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Abstract

Regional centroid moment tensor solutions have been determined for twelve moderate-sized earthquakes in eastern Canada during 2014. The moment tensor inversion method is used to determine the focal mechanism, depth and seismic moment of the earthquakes. These parameters, in turn, provide information about the seismotectonic environment in which the earthquakes occur and may help improve seismic hazard estimates. The purpose of this report is not to provide an in-depth analysis of any specific earthquake but to catalog the solutions and data used to obtain them to make them available for future research projects.

Introduction

Earthquake focal mechanisms provide information about the orientation and direction of motion on the fault that generated the earthquake. A suite of focal mechanisms from a particular region can be used to improve the understanding of the seismotectonic environment in which the earthquakes occur. In the past, focal mechanisms were most often determined by the polarity distribution of first motions. This method is tedious and requires a large number of clear readings from a wide variety of azimuths, which makes it difficult to obtain unique solutions for smaller earthquakes or those occurring in regions, such as the offshore, where the station density is low and azimuthal coverage poor. The moment tensor inversion, which makes use of a longer portion of the waveform, is a more robust and more objective method to determine focal mechanisms. They also provide the hypocentral depth, which has implications for seismic hazard as well as information about regional seismotectonics, and seismic moment (and moment magnitude), which is generally considered the best measure of earthquake size. However, moment tensors use relatively long-period data and they, too, do not always result in good-quality solutions for smaller earthquakes. Having said that, there has been an increase in the percentage of magnitude 4+ earthquakes for which focal mechanisms could be determined since regional centroid moment tensor (RCMT) method was implemented in eastern Canada around 2005-2006. The impact is most notable in the north where it was difficult to obtain focal mechanism solutions for all but the few earthquakes large enough to be well-recorded at teleseismic distances. For example, Bent et al (2003) were able to obtain focal mechanisms for only four of fourteen events evaluated in the region extending from the Labrador Sea to northern Baffin Bay-Baffin Island during the period 1994-2000. From 2011 through 2013 seven solutions were obtained via the RCMT inversion method for ten events evaluated in the same region (Bent, 2015) and another twelve (out of twelve) for 2014 (this paper). Note that in 2014 all RCMT solutions for eastern Canada are for earthquakes that occurred in the north as there were no southeastern earthquakes of magnitude (m_N) 4.0 or greater.

For seismological purposes eastern Canada is roughly defined as east of 100°W longitude. Some judgment calls in whether to treat earthquakes as western or eastern, however, are made in the case of the extreme north where lines of longitude are close together and where the m_N or Nuttli magnitude scale (Nuttli, 1973) used for eastern Canada may be used as the primary or database magnitude for earthquakes west of this line. As a general practice earthquakes falling within the territory of the United States or Greenland are not included although exceptions may be made in the case of any event close to the border that was widely felt in Canada. In some cases the closest seismograph station to the earthquake may be in the United States or Greenland even if the earthquake is in Canada. With respect to offshore earthquakes there are no strict criteria used to determine which earthquakes to study but most earthquakes occurring close enough to Canadian territory to have been recorded by a reasonable number of seismograph stations at distances between 150 and 1500 km will be evaluated.

RCMT solutions for all of Canada through the end of 2010 were summarized by Kao et al. (2012) and Bent (2015) catalogued eastern solutions for 2011-2013. The current paper catalogs the RCMT solutions for eastern Canada in 2014. Solutions that met the minimum quality criteria were obtained for all twelve earthquakes evaluated. This report is the second in a series of RCMT summaries for eastern Canada intended to be produced on an annual basis although other options for the dissemination of RCMT solutions, such as the creation of an online database are being explored. It should be noted that although this report focuses on eastern Canada, the RCMT method is also routinely applied to earthquakes in western Canada. (for example, Ristau, 2004; Ristau et al., 2007; Kao et al., 2012)

Regional Centroid Moment Tensor Inversion Method

Moment tensor inversion is one method by which earthquake focal mechanisms, or faulting parameters may be determined. It also provides additional source parameters including depth, seismic moment and source time function as well as a measure of any non-double couple component of the source. Note that source time function is generally not well resolved for small and moderate earthquakes. For all earthquakes summarized in this paper a 1.0/1.0/1.0 (sec) time function is assumed. Because it is based on fitting a relatively long portion of the recorded waveform and provides a quantitative measure of the fit, the RCMT is advantageous over other methods of focal mechanism determination, such as first motions which are based on a very small portion of the waveform, which can be difficult to pick accurately for small earthquakes and which require a larger number of good quality recordings for a unique solution to be determined.

The RCMT method used to analyze Canadian earthquakes is that of Kao et al (1998). More details about the method may be found in that paper and an in-depth discussion of its implementation in Canada is covered by Kao et al (2012). Both papers also include references which provide supplementary background information on centroid moment tensors. The discussion below is focused on topics specifically related to eastern Canada.

In eastern Canada the RCMT inversion is run for all earthquakes of magnitude 4.0 or greater. Note that the Nuttli m_N magnitude is the most commonly used magnitude scale in eastern Canada but that M_L may be listed as the magnitude for offshore earthquakes for which the Lg wave is either not observed or is strongly attenuated. Moment magnitude, M_W, for eastern Canada is, on average, about 0.5 magnitude units smaller than m_N (Bent, 2011). Good quality solutions cannot always be obtained for the smallest earthquakes because the signal to noise ratio is generally poor at the long periods modeled. The default frequency range is 0.03-0.06 Hz but the inversion code will modify the range if there is sufficient long period energy in the data in other frequency bands, sufficient energy being roughly defined as a signal to noise ratio (S/N) of 2.0 or greater.

Data from three-component broadband (both bh* and hh*) stations are used in the inversion. Standard practice is to use only stations from which data are received in real time by the Geological Survey of Canada (GSC; CNWA, 2015). Data from additional stations may be added if an earthquake is of particular interest and if additional data are likely to improve the quality of the solution. For example, data from Greenland often help constrain the solutions for earthquakes occurring in Baffin Bay.

Two velocity models are used- one for southeastern Canada and one for the north. Essentially these are the same model, the only difference being the depth of the Moho discontinuity- 40 km for the south and 35 km for the north. These are referred to as EM40 and EM35 models respectively. With the exception of the modified Moho depth the velocity model is that of Brune and Dorman (1963). The boundary between north and south is at approximately 60°N. If an earthquake occurs close to the boundary the inversion may be run with both models and the best solution selected. At some future point a suite of regional models may be implemented if there is evidence that this would improve the quality of the solutions. The current model is based on shield paths but it should be noted that even for those earthquakes that occur in the Appalachians most of the paths modeled are sufficiently long that there will be a strong shield component. This statement may not be true for all offshore events. The southern model is shown in Table 1. For the southeast the thickness of layer 3 is increased to 24 km. The lowermost layer is a mantle half-space.

Table 1
Velocity Model for Northeastern Canada

Layer	Thickness (km)	Vp (km/s)	Vs (km/s)	Density (g/cm^3)
1	6	5.64	3.47	2.70
2	10	6.15	3.64	2.80
3	19	6.60	3.85	2.85
4	-	8.10	4.72	3.30

Solutions are rated using the quality classification table in Kao et al. (2001). The classification consists of a character value from A through F based on the average misfit and a numerical value from 1 through 4 based on the compensated linear vector dipole (CLVD) component. Solutions must have a minimum quality of C4 to be accepted. The user of these solutions should bear in mind that the quality classification is strictly based on the fit of the solutions to the data modeled and does not consider the number of components modeled. Solutions based on small numbers of modeled waveforms should be used with some caution even if the fit is reasonably good.

Regional Centroid Moment Tensor Solutions for Eastern Canada

Twelve earthquakes were evaluated (Figure 1 and Table 2). Solutions of quality C4 or better were obtained for all events.

Table 2
Earthquakes Evaluated: Solutions Obtained

Date	Time (UT)	Lat (°N)	Lon (°W)	Mag (M_W)	Location/Region	Quality
2014-01-03	00:07:33	61.43	59.53	3.8	Labrador Sea	C3
2014-02-07	13:16:28	74.32	84.48	4.0	41 km SW of Dundas Harbour, NU	B2
2014-02-22	06:41:59	72.29	75.85	3.9	85 km SE of Pond Inlet, NU	B3
2014-03-03	19:08:48	59.79	55.70	4.2	Labrador Sea	C2
2014-03-05	13:50:52	60.93	59.26	4.1	Labrador Sea	C2
2014-03-11	05:25:38	74.49	72.78	4.6	Baffin Bay	B3
2014-05-18	14:46:59	77.62	86.17	3.6	158 km NW of Grise Fiord, NU	C4
2014-09-02	04:57:34	70.98	65.61	4.0	124 km NE of Clyde River, NU	C3
2014-10-03	02:44:29	71.16	62.85	4.4	225 km NE of Clyde River, NU	C2
2014-11-09	04:42:40	76.51	97.12	4.7	125 km N of Polaris, NU	A4
2014-11-09	06:32:44	76.62	96.88	4.6	137 km N of Polaris, NU	B2
2014-11-11	19:24:24	60.58	57.91	4.0	381 km E of Killiniq, QC	B2

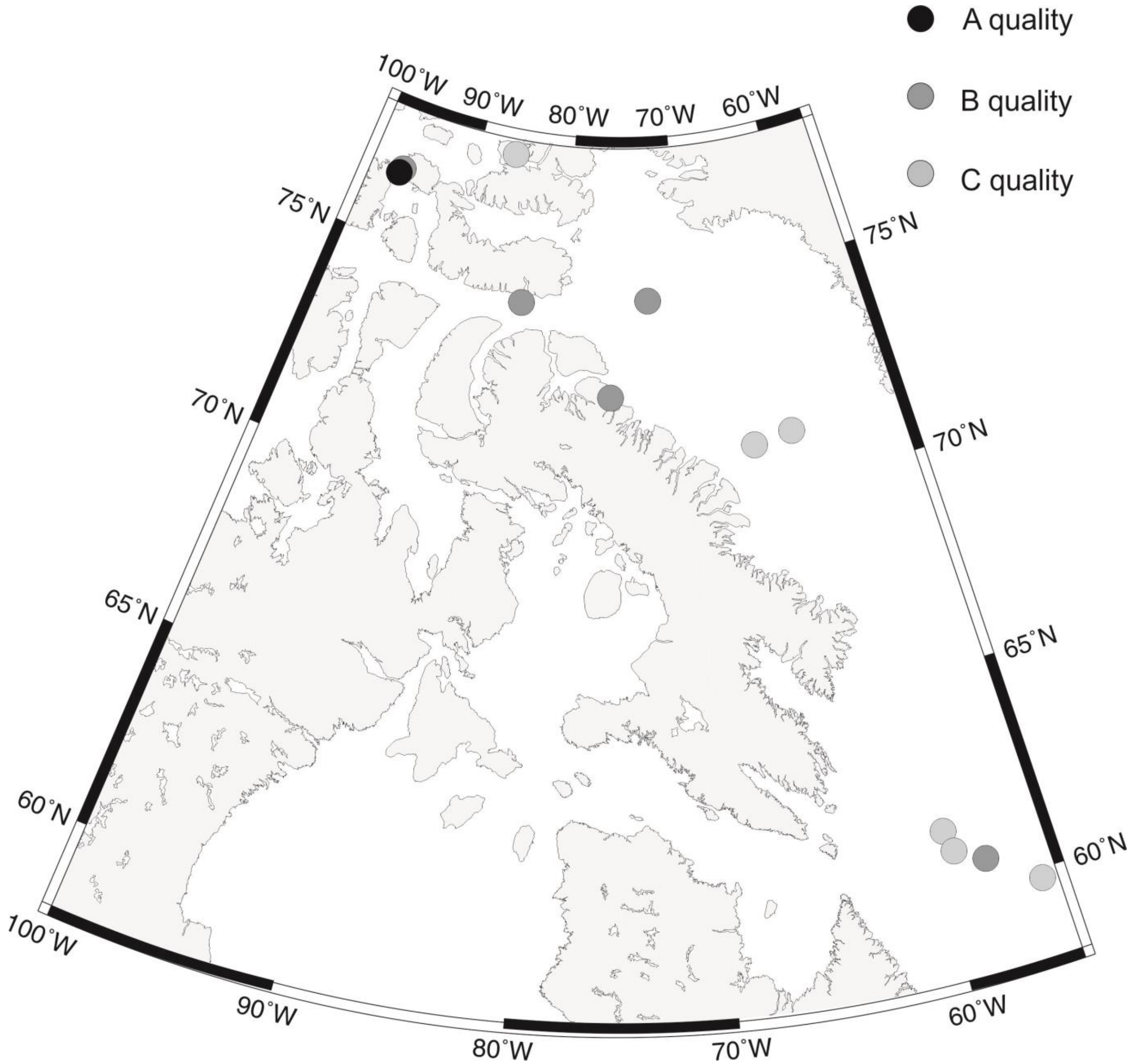


Figure 1: Locations and quality of solutions of all earthquakes evaluated in this study. Note that some points may plot on top of each other.

