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New and Revised Earthquake Focal Mechanisms of the Charlevoix Seismic Zone, Canada

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New and Revised Earthquake Focal Mechanisms of the Charlevoix Seismic Zone, Canada

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Abstract

The Charlevoix Seismic Zone (CSZ) is one of the most active seismic areas of eastern Canada. This report presents a series of new and revised CSZ focal mechanisms for the period 1974-1997. The report documents the methodology used, the input data and the results for 52 mechanisms computed with the program FOCMEC. For most new solutions, P and SH first motion data were used to constrain the mechanisms. The P first motions were read on the vertical components of the digital and analogue records for stations located within 150 km of the CSZ. SH first motions (tranverse horizontal S waves) were read off the two horizontal component data of the Charlevoix Local Telemetered Network (CLTN). Mechanisms of earthquakes with magnitude >= 3.0 for the period 1989-1997 were computed. For events of magnitude >= 2.0 recorded between June and November 1996, field data were added to the CLTN to define the focal mechanisms. In addition to these new mechanisms, some published mechanisms were re-computed. Two of the six focal mechanisms from the 1974 field survey appeared well defined, while the other four are less constrained. The August 19, 1979 magnitude m_N 5.0 earthquake was re-analyzed with the current GSC practice for plotting first motions on the focal sphere. Although the original thrust faulting mechanism of the solution remains, the two nodal planes are somewhat different than the ones published. Revisions to the mechanisms published by the Geological Survey of Canada and by Li et al. (1995) are also presented. Finally, the three mechanisms of Lamontagne and Ranalli (1997) are presented. The tectonic implications of these mechanisms will be discussed in a future paper.

Résumé

La zone sismique de Charlevoix (ZSC) est une des régions sismiques les plus actives de l'Est du Canada. Ce rapport présente une série de mécanismes au foyer de la ZSC qui sont nouveaux ou révisés et ce, pour la période 1974-1997. Ce rapport documente la méthodologie utilisée, les données entrées et les résultats pour quelque 52 mécanismes calculés avec le programme FOCMEC. Pour la plupart des nouvelles solutions, les premiers mouvements de P et de SH furent utilisés pour contraindre les mécanismes. Les premiers mouvements de P furent lus sur des enregistrements numériques et analogiques de postes localisés à moins de 150 km de la ZSC. Les premiers mouvements de SH furent lus à partir des données tri-axiales du réseau local télémétrique de Charlevoix (RLTC). Des mécanismes des séismes de magnitude >= 3.0 de la période 1988-1997 furent calculés. Pour les événements de magnitude >= 2.0 enregistrés entre juin et novembre 1996, des données de terrain furent ajoutées à celles du RLTC pour obtenir les mécanismes au foyer. En plus de ces nouveaux mécanismes, quelques autres déjà publiés furent recalculés. Deux des six mécanismes au foyer du levé de terrain de 1974 sont bien définis alors que les quatre autres sont moins bien contraints. Le séisme de magnitude m_N 5,0 du 19 août 1979 fut réanalysé avec la méthode courante pour positionner les premiers mouvements sur la sphère focale. Quoique le mécanisme de faille inverse est préservé, les deux plans nodaux sont quelque peu différents de ceux publiés. Des révisions aux mécanismes publiés par la Commission géologique du Canada et par Li et al. (1995) sont aussi présentés. Finalement, les trois mécanismes de Lamontagne et Ranalli (1997) sont montrés. Les implications tectoniques de ces

mécanismes seront discutés dans un article à venir.

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1- Introduction.

a) Purpose of the report.

Earthquake focal mechanisms can bring to light the relationships between earthquake sources and active faults. They are indicators of the nature of faulting and of the ambient stress system at the earthquake focus. Thus, they are unique sources of seismotectonic information.

This report shows the results of 52 focal mechanism calculations for earthquakes of the Charlevoix Seismic Zone. Focal mechanisms of micro-earthquakes are generally calculated using P first motions. In eastern Canada however, the large inter-station spacing limits the calculations to earthquakes that are at least magnitude 4.0. For smaller earthquakes, P arrivals are generally emergent on stations at regional distances. With the addition of SH first motions in the near field, focal mechanisms can be calculated for events in the magnitude 3.0 to 4.0 range. Most mechanisms of this report are new ones (58%) computed with P first motions and SH first motions. About 40% of these are well constrained. The others are updated mechanisms of six earthquakes of the 1974 field survey, the 1979 Magnitude 5.0 earthquake, and some previously published ones.

This report provides the basic parameters used in the computations of these mechanisms. It also proposes a methodology to be used in similar studies. The tectonic implications of these mechanisms will be treated in an forthcoming paper.

b) Earthquake monitoring in the Charlevoix Seismic Zone.

The Charlevoix Seismic Zone (CSZ) of Québec, Canada, is one of the most seismically active areas of Eastern Canada. Historically, it has been the site of a number of moderate to large earthquakes (Figure 1). Since November 1976, between six to eight digital stations have monitored the area (Figure 2A; 2B). This array has been central to the current understanding of the CSZ seismotectonics. As of 1997, the permanent network of the Charlevoix Region (called the CLTN: Charlevoix Local Telemetered Network) has seven 3-component stations (one broadband: LMQ; and six short-period: A11, A16, A21, A54, A61 and A64; Figure 2B). Four additional stations are located within 150 km of the active zone (one digital: DAQ and four analogue: SHQ, SLQ, CIQ and QCQ; Figures 2B and 2C;). During the period mid-June to mid-November 1996, up to 8 additional analogue and digital field seismographs were in operation (Lamontagne et al., 1997 for details; Figure 2D).

c) Earthquake locations.

All hypocentre locations of this study were routinely computed with the CLTN phases only. The only exception is the June to November 1996 period, when additional phases from up to 6 field stations were added. Earthquakes were located using the "standard" GSC velocity model, which assumes a 36 km thick crust with 6.2 km/s Pg velocity and 3.57 km/s Sg velocity. Mantle velocities are 8.2 km/s for P and 4.7 km/s for S. Take-off angles and azimuths are based on this model. For a focal depth of 18 km, Pg is the first wave to arrive up to about 150 km epicentral distance. Beyond this distance, the first arrival is assumed to be Pn for which a take-off angle of 49° is assumed.

In Charlevoix, a half space velocity model does not take into account the strong lateral velocity change introduced by the Appalachian nappes. A dipping boundary model representing the interface between the Precambrian and the Appalachian nappes does not change significantly the take-off angles and azimuths for south shore stations (Lamontagne, 1987).

d) Determination of P-first motions.

For the digital stations of the Canadian National Seismograph Network (CNSN), most P-first motions were read by the author. Some additional first motions were read from the analogue seismograms. In all cases, the author only used the maximum number of conspicuous first motions. For station CIQ (Chicoutimi, Qué), the first motions were read by Reynald Du Berger of the Université du Québec à Chicoutimi.

e) Instrument polarity.

The CNSN vertical component polarities are checked about once a year using teleseisms or nuclear test sources. Polarity of the CLTN stations were correct. Similar checks were made for the analogue stations. The seismometers and cables were never changed during the period 1988-1997 which insures consistency in the polarities (Gilles Girouard, pers. comm.). To illustrate the polarity correctness, Figure 3 presents the first motions for a South American earthquake recorded on March 25, 1997. Note the similarity of first motion on all components.

f) Methodology.

The program FOCMEC of Snoke et al. (1984) uses a grid search algorithm that finds all mechanisms that match a series of conditions. In this report, the conditions are the number of misfits for P and SH first motions and the search increment for the b axis. The program is run interactively. The results are displayed on a lower hemisphere equi-area projection. In general, the search was made using a one degree b-axis increment. In cases where too many solutions existed, 2 degree, then, 5 degree increments were used. For each event, the parameters that were used are listed in the appendices.

2- New focal mechanisms.

a) Convention for SH first motions.

SH first motions can only be read from rotated traces. This was done with the software package SAC (Seismic Analysis Code; Lawrence Livermore National Laboratory). To automate the process, a Perl Script was written to rotate the two horizontal component time series files with the SAC's function ROTATE. The description of the SAC function ROTATE in Tapley and Tull

(1990) is:

"Pairs of data components are rotated in this command. Each pair must have the same station name, event name, and sampling rate... Both components must be horizontals when the TO option is used. This means that the CMPAZ must be defined and that the CMPINC must be 90°. After the rotation is completed, the first component of each pair will be directed along the angle given after the TO keyword. If the TO GCP (TO Great Circle Path) option is used, this component will be directed along the angle given by the station-event back azimuth plus or minus 180°. This component therefore points from the event towards the station. The station and event coordinates (STLA, STLO, EVLA, and EVLO) must be defined so that the back azimuth can be calculated."

The following SAC instructions are used in the script.

cut start_time end_time	defines start and end times of data
r time-series_n time-series_e	Reads in horizontal time series files (n= north-south e= east-west).
lp be co 11.4 npoles 6	filter traces with a Butterworth filter to simulate pre-1995 CLTN response.
chnhdr evla lat_value evlo long_value	change epicentre coordinates in header
rotate to gcp	rotate traces to "Great Circle Path"
p1 relative perplot 2	plot 2 traces with relative time scale.

In conclusion, two rotated traces are obtained:

a) the radial component, where:
Up: away from the event.
Down: Towards the event.

and the transverse component, where
Up: Towards the right, back to event (> for FOCMEC).
Down: Towards the left, back to event (< for FOCMEC).

The following figures illustrate that the convention is respected. On September 24, 1996 at 23:40 U.T., an earthquake of magnitude 3.0 occurred in the Charlevoix Seismic Zone (Figure 4). The event was recorded by most stations of the 1996 summer field survey. Station A80P was located almost due West of the epicentre (Azimuth N275°). The E-W trace shows an impulsive West-directed Pg motion (Figure 5, bottom trace). This motion is directed at 275° as expected (Figure 6). Traces were rotated into the radial and transverse components (Figure 7). The top trace shows the radial component and the lower one the transverse. As can be seen, the first motion is away from the event (up on upper trace), while the transverse component has very little motion at the peak of the P first break (as expected). For the same event, station A76P was located directly North of the epicentre (Azimuth N0.3°E ; Figure 4). The first motion was mainly directed to the North, away from the epicentre (Figure 8), with a small NNE component, i.e. to the right with our back to the event (Figure 9). The motion is away from the epicentre (Figure 10, top) and the small right component with our back to the epicentre (Figure 10, bottom). The motion would have been read as a (>).

To illustrate that FOCMEC is using the right sign convention, Figure 11 shows the radiation pattern for P and SH expected for a vertical NS striking strike-slip earthquake. FOCMEC gives 0 error for the solution shown. If a station located at N85°E is considered, a (<) SH motion is expected, i.e. a left motion with our back to the event. With the SAC function ROTATE, the radial trace is oriented N85° (i.e. station-event back azimuth) and the transverse component is oriented N175°. The Y-axis is pointing South. The SH first motion is nearly due North, it is plotted Down, i.e. giving a (<) first motion on the SAC plot. Thus, the expected and the SAC derived results are the same.

SH first motions were found to be fairly reliable. During the 1996 summer field survey, two focal mechanism could be determined using the P first motions only (events 960714 18:46 and 960924 23:41; both are described in Appendix 2). In the first case, 3 SH out of 7 did not fit the solution, while 2 out of 9 did not fit the second solution. From these results, it was decided that the P first motions would be preferred over the SH in the determination of the solutions. Thus, a solution with fairly well constrained planes based on P is necessary to get a reliable solution.

b) Listing and displaying the results.

Focal mechanisms were computed as followed. First, the seismic traces for P and transverse SH waves were plotted. From these, the first motions were picked and the pikfile was updated. The updated pickfiles are now in the Canadian seismicity database. From the P first motions only, a FOCMEC run was done, usually with a 5 degree b-axis increment. In most cases, due to the poor constraints, numerous solutions were found. In a few rare cases, one P first motion was wrong. In a second step, using all P and SH first motions, another FOCMEC run was made. If no solution was found using a 1 degree increment, one SH misfit was accepted (P-first motions were considered more reliable). If no solutions was found, one additional SH misfit was accepted until some solutions existed. Naturally, if one P was found to be wrong in the calculation with P first motions only, one P misfit was our starting point for the P and SH calculations.

The variations in the P, T and B axes were used to quantify the constraints on the nodal planes. Our method was inspired by the work of Moustafa (1992). The P, T and B axes were treated as vectors for which an average direction, plunge and length were computed. The average length is a measure of the dispersion of the axes, i.e. the best solutions have lengths close to 1. The solutions were rated as follows:

Quality	Considered as:	Average length P, T, B	Corresponding variation in degrees around average position	Maximum P errors (%)	Maximum SH errors (%)
A	Reliable	> 0.994	+- 10	<10	<50
B	Reliable	> 0.988	+-15	<25	<75
C	Weakly constrained	> 0.979	+-20	<50	100
X	Rejected	<= 0.979	> +- 20.	>50	100
O	Cannot be computed	---------	-------	-------	--------

One should note that the three conditions had to be matched for the event to be of the corresponding quality. This rating scheme agreed with a visual inspection of the focal mechanisms. In a few cases, it was found that the P, T and B axes were well constrained but that the distribution of first motions did not warrant a high quality rating. In that case, the solution was rated "X". It was also found that very few P and SH were misfits and that the P, T, and B were the most important constraints. In other words, the high proportions of misfits for P and SH were rarely determining the quality of the solution.

For every event, three figures were produced that showed the focal mechanisms, the first motion picks and the epicentral map. Figure 12 shows an example of such an output.

i) Focal mechanisms.

For all solutions, the first figure shows the FOCMEC results in five focal spheres (Figure 12A). Starting in the upper left and going clockwise, the first sphere shows the series of solutions obtained with P and SH first motions (entitled *"P, SH and P-Nodal"*). The second shows the solutions obtained using the P first motions uniquely (entitled *"Solution with P FM only"*). Unless well constrained with P first motions only (rather rare), the increment for the b axis was 5°. The lower right one shows the SH first motions and the SH "nodal" lines computed with the P and SH solutions (entitled *"SH motions and Lines"*). The lower left one shows all first motions (entitled *"First Motions Only"*). Finally, the central mechanism is the average solution using the P and SH families of solutions (entitled *"Best Solution"*). One should also note that the exact position of the first motion on the focal sphere is not in the centre but in the lower left corner of the C and D first motion symbols.

ii) First motion picks.

The second figure in the series (Figure 12B) shows the digital vertical traces of the P arrivals (left window) and the transverse horizontal traces of the S arrivals (right window). The station name can be found in the left portion of the trace. The first motion reading is shown in the left portion as well as where it was read (vertical bar). An "X" means that no first motion was read.

iii) Epicentral map.

The third figure (Figure 12C) shows an epicentral map of all earthquakes of magnitude 1 and larger for the period 1978-1996. The event is shown with its average focal mechanism solution. The stations that provided first motion readings are shown with a symbol that correspond to the number of P and SH first motions.

c) Results.

i) Earthquakes with magnitude >= 3.0

Table 1 lists all events of magnitude 3.0 for the period November 1988 to April 1997. Most have a focal mechanism calculated for the first time. The results for the 10 quality A and B events are shown in Figure 13 the base information is shown in Appendix 1. The ones that had been previously calculated by other authors (shown by a * in Table 1) will be discussed in Section 3C.

ii) Earthquakes recorded during the 1996 summer field survey.

A total of 15 mechanisms were computed with the data recorded during the 1996 summer field survey. A total of 8 events were of quality A and B and are shown in Figure 14. The additional data was central to the focal mechanism calculations for events as small as m_N 2.0. The base information for all events are shown in Appendix 2.

3- Re-analysis of previously published focal mechanisms.

a) The 1974 Field Survey.

In the 1974 experiment, six of the 34 events had sufficient P-first motions to have a focal mechanism computed (Figure 15). Leblanc and Buchbinder (1977) warned readers that "except for the 20/06/74 event, these events are neither unique nor tightly defined". These original mechanisms were computed with the program of Wickens and Hodgson (1967), later modified by A.E. Stevens, that "presents up to 5 of the best pairs of nodal planes" (Leblanc and Buchbinder, 1977). A preferred solution was chosen from these.

The focal mechanisms were re-computed using the program FOCMEC. Take-off angles and azimuths were the same as in Leblanc and Buchbinder (1977) and were based on the standard

GSC velocity model. Since all first motions were read from stations within 130 km distance, they all correspond to direct Pg arrivals. The outputs of the solutions are presented in Appendix 3.

The mechanisms are not equally constrained. Two of the six mechanisms are well constrained (74/06/09 and 74/06/23; Figure 16A), two mechanisms have two main families of solutions (74/06/20 and 74/06/30) and the last two are very poorly constrained (74/07/02 and 74/07/13; Figure 16B). The two best-constrained mechanisms (74/06/09 and 74/06/23) are similar to the original solutions of Leblanc and Buchbinder (1977) and to the re-computed solutions of Adams et al. (1989). The 74/06/09 solution is a mixed strike-slip--reverse faulting type while the other is almost a pure reverse faulting type. For the two events which have two families of solutions, the 74/06/20 event has a non-traditional normal-faulting mechanisms.

b) The 19 August 1979, mbLg 5.0 earthquake.

The August 19, 1979 mbLg 5.0 earthquake is the largest CSZ earthquake within the time period 1952-1996. Using P-first motions, a fairly well constrained focal mechanism was determined (Hasegawa and Wetmiller, 1980; Figure 17). One of the very few CSZ focal mechanisms, the solution was referred to in numerous studies of the CSZ and of eastern North American seismotectonics. The southeast steeply-dipping nodal plane (76°) was interpreted to be the fault plane, with a trend similar to the St. Lawrence paleorift faults.

Due to its seismotectonic importance, this focal mechanism was recomputed using the program FOCMEC. Due to the loss of the original data set, first motion data were assembled from the GSC analogue and digital playouts, including paper playouts of the Charlevoix Local Network. In addition, first motions were obtained from the ISC Bulletin for regional and teleseismic phases and from the original photocopies of seismograms and notes for northeast U.S. stations. A total of 45 P-first motions were gathered, a little more than the 39 used in Hasegawa and Wetmiller (1980).

Compared with today's convention for a lower hemisphere projection, some P first motions were not plotted in the same positions in Hasegawa and Wetmiller (1980). In that paper, the azimuth of the P phase was not reversed for a station located between 1° and 2° epicentral distance (i.e. between about 110 and 220 km). With today's convention, the first motion positions are reversed, i.e. assumed to be upper focal sphere, up to about 166 km epicentral distance, assuming a focal depth of 10 km and a velocity model described in the section 1. This convention changed the first motion positions for stations CHQ, QCQ and CBM. In some cases, it is possible to tell if the first arrival is a Pg or a Pn. At distances between 135 and 166 km, the Pg should be emergent, whereas the Pn should be impulsive. Since CHV and QCQ are analogue stations with high microseisms, we cannot tell if the first motion is Pn or Pg by looking at the amplitude of the first arrival. Nodal planes computed without the CHQ, QCQ and CBM first motions were not very different than the ones obtained with them.

With FOCMEC, a 1° search gave 32 solutions (Figure 18). Ten first motions out of forty-five are misfits to the solution (stations: CBM, JKM, BNH, MSNY, SCH, ECM, MRG, AAM, BLA and

BNG; see Appendix 3 for solution details). The solution depends strongly on the northeastern U.S. data plotted in the southwestern quadrant and on the James Bay stations PBQ (C), LBQ (D) and LGQ (D).

Although both the original and the new solution show predominantly reverse faulting, the positions of the nodal planes are somewhat different. The new solution shows one plane steeply dipping to the west and one plane more shallowly dipping towards the southeast.

c) Other published mechanisms.

Our versions of the following mechanisms can be found in Appendix 1.

i) By the Geological Survey of Canada.

While most magnitude >= 3.0 earthquake mechanisms are new, a few however, had already been calculated by J. Adams, W. McNeil or R.J. Wetmiller of the GSC. The figures that were published in the Canadian Earthquake Summaries are given in Appendix 4. Some of our mechanisms are similar to the ones previously calculated (890309; 890311; 900311; 900313) while others are significantly different (900421; 900423; 901026; 901106 all quality "C" or "X" in our study). The previously computed ones relied on P first motions (including at times, emergent first motions at regional distances) and on P/Sv ratios. As the earthquakes become smaller in magnitude, picking emergent P first motions can cause spurious solutions.

ii) By Li, Doll and Toksöz (1995).

The paper by Li, Doll and Toksöz (1995) presents four different focal mechanisms (901021; 920310; 9890309; and 9890311; Figure 19). These mechanisms were computed using P and SH first motions. In these solutions, the plotting of the first motions for stations within 150 km was wrong. For direct P and S phases, the azimuths were not reversed, which imply that the mechanisms are questionable especially for the 901021 and 920310 solutions that depend heavily on the CLTN data. Our solutions for the same events can be found in Appendix 1. It appears that some SH first motions were read quite liberally by Li et al. (1995), which may explain the differences seen in the resulting mechanisms.

iii) Lamontagne and Ranalli (1997)

For a sub-zone near station A61, Lamontagne and Ranalli (1997) published three focal mechanisms for three small events (magnitude 2.6: 891208; 1.9: 910703 and 2.6: 930330). While the general tectonic style is well defined, the nodal planes are moderately constrained. The solutions are shown in Figure 20 and described in Appendix 5.

4- Conclusions.

With the current CSZ seismograph network, earthquake focal mechanisms can be computed for events as small as magnitude m_N 3.0. This can be done by adding constraints with SH first motions. Approximately 50% of the mechanisms in that magnitude range can be considered reliable. The 8 additional seismograph stations of the 1996 summer field survey added much needed P and SH first motions. They allowed the calculation of focal mechanisms for events as small as magnitude m_N 2.0. With the recalculation of some previously published mechanisms, we are able to update the previously published ones shown in Figure 21 by discarding some poorly defined solutions. In addition, we are now able to propose a series of 20 well defined mechanisms for the CSZ (Figure 22). In this paper, we have developed a methodology that can be applied to future earthquakes in Charlevoix. The forthcoming study will invert the stress system from the new and old focal mechanisms.

5- Recommendations.

More than 30 years of earthquake recording in Charlevoix has produced a fair number of focal mechanisms. It is possible to compute focal mechanisms for earthquakes as small as magnitude 3.0. These solutions, however, are strongly dependent on the correctness of every first motion reading. In order to make the solutions more robust, the number of stations within 100 km of the seismic zone should be increased especially in the NE and SW quadrants. The 1996 summer field survey showed that with about 6 additional stations, focal mechanisms can be computed for events as small as magnitude 2.0. Clearly, additional stations are needed to derive well defined focal mechanisms from which seismo-tectonic conclusions can be drawn.

The use of Sv/P ratios should be studied in more detail. We have a series of focal mechanisms computed with Sv/P ratios. Although they can theoretically be used, the robustness of Sv/P ratios have never been demonstrated. From this study, some focal mechanisms well constrained with P first motions only could be used for this purpose.

For events below magnitude 4.0, P first motions readings from stations at regional distances are difficult to read due to their emerging character. In addition, the velocity models between the CSZ and these stations is at best approximate. A better defined velocity model is necessary to obtain reliable mechanisms and should be defined by other studies.

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Table 1: Focal mechanisms of earthquakes of magnitude 3.0 and larger.

Q	Date yymmdd	Time hhmm ss	Latitude (°N)	Long. (°W)	Depth (km)	Mag	Sta/Pha	References:
A	890131	1439 48.20	47.4426	-70.6710	19.69	3.1m_N	7/012	
X	890309	0941 32.26	47.7171	-69.8569	10.52	4.3mN	6/011	1 2 3
X	890311	0831 52.16	47.7182	-69.8699	10.41	4.4mN	7/012	1 2 3
B	891013	1404 42.80	47.3926	-70.1330	22.74	3.2mN	6/012	
A	891122	2302 51.72	47.4559	-70.3420	7.39	3.4mN	7/014	
A	900303	0206 03.38	47.8559	-69.9765	20.85	3.6mN	8/015	4
A	900313	1910 39.34	47.5338	-70.1366	15.38	3.2mN	7/014	4
C	900421	0123 04.12	47.5532	-70.0698	9.56	3.1mN	7/014	5
X	900423	0028 04.78	47.4143	-70.1787	8.04	3.0mN	7/014	
A	901021	1338 43.20	47.3975	-70.3644	15.85	3.3mN	7/013	5
X	901026	0913 51.51	47.5692	-69.9848	10.96	3.1mN	6/012	
X	901106	1130 10.76	47.3943	-70.1506	14.19	3.4mN	6/011	6
X	901218	0710 46.23	47.2627	-70.3359	9.38	3.3mN	7/013	6
0	910703	0926 42.32	47.5290	-70.1464	18.44	3.0mN	CLTN data not saved.	
C	911208	0300 30.12	47.7792	-69.8643	23.05	4.3mN	7/013	
X	920310	0545 32.64	47.7167	-69.8574	9.96	3.3mN	7/013	3
X	920501	0037 51.49	47.4463	-70.4069	2.67	3.2mN	6/011	
A	930304	2202 21.84	47.5145	-70.3621	4.39	3.1mN	6/011	
X	930807	2125 31.92	47.6681	-69.8893	7.75	3.1mN	7/014	
0	931201	1247 15.89	47.4671	-70.1584	18.0g	3.5mN	No CLTN data.	
X	931230	2301 47.69	47.4532	-70.3609	5.94	3.8mN	6/012	
A	940925	0053 29.46	47.7518	-69.9612	12.18	4.3mN	6/012	
B	941201	1302 47.14	47.4374	-70.3138	10.77	3.0mN	5/009	
C	960512	1153 21.91	47.5161	-70.0281	14.82	3.1mN	7/014	
X	960607	0941 42.83	47.5299	-69.9417	13.32	3.1mN	7/014	
A	970110	1927 27.56	47.5094	-70.1965	17.06	3.2mN	7/014	
X	970114	0447 32.39	47.6574	-69.8765	14.96	3.1mN	7/014	

1- Drysdale et al. (1989);
2- Wetmiller and Adams (1990).
3- Li et al. (1995).
4- Drysdale et al. (1990);
5- Drysdale et al. (1991a).
6- Drysdale et al. (1991b).

Q: Quality.

- A: Very good
- B: Good
- C: Fair
- X: Rejected
- 0: Cannot be computed.

Total: 8 A; 2 B; 3 C; 12 X; 2 O

Table 2: Focal mechanisms of earthquakes recorded during the 1996 summer field survey.

Q	Date yymmdd	Time hhmm ss	Latitude (°N)	Longitude (°W)	Depth (km)	Mag	Sta/Pha
A	960617	1118 30.66	47.5328	-70.1463	14.11	1.9mN	8/016
X	960624	1311 16.55	47.4862	-70.1239	14.36	1.6mN	7/014
X	960704	1227 07.48	47.6197	-70.1352	5.28	2.0mN	7/014
A	960714	0715 02.89	47.4829	-70.0503	13.71	2.2mN	7/014
A	960714	1846 49.22	47.6938	-69.9927	7.26	3.3mN	7/013
C	960726	1438 45.14	47.6097	-69.9468	10.36	2.3mN	7/014
X	960819	1706 09.66	47.3002	-70.2448	6.44	2.1mN	11/022
C	960913	2355 35.92	47.5008	-70.2134	12.09	2.2mN	11/022
B	960923	0526 54.22	47.6591	-69.8932	14.04	2.2mN	12/024
A	960924	0644 45.55	47.5875	-70.1451	21.40	2.0mN	12/024
A	960924	2341 02.88	47.5475	-70.2417	12.83	3.1mN	11/021
C	960925	0834 24.87	47.8528	-69.7504	22.35	2.2mN	9/018
C	961011	0228 50.34	47.4761	-70.0551	15.56	1.9mN	11/022
A	961025	0947 24.43	47.4281	-70.3887	4.06	2.2mN	13/025
A	961028	0245 39.23	47.5536	-70.0414	11.56	2.3mN	12/024

Q: Quality.

- A: Very good
- B: Good
- C: Fair
- X: Rejected
- 0: Cannot be computed.

Total: 7 A; 1 B; 4 C; 3 X.

Figures.

Figure 1: Location map of the Charlevoix Seismic Zone. The earthquakes shown are the ones of the seismicity map of Canada (Anglin et al., 1990).

Figure 2A: Time-history of the Charlevoix network for the period 1970-1997. Acronyms used: **field exp.**: field experiments of Leblanc et al. (1973) and Leblanc and Buchbinder (1977); 2) **CLTN**: Charlevoix Local Telemetered Network; 3) **CNSN**: Canadian National Seismograph Network; 4) sp: short period; 5) **bb**: broad-band; 6) **CHX network**: Charlevoix Short-Period Local Network (6 stations + A56).

Figure 2B: Seismograph Network of Charlevoix. Stations LPQ and POC are not currently operational.

Figure 2C: Seismograph stations surrounding Charlevoix.

Figure 2D: Seismograph stations used during the June-November 1996 field survey. The white triangles are the digital seismograph sites, while pasq and rsfq are two analogue recorder stations.

Figure 3. Polarity check for the South American earthquake of March 25, 1997 at 16 UT. The figure shows P arrivals on the vertical components (left window), and the corresponding radial motion of the P wave for CLTN stations only (right window).

Figure 4. Location map of the 960924 23:40 U.T. earthquake and the 1996 summer seismograph stations. Station A80P is located almost exactly west of the epicentre.

Figure 5. Horizontal seismic traces recorded at site A80 with similar Y scales (N-S, upper ; E-W lower).

Figure 6. Corresponding particle motions of the seismic traces.

Figure 7. Rotated traces of the horizontal seismic traces with similar Y scales (radial: upper; transverse: lower). Note that the maximum amplitude on the radial corresponds to a very small amplitude on the transverse.

Figure 8. Similar to Figure 5 for station A76P.

Figure 9. Similar to Figure 6 for station A76P.

Figure 10. Similar to Figure 7 for station A76P.

Figure 11. Theoretical P and SH first motions for a strike-slip mechanism on a north-south fault plane.

Figure 12. Example of an output for a focal mechanism computed with P and SH first motions. The first two pages are the text.

Figure 12A: Focal mechanisms.

Figure 12B: First motion picks.

Figure 12C: Epicentral map.

Figure 13. Location map of the 10 quality A and B focal mechanisms for events of magnitude >= 3.0.

Figure 14. Location map of the 8 quality A and B focal mechanisms for summer 1996 events.

Figure 15. Focal mechanisms for the 1974 field survey and for the 1979 m_N 5.0 earthquake (published in Lamontagne (1987).

Figure 16A: The two well constrained focal mechanisms for the 1974 field survey (5° b-axis search).

Figure 16B: The four poorly constrained mechanisms for the 1974 field survey (5° b-axis search).

Figure 17. The focal mechanism of the m_N 1979 earthquake as published in Hasegawa and Wetmiller (1980).

Figure 18. The new focal mechanism for the m_N 5.0 1979 earthquake.

Figure 19. Focal mechanisms of Li et al. (1995).

Figure 20. Focal mechanisms published in Lamontagne and Ranalli (1997).

Figure 21. Modified figure of Lamontagne and Ranalli (1997). Poorly constrained mechanisms of 1974 are crossed while the two acceptable ones are checked. Events 890309 and 890311 were found to have one poorly constrained nodal plane and were rated as "X". For the 1979 m_N 5.0 event, the two nodal planes found in this study are shown on the previous solution. The other mechanisms are not part of this report.

Figure 22. Quality "A" and "B" solutions found in this study.

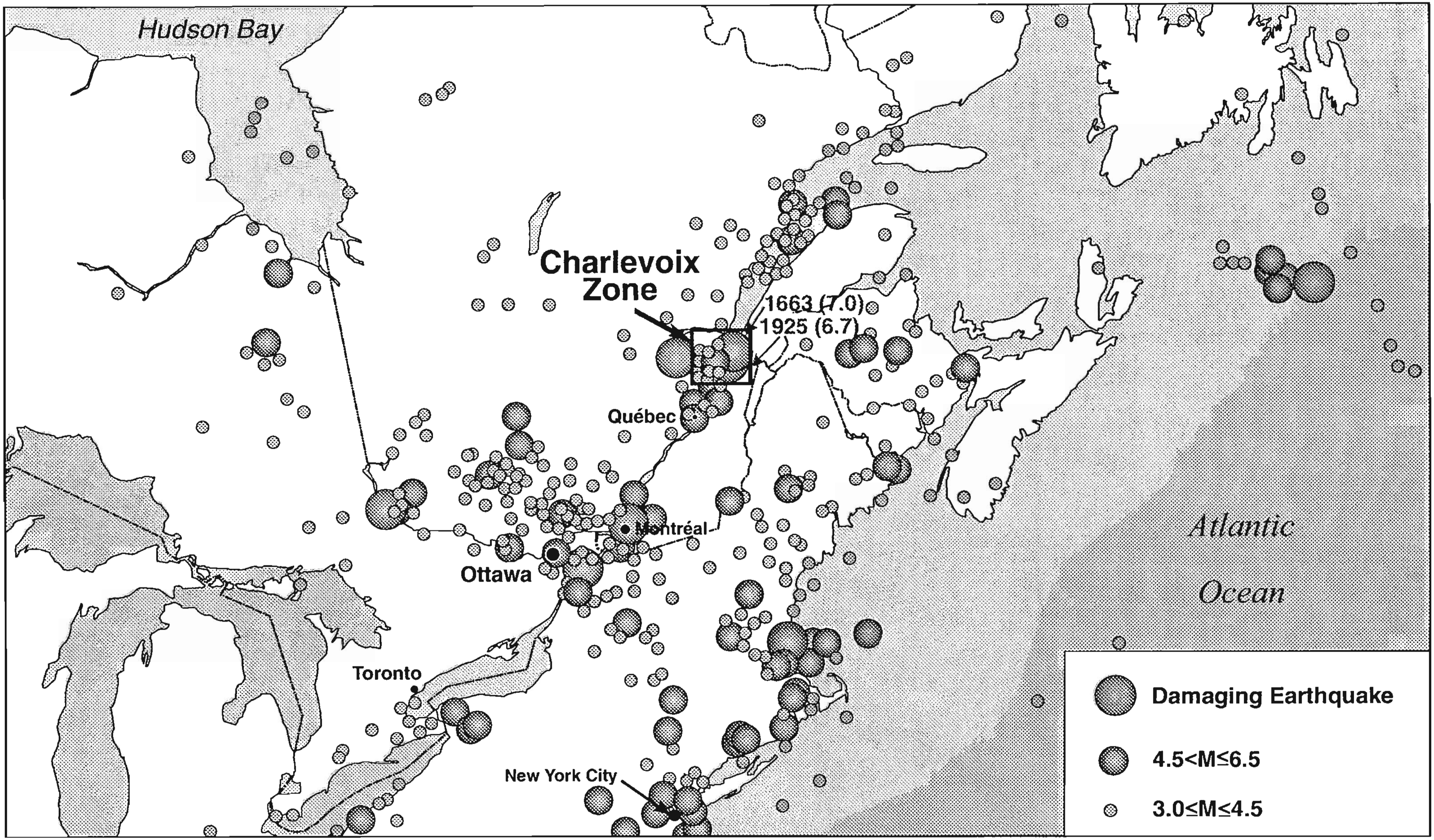

Hudson Bay
Charlevoix Zone
1663 (7.0)
1925 (6.7)
Québec
Montréal
Ottawa
Toronto
New York City
Atlantic Ocean
Damaging Earthquake
4.5<M≤6.5
3.0≤M≤4.5

Figure 1

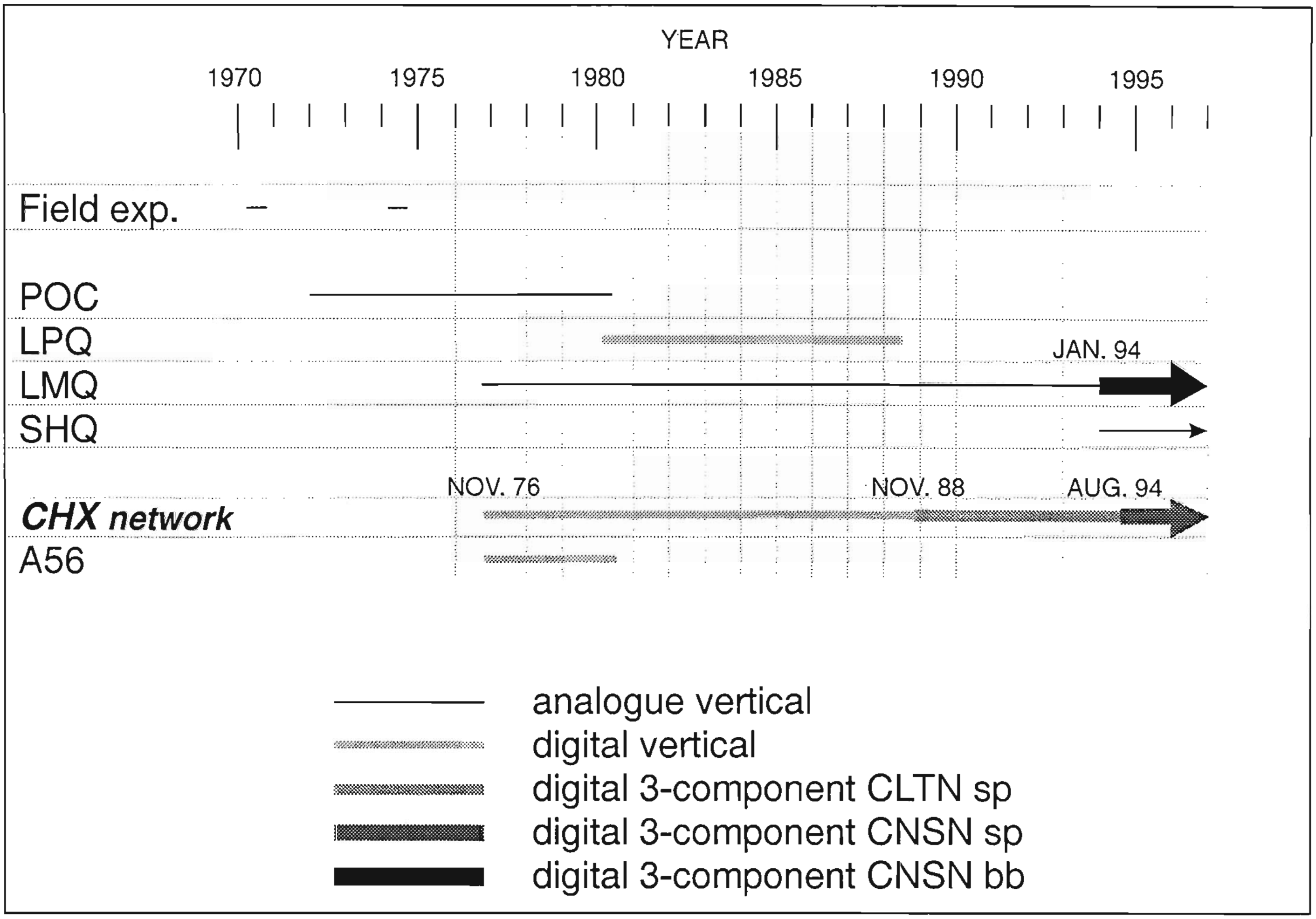

YEAR
1970
1975
1980
1985
1990
1995
Field exp.
POC
LPQ
LMQ
SHQ
CHX network
A56
JAN. 94
NOV. 76
NOV. 88
AUG. 94
analogue vertical
digital vertical
digital 3-component CLTN sp
digital 3-component CNSN sp
digital 3-component CNSN bb

Figure 2A

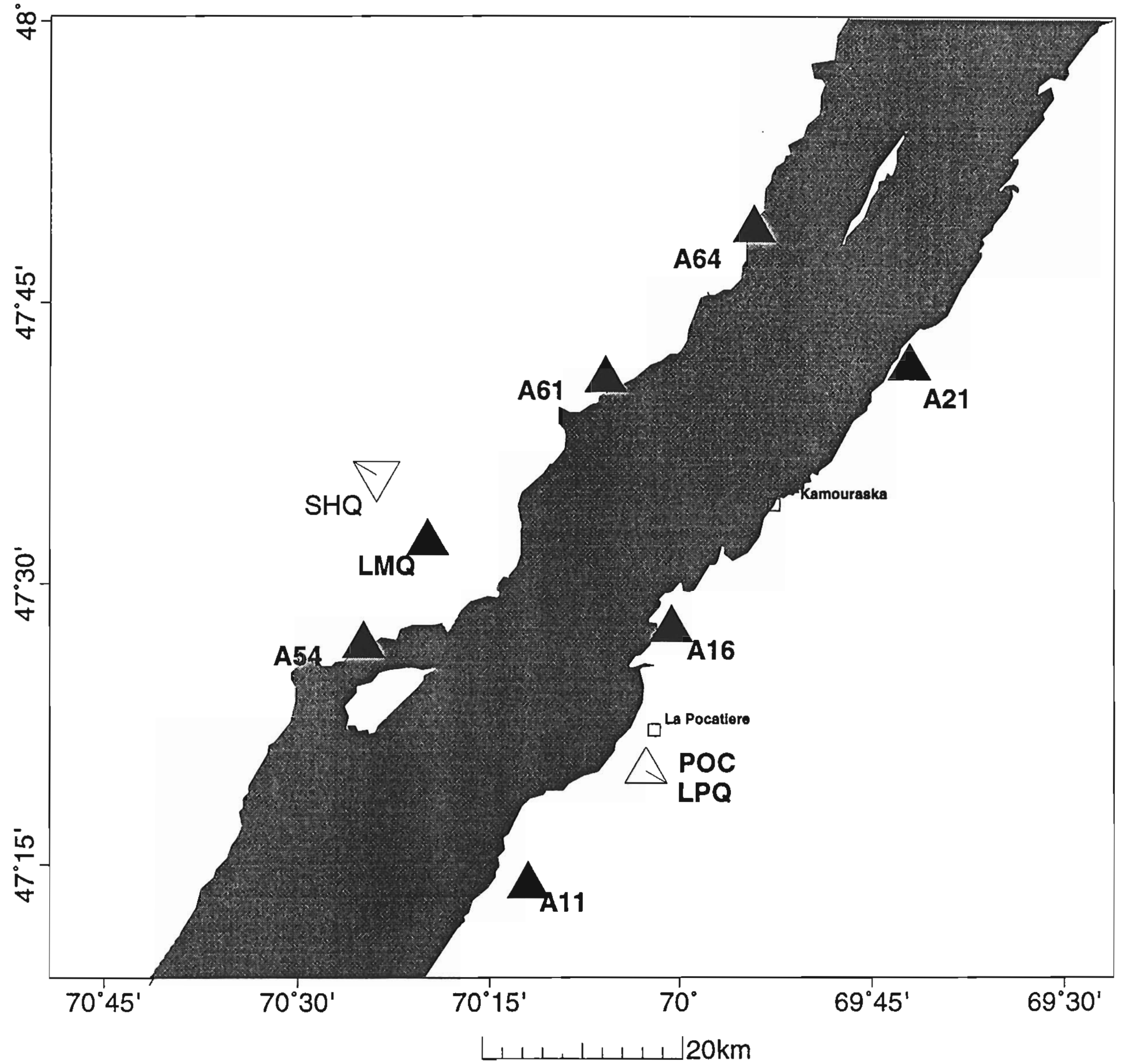

48°
47°45'
47°30'
47°15'
70°45'
70°30'
70°15'
70°
69°45'
69°30'
A64
A61
A21
SHQ
Kamouraska
LMQ
A54
A16
La Pocatiere
POC
LPQ
A11
20km

Figure 2B

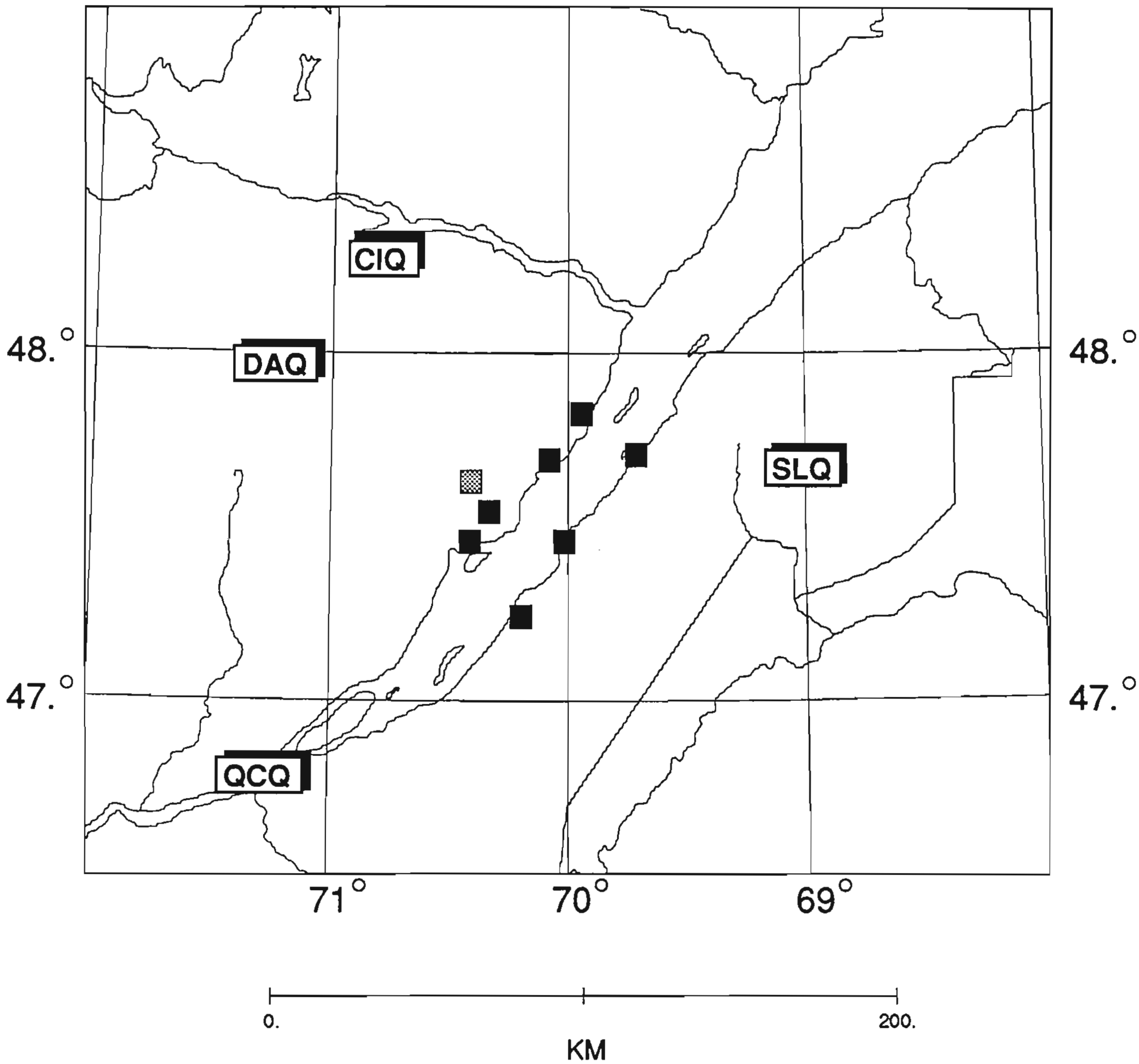


Figure 2C

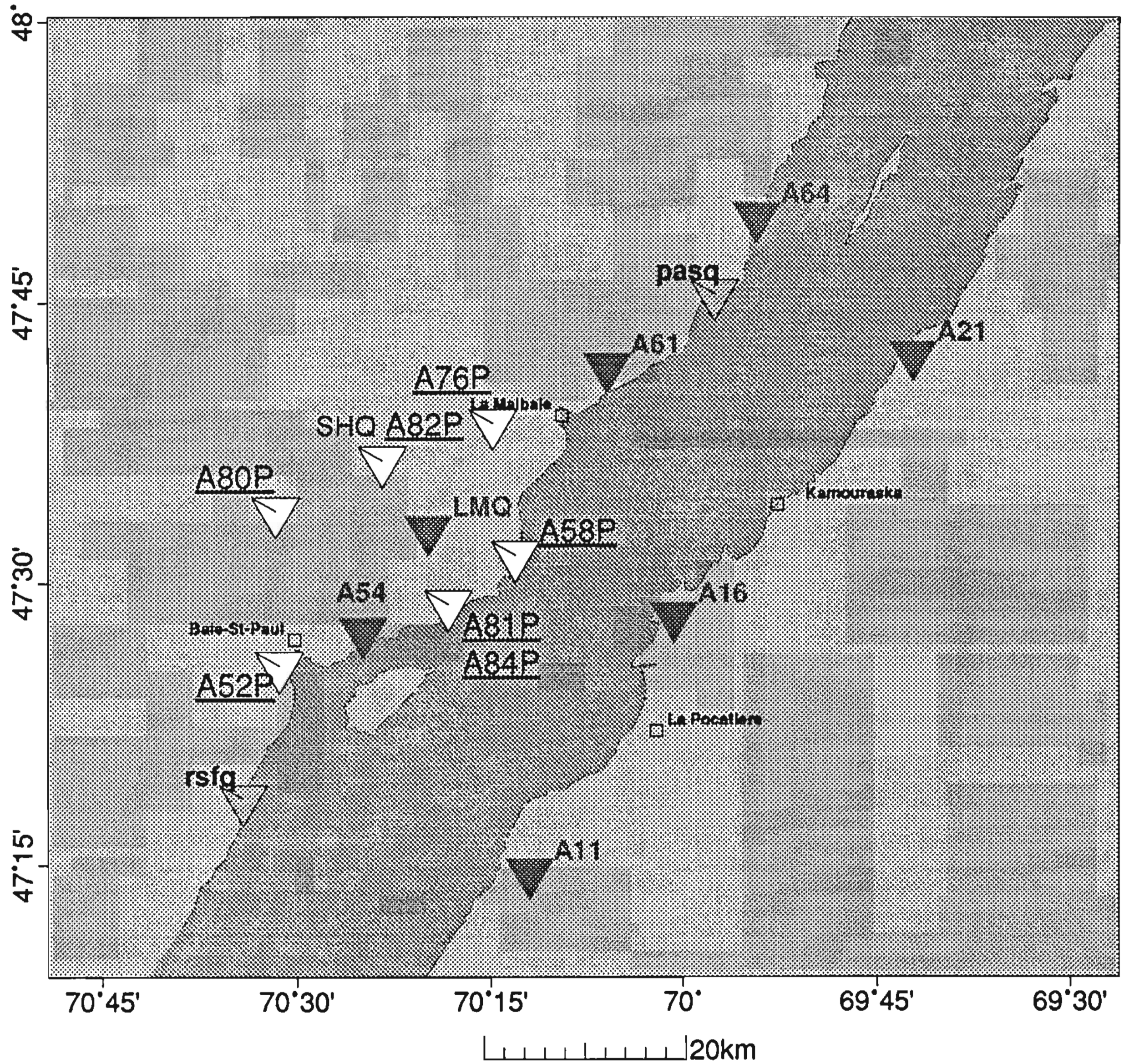

48°
47°45'
47°30'
47°15'
70°45'
70°30'
70°15'
70°
69°45'
69°30'
20km
A64
pasq
A61
A21
A76P
La Malbaie
SHQ
A82P
A80P
LMQ
Kamouraska
A58P
A54
A16
Baie-St-Paul
A81P
A84P
A52P
La Pocatiere
rsfg
A11

Figure 2D

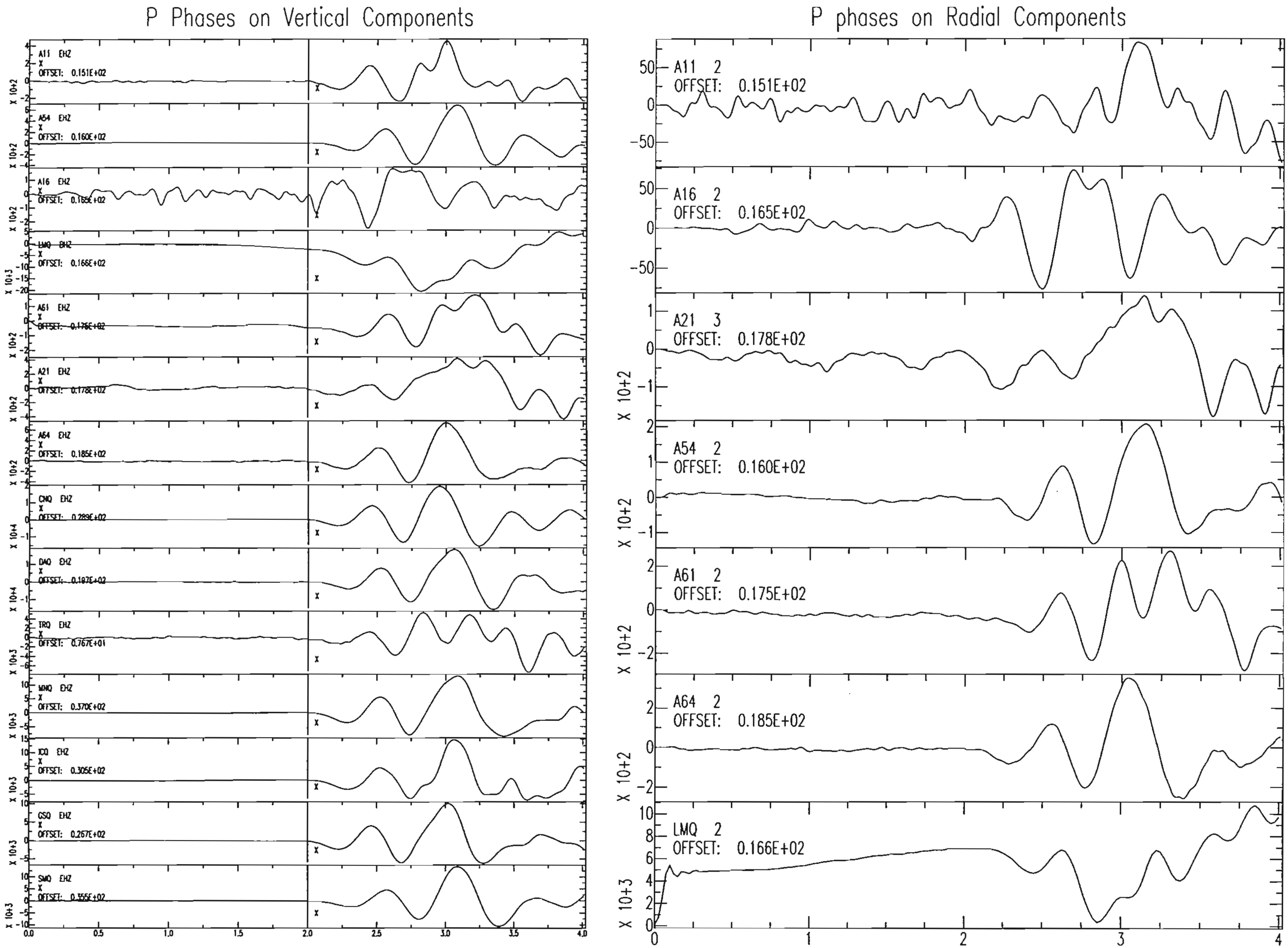

P Phases on Vertical Components
A11 EHZ OFFSET: 0.151E+02
A54 EHZ OFFSET: 0.160E+02
A16 EHZ OFFSET: 0.165E+02
LMQ EHZ OFFSET: 0.166E+02
A61 EHZ OFFSET: 0.176E+02
A21 EHZ OFFSET: 0.178E+02
A64 EHZ OFFSET: 0.185E+02
CNQ EHZ OFFSET: 0.289E+02
DAQ EHZ OFFSET: 0.197E+02
TRQ EHZ OFFSET: 0.767E+01
MNQ EHZ OFFSET: 0.370E+02
ICQ EHZ OFFSET: 0.305E+02
GSQ EHZ OFFSET: 0.267E+02
SMQ EHZ OFFSET: 0.355E+02
P phases on Radial Components
A11 2 OFFSET: 0.151E+02
A16 2 OFFSET: 0.165E+02
A21 3 OFFSET: 0.178E+02
A54 2 OFFSET: 0.160E+02
A61 2 OFFSET: 0.175E+02
A64 2 OFFSET: 0.185E+02
LMQ 2 OFFSET: 0.166E+02
X 10+2
X 10+3

Figure 3

960924 23:40 U.T.

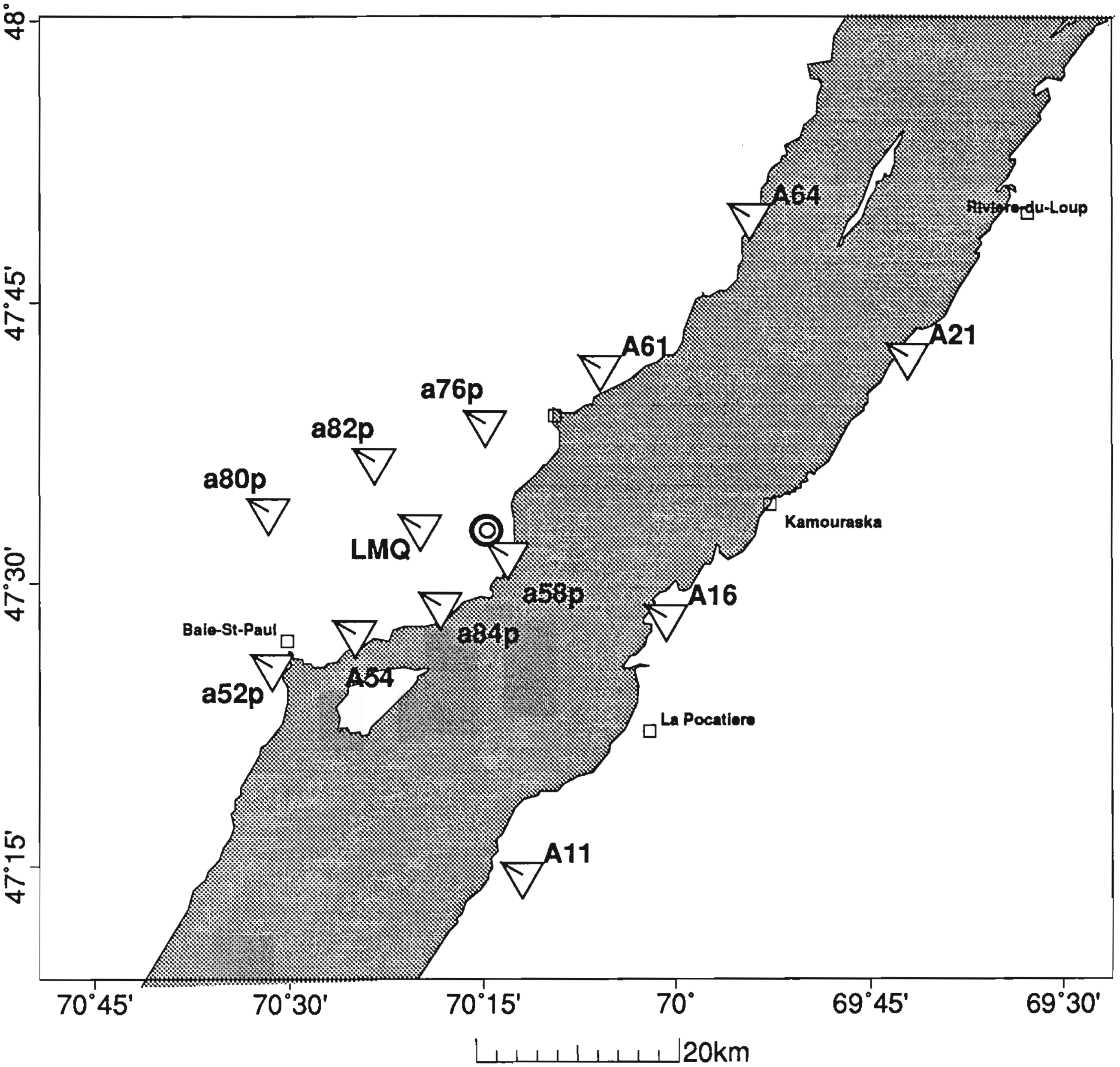
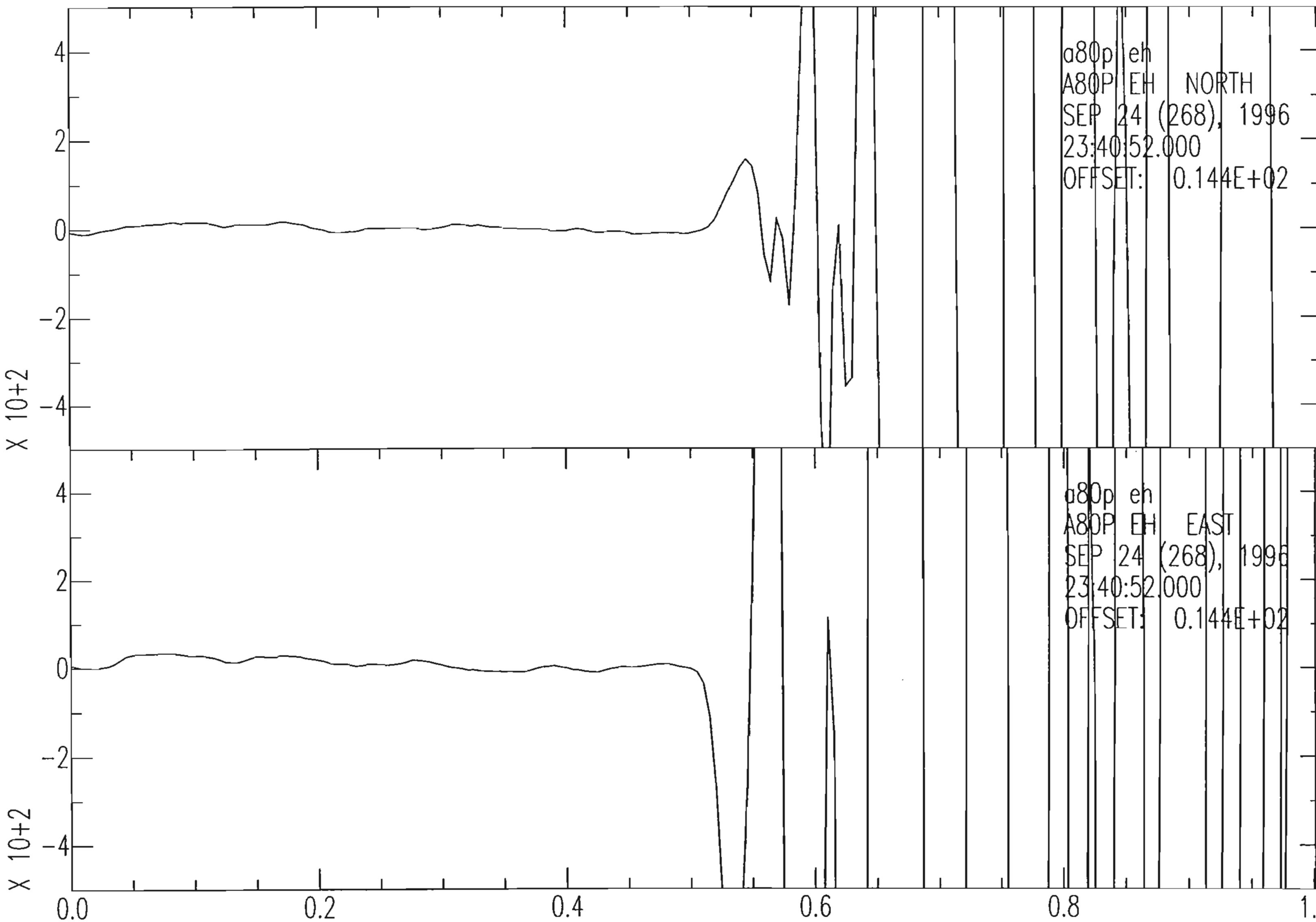
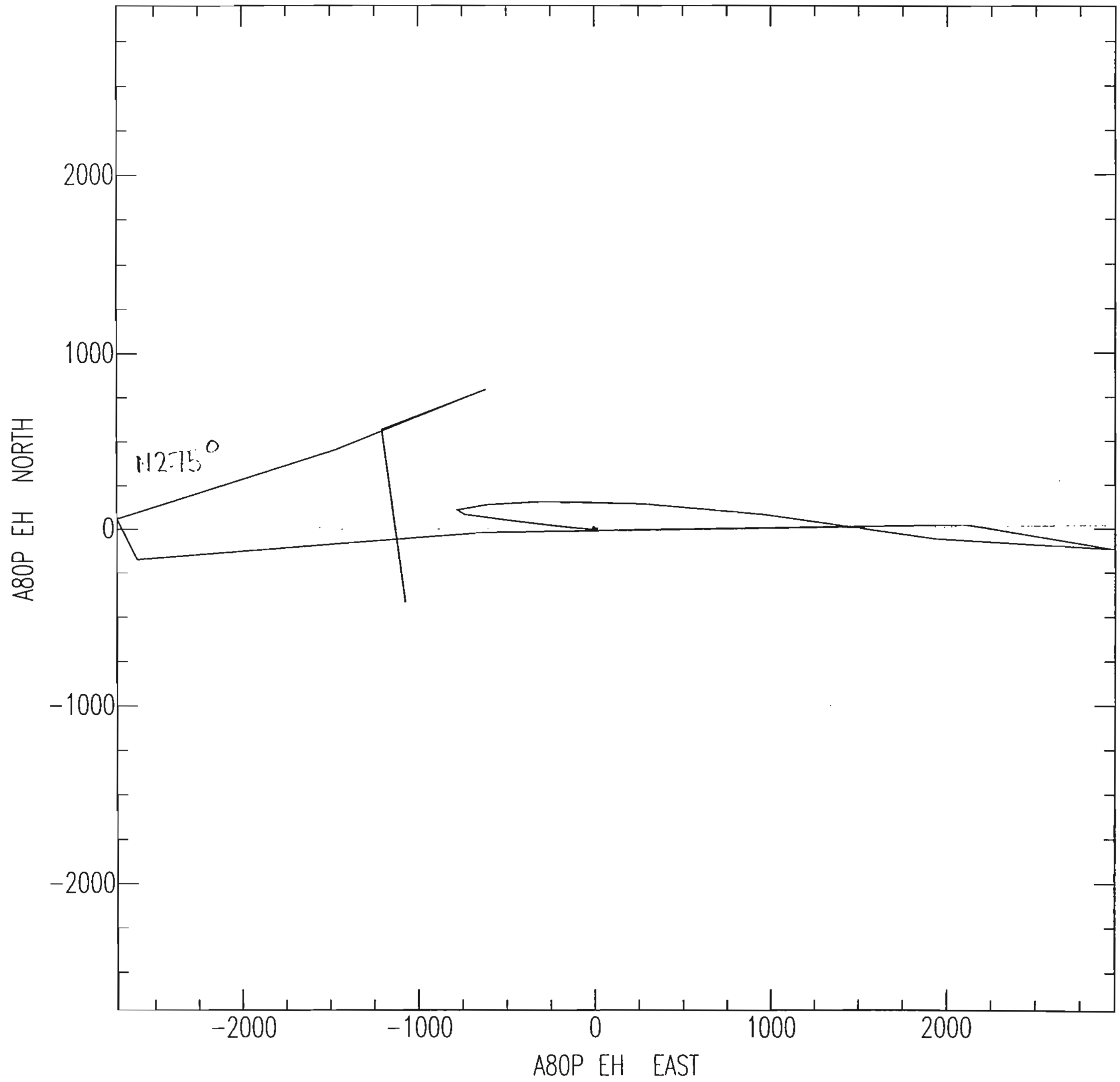


Figure 4



a80p eh
A80P EH NORTH
SEP 24 (268), 1996
23:40:52.000
OFFSET: 0.144E+02
a80p eh
A80P EH EAST
SEP 24 (268), 1996
23:40:52.000
OFFSET: 0.144E+02
X 10+2
X 10+2
4
2
0
-2
-4
0.0
0.2
0.4
0.6
0.8
1.0

Figure 5



6

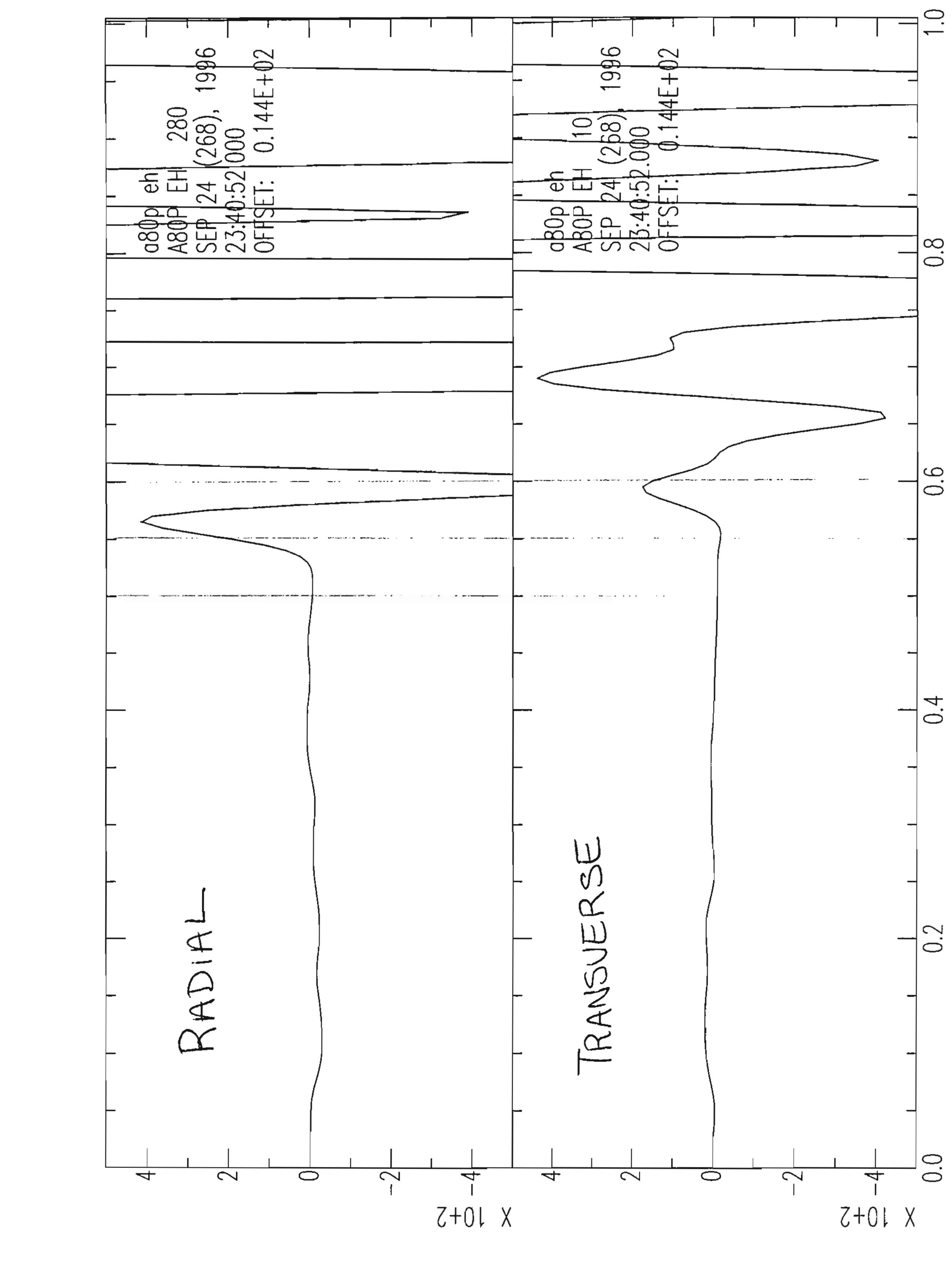
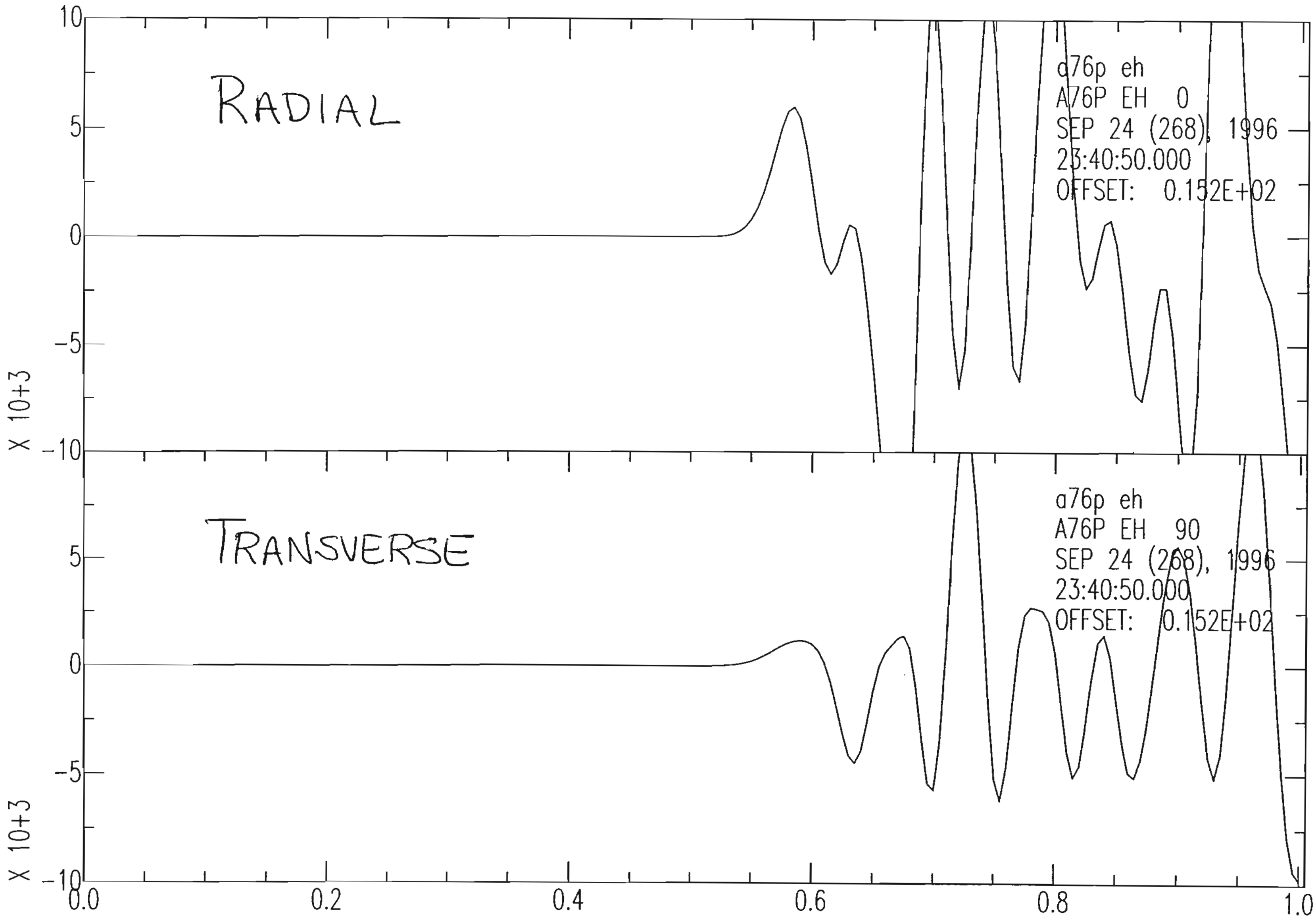

RADIAL
a80p eh
A80P EH 280
SEP 24 (268), 1996
23:40:52.000
OFFSET: 0.144E+02
TRANSVERSE
a80p eh
A80P EH 10
SEP 24 (268), 1996
23:40:52.000
OFFSET: 0.144E+02
X 10+2
X 10+2
4
2
0
-2
-4
0.0
0.2
0.4
0.6
0.8
1.0

Figure 7


RADIAL
a76p eh
A76P EH 0
SEP 24 (268), 1996
23:40:50.000
OFFSET: 0.152E+02
TRANSVERSE
a76p eh
A76P EH 90
SEP 24 (268), 1996
23:40:50.000
OFFSET: 0.152E+02
X 10+3
X 10+3

8

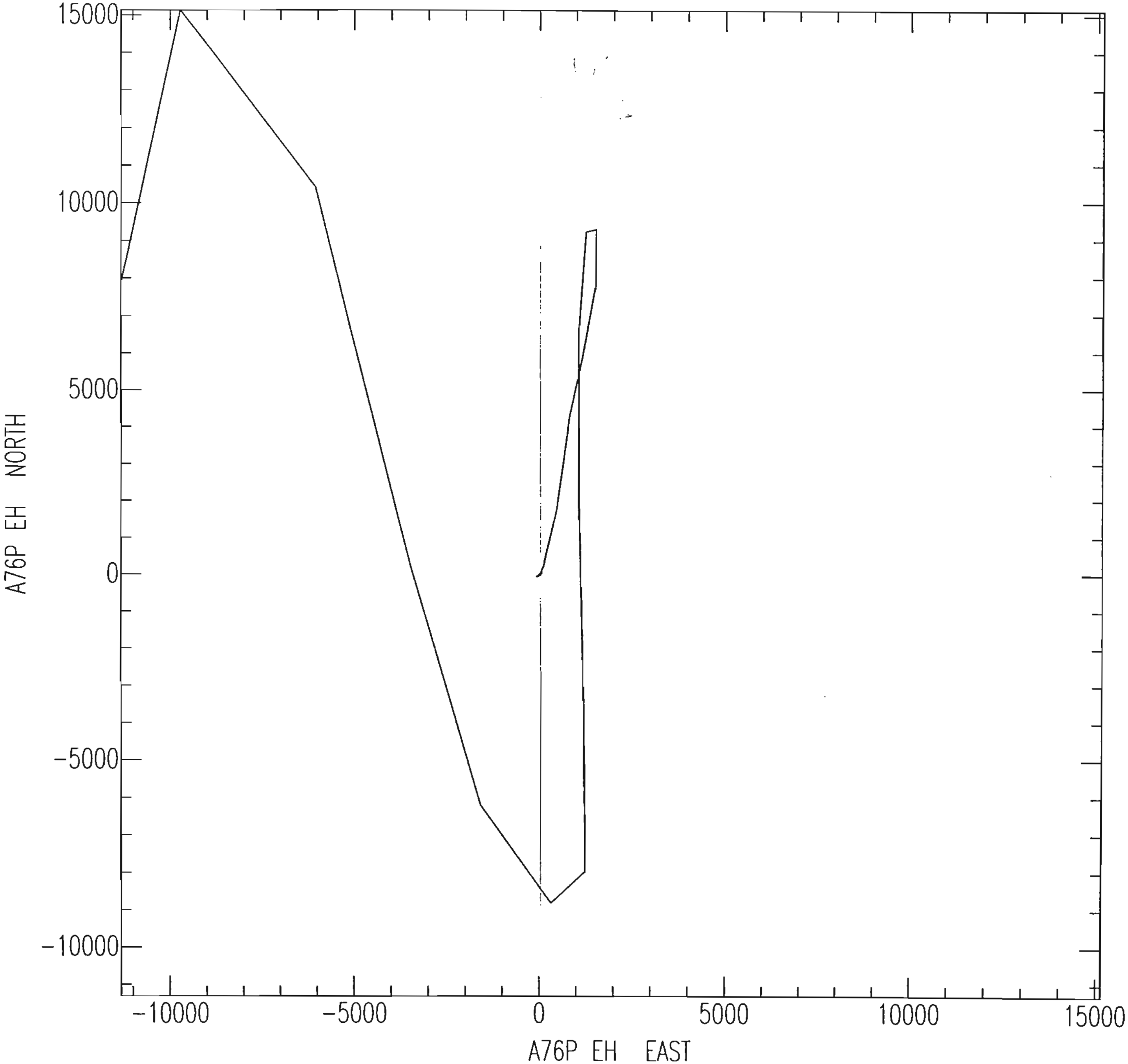
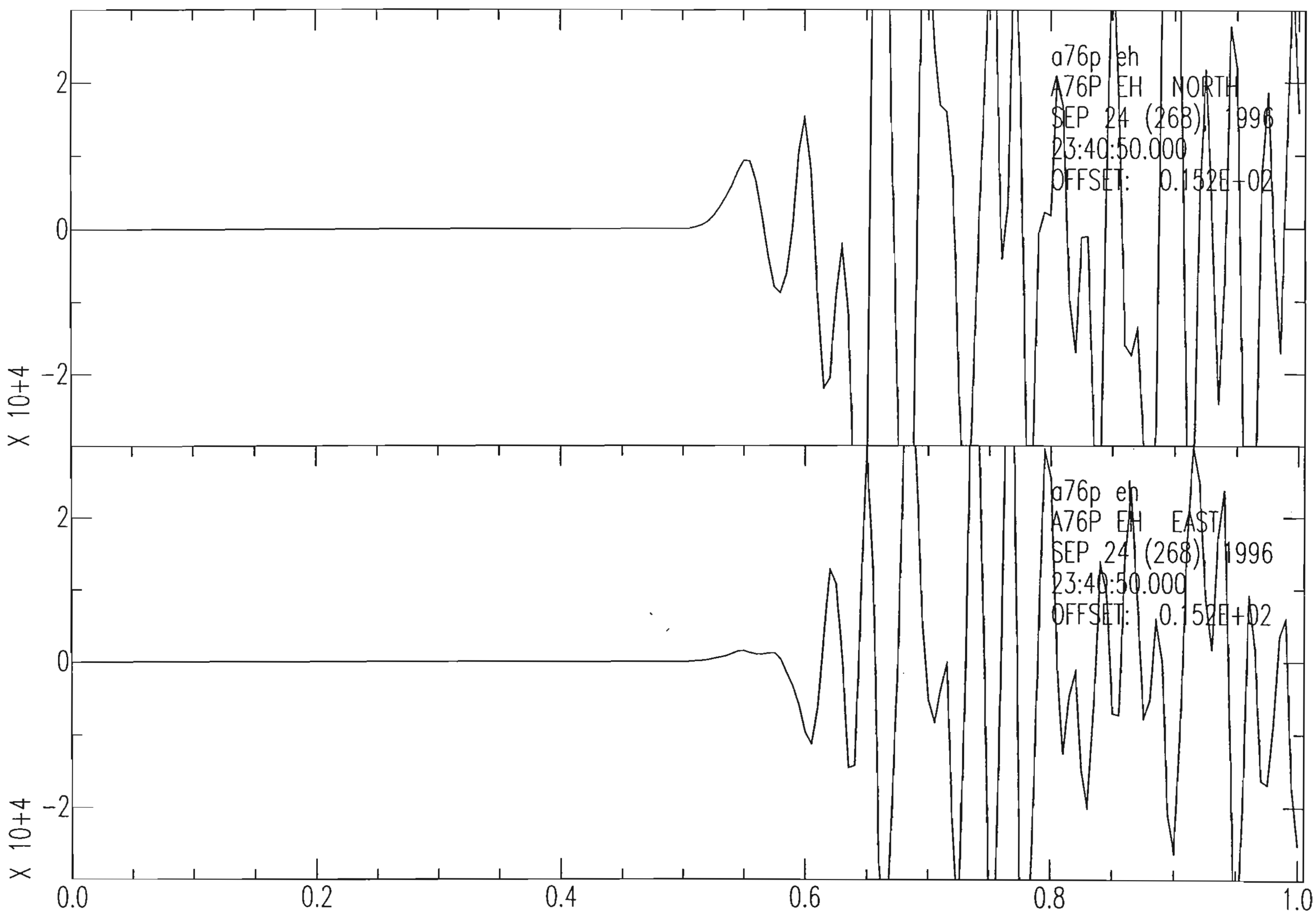


Figure 9


a76p eh
A76P EH NORTH
SEP 24 (268), 1996
23:40:50.000
OFFSET: 0.152E+02
a76p eh
A76P EH EAST
SEP 24 (268), 1996
23:40:50.000
OFFSET: 0.152E+02
X 10+4
2
0
-2
0.0
0.2
0.4
0.6
0.8
1.0

10

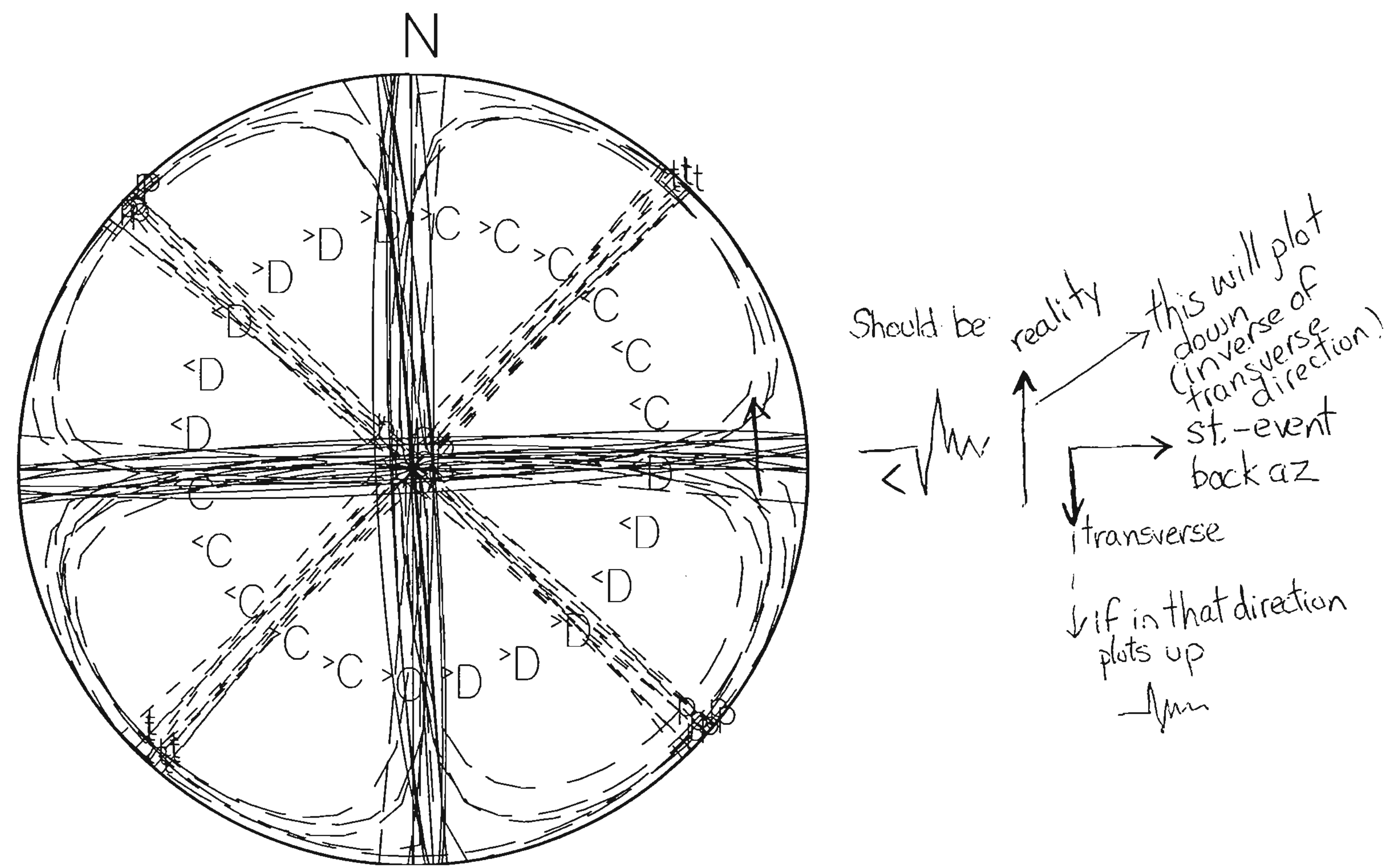

N
Should be
reality
this will plot down (inverse of transverse direction)
st.-event back az
transverse
if in that direction plots up

Figure 11

Figure 12 Text

Earthquake of 19960924 2341 Magnitude 3.1MN

1- Earthquake information and list of first motions.

Date	Time hhmm ss	Latitude	Longitude	Depth (km)	Mag	Sta/Pha
960924	2341 02.88	47.5475	-70.2417	12.83	3.1MN	11/021

COMMENTS:

Felt, CHARLEVOIX SEISMIC ZONE, QUE.
Felt in St-Irenee, St-Hilarion, La Malbaie, and Clermont.
$ Felt info from local radio station.
$ CIQ FM from R. Du Berger, Chicoutimi.
$ QCQ FM is unclear.
$
$ The Sg lines of some stations include the SH FM.
$ The convention used is the Virginia Tech convention used in FOCMEC:
$ <: SH first motion to left (back to event) impulsive
$ >: SH first motion to right (back to event) impulsive
$ Preliminary Focmec computed by ML.
$ SH FM not picked on: A11 and A21.

Sta	Pha	Dist (km)	Azim	Take-off Angle	FM
A58P	PG	3	139	-14	C
A58P	SG	3	139	-14	<
LMQ	PG	6	271	-26	C
LMQ	SG	6	271	-26	>
A84P	PG	9	211	-34	C
A84P	SG	9	211	-34	>
A76P	PG	11	0	-40	C
A76P	SG	11	0	-40	>
SHQ	PG	14	298	-46	C
A54	PG	16	232	-52	C
A54	SG	16	232	-52	>
A16	PG	20	116	-57	D
A16	SG	20	116	-57	<
A61	PG	20	35	-57	C
A61	SG	20	35	-57	<
A80P	PG	21	275	-59	C
A80P	SG	21	275	-59	>
A11	PG	34	174	-69	D
RSFQ	PG	36	223	-70	D
A64	PG	41	40	-72	D
A64	SG	41	40	-72	<
A21	PG	45	67	-74	C
DAQ	PG	88	302	-82	D
CIQ	PG	90	333	-82	D
SLQ	PG	94	81	-82	D

Figure 12: text

Number of P first motions: 16
Number of SH first motions: 9

2- Most Representative Solution.

A total of 100 solutions were found using a b axis increment of 1 degree. The following parameters describe the most representative solution, which was derived from the average B, P, and T axes listed below.

dip,strike,rake	67.37	246.26	79.16		
dip,strike,rake	24.97	92.73	114.29	:auxiliary plane	
lower hem. trend, plunge of a,n	2.73	65.03	156.26	22.63	
lower hem. trend & plunge of b	250.48	10.00			
lower hem. trend, plunge of p,t	344.49	21.65	137.22	65.94	

Average B, P, and T axes:

	B	P	T
Mean trend:	N 250	N 343	N 142
Mean Plunge:	7	20	69
Vector Magnitude:	100	100	100
Mean length of resulting vector:	0.996	0.998	0.996

3- Misfits.

All 16 P first motions agreed with the solution.
Out of 9 SH first motions, a total of 2 did not fit the solutions (22/100).

Station Name	Number of misfits	Percentage of wrongs
A61	25	25
A64	100	100
A76P	75	75

4- Rating of the focal mechanism.

The solution has an A rating based on the small number of P and SH misfits (0 /100 and 22 /100 respectively) and on the good constraints on the P, T and B axes (value of 0.996).

Figure 12A

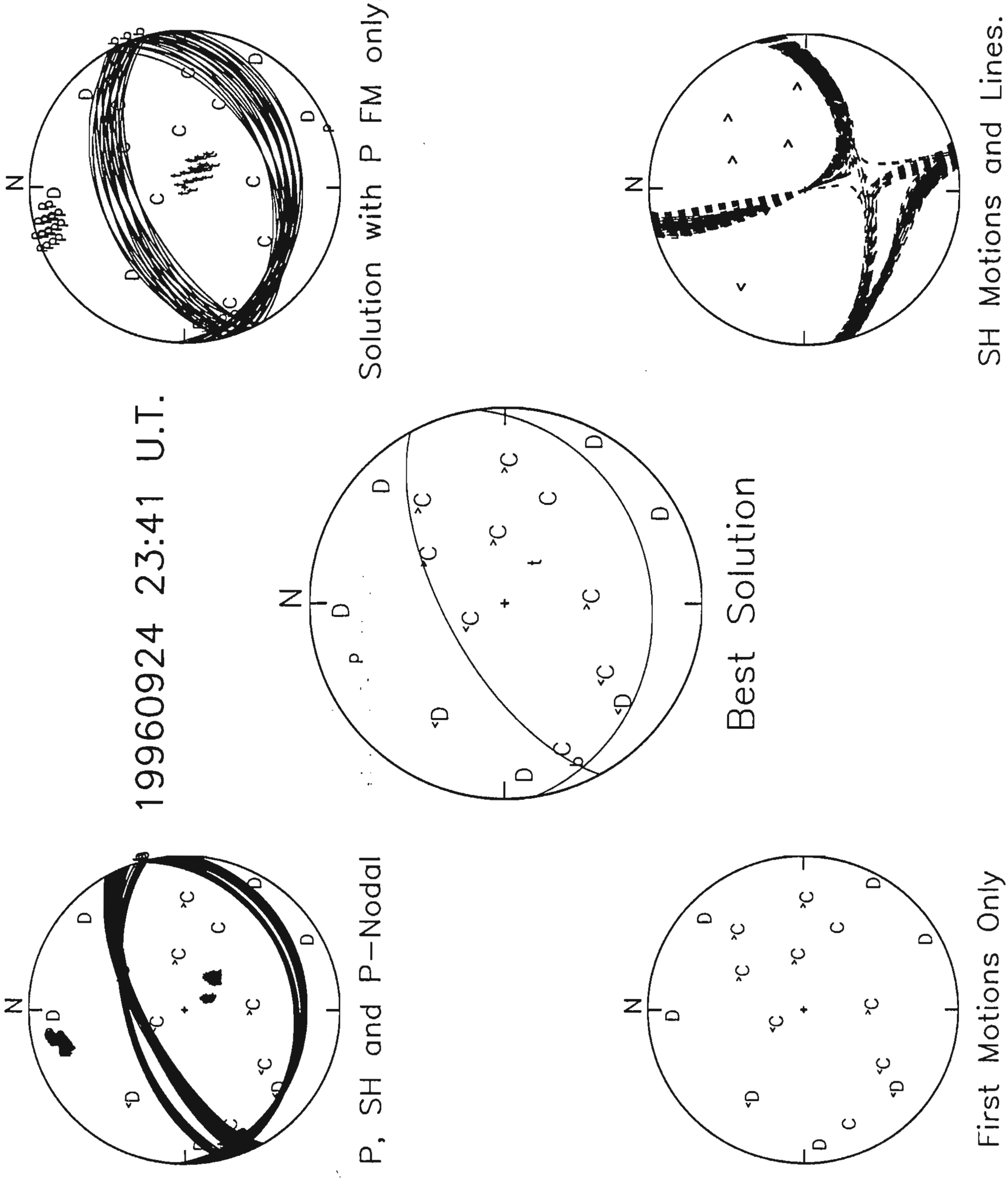
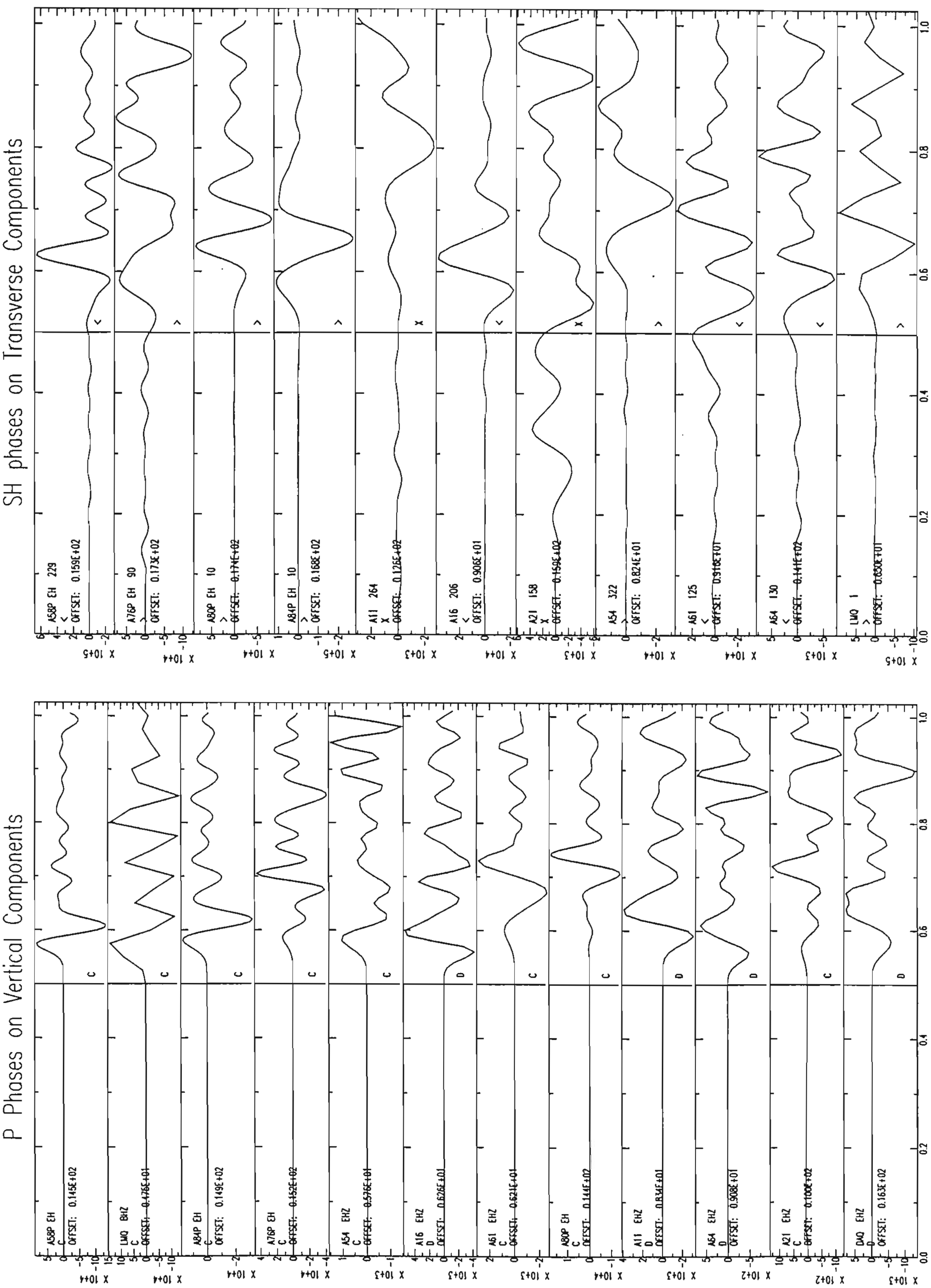

19960924 23:41 U.T.
P, SH and P–Nodal
Best Solution
Solution with P FM only.
First Motions Only
SH Motions and Lines.
N

Figure 12B



SH phases on Transverse Components
P Phases on Vertical Components

Figure 12C

Location Map

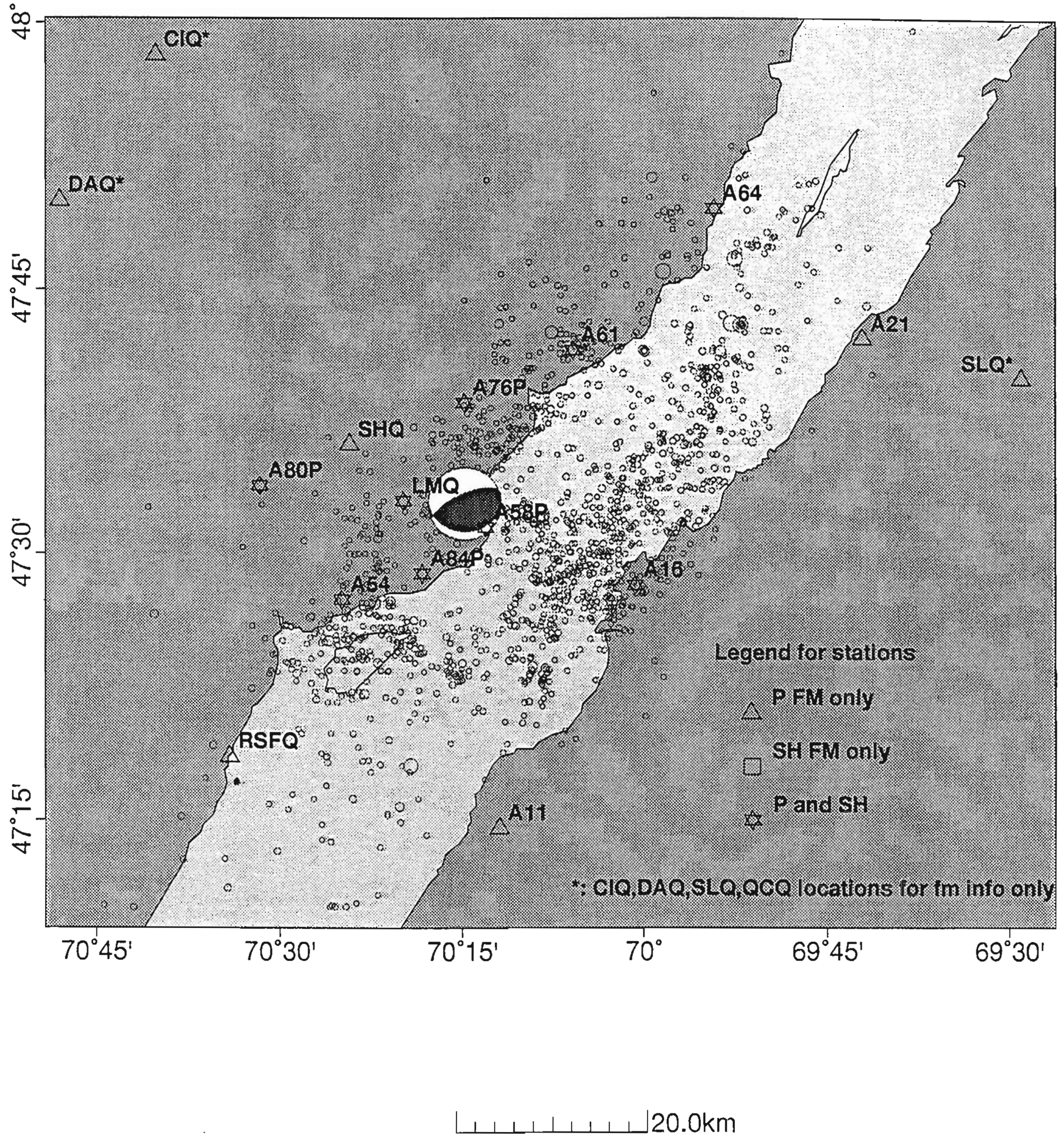


Figure 13

Focal Mechanisms M3+ Qual: A B

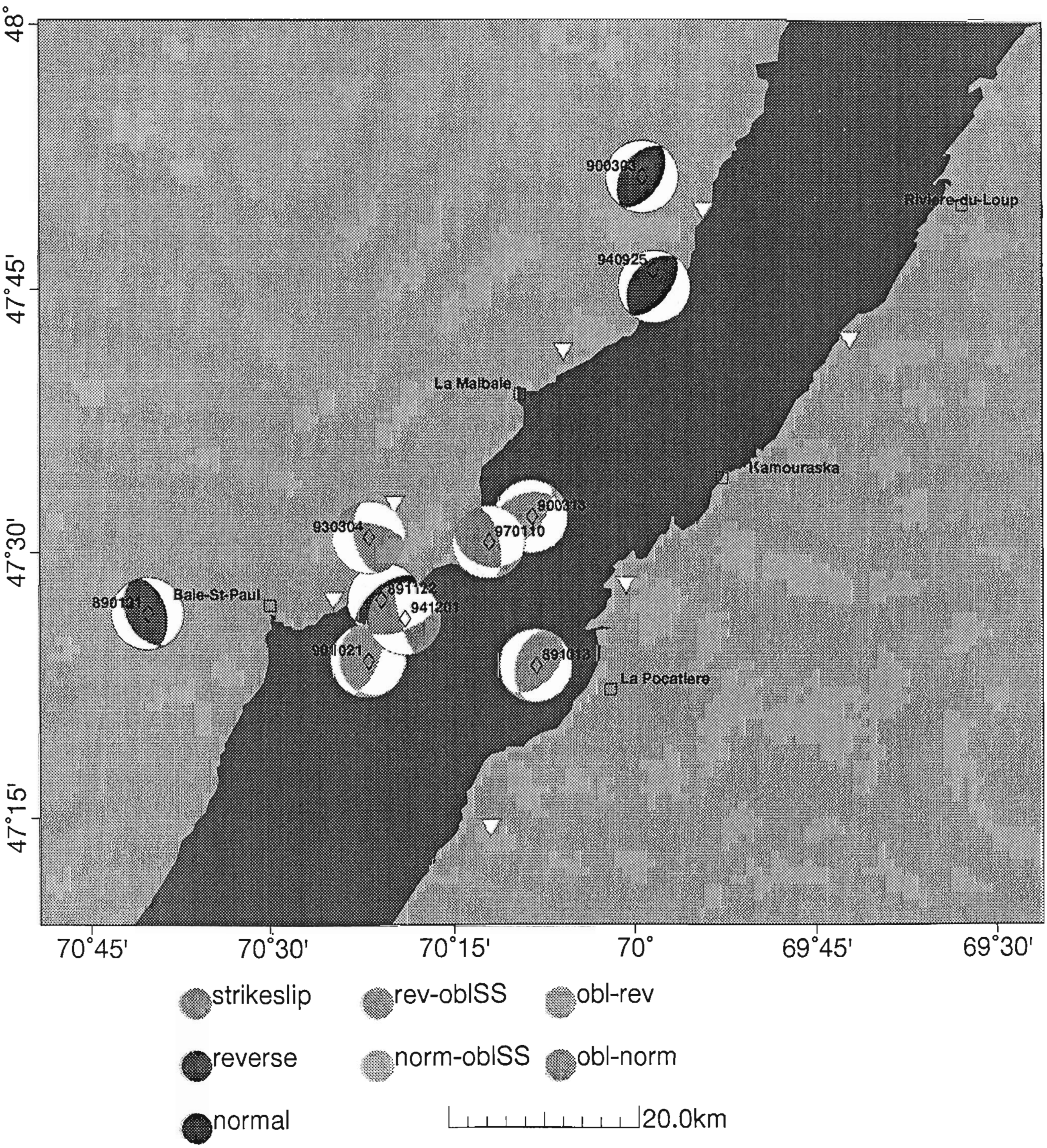
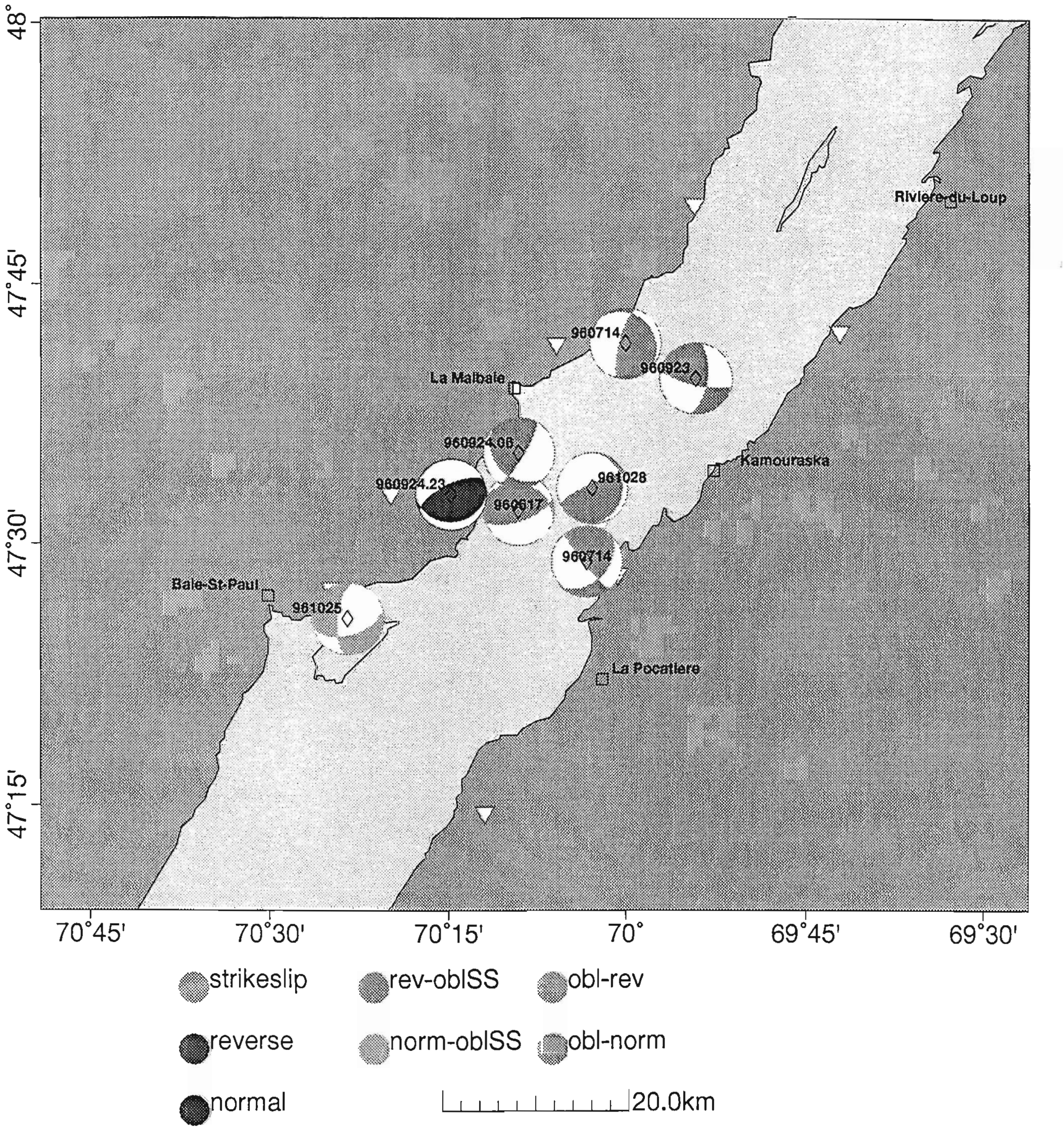


Figure 14

1996 Field Survey Q: A B



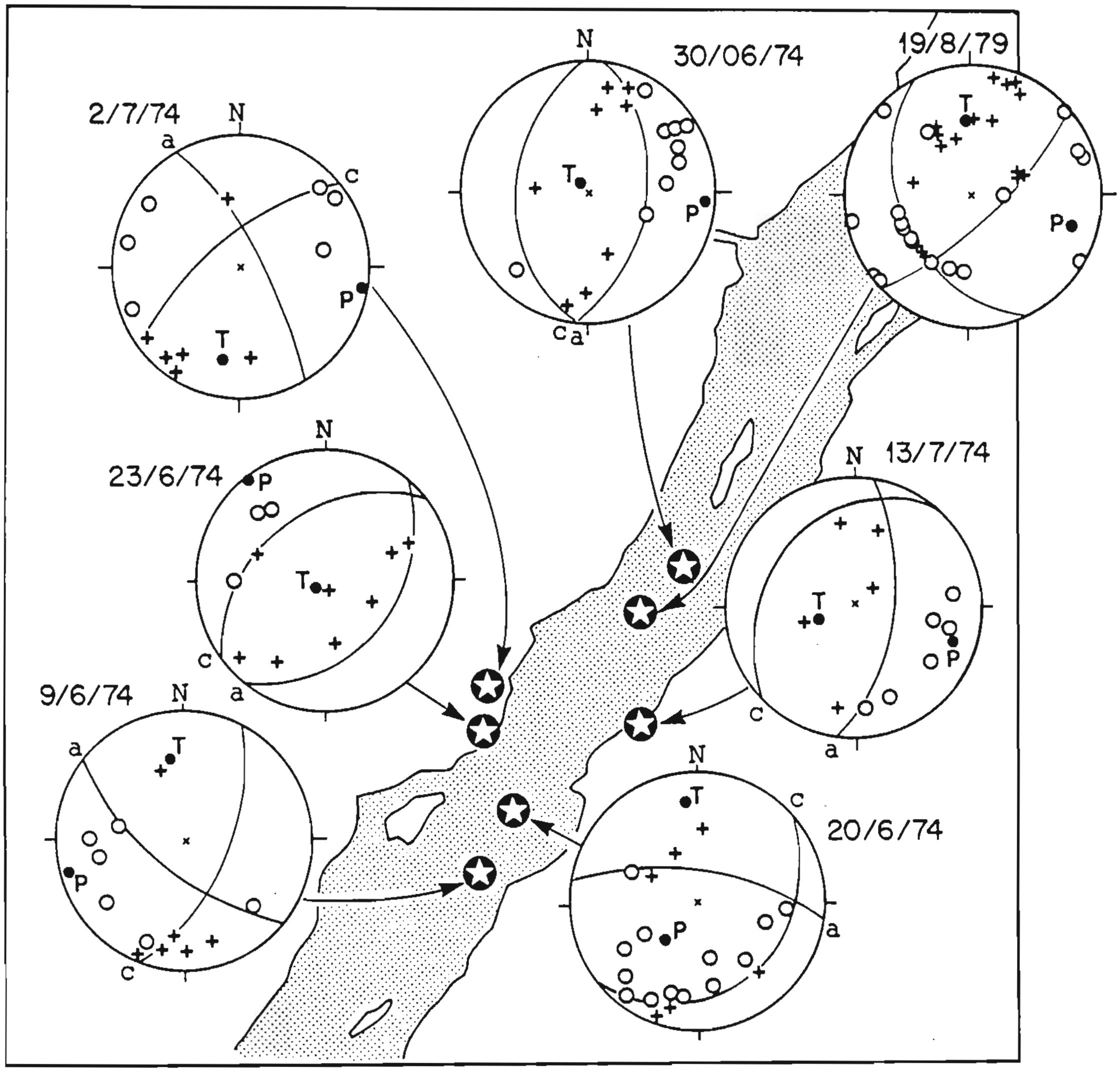


FIG. ♦. P-wave nodal solution of micro-earthquakes from the 1974 survey (Leblanc and Buchbinder 1977) and of the August 19, 1979, earthquake (Hasegawa and Wetmiller 1980). Open dot and plus sign denote dilatational and compressional first motion, respectively. The maximum compressive stress axis (*P*) and the maximum tensile stress (*T*) are also indicated. The centre of the focal sphere is represented by ×. The diagrams are equal-area projections of the lower hemisphere. Modified from Leblanc and Buchbinder (1977) and Hasegawa and Wetmiller (1980).

