible in some places where the geometry of the sparse northern seismograph network is favourable.

The mechanisms show thrust or thrust/strike-slip faulting is dominant in eastern Canada and is in response to nearly-horizontal compression. A rare strike-slip solution was found for an event in Baie des Chaleurs. For the first time evidence of north-south compression has been found for the Labrador margin – Ungava region. The strike of the nodal planes provides valuable insights into the seismotectonics of eastern Canada.

The methods used in this paper are now being applied to current events during routine processing, and I foresee a considerable improvement in our understanding of the seismotectonics of eastern Canada as mechanisms are accumulated over the next few years, particularly when the digital stations of the new Canadian seismograph network begin to operate.

ACKNOWLEDGEMENTS

I thank John Ebel of Weston Observatory and Frank Revetta of Potsdam College for supplying data from their networks. The implementation of FOCMEC on Geophysics Division computers, and the development of many of the procedures, were the work of Swedish Research Fellow Rutger Wahlstrom during his sabbatical in Ottawa in 1985. Steve Halchuk constructed the link between SAM and FOCMEC. Wayne McNeil provided second opinions on some of the waveforms and mechanisms. Seismotectonic ideas used in this paper were developed in conjunction with Peter Basham during the writing of our joint review (Adams and Basham, 1989). I thank H.S. Hasegawa and R.J. Wetmiller for their 1990 review comments.

REFERENCES

Adams, J., 1987, Canadian crustal stress database — a compilation to 1987: Geological Survey of Canada Open File 1622, 130 pp.

Adams, J., 1989, Crustal stresses in eastern Canada: *in* Gregersen, S., and Basham, P.W., (eds) Earthquakes at North Atlantic Passive Margins: Neotectonics and Postglacial Rebound. Kluwer Academic Publishers, Dordrecht, p. 289-297.

Adams, J., and Basham, P. W., 1989, The seismicity and seismotectonics of Canada east of the Cordillera: Geoscience Canada, v. 16, p. 3-16.

Adams, J., and Bell, J. S., 1991, Crustal stresses in Canada: Chapter 20 *in* Slemmons and others (eds) Neotectonics of North America, Decade of North American Geology Vol CSMV-1, Geological Socoiety of America, (in press).

Adams, J., and Simmons, D.G., 1991, Relocation of earthquakes in the Labrador Sea and southern Labrador: Geological Survey of Canada Open File 2326, 103 pp.

Adams, J., Sharp, J., and Stagg, M. C., 1988, New focal mechanisms for southeastern Canadian earthquakes: Geological Survey of Canada Open File 1892, 109 pp.

Adams, J., Vonk, A., Pittman, D., and Vatcher, H., 1989, New focal mechanisms for southeastern Canadian earthquakes – Volume II: Geological Survey of Canada Open File 1995, 97 pp.

Adams, J., North , R. G., Wetmiller, R. J., Hasegawa, H. S. , and Drysdale, J., 1990a, The December 25 1989, M_S=6.2 Ungava (Quebec) earthquake: yet another M6 event in the Canadian craton: Seismological Research Letters, v. 61, p. 40-41.

Adams, J., Wetmiller, R. J., Hasegawa, H. S., and Drysdale, J., 1991a, The first surface faulting from a historical intraplate earthquake in North America: Nature, v. 352, p. 617-619.

Adams, J., Wetmiller, R. J., Hasegawa, H. S., Lamontagne, M., and Drysdale, J., 1990b, Surface faulting, lakeshore deformation, and seismicity caused by the 1989 Ungava, Quebec, Earthquake: EOS, v. 71, p. 1470.

Adams, J., Wetmiller, R. J., Drysdale, J., and Hasegawa, H. S., 1991b, The first surface rupture from an earthquake in eastern North America: *in Current Research, Part C,* Geological Survey of Canada Paper 91-1C, p. 9-15.

Adams, J., Percival, J. A., Wetmiller, R. J., Drysdale, J. A., and Robertson, P. B., 1992, Geological controls on the 1989 Ungava surface rupture: a preliminary interpretation: *in Current Research,* Geological Survey of Canada Paper 92-1, in press.

Anglin, F.M., 1984, Seismicity and faulting in the Charlevoix zone of the St. Lawrence Valley: Bulletin of the Seismological Society of America, v. 74, p. 595-603.

Anglin F.M. and Buchbinder. G., 1981, Microseismicity in the mid-St. Lawrence Valley Charlevoix zone: Seismological Society of America Bulletin, v. 71, p. 1553-1560.

Basham, P. W., and Adams, J., 1983, Earthquakes on the continental margion of eastern Canada: need future large events be confined to the locations of large historical events? United States Geological Survey Open File Report 83-843, p. 456-467.

Basham, P.W., Forsyth, D.A., and Wetmiller, R.J., 1977, The seismicity of northern Canada: Canadian Journal of Earth Sciences. v. 14, p. 1646-1667.

Basham, P.W., Weichert, D.H., Anglin, F.M., and Berry, M.J., 1982, New probabilistic strong seismic ground motion maps of Canada: a compilation of earthquake source zones, methods and results: Earth Physics Branch Open File 82-33, 202 p.

Basham, P. W., Adams, J., and Anglin, F., 1983, Earthquake source models for estimating seismic risk on the eastern Canadian continental margin: Proceedings, Fourth Canadian conference on earthquake engineering, June 15-17, Vancouver, p. 495-508.

Bell, J. S., 1989, Labrador Sea: East Coast Basin Atlas Series, Geological Survey of Canada, Dartmouth, Nova Scotia, 112 pp.

Chen, W.-P., 1989, A brief update on the focal depths of intracontinental earthquakes and their correlations with heat flow and tectonic age: Seismological Research Letters, v. 59, p. 263-272.

Chen, W.-P. and Molnar, P., 1983, Focal depths of intracontinental and intraplate earthquakes and their implications for the thermal and mechanical properties of the lithosphere: Journal of Geophysical Research, v. 88, p. 4183-4214.

Ebel, J.E., 1989, The effect of crustal scattering on observed high-frequency earthquake seismograms: Geophysical Journal International, v. 98, p. 329-341.

Forsyth, D.A., 1981, Characteristics of the western Quebec seismic zone: Canadian Journal of Earth Science, v. 18, p. 103-119.

Gross, G. A., 1968, Geology of iron deposits in Canada, volume III, Iron ranges of the Labrador Geosyncline: Geological Survey of Canada Economic Geology Report No. 22, 154 pp.

Haddon, R. A. W., 1992, Waveform modeling of strong ground morion data for the Saguenay earthquake of 25th November, 1988: Bulletin of the Seismological Society of America, in press.

Hasegawa, H.S., and Adams, J., 1990, Reanalysis of the 1963 Baffin Island earthquake (M_S 6.2) and its seismotectonic environment: Seismological Research Letters, v. 61, p. 181-192.

Hasegawa, H.S., and Basham, P.W., 1989, Spatial correlation between seismicity and post-glacial rebound in eastern Canada: *in* Gregersen, S., and Basham, P.W., (eds) Earthquakes at North Atlantic Passive Margins: Neotectonics and Postglacial Rebound. Kluwer Academic Publishers, Dordrecht, p. 483-500.

Hasegawa, H.S., and Wetmiller, R.J., 1980, The Charlevoix earthquake of 19 August 1979 and its seismo-tectonic envronment: Earthquake Notes, v. 51, p. 23-37.

Hasegawa, H.S., Adams, J., and Yamazaki, K., 1985, Upper crustal stresses and vertical stress migration in eastern Canada: Journal of Geophysical Research, v. 90, p. 3637-3648.

Hashizume, M., 1974, Surface wave study of earthquakes near northwestern Hudson Bay, Canada: Journal of Geophysical Research, v. 79, p. 5458-5468.

Hashizume, M., 1977, Surface-wave study of the Labrador Sea earthquake, 1971 December: Geophysical Journal of the Royal Astronomical Society, v. 51, p. 149-168.

Johnston, A. C., 1989, The seismicity of 'Stable Continental Interiors': *in* Gregersen, S., and Basham, P.W., (eds) Earthquakes at North Atlantic Passive Margins: Neotectonics and Postglacial Rebound. Kluwer Academic Publishers, Dordrecht, p. 299-327.

Kerr, J.W., 1977, Cornwallis Fold Belt and the mechanism of basement uplift: Canadian Journal of Earth Sciences, v. 14, p. 1374-1401.

Kerr, J.W., 1980, Structural framework of Lancaster Aulacogen, Arctic Canada: Geological Survey of Canada, Bulletin 319, 24 pp.

Kumarapeli, P.S., 1985, Vestiges of Iapetan rifting in the west of the northern Appalachians: Geoscience Canada, v. 12, p. 55-59.

Lamontagne, M., 1987, Composite P-nodal solution analysis of earthquakes from the Charlevoix seismic zone: Canadian Journal of Earth Sciences, v. 24, p. 2118-2129.

Lamontagne, M, Wetmiller, R. J., and Du Berger, R., 1990, Some results from the 25 November, 1988 Saguenay, Québec, earthquake: *in Current Research, Part B,* Geological Survey of Canada Paper 90-1B, p. 115-121.

Leblanc, G., and Buchbinder, G., 1977, Second microearthquake survey of the St. Lawrence Valley near La Malbaie, Quebec: Canadian Journal of Earth Sciences, v. 14, p. 2778-2789.

North, R.G., Wetmiller, R. J., Adams, J., Anglin, F. M., Hasegawa, H. S., Lamontagne, M., Du Berger, R., Seeber, L., and Armbruster, J., 1989, Preliminary results from the November 25, 1988 Saguenay (Quebec) earthquake: Seismological Research Letters, v. 60, p. 89-93.

Okulitch, A.V., Packard, J.J., and Zolani, A.I., 1986, Evolution of the Boothia uplift, Arctic Canada: Canadian Journal of Earth Sciences, v. 23, p. 350-358.

Sanford, B. V., and Grant, A. C., 1990, New findings relating to the stratigraphy and structure of the Hudson Platform: *in Current Research, Part D,* Geological Survey of Canada Paper 90-1D, p. 17-30.

Snoke, J.A., Munsey, J. W., Teague, A.G., and Bollinger, G. A., 1984 A program for focal mechanism determination by combined use of polarity and SV-P amplitude ratio data: Earthquake Notes, v. 55, no. 3, p. 15.

Srivastava, S.P., and Tapscott, C.R., 1986, Plate kinematics of the North Atlantic: *in* Vogt, P.R., and Tucholke, B.E. eds., The Geology of North America, v. M, The Western North Atlantic Region, Geological Society of America, Boulder, Colorado, p. 379-404.

Staveley, M. and Adams, J., 1985, Historical seismicity of Newfoundland: Earth Physics Branch Open File 85-22, 73 pp.

Stevens, A., 1980, Reexamination of some larger La Malbaie, Quebec, earthquakes (1924-1978): Bulletin of the Seismological Society of America, v. 70, p. 529-557.

Wahlstrom, R., 1987, Focal mechanisms of earthquakes in southern Quebec, southeastern Ontario, and northeastern New York with implications for regional seismotectonics and stress field characteristics: Bulletin of the Seismological Society of America, v. 77, p. 891-924.

Wetmiller, R. J., and Adams, J, 1990, An earthquake doublet in the Charlevoix seismic zone, Quebec: *in Current Research, Part B,* Geological Survey of Canada Paper 90-1B, p. 105-113.

Wetmiller, R.J., and Forsyth, D.A., 1982, Review of seismicity and other geophysical data near Nares Strait: *in* Dawes P.R., and Kerr, J.W., eds., Nares Strait and the drift of Greenland: a conflict in plate tectonics, Meddelelser om Gronland, Geoscience. v. 8. p. 261-274.

Wetmiller, R. J., McNeil, W., Adams, J., Drysdale, J. A., and Lamontagne, M., 1991, P-nodal solutions for earthquakes in eastern Canada July1, 1989 – June 30, 1991: Internal Report, Geophysics Division (in preparation).

FIGURE CAPTIONS

Figure 1. New focal mechanisms for southeastern Canada derived in this report (see Appendix for details). Shown are equal-area lower-hemisphere projections of the focal mechanism with compressional quadrants shaded. Black and white dots represent the P and T axes respectively. Pairs of inward-pointing arrows on the map represent the direction of maximum horizontal compression taken from the earthquake P-axes. Dotted lines enclose the seismic zones of Basham et al. (1982), as discussed in the text.

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

Figure 3. Focal mechanisms for southeastern Canada derived in the first phase of this project (from Adams et al. 1988).

Figure 4. Focal mechanisms for southeastern Canada derived in the second phase of this project (from Adams et al. 1989).

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	T	B (TREND / PLUNGE)	SCORE POL.	RAT.	QUAL.	STRESS DB NO.
86 04 20	57.22	59.61	18	4.8	LAB	186	56	019	139	040	244	2/28.5	0/0	A	1203
						085	74	145	12	36	52				
87 04 05	51.78	82.75	18	3.6	EBG				145	235		0/8.5	0/0	D	1182
87 12 06	47.82	69.96	20	3.0	CHV	130	65	079	229	019	135	0/9.5	3/8	A	1208
						335	27	113	20	68	10				
87 12 14	56.72	56.33	18	4.6	LAB	222	53	056	336	071	244	0.5/21.5	0/0	A	1380
						091	49	127	03	63	27				
88 01 02	47.41	70.44	12	3.6	CHV	133	44	060	063	321	155	1/11	1/2	B	1216
						351	53	115	05	69	20				
88 01 28	48.00	65.67	18	3.9	NAP	120	81	003	075	345	190	2.5/23	0/0	A	1209
						030	87	171	04	09	80				
88 02 26	77.32	84.69	18	4.6	SVD				045	135		0/6.5	0/0	D	1371
88 03 13	47.44	70.38	7	3.1	CHV	183	25	035	134	356	235	1.5/14	2/7	A	1221
						060	76	111	28	54	20				
88 05 12	47.03	70.82	14	3.1	EBG	297	51	077	036	152	305	1/16.5	2/6	A	1220
						137	41	105	05	79	10				
88 05 15	45.17	75.62	18	3.3	WQU	291	46	077	210	120	300	2/16.5	2/4	A	1217
						129	46	103	00	81	09				
88 08 09	45.01	75.00	9	3.4	WQU	310	40	044	251	137	348	0.5/14	1/3	A	1218
						183	64	120	13	59	27				
88 08 11	45.01	74.99	9	2.1	WQU	314	38	047	254	138	350	0/7	1/3	A	1219
						184	63	118	14	61	25				
88 11 23	48.13	71.20	29	4.7	SAG	343	48	082	078	195	348	4.5/34.5	0/0	B	1372
						175	42	099	03	83	06				
88 11 25	48.13	71.21	29	6.5	SAG	326	67	055	081	192	342	2/67.5	0/0	A	1373
						207	42	143	14	54	32				
88 11 26	48.14	71.30	26	4.1	SAG	339	46	103	240	330	150	2/27.5	0/0	A	1374
						141	46	077	00	81	09				
89 03 09	47.72	69.86	10	4.3	CHV	168	31	071	092	308	185	4.5/27	4/7	A	1375
						011	60	102	15	72	10				
89 03 11	47.72	69.87	10	4.4	CHV	184	38	080	101	322	192	3/31.5	5/7	A	1376
						017	52	098	07	81	06				
89 03 16	60.05	70.10	11	5.7	UNG	260	42	058	192	085	285	3.5/44	0/0	A	1377
						120	55	116	07	68	21				
89 12 25A	60.06	73.75	5	5.0	UNG	251	54	046	190	100	280	5/33.5	0/0	B	1378
						129	54	134	00	56	34				
89 12 25B	60.05	73.70	5	6.1	UNG	235	53	062	344	085	252	2.5/129	0/0	A	1379
						096	45	122	05	67	22				

NOTES:

MN: earthquake magnitude on the Nuttli scale
ZONE: LAB = Labrador, EBG = Eastern Background, CHV = Charlevoix, NAP = Northern Appalachians, SVD = Sverdrup, WQU = Western Quebec, SAG = Saguenay, UNG = Ungava
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)

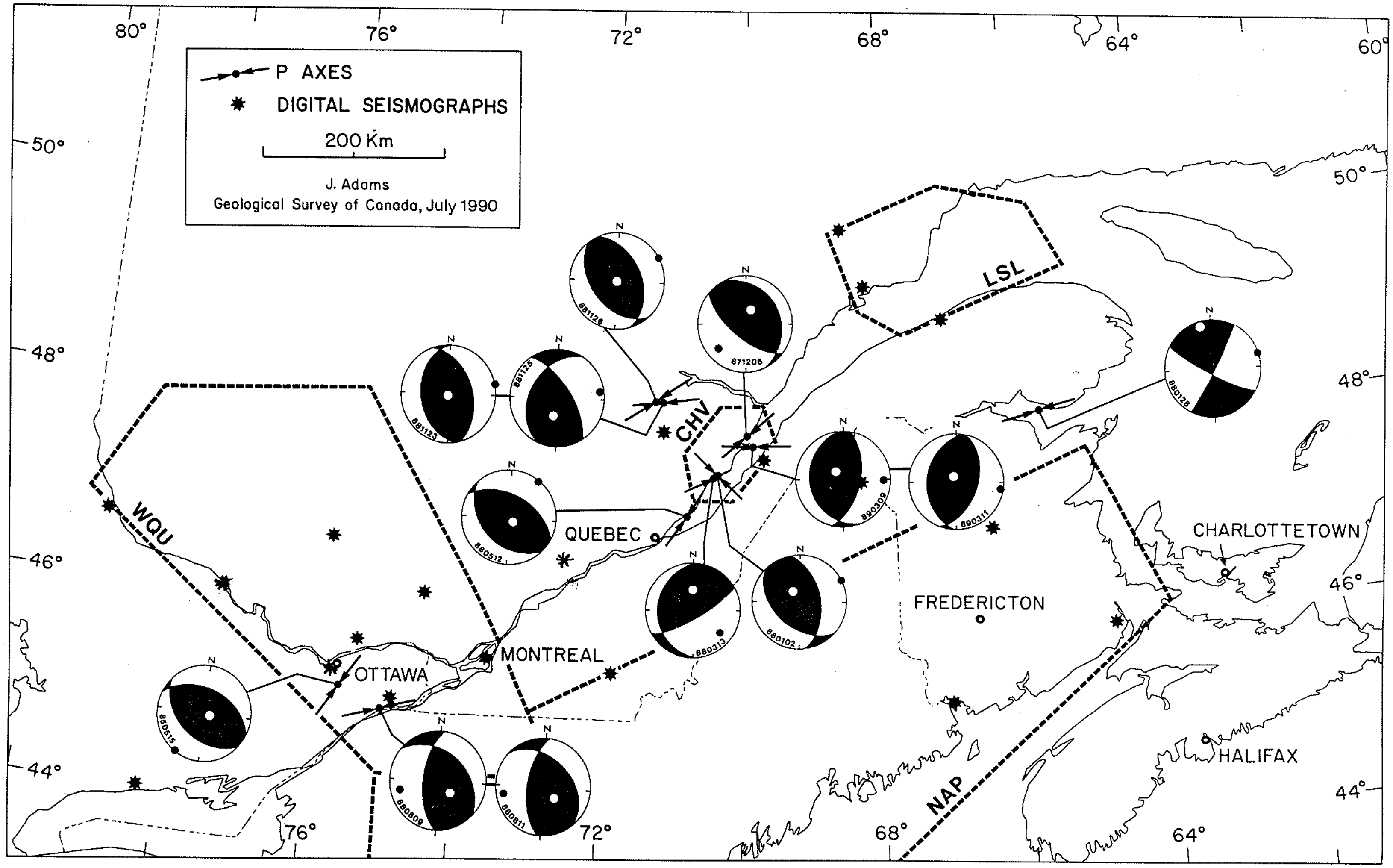


Figure 1. New focal mechanisms for southeastern Canada derived in this report (see Appendix for details). Shown are equal-area lower-hemisphere projections of the focal mechanism with compressional quadrants shaded. Black and white dots represent the P and T axes respectively. Pairs of inward-pointing arrows on the map represent the direction of maximum horizontal compression taken from the earthquake P-axes. Dotted lines enclose the seismic zones of Basham et al. (1982), as discussed in the text.

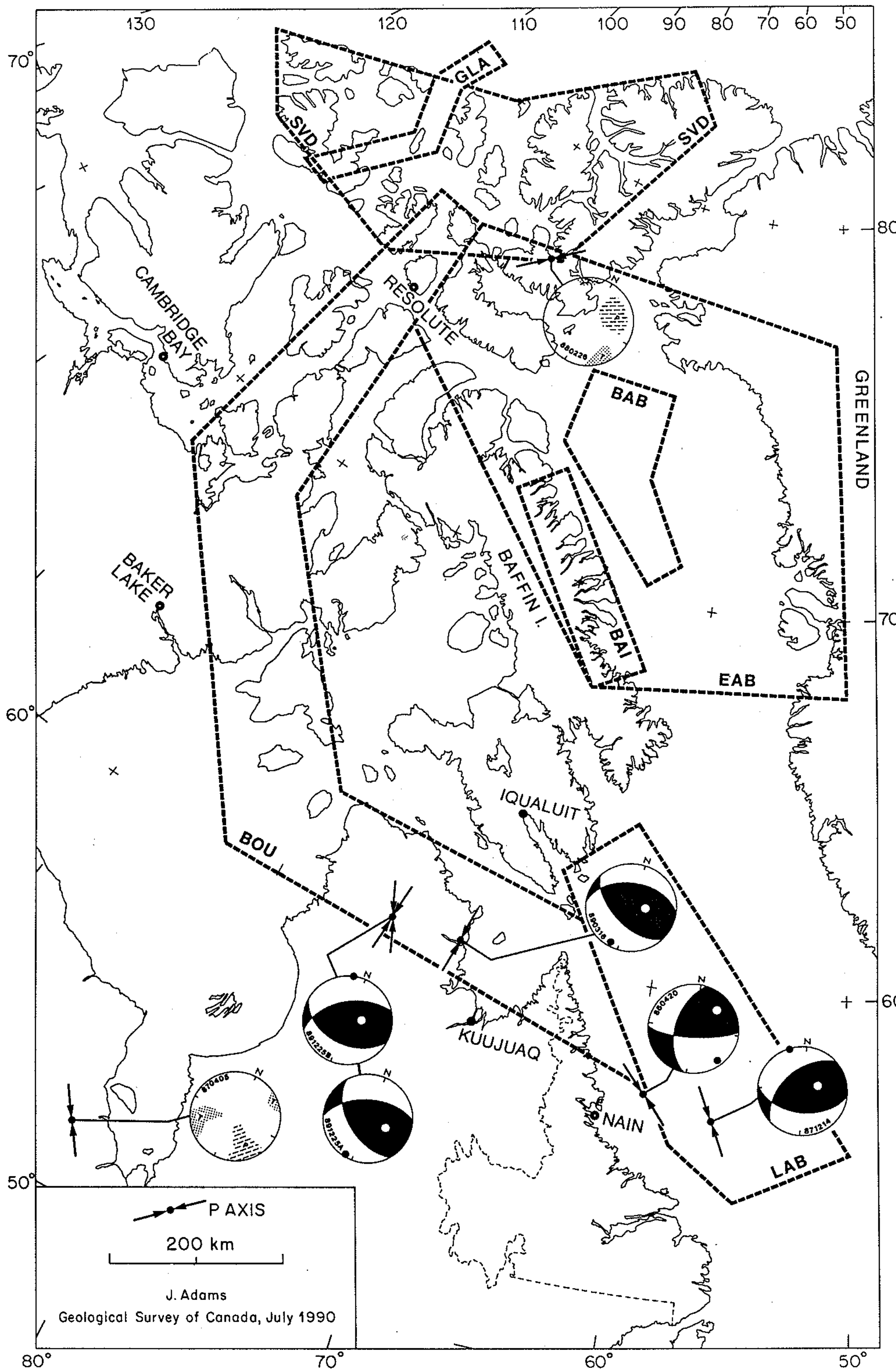


Figure 2 New focal mechanisms for northeastern Canada derived in this report (see Appendix for details). Shown are equal-area lower-hemisphere projections of the focal mechanism with compressional quadrants shaded. Black and white dots represent the P and T axes respectively. Pairs of inward-pointing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

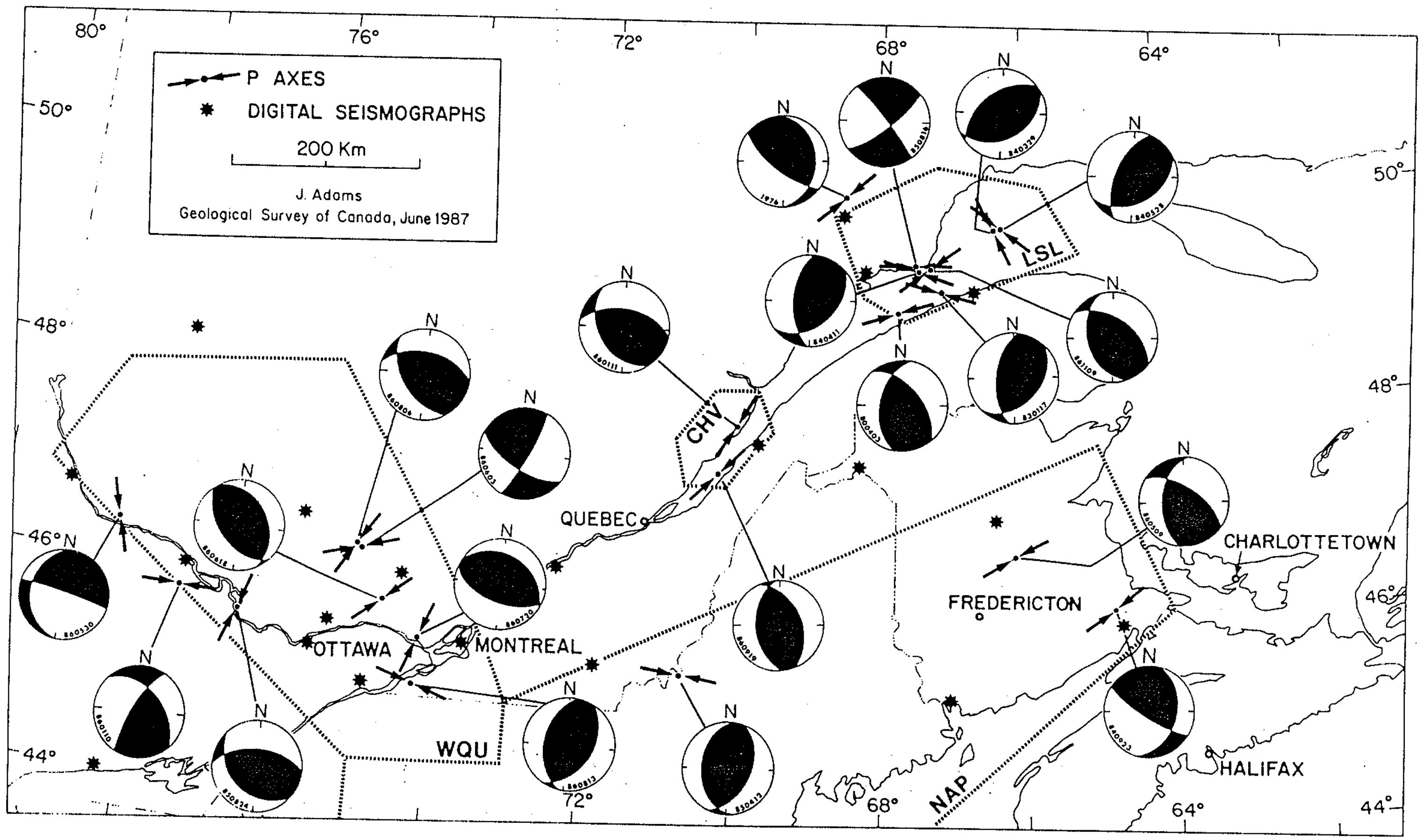


Figure 3. Focal mechanisms for southeastern Canada derived in the first phase of this project (from Adams et al. 1988).

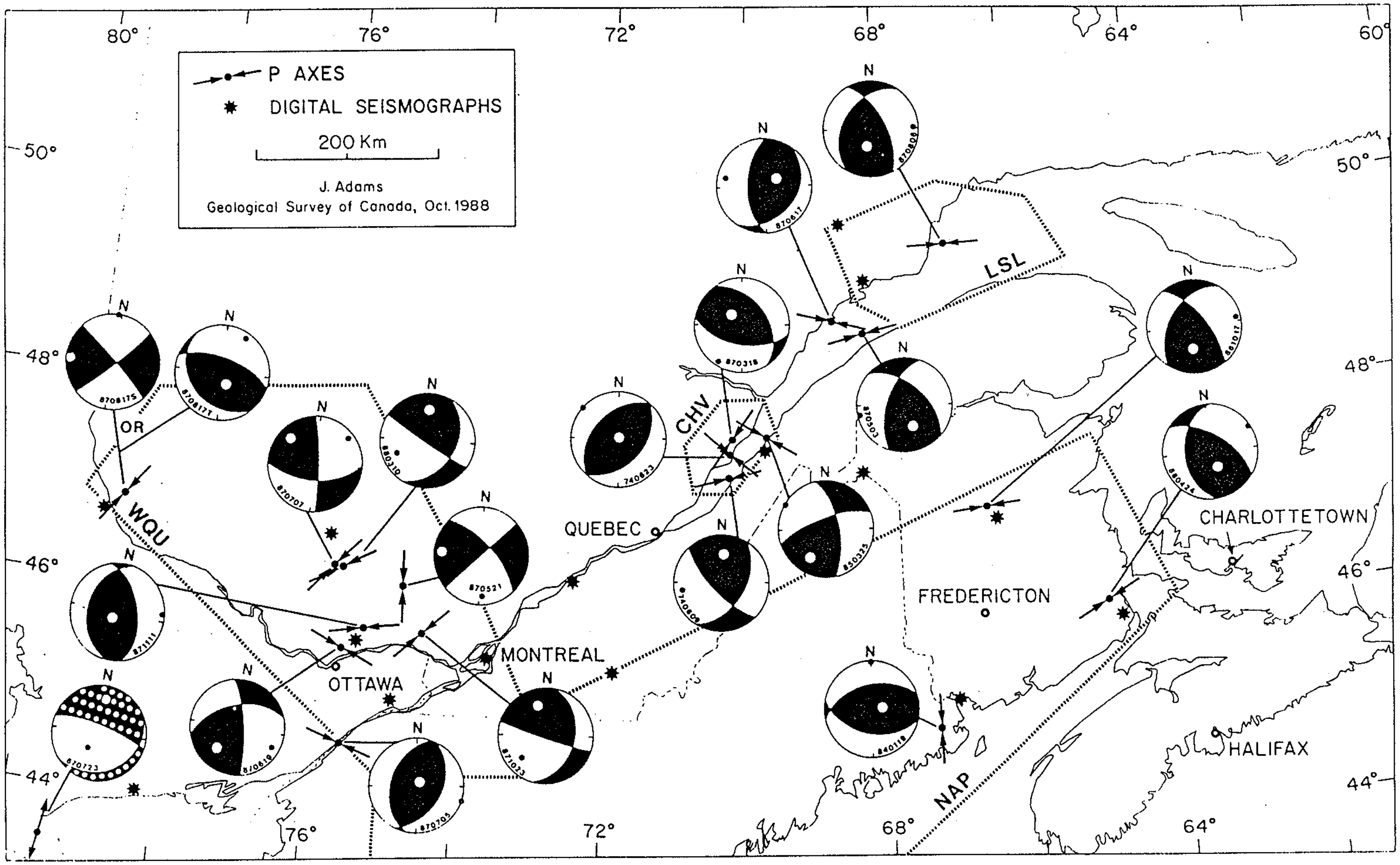


Figure 4. Focal mechanisms for southeastern Canada derived in the second phase of this project (from Adams et al. 1989).

APPENDIX

Event files in this appendix are arranged chronologically. I have tried to provide a full documentation of our data and results, so for each file there is a summary page giving a commentary on the mechanism, a copy of the "PIK" listing of the earthquake phase data used to compute the hypocentre (a description of the format is given by Adams et al., 1988), 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 is a median (non-extreme) solution, or provides a best qualitative fit to the Pn phase amplitudes, or minimises the RMS of the ratio errors.