The solutions for the earthquakes listed in Table 2 are presented below (Figures 2a-2l) in chronological order without additional comments. Each solution is presented as a figure with the format discussed in the next few paragraphs. The solution is summarized in the upper left corner. The origin times and epicenters are taken from the Canadian National Earthquake Database (CNED, 2015). All other parameters are derived from the RCMT inversion. Only the best fitting double couple solution is summarized on the figure. The complete moment tensor solutions may be found in the Appendix.

The map in each plot shows the best fitting focal mechanism (lower hemisphere projection) from the inversion. The solid lines show the best fitting double couple solution and the shaded and white regions show the full moment tensor solution with the shaded regions representing compressional regions and white dilations. The P- and T-axes are indicated by gray and white dots, respectively.

To the right of the map the average misfit is plotted as a function of depth. The best fitting focal mechanism for each depth is plotted and the size of the symbol is scaled to the moment magnitude for that particular solution. Lack of variation in symbol size, as is most often the case, indicates that the calculated seismic moment is not heavily dependent on depth. A flat misfit plot indicates that the depth is not well constrained (for example, 20140507, Figure 2g) whereas a sharp dip in the misfit function is an indication of a well-constrained depth (for example, 20140103, Figure 2a). In most cases the focal mechanism is relatively independent of depth but there are solutions for which this is not the case. If the best fitting mechanism has a significantly lower misfit than one indicating a different style and/or orientation of faulting it is likely correct (for example, 20140207, Figure 2b). If two significantly different mechanisms have similar misfits (for example, 20141003, Figure 2f) anyone with a particular interest in that earthquake may need to consider both as viable options or apply additional techniques to the data to determine which solution is better.

Below that, the waveforms are shown with the solid lines representing the data and the dashed lines the synthetic seismograms. For each station the waveforms from left to right are the vertical, radial and tangential components respectively. The misfit is indicated below the waveforms. The horizontal (time) and vertical (amplitude) scales are indicated to the right. The waveforms for each station are scaled to the largest amplitude at that station. Components not plotted were not used in the inversion. The most common reason for rejecting a component is a poor signal to noise ratio at the periods modeled. There could be other reasons, however, such as lack of data from one component. Note that the RCMT inversion program allows for more complicated weighting schemes but practice is to use either 1.0 (full weight) or 0.0 (not used). There were other weighting schemes proposed in RCMT studies in other regions, such as given higher weighting for stations with good S/N or lower weight for a group of stations in the same area. Give the station distribution in eastern and northern Canada there have been no obvious benefits derived from using other weighting schemes. The text to the left of each set of waveforms provides information about the station. The first line is the station code and velocity model used. The second line indicates the azimuth of the station with respect to the epicenter. The third line gives the epicentral distance, the fourth the frequency range modeled and the fifth the average misfit for the station.

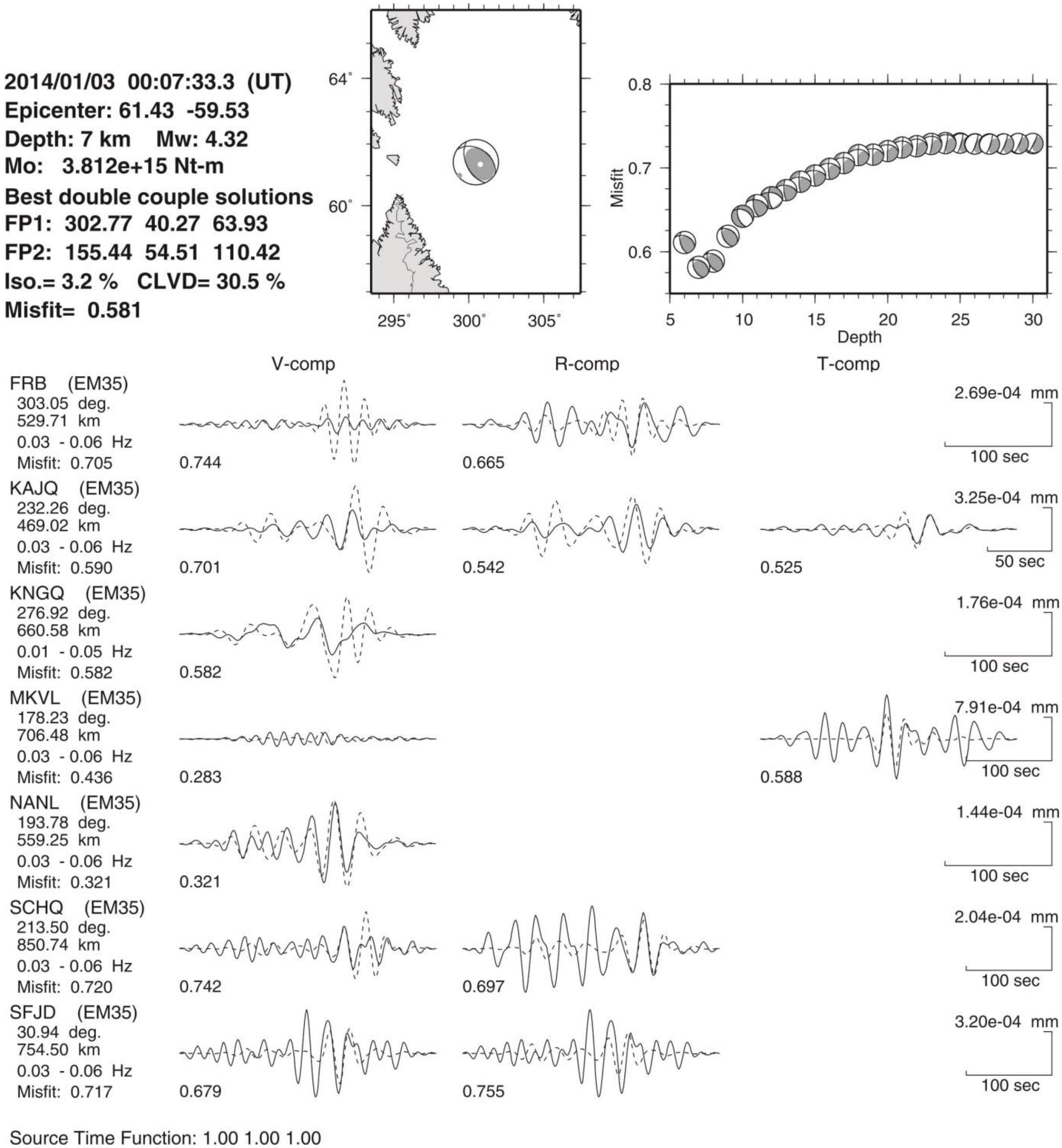

2014/01/03 00:07:33.3 (UT)
Epicenter: 61.43 -59.53
Depth: 7 km Mw: 4.32
Mo: 3.812e+15 Nt-m
Best double couple solutions
FP1: 302.77 40.27 63.93
FP2: 155.44 54.51 110.42
Iso.= 3.2 % CLVD= 30.5 %
Misfit= 0.581
64°
60°
295°
300°
305°
0.8
0.7
0.6
Misfit
5
10
15
20
25
30
Depth
V-comp
R-comp
T-comp
FRB (EM35)
303.05 deg.
529.71 km
0.03 - 0.06 Hz
Misfit: 0.705
0.744
0.665
2.69e-04 mm
100 sec
KAJQ (EM35)
232.26 deg.
469.02 km
0.03 - 0.06 Hz
Misfit: 0.590
0.701
0.542
0.525
3.25e-04 mm
50 sec
KNGQ (EM35)
276.92 deg.
660.58 km
0.01 - 0.05 Hz
Misfit: 0.582
0.582
1.76e-04 mm
100 sec
MKVL (EM35)
178.23 deg.
706.48 km
0.03 - 0.06 Hz
Misfit: 0.436
0.283
0.588
7.91e-04 mm
100 sec
NANL (EM35)
193.78 deg.
559.25 km
0.03 - 0.06 Hz
Misfit: 0.321
0.321
1.44e-04 mm
100 sec
SCHQ (EM35)
213.50 deg.
850.74 km
0.03 - 0.06 Hz
Misfit: 0.720
0.742
0.697
2.04e-04 mm
100 sec
SFJD (EM35)
30.94 deg.
754.50 km
0.03 - 0.06 Hz
Misfit: 0.717
0.679
0.755
3.20e-04 mm
100 sec
Source Time Function: 1.00 1.00 1.00

Figure 2a

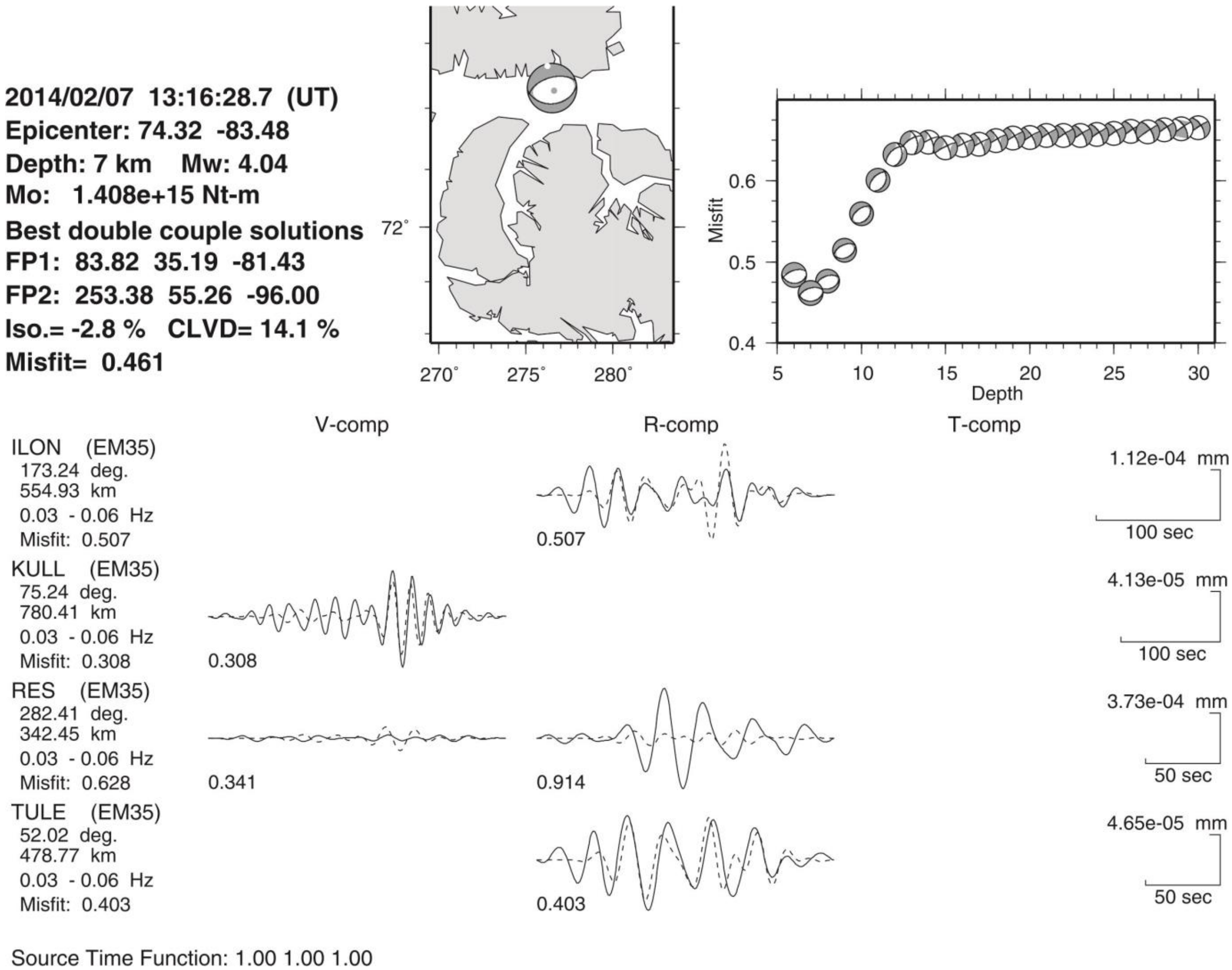
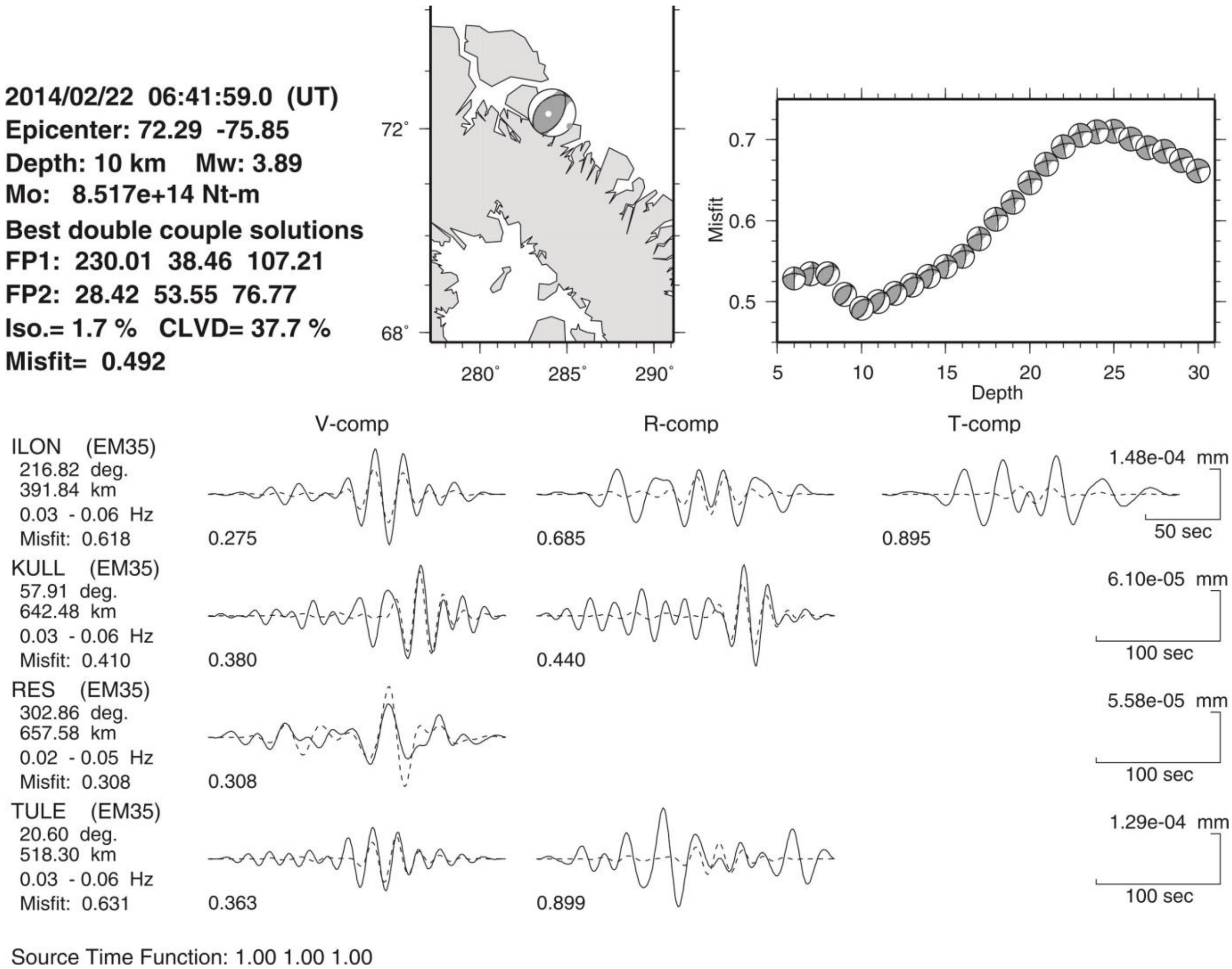