From Lamontagne (1987)

Figure 15

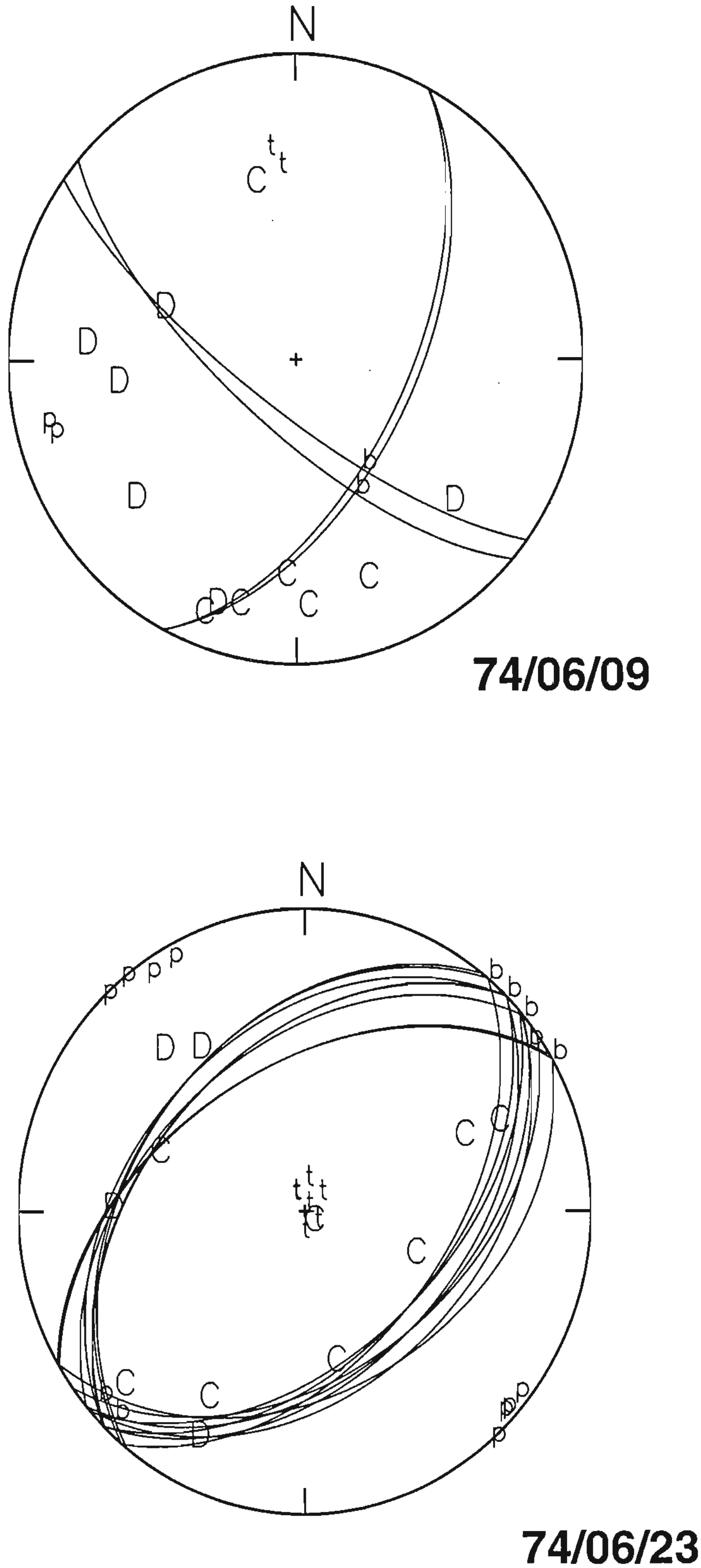
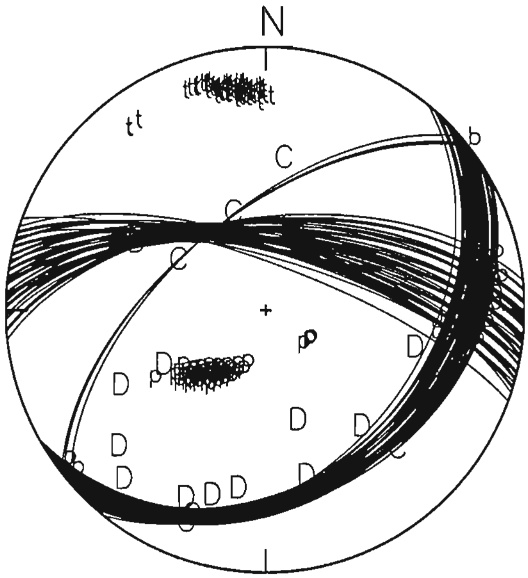
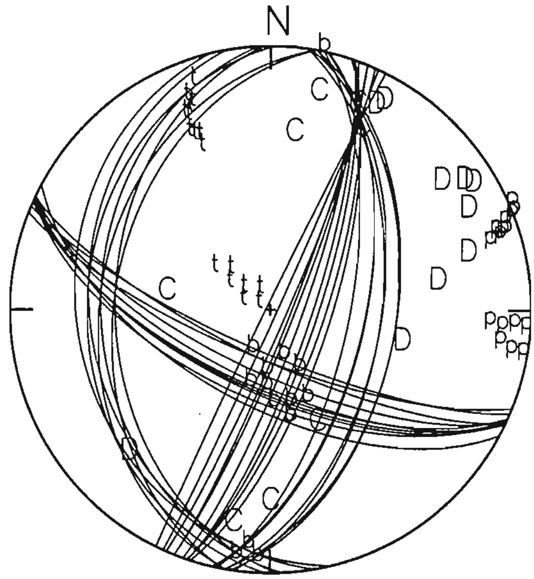


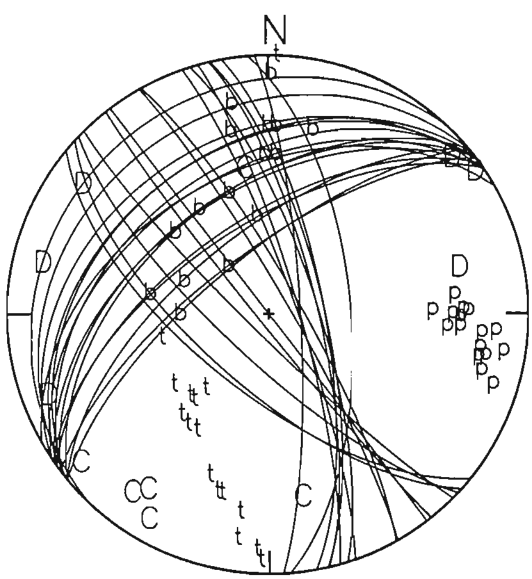
Figure 16A



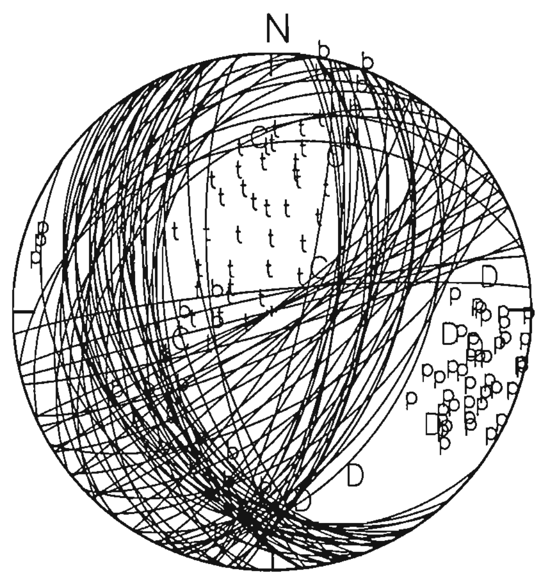
740620



740630



740702



740714

Figure 16 B

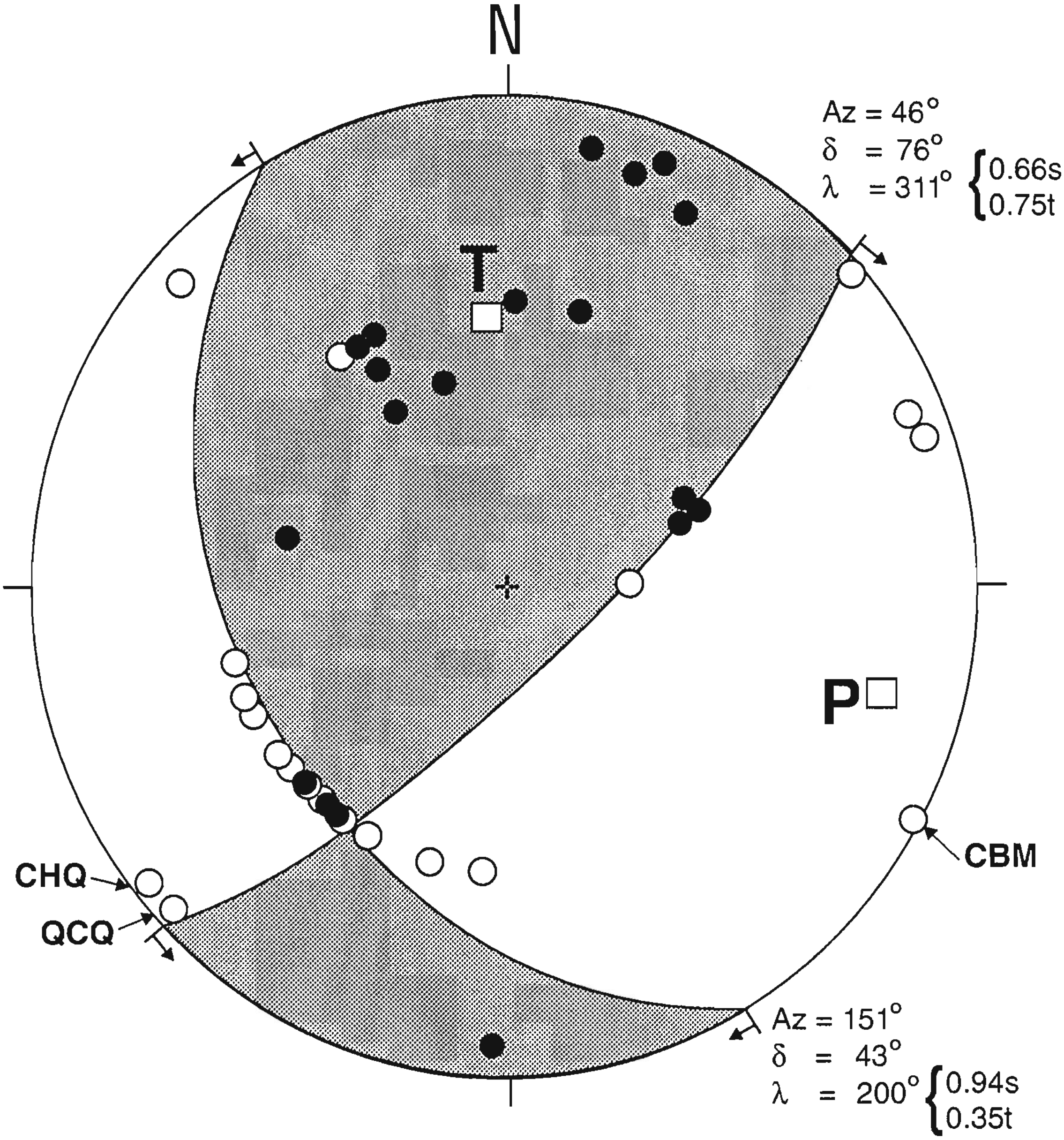

N
Az = 46°
δ = 76°
λ = 311°
0.66s
0.75t
T
P
CBM
CHQ
QCQ
Az = 151°
δ = 43°
λ = 200°
0.94s
0.35t

Figure 17

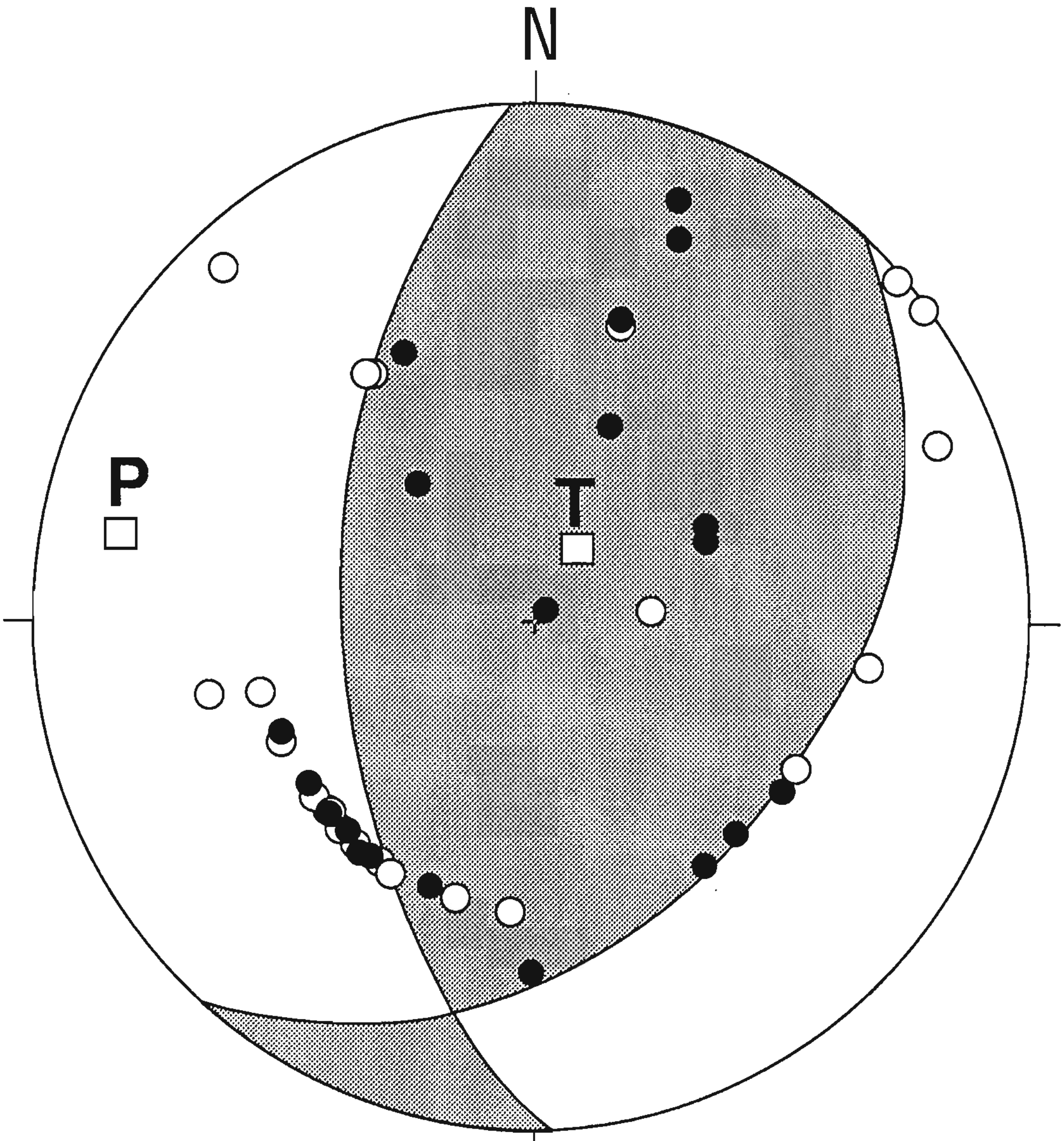


Figure 18

079602

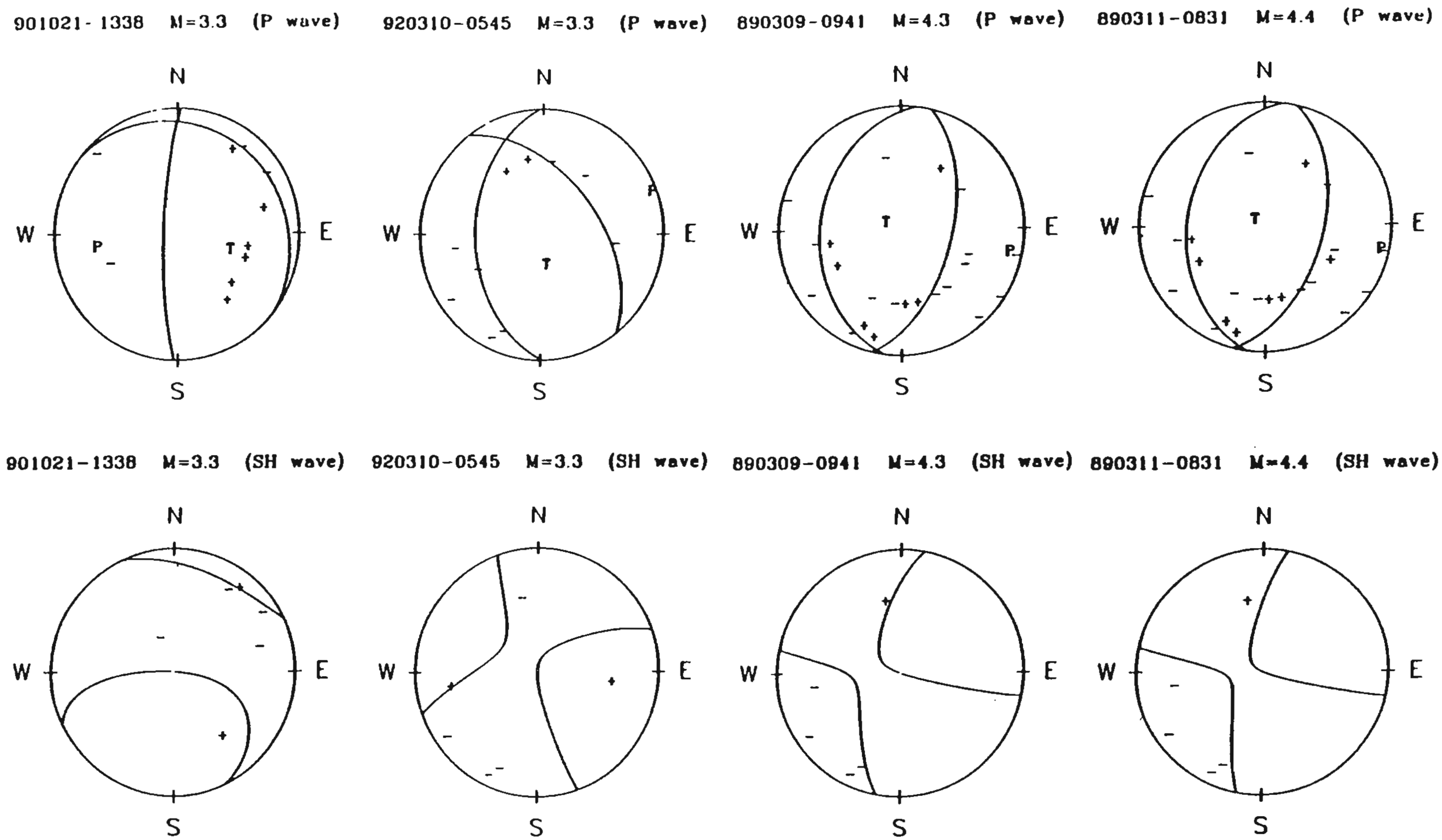
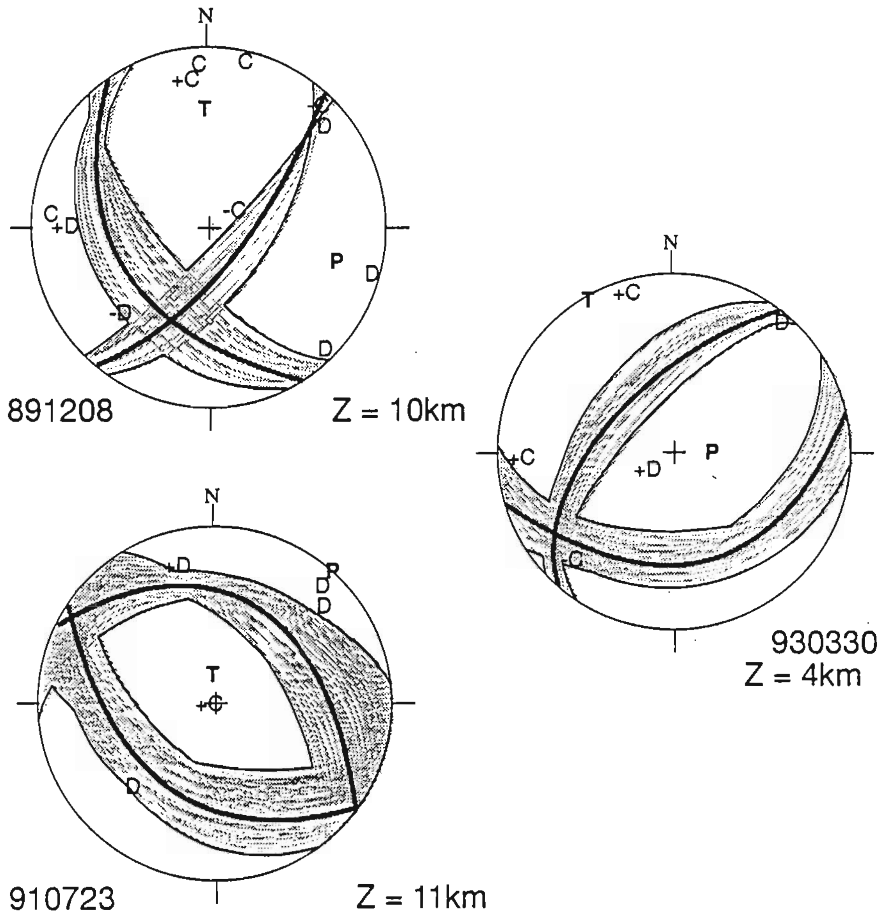


Figure 19

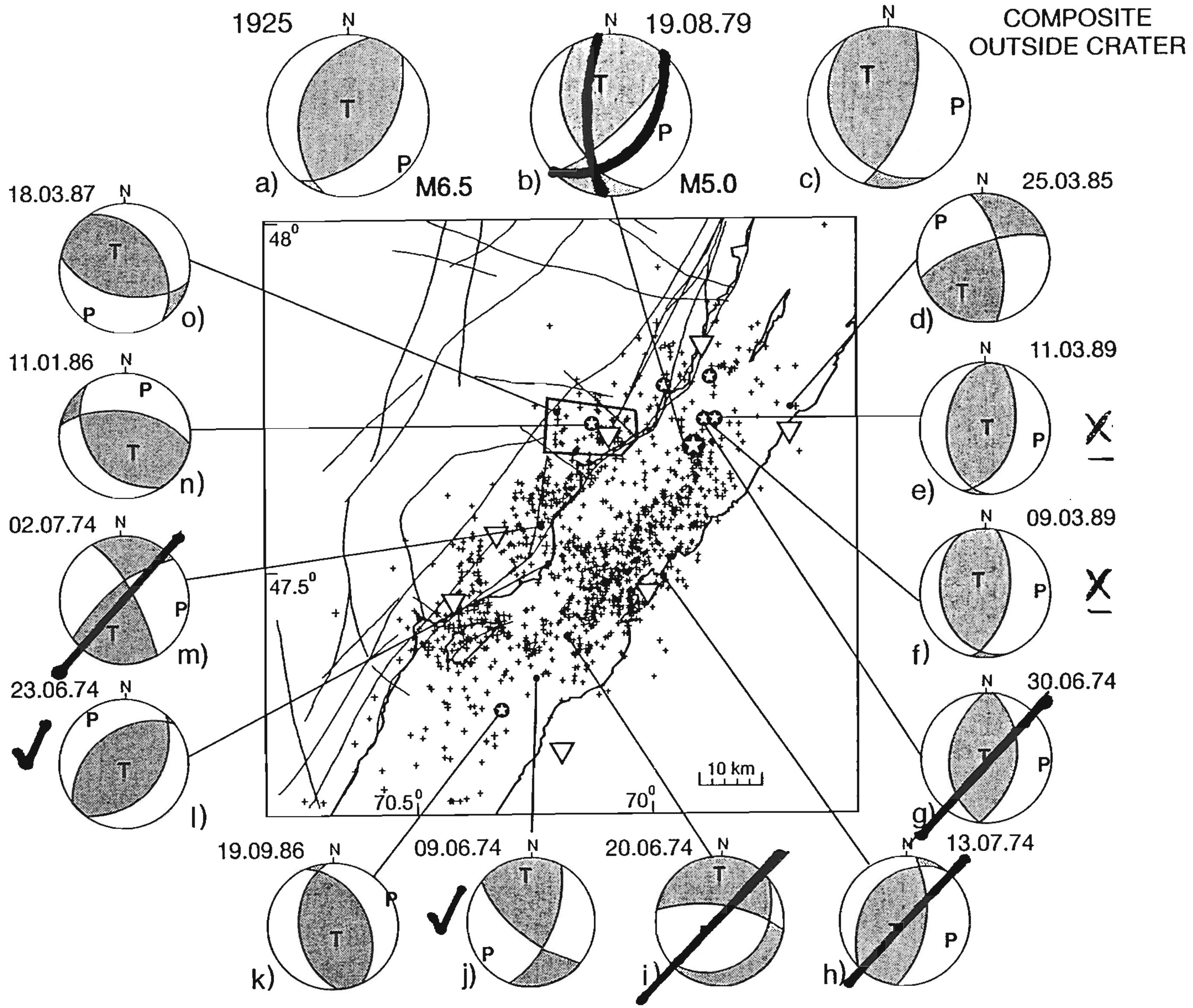
Figure *P* and *SH* focal mechanisms for the four largest (*M* 3.3 to 4.4) earthquakes. *P* first-motion data from the CLTN, ECTN, and NESN were used to constrain the *P* focal mechanisms. The observed *SH* polarities fit the *SH* focal mechanism predicted from the strike, dip, and rake of the *P* focal mechanism for each event.

From Li et al, 1995.



▲ **Figure** Focal mechanisms computed using first motion data (C, D) and transverse *SH* polarities (+, –). Possible variations in the nodal planes are shown as grey lines. Note the normal faulting mechanism of event 930330. ~~See Table 1 for detail~~s. Event 891208 is part of Triplet A. From Lamontagne and Ranalli (1997)

Figure 20

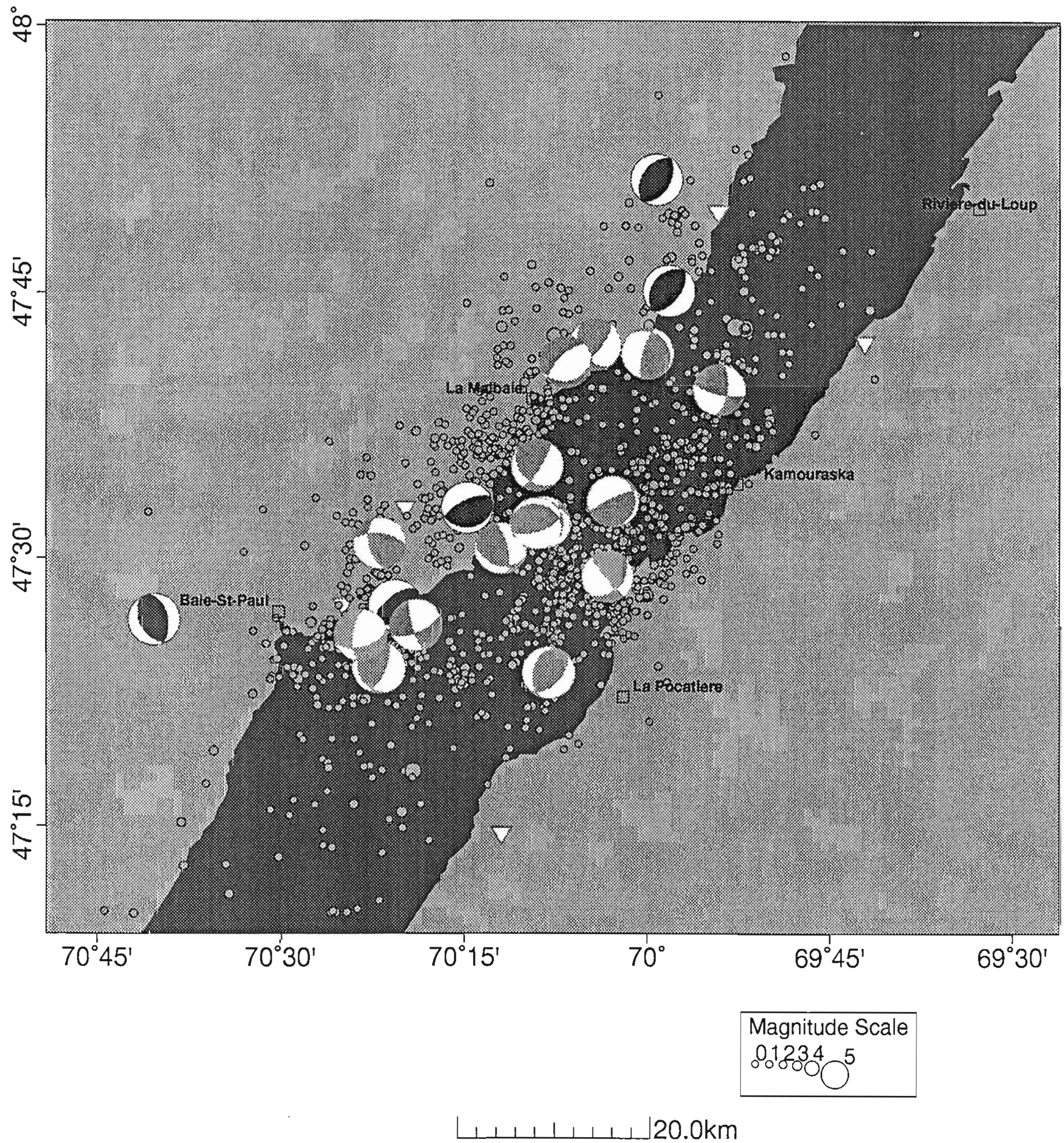


▲ **Figure** . Lower hemisphere focal mechanism solutions of the CSZ. Regions with compressional first motions are shaded. The maximum and minimum pressure axes are shown as *P* and *T*, respectively. The dates of the events and the magnitudes (*M*) of the two largest events are given. Mechanisms are from: (a) Bent, 1992; (b) Hasegawa and Wetmiller, 1980; (c) Lamontagne, 1987; (e) and (f): Wetmiller and Adams, 1990; (g), (h), (i), (j), (l), (m): in Leblanc and Buchbinder, 1977; (k) and (n) in Adams *et al.*, 1988; (d), and (o) in Adams *et al.*, 1989.

Figure 21

Figure 22

Focal Mec Qual A B



Appendix 1: Focal mechanisms of earthquakes of magnitude 3.0 and larger.

Q	Date yymmdd	Time hhmm ss	Latitude (°N)	Long. (°W)	Depth (km)	Mag	Sta/Pha	References:
A	890131	1439 48.20	47.4426	-70.6710	19.69	3.1		
X	890309	0941 32.26	47.7171	-69.8569	10.52	4.3mN	6/011	1 2 3
X	890311	0831 52.16	47.7182	-69.8699	10.41	4.4mN	7/012	1 2 3
B	891013	1404 42.80	47.3926	-70.1330	22.74	3.2mN	6/012	
A	891122	2302 51.72	47.4559	-70.3420	7.39	3.4mN	7/014	
A	900303	0206 03.38	47.8559	-69.9765	20.85	3.6mN	8/015	4
A	900313	1910 39.34	47.5338	-70.1366	15.38	3.2mN	7/014	4
C	900421	0123 04.12	47.5532	-70.0698	9.56	3.1mN	7/014	5
X	900423	0028 04.78	47.4143	-70.1787	8.04	3.0mN	7/014	
A	901021	1338 43.20	47.3975	-70.3644	15.85	3.3mN	7/013	5
X	901026	0913 51.51	47.5692	-69.9848	10.96	3.1mN	6/012	
X	901106	1130 10.76	47.3943	-70.1506	14.19	3.4mN	6/011	6
X	901218	0710 46.23	47.2627	-70.3359	9.38	3.3mN	7/013	6
0	910703	0926 42.32	47.5290	-70.1464	18.44	3.0mN	CLTN data not saved.	
C	911208	0300 30.12	47.7792	-69.8643	23.05	4.3mN	7/013	
X	920310	0545 32.64	47.7167	-69.8574	9.96	3.3mN	7/013	3
X	920501	0037 51.49	47.4463	-70.4069	2.67	3.2mN	6/011	
A	930304	2202 21.84	47.5145	-70.3621	4.39	3.1mN	6/011	
X	930807	2125 31.92	47.6681	-69.8893	7.75	3.1mN	7/014	
0	931201	1247 15.89	47.4671	-70.1584	18.0g	3.5mN	No CLTN data.	
X	931230	2301 47.69	47.4532	-70.3609	5.94	3.8mN	6/012	
A	940925	0053 29.46	47.7518	-69.9612	12.18	4.3mN	6/012	
B	941201	1302 47.14	47.4374	-70.3138	10.77	3.0mN	5/009	
C	960512	1153 21.91	47.5161	-70.0281	14.82	3.1mN	7/014	
X	960607	0941 42.83	47.5299	-69.9417	13.32	3.1mN	7/014	
A	970110	1927 27.56	47.5094	-70.1965	17.06	3.2mN	7/014	
X	970114	0447 32.39	47.6574	-69.8765	14.96	3.1mN	7/014	

1- Drysdale et al. (1989);
2- Wetmiller and Adams (1990).
3- Li et al. (1995).
4- Drysdale et al. (1990);
5- Drysdale et al. (1991a).
6- Drysdale et al. (1991b).

Q: Quality.
- A: Very good
- B: Good
- C: Fair
- X: Rejected
- 0: Cannot be computed.

Total: 8 A; 2 B; 3 C; 12 X; 2 O

Earthquake of 19890131 1439 Magnitude 3.1MN

1- Earthquake information and list of first motions.

Date	Time hhmm ss	Latitude	Longitude	Depth (km)	Mag	Sta/Pha
890131	1439 48.20	47.4426	-70.6710	19.69	3.1MN	7/012

COMMENTS:

CHARLEVOIX, QUEBEC; FELT IN SAINT-HILARION, BAIE-SAINT-PAUL
LES EBOULEMENTS AND LA MALBAIE
$
$ The Sg lines of some stations include the SH FM.
$ The convention used is the Virginia Tech convention used in FOCMEC:
$ <: SH first motion to left (back to event) impulsive
$ >: SH first motion to right (back to event) impulsive
$ Preliminary Focmec computed by ML.

Sta	Pha	Dist (km)	Azim	Take-off Angle	FM
A54	PG	20	85	-45	C
LMQ	PG	28	66	-55	D
A11	PG	42	122	-65	D
A11	SG	42	122	-65	>
A16	PG	50	86	-69	D
LPQ	PG	51	102	-69	D
A61	PG	52	57	-69	D
A61	SG	52	57	-69	<
DAQ	PG	72	324	-75	D
A64	PG	72	54	-75	D
A21	PG	79	68	-76	D
A21	SG	79	68	-76	>
CQ22	PG	92	333	-78	D
CQ8	PG	99	333	-79	D
SLQ	PG	128	78	-81	D

Number of P first motions: 12
Number of SH first motions: 3

2- Most Representative Solution.

A total of 65 solutions were found using a b axis increment of 1 degree. The following parameters describe the most representative solution, which was derived from the average B, P, and T axes listed below.

dip,strike,rake	42.47	152.63	79.60	
dip,strike,rake	48.38	346.60	99.38	:auxiliary plane

lower hem. trend, plunge of a,n	256.60	41.62	62.63	47.53
lower hem. trend & plunge of b	160.34	7.00		
lower hem. trend, plunge of p,t	69.97	2.98	317.07	82.39

Average B, P, and T axes:

	B	P	T
Mean trend:	N 159	N 249	N 343
Mean Plunge:	10	1	80
Vector Magnitude:	65	65	65
Mean length of resulting vector:	0.999	0.999	0.999

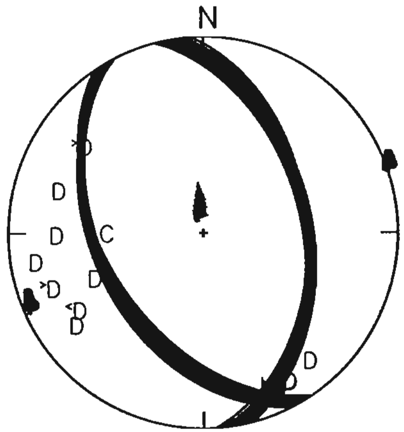
3- Misfits.

All 12 P first motions agreed with the solution.
All 3 SH first motions agreed with the solution.

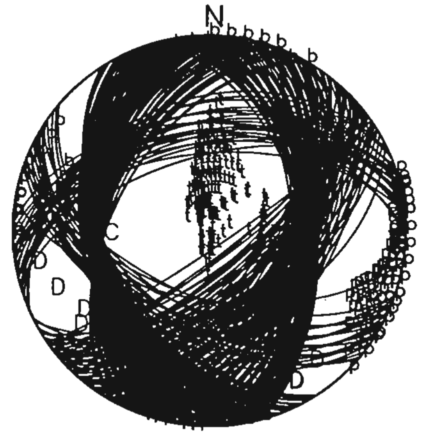
4- Rating of the focal mechanism.

The solution has an A rating based on the small number of P and SH misfits (0 /100 and 0 /100 respectively) and on the good constraints on the P, T and B axes (value of 0.999).

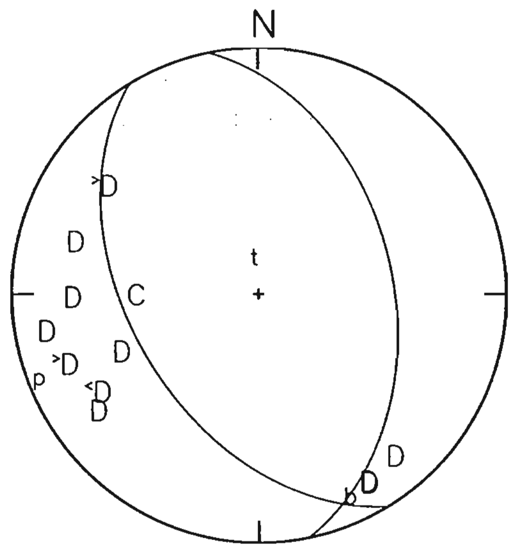
19890131 14:39 U.T.



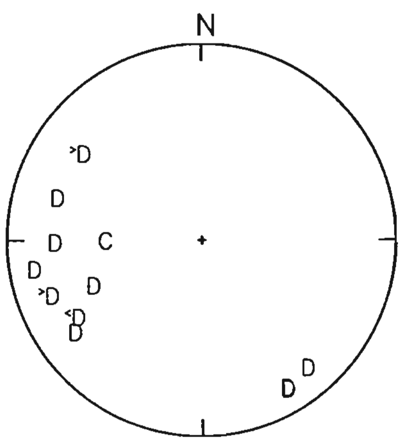
P, SH and P–Nodal



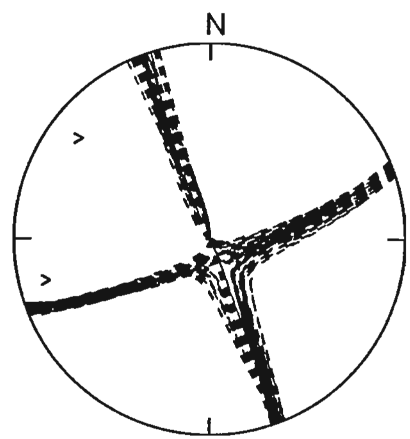
Solution with P FM only.



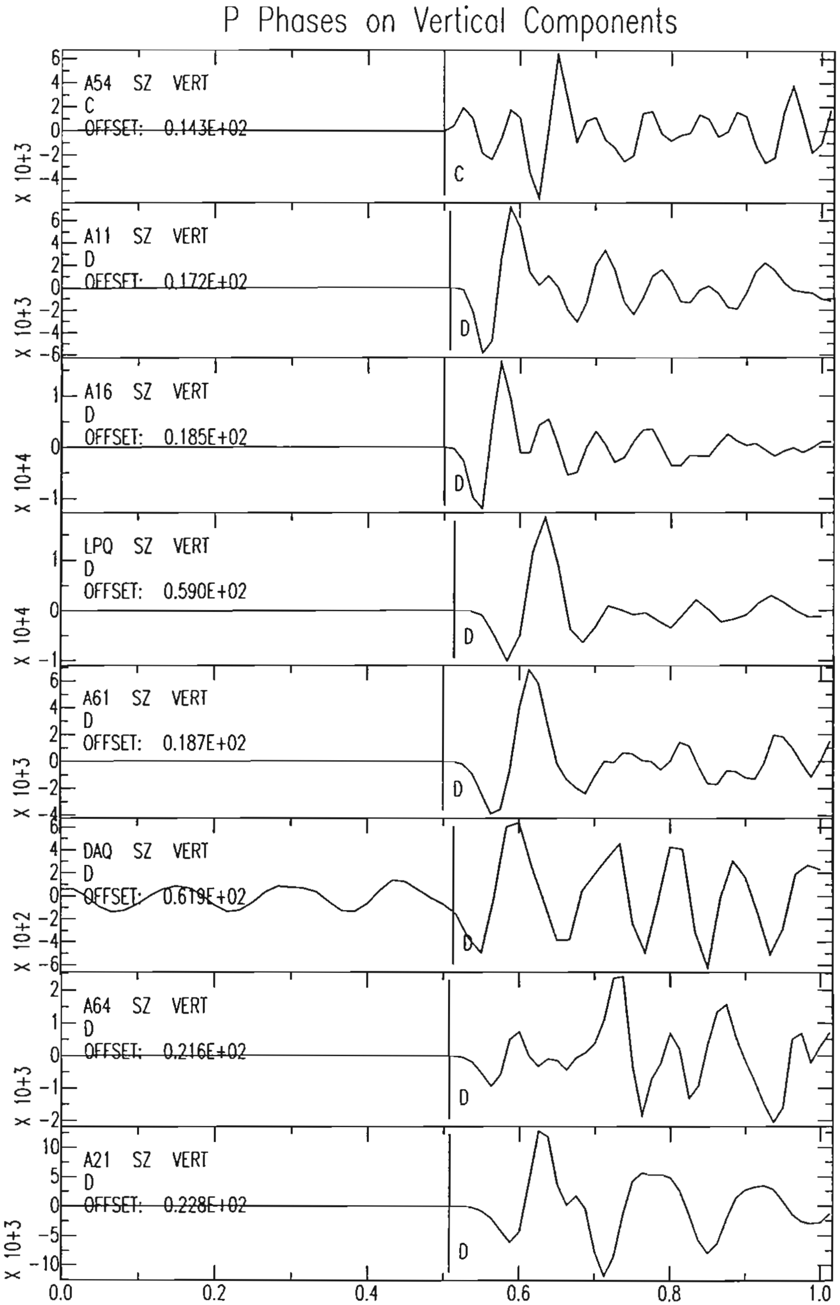
Best Solution

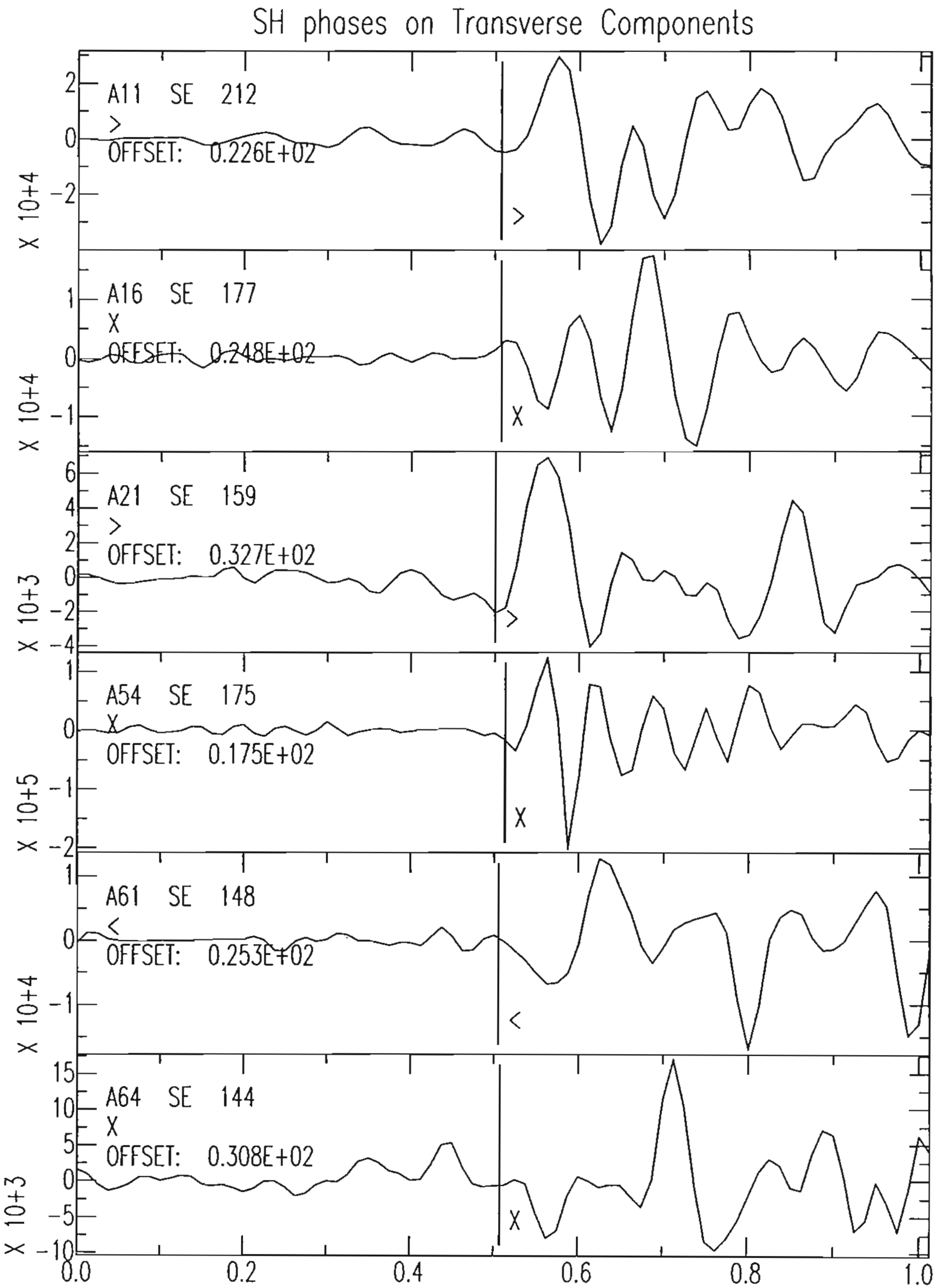


First Motions Only

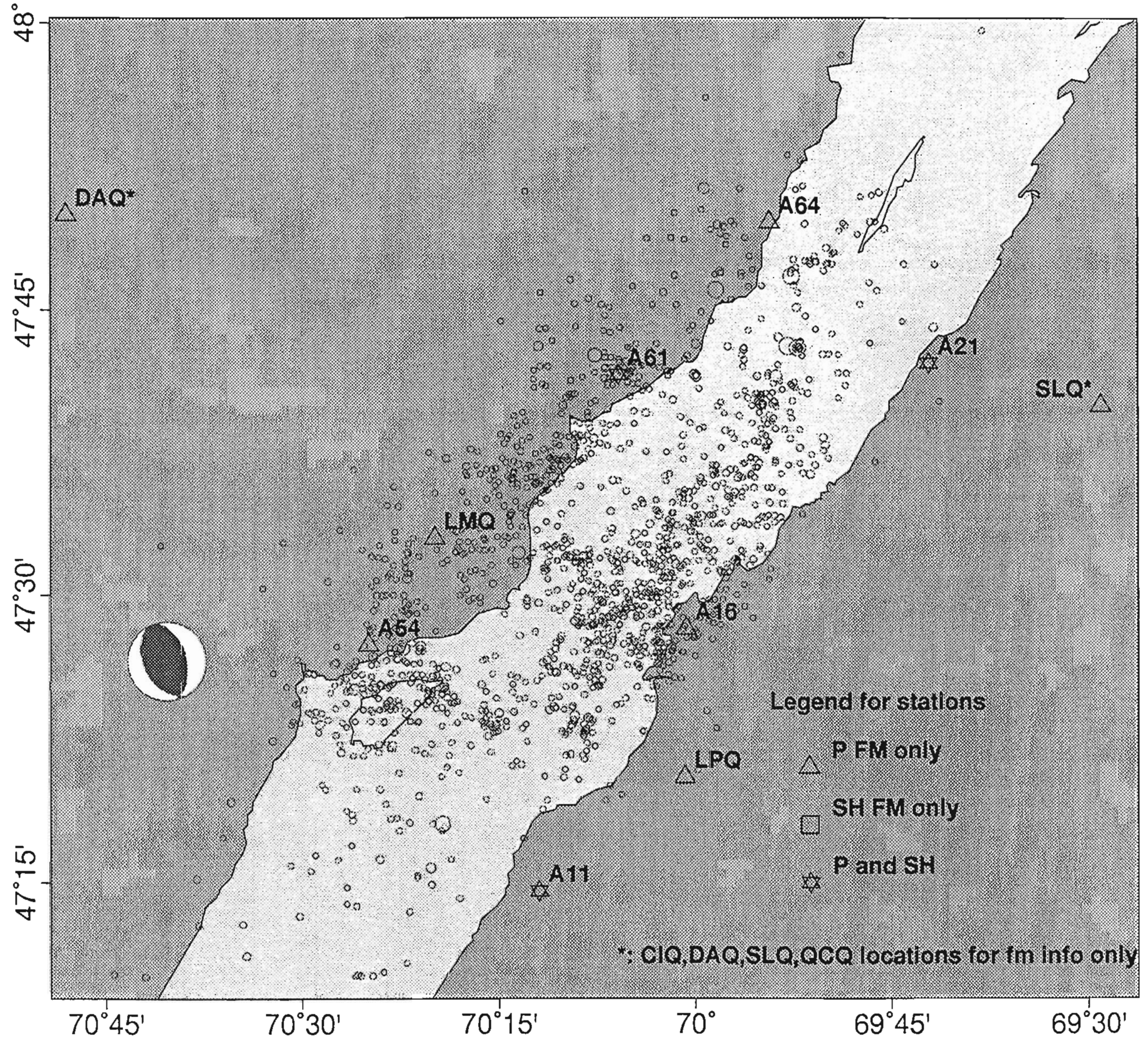


SH Motions and Lines.


P Phases on Vertical Components
A54 SZ VERT
C
OFFSET: 0.143E+02
A11 SZ VERT
D
OFFSET: 0.172E+02
A16 SZ VERT
D
OFFSET: 0.185E+02
LPQ SZ VERT
D
OFFSET: 0.590E+02
A61 SZ VERT
D
OFFSET: 0.187E+02
DAQ SZ VERT
D
OFFSET: 0.619E+02
A64 SZ VERT
D
OFFSET: 0.216E+02
A21 SZ VERT
D
OFFSET: 0.228E+02
X 10+3
X 10+4
X 10+2


SH phases on Transverse Components
A11 SE 212
OFFSET: 0.226E+02
A16 SE 177
OFFSET: 0.248E+02
A21 SE 159
OFFSET: 0.327E+02
A54 SE 175
OFFSET: 0.175E+02
A61 SE 148
OFFSET: 0.253E+02
A64 SE 144
OFFSET: 0.308E+02
X 10+4
X 10+3
X 10+5

Location Map



20.0km

Earthquake of 19890309 0941 Magnitude 4.25MN

1- Earthquake information and list of first motions.

Date	Time hhmm ss		Latitude	Longitude	Depth (km)	Mag	Sta/Pha
890309	0941	32.26	47.7171	-69.8569	10.52	4.25MN	6/011

COMMENTS:

```
CHARLEVOIX-KAMOURASKA, QUE.; FELT IN LA MALBAIE (IV)
AND BAIE-SAINT-PAUL. ALSO FELT ON THE SOUTH SHORE IN
RIVIERE-OUELLE AND KAMOURASKA. MAG (EDR) 3.9 MB (1 OBS)
$ TRQ,GRQ,WBO,CKO DOWN, MNQ SPIKY
$ LPQ DEAD AT START ? A21 dead.
$ CLTN CLOCK CORRECT ?
$FOCAL MECHANISM PUBLISHED IN
$WETMILLER AND ADAMS (1990): "AN EARTHQUAKE DOUBLET IN THE CHARLEVOIX
$SEISMIC ZONE" IN CURRENT RESEARCH, PART B, GSC, PAPER 90-1, P. 105-113.
$ADDITIONAL FIRST MOTIONS USED:
$HTQ  SZ PN  XC0942 03.07 E  L
$GSQ  SZ PN  XB0942 09.04 +  L
$MNQ  SZ PN  XA0942 17.79 C  L
$SIC  SZ PN  XB0942 20.30 +  L
$GGN  SZ PN  XB0942 24.12 -  L
$GAC  SZ PN  XB0942 38.46 -  L
$HAL  SZ PN  XB0942 51.20 +  L
$GBN  SZ PN  XB0943 02.00 -  L
$EEO  SZ PN  XB0943 03.44 C  L
$JAQ  SZ PN  XA0943 14.10 D  L
$SCH  SZ PN  XA0943 17.20 -  L
$KAO  SZ PN  XB0943 31.50 -  L
$GTO  SZ PN  XC0944 12.50 E  L
$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
$
$ The Sg lines of some stations include the SH FM.
$ The convention used is the Virginia Tech convention used in FOCMEC:
$ <: SH first motion to left  (back to event) impulsive
$ >: SH first motion to right (back to event) impulsive
$ Preliminary Focmec also computed by ML.
```

Sta	Pha	Dist (km)	Azim	Take-off Angle	FM
A64	PG	12	348	-50	D

A64	SG	12	348	-50	>
A61	PG	18	261	-59	D
A61	SG	18	261	-59	<
A16	PG	30	202	-70	C
A16	SG	30	202	-70	<
LMQ	PG	40	242	-75	D
LPQ	PG	43	196	-76	C
A54	PG	51	236	-78	D
A54	SG	51	236	-78	>
A11	PG	59	206	-80	D
SLQ	PG	64	95	-81	D
DAQ	PG	107	285	-84	D
EBN	PG	125	102	-85	D
JOQ	PG	129	307	-85	D
QCQ	PG	150	226	-86	D
DPQ	PN	250	244	49	C
KLN	PN	281	109	49	D

Number of P first motions: 14
Number of SH first motions: 4

2- Most Representative Solution.

A total of 910 solutions were found using a b axis increment of 2 degree. The following parameters describe the most representative solution, which was derived from the average B, P, and T axes listed below.

dip,strike,rake	18.11	194.42	83.55		
dip,strike,rake	72.01	21.21	92.10	:auxiliary plane	
lower hem. trend, plunge of a,n	291.21	17.99	104.42	71.89	
lower hem. trend & plunge of b	200.56	2.00			
lower hem. trend, plunge of p,t	109.54	26.98	294.47	62.93	

Average B, P, and T axes:

	B	P	T
Mean trend:	N 195	N 98	N 311
Mean Plunge:	14	24	60
Vector Magnitude:	871	892	889
Mean length of resulting vector:	0.957	0.980	0.977

3- Misfits.

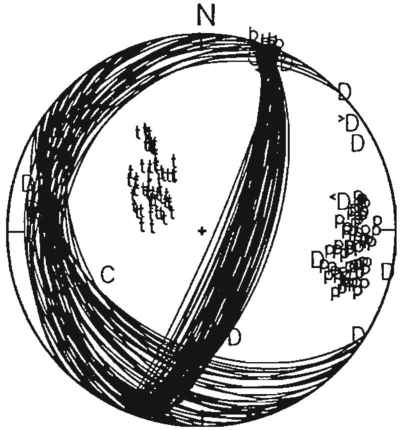
All 14 P first motions agreed with the solution.
Out of 4 SH first motions, a total of 1 did not fit the solutions (25/100).

Station Name	Number of misfits	Percentage of wrongs
A54	910	100

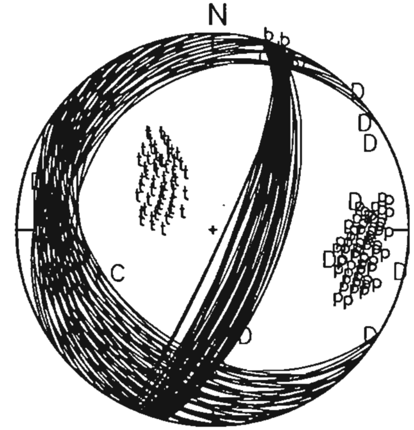
4- Rating of the focal mechanism.

The solution is rejected (rating X) based on the high number of P and SH misfits (0 /100 and 25 /100 respectively) and the absence of constraints on the P, T and B axes (value of 0.971).

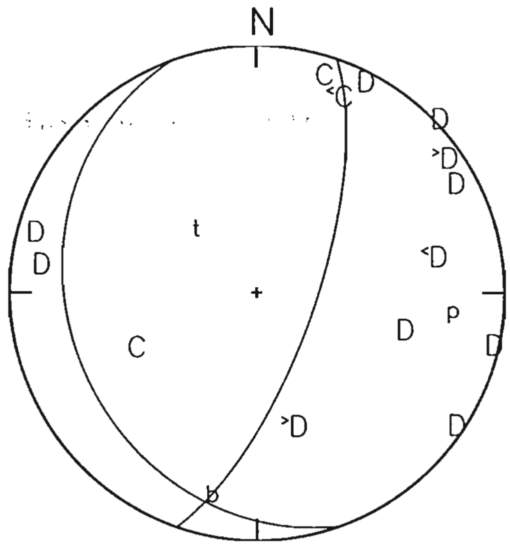
19890309 09:40 U.T.



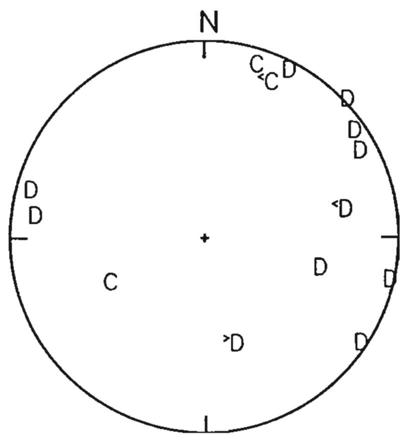
P, SH and P–Nodal



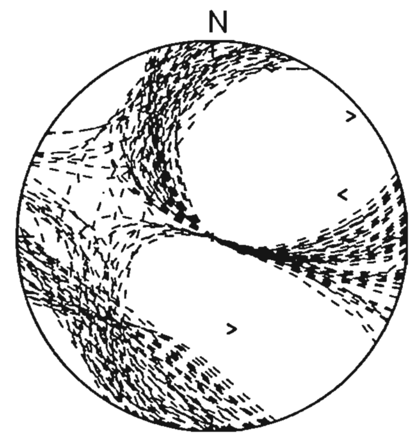
Solution with P FM only.



Best Solution

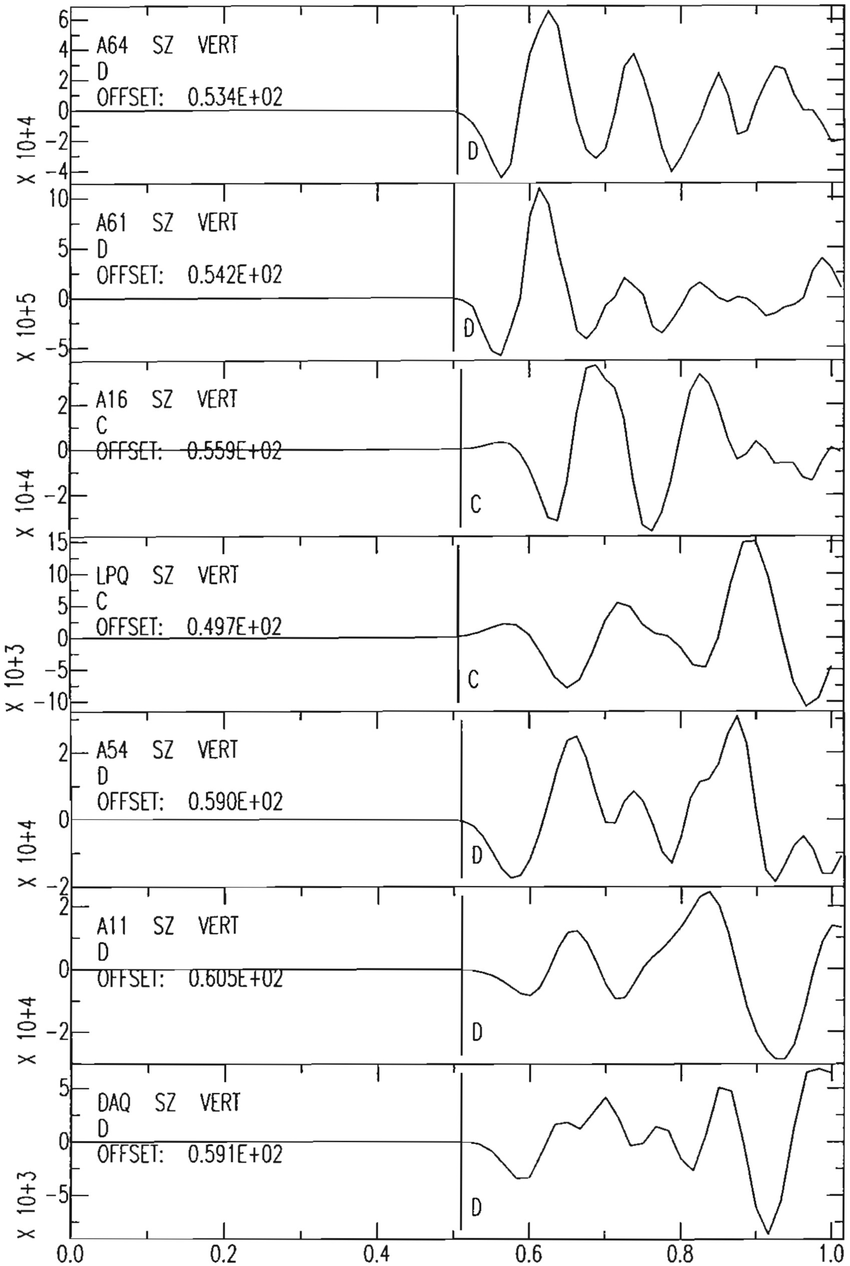


First Motions Only

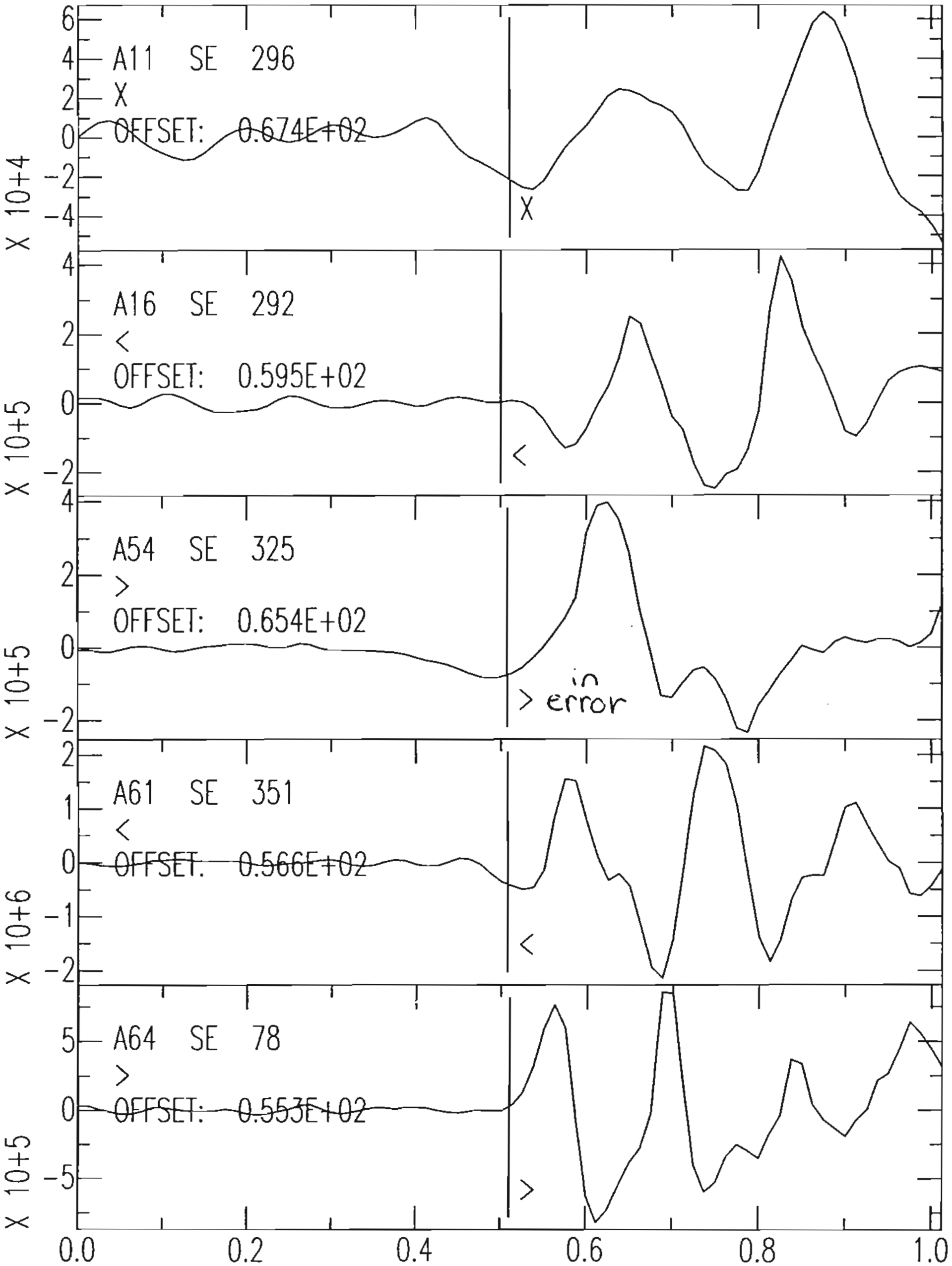


SH Motions and Lines.

P Phases on Vertical Components

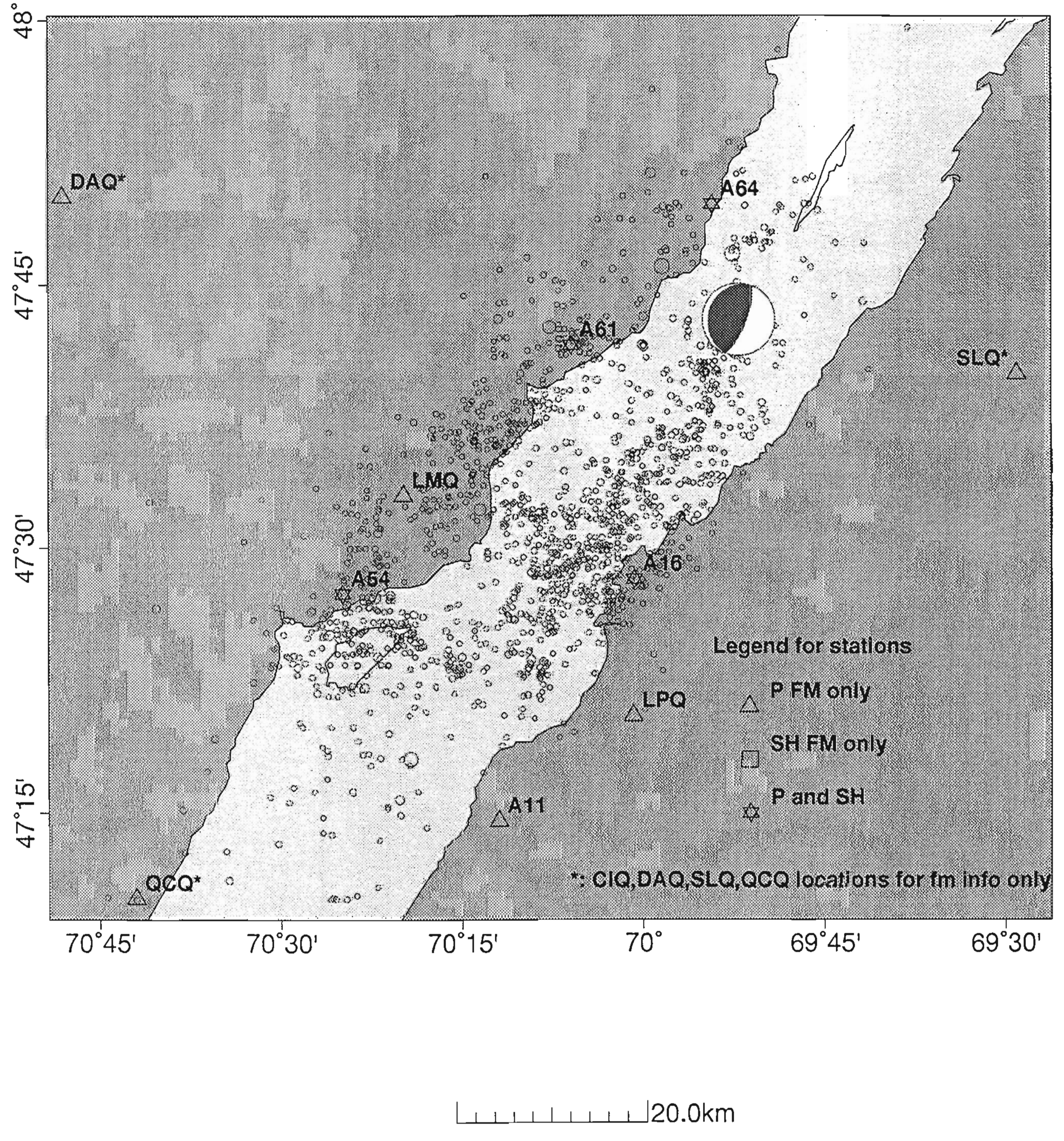


SH phases on Transverse Components



8603019

Location Map



62
890309

Earthquake of 19890311 0831 Magnitude 4.4MN

1- Earthquake information and list of first motions.

Date	Time hhmm ss	Latitude	Longitude	Depth (km)	Mag	Sta/Pha
890311	0831 52.16	47.7182	-69.8699	10.41	4.4MN	7/012

COMMENTS:

```
CHARLEVOIX-KAMOURASKA, QUE. FELT
IN LA MALBAIE, BAIE-SAINT-PAUL, ON THE SOUTH SHORE
AND IN THE SAGUENAY REGION. CLOSE TO MAG. 4.3 EVENT
TWO DAYS EARLIER.
$ EDR QUOTES GSC PRELIMINARY SOLUTION
$A21 down.
$
$Additional Phases used by Wetmiller and Adams (1990):
$GSQ  SZ PN  XB0832 28.27 C  L
$HTQ  SZ PN  XB0832 21.80 C  L
$GGN  SZ PN  XB0832 43.18 D  L
$TRQ  SZ PN  XA0832 45.82 C  L
$JAQ  SZ PN  XB0833 33.57 D  L
$YKA  SZ PN  XB0837 50.00 C  L
$SIC  SZ PN  XB0832 41.00 -  L
$LMN  SZ PN  XB0832 51.06 -  L
$HAL  SZ PN  XB0833 11.00 -  L
$CKO  SZ PN  XB0833 10.68 +  L
$GBN  SZ PN  XB0833 21.90 -  L
$KAO  SZ PN  XB0833 51.20 -  L
$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
$
$ The Sg lines of some stations include the SH FM.
$ The convention used is the Virginia Tech convention used in FOCMEC:
$ <: SH first motion to left  (back to event) impulsive
$ >: SH first motion to right (back to event) impulsive
$ Preliminary Focmec computed by ML.
```

Sta	Pha	Dist (km)	Azim	Take-off Angle	FM
A64	PG	12	352	-49	D
A64	SG	12	352	-49	>
A61	PG	17	260	-58	D
A61	SG	17	260	-58	<

A16	PG	29	200	-70	C
A16	SG	29	200	-70	<
LMQ	PG	39	241	-75	D
LPQ	PG	43	194	-76	C
A54	PG	50	235	-78	D
A11	PG	58	205	-80	D
SLQ	PG	65	95	-81	D
DAQ	PG	106	285	-84	D
EBN	PG	126	102	-85	D
JOQ	PG	128	307	-85	D
QCQ	PG	149	226	-86	D
DPQ	PN	249	243	49	C
KLN	PN	282	109	49	D
GRQ	PN	471	257	49	C
EEO	PN	708	264	49	C

Number of P first motions: 16
Number of SH first motions: 3

2- Most Representative Solution.

A total of 853 solutions were found using a b axis increment of 2 degree. The following parameters describe the most representative solution, which was derived from the average B, P, and T axes listed below.

dip,strike,rake	72.05	14.75	85.79		
dip,strike,rake	18.42	208.16	102.75	:auxiliary plane	
lower hem. trend, plunge of a,n	118.16	71.58	284.75	17.95	
lower hem. trend & plunge of b	16.04	4.00			
lower hem. trend, plunge of p,t	108.08	26.93	278.25	62.73	

Average B, P, and T axes:

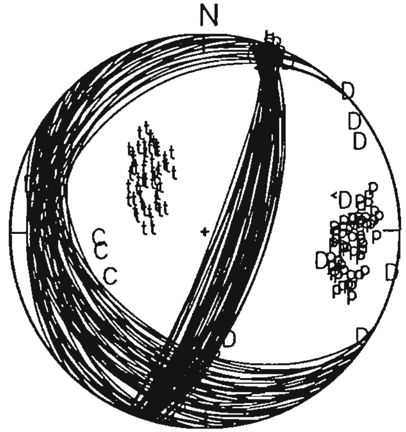
	B	P	T
Mean trend:	N 195	N 97	N 309
Mean Plunge:	15	26	58
Vector Magnitude:	816	837	835
Mean length of resulting vector:	0.957	0.981	0.979

3- Misfits.

All 16 P first motions agreed with the solution.
All 3 SH first motions agreed with the solution.

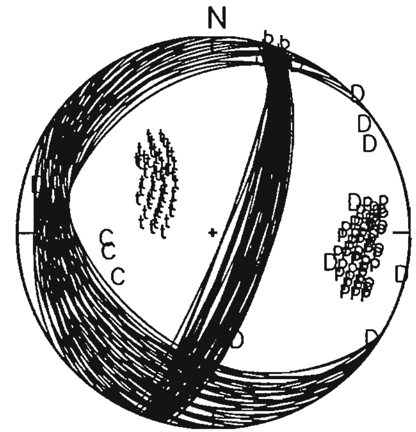
4- Rating of the focal mechanism.

The solution is rejected (rating X) based on the high number of P and SH misfits (0 /100 and 0 /100 respectively) and the absence of constraints on the P, T and B axes (value of 0.972).

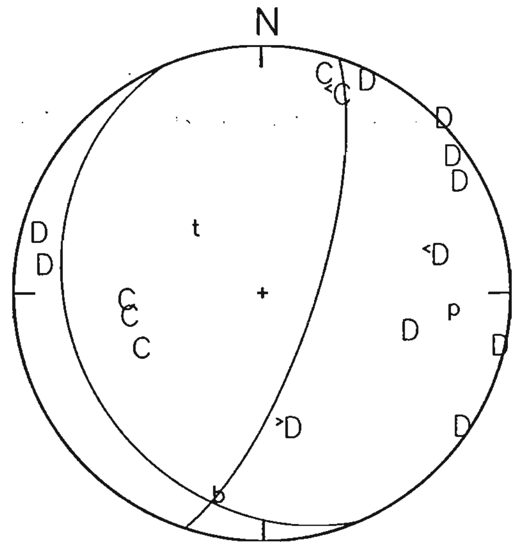


P, SH and P–Nodal

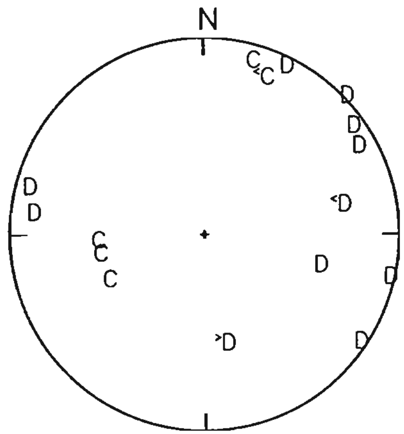
19890311 08:31 U.T.



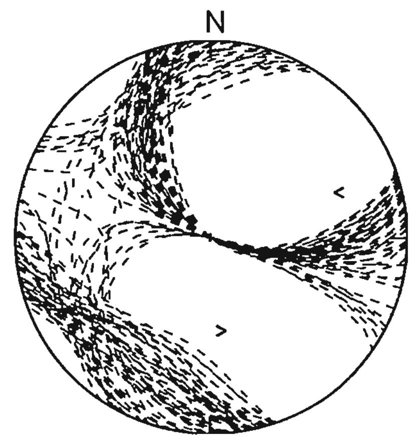
Solution with P FM only.



Best Solution



First Motions Only



SH Motions and Lines.

890311

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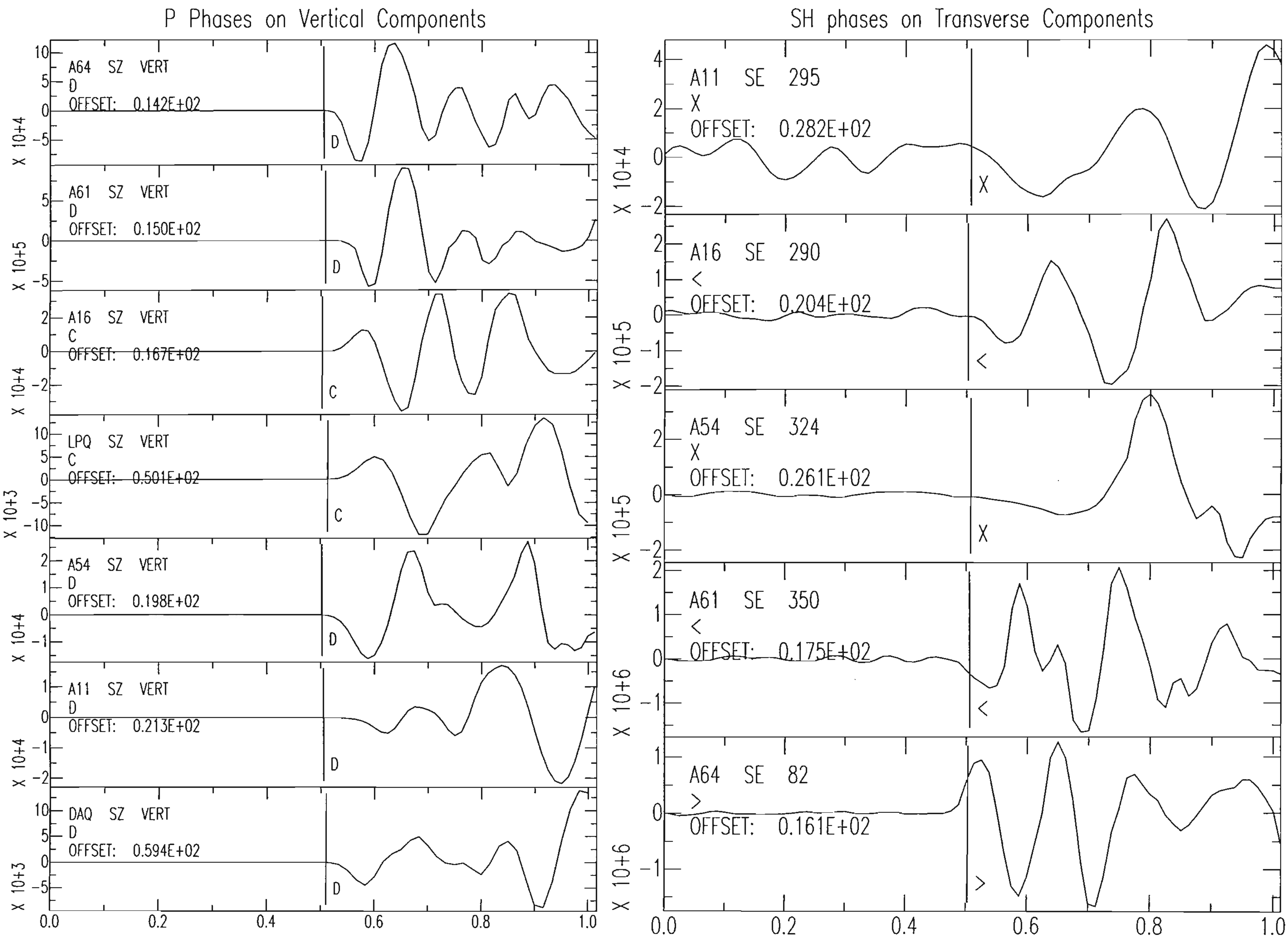
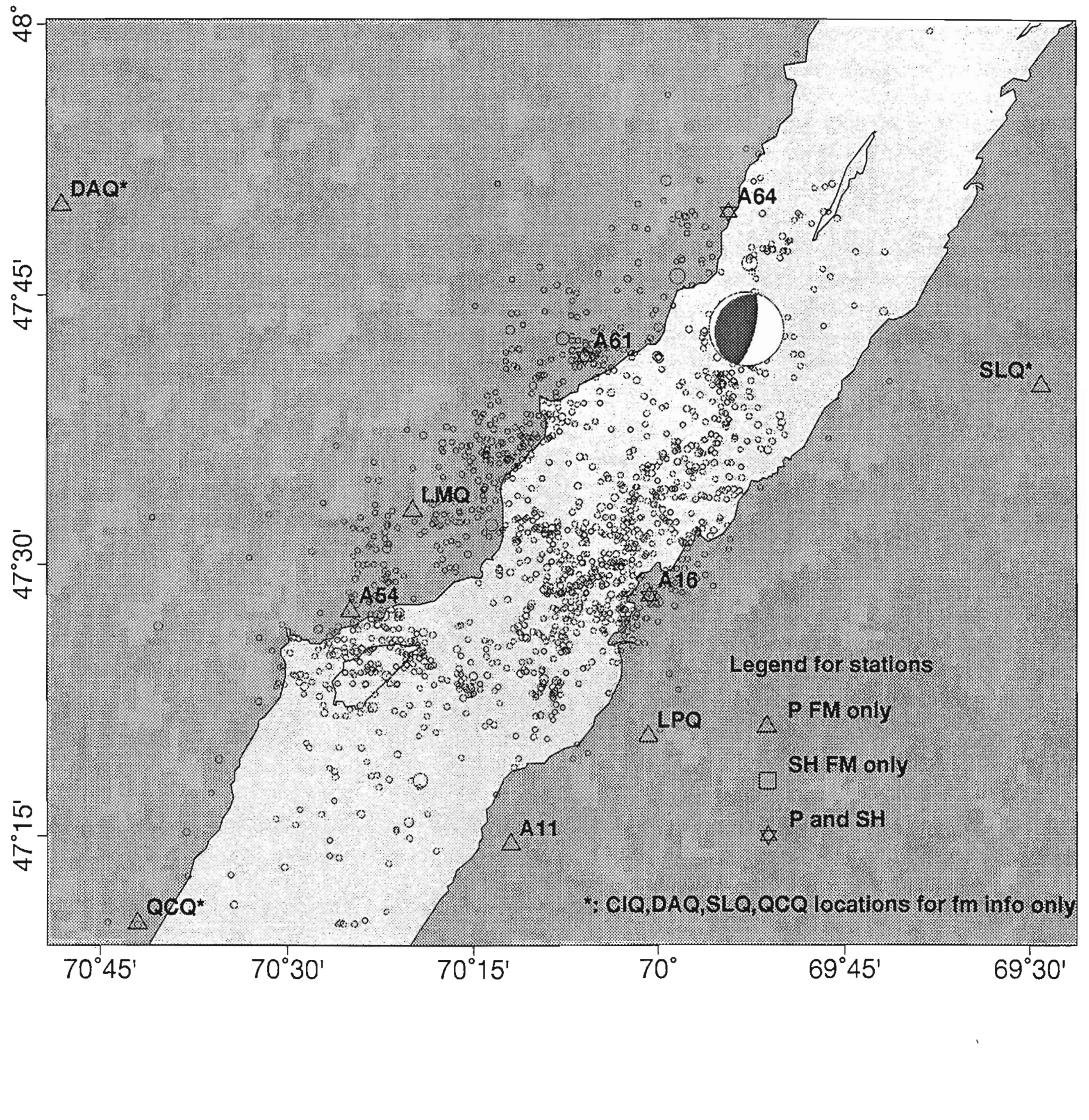

P Phases on Vertical Components
A64 SZ VERT
D
OFFSET: 0.142E+02
A61 SZ VERT
D
OFFSET: 0.150E+02
A16 SZ VERT
C
OFFSET: 0.167E+02
LPQ SZ VERT
C
OFFSET: 0.501E+02
A54 SZ VERT
D
OFFSET: 0.198E+02
A11 SZ VERT
D
OFFSET: 0.213E+02
DAQ SZ VERT
D
OFFSET: 0.594E+02
X 10+4
X 10+5
X 10+3
SH phases on Transverse Components
A11 SE 295
X
OFFSET: 0.282E+02
A16 SE 290
<
OFFSET: 0.204E+02
A54 SE 324
X
OFFSET: 0.261E+02
A61 SE 350
<
OFFSET: 0.175E+02
A64 SE 82
>
OFFSET: 0.161E+02
X 10+4
X 10+5
X 10+6
0.0
0.2
0.4
0.6
0.8
1.0

Location Map



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890311

Earthquake of 19891013 1404 Magnitude 3.2MN

1- Earthquake information and list of first motions.

Date	Time hhmm ss	Latitude	Longitude	Depth (km)	Mag	Sta/Pha
891013	1404 42.80	47.3926	-70.1330	22.74	3.2MN	6/012

COMMENTS:

CHARLEVOIX, QUEBEC; FELT ON THE NORTH SHORE
AT ST-HILARION, BAIE-SAINT-PAUL, LA MALBAIE, LES EBOULEMENTS.
$ SLQ dead.
$ Other first motions in original pikfile:
$KLN SZ PN XA1405 24.13 E L
$GGN SZ PN XA1405 32.83 + L
$TRQ SZ Trac Y1404 43.80 L
$LMN SZ PN XA1405 42.68 + L
$
$ The Sg lines of some stations include the SH FM.
$ The convention used is the Virginia Tech convention used in FOCMEC:
$ <: SH first motion to left (back to event) impulsive
$ >: SH first motion to right (back to event) impulsive
$ Preliminary Focmec computed by ML.

Sta	Pha	Dist (km)	Azim	Take-off Angle	FM
LPQ	PG	11	122	-26	C
A16	PG	13	48	-30	C
A16	SG	13	48	-30	<
A11	PG	17	196	-37	C
A54	PG	22	289	-44	D
A54	SG	22	289	-44	<
LMQ	PG	23	320	-45	D
A61	PG	34	6	-56	D
A61	SG	34	6	-56	>
A21	PG	48	44	-65	C
A64	PG	52	20	-66	D
DAQ	PG	105	308	-78	D
CIQ	PG	110	334	-78	D

Number of P first motions: 10
Number of SH first motions: 3

2- Most Representative Solution.

A total of 44 solutions were found using a b axis increment of 1 degree. The following parameters describe the most representative solution, which was derived

from the average B, P, and T axes listed below.

dip,strike,rake	44.12	195.00	68.18			
dip,strike,rake	49.73	44.15	109.83	:auxiliary plane		
lower hem. trend, plunge of a,n				314.15	40.27	105.00 45.88
lower hem. trend & plunge of b				211.03	15.00	
lower hem. trend, plunge of p,t				120.26	2.90	19.59 74.71

Average B, P, and T axes:

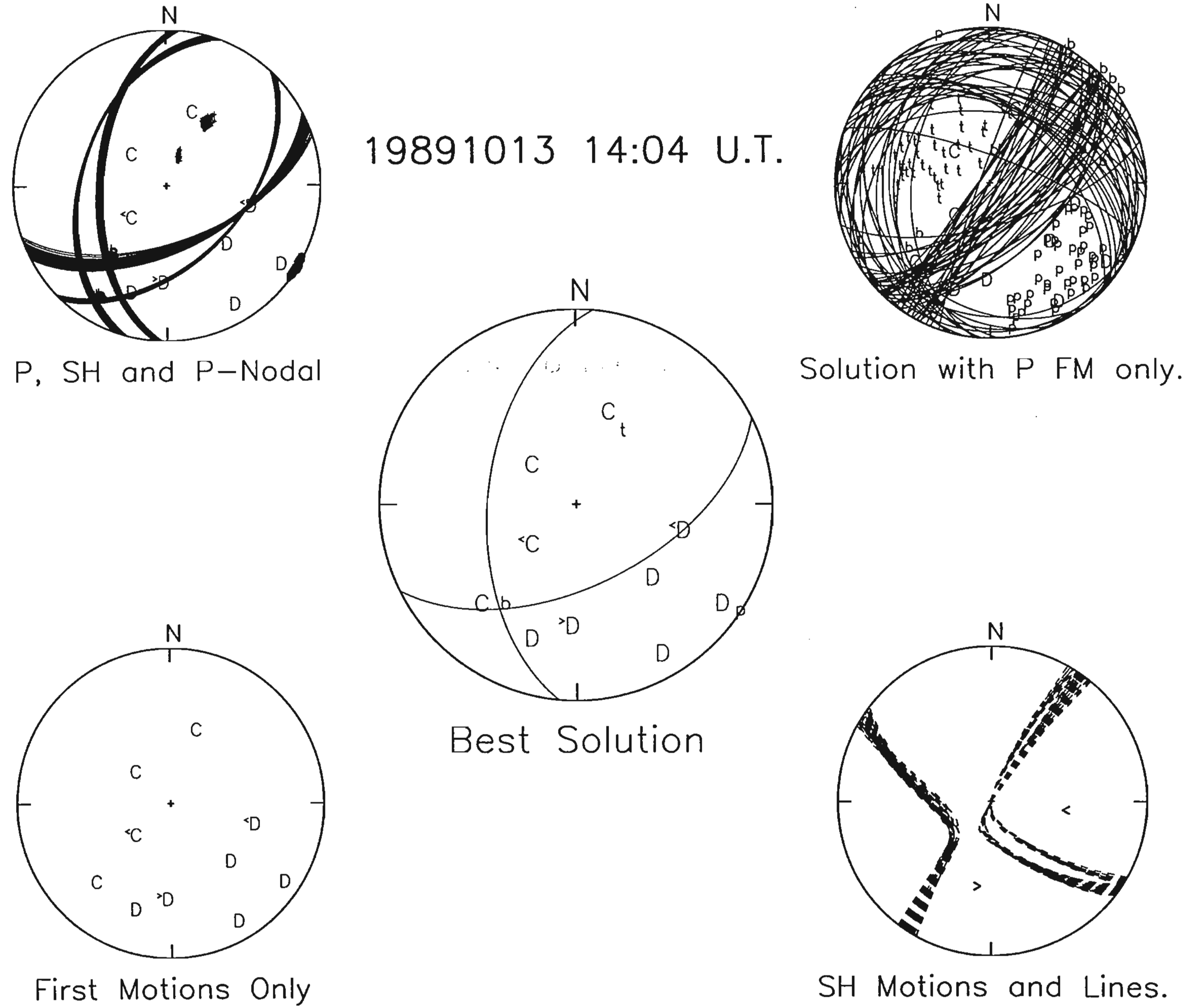
	B	P	T
Mean trend:	N 215	N 124	N 31
Mean Plunge:	31	2	59
Vector Magnitude:	43	44	43
Mean length of resulting vector:	0.983	0.999	0.983

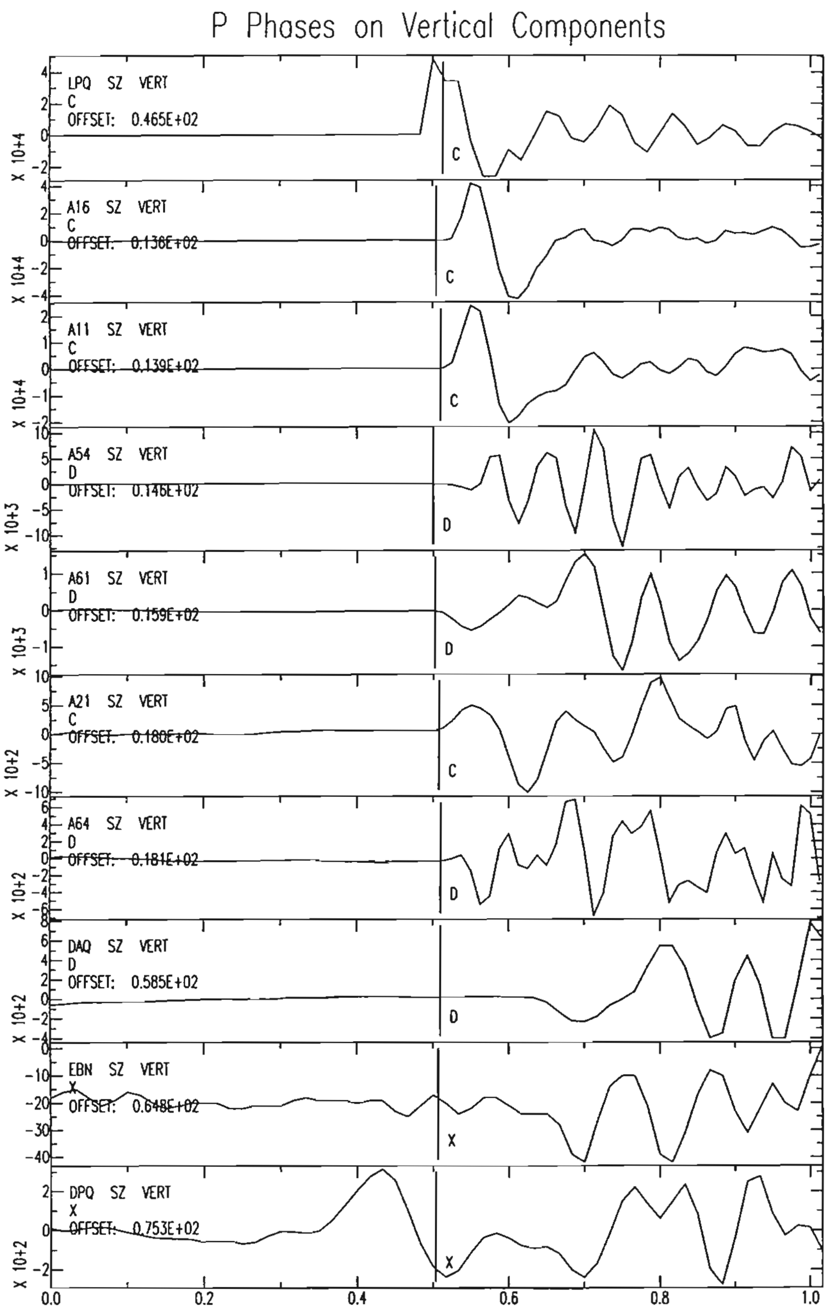
3- Misfits.

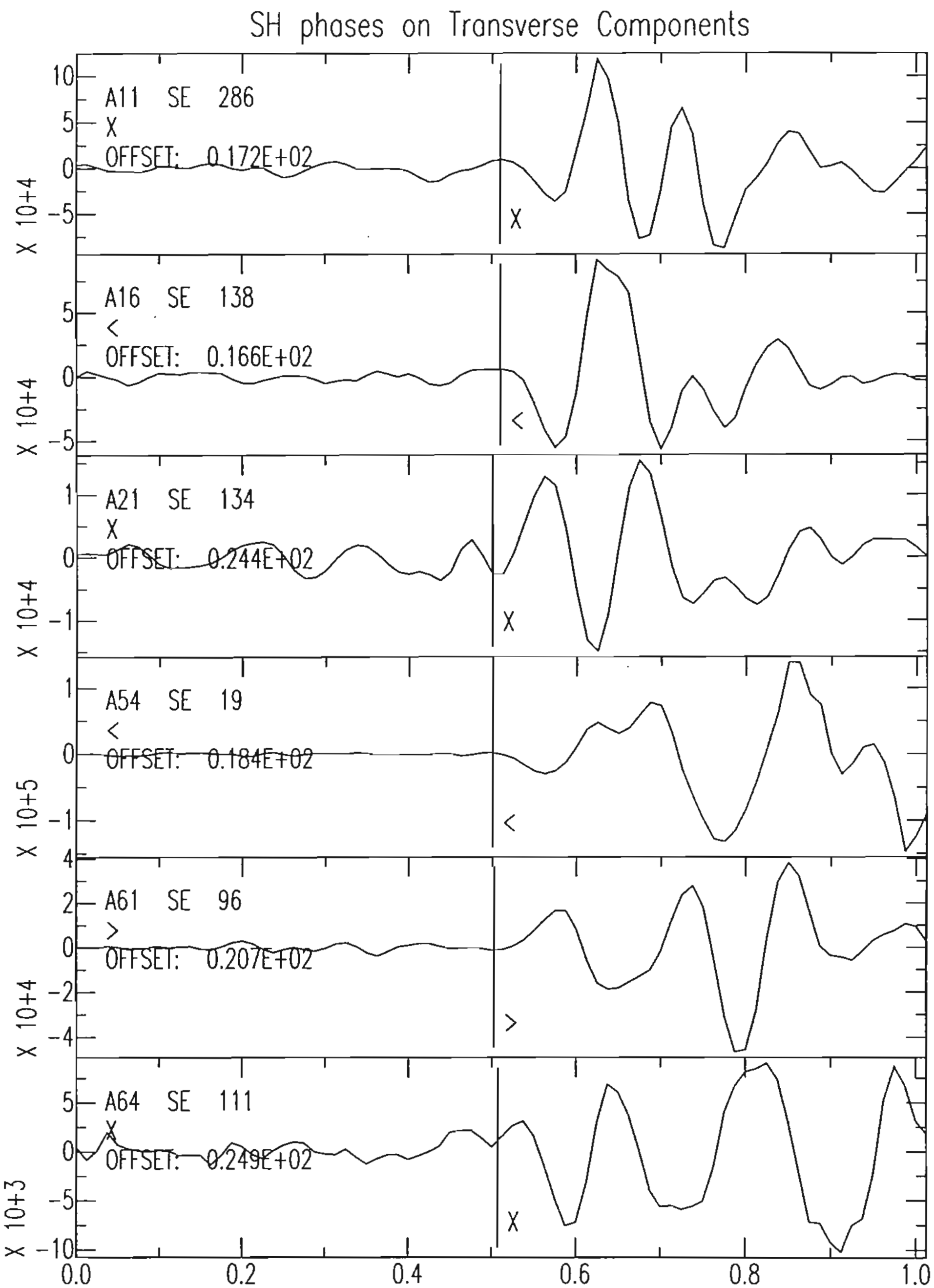
All 10 P first motions agreed with the solution.
All 3 SH first motions agreed with the solution.

4- Rating of the focal mechanism.

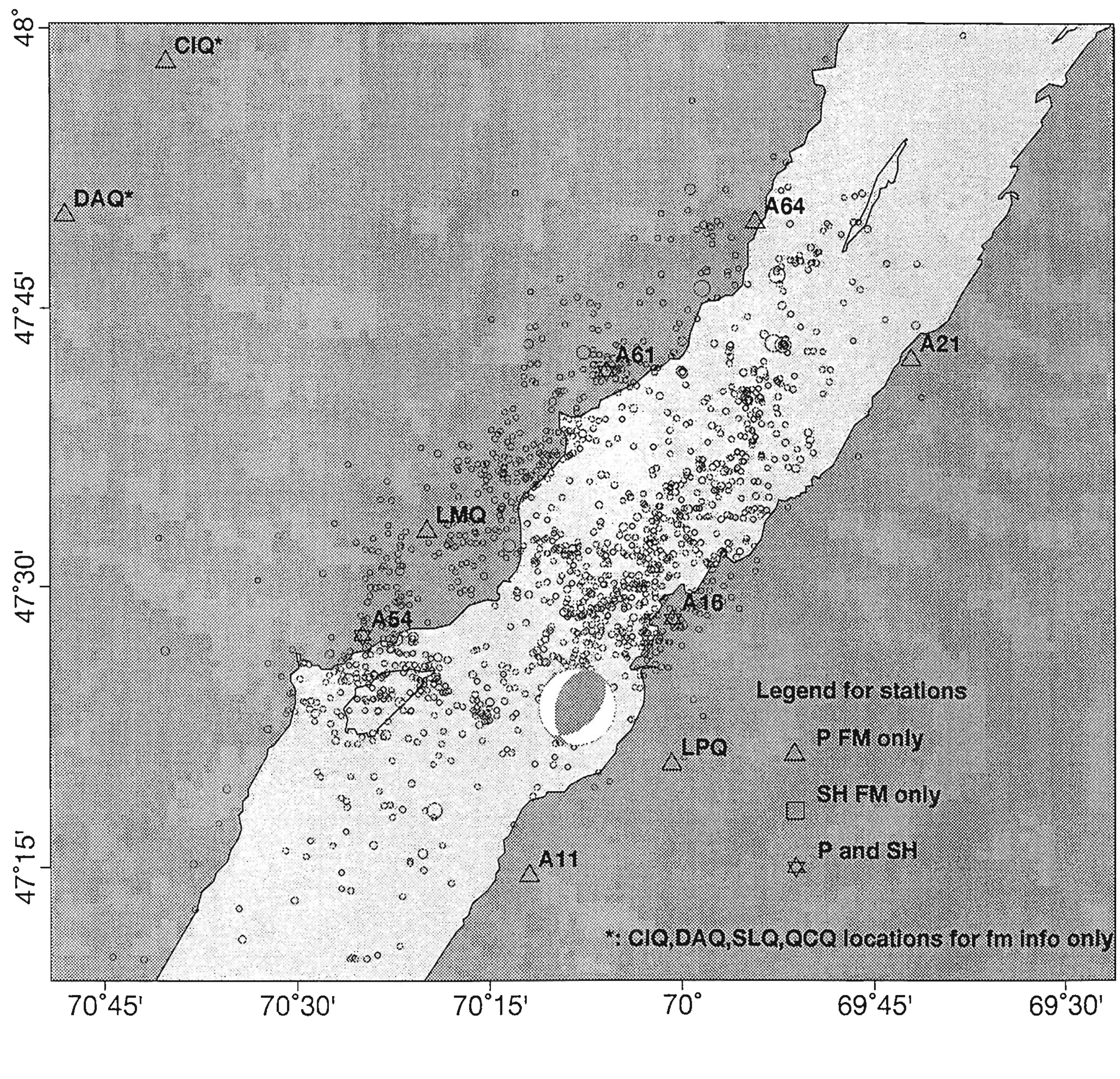
The solution has a B rating based on the number of P and SH misfits (0 /100 and 0 /100 respectively) and on the constraints on the P, T and B axes (value of 0.988).


19891013 14:04 U.T.
N
P, SH and P–Nodal
Solution with P FM only.
Best Solution
First Motions Only
SH Motions and Lines.


P Phases on Vertical Components
LPQ SZ VERT
C
OFFSET: 0.465E+02
A16 SZ VERT
C
OFFSET: 0.136E+02
A11 SZ VERT
C
OFFSET: 0.139E+02
A54 SZ VERT
D
OFFSET: 0.146E+02
A61 SZ VERT
D
OFFSET: 0.159E+02
A21 SZ VERT
C
OFFSET: 0.180E+02
A64 SZ VERT
D
OFFSET: 0.181E+02
DAQ SZ VERT
D
OFFSET: 0.585E+02
EBN SZ VERT
X
OFFSET: 0.648E+02
DPQ SZ VERT
X
OFFSET: 0.753E+02
X 10+4
X 10+3
X 10+2


SH phases on Transverse Components
A11 SE 286
X
OFFSET: 0.172E+02
A16 SE 138
<
OFFSET: 0.166E+02
A21 SE 134
X
OFFSET: 0.244E+02
A54 SE 19
<
OFFSET: 0.184E+02
A61 SE 96
>
OFFSET: 0.207E+02
A64 SE 111
X
OFFSET: 0.249E+02
X 10+4
X 10+5
X 10+3

Location Map



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Earthquake of 19891122 2302 Magnitude 3.4MN

1- Earthquake information and list of first motions.

Date	Time hhmm ss	Latitude	Longitude	Depth (km)	Mag	Sta/Pha
891122	2302 51.72	47.4559	-70.3420	7.39	3.4MN	7/014

COMMENTS:

CHARLEVOIX-KAMOURASKA, QUE.; FELT (IV)
IN BAIE-ST-PAUL, LA MALBAIE, LES EBOULEMENTS, ST-IRENEE
FELT (III) IN ST-HILARION,
AND ON THE SOUTH SHORE AT ST-PASCAL, RIVIERE-OUELLE, KAMOURASKA.
$ FELT INFO FROM LMQ OPERATOR AND FROM RADIO STATIONS.
$
$ The Sg lines of some stations include the SH FM.
$ The convention used is the Virginia Tech convention used in FOCMEC:
$ <: SH first motion to left (back to event) impulsive
$ >: SH first motion to right (back to event) impulsive
$ Preliminary Focmec computed by ML.

Sta	Pha	Dist (km)	Azim	Take-off Angle	FM
A54	PG	5	271	-36	C
A54	SG	5	271	-36	>
LMQ	PG	10	6	-54	C
A16	PG	25	86	-74	D
A16	SG	25	86	-74	<
A11	PG	26	155	-74	D
A11	SG	26	155	-74	>
LPQ	PG	28	117	-75	D
A61	PG	32	36	-77	D
A61	SG	32	36	-77	>
A64	PG	53	39	-82	D
A21	PG	56	60	-82	D
DAQ	PG	88	310	-85	D
CIQ	PG	97	340	-86	D
SLQ	PG	103	76	-86	D
QCQ	PG	103	224	-86	D

Number of P first motions: 12
Number of SH first motions: 4

2- Most Representative Solution.

A total of 846 solutions were found using a b axis increment of 1 degree. The following parameters describe the most representative solution, which was derived

from the average B, P, and T axes listed below.

dip,strike,rake	60.13	230.77	84.23			
dip,strike,rake	30.38	62.23	99.92	:auxiliary plane		
lower hem. trend, plunge of a,n		332.23	59.62	140.77	29.87	
lower hem. trend & plunge of b		233.65	5.00			
lower hem. trend, plunge of p,t		324.99	14.94	125.63	74.21	

Average B, P, and T axes:

	B	P	T
Mean trend:	N 235	N 328	N 125
Mean Plunge:	7	19	69
Vector Magnitude:	844	842	842
Mean length of resulting vector:	0.997	0.995	0.996

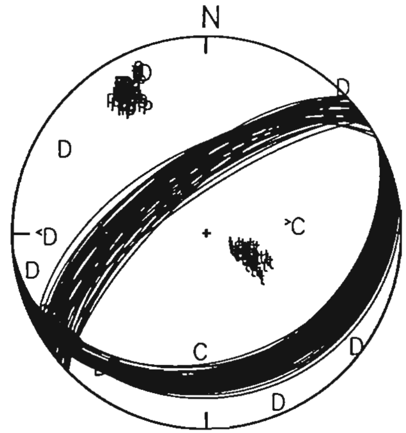
3- Misfits.

All 12 P first motions agreed with the solution.
All 4 SH first motions agreed with the solution.

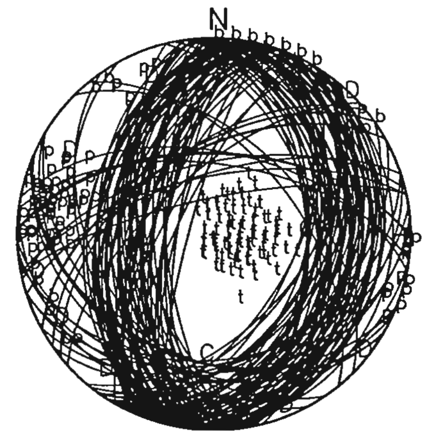
4- Rating of the focal mechanism.

The solution has an A rating based on the small number of P and SH misfits (0 /100 and 0 /100 respectively) and on the good constraints on the P, T and B axes (value of 0.996).

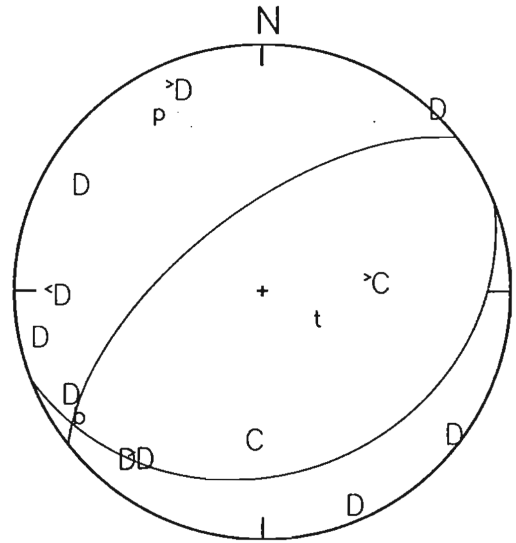
19891022 23:02 U.T.



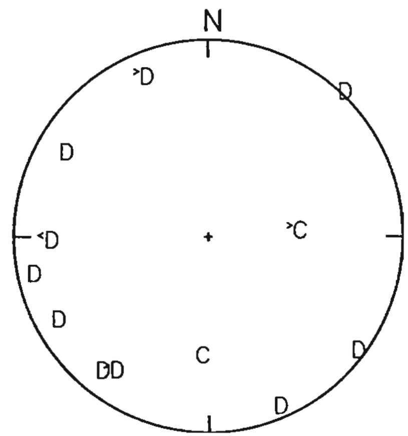
P, SH and P–Nodal



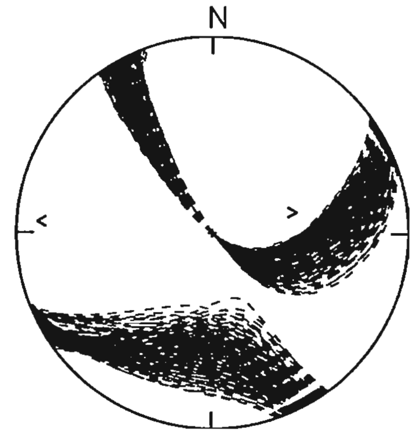
Solution with P FM only.



Best Solution

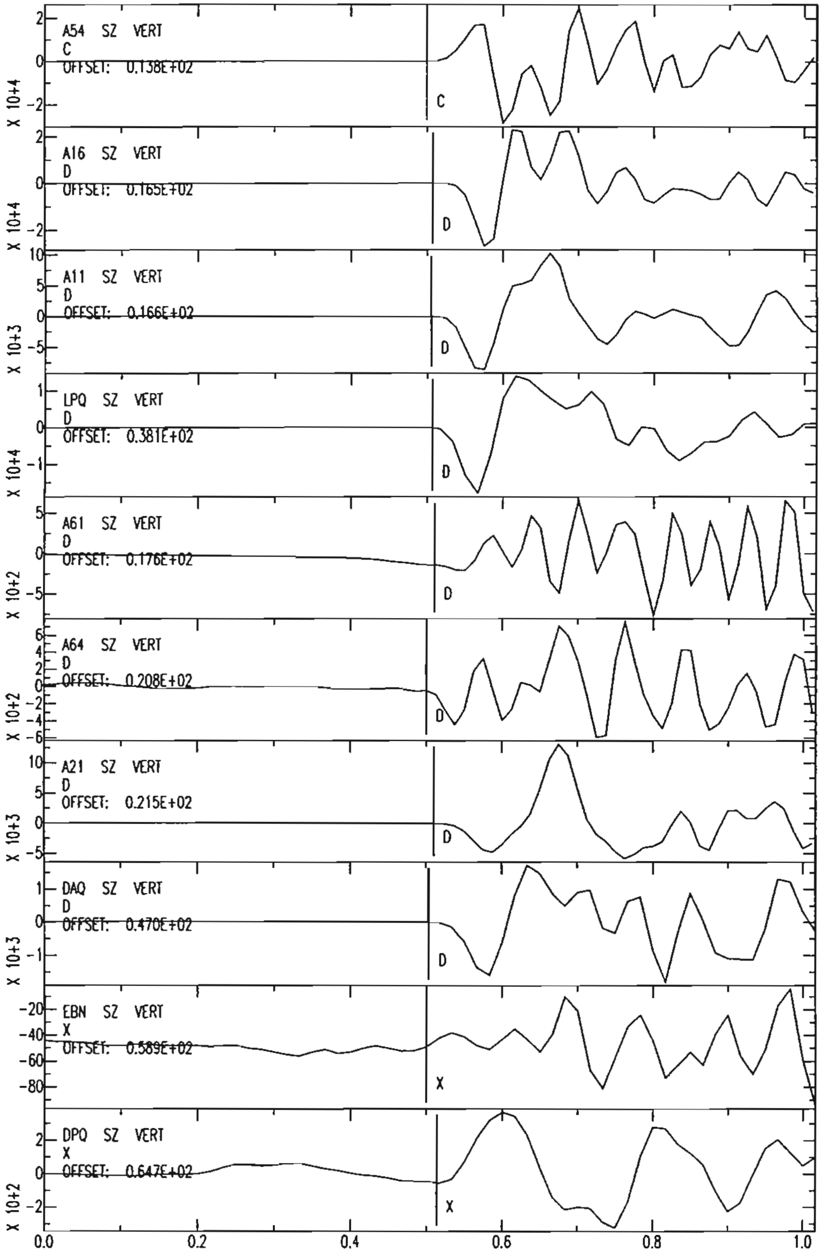


First Motions Only

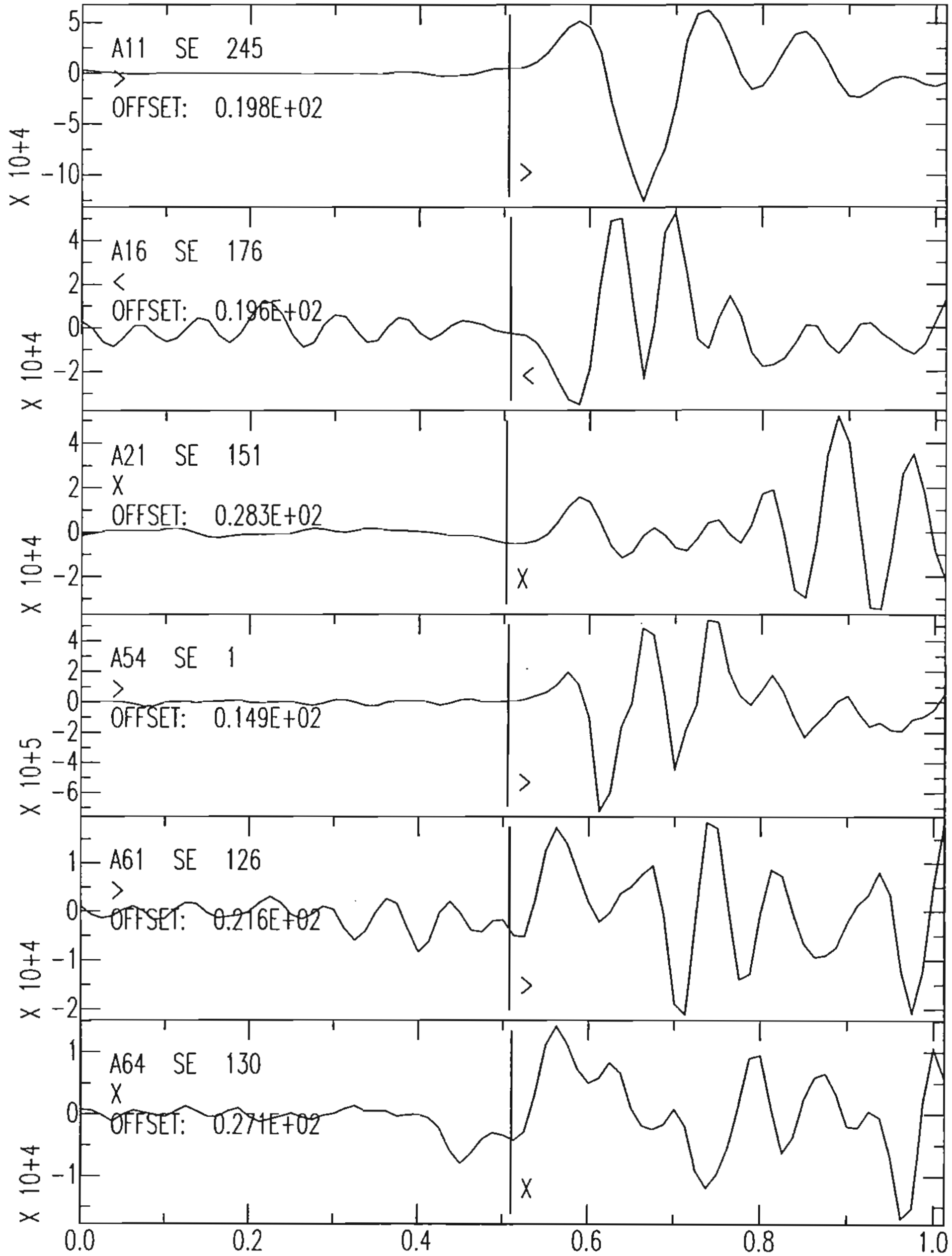


SH Motions and Lines.

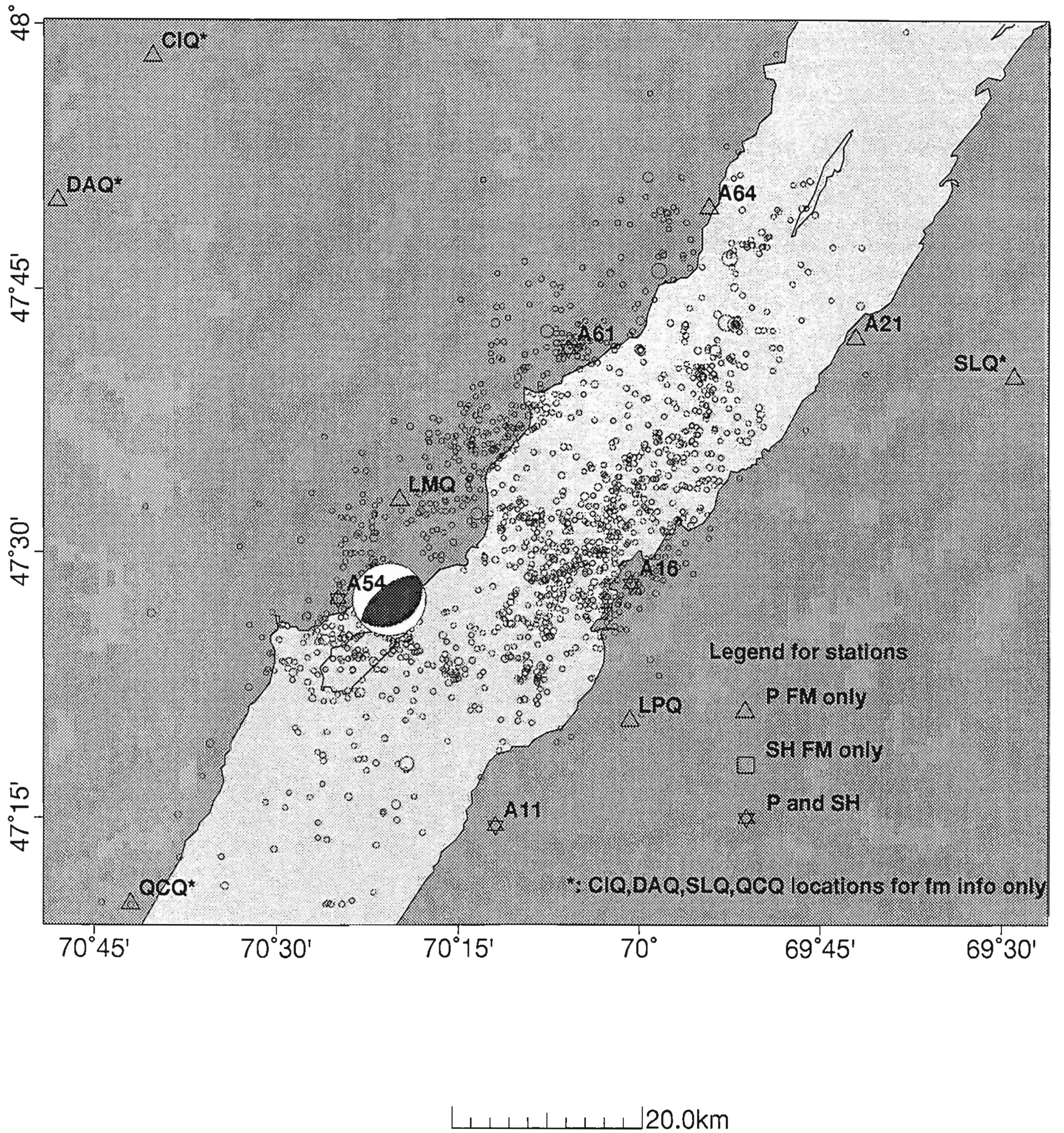
P Phases on Vertical Components



SH phases on Transverse Components



Location Map



Earthquake of 19900303 0206 Magnitude 3.6MN

1- Earthquake information and list of first motions.