Seismic Zone: LABRADOR SHELF

Magnitude : 4.7 Mb, 4.8 MN

Location : 57.22N 59.61W
Nain Bank, Labrador Shelf

Date(Y/M/D) : 860420

Time(UT) : 0959

Depth:
closest station: SCH (522 km)
free depth = not known
pegged at 18 km (10 km might be better)
not critical to the mechanism

Quality of Readings:
Variable
ECTN and southeastern stations show two clear reversals with azimuth
FRB is nodal
good arrivals on photographic stations

Comments:
Mechanism has been run at 2 degree increments. "Best Solution" misfits only 4 half weight polarities (CBK, GRQ, EEO, SXO) and fits nodal FRB arrival.
N-S plane is clearly constrained within ECTN and between Pn and deeper-diving rays to NW Canadian stations
E-W plane is well constrained between ECTN and NW Ontario Stns
Mechanism is strike-slip/thrust in response to NW-SE compression

Best Solution:

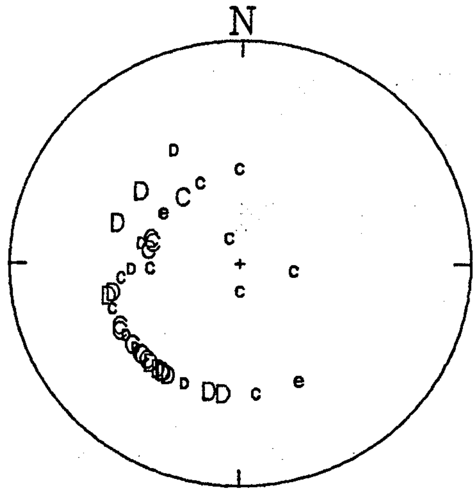
Strike, Dip, Rake	186	56	019
Strike, Dip, Rake	085	74	145
Trend & Plunge of P	139	12	
Trend & Plunge of T	040	36	
Trend & Plunge of B	244	52	

```
+57.225- 59.612F1MN=4.8 0959563 20041986 00.0340.122 0.2 37 44 151.85 218.00   0 1ML=5.2  50F 0 0.00
057.426- 60.255F1MB=4.7 0959542 20041986 1 7KM  7KM  0.0 13  0 131.20 510.00   0 0ML=0.0  00F 0 0.00
FELT BY SEVERAL PEOPLE WHO WERE        A NAIN AU LABRADOR PLUSIEURS PERSONNES
AWAKENED IN NAIN LABRADOR. WINDOWS     FURENT REVEILLEES. FENETRES ET
AND DISHES RATTLED.                    VAISSELLE ONT VIBRE
NOT FELT 90 KM S OF NAIN               NON RESSENTI 90 KM AU SUD DE NAIN
NOT FELT IN HOPEDALE - TRUDY FLOWERS   NON RESSENTI A HOPEDALE - TRUDY FLOWERS
AND HULDA PIJOGGE, LABRADOR            ET HULDA PIJOGGE, LABRADOR
$CONTACT VICKEY WILLIAMS, TOWN COUNCIL NAIN 709-922-2842
$ KLN GGN HTQ LPQ DOWN
540 KM NE FROM SCHEFFERVILLE, QUE.     540 KM NE DE SCHEFFERVILLE, QUE.
ASPA 8604201005P  X19322 +
SPA  8604201005P  X1938  +
SCH  8604201001P  A01080 C   0.00                          050 1021000    0  8
SCH   SW 0522KM 19  226 242 49                               0012320 52ML47MN
FRB  8604201001P  A0148  -   0.00          0311            050 101 100    0  8
FRB   NW 0877KM 19 -098 330 49            05 -173            0001244 49ML41MN
SIC  8604201005P  A01543 D
SIC   SW 0915KM 19  059 214 49                               0000000 00ML00MN
CBK  8604201001P  A0155  +   0.00          03245           040 132 300    0  1
CBK   S  0932KM 19 -073 173 49            05 -001            0003570 54ML46MN
MNQ  8604201001P  B015910E   0.00         B033340 X043125 040 100 331    0  0
MNQ   SW 0957KM 05  021 223 49            05  338 00  665    0005199 56ML48MN
HTQ  8604201002P  B021188D   0.00         B035702 X045834 070 100 750    0  0
HTQ   SW 1069KM 05 -052 217 49            05  342 00  259    0006732 60ML50MN
JAQ  8604201002P  B021450D   0.00         B035735 X050170 057 100 678    0  0
JAQ   W  1085KM 05  009 256 49            05  026 00  141    0007474 60ML50MN
STJ  8604201002P   0226  E   0.00          0418            050  24  10    0  8
STJ   SE 1172KM 05  105 154 49            05  251            0000524 49ML39MN
EBN  8604201002P  B023305D  -0.21        XB043237 X054650 083 100 580    0  0
EBN   SW 1234KM 05  021 212 49            00  328 00  412    0004391 60ML49MN
SLQ  8604201005P  B02336 D
SLQ   SW 1240KM 05  032 215 49                               0000000 00ML00MN
GBN  8604201002P  A02432 D   0.00         X04495           050 113 150    0  8
GBN   S  1323KM 19 -016 187 49            00  188            0001668 55ML45MN
UNB  8604201005P  B02467 -
UNB   SW 1345KM 05  059 204 49                               0000000 00ML00MN
HAL  8604201002P  A02555 D   0.00         X0512            090  59 100    0  8
HAL   S  1429KM 19 -080 193 49            00  181            0001183 56ML44MN
GNT  8604201003P  B030261D   0.00        XB052888 X070268 080 100 805    0  0
GNT   SW 1491KM 05 -134 221 49            00  533 00  850    0006322 63ML52MN
SBQ  8604201003P  B031263    0.00        XB054039 X072062 070 100 307    0  0
SBQ   SW 1569KM 05 -084 218 49            00  024 00  464    0002756 60ML48MN
TRQ  8604201003P  B031439C   0.00        XB054812 X072909 060 100 246    0  0
TRQ   SW 1596KM 05 -240 226 49            00  219 00  564    0002576 60ML48MN
GRQ  8604201003P  B031756C   0.00        XC055349 X073145 047 100 157    0  0
GRQ   SW 1620KM 05 -211 230 49            00  253 00  125    0002099 59ML48MN
MNT  8604201003P  C031791    0.00        XC055294 X073770 077 100 338    0  0
MNT   SW 1624KM 01 -218 222 49            00  125 00  649    0002758 61ML49MN
GAC  8604201003P  B032521C   0.00        XC060492 X075056 000   0   0    0  0
GAC   SW 1684KM 05 -224 227 49            00  038 00  243    0000000 00ML00MN
IGL  8604201003P  B03302     0.00          0610            040 235  75    0  0
IGL   NW 1735KM 05 -350 330 49            05 -543            0000501 52ML42MN
WBO  8604201003P  C033334    0.00        XB062005 X080854 093 100 300    0  0
WBO   SW 1740KM 01 -095 225 49            00  358 00  471    0002027 60ML48MN
KAO  8604201005P  B03303 +
KAO   W  1742KM 05 -423 250 49                               0000000 00ML00MN
EEO  8604201003P  B033409+   0.00        XB062046 X081604 053 100 172    0  0
EEO   SW 1773KM 05 -426 237 49            00 -308 00  296    0002039 60ML48MN
SUD  8604201005P  B0348  +


SUO   SW 1892KM 05 -386 240 50                               0000000 00ML00MN
WEO  8604201004P  C040109    0.00        X071023 X091190 053 100 137    0  0
WEO   SW 1969KM 01  067 230 47            00  510 00  402    0001624 60ML48MN
GTO  8604201005P  A03582 D
GTO   W  1982KM 19 -368 257 47                               0000000 00ML00MN
FCC  8604201004P   04041 D   0.00        X0712   X0925   130  45 125    0  0
FCC   W  2026KM 05 -256 289 47            00 -532 00  104    0001343 59ML47MN
BLC  8604201004P   04127 D   0.00        X0727   XC0944  080 130 130    0  0
BLC   NW 2103KM 05 -221 307 45            00 -655 00 -133    0000785 58ML45MN
SXO  8604201005P  B04321 +
SXO   W  2260KM 05  104 263 43                               0000000 00ML00MN
ULM  8604201005P  B04525 -
ULM   W  2484KM 05  005 267 39                               0000000 00ML00MN
FFC  8604201005P  B05063 -
FFC   W  2620KM 05  171 282 36                               0000000 00ML00MN
ALE  8604201005P   05230 +   0.00                          000   0   0    0  0
ALE   N  2826KM 05  087 359 35                               0000000 00ML00MN
B10  8604201005P  A05410 E   0.00                          000   0   0    0  0
B10   NW 3040KM 19  135 304 33                               0000000 00ML00MN
BMS  8604201005P  A0546
BMS   W  3087KM 19  253 273 33                               0000000 00ML00MN
MBC  8604201005P  B05490 +   0.00                          000   0   0    0  0
MBC   NW 3149KM 05  062 334 33                               0000000 00ML00MN
EDM  8604201005P  X0607  C
EDM   W  3362KM 00  141 286 33                               0000000 00ML00MN
SES  8604201005P  B06100 C
SES   W  3389KM 05  226 279 33                               0000000 00ML00MN
INK  8604201005P  A06340 C
INK   NW 3712KM 19  087 320 32                               0000000 00ML00MN
BDW  8604201005P  X0642  +
BDW   W  3821KM 00  002 267 32                               0000000 00ML00MN
PNT  8604201005P  X06557 C
PNT   W  3966KM 00  273 284 32                               0000000 00ML00MN
BNG  8604201005P  X12113 +
BNG   E  8882KM 00  766 098 19                               0000000 00ML00MN
             Z
```

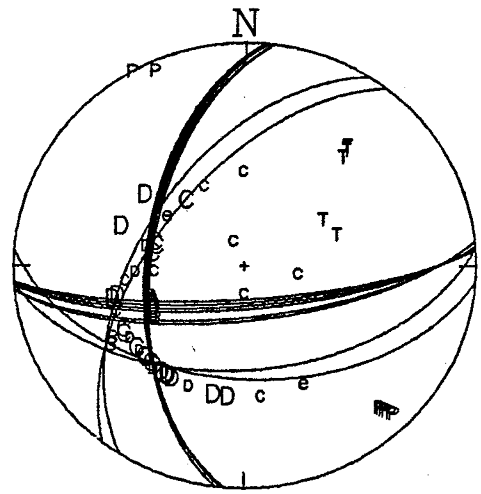
19860420 09:59 MN=4.8 57.225N 59.612W 18.00 KM

SCH	242.000	49.000	C	Strong
FRB	330.000	49.000	-	Very nodal
SIC	214.000	49.000	D	Not strong
CBK	173.000	49.000	+	Very weak
MNQ	223.000	49.000	C	Nodal
HTQ	217.000	49.000	D	
JAQ	256.000	49.000	D	Strong
STJ	154.000	49.000	e	
EBN	212.000	49.000	D	
SLQ	215.000	49.000	D	
GBN	187.000	49.000	D	
UNB	204.000	49.000	-	Not strong
HAL	193.000	49.000	D	
GNT	221.000	49.000	D	
TRQ	226.000	49.000	C	
GRQ	230.000	49.000	-	
GAC	227.000	49.000	C	
KAO	250.000	49.000	+	Very weak
CKO	232.000	49.000	C	
EEO	237.000	49.000	-	Weak
SUO	240.000	50.000	C	Clear
GTO	257.000	47.000	D	
FCC	289.000	47.000	D	
BLC	307.000	45.000	D	
SXO	263.000	43.000	+	Very weak
ULM	267.000	39.000	-	?
FFC	282.000	36.000	-	Weak, emergent
ALE	359.000	35.000	+	Weak
B10	304.000	33.000	e	
MBC	334.000	33.000	+	
EDM	286.000	33.000	C	Good
SES	279.000	33.000	C	
INK	320.000	32.000	C	
BDW	267.000	32.000	+	From EDR
PNT	284.000	32.000	C	Good
BNG	098.000	19.000	+	From EDR
ASPA	337.000	10.000	+	From EDR
SPA	180.000	10.000	+	From EDR

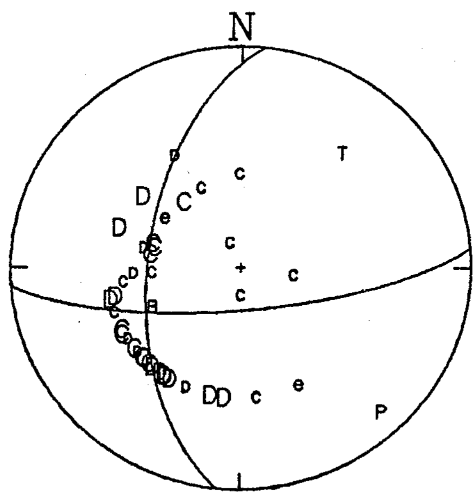
LAB860420.OUT
6-JAN-88 14:58:44



data



P2.5



BEST SOLUTION

Seismic Zone: James Bay

Magnitude : 3.6 MN

Location : 51.78N 82.75W

Date(Y/M/D) : 870405

Time(UT) : 07:27

Depth:

closest station: KAO (260 km)
depth pegged at 18 km

Quality of Readings:

Western ECTN give consistent D's
MNQ is weak and near nodal
FCC is weak

Comments:

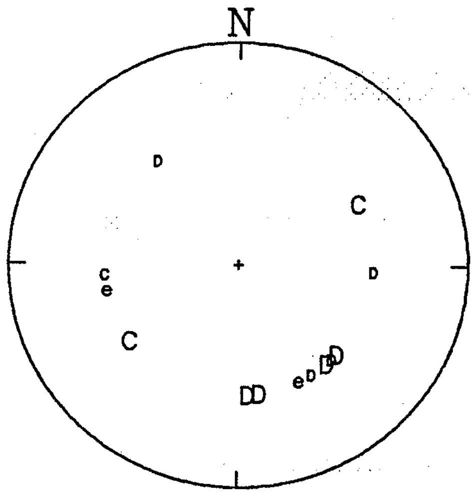
Poor data distribution
Mechanisn undefined - could be thrust, normal, or strike slip
Azimuth of P and T axis relatively well defined -
earthquake represents SE compression or SW deviatoric extension

```
+51.781- 82.754F1MN=3.6 0727061 05041987 00.0210.030 0.2 13 24 200.93 218.00    0 1ML=3.6  40
$ DIFFICULT TO READ SOME SN
JAMES BAY REGION                           REGION DE LA BAIE JAMES
BETWEEN ALBANY AND STOOPING                ENTRE LES RIVIERES ALBANY ET
RIVERS, ONT.                               STOOPING, ONT.
KAO8704050727P A27445 D   0.00                             B2817    010 458 500      0  0
KAO    S  0260KM24  092  176 49                            06 -221      0006859 33ML39MN
GTO8704050727P A27575 C   0.00 C2804      B2836            B2848    010 452 450      0  0
GTO    SW 0374KM24  010  234 49 01 -243   06  050          06 -288      0006255 38ML42MN
JAQ8704050727P A281560C  -0.07                             X292904  020 100  26      0  0
JAQ    NE 0525KM24 -036  062 49                            00 -435      0000817 37ML35MN
TBO8704050727P B2824      0.00 B28405     B2922            X2947    010 437 100      0  0
TBO    SW 0589KM06  029  236 49 06 -068   06  060          00 -424      0001438 37ML39MN
SZO8704050727P B282626D   0.00            X292670          B295507  030 900 225      0  0
SZO    S  0602KM06  105  171 49           00  268          06  035      0000524 39ML34MN
SUO8704050727P            0.00            X292913          B295631  030 900 188      0  0
SUO    S  0612KM         167 49           00  294          06 -128      0000437 39ML34MN
EEO8704050727P B282958E  -0.06            B293119          B295933  030 100  14      0  0
EEO    SE 0632KM06  064  153 49           06  071          06 -385      0000293 37ML32MN
HUO8704050727P B28355 E   0.00            B29405                    000   0   0      0  0
HUO    W  0684KM06  019  258 49           06 -113                       0000000 00ML00MN
CKO8704050727P X284480-  -0.06            B295462          B303644  047 100  26      0  0
CKO    SE 0752KM00  121  147 49           06 -141          06 -043      0000348 41ML34MN
GRQ8704050727P X284654-  -0.09            X295959          X303537  050 100  29      0  0
GRQ    SE 0764KM00  146  136 49           00  098          00 -484      0000364 42ML34MN
TRQ8704050727P B285723D  -0.09            X302089          X310271  033 100  19      0  0
TRQ    SE 0861KM06  024  133 49           00  150          00 -472      0000362 42ML35MN
GAC8704050727P B285797D  -0.06            X302015          X310394  047 100  61      0  3
GAC    SE 0862KM06  100  139 49           00  077          00 -367      0000815 47ML39MN
OTT8704050727P           -0.06                             X310806  040 100  29      0  0
OTT    SE 0880KM         141 49                            00 -451      0000456 44ML36MN
WBO8704050727P           -0.06                             X312418  067 100  18      0  0
WBO    SE 0935KM         141 49                            00 -399      0000169 42ML33MN
ULM8704050727P X2902  +   0.00            B3033                     000   0   0      0  0
ULM    W  0936KM00 -396  265 49           06 -211                       0000000 00ML00MN
GNT8704050727P           -0.06                             X313064  043 100  32      0  0
GNT    SE 0968KM         124 49                            00 -669      0000468 46ML37MN
MNQ8704050727P B291266-  -0.10            X304744          X313641  040 100  21      0  0
MNQ    E  0987KM06  031  093 49           00  126          00 -635      0000330 44ML36MN
LPQ8704050727P           -0.22                             X315183  050 100  32      0  0
LPQ    SE 1045KM         113 49                            00 -718      0000402 47ML37MN
HTQ8704050727P X292136   -0.07            X305872          X315616  057 100  23      0  0
HTQ    E  1058KM00  045  100 49           00 -241          00 -640      0000254 45ML35MN
FCC8704050727P X2921  -   0.00            X31015                    010 754  24      0  3
FCC    NW 1058KM00  015  322 49           00  041                       0000200 37ML34MN
SBQ8704050727P           -0.07                             X315965  053 100  39      0  0
SBQ    SE 1069KM         128 49                            00 -598      0000462 48ML38MN
EBN8704050727P           -0.22                             X322504  050 100  18      0  0
EBN    E  1152KM         109 49                            00 -392      0000226 45ML35MN
GSQ8704050727P X293314   -0.22            X312183          X322225  047 100  13      0  0
GSQ    E  1157KM00  002  100 49           00 -049          00 -809      0000174 44ML34MN
KLN8704050727P           -0.29                             X330560  060 100  13      0  0
KLN    E  1309KM         108 49                            00 -747      0000136 45ML34MN
                    Z
```

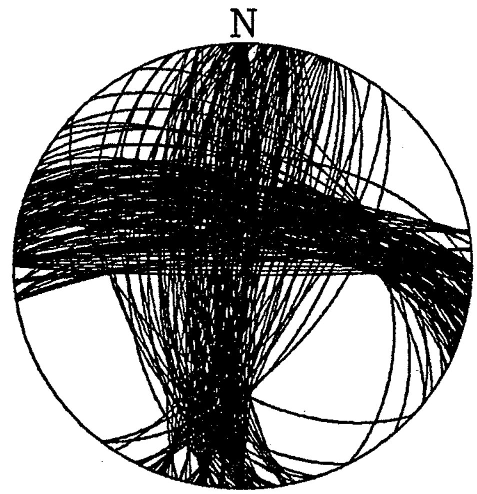
19870405 07:27 MN=3.6 51.781N 82.754W 18.00 KM

KAO	176.000	49.000	D	strong down
GTO	234.000	49.000	C	weakly up before down
JAQ	062.000	49.000	C	
SZO	171.000	49.000	D	
EEO	153.000	49.000	e	emergent
HUO	258.000	49.000	e	weak analog reading
CKO	147.000	49.000	-	
GRQ	136.000	49.000	-	
TRQ	133.000	49.000	D	
GAC	139.000	49.000	D	
ULM	265.000	49.000	+	weak analog reading
MNQ	093.000	49.000	-	weak, near nodal
FCC	322.000	49.000	-	weak analog

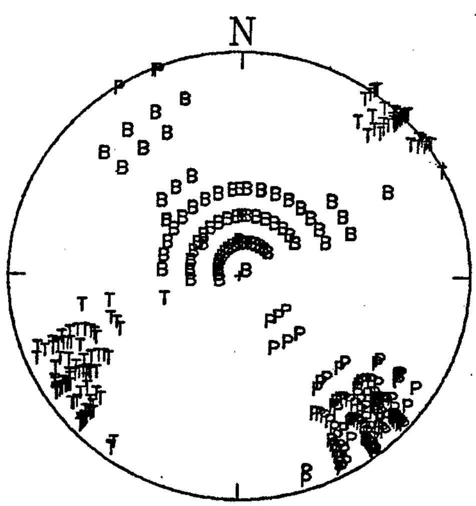
JMS870405.OUT
16-JUL-87 11:35:19



DATA



PLANES



P0 INC 10 AXES

Seismic Zone: CHARLEVOIX

Magnitude : 3.0 MN

Location : 47.825N 69.960W

Date(Y/M/D) : 871206

Time(UT) : 1152

Depth:

closest station: A64 (5 km)
free depth = 19.9 km (from CHV array)

Quality of Readings:

Digital data from Charlevoix Network and ECTN
LMQ is analog
Digital horizontal components for CLTN not used for ratios
PN's on ECTN are weak

Comments:

Well-defined mechanism even if ratios are not used
Best solution is P0 R3 and is same as P0 R4. It misfits ratios at A11 and A61 acceptably, but the misfit on the closest station, A64 is large.
Mechanism represents thrust faulting on NW-trending planes, in response to NE-directed compression.

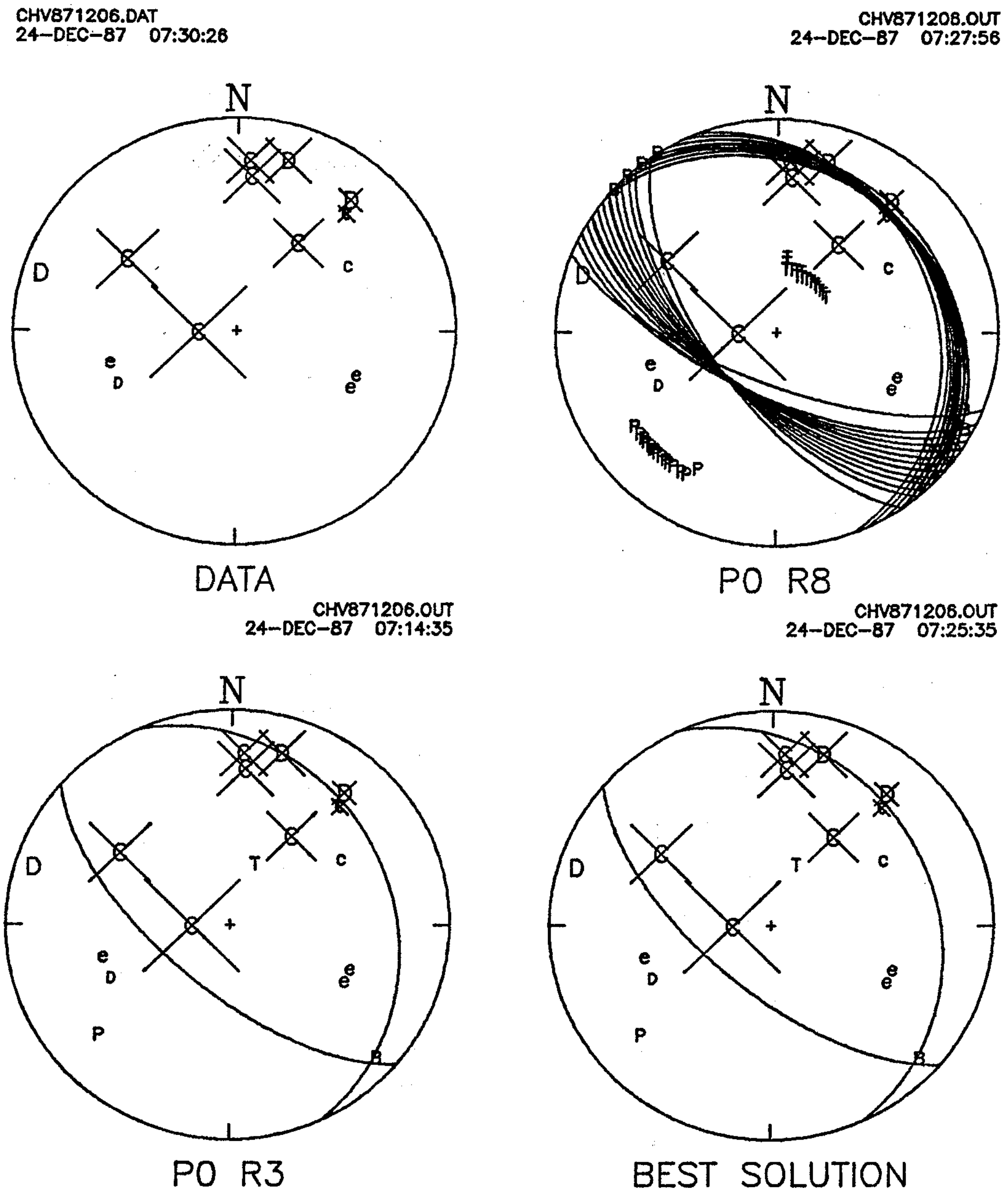
Best Solution:

Strike, Dip, Rake	130	65	079
Strike, Dip, Rake	335	27	113
Trend & Plunge of P	229	20	
Trend & Plunge of T	019	68	
Trend & Plunge of B	135	10	

```
+47.825- 69.960F1MN=3.0 1152542 06121987 00.0070.010 0.4 16 22  70.00N219.89   0 1ML=2.2 110  0 0.00
CHARLEVOIX, QUE.
$WESTON STATIONS DID NOT TRIGGER; ANALOGS TOO EMERGENT TO READ
$RATIO=  1.114 LPQ 530369C 0.07       57.81       99.81 531057 0.21       752.19
$RATIO=  0.842 A16 530142C 0.07     1921.45     2747.45 53 677 0.07     13350.00
$RATIO=  1.797 A54 530337D 0.08     -122.55      163.45 531038 0.06      7676.55
$RATIO=  1.035 A61 535858C 0.09     1948.71     1948.71 53 193 0.08     21123.29
$RATIO= -0.296 A64 525761C 0.07    22070.88    22070.88 525995 0.05     11161.12
$RATIO=  1.126 A11 530547D 0.09     -121.00      203.00 531404 0.08      1617.00
$RATIO=  0.709 A21 535933C 0.08     6577.47     6577.47 53 307 0.21     33622.53
$RATIO=  2.0   LMQ
A64  8712061152P               A525762C        A525994 008 100 187                530013
A64   E  0005KM        088-14  12  008         12 -004   0014687 11ML29MN
A61  8712061152P               A525861C        A530180 010 100 357                530201
A61   SW 0018KM        214-41  12  008         12  008   0022431 17ML36MN
A21  8712061152P               A525933C        A530303 017 100 776                530320
A21   SE 0024KM        124-50  12  006         12  003   0028681 22ML38MN
A16  8712061152P               A530141C        A530672 023 100 453                530698
A16   S  0040KM        185-62  12  002         12  003   0012375 25ML36MN
LMQ  8712061152P              XB53011 +
LMQ   SW 0041KM        222-63  00 -052                   0000000 00ML00MN
A54  8712061152P               A530337D        A531016 005 100 170                531063
A54   SW 0053KM        220-69  12 -001         12  000   0021363 24ML33MN
LPQ  8712061153P          -0.22 A530370C        531056 010 100 397                532509
LPQ   S  0054KM        184-69  12  000         03  001   0024944 27ML34MN
A11  8712061152P               X530555D        C531383 013 100  30                531423
A11   S  0067KM        196-72  00  005         01  000   0001450 17ML23MN
EBN  8712061153P          -0.22 A531607D        D533232
EBN   E  0135KM        107-81  12 -041         00 -042   0000000 00ML00MN
HTQ  8712061153P  A532388   -0.07             XB534496 013 100  24                534669
HTQ   NE 0191KM 12  078 037 49                 00 -314   0001160 23ML30MN
GSQ  8712061153P  B533048+  -0.22
GSQ   NE 0244KM 03  082 059 49                           0000000 00ML00MN
GNT  8712061153P  C532909   -0.06             XB535985 020 100  13                540201
GNT   SW 0245KM 01 -054 229 49                 00 -326   0000408 23ML27MN
KLN  8712061153P  X533635E  -0.29
KLN   E  0293KM 00  064 111 49                           0000000 00ML00MN
SBQ  8712061153P            -0.07             XB541591 010 100  18                542684
SBQ   SW 0311KM        210 49                  00 -568   0001131 28ML33MN
MNQ  8712061153P  B533832   -0.10      XB541234XB542099 017 100  12                542730
MNQ   N  0314KM 03  022 016 49          00  172 00 -133   0000444 26ML29MN
TRQ  8712061153P  A534745-  -0.09
TRQ   SW 0392KM 12 -027 245 49                           0000000 00ML00MN
LMN  8712061153P  C535457E  -0.29
LMN   SE 0450KM 01 -037 117 49                           0000000 00ML00MN
GRQ  8712061153P  C535777E  -0.09
GRQ   W  0467KM 01  098 255 49                           0000000 00ML00MN
EEO  8712061153P  X542428   -0.06
EEO   W  0703KM 00 -119 263 49                           0000000 00ML00MN
JAQ  8712061153P  A543553   -0.07
JAQ   NW 0779KM 12  069 331 49                           0000000 00ML00MN
            Z
```

19871206 11:52 MN=3.0 47.825N 69.960W 19.89 KM

A64	088.000	-14.000	C		very strong P
A64	088.000	-14.000	R	-0.296	
A61	214.000	-41.000	C		weak P
A61	214.000	-41.000	R	1.035	
A21	124.000	-50.000	C		good
A21	124.000	-50.000	R	0.709	
A16	185.000	-62.000	C		good
A16	185.000	-62.000	R	0.842	
LMQ	222.000	-63.000	+		nodal, very emergent
LMQ	222.000	-63.000	R	2.0	
A54	220.000	-69.000	D		weak P
A54	220.000	-69.000	R	1.797	
LPQ	184.000	-69.000	C		weak P
LPQ	184.000	-69.000	R	1.114	
A11	196.000	-72.000	D		weak P
A11	196.000	-72.000	R	1.126	
EBN	107.000	-81.000	D		emergent
GSQ	059.000	49.000	+		v weak
KLN	111.000	49.000	e		emergent
TRQ	245.000	49.000	-		weak
LMN	117.000	49.000	e		emergent
GRQ	255.000	49.000	e		emergent


CHV871206.DAT
24-DEC-87 07:30:26
CHV871206.OUT
24-DEC-87 07:27:56
N
D
C
e
D
e
e
DATA
PO R8
CHV871206.OUT
24-DEC-87 07:14:35
CHV871206.OUT
24-DEC-87 07:25:35
T
P
B
PO R3
BEST SOLUTION

Seismic Zone: Labrador Sea

Magnitude : 4.6 ML

Location : 56.72N 56.33W
(east of Nain)

Date(Y/M/D) : 87 12 14

Time(UT) : 21:09:31

Depth:
closest station: SCH (686 km)
depth pegged at 18 km;
probably shallower, but does not affect the mechanism

Quality of Readings:
ECTN readings made from analog records; clear polarity reversal from east to west
eastern Arctic readings very poor except BLC
western Arctic readings at MBC and INK good

Comments:
Mechanism as shown is constrained chiefly by polarity reversals BLC/western Arctic, JAQ/northern Ontario, and within ECTN, and has little data redundancy at the critical points.
FOCMEC is run at 3 degree increments
P2 misfits various stations (GSQ, SIC, JAQ) as well as LMQ
It, and subsequent solutions satisfy the data, but as discussed above, depend heavily on BLC being read correctly.
P0.5 solutions misfit only LMQ
Best solution represents a median solution of the P0.5 set
Best solution represents thrust faulting on NE-striking planes in response to NW-SE directed compression. It is very similar to one of the alternative mechanisms for the 860420 (Nain Bank) earthquake, though the chosen solution for that earthquake had a larger strike-slip component.

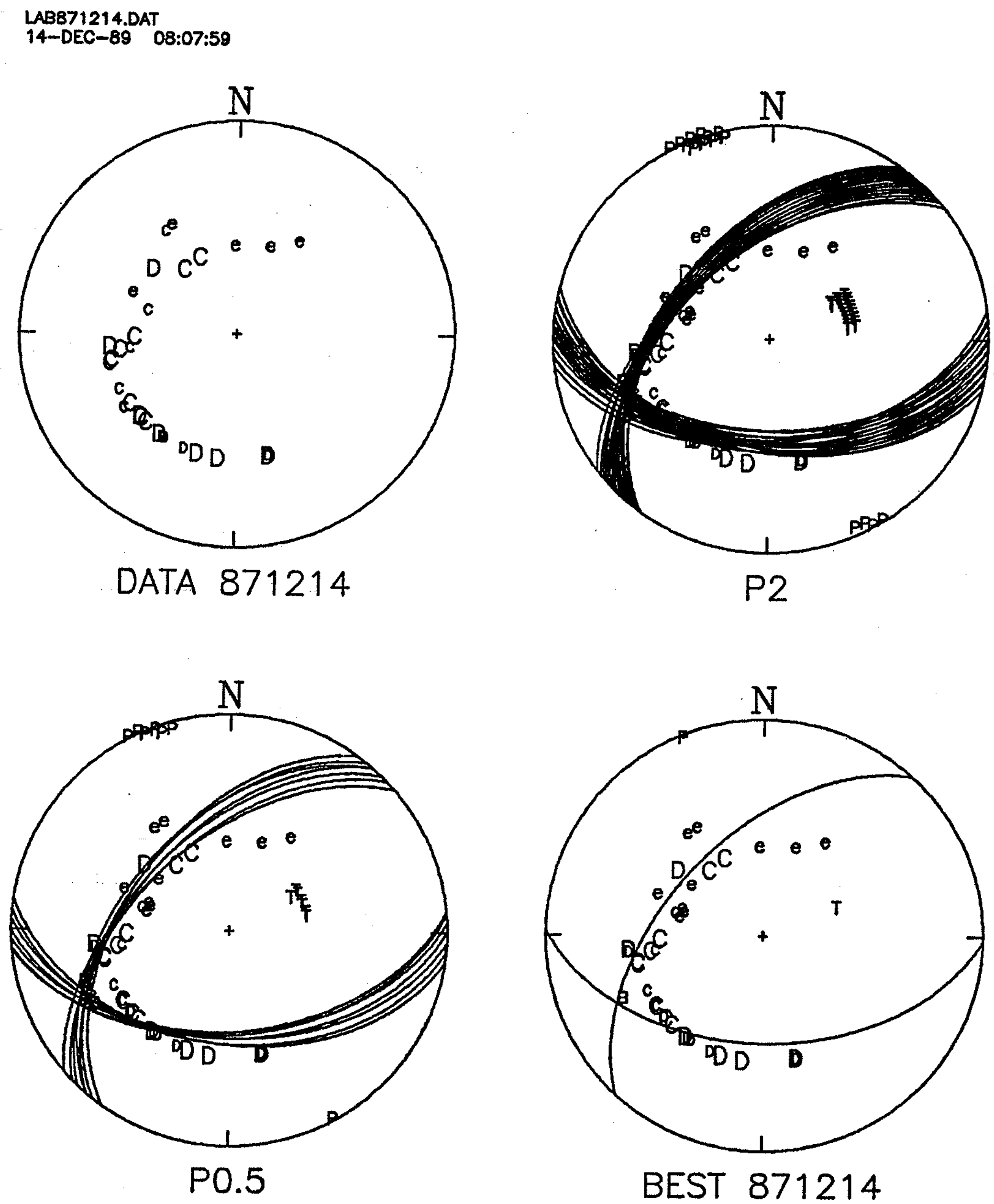
Best Solution:

Strike, Dip, Rake	222	53	056
Strike, Dip, Rake	091	49	127
Trend & Plunge of P	336	03	
Trend & Plunge of T	071	63	
Trend & Plunge of B	244	27	

```
+56.620- 56.228F1ML=4.6 2109300 14121987 00.0170.060 0.2 26 40 120.97 218.00    0 1MN=3.4  10  0 0.00
LABRADOR SEA                                      MER DU LABRADOR
$ NOTHING ON GNT, SBQ, OTT, CKO, WEO, WBO
$ MNQ HAS A SEMI LG WAVE
$ CBK HAS ATTENUATED LG
$ NOTHIN IN EDR
SCH  8712142109P  A11017 C    0.00          A12075       020 141 400     0  8
SCH   W  0693KM 59  137 258 49              00  006        0008912 51ML48MN
CBK  8712142109P  A11217 D    0.00          A1245        000   0   0     0  8
CBK   S  0866KM 03  032 188 49              22  083        0000000 00ML00MN
SIC  8712142109P  B11378 C    0.00           1313        030 257  69     0  8
SIC   SW 1001KM 00 -005 229 49              00  010        0000562 46ML38MN
MUN  8712142109P            -
MUN   S  1036KM             165 49                         0000000 00ML00MN
STJ  8712142109P   1143  D    0.00           13215       040  29   7     0  8
STJ   S  1036KM 02  094 165 49              03  125        0000379 45ML37MN
FRB  8712142109P  A11430 E                  A1323        040 124  15
FRB   NW 1046KM 02 -028 324 49              12  063        0000190 43ML34MN
MNQ  8712142109P  A114526C   -0.10          B132662      027 100  23     0  8
MNQ   SW 1071KM 46 -122 236 49              03 -125        0000535 46ML39MN
GSQ  8712142109P  A115407C   -0.22          B134082      023 100  18     0  8
GSQ   SW 1128KM 09  053 225 49              01  071        0000492 45ML39MN
HTQ  8712142109P  B115651    -0.07          C134635      033 100  15     0  8
HTQ   SW 1161KM 02 -096 230 49              00 -074        0000286 45ML36MN
JAQ  8712142109P   120880D   -0.07          C141282      017 100  19     0  8
JAQ   W  1277KM 15 -275 264 49              00  116        0000702 47ML41MN
JBQ  8712142109P            -
JBQ   W  1278KM             263 49                         0000000 00ML00MN
KLN  8712142109P  A121337D   -0.29          C141527      047 100  18     0  8
KLN   SW 1292KM 03 -032 217 49              00  006        0000241 47ML36MN
JCQ  8712142109P            -
JCQ   W  1297KM             263 49                         0000000 00ML00MN
GBN  8712142109P  B12141 D    0.00           14175       030 188  38     0  8
GBN   S  1302KM 00 -041 199 49              01  064        0000423 47ML39MN
EBN  8712142109P  A121570    -0.22          B142233      037 100  12     0  8
EBN   SW 1308KM 01  017 224 49              29  385        0000204 45ML36MN
LMN  8712142109P  A121823    -0.29          B142822      0301000  58     0  8
LMN   SW 1338KM 36 -107 210 49              20  322        0000121 42ML34MN
UNB  8712142109P XB12250 -
UNB   SW 1390KM 00 -029 216 49                             0000000 00ML00MN
LMQ  8712142109P  B12249 -
LMQ   SW 1394KM 01 -086 230 49                             0000000 00ML00MN
LPQ  8712142109P  A122594    -0.22          C143859      037 100  11     0  8
LPQ   SW 1397KM 06 -045 228 49              00  117        0000187 45ML36MN
HAL  8712142109P  B12295 -
HAL   SW 1430KM 01 -072 204 49                             0000000 00ML00MN
GGN  8712142109P  B123586-   -0.29                       000   0    0    0  0
GGN   SW 1479KM 01 -052 214 49                             0000000 00ML00MN
TRQ  8712142109P  B130168    -0.09                       000   0    0    0  0
TRQ   SW 1713KM 20 -319 235 49                             0000000 00ML00MN
GRQ  8712142109P  C130472    -0.09                       000   0    0    0  0
GRQ   SW 1749KM 02 -442 239 49                             0000000 00ML00MN
GAC  8712142109P  B131326+   -0.06                       000   0    0    0  0
GAC   SW 1804KM 10 -221 236 52                             0000000 00ML00MN
IGL  8712142109P XB1328  E
IGL   NW 1898KM 00  177 329 50                             0000000 00ML00MN
EEO  8712142109P  B132476+   -0.06                       000   0    0    0  0
EEO   SW 1920KM 30 -394 244 50                             0000000 00ML00MN
KAO  8712142109P  B13242 C
KAO   W  1920KM 39 -448 257 50                             0000000 00ML00MN


GTO  8712142109P  B13537 C
GTO   W  2173KM 09 -218 262 43                             0000000 00ML00MN
FCC  8712142109P XB1405  E
FCC   W  2243KM 00  201 292 43                             0000000 00ML00MN
KTG  8712142109P         E
KTG   NE 2244KM         033 43                             0000000 00ML00MN
BLC  8712142109P  B14105 D
BLC   NW 2307KM 03  113 308 41                             0000000 00ML00MN
TBO  8712142109P         +
TBO   W  2389KM         262 41                             0000000 00ML00MN
SIO  8712142109P  B14244 C
SIO   W  2455KM 02  095 268 39                             0000000 00ML00MN
RES  8712142109P XC1439
RES   NW 2597KM 00  276 335 37                             0000000 00ML00MN
ULM  8712142109P  B14460 -
ULM   W  2690KM 05  163 272 36                             0000000 00ML00MN
DAG  8712142109P         E
DAG   N  2695KM         020 36                             0000000 00ML00MN
FFC  8712142109P XB1501  +
FFC   W  2836KM 00  432 285 34                             0000000 00ML00MN
ALE  8712142109P         E
ALE   N  2898KM         358 34                             0000000 00ML00MN
YKA  8712142109P         E
YKA   NW 3251KM         306 33                             0000000 00ML00MN
MBC  8712142109P XB15366 C
MBC   NW 3299KM 00  250 334 33                             0000000 00ML00MN
EDM  8712142109P         E
EDM   W  3579KM         289 32                             0000000 00ML00MN
SES  8712142109P         E
SES   W  3605KM         283 32                             0000000 00ML00MN
INK  8712142109P XB16227 C
INK   NW 3896KM 00  154 321 32                             0000000 00ML00MN
PNT  8712142109P         E
PNT   W  4182KM         287 31                             0000000 00ML00MN
          Z
```