2014/02/07 13:16:28.7 (UT)
Epicenter: 74.32 -83.48
Depth: 7 km Mw: 4.04
Mo: 1.408e+15 Nt-m
Best double couple solutions
FP1: 83.82 35.19 -81.43
FP2: 253.38 55.26 -96.00
Iso.= -2.8 % CLVD= 14.1 %
Misfit= 0.461
72°
270° 275° 280°
Misfit
0.4 0.5 0.6
5 10 15 20 25 30
Depth
V-comp
R-comp
T-comp
ILON (EM35)
173.24 deg.
554.93 km
0.03 - 0.06 Hz
Misfit: 0.507
0.507
1.12e-04 mm
100 sec
KULL (EM35)
75.24 deg.
780.41 km
0.03 - 0.06 Hz
Misfit: 0.308
0.308
4.13e-05 mm
100 sec
RES (EM35)
282.41 deg.
342.45 km
0.03 - 0.06 Hz
Misfit: 0.628
0.341
0.914
3.73e-04 mm
50 sec
TULE (EM35)
52.02 deg.
478.77 km
0.03 - 0.06 Hz
Misfit: 0.403
0.403
4.65e-05 mm
50 sec
Source Time Function: 1.00 1.00 1.00

Figure 2b



2014/02/22 06:41:59.0 (UT)
Epicenter: 72.29 -75.85
Depth: 10 km Mw: 3.89
Mo: 8.517e+14 Nt-m
Best double couple solutions
FP1: 230.01 38.46 107.21
FP2: 28.42 53.55 76.77
Iso.= 1.7 % CLVD= 37.7 %
Misfit= 0.492
72°
68°
280°
285°
290°
Misfit
0.7
0.6
0.5
5
10
15
20
25
30
Depth
V-comp
R-comp
T-comp
ILON (EM35)
216.82 deg.
391.84 km
0.03 - 0.06 Hz
Misfit: 0.618
0.275
0.685
0.895
1.48e-04 mm
50 sec
KULL (EM35)
57.91 deg.
642.48 km
0.03 - 0.06 Hz
Misfit: 0.410
0.380
0.440
6.10e-05 mm
100 sec
RES (EM35)
302.86 deg.
657.58 km
0.02 - 0.05 Hz
Misfit: 0.308
0.308
5.58e-05 mm
100 sec
TULE (EM35)
20.60 deg.
518.30 km
0.03 - 0.06 Hz
Misfit: 0.631
0.363
0.899
1.29e-04 mm
100 sec
Source Time Function: 1.00 1.00 1.00

Figure 2c

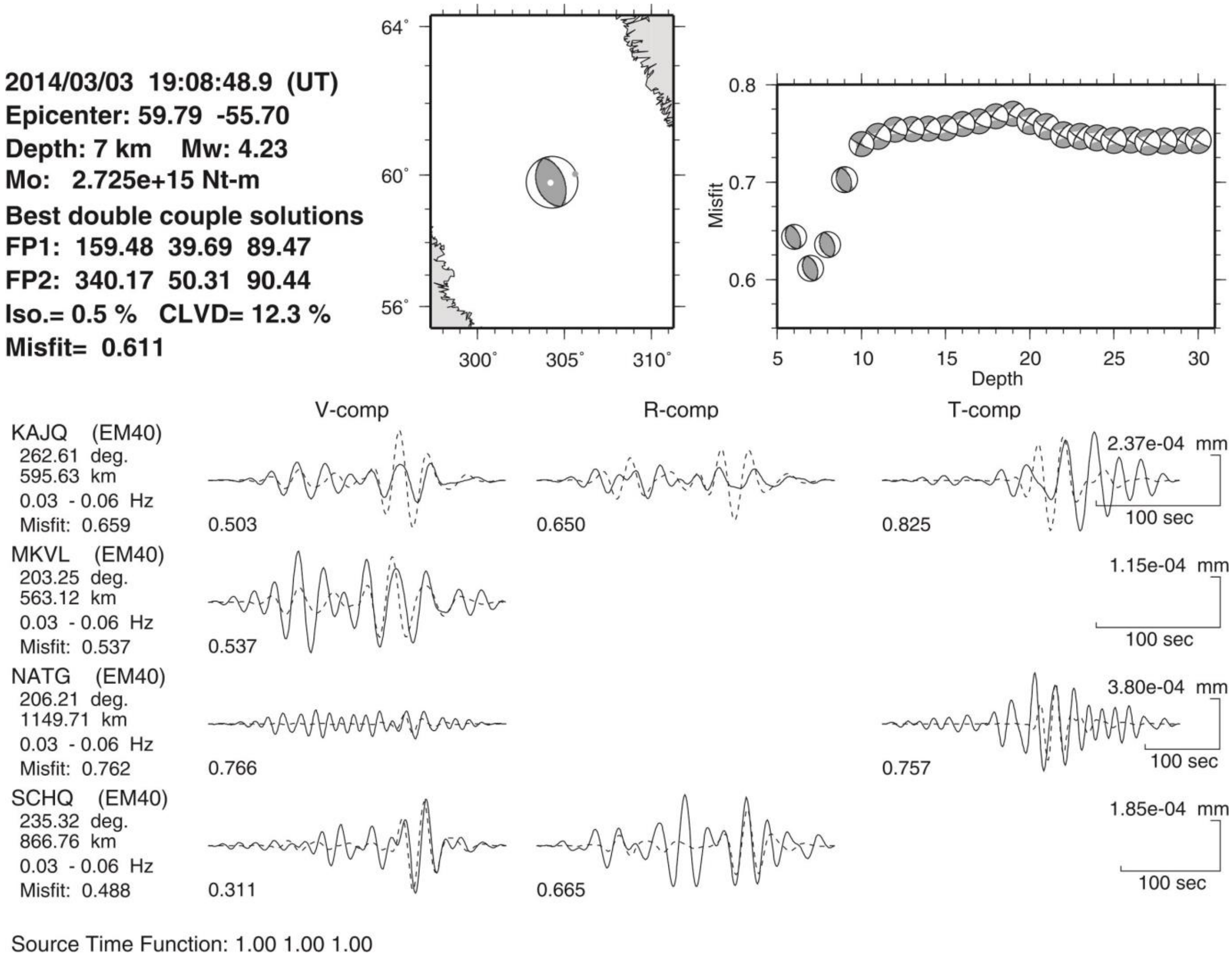

2014/03/03 19:08:48.9 (UT)
Epicenter: 59.79 -55.70
Depth: 7 km Mw: 4.23
Mo: 2.725e+15 Nt-m
Best double couple solutions
FP1: 159.48 39.69 89.47
FP2: 340.17 50.31 90.44
Iso.= 0.5 % CLVD= 12.3 %
Misfit= 0.611
64°
60°
56°
300°
305°
310°
Misfit
Depth
V-comp
R-comp
T-comp
KAJQ (EM40)
262.61 deg.
595.63 km
0.03 - 0.06 Hz
Misfit: 0.659
0.503
0.650
0.825
2.37e-04 mm
100 sec
MKVL (EM40)
203.25 deg.
563.12 km
0.03 - 0.06 Hz
Misfit: 0.537
0.537
1.15e-04 mm
100 sec
NATG (EM40)
206.21 deg.
1149.71 km
0.03 - 0.06 Hz
Misfit: 0.762
0.766
0.757
3.80e-04 mm
100 sec
SCHQ (EM40)
235.32 deg.
866.76 km
0.03 - 0.06 Hz
Misfit: 0.488
0.311
0.665
1.85e-04 mm
100 sec
Source Time Function: 1.00 1.00 1.00