Date	Time hhmm ss	Latitude	Longitude	Depth (km)	Mag	Sta/Pha
900303	0206 03.38	47.8559	-69.9765	20.85	3.6MN	8/015

COMMENTS:

CHARLEVOIX, QUE.; AFTERSHOCK AT 02:09
FELT IN CHARLEVOIX FROM SAINT-SIMEON TO LES EBOULEMENTS
ALSO REPORTED FELT IN RIVIERE-DU-LOUP
$ HTQ,MNQ,JAQ DOWN
$ Focmec by W. McNeil and J. Adams in National Summary Jan.-March 1990.
$TRQ SZ PN XA0206 56.77 D L
$ The Sg lines of some stations include the SH FM.
$ The convention used is the Virginia Tech convention used in FOCMEC:
$ <: SH first motion to left (back to event) impulsive
$ >: SH first motion to right (back to event) impulsive
$ Preliminary Focmec computed by ML

Sta	Pha	Dist (km)	Azim	Take-off Angle	FM
A64	PG	7	118	-19	C
A61	PG	20	205	-44	C
A61	SG	20	205	-44	>
A21	PG	27	128	-53	D
A16	PG	43	183	-64	C
A16	SG	43	183	-64	>
LMQ	PG	43	218	-64	C
A54	PG	55	217	-69	C
LPQ	PG	57	182	-70	D
A11	PG	70	194	-74	D
SLQ	PG	76	106	-75	D
CIQ	PG	76	308	-75	D
DAQ	PG	95	278	-78	D
EBN	PG	138	108	-81	D
QCQ	PG	155	220	-82	D
DPQ	PN	249	239	49	C

Number of P first motions: 14
Number of SH first motions: 2

2- Most Representative Solution.

A total of 28 solutions were found using a b axis increment of 1 degree. The following parameters describe the most representative solution, which was derived

from the average B, P, and T axes listed below.

```
     dip,strike,rake      48.01    32.10    88.65
     dip,strike,rake      42.01   214.11    91.49     :auxiliary plane
     lower hem. trend, plunge of a,n    124.11    47.99   302.10    41.99
     lower hem. trend & plunge of b     33.00     1.00
     lower hem. trend, plunge of p,t    123.05     3.00   284.58    86.84
```

Average B, P, and T axes:

	B	P	T
Mean trend:	N 30	N 120	N 236
Mean Plunge:	2	1	88
Vector Magnitude:	28	28	28
Mean length of resulting vector:	0.999	0.999	0.999

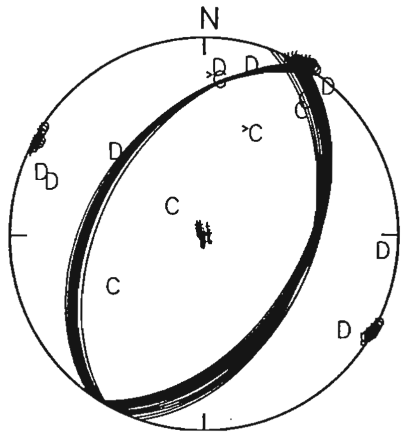
3- Misfits.

All 14 P first motions agreed with the solution.
All 2 SH first motions agreed with the solution.

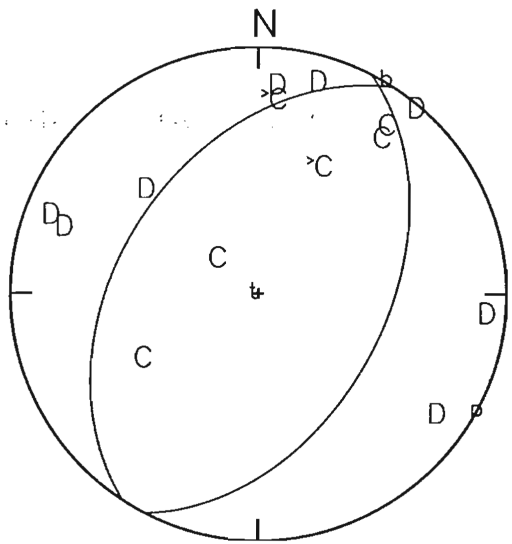
4- Rating of the focal mechanism.

The solution has an A rating based on the small number of P and SH misfits (0 /100 and 0 /100 respectively) and on the good constraints on the P, T and B axes (value of 0.999).

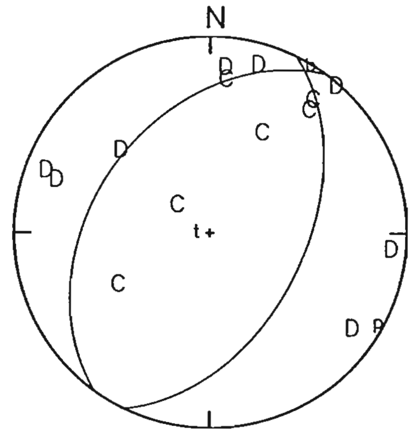
19900303 02:06 U.T.



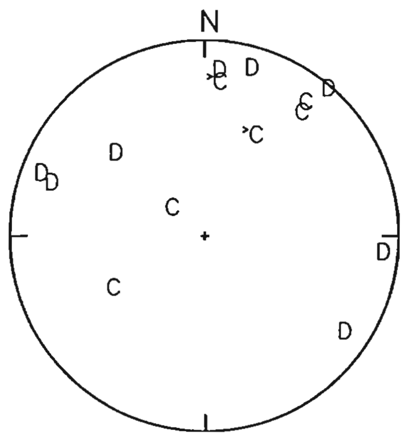
P, SH and P–Nodal



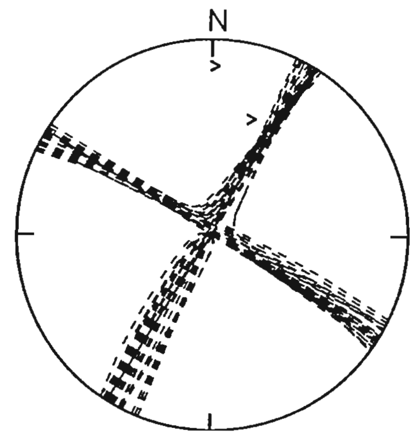
Best Solution



Solution with P FM only.

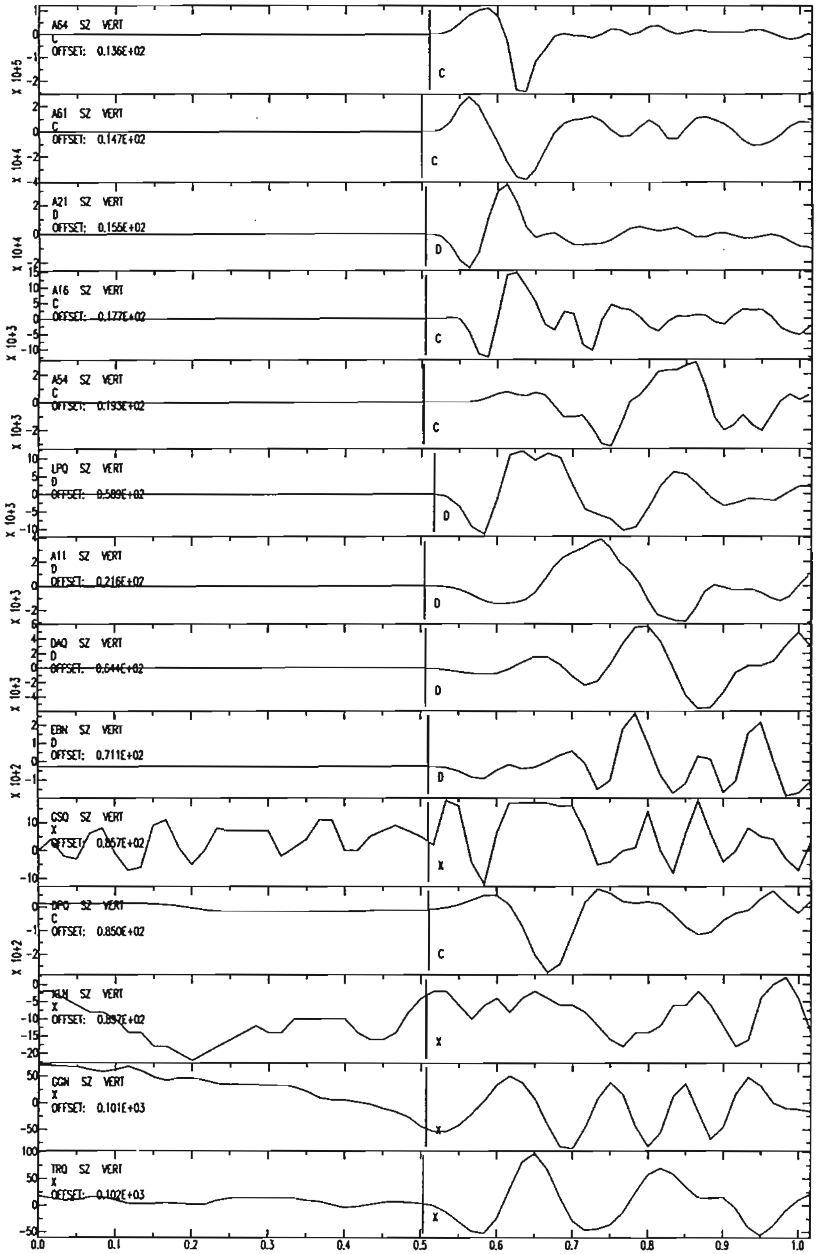


First Motions Only

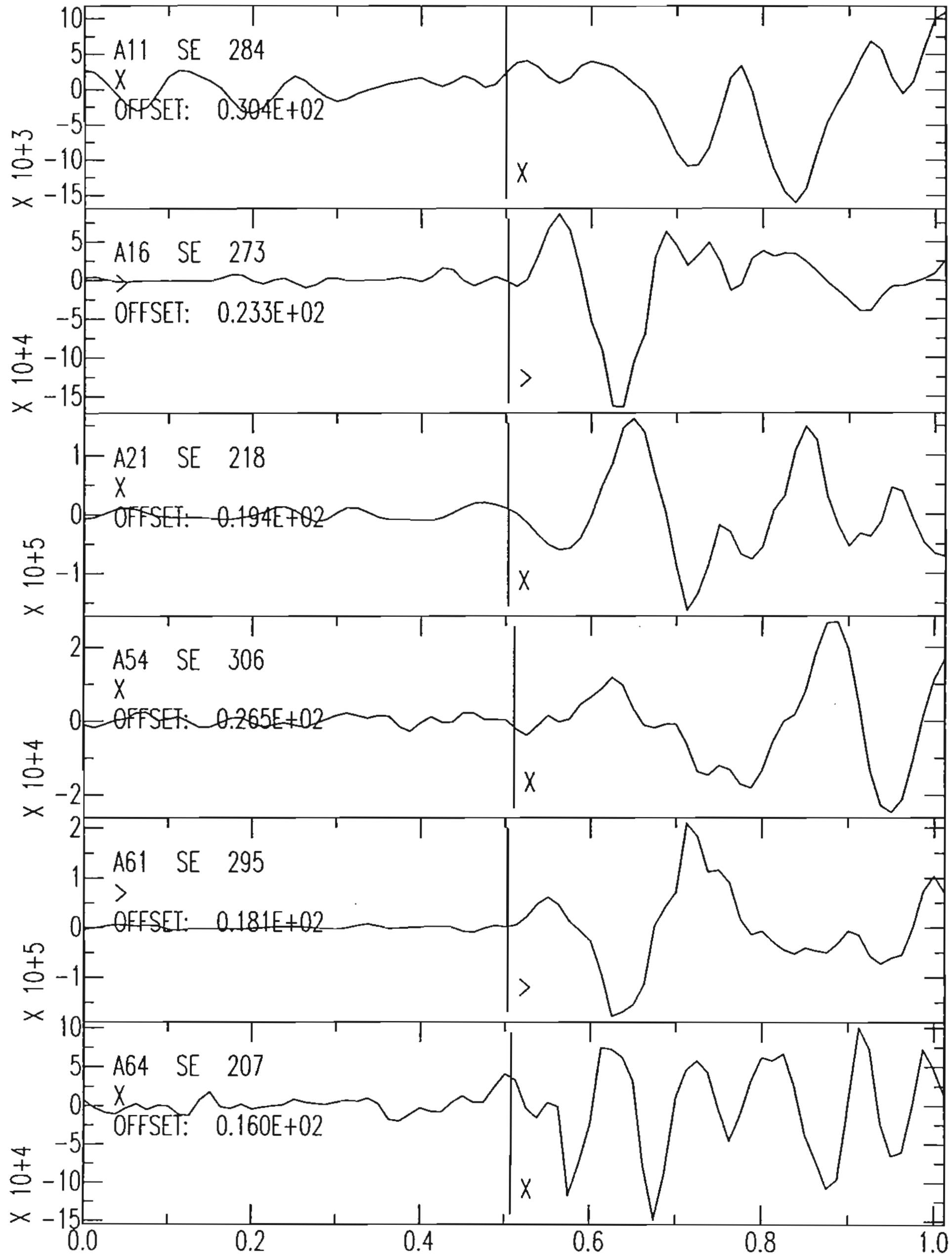


SH Motions and Lines.

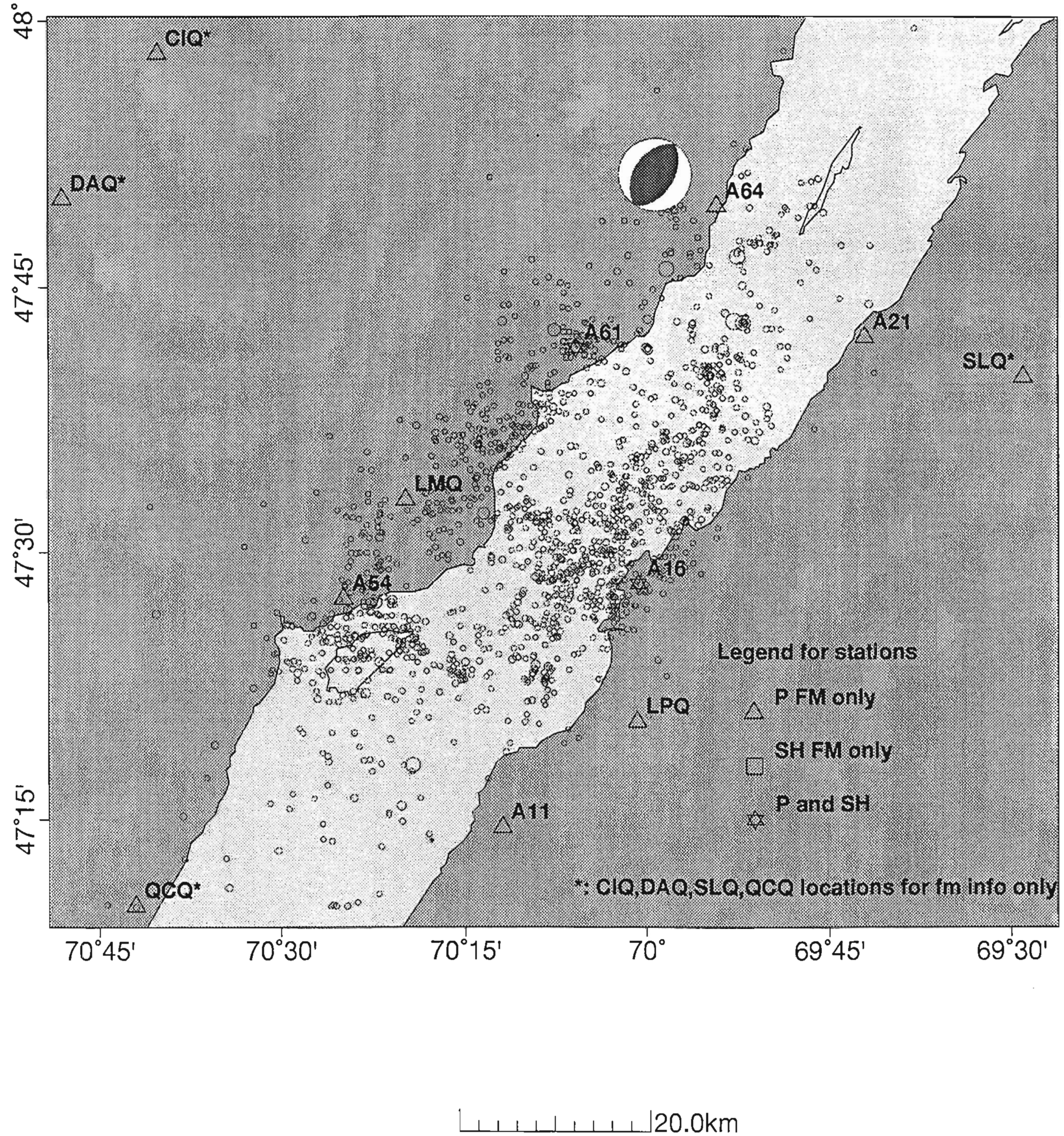
P Phases on Vertical Components



SH phases on Transverse Components



Location Map



Earthquake of 19900313 1910 Magnitude 3.2MN

1- Earthquake information and list of first motions.

Date	Time hhmm ss		Latitude	Longitude	Depth (km)	Mag	Sta/Pha
900313	1910	39.34	47.5338	-70.1366	15.38	3.2MN	7/014

COMMENTS:

NEAR LA MALBAIE; FELT IN LA MALBAIE AND POINTE-AU-PIC
CHARLEVOIX, QUE.
FORESHOCK AT 18:47 (MAG 2.4)
$ Focmec published by W. McNeil and J. Adams
$ in the National Summary of January-March 1990.
$ They used: A64 D.
$
$ The Sg lines of some stations include the SH FM.
$ The convention used is the Virginia Tech convention used in FOCMEC:
$ <: SH first motion to left (back to event) impulsive
$ >: SH first motion to right (back to event) impulsive
$ Preliminary Focmec computed by ML.

Sta	Pha	Dist (km)	Azim	Take-off Angle	FM
A16	PG	12	126	-38	C
A16	SG	12	126	-38	<
LMQ	PG	14	276	-43	D
A61	PG	18	11	-50	D
A61	SG	18	11	-50	>
A54	PG	22	248	-56	D
A54	SG	22	248	-56	<
LPQ	PG	23	156	-57	D
A11	PG	33	188	-65	D
A64	PG	37	29	-68	C
A64	SG	37	29	-68	>
A21	PG	39	60	-68	C
A21	SG	39	60	-68	>
SLQ	PG	86	80	-80	D
CIQ	PG	96	330	-81	D
DAQ	PG	96	300	-81	D
EBN	PG	143	92	-84	D

Number of P first motions: 12
Number of SH first motions: 5

2- Most Representative Solution.

A total of 100 solutions were found using a b axis increment of 1 degree. The following parameters describe the most representative solution, which was derived from the average B, P, and T axes listed below.

dip,strike,rake	65.30	34.42	64.53		
dip,strike,rake	34.90	263.16	133.08	:auxiliary plane	
lower hem. trend, plunge of a,n		173.16	55.10	304.42	24.70
lower hem. trend & plunge of b		45.68	23.00		
lower hem. trend, plunge of p,t		142.92	16.53	265.43	61.10

Average B, P, and T axes:

	B	P	T
Mean trend:	N 50	N 145	N 272
Mean Plunge:	17	14	68
Vector Magnitude:	100	100	100
Mean length of resulting vector:	0.996	0.999	0.998

3- Misfits.

Out of 12 P first motions, one did not fit the solutions (8/100)

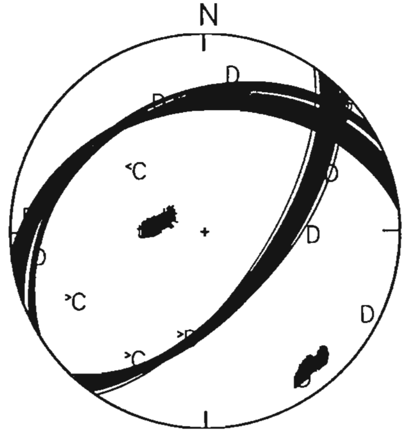
Station Name	Number of misfits	Percentage of wrongs
A54	1	1
A61	5	5
LPQ	10	10
SLQ	84	84

All 5 SH first motions agreed with the solution.

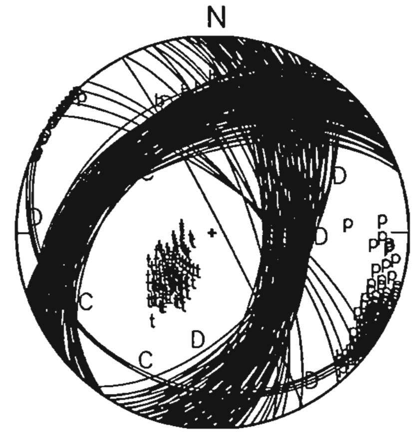
4- Rating of the focal mechanism.

The solution has an A rating based on the small number of P and SH misfits (8 /100 and 0 /100 respectively) and on the good constraints on the P, T and B axes (value of 0.998).

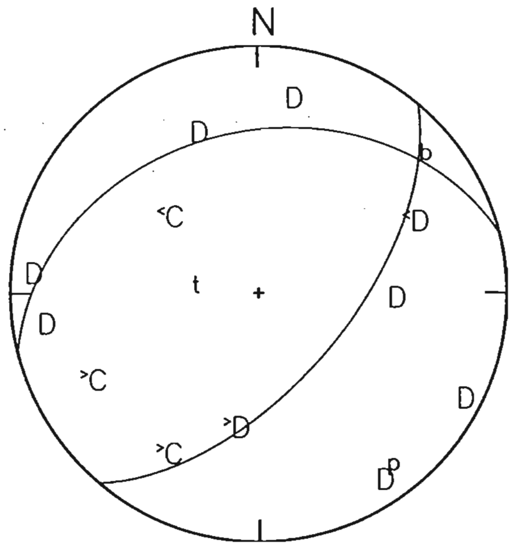
19900313 19:10 U.T.



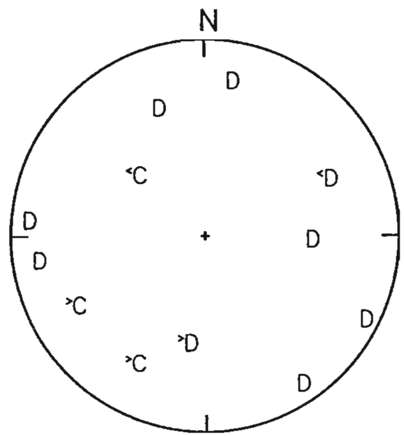
P, SH and P–Nodal



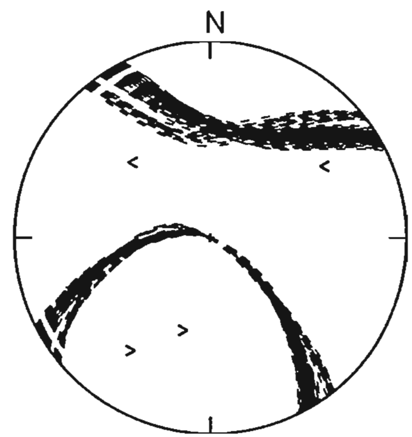
Solution with P FM only.



Best Solution

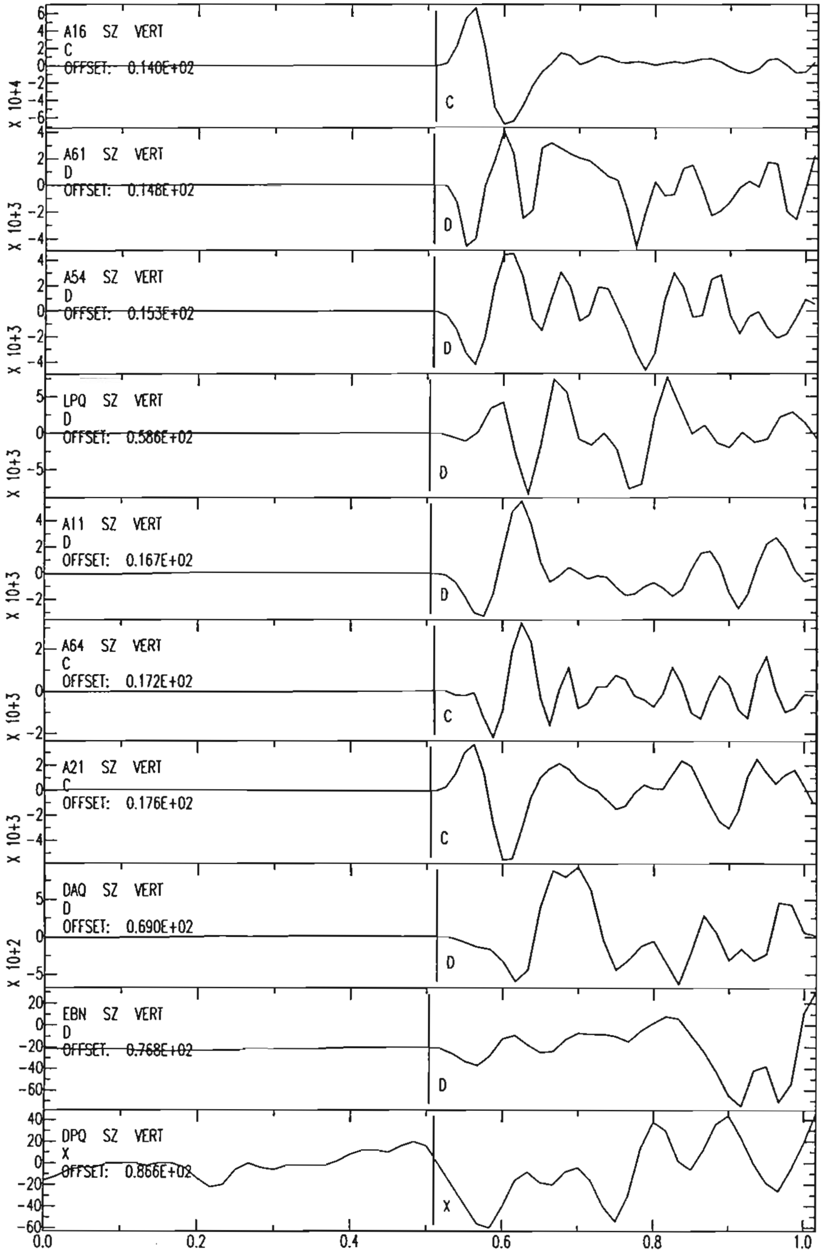


First Motions Only

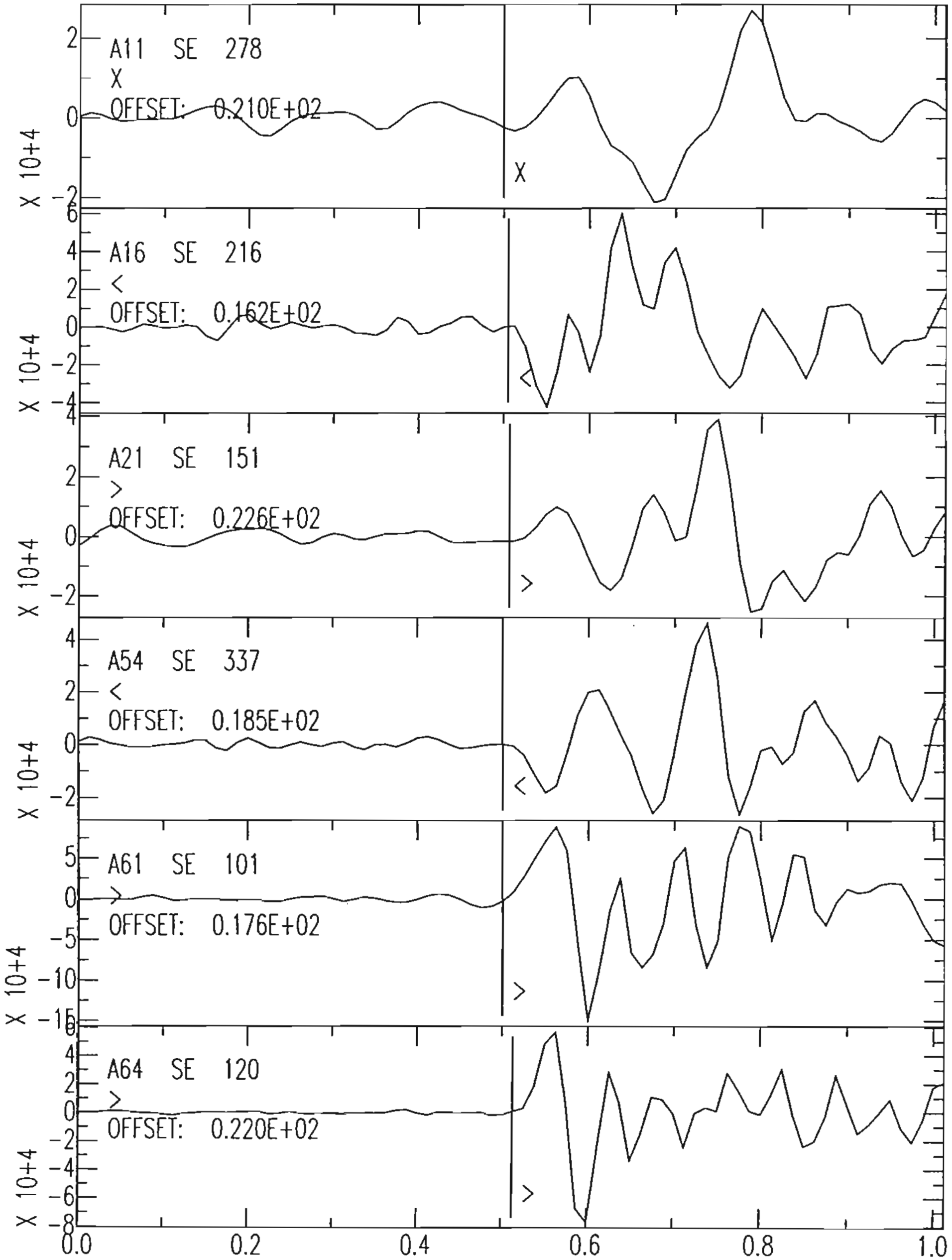


SH Motions and Lines.

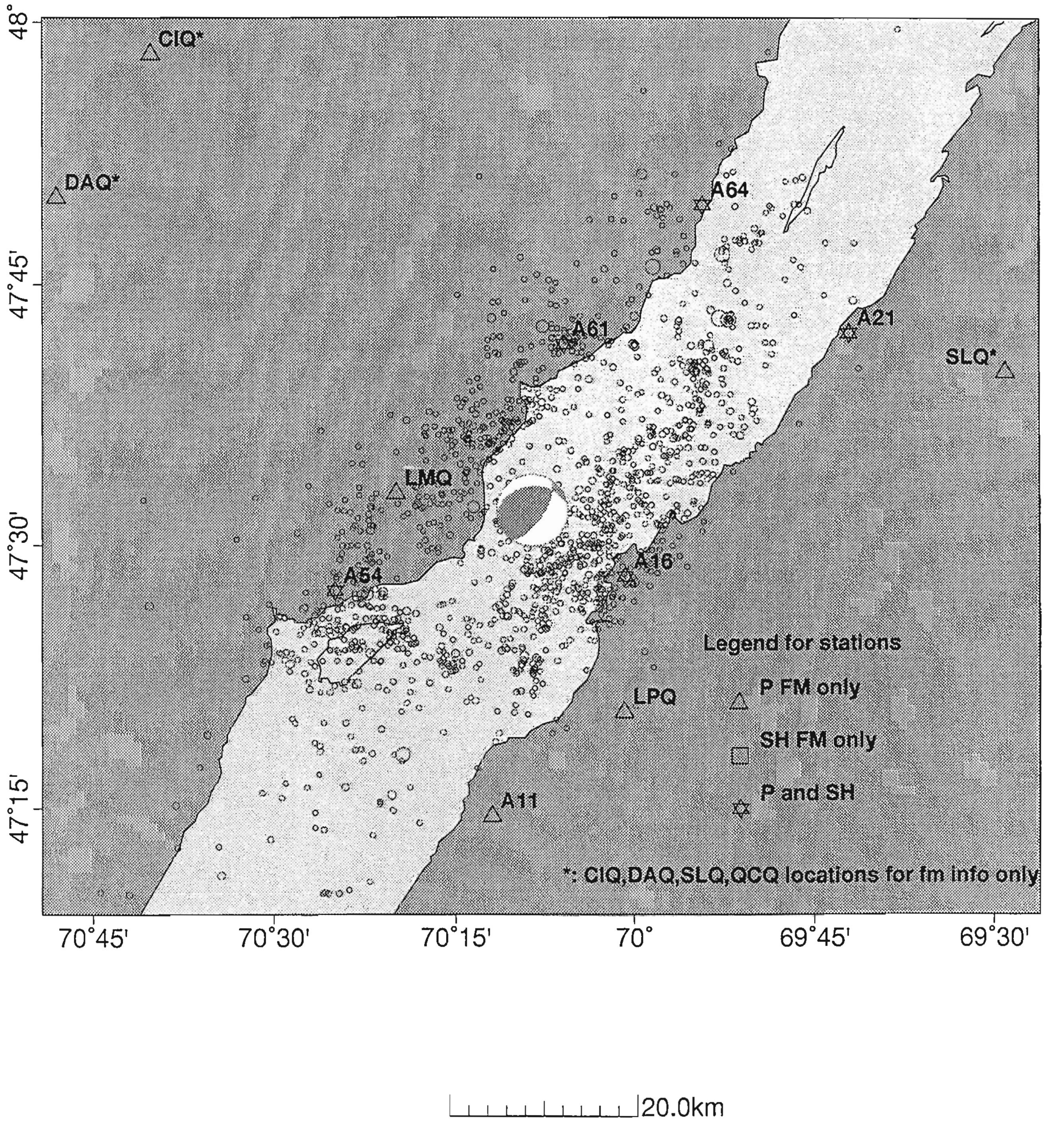
P Phases on Vertical Components



SH phases on Transverse Components



Location Map



Earthquake of 19900421 0123 Magnitude 3.1MN

1- Earthquake information and list of first motions.

Date	Time hhmm ss	Latitude	Longitude	Depth (km)	Mag	Sta/Pha
900421	0123 04.12	47.5532	-70.0698	9.56	3.1MN	7/014

COMMENTS:

12 KM SE OF LA MALBAIE, CHARLEVOIX, QUE.
FELT AT ST-HILARION, LA MALBAIE
POINTE-AU-PIC, LES EBOULEMENTS.
$ MECHANISM DONE BY W. MCNEIL. PHASES ADDED NOT CHECKED BY JD
$Additional phases used by Wayne Mcneil:
$DAQ SZ PG X0123 19.57 + L
$DPQ SZ PN X0123 38.99 + L
$KLN SZ PN X0123 45.63 + L
$EBN SZ PG X0123 26.95 - L
$QCQ SZ PG X0123 33.50 C L
$
$ The Sg lines of some stations include the SH FM.
$ The convention used is the Virginia Tech convention used in FOCMEC:
$ <: SH first motion to left (back to event) impulsive
$ >: SH first motion to right (back to event) impulsive
$ Preliminary Focmec computed by ML.

Sta	Pha	Dist (km)	Azim	Take-off Angle	FM
A16	PG	10	153	-47	C
A16	SG	10	153	-47	<
A61	PG	16	354	-58	C
A61	SG	16	354	-58	>
LMQ	PG	19	268	-64	D
LPQ	PG	24	169	-68	D
A54	PG	28	248	-71	D
A54	SG	28	248	-71	>
A21	PG	33	60	-74	D
A64	PG	33	24	-74	D
A11	PG	36	196	-75	D
SLQ	PG	81	81	-83	D

Number of P first motions: 9
Number of SH first motions: 3

2- Most Representative Solution.

A total of 602 solutions were found using a b axis increment of 2 degree. The

following parameters describe the most representative solution, which was derived from the average B, P, and T axes listed below.

dip,strike,rake	70.01	320.16	87.87		
dip,strike,rake	20.10	146.37	95.83	:auxiliary plane	
lower hem. trend, plunge of a,n	56.37	69.90	230.16	19.99	
lower hem. trend & plunge of b	320.89	2.00			
lower hem. trend, plunge of p,t	51.82	24.98	226.61	64.93	

Average B, P, and T axes:

	B	P	T
Mean trend:	N 147	N 54	N 252
Mean Plunge:	7	24	65
Vector Magnitude:	591	597	594
Mean length of resulting vector:	0.982	0.991	0.987

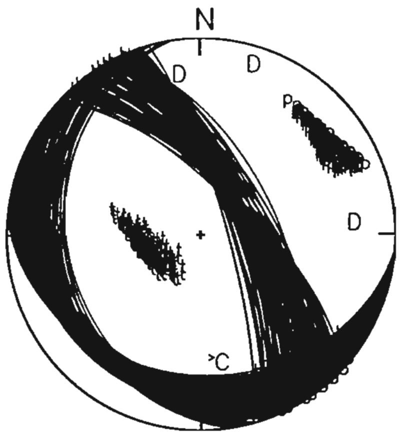
3- Misfits.

All 9 P first motions agreed with the solution.
All 3 SH first motions agreed with the solution.

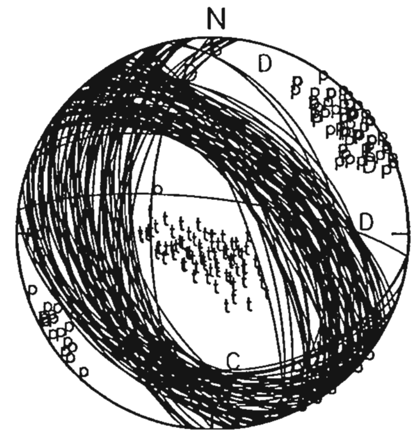
4- Rating of the focal mechanism.

The solution has a C rating based on the high number of P and SH misfits (0 /100 and 0 /100 respectively) and on the poor constraints on the P, T and B axes (value of 0.987).

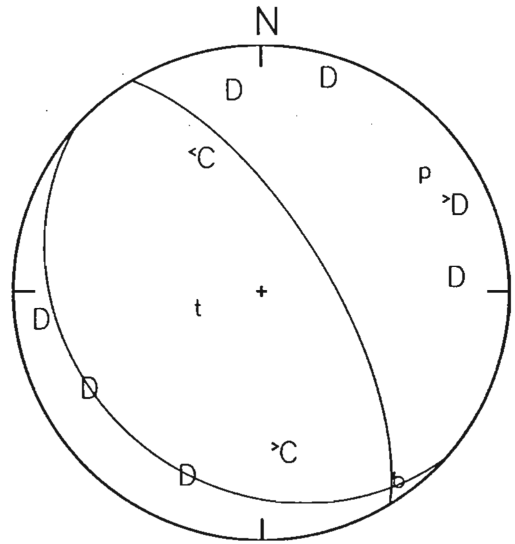
19900421 01:23 U.T.



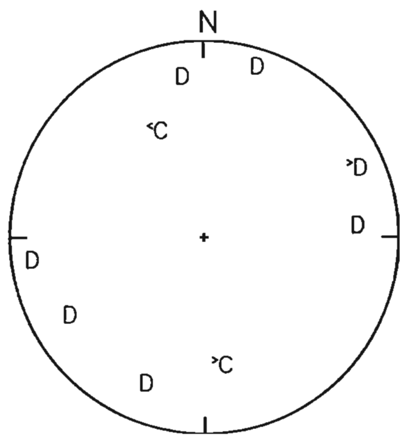
P, SH and P–Nodal



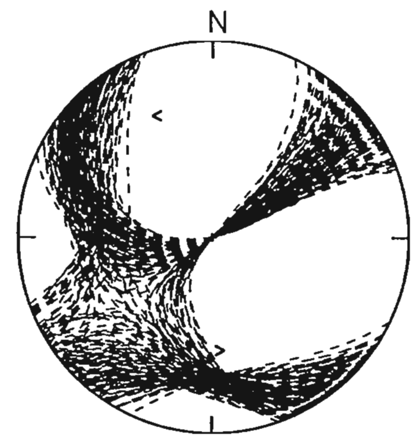
Solution with P FM only.



Best Solution

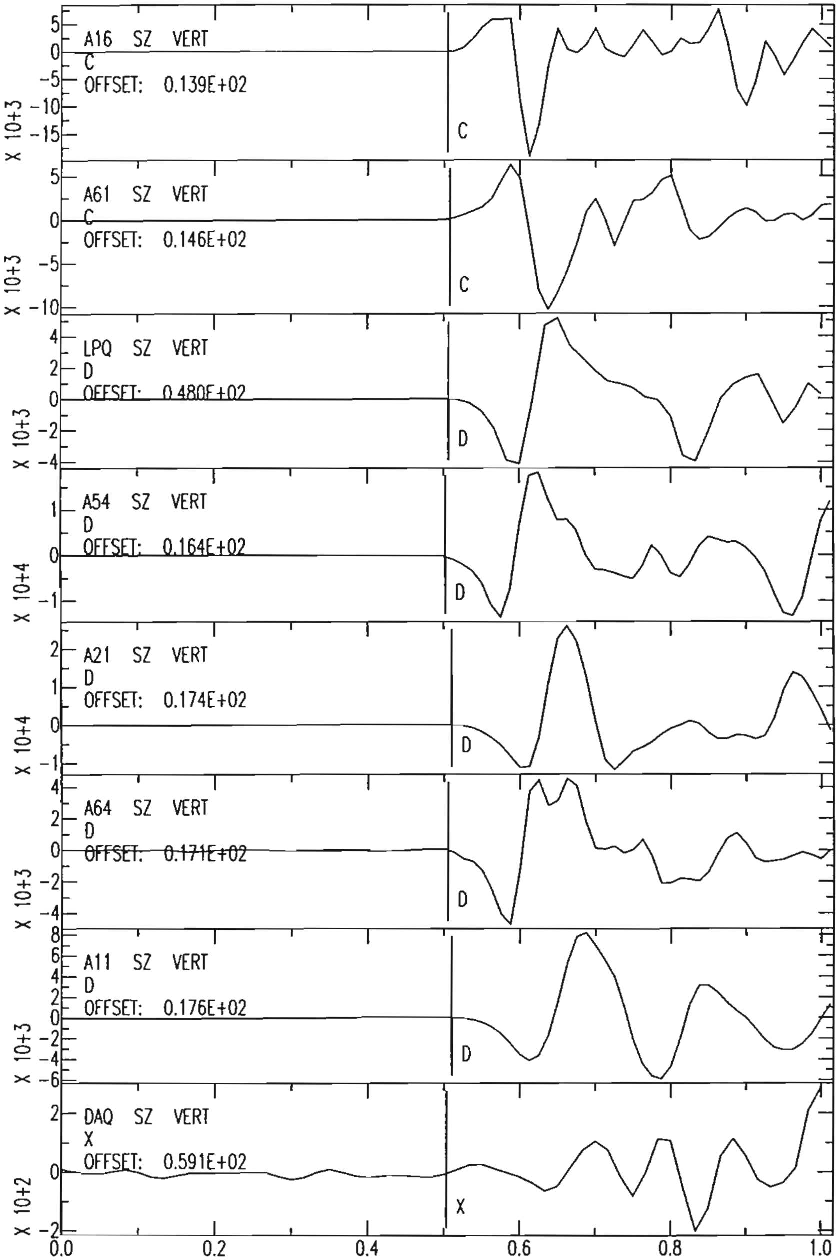


First Motions Only

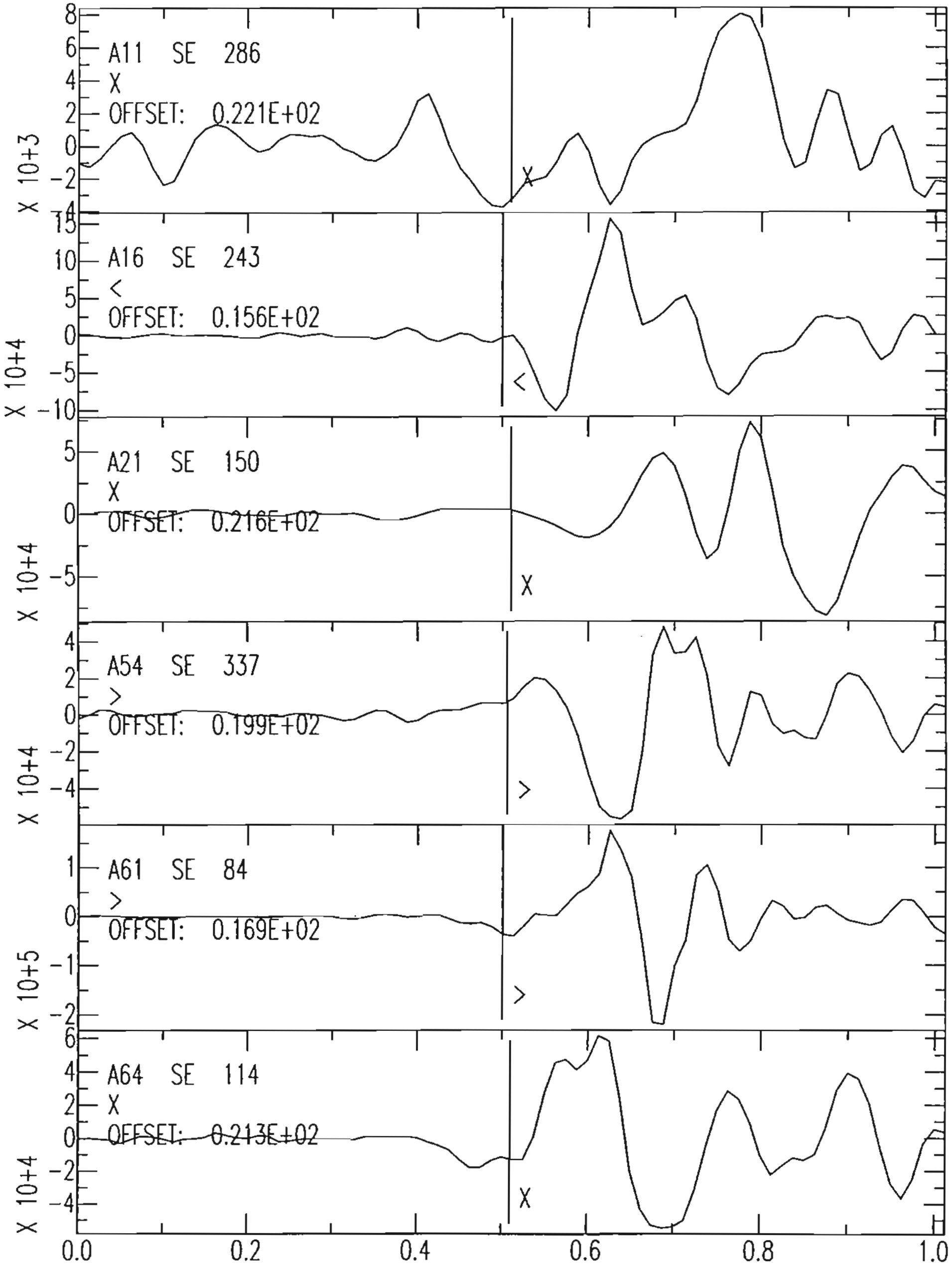


SH Motions and Lines.

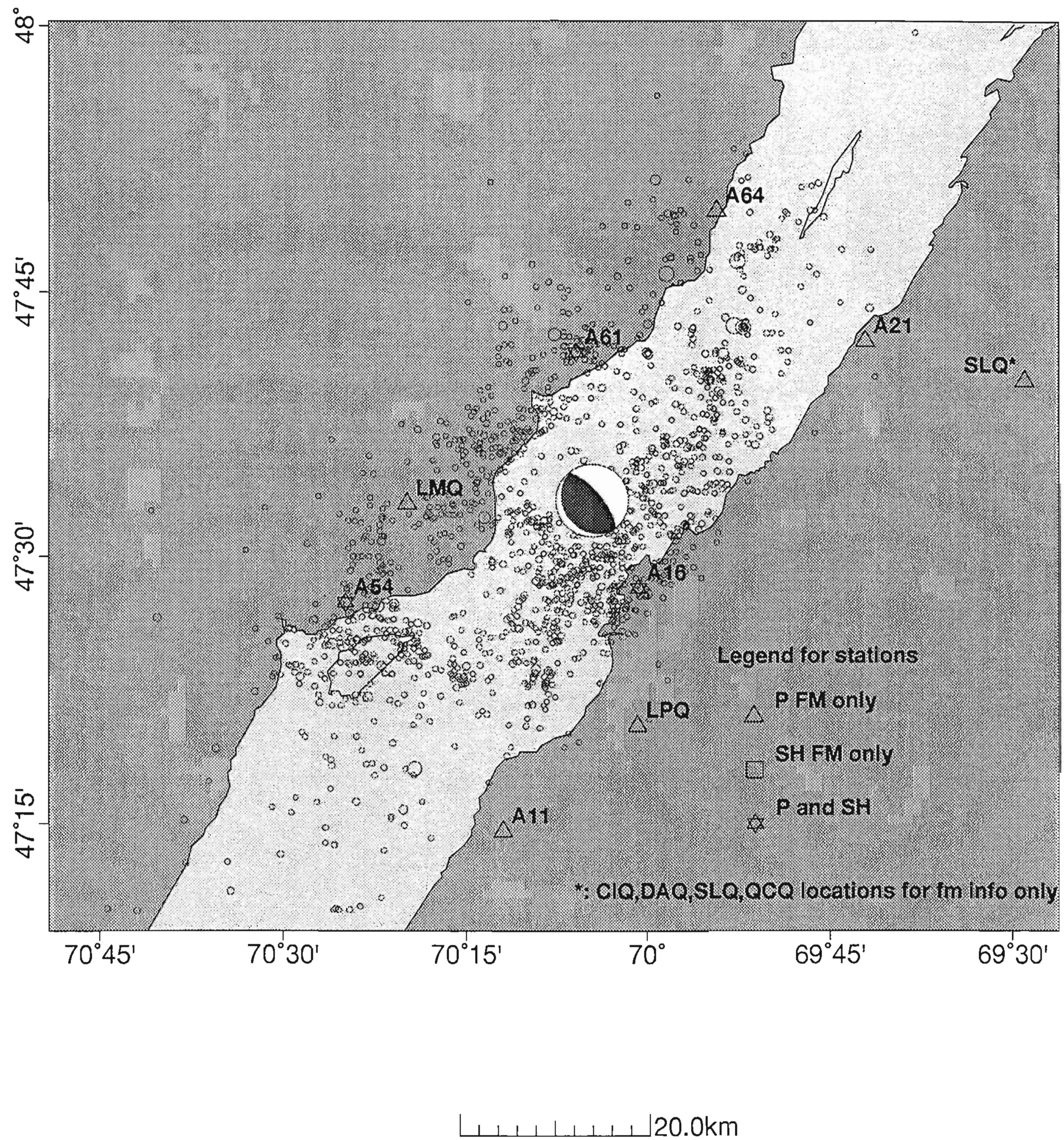
P Phases on Vertical Components



SH phases on Transverse Components



Location Map



Earthquake of 19900423 0028 Magnitude 3.0MN

1- Earthquake information and list of first motions.

Date	Time hhmm ss	Latitude	Longitude	Depth (km)	Mag	Sta/Pha
900423	0028 04.78	47.4143	-70.1787	8.04	3.0MN	7/014

COMMENTS:

24 KM E OF BAIE-SAINT-PAUL, CHARLEVOIX, QUE.
CHARLEVOIX-KAMOURASKA, QUEBEC.; FELT LOCALLY
AT L'ILE AUX COUDRES, SAINT-HILARION, LES EBOULEMENTS, SAINT-IRENEE,
BAIE-SAINT-PAUL. NOT FELT AT LA MALBAIE.
$ SLQ dead.
$
$ The Sg lines of some stations include the SH FM.
$ The convention used is the Virginia Tech convention used in FOCMEC:
$ <: SH first motion to left (back to event) impulsive
$ >: SH first motion to right (back to event) impulsive
$ Preliminary Focmec computed by ML.

Sta	Pha	Dist (km)	Azim	Take-off Angle	FM
A16	PG	14	64	-61	D
A16	SG	14	64	-61	<
LPQ	PG	15	123	-62	D
A54	PG	18	285	-66	D
A54	SG	18	285	-66	>
LMQ	PG	19	323	-67	D
A11	PG	19	184	-67	C
A61	PG	32	12	-76	C
A21	PG	49	49	-81	D
A64	PG	51	25	-81	C
DAQ	PG	101	308	-85	D
CIQ	PG	106	335	-86	D

Number of P first motions: 10
Number of SH first motions: 2

2- Most Representative Solution.

A total of 382 solutions were found using a b axis increment of 2 degree. The following parameters describe the most representative solution, which was derived from the average B, P, and T axes listed below.

dip,strike,rake	40.66	6.72	77.67	
dip,strike,rake	50.47	202.79	100.40	:auxiliary plane

lower hem. trend, plunge of a,n	112.79	39.53	276.72	49.34
lower hem. trend & plunge of b	16.13	8.00		
lower hem. trend, plunge of p,t	285.44	4.95	163.98	80.57

Average B, P, and T axes:

	B	P	T
Mean trend:	N 10	N 99	N 234
Mean Plunge:	3	2	87
Vector Magnitude:	332	380	357
Mean length of resulting vector:	0.870	0.994	0.935

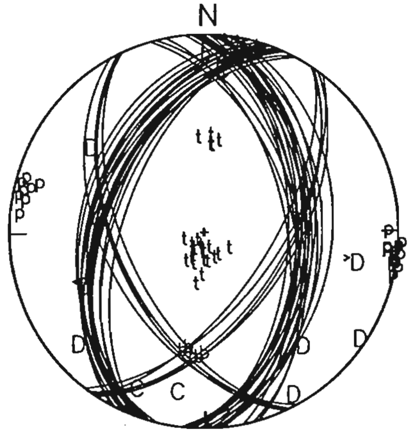
3- Misfits.

All 10 P first motions agreed with the solution.
All 2 SH first motions agreed with the solution.

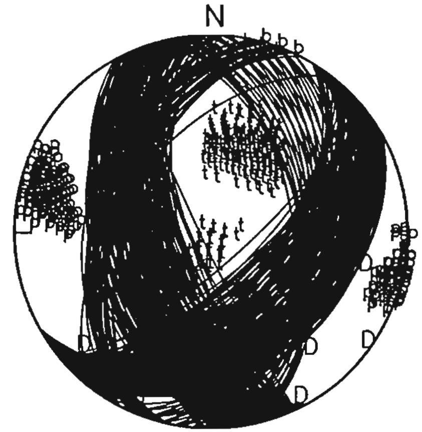
4- Rating of the focal mechanism.

The solution is rejected (rating X) based on the high number of P and SH misfits (0 /100 and 0 /100 respectively) and the absence of constraints on the P, T and B axes (value of 0.933).

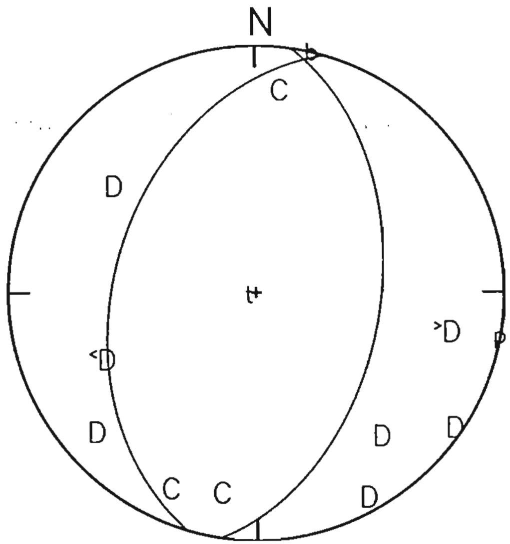
19900423 00:27 U.T.



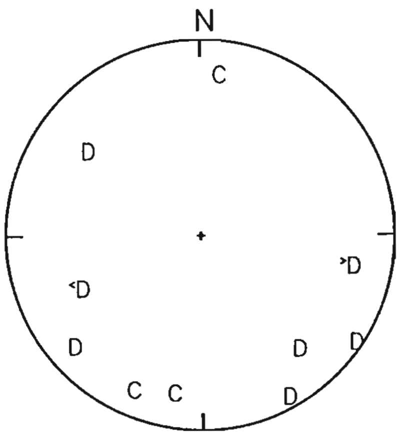
P, SH and P–Nodal



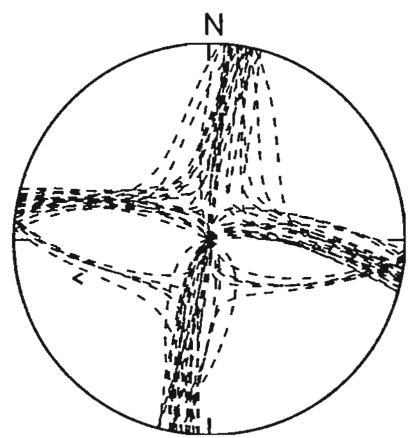
Solution with P FM only.



Best Solution

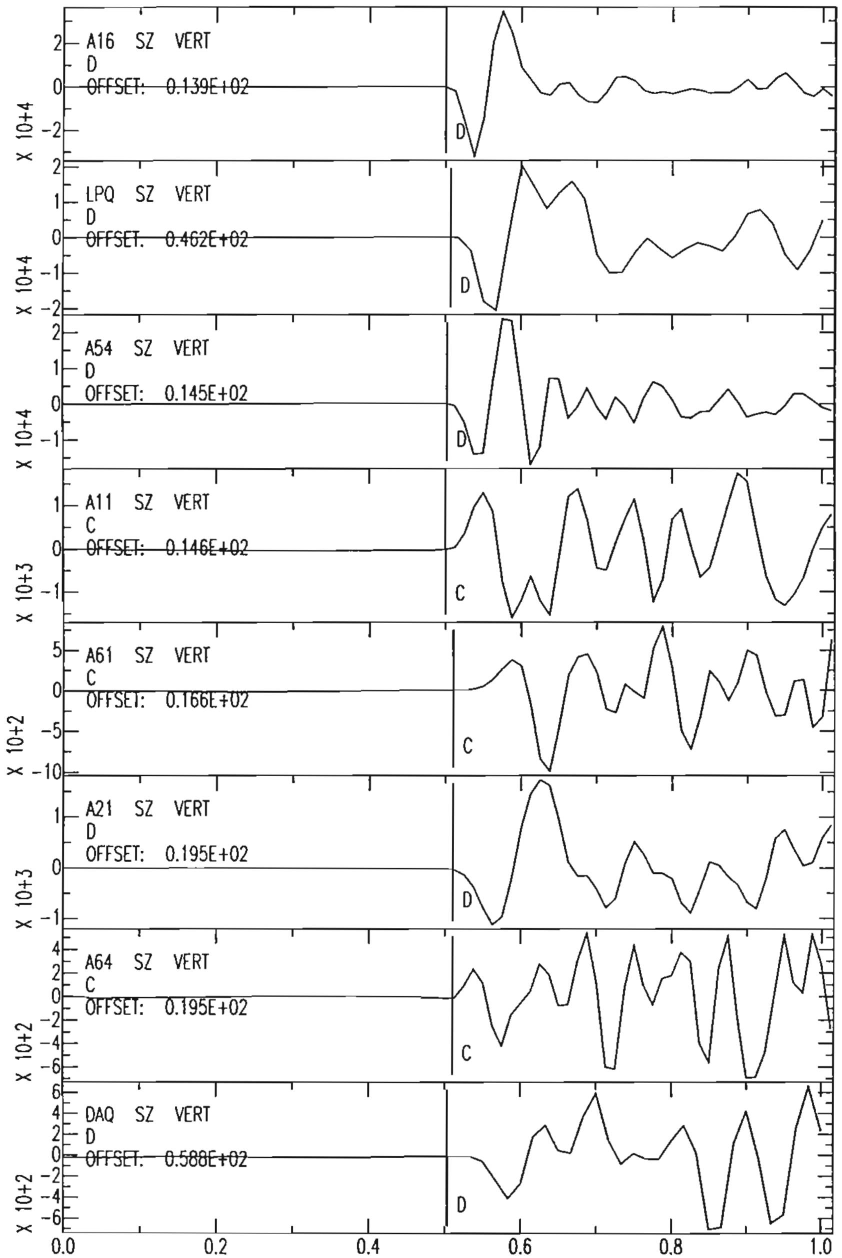


First Motions Only

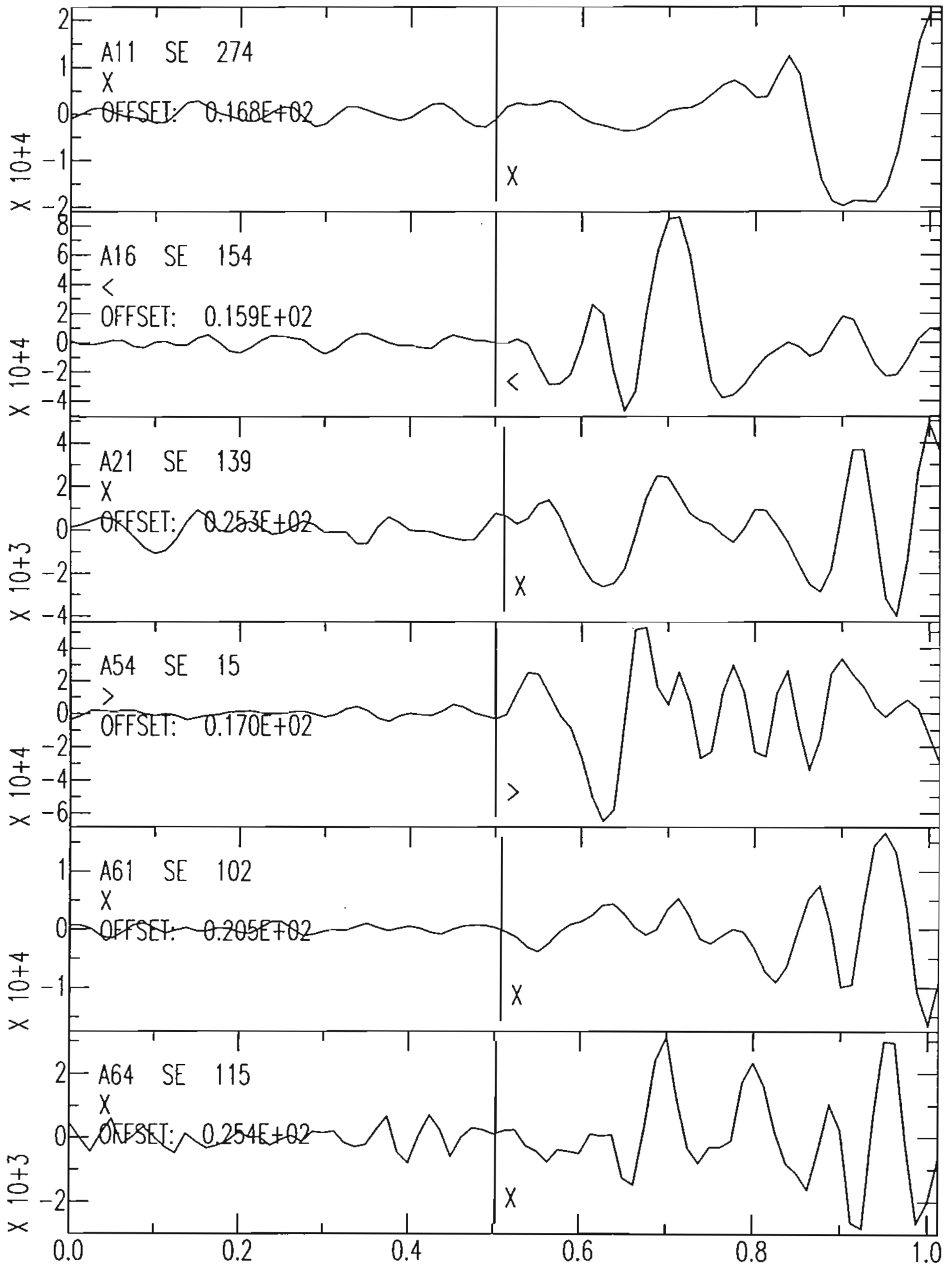


SH Motions and Lines.

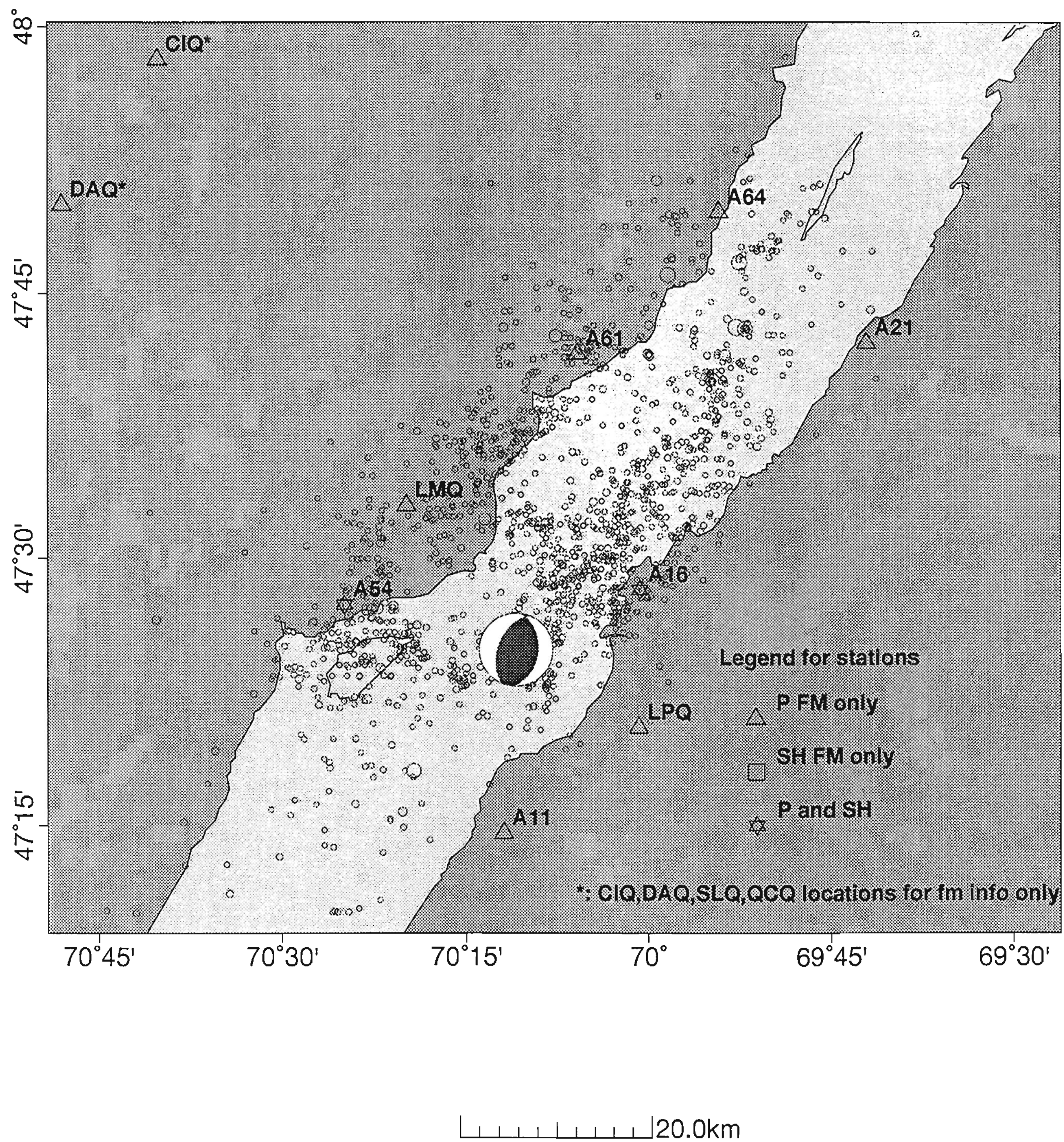
P Phases on Vertical Components



SH phases on Transverse Components



Location Map



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Earthquake of 19901021 1338 Magnitude 3.3MN

1- Earthquake information and list of first motions.

Date	Time hhmm ss	Latitude	Longitude	Depth (km)	Mag	Sta/Pha
901021	1338 43.20	47.3975	-70.3644	15.85	3.3MN	7/013

COMMENTS:

CHARLEVOIX, QUE.; FELT AT BAIE-SAINT-PAUL
$ LPQ; HTQ; GSQ; GRQ; CKO; EEO; down.
$
$ The Sg lines of some stations include the SH FM.
$ The convention used is the Virginia Tech convention used in FOCMEC:
$ <: SH first motion to left (back to event) impulsive
$ >: SH first motion to right (back to event) impulsive
$ Preliminary Focmec computed by ML.
$JOQ SZ PG YY . C

Sta	Pha	Dist (km)	Azim	Take-off Angle	FM
A54	PG	8	331	-25	D
A54	SG	8	331	-25	>
LMQ	PG	17	10	-47	C
A11	PG	21	144	-53	C
A16	PG	28	73	-61	C
A61	PG	39	32	-68	C
A61	SG	39	32	-68	<
A64	PG	59	36	-75	D
A64	SG	59	36	-75	>
A21	PG	61	56	-76	D
A21	SG	61	56	-76	<
DAQ	PG	91	314	-80	D
CIQ	PG	102	342	-81	D
SLQ	PG	106	73	-82	D

Number of P first motions: 10
Number of SH first motions: 4

2- Most Representative Solution.

A total of 434 solutions were found using a b axis increment of 1 degree. The following parameters describe the most representative solution, which was derived from the average B, P, and T axes listed below.

dip,strike,rake	24.25	163.41	53.91	
dip,strike,rake	70.62	22.05	104.86	:auxiliary plane

lower hem. trend, plunge of a,n	292.05	19.38	73.41	65.75
lower hem. trend & plunge of b	197.02	14.00		
lower hem. trend, plunge of p,t	100.58	24.21	314.44	61.57

Average B, P, and T axes:

	B	P	T
Mean trend:	N 194	N 96	N 311
Mean Plunge:	16	27	59
Vector Magnitude:	432	432	433
Mean length of resulting vector:	0.996	0.996	0.997

3- Misfits.

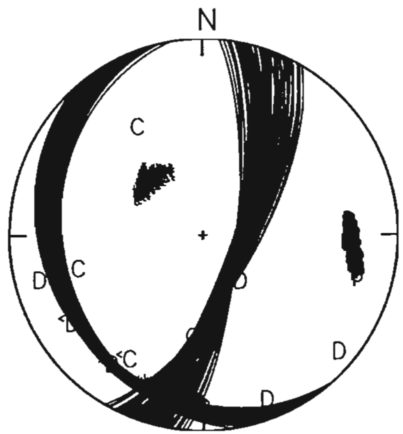
All 10 P first motions agreed with the solution.
Out of 4 SH first motions, a total of 1 did not fit the solutions (25/100).

Station Name	Number of misfits	Percentage of wrongs
A64	434	100

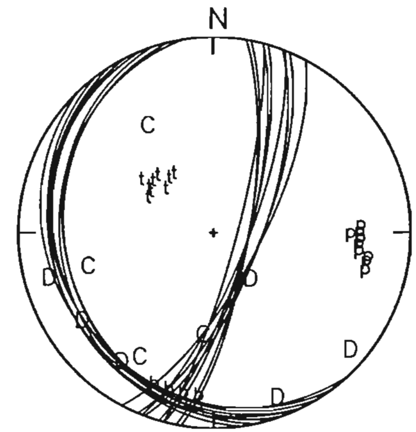
4- Rating of the focal mechanism.

The solution has an A rating based on the small number of P and SH misfits (0 /100 and 25 /100 respectively) and on the good constraints on the P, T and B axes (value of 0.996).

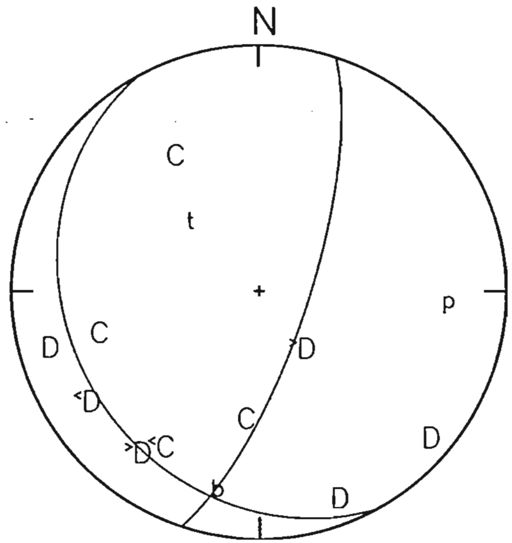
19901021 13:38 U.T.



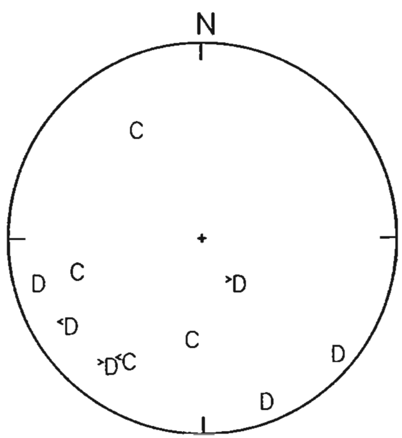
P, SH and P–Nodal



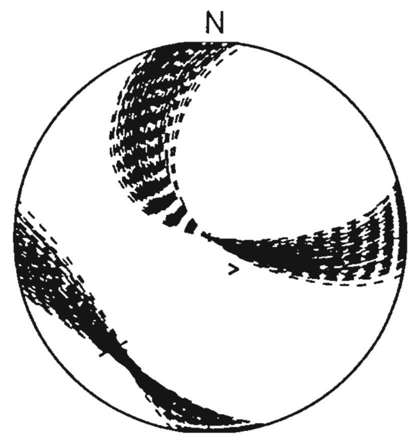
Solution with P FM only.



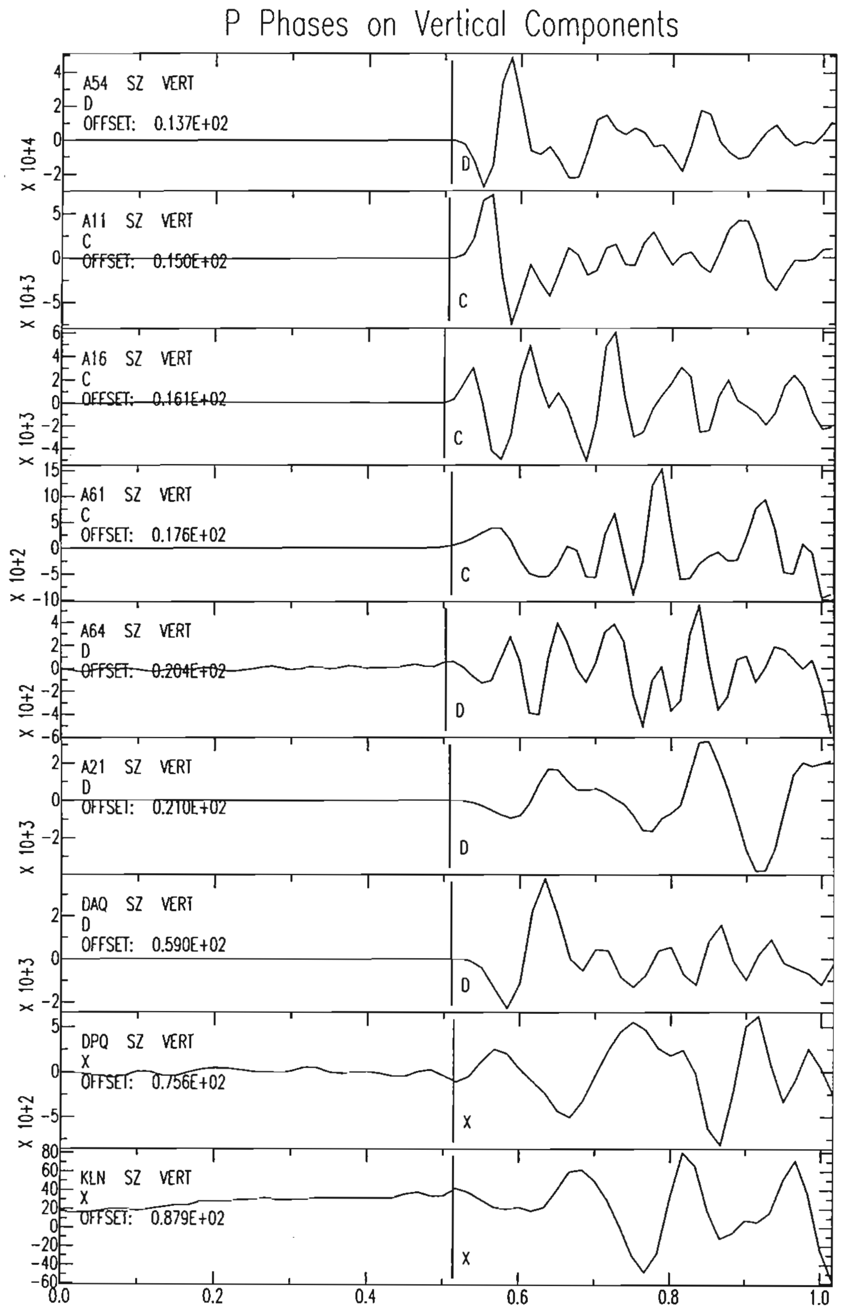
Best Solution

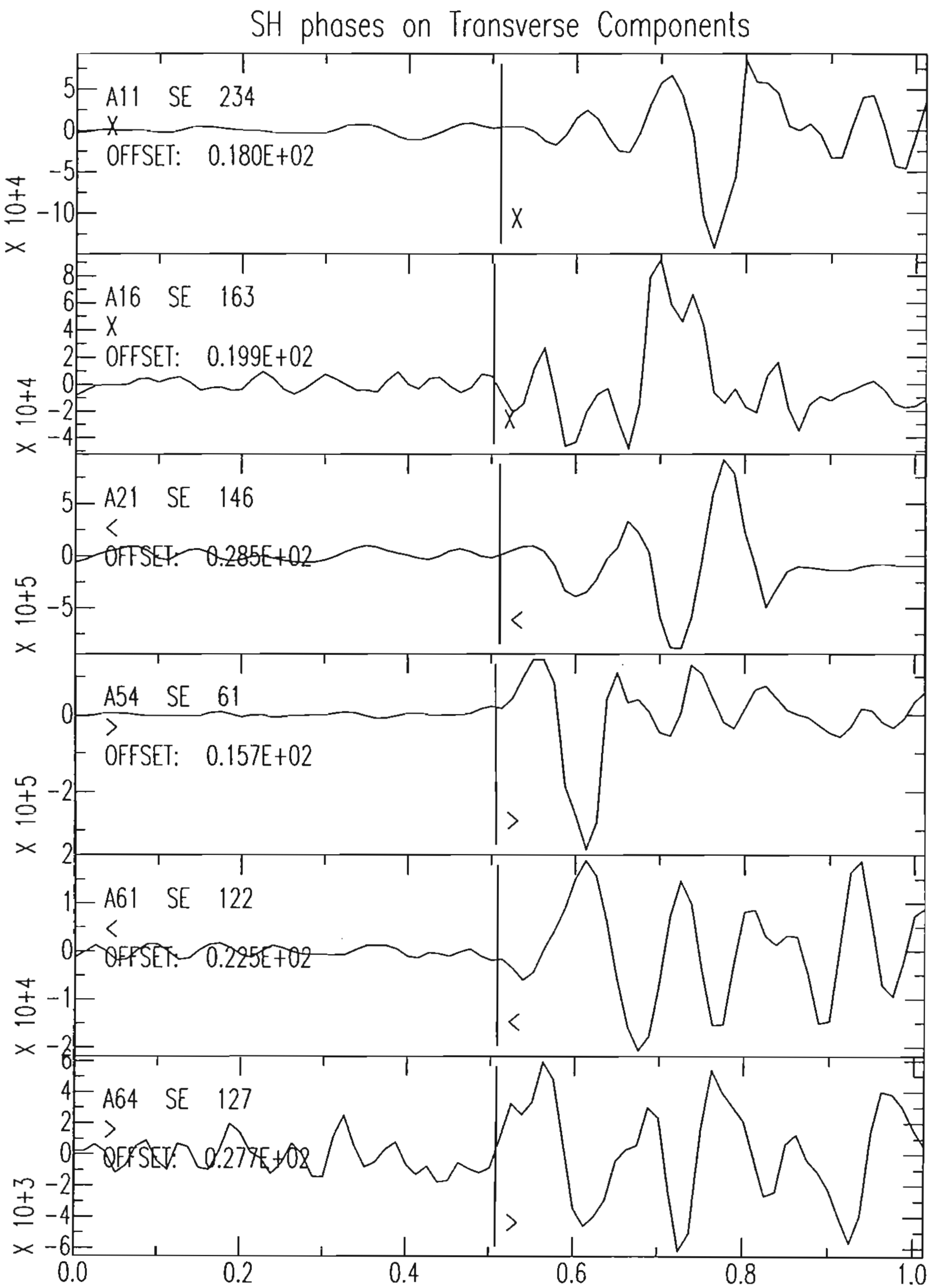


First Motions Only

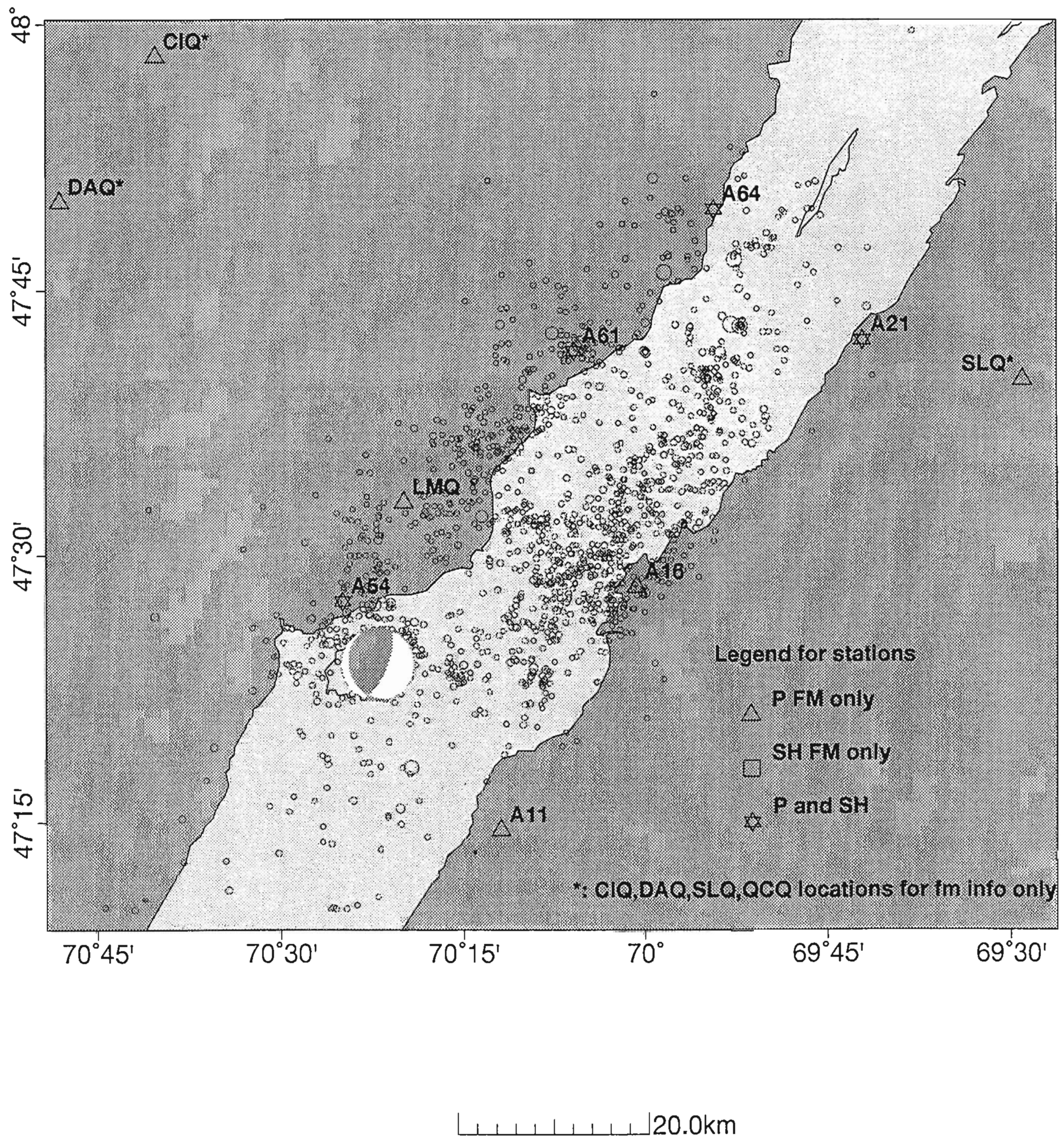


SH Motions and Lines.


P Phases on Vertical Components
A54 SZ VERT
D
OFFSET: 0.137E+02
A11 SZ VERT
C
OFFSET: 0.150E+02
A16 SZ VERT
C
OFFSET: 0.161E+02
A61 SZ VERT
C
OFFSET: 0.176E+02
A64 SZ VERT
D
OFFSET: 0.204E+02
A21 SZ VERT
D
OFFSET: 0.210E+02
DAQ SZ VERT
D
OFFSET: 0.590E+02
DPQ SZ VERT
X
OFFSET: 0.756E+02
KLN SZ VERT
X
OFFSET: 0.879E+02


SH phases on Transverse Components
A11 SE 234
X
OFFSET: 0.180E+02
A16 SE 163
X
OFFSET: 0.199E+02
A21 SE 146
<
OFFSET: 0.285E+02
A54 SE 61
>
OFFSET: 0.157E+02
A61 SE 122
<
OFFSET: 0.225E+02
A64 SE 127
>
OFFSET: 0.277E+02

Location Map



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Earthquake of 19901026 0913 Magnitude 3.1MN

1- Earthquake information and list of first motions.

Date	Time hhmm ss	Latitude	Longitude	Depth (km)	Mag	Sta/Pha
901026	0913 51.51	47.5692	-69.9848	10.96	3.1MN	6/012

COMMENTS:

CHARLEVOIX, QUE.; FELT AT SAINT-HILARION, LA MALBAIE
AND POINTE-AU-PIC.
$ Focmec published by W. McNeil and J. Adams
$ in the National Summary of January-March 1990.
$
$ The Sg lines of some stations include the SH FM.
$ The convention used is the Virginia Tech convention used in FOCMEC:
$ <: SH first motion to left (back to event) impulsive
$ >: SH first motion to right (back to event) impulsive
$ Preliminary Focmec computed by ML.

Sta	Pha	Dist (km)	Azim	Take-off Angle	FM
A16	PG	11	188	-45	D
A16	SG	11	188	-45	<
A61	PG	16	330	-55	C
A61	SG	16	330	-55	>
LMQ	PG	26	265	-67	D
A21	PG	27	56	-68	D
A64	PG	29	14	-70	C
A64	SG	29	14	-70	<
A54	PG	35	249	-72	D
A11	PG	40	204	-75	D
SLQ	PG	74	81	-82	D
CIQ	PG	99	323	-84	D
DAQ	PG	104	296	-84	D

Number of P first motions: 10
Number of SH first motions: 3

2- Most Representative Solution.

A total of 420 solutions were found using a b axis increment of 2 degree. The following parameters describe the most representative solution, which was derived from the average B, P, and T axes listed below.

dip,strike,rake	22.76	141.93	74.33	
dip,strike,rake	68.13	338.85	96.47	:auxiliary plane

lower hem. trend, plunge of a,n	248.85	21.87	51.93	67.24
lower hem. trend & plunge of b	156.43	6.00		
lower hem. trend, plunge of p,t	63.89	22.87	260.27	66.27

Average B, P, and T axes:

	B	P	T
Mean trend:	N 340	N 74	N 209
Mean Plunge:	15	15	67
Vector Magnitude:	405	414	412
Mean length of resulting vector:	0.964	0.985	0.980

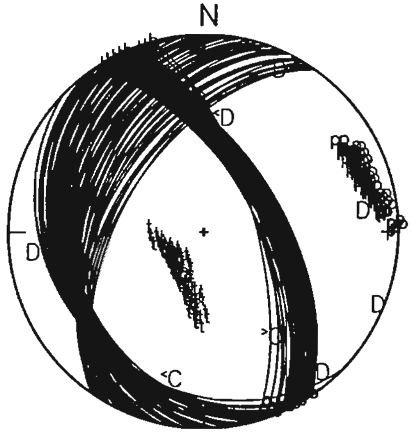
3- Misfits.

All 10 P first motions agreed with the solution.
All 3 SH first motions agreed with the solution.

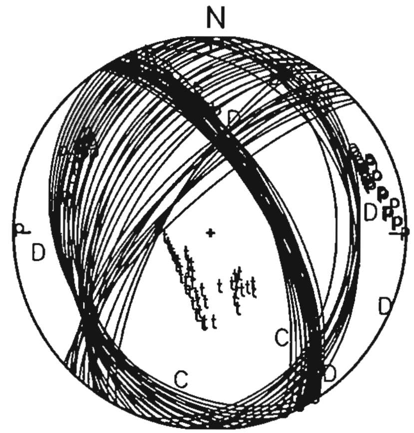
4- Rating of the focal mechanism.

The solution is rejected (rating X) based on the high number of P and SH misfits (0 /100 and 0 /100 respectively) and the absence of constraints on the P, T and B axes (value of 0.976).

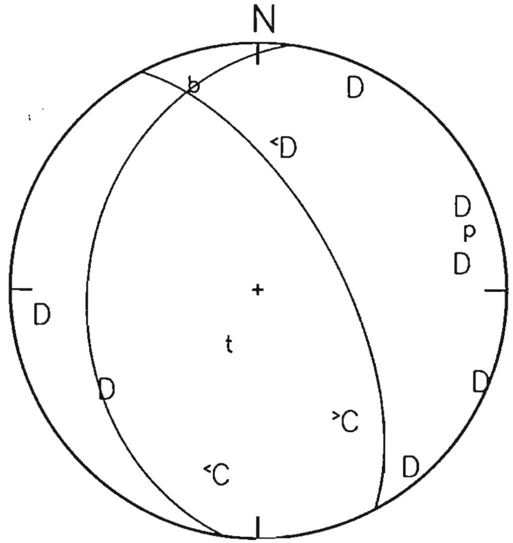
19901026 09:13 U.T.



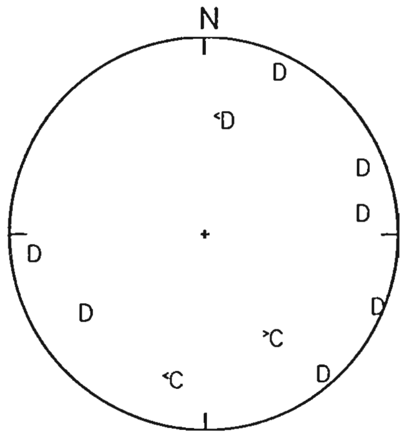
P, SH and P–Nodal



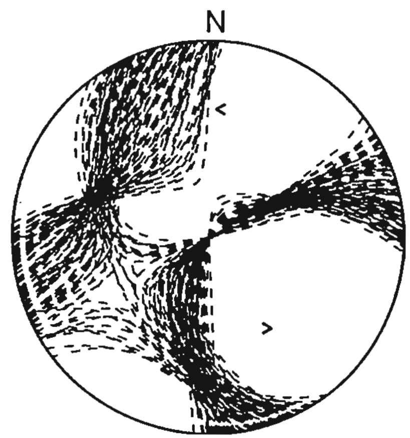
Solution with P FM only.



Best Solution

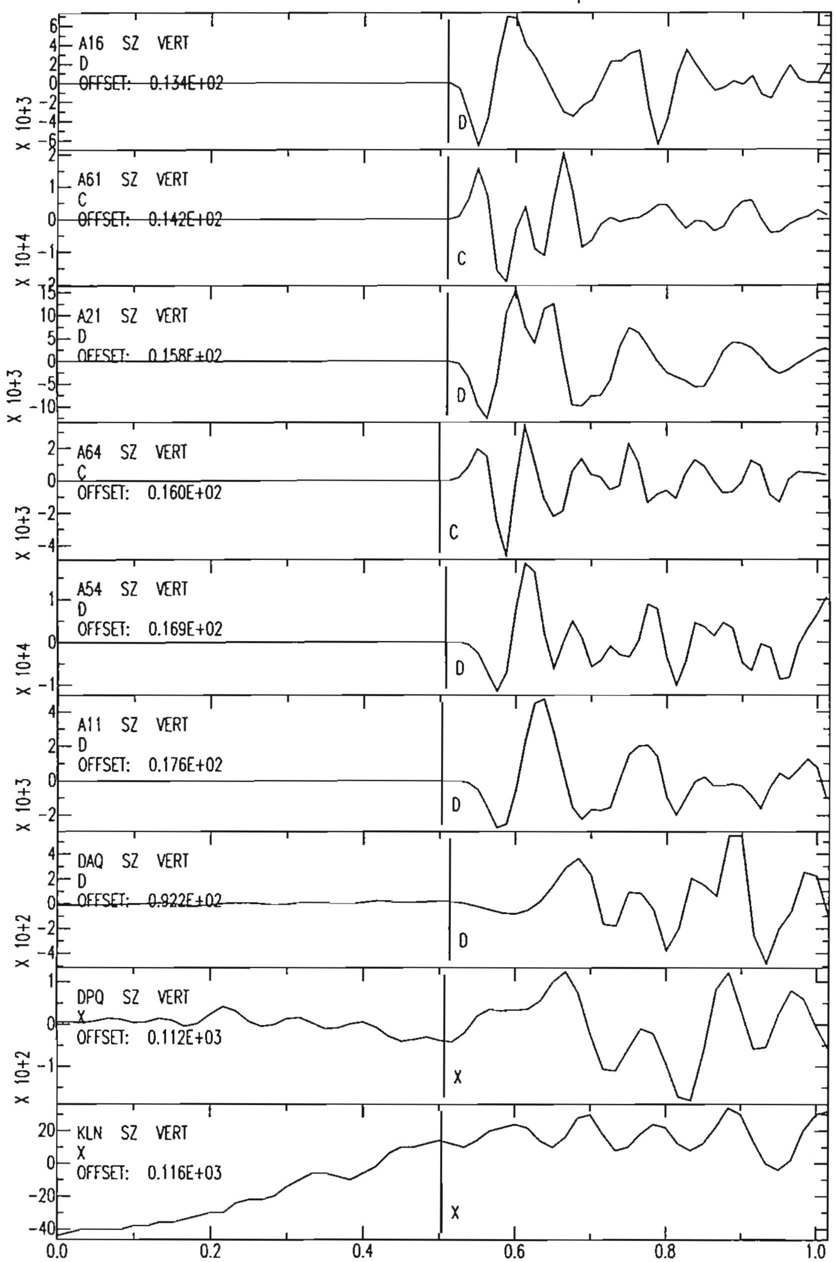


First Motions Only

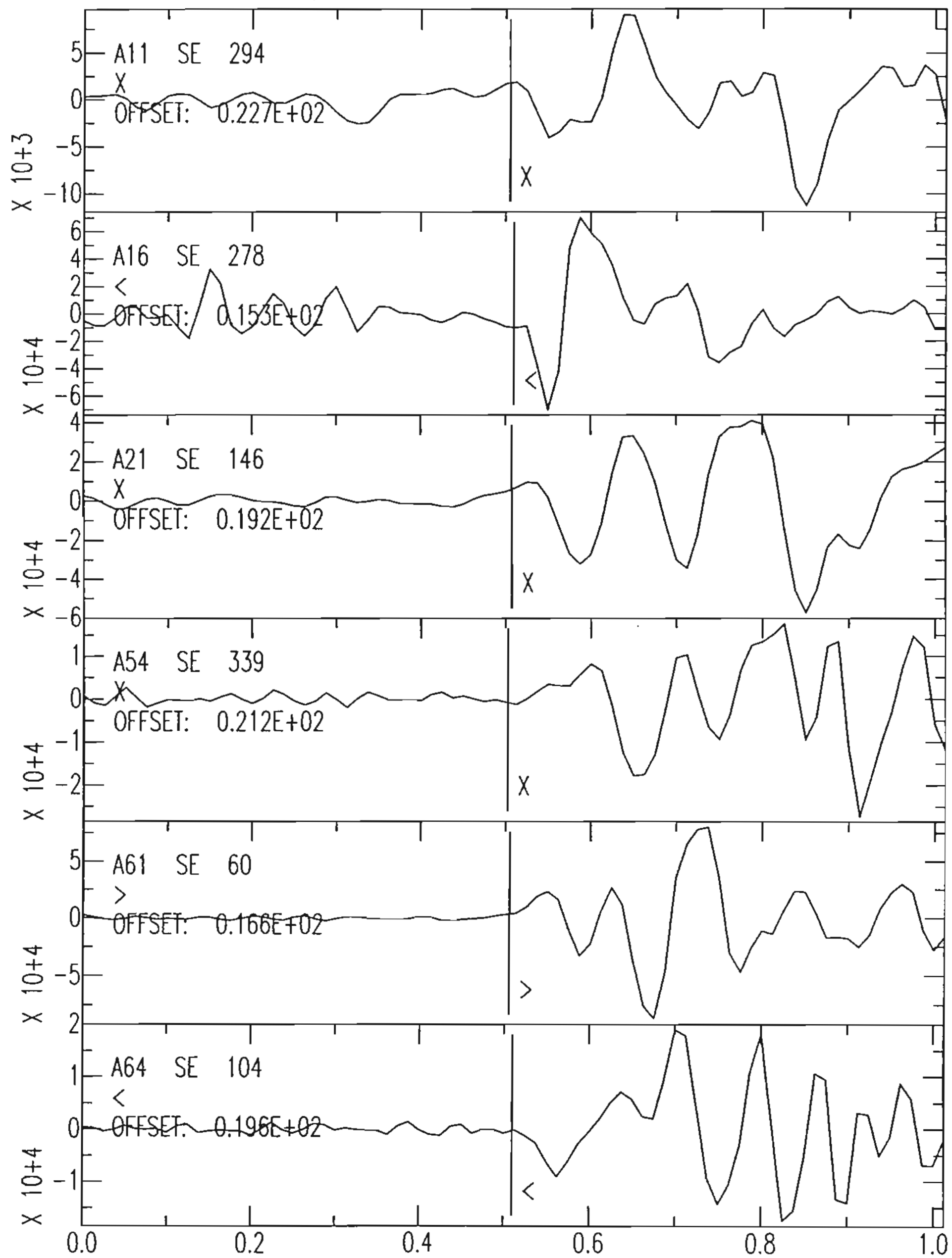


SH Motions and Lines.

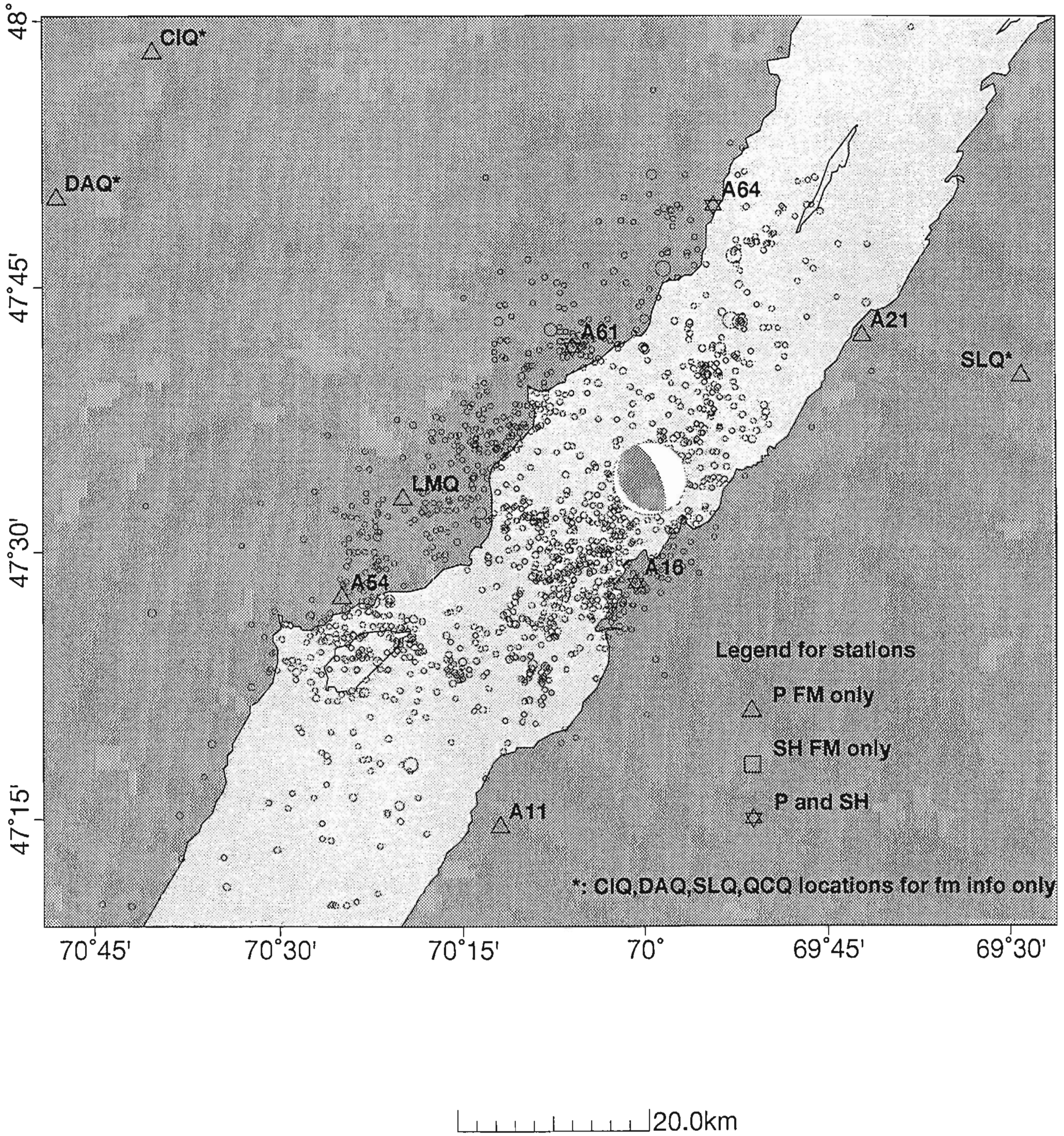
P Phases on Vertical Components



SH phases on Transverse Components



Location Map



Earthquake of 19901106 1130 Magnitude 3.4MN

1- Earthquake information and list of first motions.

Date	Time hhmm ss		Latitude	Longitude	Depth (km)	Mag	Sta/Pha
901106	1130	10.76	47.3943	-70.1506	14.19	3.4MN	6/011

COMMENTS:

26 KM E OF BAIE-SAINT-PAUL, CHARLEVOIX, QUE.
CHARLEVOIX-KAMOURASKA, QUE. FELT AT LA POCATIERE WHERE PEOPLE
REPORTED THEY HEARD A BOOM FOLLOWED BY A SHORT VIBRATION. ALSO FELT AT
STE-HELENE AND OTHER COMMUNITIES NEAR LA POCATIERE.
$ QCQ too weak for first motion.
$ Focmec published by W. McNeil and J. Adams
$ in the National Summary of October-December 1990.
$
$ The Sg lines of some stations include the SH FM.
$ The convention used is the Virginia Tech convention used in FOCMEC:
$ <: SH first motion to left (back to event) impulsive
$ >: SH first motion to right (back to event) impulsive
$ Preliminary Focmec computed by ML.

Sta	Pha	Dist (km)	Azim	Take-off Angle	FM
A16	PG	14	52	-44	C
A16	SG	14	52	-44	<
A11	PG	17	192	-51	C
A54	PG	21	289	-56	D
A54	SG	21	289	-56	<
LMQ	PG	22	322	-57	C
A61	PG	34	8	-67	D
A61	SG	34	8	-67	>
A21	PG	49	45	-74	C
A64	PG	52	22	-75	D
SLQ	PG	91	70	-81	C
DAQ	PG	104	308	-82	D
CIQ	PG	109	334	-83	D

Number of P first motions: 10
Number of SH first motions: 3

2- Most Representative Solution.

A total of 367 solutions were found using a b axis increment of 1 degree. The following parameters describe the most representative solution, which was derived from the average B, P, and T axes listed below.

dip,strike,rake 68.76 209.02 56.46
dip,strike,rake 39.03 90.37 144.88 :auxiliary plane
lower hem. trend, plunge of a,n 0.37 50.97 119.02 21.24
lower hem. trend & plunge of b 222.52 31.00
lower hem. trend, plunge of p,t 323.14 17.05 77.77 53.66

Average B, P, and T axes:

	B	P	T
Mean trend:	N 227	N 139	N 55
Mean Plunge:	35	-4	55
Vector Magnitude:	362	363	359
Mean length of resulting vector:	0.986	0.990	0.979

3- Misfits.

Out of 10 P first motions, one did not fit the solutions (10/100)

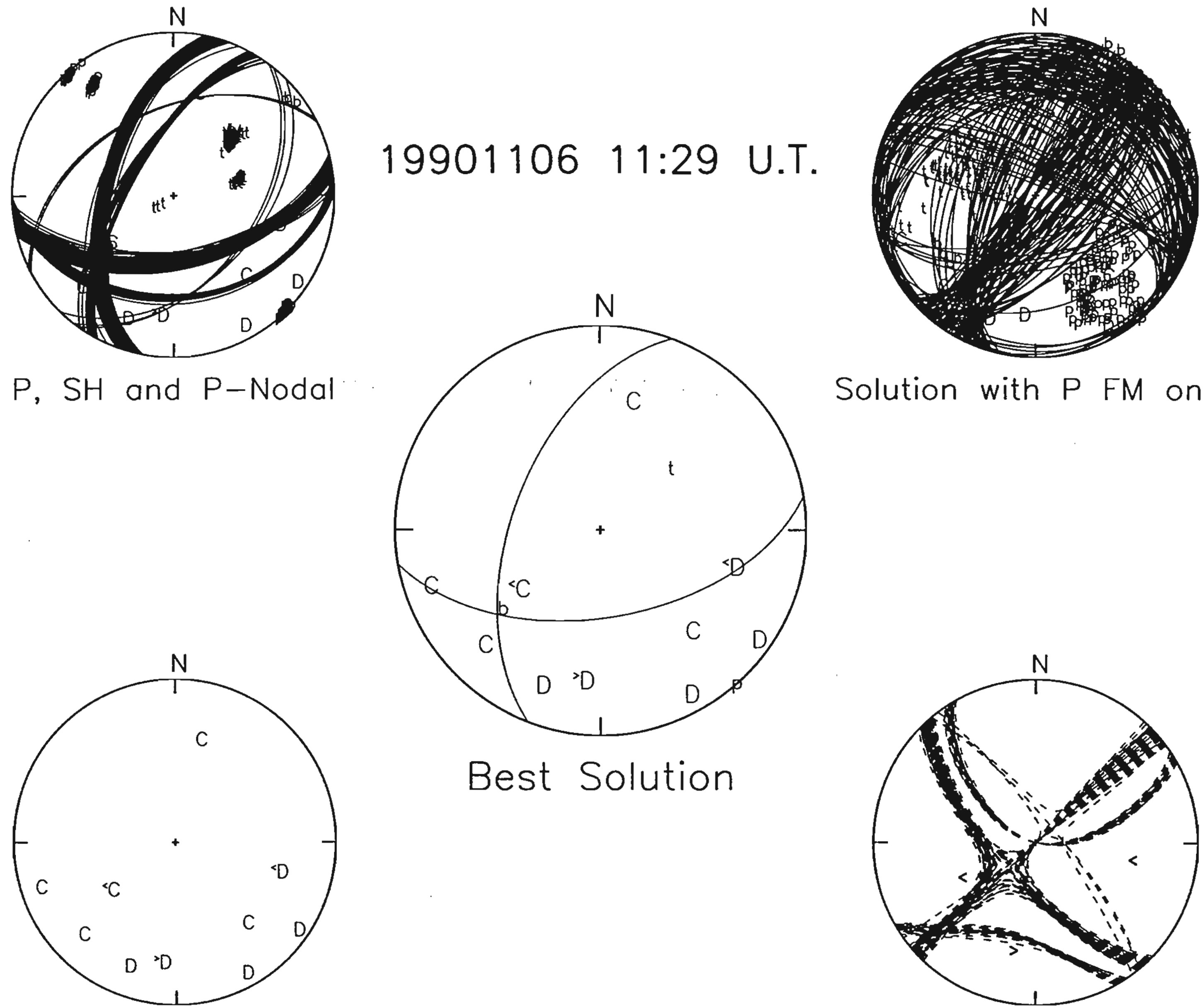
Station Name	Number of misfits	Percentage of wrongs
A54	96	26
LMQ	271	73

All 3 SH first motions agreed with the solution.

4- Rating of the focal mechanism.

The solution is rejected (X rating) because of the large number of solutions.

19901106 11:29 U.T.



P, SH and P–Nodal

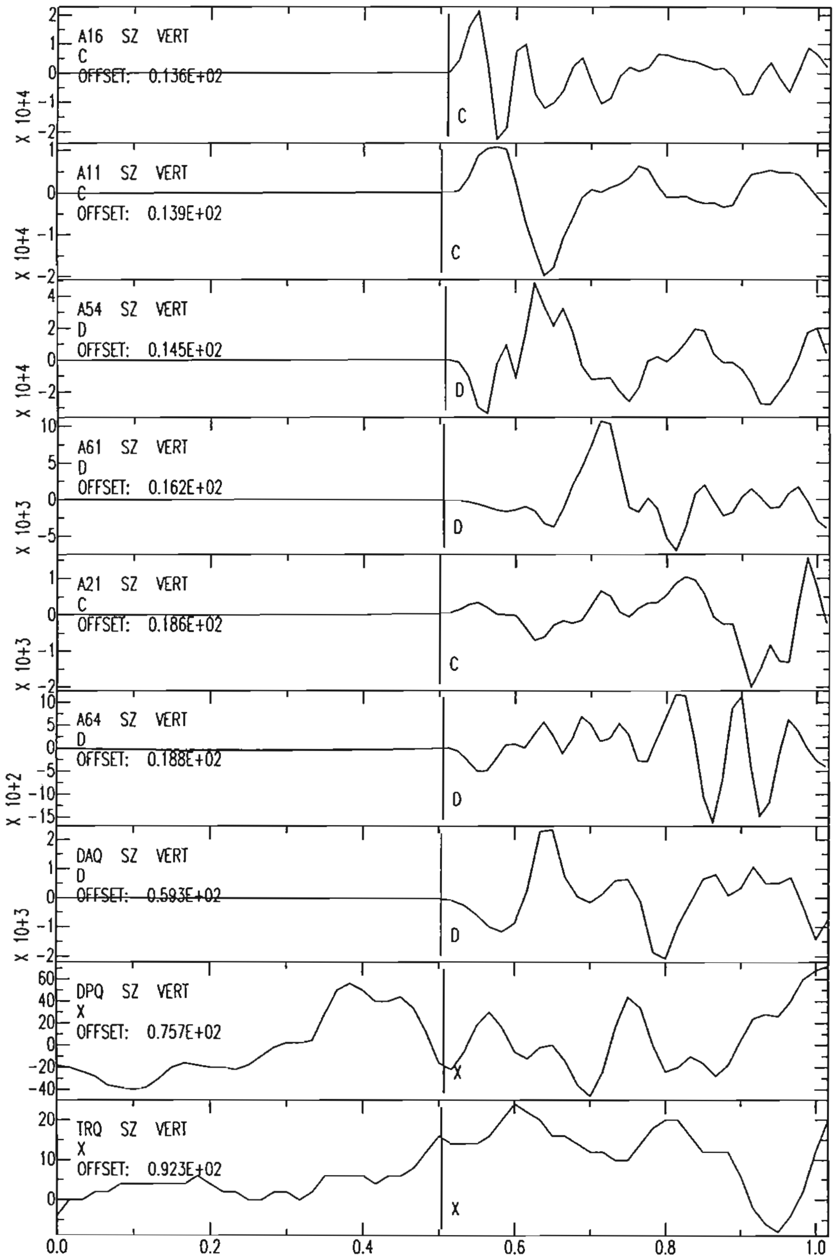
Solution with P FM only.

Best Solution

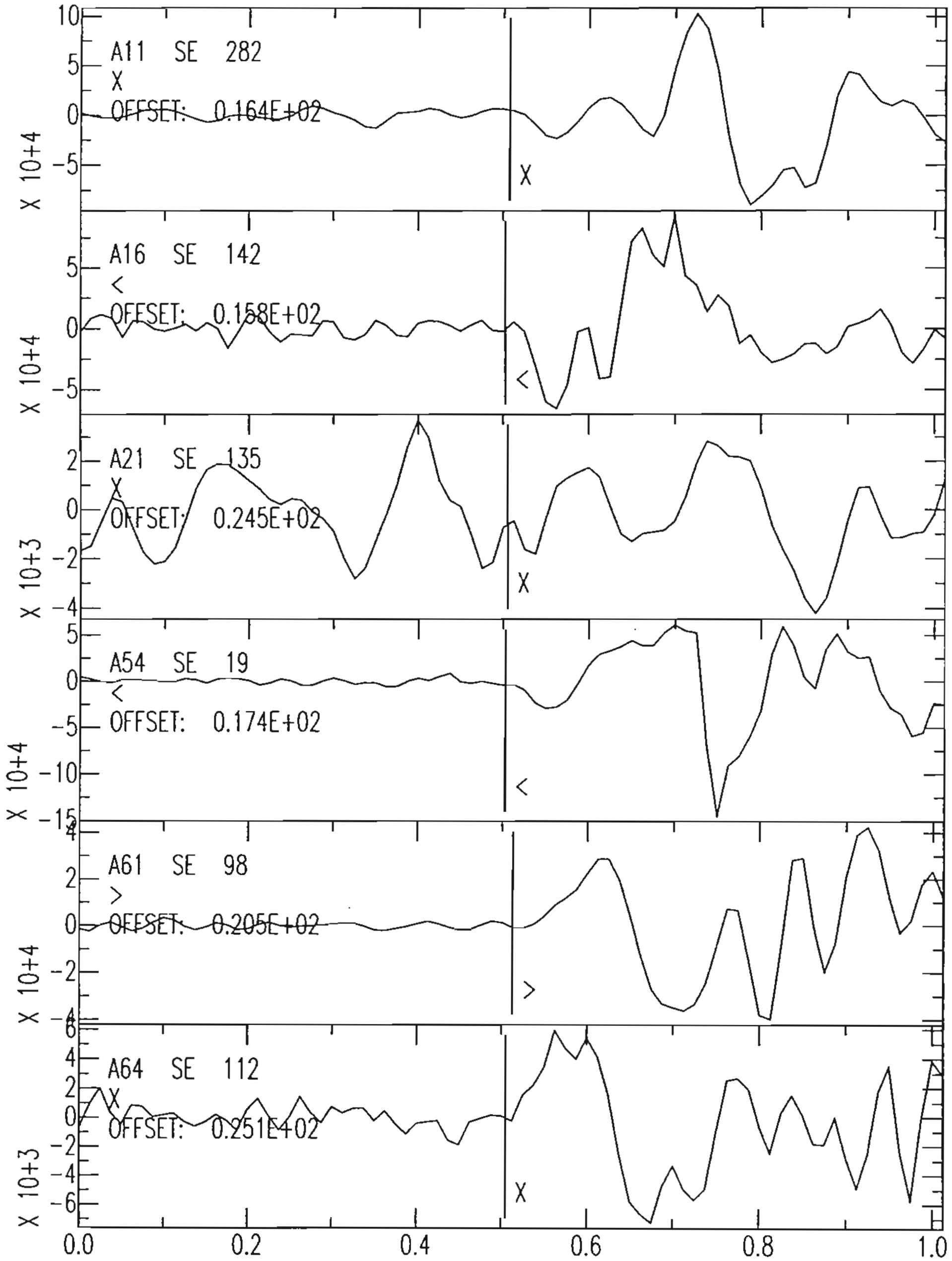
First Motions Only

SH Motions and Lines.