19871214 21:09 ML=4.6 56.621N 56.225W 18.00 KM

SCH	258.000	49.000	C	good; arrives before end of minute mark
CBK	189.000	49.000	D	good
SIC	229.000	49.000	C	OK
MUN	165.000	49.000	-	not strong
STJ	165.000	49.000	D	good
FRB	324.000	49.000	e	very weak
MNQ	236.000	49.000	C	good, from analog record
GSQ	225.000	49.000	C	from analog record
JAQ	264.000	52.000	D	clear but not strong, from analog record
JBQ	263.000	52.000	-	analog record
KLN	217.000	49.000	D	good, from analog record
JCQ	263.000	52.000	-	analog record
GBN	199.000	49.000	D	good
UNB	216.000	49.000	-	ok
LMQ	230.000	49.000	-	good might be D
HAL	204.000	49.000	-	ok
GGN	214.000	49.000	-	weak, from analog record
GAC	236.000	49.000	+	weak, from analog record
IGL	329.000	49.000	e	barely readable for time
EEO	244.000	49.000	+	from analog record
KAO	257.000	49.000	C	ok
GTO	262.000	43.000	C	ok
FCC	292.000	43.000	e	barely readable for time
KTG	033.000	43.000	e	not available
BLC	308.000	41.000	D	good
BLC	308.000	41.000	D	duplicate to force solution
TBO	262.000	41.000	+	ok
SIO	268.000	39.000	C	good
DAG	020.000	36.000	e	not available
FFC	285.000	34.000	+	poor
ALE	358.000	34.000	e	even onset time unreadable
YKA	306.000	33.000	e	not readable
MBC	334.000	33.000	C	clear
EDM	289.000	32.000	e	even onset time unreadable
SES	283.000	32.000	e	even onset time unreadable
INK	321.000	32.000	C	clear
PNT	287.000	31.000	e	even onset time unreadable


LAB871214.DAT
14-DEC-89 08:07:59
N
DATA 871214
N
P2
N
P0.5
N
BEST 871214

Seismic Zone: CHARLEVOIX

Magnitude : 3.6 MN

Location : 47.41N 70.44W

Date(Y/M/D) : 88 01 02

Time(UT) : 09 25

Depth:
closest station: LMQ (17 km)
free depth = 11.6 km

Quality of Readings:
Charlevoix array down, SLQ not operating
SLTN triggered too late
LMQ, QCQ are good analog signals
EBN very nodal
western ECTN very weak arrivals
KLN arrival problematical

Comments:
P1.5 R2 suggests a range of thrust/SS mechanisms
Either the strike-slip or a well-defined thrust fit the ratios for P1.5 R0
P1 R1 misfits KLN+GGN or KLN+JKM as well as LPQ ratio
'Best solution' is chosen from P1 R1 as the solution which fits GGN in preference to JKM, misfits the LPQ ratio the least, and most importantly explains the very weak arrivals on eastern and western ECTN
Although the strike-slip mechanism on P1.5 R0 fits the read polarity data almost as well, it does not explain the weak arrivals on GAC etc.
The chosen solution represents thrust faulting on NW-trending planes in response to ENE compression

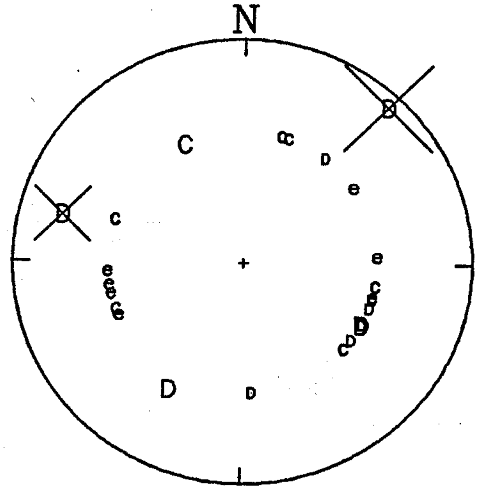
Best Solution:

Strike, Dip, Rake	133	44	60
Strike, Dip, Rake	351	53	115
Trend & Plunge of P	063	05	
Trend & Plunge of T	321	69	
Trend & Plunge of B	155	20	

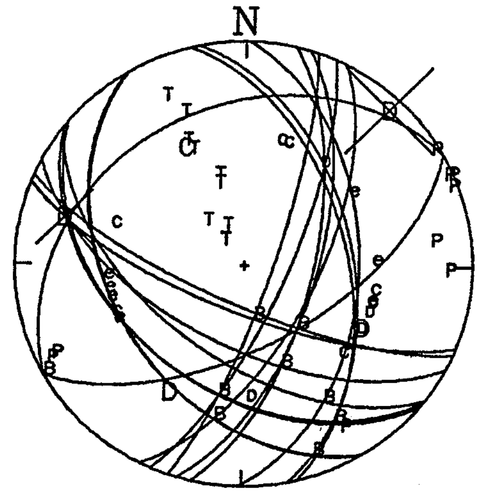
```
+47.412- 70.43701MN=3.6 0925173 02011988 00.0080.007 0.2 22 24 180.28Z211.60   8 1ML=3.4 140F 0 3.65
FELT AT BAIE-SAINT-PAUL                 RESSENTI A BAIE-SAINT-PAUL, QUE.
ST.JOSEPH-DE-LA-RIVE, ST.PLACIDE,       SAINT-JOSEPH-DE-LA-RIVE, SAINT-PLACIDE,
LES EBOULEMENTS, ST.HILARION, PORTNEUF, LES EBOULEMENTS, SAINT-HILARION,
LAC BEAUPORT                            PORTNEUF, LAC BEAUPORT
CHARLEVOIX, QUE.
$ FELT REPORT FROM HILARION BERGERON, LMQ OPERATOR
$ NO CHARLEVOIX ARRAY DATA
$RATIO=  0.000 QCQ
$RATIO=  0.906 LPQ 252319D 0.14     -555.64    1309.36 252705 0.15     4477.64
LMQ  8801020925P             0.00 A25205 D                    000   0   0    0  0
LMQ   NE 0017KM        029-56   14 -021                         0000000 00ML00MN
LPQ  8801020925P            -0.22 A252318D           A252703 010 100 789           252774
LPQ   E  0033KM        104-71   14 -004              14 -017  0049574 26ML42MN
QCQ  8801020925P                  A25329 D          XB25458
QCQ   SW 0095KM        222-83   14  015              00  227  0000000 00ML00MN
EBN  8801020925P  A254398E  -0.22                    A260358 020 100 412           260560
EBN   E  0166KM 14 -017 087 49                       14  051  0012943 34ML39MN
CBM  8801020929P  B254704-                          XB260912
CBM   E  0184KM 04  093 106 49                       00  139  0000000 00ML00MN
GNT  8801020925P  C254664   -0.06                   XB261167 013 100  83           261308
GNT   SW 0188KM 01 -005 232 49                       00  265  0004012 28ML35MN
JKM  8801020929P XB254916-                          XB261214
JKM   S  0196KM 00  154 176 49                       00  104  0000000 00ML00MN
HNME 8801020929P  B255284-                          XB262032
HNME  SE 0233KM 04  068 126 49                       00 -100  0000000 00ML00MN
HTQ  8801020925P  B255523-  -0.07                   XB262515 017 100 117           262644
HTQ   NE 0249KM 04  104 037 49                       00 -065  0004324 33ML37MN
SBQ  8801020925P XB255593   -0.07            X262537XB262921 023 100 766        3  263734
SBQ   SW 0254KM 00  122 207 49               00  357 00  228  0020926 41ML44MN
GSQ  8801020925P  B260196E  -0.22            X263427XB263982 023 100  90           264145
GSQ   NE 0299KM 04  158 055 49               00  268 00  037  0002459 34ML36MN
KLN  8801020925P  B260217+  -0.29                   XB264293 020 100  50           265096
KLN   E  0315KM 04 -027 100 49                       00 -105  0001571 32ML34MN
MNT  8801020925P XB260639   -0.06           XB264008XX264461 013 100  49           264911
MNT   SW 0324KM 00  310 230 49               00  330 00 -162  0002368 33ML36MN
UNB  8801020925P  A26043 D
UNB   SE 0334KM 14 -009 118 49                                0000000 00ML00MN
TRQ  8801020925P  A260558+  -0.09            X264437         020 100  63           265938
TRQ   W  0341KM 14  011 249 49               00  381          0001979 35ML36MN
MNQ  8801020925P  B260873+  -0.10           XC264736XB265625 020 100  57           270133
MNQ   N  0368KM 04 -001 019 49               00  110 00 -207  0001791 35ML36MN
GGN  8801020925P  A261013+  -0.29
GGN   SE 0378KM 14  005 131 49                                0000000 00ML00MN
GRQ  8801020925P  B261544E  -0.09           XB270131XB271573 033 100  72           271896
GRQ   W  0422KM 04  015 260 49               00  361 00  262  0001371 38ML36MN
GAC  8801020925P XC261891E  -0.06XC262418   XC270423XC271589 027 100  63        3   271946
GAC   SW 0431KM 00  261 246 49    00 -271    00  475 00  043  0001466 38ML36MN
WBO  8801020925P XC262211   -0.06           XB270953XC272230 023 100  42           272804
WBO   SW 0460KM 00  228 236 49               00  389 00 -108  0001147 37ML36MN
OTT  8801020925P            -0.06                   XC272277 023 100  48           272964
OTT   SW 0464KM             243 49                   00 -176  0001311 38ML36MN
LMN  8801020925P  A262033-  -0.29            X270830 X272804 027 100  15           273693
LMN   E  0465KM 14 -039 110 49               00  128 00  301  0000349 33ML31MN
CKO  8801020925P  C263081E  -0.06           XB272998XB275018 033 100  49           280053
CKO   W  0559KM 01 -115 256 49               00  318 00 -041  0000933 40ML36MN
HAL  8801020925P XA26395 -
HAL   SE 0613KM 00  102 118 49                                0000000 00ML00MN
EEO  8801020925P  B264422E  -0.06                   XB281839 027 100  34           282768
EEO   W  0662KM 04 -032 266 49                       00 -043  0000791 41ML37MN


GBN  8801020925P  B26515 E
GBN   E  0721KM 04 -017 105 49                                0000000 00ML00MN
JAQ  8801020925P  A270179C  -0.07           XB282089 X290073 023 100  11           291314
JAQ   NW 0803KM 14  001 334 49               00  207 00  320  0000301 39ML34MN
SWO  8801020929P                                    XC290158 053 100  40           290796
SWO   W  0806KM             268 49                   00  350  0000474 44ML36MN
SUO  8801020929P                                    XB290411 0301000 103           290444
SUO   W  0813KM             266 49                   00  405  0000216 39ML33MN
SZO  8801020929P                                    XB291163 037 100  17           291892
SZO   W  0849KM             267 49                   00  168  0000289 41ML34MN
SCH  8801020925P  B27093 +
SCH   N  0863KM 04  028 016 49                                0000000 00ML00MN
KAO  8801020925P  B27160 +
KAO   W  0919KM 04  016 289 49                                0000000 00ML00MN
              Z
```

19880102 09:25 MN=3.6 47.417N 70.433W 11.85 KM

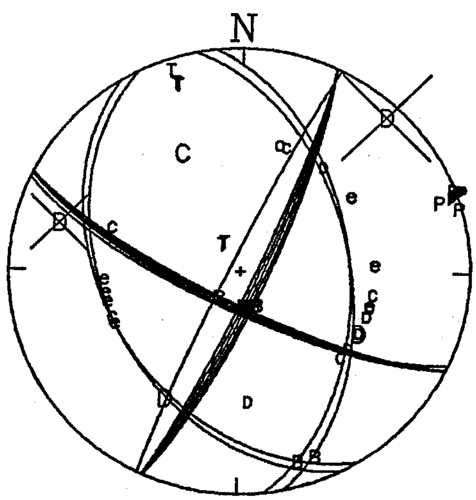
LMQ	029.000	-56.000	D		strong
LPQ	105.000	-71.000	D		quite weak P
LPQ	105.000	-71.000	R	0.906	
QCQ	222.000	-83.000	D		strong
QCQ	222.000	-83.000	R	0.000	strong P relative to S
EBN	087.000	49.000	e		possibly +
CBM	106.000	49.000	-		Weston playout
JKM	176.000	49.000	-		Weston playout
HNME	126.000	49.000	-		Weston playout
HTQ	037.000	49.000	-		quite sharp
GSQ	055.000	49.000	e		weak signal on noisy trace
KLN	100.000	49.000	+		preceeded by noise or emergent arrival
UNB	118.000	49.000	D		good
TRQ	249.000	49.000	+		ok
MNQ	019.000	49.000	+		ok
GGN	131.000	49.000	+		when filtered
GRQ	260.000	49.000	e		emergent
GAC	246.000	49.000	e		emergent
LMN	110.000	49.000	-		ok
CKO	256.000	49.000	e		emergent
HAL	118.000	49.000	-		on LP noise
EEO	266.000	49.000	e		emergent
GBN	105.000	49.000	e		emergent
JAQ	334.000	49.000	C		good
SCH	016.000	49.000	+		ok
KAO	289.000	49.000	+		ok



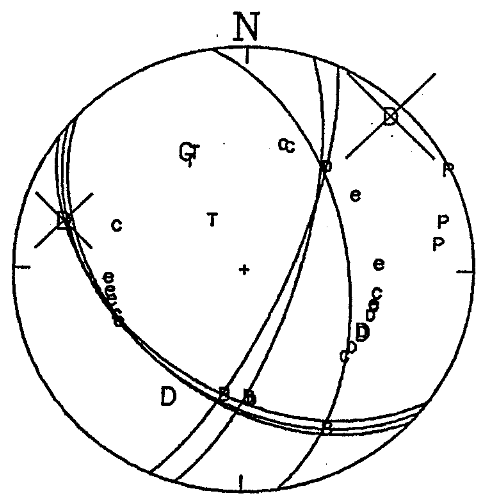
DATA 880102



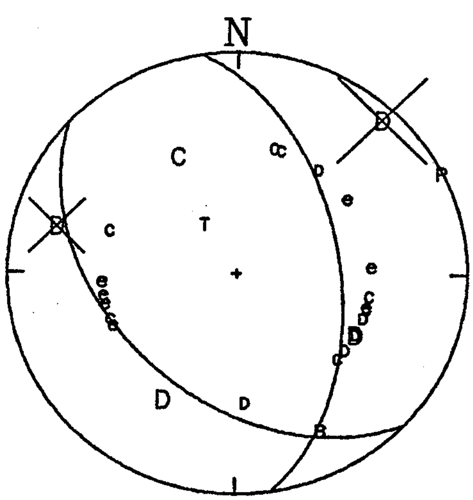
P1.5 R2 Inc 10



P1.5 R0



P1 R1



BEST SOLUTION

Seismic Zone: NORTHERN APPALACHIANS

Magnitude : 3.9 MN

Location : 48.00 N 65.67 W
(in Baie Des Chaleurs)

Date(Y/M/D) : 88 01 28

Time(UT) : 0838

Depth:

closest station: KLN (139 km)
free depth unknown, but possibly slightly deeper than 18 km.
Mechanism is not dependant on exact focal depth.

Quality of Readings:

Coverage of stations to the east is poor.
Some stations (eg GSQ EBN KLN) have unusually weak beginnings.
Secondary phase (Pg) on KLN is clear.
Sn/P ratio is read for KLN, but not used in solution.

Comments: "P4 10 DEG INC" does not use second-arriving Pg at KLN.
"P5 R1 INC 10" uses KLN Pg.
"Subset" excludes some solutions that misfit KLN Pn and some which have an order of magnitude error on KLN ratio. All misfit half-weight polarities LPQ, EMM. TRM, HAL, and KAO.
"Best solution" is chosen as least extreme of "Subset"
Solution represents almost pure strike-slip faulting on vertical planes in response to ENE-directed compression.

Best Solution:

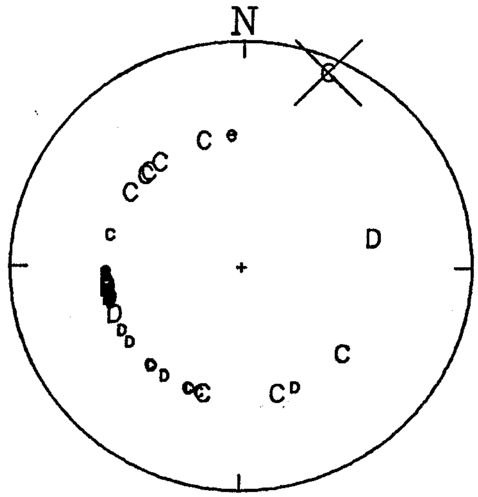
Strike, Dip, Rake	120	81	003
Strike, Dip, Rake	030	87	171
Trend & Plunge of P	075	04	
Trend & Plunge of T	345	09	
Trend & Plunge of B	190	80	

```
+48.000- 65.675F1MN=3.9 0838282 28011988 00.0140.023 0.4 27 31 230.66 218.00   0 1ML=4.0 150  0 0.00
$ BAIE DES CHALEURS
$ FREE DEPTH 21 KM, 47.99 65.60
$ SBQ AND DPQ MAGNITUDES ARE HIGH
$ USE KLN RATIO WITH CAUTION
$RATIO=  0.619 KLN 395136C 0.20      159.53      303.47 39 846 0.08      663.47
KLN  8801280838P XA385075+
KLN   SW 0139KM 00 -022 203 49                                 0000000 00ML00MN
KLN  8801280838P  A385075   -0.29 A385134C           B390844 020 100 530           390985
KLN   SW 0139KM 13 -051 203-83    13  016            03  060   0016650 34ML39MN
GSQ  8801280838P  A385216C  -0.22                    B391138 023 1001031           391192
GSQ   NW 0147KM 13 -002 314 49                       03  135   0028165 37ML41MN
EBN  8801280838P  B385911E  -0.22                    B392578 023 100 543           392852
EBN   W  0202KM 03  029 254 49                       03  054   0014834 37ML41MN
UNB  8801280838P  B39042 +        X39080
UNB   S  0239KM 03  103 198 49    00  102                      0000000 00ML00MN
HTQ  8801280838P  A390394C  -0.07 X390666   XB393486XC393653 020 100 471           393763
HTQ   NW 0241KM 13  054 304 49    00 -060    00  547 00  061   0014797 39ML42MN
LMN  8801280838P  A390382C  -0.29                   XB393647 043 100 140           393939
LMN   S  0248KM 13 -072 164 49                       00 -173   0002046 34ML34MN
SLQ  8801280838P  A39055 D
SLQ   W  0253KM 13  069 263 49                                 0000000 00ML00MN
SIC  8801280838P  A39048 C                  XC3933
SIC   N  0254KM 13 -017 343 49               00  080           0000000 00ML00MN
HNME 8801280838P          -
HNME  SW 0270KM       /  221 49                                0000000 00ML00MN
A21  8801280839P  X391161
A21   W  0302KM 00  075 265 49                                 0000000 00ML00MN
A64  8801280839P  B391281E                                   020 100  68           400275
A64   W  0316KM 03  029 268 49                                 0002136 34ML36MN
A16  8801280839P  A391483D                                   028 100 192           400641
A16   W  0331KM 13  052 261 49                                 0004308 39ML39MN
A61  8801280839P  A391481-                                   027 100 128           400490
A61   W  0332KM 13  025 266 49                                 0002979 37ML38MN
GGN  8801280838P  A391451C  -0.29XB392386   X400085          040 100 216           401411
GGN   S  0332KM 13 -031 196 49    00  159   00 1170$           0003393 40ML38MN
LPQ  8801280838P  A391554+  -0.22                   XC400398 023 100 154           400834
LPQ   W  0334KM 13  062 259 49                        00  183  0004207 38ML39MN
A11  8801280839P  X391751-                                   035 100 282           401509
A11   W  0350KM 00  080 258 49                                 0005062 41ML40MN
LMQ  8801280838P  B39171 -
LMQ   W  0352KM 03  010 264 49                                 0000000 00ML00MN
A54  8801280839P  B391842E                                   028 100 210           401498
A54   W  0361KM 03  041 262 49                                 0004712 41ML40MN
MNQ  8801280838P  A391812C  -0.10           XB395694XC400689 017 100 121           401069
MNQ   NW 0361KM 13 -006 322 49               00  178 00 -279   0004472 38ML40MN
EMM  8801280838P          -
EMM   S  0389KM          202 49                                0000000 00ML00MN
HAL  8801280838P  A39246 -
HAL   SE 0407KM 13  100 156 49                                 0000000 00ML00MN
GBN  8801280838P  A39266 C
GBN   SE 0430KM 13  024 131 49                                 0000000 00ML00MN
JKM  8801280838P          -
JKM   SW 0435KM          235 49                                0000000 00ML00MN
BPM  8801280838P          -
BPM   SW 0445KM          214 49                                0000000 00ML00MN
HKM  8801280838P          -
HKM   SW 0481KM          221 49                                0000000 00ML00MN
TRM  8801280838P          +
TRM   SW 0546KM          222 49                                0000000 00ML00MN
```

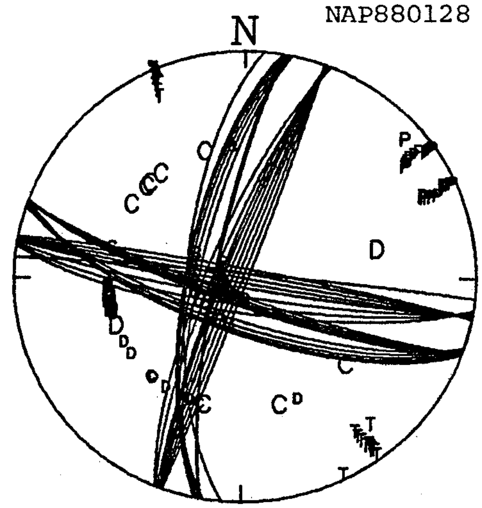
```
DPQ  8801280838P  B394227E  -0.06           XB404167XB410811 033 100 514           411061
DPQ   W  0557KM 03  034 257 49               00  504 00  378   0009787 50ML47MN
SBQ  8801280838P  X394412-  -0.07                    X410638 037 1001036           411477
SBQ   SW 0560KM 00  174 241 49                        00  106  0017593 53ML49MN
CBK  8801280838P  A39445 D                  XC4044  XB41075
CBK   E  0579KM 13 -016 077 49               00  256 00 -312   0000000 00ML00MN
MNT  8801280838P            -0.06                            053 100  40           414546
MNT   W  0668KM          248 49                                0000474 42ML35MN
TRQ  8801280838P  A395964D  -0.09           XC411042XC414905 037 100  43           415664
TRQ   W  0702KM 13 -018 257 49               00  261 00  386   0000730 43ML37MN
SCH  8801280838P  B40063 E
SCH   N  0763KM 03 -080 355 49                                 0000000 00ML00MN
GRQ  8801280838P  B400897E  -0.09           XC412728XC421387 030 100  30           421594
GRQ   W  0786KM 03 -093 262 49               00  188 00  539   0000628 43ML37MN
GAC  8801280838P  B401046E  -0.06           XC413047         060 100  49           422321
GAC   W  0790KM 03  009 255 49               00  422           0000513 45ML36MN
WBO  8801280838P XA401439D  -0.06            X413191         047 100  33           423503
WBO   W  0809KM 00  173 249 49               00  167           0000441 43ML36MN
CKO  8801280838P XA402471-  -0.06           XC415696XC424321 050 100  43           425794
CKO   W  0923KM 00 -185 260 49               00  246 00 -360   0000540 46ML38MN
JAQ  8801280838P  A403070C  -0.07           XC420274 X425092 027 100  18           425776
JAQ   NW 0956KM 13 -002 316 49               00  101 00 -537   0000419 43ML37MN
EEO  8801280838P  A403681-  -0.06                            053 100  45           432591
EEO   W  1024KM 13 -208 266 49                                 0000533 48ML38MN
SUO  8801280838P          E
SUO   W  1174KM          267 49                                0000000 00ML00MN
KAO  8801280838P  C4105  +
KAO   W  1246KM 01 -090 284 49                                 0000000 00ML00MN
              Z
```

19880128 08:38 MN=3.9 48.000N 65.675W 18.00 KM

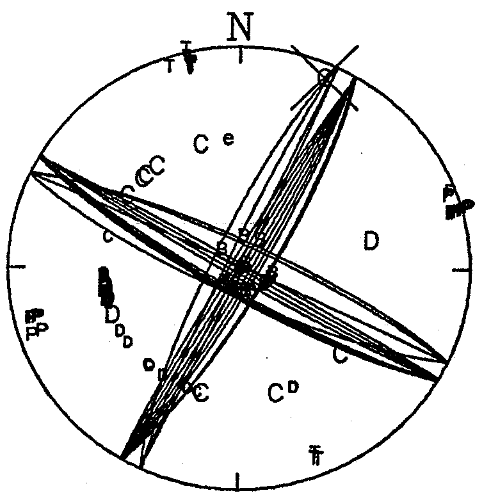
KLN	203.000	49.000	+		Very weak
KLN	203.000	-83.000	C		Strong
KLN	203.000	-83.000	R	0.619	(at 139 km distance)
GSQ	314.000	49.000	C		Definite but weak
EBN	254.000	49.000	e		Weak beginning
UNB	198.000	49.000	+		Analog
HTQ	304.000	49.000	C		Good
LMN	164.000	49.000	C		OK
SLQ	263.000	49.000	D		Good analog
SIC	343.000	49.000	C		
HNME	221.000	49.000	-		Weston analog data
A64	268.000	49.000	e		
A16	261.000	49.000	D		
A61	266.000	49.000	-		Poor
GGN	196.000	49.000	C		On LP noise
LPQ	259.000	49.000	+		Apparently OK
A11	258.000	49.000	-		Good
LMQ	264.000	49.000	-		
A54	262.000	49.000	e		
MNQ	322.000	49.000	C		Weston analog data
EMM	202.000	49.000	-		
HAL	156.000	49.000	-		
GBN	131.000	49.000	C		
GBN	131.000	49.000	C		
JKM	235.000	49.000	-		Weston analog data
BPM	214.000	49.000	-		Weston analog data
HKM	221.000	49.000	-		Weston analog data
TRM	222.000	49.000	+		Weston analog data
DPQ	257.000	49.000	e		Probably -
SBQ	241.000	49.000	-		
CBK	077.000	49.000	D		
TRQ	257.000	49.000	D		Good
SCH	355.000	49.000	e		
GRQ	262.000	49.000	e		
GAC	255.000	49.000	e		
WBO	249.000	49.000	D		
CKO	260.000	49.000	-		On LP noise
JAQ	316.000	49.000	C		Good
EEO	266.000	49.000	-		Weak
SUO	267.000	49.000	e		
KAO	284.000	49.000	+		Poor



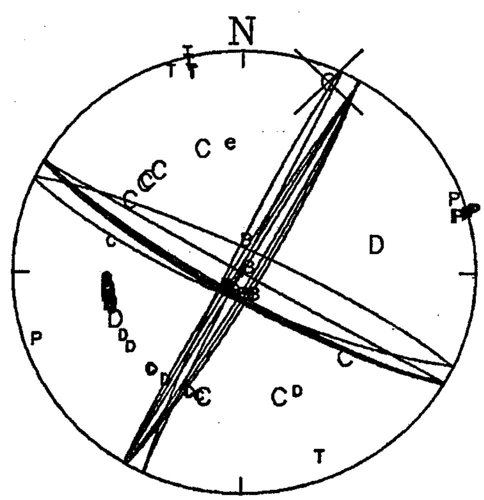
DATA



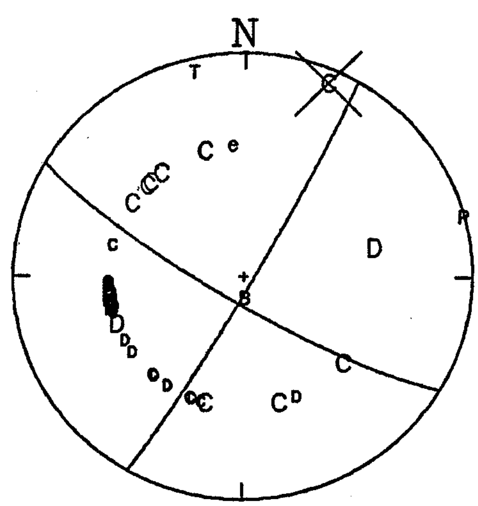
P4 10 DEG INC



P5 R1 INC 10



SUBSET OF P5 R1



BEST SOLUTION

Seismic Zone: Sverdrup

Magnitude : 4.6 ML

Location : 77.32N 84.69W

Date(Y/M/D) : 1988 02 26

Time(UT) : 22:00

Depth:
closest station: RES (403 km)
depth pegged at 18 km

Quality of Readings:
All readings are weak

Comments:
Unconstrained mechanism - could be thrust, strike-slip or normal.
Nevertheless, the positions of the P and T axes are fairly well constrained.