Figure 2d

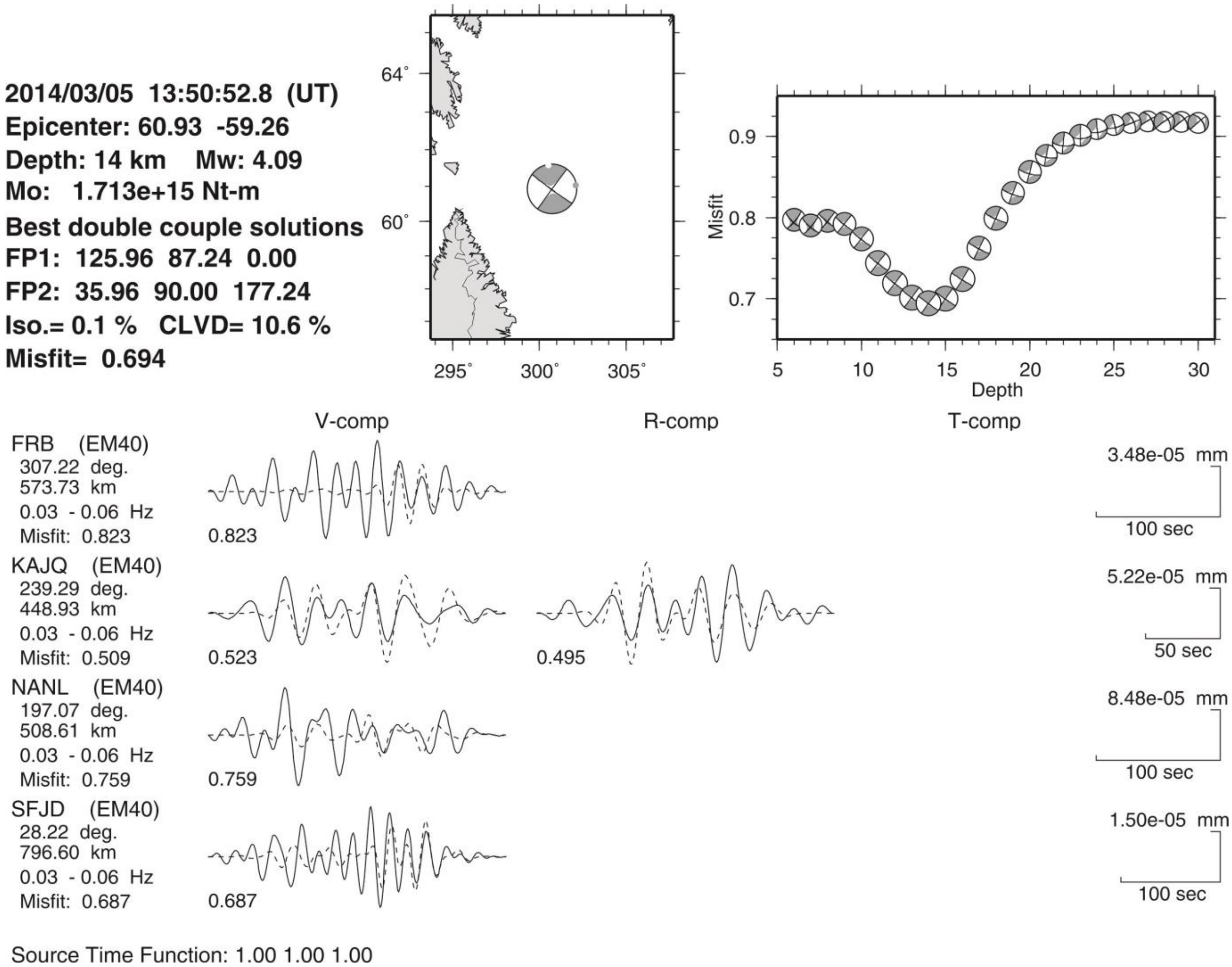

2014/03/05 13:50:52.8 (UT)
Epicenter: 60.93 -59.26
Depth: 14 km Mw: 4.09
Mo: 1.713e+15 Nt-m
Best double couple solutions
FP1: 125.96 87.24 0.00
FP2: 35.96 90.00 177.24
Iso.= 0.1 % CLVD= 10.6 %
Misfit= 0.694
64°
60°
295°
300°
305°
Misfit
0.9
0.8
0.7
5
10
15
20
25
30
Depth
V-comp
R-comp
T-comp
FRB (EM40)
307.22 deg.
573.73 km
0.03 - 0.06 Hz
Misfit: 0.823
0.823
3.48e-05 mm
100 sec
KAJQ (EM40)
239.29 deg.
448.93 km
0.03 - 0.06 Hz
Misfit: 0.509
0.523
0.495
5.22e-05 mm
50 sec
NANL (EM40)
197.07 deg.
508.61 km
0.03 - 0.06 Hz
Misfit: 0.759
0.759
8.48e-05 mm
100 sec
SFJD (EM40)
28.22 deg.
796.60 km
0.03 - 0.06 Hz
Misfit: 0.687
0.687
1.50e-05 mm
100 sec
Source Time Function: 1.00 1.00 1.00

Figure 2e

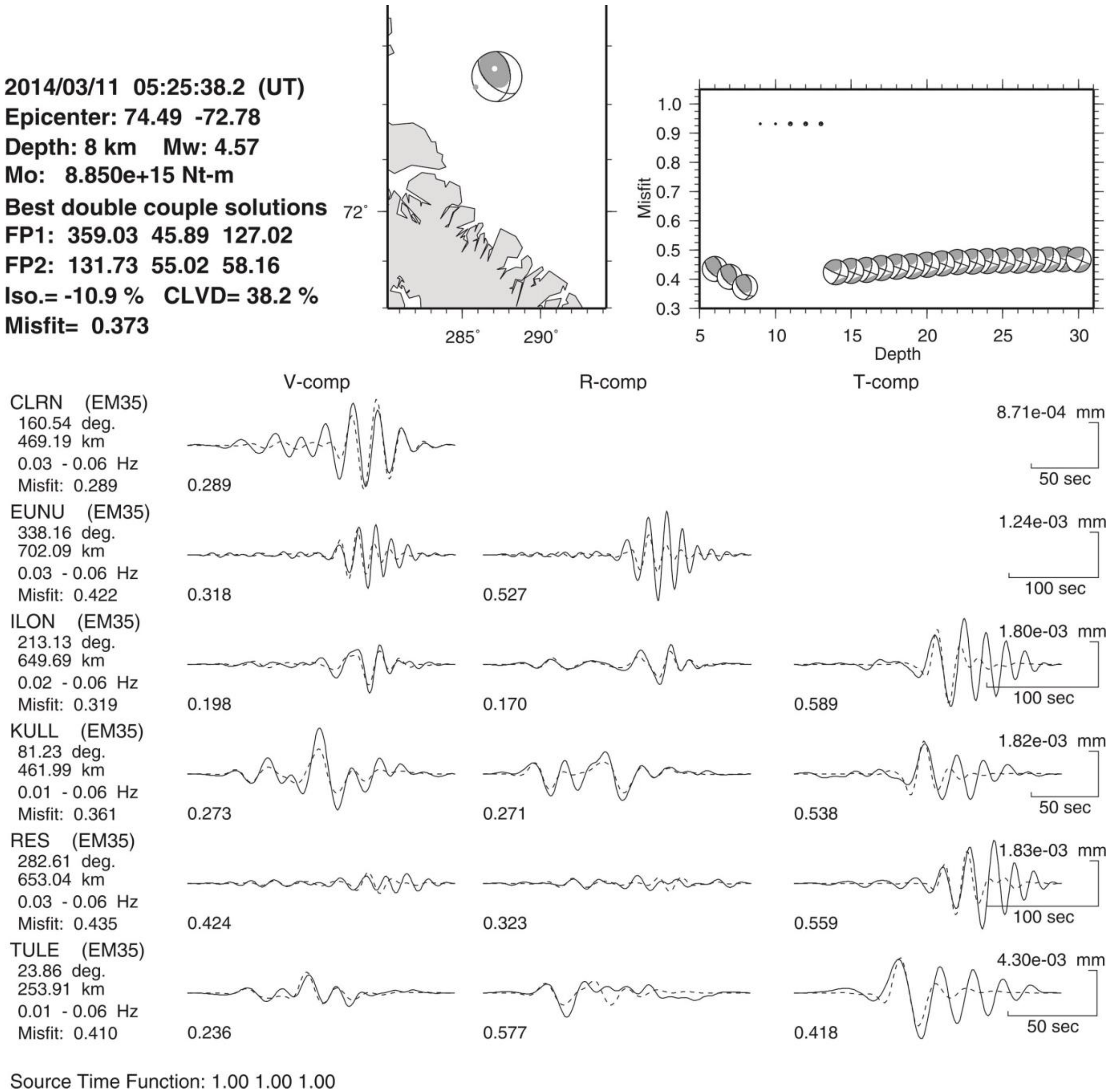

2014/03/11 05:25:38.2 (UT)
Epicenter: 74.49 -72.78
Depth: 8 km Mw: 4.57
Mo: 8.850e+15 Nt-m
Best double couple solutions
FP1: 359.03 45.89 127.02
FP2: 131.73 55.02 58.16
Iso.= -10.9 % CLVD= 38.2 %
Misfit= 0.373
72°
285°
290°
Misfit
Depth
V-comp
R-comp
T-comp
CLRN (EM35)
160.54 deg.
469.19 km
0.03 - 0.06 Hz
Misfit: 0.289
0.289
8.71e-04 mm
50 sec
EUNU (EM35)
338.16 deg.
702.09 km
0.03 - 0.06 Hz
Misfit: 0.422
0.318
0.527
1.24e-03 mm
100 sec
ILON (EM35)
213.13 deg.
649.69 km
0.02 - 0.06 Hz
Misfit: 0.319
0.198
0.170
0.589
1.80e-03 mm
100 sec
KULL (EM35)
81.23 deg.
461.99 km
0.01 - 0.06 Hz
Misfit: 0.361
0.273
0.271
0.538
1.82e-03 mm
50 sec
RES (EM35)
282.61 deg.
653.04 km
0.03 - 0.06 Hz
Misfit: 0.435
0.424
0.323
0.559
1.83e-03 mm
100 sec
TULE (EM35)
23.86 deg.
253.91 km
0.01 - 0.06 Hz
Misfit: 0.410
0.236
0.577
0.418
4.30e-03 mm
50 sec
Source Time Function: 1.00 1.00 1.00

Figure 2f

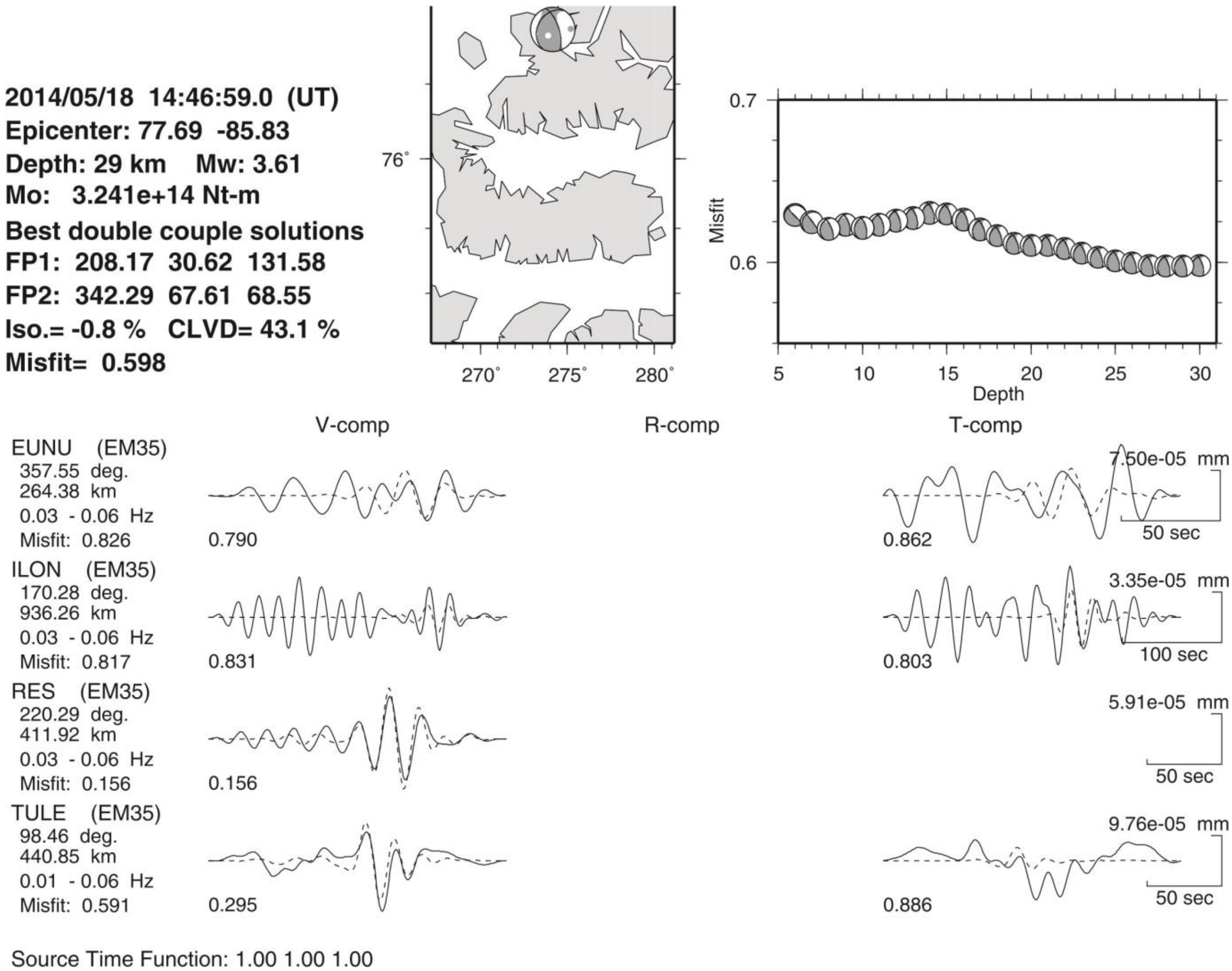

2014/05/18 14:46:59.0 (UT)
Epicenter: 77.69 -85.83
Depth: 29 km Mw: 3.61
Mo: 3.241e+14 Nt-m
Best double couple solutions
FP1: 208.17 30.62 131.58
FP2: 342.29 67.61 68.55
Iso.= -0.8 % CLVD= 43.1 %
Misfit= 0.598
76°
270°
275°
280°
0.7
0.6
Misfit
5
10
15
20
25
30
Depth
V-comp
R-comp
T-comp
EUNU (EM35)
357.55 deg.
264.38 km
0.03 - 0.06 Hz
Misfit: 0.826
0.790
0.862
7.50e-05 mm
50 sec
ILON (EM35)
170.28 deg.
936.26 km
0.03 - 0.06 Hz
Misfit: 0.817
0.831
0.803
3.35e-05 mm
100 sec
RES (EM35)
220.29 deg.
411.92 km
0.03 - 0.06 Hz
Misfit: 0.156
0.156
5.91e-05 mm
50 sec
TULE (EM35)
98.46 deg.
440.85 km
0.01 - 0.06 Hz
Misfit: 0.591
0.295
0.886
9.76e-05 mm
50 sec
Source Time Function: 1.00 1.00 1.00