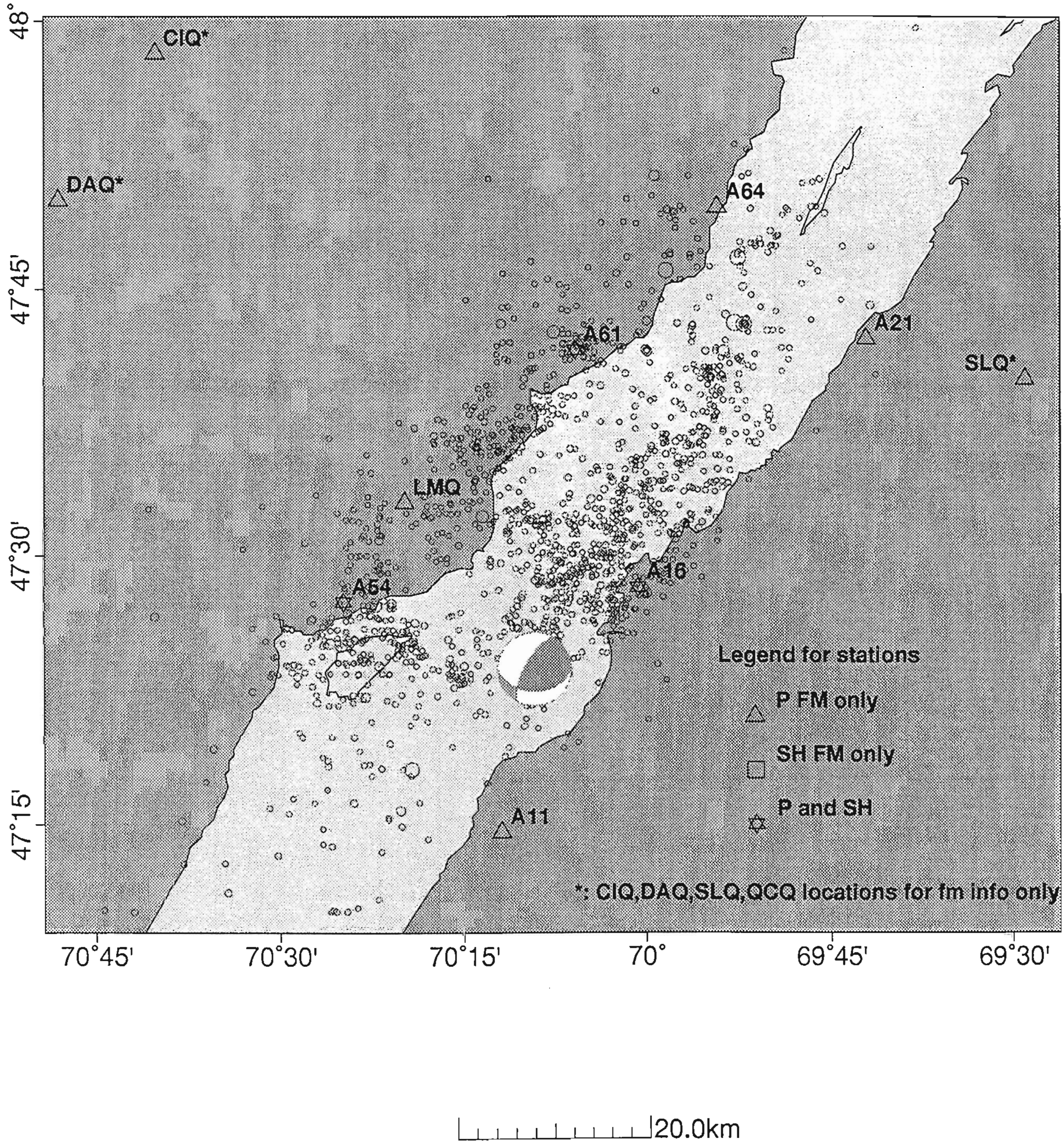
P Phases on Vertical Components



SH phases on Transverse Components



Location Map



Earthquake of 19901218 0710 Magnitude 3.3MN

1- Earthquake information and list of first motions.

Date	Time hhmm ss	Latitude	Longitude	Depth (km)	Mag	Sta/Pha
901218	0710 46.23	47.2627	-70.3359	9.38	3.3MN	7/013

COMMENTS:

CHARLEVOIX, QUE. 8 KM NW OF ST-JEAN-PORT-JOLI
NOT REPORTED FELT
$ GRQ, CKO LMN NOISY; SLQ down.
$
$ The Sg lines of some stations include the SH FM.
$ The convention used is the Virginia Tech convention used in FOCMEC:
$ <: SH first motion to left (back to event) impulsive
$ >: SH first motion to right (back to event) impulsive
$ Preliminary Focmec computed by ML.

Sta	Pha	Dist (km)	Azim	Take-off Angle	FM
A11	PG	11	102	-49	D
A11	SG	11	102	-49	>
A54	PG	22	345	-67	C
A54	SG	22	345	-67	>
LMQ	PG	32	1	-74	C
A16	PG	34	47	-75	D
A16	SG	34	47	-75	<
A61	PG	51	21	-80	C
A61	SG	51	21	-80	>
A21	PG	69	45	-82	C
A64	PG	71	28	-82	D
A64	SG	71	28	-82	>
DAQ	PG	104	319	-85	D
CIQ	PG	117	343	-85	D

Number of P first motions: 9
Number of SH first motions: 5

2- Most Representative Solution.

One solution was found using a b axis increment of 1 degree.
The
following parameters describe the most representative solution, which was derived from the average B, P, and T axes listed below.

dip,strike,rake 74.04 222.48 85.84

dip,strike,rake	16.48	57.29	104.24	:auxiliary plane		
lower hem. trend, plunge of a,n		327.29	73.52	132.48	15.96	
lower hem. trend & plunge of b		223.62	4.00			
lower hem. trend, plunge of p,t		315.84	28.92	126.45	60.75	

Average B, P, and T axes:

	B	P	T
Mean trend:	N 224	N 316	N 126
Mean Plunge:	4	29	61
Vector Magnitude:	1	1	1
Mean length of resulting vector:	1.000	1.000	1.000

3- Misfits.

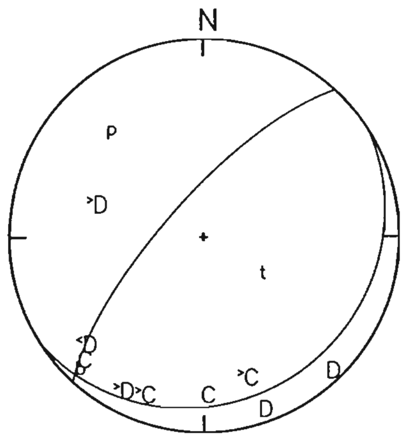
All 9 P first motions agreed with the solution.
Out of 5 SH first motions, a total of 1 did not fit the solutions (20/100).

Station Name	Number of misfits	Percentage of wrongs
A11	1	100

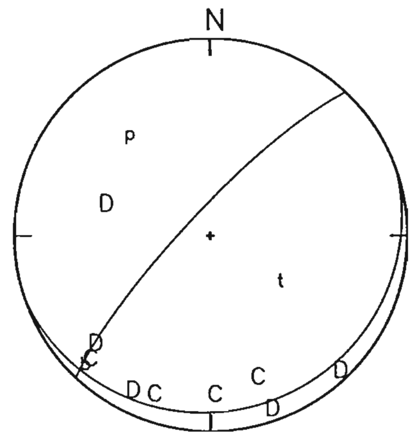
4- Rating of the focal mechanism.

Although most characteristics of this solution correspond to an A rating (small number of P and SH misfits and on the good constraints on the P, T and B axes, the poor distribution on the focal sphere makes the nodal planes poorly defined. Thus, this solution is rated as X.

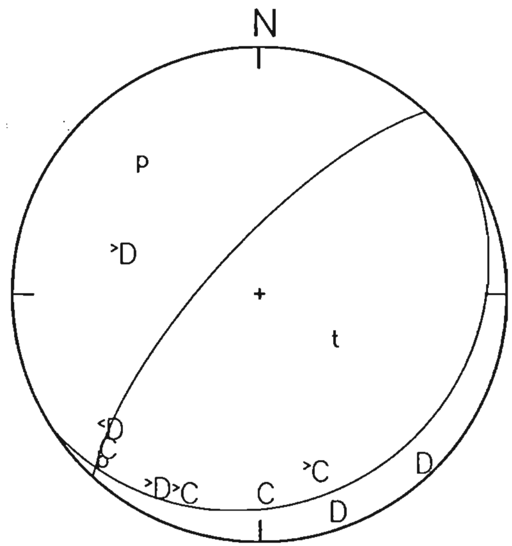
19901218 07:11 U.T.



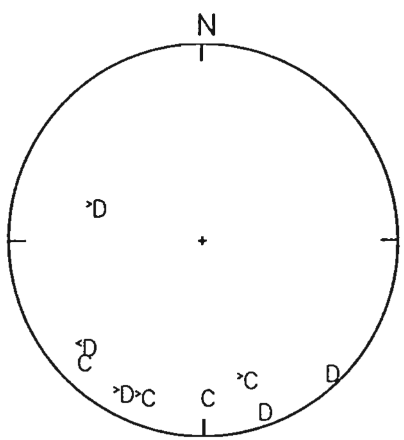
P, SH and P–Nodal



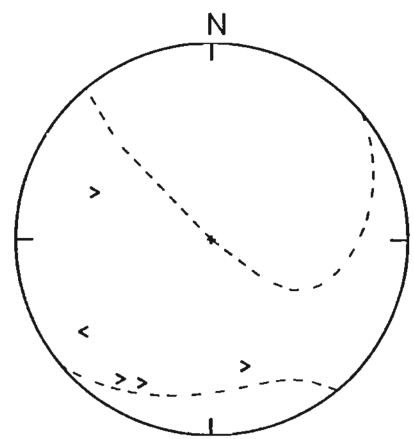
Solution with P FM only.



Best Solution

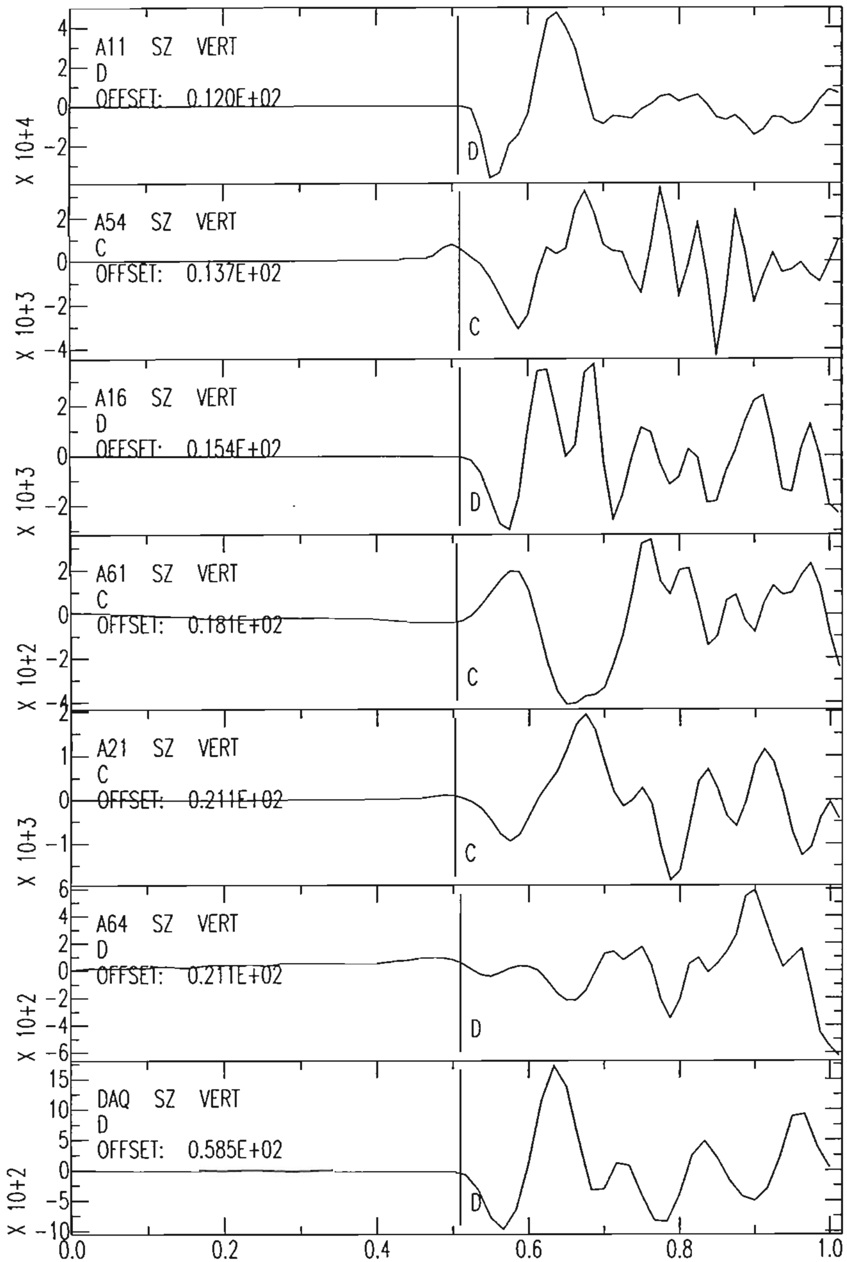


First Motions Only

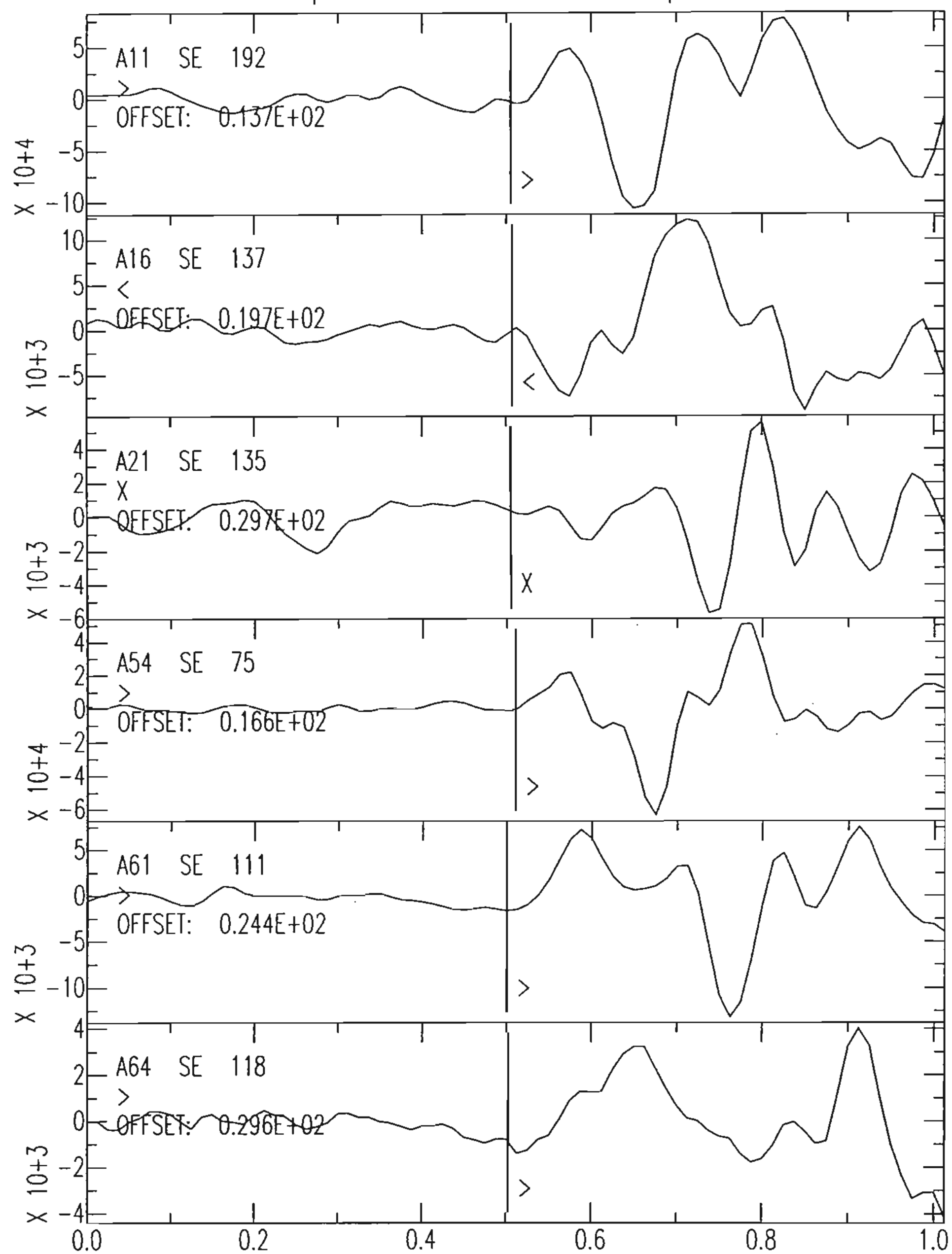


SH Motions and Lines.

P Phases on Vertical Components

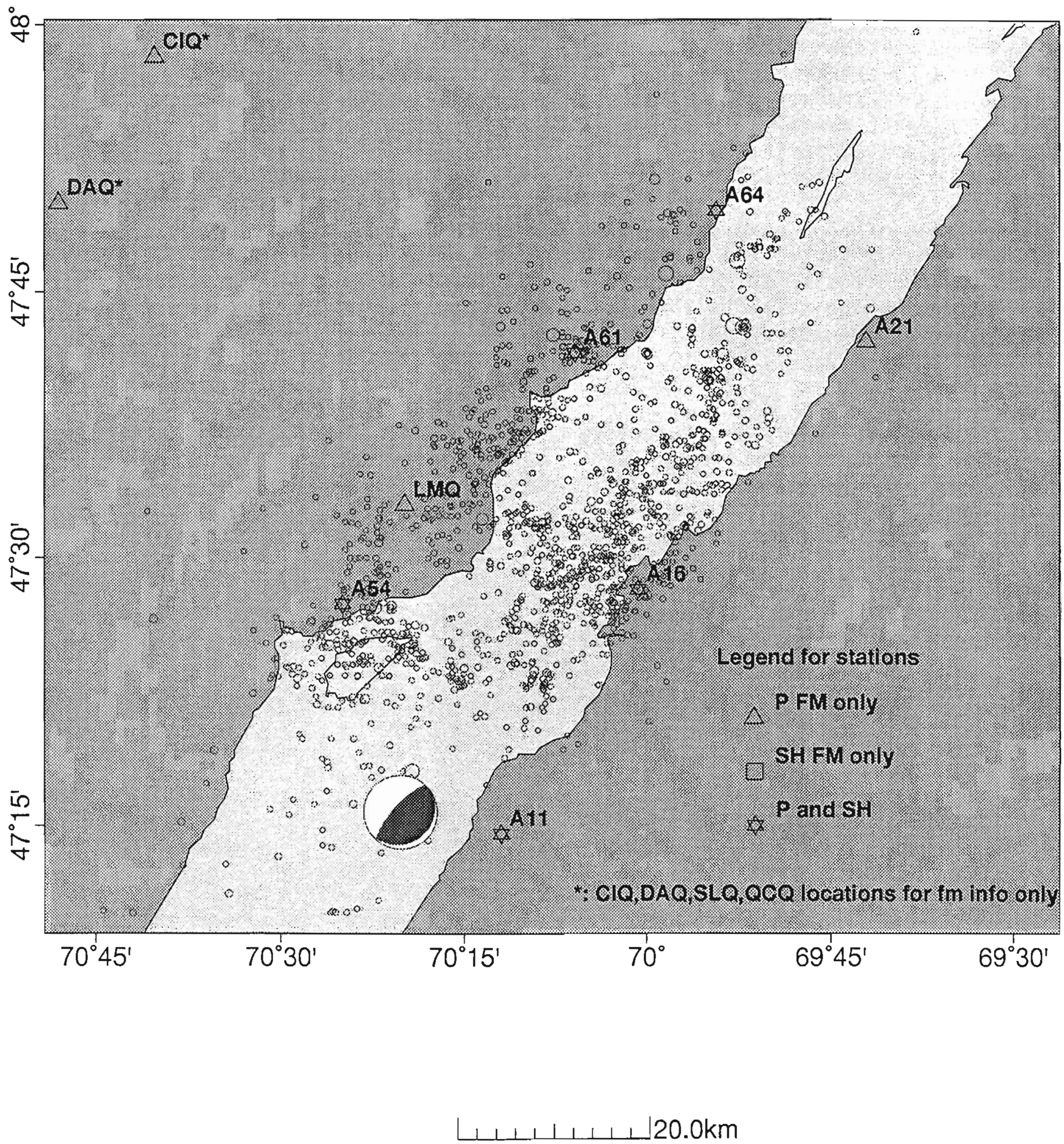


SH phases on Transverse Components



90/218

Location Map



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Earthquake of 19911208 0300 Magnitude 4.3MN

1- Earthquake information and list of first motions.

Date	Time hhmm ss		Latitude	Longitude	Depth (km)	Mag	Sta/Pha
911208	0300	30.12	47.7792	-69.8643	23.05	4.3MN	7/013

COMMENTS:

25 KM W OF RIVIERE-DU-LOUP, QUE.
FELT IN CHARLEVOIX-KAMOURASKA, ST-HILARION, LA MALBAIE, CAP-A-L'AIGLE,
POINTE-AU-PIC, CLERMONT, ILE AUX COUDRES. FELT AT RIVIERE-DU-LOUP, CHICOUTIMI,
LA BAIE, ROBERVAL.
$ SLQ NO RECORD; QCQ EMERGENT.
$ 5 KM S OF ST-SIMEON, QUE. 5 KM S DE ST-SIMEON, QUE.
$
$ The Sg lines of some stations include the SH FM.
$ The convention used is the Virginia Tech convention used in FOCMEC:
$ <: SH first motion to left (back to event) impulsive
$ >: SH first motion to right (back to event) impulsive
$ Preliminary Focmec computed by ML
$ emergent fm on DPQ (C); GSQ (D); ICQ (D) and CNQ (D).

Sta	Pha	Dist (km)	Azim	Take-off Angle	FM
A64	PG	6	338	-14	C
A64	SG	6	338	-14	<
A21	PG	16	123	-34	C
A21	SG	16	123	-34	<
A61	PG	19	240	-40	C
A61	SG	19	240	-40	<
A16	PG	36	197	-57	D
LMQ	PG	43	234	-62	C
A54	PG	55	229	-67	C
A11	PG	65	203	-70	C
CIQ	PG	88	309	-75	D
DAQ	PG	105	282	-78	D

Number of P first motions: 9
Number of SH first motions: 3

2- Most Representative Solution.

A total of 1385 solutions were found using a b axis increment of 1 degree. The following parameters describe the most representative solution, which was derived from the average B, P, and T axes listed below.

dip,strike,rake	79.73	17.90	21.81		
dip,strike,rake	68.56	283.82	168.96	:auxiliary plane	
lower hem. trend, plunge of a,n	193.82	21.44	287.90	10.27	
lower hem. trend & plunge of b	41.92	66.00			
lower hem. trend, plunge of p,t	149.38	7.61	242.57	22.62	

Average B, P, and T axes:

	B	P	T
Mean trend:	N 46	N 144	N 236
Mean Plunge:	63	4	27
Vector Magnitude:	1375	1378	1373
Mean length of resulting vector:	0.993	0.995	0.992

3- Misfits.

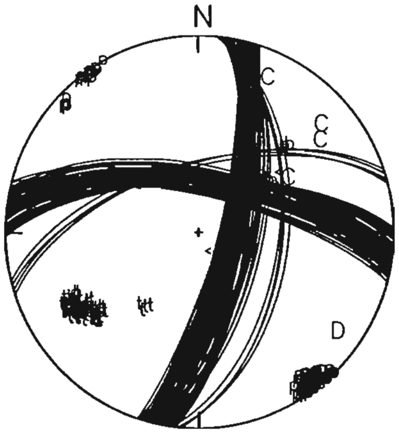
All 9 P first motions agreed with the solution.
Out of 3 SH first motions, a total of 1 did not fit the solutions (33/100).

Station Name	Number of misfits	Percentage of wrongs
A64	1385	100

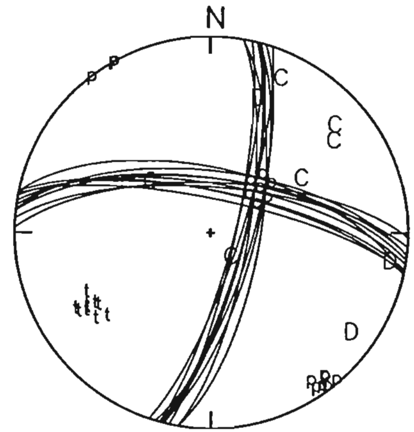
4- Rating of the focal mechanism.

Although the solution has a B rating based on the number of P and SH misfits (0 /100 and 33 /100 respectively) and on the constraints on the P, T and B axes (value of 0.993), we prefer to assign a C rating to the solution due to the two distinct families of solutions found.

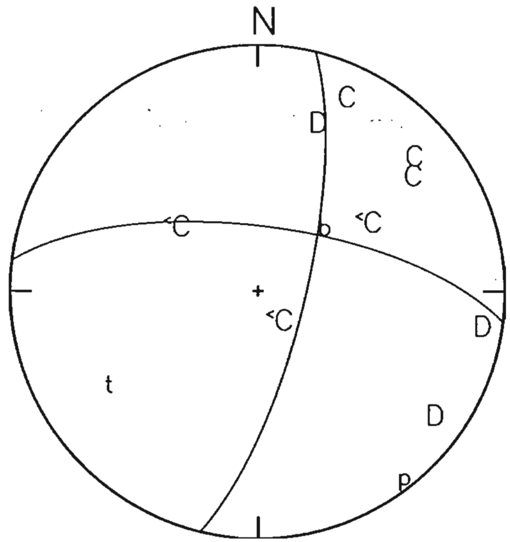
19911208 03:00 U.T.



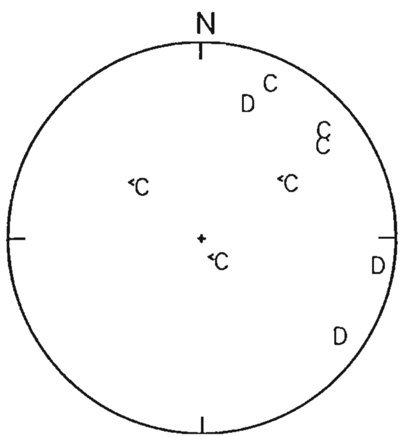
P, SH and P-Nodal



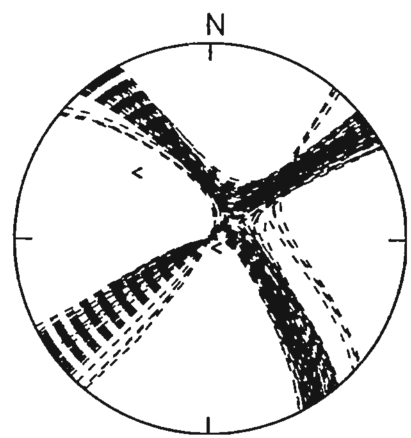
Solution with P FM only.
(5° search)



Best Solution

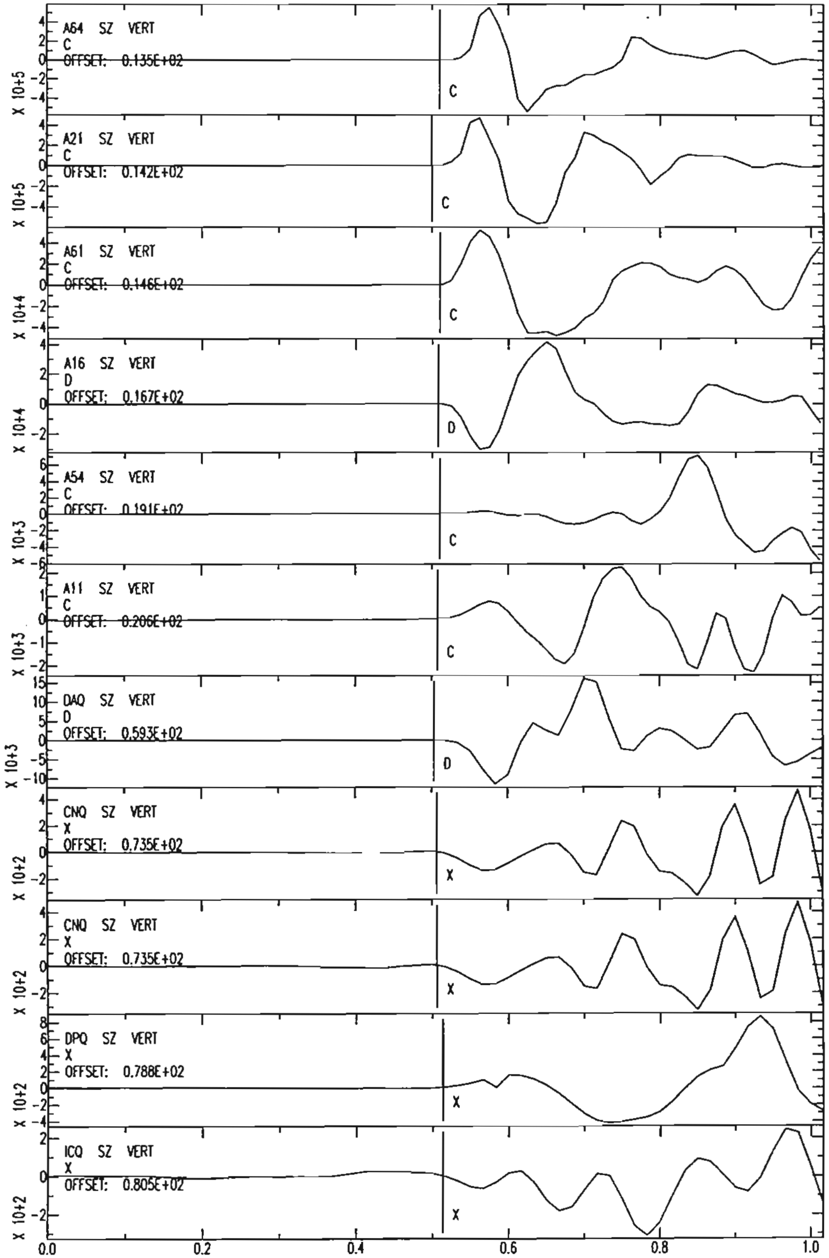


First Motions Only

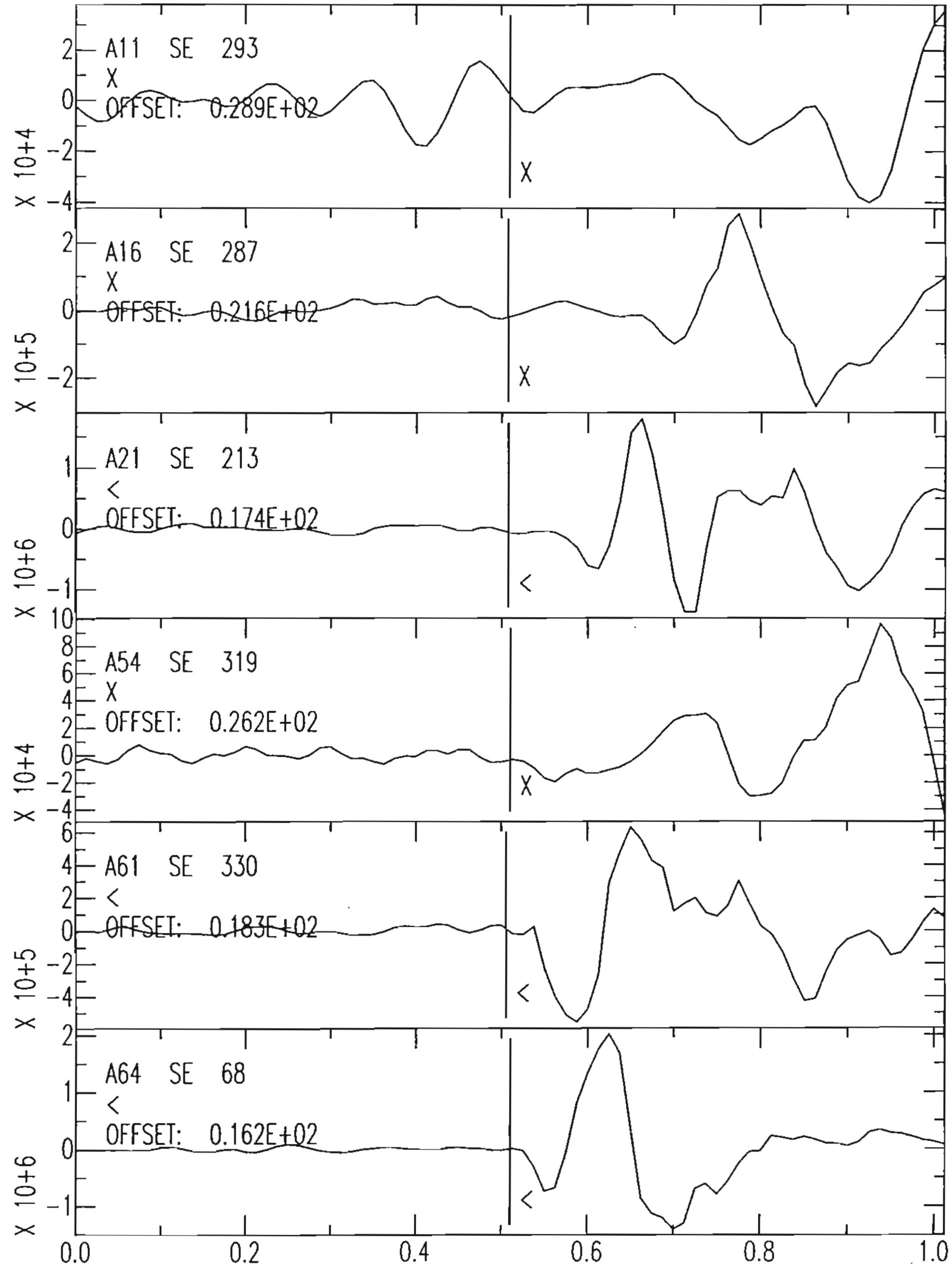


SH Motions and Lines.

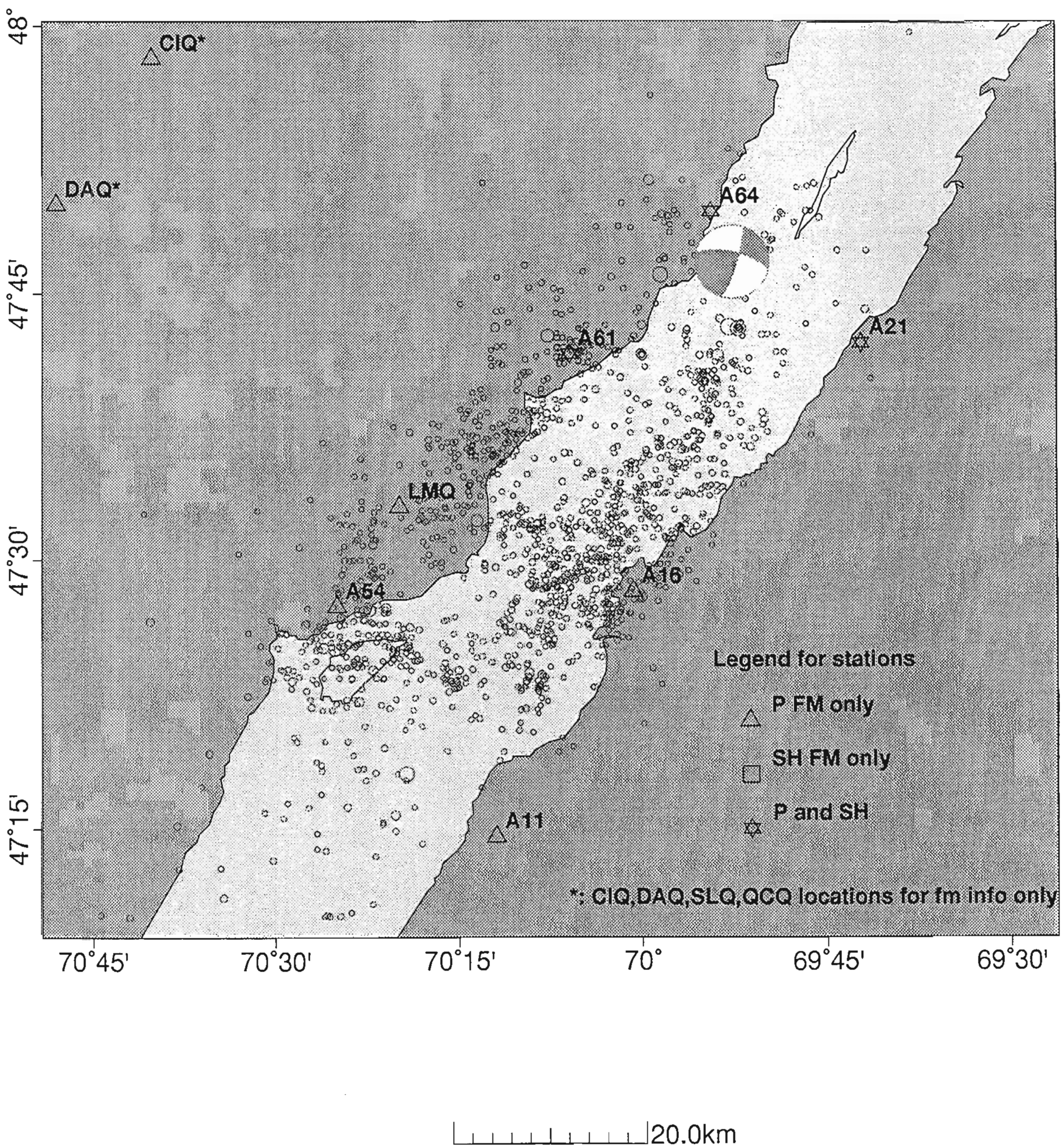
P Phases on Vertical Components



SH phases on Transverse Components



Location Map



Earthquake of 19920310 0545 Magnitude 3.3MN

1- Earthquake information and list of first motions.

Date	Time hhmm ss	Latitude	Longitude	Depth (km)	Mag	Sta/Pha
920310	0545 32.64	47.7167	-69.8574	9.96	3.3MN	7/013

COMMENTS:

23 KM E OF LA MALBAIE, CHARLEVOIX, QUE.
FELT AT SAINT-FIDELE
$ 9 KM E OF ST-FIDELE, QUE.
$47.830 -69.970 MN=3.3 0545326 10031992   15 20 13   10.00
$ MN=3.3 FROM AUTO LOCATION
$ DAQ DOWN; JOQ fm unreadable.
$ The Sg lines of some stations include the SH FM.
$
$ The convention used is the Virginia Tech convention used in FOCMEC:
$ <: SH first motion to left (back to event) impulsive
$ >: SH first motion to right (back to event) impulsive
$ Preliminary Focmec computed by ML.
$ focmec published in Li et al. 1996 BSSA.
$ Li et al. propose that it is a double-event.
$ Li et al. suggest SH fm are: A11 < ; A64 < .

Sta	Pha	Dist (km)	Azim	Take-off Angle	FM
A64	PG	12	348	-51	C
A21	PG	13	97	-52	D
A21	SG	13	97	-52	>
A61	PG	18	261	-61	D
A61	SG	18	261	-61	>
A16	PG	30	202	-71	D
A16	SG	30	202	-71	<
LMQ	PG	40	242	-76	D
A54	PG	51	236	-79	D
A54	SG	51	236	-79	<
A11	PG	59	206	-80	D
SLQ	PG	64	95	-81	D
CIQ	PG	93	312	-84	C

Number of P first motions: 9
Number of SH first motions: 4

2- Most Representative Solution.

A total of 487 solutions were found using a b axis increment of 5 degree. The

following parameters describe the most representative solution, which was derived from the average B, P, and T axes listed below.

dip,strike,rake	63.94	300.77	44.31		
dip,strike,rake	51.13	187.55	145.64	:auxiliary plane	
lower hem. trend, plunge of a,n	97.55	38.87	210.77	26.06	
lower hem. trend & plunge of b	325.00	40.00			
lower hem. trend, plunge of p,t	61.47	7.64	160.34	48.97	

Average B, P, and T axes:

	B	P	T
Mean trend:	N 329	N 66	N 157
Mean Plunge:	61	2	29
Vector Magnitude:	414	467	454
Mean length of resulting vector:	0.849	0.959	0.931

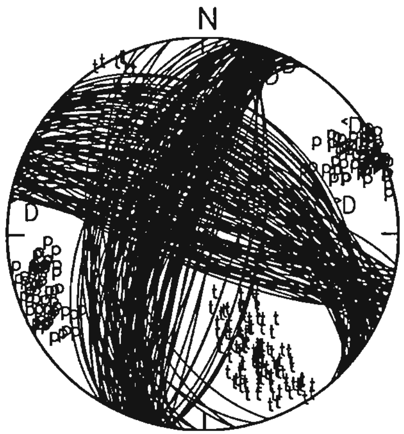
3- Misfits.

All 9 P first motions agreed with the solution.
All 4 SH first motions agreed with the solution.

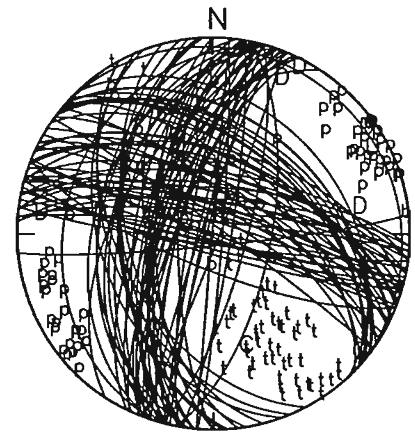
4- Rating of the focal mechanism.

The solution is rejected (rating X) based on the high number of P and SH misfits (0 /100 and 0 /100 respectively) and the absence of constraints on the P, T and B axes (value of 0.913).

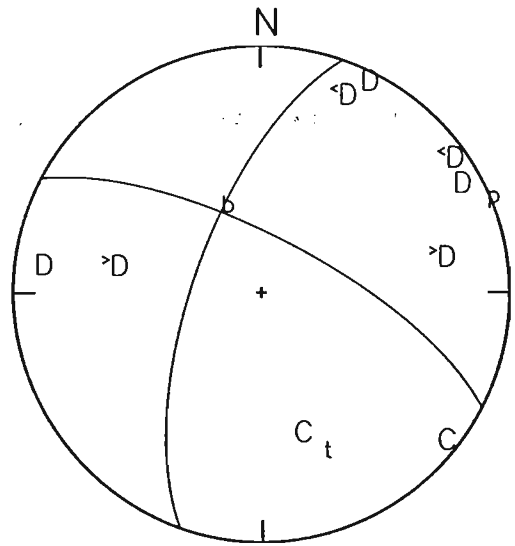
19920310 05:45 U.T.



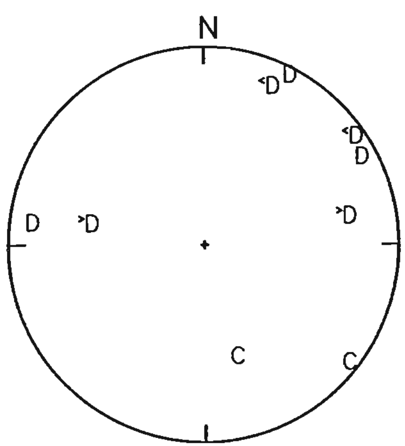
P, SH and P–Nodal



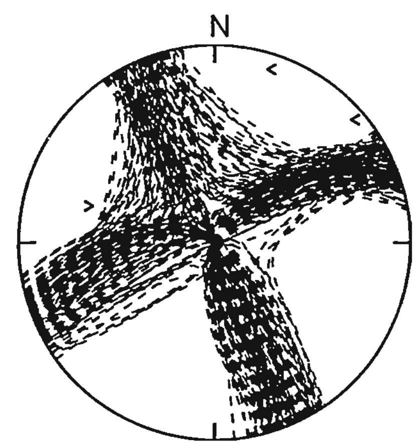
Solution with P FM only.



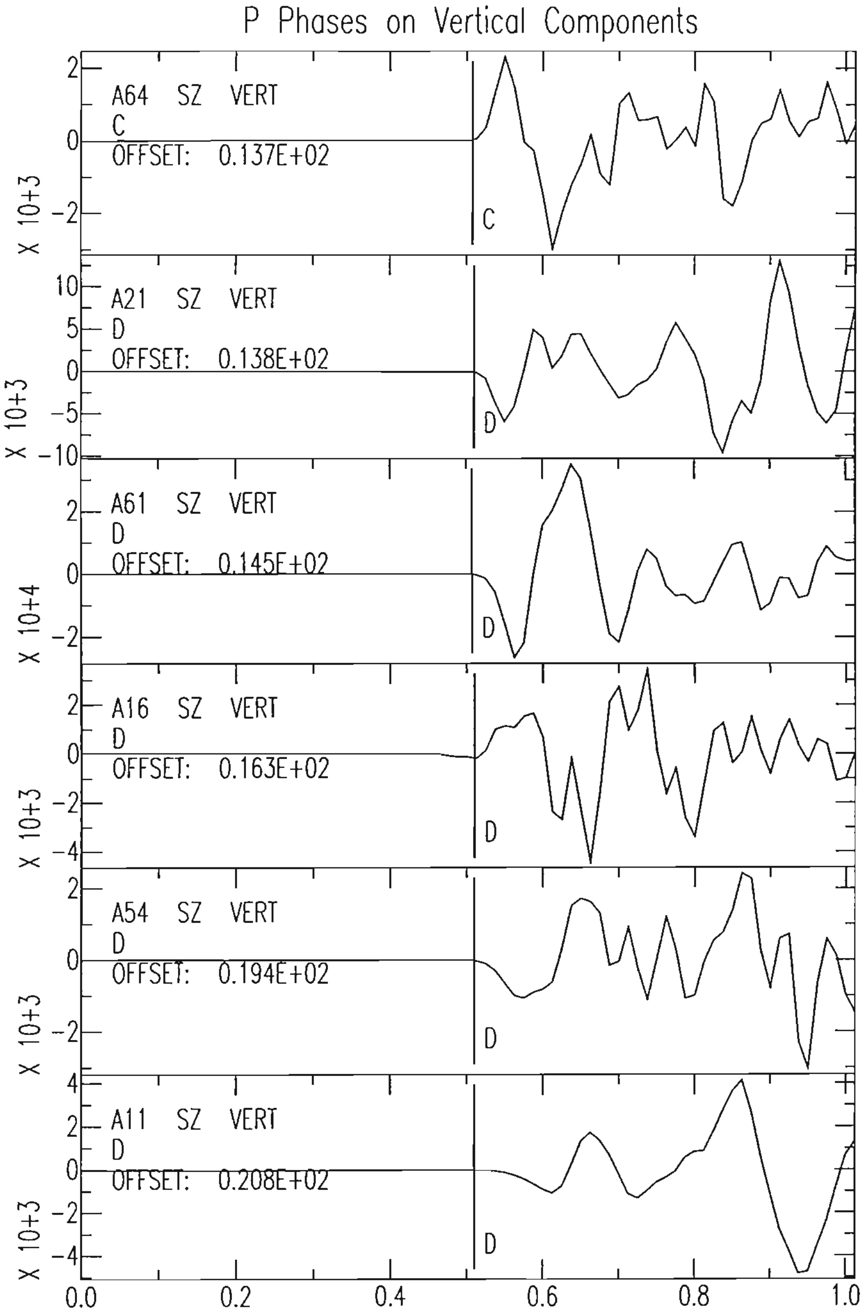
Best Solution

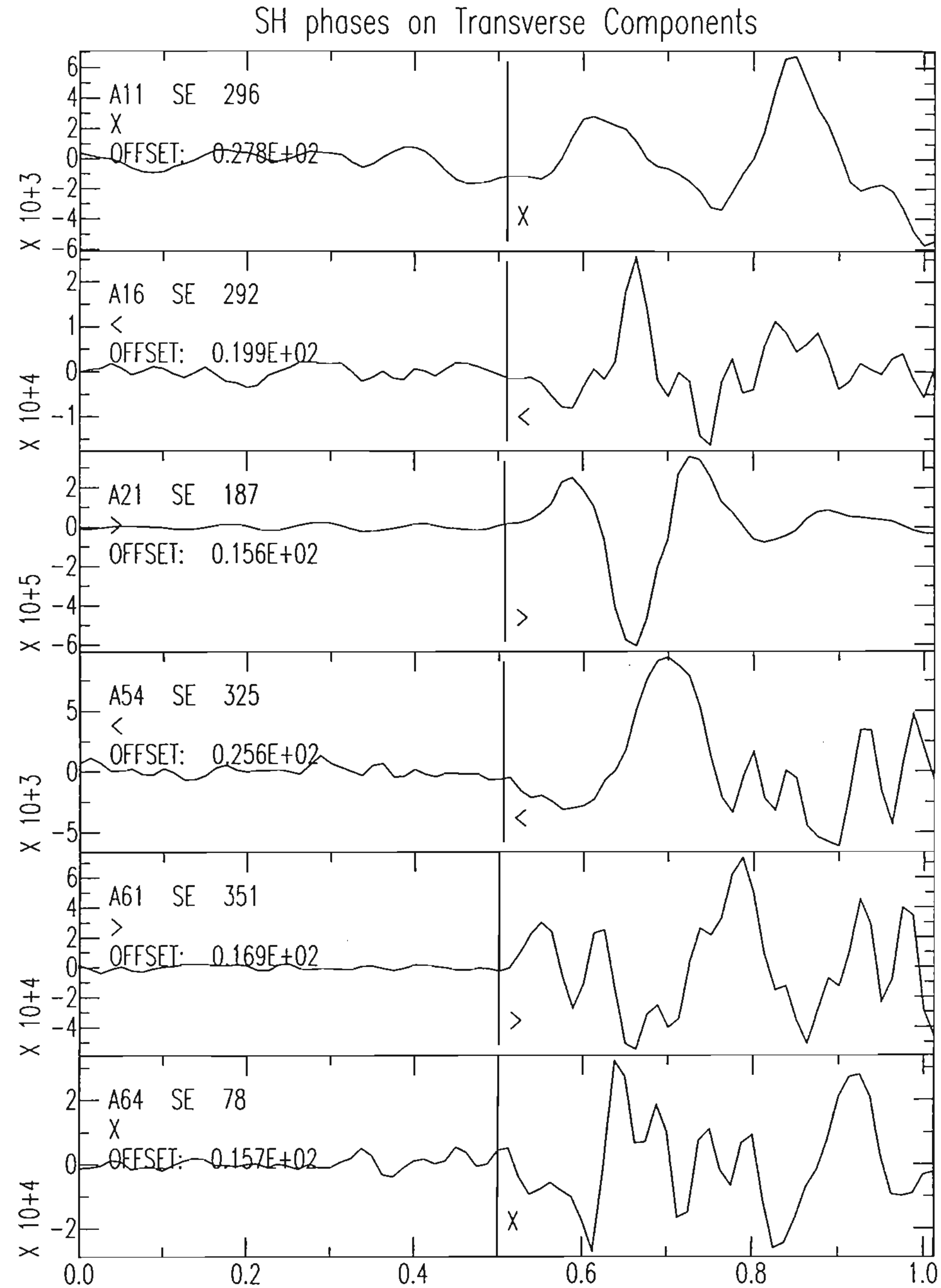


First Motions Only

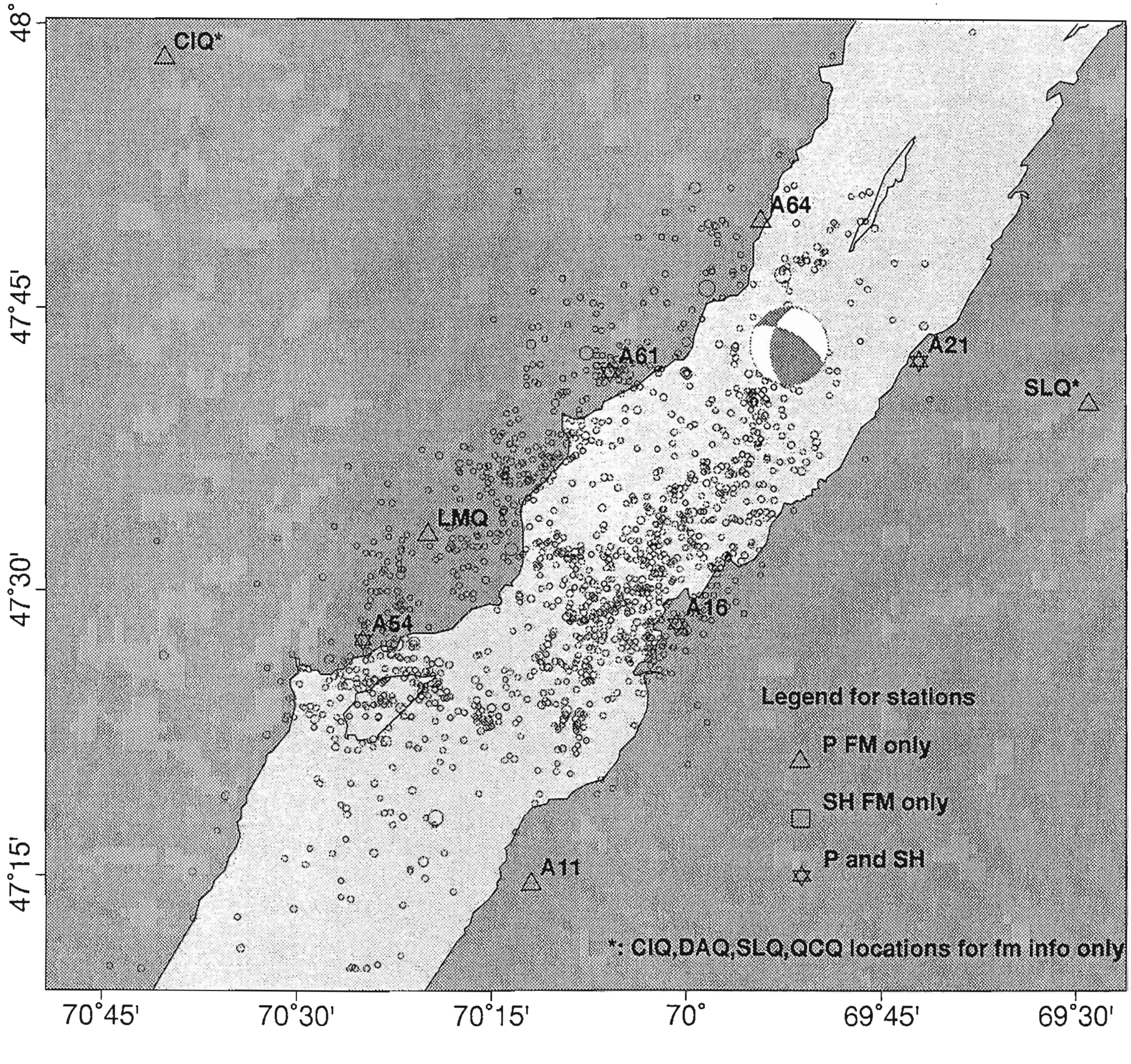


SH Motions and Lines.


P Phases on Vertical Components
A64 SZ VERT
C
OFFSET: 0.137E+02
A21 SZ VERT
D
OFFSET: 0.138E+02
A61 SZ VERT
D
OFFSET: 0.145E+02
A16 SZ VERT
D
OFFSET: 0.163E+02
A54 SZ VERT
D
OFFSET: 0.194E+02
A11 SZ VERT
D
OFFSET: 0.208E+02
X 10+3
X 10+3
X 10+4
X 10+3
X 10+3
X 10+3


SH phases on Transverse Components
A11 SE 296
X
OFFSET: 0.278E+02
A16 SE 292
<
OFFSET: 0.199E+02
A21 SE 187
>
OFFSET: 0.156E+02
A54 SE 325
<
OFFSET: 0.256E+02
A61 SE 351
>
OFFSET: 0.169E+02
A64 SE 78
X
OFFSET: 0.157E+02
X 10+3
X 10+4
X 10+5
X 10+3
X 10+4
X 10+4

Location Map



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920310

Earthquake of 19920501 0037 Magnitude 3.2MN

1- Earthquake information and list of first motions.

Date	Time hhmm ss	Latitude	Longitude	Depth (km)	Mag	Sta/Pha
920501	0037 51.49	47.4463	-70.4069	2.67	3.2MN	6/011

COMMENTS:

6 KM E OF BAIE-SAINT-PAUL, CHARLEVOIX, QUE.
FELT STRONGEST AT ILE AUX COUDRES, ALSO FELT AT SAINT-HILARION, BAIE-ST-PAUL, LES EBOULEMENTS, SAINT-URBAIN.
$ FROM AUTO LOCATION
$+47.460- 70.496F1MN=3.3 0037505 01051992 00.0290.036 0.0 17 21 01.02 210.00
$ A54 DEAD
$ CIQ down.
$ NOTE: the focal depth may not be very accurate as A54 is down.
$
$ The Sg lines of some stations include the SH FM.
$ The convention used is the Virginia Tech convention used in FOCMEC:
$ <: SH first motion to left (back to event) impulsive
$ >: SH first motion to right (back to event) impulsive
$ Preliminary Focmec computed by ML.

Sta	Pha	Dist (km)	Azim	Take-off Angle	FM
LMQ	PG	13	28	-78	D
A11	PG	28	145	-84	D
A16	PG	30	85	-85	C
A16	SG	30	85	-85	<
A61	PG	36	41	-86	D
A64	PG	57	42	-87	D
A21	PG	61	62	-88	C
DAQ	PG	85	313	-88	D
SLQ	PG	108	76	-89	D
DPQ	PN	199	246	49	D

Number of P first motions: 9
Number of SH first motions: 1

2- Most Representative Solution.

A total of 5 solutions were found using a b axis increment of 1 degree. The following parameters describe the most representative solution, which was derived from the average B, P, and T axes listed below.

dip,strike,rake   6.40   217.14   51.26

dip,strike,rake	85.01	76.06	94.02	:auxiliary plane	
lower hem. trend, plunge of a,n	346.06	4.99	127.14	83.60	
lower hem. trend & plunge of b	255.71	4.00			
lower hem. trend, plunge of p,t	162.36	39.88	350.46	49.83	

Average B, P, and T axes:

	B	P	T
Mean trend:	N 254	N 161	N 349
Mean Plunge:	4	40	50
Vector Magnitude:	5	5	5
Mean length of resulting vector:	1.000	1.000	1.000

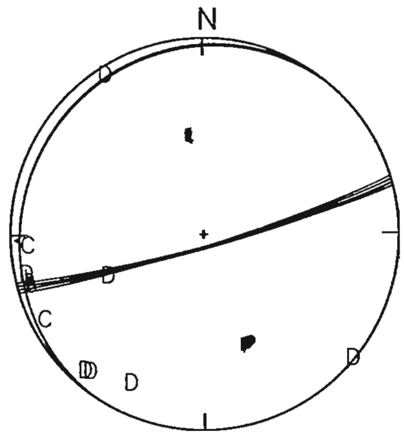
3- Misfits.

All 9 P first motions agreed with the solution.
All 1 SH first motions agreed with the solution.

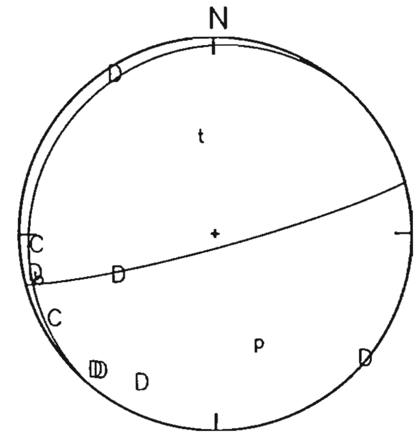
4- Rating of the focal mechanism.

Although the solution could have an A rating based on the small number of P and SH misfits (0 /100 and 0 /100 respectively) and on the good constraints on the P, T and B axes (value of 1.000), we believe that the poor distribution of first motions makes it an X (rejected) solution.

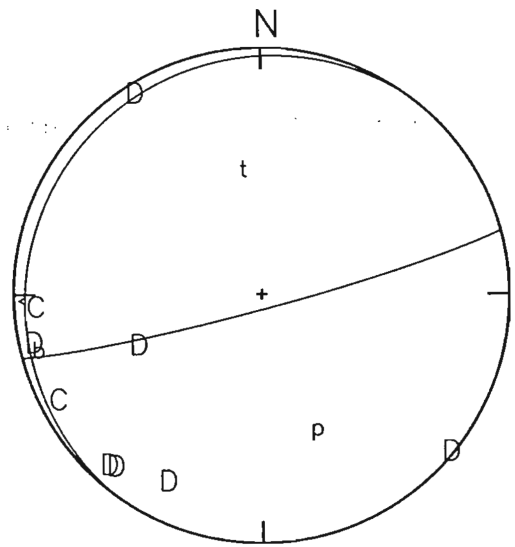
19920501 00:38 U.T.



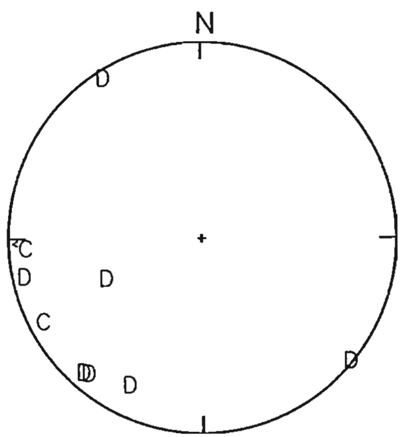
P, SH and P–Nodal



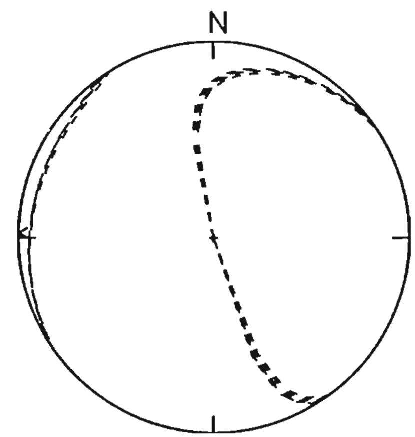
Solution with P FM only.



Best Solution

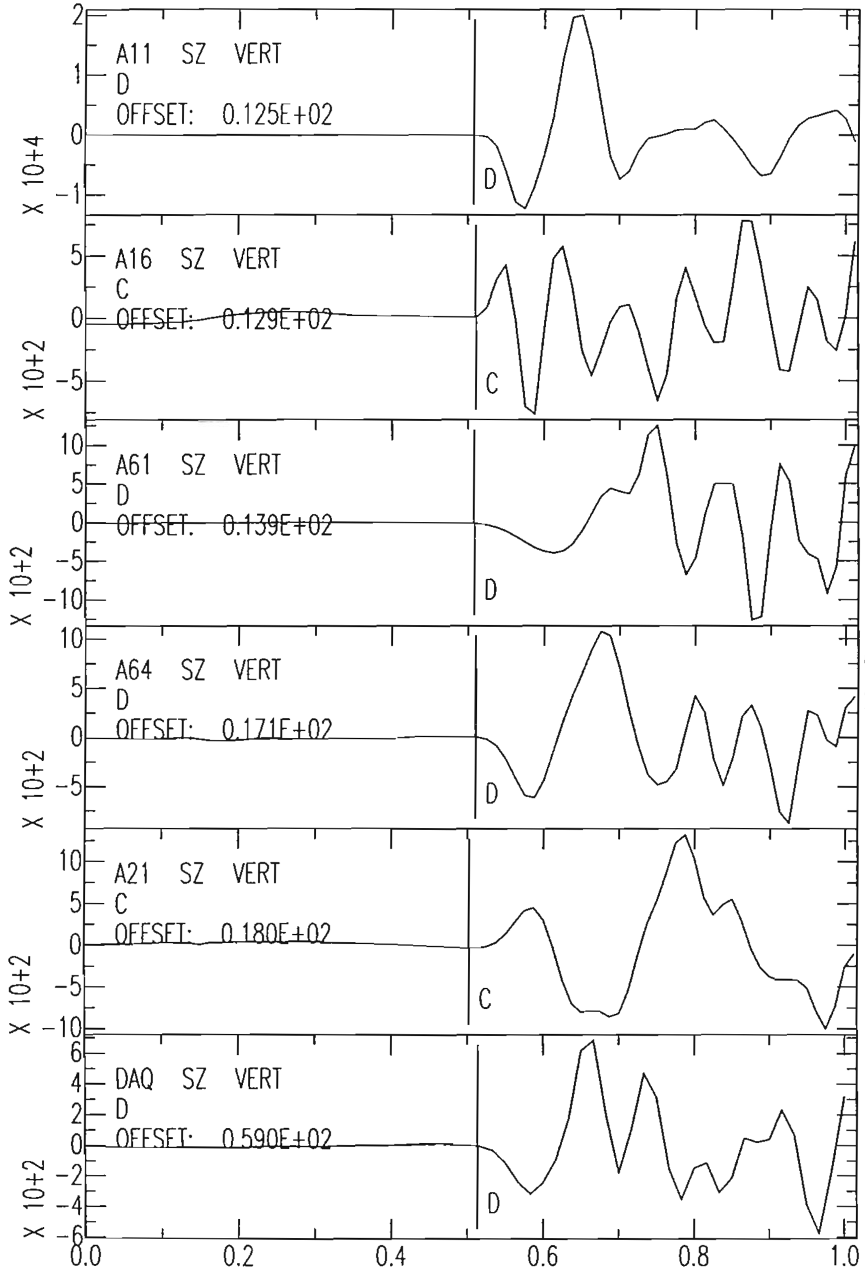


First Motions Only

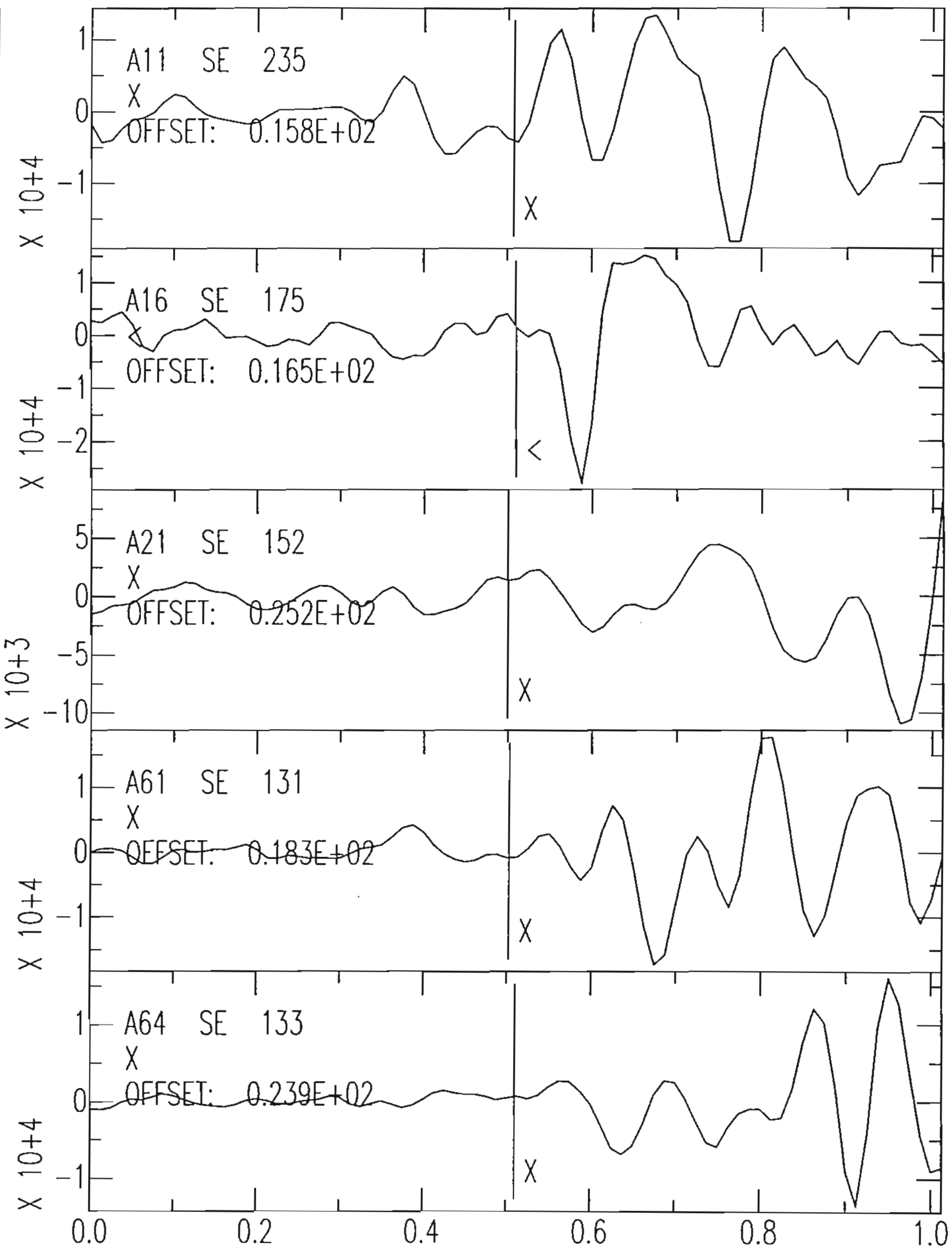


SH Motions and Lines.

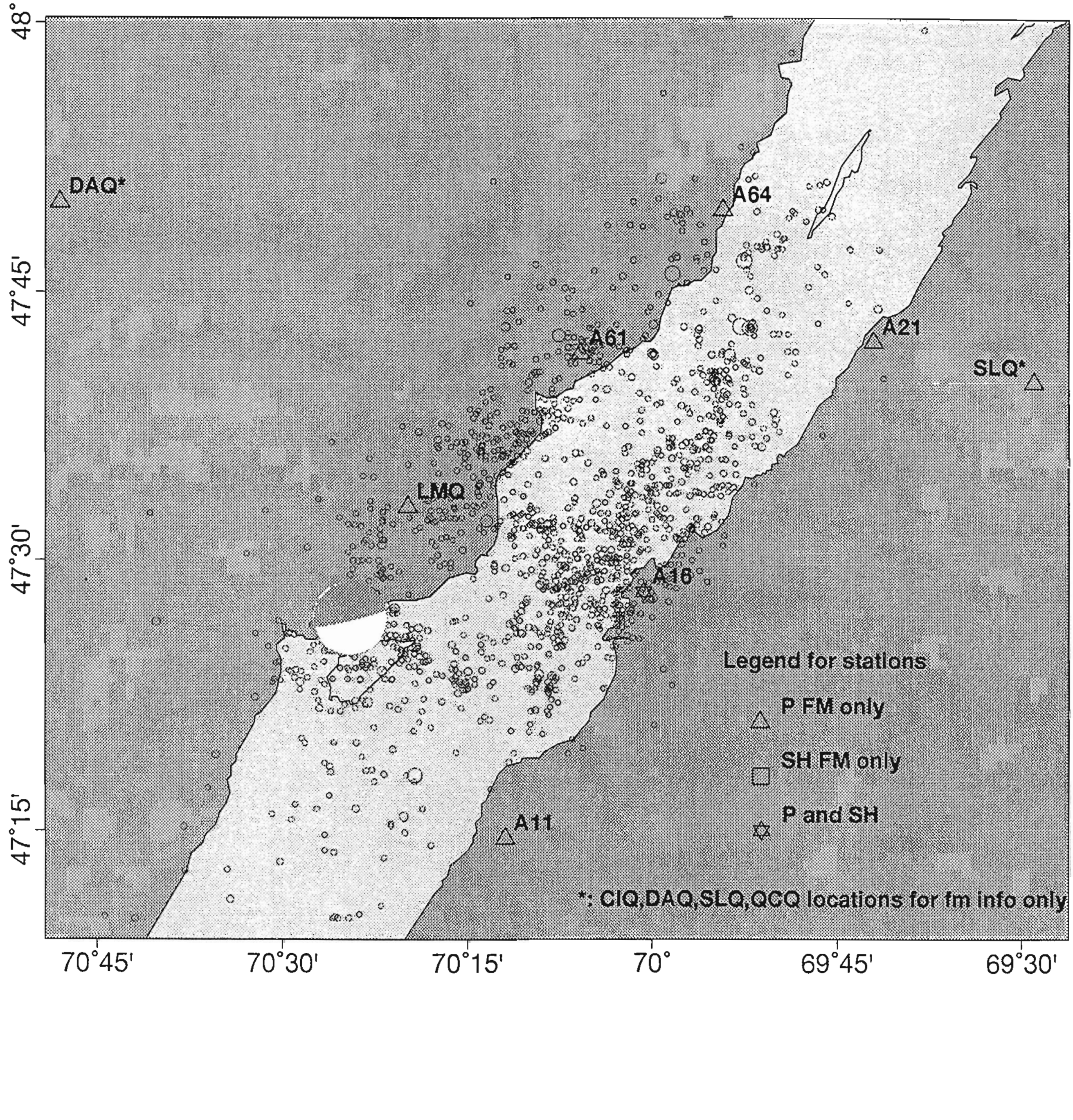
P Phases on Vertical Components



SH phases on Transverse Components



Location Map



Earthquake of 19930304 2202 Magnitude 3.1MN

1- Earthquake information and list of first motions.

Date	Time hhmm ss	Latitude	Longitude	Depth (km)	Mag	Sta/Pha
930304	2202 21.84	47.5145	-70.3621	4.39	3.1MN	6/011

COMMENTS:

LA MALBAIE, CHARLEVOIX, QUE. FELT IN ISLE AUX COUDRES, ST-HILARION
LES EBOULEMENT, ST-URBAIN AND BAIE-ST-PAUL.
$ TRQ NOISY; NO MAGNITUDE; LMN DEAD
$ LMQ PHASES X'ED OUT DUE TO SUSPECTED TIMING DESCREPANCY
$ BETWEEN CNSN AND CLTN, AND TO FIR-FILTER RINGING BEFORE PG
$ MNT,GSQ SG INDISTINCT
$ CIQ first motion read by Reynald Du Berger in Chicoutimi.
$ Sg on A21 has large residual but is quite clear.
$
$ The Sg lines of some stations include the SH FM.
$ The convention used is the Virginia Tech convention used in FOCMEC:
$ <: SH first motion to left (back to event) impulsive
$ >: SH first motion to right (back to event) impulsive
$ Preliminary Focmec computed by ML.

Sta	Pha	Dist (km)	Azim	Take-off Angle	FM
LMQ	PG	5	35	-46	D
A54	PG	7	210	-60	D
A54	SG	7	210	-60	<
SHQ	PG	10	344	-67	C
A16	PG	27	100	-81	D
A16	SG	27	100	-81	>
A61	PG	29	46	-81	D
A11	PG	33	158	-82	C
LPQ	PG	33	126	-82	C
A64	PG	50	45	-85	D
A64	SG	50	45	-85	>
A21	PG	55	67	-85	D
DAQ	PG	83	308	-87	C
CIQ	PG	90	339	-87	C
SLQ	PG	103	80	-88	D

Number of P first motions: 12
Number of SH first motions: 3

2- Most Representative Solution.

A total of 343 solutions were found using a b axis increment of 1 degree. The following parameters describe the most representative solution, which was derived from the average B, P, and T axes listed below.

dip,strike,rake	59.55	279.68	39.09		
dip,strike,rake	57.08	167.30	142.86	:auxiliary plane	
lower hem. trend, plunge of a,n	77.30	32.92	189.68	30.45	
lower hem. trend & plunge of b	311.64	42.00			
lower hem. trend, plunge of p,t	42.98	1.49	134.63	47.96	

Average B, P, and T axes:

	B	P	T
Mean trend:	N 314	N 223	N 133
Mean Plunge:	45	1	45
Vector Magnitude:	340	341	342
Mean length of resulting vector:	0.993	0.995	0.996

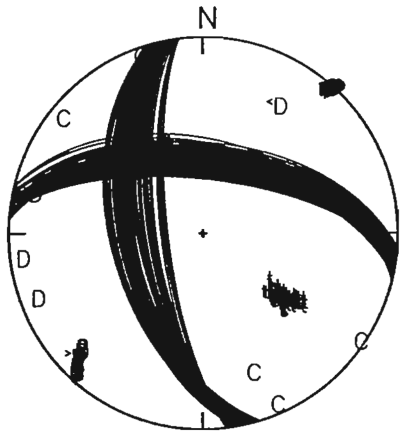
3- Misfits.

All 12 P first motions agreed with the solution.
All 3 SH first motions agreed with the solution.

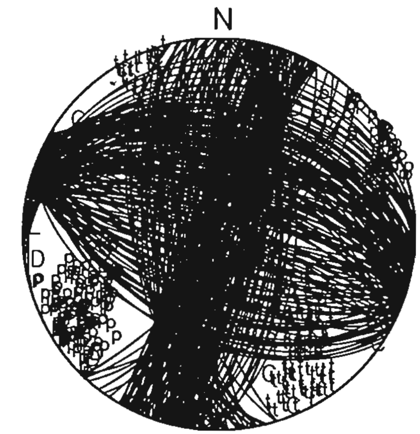
4- Rating of the focal mechanism.

The solution has an A rating based on the small number of P and SH misfits (0 /100 and 0 /100 respectively) and on the good constraints on the P, T and B axes (value of 0.994).

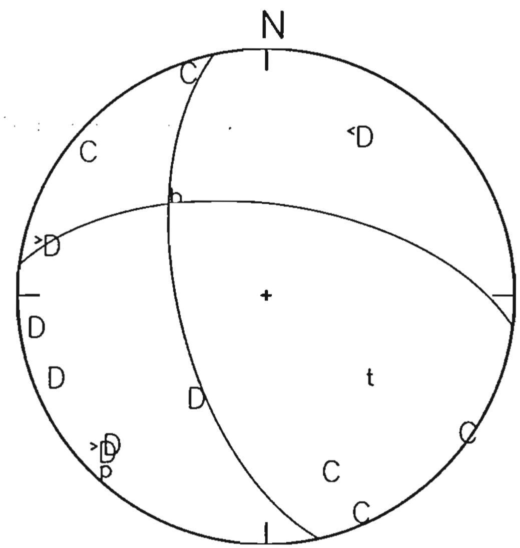
19930304 22:00 U.T.



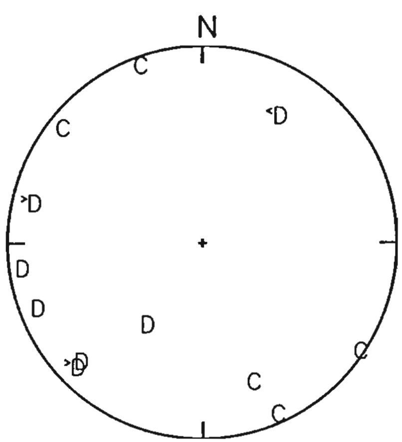
P, SH and P–Nodal



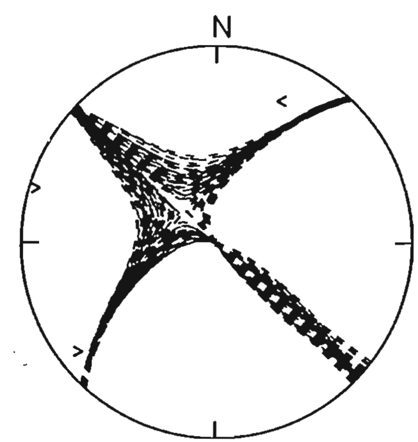
Solution with P FM only.



Best Solution

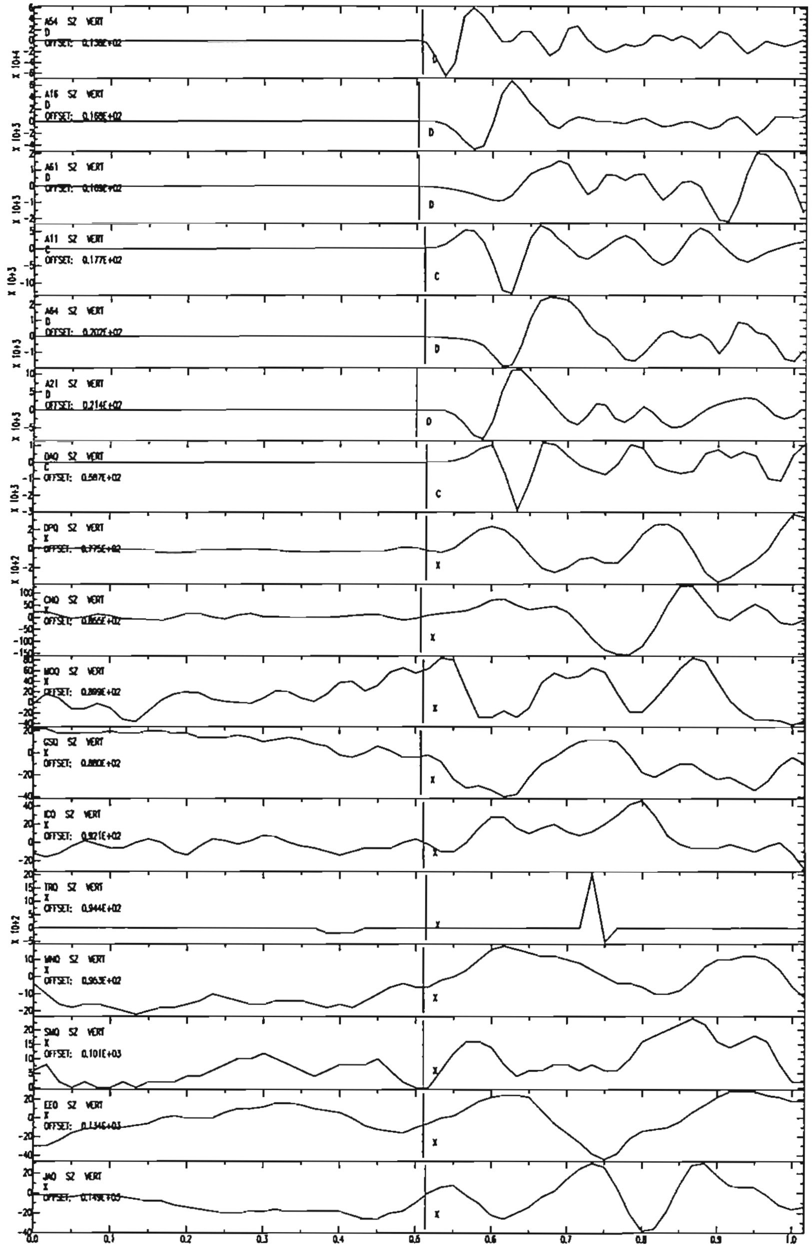


First Motions Only

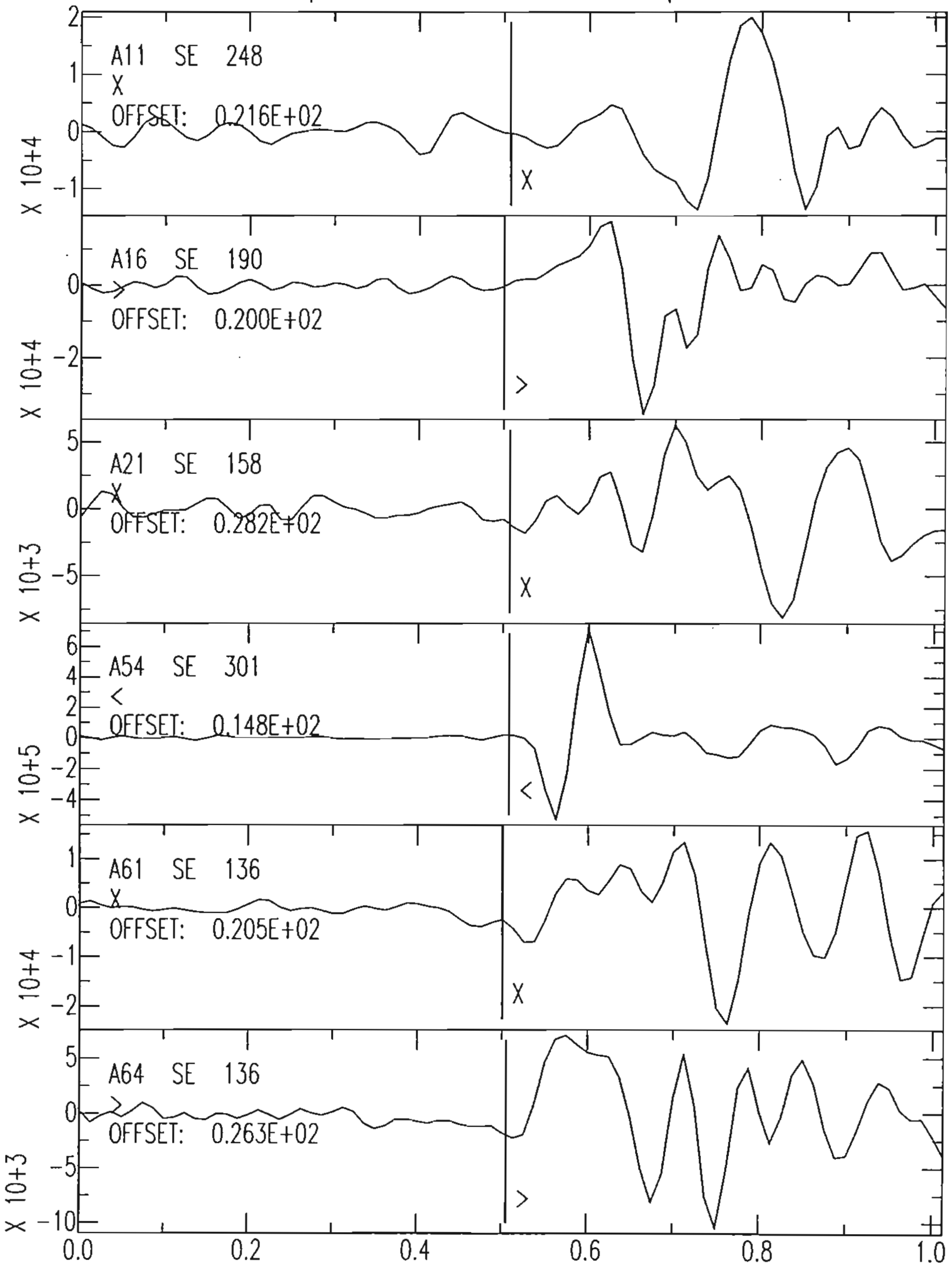


SH Motions and Lines.

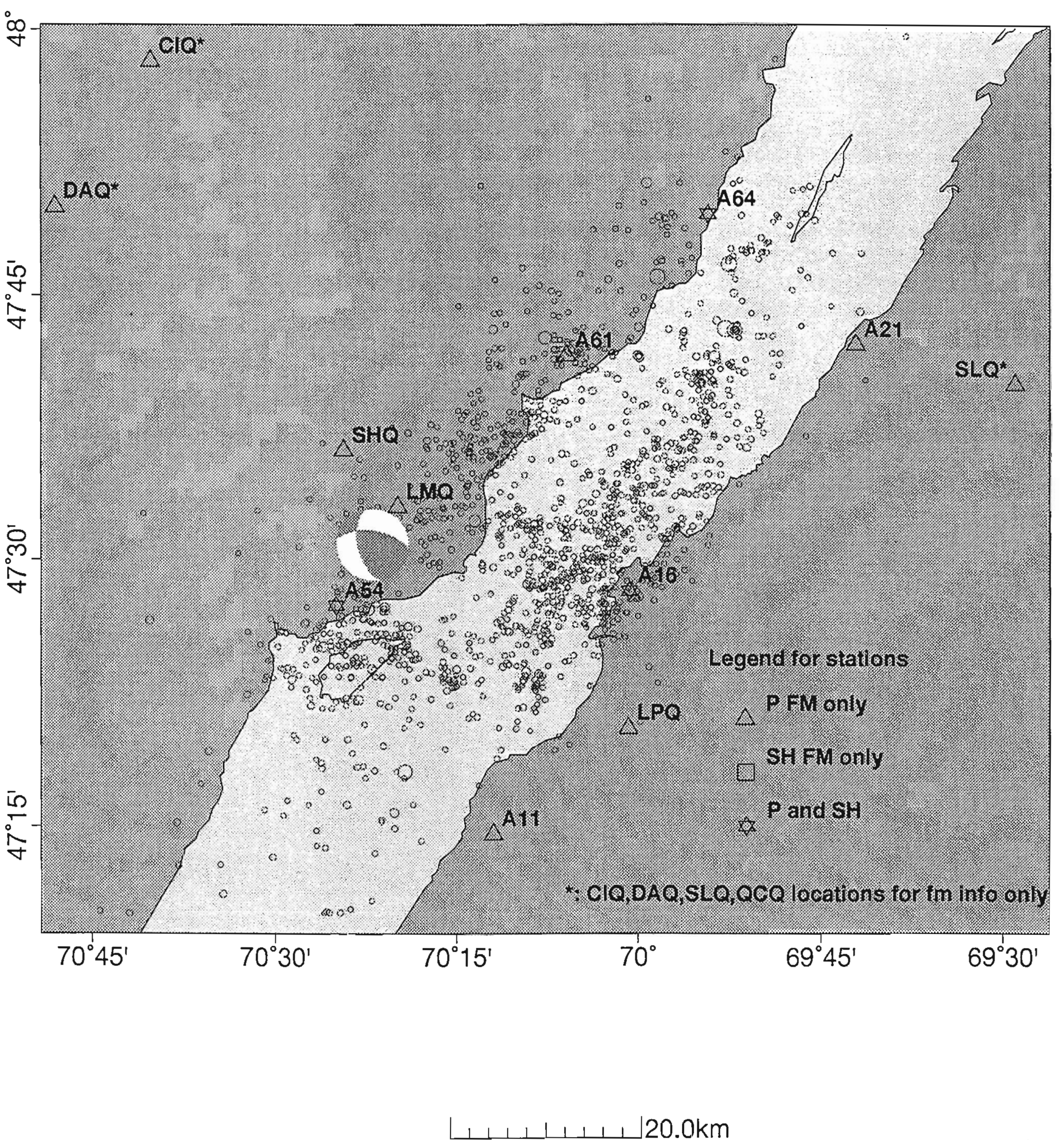
P Phases on Vertical Components



SH phases on Transverse Components



Location Map



Earthquake of 19930807 2125 Magnitude 3.1MN

1- Earthquake information and list of first motions.

Date	Time hhmm ss	Latitude	Longitude	Depth (km)	Mag	Sta/Pha
930807	2125 31.92	47.6681	-69.8893	7.75	3.1MN	7/014

COMMENTS:

19 KM E OF LA MALBAIE, CHARLEVOIX, QUE.
$ LPQ PHASES X'ED OUT DUE TO SUSPECTED TIMING DESCREPANCY
$ BETWEEN CNSN AND CLTN, AND TO FIR-FILTER RINGING BEFORE PG
$ ECTN RESCANNED BY PFC USING DAN 1.83I; SLIGHT CHANGES TO PN,SG PHASES
$ PN NOT VISIBLE AT MNT
$ LPQ DATA NOT SAVED; SG AND AMPLITUDE UNAVAILABLE
$ CIQ first motion read by Reynald Du Berger in Chicoutimi.
$ SLQ down.
$
$ The Sg lines of some stations include the SH FM.
$ The convention used is the Virginia Tech convention used in FOCMEC:
$ <: SH first motion to left (back to event) impulsive
$ >: SH first motion to right (back to event) impulsive

Sta	Pha	Dist (km)	Azim	Take-off Angle	FM
A61	PG	15	280	-63	D
A61	SG	15	280	-63	>
A21	PG	16	75	-63	D
A21	SG	16	75	-63	<
A64	PG	18	359	-66	C
A16	PG	24	202	-72	C
LMQ	PG	36	248	-78	D
SHQ	PG	39	260	-79	D
A54	PG	46	239	-80	D
A11	PG	53	206	-82	D
CIQ	PG	95	315	-85	D
DAQ	PG	107	288	-86	D

Number of P first motions: 10
Number of SH first motions: 2

2- Most Representative Solution.

A total of 1144 solutions were found using a b axis increment of 2 degree. The following parameters describe the most representative solution, which was derived from the average B, P, and T axes listed below.

dip,strike,rake	53.32	164.64	72.44		
dip,strike,rake	40.13	12.55	112.05	:auxiliary plane	
lower hem. trend, plunge of a,n	282.55	49.87	74.64	36.68	
lower hem. trend & plunge of b	175.34	14.00			
lower hem. trend, plunge of p,t	267.04	6.79	22.25	74.38	

Average B, P, and T axes:

	B	P	T
Mean trend:	N 21	N 273	N 72
Mean Plunge:	10	6	84
Vector Magnitude:	397	1124	1116
Mean length of resulting vector:	0.347	0.982	0.975

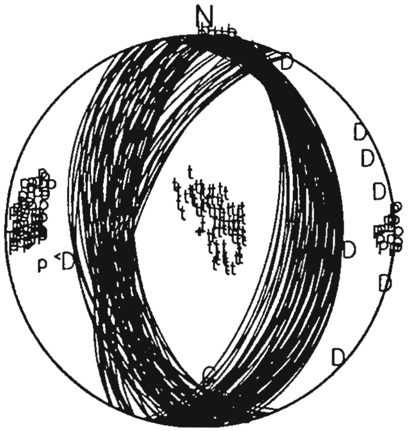
3- Misfits.

All 10 P first motions agreed with the solution.
All 2 SH first motions agreed with the solution.

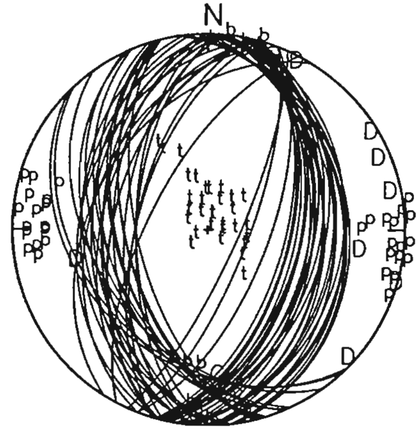
4- Rating of the focal mechanism.

The solution is rejected (rating X) based on the high number of P and SH misfits (0 /100 and 0 /100 respectively) and the absence of constraints on the P, T and B axes (value of 0.768).

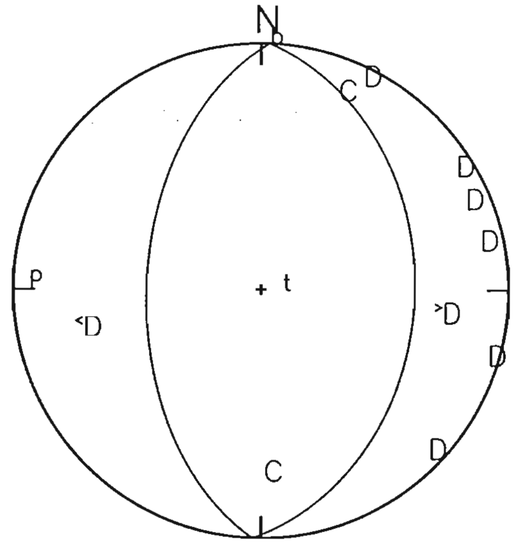
19930807 21:25 U.T.



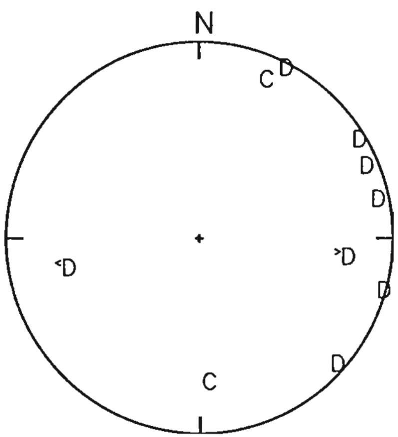
P, SH and P—Nodal



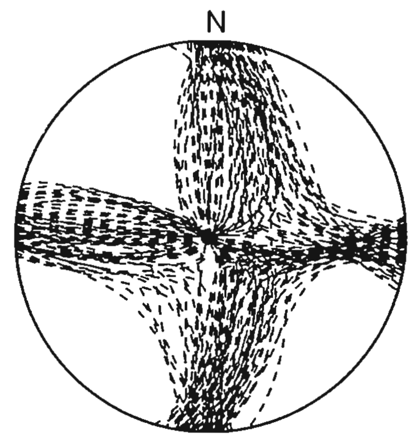
Solution with P FM only.



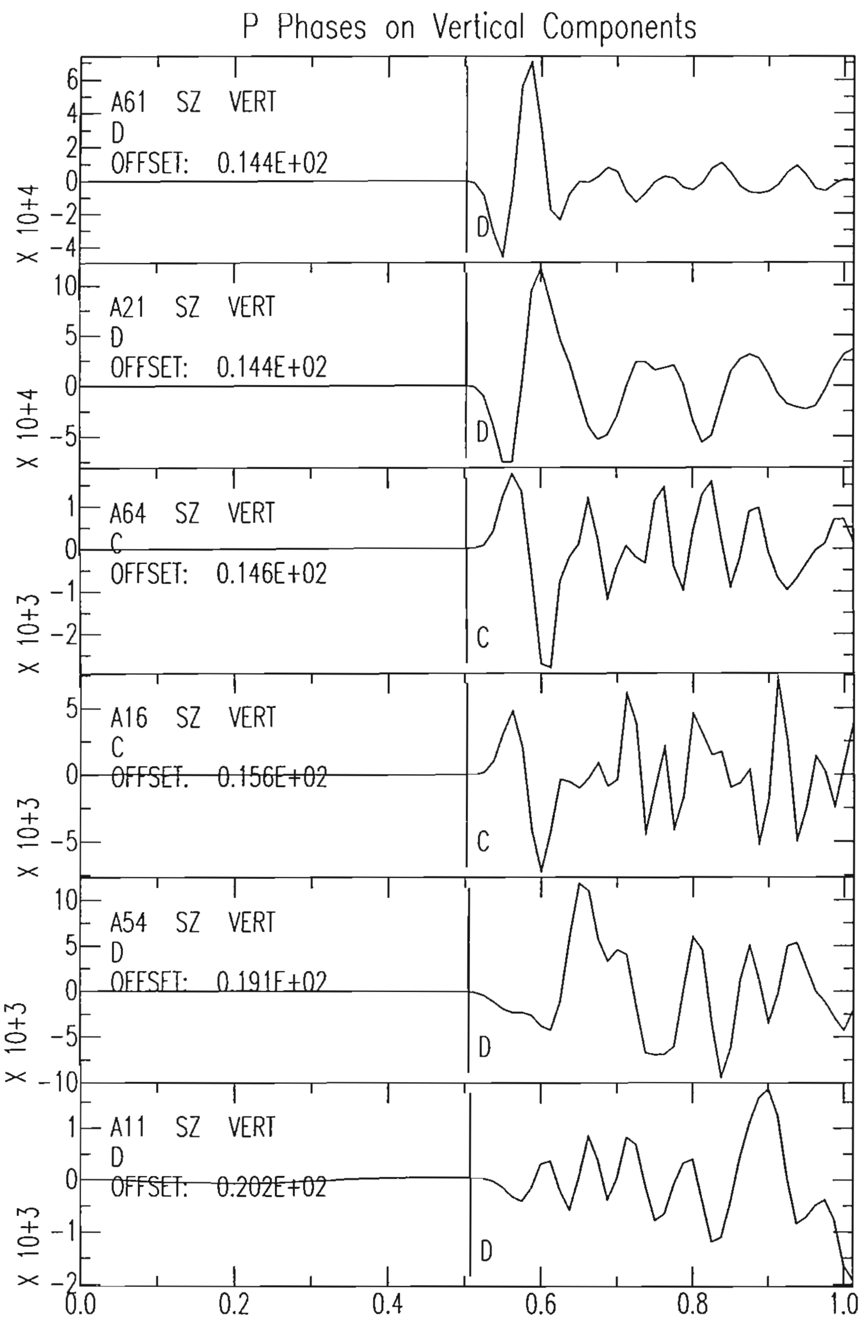
Best Solution

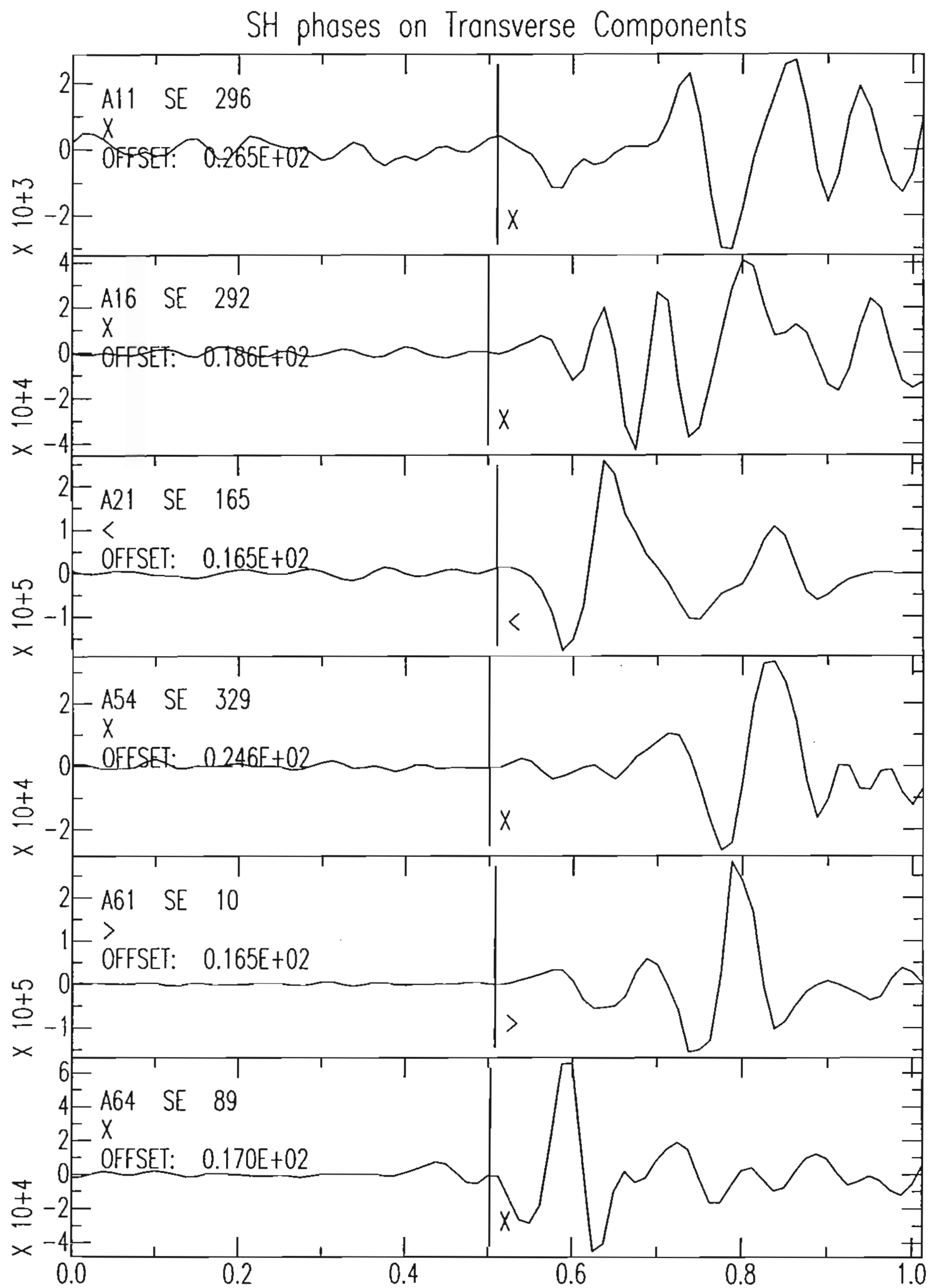


First Motions Only

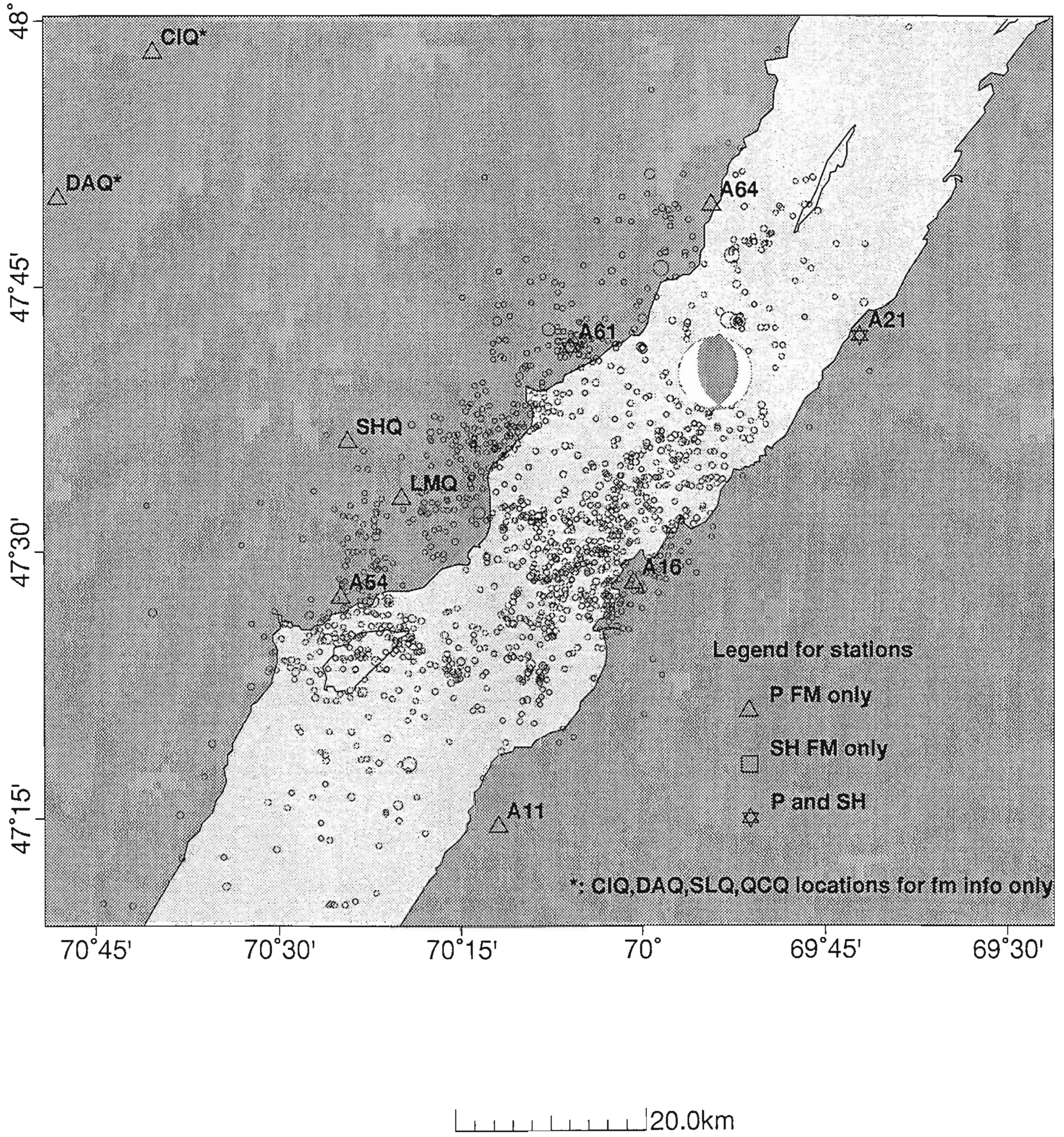


SH Motions and Lines.


P Phases on Vertical Components
A61 SZ VERT
D
OFFSET: 0.144E+02
A21 SZ VERT
D
OFFSET: 0.144E+02
A64 SZ VERT
C
OFFSET: 0.146E+02
A16 SZ VERT
C
OFFSET: 0.156E+02
A54 SZ VERT
D
OFFSET: 0.191E+02
A11 SZ VERT
D
OFFSET: 0.202E+02
X 10+4
X 10+4
X 10+3
X 10+3
X 10+3
X 10+3
0.0
0.2
0.4
0.6
0.8
1.0


SH phases on Transverse Components
A11 SE 296
X
OFFSET: 0.265E+02
A16 SE 292
X
OFFSET: 0.186E+02
A21 SE 165
<
OFFSET: 0.165E+02
A54 SE 329
X
OFFSET: 0.246E+02
A61 SE 10
>
OFFSET: 0.165E+02
A64 SE 89
X
OFFSET: 0.170E+02
X 10+3
X 10+4
X 10+5
X 10+4
X 10+5
X 10+4
0.0
0.2
0.4
0.6
0.8
1.0

Location Map



142

Earthquake of 19931230 2301 Magnitude 3.8MN

1- Earthquake information and list of first motions.

Date	Time hhmm ss	Latitude	Longitude	Depth (km)	Mag	Sta/Pha
931230	2301 47.69	47.4532	-70.3609	5.94	3.8MN	6/012

COMMENTS:

10 KM E OF BAIE-SAINT-PAUL, CHARLEVOIX, QUE.
FELT AT BAIE-SAINT-PAUL AND LA MALBAIE.
$ LMQ,LPQ PHASES X'ED OUT DUE TO SUSPECTED TIMING DESCREPANCY
$ BETWEEN CNSN AND CLTN, AND TO FIR-FILTER RINGING BEFORE PG
$KAO RECORD CHANGE; NOT ON GTO
$ CIQ first motion read by Reynald Du Berger in Chicoutimi.
$
$ The Sg lines of some stations include the SH FM.
$ The convention used is the Virginia Tech convention used in FOCMEC:
$ <: SH first motion to left (back to event) impulsive
$ >: SH first motion to right (back to event) impulsive
$ Preliminary Focmec computed by ML

Sta	Pha	Dist (km)	Azim	Take-off Angle	FM
A54	PG	4	276	-33	D
A54	SG	4	276	-33	>
LMQ	PG	11	14	-61	D
SHQ	PG	17	350	-71	C
A11	PG	26	152	-77	C
A11	SG	26	152	-77	>
A16	PG	27	86	-78	D
A16	SG	27	86	-78	>
LPQ	PG	29	115	-78	D
A61	PG	34	37	-80	D
A61	SG	34	37	-80	<
A64	PG	54	40	-84	D
A21	PG	58	61	-84	D
DAQ	PG	87	311	-86	C
CIQ	PG	97	341	-86	C
QCQ	PG	102	223	-87	D
SLQ	PG	104	76	-87	D
DPQ	PN	203	246	49	D

Number of P first motions: 14
Number of SH first motions: 4

2- Most Representative Solution.

A total of 112 solutions were found using a b axis increment of 2 degree. The following parameters describe the most representative solution, which was derived from the average B, P, and T axes listed below.

dip,strike,rake	86.75	116.31	23.79		
dip,strike,rake	66.25	24.88	176.45	:auxiliary plane	
lower hem. trend, plunge of a,n	294.88	23.75	26.31	3.25	
lower hem. trend & plunge of b	123.63	66.00			
lower hem. trend, plunge of p,t	248.17	14.17	343.15	18.96	

Average B, P, and T axes:

	B	P	T
Mean trend:	N 149	N 250	N 341
Mean Plunge:	59	5	30
Vector Magnitude:	107	110	109
Mean length of resulting vector:	0.955	0.978	0.969

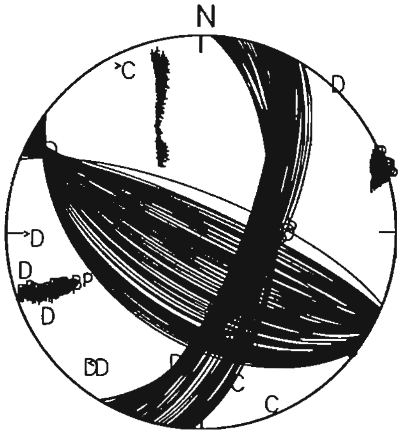
3- Misfits.

All 14 P first motions agreed with the solution.
All 4 SH first motions agreed with the solution.

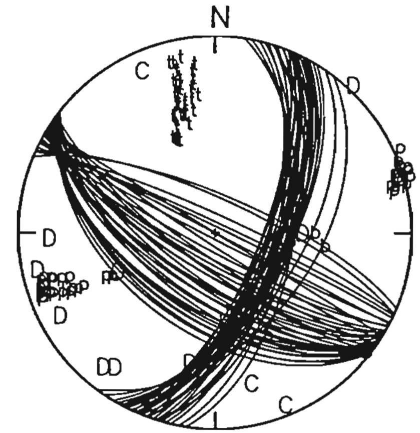
4- Rating of the focal mechanism.

The solution is rejected (rating X) based on the high number of P and SH misfits (0 /100 and 0 /100 respectively) and the absence of constraints on the P, T and B axes (value of 0.967).

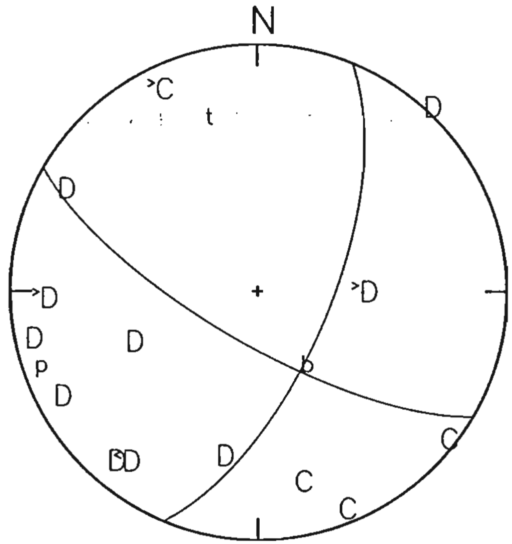
19931230 23:00 U.T.



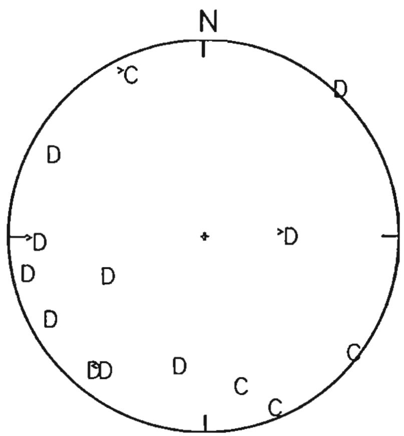
P, SH and P–Nodal



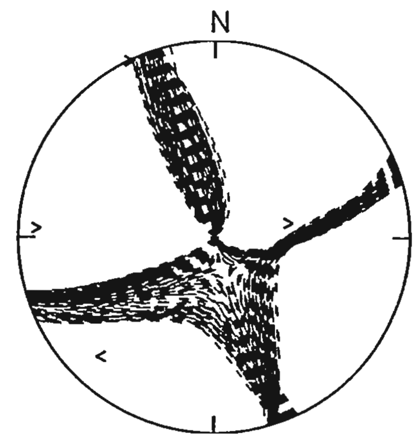
Solution with P FM only.