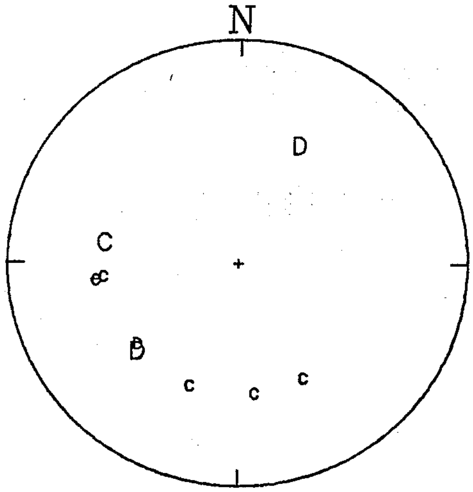
Best Solution:
Strike, Dip, Rake
Strike, Dip, Rake
Trend & Plunge of P 045
Trend & Plunge of T 315
Trend & Plunge of B

```
+77.315- 84.611F1ML=4.6 2200239 26021988 00.0400.255 0.1 10 14  31.56 218.00   0 1MN=4.0  30  0 0.00
ELLESMERE ISLAND, N.W.T.                 ILE ELLESMERE, T.N.-O.
$ EDR QUOTE GSC PRELIMINARY EPICENTRE AND MAGNITUDE
RES  8802262200P   01205 D   0.00 X0132       C0203            000   0   0    0  0
RES    SW 0404KM 12  162 229 49    00  286     03  330            0000000 00ML00MN
ALE  8802262200P   01585 D   0.00              03056           040 310 180    0  8
ALE    NE 0716KM 11  153 026 49               01 -056             0000912 44ML38MN
MBC  8802262200P   02176 C W 0.00             X03405           030 287  59    0  0
MBC    W  0884KM 00  017 279 49               00 -135             0000431 43ML36MN
IGL  8802262200P   0220  +   0.00              03455           030 315 142    0  8
IGL    S  0892KM 12  159 173 49               18  194             0000944 46ML40MN
SXT  8802262200P   0310  +
SXT    W  1306KM 06  109 264 49                                   0000000 00ML00MN
BLC  8802262200P   0332  +   0.00              0551   X0720    050 245 125    0  0
BLC    S  1506KM 07 -125 202 49               47 -313 00 -572     0000641 53ML42MN
DAG  8802262200P   03392 D   0.00                              000   0   0    0  0
DAG    NE 1570KM 17 -190 060 49                                   0000000 00ML00MN
FRB  8802262200P  C0347  +   0.00             X0626            060  82  10    0  8
FRB    SE 1617KM 00  017 151 49               00  818             0000128 47ML35MN
INK  8802262200P   04110 E   0.00                              000   0   0    0  0
INK    W  1822KM 01 -043 263 52                                   0000000 00ML00MN
B09  8802262200P   0426  -   0.00             X0728            000   0   0    0  0
B09    SW 1959KM 04 -090 230 47               00 -264             0000000 00ML00MN
FCC  8802262200P             0.00                     X1012    070  60  26    0  0
FCC    S  2104KM         195 45                       00 -131     0000389 55ML42MN
            Z
```

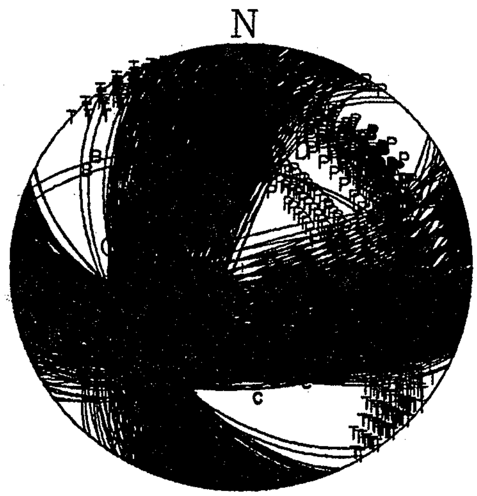
19880226 22:00 ML=4.6 77.322N 84.695W 18.00 KM

RES	228.000	49.000	D	weak but clear
ALE	026.000	49.000	D	weak
MBC	279.000	49.000	C	goes c?w
IGL	173.000	49.000	+	very weak
SXT	264.000	49.000	+	weak
BLC	201.000	49.000	+	ok
DAG	060.000	49.000	D	PDE reading
FRB	151.000	49.000	+	v weak
INK	263.000	52.000	e	emergent
B09	230.000	47.000	-	ok

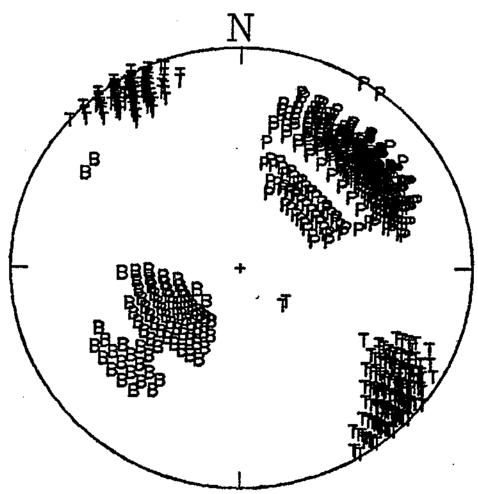
AI880226.DAT
20-DEC-89 11:19:03



DATA 880226



PO



AXES 880226

Seismic Zone: CHARLEVOIX

Magnitude : 3.1 MN

Location : 47.44N 70.38W

Date(Y/M/D) : 88 03 13

Time(UT) : 1624

Depth:

closest station: A54 (3 km)
free depth = 6.8 km (from Charlevoix array)

Quality of Readings:

Array readings good, though A61 and A64 weak beginnings
QCQ very low gain analog, appears to go down
TRQ, GAC emergent
EBN P residual rather large

Comments:

All solutions misfit KLN and JKM polarities
P1 R7 misfits KLN and JKM and most ratios, but fits QCQ
P1.5 R3 misfits KLN, JKM, and QCQ, also A54 and A11 and one other ratio; represents similar mechanism to P1 R7 but with a larger strike-slip component.
P1.5 R2 misfits KLN, JKM, and QCQ, also A54 and A11 ratios but fits other ratios well and appears to be the best compromise
'Best Solution' is P1.5 R2 which represents thrust faulting on north or northeast striking planes in response to compression from the southeast. Mechanism is strongly constrained by A54 arrival

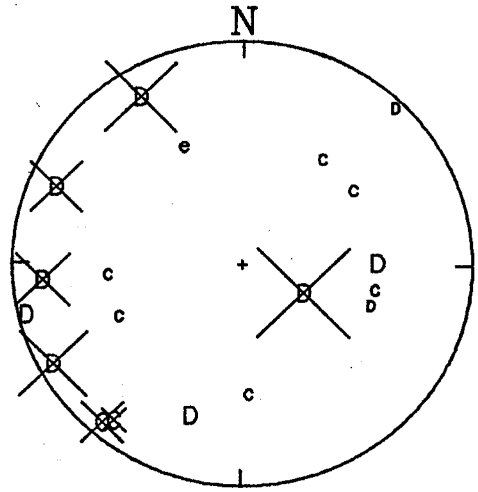
Best Solution:

Strike, Dip, Rake	183	25	035
Strike, Dip, Rake	060	76	111
Trend & Plunge of P	134	28	
Trend & Plunge of T	356	54	
Trend & Plunge of B	235	20	

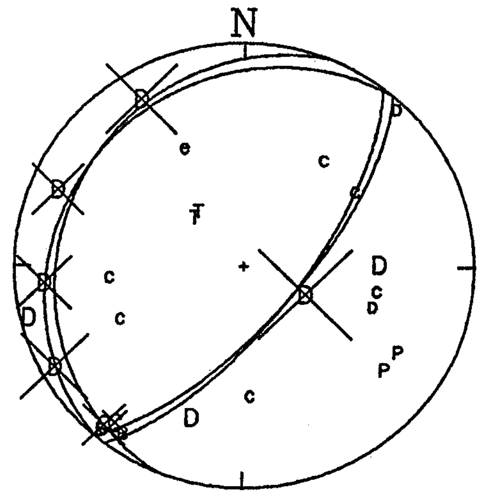
```
+47.445- 70.376F1MN=3.1 1624399 13031988 00.0020.005 0.2  7 14  90.09Z2 6.76   6 1ML=2.5 140F 0 0.00
CHARLEVOIX, QUE.
FELT ST-JOSEPH DE LA RIVE, LES EBOULEMENTS, BAIE ST PAUL, ILES AUX COUDES
FELT ST HILARION   INFO FROM LMQ OPERATOR
$ SBQ DEAD
$RATIO=  0.964 A16 244456D 0.13   -4829.79    6842.21 244796 0.12    44485.79
$RATIO=  0.596 A21 244966D 0.19    -716.18    2672.18 245664 0.15     2828.18
$RATIO= -0.114 A54 244117D 0.05  -96458.34   96458.34 244215 0.09    74186.34
$RATIO=  1.8   A61
$RATIO=  1.298 A64 244884C 0.08      96.90      99.10 245555 0.12     1923.10
$RATIO=  0.483 A11 244432D 0.16   -3860.80    7507.20 244715 0.11    11740.80
$RATIO=  1.042 LPQ 244509D 0.14    -810.09     957.91 244873 0.19     8918.09
A54   8803131624P            0.00 A244120D           A244212 015 1002733    0  0
A54    NW 0003KM       295-24     10  002            10  002   0114480 23ML36MN
LMQ   8803131624P            0.00 X24424 D                   000    0   0    0  0
LMQ    N  0012KM       018-61     00  021                      0000000 00ML00MN
A11   8803131624P            0.00 A244435D           A244745 010 100 186    0  0
A11    SE 0026KM       149-76     10  005            10 -008   0011687 17ML35MN
A16   8803131624P            0.00 A244457D           A244795 010 100 910    0  0
A16    E  0028KM       085-76     10  004            10  003   0057177 24ML42MN
LPQ   8803131624P           -0.22 A244512D           A244873 013 1001491    0  0
LPQ    SE 0030KM       113-77     10  000            10 -005   0072063 27ML43MN
A61   8803131624P            0.00 A244574C           A244979 013 100 110    0  0
A61    NE 0035KM       038-79     10  006            10 -013   0005317 18ML32MN
A64   8803131624P            0.00 A244884C           B245542 008 100  74    0  0
A64    NE 0056KM       040-83     10 -018            03 -030   0005812 20ML28MN
A21   8803131624P            0.00 A244966D           A245672 013 100 242    0  0
A21    NE 0059KM       061-83     10  014            10  012   0011696 26ML31MN
QCQ   8803131624P                XB24559 -
QCQ    SW 0101KM       223-86     00 -033                      0000000 00ML00MN
SLQ   8803131624P            0.00 X25022 D           X25157  000    0   0    0  0
SLQ    E  0106KM       076-86     00  518            00  608   0000000 00ML00MN
EBN   8803131624P  X250794D  -0.22                   X252495 010 100  45    0  0
EBN    E  0161KM 00  125 089 49                      00 -035   0002827 24ML32MN
CBM   8803131624P  X250880-
CBM    E  0180KM 00 -003 108 49                                0000000 00ML00MN
JKM   8803131624P  X251195+                          X25343
JKM    S  0199KM 00  078 177 49                      00 -151   0000000 00ML00MN
DPQ   8803131624P XA251126+  -0.06                   X253487 023 100  76    0  0
DPQ    SW 0201KM 00 -019 246 49                      00 -156   0002076 29ML32MN
HTQ   8803131624P  X251640+  -0.07                   X254409 013 100  25    0  0
HTQ    NE 0244KM 00 -022 036 49                      00 -420   0001208 26ML31MN
GSQ   8803131624P XA252302+  -0.22           X255115 X260141 030 100  33    0  0
GSQ    NE 0293KM 00  023 055 49              00 -326 00 -078   0000691 30ML30MN
KLN   8803131624P  X252389+  -0.29                   X255861 020 100  15    0  0
KLN    E  0311KM 00 -121 101 49                      00 -880   0000471 27ML29MN
TRQ   8803131624P  X252919   -0.09           X260703 X261500 0071000  84    0  0
TRQ    W  0347KM 00 -010 248 49              00  118 00 -219   0000754 26ML32MN
MNQ   8803131624P  X253148   -0.10                   X261856 003 100 176    0  3
MNQ    N  0363KM 00  023 018 49                      00 -320   0036861 40ML49MN
GRQ   8803131624P  X253791   -0.09           X262486 X263399 020 100  18    0  0
GRQ    W  0427KM 00 -114 259 49              00  197 00 -576   0000565 33ML32MN
EEO   8803131624P XA260619+  -0.06
EEO    W  0667KM 00 -207 265 49                                0000000 00ML00MN
JAQ   8803131624P XB262398E  -0.07
JAQ    NW 0802KM 00 -076 334 49                                0000000 00ML00MN
             Z
```

19880313 16:24 MN=3.1 47.445N 70.376W 6.76 KM

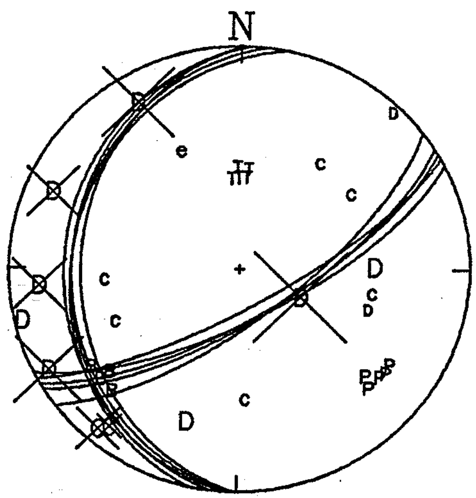
A54	295.000	-24.000	D		strong
A54	295.000	-24.000	R	-0.114	
LMQ	018.000	-61.000	D		strong, analog
A11	149.000	-76.000	D		
A11	149.000	-76.000	R	0.483	
A16	085.000	-76.000	D		very strong S
A16	085.000	-76.000	R	0.964	
LPQ	113.000	-77.000	D		strong S
LPQ	113.000	-77.000	R	1.042	
A61	038.000	-79.000	C		extremely weak
A61	038.000	-79.000	R	1.8	redone off playout
A64	040.000	-83.000	C		weak but definite
A64	040.000	-83.000	R	1.298	
A21	061.000	-83.000	D		not strong
A21	061.000	-83.000	R	0.596	
QCQ	223.000	-86.000	-		analog, low gain, poor
SLQ	076.000	-86.000	D		good
EBN	089.000	49.000	D		good
CBM	108.000	49.000	-		Weston data from bulletin
JKM	177.000	49.000	+		Weston data from bulletin
DPQ	246.000	49.000	+		weak beginning
HTQ	036.000	49.000	+		ok
GSQ	055.000	49.000	+		ok
KLN	101.000	49.000	+		apparently ok
EEO	265.000	49.000	+		noisy trace
JAQ	334.000	49.000	e		



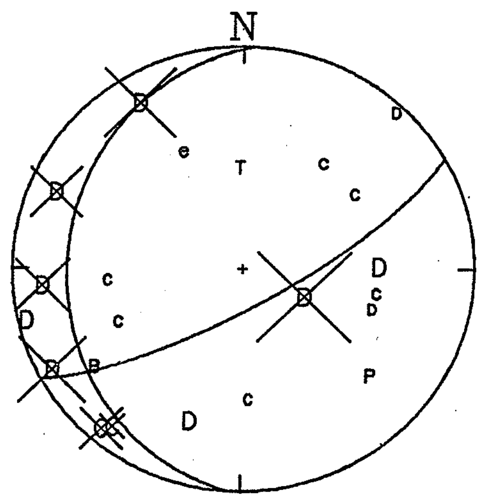
DATA 880313



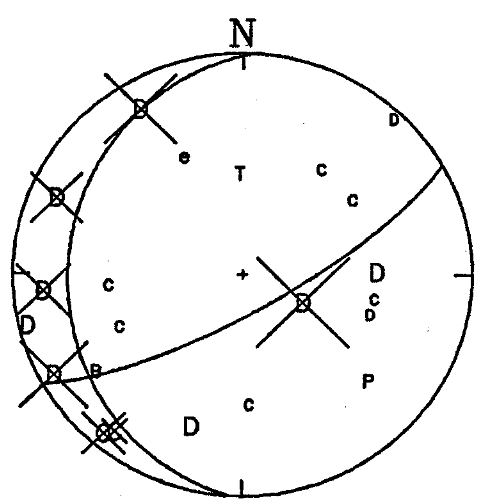
P1 R7



P1.5 R3



P1.5 R2



BEST SOLUTION

Seismic Zone: St Lawrence Valley

Magnitude : 3.1 MN

Location : 47.03N 70.82W (Beaupre, Quebec)

Date(Y/M/D) : 1988 05 12

Time(UT) : 06:16

Depth:

closest station: QCQ (45 km)
free depth = 14 km, based on close Pg, Sg, and some Pn

Quality of Readings:

good arrivals on CHV array, though some P amplitudes are weaker than others. These correlate better with distance than azimuth.
EBN and perhaps MNQ look nodal
JOQ polarity uncertain
could use some more Pn polarities

Comments:

Solution not dependent on exact depth.
All solutions misfit LMN and CKO half-weight polarities and ratios on A11 (P too strong) and A61 (P too weak)
Mechanism is fairly well defined without using ratios
Best solution is chosen from P1 R2 to minimise the ratio errors on the fitted ratios; but is not obviously better than the others of the subset
Chosen mechanism represents thrust faulting on NW-trending planes in response to compression from the NE

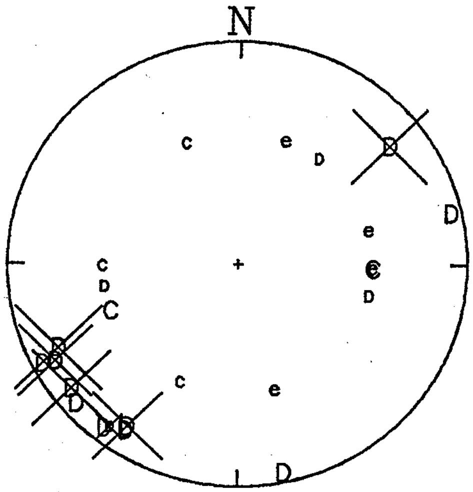
Best Solution:

Strike, Dip, Rake	296	51	77
Strike, Dip, Rake	137	41	105
Trend & Plunge of P	036	05	
Trend & Plunge of T	152	79	
Trend & Plunge of B	305	10	

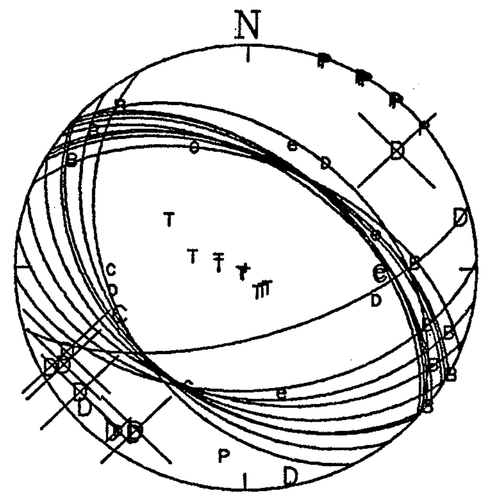
```
+47.035- 70.819F1MN=3.1 0616191 12051988 00.0140.019 0.3 17 19 170.42Z214.15  14 1ML=2.7 170  0 0.00
$ MOST CHV ARRAY READINGS NOT USED IN ORDER TO AVOID BIAS
$ POLARITY OF JOQ NOT CERTAIN
$RATIO=  0.36  QCQ
$RATIO=  0.424 LPQ                   481                              1278
$RATIO=  0.058 A11 162821D 0.10    -2847.76      3168.24 163477 0.09     3251.76
$RATIO=  0.313 A16 163215D 0.09    -1840.83      2031.17 164183 0.14     3784.83
$RATIO=  0.537 A54 162866D 0.09    -1393.85      2398.15 163577 0.07     4802.15
$RATIO=  1.742 A61 163395- 0.06      -30.89        34.89 164553 0.06     1707.11
QCQ  8805120616P              +1.9  A16246 D             A16305  030  36  9
QCQ   SW 0045KM          231-73      14 -025             14  004   0005236 24ML33MN
A11  8805120616P                   XA162822D            XB163478 010 100  69           163500
A11   NE 0053KM          064-75      00  031             00  040   0004335 20ML26MN
A54  8805120616P                    A162867D             A163578 005 100 231           163687
A54   NE 0056KM          033-76      14  019             14  041   0029028 25ML35MN
LMQ  8805120616P                   XA16302 D            XB16385
LMQ   NE 0068KM          033-78      00 -018             00 -016   0000000 00ML00MN
LPQ  8805120616P             -0.22XA163120D            XA164004 020 100 310           164018
LPQ   NE 0070KM          061-79      00  030             00  063   0009739 28ML32MN
A16  8805120616P                   XA163216D            XA164183 015 100 169           164235
A16   NE 0078KM          052-80      00  025             00  051   0007079 26ML31MN
A61  8805120616P                    A163395-            XB164554 010 100  58           164578
A61   NE 0092KM          037-81      14 -014             00  043   0003644 22ML29MN
A64  8805120616P                   XA163695D            XA165080 013 100  76           165115
A64   NE 0113KM          038-83      00 -048             00 -011   0003673 24ML31MN
A21  8805120616P                   XA163744D             X165147
A21   NE 0113KM          048-83      00 -009             00  038   0000000 00ML00MN
SLQ  8805120616P                    A16436 D
SLQ   NE 0154KM          062-85      14 -043                       0000000 00ML00MN
DPQ  8805120616P             -0.06XA16428 D            XB170119 010 100  63           170405
DPQ   W  0155KM          256-85      00 -143             00 -148   0003958 25ML33MN
JOQ  8805120616P                   XA16437 D            XB17032
JOQ   N  0156KM          348-85      00 -066             00  026   0000000 00ML00MN
JKM  8805120616P           E
JKM   S  0160KM          164 49                                    0000000 00ML00MN
EBN  8805120616P  B16507 E  -0.22              X171413            023 100  80           171642
EBN   E  0201KM 04  072 075 49                 00  146             0002185 29ML33MN
SBQ  8805120616P  C165004   -0.07                     X171437 013 100 295           171911
SBQ   SW 0203KM 01 -007 205 49                         00 -188   0014258 35ML41MN
CBM  8805120616P           E
CBM   E  0206KM          092 49                                    0000000 00ML00MN
DVT  8805120616P           +
DVT   SW 0253KM          205 49                                    0000000 00ML00MN
MNT  8805120616P  B165821   -0.06              X172861 X173394 010 100  15           173502
MNT   SW 0275KM 04 -068 233 49                 00  027 00 -249   0000942 25ML31MN
HTQ  8805120616P  B170227-  -0.07              X173532 X174419 017 100  24           174684
HTQ   NE 0300KM 04  032 036 49                 00  165 00  076   0000887 28ML32MN
KLN  8805120616P  A170697C  -0.29              X174265          0101000  56           174372
KLN   E  0339KM 14  000 092 49                 00  038             0000352 24ML28MN
GSQ  8805120616P  B170901   -0.22                      X175350 027 100  21           175578
GSQ   NE 0347KM 04  119 052 49                         00 -315   0000489 30ML30MN
GAC  8805120616P  A171335C  -0.06                      X180189 033 100  16           180915
GAC   W  0388KM 14  072 249 49                         00 -607   0000305 31ML29MN
WBO  8805120616P  C171572   -0.06              X180014 X181410 0131000  68           181425
WBO   SW 0413KM 01  008 238 49                 00  257 00 -078   0000329 28ML30MN
MNQ  8805120616P  B171677E  -0.10              X180084 X181379 023 100  16
MNQ   N  0417KM 04  048 020 49                 00  218 00 -241   0000437 32ML31MN
LMN  8805120616P  B172452-  -0.29
LMN   E  0481KM 04  035 104 49                                   0000000 00ML00MN
CKO  8805120616P  B172771-  -0.06



CKO   W  0522KM 04 -127 260 49                                   0000000 00ML00MN
EEO  8805120616P  C174384+  -0.06              X184457 X190906 043 100  15           191992
EEO   W  0631KM 01  151 269 49                 00  044 00 -703   0000219 37ML31MN
JAQ  8805120616P  A180591+  -0.07
JAQ   NW 0830KM 14 -062 337 49                                   0000000 00ML00MN
             Z
```

19880512 06:16 MN=3.1 47.035N 70.819W 14.15 KM

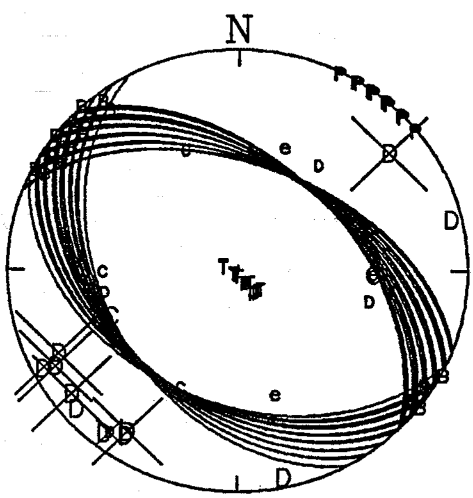
QCQ	231.000	-73.000	D		strong
QCQ	231.000	-73.000	R	0.36	
A11	064.000	-75.000	D		strong
A11	064.000	-75.000	R	0.058	
A54	033.000	-76.000	D		moderate
A54	033.000	-76.000	R	0.537	
LMQ	033.000	-78.000	D		good
LPQ	061.000	-79.000	D		strong
LPQ	061.000	-79.000	R	0.424	
A16	052.000	-80.000	D		strong
A16	052.000	-80.000	R	0.313	
A61	037.000	-81.000	-		v weak
A61	037.000	-81.000	R	1.742	
A64	038.000	-83.000	D		moderate
A21	048.000	-83.000	D		weak
SLQ	062.000	-85.000	D		good
DPQ	256.000	-85.000	D		good polarity
JOQ	348.000	-85.000	D		down; polarity not certain
JKM	164.000	49.000	e		emergent
EBN	075.000	49.000	e		emergent
CBM	092.000	49.000	e		emergent
DVT	205.000	49.000	+		goes down; polarity was reversed
HTQ	036.000	49.000	-		weak
KLN	092.000	49.000	C		ok
GAC	249.000	49.000	C		ok
MNQ	020.000	49.000	e		emergent
LMN	104.000	49.000	-		weak
CKO	260.000	49.000	-		weak
EEO	269.000	49.000	+		ok
JAQ	337.000	49.000	+		ok



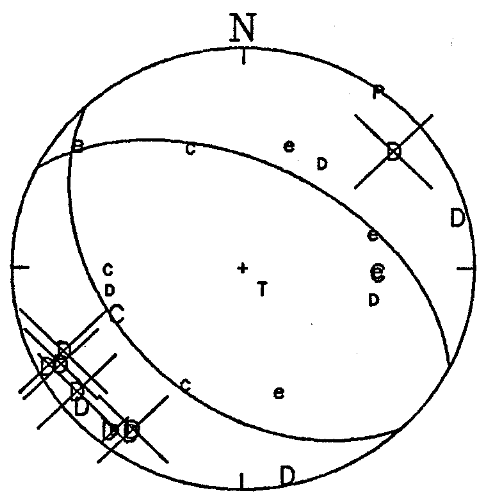
880512 DATA



P1 R6 INC 10



P1 R2



880512.PFB

Seismic Zone: Western Quebec

Magnitude : 3.3 MN

Location : 45.172N 75.624W
(Osgoode, Ont.)

Date(Y/M/D) : 88 05 15

Time(UT) : 0610

Depth:

closest station: OTT (26 km)
free depth = 8.7 km
pegged at 18 km for solution

Quality of Readings:

Strong readings on OTT, WBO, GAC, also on up-state NY data from Revetta
DPQ is a good reading but time fits poorly
Many of Woodward Clyde arrivals are emergent
Mechanism is constrained by oppossing polarities on WBO and Revetta's stations

Comments:

For an 8 km depth it is hard to fit a plane between WBO and Revetta's stations without misfitting one of WBO, OTT or GAC (e.g. P4 R3 Z=9)
When pegged at 18 km depth the different take-off angles for WBO and GAC make a thrust solution possible
P2 R2 Z=18 INC 3 misfits half-weight polarities at OSWG, GLOV, STWA and JAQ/NO and includes one solution that misfits only the OTT polarity. This is chosen as the best solution
The best solution represents thrust faulting on NW-trending planes in response to compression from the northeast.

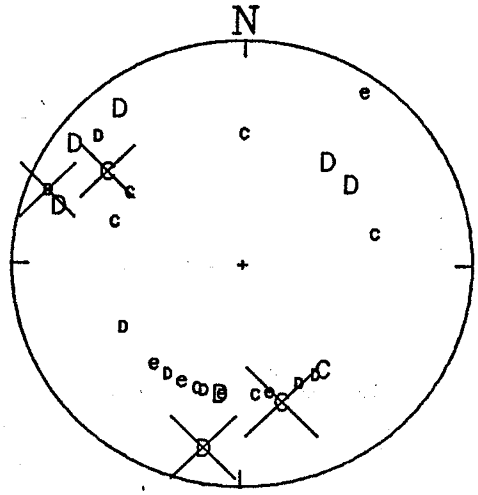
Best Solution:

Strike, Dip, Rake	291	46	077
Strike, Dip, Rake	129	46	103
Trend & Plunge of P	210	00	
Trend & Plunge of T	120	81	
Trend & Plunge of B	300	09	

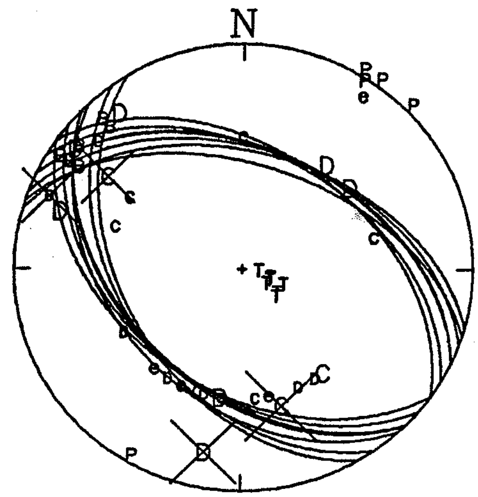
```
+45.172- 75.624F1MN=3.3 0610054 15051988 00.0130.027 0.3 30 33 160.75 218.00    0 1ML=3.3 100F 0 3.65
$ FREE DEPTH LOCATION
$45.151- 75.615F1MN=3.3 0610054 15051988 00.0050.010 0.3 30 33 160.2722 8.72    7 1ML=3.3 100F 0 3.65
FELT AND HEARD IN MANOTICK,                RESSENTI ET ENTENDU A MANOTICK,
OSGOODE, CARSONBY, WESTERN OTTAWA          OSGOODE, CARSONBY, OUEST D'OTTAWA
ONTARIO                                    ONTARIO
$ LAST LARGE EVENT - MN=4.1 OCTOBER 11/83
$RATIO=  0.643 GAC 101536D 0.24    -1627.60    2008.60 102247 0.26     7152.60
$RATIO=  0.476 OTT 101023C 0.12     1356.80    1971.20 101365 0.08     4060.80
$RATIO=  0.980 WBO 101087C 0.08      288.22
$RATIO=  0.94  BGR
OTT   880515061OP             -0.06 A101025C           A101371 007 100 597     0  0
OTT    N  0026KM          344-55    23 -030            23 -039   0053587 22ML41MN
WBO   880515061OP             -0.06 A101088C           B101485 010 100 856     0  0
WBO    SE 0033KM          125-62    23 -071            06 -103   0053784 26ML42MN
GAC   880515061OP             -0.06 A101537D           B102269 020 100 182     0  3
GAC    N  0060KM          011-73    23 -024            06  000   0005718 25ML28MN
MSNY  880515061OP                   B10155 D
MSNY   E  0063KM          108-74    06 -048                      0000000 00ML00MN
NO    880515061OP                   B10158 -
NO     SE 0065KM          132-75    06 -051                      0000000 00ML00MN
PTN   880515061OP                   B10185 D
PTN    SE 0084KM          142-78    06 -071                      0000000 00ML00MN
LOZ   880515061OP                   B10213 D
LOZ    SE 0103KM          126-80    06 -095                      0000000 00ML00MN
BGR   880515061OP                   B10216 -
BGR    E  0106KM          111-80    06 -110                      0000000 00ML00MN
RSNY  880515061OP              0.00 C10226                     000    0    0     0  0
RSNY   SE 0111KM          128-81    01 -093                      0000000 00ML00MN
KGN   880515061OP                         E
KGN    SW 0126KM          214-82                                 0000000 00ML00MN
MNT   880515061OP XB103052+  -0.06                     B104920 013 100 111     0  0
MNT    E  0161KM 00 -031 076 49                        06 -070   0005365 28ML35MN
LCNA  880515061OP  B103204E                            X105201
LCNA   S  0172KM 06 -002 188 49                        00 -065   0000000 00ML00MN
ILNY  880515061OP  B103445C                            X105811
ILNY   SE 0193KM 06 -027 143 49                        00 -046   0000000 00ML00MN
OSWG  880515061OP  B103568+                            X105745
OSWG   S  0195KM 06  085 199 49                        00 -147   0000000 00ML00MN
BVNY  880515061OP  B103568+                            X105811
BVNY   S  0195KM 06  076 174 49                        00 -093   0000000 00ML00MN
WMNY  880515061OP  B103697D                            X110074
WMNY   S  0204KM 06  091 189 49                        00 -090   0000000 00ML00MN
ABRN  880515061OP  B104376-                            X1112
ABRN   S  0251KM 06  196 196 49                        00 -248   0000000 00ML00MN
WEO   880515061OP  B104240-   -0.07                   XB111714 013 100 241     0  3
WEO    SW 0253KM 06  031 241 49                        00  208   0011648 36ML42MN
GLOV  880515061OP  B104256-                            X111086
GLOV   SE 0254KM 06  051 155 49                        00 -418   0000000 00ML00MN
PHEL  880515061OP  C10457 E                            X111797
PHEL   SW 0273KM 01  125 206 49                        00 -246   0000000 00ML00MN
DPQ   880515061OP  A104626D   -0.06           XB111674           020 100  78     0  0
DPQ    NE 0277KM 23  125 052 49                00  291           0002450 33ML35MN
CPNY  880515061OP  B104592E                            X111815
CPNY   S  0281KM 06  053 168 49                        00 -434   0000000 00ML00MN
STWA  880515061OP  B104756-                            X112078
STWA   SE 0291KM 06  096 147 49                        00 -450   0000000 00ML00MN
SBQ   880515061OP  C104768    -0.07                   XC112315 037 100 712     0  0
SBQ    E  0291KM 01  097 084 49                        00 -225   0012091 43ML43MN
LILH  880515061OP  X105035-                            X112387


LILH   SW 0297KM 00  302 213 49                        00 -302   0000000 00ML00MN
EEO   880515061OP  B105041+   -0.06                   XB113012 023 100  65     0  0
EEO    NW 0314KM 06  094 303 49                        00 -145   0001776 34ML35MN
DHN   880515061OP  C10516      0.00                            000    0    0     0  0
DHN    SW 0332KM 01 -010 219 49                                  0000000 00ML00MN
ATNY  880515061OP  X105682                             X113555
ATNY   SW 0340KM 00  424 220 49                        00 -306   0000000 00ML00MN
SUO   880515061OP XB110894     0.00                    X120573 030 100  33     0  0
SUO    W  0441KM 00  408 290 49                        00 -048   0000691 36ML33MN
SWO   880515061OP  B110739     0.00                    X120861 030 100  39     0  0
SWO    NW 0452KM 06  117 295 49                        00 -063   0000817 37ML34MN
TBR   880515061OP  C11081      0.00                            000    0    0     0  0
TBR    S  0462KM 01  061 165 49                                  0000000 00ML00MN
SZO   880515061OP  C111206+    0.00                    X121563 030 100  25     0  0
SZO    W  0478KM 01  264 289 49                        00 -080   0000524 35ML33MN
LPQ   880515061OP XC111821    -0.22                   XB122028 027 100  36     0  0
LPQ    NE 0496KM 00  643 059 49                        00 -123   0000838 37ML35MN
EBN   880515061OP             -0.22                            0171000  29     0  0
EBN    NE 0623KM         063 49                                  0000107 30ML28MN
GGN   880515061OP             -0.29                    X131689 033 100  13     0  0
GGN    E  0692KM         087 49                                00  145   0000248 37ML32MN
HTQ   880515061OP             -0.07                    X131611 037 100  18     0  0
HTQ    NE 0707KM         048 49                        00 -315   0000306 39ML33MN
KLN   880515061OP             -0.29                    X133148 0401000  79     0  0
KLN    E  0740KM         072 49                        00  291   0000124 36ML30MN
GSQ   880515061OP             -0.22                    X133160 053 100  24     0  0
GSQ    NE 0769KM         054 49                        00 -478   0000285 41ML33MN
MNQ   880515061OP  B114886D   -0.10                    X134472 030 100  14     0  0
MNQ    NE 0786KM 06  173 038 49                        00  378   0000293 39ML34MN
LMN   880515061OP             -0.29                    X140312 0601000  79     0  0
LMN    E  0849KM         081 49                        00  489   0000083 38ML29MN
JAQ   880515061OP  B120952+   -0.07           X134260 X143061 0271000  73     0  0
JAQ    N  0961KM 06  115 360 49               00  334 00  188   0000170 39ML33MN
             Z
```

19880515 06:10 MN=3.3 45.172N 75.625W 18.00 KM

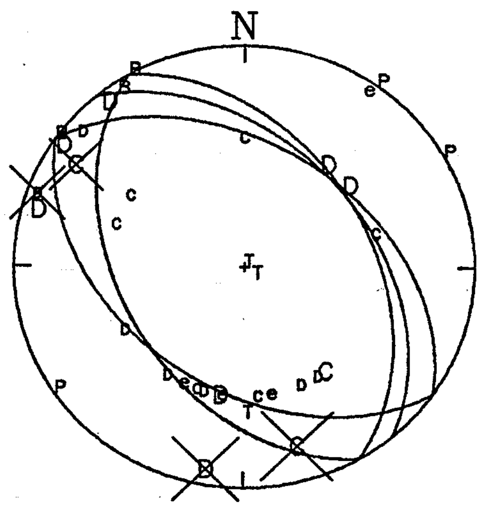
OTT	344.000	-54.000	C		strong
OTT	344.000	-54.000	R	0.476	Sv is up
WBO	125.000	-61.000	C		weak P
WBO	125.000	-61.000	R	0.980	
GAC	011.000	-73.000	D		strong
GAC	011.000	-73.000	R	0.643	
MSNY	108.000	-73.000	D		good, analog
NO	132.000	-74.000	-		goes W therefore -
PTN	142.000	-77.000	D		good, analog
LOZ	126.000	-80.000	D		goes up therefore D
BGR	111.000	-80.000	-		low gain from analog
BGR	111.000	-80.000	R	0.94	from analog
KGN	214.000	-82.000	e		not available
MNT	076.000	49.000	+		weak but probably up
LCNA	188.000	49.000	e		emergent
ILNY	143.000	49.000	C		WCC data; good
OSWG	199.000	49.000	+		WCC data
BVNY	174.000	49.000	+		WCC data
WMNY	189.000	49.000	D		WCC data; good
ABRN	196.000	49.000	-		WCC data
WEO	241.000	49.000	-		ok
GLOV	155.000	49.000	-		WCC data, weak beg. then C
PHEL	206.000	49.000	e		WCC data, weak beg. then C
DPQ	052.000	49.000	D		good
CPNY	168.000	49.000	e		WCC data
STWA	147.000	49.000	-		WCC data
LILH	213.000	49.000	-		WCC data
EEO	303.000	49.000	+		ok
ATNY	220.000	49.000	e		WCC data
SZO	289.000	49.000	+		ok when filtered
MNQ	038.000	49.000	D		ok
JAQ	360.000	49.000	+		marginally above noise



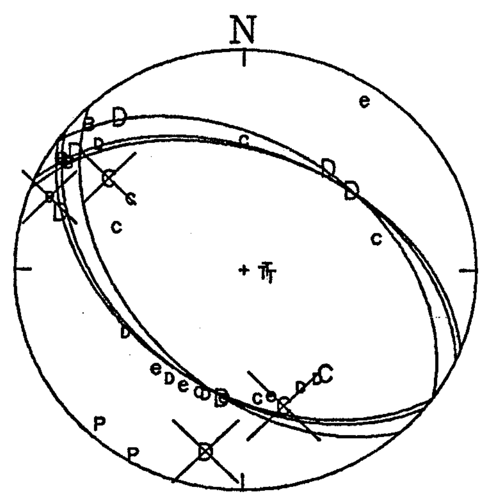
DATA 880515



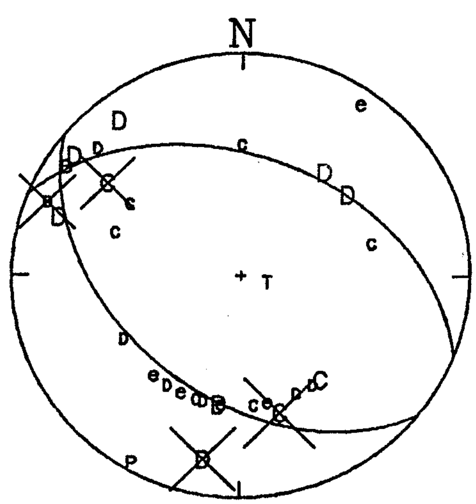
P3 R4 Z=18



P4 R3 Z=9



P2 R2 Z=18 INC 3



BEST 880515

Seismic Zone: Western Quebec

Magnitude : 3.4 Mn

Location : 45.008N 75.000W
(Ingleside, Ont.)