Figure 2g

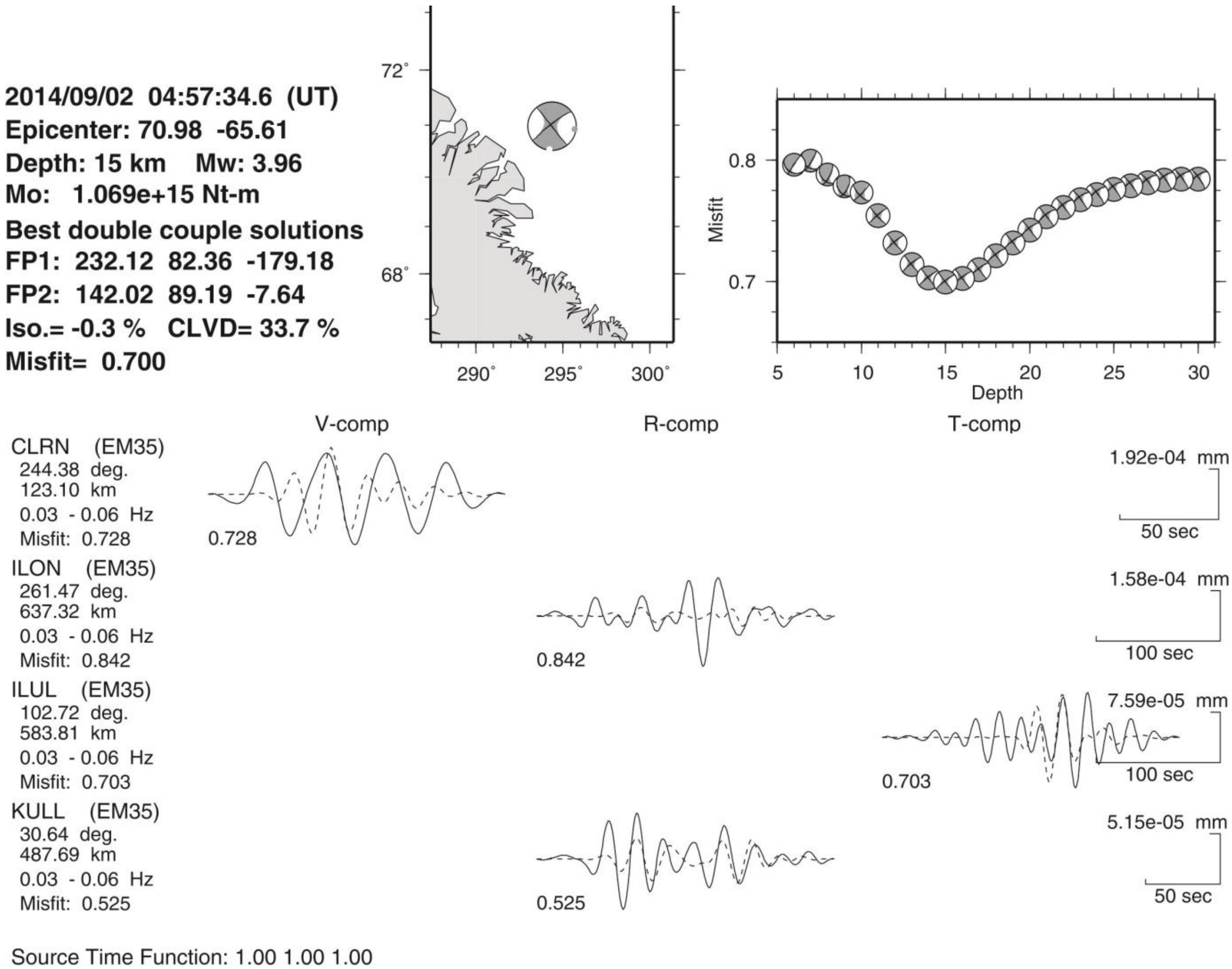

2014/09/02 04:57:34.6 (UT)
Epicenter: 70.98 -65.61
Depth: 15 km Mw: 3.96
Mo: 1.069e+15 Nt-m
Best double couple solutions
FP1: 232.12 82.36 -179.18
FP2: 142.02 89.19 -7.64
Iso.= -0.3 % CLVD= 33.7 %
Misfit= 0.700
72˚
68˚
290˚
295˚
300˚
0.8
0.7
Misfit
5
10
15
20
25
30
Depth
V-comp
R-comp
T-comp
CLRN (EM35)
244.38 deg.
123.10 km
0.03 - 0.06 Hz
Misfit: 0.728
0.728
1.92e-04 mm
50 sec
ILON (EM35)
261.47 deg.
637.32 km
0.03 - 0.06 Hz
Misfit: 0.842
0.842
1.58e-04 mm
100 sec
ILUL (EM35)
102.72 deg.
583.81 km
0.03 - 0.06 Hz
Misfit: 0.703
0.703
7.59e-05 mm
100 sec
KULL (EM35)
30.64 deg.
487.69 km
0.03 - 0.06 Hz
Misfit: 0.525
0.525
5.15e-05 mm
50 sec
Source Time Function: 1.00 1.00 1.00

Figure 2h

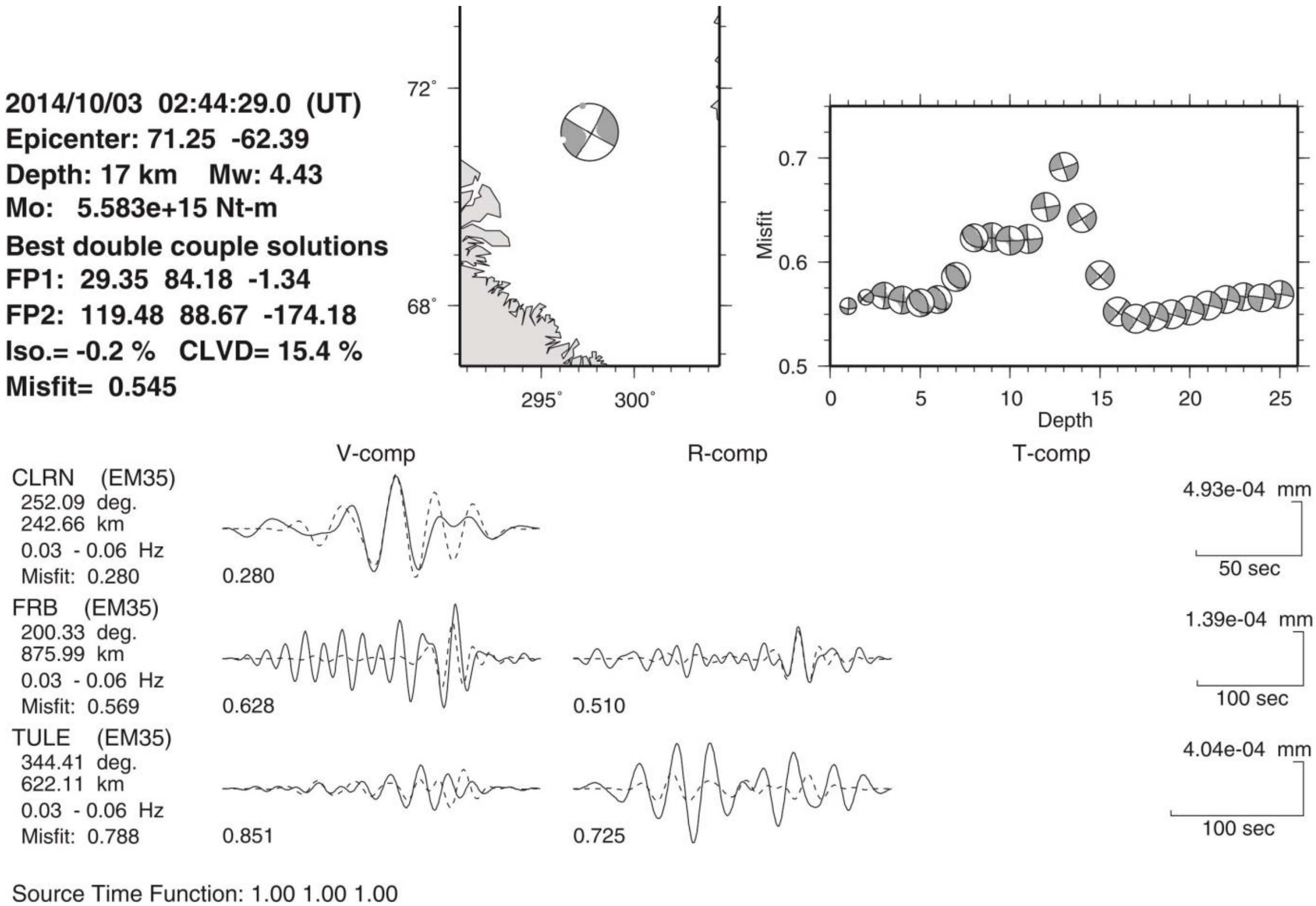

2014/10/03 02:44:29.0 (UT)
Epicenter: 71.25 -62.39
Depth: 17 km Mw: 4.43
Mo: 5.583e+15 Nt-m
Best double couple solutions
FP1: 29.35 84.18 -1.34
FP2: 119.48 88.67 -174.18
Iso.= -0.2 % CLVD= 15.4 %
Misfit= 0.545
72°
68°
295°
300°
0.7
0.6
0.5
Misfit
0
5
10
15
20
25
Depth
V-comp
R-comp
T-comp
CLRN (EM35)
252.09 deg.
242.66 km
0.03 - 0.06 Hz
Misfit: 0.280
0.280
4.93e-04 mm
50 sec
FRB (EM35)
200.33 deg.
875.99 km
0.03 - 0.06 Hz
Misfit: 0.569
0.628
0.510
1.39e-04 mm
100 sec
TULE (EM35)
344.41 deg.
622.11 km
0.03 - 0.06 Hz
Misfit: 0.788
0.851
0.725
4.04e-04 mm
100 sec
Source Time Function: 1.00 1.00 1.00

Figure 2i

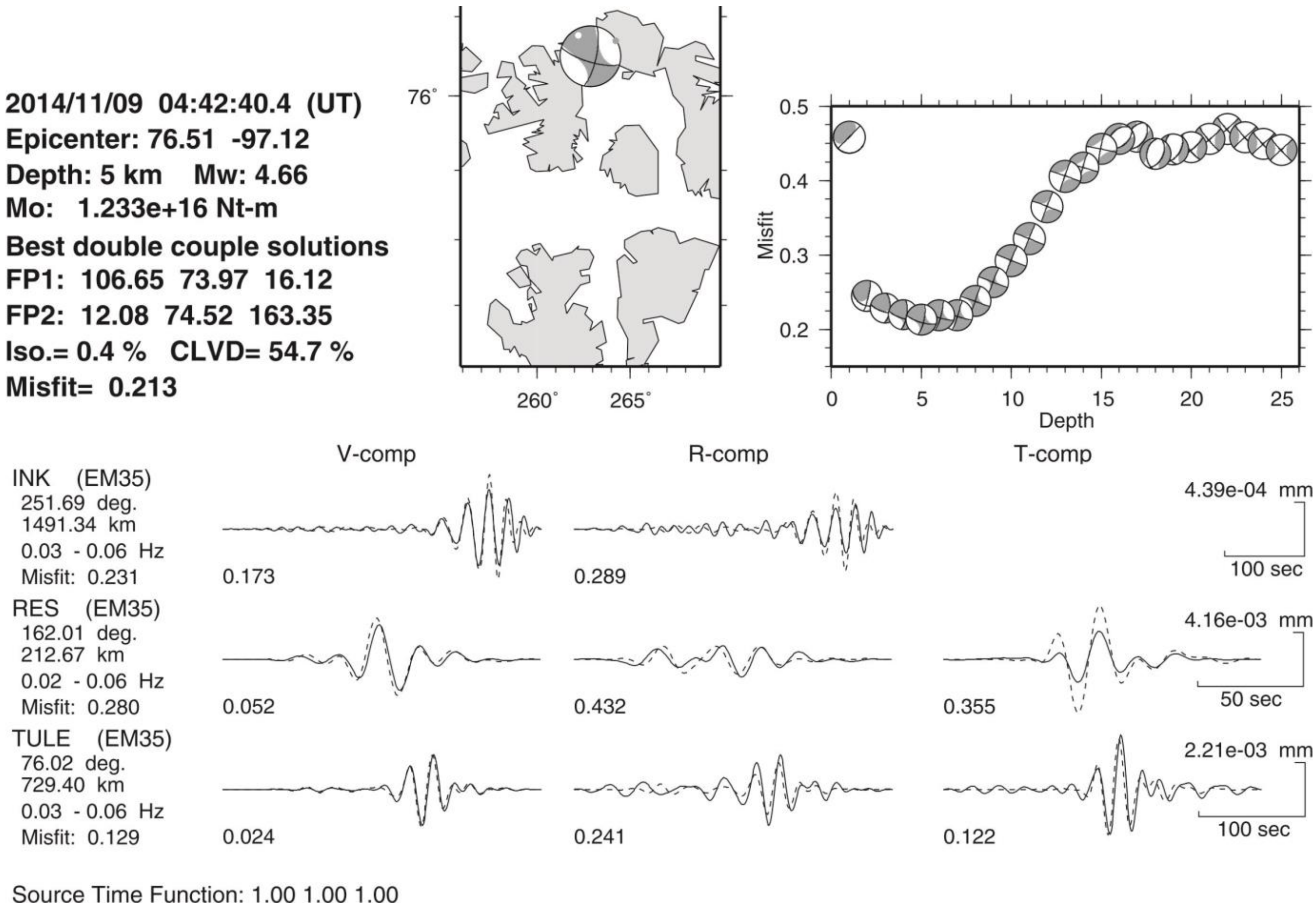

2014/11/09 04:42:40.4 (UT)
Epicenter: 76.51 -97.12
Depth: 5 km Mw: 4.66
Mo: 1.233e+16 Nt-m
Best double couple solutions
FP1: 106.65 73.97 16.12
FP2: 12.08 74.52 163.35
Iso.= 0.4 % CLVD= 54.7 %
Misfit= 0.213
76°
260°
265°
Misfit
0.5
0.4
0.3
0.2
0 5 10 15 20 25
Depth
V-comp
R-comp
T-comp
INK (EM35)
251.69 deg.
1491.34 km
0.03 - 0.06 Hz
Misfit: 0.231
0.173
0.289
4.39e-04 mm
100 sec
RES (EM35)
162.01 deg.
212.67 km
0.02 - 0.06 Hz
Misfit: 0.280
0.052
0.432
0.355
4.16e-03 mm
50 sec
TULE (EM35)
76.02 deg.
729.40 km
0.03 - 0.06 Hz
Misfit: 0.129
0.024
0.241
0.122
2.21e-03 mm
100 sec
Source Time Function: 1.00 1.00 1.00