Best Solution

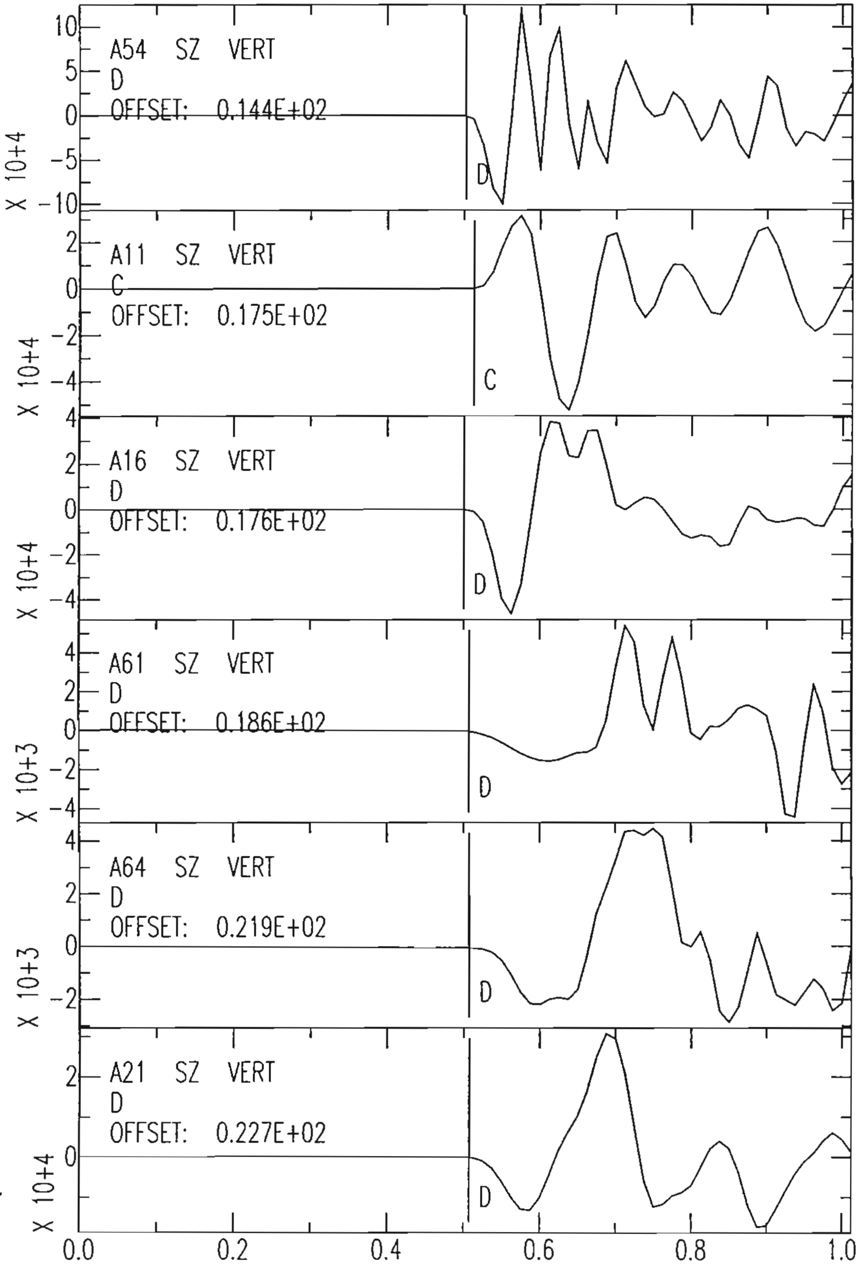


First Motions Only

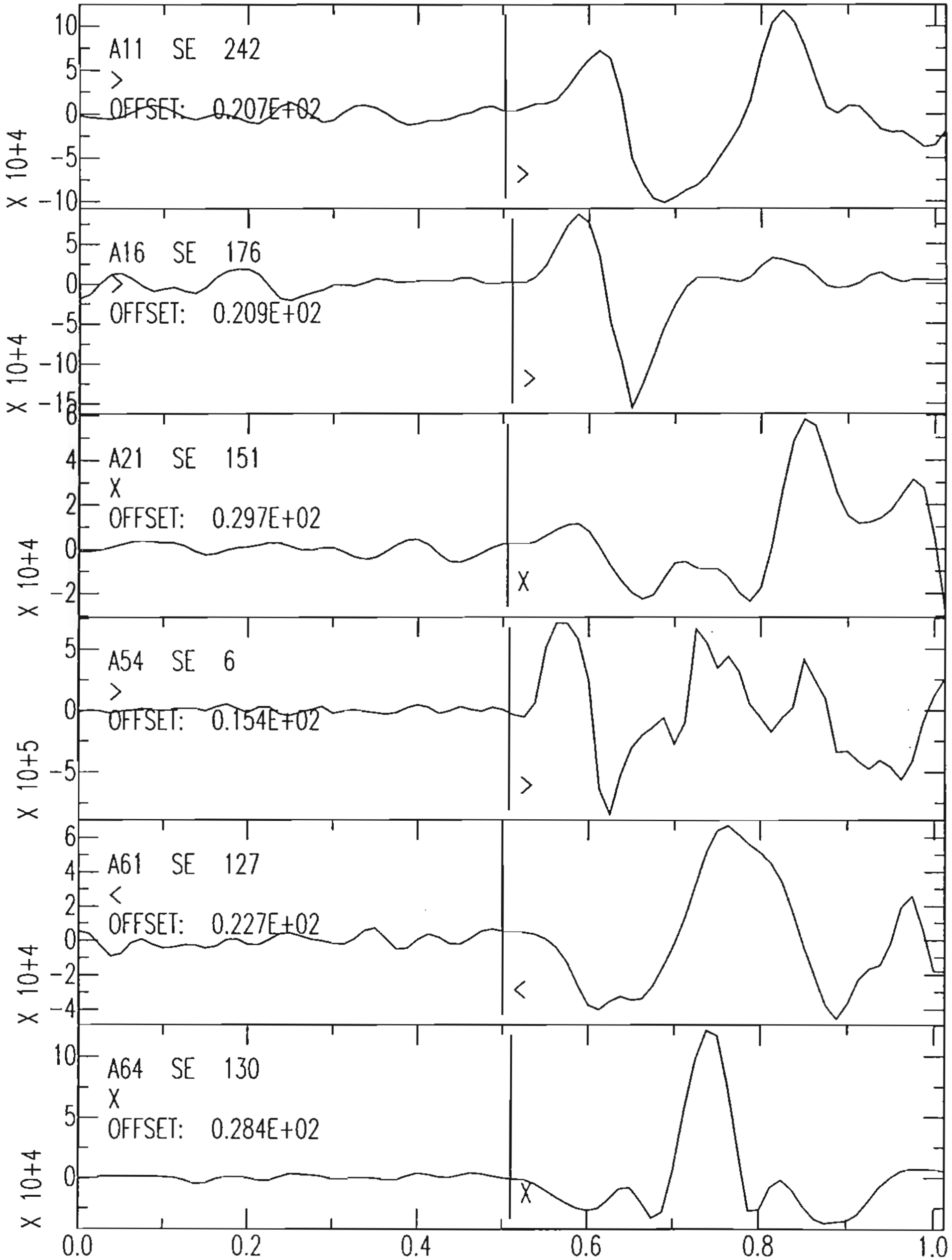


SH Motions and Lines.

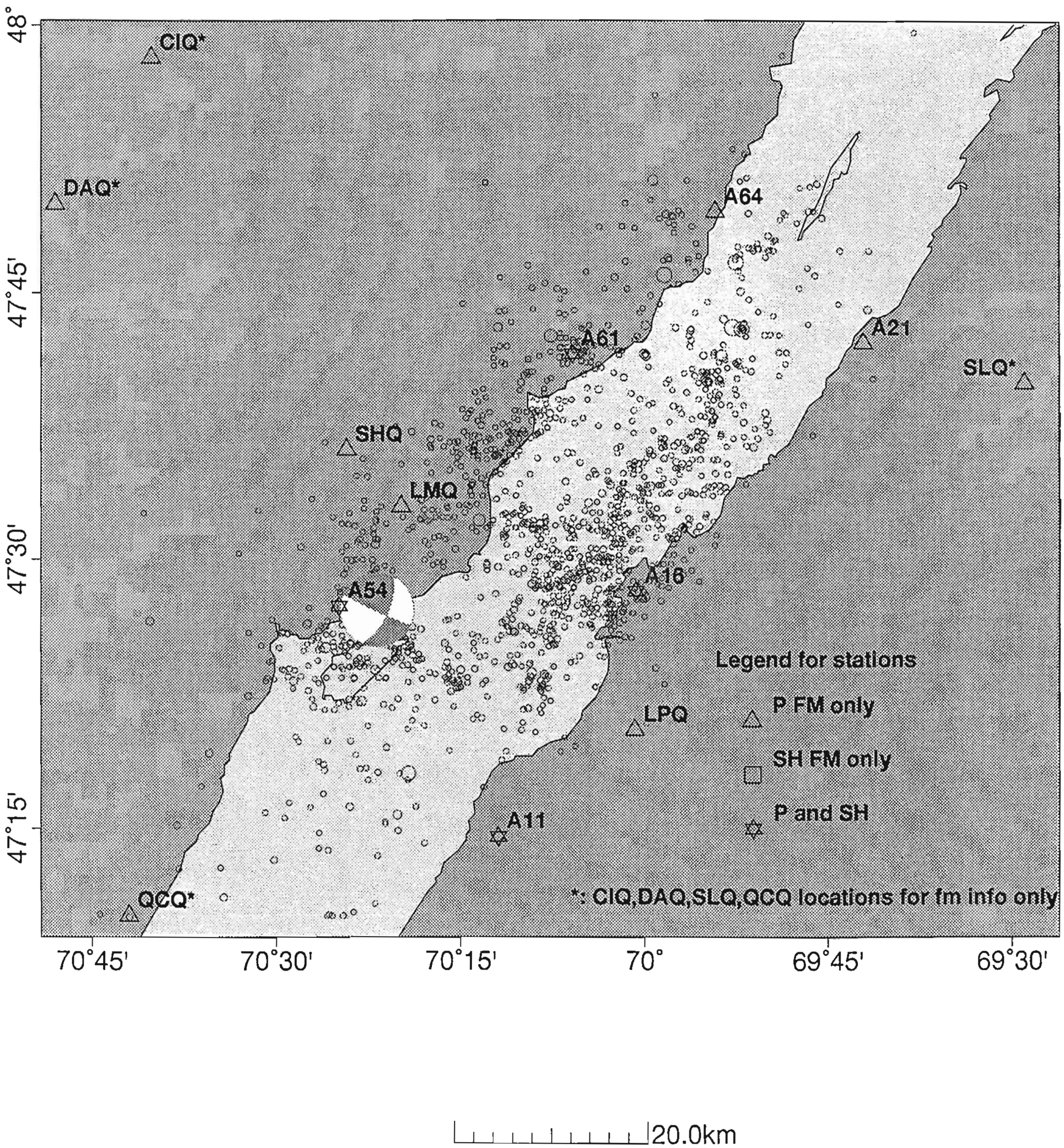
P Phases on Vertical Components



SH phases on Transverse Components



Location Map



147

Earthquake of 19940925 0053 Magnitude 4.3MN

1- Earthquake information and list of first motions.

Date	Time hhmm ss	Latitude	Longitude	Depth (km)	Mag	Sta/Pha
940925	0053 29.46	47.7518	-69.9612	12.18	4.3MN	6/012

COMMENTS:

19 KM NE OF LA MALBAIE, CHARLEVOIX, QUE.
CHARLEVOIX-KAMOURASKA, QUE.; LARGELY FELT IN CHARLEVOIX AS WELL AS
ON THE SOUTH SHORE. IN CHARLEVOIX, REPORTED FELT IN:
ST-HILARION, NOTRE-DAME-DES-MONTS, ST-AIME-DES-LACS, LA MALBAIE, CLERMONT,
POINTE-AU-PIC, LES EBOULEMENTS, BAIE-ST-PAUL, ST-URBAIN,
AND ON ILE-AUX-COUDRES. FELT AS FAR EAST AS NORTHWESTERN NEW
BRUNSWICK, AS FAR NORTH AS LES ESCOUMINS,AS FAR SOUTH AS TO BEAUPORT (1 REPORT)
AND AS FAR WEST AS JONQUIERE.
$ CIQ READING FROM REYNALD DU BERGER, UQAC.
$ CHARLEVOIX FELT REPORTS FROM HILARION BERGERON.
$ SONT PHASES READ BY UWO NOT GSC
$ N.Y. STATE PHASES FROM F. REVETTA.
$ SLTN ADDED BY MGC
$ SWO BAD SIGNAL; ELO NO RESPONSE CURVE; CODE DISCREPANCY
$ CIQ first motion read by Reynald Du Berger in Chicoutimi.
$SWX SZ Sn XB0056 42.60 L -0.570 0.00 867.00 266.0W 4.40 MN 0.00 0.00
$SWX SZ Sg XB0057 23.27 L -8.430 0.00 867.00 266.0W 4.40 MN 0.00 0.58
$SWX SZ Trac Y0057 24.27 L 0.000 0.00 867.00 266.0W 4.40 MN 0.00 0.58
$
$ The Sg lines of some stations include the SH FM.
$ The convention used is the Virginia Tech convention used in FOCMEC:
$ <: SH first motion to left (back to event) impulsive
$ >: SH first motion to right (back to event) impulsive
$ Preliminary Focmec computed by ML.

Sta	Pha	Dist (km)	Azim	Take-off Angle	FM
A64	PG	10	32	-39	C
A64	SG	10	32	-39	>
A61	PG	12	236	-44	C
A61	SG	12	236	-44	<
A21	PG	21	105	-60	D
A21	SG	21	105	-60	<
A16	PG	31	186	-69	C
SHQ	PG	37	244	-72	D
A54	PG	47	226	-76	C
A54	SG	47	226	-76	>
A11	PG	59	198	-78	D
SLQ	PG	72	97	-80	D
CIQ	PG	85	313	-82	D

DAQ	PG	99	284	-83	D
QCQ	PG	147	223	-85	D

Number of P first motions: 11
Number of SH first motions: 4

2- Most Representative Solution.

A total of 77 solutions were found using a b axis increment of 1 degree. The following parameters describe the most representative solution, which was derived from the average B, P, and T axes listed below.

dip,strike,rake	56.00	37.00	90.00		
dip,strike,rake	34.00	217.00	90.00	:auxiliary plane	
lower hem. trend, plunge of a,n	127.00	56.00	307.00	34.00	
lower hem. trend & plunge of b	37.00	0.00			
lower hem. trend, plunge of p,t	127.00	11.00	307.00	79.00	

Average B, P, and T axes:

	B	P	T
Mean trend:	N 217	N 127	N 312
Mean Plunge:	1	9	81
Vector Magnitude:	77	77	77
Mean length of resulting vector:	0.999	0.998	0.999

3- Misfits.

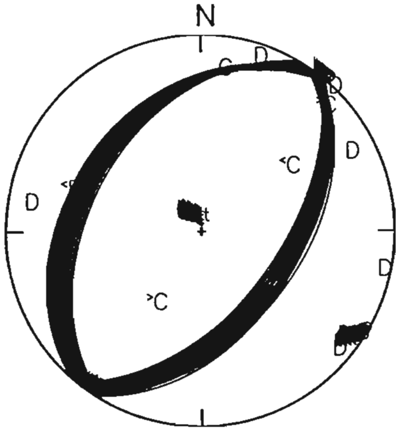
All 11 P first motions agreed with the solution.
Out of 4 SH first motions, a total of 1 did not fit the solutions (25/100).

Station Name	Number of misfits	Percentage of wrongs
A54	77	100

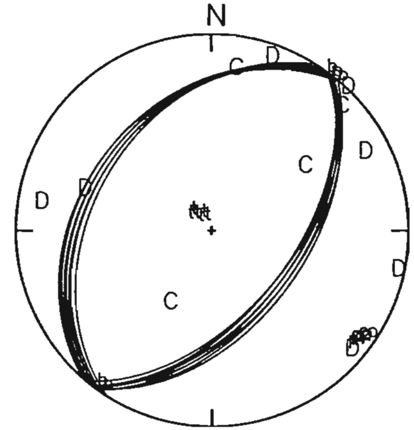
4- Rating of the focal mechanism.

The solution has an A rating based on the small number of P and SH misfits (0 /100 and 25 /100 respectively) and on the good constraints on the P, T and B axes (value of 0.999).

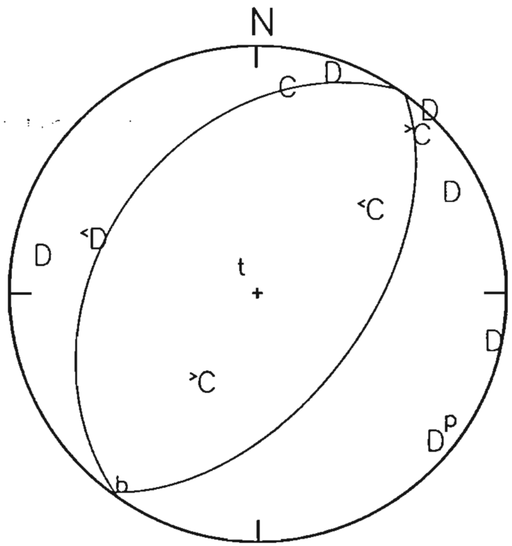
19940925 00:53 U.T.



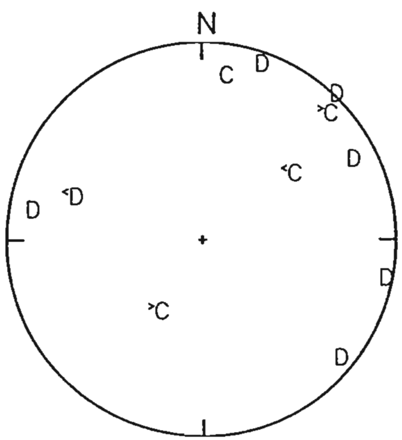
P, SH and P–Nodal



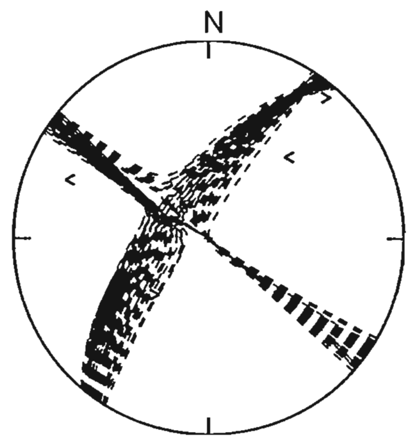
Solution with P FM only.



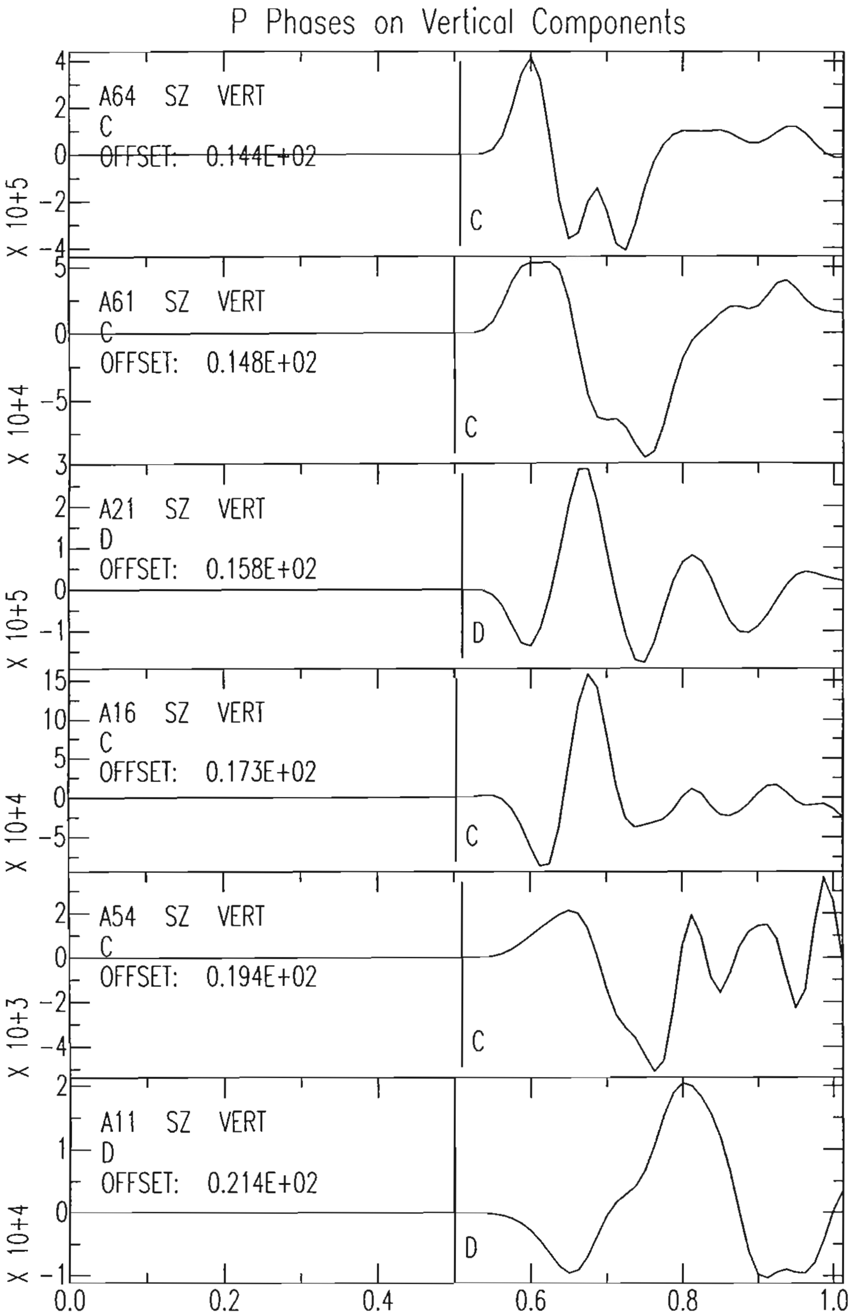
Best Solution

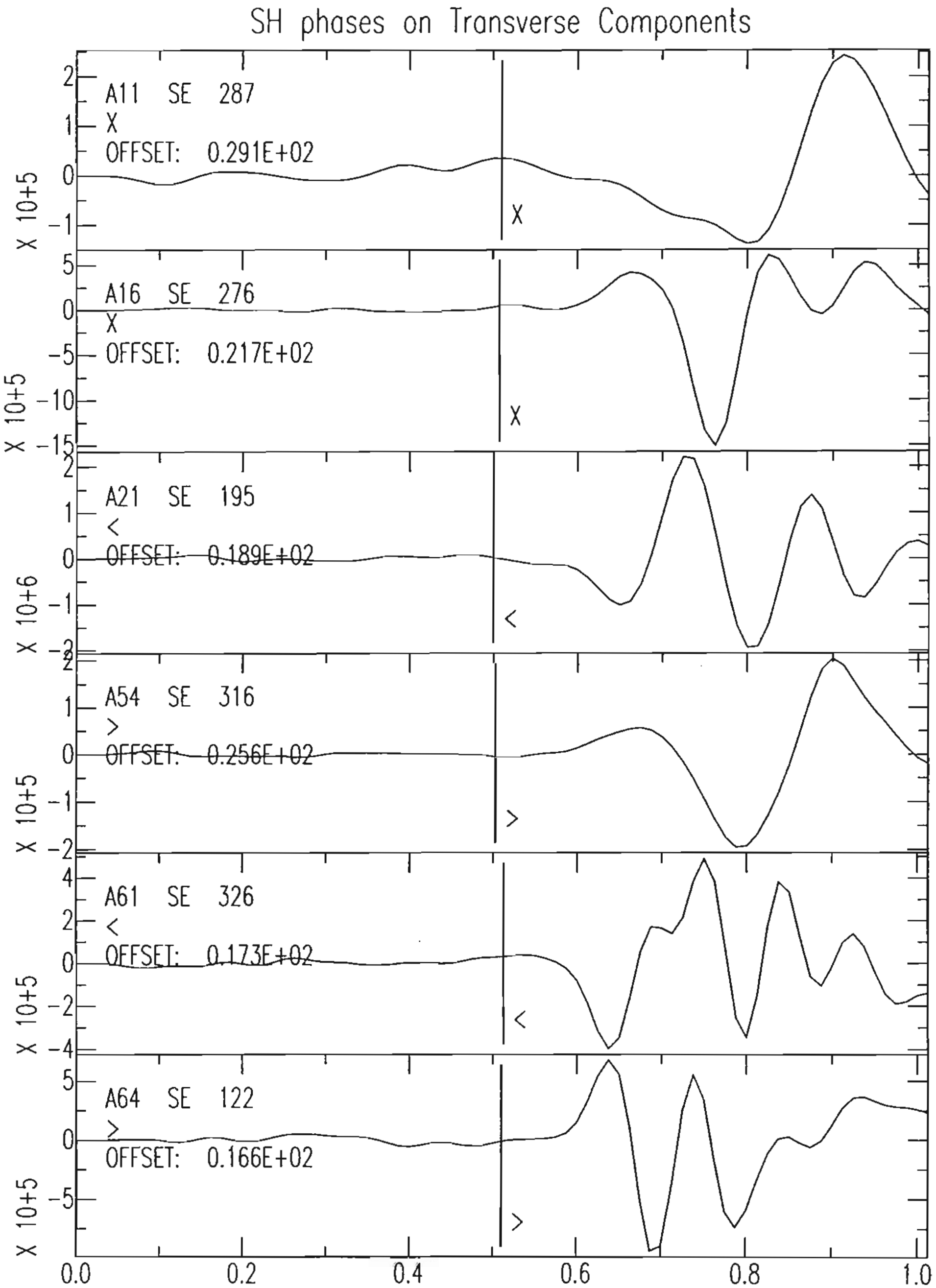


First Motions Only

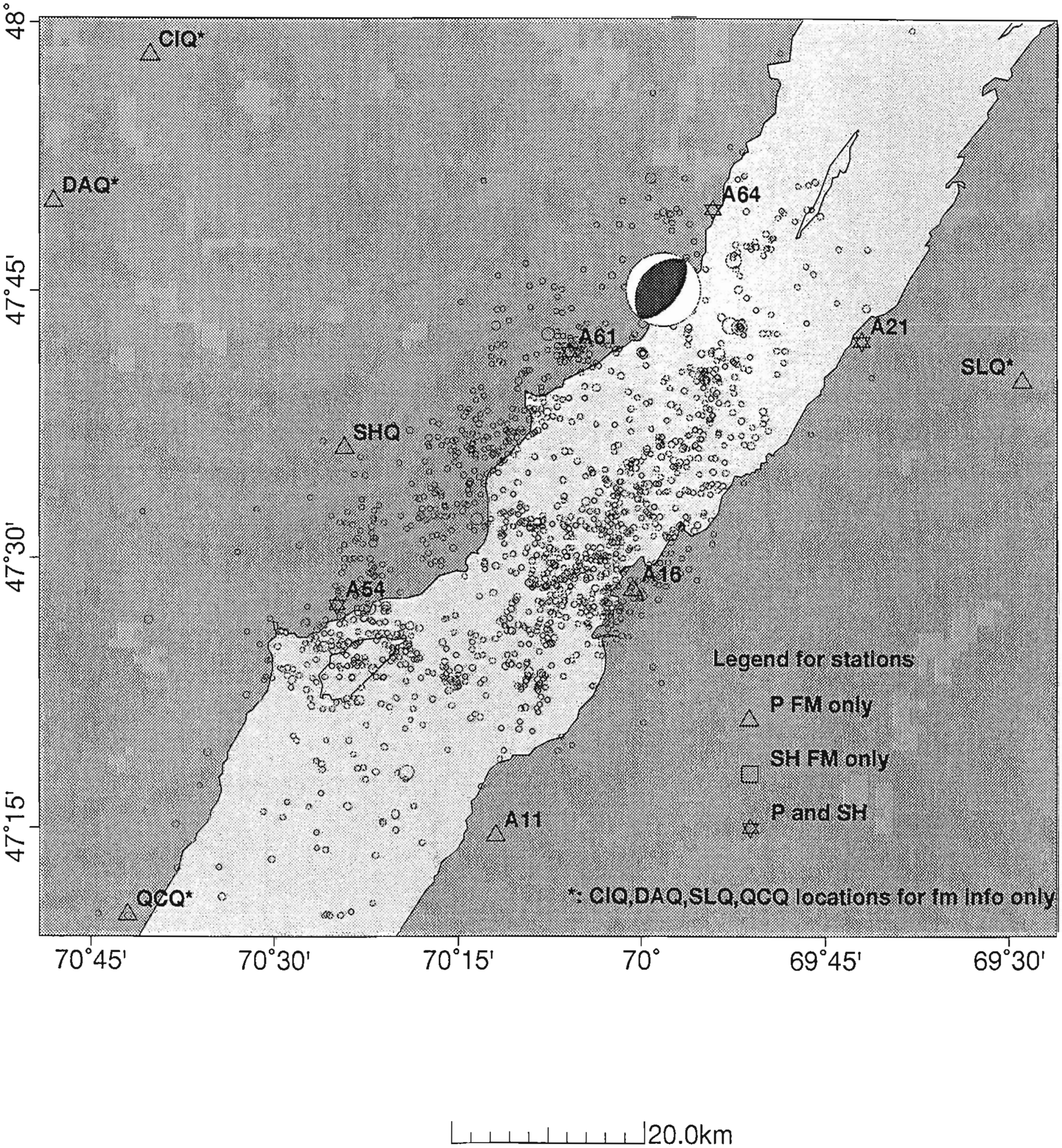


SH Motions and Lines.


P Phases on Vertical Components
A64 SZ VERT
C
OFFSET: 0.144E+02
A61 SZ VERT
C
OFFSET: 0.148E+02
A21 SZ VERT
D
OFFSET: 0.158E+02
A16 SZ VERT
C
OFFSET: 0.173E+02
A54 SZ VERT
C
OFFSET: 0.194E+02
A11 SZ VERT
D
OFFSET: 0.214E+02
X 10+5
X 10+4
X 10+5
X 10+4
X 10+3
X 10+4
0.0
0.2
0.4
0.6
0.8
1.0


SH phases on Transverse Components
A11 SE 287
X
OFFSET: 0.291E+02
A16 SE 276
X
OFFSET: 0.217E+02
A21 SE 195
<
OFFSET: 0.189E+02
A54 SE 316
>
OFFSET: 0.256E+02
A61 SE 326
<
OFFSET: 0.173E+02
A64 SE 122
>
OFFSET: 0.166E+02
X 10+5
X 10+5
X 10+6
X 10+5
X 10+5
X 10+5
0.0
0.2
0.4
0.6
0.8
1.0

Location Map



Earthquake of 19941201 1302 Magnitude 3.0MN

1- Earthquake information and list of first motions.

Date	Time hhmm ss	Latitude	Longitude	Depth (km)	Mag	Sta/Pha
941201	1302 47.14	47.4374	-70.3138	10.77	3.0MN	5/009

COMMENTS:

CHARLEVOIX, QUE.; FELT AT ILE-AUX-COUDRES, QUE.
$ NO HORIZONTALS FOR A11
$ RG LIKE PHASE ON A11 AND A16.
$ LMQ HAS SOME RINGING; HENCE PHASE READINGS WERE X'ED OUT.
$ LMQ first motion is uncertain.
$ PICKS ON A64 LOOK FINE; PROBLEM WITH NETWORK?
$ CIQ first motion read by Reynald Du Berger in Chicoutimi.
$
$ The Sg lines of some stations include the SH FM.
$ The convention used is the Virginia Tech convention used in FOCMEC:
$ <: SH first motion to left (back to event) impulsive
$ >: SH first motion to right (back to event) impulsive
$ Preliminary Focmec computed by ML.

Sta	Pha	Dist (km)	Azim	Take-off Angle	FM
A54	PG	8	286	-36	C
A54	SG	8	286	-36	>
LMQ	PG	12	356	-49	C
SHQ	PG	20	340	-61	C
A11	PG	23	158	-65	C
A16	PG	23	81	-65	C
A16	SG	23	81	-65	>
A61	PG	33	31	-72	D
A64	PG	54	36	-79	D
A21	PG	56	58	-79	D
DAQ	PG	91	310	-83	C
CIQ	PG	100	339	-84	C
SLQ	PG	101	75	-84	C

Number of P first motions: 11
Number of SH first motions: 2

2- Most Representative Solution.

A total of 197 solutions were found using a b axis increment of 2 degree. The following parameters describe the most representative solution, which was derived from the average B, P, and T axes listed below.

dip,strike,rake	68.69	69.61	-15.26		
dip,strike,rake	75.81	165.27	-157.98	:auxiliary plane	
lower hem. trend, plunge of a,n	75.27	14.19	339.61	21.31	
lower hem. trend & plunge of b	196.49	64.00			
lower hem. trend, plunge of p,t	28.70	25.49	296.40	4.80	

Average B, P, and T axes:

	B	P	T
Mean trend:	N 221	N 31	N 124
Mean Plunge:	62	28	4
Vector Magnitude:	194	195	196
Mean length of resulting vector:	0.983	0.989	0.993

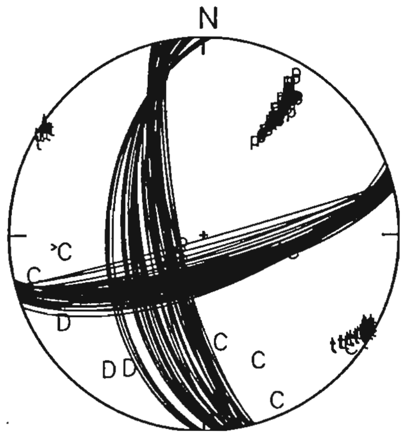
3- Misfits.

All 11 P first motions agreed with the solution.
All 2 SH first motions agreed with the solution.

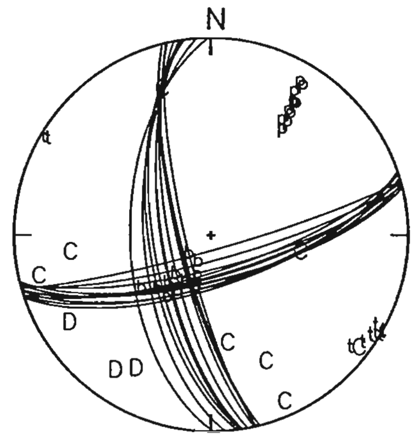
4- Rating of the focal mechanism.

The solution has a B rating based on the number of P and SH misfits (0 /100 and 0 /100 respectively) and on the constraints on the P, T and B axes (value of 0.988).

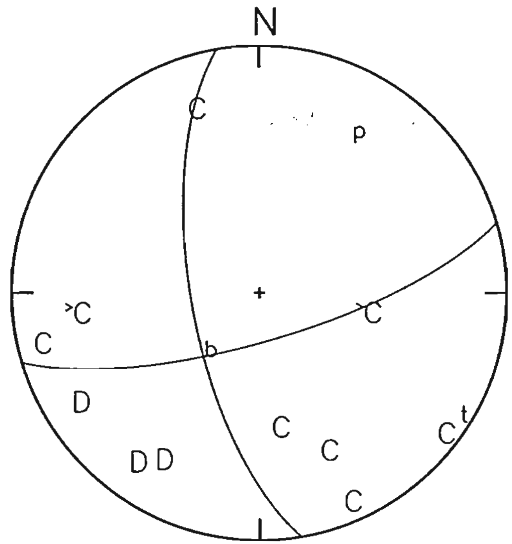
19941201 13:03 U.T.



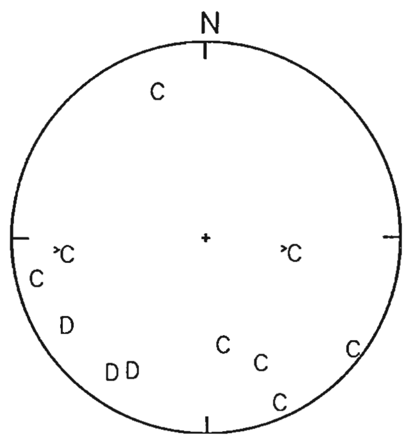
P, SH and P–Nodal



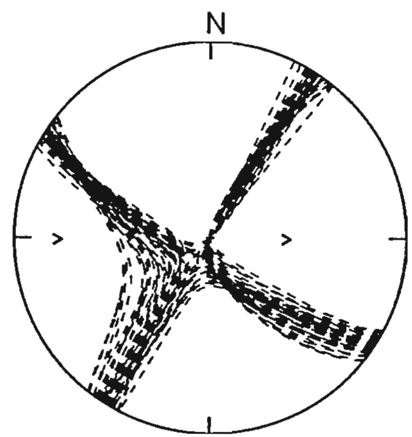
Solution with P FM only.



Best Solution

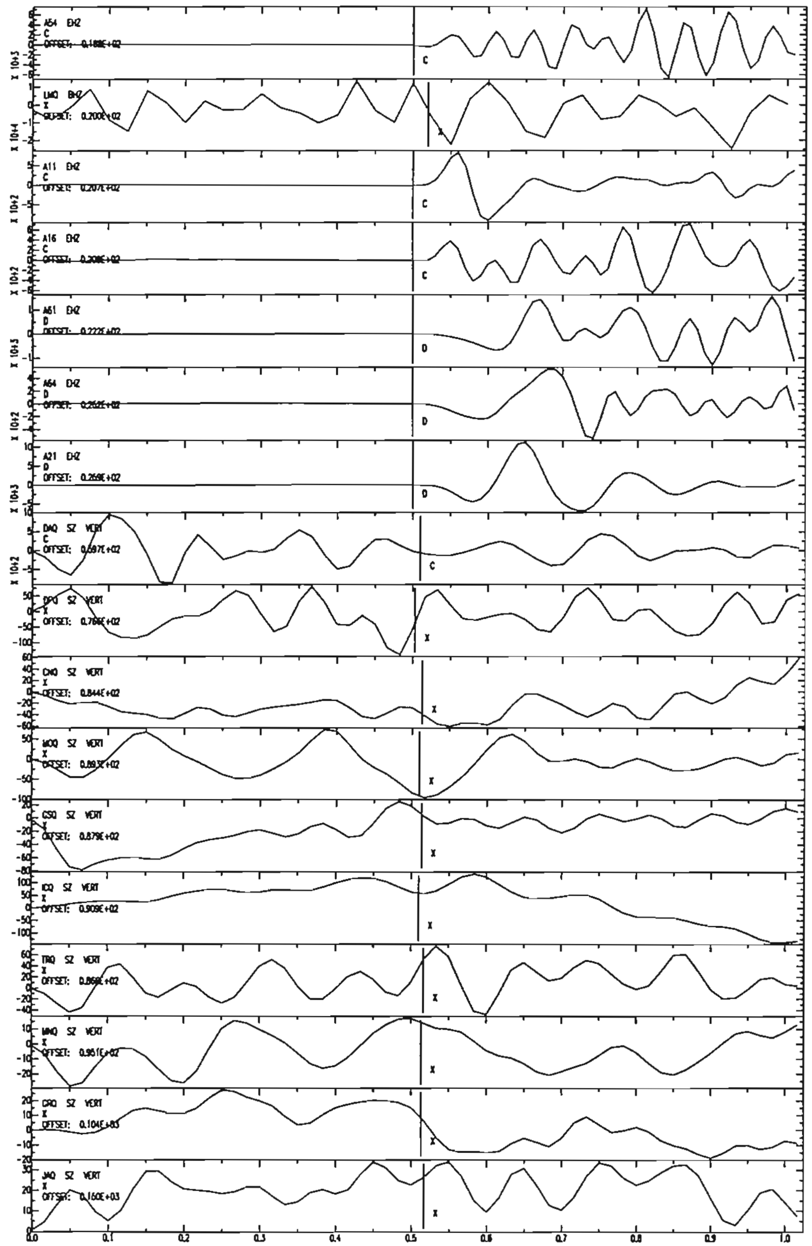


First Motions Only

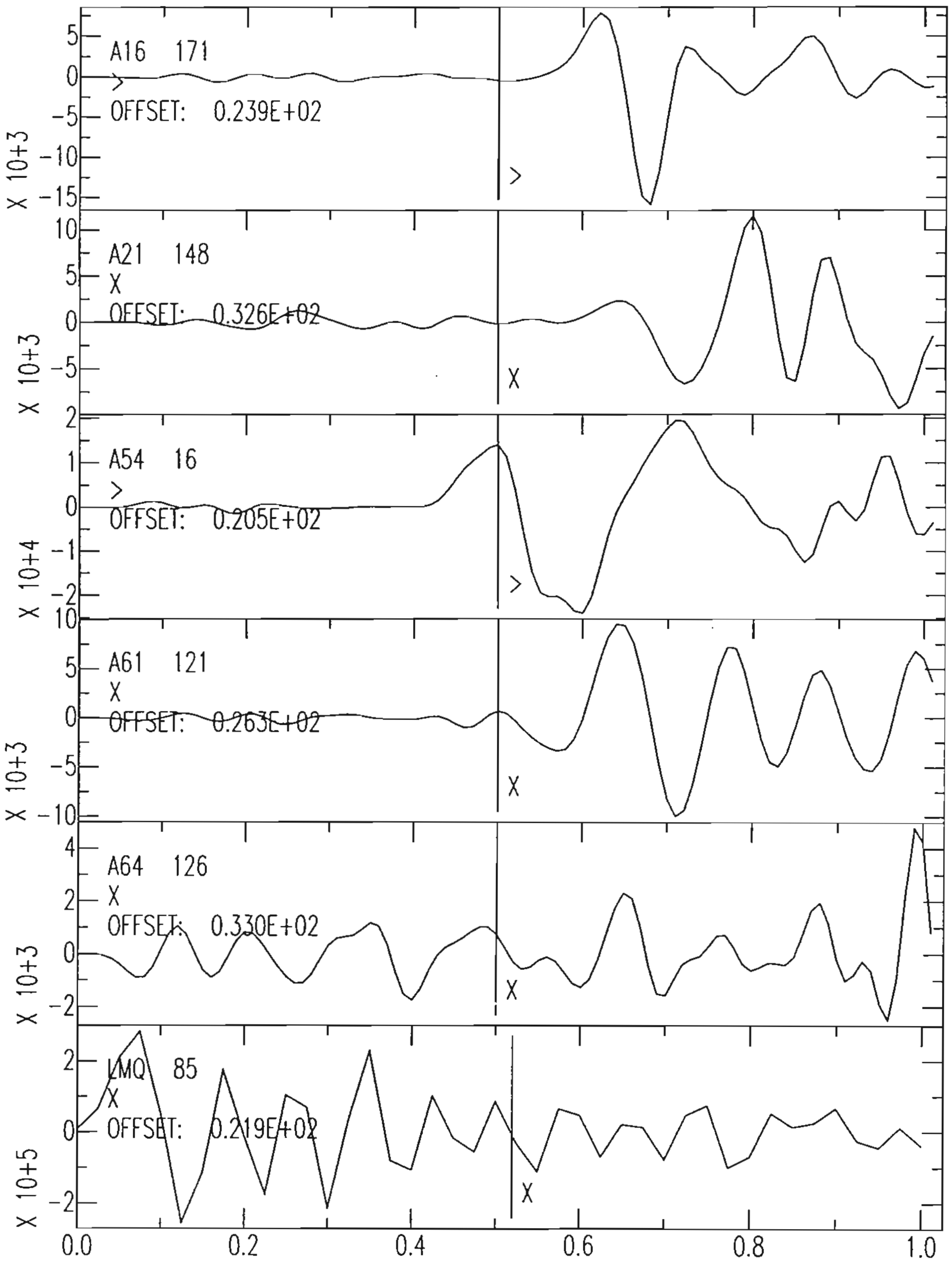


SH Motions and Lines.

P Phases on Vertical Components

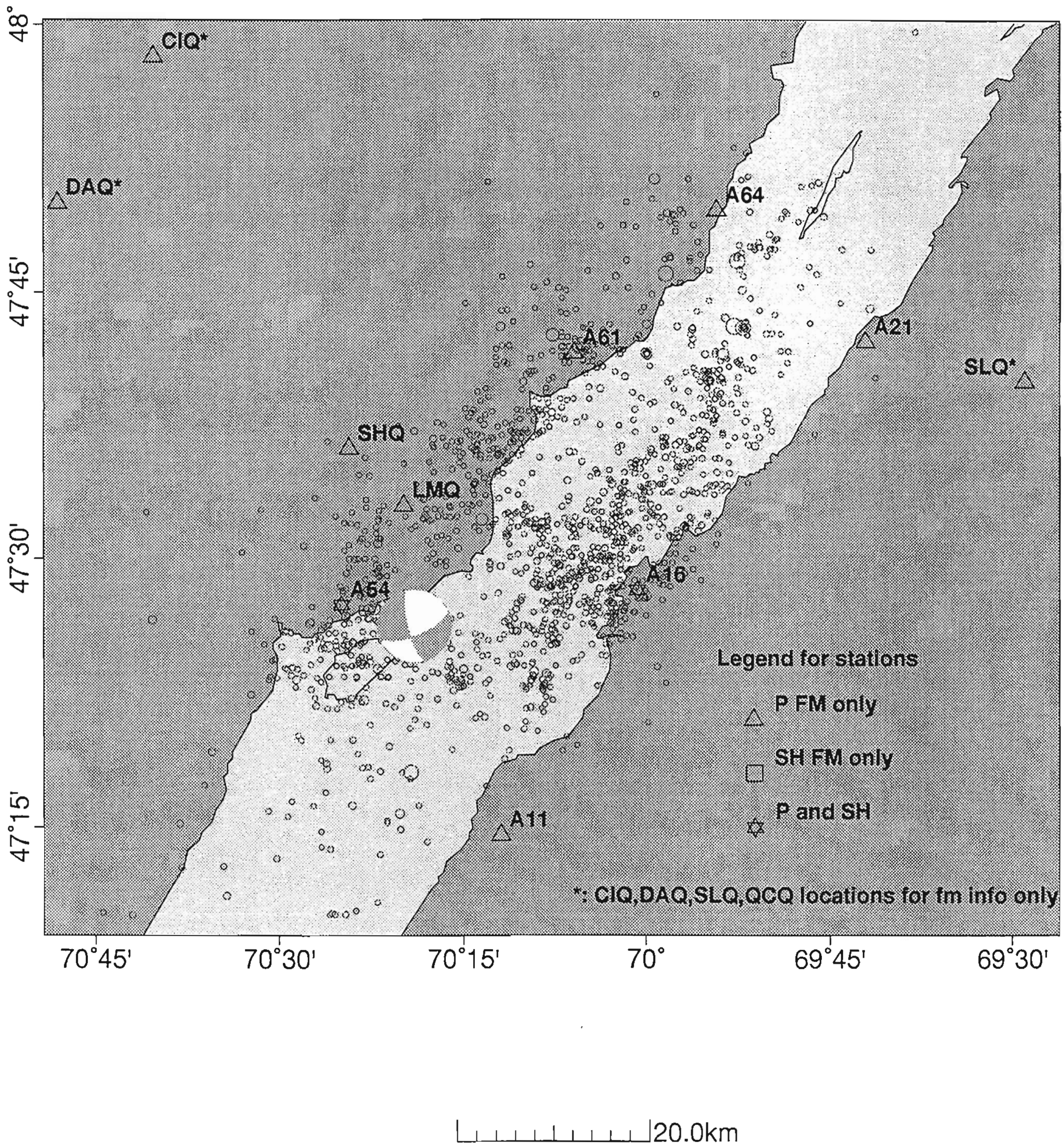


SH phases on Transverse Components



941201

Location Map



Earthquake of 19960512 1153 Magnitude 3.1MN

1- Earthquake information and list of first motions.

Date	Time hhmm ss	Latitude	Longitude	Depth (km)	Mag	Sta/Pha
960512	1153 21.91	47.5161	-70.0281	14.82	3.1MN	7/014

COMMENTS:

Felt, CHARLEVOIX SEISMIC ZONE, QUE.
Felt at Saint-Denis on the South Shore.
Also felt on the North shore at St-Irenee and La Malbaie.
$ DAQ Pg was truncated by a line drop-out.
$ Maurice called St-Denis Municipal Office; people felt it
$ as a bump. Charlevoix radio station gave felt info. for the
$ north shore.
$
$ The Sg lines of some stations include the SH FM.
$ The convention used is the Virginia Tech convention used in FOCMEC:
$ <: SH first motion to left (back to event) impulsive
$ >: SH first motion to right (back to event) impulsive
$ Preliminary Focmec computed by ML.
$ CIQ first motion by Reynald Du Berger, UQAC.

Sta	Pha	Dist (km)	Azim	Take-off Angle	FM
A16	PG	5	162	-20	C
A16	SG	5	162	-20	>
A61	PG	20	347	-54	D
LMQ	PG	23	279	-57	D
A54	PG	30	257	-64	D
A21	PG	33	51	-66	D
A21	SG	33	51	-66	<
A11	PG	33	203	-66	C
A64	PG	36	16	-68	D
A64	SG	36	16	-68	<
CIQ	PG	102	326	-82	D

Number of P first motions: 8
Number of SH first motions: 3

2- Most Representative Solution.

A total of 662 solutions were found using a b axis increment of 2 degree. The following parameters describe the most representative solution, which was derived from the average B, P, and T axes listed below.

dip,strike,rake	48.92	163.13	57.34		
dip,strike,rake	50.61	27.41	121.76	:auxiliary plane	
lower hem. trend, plunge of a,n	297.41	39.39	73.13	41.08	
lower hem. trend & plunge of b	185.97	24.00			
lower hem. trend, plunge of p,t	95.56	0.91	3.51	65.98	

Average B, P, and T axes:

	B	P	T
Mean trend:	N 178	N 270	N 5
Mean Plunge:	31	4	59
Vector Magnitude:	650	649	655
Mean length of resulting vector:	0.981	0.981	0.989

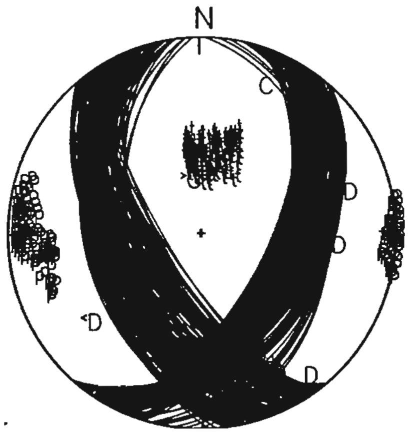
3- Misfits.

All 8 P first motions agreed with the solution.
All 3 SH first motions agreed with the solution.

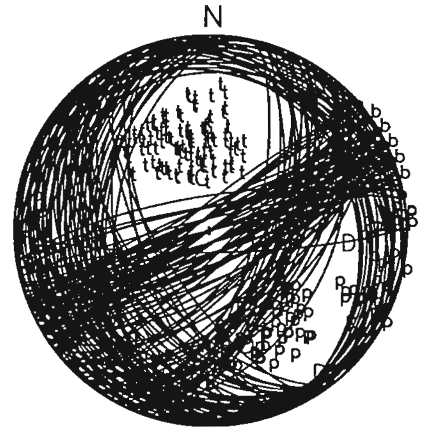
4- Rating of the focal mechanism.

The solution has a C rating based on the high number of P and SH misfits (0 /100 and 0 /100 respectively) and on the poor constraints on the P, T and B axes (value of 0.984).

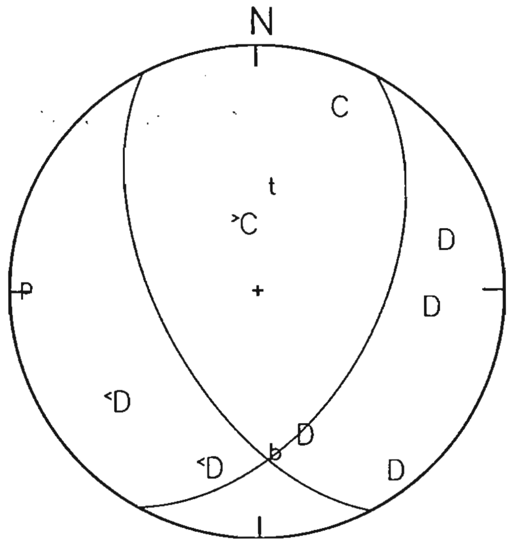
19960512 11:53 U.T.



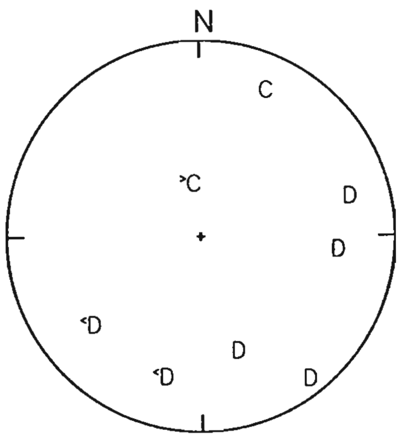
P, SH and P–Nodal



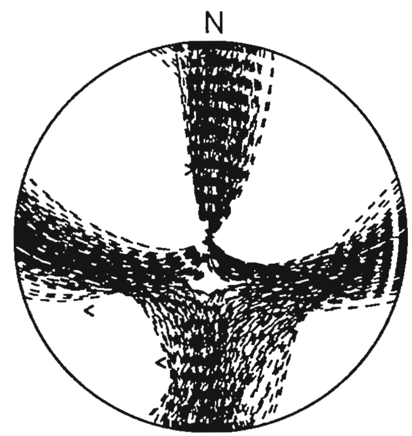
Solution with P FM only.



Best Solution

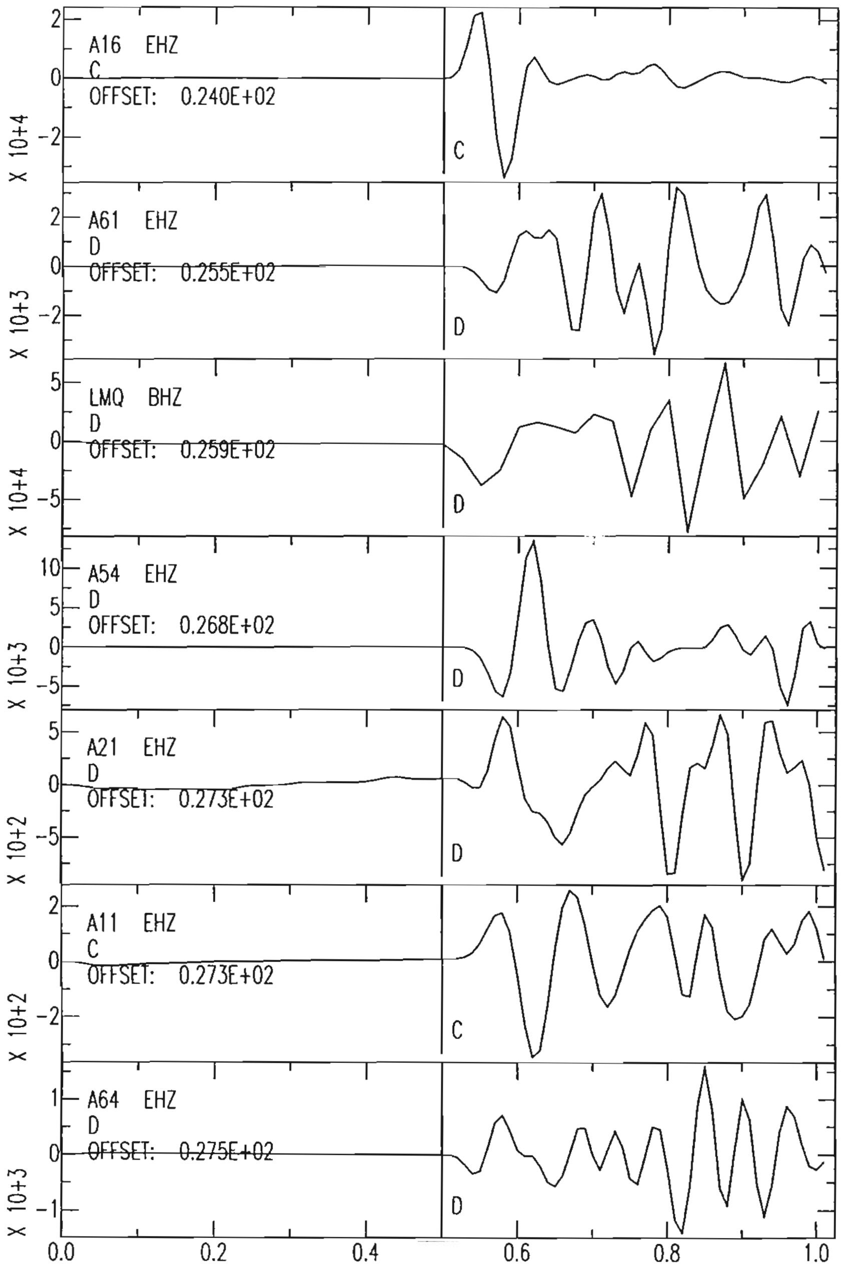


First Motions Only

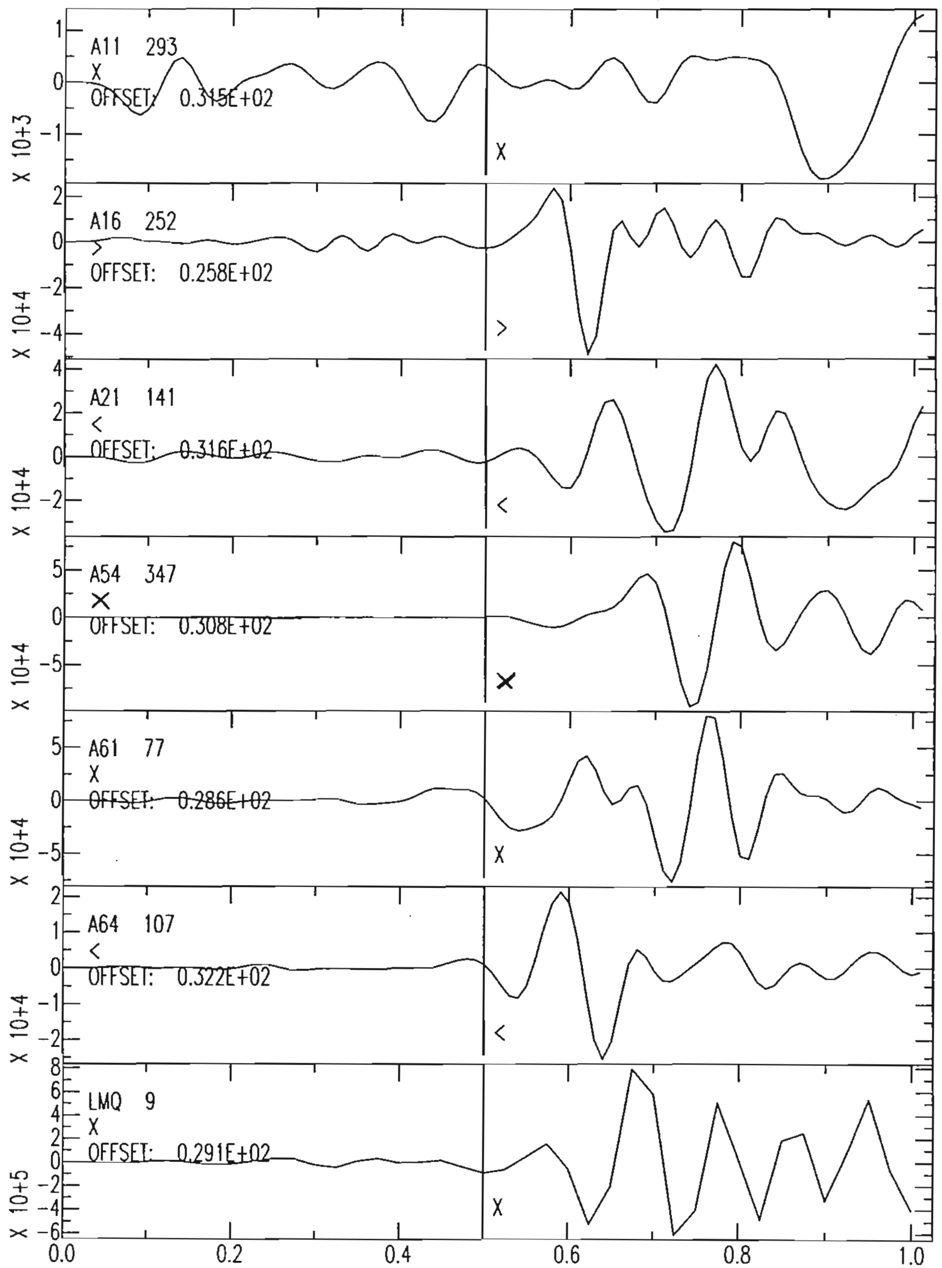


SH Motions and Lines.

P Phases on Vertical Components



SH phases on Transverse Components



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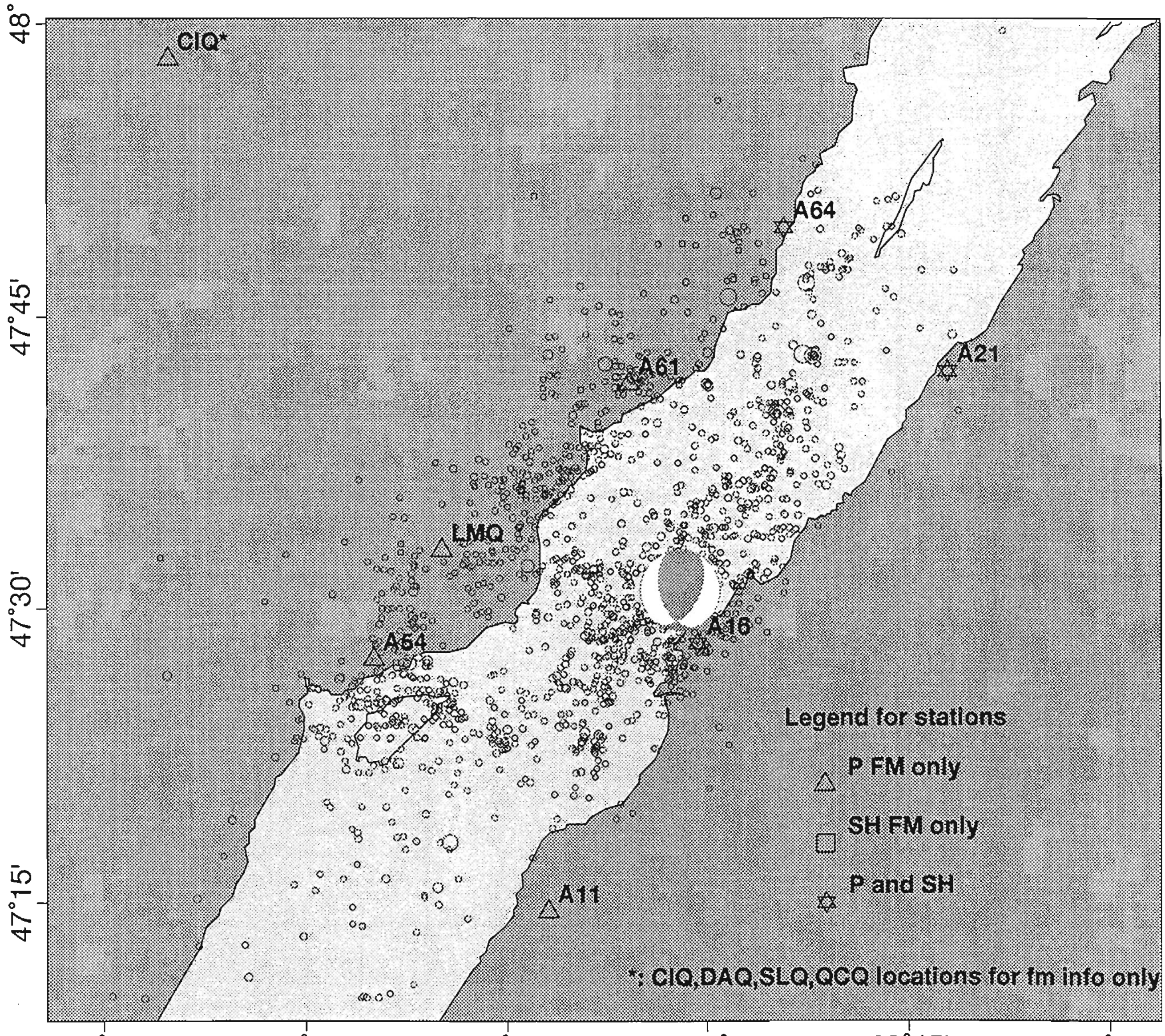
Location Map



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Earthquake of 19960607 0941 Magnitude 3.08MN

1- Earthquake information and list of first motions.

Date	Time hhmm ss	Latitude	Longitude	Depth (km)	Mag	Sta/Pha
960607	0941 42.84	47.5299	-69.9417	13.31	3.08MN	7/014

COMMENTS:

Felt, CHARLEVOIX SEISMIC ZONE, QUE.
Reported felt on the South Shore at St-Denis and St-Pascal.
On the North Shore: St-Irenee, Pointe-au-Pic et St-Hilarion.
$Felt info from radio announcers in Kamouraska and Charlevoix.
$
$ The Sg lines of some stations include the SH FM.
$ The convention used is the Virginia Tech convention used in FOCMEC:
$ <: SH first motion to left (back to event) impulsive
$ >: SH first motion to right (back to event) impulsive
$ Preliminary Focmec computed by ML.
$ CIQ fm from reynald Du Berger.

Sta	Pha	Dist (km)	Azim	Take-off Angle	FM
A16	PG	8	216	-32	C
A16	SG	8	216	-32	>
A61	PG	21	328	-58	C
A61	SG	21	328	-58	>
A21	PG	27	44	-64	D
A21	SG	27	44	-64	<
LMQ	PG	29	274	-65	D
LMQ	SG	29	274	-65	>
A64	PG	33	6	-68	C
SHQ	PG	36	284	-70	D
A54	PG	36	257	-70	D
A54	SG	36	257	-70	>
A11	PG	37	211	-70	C
SLQ	PG	72	78	-80	D
CIQ	PG	104	323	-83	D
DAQ	PG	109	297	-83	D

Number of P first motions: 11
Number of SH first motions: 5

2- Most Representative Solution.

A total of 205 solutions were found using a b axis increment of 2 degree. The following parameters describe the most representative solution, which was derived

from the average B, P, and T axes listed below.

dip,strike,rake	28.58	352.89	77.38		
dip,strike,rake	62.17	187.19	96.79	:auxiliary plane	
lower hem. trend, plunge of a,n		97.19	27.83	262.89	61.42
lower hem. trend & plunge of b		4.01	6.00		
lower hem. trend, plunge of p,t		272.18	16.90	112.89	72.00

Average B, P, and T axes:

	B	P	T
Mean trend:	N 15	N 277	N 118
Mean Plunge:	9	17	72
Vector Magnitude:	133	203	203
Mean length of resulting vector:	0.647	0.992	0.990

3- Misfits.

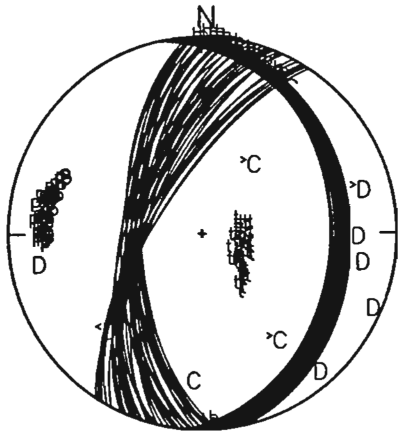
All 11 P first motions agreed with the solution.
Out of 5 SH first motions, a total of 1 did not fit the solutions (20/100).

Station Name	Number of misfits	Percentage of wrongs
A54	205	100

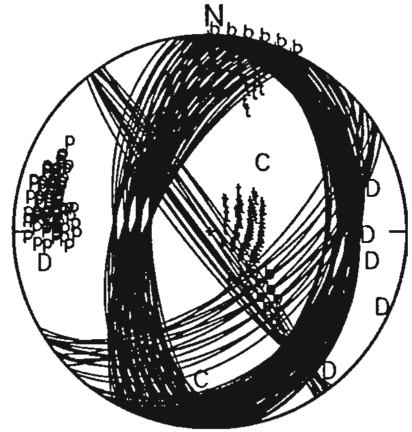
4- Rating of the focal mechanism.

The solution is rejected (rating X) based on the high number of P and SH misfits (0 /100 and 20 /100 respectively) and the absence of constraints on the P, T and B axes (value of 0.876).

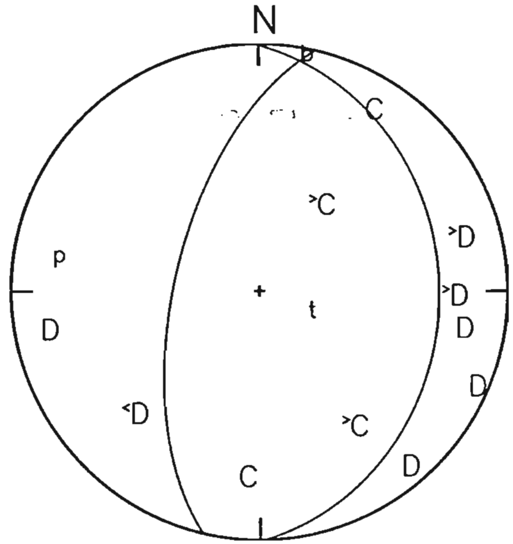
19960607 09:41 U.T.



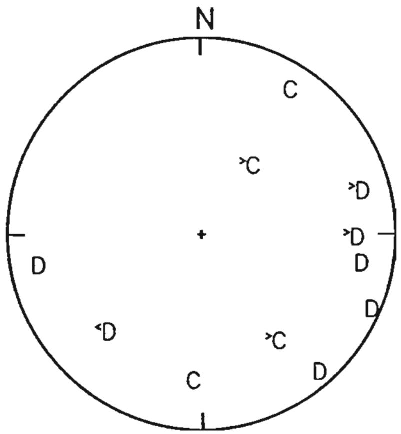
P, SH and P–Nodal



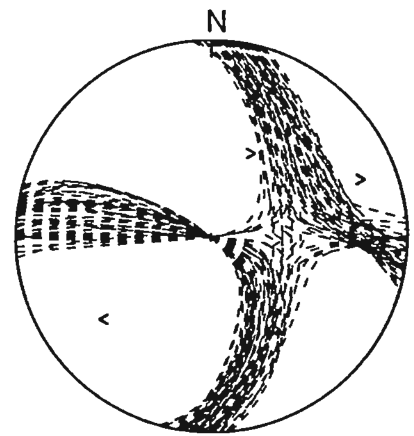
Solution with P FM only.



Best Solution

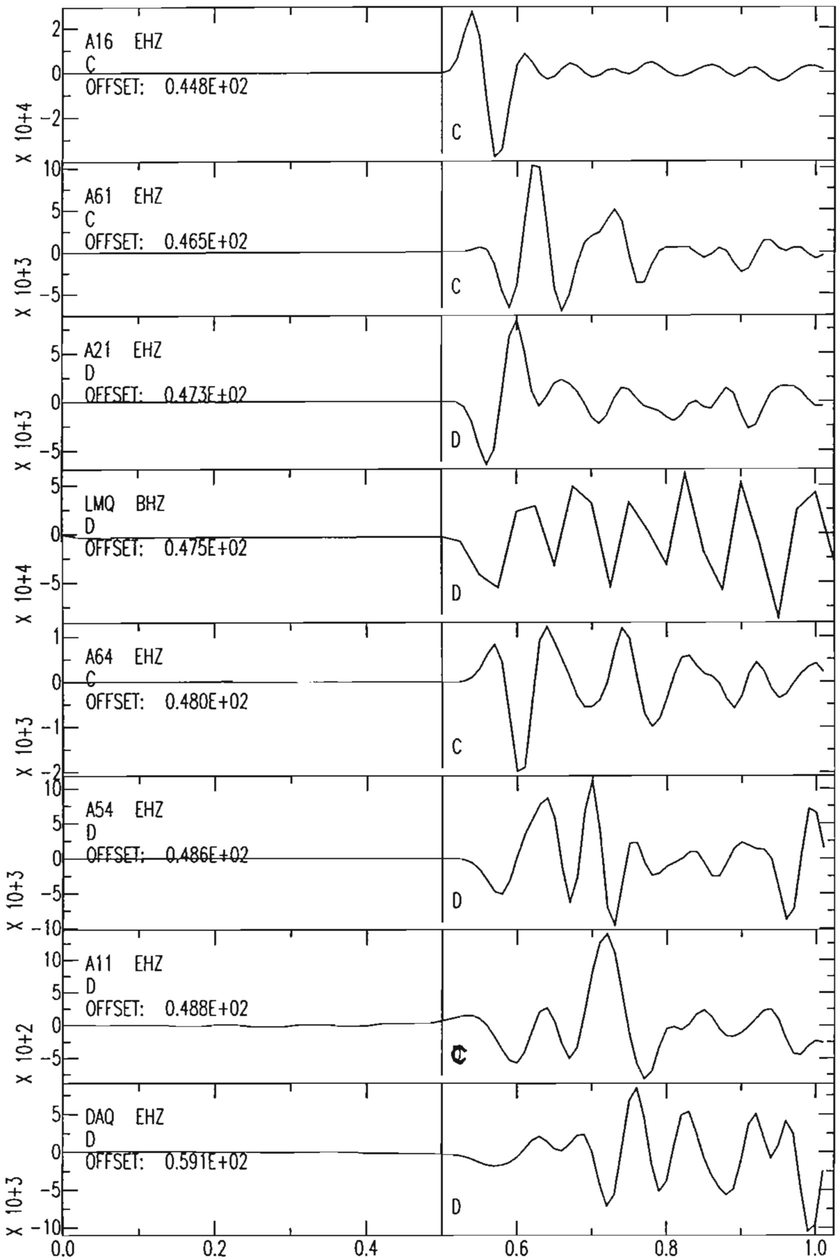


First Motions Only

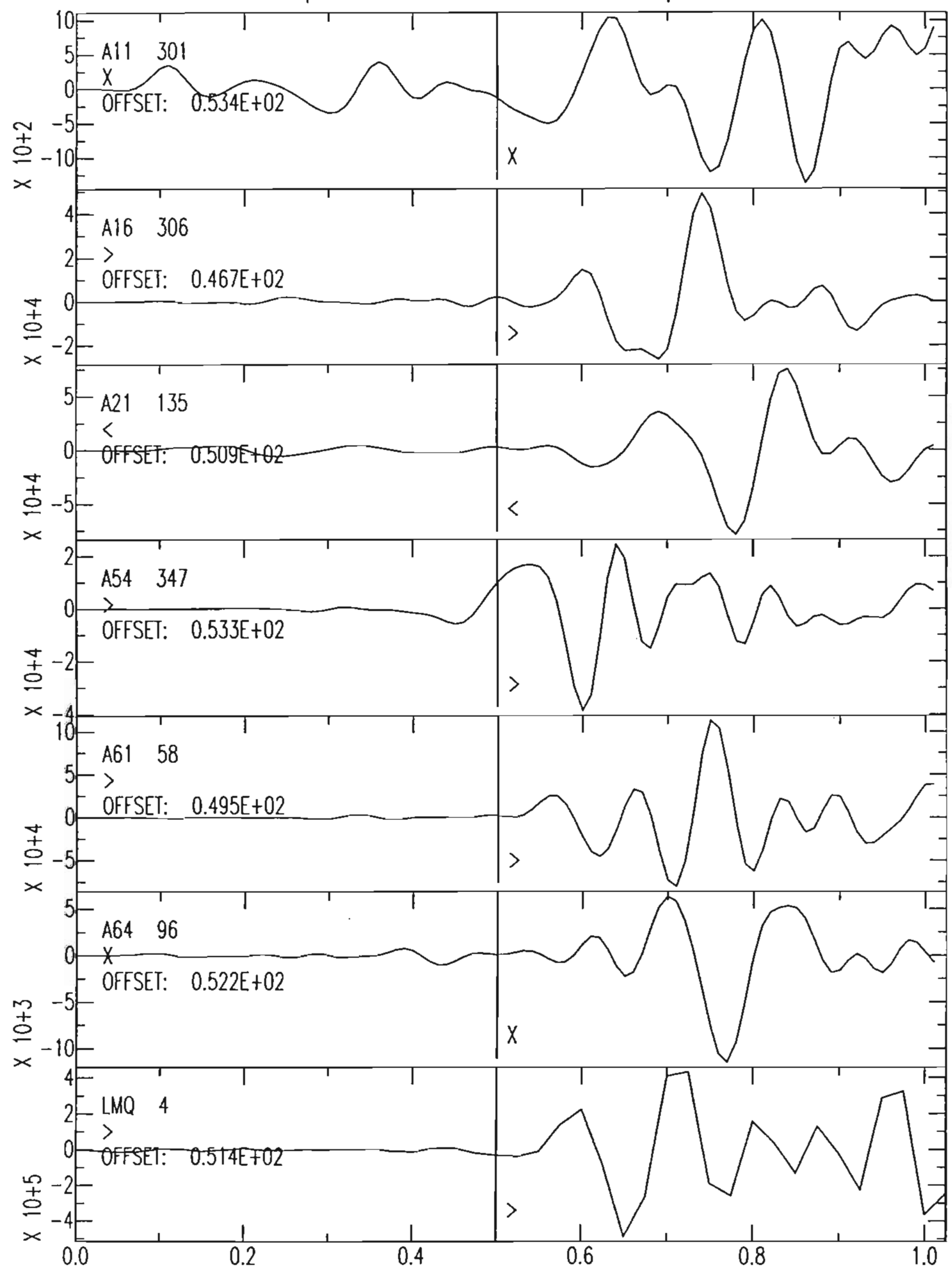


SH Motions and Lines.

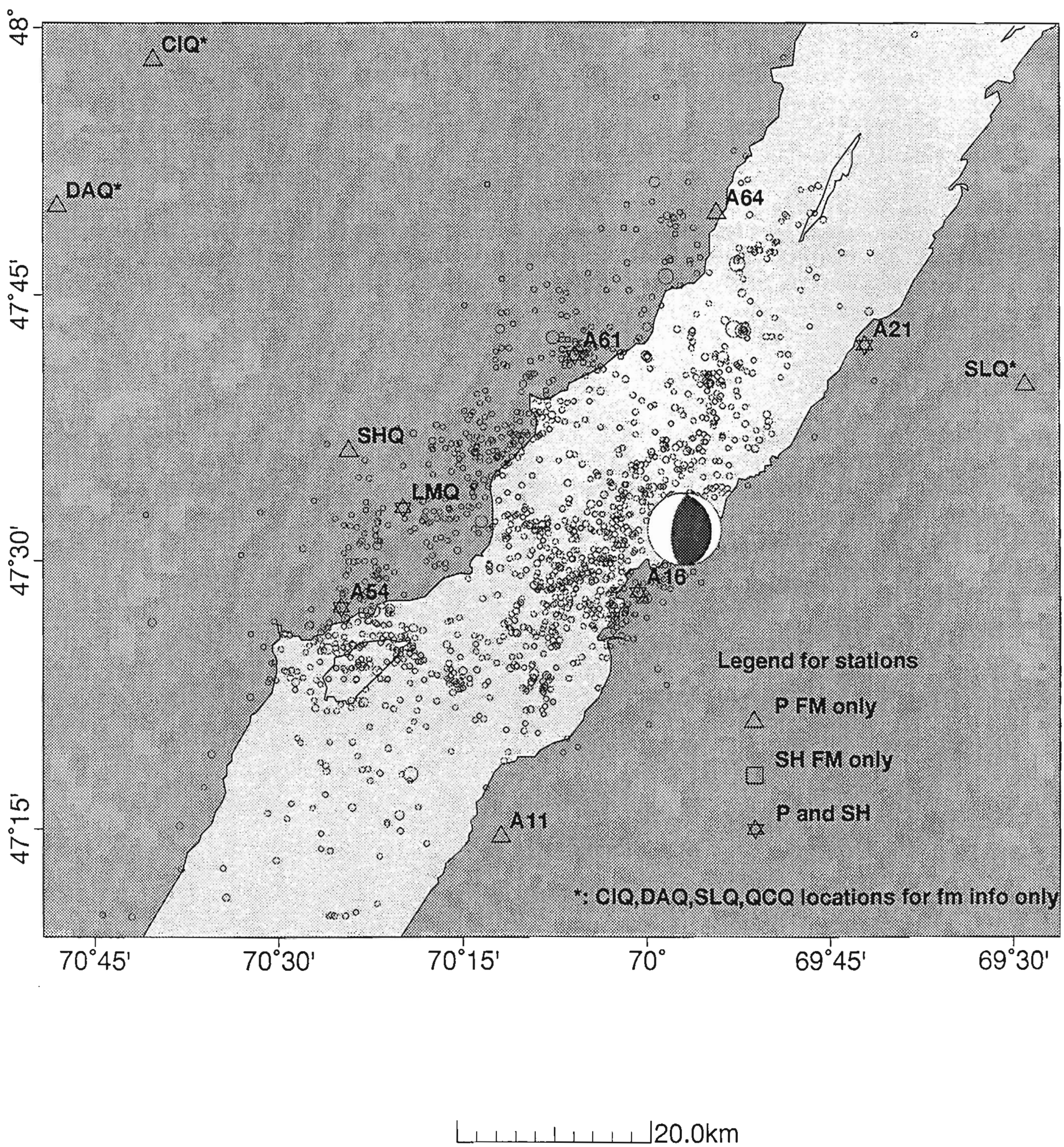
P Phases on Vertical Components



SH phases on Transverse Components



Location Map



Earthquake of 19970110 1927 Magnitude 3.21MN

1- Earthquake information and list of first motions.

Date	Time hhmm ss	Latitude	Longitude	Depth (km)	Mag	Sta/Pha
970110	1927 27.56	47.5094	-70.1965	17.06	3.21MN	7/014

COMMENTS:

Felt, CHARLEVOIX SEISMIC ZONE, QUE.
Felt in St-Irenee, St-Joseph-de-la-Rive and St-Hilarion.
16 km S from LA MALBAIE, QUE.
$ maurice talked with local radio station to get felt info.
$ CIQ first motion read by R. Du Berger.
$
$ The Sg lines of some stations include the SH FM.
$ The convention used is the Virginia Tech convention used in FOCMEC:
$ <: SH first motion to left (back to event) impulsive
$ >: SH first motion to right (back to event) impulsive
$ Preliminary Focmec computed by ML.

Sta	Pha	Dist (km)	Azim	Take-off Angle	FM
LMQ	PG	11	294	-32	D
LMQ	SG	11	294	-32	>
A16	PG	15	107	-41	C
A16	SG	15	107	-41	>
A54	PG	17	250	-45	D
A54	SG	17	250	-45	>
SHQ	PG	19	304	-48	D
A61	PG	22	21	-52	C
A61	SG	22	21	-52	>
A11	PG	30	180	-60	D
A64	PG	42	33	-68	D
A21	PG	44	60	-69	D
DAQ	PG	93	303	-80	D
CIQ	PG	96	333	-80	C

Number of P first motions: 10
Number of SH first motions: 4

2- Most Representative Solution.

A total of 104 solutions were found using a b axis increment of 2 degree. The following parameters describe the most representative solution, which was derived from the average B, P, and T axes listed below.

dip,strike,rake	34.81	111.43	39.83		
dip,strike,rake	68.56	347.03	118.10	:auxiliary plane	
lower hem. trend, plunge of a,n	257.03	21.44	21.43	55.19	
lower hem. trend & plunge of b	155.99	26.00			
lower hem. trend, plunge of p,t	56.44	18.79	294.78	57.04	

Average B, P, and T axes:

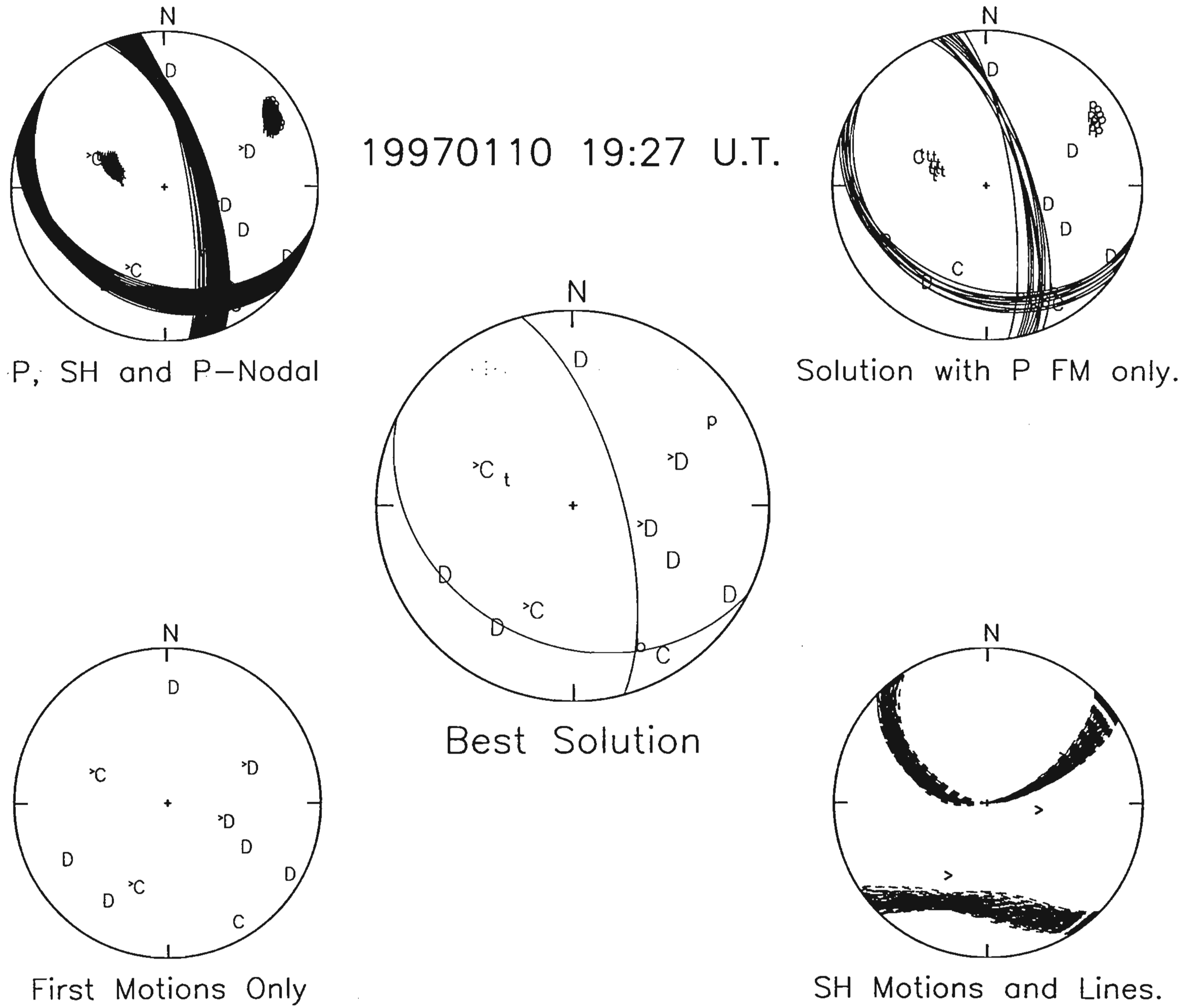
	B	P	T
Mean trend:	N 156	N 58	N 286
Mean Plunge:	20	21	60
Vector Magnitude:	104	104	104
Mean length of resulting vector:	0.996	0.997	0.997

3- Misfits.

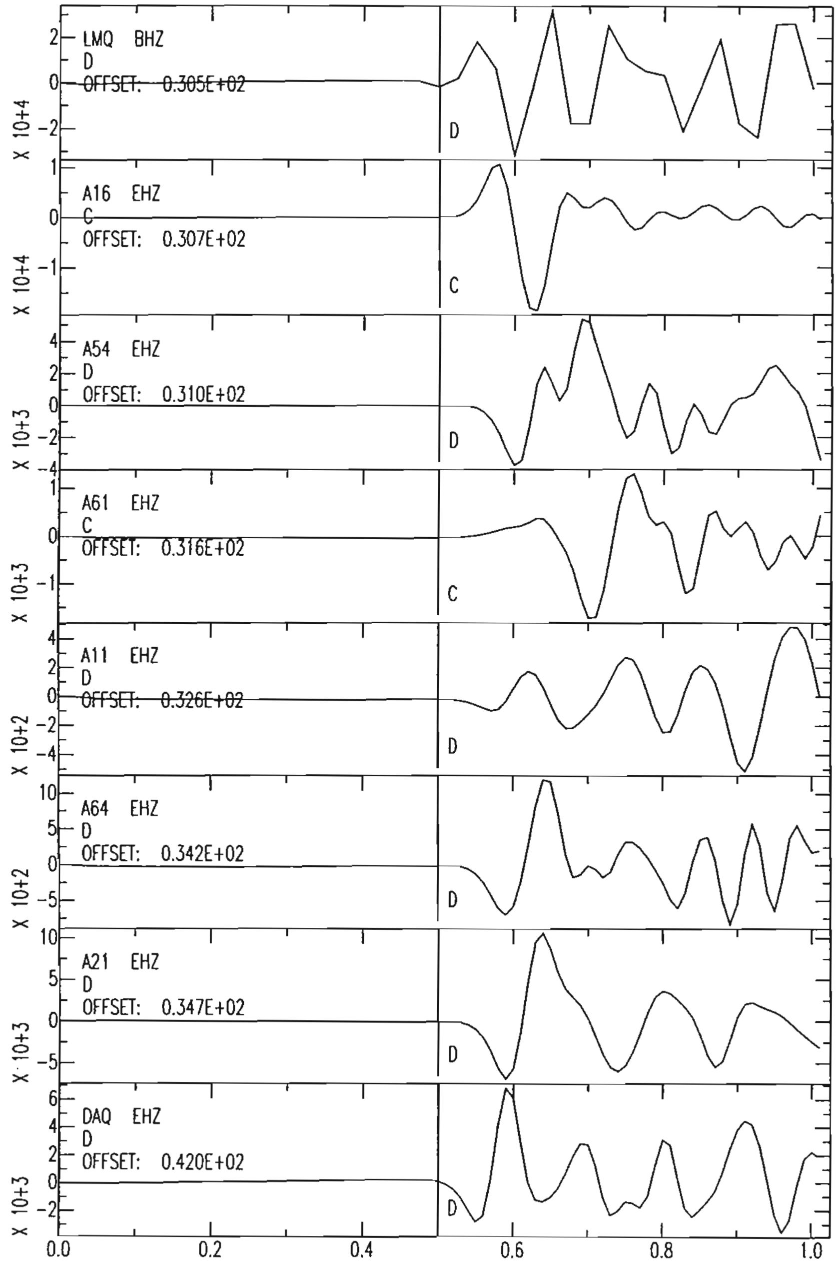
All 10 P first motions agreed with the solution.
All 4 SH first motions agreed with the solution.

4- Rating of the focal mechanism.

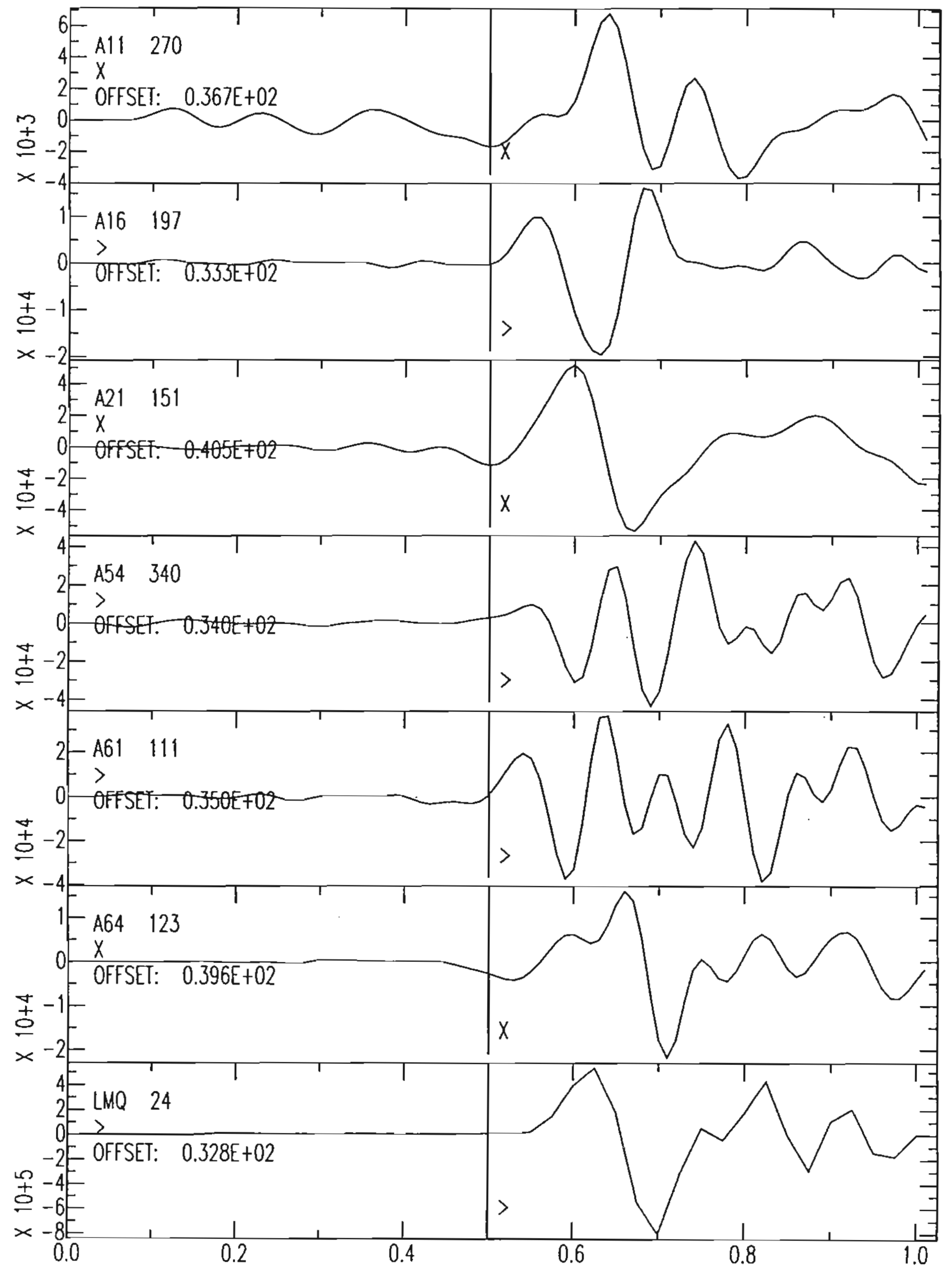
The solution has an A rating based on the small number of P and SH misfits (0 /100 and 0 /100 respectively) and on the good constraints on the P, T and B axes (value of 0.997).


19970110 19:27 U.T.
N
P, SH and P–Nodal
Best Solution
Solution with P FM only.
First Motions Only
SH Motions and Lines.

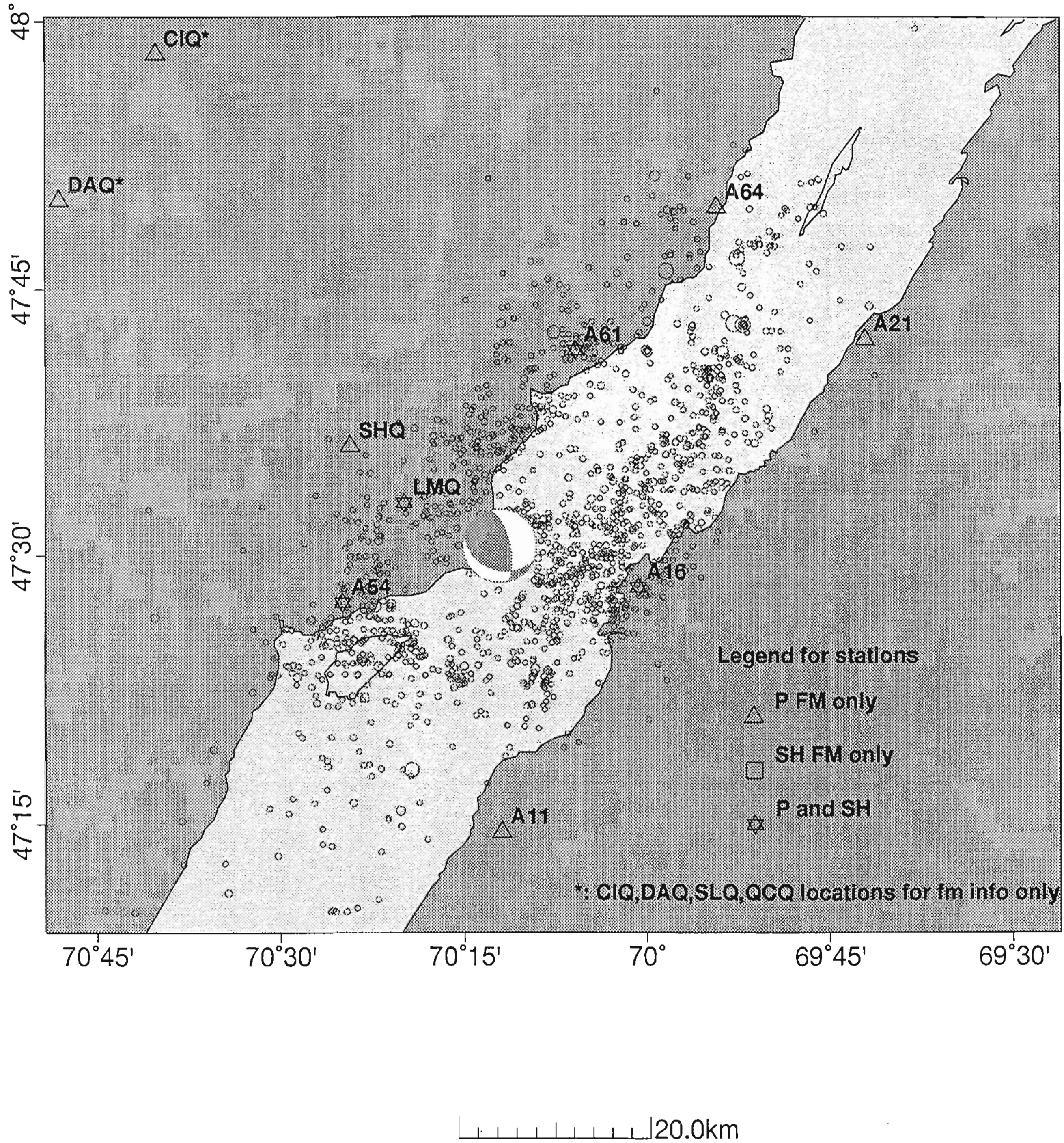
P Phases on Vertical Components



SH phases on Transverse Components



Location Map



Earthquake of 19970114 0447 Magnitude 3.1MN

1- Earthquake information and list of first motions.

Date	Time hhmm ss	Latitude	Longitude	Depth (km)	Mag	Sta/Pha
970114	0447 32.42	47.6569	-69.8765	14.74	3.1MN	7/014

COMMENTS:

CHARLEVOIX SEISMIC ZONE, QUE.
21 km E from LA MALBAIE, QUE.
Weakly felt in St-Fidele.
$ Maurice talked to local media. No phone calls from residents to radio stations
$ Talked to St-Fidele Town Hall; felt by one person.
$ CIQ first motion read by R. Du Berger.
$
$ The Sg lines of some stations include the SH FM.
$ The convention used is the Virginia Tech convention used in FOCMEC:
$ <: SH first motion to left (back to event) impulsive
$ >: SH first motion to right (back to event) impulsive
$ Preliminary Focmec computed by ML.

Sta	Pha	Dist (km)	Azim	Take-off Angle	FM
A21	PG	15	70	-45	D
A61	PG	17	284	-48	C
A61	SG	17	284	-48	>
A64	PG	19	356	-52	D
A64	SG	19	356	-52	<
A16	PG	23	205	-57	D
A16	SG	23	205	-57	>
LMQ	PG	36	250	-68	C
LMQ	SG	36	250	-68	>
SHQ	PG	40	262	-70	C
A54	PG	46	241	-72	C
A54	SG	46	241	-72	>
A11	PG	52	208	-74	D
SLQ	PG	65	89	-77	C
CIQ	PG	97	315	-81	C
DAQ	PG	108	289	-82	C

Number of P first motions: 11
Number of SH first motions: 5

2- Most Representative Solution.

A total of 137 solutions were found using a b axis increment of 5 degree. The

following parameters describe the most representative solution, which was derived from the average B, P, and T axes listed below.

dip,strike,rake	50.73	255.98	8.29		
dip,strike,rake	83.59	160.71	140.43	:auxiliary plane	
lower hem. trend, plunge of a,n	70.71	6.41	165.98	39.27	
lower hem. trend & plunge of b	333.02	50.00			
lower hem. trend, plunge of p,t	214.81	21.63	110.59	31.77	

Average B, P, and T axes:

	B	P	T
Mean trend:	N 224	N 212	N 111
Mean Plunge:	37	51	17
Vector Magnitude:	81	102	133
Mean length of resulting vector:	0.592	0.746	0.970

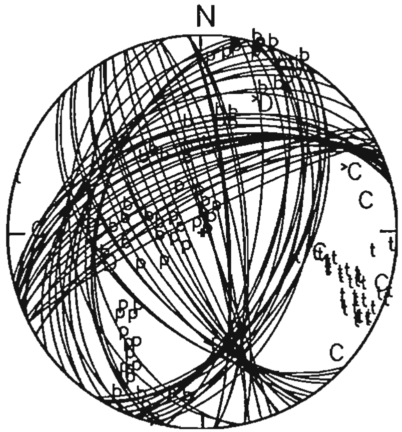
3- Misfits.

All 11 P first motions agreed with the solution.
All 5 SH first motions agreed with the solution.

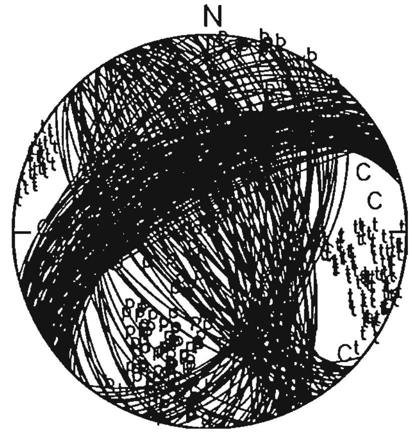
4- Rating of the focal mechanism.

The solution is rejected (rating X) based on the high number of P and SH misfits (0 /100 and 0 /100 respectively) and the absence of constraints on the P, T and B axes (value of 0.769).

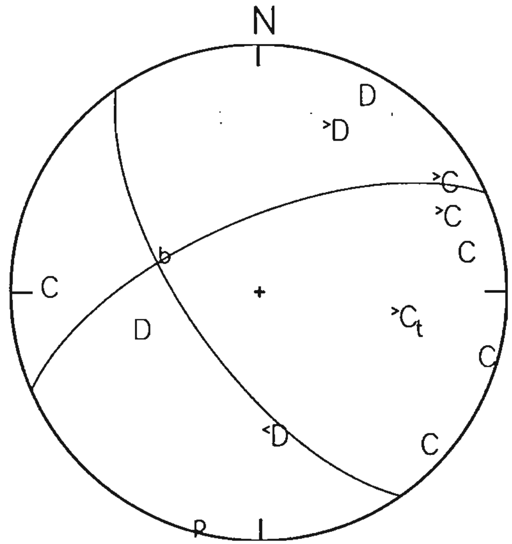
19970114 04:47 U.T.



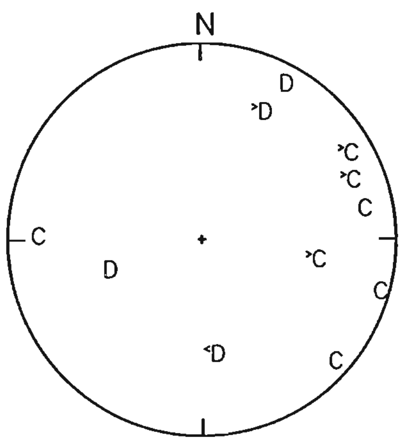
P, SH and P–Nodal



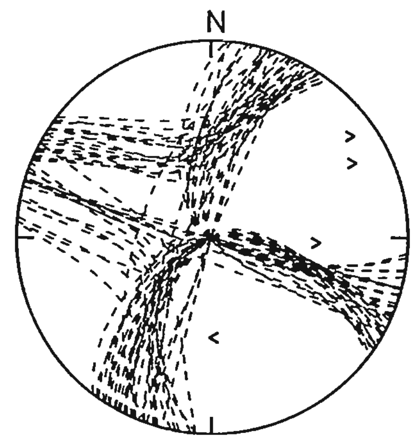
Solution with P FM only.



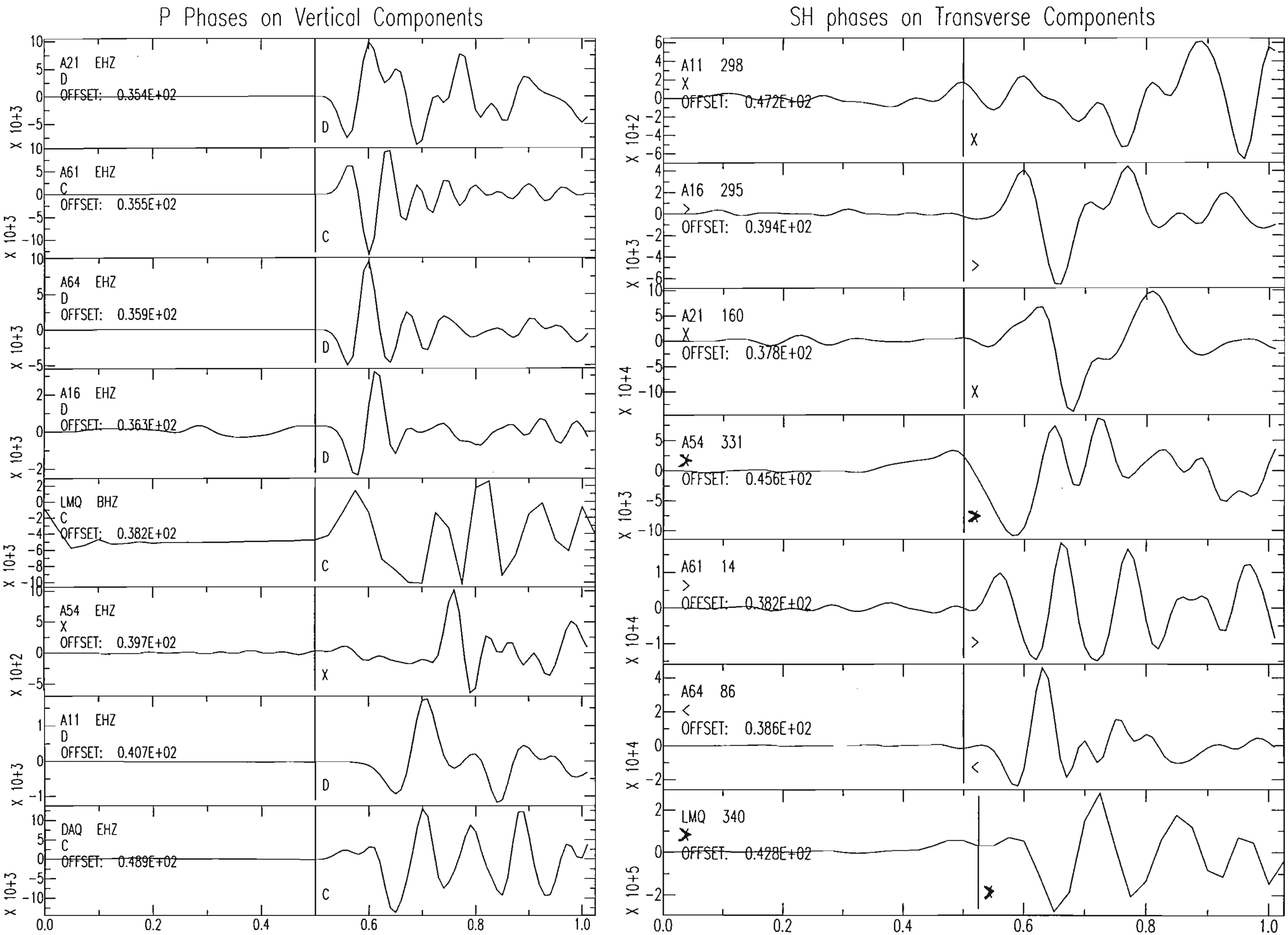
Best Solution



First Motions Only



SH Motions and Lines.


P Phases on Vertical Components
A21 EHZ D OFFSET: 0.354E+02
A61 EHZ C OFFSET: 0.355E+02
A64 EHZ D OFFSET: 0.359E+02
A16 EHZ D OFFSET: 0.363E+02
LMQ BHZ C OFFSET: 0.382E+02
A54 EHZ X OFFSET: 0.397E+02
A11 EHZ D OFFSET: 0.407E+02
DAQ EHZ C OFFSET: 0.489E+02
SH phases on Transverse Components
A11 298 X OFFSET: 0.472E+02
A16 295 > OFFSET: 0.394E+02
A21 160 X OFFSET: 0.378E+02
A54 331 OFFSET: 0.456E+02
A61 14 > OFFSET: 0.382E+02
A64 86 < OFFSET: 0.386E+02
LMQ 340 OFFSET: 0.428E+02

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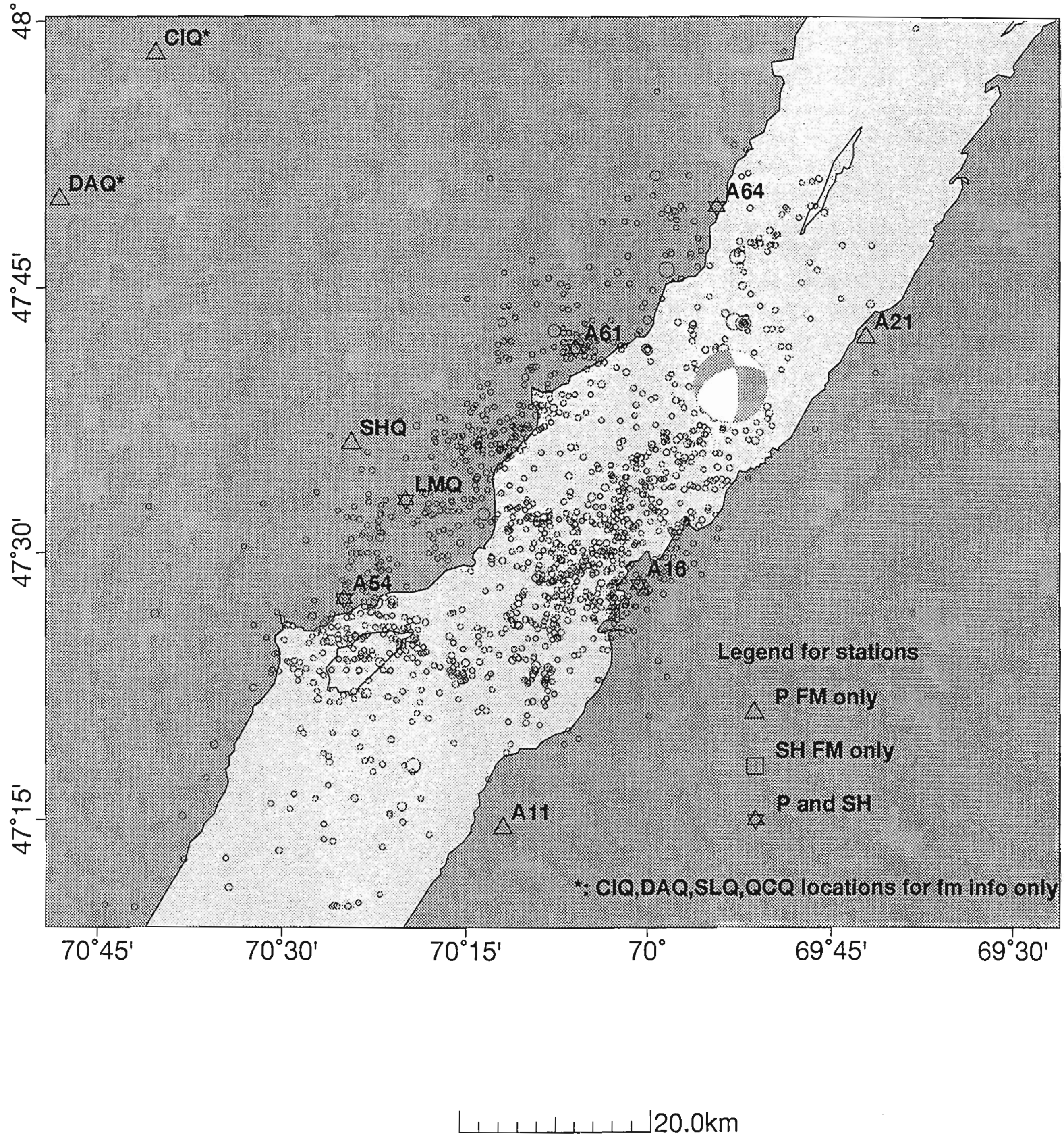
Location Map



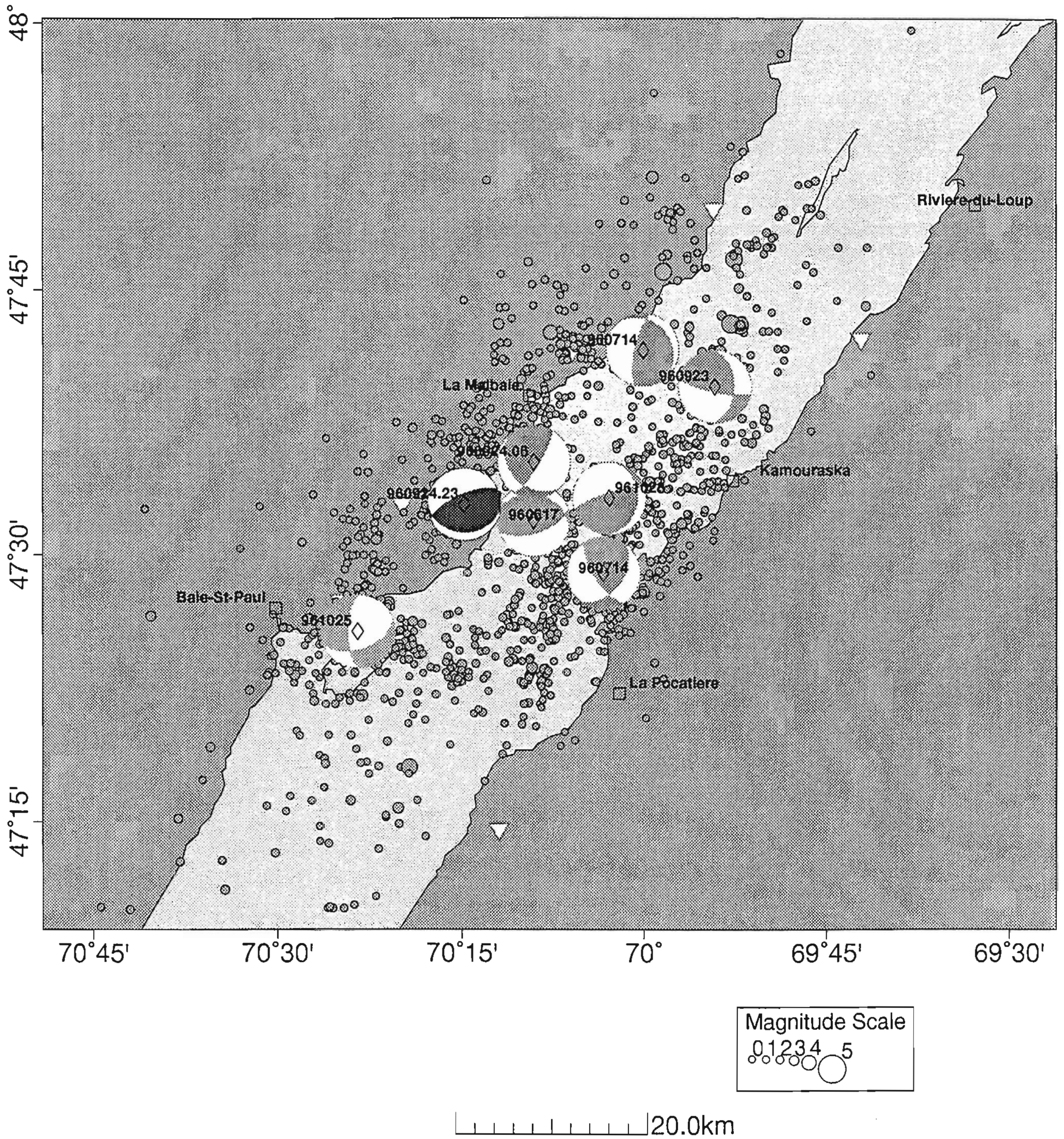
Appendix 2: Focal mechanisms of earthquakes recorded during the 1996 summer field survey.