Date(Y/M/D) : 1988 08 09

Time(UT) : 1357

Depth:
closest station: MSNY 11 km
free depth = 9.4 km

Quality of Readings:
Impulsive readings from N.Y. State and close ECTN
OTT and TRQ P's are not very strong
OTT ratio value probably in error because SV weak and P first cycle is weak relative to P coda

Comments:
All solutions misfit TRQ polarity and OTT ratio.
All the solutions that do not use ratios (P0.5 R3) are generally similar thrust mechanisms.
'Best solution' has the lowest ratio error on OTT and also comes close to making TRQ nodal. It represents thrust faulting on N- or NW-trending planes in response to compression from the ENE.

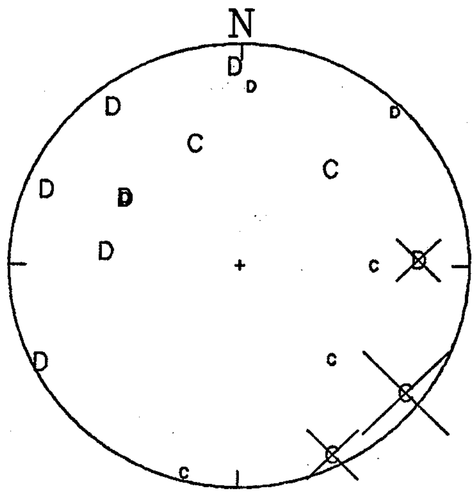
Best Solution:

Strike, Dip, Rake	310	40	044
Strike, Dip, Rake	183	63	120
Trend & Plunge of P	251	13	
Trend & Plunge of T	137	59	
Trend & Plunge of B	348	27	

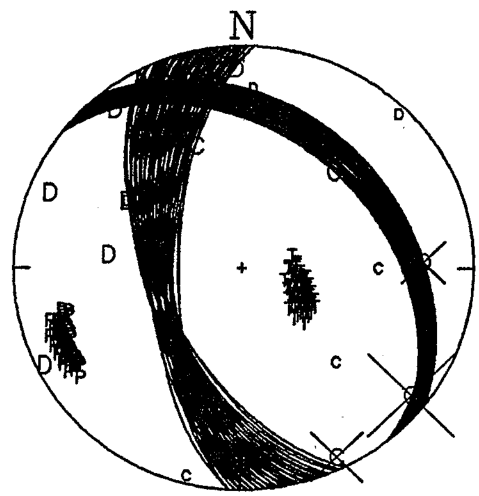
19880809 13:57 MN=3.4 45.008N 75.000W 9.41 KM

MSNY	096.000	-49.000	D		Revetta 'impulsive'
WBO	268.000	-67.000	D		clear
WBO	268.000	-67.000	R	1.264	strong S
NO	183.000	-70.000	-		went E therefore -
PTN	178.000	-79.000	D		Revetta 'impulsive'
BGR	112.000	-80.000	D		Revetta 'impulsive'
LOZ	142.000	-80.000	D		went up but pol. rev.
OTT	308.000	-82.000	C		P not very strong
OTT	308.000	-82.000	R	0.085	weak Sv
GAC	334.000	-84.000	C		good
GAC	334.000	-84.000	R	1.045	
MNT	063.000	-86.000	D		OK
CHAU	224.000	-86.000	-		from WCC letter
TRQ	014.000	-86.000	+		very weak
GRQ	340.000	49.000	C		good
CKO	301.000	49.000	-		weak
DVT	090.000	49.000	+		Weston Bulletin 'C'
IVT	136.000	49.000	+		Weston Bulletin 'C'
DPQ	042.000	49.000	C		good
EEO	301.000	49.000	D		OK

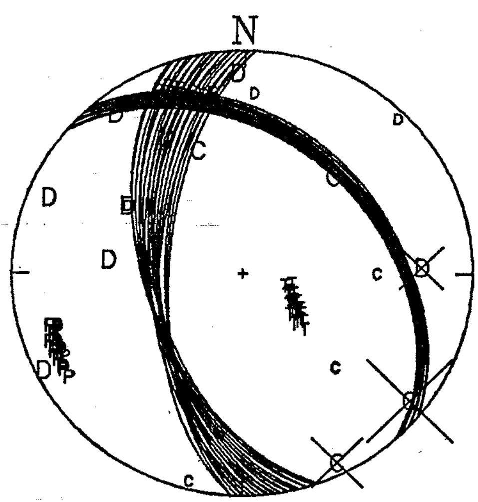
```
+45.008- 75.000F1MN=3.4 1357278 09081988 00.0070.008 0.2 22 31 110.4222 9.41  11 1ML=2.8  90F 0 0.00
NEAR CORNWALL, ONT.                        PRES DE CORNWALL, ONT.
FELT                                       RESSENTI
$RATIO=  1.264 WBO 573199D 0.12    -840.74    1351.26 573486 0.11    15453.74
$RATIO=  1.045 GAC 574207C 0.18    1430.01    1712.99 575223 0.35    15850.01
$RATIO=  0.085 OTT 573967C 0.09     303.24     303.24 574807 0.09      368.76
$ NEIS SAYS POLARITY OF RSNY IS NOT KNOWN
MSNY 8808091357P                  A573045D            A573199
MSNY  E  0011KM          096-49   13  024             13  006   0000000 00ML00MN
WBO  8808091357P            -0.06 A573200D            A573487 007 1001416     0  0
WBO   W  0022KM          268-67   13  023             13  028   0127100 24ML44MN
NO   8808091357P                  A57325 -           XB57385
NO    S  0026KM          183-70   13  019             00  293   0000000 00ML00MN
PTN  8808091357P             0.00 B573589D           XB57440        000   0   0     0  0
PTN   S  0048KM          178-79   03  006             00  232   0000000 00ML00MN
BGR  8808091357P                  A57365 D            B57430
BGR   E  0053KM          112-80   13 -011             03 -005   0000000 00ML00MN
LOZ  8808091357P                  A57365 D           XB57450
LOZ   SE 0054KM          142-80   13 -030             00  163   0000000 00ML00MN
RSNY 8808091357P             0.00 B57379                     000   0   0     0  0
RSNY  SE 0063KM          144-82   03 -030                       0000000 00ML00MN
OTT  8808091357P            -0.06 A573966C            B574808 010 100 254     0  0    574877
OTT   NW 0071KM          308-82   13  018             03  010   0015959 27ML34MN
GAC  8808091357P            -0.06 A574206C            A575223 020 100 235     0  3
GAC   NW 0086KM          334-84   13  017             13  006   0007383 28ML32MN
MNT  8808091357P            -0.06 A574712D            B580153 007 100  69     0  0
MNT   NE 0121KM          063-86   13 -045             03 -050   0006193 24ML34MN
CHAU 8808091357P                        -
CHAU  SW 0134KM          224-86                                 0000000 00ML00MN
TRQ  8808091357P            -0.09 A575029+            A580733 010 100 138     0  0
TRQ   N  0139KM          014-86   13 -023             13  019   0008671 28ML36MN
GRQ  8808091357P  A575797C  -0.09                     B582042 010 100  53     0  0
GRQ   N  0190KM 13  019 340 49                        03 -085   0003330 26ML34MN
CKO  8808091357P  A580080-  -0.06 A580245            XB582907 010 100  40     0  0
CKO   NW 0221KM 13 -070 301 49    13 -114          -  00 -078   0002513 27ML34MN
DVT  8808091357P  B580258+
DVT   E  0223KM 03  082 090 49                                  0000000 00ML00MN
IVT  8808091357P  B580256+
IVT   SE 0227KM 03  038 136 49                                  0000000 00ML00MN
SBQ  8808091357P  C580634   -0.07                    XC583672 060 100 180     0  0
SBQ   E  0245KM 01  186 079 49                        00  006   0001885 34ML33MN
DPQ  8808091357P  A580610C  -0.06              X583369XC583626 010 100  37     0  0
DPQ   NE 0254KM 13  058 042 49                 00  030 00 -284   0002325 28ML35MN
WEO  8808091357P  C581251   -0.07              X584247          010 100 160     0  3
WEO   W  0290KM 01  256 249 49                 00  137          0010053 36ML42MN
EEO  8808091357P  A581967D  -0.06                    XC590732 020 100  40     0  0
EEO   NW 0365KM 13  056 301 49                        00 -292   0001257 34ML35MN
EBN  8808091356P  C584718   -0.22
EBN   NE 0588KM 01  069 060 49                                  0000000 00ML00MN
KLN  8808091357P  C590023   -0.29                              0071000  45     0  0
KLN   E  0700KM 01  008 070 49                                  0000404 33ML34MN
MNQ  8808091357P  B590880   -0.10             XB602507XB605996 040 100  15     0  0
MNQ   NE 0771KM 03  007 035 49                 00  144 00 -414  0000236 39ML33MN
LMN  8808091357P            -0.29                    XC611609 083 100  12     0  0
LMN   E  0803KM          080 49                       00  294   0000091 38ML29MN
               Z
```



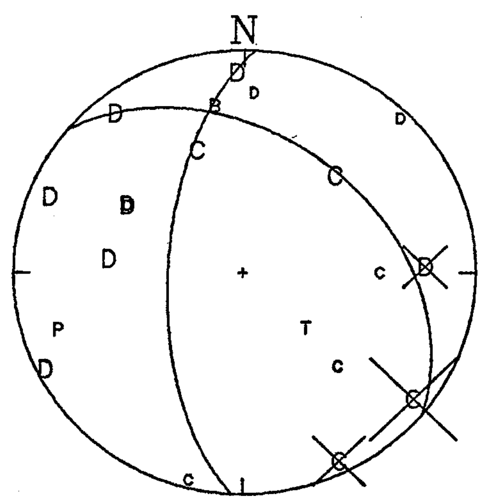
DATA 880809



P0.5 R3 INC 3



P0.5 R1 INC 3



BEST 880809

Seismic Zone: Western Quebec

Magnitude : 2.1 Mn

Location : 45.007N 74.987W (Ingleside, Ont.)

Date(Y/M/D) : 1988 08 11

Time(UT) : 0505

Depth:

closest station: MSNY 10 km
Free depth = 11.7 km
Pegged at depth of mainshock (9.4 km) for mechanism

Quality of Readings:

Weaker readings than for mainshock
OTT and TRQ P's are not very strong
Ratios measured off printouts for simplicity
OTT ratio value probably in error because SV weak and P first cycle is weak relative to P coda

Comments:

Same distribution of stations as for mainshock, though onsets are weaker as to be expected.
Same polarities as for mainshock except TRQ, which is poor for both
All solutions misfit OTT ratio.
All the solutions are generally similar thrust mechanisms, and as expected are similar to the mainshock preferred mechanism.
'Best solution' has the lowest ratio error on OTT and also comes close to making TRQ nodal. It represents thrust faulting on N- or NW-trending planes in response to compression from the ENE.
This mechanism is within 4 degrees of the mainshock strike, dip and rake.

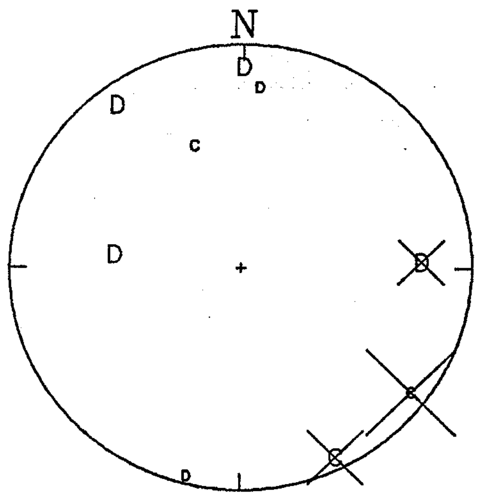
Best Solution:

Strike, Dip, Rake	314	38	047
Strike, Dip, Rake	184	63	118
Trend & Plunge of P	254	14	
Trend & Plunge of T	138	61	
Trend & Plunge of B	350	25	

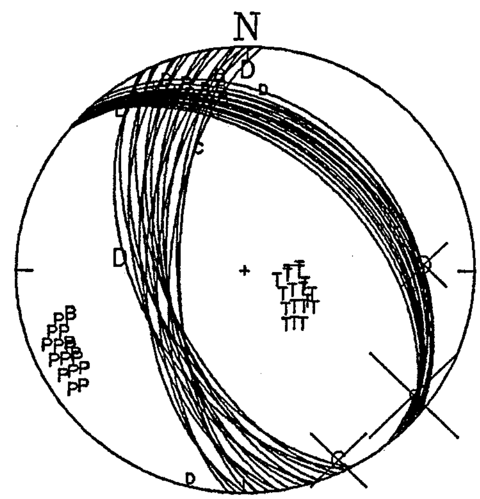
```
+45.007- 74.98701MN=2.1 0505390 11081988 00.0030.006 0.2 11 17  60.18 2 9.40    0 1ML=1.4  70  0 0.00
AFTERSHOCK OF THE 880809 13:57 EVENT    REPLIQUE DE L'EVENEMENT DU 880809 13:57
NEAR CORNWALL, ONT.                     PRES DE CORNWALL, ONT.
$ FREE LOCATION, PEGGED AT DEPTH OF MAIN SHOCK
$RATIO=  1.2   WBO
$RATIO=  0.9   GAC
$RATIO=  0.0   OTT
MSNY 8808110505P                  A05416 D           XB05434
MSNY  E  0010KM          096-46   13  032             00  050   0000000 00ML00MN
WBO  8808110505P           -0.06 A054320D           A054604 003 100 231            054609
WBO   W  0023KM          268-68   13  009             13  001   0048381 16ML40MN
NO   8808110505P                  A05435 -           XB05466
NO    S  0026KM          185-70   13 -001             00 -018   0000000 00ML00MN
PTN  8808110505P                  A05472 D           B05525
PTN   S  0048KM          180-79   13  019             03 -037   0000000 00ML00MN
LOZ  8808110505P                  A05477 D           XB05542
LOZ   SE 0054KM          143-80   13 -019             00 -019   0000000 00ML00MN
RSNY 8808110505P                  A05490
RSNY  SE 0063KM          145-81   13 -029                       0000000 00ML00MN
OTT  8808110505P           -0.06 B055085+           B055948 007 100  11            055990
OTT   NW 0072KM          307-83   03  005             03  009   0000987 13ML22MN
GAC  8808110505P           -0.06 A055317C           A060332
GAC   NW 0086KM          334-84   13  001             13 -017   0000000 00ML00MN
MNT  8808110505P           -0.06                     B061272 0071000  29            061776
MNT   NE 0120KM          062-86                       03 -024   0000260 10ML20MN
TRQ  8808110505P           -0.09 A060175-           B061849 0071000  60            061938
TRQ   N  0139KM          014-86   13  008             03  023   0000539 15ML24MN
GRQ  8808110505P  B060924+  -0.09                     B063181 0131000  31            063294
GRQ   N  0190KM 03   022 339 49                       03 -075   0000150 14ML21MN
CKO  8808110505P XB061367   -0.06                    XB064014 0101000  16            064069
CKO   NW 0222KM 00   088 301 49                       00 -115   0000101 13ML20MN
DPQ  8808110505P            -0.06                    XB064753 0171000  19            064895
DPQ   NE 0253KM          042 49                       00 -257   0000070 15ML19MN
              Z
```

19880811 05:05 MN=2.1 45.007N 74.987W 9.60 KM

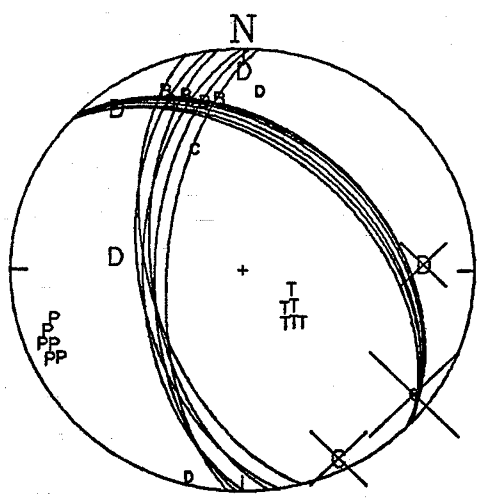
MSNY	096.000	-46.000	D		Revetta analog
WBO	268.000	-67.000	D		clear
WBO	268.000	-67.000	R	1.2	off printout, strong S
NO	185.000	-70.000	-		went E therefore -
PTN	180.000	-79.000	D		Revetta analog
LOZ	143.000	-80.000	D		Revetta analog
OTT	307.000	-82.000	+		noisy
OTT	307.000	-82.000	R	0.0	off printout
GAC	334.000	-84.000	C		OK
GAC	334.000	-84.000	R	0.9	off printout
TRQ	014.000	-86.000	-		
GRQ	339.000	49.000	+		poor



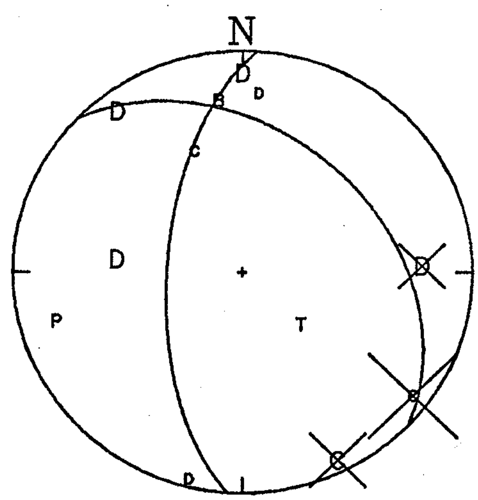
data 880811



P0 R3



P0 R1



BEST 880811

Seismic Zone: Saguenay

Magnitude : 4.7 MN
(Foreshock)

Location : 48.13 N 71.20 W

Date(Y/M/D) : 88 11 23

Time(UT) : 09:11

Depth:

closest station: LMQ (92 km)
free depth = 29 km (based on depth phases)

Quality of Readings:

EBN and MNQ are nodal ECTN sites
CLTN are all dilatations
Arctic stations give weak readings
QCQ plotted as Pg

Comments:

Ratios are not used for these solutions.
Solution 'P6 R7' misfits a number of good readings.
Solution 'P5 R7' has two subsets; one misfits KAO and MNQ, and sometimes QCQ; the other makes KAO and MNQ nodal and fits QCQ and it just misfits EEO and KLN polarities.
Solution 'P4.5 R7'includes only the first subset of data.
'Best solution' is chosen from the second subset. It fits polarity reversals on eastern ECTN and mixed polarities EEO/SLTN and KAO/GTO which suggest the two planes of the best solution are well constrained.
Mechanism represents thrust faulting on NNW-trending planes in response to ENE-directed compression. It differs from the main shock in that the east-dipping plane strikes more northerly and dips more gently than for the main shock.

Best Solution:

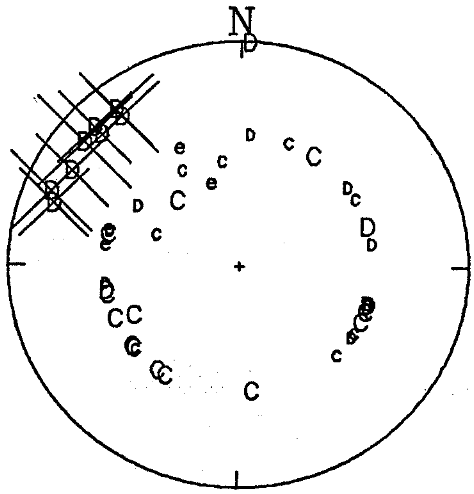
Strike, Dip, Rake	343	48	082
Strike, Dip, Rake	175	42	099
Trend & Plunge of P	078	03	
Trend & Plunge of T	195	83	
Trend & Plunge of B	348	06	

```
+48.132- 71.200F1MN=4.7 0911273 23111988 00.0240.023 0.4 28 36 180.00N229.00   0 1ML=4.4 170F 0 0.00
SAGUENAY REGION, QUEBEC                   REGION DU SAGUENAY, QUEBEC
IN LAURENTIDE PARK, QUEBEC                DANS LA RESERVE FAUNIQUE DES
35 KM S OF CHICOUTIMI                     LAURENTIDES. 35 KM AU SUD DE
FORESHOCK OF MAG. 6.0 EVENT OF            CHICOUTIMI.  PRECURSEUR DU MAG 6.0
25-11-1988.                               DU 25-11-1988.
FELT IN THE SAGUENAY AND CHARLEVOIX       RESSENTI AU SAGUENAY,
REGIONS, QUEBEC CITY AND                  DANS CHARLEVOIX, A QUEBEC ET A
TROIS-RIVIERES, QUE.                      TROIS-RIVIERES, QUE.
$ FOCAL MECHANISM MADE
$ EPICENTRE IS VERY CLOSE TO MAIN SHOCK FROM SEISMIC TRACES.
$ THIS EPICENTRE PEGGED AT CEEF ONE, DEPTH FIXED AT THE MAIN SHOCK DEPTH
$ QCQ CLOCK NOT WORKING
$ JAQ DOWN
$ S-WAVE POLARITY OF TANGENTIAL A54..D, A16..D
$ EBN POSSIBLE PG..D
$ EBN PN VERY NODAL
$RATIO= -0.133 A16 124682D 0.28  -31935.65    59648.35 12  95 0.13    23519.65
$RATIO=  0.185 A21 124761D 0.17  -20967.89    20967.89 12 241 0.09    32071.89
$RATIO=  0.450 A54 114355D 0.22  -64223.04   161056.97 115549 0.17   180959.03
$RATIO=  0.443 A61 114364D 0.16  -21710.29    21710.29 115565 0.13    60206.29
$RATIO=  0.567 A64 114466D 0.11  -13122.76    17042.76 115792 0.16    48429.24
$RATIO=  0.462 A11 124794D 0.38  -13781.74    36586.26 12 351 0.08    39914.26
$RATIO=  0.443 LPQ 124839D 0.21   -2201.40     2201.40 12 389 0.17     6110.60
$
JOQ  8811230911P                          C
JOQ   N  0031KM          354-47                                0000000 00ML00MN
LMQ  8811230911P             0.00 A11431 D                 000    0    0    0  0
LMQ   SE 0092KM          134-73    00  019                     0000000 00ML00MN
A54  8811230911P                   A114354D       A115533 017 1005176          115600
A54   SE 0096KM          142-73    00  012        00  003    0191305 41ML47MN
A61  8811230911P                   A114363D       A115588 020 1003045          115725
A61   SE 0096KM          120-73    00  009        00  037    0095661 39ML44MN
A64  8811230911P                   A114465D       A115792 017 1002194          120199
A64   E  0103KM          109-74    00  001        00  051    0081090 38ML44MN
A16  8811230911P                   A114683D       A120093 018 1001479          120215
A16   SE 0116KM          129-76    00  027        00  018    0051627 37ML42MN
A21  8811230911P                   A114762D       C120241 013 1001374          120634
A21   E  0123KM          112-77    00  000        00 -019    0066408 37ML44MN
A11  8811230911P                   A114791D       B120357 025 1002430          120502
A11   SE 0124KM          142-77    00  001        00  050    0061073 40ML44MN
LPQ  8811230911P            -0.22 A114840D        B120384 010 1001705          120775
LPQ   SE 0125KM          134-77    00  011        00  025    0107128 38ML46MN
QCQ  8811230911P                         D
QCQ   S  0151KM          182 49                              0000000 00ML00MN
SLQ  8811230911P  A1155  D
SLQ   E  0172KM 00  217 107 49                               0000000 00ML00MN
DPQ  8811230911P  A115789C  -0.06        XC122183 B122273 023 1006747          122289
DPQ   SW 0201KM 00  150 217 49            00  391 00 -143    0184316 48ML52MN
EBN  8811230911P  A120241-  -0.22                         027 1001383         1238460
EBN   E  0234KM 00  180 107 49                               0032184 43ML45MN
EBN  8811230911P            -0.22XB120441
EBN   E  0234KM          107-83    00 -114                   0000000 00ML00MN
HTQ  8811230911P  A120260+  -0.07                         010 100 642          123970
HTQ   NE 0238KM 00  164 059 49                               0040338 40ML47MN
SBQ  8811230911P  C121178   -0.07                         040 1004939          125676
SBQ   S  0311KM 00  188 191 49                               0077582 52ML51MN
GSQ  8811230911P  A121226D  -0.22                 XB125648 030 100 943         125729
GSQ   E  0315KM 00  180 072 49                    00  047    0019750 45ML45MN
MNQ  8811230911P  A121311C  -0.10


MNQ   NE 0320KM 00  206 033 49                               0000000 00ML00MN
TRQ  8811230911P  A121351C  -0.09                XB125656 033 1004673          130235
TRQ   SW 0332KM 00  106 231 49                    00 -407    0088974 53ML52MN
MNT  8811230911P  A121545C  -0.06
MNT   SW 0346KM 00  133 213 49                               0000000 00ML00MN
MIM  8811230911P  X12176     0.00                          000    0    0    0  0
MIM   SE 0361KM 00  169 152 49                               0000000 00ML00MN
GRQ  8811230911P  A122037C  -0.09
GRQ   SW 0391KM 00  074 246 49                               0000000 00ML00MN
KLN  8811230911P  A122086C  -0.29                          023 100 312          132794
KLN   E  0391KM 00  097 110 49                               0008523 44ML43MN
BNH  8811230911P  X12218     0.00                          000    0    0    0  0
BNH   S  0394KM 00  187 181 49                               0000000 00ML00MN
SIC  8811230911P  A12217 -
SIC   NE 0397KM 00  142 053 49                               0000000 00ML00MN
UNB  8811252346P XB12247 -
UNB   SE 0423KM 00  125 123 49                               0000000 00ML00MN
GAC  8811230911P  A122498C  -0.06
GAC   SW 0423KM 00  144 232 49                               0000000 00ML00MN
OTT  8811230911P XB123009+  -0.06
OTT   SW 0460KM 00  205 230 49                               0000000 00ML00MN
WBO  8811230911P  B123077   -0.06                XB133475 037 1001753          133745
WBO   SW 0468KM 00  180 223 49                    00 -394    0029769 54ML50MN
RSNY 8811230911P  X12296     0.00                          000    0    0    0  0
RSNY  SW 0474KM 00 -008 214 49                               0000000 00ML00MN
GGN  8811230911P  A123133+  -0.29XB124004                  040 100 568          135343
GGN   SE 0474KM 00  136 133 49    00 -418                    0008922 49ML45MN
CKO  8811230911P  A123671C  -0.06
CKO   SW 0531KM 00  002 246 49                               0000000 00ML00MN
LMN  8811230911P  A123994C  -0.29           XB133508XC140325 070 100 473       140679
LMN   SE 0549KM 00  087 115 49                00  287 00  177 0004246 49ML43MN
DNH  8811230911P  X13112     0.00                          000    0    0    0  0
DNH   S  0558KM 00 3136$177 49                               0000000 00ML00MN
EEO  8811230911P  A124760C  -0.06                XB142023 030 1002757          142190
EEO   W  0617KM 00  038 257 49                    00 -023    0057742 60ML55MN
HAL  8811230911P             +
HAL   SE 0702KM             121 49                           0000000 00ML00MN
LXQ  8811252346P XB12597 -
LXQ   NW 0709KM 00  143 333 49                               0000000 00ML00MN
SWO  8811230913P XB130393-
SWO   W  0755KM 00 -007 262 49                               0000000 00ML00MN
SUO  8811230913P XA130528D
SUO   W  0767KM 00 -007 259 49                               0000000 00ML00MN
GBN  8811252346P XB1311   -
GBN   E  0799KM 00  168 109 49                               0000000 00ML00MN
SZO  8811230913P XB130919
SZO   W  0801KM 00 -040 260 49                               0000000 00ML00MN
SCH  8811230911P  B13127 -
SCH   N  0805KM 00  263 021 49                               0000000 00ML00MN
SCH  8811230911P XB13127     0.00                          000    0    0    0  0
SCH   N  0805KM 00  263 021 49                               0000000 00ML00MN
KAO  8811230911P  A13139 C
KAO   W  0842KM 00 -063 284 49                               0000000 00ML00MN
GTO  8811252346P XB13529 D
GTO   W  1167KM 00 -133 285 49                               0000000 00ML00MN
TBO  8811252346P           E
TBO   W  1348KM             279 49                           0000000 00ML00MN
SIO  8811252346P XB14383 E
SIO   W  1522KM 00  078 286 49                               0000000 00ML00MN
RSON 8811230911P  X14509     0.00                          000    0    0    0  0
```

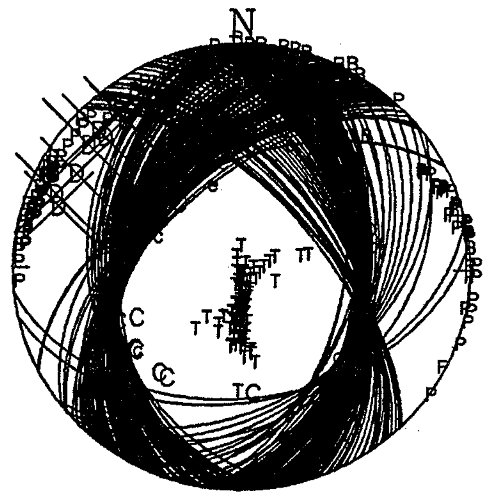
```
RSON   W  1653KM 00 -254 289 49          0000000 00ML00MN
FRB  8811252346P XB15055 -
FRB    N  1748KM 00  048 004 49          0000000 00ML00MN
ULM  8811252346P XB15077
ULM    W  1807KM 00 -411 287 52          0000000 00ML00MN
FCC  8811252346P XB15215
FCC    NW 1912KM 00 -224 317 50          0000000 00ML00MN
FFC  8811252346P XB15592 -
FFC    NW 2244KM 00  027 301 43          0000000 00ML00MN
BLC  8811252346P XB16120 +
BLC    NW 2342KM 00  349 329 41          0000000 00ML00MN
IGL  8811230911P XB16195 -
IGL    N  2440KM 00  166 350 39          0000000 00ML00MN
SES  8811252346P XB16595
SES    W  2878KM 00  353 290 34          0000000 00ML00MN
YKC  8811252346P XA171634C
YKC    NW 3098KM 00  260 317 33          0000000 00ML00MN
PNT  8811252346P XB1750   +
PNT    W  3506KM 00  364 291 32          0000000 00ML00MN
MBC  8811252346P          E
MBC    N  3795KM          341 32          0000000 00ML00MN
              Z
```

19881123 09:11 MN=4.7 48.132N 71.200W 29.00 KM

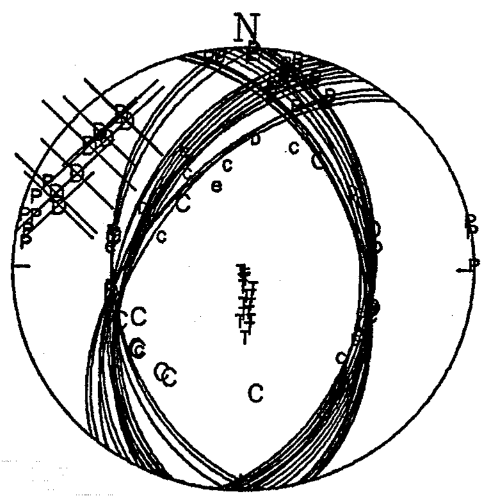
JOQ	354.000	-47.000	C		analog smoker
LMQ	134.000	-73.000	D		analog
A54	142.000	-73.000	D		CLTN; strong
A54	142.000	-73.000	R	0.450	
A61	120.000	-73.000	D		CLTN; strong
A61	120.000	-73.000	R	0.443	
A64	109.000	-74.000	D		CLTN; strong
A64	109.000	-74.000	R	0.567	
A16	129.000	-76.000	D		CLTN; strong
A16	129.000	-76.000	R	-0.133	
A21	112.000	-77.000	D		CLTN; strong
A21	112.000	-77.000	R	0.185	
A11	142.000	-77.000	D		CLTN; clear but not strong
A11	142.000	-77.000	R	0.462	
LPQ	134.000	-77.000	D		clear, but not strong
LPQ	134.000	-77.000	R	0.443	poor S
QCQ	182.000	-89.500	D		strong; plotted as Pg
SLQ	107.000	49.000	D		good
DPQ	217.000	49.000	C		strong
EBN	107.000	49.000	-		very emergent; Pg stronger
HTQ	059.000	49.000	+		very weak
GSQ	072.000	49.000	D		weak
MNQ	033.000	49.000	C		weak; better when filtered
TRQ	231.000	49.000	C		clear
MNT	213.000	49.000	C		ok
GRQ	246.000	49.000	C		clear
KLN	110.000	49.000	C		ok
SIC	053.000	49.000	-		very weak
UNB	123.000	49.000	-		emergent
GAC	232.000	49.000	C		ok
OTT	230.000	49.000	+		poor
GGN	133.000	49.000	+		poor
CKO	246.000	49.000	C		strong
LMN	115.000	49.000	C		clear
EEO	257.000	49.000	C		clear
HAL	121.000	49.000	+		
LXQ	333.000	49.000	e		emergent
CBK	080.000	49.000	-		poor
SWO	262.000	49.000	-		poor
SUO	259.000	49.000	D		ok
GBN	109.000	49.000	-		ok
SCH	021.000	49.000	+		very weak
KAO	284.000	49.000	C		good
GTO	285.000	49.000	-		ok, might be +
TBO	279.000	49.000	e		emergent
SIO	286.000	49.000	e		emergent, possibly +
FRB	004.000	49.000	-		ok
FFC	301.000	43.000	-		ok
RLO	244.000	42.000	C		from PDE
BLC	329.000	41.000	+		
IGL	350.000	39.000	+		might go down first
YKC	317.000	33.000	C		good
PNT	291.000	32.000	+		ok
MBC	341.000	32.000	e		emergent



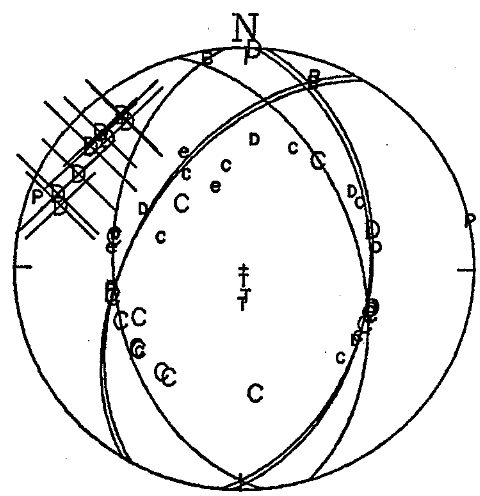
Data 881123



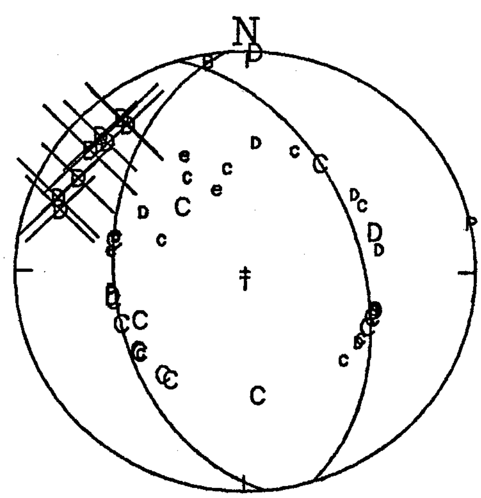
P6 R7



P5 R7



P4.5 R7



BEST 881123

Seismic Zone: Saguenay

Magnitude : 6.5 Mn, 5.9 mb

Location : 48.13 N 71.21 W
(30 KM S OF Jonquiere)

Date(Y/M/D) : 88 11 25

Time(UT) : 23:46

Depth:
closest station: CQ3 (4 km)
free depth = 28.5 km
(confirmed by teleseismic depth phases)

Quality of Readings:
JAQ, GGN definite, but distinctly low amplitude arrivals
OTT, WEO not strong, marked by slow rise
KLN spiky; HTQ, MNQ dead
CLTN amplitudes decrease with azimuth from A64 to A54/A11
Most other Canadian stations good
Selected teleseismic stations added from PDE to constrain ENE-dipping plane

Comments:
Only one clear polarity reversal is defined by ECTN Pn's; between GGN and LMN.
Ratios are not used for these solutions.
Solution 'P4' has 30 solutions that misfit GDH, ELO, and UNB and a mix of RSON, ULM, GTO, and HNME.
Best solution is 'P2' which misfits GDH, ELO, and UNB, of which only ELO is at all distant from a nodal plane.
This solution is within 1 degree of dip, strike, rake of the one published by North et al. in SRL.
Chosen mechanism represents thrust faulting (with a small amount of strike slip displacement) on NNW-striking, moderately-dipping, planes in response to compression from the ENE. The mechanism is consistent with the regional stress field.