Figure 2j

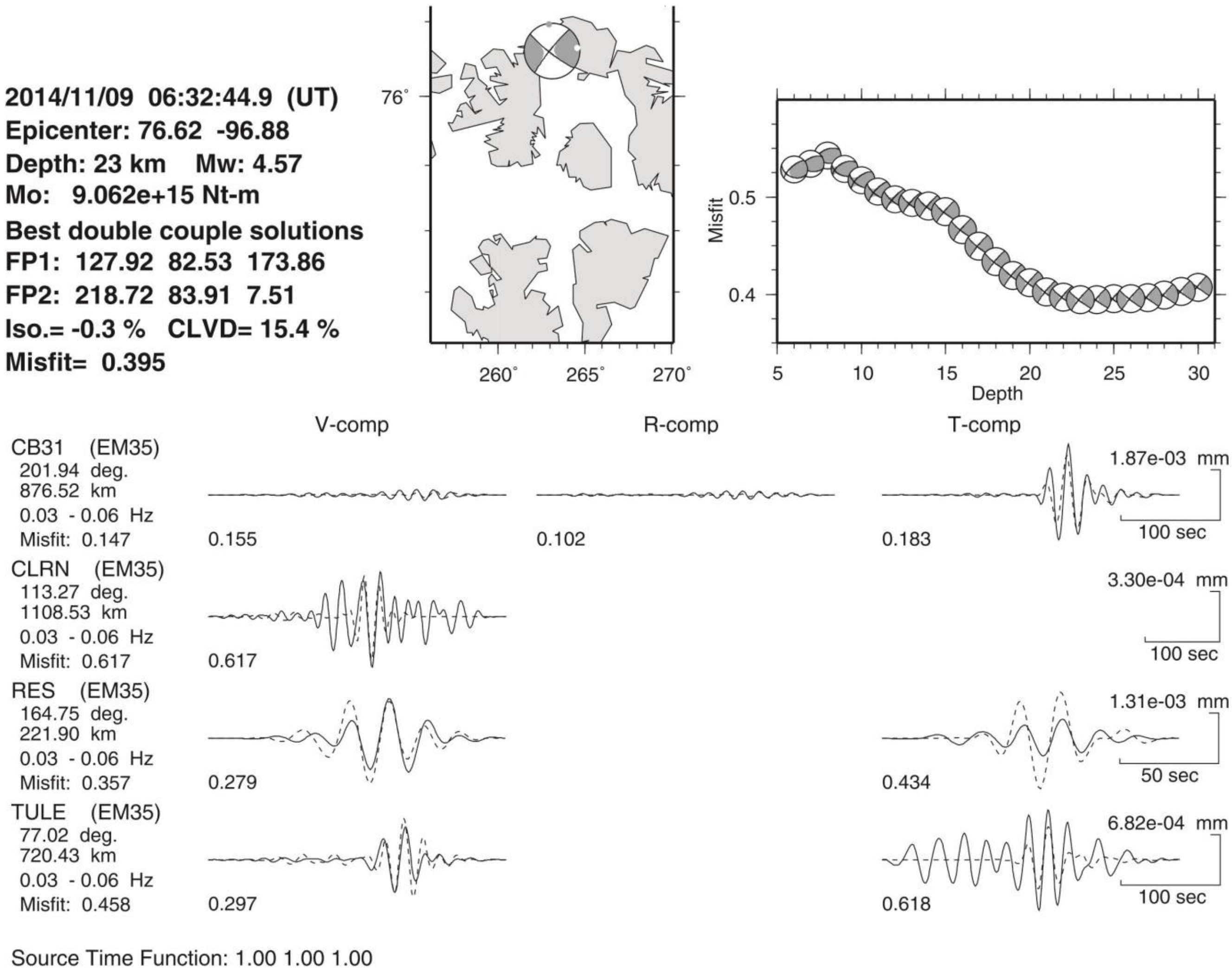

2014/11/09 06:32:44.9 (UT)
Epicenter: 76.62 -96.88
Depth: 23 km Mw: 4.57
Mo: 9.062e+15 Nt-m
Best double couple solutions
FP1: 127.92 82.53 173.86
FP2: 218.72 83.91 7.51
Iso.= -0.3 % CLVD= 15.4 %
Misfit= 0.395
76˚
260˚
265˚
270˚
Misfit
0.5
0.4
5
10
15
20
25
30
Depth
V-comp
R-comp
T-comp
CB31 (EM35)
201.94 deg.
876.52 km
0.03 - 0.06 Hz
Misfit: 0.147
0.155
0.102
0.183
1.87e-03 mm
100 sec
CLRN (EM35)
113.27 deg.
1108.53 km
0.03 - 0.06 Hz
Misfit: 0.617
0.617
3.30e-04 mm
100 sec
RES (EM35)
164.75 deg.
221.90 km
0.03 - 0.06 Hz
Misfit: 0.357
0.279
0.434
1.31e-03 mm
50 sec
TULE (EM35)
77.02 deg.
720.43 km
0.03 - 0.06 Hz
Misfit: 0.458
0.297
0.618
6.82e-04 mm
100 sec
Source Time Function: 1.00 1.00 1.00

Figure 2k

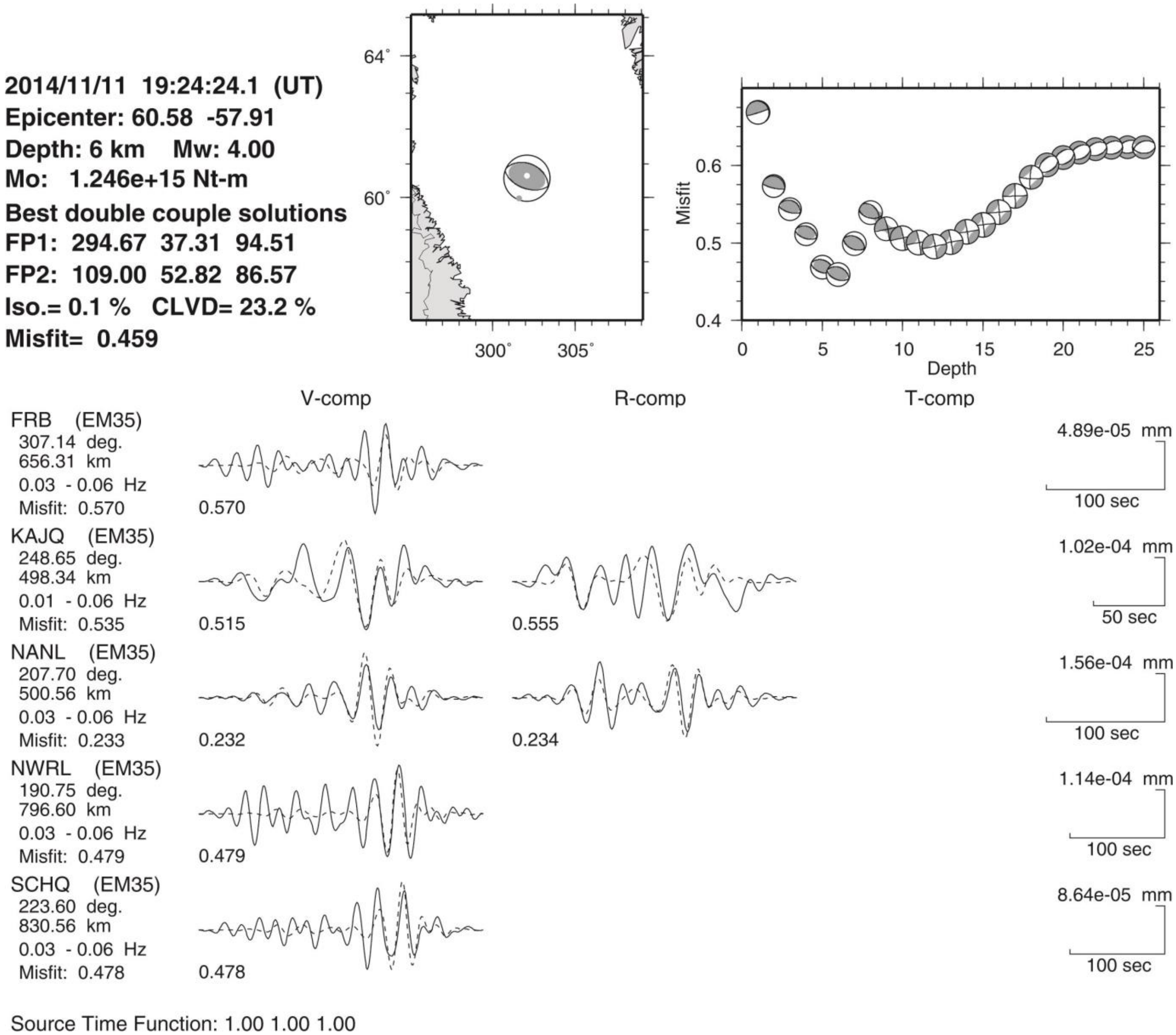


Figure 2l

Summary

Regional moment tensor solutions have been determined for twelve moderate earthquakes occurring in northeastern Canada during 2014. These moment tensor solutions include focal mechanisms, depths and moment magnitudes which provide input into further studies regarding seismic hazard, regional seismotectonics or stress field to name a few. These results are particularly valuable in this region where there have been considerable difficulties in obtaining these parameters through other methods. Note that there were no earthquakes in southeastern Canada during 2014 that met the minimum magnitude criterion for running the RCMT inversion. This paper is the second in what is intended to be a series of annual updates but other methods, such as an online database, for disseminating the solutions are being explored.

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Appendix
Complete Moment Tensor Solution for Earthquakes in Table 1

For each event listed in Table 1 the full moment tensor from the RCMT inversion is given. The format is described below (written communication from Kao, 2005). The earthquakes are identified by date of occurrence. In the case of two events on the same day, the origin time (hh:mm) is added for clarification.

Line 1-25: depth, E_nosh, E_sh, Mxx, Myy, Mzz, Mxy, Mxz, Myz

(E_nosh: average misfit without any shift of synthetic seismograms)

(E_sh: average misfit with shift of synthetic seismograms)

< repeat for each depth >

Line 26: station(i), ishift(i), E(i), Ez(i), Er(i), Et(i)

(station: station name)

(ishift: number of shifted points,

original position + ishift = final position)

(E: average misfit for this station at the best-fitting depth)

(Ez: Z-comp misfit for this station at the best-fitting depth)

(Er: R-comp misfit for this station at the best-fitting depth)

(Et: T-comp misfit for this station at the best-fitting depth)

< repeat for each station >

Author's note: the misfit for each component is given for all stations used regardless of whether the component was used in the inversion; the average misfit, both for each station and overall, is calculated only from the components that were used