Q	Date	Time hhmm ss		Latitude	Longitude	Depth (km)	Mag	Sta/Pha
A	960617	1118	30.66	47.5328	-70.1463	14.11	1.9mN	8/016
X	960624	1311	16.55	47.4862	-70.1239	14.36	1.6mN	7/014
X	960704	1227	07.48	47.6197	-70.1352	5.28	2.0mN	7/014
A	960714	0715	02.89	47.4829	-70.0503	13.71	2.2mN	7/014
A	960714	1846	49.22	47.6938	-69.9927	7.26	3.3mN	7/013
C	960726	1438	45.14	47.6097	-69.9468	10.36	2.3mN	7/014
X	960819	1706	09.66	47.3002	-70.2448	6.44	2.1mN	11/022
C	960913	2355	35.92	47.5008	-70.2134	12.09	2.2mN	11/022
B	960923	0526	54.22	47.6591	-69.8932	14.04	2.2mN	12/024
A	960924	0644	45.55	47.5875	-70.1451	21.40	2.0mN	12/024
A	960924	2341	02.88	47.5475	-70.2417	12.83	3.1mN	11/021
C	960925	0834	24.87	47.8528	-69.7504	22.35	2.2mN	9/018
C	961011	0228	50.34	47.4761	-70.0551	15.56	1.9mN	11/022
A	961025	0947	24.43	47.4281	-70.3887	4.06	2.2mN	13/025
A	961028	0245	39.23	47.5536	-70.0414	11.56	2.3mN	12/024

Q: Quality.

A: Very good
B: Good
C: Fair
X: Rejected
0: Cannot be computed.

Focal Mechanisms from 1996 Field Survey



Earthquake of 19960617 1118 Magnitude 1.9MN

1- Earthquake information and list of first motions.

Date	Time hhmm ss	Latitude	Longitude	Depth (km)	Mag	Sta/Pha
960617	1118 30.66	47.5328	-70.1463	14.11	1.9MN	8/016

COMMENTS:

CHARLEVOIX SEISMIC ZONE, QUE.
$
$ The Sg lines of some stations include the SH FM.
$ The convention used is the Virginia Tech convention used in FOCMEC:
$ <: SH first motion to left (back to event) impulsive
$ >: SH first motion to right (back to event) impulsive
$ Preliminary Focmec computed by ML.
$ time corrections to be added as soon as station
$ conditions get clarified.

Sta	Pha	Dist (km)	Azim	Take-off Angle	FM
A16	PG	13	123	-42	C
A16	SG	13	123	-42	<
LMQ	PG	14	277	-44	C
A81P	PG	14	243	-44	C
A81P	SG	14	243	-44	>
A61	PG	18	13	-52	D
A61	SG	18	13	-52	>
A82P	PG	20	295	-55	D
A54	PG	22	247	-57	C
A54	SG	22	247	-57	<
A80P	PG	29	277	-64	D
A80P	SG	29	277	-64	<
A11	PG	33	187	-66	D
A11	SG	33	187	-66	<
A64	PG	38	30	-70	D
A64	SG	38	30	-70	>
A21	PG	39	61	-70	D
DAQ	PG	95	301	-82	D

Number of P first motions: 11
Number of SH first motions: 7

2- Most Representative Solution.

A total of 347 solutions were found using a b axis increment of 1 degree. The following parameters describe the most representative solution, which was derived

from the average B, P, and T axes listed below.

dip,strike,rake	61.94	72.82	74.09	
dip,strike,rake	31.94	284.04	117.22	:auxiliary plane
lower hem. trend, plunge of a,n	194.04	58.06	342.82	28.06
lower hem. trend & plunge of b	80.46	14.00		
lower hem. trend, plunge of p,t	174.43	15.51	310.30	68.86

Average B, P, and T axes:

	B	P	T
Mean trend:	N 84	N 178	N 310
Mean Plunge:	16	16	67
Vector Magnitude:	346	346	346
Mean length of resulting vector:	0.996	0.996	0.997

3- Misfits.

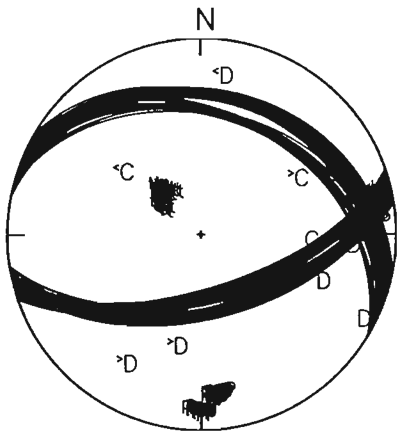
All 11 P first motions agreed with the solution.
Out of 7 SH first motions, a total of 1 did not fit the solutions (14/100).

Station Name	Number of misfits	Percentage of wrongs
A54	101	29
A81P	246	70

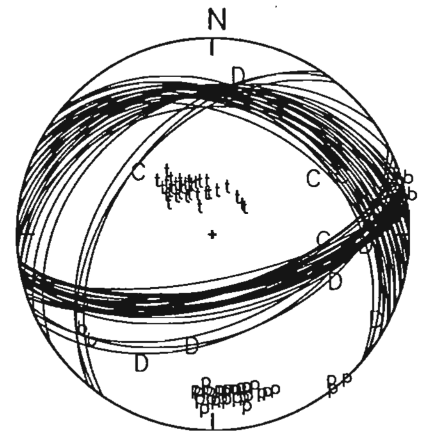
4- Rating of the focal mechanism.

The solution has an A rating based on the small number of P and SH misfits (0 /100 and 14 /100 respectively) and on the good constraints on the P, T and B axes (value of 0.997).

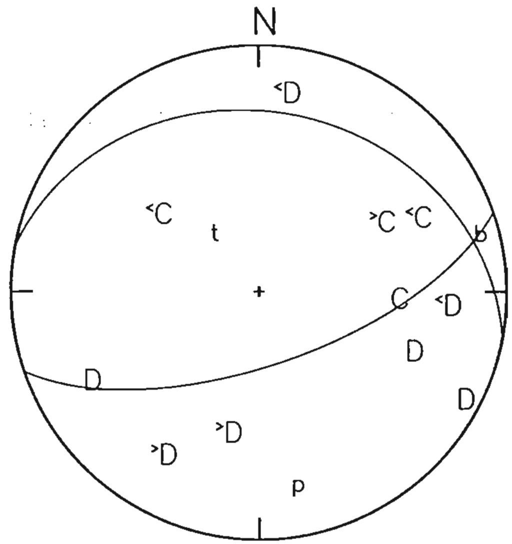
19960617 11:18 U.T.



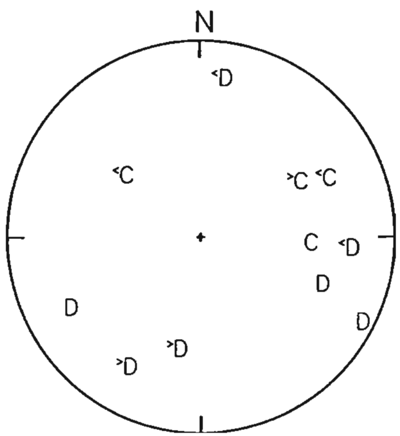
P, SH and P–Nodal



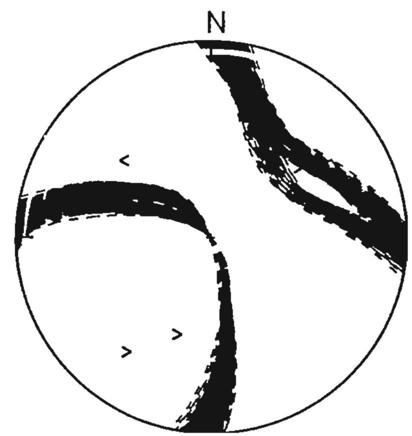
Solution with P FM only.



Best Solution

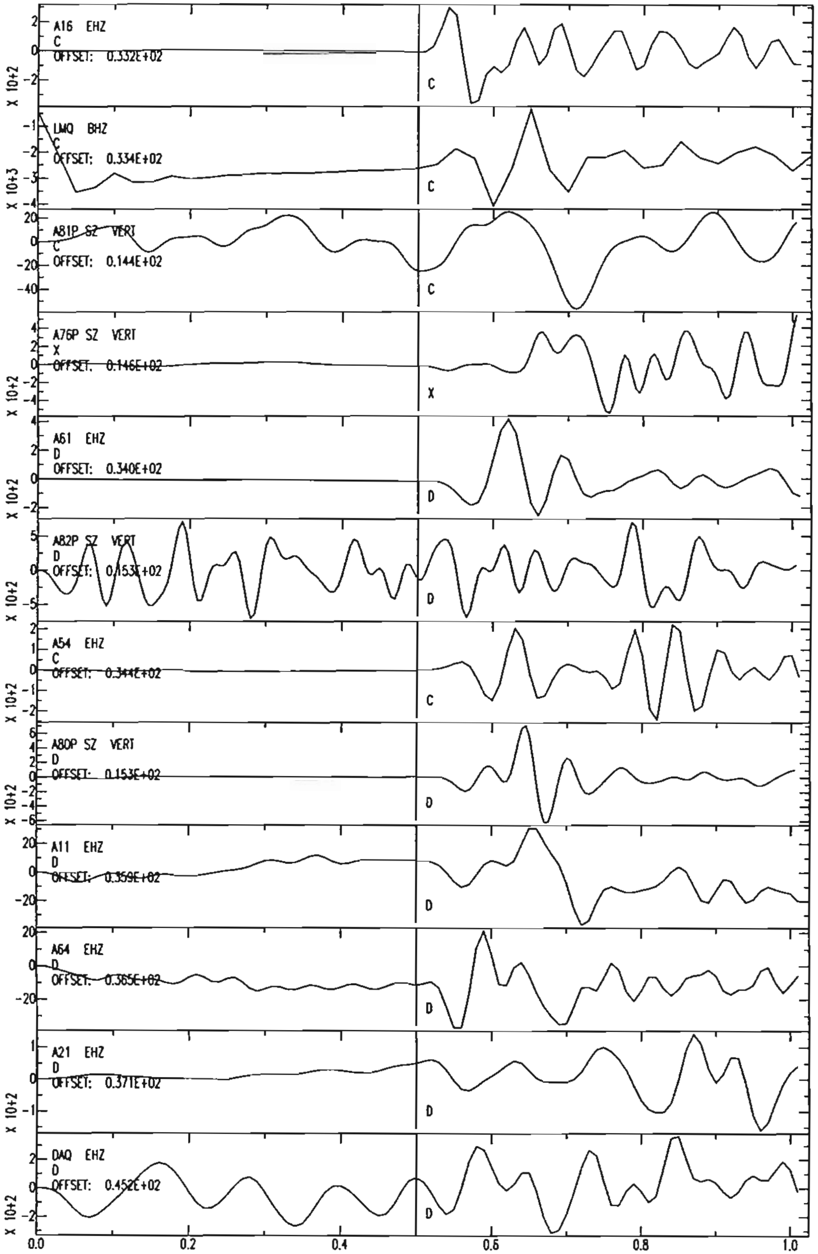


First Motions Only

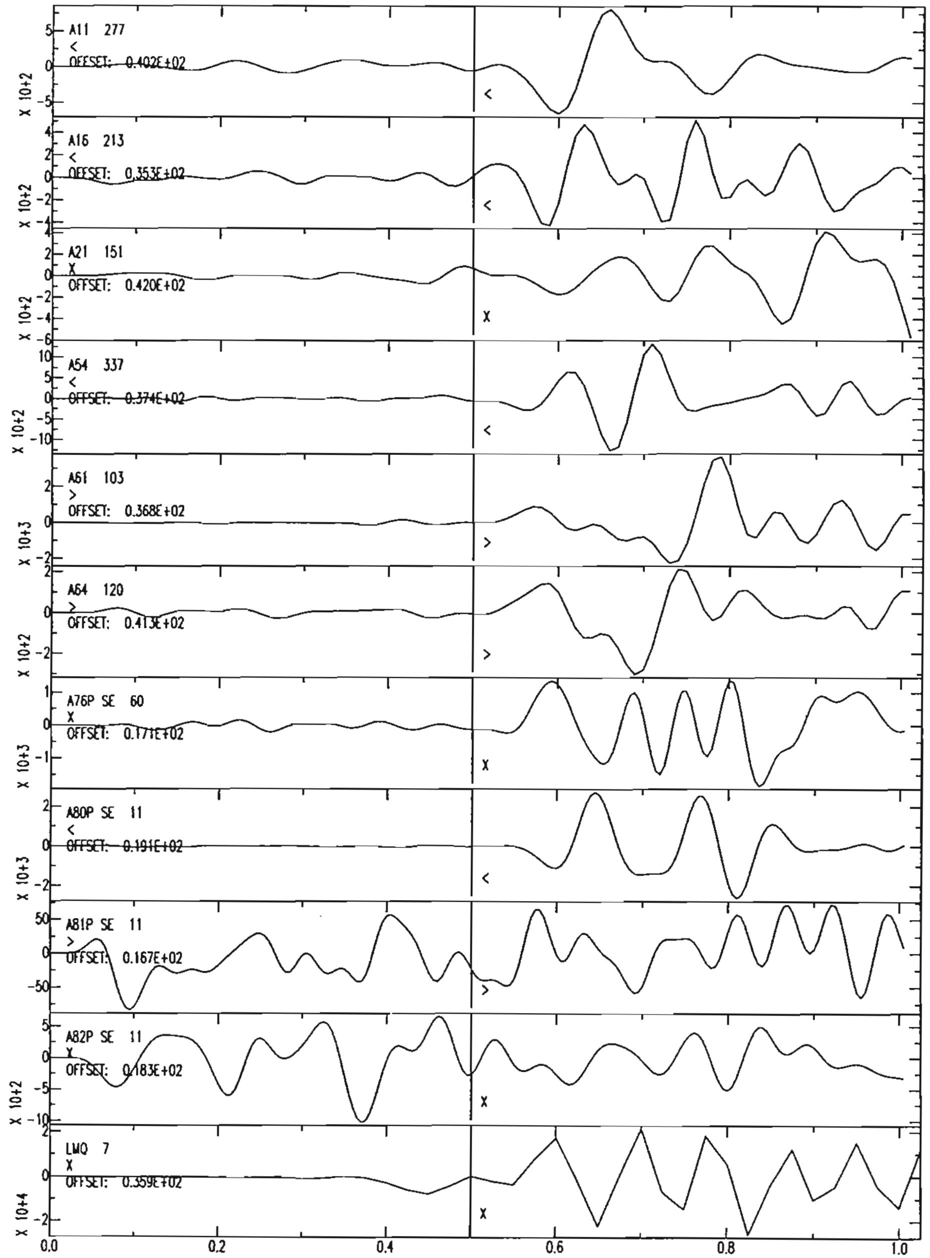


SH Motions and Lines.

P Phases on Vertical Components

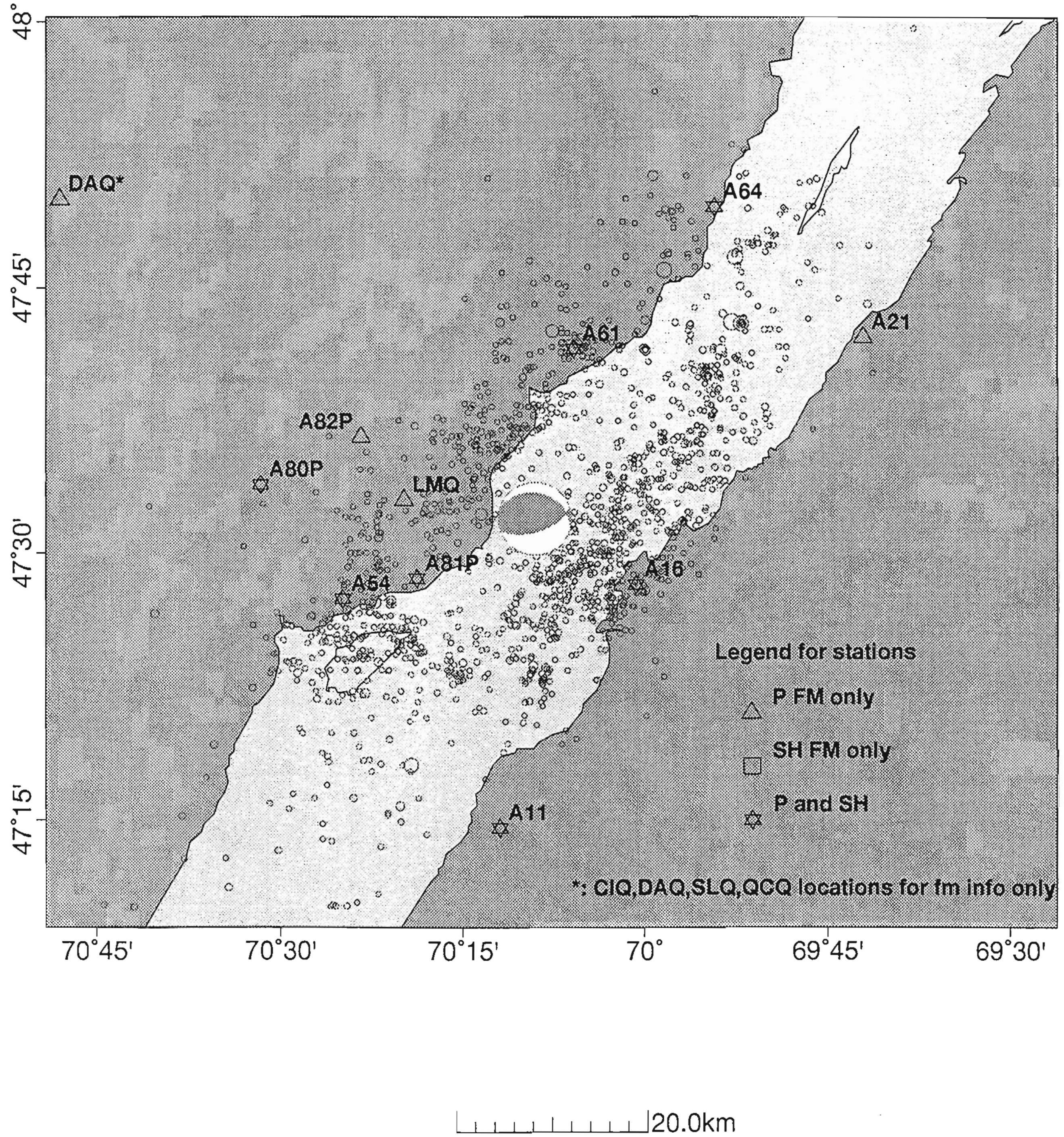


SH phases on Transverse Components



96.11.17 183

Location Map



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Earthquake of 19960624 1311 Magnitude 1.6MN

1- Earthquake information and list of first motions.

Date	Time hhmm ss	Latitude	Longitude	Depth (km)	Mag	Sta/Pha
960624	1311 16.55	47.4862	-70.1239	14.36	1.6MN	7/014

COMMENTS:

CHARLEVOIX SEISMIC ZONE, QUE.
$
$ The Sg lines of some stations include the SH FM.
$ The convention used is the Virginia Tech convention used in FOCMEC:
$ <: SH first motion to left (back to event) impulsive
$ >: SH first motion to right (back to event) impulsive
$ Preliminary Focmec computed by ML.
$ Time drift of station A81P is -0.07 sec
$ Time drift of station A76P is 0.01 sec
$ Time drift of station A82P is 0.03 sec
$ Time drift of station A80P is -0.58 sec

Sta	Pha	Dist (km)	Azim	Take-off Angle	FM
A16	PG	9	101	-32	C
A16	SG	9	101	-32	<
A81P	PG	14	265	-44	C
A81P	SG	14	265	-44	<
LMQ	PG	17	294	-49	D
A54	PG	22	261	-57	D
A54	SG	22	261	-57	<
A61	PG	23	6	-58	D
A61	SG	23	6	-58	>
A82P	PG	24	305	-59	D
A80P	PG	31	286	-65	D

Number of P first motions: 7
Number of SH first motions: 4

2- Most Representative Solution.

A total of 58 solutions were found using a b axis increment of 5 degree. The following parameters describe the most representative solution, which was derived from the average B, P, and T axes listed below.

dip,strike,rake 55.15 46.37 83.90
dip,strike,rake 35.31 236.96 98.67 :auxiliary plane
lower hem. trend, plunge of a,n 146.96 54.69 316.37 34.85

lower hem. trend & plunge of b	49.86	5.00		
lower hem. trend, plunge of p,t	140.74	9.96	293.56	78.83

Average B, P, and T axes:

	B	P	T
Mean trend:	N 58	N 150	N 265
Mean Plunge:	16	6	71
Vector Magnitude:	56	57	55
Mean length of resulting vector:	0.958	0.975	0.947

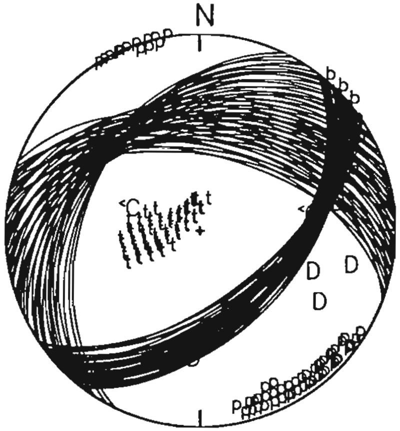
3- Misfits.

All 7 P first motions agreed with the solution.
All 0 SH first motions agreed with the solution.

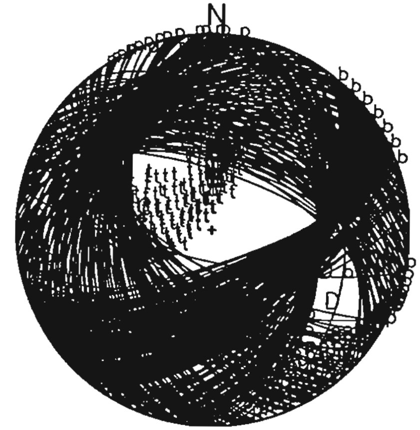
4- Rating of the focal mechanism.

The solution is rejected (rating X) based on the high number of P and SH misfits (0 /100 and 0 /100 respectively) and the absence of constraints on the P, T and B axes (value of 0.960).

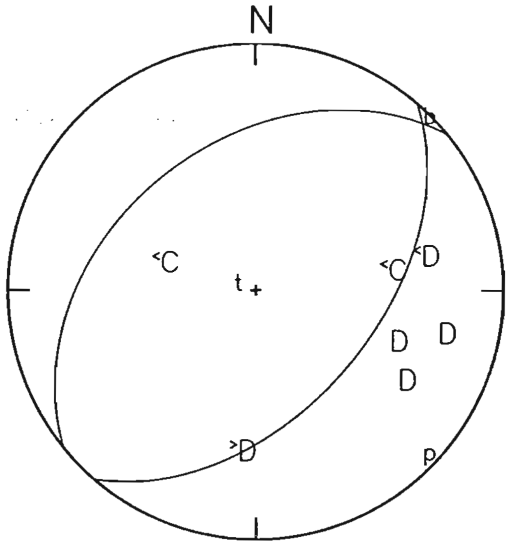
19960624 13:11 U.T.



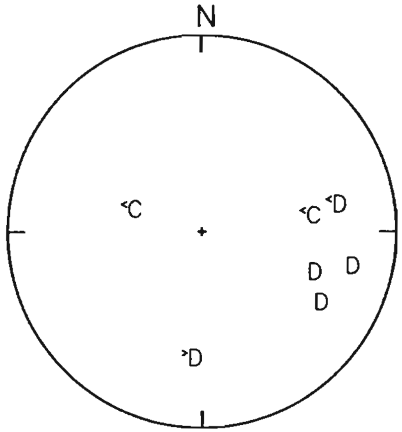
P, SH and P–Nodal



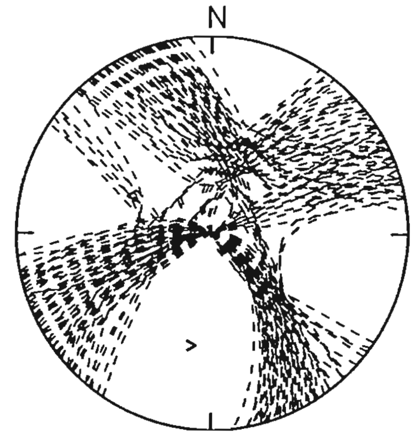
Solution with P FM only.



Best Solution

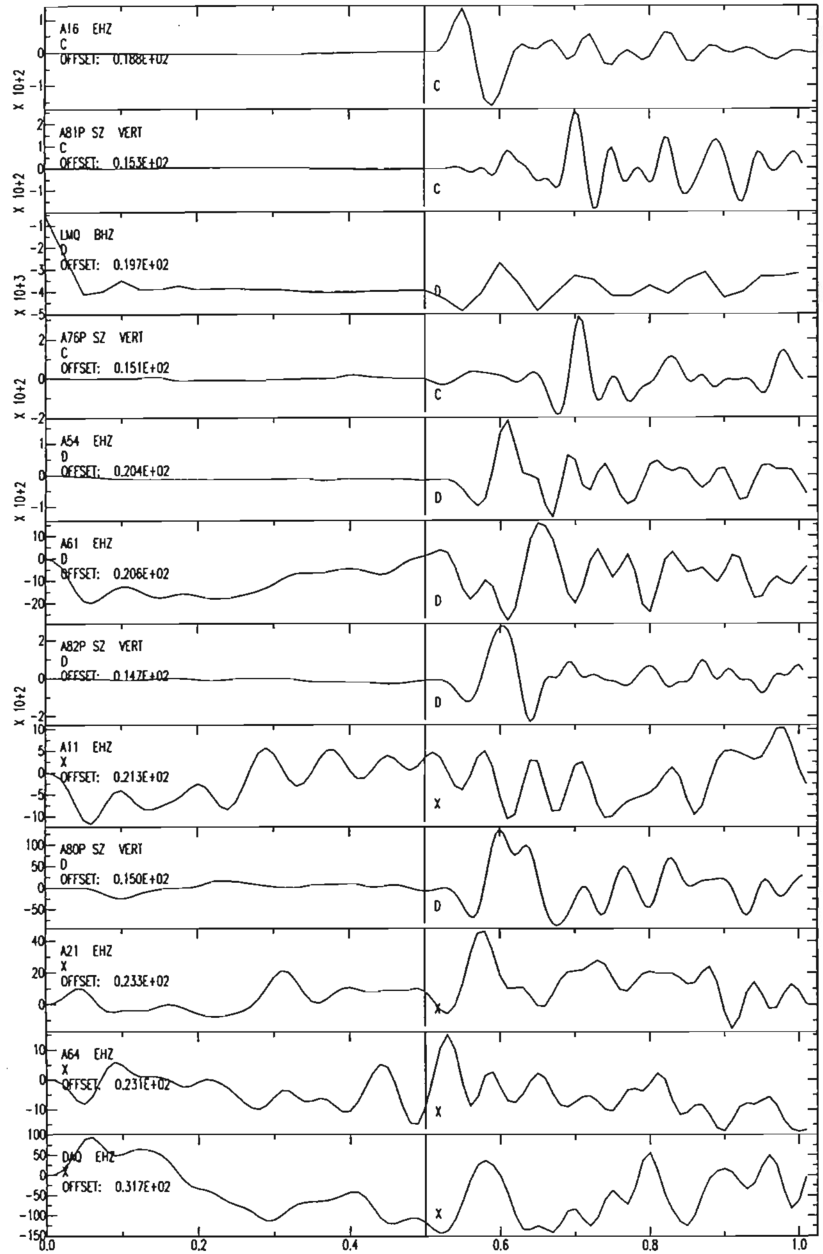


First Motions Only

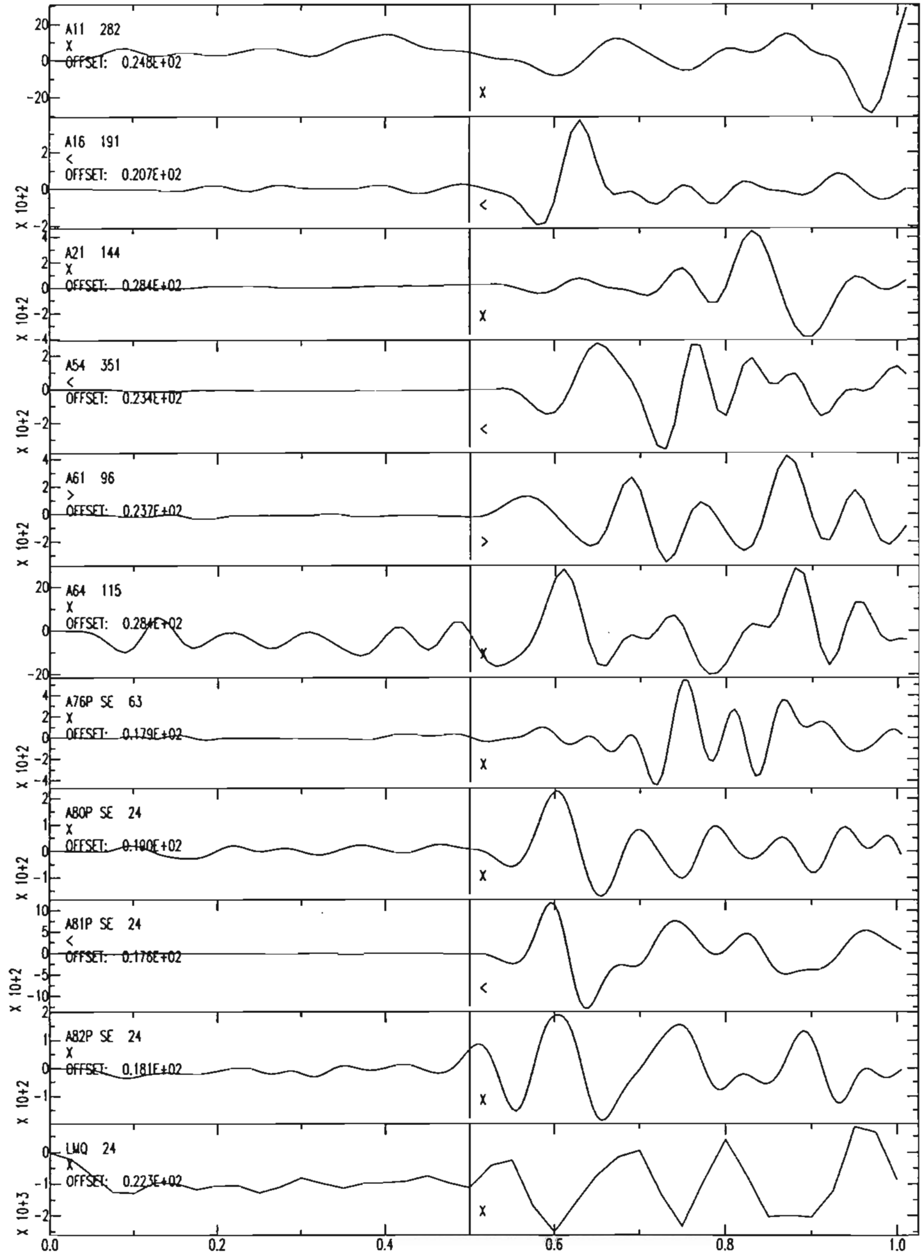


SH Motions and Lines.

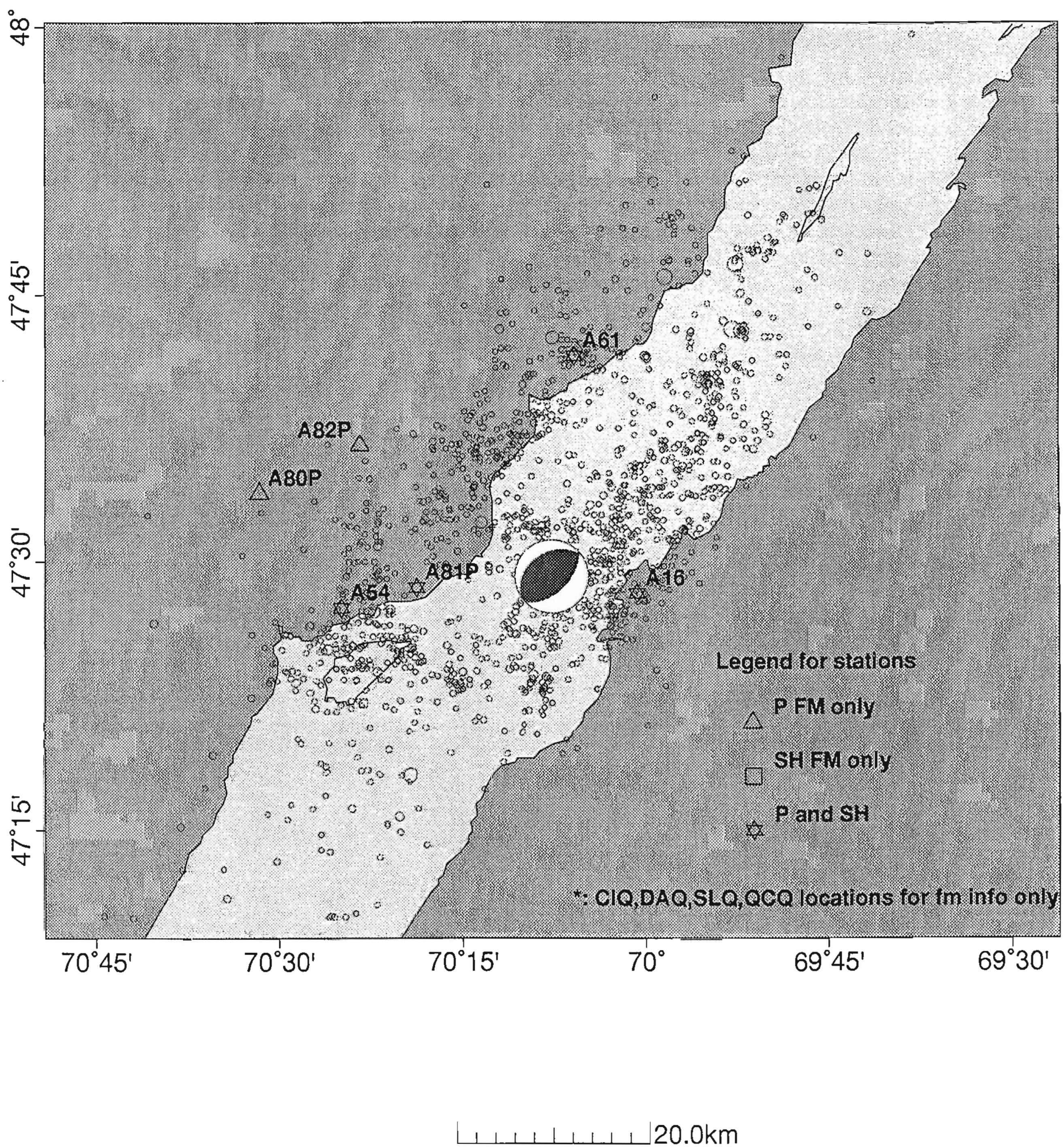
P Phases on Vertical Components



SH phases on Transverse Components



Location Map



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960624

Earthquake of 19960704 1227 Magnitude 2.0MN

1- Earthquake information and list of first motions.

Date	Time hhmm ss	Latitude	Longitude	Depth (km)	Mag	Sta/Pha
960704	1227 07.48	47.6197	-70.1352	5.28	2.0MN	7/014

COMMENTS:

CHARLEVOIX SEISMIC ZONE, QUE.
$ triggered A80P and A82P;
$ A82P fm is uncertain.
$ Time drift of station A82P is 0.00 sec
$ Time drift of station A80P is -0.05 sec
$ The Sg lines of some stations include the SH FM.
$ The convention used is the Virginia Tech convention used in FOCMEC:
$ <: SH first motion to left (back to event) impulsive
$ >: SH first motion to right (back to event) impulsive
$ Focmec computed by ML is poorly constrained.

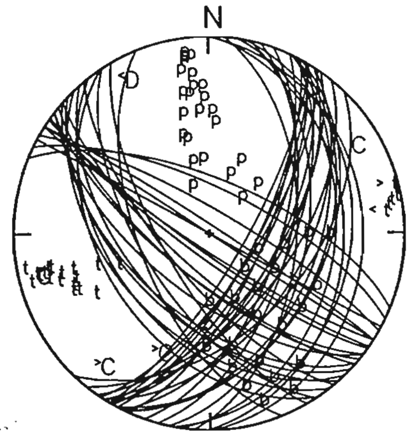
Sta	Pha	Dist (km)	Azim	Take-off Angle	FM
A61	PG	9	23	-59	C
A61	SG	9	23	-59	>
LMQ	PG	16	241	-72	C
A82P	SG	19	266	-74	<
A16	PG	19	150	-75	D
A16	SG	19	150	-75	<
A64	PG	29	38	-80	C
A64	SG	29	38	-80	>
A80P	SG	30	258	-80	>
A21	PG	35	74	-81	C

Number of P first motions: 5
Number of SH first motions: 5

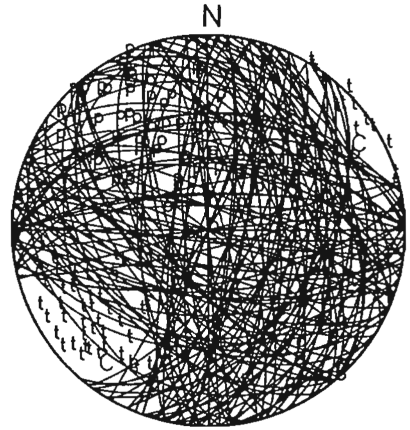
2- Rating of the solution.

The solution has an X rating (rejected) due to the absence of constraints on the positions of the nodal planes.

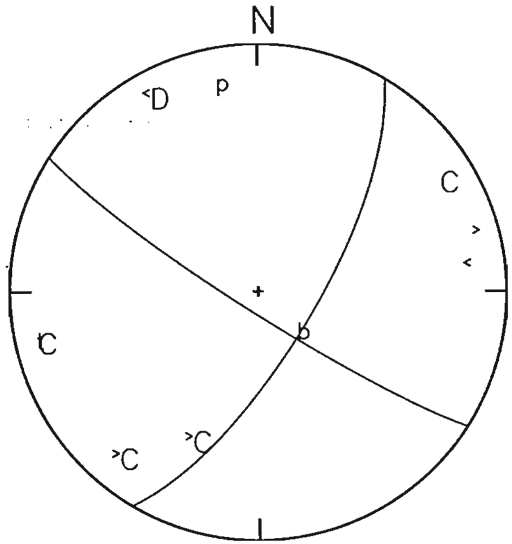
19960704 12:27 U.T.



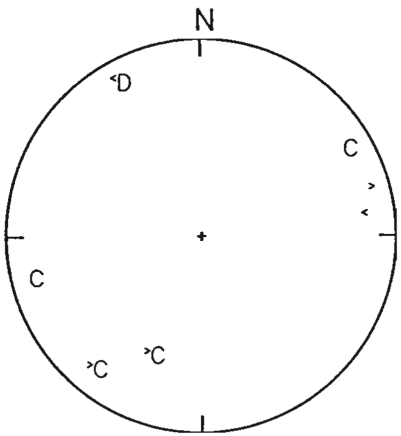
P, SH and P–Nodal



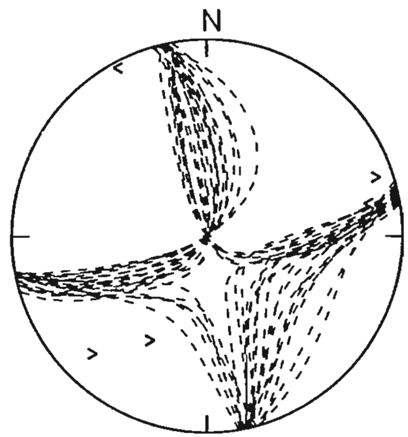
Solution with P FM only.



Best Solution

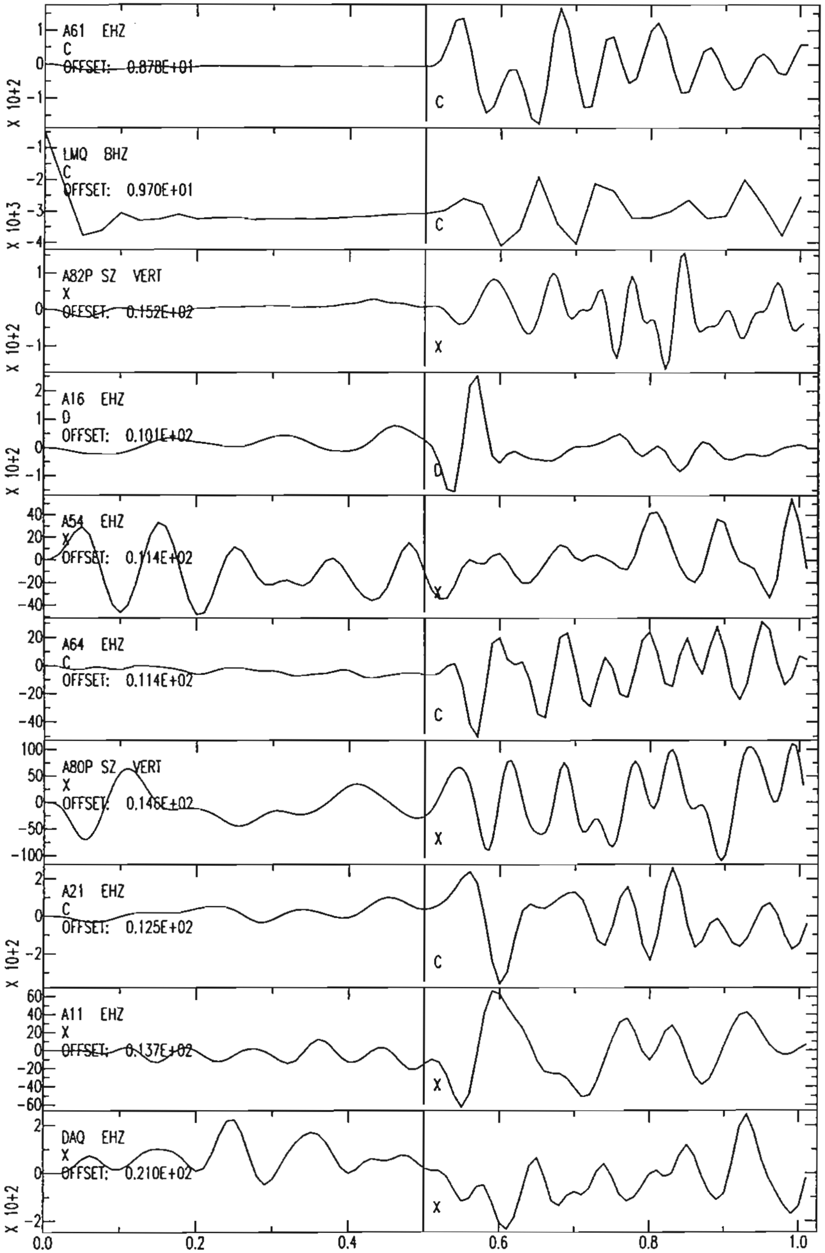


First Motions Only

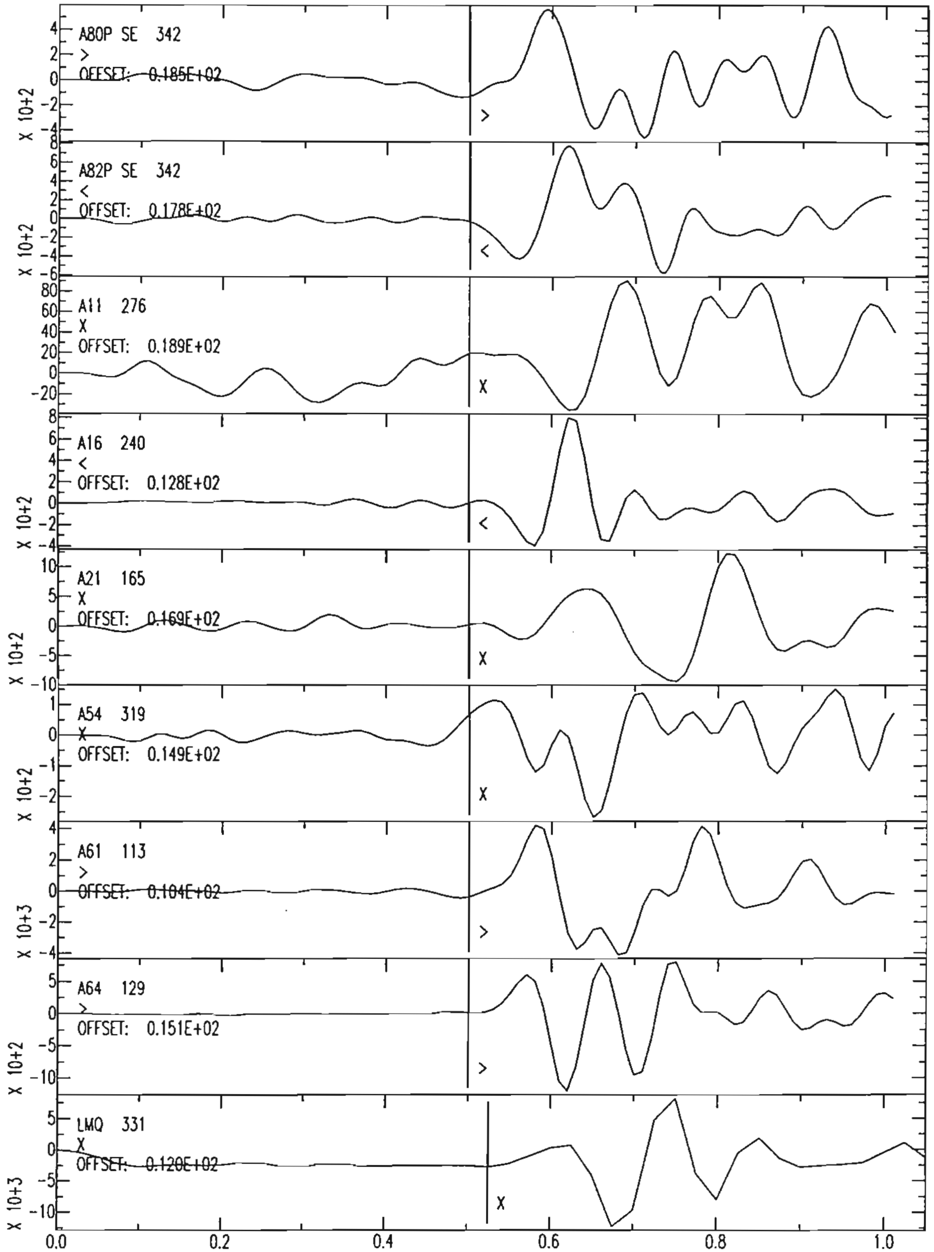


SH Motions and Lines.

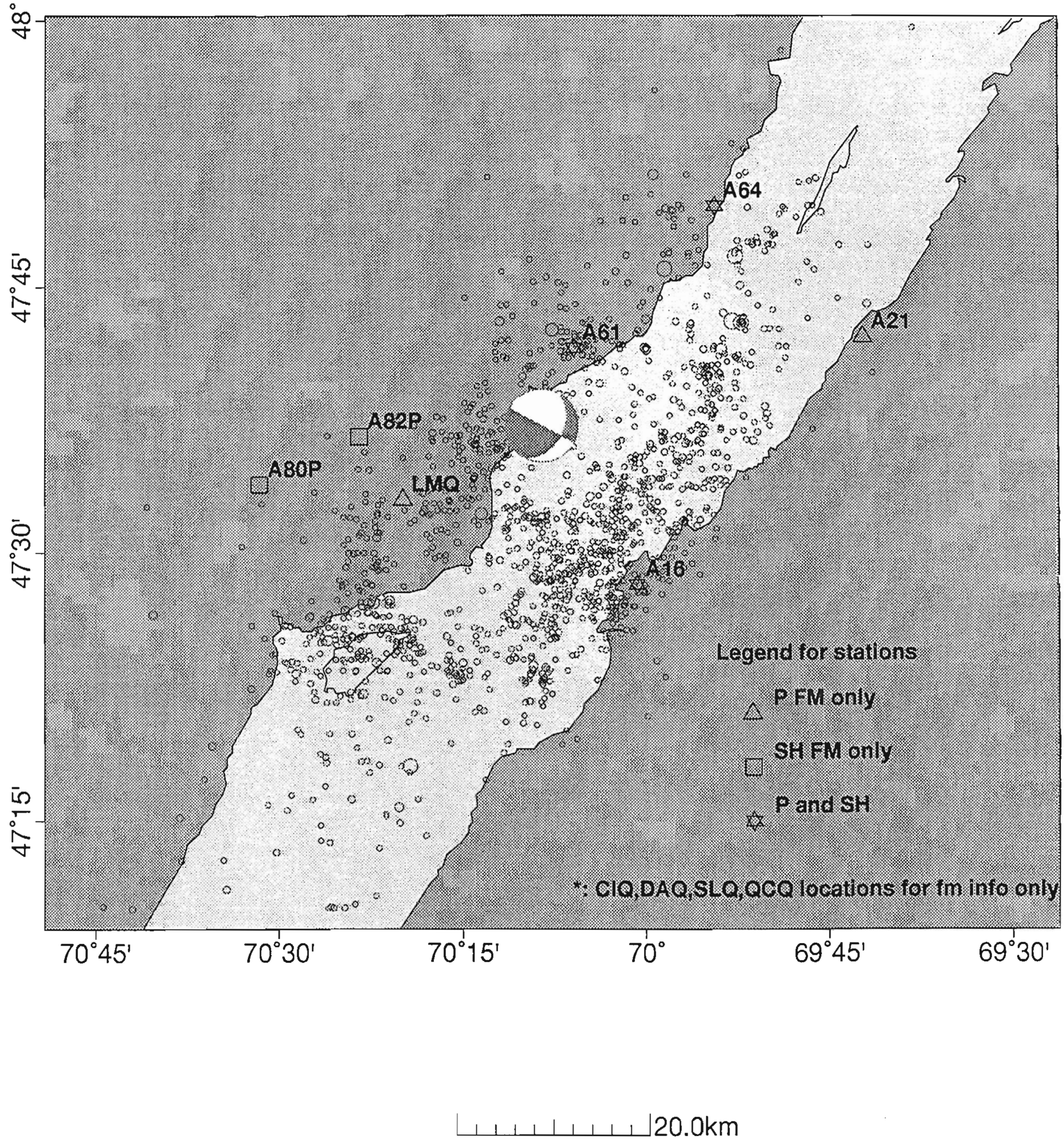
P Phases on Vertical Components



SH phases on Transverse Components



Location Map



Earthquake of 19960714 0715 Magnitude 2.2MN

1- Earthquake information and list of first motions.

Date	Time hhmm ss	Latitude	Longitude	Depth (km)	Mag	Sta/Pha
960714	0715 02.89	47.4829	-70.0503	13.71	2.2MN	7/014

COMMENTS:

CHARLEVOIX SEISMIC ZONE, QUE.
20 km S from LA MALBAIE, QUE.
$ 3 field stations triggered: A76P, A80P, and A58P.
$ Time drift of station A58P is 0.09 sec
$ Time drift of station A76P is -0.03 sec
$ Time drift of station A80P is 0.09 sec
$ The Sg lines of some stations include the SH FM.
$ The convention used is the Virginia Tech convention used in FOCMEC:
$ <: SH first motion to left (back to event) impulsive
$ >: SH first motion to right (back to event) impulsive
$ Preliminary Focmec computed by ML.

Sta	Pha	Dist (km)	Azim	Take-off Angle	FM
A16	PG	4	112	-15	C
A16	SG	4	112	-15	>
A58P	PG	13	291	-44	C
LMQ	PG	22	289	-58	D
A76P	PG	23	321	-59	D
A76P	SG	23	321	-59	>
A61	PG	24	353	-60	C
A61	SG	24	353	-60	<
A54	PG	27	264	-64	D
A54	SG	27	264	-64	>
A11	PG	29	203	-65	C
A21	PG	37	48	-70	D
A21	SG	37	48	-70	<
A80P	PG	37	284	-70	D
A80P	SG	37	284	-70	>
A64	PG	40	17	-71	C
A64	SG	40	17	-71	>

Number of P first motions: 10
Number of SH first motions: 7

2- Most Representative Solution.

A total of 442 solutions were found using a b axis increment of 1 degree. The

following parameters describe the most representative solution, which was derived from the average B, P, and T axes listed below.

dip,strike,rake	69.65	147.52	46.72		
dip,strike,rake	46.96	37.25	151.58	:auxiliary plane	
lower hem. trend, plunge of a,n	307.25	43.04	57.52	20.35	
lower hem. trend & plunge of b	165.65	40.00			
lower hem. trend, plunge of p,t	267.45	13.69	12.47	46.77	

Average B, P, and T axes:

	B	P	T
Mean trend:	N 154	N 264	N 13
Mean Plunge:	43	21	40
Vector Magnitude:	441	441	441
Mean length of resulting vector:	0.997	0.998	0.998

3- Misfits.

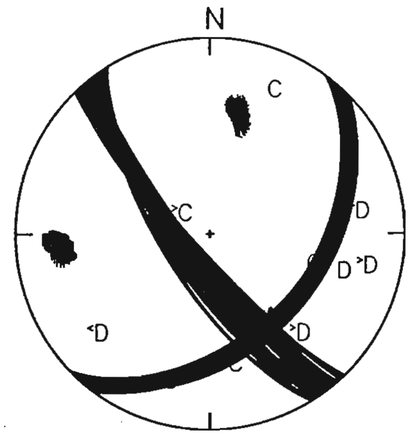
All 10 P first motions agreed with the solution.
Out of 7 SH first motions, a total of 2 did not fit the solutions (28/100).

Station Name	Number of misfits	Percentage of wrongs
A54	442	100
A64	442	100

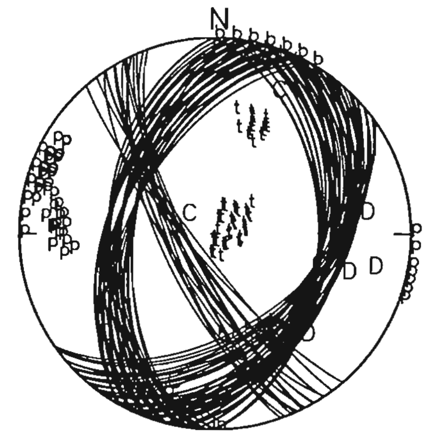
4- Rating of the focal mechanism.

The solution has an A rating based on the small number of P and SH misfits (0 /100 and 28 /100 respectively) and on the good constraints on the P, T and B axes (value of 0.998).

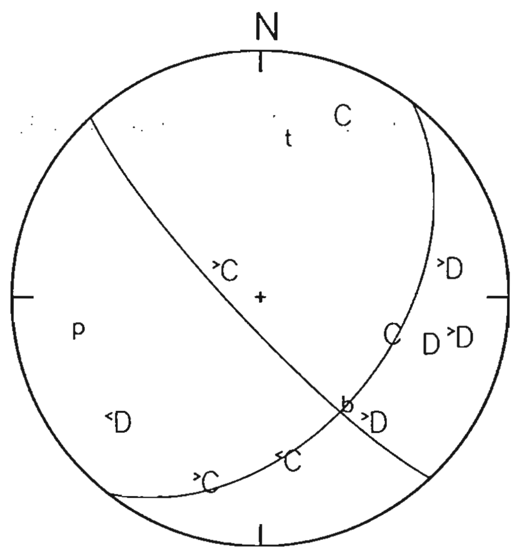
19960714 07:15 U.T.



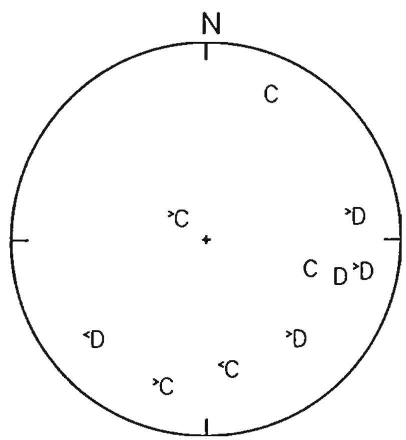
P, SH and P–Nodal



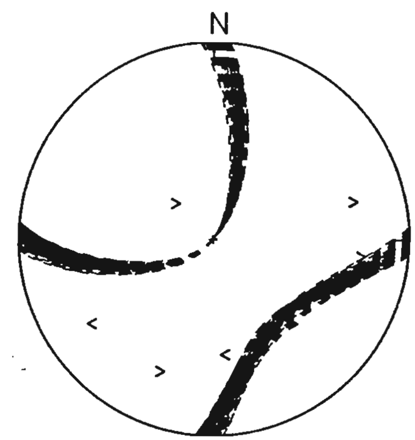
Solution with P FM only.



Best Solution

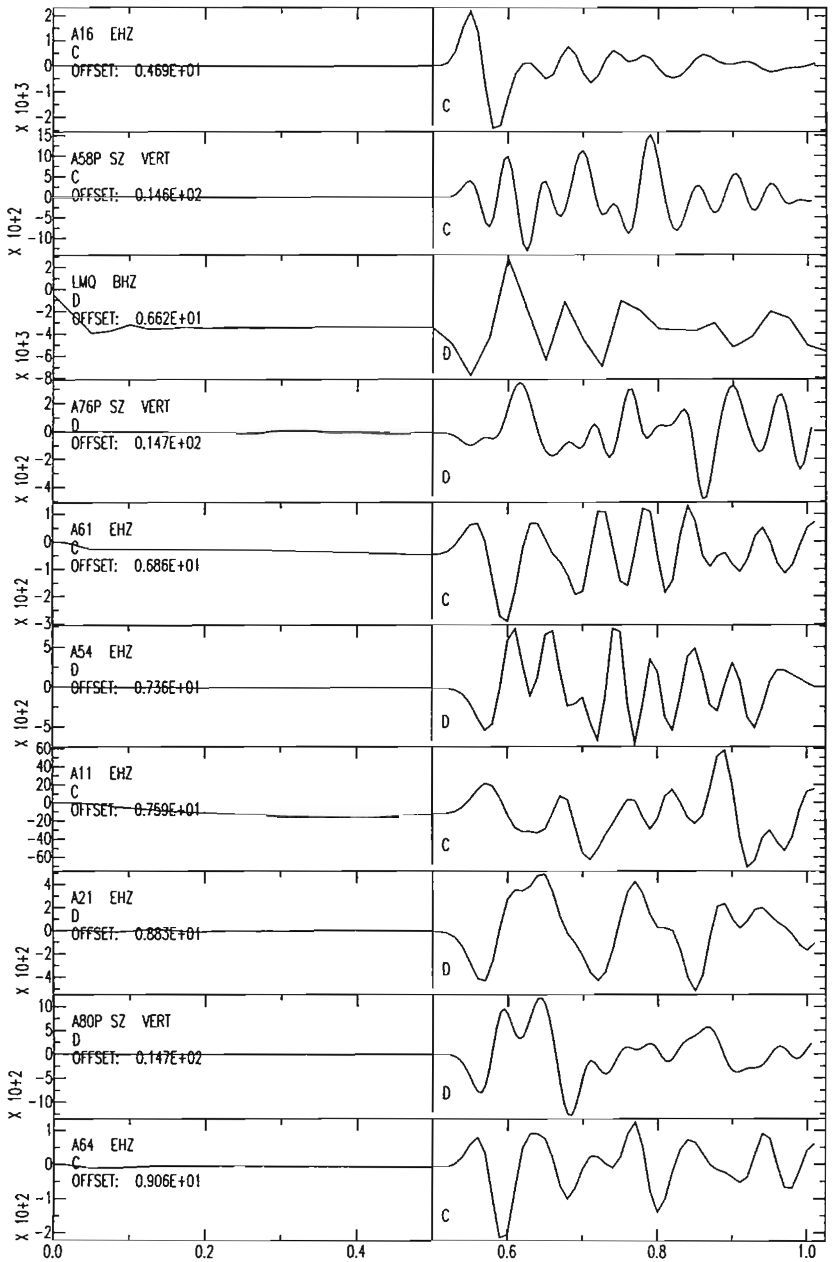


First Motions Only

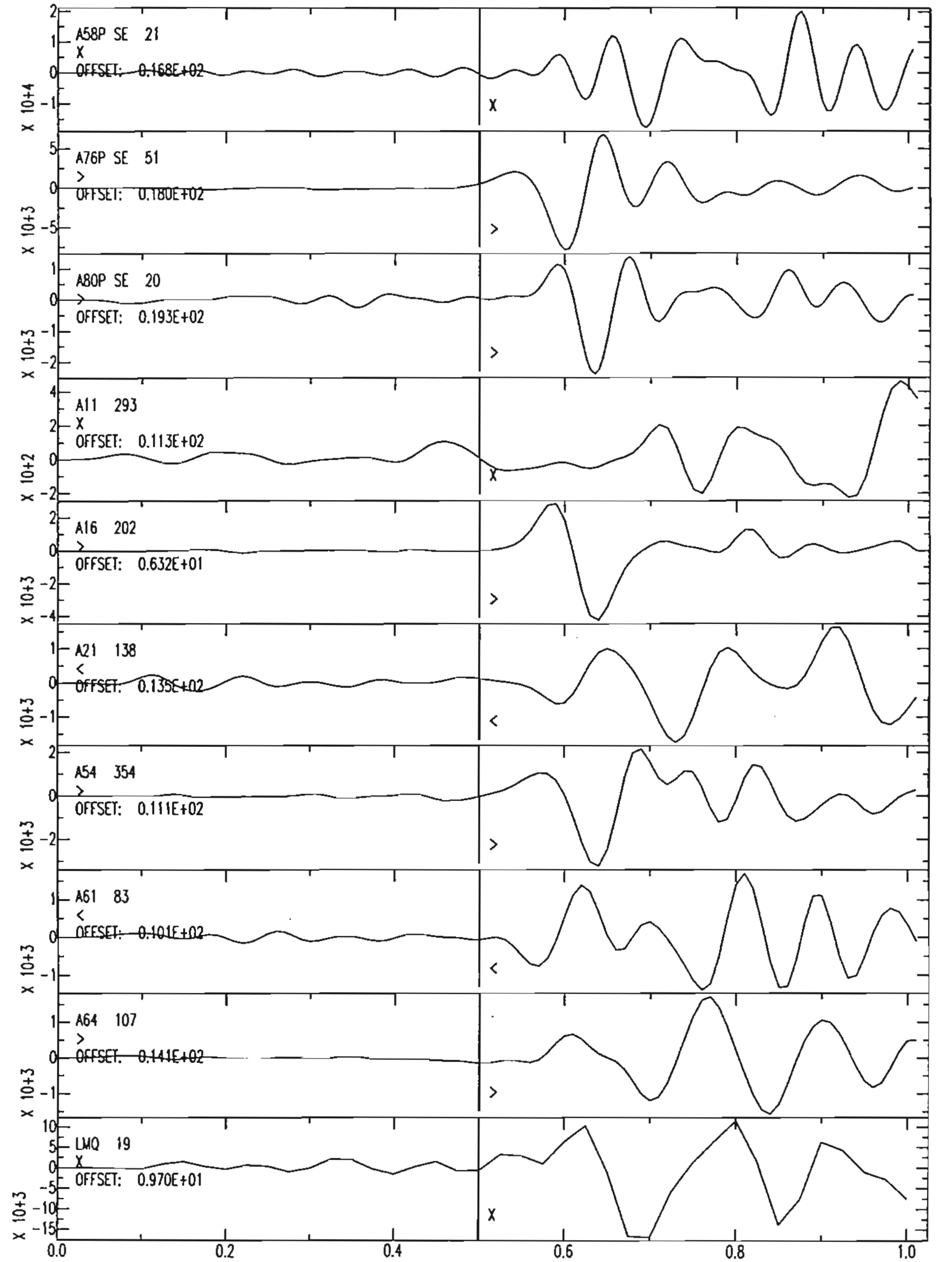


SH Motions and Lines.

P Phases on Vertical Components



SH phases on Transverse Components



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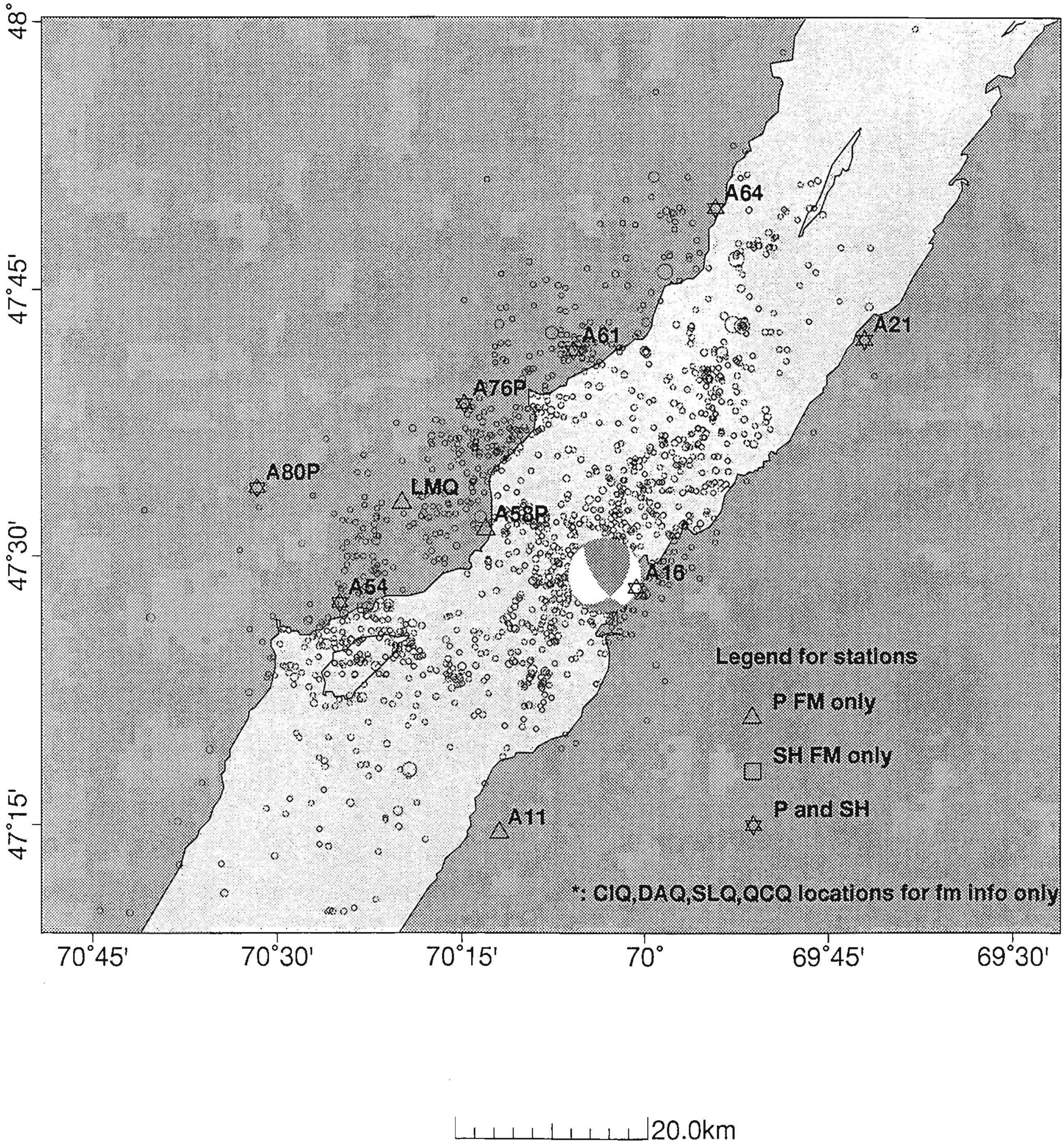
Location Map



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Earthquake of 19960714 1846 Magnitude 3.4MN

1- Earthquake information and list of first motions.

Date	Time hhmm ss		Latitude	Longitude	Depth (km)	Mag	Sta/Pha
960714	1846	49.22	47.6938	-69.9927	7.26	3.4MN	7/013

COMMENTS:

CHARLEVOIX SEISMIC ZONE, QUE.
13 km E from LA MALBAIE, QUE.
Felt in La Malbaie, Clermont, St-Irenee, St-Hilarion,
St-Fidele, Pointe-au-Pic and Port-au-Saumon.
$ Felt info from M. Bergeron
$ Talked to radio station (418) 457-3333
$ who had received calls from Clermont.
$ No first motion readable on ICQ and TRQ.
$ CIQ data from R. Du Berger, Chicoutimi.
$ all phases were doubled-checked.
$ Field data X-ed out due to large residuals.
$ Time drift of station A76P is -0.03 sec
$ Time drift of station A58P is 0.09 sec
$ Time drift of station A82P is -0.38 sec
$ Time drift of station A80P is 0.10 sec
$ PASQ fm from smoker records.
$ The Sg lines of some stations include the SH FM.
$ The convention used is the Virginia Tech convention used in FOCMEC:
$ <: SH first motion to left (back to event) impulsive
$ >: SH first motion to right (back to event) impulsive
$ Preliminary Focmec computed by ML.

Sta	Pha	Dist (km)	Azim	Take-off Angle	FM
A61	PG	7	269	-45	C
A61	SG	7	269	-45	<
PASQ	PG	8	25	-47	C
A64	PG	17	27	-66	D
A64	SG	17	27	-66	>
A76P	PG	20	253	-70	D
A76P	SG	20	253	-70	>
A21	PG	23	87	-72	D
A21	SG	23	87	-72	>
A16	PG	25	182	-74	C
A16	SG	25	182	-74	>
A58P	PG	25	222	-74	D
A58P	SG	25	222	-74	>
LMQ	PG	30	237	-76	D
A82P	PG	31	252	-77	D
SHQ	PG	32	252	-77	D

A54	PG	41	230	-80	D
A80P	PG	42	250	-80	D
A11	PG	53	197	-82	D
RSFQ	PG	61	226	-83	D
SLQ	PG	74	92	-84	C
CIQ	PG	88	318	-85	C
DAQ	PG	98	288	-86	D
QCQ	PG	141	224	-87	D

Number of P first motions: 18
Number of SH first motions: 6

2- Most Representative Solution.

A total of 75 solutions were found using a b axis increment of 1 degree. The following parameters describe the most representative solution, which was derived from the average B, P, and T axes listed below.

dip,strike,rake	23.86	323.61	43.72		
dip,strike,rake	73.76	192.43	107.73	:auxiliary plane	
lower hem. trend, plunge of a,n		102.43	16.24	233.61	66.14
lower hem. trend & plunge of b		7.33	17.00		
lower hem. trend, plunge of p,t		268.49	26.68	126.13	57.60

Average B, P, and T axes:

	B	P	T
Mean trend:	N 10	N 269	N 129
Mean Plunge:	19	29	54
Vector Magnitude:	75	75	75
Mean length of resulting vector:	0.999	0.999	0.999

3- Misfits.

Out of 18 P first motions, one did not fit the solutions (5/100)

Station Name	Number of misfits	Percentage of wrongs
SLQ	75	100

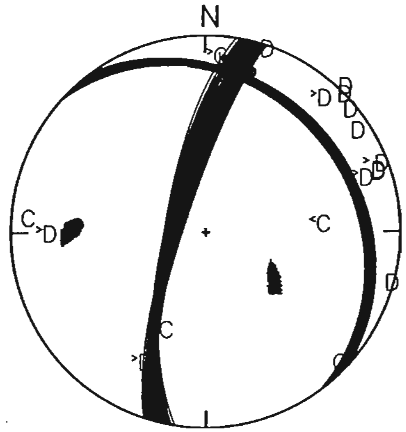
Out of 7 SH first motions, a total of 3 did not fit the solutions (42/100).

Station Name	Number of misfits	Percentage of wrongs
A58P	75	100
A61	75	100
A64	75	100

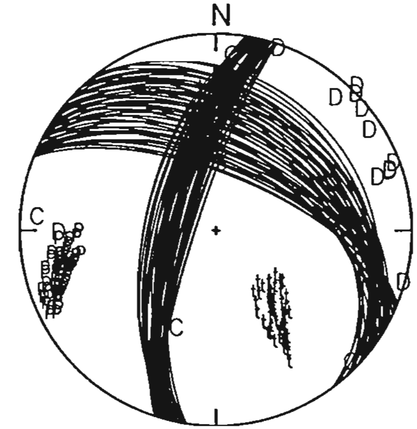
4- Rating of the focal mechanism.

The solution has an A rating based on the small number of P and SH misfits (5 /100 and 42 /100 respectively) and on the good constraints on the P, T and B axes (value of 0.999).

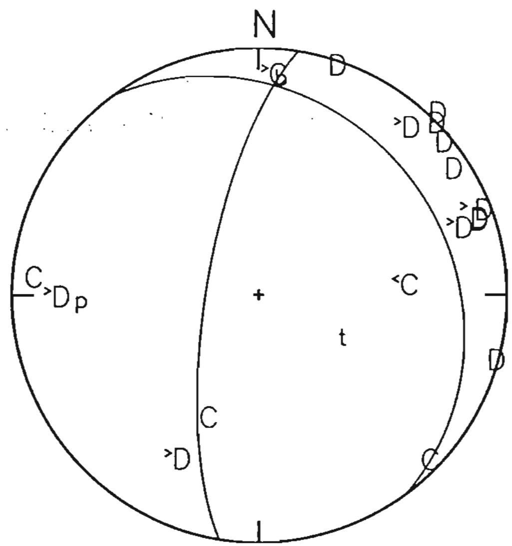
19960714 18:46 U.T.



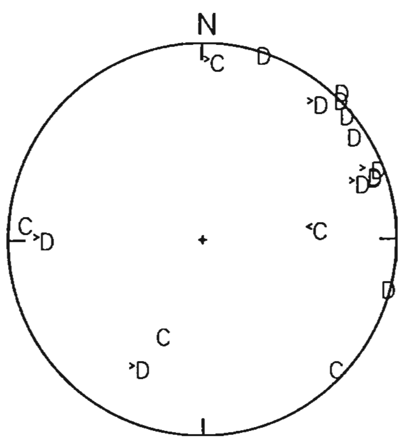
P, SH and P–Nodal



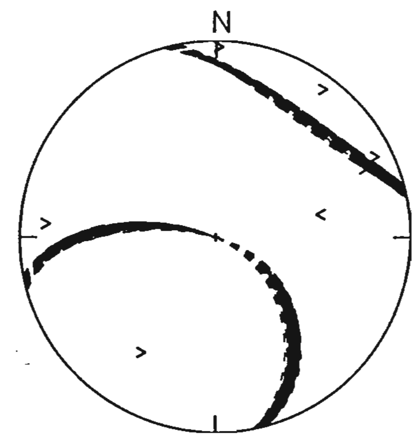
Solution with P FM only.



Best Solution

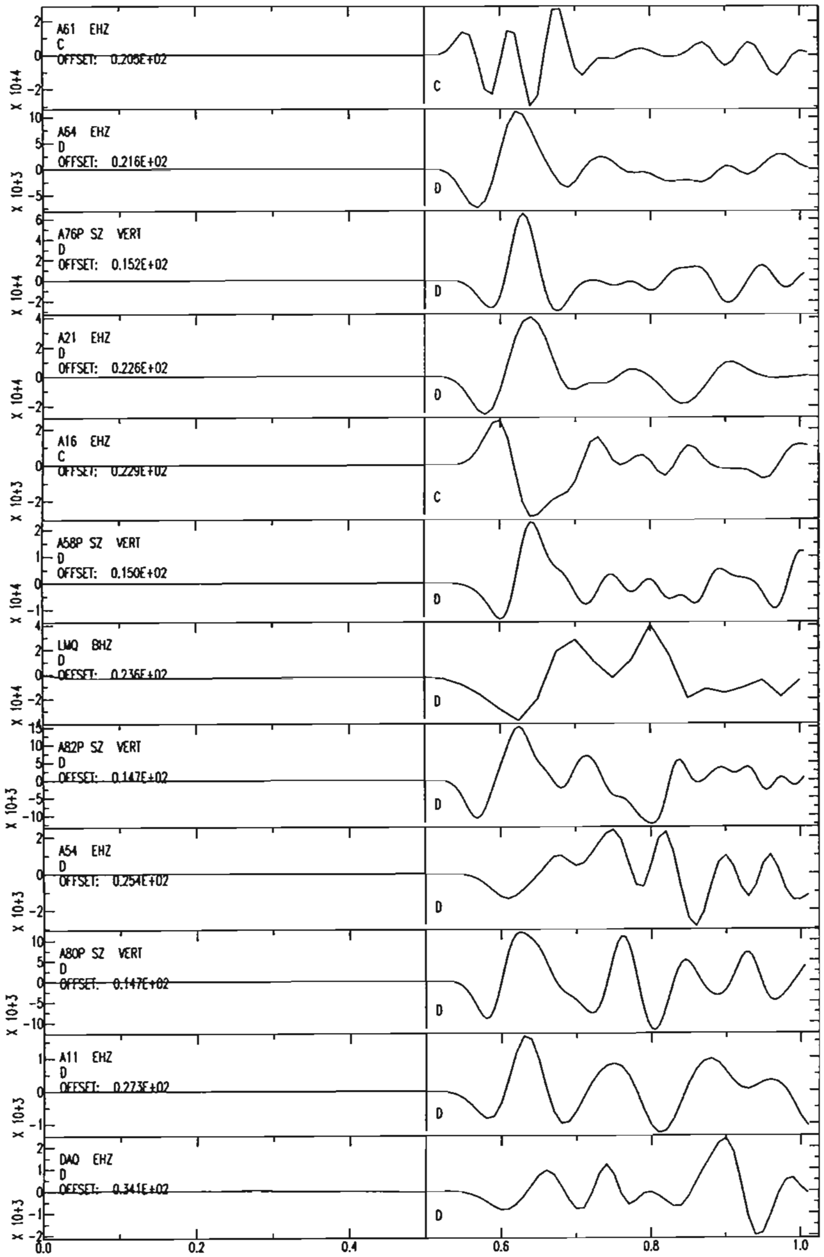


First Motions Only

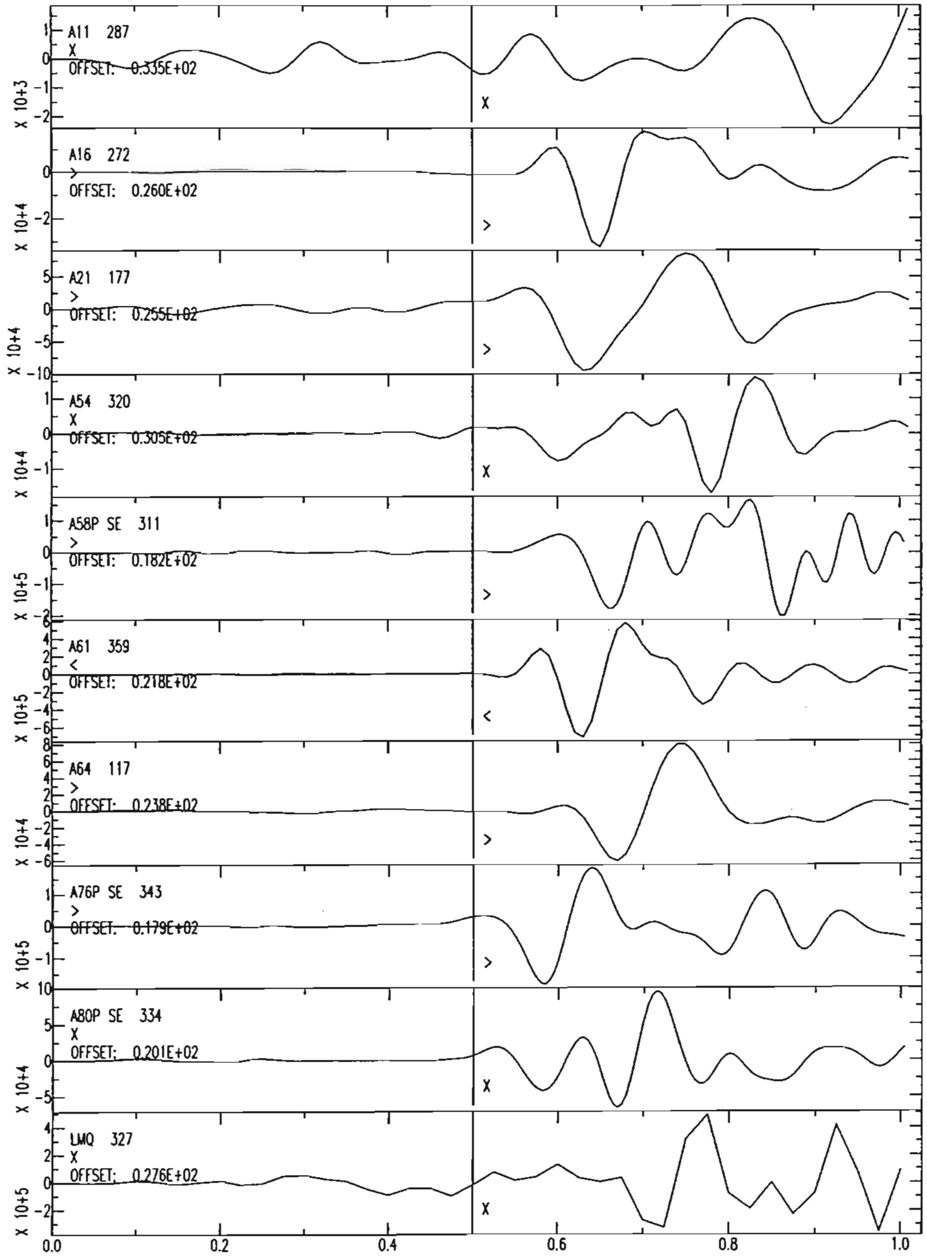


SH Motions and Lines.

P Phases on Vertical Components



SH phases on Transverse Components



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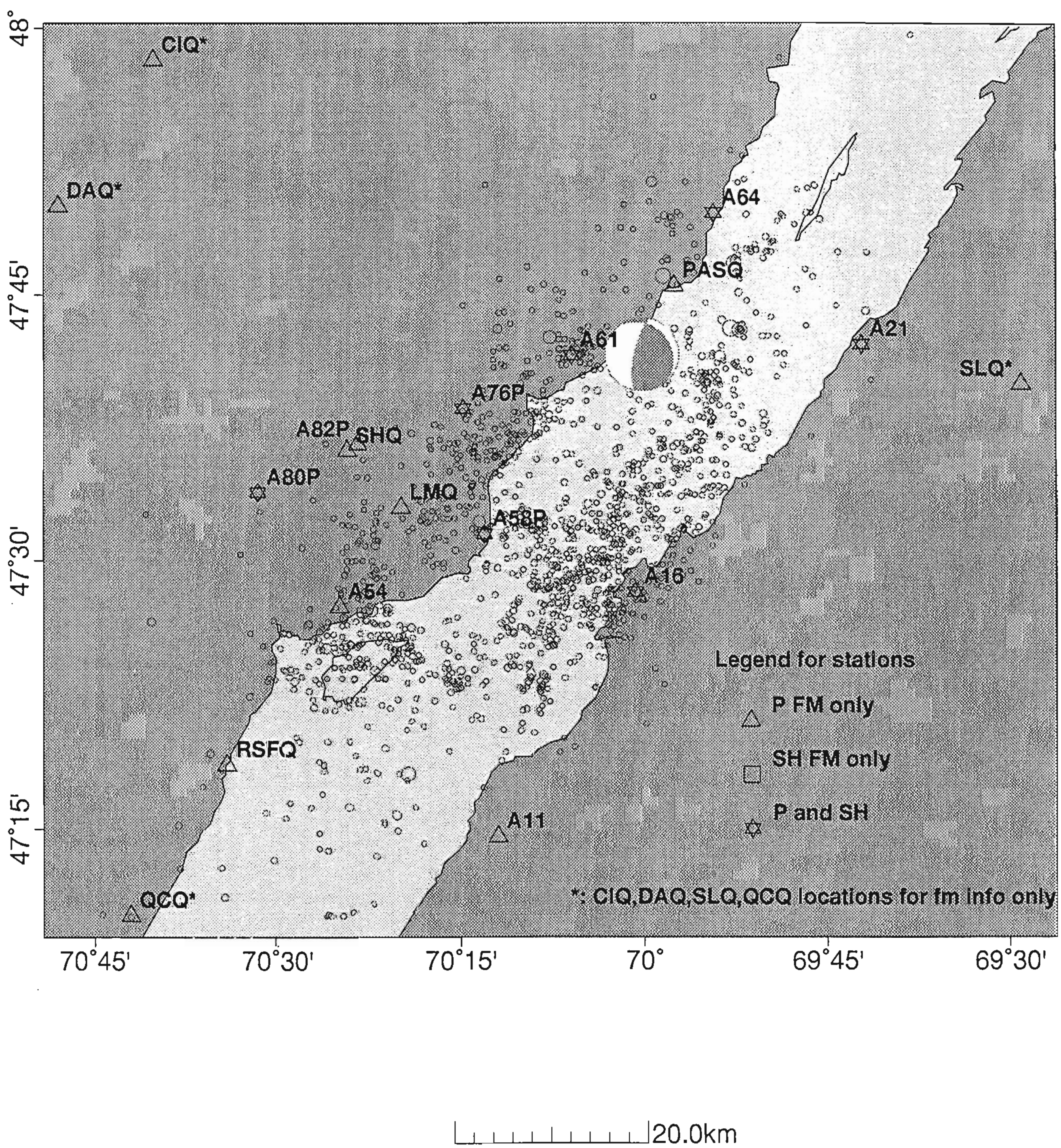
Location Map



Earthquake of 19960726 1438 Magnitude 2.3MN

1- Earthquake information and list of first motions.

Date	Time hhmm ss	Latitude	Longitude	Depth (km)	Mag	Sta/Pha
960726	1438 45.14	47.6097	-69.9468	10.36	2.3MN	7/014

COMMENTS:

CHARLEVOIX SEISMIC ZONE, QUE.
$
$ The Sg lines of some stations include the SH FM.
$ The convention used is the Virginia Tech convention used in FOCMEC:
$ <: SH first motion to left (back to event) impulsive
$ >: SH first motion to right (back to event) impulsive
$ Preliminary Focmec computed by ML.
$ PASQ FM is from smoker record; No T.C. available.

Sta	Pha	Dist (km)	Azim	Take-off Angle	FM
A61	PG	14	311	-54	C
A61	SG	14	311	-54	>
A16	PG	16	196	-57	D
A16	SG	16	196	-57	>
PASQ	PG	16	360	-58	D
A21	SG	22	62	-65	>
A58P	PG	22	245	-65	C
A76P	PG	22	280	-65	C
A64	PG	24	10	-67	C
A64	SG	24	10	-67	<
LMQ	PG	29	257	-71	C
A82P	PG	33	270	-73	D
A82P	SG	33	270	-73	>
A54	PG	39	244	-75	C
A54	SG	39	244	-75	>
A80P	PG	44	264	-77	D
A80P	SG	44	264	-77	>
DAQ	PG	105	293	-84	D

Number of P first motions: 11
Number of SH first motions: 7

2- Most Representative Solution.

A total of 259 solutions were found using a b axis increment of 1 degree. The following parameters describe the most representative solution, which was derived from the average B, P, and T axes listed below.

dip,strike,rake	28.76	310.41	-38.86		
dip,strike,rake	72.43	75.64	-113.14	:auxiliary plane	
lower hem. trend, plunge of a,n	345.64	17.57	220.41	61.24	
lower hem. trend & plunge of b	82.99	22.00			
lower hem. trend, plunge of p,t	315.47	56.44	183.35	23.98	

Average B, P, and T axes:

	B	P	T
Mean trend:	N 81	N 312	N 182
Mean Plunge:	23	56	23
Vector Magnitude:	258	258	258
Mean length of resulting vector:	0.997	0.996	0.995

3- Misfits.

Out of 11 P first motions, one did not fit the solutions (9/100)

Station Name	Number of misfits	Percentage of wrongs
PASQ	259	100

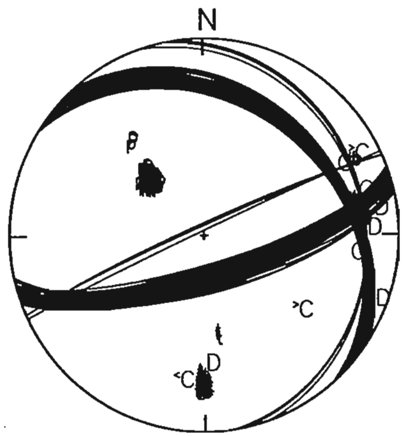
Out of 7 SH first motions, a total of 3 did not fit the solutions (42/100).

Station Name	Number of misfits	Percentage of wrongs
A21	259	100
A54	259	100
A80P	259	100

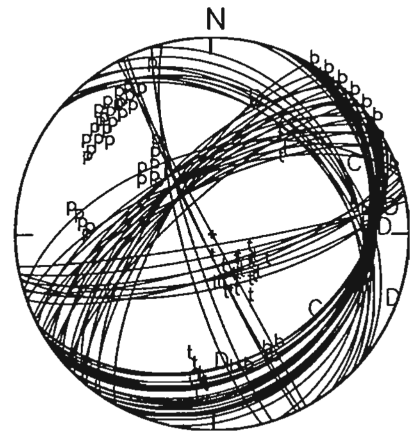
4- Rating of the focal mechanism.

Although the solution has a small number of P and SH misfits (9 /100 and 42 /100 respectively)relatively good constraints on the P, T and B axes (value of 0.996), the poor distribution of first motions makes the results uncertain. For this reason, we assign a "B" to this solution.

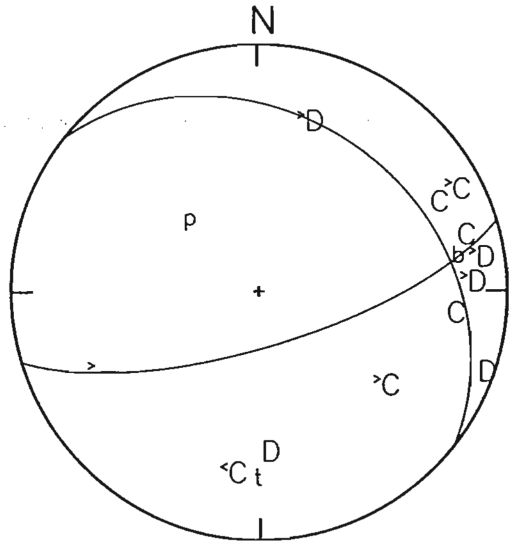
19960726 14:38 U.T.



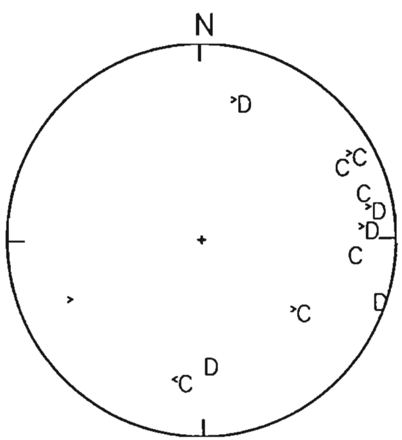
P, SH and P–Nodal



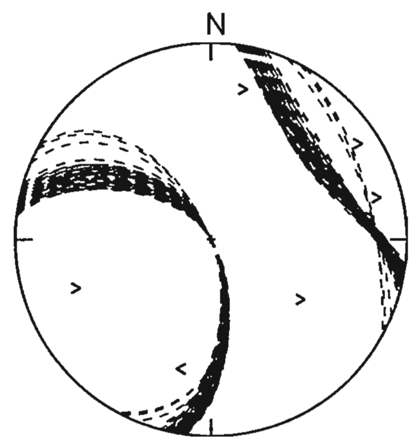
Solution with P FM only.



Best Solution

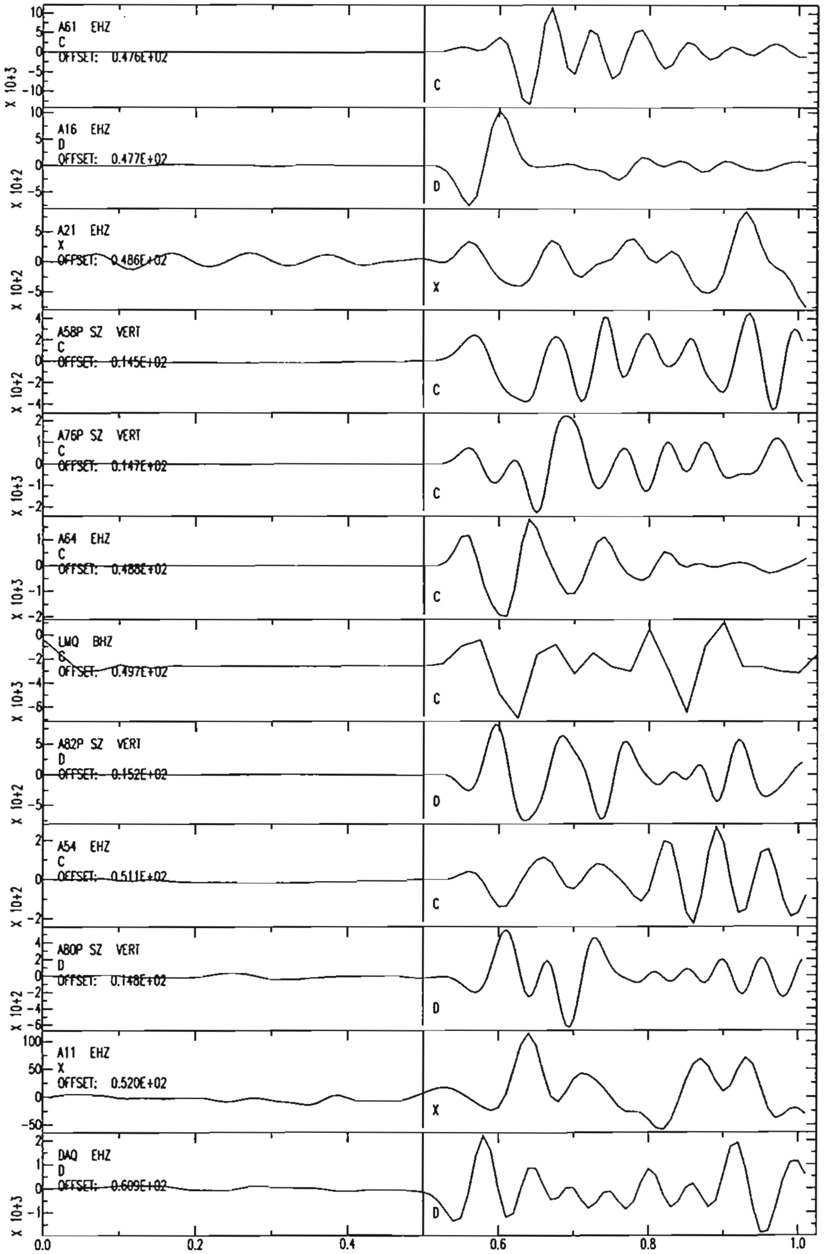


First Motions Only

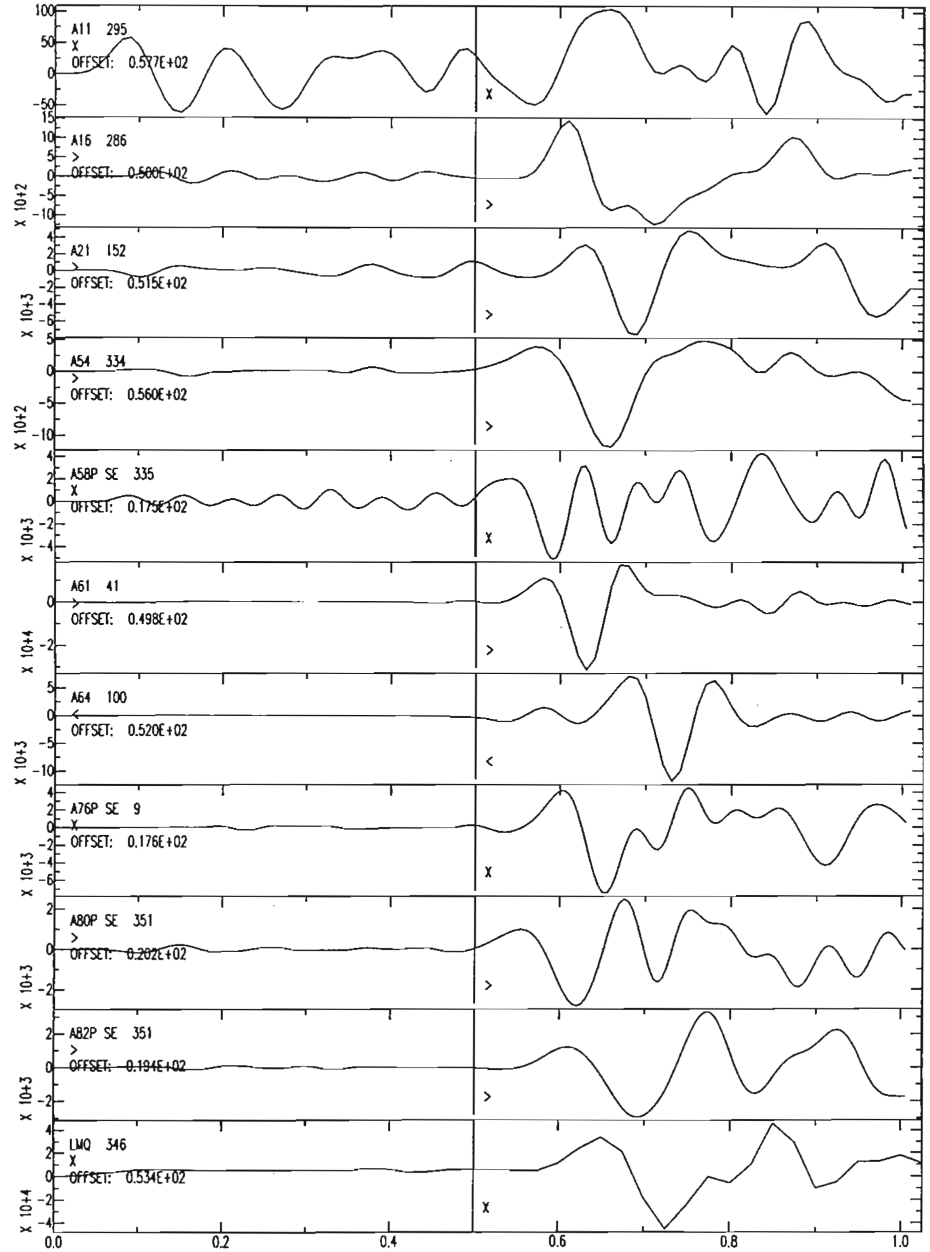


SH Motions and Lines.

P Phases on Vertical Components



SH phases on Transverse Components



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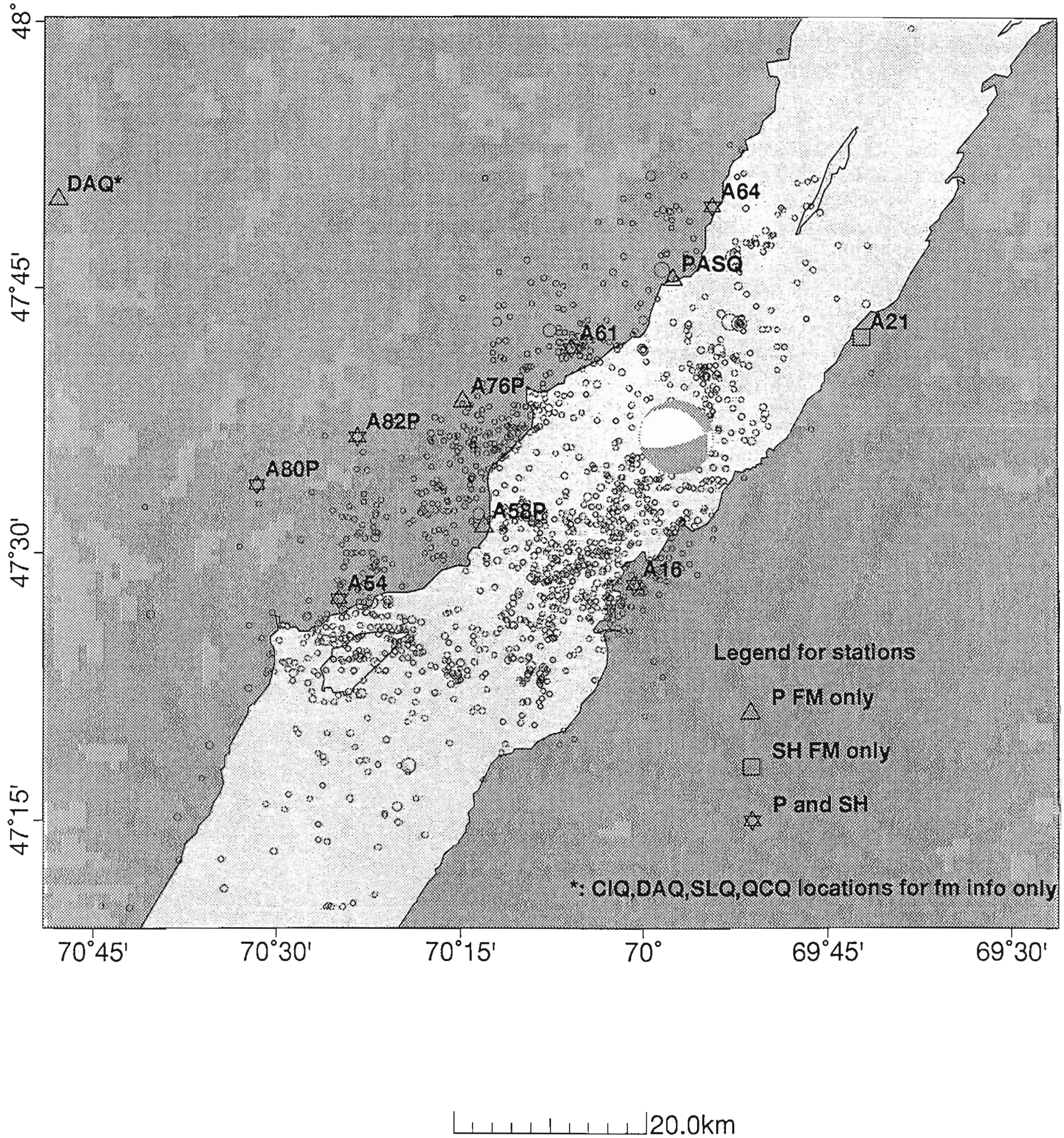
960726

Location Map



Earthquake of 19960819 1706 Magnitude 2.1MN

1- Earthquake information and list of first motions.

Date	Time hhmm ss	Latitude	Longitude	Depth (km)	Mag	Sta/Pha
960819	1706 09.66	47.3002	-70.2448	6.44	2.1MN	11/022

COMMENTS:

CHARLEVOIX SEISMIC ZONE, QUE.
24 km SE from BAIE-SAINT-PAUL, QUE.
$ all dead.
$
$ The Sg lines of some stations include the SH FM.
$ The convention used is the Virginia Tech convention used in FOCMEC:
$ <: SH first motion to left (back to event) impulsive
$ >: SH first motion to right (back to event) impulsive
$ Focmec computed by ML is poorly constrained.

Sta	Pha	Dist (km)	Azim	Take-off Angle	FM
A84P	PG	21	348	-73	C
A54	PG	22	324	-73	D
RSFQ	PG	24	272	-75	D
A58P	PG	25	6	-76	C
A58P	SG	25	6	-76	<
A16	PG	26	43	-76	C
A16	SG	26	43	-76	<
A82P	PG	36	343	-80	D
A80P	PG	36	324	-80	D
A80P	SG	36	324	-80	<
A76P	PG	38	0	-80	D
A61	PG	45	15	-82	D
A21	PG	61	43	-84	C
DAQ	PG	105	315	-86	D

Number of P first motions: 11
Number of SH first motions: 3

2- Most Representative Solution.

A total of 902 solutions were found using a b axis increment of 1 degree. The following parameters describe the most representative solution, which was derived from the average B, P, and T axes listed below.

dip,strike,rake	21.56	37.35	76.28	
dip,strike,rake	69.08	232.06	95.35	:auxiliary plane

lower hem. trend, plunge of a,n	142.06	20.92	307.35	68.44
lower hem. trend & plunge of b	50.14	5.00		
lower hem. trend, plunge of p,t	317.92	23.90	151.22	65.51

Average B, P, and T axes:

	B	P	T
Mean trend:	N 94	N 83	N 209
Mean Plunge:	14	17	58
Vector Magnitude:	803	261	860
Mean length of resulting vector:	0.890	0.289	0.954

3- Misfits.

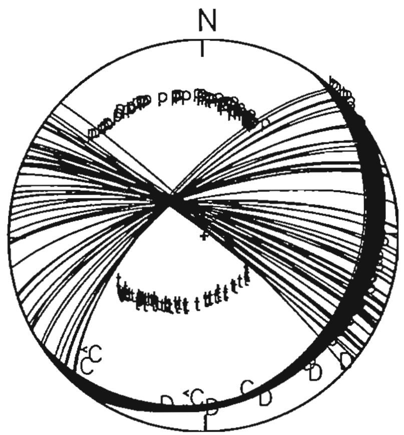
All 11 P first motions agreed with the solution.
Out of 3 SH first motions, a total of 2 did not fit the solutions (66/100).

Station Name	Number of misfits	Percentage of wrongs
A16	651	72
A58P	902	100
A80P	251	27

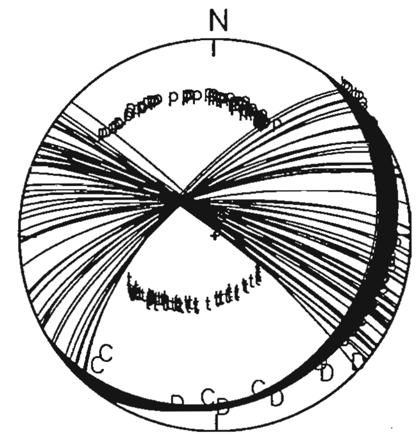
4- Rating of the focal mechanism.

The solution is rejected (rating X) based on the high number of P and SH misfits (0 /100 and 66 /100 respectively) and the absence of constraints on the P, T and B axes (value of 0.711).

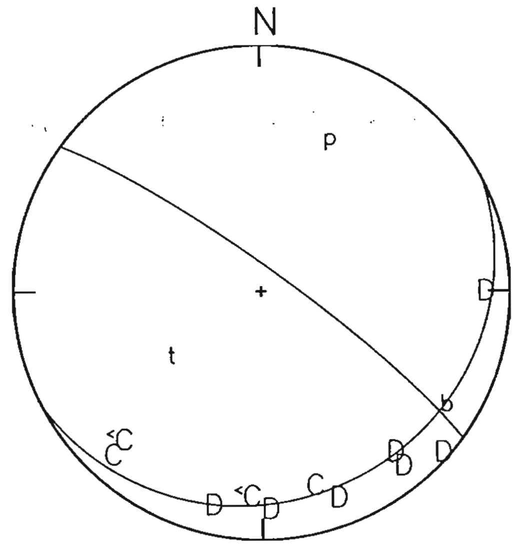
19960819 17:06 U.T.



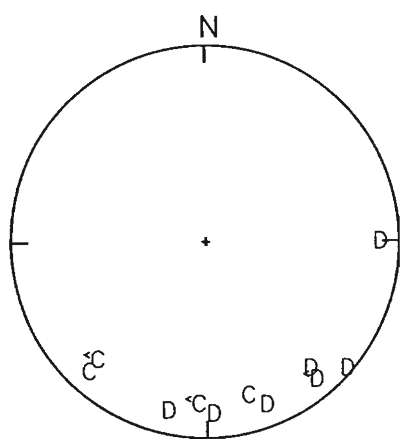
P, SH and P–Nodal



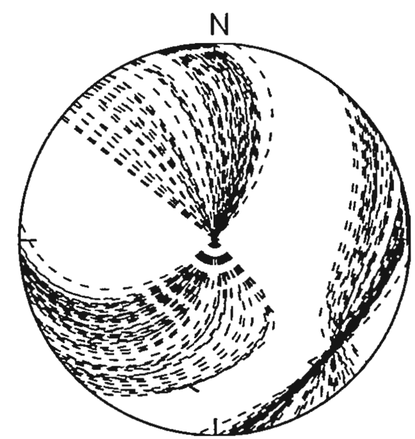
Solution with P FM only.



Best Solution

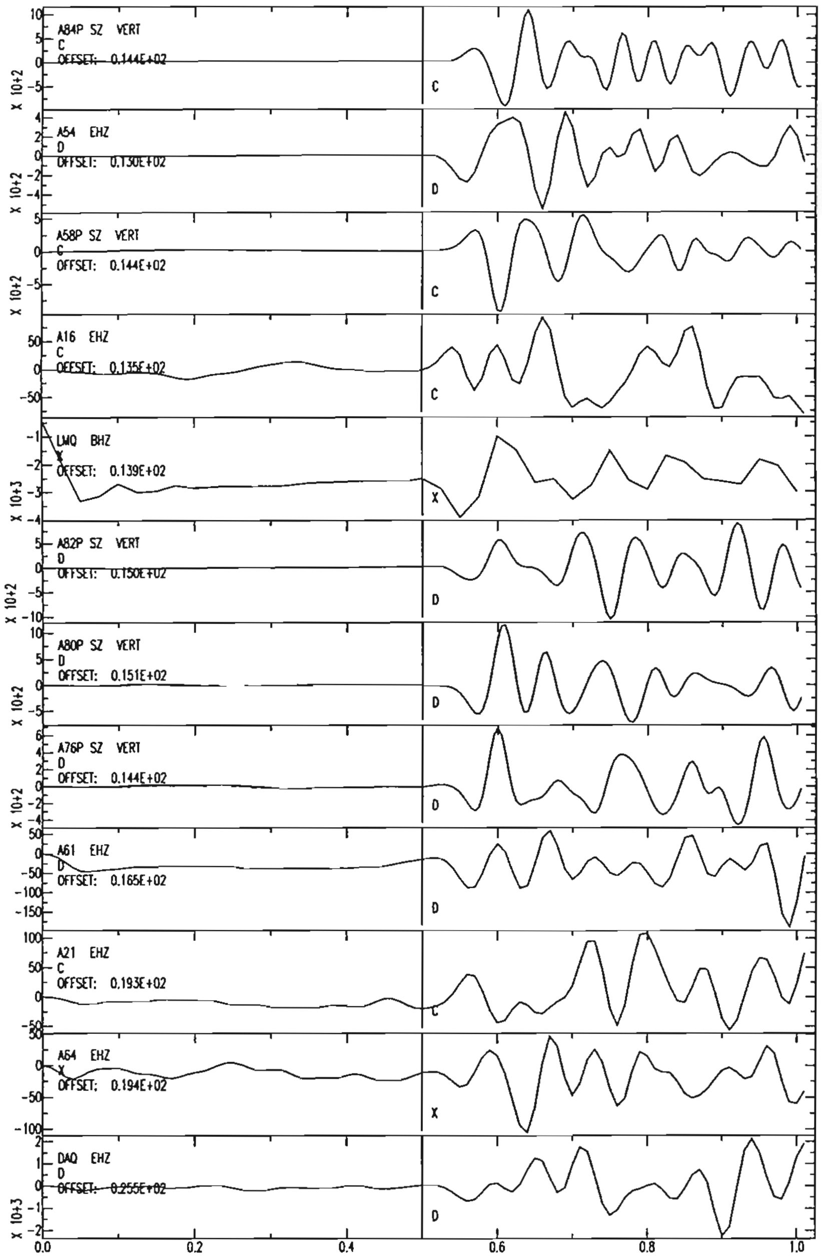


First Motions Only

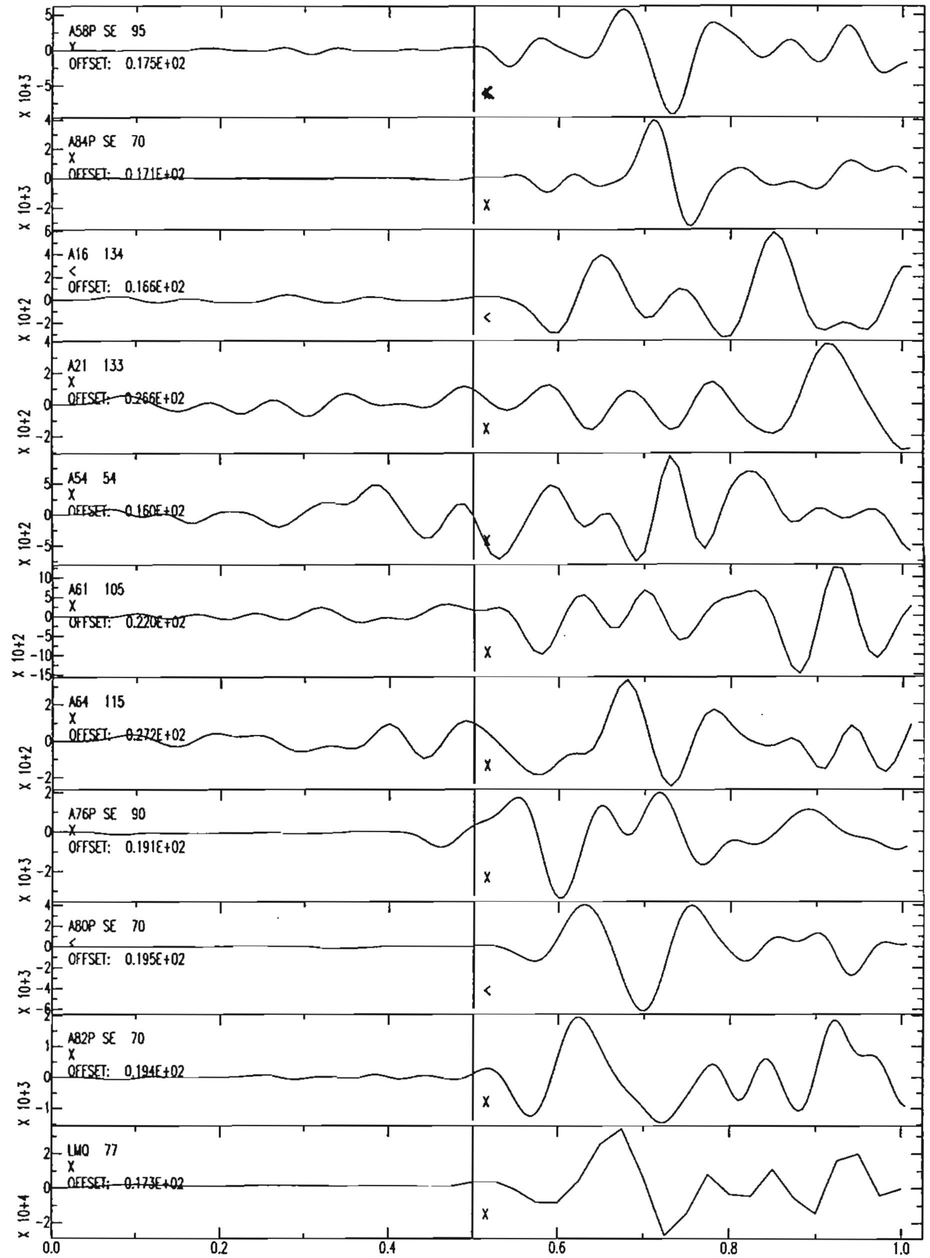


SH Motions and Lines.

P Phases on Vertical Components



SH phases on Transverse Components



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Earthquake of 19960913 2355 Magnitude 2.2MN

1- Earthquake information and list of first motions.

Date	Time hhmm ss	Latitude	Longitude	Depth (km)	Mag	Sta/Pha
960913	2355 35.92	47.5008	-70.2134	12.09	2.2MN	11/022

COMMENTS:

CHARLEVOIX SEISMIC ZONE, QUE.
$ All down.
$
$ The Sg lines of some stations include the SH FM.
$ The convention used is the Virginia Tech convention used in FOCMEC:
$ <: SH first motion to left (back to event) impulsive
$ >: SH first motion to right (back to event) impulsive
$ Preliminary Focmec computed by ML.

Sta	Pha	Dist (km)	Azim	Take-off Angle	FM
A58P	PG	3	1	-13	C
A58P	SG	3	1	-13	<
A84P	PG	7	252	-30	D
A84P	SG	7	252	-30	<
LMQ	PG	10	302	-40	D
LMQ	SG	10	302	-40	<
A54	PG	16	252	-53	D
A54	SG	16	252	-53	<
A16	PG	16	102	-53	C
A16	SG	16	102	-53	<
A82P	PG	18	313	-56	D
A82P	SG	18	313	-56	<
A61	SG	23	23	-63	<
A80P	PG	24	287	-64	D
A80P	SG	24	287	-64	<
A52P	PG	25	251	-64	D
A52P	SG	25	251	-64	<
A21	PG	45	60	-75	C

Number of P first motions: 9
Number of SH first motions: 9

2- Most Representative Solution.

A total of 843 solutions were found using a b axis increment of 2 degree. The following parameters describe the most representative solution, which was derived from the average B, P, and T axes listed below.

dip,strike,rake	74.80	32.72	71.32		
dip,strike,rake	23.91	264.92	139.69	:auxiliary plane	
lower hem. trend, plunge of a,n	174.92	66.09	302.72	15.20	
lower hem. trend & plunge of b	37.78	18.00			
lower hem. trend, plunge of p,t	137.50	27.46	278.64	56.29	

Average B, P, and T axes:

	B	P	T
Mean trend:	N 38	N 143	N 268
Mean Plunge:	29	26	49
Vector Magnitude:	829	836	830
Mean length of resulting vector:	0.983	0.992	0.985

3- Misfits.