Best Solution:

Strike, Dip, Rake	326	67	055
Strike, Dip, Rake	207	42	143
Trend & Plunge of P	081	14	
Trend & Plunge of T	192	54	
Trend & Plunge of B	342	32	

```
+48.133- 71.207F1MN=6.5 2346048 25111988 00.0180.017 0.1 31 31  50.67 228.50   0 1ML=6.9  40  0 0.00
BRG  8811252346P          D
KBA  8811252346P          D
QUE  8811252346P          C
CQ3  8811252346P                 46093 C
CQ3   NE 0003KM         027 -5  03 -022                  0000000 00ML00MN
CQ1  8811252346P                 46093 C
CQ1   SW 0006KM         223-12  03 -032                  0000000 00ML00MN
CQ2  8811252346P                 46093 +
CQ2   N  0008KM         340-15  03 -036                  0000000 00ML00MN
LMQ  8811252346P                       D
LMQ   SE 0093KM         134-73                           0000000 00ML00MN
A54  8811252346P                A462037D      X463212
A54   SE 0096KM         141-73  12 -063       00 -079    0000000 00ML00MN
A61  8811252346P                A462067D      X463208
A61   SE 0097KM         120-74  12 -047       00 -106    0000000 00ML00MN
A64  8811252346P                A462175D      X463406
A64   E  0104KM         109-75  12 -049       00 -099    0000000 00ML00MN
A16  8811252346P                A462374D      X463734
A16   SE 0116KM         129-76  12 -042       00 -105    0000000 00ML00MN
A21  8811252346P                A462457D      X463917
A21   E  0123KM         112-77  12 -066       00 -108    0000000 00ML00MN
A11  8811252346P                A462488D      X463943
A11   SE 0125KM         142-77  12 -060       00 -126    0000000 00ML00MN
LPQ  8811252346P             -0.22 A462533D
LPQ   SE 0126KM         134-77  12 -055                  0000000 00ML00MN
QCQ  8811252346P          C
QCQ   S  0151KM         182 49                           0000000 00ML00MN
SLQ  8811252346P          D
SLQ   E  0172KM         107 49                           0000000 00ML00MN
DPQ  8811252346P  A463451C  -0.06
DPQ   SW 0200KM 12  055 217 49                           0000000 00ML00MN
EBN  8811252346P  A463942D  -0.22
EBN   E  0234KM 12  115 107 49                           0000000 00ML00MN
SBQ  8811252346P  A464818C  -0.07             X472832 057   11536           473470
SBQ   S  0311KM 12  069 190 49                00 -416    1693153 67ML65MN
GSQ  8811252346P  A464937D  -0.22
GSQ   E  0315KM 12  126 072 49                           0000000 00ML00MN
HNME 8811252346P          C
HNME  SE 0328KM         131 49                           0000000 00ML00MN
TRQ  8811252346P  A465020C  -0.09
TRQ   SW 0331KM 12  020 231 49                           0000000 00ML00MN
MNT  8811252346P  A465203C  -0.06
MNT   SW 0346KM 12  034 213 49                           0000000 00ML00MN
MIM  8811252346P          C
MIM   SE 0362KM         152 49                           0000000 00ML00MN
GRQ  8811252346P  B465706C  -0.09
GRQ   SW 0390KM 03 -011 246 49                           0000000 00ML00MN
KLN  8811252346P  A465833   -0.29                    040  105450            475760
KLN   E  0392KM 12  079 110 49                           0856084 66ML63MN
BNH  8811252346P          C
BNH   S  0394KM         181 49                           0000000 00ML00MN
BNH  8811252346P          C
BNH   S  0394KM         181 49                           0000000 00ML00MN
HKM  8811252346P          C
HKM   S  0405KM         162 49                           0000000 00ML00MN
GAC  8811252346P  A470170C  -0.06
GAC   SW 0423KM 12  061 232 49                           0000000 00ML00MN
UNB  8811252346P          +
```

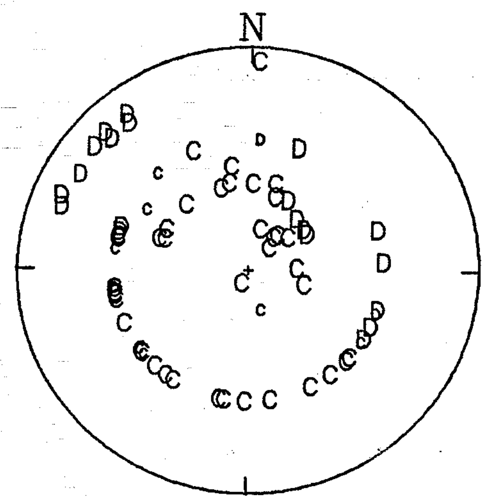
```
TRM  8811252346P            C
TRM   S  0437KM            170 49                         0000000 00ML00MN
OTT  8811252346P  C470648+  -0.06
OTT   SW 0460KM 01  089 230 49                            0000000 00ML00MN
WBO  8811252346P  A470696C  -0.06
WBO   SW 0468KM 12  043 223 49                            0000000 00ML00MN
EMM  8811252346P            C
EMM   SE 0473KM            142 49                         0000000 00ML00MN
GGN  8811252346P  A470830C  -0.29   X475593 X481857 053  109761            482485
GGN   SE 0475KM 12  069 133 49      00  187 00  023  1157173 71ML66MN
CKO  8811252346P  A471338C  -0.06
CKO   SW 0531KM 12 -085 246 49                            0000000 00ML00MN
BVT  8811252346P            C
BVT   S  0543KM            192 49                         0000000 00ML00MN
LMN  8811252346P  471698D   -0.29   X481009 X484055 090   11144            484355
LMN   SE 0549KM 03  025 115 49      00  014 00  140  0798663 71ML66MN
EEO  8811252346P  A472436C  -0.06   X482291 X485551 043  103998            490245
EEO   W  0617KM 12 -039 257 49      00 -122 00 -235  0584190 72ML65MN
HAL  8811252346P            D
HAL   SE 0703KM            121 49                         0000000 00ML00MN
JAQ  8811252346P  A473588C  -0.07
JAQ   NW 0706KM 12  021 335 49                            0000000 00ML00MN
WEO  8811252346P  A473727+  -0.07   X484758 X491649 063   16636    3       492672
WEO   SW 0719KM 12  011 233 49      00  182 00 -988  6618289 85ML77MN
SWO  8811252347P  C474007C                           027  101523   3       494280
SWO   W  0755KM 01 -147 262 49                       0354418 69ML64MN
SUO  8811252347P  A474176C                           043  102493   3 3     494470
SUO   W  0766KM 12 -113 259 49                       0364279 72ML65MN
GBN  8811252346P            -
GBN   E  0800KM            109 49                    0000000 00ML00MN
SZO  8811252347P  C474555C                           027  101836   3       495401
SZO   W  0801KM 01 -157 260 49                       0427257 71ML66MN
SCH  8811252346P  A47469 D
SCH   N  0805KM 12 -078 021 49                       0000000 00ML00MN
KAO  8811252346P            C
KAO   W  0841KM            284 49                    0000000 00ML00MN
EFO  8811252346P            C
EFO   SW 0844KM            231 49                    0000000 00ML00MN
ELO  8811252346P            -
ELO   W  0888KM            262 49                    0000000 00ML00MN
GTO  8811252346P            C
GTO   W  1167KM            285 49                    0000000 00ML00MN
TBO  8811252346P            +
TBO   W  1347KM            279 49                    0000000 00ML00MN
STJ  8811252346P  X48563 D
STJ   E  1382KM 00 -164 086 49                       0000000 00ML00MN
SIO  8811252346P            D
SIO   W  1522KM            286 49                    0000000 00ML00MN
RSON 8811252346P            D
RSON  W  1652KM            289 49                    0000000 00ML00MN
FRB  8811252346P  X4937   -S
FRB   N  1748KM 00 -461 004 49                       0000000 00ML00MN
ULM  8811252346P            D
ULM   W  1806KM            287 52                    0000000 00ML00MN
FCC  8811252346P            +
FCC   NW 1912KM            317 50                    0000000 00ML00MN
FFC  8811252346P            +
FFC   NW 2243KM            301 43                    0000000 00ML00MN
```

```
IGL  8811252346P  X50558 C
IGL   N  2439KM 00  037 350 39                    0000000 00ML00MN
GDH  8811252346P         C
GDH   N  2547KM         016 37                    0000000 00ML00MN
SES  8811252346P         C
SES   W  2878KM         290 34                    0000000 00ML00MN
EDM  8811252346P  X51443 C
EDM   NW 2990KM 00  165 297 33                    0000000 00ML00MN
YKC  8811252346P         C
YKC   NW 3098KM         317 33                    0000000 00ML00MN
RES  8811252346P         C
RES   N  3170KM         347 33                    0000000 00ML00MN
RES  8811252346P  X51585 C
RES   N  3170KM 00  146 347 33                    0000000 00ML00MN
PNT  8811252346P         C
PNT   W  3506KM         291 32                    0000000 00ML00MN
MBC  8811252346P         C
MBC   N  3794KM         341 32                    0000000 00ML00MN
ALE  8811252346P         C
ALE   N  3849KM         002 32                    0000000 00ML00MN
DAG  8811252346P         C
DAG   N  3923KM         018 32                    0000000 00ML00MN
INK  8811252346P         C
INK   NW 4047KM         326 32                    0000000 00ML00MN
BNG  8811252346P         C
BNG   E  9626KM         087 17                    0000000 00ML00MN
            Z
```

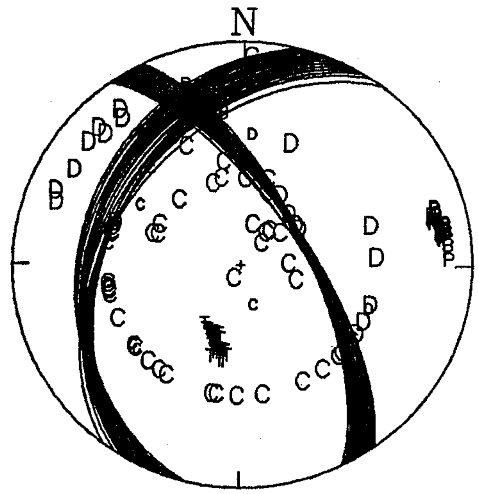
19881125 23:46 MN=6.5 48.133N 71.207W 28.50 KM

CQ3	028.000	-5.000	C		Field analog instrument
CQ1	221.000	-11.000	C		Field analog instrument
CQ2	342.000	-15.000	+		Field analog instrument
LMQ	134.000	-73.000	D		Clear, analog
A54	141.000	-73.000	D		Clear, CLTN
A54	141.000	-73.000	R	1.579	Ratio not used for mechanism
A61	120.000	-74.000	D		Clear, CLTN
A61	120.000	-74.000	R	0.819	Ratio not used for mechanism
A64	109.000	-75.000	D		Clear, CLTN
A64	109.000	-75.000	R	0.870	Ratio not used for mechanism
A16	129.000	-76.000	D		Clear, CLTN
A16	129.000	-76.000	R	0.945	Ratio not used for mechanism
A21	112.000	-77.000	D		Clear, CLTN
A21	112.000	-77.000	R	0.624	Ratio not used for mechanism
A11	142.000	-77.000	D		Clear, CLTN
A11	142.000	-77.000	R	2.257	Ratio not used for mechanism
LPQ	134.000	-77.000	D		
QCQ	182.000	-83.000	C		Strong
SLQ	107.000	49.000	D		
DPQ	217.000	49.000	C		
EBN	107.000	49.000	D		
SBQ	190.000	49.000	C		Clear
GSQ	072.000	49.000	D		Clear,strong
HNME	131.000	49.000	C		Representative of Weston data
MNT	213.000	49.000	C		
MIM	152.000	49.000	C		Representative of Weston data
GRQ	246.000	49.000	C		
BNH	181.000	49.000	C		Representative of Weston data
GAC	232.000	49.000	C		
UNB	123.000	49.000	+		
TRM	170.000	49.000	C		Representative of Weston data
OTT	230.000	49.000	+		Up, with high frequency buzz
WBO	223.000	49.000	C		
EMM	142.000	49.000	C		Representative of Weston data
GGN	133.000	49.000	C		Clear but weak
CKO	246.000	49.000	C		
BVT	192.000	49.000	C		Representative of Weston data
LMN	115.000	49.000	D		Strong
EEO	257.000	49.000	C		Clear, not strong
HAL	121.000	49.000	D		Sharp
JAQ	335.000	49.000	C		Clear, rather weak
WEO	233.000	49.000	+		
SWO	262.000	49.000	C		
SUO	259.000	49.000	C		
GBN	109.000	49.000	-		ok
SZO	260.000	49.000	C		
SCH	021.000	49.000	D		ok, not strong
KAO	284.000	49.000	C		Strong
EFO	231.000	49.000	C		
ELO	262.000	49.000	-		Goes up, but polarity reveresed
GTO	285.000	49.000	C		Sharp
TBO	279.000	49.000	+		
STJ	086.000	49.000	D		Clear
RSON	289.000	49.000	D		Very clear
FRB	004.000	49.000	-		Read as -S? gives -
ULM	287.000	49.000	D		Clear, polarity checked
FCC	317.000	49.000	+		Poor
FFC	301.000	43.000	+		
IGL	350.000	39.000	C		Very strong

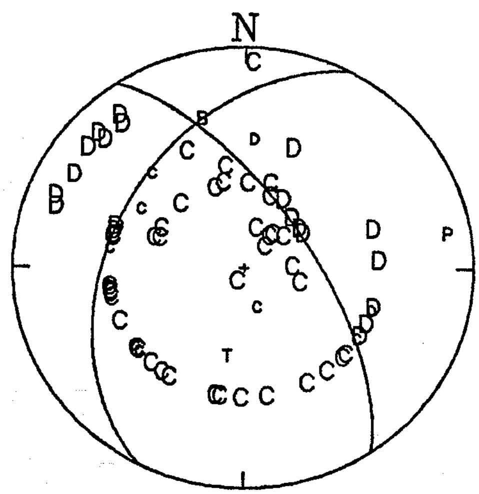
SES	290.000	34.000	C	
EDM	297.000	33.000	C	
YKC	317.000	33.000	C	Clear
RES	347.000	33.000	C	
PNT	291.000	32.000	C	
MBC	341.000	32.000	C	
ALE	002.000	32.000	C	Clear
SCO	028.000	29.200	D	From copy of record
TIC	104.000	20.300	C	From PDE
GDH	016.000	33.200	C	From PDE
DAG	018.400	28.400	C	From PDE
MAIO	037.800	16.300	C	From PDE
BNG	087.000	17.000	C	From PDE
WMQ	015.000	15.600	C	From PDE
MSL	048.770	18.300	C	From PDE
UPP	041.400	25.240	D	From PDE
BRG	052.000	24.600	D	From PDE
KBA	056.990	24.440	D	From PDE
QUE	035.340	14.900	C	From PDE



DATA 881125



P4



BEST 881125

Seismic Zone: Saguenay

Magnitude : 4.1 Mn
(largest aftershock)

Location : 48.142 N 71.299 W

Date(Y/M/D) : 1988 11 26

Time(UT) : 03:38

Depth:
closest station: CQ1 (6 km)
free depth = 26.4 km

Quality of Readings:
Weak reading on much of ECTN, explained by moderate dip of nodal planes.
CLTN good.
No Weston (malfunction) or teleseismic data.

Comments:
In constrast to main shock, has a polarity reversal on CLTN, also MNQ is compression, western ECTN are dilations.
P2R2 just misfits EEO and weak arrival on DPQ, and misfits LPQ polarity
Best solution comes closest to fit EEO, and has lowest amplitude residuals.
Mechanism is pure thrusting on NNW-trending planes in response to ENE-directed compression. NE-dipping plane differs from that of the mainshock by having a less steep dip and striking slightly more northerly.

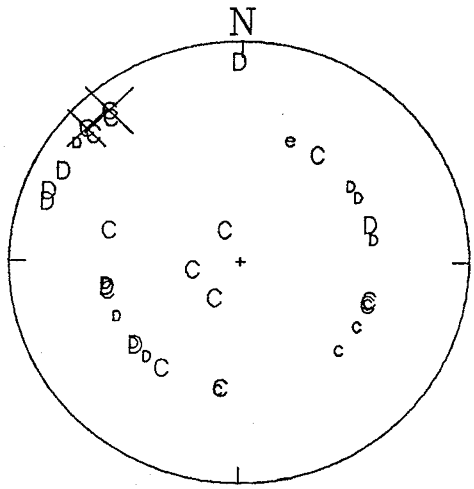
Best Solution:

Strike, Dip, Rake	339	46	103
Strike, Dip, Rake	141	46	077
Trend & Plunge of P	240	00	
Trend & Plunge of T	330	81	
Trend & Plunge of B	150	09	

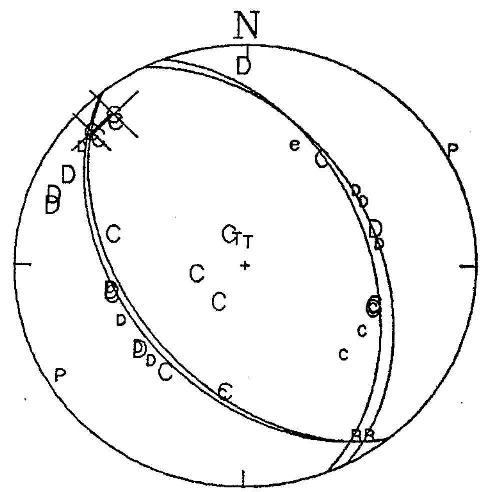
```
+48.142- 71.299F1MN=4.1 0338082 26111988 00.0050.006 0.2  7 10 130.00N226.42    0 1ML=3.7 120F 0 0.00
SAGUENAY REGION, QUEBEC                   REGION DU SAGUENAY, QUEBEC
LARGEST AFTERSHOCK                        PLUS FORTE REPLIQUE
FELT IN SAGUENAY AND CHARLEVOIX           RESSENTI AU SAGUENAY ET DANS
REGIONS                                   CHARLEVOIX.
$ CLTN RE-READ
$ FIELD DATA READ BY FA
$ POLARITIES AND PN TIMES BY ADAMS
$
$RATIO=  1.406 LPQ 383023C 0.09     100.52      115.48 384647 0.06     2560.48
$RATIO=  1.130 A11 382964C 0.12     961.61     2455.61 384608 0.13    12960.39
CQ1   8811260338P              0.02 A381263C                   000   0   0    0  0
CQ1    SE 0006KM           154-13    00  000                     0000000 00ML00MN
CQ2   8811260338P              0.02 A381270C                   000   0   0    0  0
CQ2    NE 0008KM           034-16    00  003                     0000000 00ML00MN
CQ3   8811260338P              0.02 A381283C                   000   0   0    0  0
CQ3    E  0008KM           080-17    00  013                     0000000 00ML00MN
JOQ   8811260338P                           C
JOQ    N  0030KM           008-48                                0000000 00ML00MN
LMQ   8811260338P              0.00 A38247 C                   000   0   0    0  0
LMQ    SE 0098KM           132-75    00  006                     0000000 00ML00MN
A54   8811260338P              0.00 A382514C          A383759 032 1002351     0  0
A54    SE 0101KM           139-75    00  006          00  008   0046162 38ML41MN
A61   8811260338P              0.00 A382548D          A383803 010 100 584     0  0
A61    SE 0103KM           118-76    00  006          00 -007   0036694 32ML40MN
A64   8811260338P              0.00 A382658D          A384024 015 1001059     0  0
A64    E  0111KM           108-77    00  000          00  012   0044359 36ML41MN
A16   8811260338P              0.00XA382868-          X384350 013 100 384     0  0
A16    SE 0122KM           127-78    00  029          00  024   0018560 32ML38MN
A11   8811260338P              0.00XA382964C          X384564 013 100 251     0  0
A11    SE 0130KM           140-78    00  007          00  032   0012131 30ML37MN
A21   8811260338P              0.00XA382951D          X384533 013 100 847     0  0
A21    E  0130KM           111-78    00 -007          00  000   0040937 36ML42MN
LPQ   8811260338P             -0.22XA383021C          X384650 013 1001208     0  0
LPQ    SE 0132KM           132-79    00  014          00  048   0058385 37ML44MN
QCQ   8811260339P                  XB38331 D
QCQ    S  0152KM           179-80    00  007                    0000000 00ML00MN
DPQ   8811260338P XA383851C  -0.06                    X390264 027 1001165     0  0
DPQ    SW 0197KM 00  137 215 49                       00 -137   0027111 40ML43MN
EBN   8811260338P XA384490C  -0.22                    X391542 020 100 310     0  0
EBN    E  0241KM 00  222 107 49                       00 -101   0009739 37ML40MN
HTQ   8811260338P XA384484-  -0.07
HTQ    NE 0244KM 00  200 060 49                                 0000000 00ML00MN
SBQ   8811260338P XA385337+  -0.07                    X393208 023 100 410     0  0
SBQ    S  0311KM 00  232 189 49                       00 -367   0011200 41ML43MN
GSQ   8811260338P XA385443D -0.22                     X393933 023 100 192     0  0
GSQ    E  0321KM 00  242 073 49                       00  105   0005245 39ML40MN
MNQ   8811260338P XA385412C  -0.10
MNQ    NE 0323KM 00  152 034 49                                 0000000 00ML00MN
TRQ   8811260338P XA385403D  -0.09                    X393658 013 100 319     0  0
TRQ    SW 0326KM 00  102 230 49                       00 -348   0015418 41ML45MN
MNT   8811260338P XC385626   -0.06
MNT    SW 0343KM 00  134 212 49                                 0000000 00ML00MN
GRQ   8811260338P XA390075-  -0.09
GRQ    SW 0385KM 00  071 245 49                                 0000000 00ML00MN
KLN   8811260338P XA390352C  -0.29
KLN    E  0399KM 00  157 109 49                                 0000000 00ML00MN
SIC   8811260339P XB3903   -
SIC    NE 0402KM 00  090 054 49                                 0000000 00ML00MN
GAC   8811260338P XB390562-  -0.06

GAC    SW 0418KM 00  153 231 49                                 0000000 00ML00MN
WBO   8811260339P            -
WBO    SW 0464KM             223 49                             0000000 00ML00MN
GGN   8811260339P            +
GGN    SE 0480KM             133 49                             0000000 00ML00MN
CKO   8811260339P            -
CKO    SW 0525KM             245 49                             0000000 00ML00MN
EEO   8811260338P XA392802C  -0.06           X402970 X405825 030 100 205     0  0
EEO    W  0610KM 00  048 257 49              00   321 00 -114   0004294 49ML44MN
HAL   8811260339P XB39420 +
HAL    SE 0709KM 00  249 120 49                                 0000000 00ML00MN
SWO   8811260339P XC394415
SWO    W  0748KM 00 -016 262 49                                 0000000 00ML00MN
SUO   8811260339P XB394556D
SUO    W  0760KM 00 -011 259 49                                 0000000 00ML00MN
SZO   8811260339P XB394925-
SZO    W  0794KM 00 -064 260 49                                 0000000 00ML00MN
SCH   8811260339P XB39526 -
SCH    N  0807KM 00  116 021 49                                 0000000 00ML00MN
GBN   8811260339P XB3954  +
GBN    E  0807KM 00  261 109 49                                 0000000 00ML00MN
KAO   8811260339P XB39544 C
KAO    W  0834KM 00 -039 284 49                                 0000000 00ML00MN
CBK   8811260339P XB40150 -
CBK    E  0988KM 00  148 080 49                                 0000000 00ML00MN
              Z
```

19881126 03:38 MN=4.1 48.142N 71.299W 26.42 KM

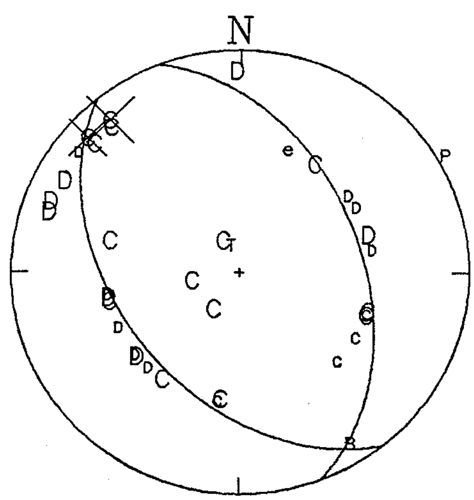
CQ1	154.000	-13.000	C		Field analog instrument
CQ2	034.000	-16.000	C		Field analog instrument
CQ3	080.000	-17.000	C		Field analog instrument
JOQ	008.000	-48.000	C		MEQ-800 analog recorder
LMQ	132.000	-75.000	C		Strong
A54	139.000	-75.000	C		Good, CLTN
A61	118.000	-76.000	D		Good, CLTN
A64	108.000	-77.000	D		Good, CLTN
A16	127.000	-78.000	-		Very weak
A11	140.000	-78.000	C		Good, CLTN
A11	140.000	-78.000	R	1.130	Ratio not used for mechanism
A21	111.000	-78.000	D		Good, CLTN
LPQ	132.000	-79.000	C		Good
LPQ	132.000	-79.000	R	1.406	Ratio not used for mechanism
QCQ	179.000	-80.000	D		
DPQ	215.000	49.000	C		Weak
EBN	107.000	49.000	C		Weak
HTQ	060.000	49.000	-		Weak
SBQ	189.000	49.000	+		Weak
GSQ	073.000	49.000	D		OK
MNQ	034.000	49.000	C		OK
TRQ	230.000	49.000	D		OK
GRQ	245.000	49.000	-		Weak
KLN	109.000	49.000	C		OK
SIC	054.000	49.000	-		Very weak
GAC	231.000	49.000	-		Weak
WBO	223.000	49.000	-		Weak
GGN	133.000	49.000	+		Very weak
CKO	245.000	49.000	-		Weak
EEO	257.000	49.000	C		OK
HAL	120.000	49.000	+		Poor
SUO	259.000	49.000	D		Good
SZO	260.000	49.000	-		Poor
SCH	021.000	49.000	e		Very weak
GBN	109.000	49.000	+		Weak
KAO	284.000	49.000	C		Clear
CBK	080.000	49.000	-		Weak, noisy trace



DATA 881126



P2 R2



BEST 881126

Seismic Zone: CHARLEVOIX

Magnitude : 4.3 MN

Location : 47.72N 69.86W

Date(Y/M/D) : 89 03 09

Time(UT) : 09:41

Depth:

closest station: A64 (12 km)
free depth = 10.9 km from Charlevoix Network

Quality of Readings:

Excellent readings from CLTN
N.B. stations nearly nodal
JAQ might be +

Comments:

First of a pair of earthquakes on 9th and 11th
Large amount of polarity data, making ratio data less important.
CLTN station A64 take-off angle was increased to avoid polarity conflict with Weston Pn arrivals.
The east-dipping plane is well-constrained, and the increased restrictions on the data are mostly to pin the rake.
The data for 890309 is shown togrther with the planes derived for its sister event on the 11th.
The 'best' solution is chosen from P4.5 R4 as having the minimum residuals for the fitted ratios. It misfits JAQ and KAO, and SCH, BVT, and TRM.
It represents nearly pure thrust faulting on north-striking planes, the east-dipping of which might be inferred to be the fault plane. The mechanism differs only slightly from that for the 11 th.

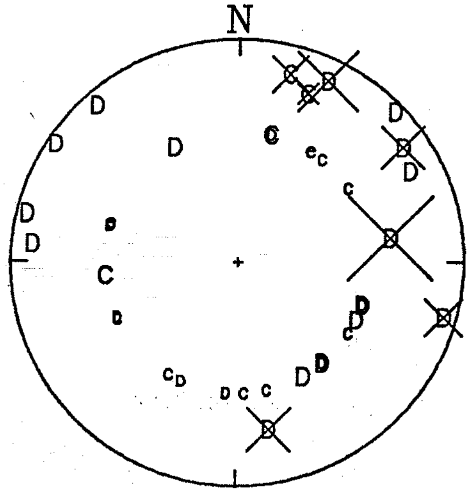
Best Solution:

Strike, Dip, Rake	168	31	070
Strike, Dip, Rake	011	60	102
Trend & Plunge of P	092	15	
Trend & Plunge of T	308	72	
Trend & Plunge of B	185	10	

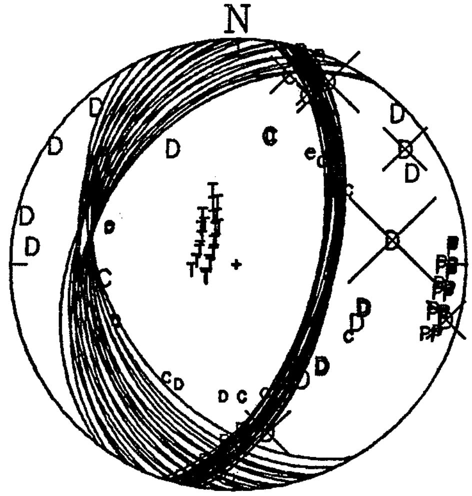
```
+47.717- 69.857F1MN=4.3 0941322 09031989 00.0030.006 0.3  6 11 160.07Z210.46   8 1ML=3.9 170F 0 0.00
CHARLEVOIX-KAMOURASKA, QUE.                CHARLEVOIX-KAMOURASKA, QUE.
FELT IN LA MALBAIE (IV)                    RESSENTI A LA MALBAIE (IV)
AND BAIE-SAINT-PAUL.                       ET BAIE-SAINT-PAUL.
ALSO FELT ON THE SOUTH SHORE IN            AUSSI RESSENTI SUR LA RIVE SUD A
RIVIERE-OUELLE AND KAMOURASKA.             RIVIERE-OUELLE ET KAMOURASKA.
MAG (EDR) 3.9 MB (1 OBS)
$ TRQ,GRQ,WBO,CKO DOWN, MNQ SPIKY
$ LPQ DEAD AT START ?
$ CLTN CLOCK CORRECT ?
$RATIO=  1.432 LPQ 414023C 0.17    2228.83     7823.17 414552 0.12    60224.83
$RATIO=  1.399 DAQ 424955D 0.13   -3308.12     3308.12 42 298 0.13    82963.88
$RATIO=  0.746 A11 414196D 0.16   -7989.04    12426.96 414891 0.20    44554.96
$RATIO=  1.893 A16 413742C 0.13    2876.80    37068.80 414100 0.12   224972.80
$RATIO=  1.265 A54 414050D 0.17  -17228.71    25107.29 414686 0.13   317100.72
$RATIO=  0.059 A61 413565D 0.14 -572643.25  1102620.75 413813 0.12   656156.75
$RATIO=  1.217 A64 413491D 0.15  -45529.60    64870.40 413683 0.10   751078.38
A64  8903090940P              A413495D          A413683 013  101470         413689
A64   N  0013KM        348-50  02  003          03 -004   0710483 32ML50MN
A61  8903090940P              A413565D          A413812 007  101517         413833
A61   W  0018KM        262-59  02  003          03  004   1361656 33ML54MN
A16  8903090940P              A413741C          A414100 015 1006454         414130
A16   S  0030KM        202-71  12  007          10 -007   0270345 33ML49MN
LMQ  8903090941P              B41387 D
LMQ   SW 0040KM        242-75  10 -026                    0000000 00ML00MN
LPQ  8903090941P           -0.22XA414024C      XA414553 017  101771         414677
LPQ   S  0043KM        195-76  00  055          00  053   0654560 42ML54MN
A54  8903090940P              A414051D          A414687 015 1008067         414700
A54   SW 0051KM        236-78  53 -015          03  004   0337910 40ML45MN
A11  8903090940P              A414196D          B414891 017 1001523         414971
A11   SW 0059KM        206-80  11  007          01 -006   0056290 34ML38MN
SLQ  8903090940P             XB41430 D
SLQ   E  0064KM        095-81  00  028                    0000000 00ML00MN
AGM  8903090940P                     D
AGM   SE 0095KM        138-84                             0000000 00ML00MN
DAQ  8903090941P           -0.06XA414956D      XA420299 013 1002266         420318
DAQ   W  0107KM        285-84  00 -019          00  041   0109521 39ML45MN
EBN  8903090941P           -0.22XA415372D      XB421249 013 100 460         421256
EBN   E  0125KM        103-85  00  102          00  490   0022233 33ML39MN
QCQ  8903090940P             XB41560 D
QCQ   SW 0150KM        226-86  00 -049                    0000000 00ML00MN
CBM  8903090940P                     D
CBM   SE 0158KM        123-86                             0000000 00ML00MN
HTQ  8903090941P XC420307E  -0.07              XB422646 027 1001103         422780
HTQ   NE 0197KM 00  023 033 49                  00 -106   0025668 40ML43MN
HNME 8903090940P           D
HNME  SE 0224KM        140 49                             0000000 00ML00MN
GSQ  8903090941P XB420904+  -0.22              XB423980 033 100 884         424115
GSQ   NE 0244KM 00  030 056 49                  00 -098   0016831 42ML43MN
DPQ  8903090941P XA420927+  -0.06XB421082      XB424034 020 1001124         424378
DPQ   SW 0250KM 00 -002 244 49    00 -181       00 -198   0035312 43ML46MN
KLN  8903090941P XB421269D  -0.29               X425703 030 100 256         430062
KLN   E  0281KM 00 -071 109 49                  00  564   0005362 38ML39MN
MIM  8903090940P           +
MIM   S  0282KM        167 49                             0000000 00ML00MN
SBQ  8903090941P XC422116   -0.07              XC425758 013 100 252         430271
SBQ   SW 0305KM 00  513 212 49                  00 -017   0012180 39ML43MN
MNQ  8903090941P XA421779C  -0.10
MNQ   N  0323KM 00 -057 014 49                            0000000 00ML00MN
HKM  8903090940P           +


HKM   S  0341KM        177 49                             0000000 00ML00MN
DVT  8903090940P         +
DVT   SW 0354KM        211 49                             0000000 00ML00MN
SIC  8903090940P XB42203 +
SIC   NE 0356KM 00 -195 039 49                            0000000 00ML00MN
GGN  8903090941P XB422412-  -0.29    XB430385           027 100 197         430446
GGN   SE 0372KM 00 -026 140 49        00  100           0004584 41ML40MN
EMM  8903090940P           D
EMM   SE 0378KM        150 49                             0000000 00ML00MN
MNT  8903090941P XC422819   -0.06    XC430532XC431433 013 100 180           432315
MNT   SW 0379KM 00  308 231 49        00  103 00 -432   0008700 41ML43MN
TRM  8903090940P           -
TRM   S  0386KM        185 49                             0000000 00ML00MN
LMN  8903090941P XB423177D  -0.29    XB431659XC434286 047 100 149           434344
LMN   SE 0438KM 00 -075 116 49        00 -046 00  755   0001992 42ML38MN
GAC  8903090941P XB423846-  -0.06             XB434455
GAC   SW 0485KM 00  050 245 49                 00 -361   0000000 00ML00MN
OTT  8903090941P XB424430   -0.06             XB435224 027 100 305          435526
OTT   SW 0518KM 00  224 242 49                 00 -532   0007098 47ML45MN
BVT  8903090940P           -
BVT   SW 0530KM        205 49                             0000000 00ML00MN
HAL  8903090940P XB42512 +
HAL   SE 0593KM 00  015 123 49                            0000000 00ML00MN
GBN  8903090940P XB43020 -
GBN   E  0689KM 00 -085 109 49                            0000000 00ML00MN
EEO  8903090941P XB430344C  -0.06     X441309XB444773 040 100 312           445245
EEO   W  0709KM 00 -187 264 49        00 -134 00 -318   0004901 51ML45MN
WEO  8903090941P XC431634   -0.07             XC450473 020 100  87          450996
WEO   SW 0778KM 00  255 241 49                 00 -570   0002733 47ML43MN
JAQ  8903090941P XA431410D  -0.07             XC451493 040 100 232          451520
JAQ   NW 0794KM 00 -155 331 49                 00  029   0003644 52ML45MN
SCH  8903090940P XA43172 -
SCH   N  0819KM 00 -154 014 49                            0000000 00ML00MN
KAO  8903090940P XB43315 -
KAO   W  0951KM 00 -326 286 49                            0000000 00ML00MN
GTO  8903090940P XC44125 E
GTO   W  1276KM 00 -198 287 49                            0000000 00ML00MN
              Z
```