2014-01-03

6	0.7265	0.6107	-78.28946	-124.52686	266.92116	-150.05410	-46.93472	172.21486
7	0.6688	0.5812	-149.27379	-181.57545	371.03444	-155.26545	-41.96365	151.68760
8	0.6422	0.5885	-153.99435	-166.57835	305.71398	-126.74936	-30.38822	107.26442
9	0.6580	0.6185	-163.24357	-170.05050	266.51087	-152.34908	-33.96656	114.01965
10	0.6938	0.6423	-141.87745	-143.49792	185.90776	-167.33861	-38.16547	121.60712
11	0.7243	0.6549	-98.64846	-103.63631	101.37234	-172.64625	-37.75671	114.52963
12	0.7427	0.6643	-76.01258	-74.08082	52.85764	-159.38077	-37.78495	110.57620
13	0.7576	0.6733	-59.76669	-54.04891	22.25837	-152.65896	-37.30612	107.25934
14	0.7703	0.6831	-50.46558	-39.73776	3.33505	-145.05454	-36.64631	104.73144
15	0.7811	0.6910	-45.81711	-29.15734	-8.74707	-136.97964	-35.75254	102.65334
16	0.7894	0.6989	-44.37885	-22.88780	-9.40115	-128.11349	-40.94641	115.42996
17	0.7977	0.7056	-40.84331	-12.45346	-18.82694	-117.69682	-40.80187	113.00015
18	0.8054	0.7149	-39.46636	-3.64004	-25.20199	-106.99751	-40.27173	111.33142
19	0.8098	0.7158	-35.85552	1.58203	-30.70844	-106.72585	-40.21748	109.61656
20	0.8147	0.7200	-37.34339	8.07243	-33.30673	-96.30626	-39.90290	108.25336
21	0.8192	0.7239	-39.68155	13.81952	-34.59818	-85.88769	-39.42105	106.85444
22	0.8224	0.7256	-42.48042	19.38745	-35.53000	-75.78666	-39.04753	105.83789
23	0.8229	0.7281	-45.66299	25.86163	-37.17245	-65.77755	-38.84833	105.50444
24	0.8298	0.7294	-44.79602	28.25650	-33.85242	-51.03688	-34.92940	95.15160
25	0.8309	0.7296	-48.32558	32.96952	-33.68765	-42.54226	-34.54302	94.52632
26	0.8318	0.7285	-52.07759	37.71103	-33.31893	-34.26531	-34.16099	94.03543
27	0.8357	0.7282	-49.84561	38.73363	-33.40299	-35.50301	-32.62217	91.02082
28	0.8362	0.7283	-54.10716	43.16597	-33.05273	-28.19262	-32.31939	90.91360
29	0.8372	0.7286	-58.62255	47.46193	-32.35708	-20.73759	-31.97971	90.84053
30	0.8382	0.7290	-62.65751	52.88596	-31.71884	-13.74401	-31.68525	90.80312

frb	2	0.704559	0.743697	0.665420	0.621310
kajq	-1	0.589524	0.701025	0.542049	0.525499
kngq	-2	0.582060	0.582060	0.805028	0.978489
mkvl	-3	0.435701	0.283019	0.835623	0.588383
nanl	-4	0.320728	0.320728	0.921510	0.940217
schq	2	0.719531	0.741606	0.697456	1.000000
sfjd	-1	0.716632	0.678550	0.754714	1.000000

2014-02-07

6	0.5292	0.4839	102.53643	-13.54670	-104.32480	-17.49635	54.03628	-30.45191
7	0.5008	0.4613	118.30874	9.30872	-139.95770	-22.39080	44.23607	-23.30694
8	0.5012	0.4761	90.66482	24.48943	-119.47939	-20.57764	29.89938	-14.87858
9	0.5255	0.5144	71.71940	34.41175	-105.49329	-23.45466	26.82698	-12.77096
10	0.5723	0.5593	48.95470	41.50255	-87.14075	-29.38413	25.56221	-11.76037
11	0.6236	0.6005	25.33469	48.96848	-70.00032	-37.37383	24.61634	-10.98157
12	0.6722	0.6323	2.31379	58.52586	-56.37320	-46.26512	23.89749	-10.35044
13	0.7092	0.6471	-20.32373	72.67158	-47.79740	-56.62351	24.45264	-10.30976
14	0.7194	0.6476	-40.25070	83.30468	-38.67549	-61.76928	24.02111	-9.91522
15	0.7145	0.6406	-55.91609	91.52137	-31.34088	-63.34987	23.72124	-9.64613
16	0.7072	0.6437	-61.27650	93.75237	-28.85454	-59.62302	25.47522	-10.34032
17	0.7007	0.6449	-69.98816	95.49448	-22.00329	-54.40326	25.33992	-10.33900
18	0.6956	0.6495	-73.11680	93.54456	-17.01398	-48.73509	25.37045	-10.43430
19	0.6930	0.6530	-72.61220	89.45359	-13.51190	-43.61702	25.53457	-10.59380
20	0.6925	0.6531	-70.17137	84.51309	-11.09602	-39.32101	25.79008	-10.78966
21	0.6963	0.6558	-67.01630	79.60081	-9.41908	-35.01071	26.17246	-10.98351
22	0.7000	0.6559	-63.90013	75.02717	-8.05258	-31.98201	26.51472	-11.21084
23	0.7019	0.6561	-63.06629	73.34959	-7.30731	-32.39685	26.75640	-11.22756
24	0.7047	0.6570	-60.17367	69.77667	-6.75002	-29.76979	26.98335	-11.72003
25	0.7099	0.6585	-57.40294	66.46027	-6.34153	-27.99487	27.40551	-11.98530
26	0.7158	0.6609	-55.03947	63.64659	-6.04122	-26.46492	27.81876	-12.25788
27	0.7202	0.6601	-53.10670	61.33334	-5.81373	-25.17133	28.20441	-12.53756
28	0.7263	0.6632	-51.59284	59.54028	-5.65099	-24.19369	28.54032	-12.79766
29	0.7317	0.6639	-50.44414	58.23544	-5.60448	-23.05700	28.84421	-12.96552
30	0.7352	0.6652	-53.00054	60.62661	-5.58751	-26.37611	28.85984	-12.93751

ilon	-1	0.506645	0.967022	0.506645	0.975262
kull	-1	0.307823	0.307823	1.000000	1.000000
res	6	0.627676	0.341207	0.914145	0.798181
tule	-1	0.402998	1.000000	0.402998	1.000000

6	0.6375	0.5288	6.23512	-7.33580	13.03098	47.53710	3.86083	-33.07794
7	0.6379	0.5347	-2.70064	-21.68203	38.04444	54.21920	3.49947	-28.61099
8	0.6432	0.5343	-14.40949	-36.67628	63.54373	56.84195	3.71846	-26.01638
9	0.6236	0.5091	-21.38538	-44.74164	74.66876	55.25699	4.40251	-24.58094
10	0.6090	0.4919	-21.35514	-45.67105	71.67646	53.15408	5.20872	-23.69957
11	0.6103	0.5004	-16.05300	-42.58792	60.59751	52.49835	5.34036	-23.49447
12	0.6139	0.5101	-11.60016	-41.40044	53.45104	54.08775	5.75307	-22.98455
13	0.6173	0.5203	-7.32907	-40.94855	47.83337	56.52196	5.82398	-22.55361
14	0.6199	0.5312	-3.53007	-41.09375	43.62756	59.06704	5.51549	-22.18233
15	0.6229	0.5435	-0.23544	-41.54989	40.42649	61.17982	4.75656	-21.86586
16	0.6269	0.5559	1.21687	-45.54486	43.32683	65.84838	6.28297	-24.54580
17	0.6384	0.5776	4.39966	-46.01835	40.53631	67.48514	6.79743	-24.29097
18	0.6531	0.6018	7.14070	-46.09478	37.88994	67.58681	7.19563	-24.18165
19	0.6690	0.6226	8.40966	-46.15853	36.68240	65.45738	7.84558	-23.97078
20	0.6845	0.6466	10.76753	-45.53768	33.81840	63.35307	8.04607	-24.04380
21	0.6989	0.6699	13.11412	-44.92032	30.98664	60.99136	8.22147	-24.14506
22	0.7121	0.6911	15.51729	-44.37914	28.17238	58.58742	8.28812	-24.27112
23	0.7218	0.7055	18.08504	-44.31751	25.68001	56.96194	8.30078	-24.40122
24	0.7289	0.7096	20.83703	-44.65574	23.39665	55.94932	8.28433	-24.53035
25	0.7357	0.7103	22.23499	-44.40567	21.91621	54.89894	8.44571	-24.62662
26	0.7360	0.7011	25.45127	-45.61049	20.01742	55.24341	8.32219	-24.71739
27	0.7333	0.6899	28.98098	-47.33012	18.30566	56.35843	8.12199	-24.78524
28	0.7329	0.6859	31.79078	-49.56605	17.72225	56.71904	7.97878	-24.76636
29	0.7284	0.6740	36.06899	-52.15483	16.09271	58.89362	7.59897	-24.77388
30	0.7215	0.6617	40.91719	-55.56353	14.70479	62.35017	7.15838	-24.76434

ilon	-5	0.618152	0.274504	0.685403	0.894550
kull	-1	0.410432	0.380457	0.440407	0.775427
res	-1	0.308362	0.308362	0.987206	0.962382
tule	-2	0.630837	0.363050	0.898623	0.977742

2014-03-03

6	0.6783	0.6434	24.20911	-174.89891	167.60236	-92.96453	-19.60705	-50.13016
7	0.6426	0.6114	-16.18739	-239.71621	260.27040	-94.89930	-15.88267	-47.54778
8	0.6579	0.6359	-33.32854	-276.24688	278.55701	-101.40766	-21.40239	-42.39714
9	0.7165	0.7026	45.23769	-245.20594	139.37361	-115.34751	-21.59863	-49.14611
10	0.7712	0.7391	121.36923	-182.76701	2.51578	-112.41881	-27.22229	-46.83609
11	0.7845	0.7471	168.65922	-156.47197	-60.88628	-109.41452	-25.50613	-47.01742
12	0.7846	0.7537	144.57875	-109.13796	-66.07501	-79.47341	-22.21647	-33.41190
13	0.7803	0.7543	151.66737	-105.26709	-71.22212	-75.15570	-20.31132	-31.70465
14	0.7795	0.7546	156.81429	-104.40476	-74.46890	-73.44721	-23.68795	-28.96398
15	0.7759	0.7552	157.70962	-104.40045	-72.42338	-70.19953	-21.97792	-27.45402
16	0.7790	0.7597	163.30542	-101.66271	-78.45999	-69.16135	-28.24238	-29.31171
17	0.7779	0.7620	162.20428	-101.08829	-75.10541	-66.34196	-25.54456	-28.51461
18	0.7819	0.7676	162.40272	-100.72668	-74.18580	-65.51146	-28.55438	-26.65822
19	0.7819	0.7701	159.04175	-99.23995	-70.55356	-64.04771	-27.08669	-25.20647
20	0.7789	0.7624	247.70384	-155.41764	-109.09560	-99.85408	-47.59792	-36.76814
21	0.7717	0.7570	253.34374	-161.82959	-108.34952	-101.50267	-47.25856	-36.93468
22	0.7623	0.7486	251.29312	-159.63404	-108.83205	-100.65650	-52.77679	-34.06917
23	0.7587	0.7468	257.20281	-166.12230	-108.04968	-102.64881	-52.91292	-34.18159
24	0.7565	0.7452	263.65037	-172.77046	-107.34771	-104.86004	-53.20868	-34.17691
25	0.7541	0.7427	261.23055	-172.00947	-105.44413	-104.16883	-58.93072	-31.00607
26	0.7536	0.7430	268.79701	-179.35963	-104.80657	-106.61652	-59.55325	-30.79561
27	0.7525	0.7410	265.73656	-176.98216	-103.27830	-107.73688	-66.57200	-26.69001
28	0.7529	0.7420	274.65248	-185.34920	-102.69867	-110.44674	-67.29298	-26.36733
29	0.7538	0.7427	273.00514	-185.37635	-99.87676	-109.29389	-73.77549	-22.77479
30	0.7525	0.7424	284.41944	-193.85978	-101.32688	-111.72779	-74.61601	-22.65112

kajq	-2	0.659395	0.502734	0.650036	0.825416
mkvl	-1	0.536606	0.536606	0.928878	1.000000
natg	2	0.761808	0.766392	0.957867	0.757224
schq	-2	0.487832	0.310558	0.665107	1.000000

2014-03-05

6	0.8135	0.7975	31.89288	-48.52908	15.39254	-4.37872	7.44765	-4.91139

7	0.8072	0.7906	32.02082	-45.82146	11.76249	-5.80159	5.39244	-3.88686
8	0.8138	0.7960	44.82757	-50.57118	2.76744	-9.77621	5.00250	-4.05485
9	0.8084	0.7923	59.25626	-54.97183	-6.61252	-13.80527	4.66179	-4.26775
10	0.7991	0.7741	105.89787	-94.40040	-13.42923	-25.62131	6.16838	-5.97361
11	0.7749	0.7442	128.77370	-116.55445	-13.17589	-32.41248	5.87158	-5.91478
12	0.7623	0.7191	144.55153	-133.47682	-11.38980	-38.02206	5.42953	-5.66711
13	0.7661	0.7017	163.11242	-152.79670	-10.25055	-45.86250	5.43945	-5.90238
14	0.7756	0.6944	167.19960	-157.70588	-9.19338	-53.05003	5.38778	-6.27270
15	0.7863	0.7001	164.73581	-155.29041	-9.00957	-63.11493	5.80331	-7.14849
16	0.8016	0.7240	141.59127	-130.83293	-10.41886	-67.32615	6.70328	-8.73849
17	0.8249	0.7624	90.22506	-80.86215	-9.21602	-58.04814	6.07290	-8.19438
18	0.8460	0.7995	62.55307	-53.34052	-9.27624	-52.35268	6.14882	-8.72022
19	0.8616	0.8304	40.92423	-32.24694	-8.92621	-43.76453	6.02956	-8.94741
20	0.8749	0.8562	24.92189	-16.77345	-8.51790	-35.81602	5.58048	-8.68368
21	0.8887	0.8770	14.84805	-7.22832	-8.13004	-29.47794	5.47990	-8.90090
22	0.8978	0.8918	6.77589	0.05106	-7.44272	-23.55210	5.20413	-8.82595
23	0.9052	0.9012	1.77221	4.52800	-6.98411	-18.93227	4.98295	-8.59735
24	0.9109	0.9089	-1.73719	7.52394	-6.50477	-15.18618	4.73382	-8.50336
25	0.9151	0.9140	-4.34771	9.89342	-6.30795	-12.65785	4.65945	-8.71922
26	0.9179	0.9168	-6.25968	11.39610	-5.89166	-10.19830	4.47161	-8.58346
27	0.9196	0.9185	-7.82784	12.83179	-5.75014	-8.43284	4.38941	-8.78916
28	0.9194	0.9179	-9.14447	14.26145	-5.82468	-7.47454	4.21098	-8.87569
29	0.9201	0.9179	-10.23305	15.27982	-5.72137	-6.09941	4.11552	-9.07853
30	0.9195	0.9167	-11.72281	16.65884	-5.56203	-4.84288	4.02701	-9.27254

frb	1	0.823339	0.823339	0.975066	0.991102
kajq	0	0.508838	0.522638	0.495038	0.977480
nanl	1	0.759095	0.759095	0.967061	1.000000
sfjd	-8	0.686522	0.686522	0.649755	0.974853