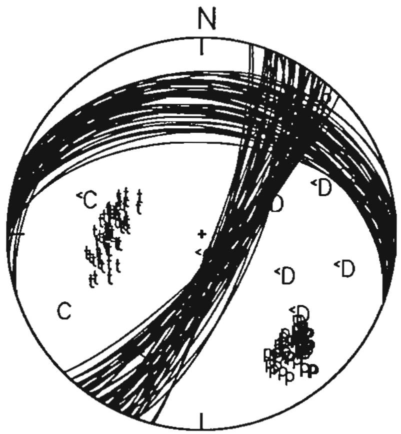
All 9 P first motions agreed with the solution.
Out of 9 SH first motions, a total of 2 did not fit the solutions (22/100).

Station Name	Number of misfits	Percentage of wrongs
A58P	843	100
A61	843	100

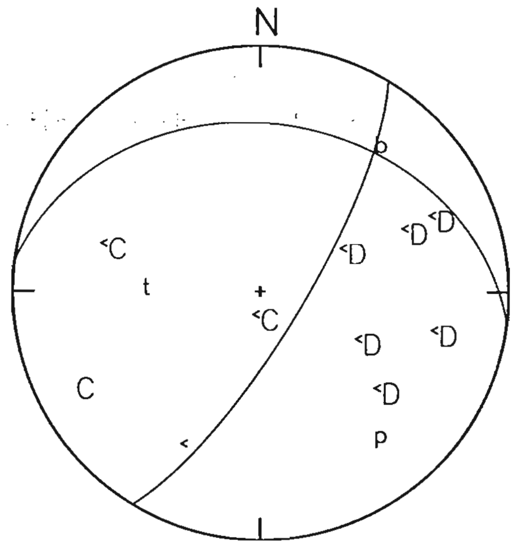
4- Rating of the focal mechanism.

The solution has a C rating based on the high number of P and SH misfits (0 /100 and 22 /100 respectively) and on the poor constraints on the P, T and B axes (value of 0.987).

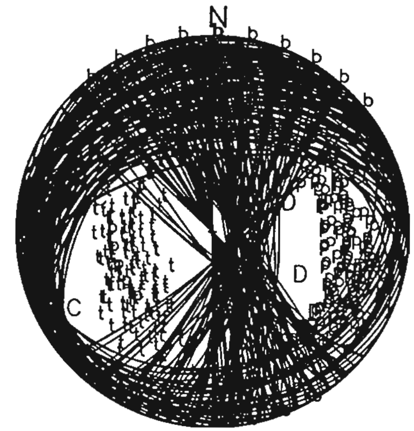
19960913 : U.T.



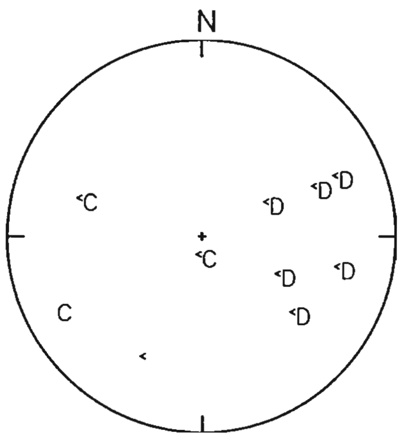
P, SH and P–Nodal



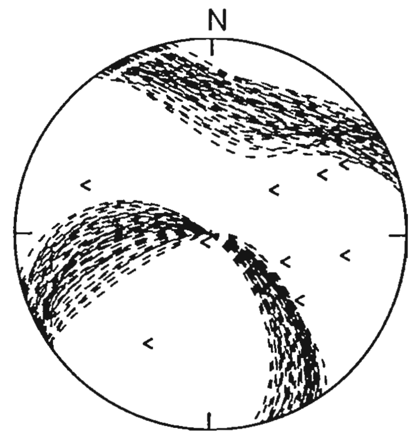
Best Solution



Solution with P FM only.

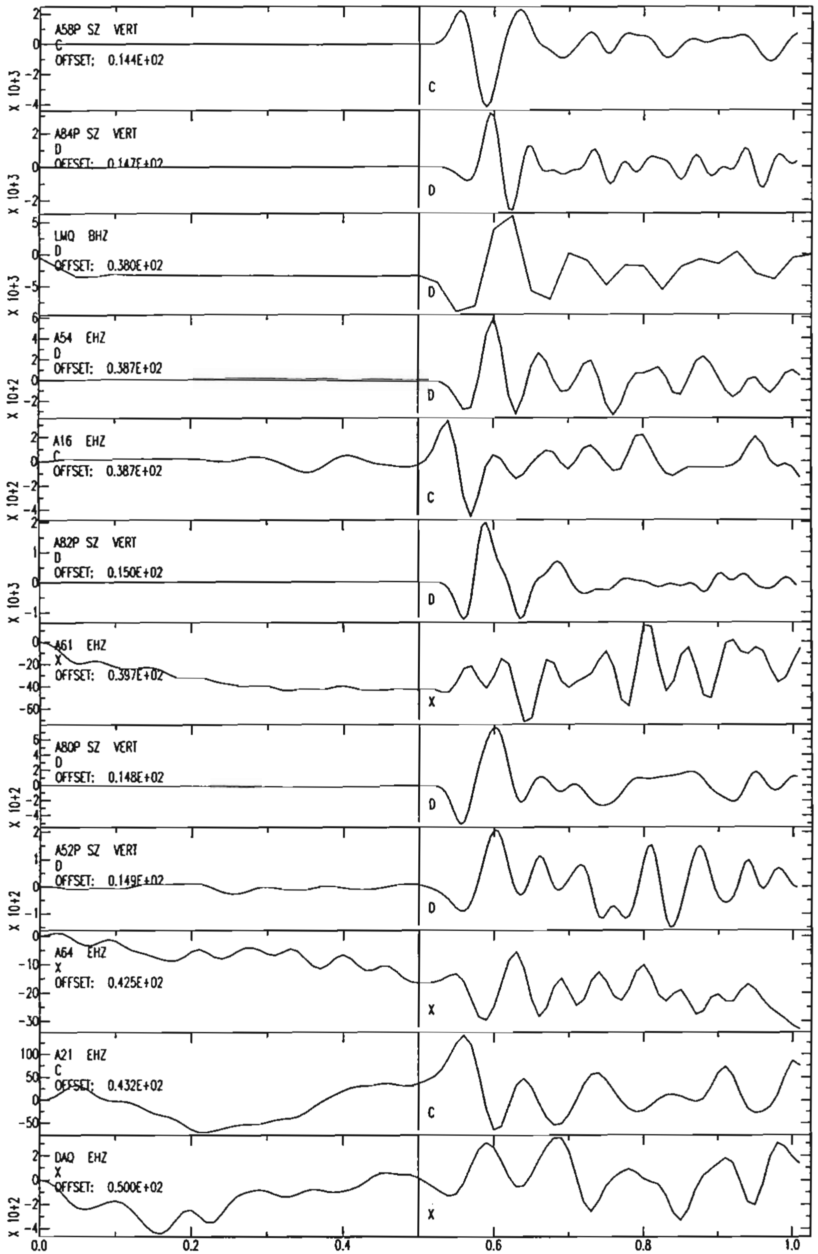


First Motions Only

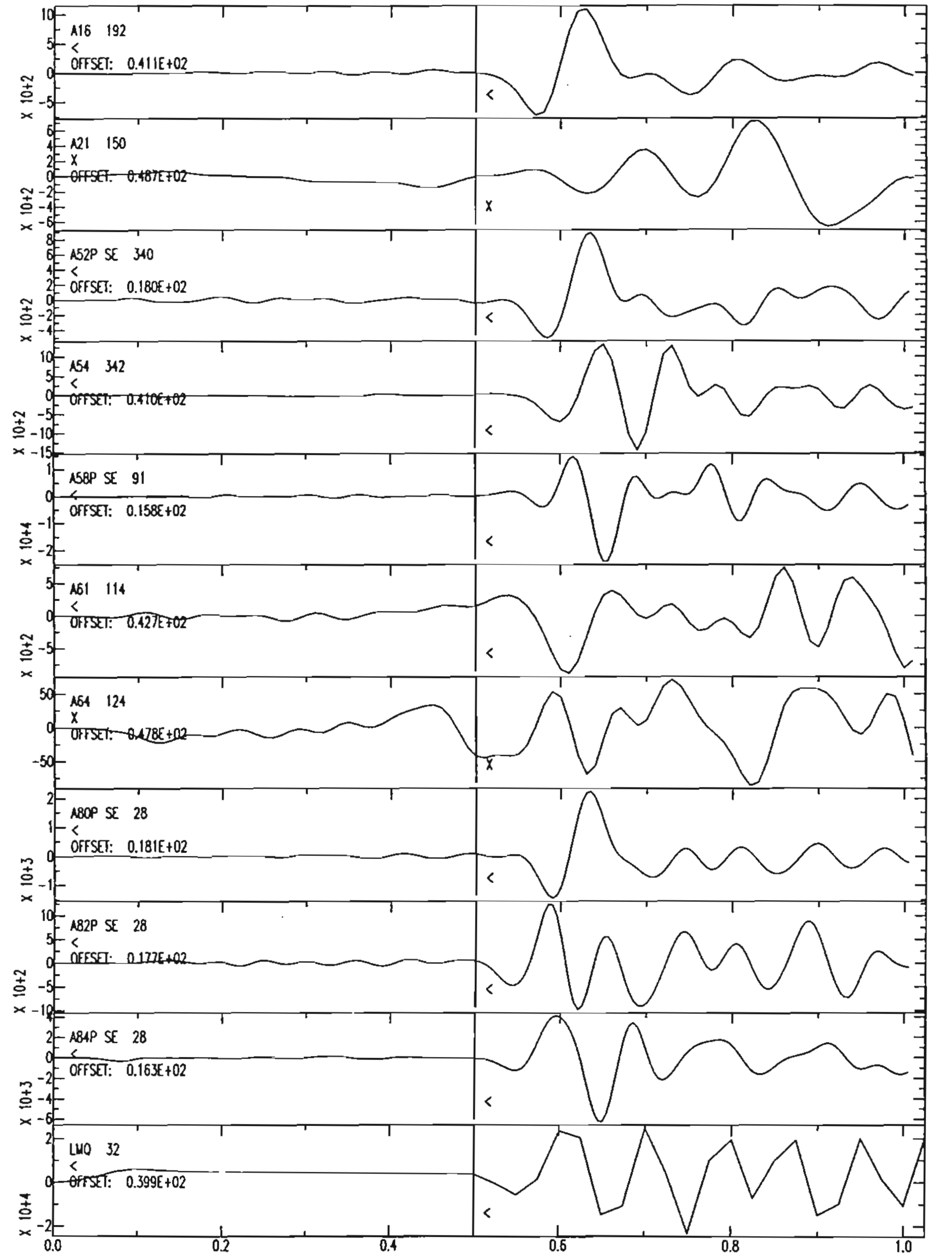


SH Motions and Lines.

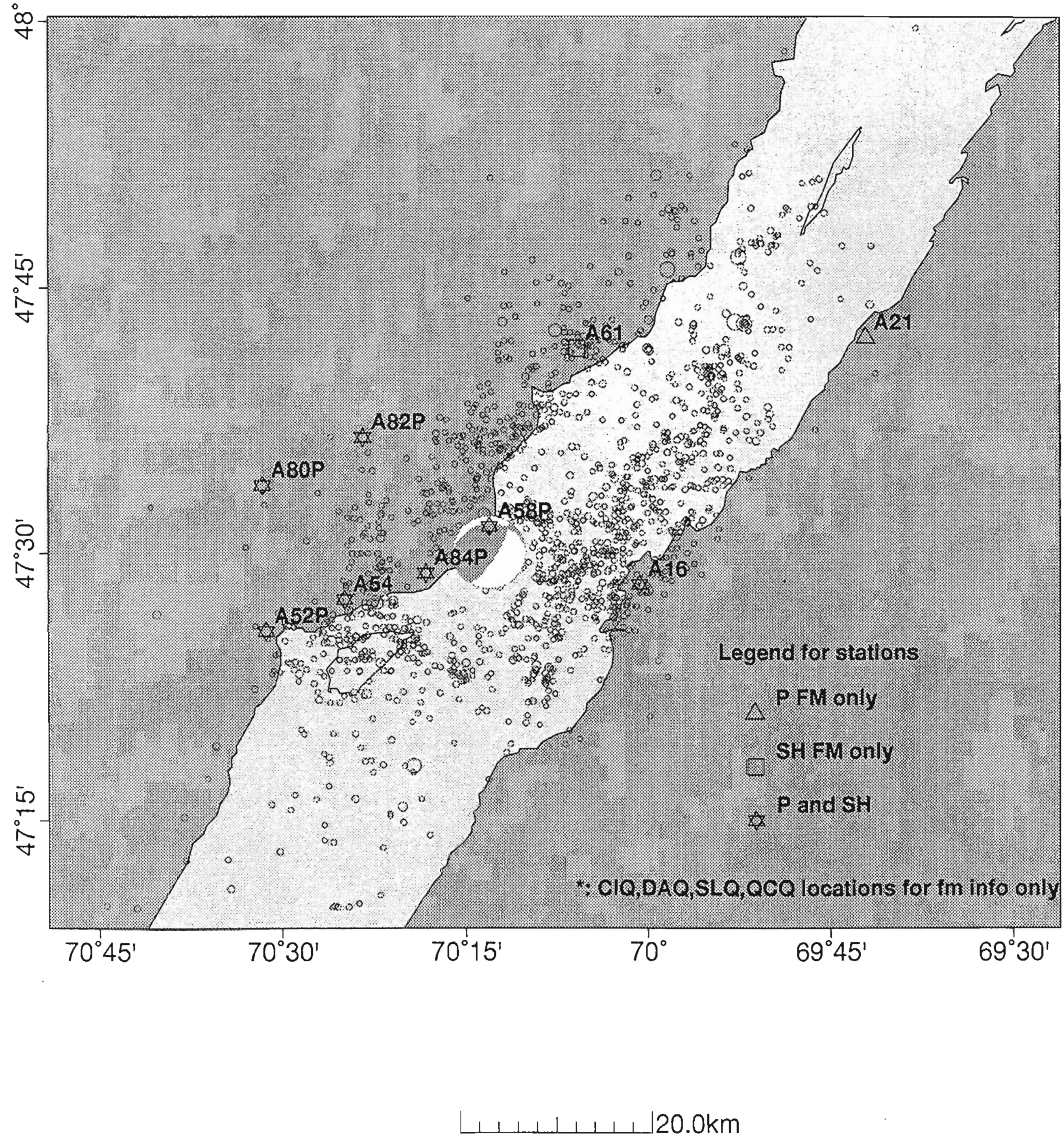
P Phases on Vertical Components



SH phases on Transverse Components



Location Map



219

Earthquake of 19960923 0526 Magnitude 2.2MN

1- Earthquake information and list of first motions.

Date	Time hhmm ss	Latitude	Longitude	Depth (km)	Mag	Sta/Pha
960923	0526 54.22	47.6591	-69.8932	14.04	2.2MN	12/024

COMMENTS:

CHARLEVOIX SEISMIC ZONE, QUE.
$
$ The Sg lines of some stations include the SH FM.
$ The convention used is the Virginia Tech convention used in FOCMEC:
$ <: SH first motion to left (back to event) impulsive
$ >: SH first motion to right (back to event) impulsive
$ Preliminary Focmec computed by ML.

Sta	Pha	Dist (km)	Azim	Take-off Angle	FM
A61	PG	15	284	-47	D
A61	SG	15	284	-47	>
A21	PG	16	72	-49	D
A21	SG	16	72	-49	>
A64	PG	19	0	-53	D
A64	SG	19	0	-53	>
A16	PG	23	202	-58	C
A16	SG	23	202	-58	<
A76P	PG	26	266	-62	D
A58P	PG	28	238	-64	D
LMQ	PG	35	250	-68	D
A84P	PG	37	237	-69	D
A82P	PG	37	262	-70	D
A82P	SG	37	262	-70	>
A54	PG	45	240	-73	D
A80P	PG	49	258	-74	D
A80P	SG	49	258	-74	<
A11	PG	52	206	-75	D
DAQ	PG	107	289	-82	C

Number of P first motions: 13
Number of SH first motions: 6

2- Most Representative Solution.

A total of 592 solutions were found using a b axis increment of 2 degree. The following parameters describe the most representative solution, which was derived from the average B, P, and T axes listed below.

dip,strike,rake 78.56 102.59 44.87
dip,strike,rake 46.25 1.42 164.07 :auxiliary plane
lower hem. trend, plunge of a,n 271.42 43.75 12.59 11.44
lower hem. trend & plunge of b 113.85 44.00
lower hem. trend, plunge of p,t 224.91 20.41 332.44 38.99

Average B, P, and T axes:

	B	P	T
Mean trend:	N 117	N 230	N 330
Mean Plunge:	53	15	32
Vector Magnitude:	584	587	585
Mean length of resulting vector:	0.986	0.991	0.988

3- Misfits.

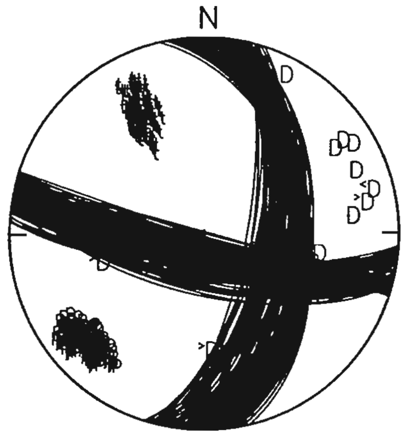
All 13 P first motions agreed with the solution.
Out of 6 SH first motions, a total of 2 did not fit the solutions (33/100).

Station Name	Number of misfits	Percentage of wrongs
A64	592	100
A80P	592	100

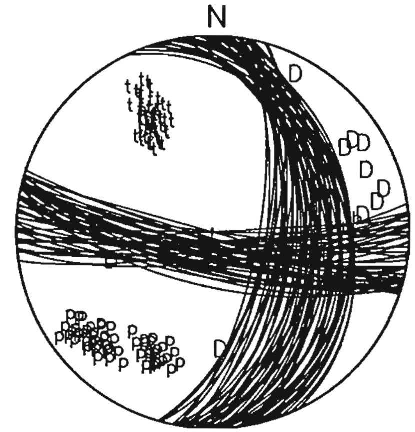
4- Rating of the focal mechanism.

The solution has a B rating based on the number of P and SH misfits (0 /100 and 33 /100 respectively) and on the constraints on the P, T and B axes (value of 0.988).

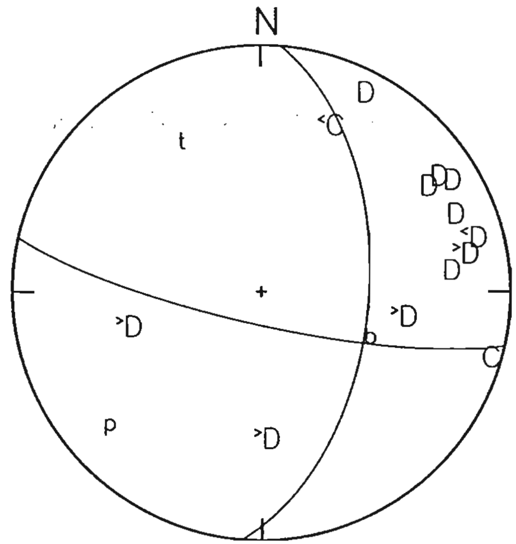
19960923 05:26 U.T.



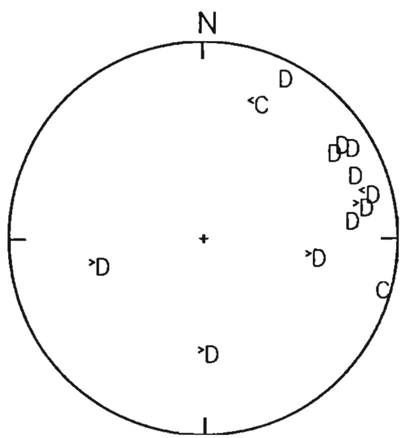
P, SH and P–Nodal



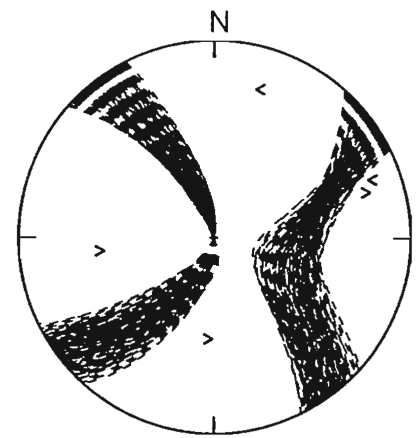
Solution with P FM only.



Best Solution

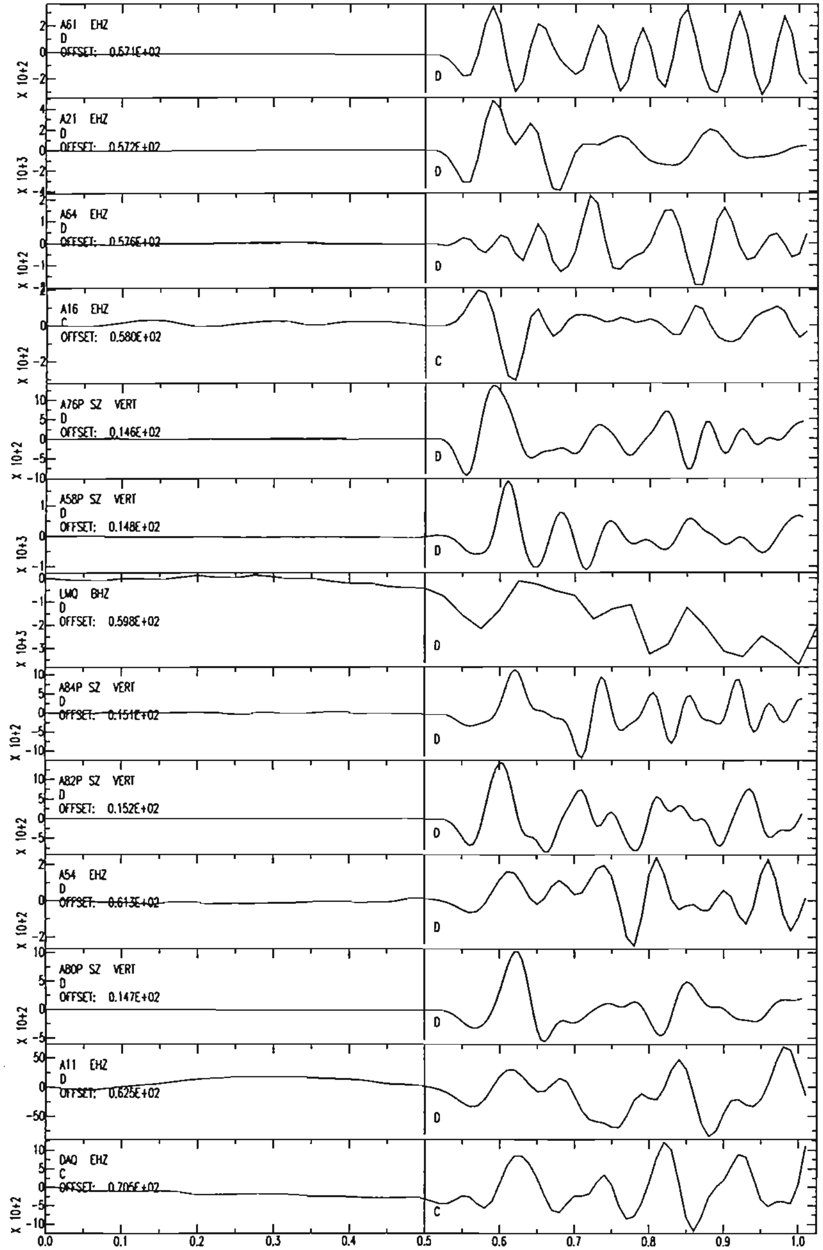


First Motions Only

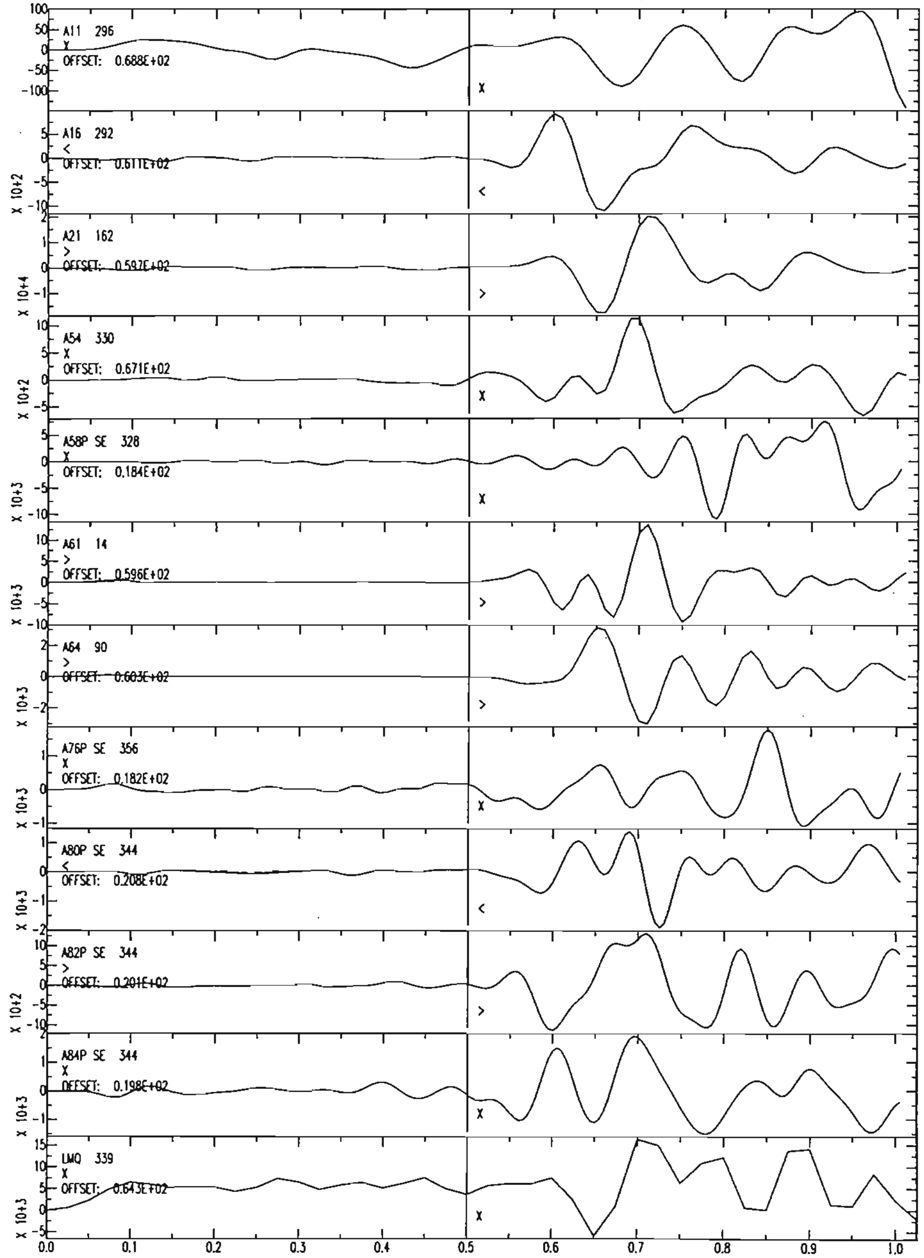


SH Motions and Lines.

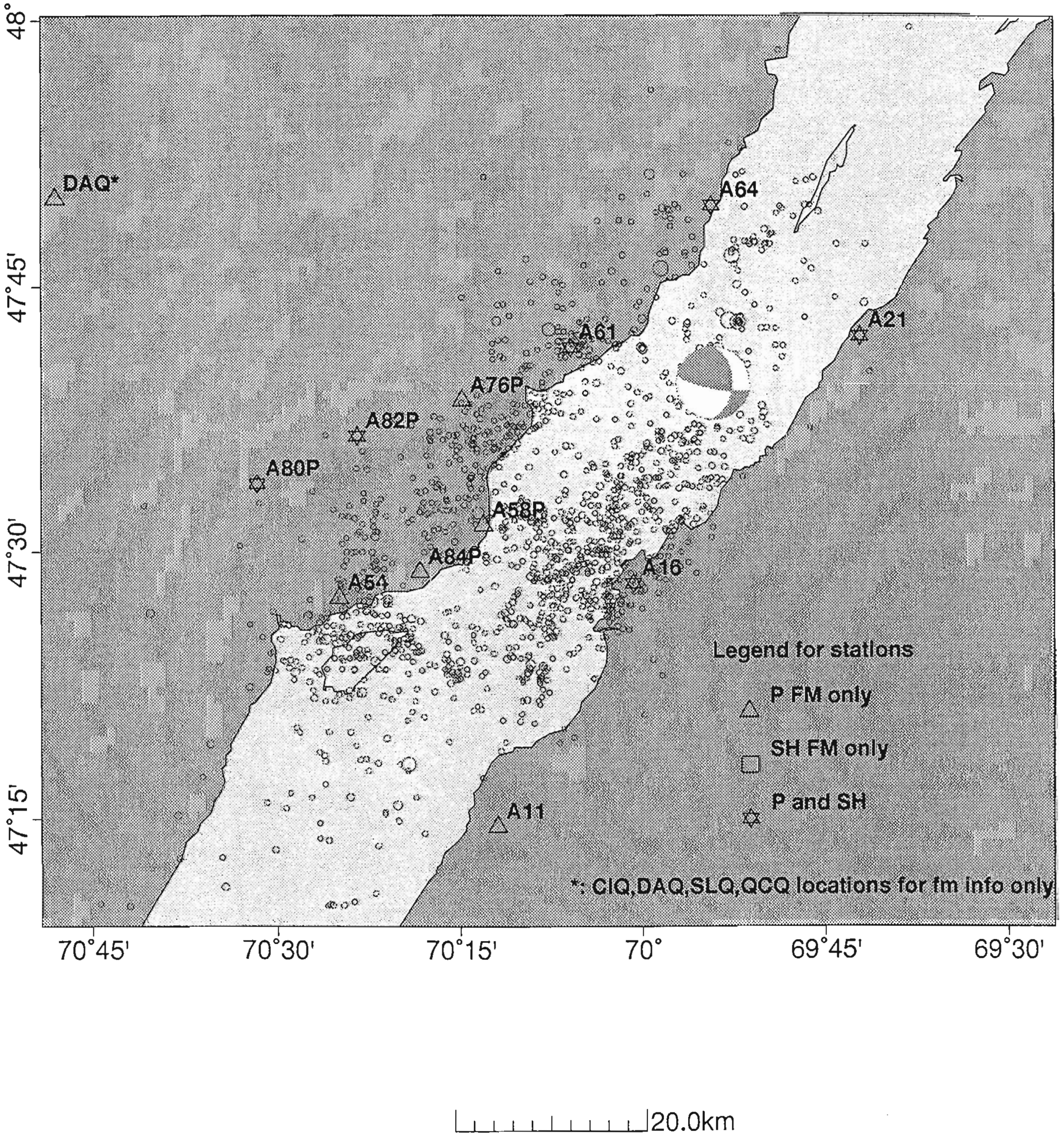
P Phases on Vertical Components



SH phases on Transverse Components



Location Map



224

Earthquake of 19960924 0644 Magnitude 2.0MN

1- Earthquake information and list of first motions.

Date	Time hhmm ss	Latitude	Longitude	Depth (km)	Mag	Sta/Pha
960924	0644 45.55	47.5875	-70.1451	21.40	2.0MN	12/024

COMMENTS:

CHARLEVOIX SEISMIC ZONE, QUE.
$
$ The Sg lines of some stations include the SH FM.
$ The convention used is the Virginia Tech convention used in FOCMEC:
$ <: SH first motion to left (back to event) impulsive
$ >: SH first motion to right (back to event) impulsive
$ Focmec computed by ML is poorly constrained.

Sta	Pha	Dist (km)	Azim	Take-off Angle	FM
A58P	PG	9	216	-22	C
A76P	PG	10	311	-24	D
A76P	SG	10	311	-24	>
A61	PG	12	19	-30	C
A61	SG	12	19	-30	>
LMQ	PG	14	252	-34	D
A16	PG	17	141	-38	C
A16	SG	17	141	-38	>
A84P	PG	17	225	-38	D
A84P	SG	17	225	-38	>
A82P	PG	18	278	-40	D
A54	PG	25	234	-49	D
A54	SG	25	234	-49	<
A80P	PG	29	265	-53	D
A64	PG	33	35	-57	C
A64	SG	33	35	-57	>
A21	PG	37	69	-60	D
A21	SG	37	69	-60	>
RSFQ	PG	44	226	-64	D

Number of P first motions: 12
Number of SH first motions: 7

2- Most Representative Solution.

A total of 107 solutions were found using a b axis increment of 1 degree. The following parameters describe the most representative solution, which was derived from the average B, P, and T axes listed below.

dip,strike,rake	33.02	137.47	19.09		
dip,strike,rake	79.73	31.30	121.56	:auxiliary plane	
lower hem. trend, plunge of a,n	301.30	10.27	47.47	56.98	
lower hem. trend & plunge of b	205.05	31.00			
lower hem. trend, plunge of p,t	96.56	27.83	333.47	45.96	

Average B, P, and T axes:

	B	P	T
Mean trend:	N 193	N 90	N 326
Mean Plunge:	28	24	52
Vector Magnitude:	106	107	107
Mean length of resulting vector:	0.994	0.997	0.996

3- Misfits.

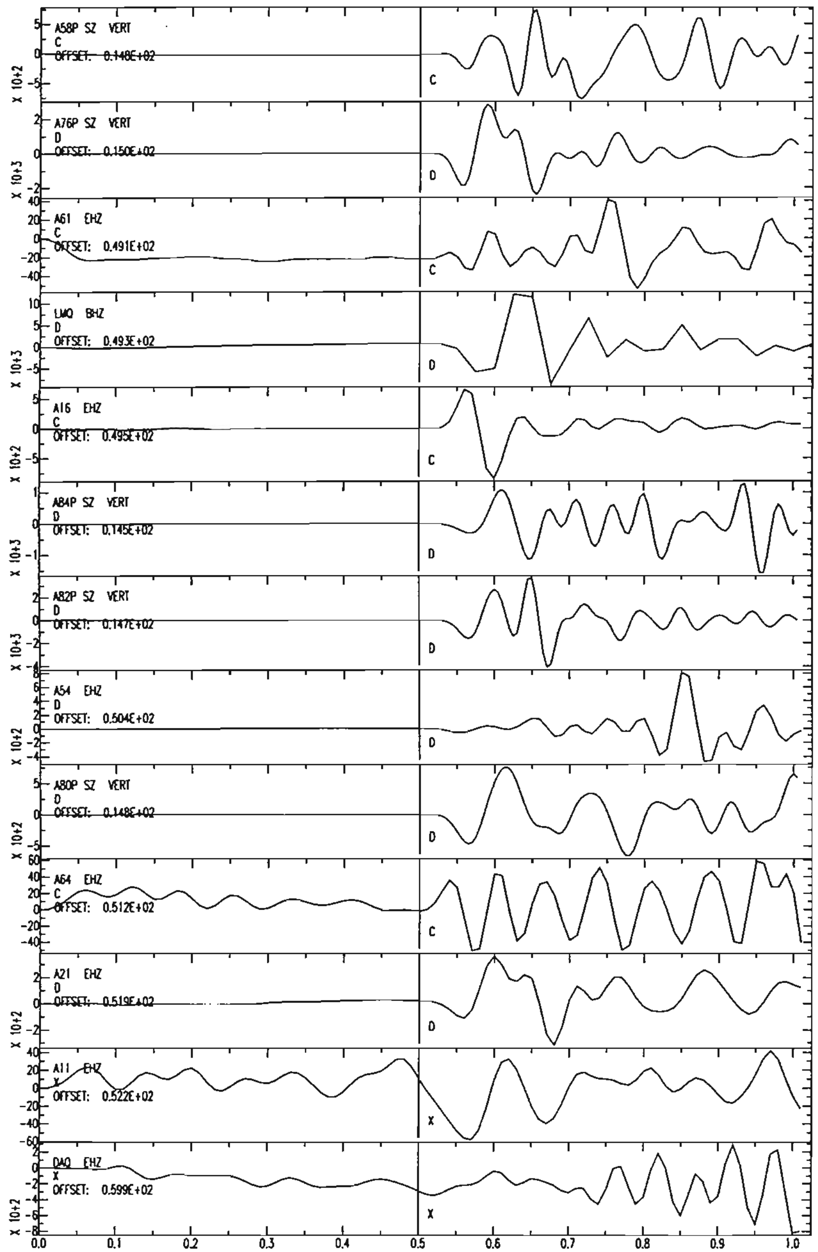
All 12 P first motions agreed with the solution.
Out of 7 SH first motions, a total of 2 did not fit the solutions (28/100).

Station Name	Number of misfits	Percentage of wrongs
A64	103	96
A84P	107	100

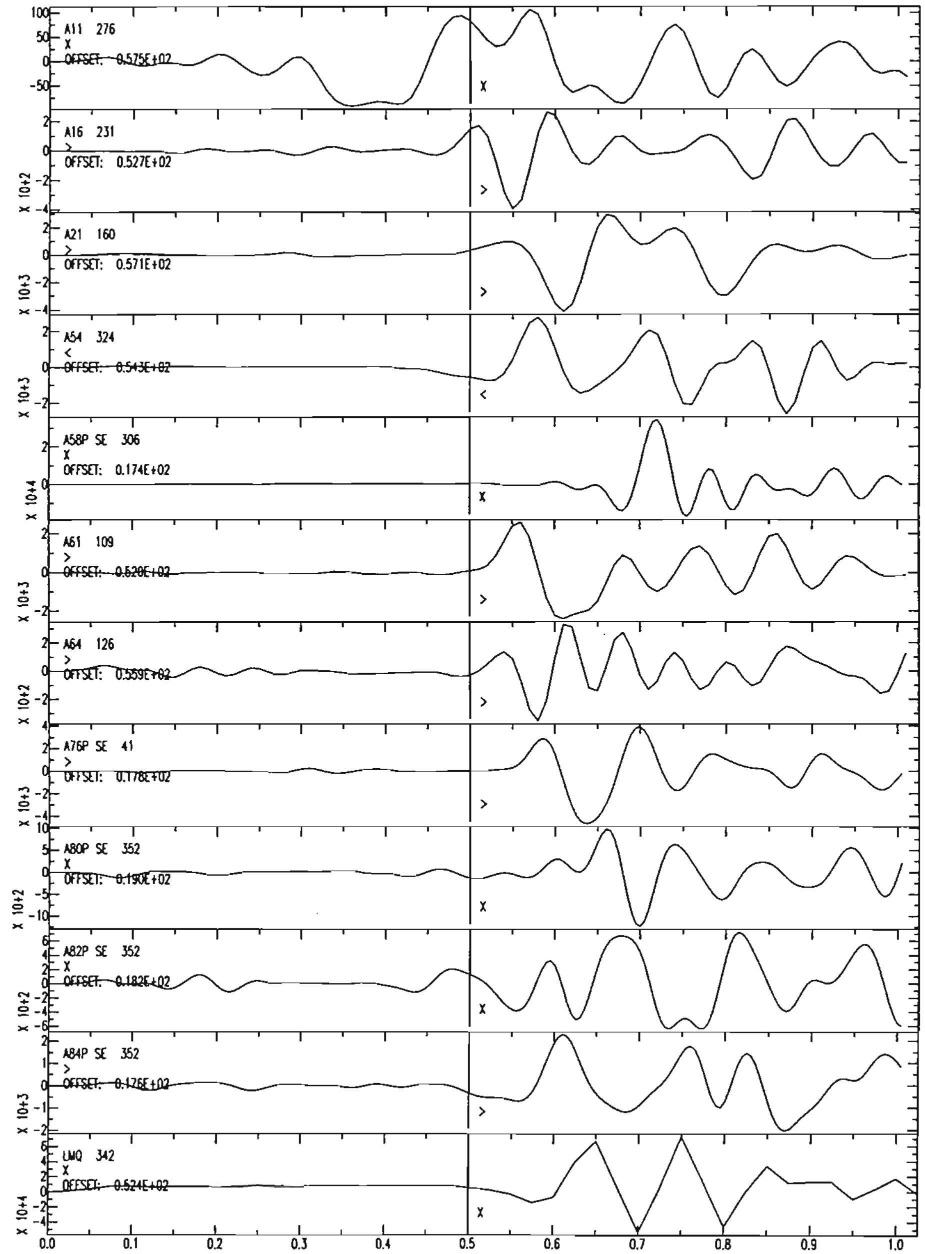
4- Rating of the focal mechanism.

The solution has an A rating based on the small number of P and SH misfits (0 /100 and 28 /100 respectively) and on the good constraints on the P, T and B axes (value of 0.996).

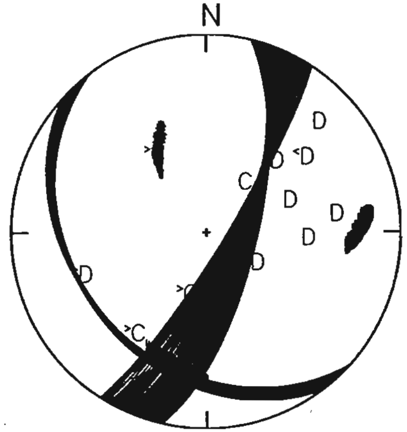
P Phases on Vertical Components



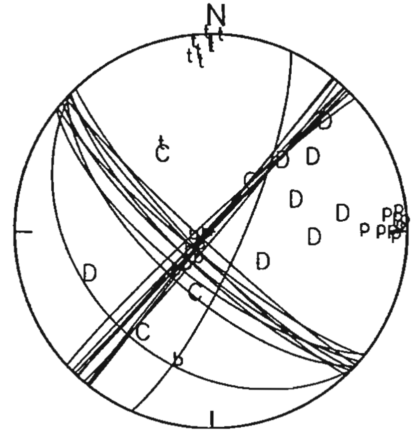
SH phases on Transverse Components



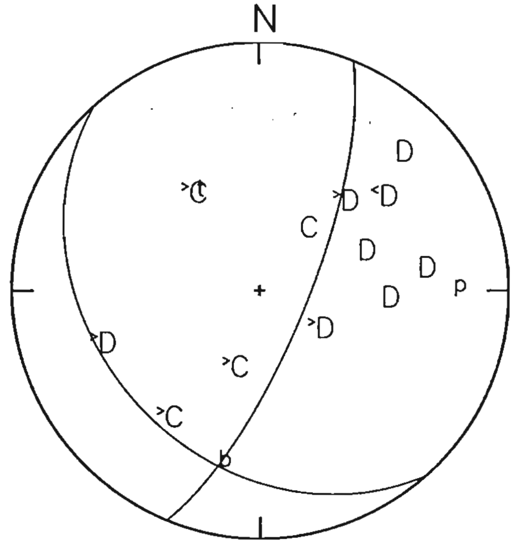
19960924 06:44 U.T.



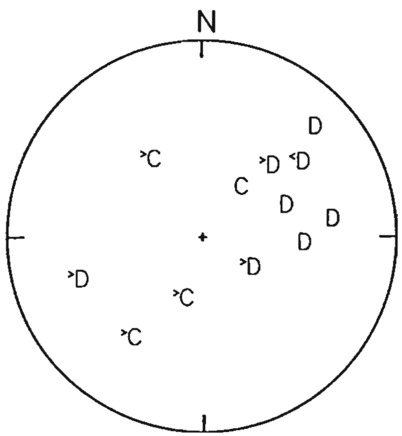
P, SH and P–Nodal



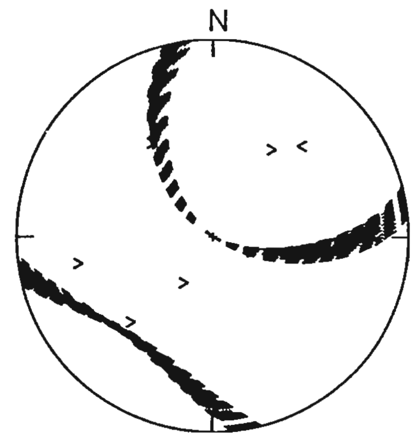
Solution with P FM only.



Best Solution

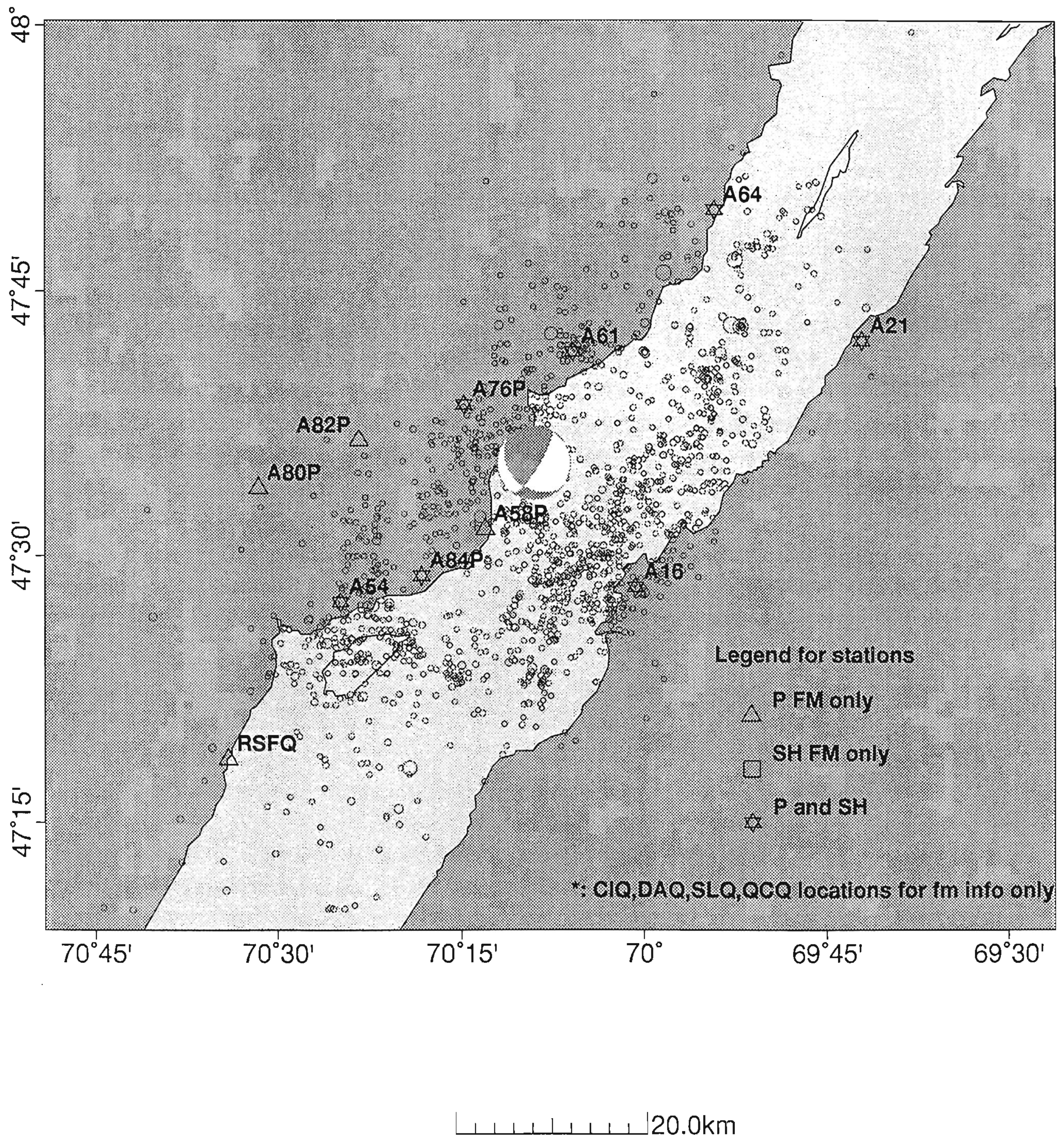


First Motions Only



SH Motions and Lines.

Location Map



960920

Earthquake of 19960924 2341 Magnitude 3.1MN

1- Earthquake information and list of first motions.

Date	Time hhmm ss	Latitude	Longitude	Depth (km)	Mag	Sta/Pha
960924	2341 02.88	47.5475	-70.2417	12.83	3.1MN	11/021

COMMENTS:

Felt, CHARLEVOIX SEISMIC ZONE, QUE.
Felt in St-Irenee, St-Hilarion, La Malbaie, and Clermont.
$ Felt info from local radio station.
$ CIQ FM from R. Du Berger, Chicoutimi.
$ QCQ FM is unclear.
$
$ The Sg lines of some stations include the SH FM.
$ The convention used is the Virginia Tech convention used in FOCMEC:
$ <: SH first motion to left (back to event) impulsive
$ >: SH first motion to right (back to event) impulsive
$ Preliminary Focmec computed by ML.
$ SH FM not picked on: A11 and A21.

Sta	Pha	Dist (km)	Azim	Take-off Angle	FM
A58P	PG	3	139	-14	C
A58P	SG	3	139	-14	<
LMQ	PG	6	271	-26	C
LMQ	SG	6	271	-26	>
A84P	PG	9	211	-34	C
A84P	SG	9	211	-34	>
A76P	PG	11	0	-40	C
A76P	SG	11	0	-40	>
SHQ	PG	14	298	-46	C
A54	PG	16	232	-52	C
A54	SG	16	232	-52	>
A16	PG	20	116	-57	D
A16	SG	20	116	-57	<
A61	PG	20	35	-57	C
A61	SG	20	35	-57	<
A80P	PG	21	275	-59	C
A80P	SG	21	275	-59	>
A11	PG	34	174	-69	D
RSFQ	PG	36	223	-70	D
A64	PG	41	40	-72	D
A64	SG	41	40	-72	<
A21	PG	45	67	-74	C
DAQ	PG	88	302	-82	D
CIQ	PG	90	333	-82	D
SLQ	PG	94	81	-82	D

Number of P first motions: 16
Number of SH first motions: 9

2- Most Representative Solution.

A total of 100 solutions were found using a b axis increment of 1 degree. The following parameters describe the most representative solution, which was derived from the average B, P, and T axes listed below.

dip,strike,rake	67.37	246.26	79.16		
dip,strike,rake	24.97	92.73	114.29	:auxiliary plane	
lower hem. trend, plunge of a,n	2.73	65.03	156.26	22.63	
lower hem. trend & plunge of b	250.48	10.00			
lower hem. trend, plunge of p,t	344.49	21.65	137.22	65.94	

Average B, P, and T axes:

	B	P	T
Mean trend:	N 250	N 343	N 142
Mean Plunge:	7	20	69
Vector Magnitude:	100	100	100
Mean length of resulting vector:	0.996	0.998	0.996

3- Misfits.

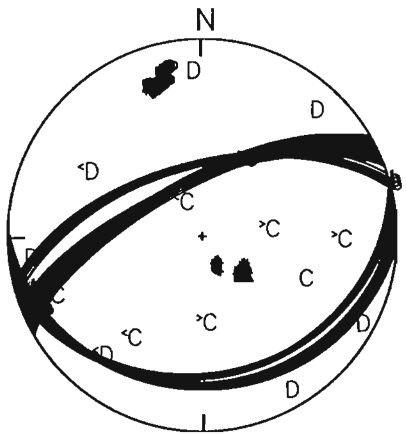
All 16 P first motions agreed with the solution.
Out of 9 SH first motions, a total of 2 did not fit the solutions (22/100).

Station Name	Number of misfits	Percentage of wrongs
A61	25	25
A64	100	100
A76P	75	75

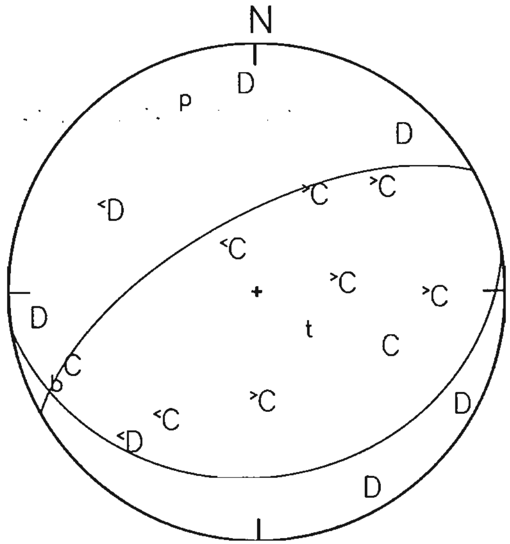
4- Rating of the focal mechanism.

The solution has an A rating based on the small number of P and SH misfits (0 /100 and 22 /100 respectively) and on the good constraints on the P, T and B axes (value of 0.996).

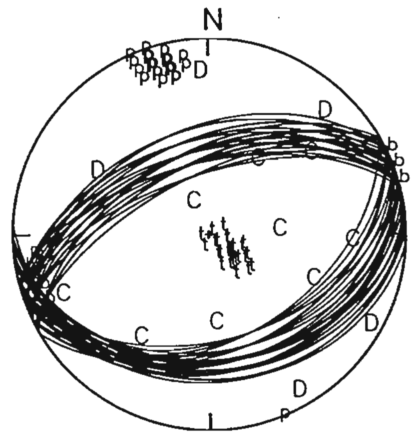
19960924 23:41 U.T.



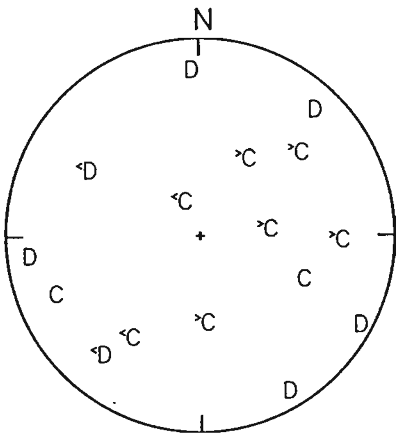
P, SH and P–Nodal



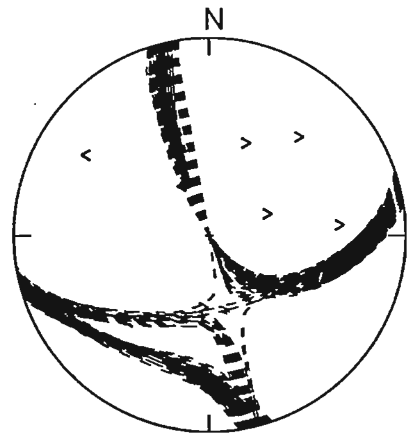
Best Solution



Solution with P FM only.

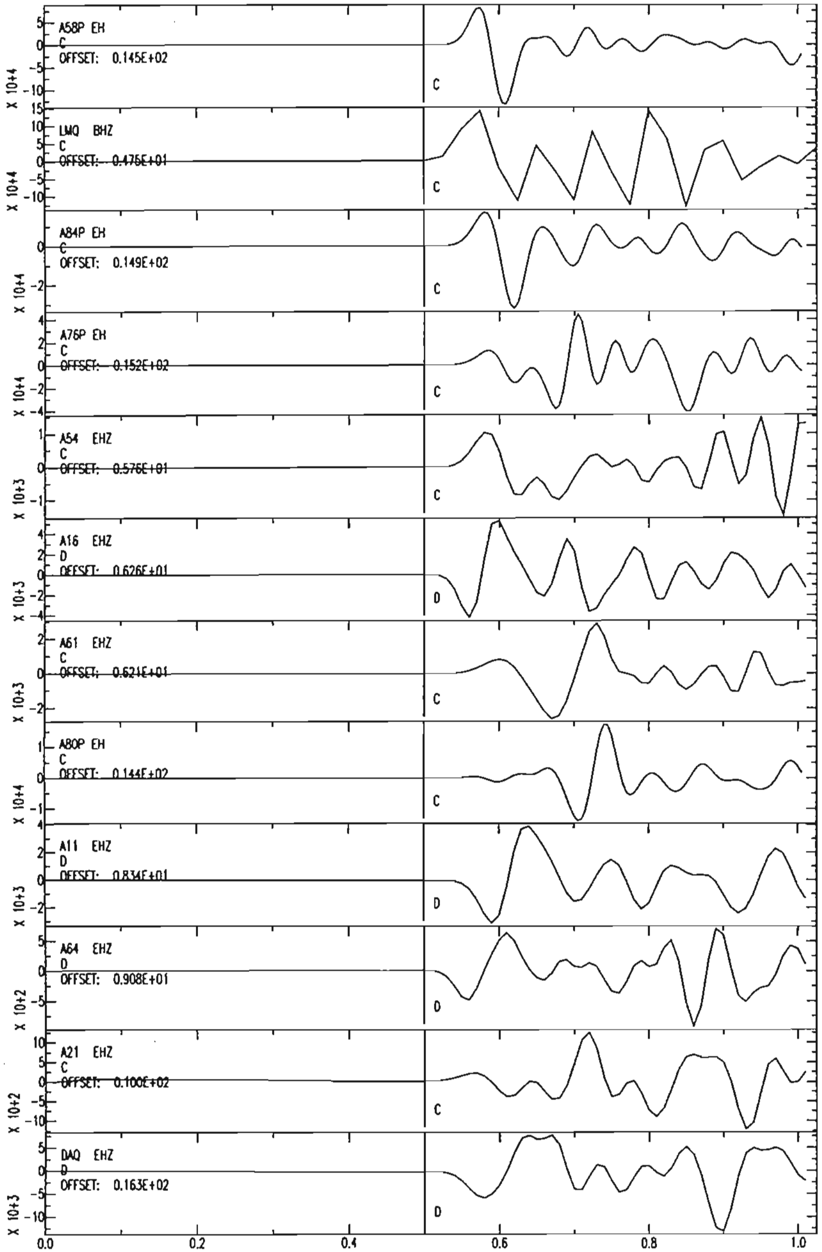


First Motions Only

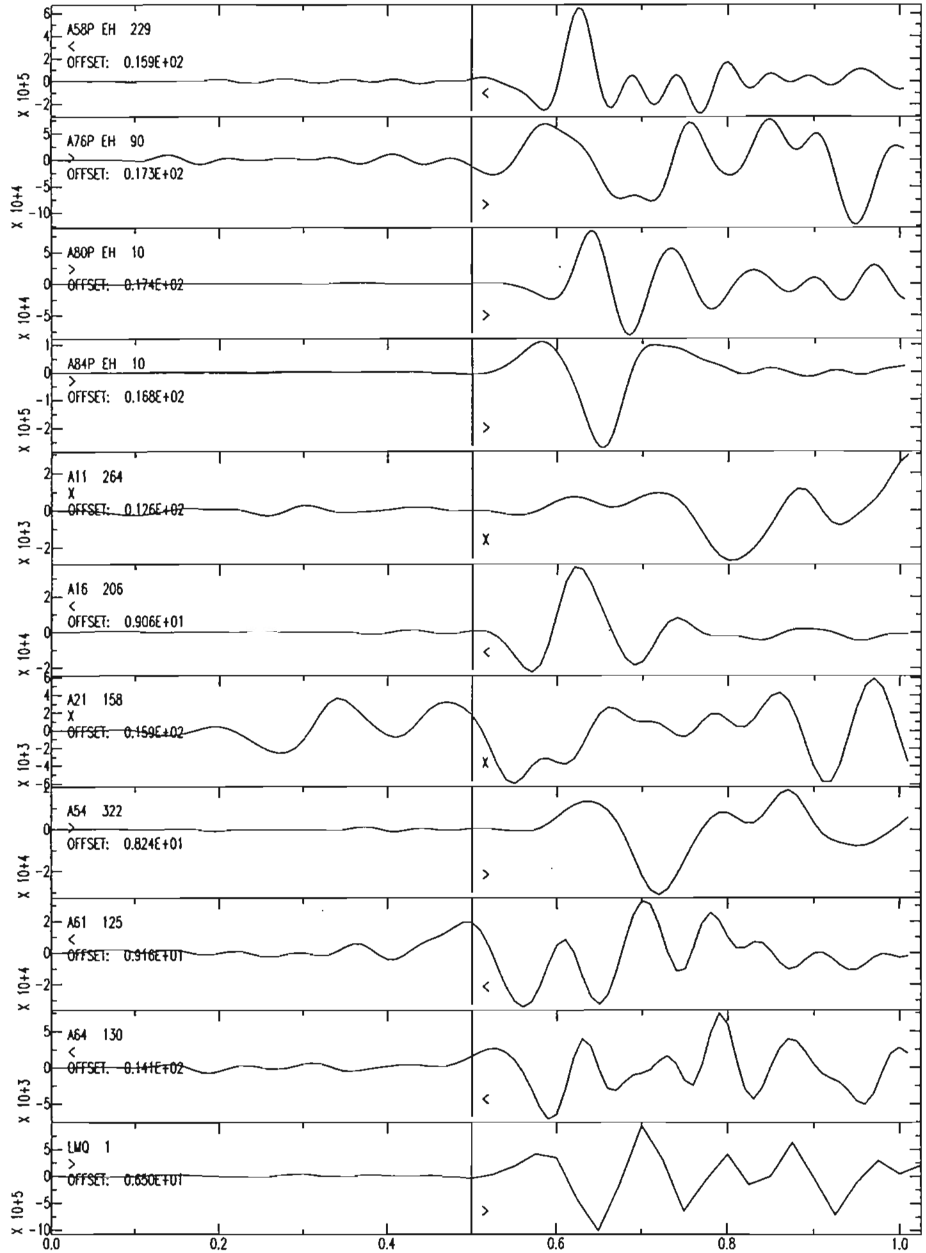


SH Motions and Lines.

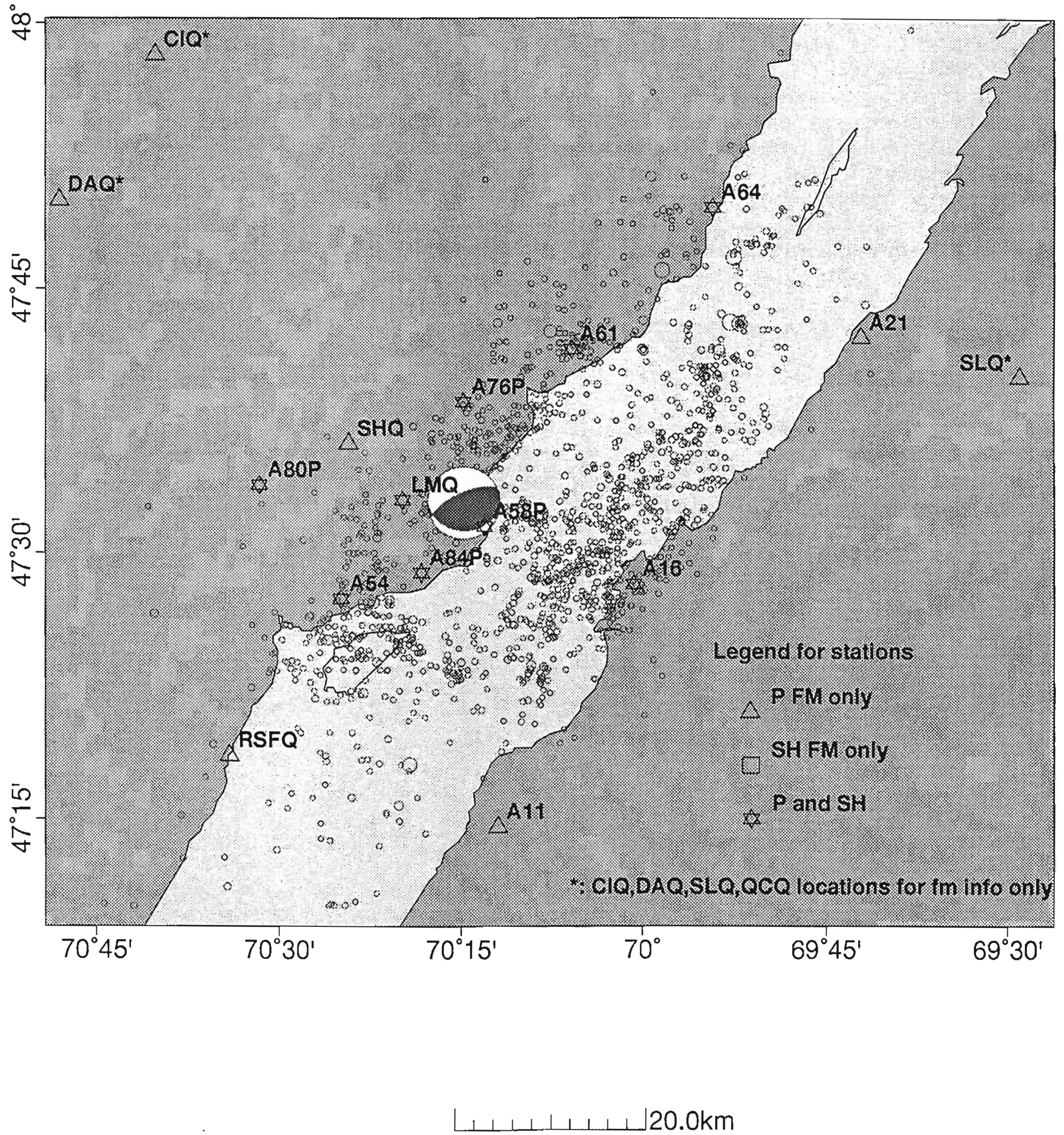
P Phases on Vertical Components



SH phases on Transverse Components



Location Map



Earthquake of 19960925 0834 Magnitude 2.2MN

1- Earthquake information and list of first motions.

Date	Time hhmm ss	Latitude	Longitude	Depth (km)	Mag	Sta/Pha
960925	0834 24.87	47.8528	-69.7504	22.35	2.2MN	9/018

COMMENTS:

CHARLEVOIX SEISMIC ZONE, QUE.
$
$ The Sg lines of some stations include the SH FM.
$ The convention used is the Virginia Tech convention used in FOCMEC:
$ <: SH first motion to left (back to event) impulsive
$ >: SH first motion to right (back to event) impulsive
$ Preliminary Focmec computed by ML.
$ slightly outside the network.
$ Not an aftershock of 960924.2341

Sta	Pha	Dist (km)	Azim	Take-off Angle	FM
A64	PG	11	254	-26	C
A64	SG	11	254	-26	<
A21	PG	17	165	-38	C
A21	SG	17	165	-38	<
A61	PG	31	235	-54	C
A61	SG	31	235	-54	<
A16	PG	47	204	-64	C
A16	SG	47	204	-64	<
A58P	PG	50	224	-66	C
LMQ	PG	55	232	-68	C
A84P	PG	59	225	-69	D
DAQ	PG	112	277	-79	D

Number of P first motions: 8
Number of SH first motions: 4

2- Most Representative Solution.

A total of 589 solutions were found using a b axis increment of 1 degree. The following parameters describe the most representative solution, which was derived from the average B, P, and T axes listed below.

dip,strike,rake	69.48	79.30	77.17		
dip,strike,rake	24.05	292.30	120.67	:auxiliary plane	
lower hem. trend, plunge of a,n	202.30	65.95	349.30	20.52	
lower hem. trend & plunge of b	83.86	12.00			

lower hem. trend, plunge of p,t   179.15   23.44   328.83   63.33

Average B, P, and T axes:

	B	P	T
Mean trend:	N 79	N 177	N 321
Mean Plunge:	16	28	59
Vector Magnitude:	573	579	582
Mean length of resulting vector:	0.973	0.984	0.987

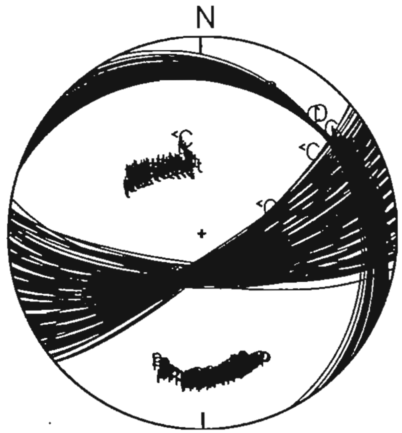
3- Misfits.

All 8 P first motions agreed with the solution.
All 0 SH first motions agreed with the solution.

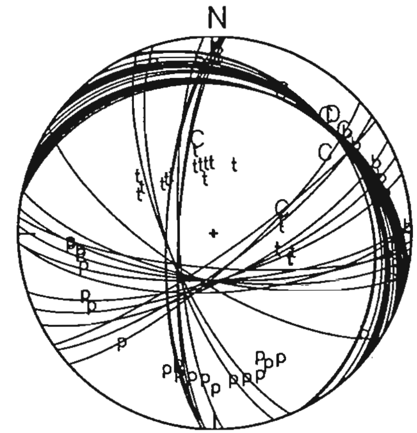
4- Rating of the focal mechanism.

The solution has a C rating based on the high number of P and SH misfits (0 /100 and 0 /100 respectively) and on the poor constraints on the P, T and B axes (value of 0.981).

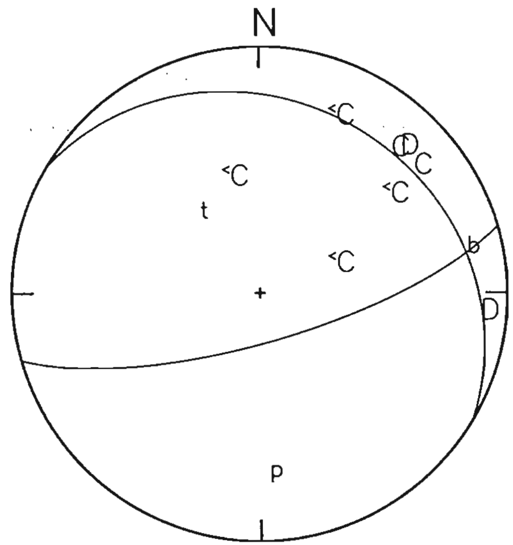
19960925 08:34 U.T.



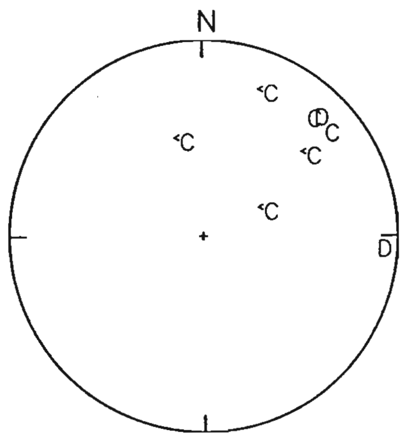
P, SH and P–Nodal



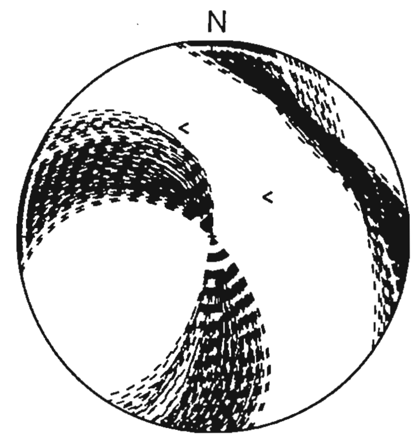
Solution with P FM only.



Best Solution



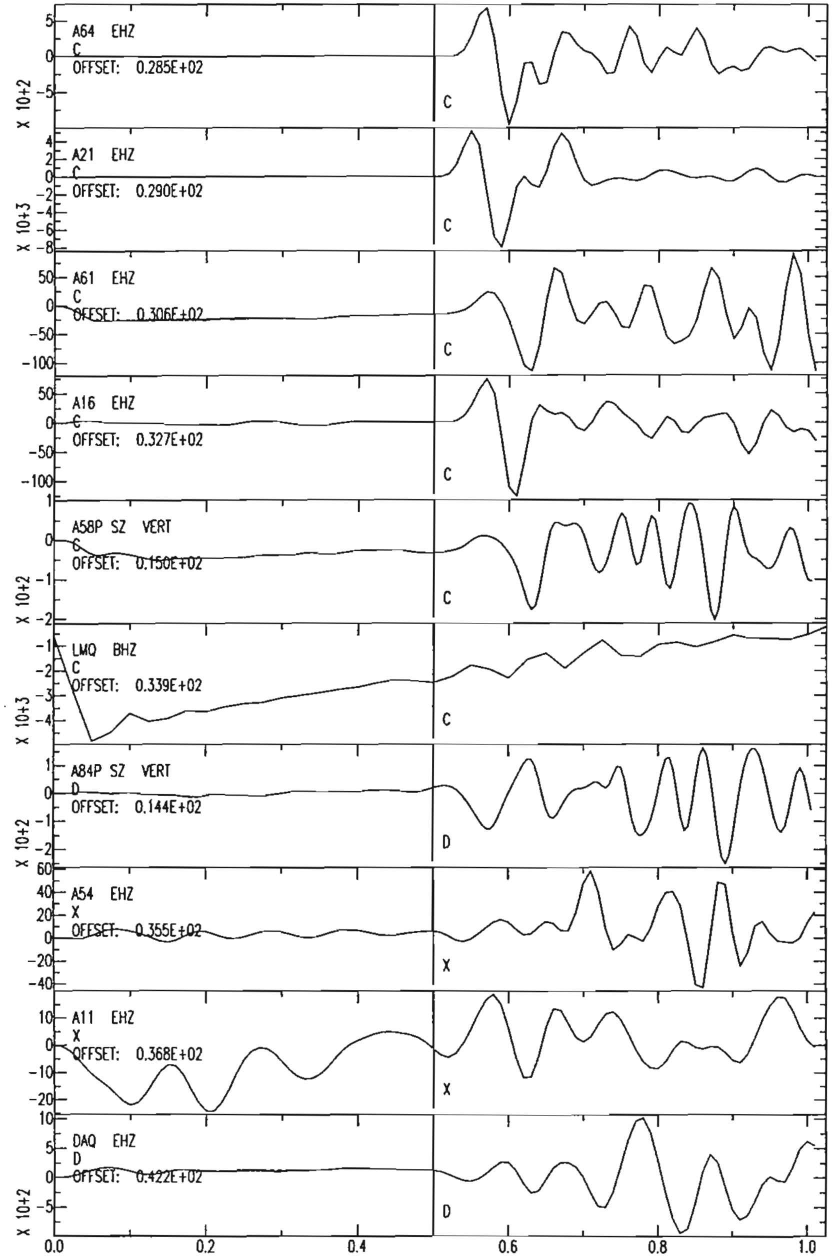
First Motions Only



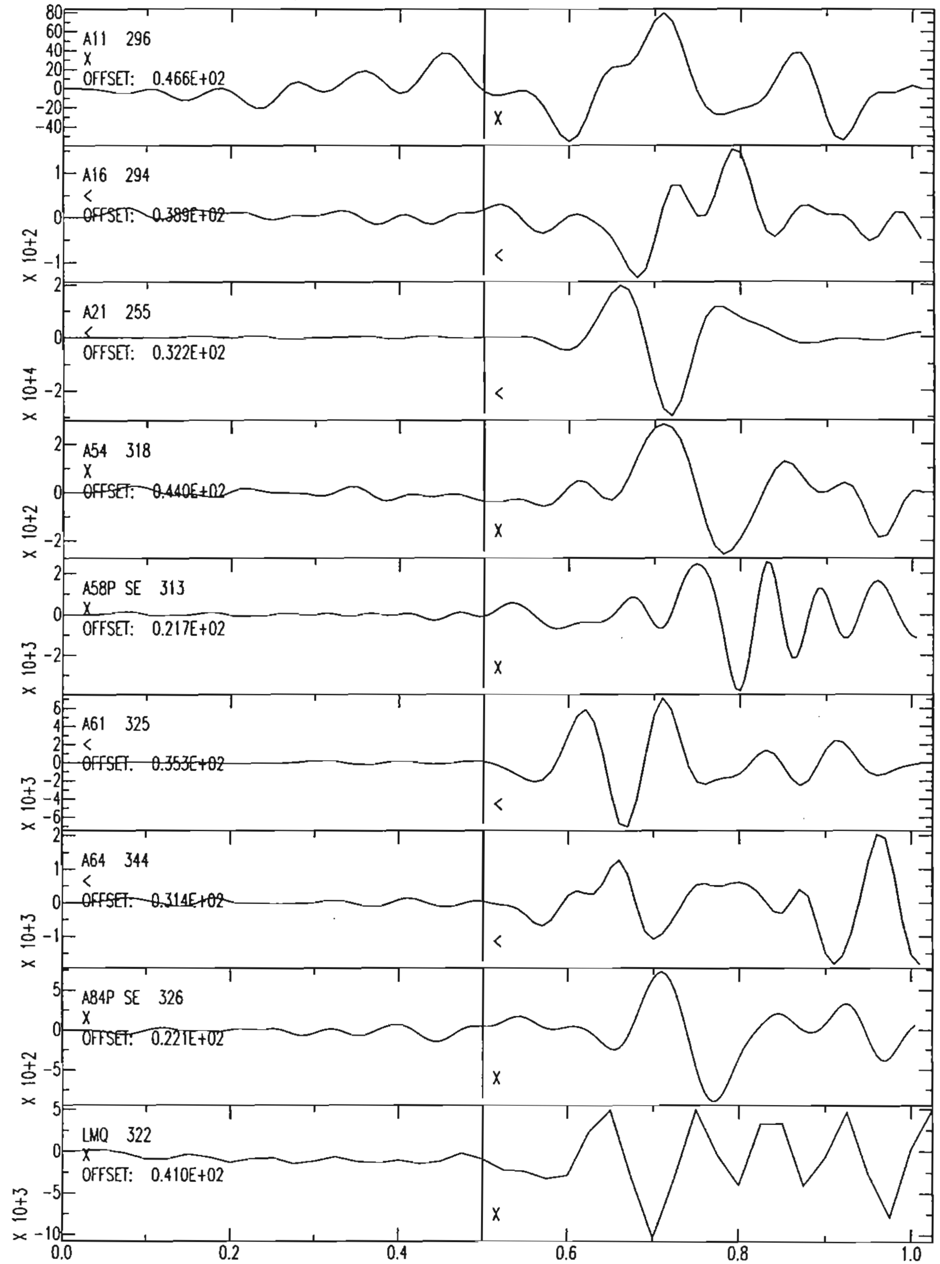
SH Motions and Lines.

960925.08

P Phases on Vertical Components



SH phases on Transverse Components



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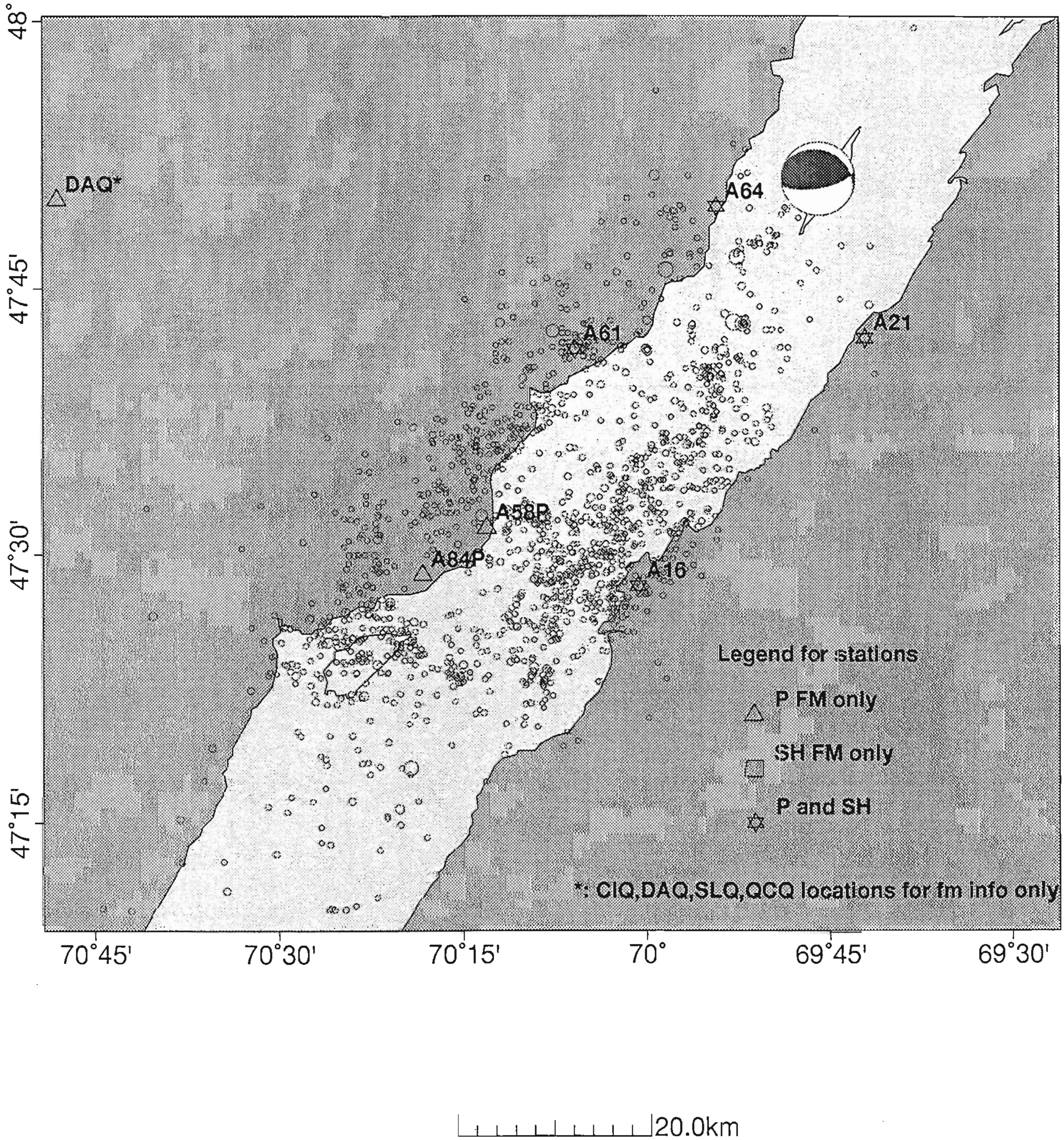
Location Map



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960925 08

Earthquake of 19961011 0228 Magnitude 1.9MN

1- Earthquake information and list of first motions.

Date	Time hhmm ss		Latitude	Longitude	Depth (km)	Mag	Sta/Pha
961011	0228	50.34	47.4761	-70.0551	15.56	1.9MN	11/022

COMMENTS:

CHARLEVOIX SEISMIC ZONE, QUE.
$ S-P conversion on A21?
$
$ The Sg lines of some stations include the SH FM.
$ The convention used is the Virginia Tech convention used in FOCMEC:
$ <: SH first motion to left (back to event) impulsive
$ >: SH first motion to right (back to event) impulsive
$ Preliminary Focmec computed by ML.

Sta	Pha	Dist (km)	Azim	Take-off Angle	FM
A16	PG	4	99	-14	C
A16	SG	4	99	-14	<
A58P	PG	13	295	-40	C
A84P	PG	19	272	-50	C
A84P	SG	19	272	-50	<
LMQ	PG	22	292	-55	C
A76P	PG	23	323	-56	C
A76P	SG	23	323	-56	>
A61	PG	24	354	-57	C
A54	PG	27	266	-60	C
A82P	PG	29	301	-62	D
A82P	SG	29	301	-62	>

Number of P first motions: 8
Number of SH first motions: 4

2- Most Representative Solution.

A total of 173 solutions were found using a b axis increment of 2 degree. The following parameters describe the most representative solution, which was derived from the average B, P, and T axes listed below.

dip,strike,rake	28.58	24.98	77.38		
dip,strike,rake	62.17	219.28	96.79	:auxiliary plane	
lower hem. trend, plunge of a,n	129.28	27.83	294.98	61.42	
lower hem. trend & plunge of b	36.10	6.00			
lower hem. trend, plunge of p,t	304.27	16.90	144.98	72.00	

Average B, P, and T axes:

	B	P	T
Mean trend:	N 30	N 299	N 135
Mean Plunge:	4	15	76
Vector Magnitude:	169	171	171
Mean length of resulting vector:	0.979	0.988	0.990

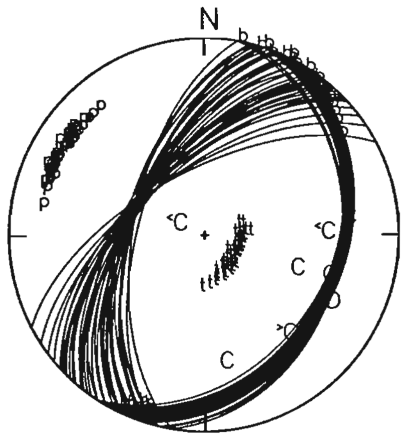
3- Misfits.

All 8 P first motions agreed with the solution.
All 4 SH first motions agreed with the solution.

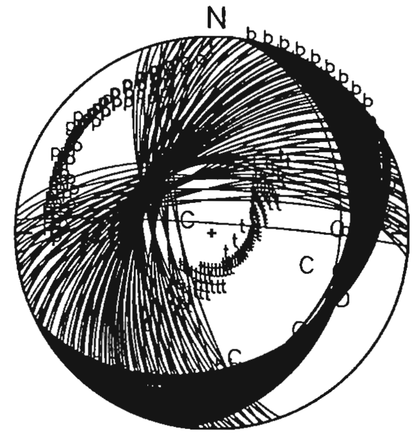
4- Rating of the focal mechanism.

The solution has a C rating based on the high number of P and SH misfits (0 /100 and 0 /100 respectively) and on the poor constraints on the P, T and B axes (value of 0.986).

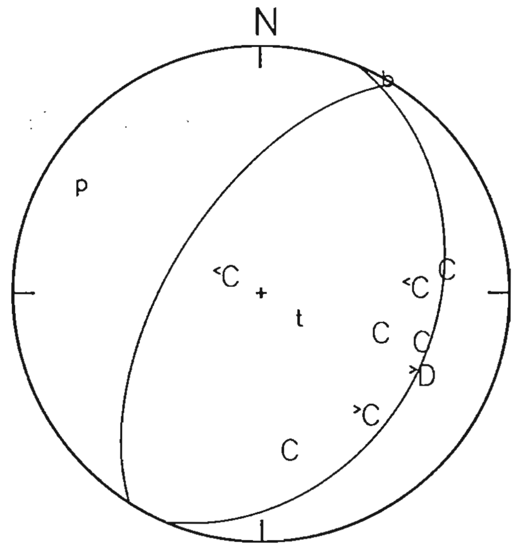
19961011 02:28 U.T.



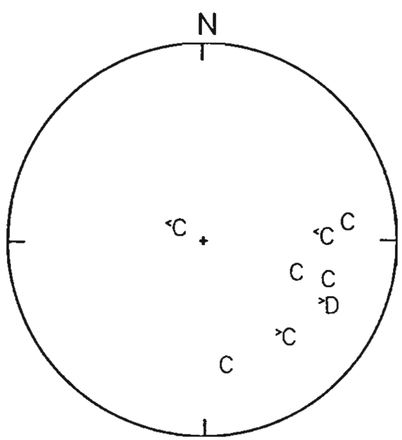
P, SH and P–Nodal



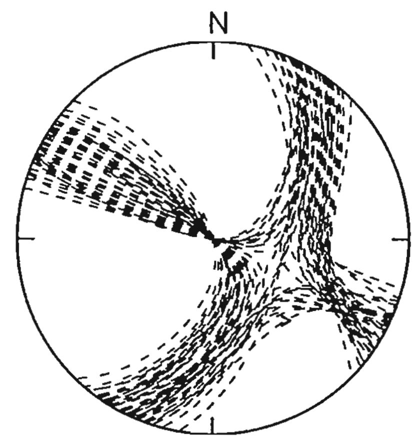
Solution with P FM only.



Best Solution

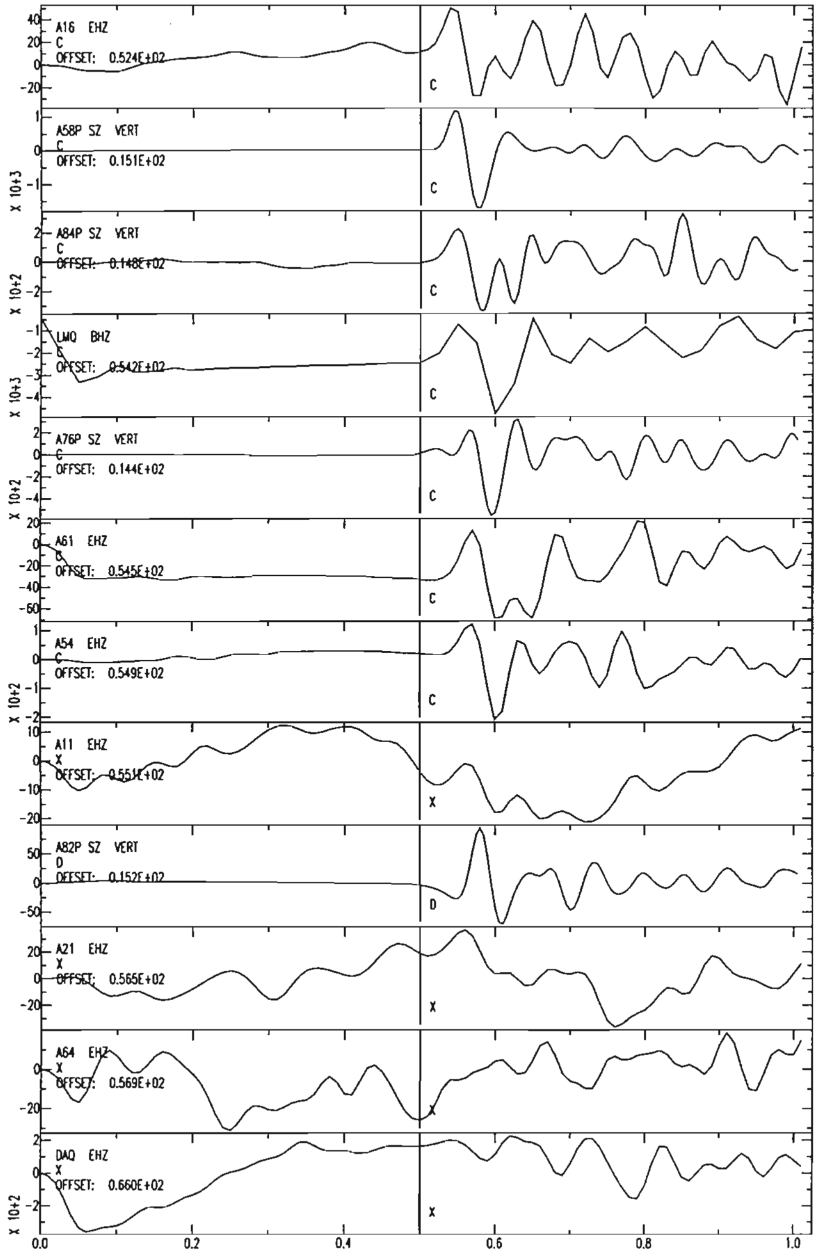


First Motions Only

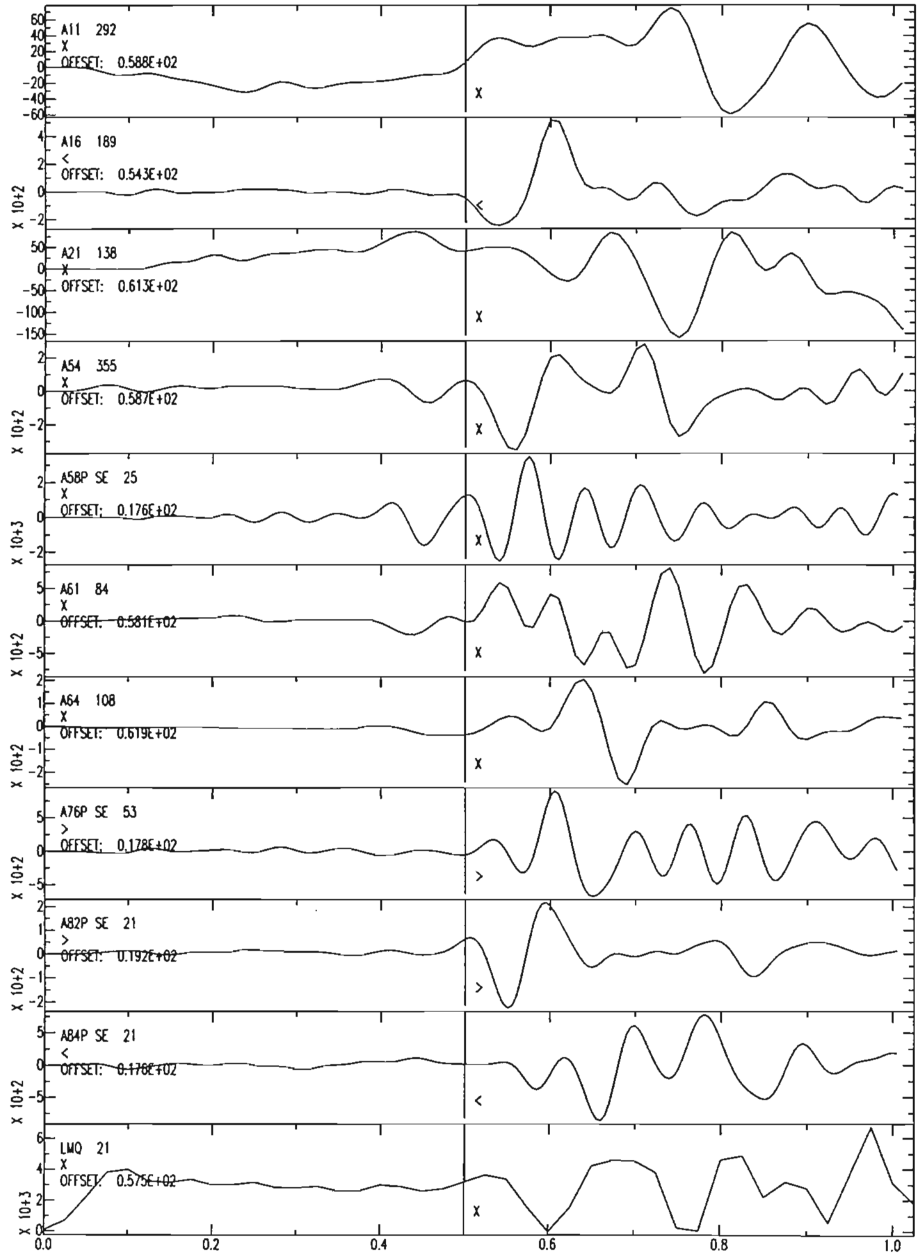


SH Motions and Lines.

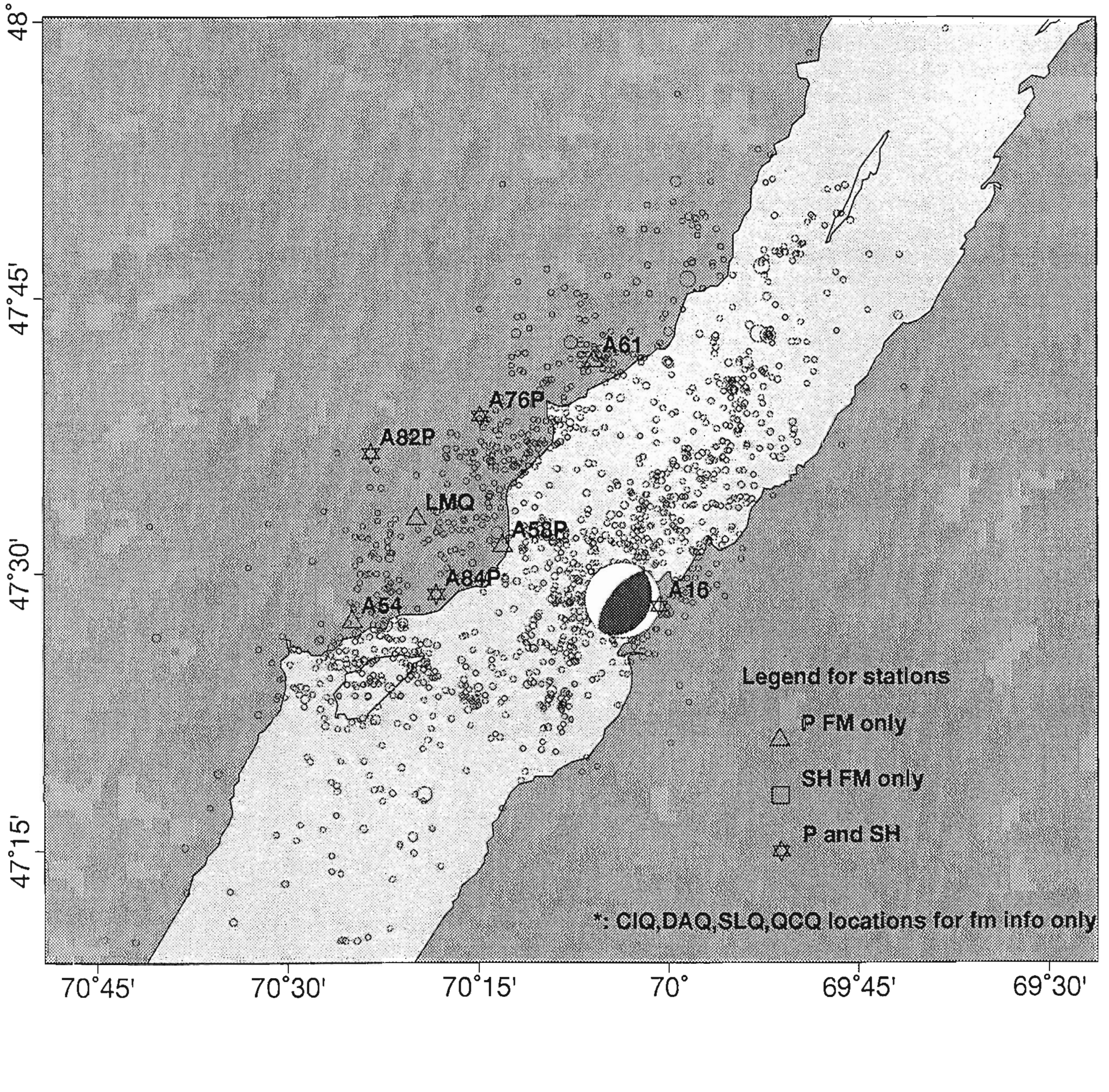
P Phases on Vertical Components



SH phases on Transverse Components



Location Map



Earthquake of 19961025 0947 Magnitude 2.2MN

1- Earthquake information and list of first motions.

Date	Time hhmm ss	Latitude	Longitude	Depth (km)	Mag	Sta/Pha
961025	0947 24.43	47.4281	-70.3887	4.06	2.2MN	13/025

COMMENTS:

CHARLEVOIX SEISMIC ZONE, QUE.
$ fm unclear on A64.
$ RSFQ was taken out the previous day.
$
$ The Sg lines of some stations include the SH FM.
$ The convention used is the Virginia Tech convention used in FOCMEC:
$ <: SH first motion to left (back to event) impulsive
$ >: SH first motion to right (back to event) impulsive
$ Preliminary Focmec computed by ML.

Sta	Pha	Dist (km)	Azim	Take-off Angle	FM
A54	PG	4	331	-42	C
A54	SG	4	331	-42	<
A84P	PG	9	48	-65	D
A84P	SG	9	48	-65	>
A52P	PG	10	269	-68	D
A52P	SG	10	269	-68	>
LMQ	PG	14	19	-74	D
A58P	PG	17	51	-77	D
A58P	SG	17	51	-77	<
A80P	PG	18	326	-78	C
A80P	SG	18	326	-78	<
A82P	PG	20	1	-79	C
A82P	SG	20	1	-79	>
A11	PG	25	145	-81	C
A76P	PG	26	25	-81	D
A76P	SG	26	25	-81	<
A16	SG	29	81	-82	>
A61	PG	37	37	-84	D
A64	SG	58	40	-86	>
A21	PG	61	60	-86	D
DAQ	PG	88	313	-87	C
SLQ	PG	107	75	-88	C

Number of P first motions: 13
Number of SH first motions: 9

2- Most Representative Solution.

A total of 60 solutions were found using a b axis increment of 2 degree. The following parameters describe the most representative solution, which was derived from the average B, P, and T axes listed below.

dip,strike,rake	49.94	71.26	-29.04		
dip,strike,rake	68.19	180.93	-136.11	:auxiliary plane	
lower hem. trend, plunge of a,n		90.93	21.81	341.26	40.06
lower hem. trend & plunge of b		202.05	42.00		
lower hem. trend, plunge of p,t		43.88	45.88	302.22	11.09

Average B, P, and T axes:

	B	P	T
Mean trend:	N 205	N 44	N 305
Mean Plunge:	45	43	9
Vector Magnitude:	60	60	60
Mean length of resulting vector:	0.996	0.998	0.998

3- Misfits.

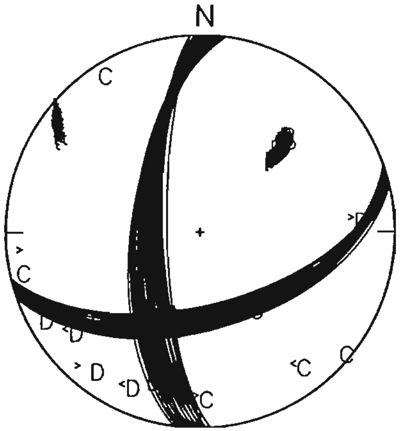
All 13 P first motions agreed with the solution.
Out of 9 SH first motions, a total of 3 did not fit the solutions (33/100).

Station Name	Number of misfits	Percentage of wrongs
A54	56	93
A58P	60	100
A82P	60	100

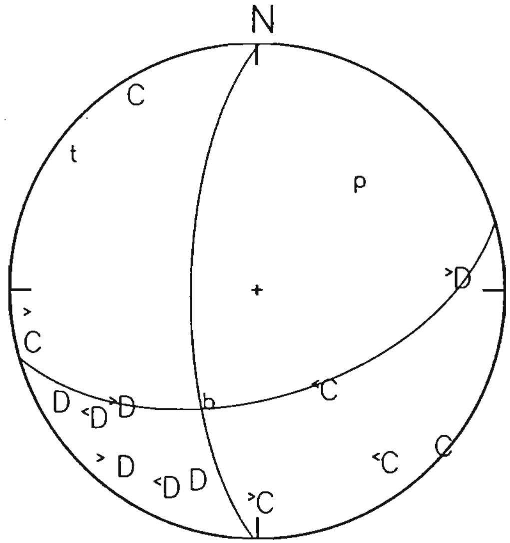
4- Rating of the focal mechanism.

The solution has an A rating based on the small number of P and SH misfits (0 /100 and 33 /100 respectively) and on the good constraints on the P, T and B axes (value of 0.997).

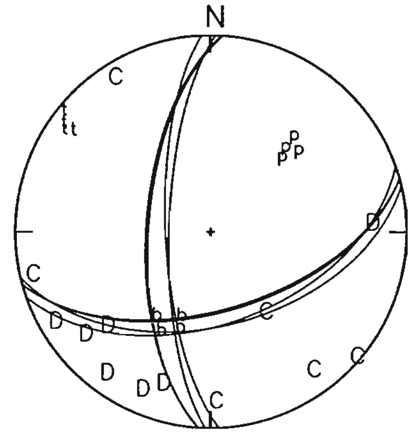
19961025 09:47 U.T.



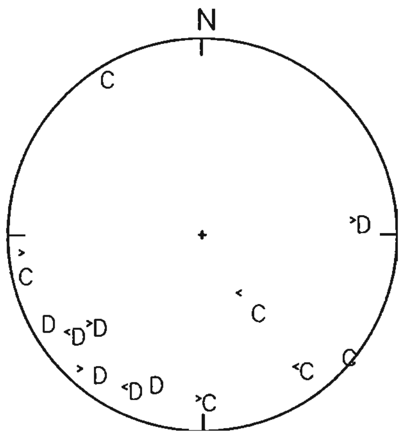
P, SH and P–Nodal



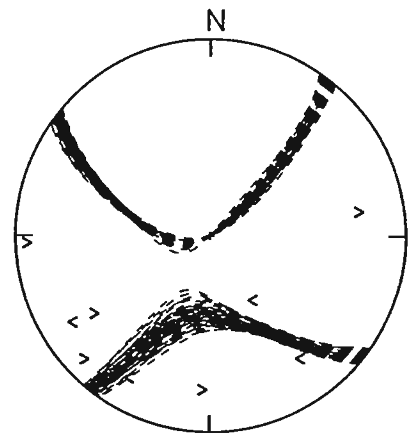
Best Solution



Solution with P FM only.

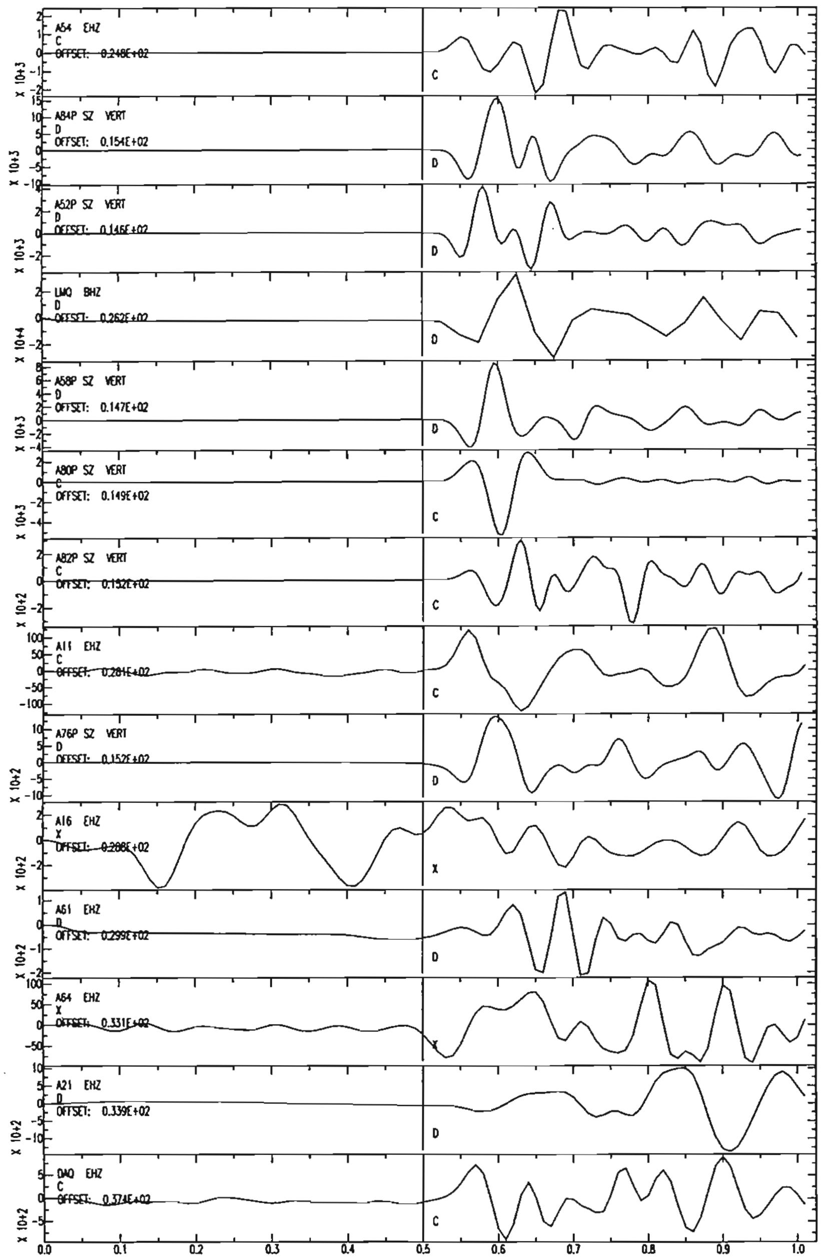


First Motions Only

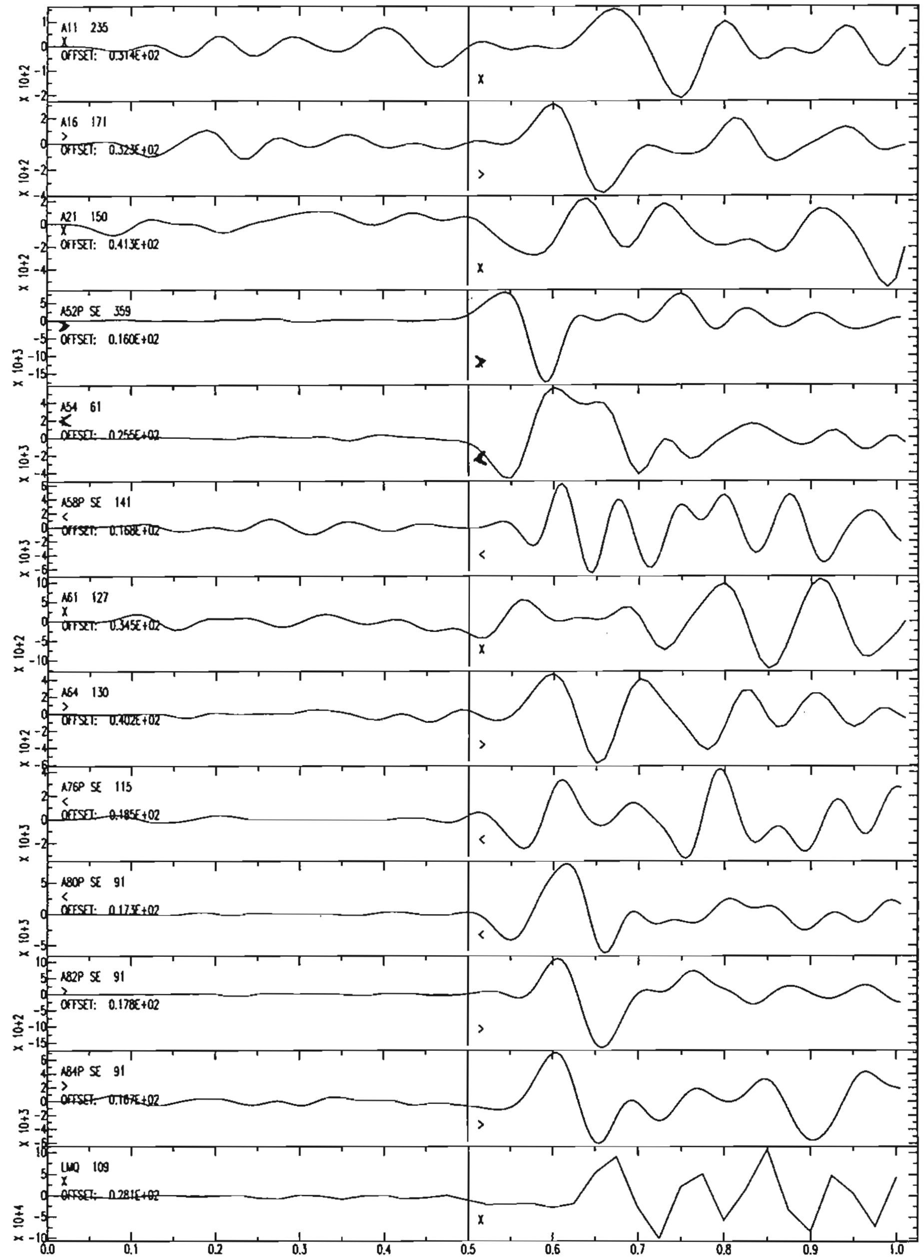


SH Motions and Lines.

P Phases on Vertical Components



SH phases on Transverse Components



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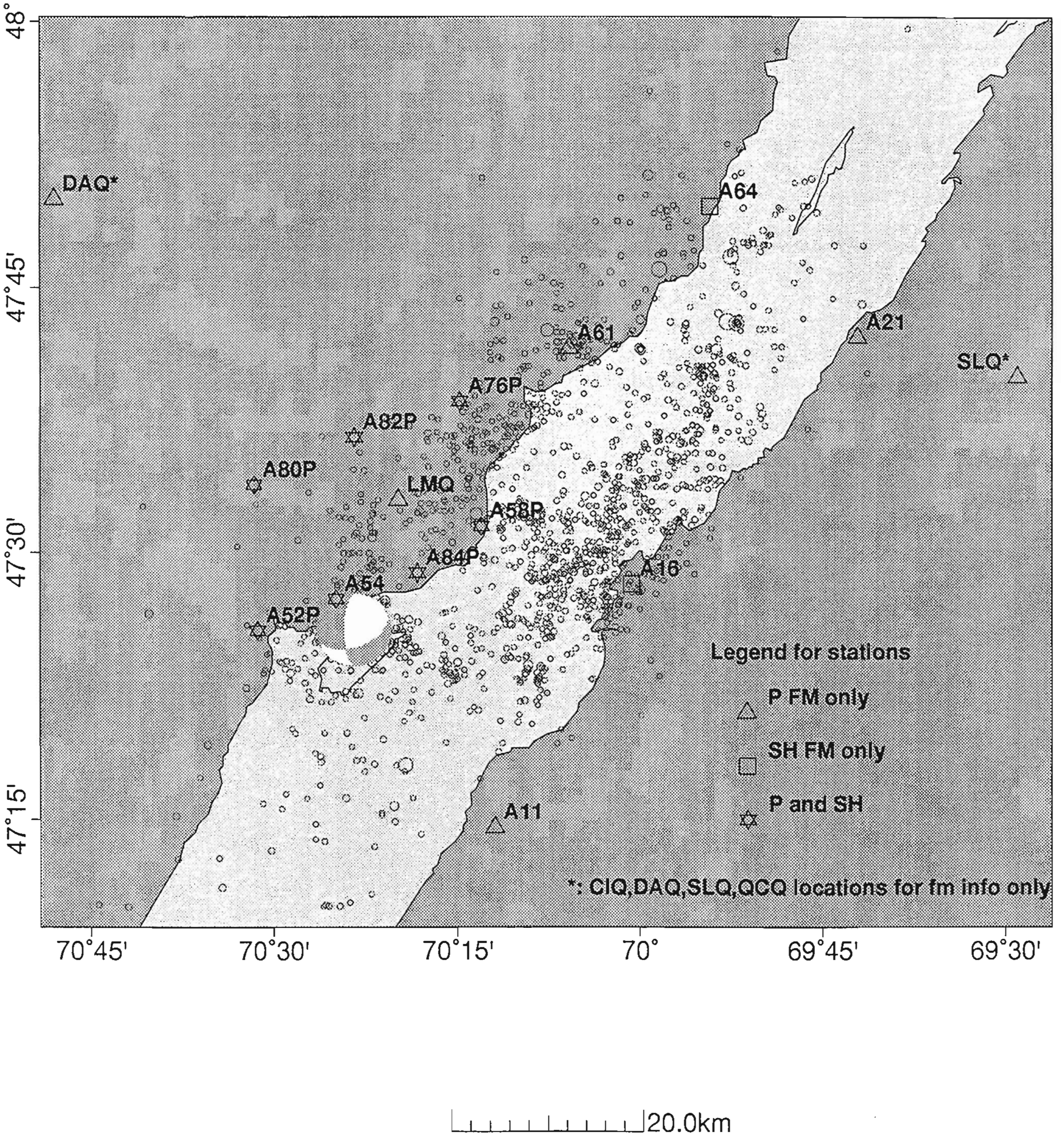
961025

Location Map



Earthquake of 19961028 0245 Magnitude 2.3MN

1- Earthquake information and list of first motions.

Date	Time hhmm ss		Latitude	Longitude	Depth (km)	Mag	Sta/Pha
961028	0245	39.23	47.5536	-70.0414	11.56	2.3MN	12/024

COMMENTS:

CHARLEVOIX SEISMIC ZONE, QUE.
$
$ The Sg lines of some stations include the SH FM.
$ The convention used is the Virginia Tech convention used in FOCMEC:
$ <: SH first motion to left (back to event) impulsive
$ >: SH first motion to right (back to event) impulsive
$ Preliminary Focmec computed by ML.

Sta	Pha	Dist (km)	Azim	Take-off Angle	FM
A16	PG	10	164	-40	D
A16	SG	10	164	-40	>
A58P	PG	13	256	-49	C
A58P	SG	13	256	-49	>
A61	PG	16	347	-54	C
A61	SG	16	347	-54	>
A76P	PG	18	304	-57	C
A76P	SG	18	304	-57	>
A84P	PG	21	248	-61	C
A84P	SG	21	248	-61	<
LMQ	PG	22	268	-62	C
LMQ	SG	22	268	-62	>
A82P	PG	27	284	-67	C
A82P	SG	27	284	-67	>
A54	PG	30	249	-69	C
A54	SG	30	249	-69	>
A21	PG	31	58	-70	C
A64	PG	32	20	-70	C
A80P	PG	36	272	-72	D
A80P	SG	36	272	-72	<
A11	PG	37	199	-72	D

Number of P first motions: 12
Number of SH first motions: 9

2- Most Representative Solution.