19890309 09:41 MN=4.3 47.717N 69.861W 10.87 KM

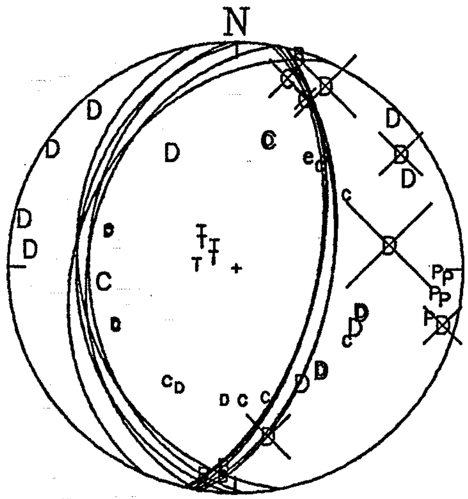
A64	349.000	-65.000	D		Clear P
A64	349.000	-65.000	R	1.217	Strong S, Sv=D
A61	261.000	-58.000	D		Strong P
A61	261.000	-58.000	R	0.059	Weak S
A16	202.000	-70.000	C		Clear but very weak
A16	202.000	-70.000	R	1.893	
LMQ	242.000	-75.000	D		Clear, analog
LPQ	195.000	-76.000	C		Clear but weak
LPQ	195.000	-76.000	R	1.432	Poor S onset
A54	235.000	-78.000	D		Weak P and P coda
A54	235.000	-78.000	R	1.265	Strong S
A11	206.000	-79.000	D		Good
A11	206.000	-79.000	R	0.746	
SLQ	095.000	-80.000	D		Strong, analog
AGM	138.000	-83.000	D		Weston Data, iD
DAQ	285.000	-84.000	D		Weak P
DAQ	285.000	-84.000	R	1.399	
EBN	103.000	-85.000	D		Good
QCQ	226.000	-86.000	D		Strong D, analog
CBM	123.000	-86.000	D		Weston Data, iD
HTQ	033.000	49.000	e		Emergent
HNME	140.000	49.000	D		Weston Data, iD
GSQ	056.000	49.000	+		Weak, filters to C
DPQ	244.000	49.000	+		Very weak onset
KLN	109.000	49.000	D		OK
MIM	167.000	49.000	+		Weston Data, eC
MNQ	014.000	49.000	C		OK
HKM	177.000	49.000	+		Weston Data, eC
DVT	211.000	49.000	+		Weston Data, eC; goes down, pol. reve
SIC	039.000	49.000	+		Weak
GGN	140.000	49.000	-		Weak
EMM	150.000	49.000	D		Weston Data, iD
TRM	185.000	49.000	-		Weston Data, eD
LMN	116.000	49.000	D		OK
GAC	245.000	49.000	-		Poor
BVT	205.000	49.000	-		Weston Data, eD
HAL	123.000	49.000	-		Weak
GBN	109.000	49.000	-		Poor
EEO	264.000	49.000	C		OK
JAQ	331.000	49.000	D		OK, might be +
SCH	014.000	49.000	-		Analog
KAO	286.000	49.000	-		Analog
GTO	287.000	49.000	e		Analog



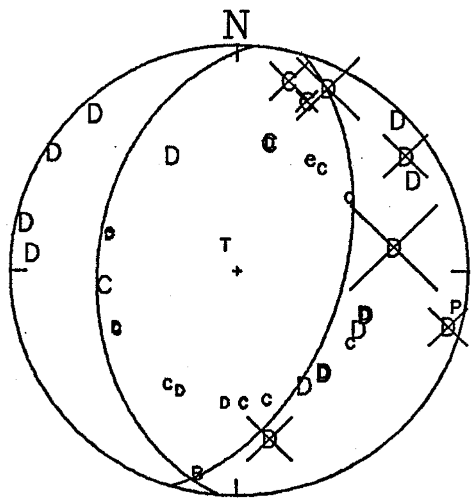
Data 890309



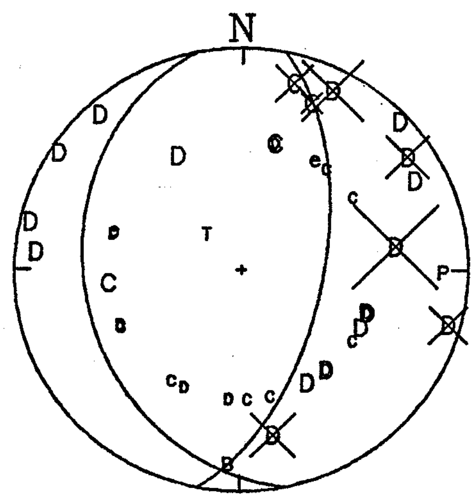
P4.5 R7 inc 5



P4.5 R4 inc 5



Planes for 8903113



BEST 890309

Seismic Zone: CHARLEVOIX

Magnitude : 4.4 Mn

Location : 47.718N 69.870W

Date(Y/M/D) : 89 03 11

Time(UT) : 08:31

Depth:

closest station: A64 (12 km)
free depth = 10.1 km from Charlevoix network

Quality of Readings:

Excellent readings from CLTN
Western stations of ECTN are nearly nodal
KAO and JAQ readings look good

Comments:

Second of a pair of earthquakes on 9th and 11th.
Large amount of polarity data, making ratio data less important.
CLTN station A64 take-off angle was increased to avoid polarity conflict with Weston Pn arrivals.
The east-dipping plane is well-constrained, and the increased restrictions on the data are mostly to pin the rake.
The 'best' solution is chosen from P3 R5 inc 2 as being the median rake and also one making the western ECTN data nearly nodal. It misfits JAQ and KAO, and SIC, BVT, and TRM
It represents nearly pure thrust faulting on north-striking planes, the east-dipping of which might be inferred to be the fault plane.

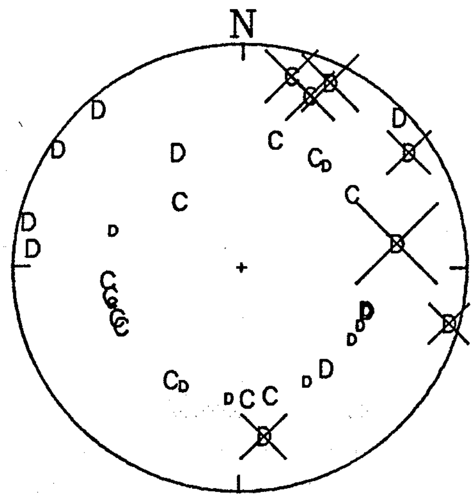
Best Solution:

Strike, Dip, Rake	184	38	080
Strike, Dip, Rake	017	52	098
Trend & Plunge of P	101	07	
Trend & Plunge of T	322	81	
Trend & Plunge of B	192	06	

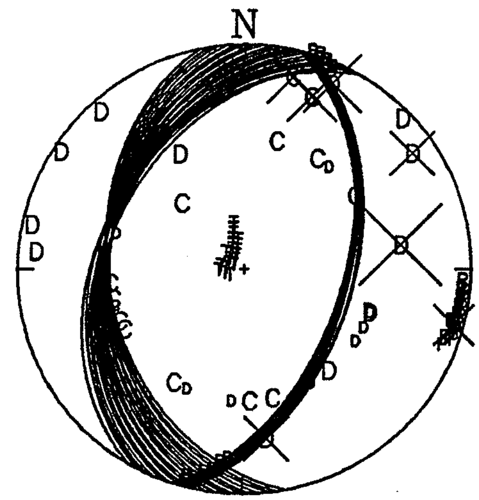
```
+47.718- 69.870F1MN=4.4 0831521 11031989 00.0020.006 0.3  7 12 180.07Z210.17   8 1ML=4.1 190  0 0.00
CHARLEVOIX-KAMNOURASKA, QUE.            CHARLEVOIX-KAMNOURASKA, QUE.
FELT                                    RESSENTI
IN LA MALBAIE, BAIE-SAINT-PAUL,         A LA MALBAIE, BAIE-SAINT-PAUL,
ON THE SOUTH SHORE                      SUR LA RIVE-SUD,
AND IN THE SAGUENAY REGION.             ET AU SAGUENAY.
CLOSE TO MAG. 4.3 EVENT                 PRES DU SEISME DE MAG. 4.3 DEUX JOURS
TWO DAYS EARLIER.                       PLUS TOT.
$ EDR QUOTES GSC PRELIMINARY SOLUTION
$RATIO=  0.983 LPQ 325964C 0.23     4885.50    12082.50 32 495 0.19    47005.50
$RATIO=  1.329 DAQ 320886D 0.19    -4371.84     5044.16 322222 0.15    93252.16
$RATIO=  0.842 A11 320180D 0.18    -5065.64     5889.64 32 877 0.22    35193.64
$RATIO=  1.094 A16 325726C 0.16    12168.37    36263.63 32  88 0.16   151256.38
$RATIO=  1.235 A54 320034D 0.16   -16321.58    23358.42 32 670 0.10   280382.44
$RATIO=  0.150 A61 315548D 0.15  -580846.44   893713.56 315797 0.10   819985.56
$RATIO=  1.211 A64 315473D 0.15   -88760.11   114887.89 315663 0.16  1442744.13
A64  8903110831P                 A315473D             A315664 022  105296                315678
A64   N  0012KM         352-50   03 -003              01 -002   1512534 37ML53MN
A61  8903110831P                 A315547D             C315798 008  101133                315819
A61   W  0017KM         261-59   24  009              01  025   0889856 31ML52MN
A16  8903110831P                 A315724C             A320089 017 1004988                320144
A16   S  0029KM         201-71   06  005              00  000   0184356 32ML47MN
LMQ  8903110832P                 B31586 D
LMQ   SW 0039KM         241-75   03 -013                        0000000 00ML00MN
LPQ  8903110832P             -0.22 A315963C          XC320512 020  102205                320591
LPQ   S  0043KM         194-77   09  006              00  027   0692721 43ML54MN
A54  8903110831P                 A320034D             A320657
A54   SW 0050KM         235-79   30 -011              04  004   0000000 00ML00MN
A11  8903110831P                 A320178D             A320867 022 1001627                320988
A11   SW 0058KM         205-80   04  004              35 -011   0046467 34ML37MN
SLQ  8903110832P                XA32028 D
SLQ   E  0065KM         095-81   00  003                        0000000 00ML00MN
AGM  8903110831P                        D
AGM   SE 0095KM         138-84                                  0000000 00ML00MN
DAQ  8903110832P             -0.06XA320886D          XA322223 023 1003877                322319
DAQ   W  0106KM         285-85    00 -064             00  001   0105913 41ML45MN
EBN  8903110832P             -0.22XA321299D           X322758 017 1001040                323275
EBN   E  0126KM         102-85    00  023             00 -018   0038438 36ML42MN
QCQ  8903110832P                XA32160 D
QCQ   SW 0149KM         226-86    00 -030                       0000000 00ML00MN
CBM  8903110831P                        D
CBM   SE 0159KM         123-86                                  0000000 00ML00MN
HTQ  8903110832P XB322180C  -0.07 X322274            XB324568 010 100 764                324857
HTQ   NE 0197KM 00 -103 033 49    00 -134             00 -185   0048004 38ML46MN
HNME 8903110832P            D
HNME  SE 0225KM         140 49                                  0000000 00ML00MN
GSQ  8903110832P XB322827C  -0.22XC323122    XC325457XB325915 027 1001302                330036
GSQ   NE 0244KM 00 -049 056 49    00 -062     00 -114 00 -174   0030299 43ML45MN
DPQ  8903110832P XB322856C  -0.06XA323015     X325763XB325969 017 1001054                330020
DPQ   SW 0249KM 00 -057 243 49    00 -226     00  115 00 -231   0038956 43ML47MN
KLN  8903110832P XB323204D  -0.29                     X330992 013 100 187                331853
KLN   E  0282KM 00 -141 109 49                        00 -163   0009038 37ML41MN
MIM  8903110832P            C
MIM   S  0282KM         167 49                                  0000000 00ML00MN
SBQ  8903110832P XC323794   -0.07                    XC331700 027 100 390                331858
SBQ   SW 0304KM 00  202 212 49                        00 -055   0009076 41ML42MN
MNQ  8903110832P            C
MNQ   N  0323KM         014 49                                  0000000 00ML00MN
HKM  8903110832P            C
HKM   S  0341KM         177 49                                  0000000 00ML00MN


DVT  8903110832P            C
DVT   SW 0354KM         211 49                                  0000000 00ML00MN
SIC  8903110832P XB32410 -
SIC   NE 0357KM 00 -125 039 49                                  0000000 00ML00MN
GGN  8903110832P XB324318D  -0.29 X324572    XC332313 X333413 023 100 194                333832
GGN   SE 0372KM 00 -123 140 49    00 -682     00  017 00 -267   0005300 41ML41MN
MNT  8903110832P XC324448   -0.06            XC332473XC333365 020 100 262                334010
MNT   SW 0379KM 00 -049 231 49                00  062 00 -472   0008231 42ML43MN
EMM  8903110832P            -
EMM   SE 0379KM         150 49                                  0000000 00ML00MN
TRM  8903110832P            -
TRM   S  0386KM         185 49                                  0000000 00ML00MN
TRQ  8903110832P XA324582C  -0.09            XB332918XB333973 033 100 736                334133
TRQ   SW 0394KM 00 -107 247 49                00  174 00 -285   0014013 47ML46MN
LMN  8903110832P XB325106-  -0.29            XB333635XC340250 050 100 190                340274
LMN   SE 0439KM 00 -151 116 49                00 -085 00  704   0002388 43ML39MN
GRQ  8903110832P XB325465C  -0.09             X334500XC340214 033 100 619                341100
GRQ   W  0471KM 00 -161 257 49                00  122 00 -207   0011786 49ML46MN
WBO  8903110832P XB330152   -0.06            XB335467XB341281 027 100 228                341433
WBO   SW 0514KM 00  003 236 49                00  174 00 -350   0005306 46ML43MN
OTT  8903110832P XC331147   -0.06                    XC341150 040 100 520                341476
OTT   SW 0518KM 00  957 242 49                        00 -575   0008168 49ML45MN
BVT  8903110832P            -
BVT   SW 0530KM         205 49                                  0000000 00ML00MN
HAL  8903110832P XB33110 -
HAL   SE 0594KM 00 -010 123 49                                  0000000 00ML00MN
CKO  8903110832P XB331068+  -0.06            XC341399XB343731 037 100 268                343912
CKO   W  0609KM 00 -239 254 49                00  085 00 -557   0004551 50ML44MN
GBN  8903110832P XB33219 -
GBN   E  0690KM 00 -100 109 49                                  0000000 00ML00MN
EEO  8903110832P XA332274C  -0.06            XC343402XC350894 037 100 384                351177
EEO   W  0708KM 00 -240 264 49                00 -018 00 -161   0006521 52ML46MN
JAQ  8903110832P XB333357D  -0.07            XB345134XC353027 043 100 358                353447
JAQ   NW 0793KM 00 -195 331 49                00 -096 00 -412   0005231 54ML46MN
KAO  8903110832P XB33512 -
KAO   W  0950KM 00 -338 286 49                                  0000000 00ML00MN
YKA  8903110832P XB37500 C
YKA   NW 3207KM 00  004 317 33                                  0000000 00ML00MN
              Z
```

19890311 08:31 MN=4.4 47.718N 69.870W 10.13 KM

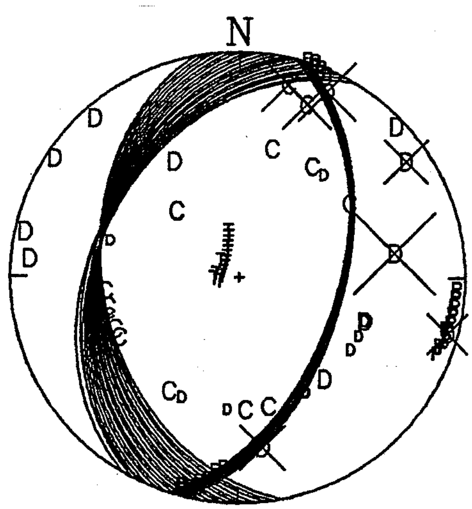
A64	352.000	-65.000	D		Clear
A64	352.000	-65.000	R	1.211	Strong s, Sv=D
A61	261.000	-59.000	D		Clear
A61	261.000	-59.000	R	0.150	Weak S
A16	201.000	-71.000	C		Clear
A16	201.000	-71.000	R	1.094	Weak S, Sv=D
LPQ	194.000	-77.000	C		Clear P
LPQ	194.000	-77.000	R	0.983	Weak P, poor S
A54	235.000	-79.000	D		Clear
A54	235.000	-79.000	R	1.235	
A11	205.000	-80.000	D		Clear
A11	205.000	-80.000	R	0.842	
SLQ	095.000	-81.000	D		Strong, analog data
AGM	138.000	-84.000	D		Weston data, impulsive
DAQ	285.000	-85.000	D		Clear
DAQ	285.000	-85.000	R	1.329	Weak P, strong S
EBN	102.000	-85.000	D		Weak but clear
QCQ	226.000	-86.000	D		Strong, analog data
CBM	123.000	-86.000	D		Weston data, impulsive
HTQ	033.000	49.000	C		Clear
HNME	140.000	49.000	D		Weston data, impulsive
GSQ	056.000	49.000	C		Not strong
DPQ	243.000	49.000	C		Very weak, but clear
KLN	109.000	49.000	D		OK
MIM	167.000	49.000	C		Weston data, impulsive
MNQ	014.000	49.000	C		Clear
HKM	177.000	49.000	C		Weston data, impulsive
DVT	211.000	49.000	C		Weston data, goes down but polarity r
SIC	039.000	49.000	-		Analog data
GGN	140.000	49.000	D		Weak
EMM	150.000	49.000	-		Weston data, emergent
TRM	185.000	49.000	-		Weston data, emergent
TRQ	247.000	49.000	C		Weak
LMN	116.000	49.000	-		Very weak
GRQ	257.000	49.000	C		Clear
BVT	205.000	49.000	-		Weston data, emergent
HAL	123.000	49.000	-		Poor
CKO	254.000	49.000	+		Poor
GBN	109.000	49.000	-		Poor
EEO	264.000	49.000	C		Not strong
JAQ	331.000	49.000	D		OK
KAO	286.000	49.000	-		Analog
YKA	317.000	33.000	C		Digital data; good



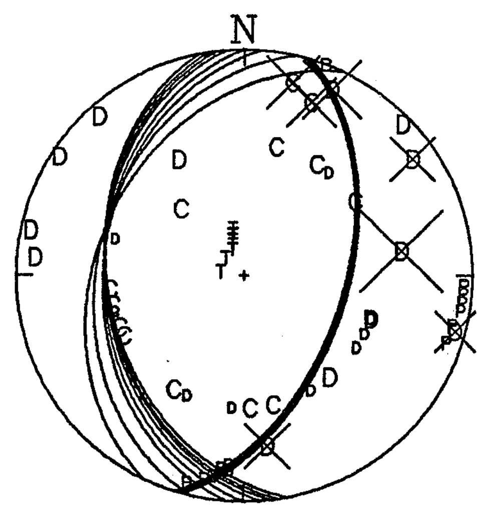
Data 890311



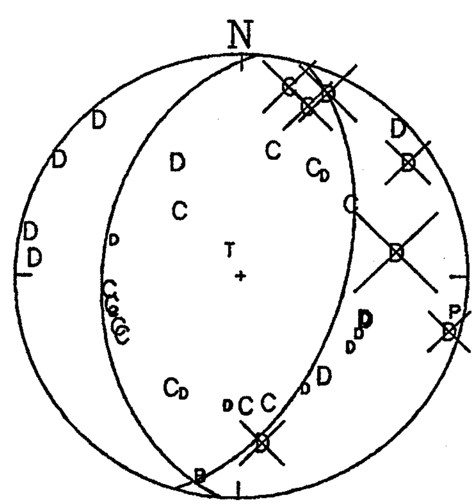
P3.5 R7 inc 2



P3 R7 inc 2



P3 R5 inc 2



Best 890311

Seismic Zone: Boothia-Ungava

Magnitude : 5.7 MN; 5.1 mb

Location : West shore of Ungava Bay
(Payne Bay, Quebec)
60.05 N 70.10 W

Date(Y/M/D) : 89 03 16

Time(UT) : 04:17

Depth:

closest station: FRB (422 km)
depth pegged at 18 km
(surface-wave modelling suggests about 11 km)

Quality of Readings:

All reading checked by J.A. and H.S. Hasegawa
Greenland readings from copies provided by S. Gregersen
DAG and GDH were reported to NEIS as 'D'
IGL and RES give strong D's and contrast with good C's on rest of Canadian Arctic stations
ECTN and SE Canada give rather weak D's mixed with a few C's; GBN is a clear C. Dubious readings (HTQ +; DPQ -; HAL +; QCQ +; GAC +; OTT +) not used
SOO and ULM are good D's
Teleseismic arrivals from NEIS are clear C's

Comments:

Mechanism is tightly constrained by a few strong readings
All mechanisms misfit JAQ, LMQ, KLN, TBO, and GTO
'P5 inc 5' is fairly well-constrained but misfits the above stations plus a mixture of BLC, FFC, GBN, and FRB
'P3.5 inc 2' is constrained to fit the good arrivals at FRB, RES, IGL, GBN, and FFC
The 'Best Solution' averages the dip, strike and rake of the 3 solutions 'P3.5 inc 2'
The mechanism represents dominantly thrust faulting on east-west planes in response to north-south compression

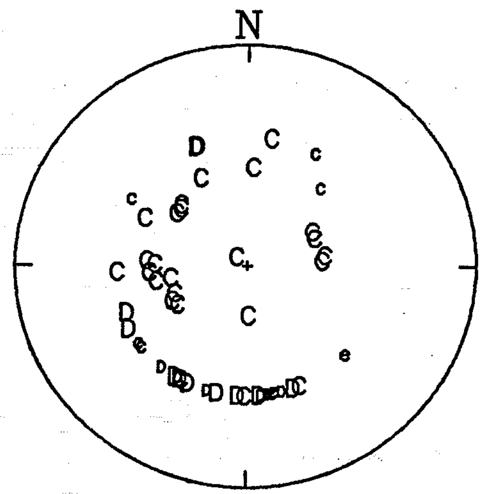
Best Solution:

Strike, Dip, Rake	260	42	058
Strike, Dip, Rake	120	55	116
Trend & Plunge of P	192	07	
Trend & Plunge of T	085	68	
Trend & Plunge of B	285	21	

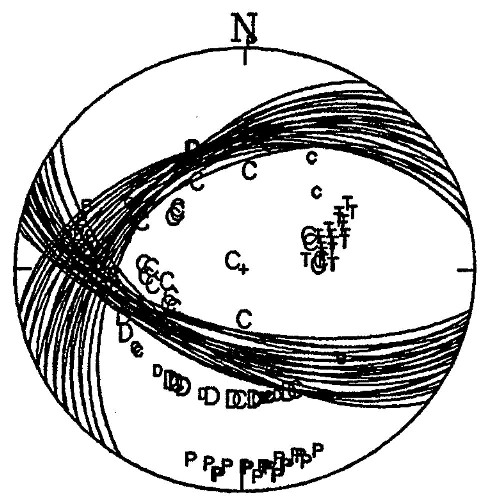
```
+60.052- 70.099F1MN=5.7 0417293 16031989 00.0280.126 0.2 11 12 150.97 218.00   0 1ML=0.0  00F 0 0.00
PAYNE BAY, UNGAVA PENN., QUEBEC          BAIE PAYNE, PENINSULE UNGAVA, QUEBEC
MAG (EDR) 5.2 MB (58 OBS), 5.0 MS (1 OBS)
FELT INTENSITY IV IN KANGIRSUK,          RESSENTI INTENSITE IV A KANGIRSUK,
AUPALUK, TASIUJAQ, KUUJJUAQ,             AUPALUK, TASIUJAQ, KUUJJUAQ,
AND KANGIQSUALUJUAQ.  NOT FELT           ET KANGIQSUALUJUAQ. PAS RESSENTI
IN QUAQTAQ AND INUKJUAK.                 A QUAQTAQ ET INUKJUAK.
$ MOST STATION AMPLITUDES ARE CLIPPED
$ NO RECORD FOR FCC ON THIS DAY
$ ADAMS READ FOR FIRST MOTION
$ JAQ READING CHECKED BY DRYSDALE
FRB  8903160419P  A1827  C
FRB   N  0420KM 07  065 011 49                            0000000 00ML00MN
SCH  8903160419P  A18505 D
SCH   S  0617KM 01  018 160 49                            0000000 00ML00MN
JAQ  8903160419P  A191205C  -0.07     XB202974 X210378 040 1004965          211366
JAQ   SW 0776KM 78  224 209 49         00  530 00 -307   0077990 65ML58MN
MNQ  8903160419P  A194465D  -0.10     XC212499
MNQ   S  1064KM 02 -037 175 49         00 -085            0000000 00ML00MN
SIC  8903160419P  B19503 -
SIC   S  1121KM 02 -158 168 49                            0000000 00ML00MN
IGL  8903160419P  A19582 D            XC2152
IGL   NW 1177KM 03 -046 337 49         00  228            0000000 00ML00MN
HTQ  8903160419P XB200219   -0.07      X215733 X230383 073 1004947          231025
HTQ   S  1215KM 00 -116 174 49         00 -052 00 -604   0042579 70ML59MN
GSQ  8903160419P XA200780E  -0.22     XB220850 X231620 070 1007223          232185
GSQ   S  1256KM 00 -070 170 49         00  179 00 -522   0064833 72ML61MN
GDH  8903160419P  B20122 +
GDH   NE 1289KM 00 -005 030 49                            0000000 00ML00MN
DAQ  8903160419P  A201881D  -0.06     XC222801 X234114 057 1002290          234660
DAQ   S  1349KM 13 -093 184 49         00  157 00 -617   0025243 68ML57MN
LMQ  8903160419P XB20235 C
LMQ   S  1393KM 00 -153 181 49                            0000000 00ML00MN
EBN  8903160419P XA202620-  -0.22     XC223564 X235863 097 1004359          241714
EBN   S  1408KM 00 -082 174 49         00 -339 00 -538   0028235 69ML58MN
KAO  8903160419P  B20285 -
KAO   SW 1421KM 00  010 219 49                            0000000 00ML00MN
BLC  8903160419P  A20280 +
BLC   NW 1421KM 03 -041 301 49                            0000000 00ML00MN
KLN  8903160419P XA203377+  -0.29     XB225516 X242837 057 1001084          243775
KLN   S  1492KM 00 -356 169 49         00 -181 00  083   0011949 66ML54MN
DPQ  8903160419P XA203660   -0.06     XB225833 X243070 067 1002336          243413
DPQ   S  1500KM 00 -149 188 49         00 -013 00  106   0021907 69ML57MN
GRQ  8903160419P XB204222-  -0.09     XB231062 X243595 123 1006366          244699
GRQ   S  1545KM 00 -139 197 49         00  255 00 -630   0032519 70ML59MN
TRQ  8903160419P XA204498D  -0.09     XC231515 X244353 147  101386          245275
TRQ   S  1568KM 00 -155 193 49         00  198 00 -530   0059241 72ML62MN
GTO  8903160419P XB20456 +
GTO   SW 1570KM 00 -096 230 49                            0000000 00ML00MN
EEO  8903160419P  A205023D  -0.06     XC232352 C245635 063 1002407          250832
EEO   SW 1606KM 10 -080 206 49         00  247 01 -297   0024006 70ML58MN
LMN  8903160419P XA204886-  -0.29     XC232106 X250393 127 1003457          251815
LMN   S  1620KM 00 -412 165 49         00 -322 00  041   0017103 68ML57MN
GAC  8903160419P XB205341   -0.06     XC233027 X250335
GAC   S  1638KM 00 -145 195 49         00  255 00 -483   0000000 00ML00MN
SBQ  8903160419P XC205489   -0.07     XC232963 X250568 080 1002573          251551
SBQ   S  1639KM 00 -017 185 49         00  157 00 -290   0020208 70ML57MN
SWO  8903160420P XB205874-  -0.06
SWO   SW 1647KM 00  271 211 49                            0000000 00ML00MN
GGN  8903160419P XA205704-  -0.29     XC233428 X251326 073 1001413          252821
GGN   S  1678KM 00 -295 171 49         00 -222 00 -642   0012162 68ML55MN
SUO  8903160420P XB210284D  -0.06
SUO   SW 1681KM 00  264 210 49                            0000000 00ML00MN
SZO  8903160420P XB210363D  -0.06
SZO   SW 1692KM 00  216 211 49                            0000000 00ML00MN
GBN  8903160419P XB21010 C


GBN   SE 1728KM 00 -484 157 49                            0000000 00ML00MN
SOO  8903160419P XB21127 D
SOO   SW 1769KM 00 -190 241 49                            0000000 00ML00MN
HAL  8903160419P XB21077
HAL   S  1771KM 00 -339 163 49                            0000000 00ML00MN
TBO  8903160419P XB21108 +            XC2359   X2543
TBO   SW 1775KM 00 -076 233 49         00  210 00 -352   0000000 00ML00MN
STJ  8903160419P XB21105 E            XC2358   XC2545   100 006 170
STJ   SE 1790KM 00 -266 133 52         00 -208 00 -581   0017802 70ML58MN
WEO  8903160419P XC212288   -0.07     XC241896
WEO   S  1871KM 00  038 201 50         00  166            0000000 00ML00MN
RES  8903160419P XB21247 D            XC2426   X2620
RES   N  1920KM 00 -320 338 50         00 -164 00 -710   0000000 00ML00MN
ULM  8903160419P XB21297 D
ULM   W  1955KM 00 -220 248 47                            0000000 00ML00MN
FFC  8903160419P XB2135  C            XC24435  X2647    110 035 490
FFC   W  1987KM 00 -049 267 47         00  144 00  099   0007997 67ML55MN
YKA  8903160419P XB22157 C
YKA   NW 2358KM 00  206 296 41                            0000000 00ML00MN
SCO  8903160419P          +
SCO   NE 2446KM          042 39                           0000000 00ML00MN
ALE  8903160419P XA22295 C
ALE   N  2520KM 00  086 003 37                            0000000 00ML00MN
MBC  8903160419P XA22389 C            XC2655   XB2936   120 051 270
MBC   NW 2594KM 00  361 333 37         00  384 00 -003   0002772 64ML52MN
DAG  8903160419P XB22425
DAG   NE 2665KM 00  096 026 36                            0000000 00ML00MN
EDM  8903160419P XA22500 C
EDM   W  2710KM 00  458 273 36                            0000000 00ML00MN
SES  8903160419P XB22550 C
SES   W  2766KM 00  475 266 35                            0000000 00ML00MN
INK  8903160419P XB23167 C             X2833    X3150    150 025 305
INK   NW 3065KM 00  204 314 33         00  159 00  198   0005110 67ML56MN
HRY  8903160419P          C
HRY   W  3081KM          260 33                           0000000 00ML00MN
PNT  8903160419P XB23403 C
PNT   W  3320KM 00  510 271 33                            0000000 00ML00MN
FBA  8903160419P XB24158 C
FBA   NW 3793KM 00  330 312 32                            0000000 00ML00MN
PMR  8903160419P XB24354 C
PMR   NW 4043KM 00  356 308 32                            0000000 00ML00MN
             Z
```

19890316 04:17 MN=5.7 60.036N 70.059W 18.00 KM

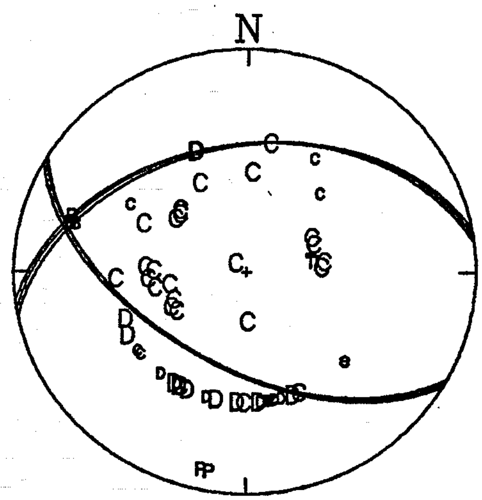
FRB	010.000	49.000	C	strong
SCH	160.000	49.000	D	good
JAQ	209.000	49.000	C	low amplitude C on digital
MNQ	175.000	49.000	D	strong
SIC	168.000	49.000	-	ok
IGL	337.000	49.000	D	strong
GSQ	170.000	49.000	e	emergent
GDH	030.000	49.000	+	from analog copies; ok (reported to NEIS as
DAQ	184.000	49.000	D	good
LMQ	181.000	49.000	C	analog, good
EBN	174.000	49.000	-	weak
KAO	219.000	49.000	-	down, but weak
BLC	301.000	49.000	+	noisy signal but up
KLN	169.000	49.000	+	poor onset
GRQ	197.000	49.000	-	weak
TRQ	193.000	49.000	D	good
GTO	231.000	49.000	+	weak
EEO	206.000	49.000	D	definite
LMN	165.000	49.000	-	weak
SWO	211.000	49.000	-	weak
GGN	171.000	49.000	-	ok
SUO	210.000	49.000	D	good
SZO	212.000	49.000	D	good
GBN	157.000	49.000	C	strong
SOO	241.000	49.000	D	not strong
TBO	233.000	49.000	+	weak
STJ	133.000	49.000	e	emergent
RES	338.000	49.000	D	strong
ULM	248.000	47.000	D	strong
FFC	267.000	47.000	C	good
YKA	296.000	41.000	C	strong
SCO	042.000	39.000	+	from analog copies; weak
ALE	003.000	37.000	C	strong
MBC	333.000	37.000	C	good
EDM	273.000	36.000	C	good
SES	266.000	35.000	C	good
INK	314.000	33.000	C	good
HRY	260.000	33.000	C	via NEIS; not seen
PNT	271.000	33.000	C	via NEIS; not seen
FBA	312.000	32.000	C	via NEIS; not seen
PMR	308.000	32.000	C	via NEIS; not seen
TOL	086.000	26.700	C	via NEIS; not seen
KSP	061.200	26.400	C	via NEIS; not seen
KBA	066.700	25.900	C	via NEIS; not seen
GOL	244.000	29.600	C	via NEIS; not seen
ALQ	240.000	28.500	C	via NEIS; not seen
GLA	248.400	27.650	C	via NEIS; not seen
BRK	260.500	27.600	C	via NEIS; not seen
LOR	082.000	27.800	C	via NEIS; not seen
ZOBO	178.800	18.250	C	via NEIS; not seen
ADE	311.000	05.000	C	via NEIS; not seen
HRY	260.000	33.000	C	via NEIS; not seen
LLM	260.000	33.000	C	via NEIS; not seen



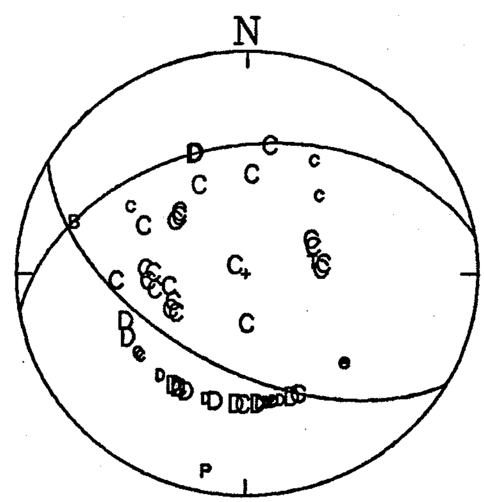
DATA 890316



P5 INC 5



P3.5 INC 2



BEST 890316

Seismic Zone: UNGAVA

Magnitude : 5.0 MN

Location : 60.06 N 73.75 W

Date(Y/M/D) : 1989 12 25

Time(UT) : 04:25

Depth:

closest station: FRB (494 km)
free depth = unknown, likely shallow
secondary arrivals suggest pP at 0.6 s
and sP at 1.0 s for a depth of 1-3 km

Quality of Readings:

Many of polarities to south are very weak, as for the mainshock; the change in polarity from - to + south across New England suggests a nodal plane.
FRB and SCH both have weak beginnings.
With respect to the main shock, FRB, YKA, and FFC have different polarity.
Waveforms across the ECTN are complex. Waveform matching of the first few cycles suggest OTT=MNT=SBQ=DPQ=D and perhaps also a polarity change between CLTN and New Brunswick stations, but also that EEO=C and SUO=SWO=D. Polarity of EEO system is not in doubt (it was ok for the mainshock), and the discrepancy is so far unexplained.