A total of 96 solutions were found using a b axis increment of 2 degree. The

following parameters describe the most representative solution, which was derived from the average B, P, and T axes listed below.

dip,strike,rake	23.20	9.81	29.74		
dip,strike,rake	78.73	252.11	110.41	:auxiliary plane	
lower hem. trend, plunge of a,n	162.11	11.27	279.81	66.80	
lower hem. trend & plunge of b	67.95	20.00			
lower hem. trend, plunge of p,t	325.43	30.78	185.73	52.01	

Average B, P, and T axes:

	B	P	T
Mean trend:	N 61	N 321	N 174
Mean Plunge:	16	32	54
Vector Magnitude:	95	96	96
Mean length of resulting vector:	0.995	0.997	0.996

3- Misfits.

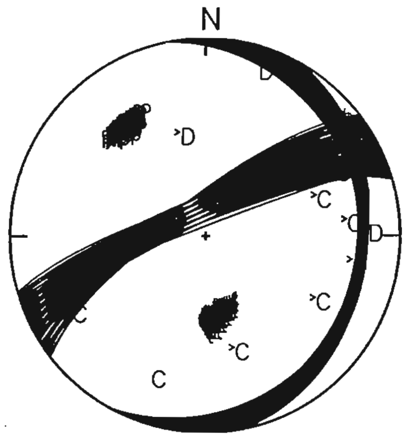
All 12 P first motions agreed with the solution.
Out of 9 SH first motions, a total of 1 did not fit the solutions (11/100).

Station Name	Number of misfits	Percentage of wrongs
A84P	96	100

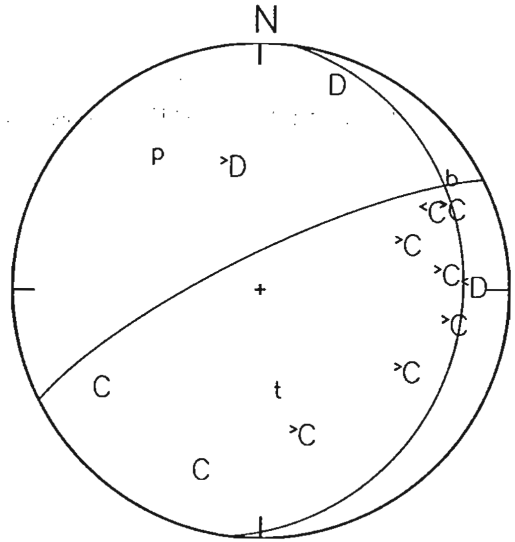
4- Rating of the focal mechanism.

The solution has an A rating based on the small number of P and SH misfits (0 /100 and 11 /100 respectively) and on the good constraints on the P, T and B axes (value of 0.996).

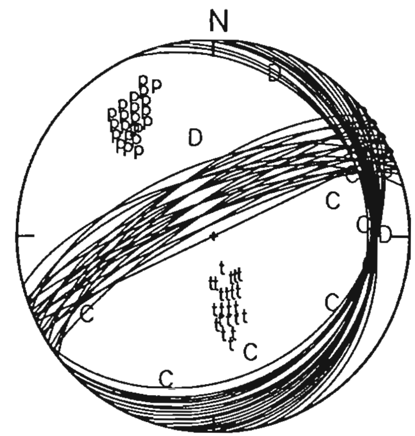
19961028 02:45 U.T.



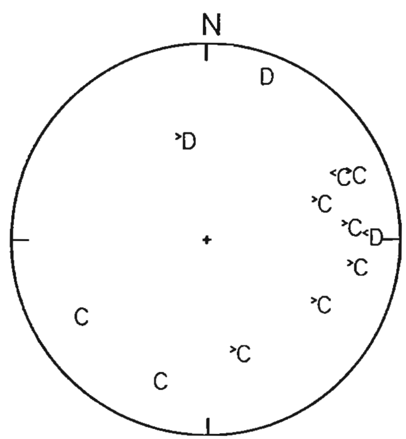
P, SH and P–Nodal



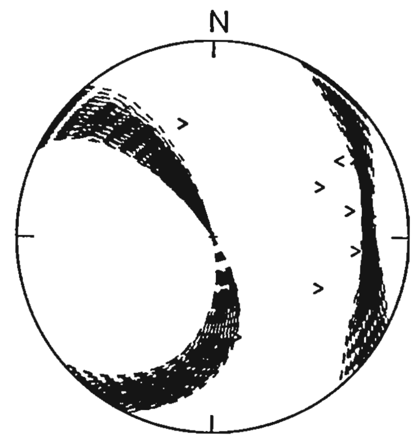
Best Solution



Solution with P FM only.

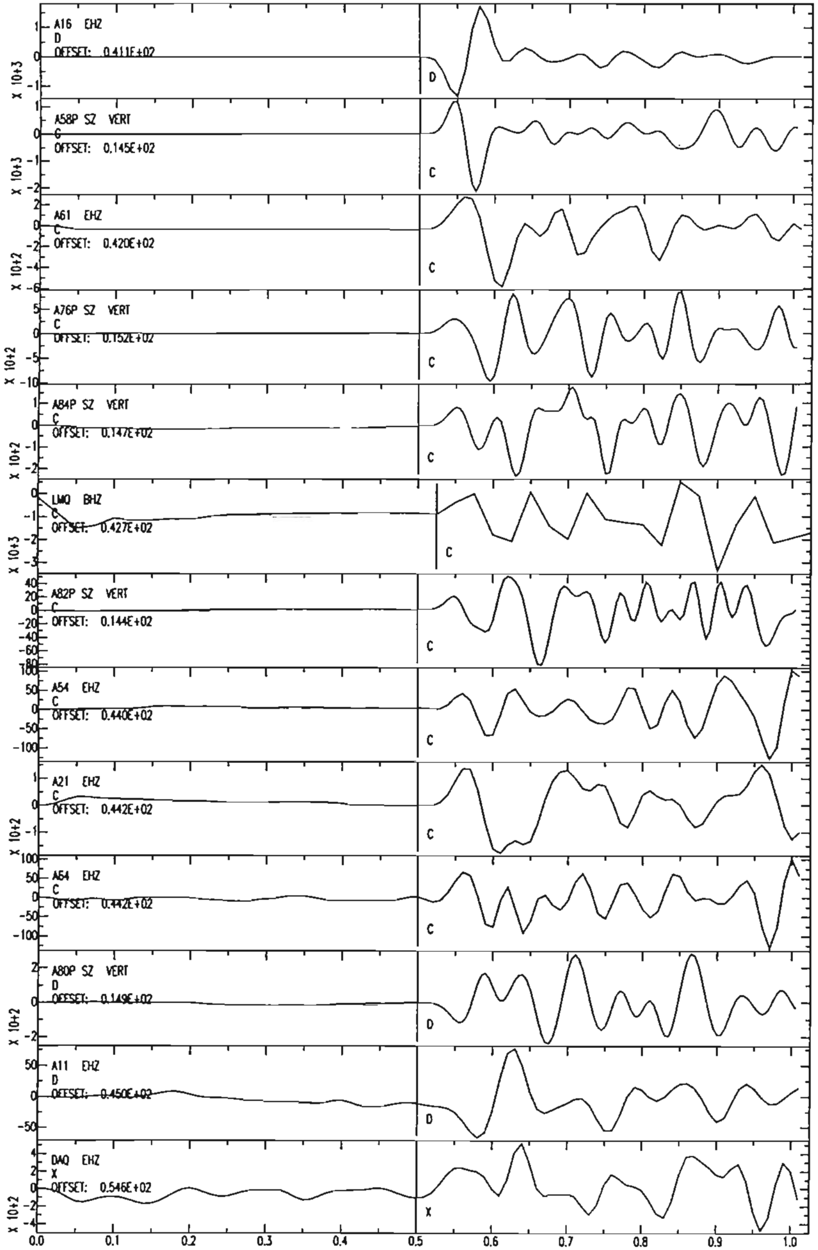


First Motions Only

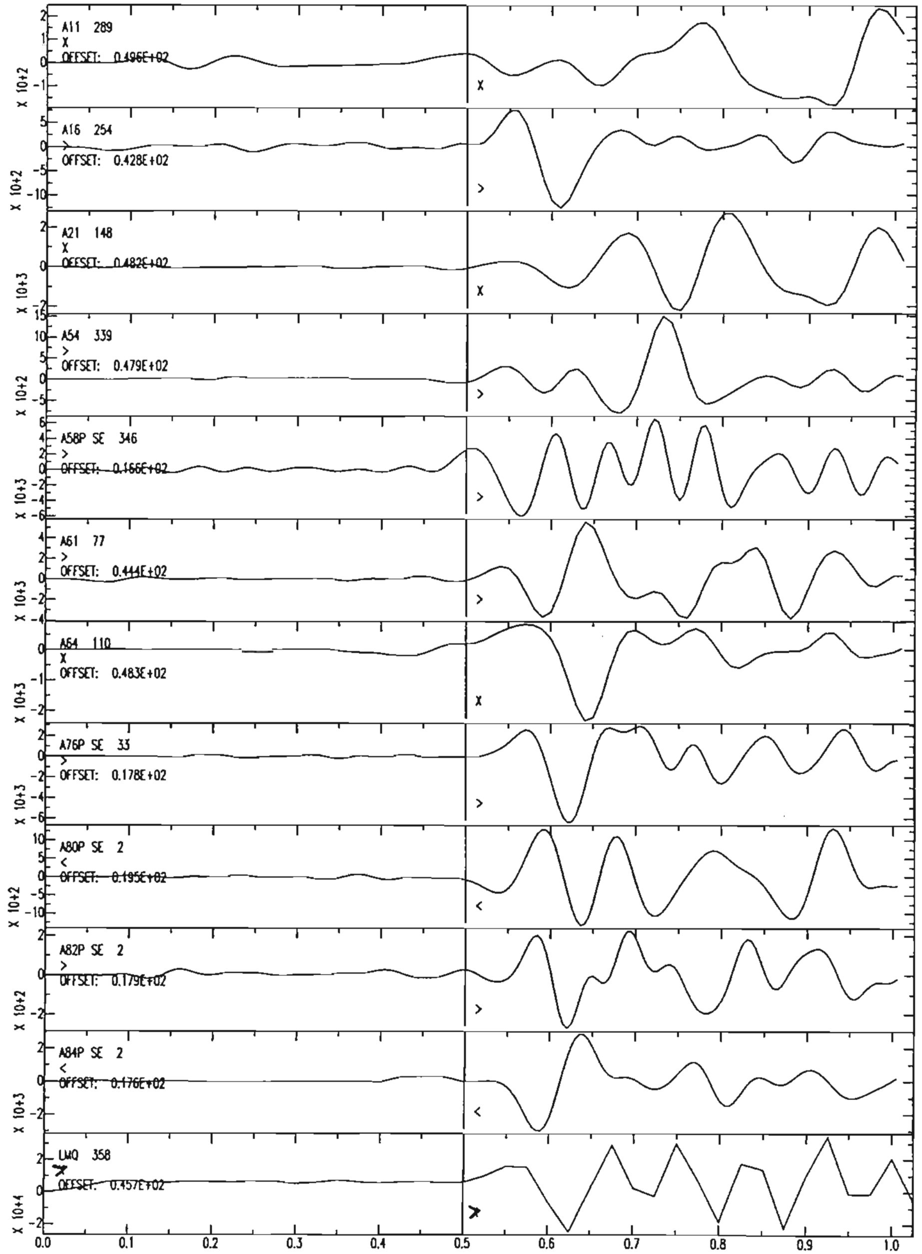


SH Motions and Lines.

P Phases on Vertical Components



SH phases on Transverse Components



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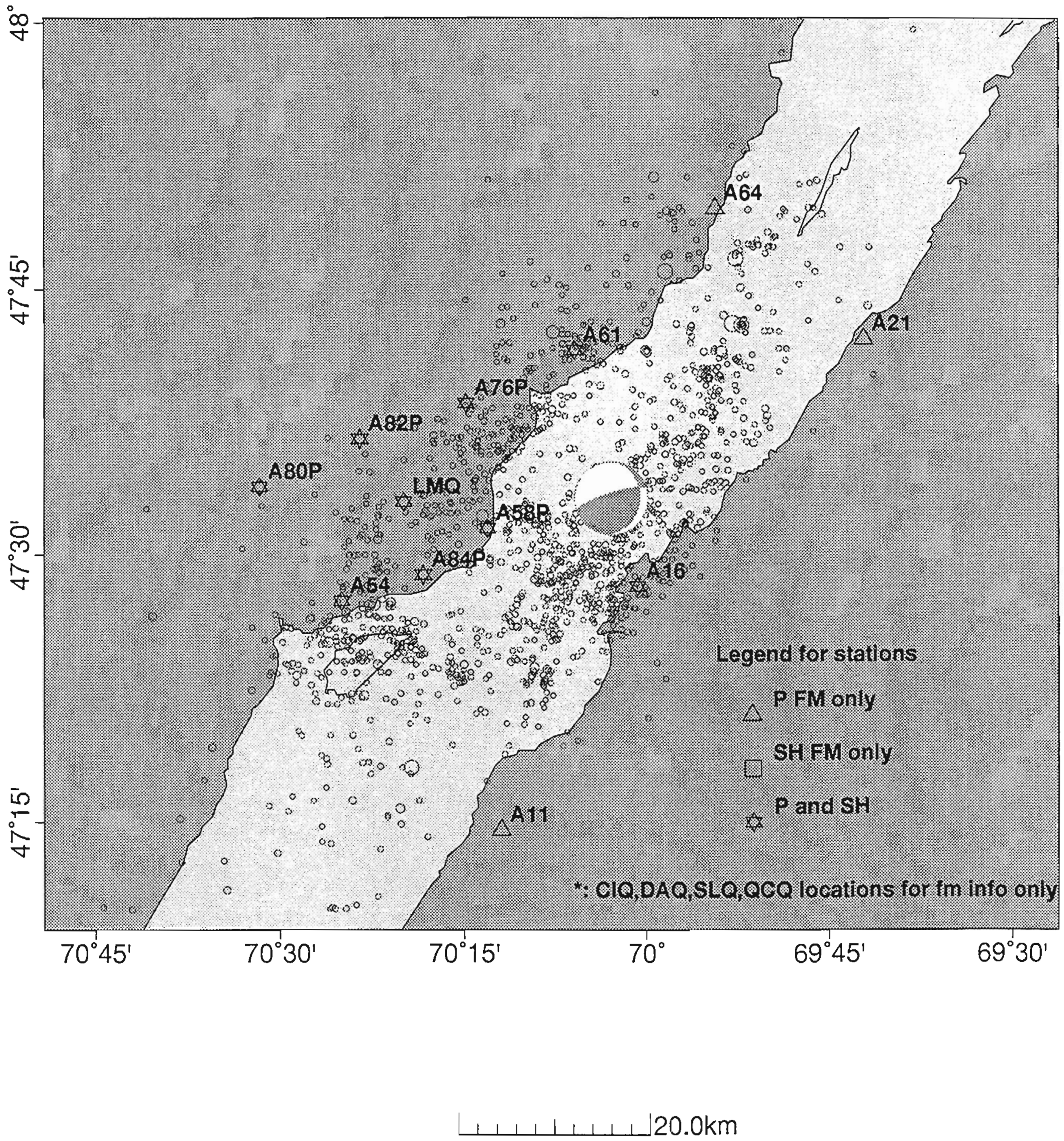
961028

Location Map



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Appendix 3: Additional information on the 1974 and 1979 mechanisms.

Earthquake of 19740609 2324 Magnitude 0.6ML

1- Earthquake information and list of first motions.

Date	Time hhmm ss	Latitude	Longitude	Depth (km)	Mag	Sta/Pha
740609	2324 30.82	47.3431	-70.2393	10.12	0.6ML	16/027

COMMENTS:

CHARLEVOIX SEISMIC ZONE, QUE.
Data from the 1974 Charlevoix Field experiment.
See paper: Leblanc and Buchbinder (1977) for details.
$Leblanc and Buchbinder (1977): Second Micro-earthquake survey of the
$St. Lawrence Valley near La Malbaie, Quebec. C.J.E.S. 14, no. 2, 2778-2789.
$Note: Time in Leblanc and Buchbinder (1977) is in Eastern Standard Time.
$Solution of Leblanc and Buchbinder (1977):
$19740609 1824 30.800L   47.342 -70.240 10.00km 0.6 ML   Z
$Focal mechanism computed; published in Leblanc and Buchbiner (1977) and
$redone in Adams, Vonk, Pittman, and Vatcher (1988).
$No Phase data for P A68 SZ.
$Entered in dbase in February 1996 by Maurice Lamontagne.

Sta	Pha	Dist (km)	Azim	Take-off Angle	FM
A12	PG	9	106	-43	D
A10	PG	11	162	-48	C
A14	PG	15	81	-56	D
A54	PG	18	314	-61	D
A58	PG	20	6	-64	C
A30	PG	23	92	-66	D
A16	PG	23	51	-66	D
A56	PG	24	344	-67	C
A76	PG	33	360	-73	C
A60	PG	40	16	-76	C
A62	PG	49	21	-78	D
A66	PG	81	23	-83	C

Number of P first motions: 12
Number of SH first motions: 0

2- Most Representative Solution.

A total of 29 solutions were found using a b axis increment of 2 degree. The following parameters describe the most representative solution, which was derived from the average B, P, and T axes listed below.

dip,strike,rake   67.59   137.60   41.29

dip,strike,rake	52.41	29.09	151.24	:auxiliary plane	
lower hem. trend, plunge of a,n	299.09	37.59	47.60	22.41	
lower hem. trend & plunge of b	161.06	44.00			
lower hem. trend, plunge of p,t	260.17	9.31	359.45	44.50	

Average B, P, and T axes:

	B	P	T
Mean trend:	N 159	N 259	N 356
Mean Plunge:	47	10	41
Vector Magnitude:	29	29	27
Mean length of resulting vector:	0.991	0.996	0.924

3- Misfits.

All 12 P first motions agreed with the solution.
4- Rating of the focal mechanism.

The solution is rejected (rating X) based on the high number of P misfits (0 /100) and the absence of constraints on the P, T and B axes (value of 0.970).

Earthquake of 19740620 1836 Magnitude 1.5ML

1- Earthquake information and list of first motions.

Date	Time hhmm ss	Latitude	Longitude	Depth (km)	Mag	Sta/Pha
740620	1836 57.48	47.4041	-70.1802	17.30	1.5ML	18/022

COMMENTS:

CHARLEVOIX SEISMIC ZONE, QUE.
Data from the 1974 Charlevoix Field experiment.
See paper: Leblanc and Buchbinder (1977) for details.
$Leblanc and Buchbinder (1977): Second Micro-earthquake survey of the
$St. Lawrence Valley near La Malbaie, Quebec. C.J.E.S. 14, no. 2, 2778-2789.
$Note: Time in Leblanc and Buchbinder (1977) is in Eastern Standard Time.
$Solution of Leblanc and Buchbinder (1977):
$19740620 1336 56.500L 47.4050 -70.1800 16.90km 1.70ML
$Focal mechanism computed; published in Leblanc and Buchbiner (1977).
$Entered in dbase in February 1996 by Maurice Lamontagne.
$ =======0=========0=========0=========0=========0=========0=========0=========0

Sta	Pha	Dist (km)	Azim	Take-off Angle	FM
A12	PG	10	154	-31	C
A14	PG	11	113	-33	C
A58	PG	14	350	-38	D
A16	PG	15	60	-41	D
A10	PG	18	183	-46	C
A54	PG	18	288	-47	D
A30	PG	20	113	-49	D
A56	PG	20	326	-49	D
A52	PG	26	276	-56	D
A76	PG	27	350	-57	D
A18	PG	27	62	-57	D
A60	PG	33	12	-62	D
A74	PG	33	320	-62	C
A62	PG	41	18	-67	D
A20	PG	50	48	-71	D
A64	PG	52	25	-72	D
A66	PG	73	22	-77	C
A22	PG	86	41	-79	D
A68	PG	98	22	-80	C

Number of P first motions: 19
Number of SH first motions: 0

2- Most Representative Solution.

A total of 230 solutions were found using a b axis increment of 2 degree. The following parameters describe the most representative solution, which was derived from the average B, P, and T axes listed below.

dip,strike,rake	67.53	277.85	-68.28		
dip,strike,rake	30.86	51.66	-131.82	:auxiliary plane	
lower hem. trend, plunge of a,n	321.66	59.14	187.85	22.47	
lower hem. trend & plunge of b	89.19	20.00			
lower hem. trend, plunge of p,t	220.89	61.32	351.71	19.68	

Average B, P, and T axes:

	B	P	T
Mean trend:	N 83	N 220	N 346
Mean Plunge:	20	64	19
Vector Magnitude:	220	224	216
Mean length of resulting vector:	0.955	0.972	0.940

3- Misfits.

Out of 19 P first motions, one did not fit the solutions (5/100)

Station Name	Number of misfits	Percentage of wrongs
A14	196	85
A30	33	14
A76	1	0

4- Rating of the focal mechanism.

The solution is rejected (rating X) based on the high number of P misfits (5 /100) and the absence of constraints on the P, T and B axes (value of 0.956).

Earthquake of 19740623 1406 Magnitude 0.4ML

1- Earthquake information and list of first motions.

Date	Time hhmm ss	Latitude	Longitude	Depth (km)	Mag	Sta/Pha
740623	1406 57.40	47.5127	-70.2144	14.95	0.4ML	16/028

COMMENTS:

CHARLEVOIX SEISMIC ZONE, QUE.
Data from the 1974 Charlevoix Field experiment.
See paper: Leblanc and Buchbinder (1977) for details.
$Leblanc and Buchbinder (1977): Second Micro-earthquake survey of the
$St. Lawrence Valley near La Malbaie, Quebec. C.J.E.S. 14, no. 2, 2778-2789.
$Note: Time in Leblanc and Buchbinder (1977) is in Eastern Standard Time.
$Solution of Leblanc and Buchbinder (1977):
$ 19740623 0906 57.400L 47.5133 -70.2150 14.80km 0.50ML
$Focal mechanism computed; published in Leblanc and Buchbinder (1977),
$ redone in Adams, Vonk, Pittman, and Vatcher (1988).
$Entered in dbase in February 1996 by Maurice Lamontagne.

Sta	Pha	Dist (km)	Azim	Take-off Angle	FM
A58	PG	1	4	-5	C
A56	PG	9	296	-32	C
A76	PG	15	352	-44	C
A54	PG	16	247	-47	C
A16	PG	16	107	-48	C
A14	PG	21	142	-55	D
A52	PG	25	248	-59	C
A18	PG	26	88	-60	D
A30	PG	29	134	-62	D
A62	PG	31	30	-64	C
A66	PG	63	28	-77	D
A22	PG	79	48	-79	C

Number of P first motions: 12
Number of SH first motions: 0

2- Most Representative Solution.

A total of 125 solutions were found using a b axis increment of 2 degree. The following parameters describe the most representative solution, which was derived from the average B, P, and T axes listed below.

dip,strike,rake	44.14	222.50	84.25	
dip,strike,rake	46.13	50.48	95.55	:auxiliary plane

lower hem. trend, plunge of a,n	320.48	43.87	132.50	45.86
lower hem. trend & plunge of b	226.63	4.00		
lower hem. trend, plunge of p,t	136.56	1.00	32.58	85.88

Average B, P, and T axes:

	B	P	T
Mean trend:	N 228	N 138	N 352
Mean Plunge:	1	1	89
Vector Magnitude:	124	124	125
Mean length of resulting vector:	0.994	0.994	0.997

3- Misfits.

All 12 P first motions agreed with the solution.

4- Rating of the focal mechanism.

The solution has an A rating based on the small number of P misfits (0 /100) and on the good constraints on the P, T and B axes (value of 0.995).

Earthquake of 19740630 1655 Magnitude 2.0ML

1- Earthquake information and list of first motions.

Date	Time hhmm ss	Latitude	Longitude	Depth (km)	Mag	Sta/Pha
740630	1655 11.21	47.7155	-69.8409	15.54	2.0ML	20/027

COMMENTS:

CHARLEVOIX SEISMIC ZONE, QUE.
Data from the 1974 Charlevoix Field experiment.
See paper: Leblanc and Buchbinder (1977) for details.
$Leblanc and Buchbinder (1977): Second Micro-earthquake survey of the
$St. Lawrence Valley near La Malbaie, Quebec. C.J.E.S. 14, no. 2, 2778-2789.
$Solution of Leblanc and Buchbinder (1977):
$Note: Time in Leblanc and Buchbinder (1977) is in Eastern Standard Time.
Earthquake of $S 19740630 Magnitude 15.20km

1- Earthquake information and list of first motions.

Date	Time hhmm ss	Latitude	Longitude	Depth (km)	Mag	Sta/Pha
19740	30 1 55.11	47.7	150 -69.8	00 150km	2.0 M	5 /197

$Focal mechanism computed; published in Leblanc and Buchbinder (1977) and
$Entered in dbase in February 1996 by Maurice Lamontagne.

Sta	Pha	Dist (km)	Azim	Take-off Angle	FM
A20	PG	11	95	-36	C
A64	PG	13	343	-40	C
A62	PG	13	288	-40	D
A60	PG	19	262	-51	D
A18	PG	22	184	-55	C
A16	PG	30	205	-63	C
A76	PG	31	255	-64	D
A66	PG	33	3	-65	C
A58	PG	35	233	-66	D
A56	PG	41	243	-69	D
A14	PG	42	201	-70	C
A30	PG	43	190	-70	C
A22	PG	43	46	-70	D
A12	PG	49	206	-72	D
A54	PG	52	236	-73	D
A68	PG	57	12	-75	C
A10	PG	59	207	-75	D

A52	PG	60	238	-76	D

Number of P first motions: 18
Number of SH first motions: 0

2- Most Representative Solution.

A total of 18 solutions were found using a b axis increment of 5 degree. The following parameters describe the most representative solution, which was derived from the average B, P, and T axes listed below.

dip,strike,rake	60.22	118.51	19.30	
dip,strike,rake	73.33	18.64	148.77	:auxiliary plane
lower hem. trend, plunge of a,n	288.64	16.67	28.51	29.78
lower hem. trend & plunge of b	173.33	55.00		
lower hem. trend, plunge of p,t	70.95	8.54	335.22	33.64

Average B, P, and T axes:

	B	P	T
Mean trend:	N 185	N 82	N 331
Mean Plunge:	39	10	48
Vector Magnitude:	15	17	16
Mean length of resulting vector:	0.849	0.969	0.864

3- Misfits.

All 18 P first motions agreed with the solution.
4- Rating of the focal mechanism.

The solution is rejected (rating X) based on the high number of P misfits (0 /100) and the absence of constraints on the P, T and B axes (value of 0.894).

Earthquake of 19740702 0730 Magnitude 0.2ML

1- Earthquake information and list of first motions.

Date	Time hhmm ss		Latitude	Longitude	Depth (km)	Mag	Sta/Pha
740702	0730	18.62	47.5641	-70.2271	4.43	0.2ML	13/022

COMMENTS:

CHARLEVOIX SEISMIC ZONE, QUE.
Data from the 1974 Charlevoix Field experiment.
See paper: Leblanc and Buchbinder (1977) for details.
$Leblanc and Buchbinder (1977): Second Micro-earthquake survey of the
$St. Lawrence Valley near La Malbaie, Quebec. C.J.E.S. 14, no. 2, 2778-2789.
$Note: Time in Leblanc and Buchbinder (1977) is in Eastern Standard Time.
$Solution of Leblanc and Buchbinder (1977):
$ 19740702 0230 18.6 L 47.5633 -70.2283 4.4km 0.3 ML
$Focal mechanism computed; published in Leblanc and Buchbinder (1977).
$Entered in dbase in February 1996 by Maurice Lamontagne.

Sta	Pha	Dist (km)	Azim	Take-off Angle	FM
A58	PG	4	166	-45	C
A56	PG	8	258	-60	D
A76	PG	9	353	-63	C
A60	PG	17	35	-76	C
A54	PG	18	229	-76	D
A16	PG	20	122	-77	D
A62	PG	27	38	-80	C
A52	PG	27	236	-81	D
A18	PG	28	100	-81	D
A20	PG	43	68	-84	D
A66	PG	59	31	-86	C
A22	PG	76	52	-87	C

Number of P first motions: 12
Number of SH first motions: 0

2- Most Representative Solution.

A total of 125 solutions were found using a b axis increment of 5 degree. The following parameters describe the most representative solution, which was derived from the average B, P, and T axes listed below.

dip,strike,rake	69.30	133.89	-22.21		
dip,strike,rake	69.30	232.11	-157.79	:auxiliary plane	
lower hem. trend, plunge of a,n	142.11	20.70	43.89	20.70	

lower hem. trend & plunge of b	273.00	60.00		
lower hem. trend, plunge of p,t	93.00	30.00	183.00	0.00

Average B, P, and T axes:

	B	P	T
Mean trend:	N 303	N 98	N 202
Mean Plunge:	55	23	35
Vector Magnitude:	68	122	113
Mean length of resulting vector:	0.544	0.979	0.901

3- Misfits.

All 12 P first motions agreed with the solution.

4- Rating of the focal mechanism.

The solution is rejected (rating X) based on the high number of P misfits (0 /100) and the absence of constraints on the P, T and B axes (value of 0.808).

Earthquake of 19740714 0029 Magnitude 0.5ML

1- Earthquake information and list of first motions.

Date	Time hhmm ss	Latitude	Longitude	Depth (km)	Mag	Sta/Pha
740714	0029 56.78	47.4919	-69.9720	12.71	0.5ML	13/024

COMMENTS:

CHARLEVOIX SEISMIC ZONE, QUE.
Data from the 1974 Charlevoix Field experiment.
See paper: Leblanc and Buchbinder (1977) for details.
$Leblanc and Buchbinder (1977): Second Micro-earthquake survey of the
$Note: Time in Leblanc and Buchbinder (1977) is in Eastern Standard Time.
$St. Lawrence Valley near La Malbaie, Quebec. C.J.E.S. 14, no. 2, 2778-2789.
$Solution of Leblanc and Buchbinder (1977):
$19740713 1929 56.800L 47.4917 -69.9717 12.70km 0.06ML
$Focal mechanism computed; published in Leblanc and Buchbinder (1977).
$Entered in dbase in February 1996 by Maurice Lamontagne.

Sta	Pha	Dist (km)	Azim	Take-off Angle	FM
A16	PG	4	228	-16	C
A18	PG	9	70	-34	C
A14	PG	15	200	-50	C
A30	PG	18	172	-54	C
A58	PG	19	282	-56	D
A60	PG	24	338	-62	D
A76	PG	26	310	-64	D
A56	PG	28	284	-65	D
A62	PG	29	354	-66	D
A54	PG	33	263	-69	D
A64	PG	38	9	-71	C
A64	SG	38	9	-71	C

Number of P first motions: 12
Number of SH first motions: 0

2- Most Representative Solution.

A total of 314 solutions were found using a b axis increment of 5 degree. The following parameters describe the most representative solution, which was derived from the average B, P, and T axes listed below.

dip,strike,rake 71.25 14.32 68.83
dip,strike,rake 27.99 244.63 136.78 :auxiliary plane
lower hem. trend, plunge of a,n 154.63 62.01 284.32 18.75

lower hem. trend & plunge of b	21.41	20.00		
lower hem. trend, plunge of p,t	120.47	23.40	255.15	58.39

Average B, P, and T axes:

	B	P	T
Mean trend:	N 207	N 109	N 282
Mean Plunge:	26	18	67
Vector Magnitude:	273	304	176
Mean length of resulting vector:	0.870	0.967	0.560

3- Misfits.

All 12 P first motions agreed with the solution.
4- Rating of the focal mechanism.

The solution is rejected (rating X) based on the high number of P misfits (0 /100) and the absence of constraints on the P, T and B axes (value of 0.799).

Earthquake of 19790819 2249 Magnitude 4.98MN

1- Earthquake information and list of first motions.

Date	Time hhmm ss	Latitude	Longitude	Depth (km)	Mag	Sta/Pha
790819	2249 30.60	47.6720	-69.9010	10.00	4.98MN	15/026

COMMENTS:

Felt; CHARLEVOIX SEISMIC ZONE, QUE.
About 8 km SE of St-Fidele, Que.
Felt in Quebec, New Brunswick and Maine.
Maximum intensity MM V. Minor damage in the epicentral region
Three damaged chimneys on the North Shore.
Followed by at least 6 aftershocks in the first 24 hours (largest is MN 3.0).
Isoseismals, aftershocks and focal mechanism are described in:
The Charlevoix earthquake of 19 August 1979 and its seismotectonic environment.
Hasegawa and Wetmiller, 1980. Earthquake notes, 51, 23-37.
SEE FIGURE 6 for isoseismals.
MAG(NEIS) 4.6 MB ON 22 stations
MAG(NEIS) 4.5 MS ON 2 stations.
SIC, HAL AND IGL not operating.

```
$+47.67 - 69.90 F1MN=0.0 224931. 19081979   0    0    0    4  8    0  Z210
$047.73 - 70.02 F1MN=5.0 224930. 19081979 0 0.02 0.03 0.1 22 47 10 1.7 218LMQ  3
$ Pegged at publised solution of Hasegawa and Wetmiller (1980).
$ April 1996, Maurice Lamontagne completed the pikfile with some first motions,
$ phase readings and additional comments. All ISC phase data for canadian statio
$ and for all stations of epicentral distance < 2000 km were added.
$
$ FIRST MOTIONS:
$ Charlevoix network fm's read from analogue display.
$ A10 first motion looks uncertain: very weak C then D.
$ A54 Noisy at the time.
$
$ ECTN fm's: MNT, MNQ, GNT, MIQ, LBQ all re-checked.
$            No fm on OTT, LDQ, LAQ: too noisy.
$            FHO fm (FORMERLY C) was taken out: Too noisy to pick.
$
$ New England fm's: Used file folder that contained some fm data.
$                   Some original records were found.
$                   BPM fm was read as C but polarity is uncertain: not entered.
$                   FLET fm is up but polarity is reversed: entered as D.
$
$ Teleseismic distances: First motions from ISC BUlletin (some might be question
$
$ fm on FHO; SUD; OTT; LAQ,: too weak.
```

Sta	Pha	Dist	Azim	Take-off	FM

		(km)		Angle	
A60	PG	15	279	-56	D
A20	PG	16	77	-58	D
A64	PG	17	2	-60	C
A16	PG	24	200	-67	C
LMQ	PG	35	247	-74	D
POC	PG	36	197	-74	C
D2A	PG	83	136	-83	D
CHQ	PG	137	231	-86	D
QCQ	PG	144	227	-86	D
CBM	PN	158	121	49	D
HNME	PN	223	138	49	C
JKM	PN	226	187	49	D
GNT	PN	238	233	49	D
UNB	PN	314	126	49	C
MNQ	PN	329	14	49	C
DVT	PN	348	211	49	D
PQ0	PN	353	147	49	C
BNH	PN	358	198	49	D
MNT	PN	374	231	49	D
FLET	PN	404	217	49	D
PNY	PN	423	223	49	D
COV	PN	426	217	49	D
WNY	PN	476	222	49	D
HNH	PN	479	204	49	C
GAC	PN	480	245	49	D
MDV	PN	481	213	49	D
MIQ	PN	484	255	49	D
MSNY	PN	484	234	49	C
PTN	PN	523	231	49	D
APH	PN	556	222	49	D
CROG	PN	599	228	49	D
SCH	PN	825	14	49	D
LBQ	PN	839	324	49	D
LGQ	PN	868	323	49	D
PBQ	PN	1006	330	49	C
ECM	PN	1091	214	49	C
MRG	PN	1205	226	49	C
AAM	PN	1236	246	49	C
BLA	PN	1447	220	49	C
DAG	PN	3941	18	32	C
MLS	PN	4592	314	30	C
LFF	PN	5261	66	28	C
CAF	PN	5352	65	28	C
BNG	PN	9530	88	17	D
WB2	PN	16241	316	0	C

Number of P first motions: 45
Number of SH first motions: 0

2- Most Representative Solution.

A total of 32 solutions were found using a b axis increment of 1 degree. The following parameters describe the most representative solution, which was derived from the average B, P, and T axes listed below.

dip,strike,rake	58.08	177.14	67.45		
dip,strike,rake	38.38	35.29	121.62	:auxiliary plane	
lower hem. trend, plunge of a,n	305.29	51.62	87.14	31.92	
lower hem. trend & plunge of b	189.53	19.00			
lower hem. trend, plunge of p,t	283.15	10.39	40.37	68.15	

Average B, P, and T axes:

	B	P	T
Mean trend:	N 190	N 284	N 40
Mean Plunge:	21	11	67
Vector Magnitude:	32	32	32
Mean length of resulting vector:	0.999	1.000	0.999

3- Misfits.

Out of 45 P first motions, a total of 10 did not fit the solutions (22/100)

Station Name	Number of misfits	Percentage of wrongs
AAM	32	100
BLA	32	100
BNG	32	100
BNH	32	100
CBM	32	100
ECM	32	100
JKM	32	100
MRG	32	100
MSNY	32	100
SCH	32	100

4- Rating of the focal mechanism.

The solution has a B rating based on the number of P misfits (22 /100) and on the constraints on the P, T and B axes (value of 0.999).

Appendix 4: Photocopies of the focal mechanisms published in the National Summaries of Canadian earthquakes.

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File / Reference
GS 2685-9

CANADIAN EARTHQUAKES

TREMBLEMENTS DE TERRE CANADIENS

NATIONAL SUMMARY SOMMAIRE NATIONAL

JANUARY–MARCH 1989 JANVIER–MARS

J.A. Drysdale
* R.B. Horner
* R. Kolinsky
M. Lamontagne

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EASTERN CANADIAN FOCAL MECHANISMS JANUARY-MARCH 1989

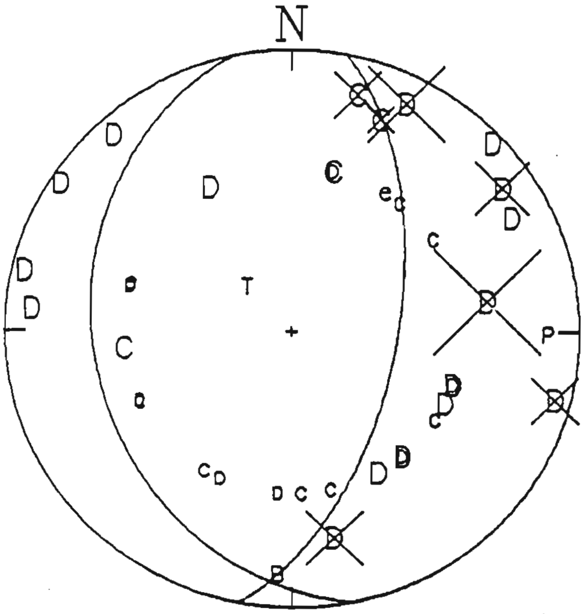
MECANISMES AU FOYER DE L'EST DU CANADA JANVIER-MARS 1989

J. Adams

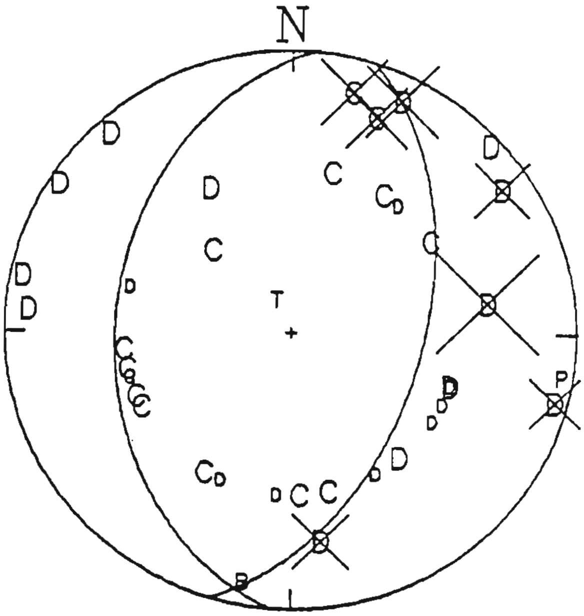
Date	H M	LAT (°N)	LONG (°W/°O)	Z (km)	MAG m_N	NODAL PLANES-PLANS NODAUX STRIKE/DIP/RAKE DIRECTION/PENDAGE/REJET			AXES TREND/PLUNGE DIRECTION/PLONGEMENT P	T	B
890309	0941	47.72	69.86	11	4.3	168	31	071	92/15	308/72	185/10
(Charlevoix, Que.)						011	60	102			
890311	0831	47.72	69.87	10	4.4	184	38	080	101/07	322/81	192/06
(Charlevoix, Que.)						017	52	098			
890316	0417	60.04	70.06	11	5.7	260	42	058	192/07	085/68	285/21
(Payne Bay, Que.)						120	55	116			

These focal mechanisms have been derived using the program FOCMEC from Arthur Snoke of Virginia Tech. On the plot, strong compressive, weakly compressive, emergent, weakly dilatational and strong dilatational P arrivals are C, c, e, d and D, respectively; P, T, and B represent the P, T and B axes; and the diagonal crosses are log Sv/P amplitude ratio data (small crosses represent large ratios).

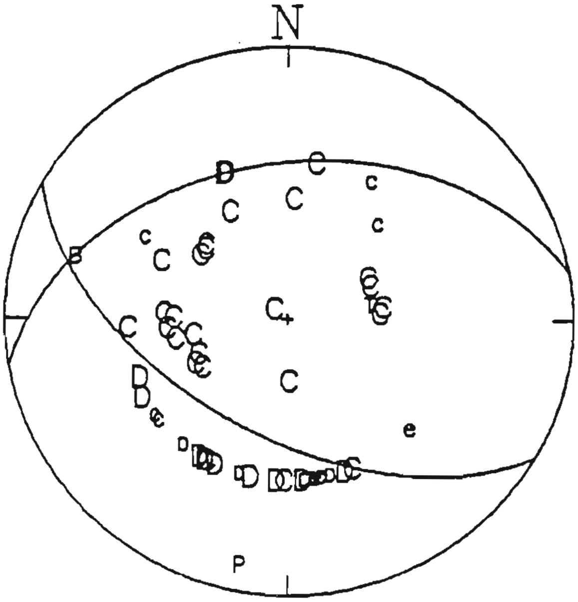
Ces mécanismes au foyer font calculé grâce au programme FOCMEC d'Arthur Snoke du Virginia Tech. Pour les premières arrivées d'onde P, les symboles utilisés dans la figure sont C, c, e, d et D représentant respectivement une compression claire, une compression faible, une arrivée émergente, une dilatation faible et une dilatation claire. P, T et B représentent les axes P, T et B. Les croix diagonales représentent les données des rapports d'amplitudes log Sv/P (les petites croix correspondent à de grands rapports).



890309



890311



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GS 2685-9

CANADIAN EARTHQUAKES
TREMBLEMENTS DE TERRE CANADIENS

NATIONAL SUMMARY SOMMAIRE NATIONAL

JULY–SEPTEMBER 1989 JUILLET–SEPTEMBRE

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* R. Kolinsky
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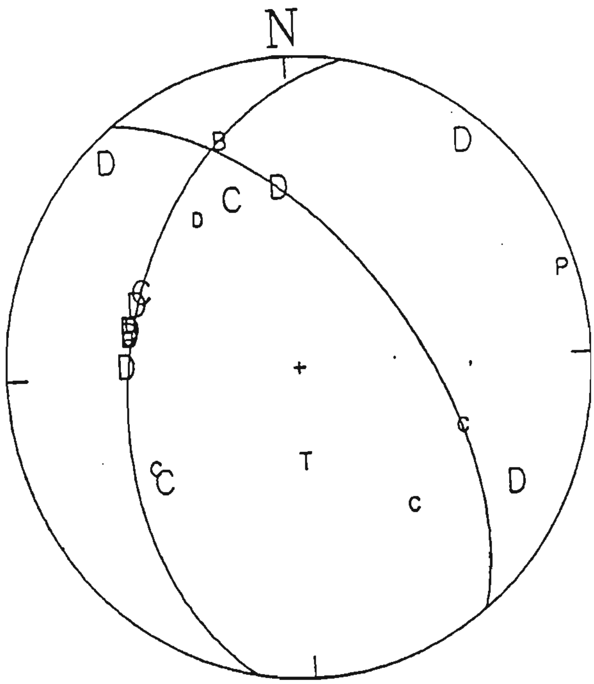
EASTERN CANADIAN FOCAL MECHANISMS (JULY - SEPTEMBER 1990)
MECANISMES AU FOYER DE L'EST DU CANADA (JUILLET - SEPTEMBRE 1990)

Date	Time Heure	LAT ° N	LONG ° W	Z km	MAG m_N	Plans Nodaux Nodal Planes str/dip/rak dir/pend/incl.	Axes des Contraintes Stress Axes az/pl
1989/08/10	21:17	46.63	65.82	17	3.5	P: 324/59/60 A: 191/42/129	P: 074/09 T: 182/63 B: 340/25
1989/09/13	14:55	47.57	70.04	15	2.9	P: 042/57/40 A: 288/57/140	P: 345/00 T: 255/50 B: 075/40

These focal mechanisms have been derived using the program FOCMEC from Arthur Snoke of Virginia Tech.. On the plot, strong compressive, weakly compressive, emergent, weakly dilatational and strong dilatational P arrivals are C, c, e, d and D respectively: P, T, and B represent the P, T and B axex; and the diagonal crosses are log Sv/P amplitude ratio data (small crosses represent large ratios).

Ces mécanismes au foyer font calculé grâce au programme FOCMEC d'Arthur Snoke du Virginia Tech. Pour les premières arrivées d'onde P, les symboles utilisés dans la figure sont C, c, e, d et D reprèsentant respectivement ane compression claire, une compression gailbe, une arrivée émergente, une dilatation faible et un dilatation claire. P, T et B reprèsentent les axes P, T, et B. Les croxi diagonales representent les donnnées des rapports d'amplitudes log Sv/P (les petites croix correspondent à de grands rapports).



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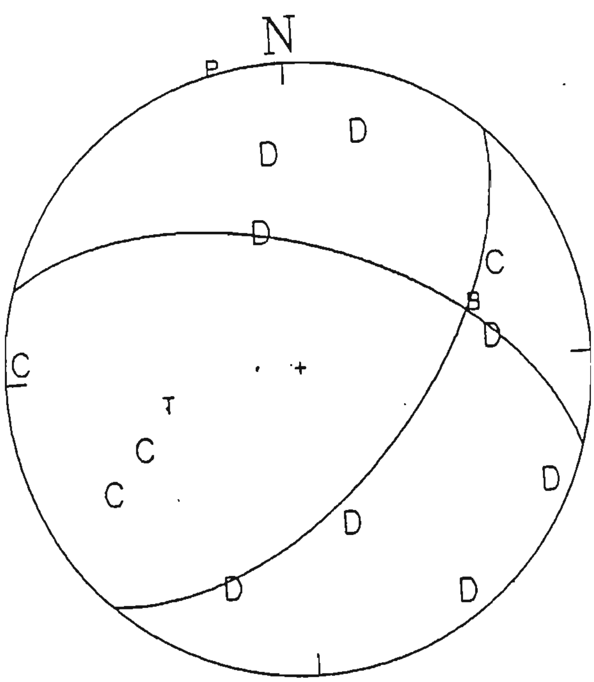

13 09 1989

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GS 2685-9

CANADIAN EARTHQUAKES
TREMBLEMENTS DE TERRE CANADIENS

NATIONAL SUMMARY SOMMAIRE NATIONAL

JANUARY–MARCH 1990 JANVIER–MARS

J.A. Drysdale
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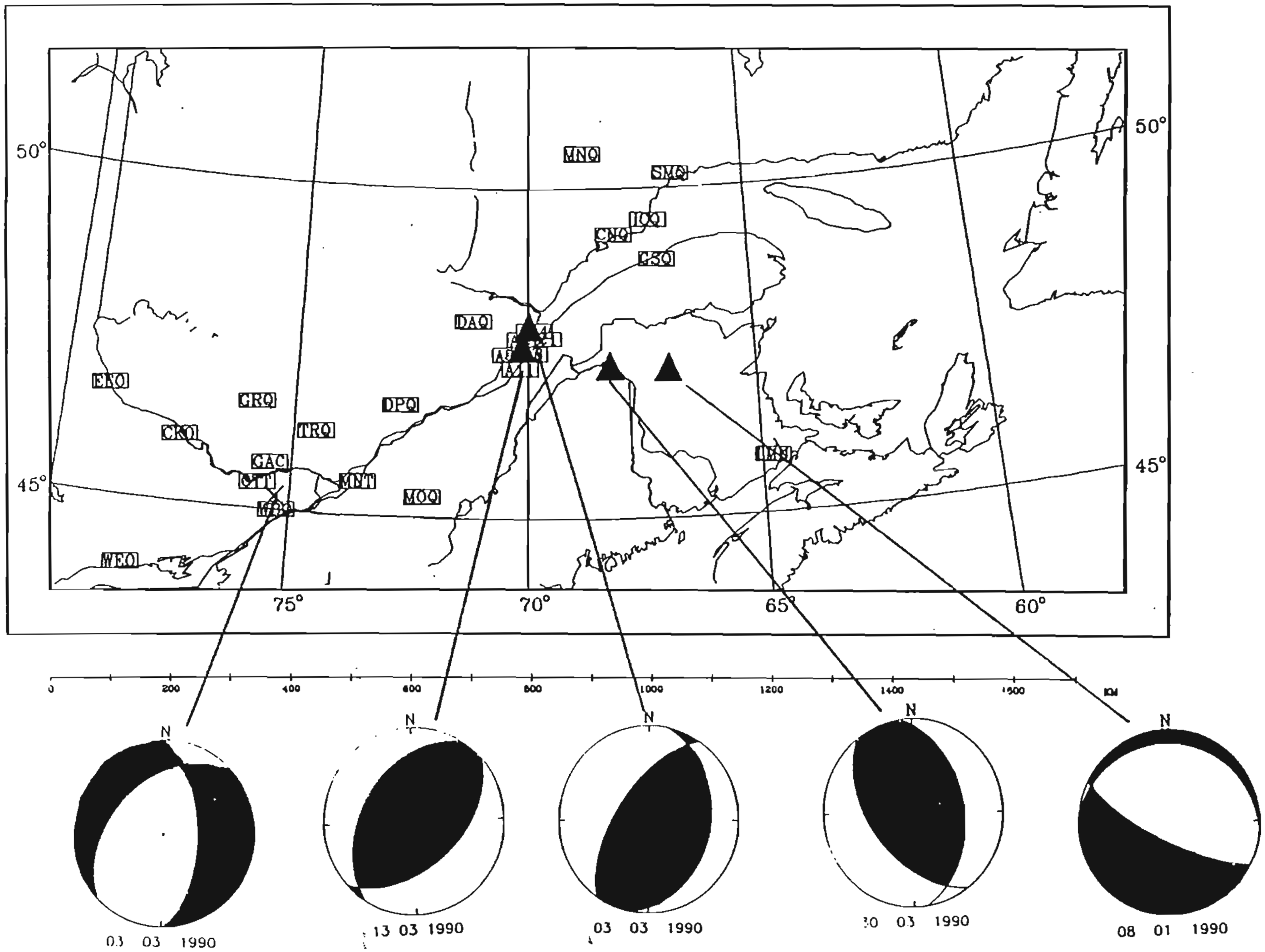

EASTERN CANADIAN FOCAL MECHANISMS (January 1 - March 31, 1990)
MECANISMES AU FOYER DE L'EST DU CANADA (Janvier 1 - Mars 31, 1990)

EASTERN CANADIAN FOCAL MECHANISMS (January 1 - March 31, 1990)
MECANISMES AU FOYER DE L'EST DU CANADA (Janvier 1 - Mars 31, 1990)

W. McNeil - J. Adams

Date	Time Heure	LAT ° N	LONG ° W	Z km	MAG m_N	Nodal Planes Plans Nodaux str/dip/rak dir/pend/incl.	Stress Axes Axes des Contraintes az/pl
1990/01/08	21:40	47.21	66.92		3.0	P: 116/75/-85 A: 277/16/-109	P: 033/60 T: 202/30 B: 295/05
1990/03/03	01:12	45.21	75.30		2.9	P: 226/42/-50 A: 358/59/-120	P: 218/63 T: 109/09 B: 015/25
1990/03/03	02:06	47.85	69.98		3.6	P: 214/61/78 A: 057/31/109	P: 312/15 T: 097/72 B: 220/10
1990/03/13	19:10	47.53	70.14		3.2	P: 042/61/73 A: 260/36/126	P: 145/14 T: 268/65 B: 050/15
1990/03/30	01:54	47.29	68.23		3.5	P: 145/52/71 A: 352/42/112	P: 246/05 T: 354/74 B: 155/15

These focal mechanisms have been derived using the program FOCMEC from Arthur Snoke of Virginia Tech.. On the plot, strong compressive, weakly compressive, emergent, weakly dilatational and strong dilatational P arrivals are C, c, e, d and D respectively: P, T, and B represent the P, T and B axes; and the diagonal crosses are log Sv/P amplitude ratio data (small crosses represent large ratios).

Ces mécanismes au foyers fonts calculés grâce au programme FOCMEC d'Arthur Snoke du Virginia Tech. Pour les premières arrivées d'onde P, les symboles utilisés dans la figure sont C, c, e, d et D représentant respectivement une compression claire, une compression faible, une arrivée émergente, une dilatation faible et une dilatation claire. P, T et B représentent les axes P, T, et B. Les croix diagonales représentent les données des rapports d'amplitudes log Sv/P (les petites croix correspondent à de grands rapports).

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CANADIAN EARTHQUAKES
TREMBLEMENTS DE TERRE CANADIENS

NATIONAL SUMMARY SOMMAIRE NATIONAL

APRIL—JUNE 1990 AVRIL—JUIN

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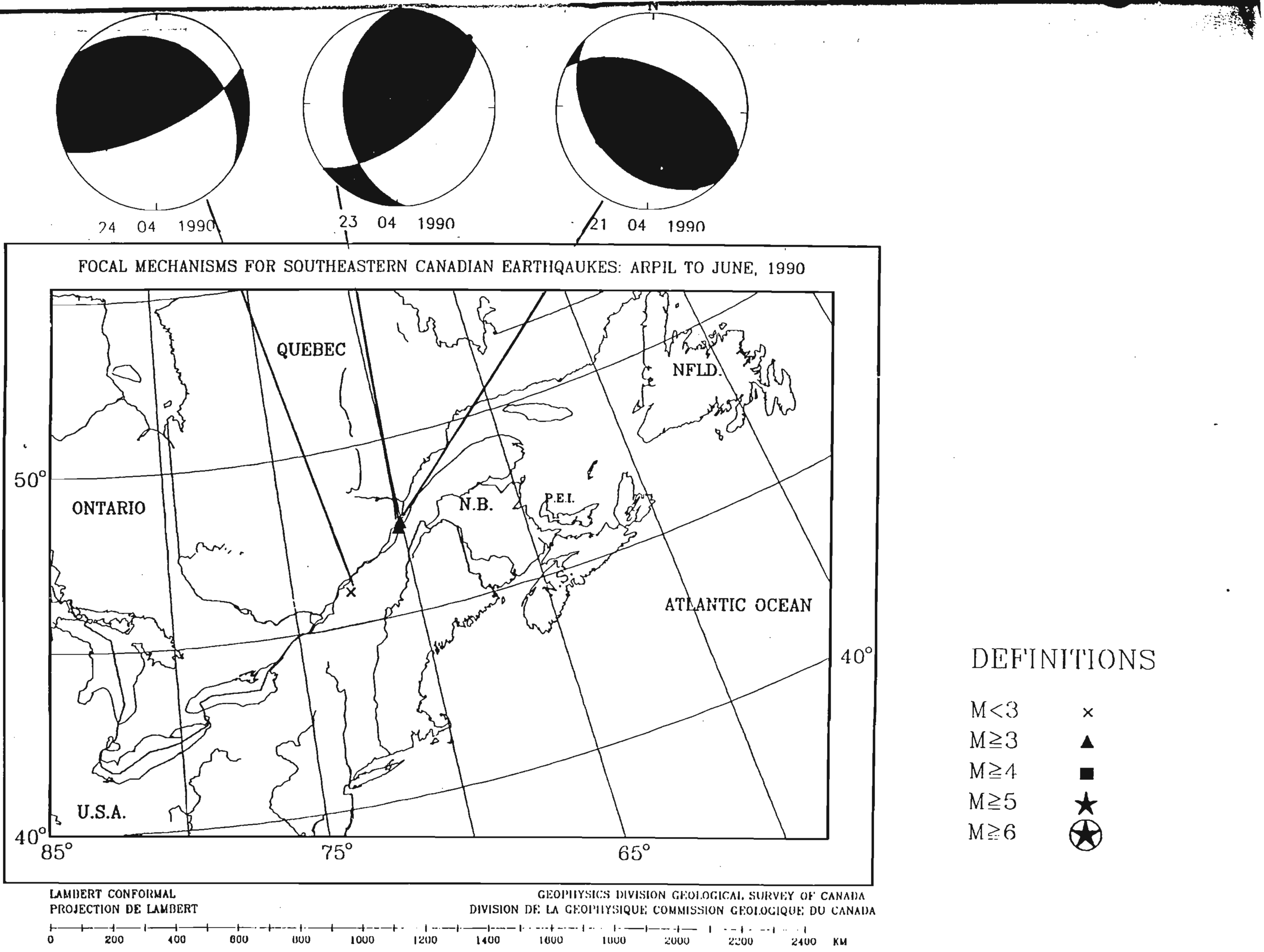
EASTERN CANADIAN FOCAL MECHANISMS (APRIL - JUNE 30, 1990)
MECANISMES AU FOYER DE L'EST DU CANADA (AVRIL 1 - JUIN 30, 1990)

W. McNeil

Date	Time Heure	LAT ° N	LONG ° W	Z km	MAG m_N	Nodal Planes Plans Nodaux str/dip/rak dir/pend/incl.	Stress Axes Axes des Contraintes az/pl
1990/04/21	01:23	47.55	70.07		3.1	P: 297/51/77 A: 137/41/105	P: 036/05 T: 152/79 B: 305/10
1990/04/23	00:28	47.41	70.18		3.0	P: 174/41/41 A: 051/65/123	P: 117/13 T: 007/57 B: 215/30
1990/04/24	13:46	45.92	72.64		2.8	P: 066/72/64 A: 304/32/144	P: 176/23 T: 303/55 B: 075/25

These focal mechanisms have been derived using the program FOCMEC from Arthur Snoke of Virginia Tech.. On the plot, strong compressive, weakly compressive, emergent, weakly dilatational and strong dilatational P arrivals are C, c, e, d and D respectively: P, T, and B represent the P, T and B axes; and the diagonal crosses are log Sv/P amplitude ratio data (small crosses represent large ratios).

Ces mécanismes au foyers sonts calculés grâce au programme FOCMEC d'Arthur Snoke du Virginia Tech. Pour les premières arrivées d'onde P, les symboles utilisés dans la figure sont C, c, e, d et D représentant respectivement une compression claire, une compression faible, une arrivée émergente, une dilatation faible et une dilatation claire. P, T et B représentent les axes P, T, et B. Les croix diagonales représentent les données des rapports d'amplitudes log Sv/P (les petites croix correspondent à de grands rapports).


24 04 1990
23 04 1990
N
21 04 1990
FOCAL MECHANISMS FOR SOUTHEASTERN CANADIAN EARTHQAUKES: ARPIL TO JUNE, 1990
QUEBEC
NFLD.
50°
ONTARIO
N.B.
P.E.I.
N.S.
ATLANTIC OCEAN
40°
U.S.A.
40°
85°
75°
65°
DEFINITIONS
M<3
M≧3
M≧4
M≧5
M≧6
LAMBERT CONFORMAL
PROJECTION DE LAMBERT
GEOPHYSICS DIVISION GEOLOGICAL SURVEY OF CANADA
DIVISION DE LA GEOPHYSIQUE COMMISSION GEOLOGIQUE DU CANADA
0 200 400 600 800 1000 1200 1400 1600 1800 2000 2200 2400 KM

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

File / Reference
GS 2685-9

CANADIAN EARTHQUAKES

TREMBLEMENTS DE TERRE CANADIENS

NATIONAL SUMMARY SOMMAIRE NATIONAL

OCTOBER–DECEMBER 1990 OCTOBRE–DÉCEMBRE

J.A. Drysdale
* R.B. Horner
* R. Kolinsky
M. Lamontagne

SEISMOLOGICAL SERVICE SERVICE SEISMOLOGIQUE

GEOPHYSICS DIVISION	DIVISION DE LA GEOPHYSIQUE
GEOLOGICAL SURVEY OF CANADA	COMMISSION GEOLOGIQUE DU CANADA
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V8L 4B2	V8L 4B2

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EASTERN CANADIAN FOCAL MECHANISMS (OCT. 1 - DEC. 31, 1990)
MECANISMES AU FOYER DE L'EST DU CANADA (OCT. 1 - DEC. 31, 1990)

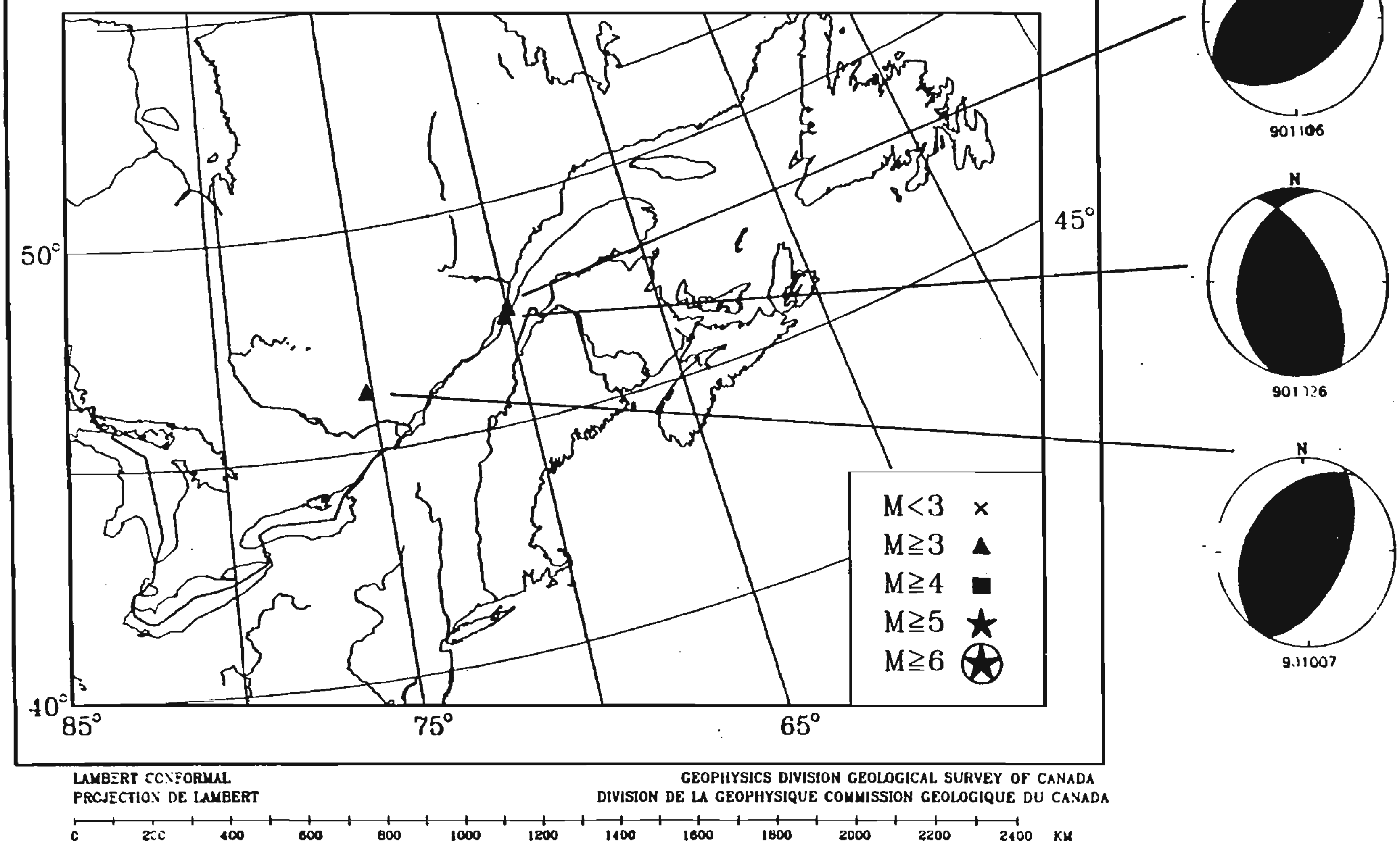
W. McNeil

Date	Time Heure	LAT ° N	LONG ° W	Z km	MAG m_N	Nodal Planes Plans Nodaux str/dip/rak dir/pend/incl.	Stress Axes Axes des Contraintes az/pl
1990/10/07	08:47	46.33	75.20		3.9	P: 027/55/084 A: 217/35/099	P: 120/10 T: 274/79 B: 030/05
1990/10/26	09:13	47.60	69.70		3.1	P: 329/62/067 A: 191/36/126	P: 075/14 T: 198/65 B: 340/20
1990/11/06	11:30	47.39	70.15		3.5	P: 055/45/083 A: 245/45/097	P: 330/00 T: 240/85 B: 060/05

These focal mechanisms have been derived using the program FOCMEC from Arthur Snoke of Virginia Tech.. On the plot, strong compressive, weakly compressive, emergent, weakly dilatational and strong dilatational P arrivals are C, c, e, d and D respectively: P, T, and B represent the P, T and B axes; and the diagonal crosses are log Sv/P amplitude ratio data (small crosses represent large ratios).

Ces mécanismes au foyers sonts calculés grâce au programme FOCMEC d'Arthur Snoke du Virginia Tech. Pour les premières arrivées d'onde P, les symboles utilisés dans la figure sont C, c, e, d et D représentant respectivement une compression claire, une compression faible, une arrivée émergente, une dilatation faible et une dilatation claire. P, T et B représentent les axes P, T, et B. Les croix diagonales représentent les données des rapports d'amplitudes log Sv/P (les petites croix correspondent à de grands rapports).

FIGURE1: P-nodal Solutions for Eastern Canada (Oct. 1,1990 - Dec. 31, 1991)



Appendix 5: Focal mechanisms of earthquakes published in Lamontagne and Ranalli (1997).

Earthquake of 19891208 1720 Magnitude 2.6MN

1- Earthquake information and list of first motions.

Date	Time hhmm ss	Latitude	Longitude	Depth (km)	Mag	Sta/Pha
891208	1720 34.44	47.7010	-70.0644	10.41	2.6MN	6/012

COMMENTS:

CHARLEVOIX, QUEBEC
$ The Sg lines of some stations include the SH FM.
$ The convention used is the Virginia Tech convention used in FOCMEC:
$ <: SH first motion to left (back to event) impulsive
$ >: SH first motion to right (back to event) impulsive
$ Preliminary Focmec computed by ML: Results to come after Nov. 1995.

Sta	Pha	Dist (km)	Azim	Take-off Angle	FM
A61	PG	2	245	-12	C
A61	SG	2	245	-12	<
A64	PG	19	43	-61	D
A64	SG	19	43	-61	<
A16	PG	26	170	-68	C
A16	SG	26	170	-68	>
LMQ	PG	26	229	-68	D
A21	PG	28	89	-70	D
A21	SG	28	89	-70	>
A54	PG	38	224	-75	C
A54	SG	38	224	-75	<
LPQ	PG	40	174	-76	C
A11	PG	52	191	-79	C
SLQ	PG	79	92	-82	C
CIQ	PG	84	320	-83	D
DAQ	PG	93	289	-84	D

Number of P first motions: 11
Number of SH first motions: 5

2- Most Representative Solution.

A total of 363 solutions were found using a b axis increment of 2 degree. The following parameters describe the most representative solution, which was derived from the average B, P, and T axes listed below.

dip,strike,rake	43.06	149.20	25.62			
dip,strike,rake	72.83	39.89	130.12	:auxiliary plane		
lower hem. trend, plunge of a,n			309.89	17.17	59.20	46.94

lower hem. trend & plunge of b   205.92   38.00
lower hem. trend, plunge of p,t   101.28   17.93   351.34   46.50

Average B, P, and T axes:

	B	P	T
Mean trend:	N 205	N 98	N 354
Mean Plunge:	47	15	39
Vector Magnitude:	353	357	335
Mean length of resulting vector:	0.973	0.984	0.923

3- Misfits.

Out of 11 P first motions, one did not fit the solutions (9/100)

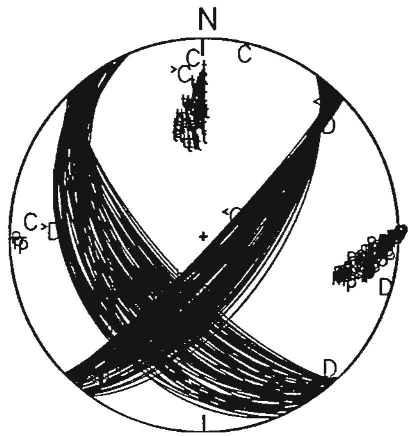
Station Name	Number of misfits	Percentage of wrongs
SLQ	363	100

All 5 SH first motions agreed with the solution.

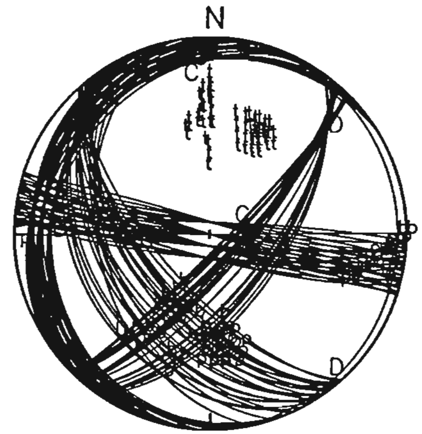
4- Rating of the focal mechanism.

The solution is rejected (rating X) based on the high number of P and SH misfits (9 /100 and 0 /100 respectively) and the absence of constraints on the P, T and B axes (value of 0.960).

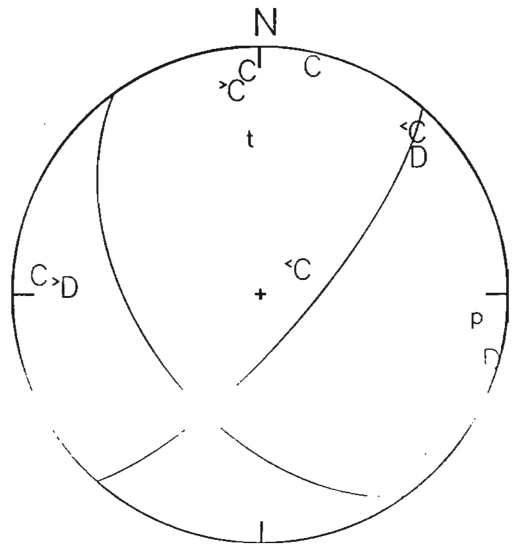
19891208 17:20 U.T.



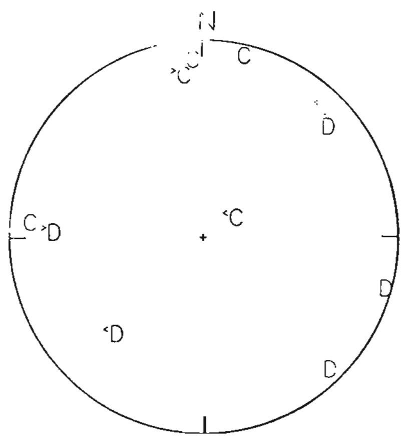
P, SH and P–Nodal



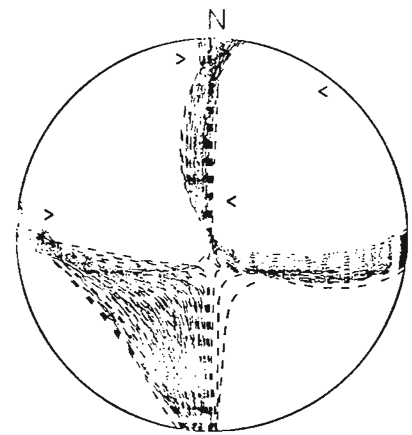
Solution with P FM only.



Best Solution

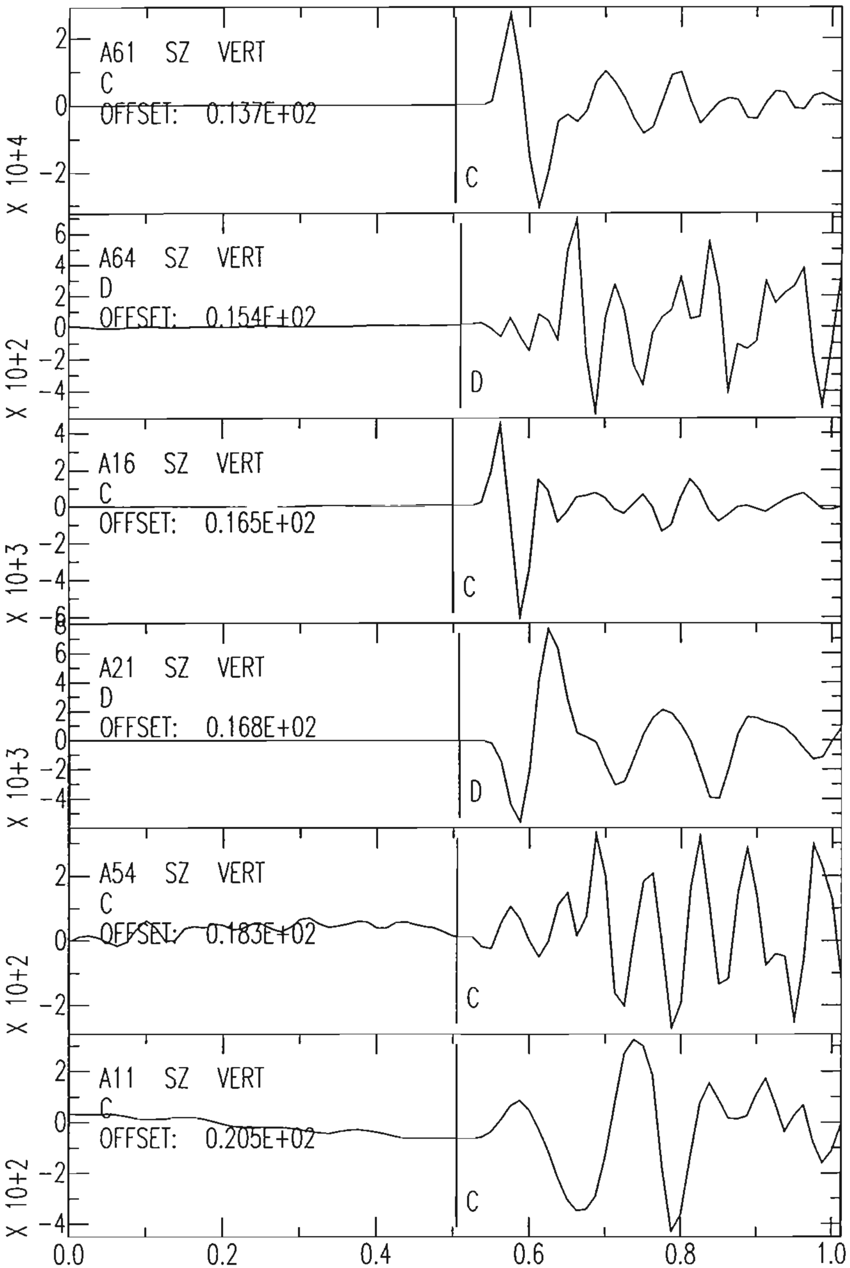


First Motions Only

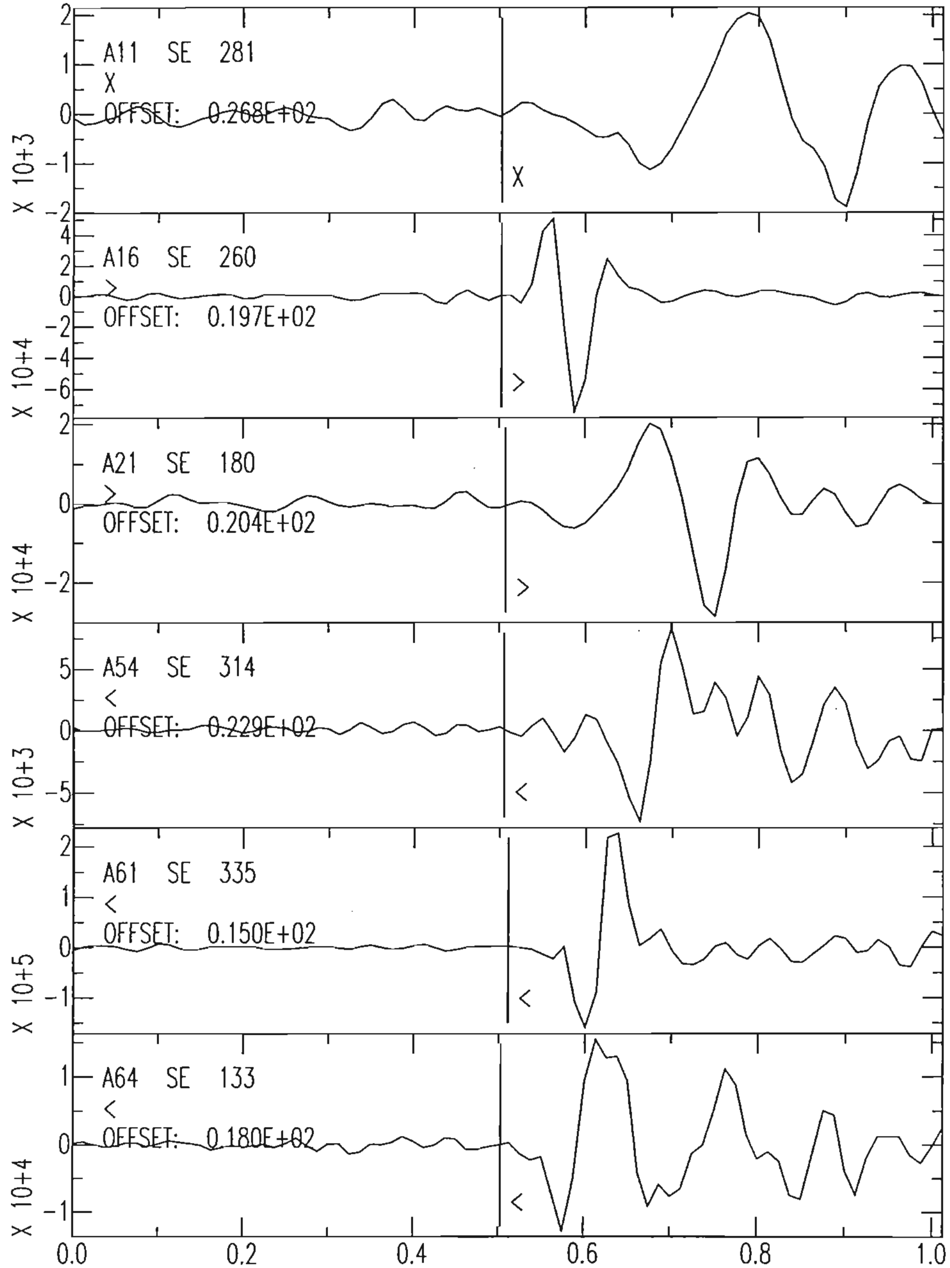


SH Motions and Lines.

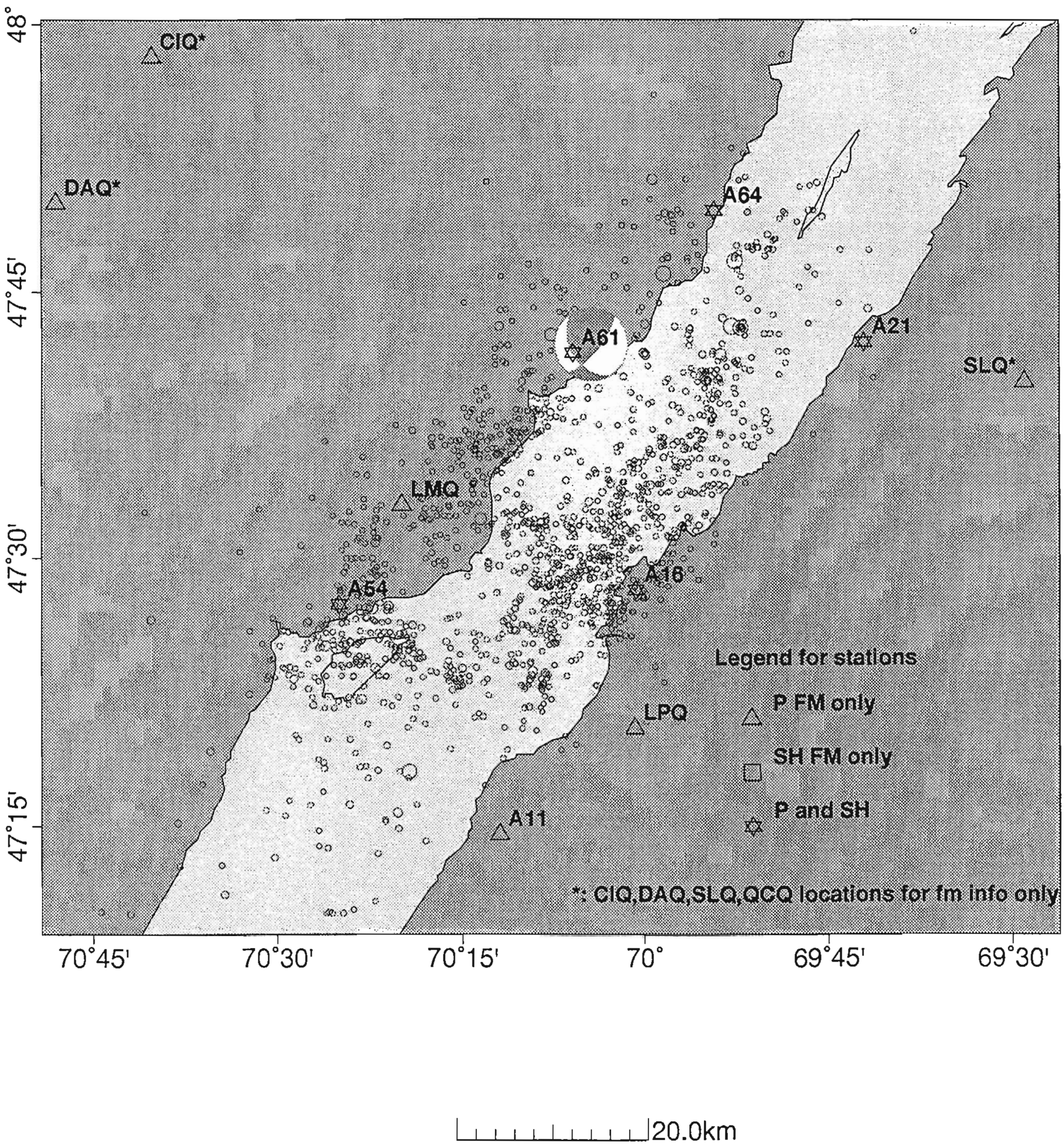
P Phases on Vertical Components



SH phases on Transverse Components



Location Map



Earthquake of 19910723 0103 Magnitude 1.9MN

1- Earthquake information and list of first motions.

Date	Time hhmm ss	Latitude	Longitude	Depth (km)	Mag	Sta/Pha
910723	0103 14.30	47.6860	-70.1030	11.02	1.9MN	7/012

COMMENTS:

7 KM NE OF POINTE-AU-PIC, QUE. CHARLEVOIX, QUE.

$

$ The Sg lines of some stations include the SH FM.

$ The convention used is the Virginia Tech convention used in FOCMEC:

$ <: SH first motion to left (back to event) impulsive

$ >: SH first motion to right (back to event) impulsive

$ Preliminary Focmec computed by ML.

Sta	Pha	Dist (km)	Azim	Take-off Angle	FM
A61	Pg	1	53	-6	C
A61	Sg	1	53	-6	>
A64	Pg	22	45	-64	D
A64	Sg	22	45	-64	>
LMQ	Pg	23	228	-64	D
A16	Pg	25	163	-66	D
A16	Sg	25	163	-66	<
A21	Pg	31	86	-70	D
A21	Sg	31	86	-70	>
A54	Pg	35	222	-72	D
A54	Sg	35	222	-72	>

Number of P first motions: 6
Number of SH first motions: 5

2- Most Representative Solution.

A total of 65 solutions were found using a b axis increment of 5 degree. The following parameters describe the most representative solution, which was derived from the average B, P, and T axes listed below.

dip,strike,rake 55.00 114.68 90.00

dip,strike,rake	35.00	294.68	90.00	:auxiliary plane	
lower hem. trend, plunge of a,n	204.68	55.00	24.68	35.00	
lower hem. trend & plunge of b	114.68	0.00			
lower hem. trend, plunge of p,t	204.68	10.00	24.68	80.00	

Average B, P, and T axes:

	B	P	T
Mean trend:	N 117	N 206	N 27
Mean Plunge:	-0	5	84
Vector Magnitude:	64	64	64
Mean length of resulting vector:	0.982	0.983	0.987

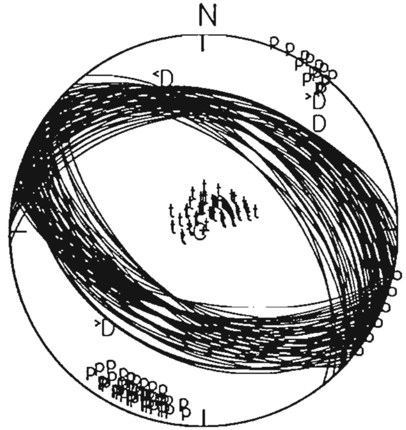
3- Misfits.

All 6 P first motions agreed with the solution.
All 5 SH first motions agreed with the solution.

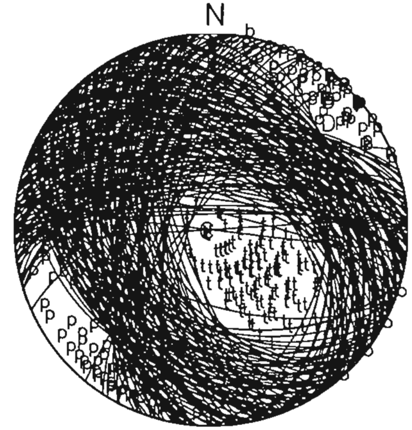
4- Rating of the focal mechanism.

The solution has a C rating based on the high number of P and SH misfits (0 /100 and 0 /100 respectively) and on the poor constraints on the P, T and B axes (value of 0.984).

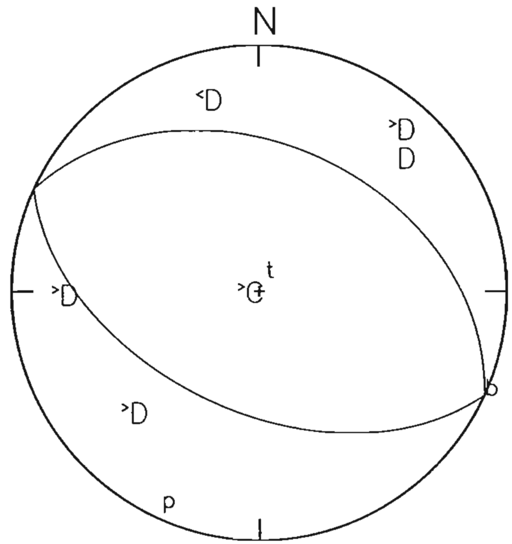
19910723 01:03 U.T.



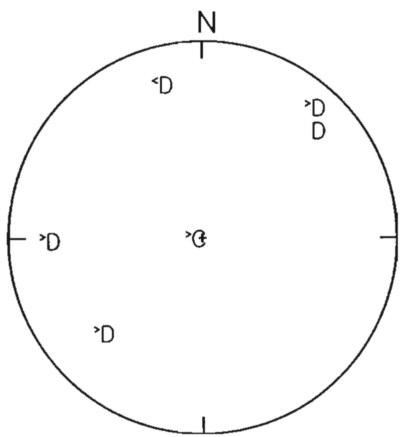
P, SH and P–Nodal



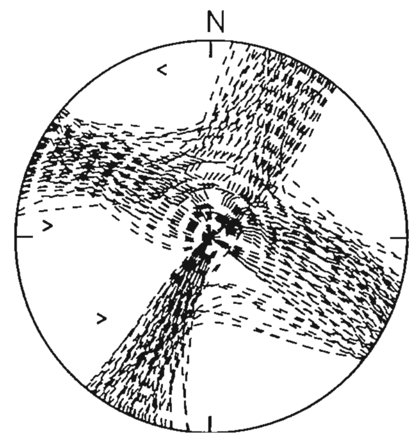
Solution with P FM only.



Best Solution

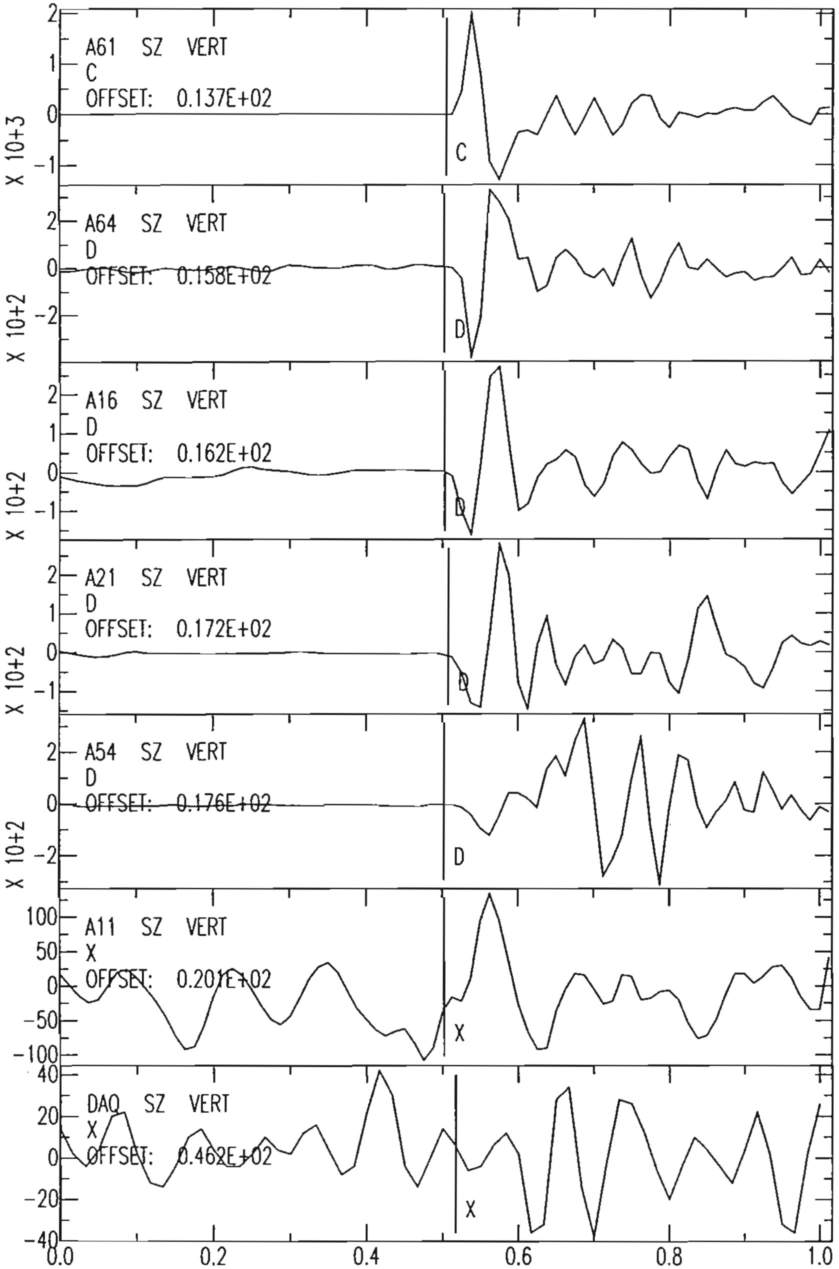


First Motions Only

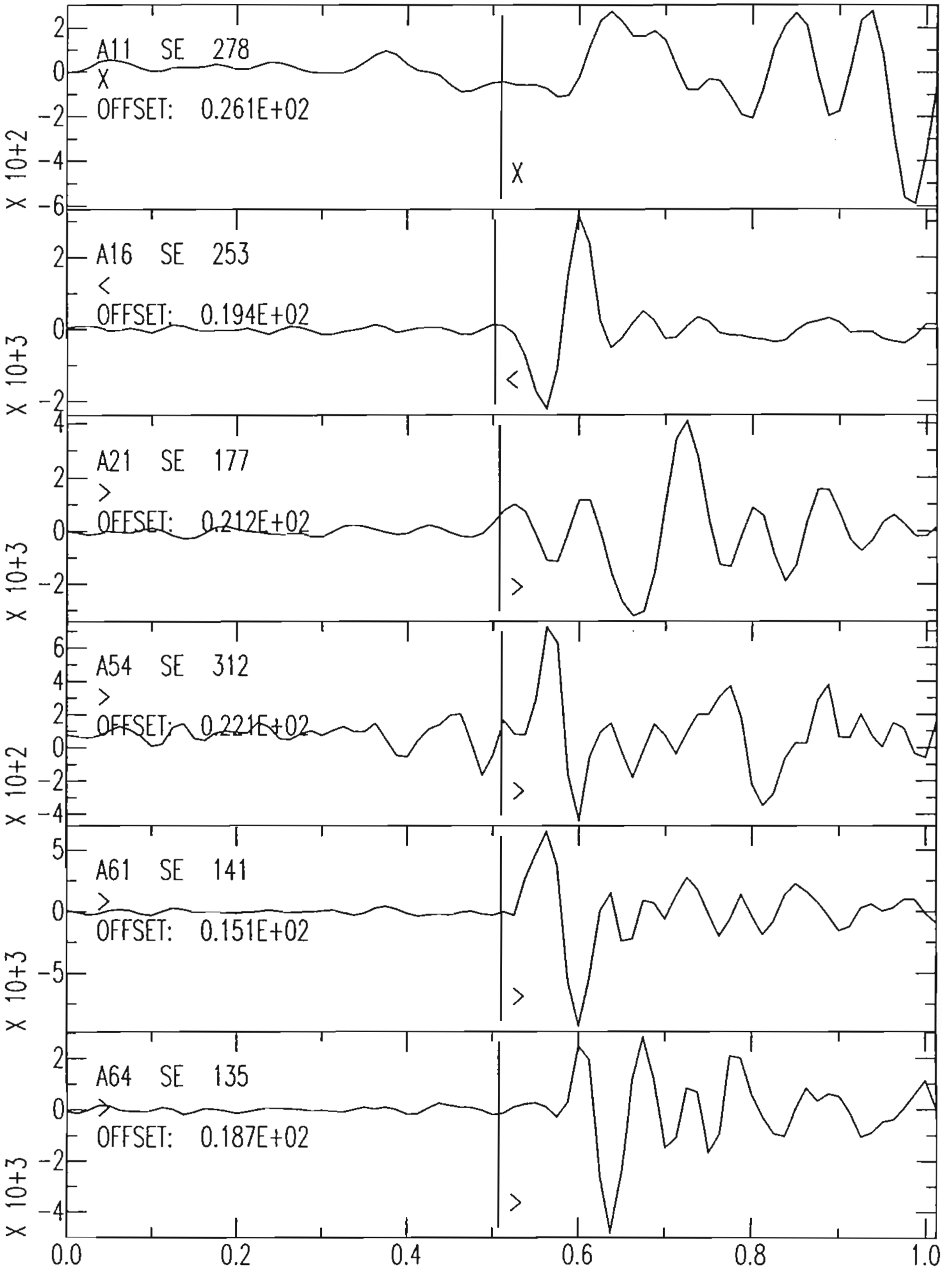


SH Motions and Lines.

P Phases on Vertical Components



SH phases on Transverse Components



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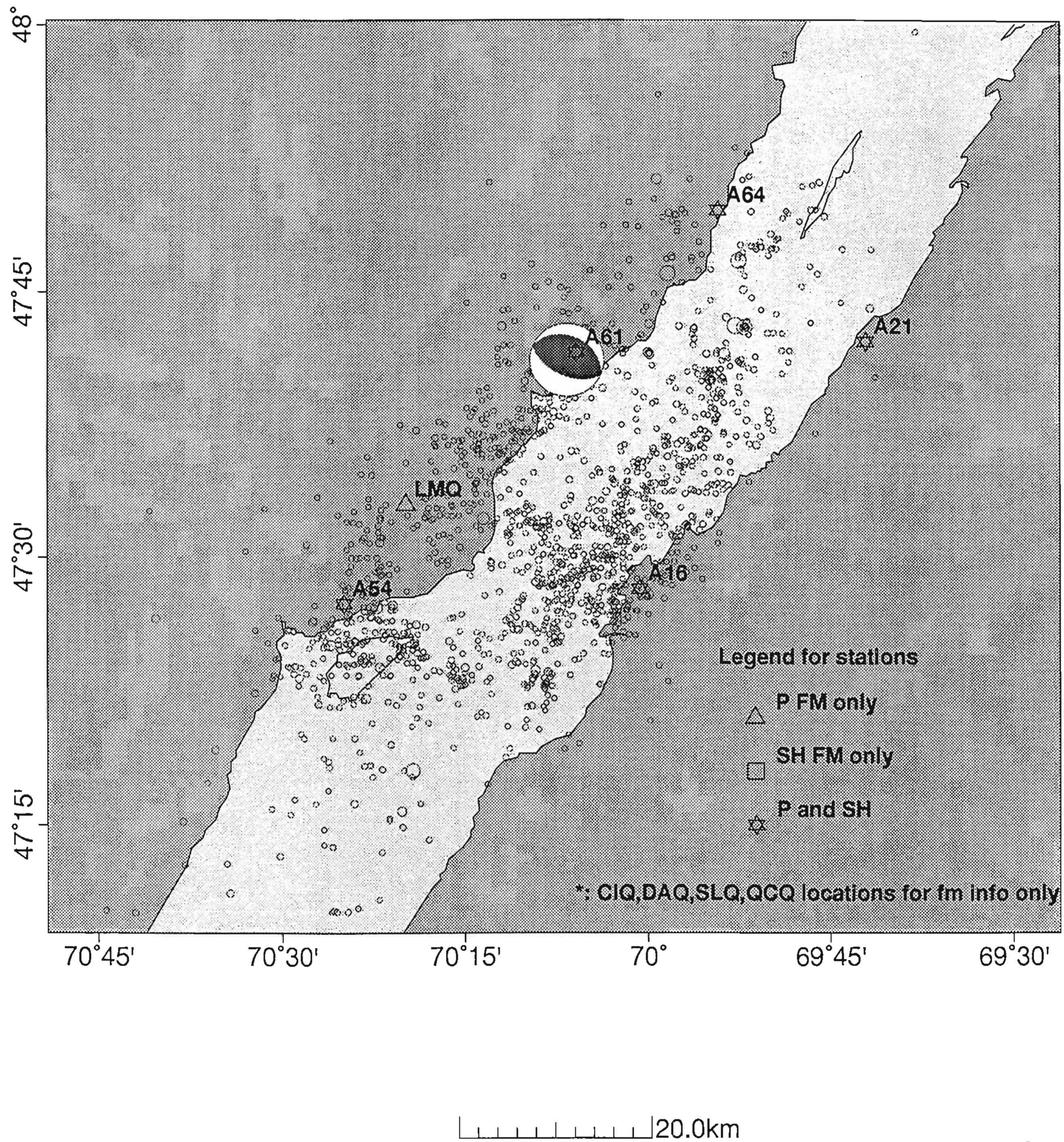
Location Map



Earthquake of 19930330 0215 Magnitude 1.82MN

1- Earthquake information and list of first motions.

Date	Time hhmm ss	Latitude	Longitude	Depth (km)	Mag	Sta/Pha
930330	0215 18.46	47.6849	-70.1044	4.58	1.82MN	7/014

COMMENTS:

```
  5 KM NE OF LA MALBAIE, CHARLEVOIX, QUE.
$  1 KM NE OF CAP-A-L'AIGLE, QUE.          1 KM NE DE CAP-A-L'AIGLE, QUE.
$ LPQ PHASES X'ED OUT DUE TO SUSPECTED TIMING DESCREPANCY
$   BETWEEN CNSN AND CLTN, AND TO FIR-FILTER RINGING BEFORE PG
$ The Sg lines of some stations include the SH FM.
$ The convention used is the Virginia Tech convention used in FOCMEC:
$ <: SH first motion to left  (back to event) impulsive
$ >: SH first motion to right (back to event) impulsive
$ Preliminary Focmec computed by ML: Results to come after Nov. 1995.
```

Sta	Pha	Dist (km)	Azim	Take-off Angle	FM
A61	PG	1	50	-17	D
A61	SG	1	50	-17	>
A64	PG	22	45	-78	C
A64	SG	22	45	-78	<
A16	PG	25	163	-80	C
A16	SG	25	163	-80	>
A21	PG	31	86	-82	C
A21	SG	31	86	-82	>
A54	PG	34	222	-82	D
A54	SG	34	222	-82	<

Number of P first motions: 5
Number of SH first motions: 5

2- Most Representative Solution.

A total of 523 solutions were found using a b axis increment of 2 degree. The following parameters describe the most representative solution, which was derived from the average B, P, and T axes listed below.

```
dip,strike,rake      26.67    75.50    -62.41
dip,strike,rake      66.56   225.18  -103.10      :auxiliary plane
lower hem. trend, plunge of a,n     135.18    23.44   345.50    63.33
lower hem. trend & plunge of b    230.47    12.00
lower hem. trend, plunge of p,t     112.03    65.95   325.03    20.52
```

Average B, P, and T axes:

	B	P	T
Mean trend:	N 235	N 86	N 328
Mean Plunge:	18	69	10
Vector Magnitude:	519	517	517
Mean length of resulting vector:	0.992	0.989	0.988

3- Misfits.

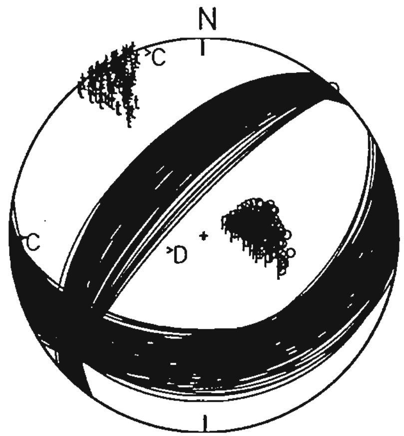
All 5 P first motions agreed with the solution.
Out of 5 SH first motions, a total of 1 did not fit the solutions (20/100).

Station Name	Number of misfits	Percentage of wrongs
A16	523	100

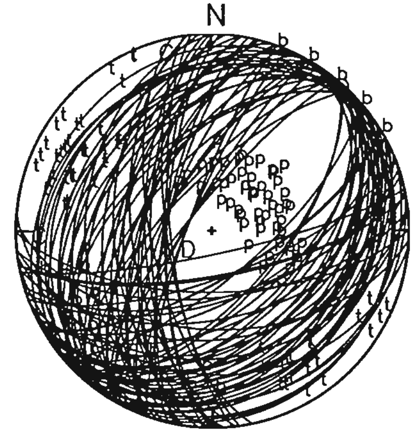
4- Rating of the focal mechanism.

The solution has a B rating based on the number of P and SH misfits (0 /100 and 20 /100 respectively) and on the constraints on the P, T and B axes (value of 0.990).

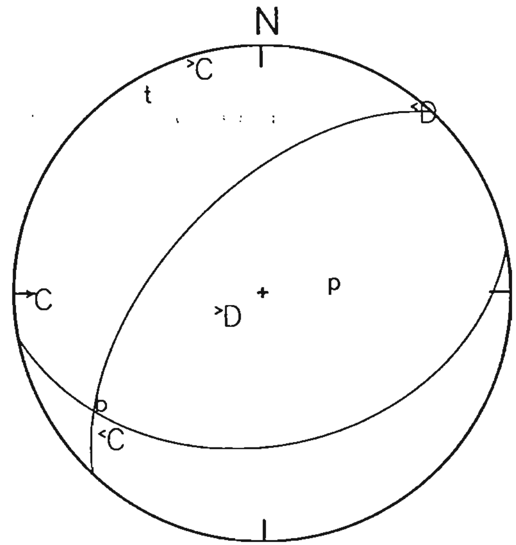
19930330 02:15 U.T.



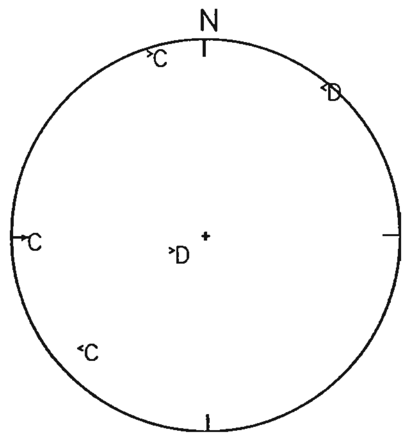
P, SH and P–Nodal



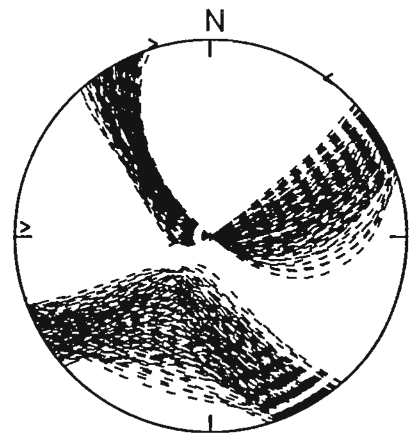
Solution with P FM only.



Best Solution

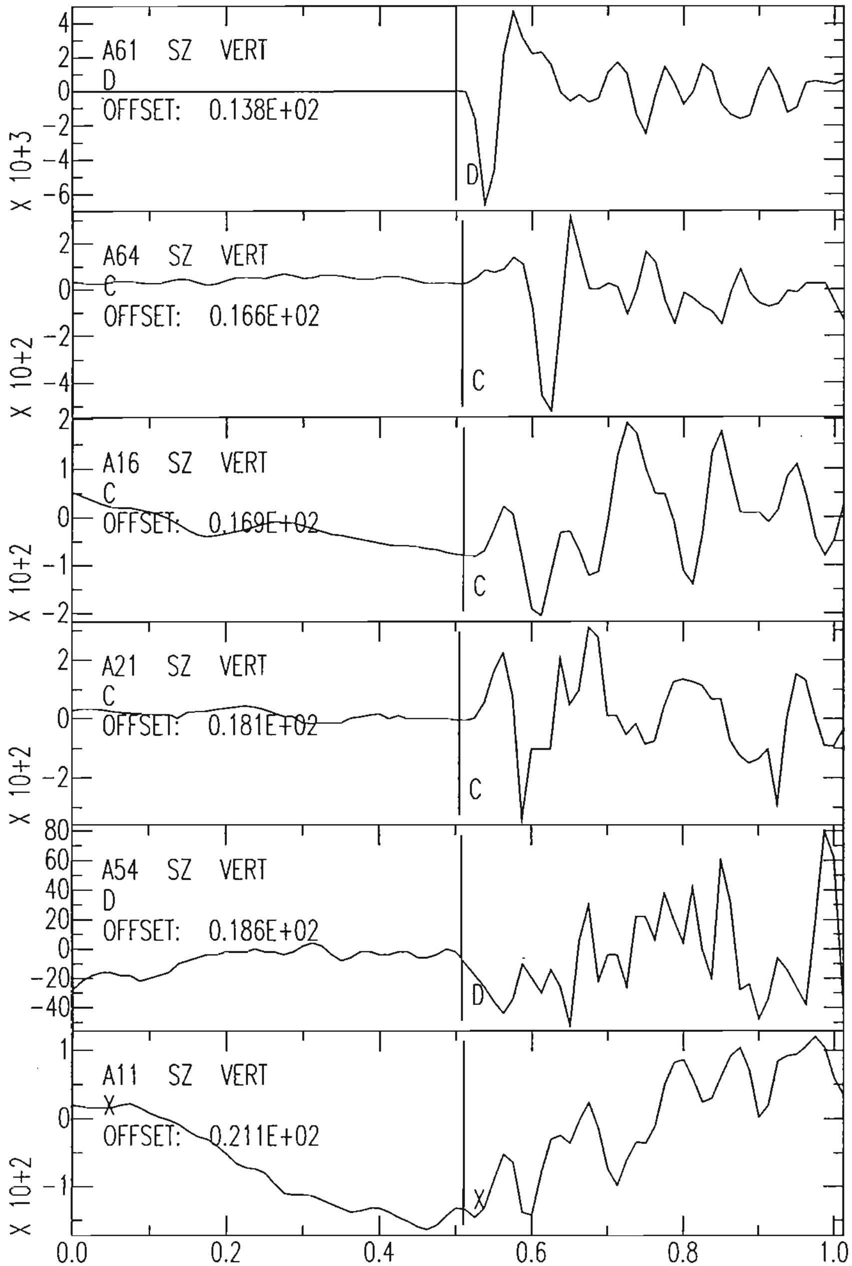


First Motions Only

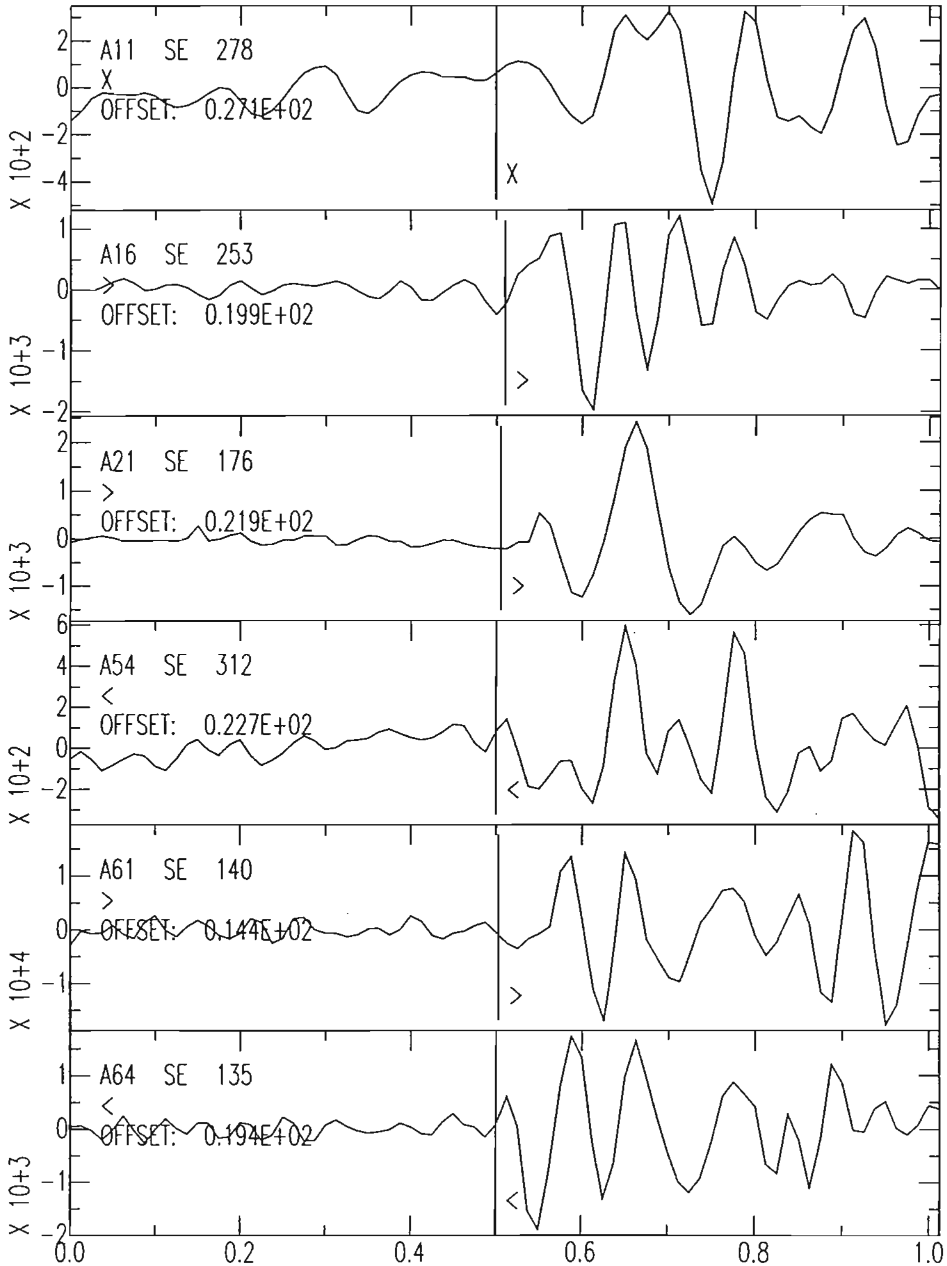


SH Motions and Lines.

P Phases on Vertical Components



SH phases on Transverse Components



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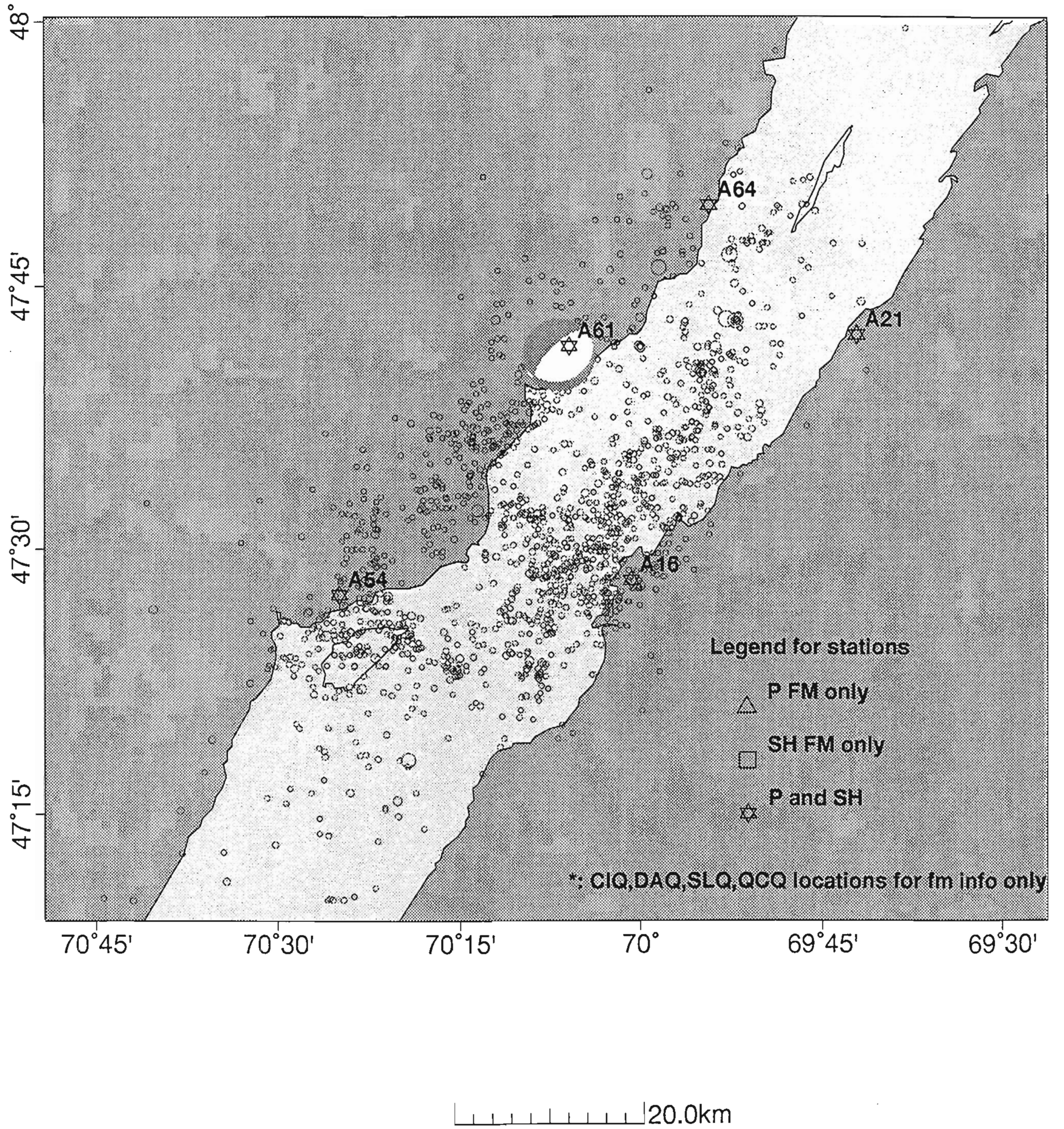
Location Map



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