Comments:

P5.5 is at 2 degree increments and is forced to fit the good critical polarities at MBC, YKA, FCC, FFC, the rather poorly defined polarity change CLTN/NB, and to come close to fitting the northern New England/IVT polarity reversal.
It misfits good readings (away from nodal planes) on EEO, KAO, FSB, and MEO and less strong readings on SCH, BLC, INK, KBT and some New England stations. FRB is on a node.
When compared to the mechanism for the main shock, the NNW-dipping plane is seen to be similar but the other nodal plane is rotated 30 degrees clockwise. Polarities for the foreshock are shown together with the mainshock nodal planes in the lower left. The foreshock mechanism would be more similar to the mainshock if the D reading at FFC were ignored.
Best solution is average of two best scoring mechanisms. It represents thrust faulting on east-west planes in response to north-south compression.

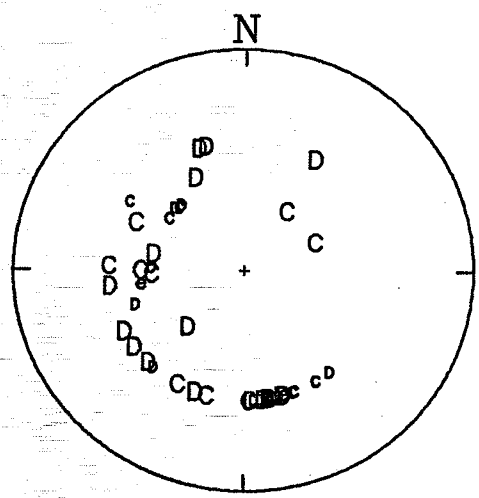
Best Solution:

Strike, Dip, Rake	251	54	046
Strike, Dip, Rake	129	54	134
Trend & Plunge of P	190	00	
Trend & Plunge of T	100	56	
Trend & Plunge of B	280	34	

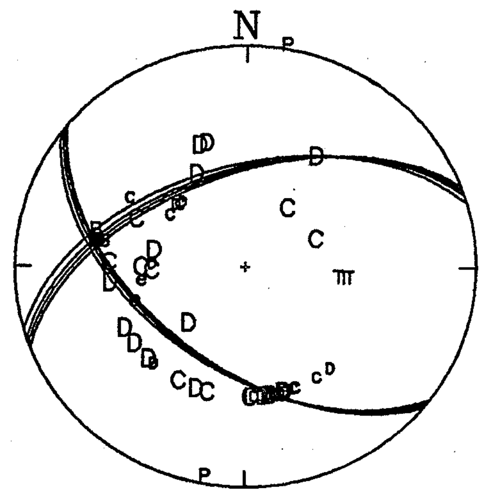
```
+60.057- 73.754F1MN=5.0 0425521 25121989 00.0260.067 0.2 42 42 160.00N218.00   0 1ML=0.0  00  0L3.62
UNGAVA PENINSULA, NORTHERN QUEBEC         PENINSULE D'UNGAVA, QUEBEC
FORESHOCK                                 PRECURSEUR
MAG (NEIC) 5.1MB                          MAG (NEIC) 5.1 MB
MAG (NEIC) 4.3MS                          MAG (NEIC) 4.3 MS
$ NOT REPORTED FELT
$ YKA MB=5.3 AT 1 HZ
$
FRB  8912250425P  A26587 D   0.00                                 000   0    0    0  0
FRB   NE 0494KM 00  061 031 49                                      0000000 00ML00MN
SCH  8912250425P  A27259 -   0.00                                 000   0    0    0  0
SCH   SE 0718KM 00  046 141 49                                      0000000 00ML00MN
IGL  8912250425P  A28115 D   0.00                XB29580 XC3059   000   0    0    0  0
IGL   N  1107KM 00 -134 343 49                    00  079 00  098   0000000 00ML00MN
FCC  8912250425P  A28201 C   0.00                XB3011  XX3116   040 267 500     0  0
FCC   W  1161KM 00  076 272 49                    00  244 00  324   0002942 56ML47MN
BLC  8912250425P  B2830  +   0.00                XB3028  XC3137   000   0    0    0  0
BLC   NW 1247KM 00  019 302 49                    00  117 00  052   0000000 00ML00MN
KAO  8912250425P   28365 C   0.00                XB3041  XX3153   050  84 600     0  0
KAO   SW 1307KM 00 -069 209 49                    00  131 00 -013   0008976 63ML52MN
GSQ  8912250425P  B283876+  -0.22                XC304411XB315864 137 1006630     0  3
GSQ   S  1313KM 00  060 158 49                    00  289 00  363   0030407 68ML58MN
CIQ  8912250425P  B28396 -
CIQ   S  1327KM 00 -006 170 49                                      0000000 00ML00MN
DAQ  8912250425P  A284460D  -0.06                XB305313XC320816 043 100 314     0  0
DAQ   S  1357KM 00  113 172 49                    00  253 00  105   0004588 60ML50MN
LMQ  8912250425P  B28492 D
LMQ   S  1411KM 00 -077 169 49                                      0000000 00ML00MN
SLQ  8912250425P  B28501 -
SLQ   S  1415KM 00 -025 165 49                                      0000000 00ML00MN
A54  8912250425P         -
A54   S  1421KM         170 49                                      0000000 00ML00MN
GTO  8912250425P   28510 -   0.00                XB3105  XX3229   050 124 400     0  0
GTO   SW 1423KM 00 -035 222 49                    00  060 00  382   0004054 60ML49MN
A11  8912250425P         -
A11   S  1446KM         169 49                                      0000000 00ML00MN
EBN  8912250425P  A285512E  -0.22                XB311008XB323390 070 100 444     0  0
EBN   S  1448KM 00  043 163 49                    00  002 00  142   0003985 61ML49MN
QCQ  8912250425P  B28587 -
QCQ   S  1488KM 00 -060 173 49                                      0000000 00ML00MN
DPQ  8912250425P  A285961D  -0.06                XC311990XB324529 097 1001296     0  0
DPQ   S  1492KM 00 -017 177 49                    00  083 00  105   0008395 64ML53MN
CBM  8912250425P         -
CBM   S  1508KM         163 49                                      0000000 00ML00MN
EEO  8912250425P  A290464C  -0.06                XC312268XB325956 063 100 644     0  0
EEO   S  1535KM 00 -044 196 49                    00 -564 00  337   0006423 64ML52MN
KLN  8912250425P  A290558+  -0.29                XB313557XB330721 113 100 785     0  0
KLN   S  1550KM 00 -152 159 49                    00  390 00  674   0004365 62ML50MN
HNME 8912250425P         -
HNME  S  1594KM         164 49                                      0000000 00ML00MN
SUO  8912250425P  B29107 D
SUO   S  1594KM 00 -155 201 49                                      0000000 00ML00MN
GAC  8912250425P  C291467   -0.06                        XC331510 080 100 619     0  0
GAC   S  1603KM 00  131 185 49                            00  009   0004862 63ML51MN
SOLO 8912250425P  A29132 D
SOLO  SW 1611KM 00 -106 234 49                                      0000000 00ML00MN
TBO  8912250425P  B29149 D
TBO   SW 1621KM 00 -061 225 49                                      0000000 00ML00MN
JKM  8912250425P         -
JKM   S  1621KM         170 49                                      0000000 00ML00MN



MNT  8912250425P   291609   -0.06                XB314830XB332157 090 100 837     0  0
MNT   S  1621KM 00  050 180 49                    00  165 00  151   0005843 64ML52MN
OTT  8912250425P   291852   -0.06                XB315808XB333031 057 100 449     0  0
OTT   S  1639KM 00  083 185 49                    00  777 00  550   0004949 63ML51MN
SBQ  8912250425P   291953   -0.07                XB315316XB332947 077 100 585     0  0
SBQ   S  1640KM 00  168 175 49                    00  258 00  435   0004774 63ML51MN
DVT  8912250425P         -
DVT   S  1685KM         176 49                                      0000000 00ML00MN
LMN  8912250425P   292212   -0.29                XB320363XB334272 103 100 537     0  0
LMN   SE 1689KM 00 -204 155 49                    00  221 00  361   0003276 62ML50MN
GGN  8912250425P  C292873   -0.29                XB321163XB335371 087 100 306     0  0
GGN   S  1727KM 00  002 161 49                    00  227 00  421   0002210 60ML48MN
EMM  8912250425P         -
EMM   S  1757KM         163 49                                      0000000 00ML00MN
ULM  8912250425P  A29302 D
ULM   SW 1771KM 00 -361 242 49                                      0000000 00ML00MN
FFC  8912250425P  B29327 D   0.00                XB32230 XB34020  000   0    0    0  0
FFC   W  1784KM 00 -252 263 52                    00  174 00 -296   0000000 00ML00MN
WEO  8912250425P  C294134   -0.07                XB323064XC342347 057 100 340     0  0
WEO   S  1813KM 00  273 192 52                    00  316 00 1041$  0003748 63ML51MN
GBN  8912250425P  C29370 +
GBN   SE 1823KM 00 -267 148 52                                      0000000 00ML00MN
IVT  8912250425P         +
IVT   S  1842KM         178 50                                      0000000 00ML00MN
RES  8912250425P   29399 D   0.00                XX3236  XX3428   060 200 700     0  0
RES   N  1846KM 00 -246 340 50                    00  153 00  581   0003665 63ML51MN
YKA  8912250425P  B301651C   0.00                                 000   0    0    0  0
YKA   NW 2174KM 00 -152 295 43                                      0000000 00ML00MN
BMS  8912250425P  B30360 -
BMS   W  2311KM 00  417 252 41                                      0000000 00ML00MN
MBC  8912250425P  B3052  D
MBC   NW 2501KM 00  232 333 39                                      0000000 00ML00MN
EDM  8912250425P         C
EDM   W  2506KM         270 37                                      0000000 00ML00MN
SES  8912250425P  B30585 E
SES   W  2564KM 00  307 262 37                                      0000000 00ML00MN
INK  8912250425P  B31270 -   0.00                                 000   0    0    0  0
INK   NW 2918KM 00  161 313 34                                      0000000 00ML00MN
FSB  8912250425P  B31389 D
FSB   W  3039KM 00  355 281 33                                      0000000 00ML00MN
SPY  8912250425P  B31388 +
SPY   NW 3052KM 00  248 315 33                                      0000000 00ML00MN
PNT  8912250425P  B31450 C   0.00                         XB40280 000   0    0    0  0
PNT   W  3116KM 00  342 268 33                             00 1499$ 0000000 00ML00MN
KBT  8912250425P  B3147  -
KBT   NW 3147KM 00  305 317 33                                      0000000 00ML00MN
WPB  8912250425P  B31590 -
WPB   W  3293KM 00  333 272 33                                      0000000 00ML00MN
DWY  8912250425P  B32012 +
DWY   NW 3314KM 00  383 306 33                                      0000000 00ML00MN
                Z
```

19891225 04:25 MN=5.0 60.057N 73.754W 18.00 KM

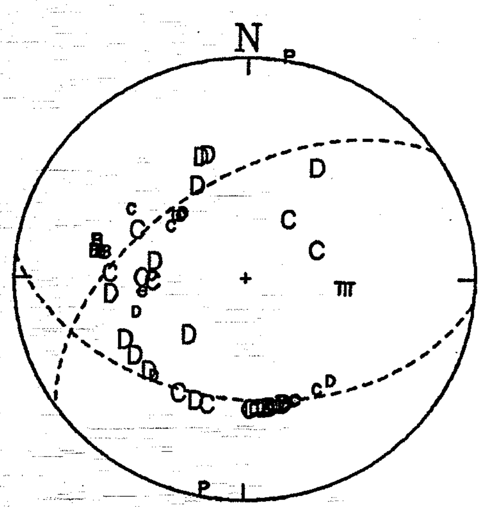
FRB	031.000	49.000	D	+N? = C, weak
SCH	141.000	49.000	-	very weak
IGL	343.000	49.000	D	strong
FCC	272.000	49.000	C	good
BLC	302.000	49.000	+	overwritten
KAO	209.000	49.000	C	good
GSQ	158.000	49.000	+	poor
CIQ	170.000	49.000	-	ok
DAQ	172.000	49.000	D	good
LMQ	169.000	49.000	D	weak
SLQ	165.000	49.000	-	weak
A54	170.000	49.000	-	ok
GTO	222.000	49.000	-	v. weak
A11	169.000	49.000	-	not strong
EBN	163.000	49.000	e	perhaps +
QCQ	173.000	49.000	-	ok
DPQ	177.000	49.000	D	good
CBM	163.000	49.000	-	Weston reading by J. Ebel, D
EEO	196.000	49.000	C	good, waveform inverse of SLTN
KLN	159.000	49.000	+	very weak
HNME	164.000	49.000	-	Weston reading by J. Ebel, D
SUO	201.000	49.000	D	good
SOLO	234.000	49.000	D	weak
TBO	225.000	49.000	D	ok
JKM	170.000	49.000	-	Weston reading by J. Ebel, D
DVT	176.000	49.000	-	Weston reading by J. Ebel, D
EMM	163.000	49.000	-	Weston reading by J. Ebel, D
ULM	242.000	49.000	D	excellent
FFC	263.000	49.000	D	good
GBN	148.000	49.000	+	ok
IVT	178.000	43.000	+	Weston reading by J. Ebel, C
RES	340.000	49.000	D	ok
YKA	295.000	43.000	C	good
BMS	252.000	41.000	-	ok
MBC	333.000	39.000	D	good
EDM	270.000	37.000	C	excellent
SES	262.000	37.000	e	emergent
INK	313.000	34.000	-	dubious, might be up
FSB	281.000	33.000	D	Not used; very clean wave
SPY	315.000	33.000	+	weak
PNT	268.000	33.000	C	good
KBT	317.000	33.000	-	noisy record
WPB	272.000	33.000	-	not strong
DWY	306.000	33.000	+	very weak
MEO	224.000	28.700	D	from PDE, not used
DOU	067.000	27.000	C	from PDE
TCF	034.000	26.500	C	from PDE, represents 5 French stations



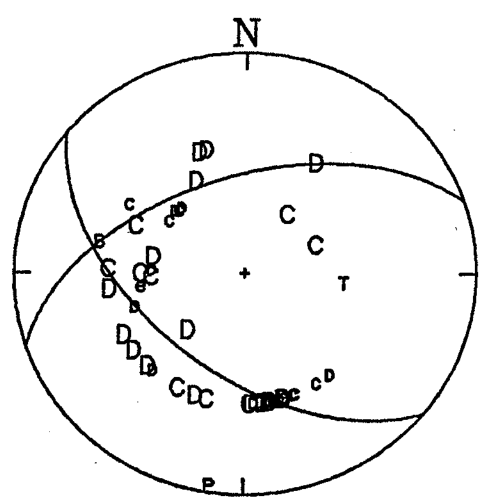
Data 891225 Fore



P5.5



F, with M planes dashed



Best 891225 Fore

Seismic Zone: UNGAVA

Magnitude : 6.1 MN

Location : 60.05 N 73.70 W

Date(Y/M/D) : 1989 12 25

Time(UT) : 14:24

Depth:

closest station: FRB (494 km)
free depth = unknown, likely shallow

Quality of Readings:

Southern Canadian stations are mostly dilatational but nodal, some of northern US are compressive
Southern plane is defined by SCH/LMN and SOLO/GTO;
Northern plane by YKA/FCC and RES
Inconsistant readings at QCQ, BMS, ULM (obliterated by red ink) and a few teleseismic stations.

Comments:

P5 INC 2 misfits a selection of KAO, GTO, ULM, LMN, BMS, QCQ, GSQ, and FCC; "Best Solution" misfits only GTO, BMS, QCQ, LMN, and ULM.
A well-determined mechanism representing thrust faulting on E-W or NE-SW planes in response to NNW compression.

Best Solution:

Strike, Dip, Rake	235	53	062
Strike, Dip, Rake	096	45	122
Trend & Plunge of P	344	05	
Trend & Plunge of T	085	67	
Trend & Plunge of B	252	22	

```
+60.026- 73.628F1MN=6.1 1424358 25121989 00.0410.099 0.2 35 35 110.00H218.00    0 1ML=0.0  00F 0 3.62
UNGAVA, NORTHERN QUEBEC
MAINSHOCK
FELT QUITE STRONGLY BY MANY IN KUUJJUAQ
(FORT CHIMO) AND AKULIVIK.
NOT FELT IN IQALUIT (FROBISHER BAY)
$ INTENSITY SURVEY DONE
MAG (NEIC) 6.3MB
MAG (NEIC) 6.3MS
$ SOLUTION BELOW HAS ADAMS P READINGS
FRB  8912251424P  A25401 C    0.00                                   000   0    0    0  0
FRB   NE 0494KM 00 -166 031 49                                        0000000 00ML00MN
SCH  8912251424P  A26075 C    0.00                                   000   0    0    0  0
SCH   SE 0711KM 00 -082 142 49                                        0000000 00ML00MN
IGL  8912251424P  B26532 D    0.00                                   000   0    0    0  0
IGL   N  1113KM 00 -403 343 49                                        0000000 00ML00MN
FCC  8912251424P  A27017 C    0.00                                   000   0    0    0  0
FCC   W  1168KM 00 -226 272 49                                        0000000 00ML00MN
BLC  8912251424P  A27112 -    0.00                                   000   0    0    0  0
BLC   NW 1254KM 00 -331 302 49                                        0000000 00ML00MN
GSQ  8912251424P  A271979D   -0.22           XB292660XC304517 087  102428      0  0
GSQ   S  1307KM 00 -141 158 49                00  287 00  802        0175351 76ML65MN
KAO  8912251424P XB27180 D
KAO   SW 1307KM 00 -298 210 49                                        0000000 00ML00MN
CIQ  8912251424P XB27215 -
CIQ   S  1322KM 00 -135 171 49                                        0000000 00ML00MN
DAQ  8912251424P  A272659D   -0.06           XB293733XC305902 090  101012      0  0
DAQ   S  1353KM 00 -009 172 49                00  391 00  937        0070651 73ML61MN
LMQ  8912251424P XB27313
LMQ   S  1407KM 00 -185 170 49                                        0000000 00ML00MN
A16  8912251424P
A16   S  1419KM          169 49                                       0000000 00ML00MN
GTO  8912251424P XB27322 -
GTO   SW 1425KM 00 -316 222 49                                        0000000 00ML00MN
LPQ  8912251424P  B273520-   -0.22                                   000   0    0    0  0
LPQ   S  1433KM 00 -132 169 49                                        0000000 00ML00MN
EBN  8912251424P  B273657D   -0.22           XB295419XC311331 070 1004879      0  0
EBN   S  1443KM 00 -121 164 49                00  152 00 -145        0043794 71ML60MN
AGM  8912251424P          D
AGM   S  1473KM          166 49                                       0000000 00ML00MN
QCQ  8912251424P XB27436 C
QCQ   S  1484KM 00  108 173 49                                        0000000 00ML00MN
DPQ  8912251424P  A274175D   -0.06           XB300123XB312880 097  101203      0  0
DPQ   S  1488KM 00 -132 177 49                00 -078 00  186        0077924 74ML63MN
CBM  8912251424P          D
CBM   S  1503KM          164 49                                       0000000 00ML00MN
EEO  8912251424P  A274701D   -0.06           XB301251XB314389 170  106142      0  3
EEO   S  1533KM 00 -165 196 49                00  075 00  434        0227008 77ML67MN
KLN  8912251424P  A274731    -0.29           XB301523XB314976 070 1004975      0  0
KLN   S  1544KM 00 -283 159 49                00  105 00  714        0044656 72ML60MN
SWO  8912251424P XB27486 D
SWO   S  1558KM 00 -298 201 49                                        0000000 00ML00MN
HNME 8912251424P          D
HNME  S  1589KM          164 49                                       0000000 00ML00MN
SUO  8912251424P XB27527 D
SUO   S  1594KM 00 -320 201 49                                        0000000 00ML00MN
SZO  8912251424P XB27535 D
SZO   S  1600KM 00 -318 202 49                                        0000000 00ML00MN
GAC  8912251424P
GAC   S  1600KM          185 49                                       0000000 00ML00MN


SOLO 8912251424P XB27556 C
SOLO  SW 1614KM 00 -285 235 49                                        0000000 00ML00MN
JKM  8912251424P          D
JKM   S  1616KM          171 49                                       0000000 00ML00MN
MNT  8912251424P XA275715D   -0.06           XC302986XB320793 103  101604      0  0
MNT   S  1618KM 00 -176 180 49                00  021 00  509        0097847 76ML64MN
TBO  8912251424P XB2800  -
TBO   SW 1623KM 00  043 226 49                                        0000000 00ML00MN
UNB  8912251424P          -
UNB   S  1635KM          160 49                                       0000000 00ML00MN
SBQ  8912251424P XA280029    -0.07           XB303568XB321164 077 1006257      0  0
SBQ   S  1636KM 00 -081 175 49                00  222 00  389        0051057 73ML61MN
OTT  8912251424P XA275972-   -0.06           XB303662XB321186 073 1006675      0  0
OTT   S  1636KM 00 -138 186 49                00  315 00  406        0057452 74ML62MN
MIM  8912251424P          D
MIM   S  1675KM          167 49                                       0000000 00ML00MN
DVT  8912251424P          D
DVT   S  1681KM          176 49                                       0000000 00ML00MN
LMN  8912251424P XA280296D   -0.29           XB304461         073 1002081      0  0
LMN   SE 1683KM 00 -421 156 49                00  073                0017911 70ML57MN
GGN  8912251424P XA280872C   -0.29           XB305164XB324072 073 1002629      0  0
GGN   S  1722KM 00 -306 162 49                00 -030 00  900        0022628 71ML58MN
BNH  8912251424P          D
BNH   S  1727KM          174 49                                       0000000 00ML00MN
HKM  8912251424P          D
HKM   S  1733KM          169 49                                       0000000 00ML00MN
EMM  8912251424P          D
EMM   S  1751KM          164 49                                       0000000 00ML00MN
ULM  8912251424P XB28124 D
ULM   SW 1776KM 00 -571 242 49                                        0000000 00ML00MN
FFC  8912251424P XB28142 C    0.00                                   000   0    0    0  0
FFC   W  1791KM 00 -552 263 52                                        0000000 00ML00MN
WEO  8912251424P XB281970-   -0.07           XB311003XB330023 103 1006915      0  0
WEO   S  1811KM 00 -244 192 52                00 -079 00  395        0042183 74ML61MN
GBN  8912251424P XB28186 +
GBN   SE 1816KM 00 -405 148 52                                        0000000 00ML00MN
HNH  8912251424P          C
HNH   S  1820KM          177 52                                       0000000 00ML00MN
IVT  8912251424P          C
IVT   S  1838KM          179 50                                       0000000 00ML00MN
HAL  8912251424P          E
HAL   SE 1841KM          154 50                                       0000000 00ML00MN
RES  8912251424P XB28197 D
RES   N  1852KM 00 -705 340 50                                        0000000 00ML00MN
BVT  8912251424P          C
BVT   S  1859KM          177 50                                       0000000 00ML00MN
MUN  8912251424P XB28359 +
MUN   SE 1940KM 00 -072 126 50                                        0000000 00ML00MN
HRV  8912251424P          C
HRV   S  1956KM          175 47                                       0000000 00ML00MN
WES  8912251424P          C
WES   S  1971KM          174 47                                       0000000 00ML00MN
MD2  8912251424P          C
MD2   S  2061KM          177 45                                       0000000 00ML00MN
MD3  8912251424P          C
MD3   S  2063KM          177 45                                       0000000 00ML00MN
BCT  8912251424P          C
BCT   S  2064KM          179 45                                       0000000 00ML00MN
YKA  8912251424P  A2901  D    0.00                                   000   0    0    0  0
YKA   NW 2182KM 00 -159 295 43                                        0000000 00ML00MN
```

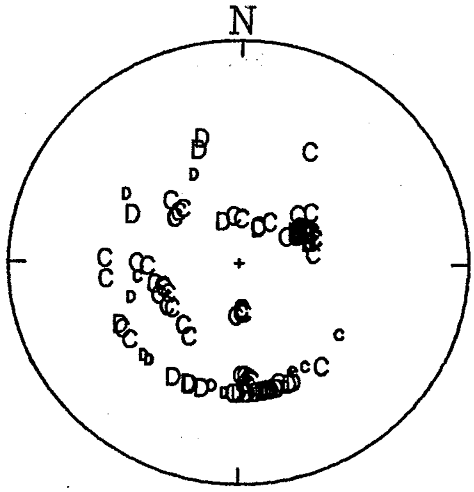
```
BMS  8912251424P XB29153 -
BMS   W  2316KM 00 -084 253 41                         0000000 00ML00MN
MBC  8912251424P XB29335 -
MBC   NW 2507KM 00 -050 333 37                         0000000 00ML00MN
EDM  8912251424P           C
EDM   W  2513KM            270 37                      0000000 00ML00MN
ALE  8912251424P                0.00                000   0    0    0  0
ALE   N  2533KM            004 37                      0000000 00ML00MN
SES  8912251424P XB29405 +
SES   W  2570KM 00  075 262 37                         0000000 00ML00MN
INK  8912251424P  B30090 C   0.00                   000   0    0    0  0
INK   NW 2925KM 00 -075 313 34                         0000000 00ML00MN
FSB  8912251424P  B30207 +
FSB   W  3046KM 00  100 281 33                         0000000 00ML00MN
SPY  8912251424P  B3021  +
SPY   NW 3059KM 00  034 315 33                         0000000 00ML00MN
PNT  8912251424P XB30272 C   0.00                   000   0    0    0  0
PNT   W  3123KM 00  132 268 33                         0000000 00ML00MN
DLB  8912251424P  B30292 D
DLB   W  3133KM 00  244 292 33                         0000000 00ML00MN
KBT  8912251424P  B3029  +
KBT   NW 3154KM 00  072 317 33                         0000000 00ML00MN
WHB  8912251424P  A30371 C
WHB   W  3252KM 00  085 273 33                         0000000 00ML00MN
WHC  8912251424P  B3039  +
WHC   NW 3271KM 00  123 299 33                         0000000 00ML00MN
HNB  8912251424P  B30395 C
HNB   W  3292KM 00  017 271 33                         0000000 00ML00MN
WPB  8912251424P  B30407 C
WPB   W  3300KM 00  072 272 33                         0000000 00ML00MN
DWY  8912251424P  B3043  D
DWY   NW 3322KM 00  126 306 33                         0000000 00ML00MN
BIB  8912251424P  B30417 +
BIB   W  3323KM 00 -011 272 33                         0000000 00ML00MN
SHB  8912251424P  B30425 +
SHB   W  3341KM 00 -091 272 33                         0000000 00ML00MN
GOB  8912251424P  B30445 +
GOB   W  3367KM 00 -079 271 33                         0000000 00ML00MN
NAB  8912251424P  B30447 +
NAB   W  3375KM 00 -129 272 33                         0000000 00ML00MN
RUB  8912251424P  B30494 -
RUB   W  3380KM 00  307 285 33                         0000000 00ML00MN
PGC  8912251424P XB30412
PGC   W  3385KM 00 -559 271 33                         0000000 00ML00MN
KBB  8912251424P  B30502 +
KBB   W  3406KM 00  161 275 33                         0000000 00ML00MN
BTB  8912251424P  B3053  -
BTB   W  3442KM 00  147 274 33                         0000000 00ML00MN
GDR  8912251424P  B3055  +
GDR   W  3448KM 00  319 274 33                         0000000 00ML00MN
PHC  8912251424P  B30555 -
PHC   W  3461KM 00  267 277 33                         0000000 00ML00MN
VIB  8912251424P  B3104  -
VIB   W  3570KM 00  241 284 32                         0000000 00ML00MN
FBA  8912251424P   31100 C   0.00                   000   0    0    0  0
FBA   NW 3647KM 00  248 311 32                         0000000 00ML00MN
PMR  8912251424P   31280 C   0.00                   000   0    0    0  0
PMR   NW 3887KM 00  173 306 32                         0000000 00ML00MN
PAS  8912251424P           C
PAS   W  4308KM            248 31                      0000000 00ML00MN
```

Z

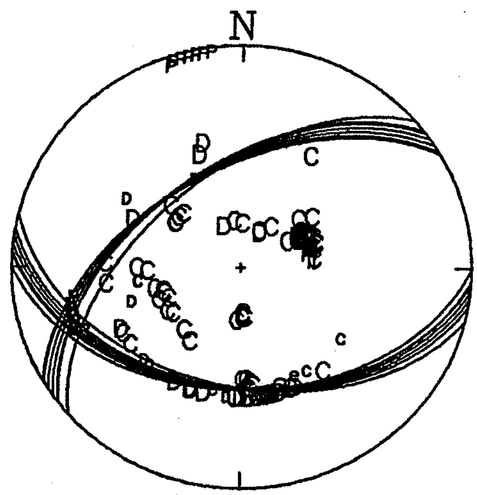
19891225 14:24 MN=6.1 60.054N 73.703W 18.00 KM

FRB	031.000	49.000	C	CNE; strong
SCH	142.000	49.000	C	C?E; not strong
IGL	343.000	49.000	D	strong
FCC	272.000	49.000	C	?, overwritten trace
BLC	302.000	49.000	-	might just be up
KAO	209.000	49.000	D	good
GSQ	158.000	49.000	D	good
CIQ	171.000	49.000	-	v. weak
DAQ	172.000	49.000	D	preceeded by weak -
GTO	222.000	49.000	-	weak, noisy trace before
LPQ	169.000	49.000	-	good
EBN	163.000	49.000	D	weak, definite
AGM	166.000	49.000	D	Weston reading
QCQ	173.000	49.000	C	good
DPQ	177.000	49.000	D	weak precursor
CBM	163.000	49.000	D	Weston reading
EEO	196.000	49.000	D	good
SWO	201.000	49.000	D	ok
SUO	201.000	49.000	D	ok
SZO	202.000	49.000	D	ok
SOLO	234.000	49.000	C	clear, but v. low amplitude up
JKM	170.000	49.000	D	Weston reading
MNT	180.000	49.000	D	ok
TBO	225.000	49.000	-	overwritten
OTT	186.000	49.000	-	noisy trace
UNB	160.000	49.000	-	poor
MIM	167.000	49.000	D	Weston reading
DVT	176.000	49.000	D	Weston reading
LMN	156.000	49.000	D	ok
GGN	162.000	47.000	C	appears ok
BNH	173.000	49.000	D	Weston reading
EMM	164.000	49.000	D	Weston reading
ULM	242.000	49.000	D	almost obliterated by red ink
FFC	263.000	49.000	C	ok
GBN	148.000	45.500	+	weak, might just be down
HNH	176.000	45.500	C	Weston reading
IVT	178.000	45.500	C	Weston reading
HAL	154.000	45.000	e	too noisy
RES	340.000	45.000	D	from LP's; SP gives weak -
BVT	177.000	45.000	C	Weston reading
MUN	126.000	45.000	+	ok
WES	174.000	44.100	C	Weston reading
BCT	179.000	41.900	C	Weston reading
MD3	177.000	41.900	C	Weston reading
HKM	169.000	49.000	D	Weston reading
WEO	192.000	47.000	-	noisy signal
MD2	177.000	45.000	C	Weston reading
YKA	295.000	43.000	D	digital HF & BB data
BMS	252.000	41.000	-	noisy signal
MBC	333.000	37.000	-	weak onset
EDM	270.000	37.000	C	strong
SES	262.000	37.000	+	onset lost in hifreq noise
INK	313.000	34.000	C	strong
FSB	281.000	33.000	+	very weak
SPY	315.000	33.000	+	overwritten ,
PNT	268.000	33.000	C	weak
DLB	292.000	33.000	D	ok
KBT	317.000	33.000	+	poor
WHB	273.000	33.000	C	good
WHC	299.000	33.000	+	very weak
HNB	271.000	33.000	C	fairly clear
WPB	272.000	33.000	C	very good
DWY	306.000	33.000	D	ok
BIB	272.000	33.000	+	?
SHB	272.000	33.000	+	poor
GOB	271.000	33.000	+	
NAB	272.000	33.000	+	good
RUB	285.000	33.000	-	ok
KBB	275.000	33.000	+	weak
BTB	274.000	33.000	-	very weak
GDR	274.000	33.000	+	weak
PHC	277.000	33.000	-	poor
VIB	284.000	32.000	-	
GRF	62.87	26.16	C	direct by phone
PAS	248.000	31.000	C	FAX from Somerville
HRV	175.000	43.000	C	FAX from Somerville
RSON	239.800	49.000	C	all below from NEIS
RSNY	182.500	49.000	C	
FVM	213.38	32.39	C	
AKU	53.29	31.64	C	
MRY	34.98	18.55	C	
LRM	255.62	31.26	C	
TUL	220.61	30.15	C	
SIO	221.28	30.15	C	
GOL	238.56	30.15	C	
FBA	310.79	29.04	C	
ANMO	235.08	29.04	C	
TOA	305.63	28.73	C	
IMA	314.74	28.62	C	
KVN	253.11	28.62	C	
PMR	306.13	28.62	C	
TNP	251.12	28.31	C	
DLE	70.18	28.31	C	
EKA	65.37	28.31	C	
ECP	71.53	28.31	C	
PLM	246.20	27.65	C	
UPP	48.69	27.29	C	
DBN	64.26	27.29	C	
WIT	62.56	26.87	C	
UCC	66.19	26.87	C	
WTS	63.35	26.87	C	
DOU	66.78	27.18	C	
ENN	65.21	27.18	C	
WLF	66.20	26.57	C	
LSF	72.79	26.57	C	
GUD	82.43	26.46	C	
MOX	61.69	26.46	C	
CLL	60.18	26.46	C	
BRG	60.00	26.16	C	
PRU	60.44	25.80	C	
KHC	61.85	25.80	C	
LRG	71.89	25.80	D	
LMR	71.88	25.80	D	
KMR	62.44	25.80	C	
KBA	63.82	25.39	C	
VKA	60.81	25.39	C	
KRA	56.93	25.39	C	
ZST	60.35	25.09	C	
SOP	61.15	25.09	C	

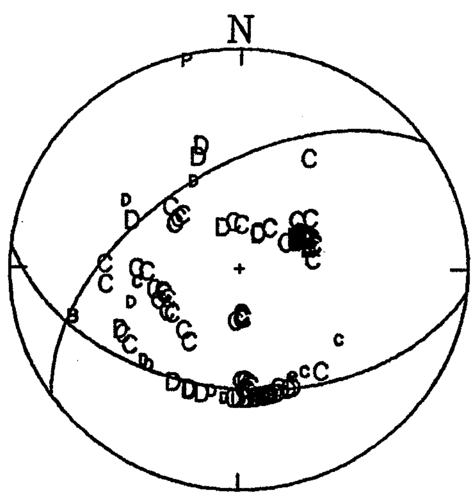
SPC	57.47	25.09	C
SRO	59.87	25.09	C
BUD	59.67	24.79	C
PUK	63.25	23.34	C
SDA	63.55	23.99	C
PHP	63.11	23.34	C
TIR	63.77	23.34	D
SKO	62.19	23.34	C
VTS	60.50	23.34	C
OHR	63.26	23.34	C
PVL	58.73	23.34	C
DIM	59.19	22.99	D
KDZ	59.63	22.99	C
ARI	176.69	17.59	C
NNA	183.33	19.22	C
PRNI	59.04	19.22	C
ARE	177.92	18.21	C
LPB	174.58	18.21	C
BJI	352.41	17.49	C
SHK	338.44	16.53	D
ANT	177.07	16.48	C
LZH	2.08	16.48	C
NDI	25.34	15.20	C
SSE	71.56	26.16	C
HYB	26.85	14.54	D



data 891225 main



P5 INC 2



891225 MAINSHOCK