2014-03-11

6	0.5151	0.4344	-190.17143	-669.56168	831.35904	-248.39651	555.84318	-106.61268

7	0.5054	0.4081	-271.36830	-860.94346	963.77126	-305.70396	567.92239	-105.25564
8	0.4711	0.3728	-187.32130	-730.52573	634.29892	-291.10189	454.78988	-78.53989
9	0.9321	0.9321	-0.13843E-04	0.38422E-04	-0.72536E-05	0.16391E-04	-0.23773E-04	0.65047E-05
10	0.9321	0.9321	0.13747E-03	-0.30639E-03	0.93268E-05	-0.17214E-03	0.17540E-03	-0.18869E-04
11	0.9321	0.9321	-0.43476E-03	0.83331E-03	-0.57188E-04	-0.48690E-03	0.52771E-03	0.59751E-04
12	0.9321	0.9321	-0.50444E-03	0.76014E-03	-0.12117E-03	-0.49196E-03	0.53251E-03	0.58649E-04
13	0.9321	0.9321	-0.57508E-03	0.66191E-03	0.24259E-03	-0.49843E-03	0.54203E-03	0.58381E-04
14	0.4456	0.4246	505.46368	-622.13453	-290.90327	-611.81994	552.60911	-80.16947
15	0.4415	0.4282	543.57865	-619.27207	-306.52226	-630.07758	540.59589	-73.54601
16	0.4424	0.4318	586.35083	-620.89728	-316.62115	-642.76985	608.26603	-74.53999
17	0.4439	0.4378	616.28842	-618.11682	-324.74429	-656.97797	600.44147	-67.84890
18	0.4476	0.4427	644.31790	-614.13529	-337.82536	-671.08362	589.56989	-58.48533
19	0.4526	0.4445	665.26515	-615.91277	-339.15019	-682.80570	584.30724	-49.11064
20	0.4586	0.4496	678.90709	-620.42374	-333.31095	-693.66532	584.85043	-48.95921
21	0.4650	0.4538	693.52291	-624.67765	-331.13180	-705.72548	581.58556	-41.89552
22	0.4719	0.4588	707.71609	-629.25064	-329.56839	-718.77864	576.07758	-37.15695
23	0.4804	0.4608	719.64339	-635.71263	-325.01726	-730.92734	573.55302	-30.26664
24	0.4884	0.4627	734.37421	-642.28205	-324.02509	-744.12528	569.78427	-22.74973
25	0.4912	0.4634	659.28997	-571.30855	-284.27935	-666.35469	497.05774	-13.39692
26	0.4970	0.4641	674.54309	-579.47645	-284.07980	-679.99334	493.03845	-6.93771
27	0.5007	0.4645	700.30939	-588.32225	-294.00638	-697.73402	486.48527	2.89628
28	0.5043	0.4662	716.89264	-602.28363	-292.62041	-716.27427	486.56207	8.85338
29	0.5099	0.4685	738.54637	-617.17825	-296.40637	-734.58732	482.42488	9.11348
30	0.5165	0.4665	792.56080	-654.97006	-309.05322	-785.73854	491.39573	12.91788

clrn	-1	0.289078	0.289078	0.983808	0.884545
eunu	4	0.422481	0.318376	0.526586	0.965775
ilon	1	0.318769	0.197591	0.169775	0.588941
kull	1	0.360653	0.272842	0.271289	0.537828
res	1	0.435422	0.424348	0.323229	0.558688
tule	2	0.410248	0.236416	0.576581	0.417747

2014-05-18

6	0.7338	0.6289	15.30932	-4.85375	-5.42194	2.83472	-28.40935	-32.62444
7	0.7387	0.6247	12.30363	-15.41077	10.21551	2.26192	-23.73084	-29.91497

8	0.7336	0.6205	2.91876	-30.59274	34.93686	1.88526	-20.22014	-28.08225
9	0.7151	0.6229	-2.66378	-40.42959	47.73721	1.69774	-17.95389	-27.43586
10	0.6964	0.6210	-0.41750	-42.12148	44.71803	1.38223	-16.09569	-25.66835
11	0.6833	0.6231	3.39551	-41.96446	39.48616	0.82795	-13.98632	-24.37137
12	0.6742	0.6256	7.70545	-41.67674	34.21352	0.50235	-12.53576	-23.08251
13	0.6710	0.6272	11.38470	-42.96489	31.48429	0.29482	-11.68009	-22.59708
14	0.6682	0.6303	14.41423	-44.08719	29.33418	0.15057	-11.14782	-22.34638
15	0.6675	0.6298	12.22800	-32.97630	20.36154	0.04538	-7.90722	-16.26032
16	0.6650	0.6261	11.77917	-34.84631	22.82870	0.07787	-8.58996	-18.32104
17	0.6632	0.6202	12.80539	-34.91556	21.78449	0.08897	-8.22491	-18.32212
18	0.6631	0.6163	13.33623	-34.67327	20.93606	0.13202	-7.92456	-18.36306
19	0.6614	0.6116	14.05658	-34.44673	19.91707	0.28776	-7.91250	-18.44792
20	0.6621	0.6104	14.15748	-34.32349	19.64857	0.27982	-7.71601	-18.31503
21	0.6647	0.6104	13.80899	-33.55255	19.16804	0.35857	-7.55204	-18.44679
22	0.6680	0.6084	13.30162	-32.70070	18.77133	0.44066	-7.41865	-18.58203
23	0.6716	0.6057	12.69347	-31.80884	18.44078	0.52311	-7.30028	-18.71787
24	0.6757	0.6030	12.07163	-30.93298	18.14950	0.57152	-7.17457	-18.85751
25	0.6800	0.6009	11.38756	-30.08495	17.94964	0.65627	-7.07460	-18.97890
26	0.6804	0.5995	10.75841	-29.25583	17.71456	0.75777	-7.11120	-19.20509
27	0.6860	0.5978	10.62394	-28.98113	17.55566	0.98599	-7.15760	-19.20679
28	0.6885	0.5977	10.57414	-29.31997	17.91921	0.98334	-7.06170	-19.14333
29	0.6942	0.5976	10.08644	-28.94340	17.99867	1.10954	-6.97590	-19.20039
30	0.6968	0.5978	10.17645	-30.04815	18.97778	1.31113	-7.18664	-20.10078

eunu	4	0.826477	0.790464	0.976128	0.862491
ilon	0	0.817082	0.831291	0.992950	0.802873
res	-2	0.156278	0.156278	0.947320	0.880846
tule	-1	0.590673	0.295160	0.803013	0.886187

2014-09-02

6	0.8227	0.7960	27.22524	-23.24848	-1.57469	-8.37841	20.33246	-39.54307
7	0.8202	0.7994	25.05185	-32.73524	10.33168	-5.86143	14.28688	-31.29924

8	0.8048	0.7881	24.74724	-45.41179	22.96676	-3.10969	9.72706	-25.15031
9	0.7921	0.7783	27.62612	-55.93263	29.72864	0.20599	6.00610	-20.39392
10	0.7879	0.7732	36.30246	-64.08975	28.30536	4.28900	2.91835	-17.44623
11	0.7748	0.7541	48.90697	-75.44091	26.35992	8.84858	1.14191	-16.43821
12	0.7611	0.7319	62.54866	-87.22504	24.07255	13.90542	-0.48181	-16.05837
13	0.7508	0.7141	76.39851	-99.13174	21.78206	19.06621	-2.08905	-15.45870
14	0.7438	0.7029	85.83403	-106.58528	19.61957	22.89096	-3.47733	-14.91443
15	0.7417	0.6997	91.77631	-111.06866	18.11297	25.28700	-4.69377	-14.64821
16	0.7430	0.7024	93.22602	-118.25567	24.37781	27.74566	-6.39816	-17.73958
17	0.7497	0.7095	88.72334	-113.79166	24.48795	26.33690	-6.84394	-18.16662
18	0.7603	0.7210	81.91979	-106.35869	23.94221	23.70987	-7.22183	-18.46552
19	0.7699	0.7317	75.46490	-99.81424	23.88298	21.32311	-7.65820	-18.72003
20	0.7807	0.7423	68.42195	-92.31327	23.44194	18.62031	-7.68963	-18.84666
21	0.7919	0.7531	60.70549	-83.72318	22.61731	15.53261	-7.91472	-19.32657
22	0.7994	0.7610	56.09332	-78.69306	22.22688	14.02597	-8.42141	-19.12975
23	0.8049	0.7672	52.42418	-74.85092	22.07315	13.03457	-8.88852	-19.01321
24	0.8092	0.7717	51.58681	-74.43100	22.49363	12.31673	-9.02219	-19.72999
25	0.8122	0.7758	49.35006	-71.92111	22.20465	11.98105	-9.51100	-19.12264
26	0.8152	0.7787	49.63736	-72.93017	22.90116	12.45368	-10.30555	-19.33281
27	0.8154	0.7812	48.52385	-71.56632	22.63651	12.73348	-10.63599	-18.60010
28	0.8183	0.7835	48.38150	-71.77900	22.93964	13.02933	-10.86497	-18.97095
29	0.8180	0.7843	50.82447	-75.10869	23.77403	14.69789	-11.52955	-18.80932
30	0.8166	0.7843	54.40340	-79.67018	24.71133	16.97519	-12.13316	-18.53624

clrn 1 0.728269 0.728269 0.922639 0.998455
ilon 4 0.841539 0.660171 0.841539 1.000000
ilul -1 0.703463 0.931681 0.885587 0.703463
kull 2 0.525375 0.991077 0.525375 0.929855

2014-10-03

1 0.5587 0.5575 -0.10148+307 0.18530+307 -0.10638+307 0.91569+307 -0.11984+307
0.38436+307

2	0.5700	0.5659	-0.99673+306	0.23553+307	-0.18541+307	0.10210+308	-0.15500+307	0.19710+307	
3	0.5709	0.5679	9.70570	-37.86179	36.15332	-124.98073	7.47606	-17.81289	
4	0.5622	0.5636	6.83678	-92.33585	102.07399	-206.90832	0.16654	-26.21588	
5	0.5610	0.5610	-15.61454	-158.83521	194.65703	-232.16286	-8.45759	-24.53731	
6	0.5642	0.5642	-13.40527	-176.14960	205.24310	-260.57080	-13.25607	-27.21022	
7	0.5894	0.5859	-56.73344	-252.06823	316.81587	-312.70383	-15.33252	-27.42038	
8	0.6249	0.6233	-60.82016	-158.62670	214.50594	-305.17137	-12.27467	-21.79052	
9	0.6303	0.6236	-59.78903	-85.69000	135.27483	-409.63970	-14.57091	-25.00456	
10	0.6369	0.6209	-65.41176	-16.65279	71.35129	-516.87089	-20.13601	-29.47638	
11	0.6578	0.6221	-91.98117	61.23840	22.23569	-562.47968	-23.72651	-30.27802	
12	0.7085	0.6530	-152.91083	158.29924	-10.62071	-513.65944	-26.89853	-28.19059	
13	0.7461	0.6916	-256.40543	284.59570	-30.45362	-385.07988	-31.01822	-25.18214	
14	0.6812	0.6424	-377.35638	418.54937	-41.63076	-194.15707	-35.71031	-21.99676	
15	0.6423	0.5872	-468.81496	515.30271	-46.80520	2.96125	-40.22624	-19.87364	
16	0.6164	0.5523	-419.02862	466.77407	-48.83333	120.40143	-44.42372	-16.78310	
17	0.6152	0.5455	-451.93661	495.97123	-47.61668	287.11427	-50.83067	-21.70010	
18	0.6098	0.5477	-369.14926	402.34666	-38.17382	348.11330	-50.49336	-22.09266	
19	0.6089	0.5499	-301.75817	325.87796	-29.91583	380.66526	-51.27960	-23.15203	
20	0.6099	0.5533	-242.94117	259.94683	-23.13052	392.94891	-50.52609	-23.09676	
21	0.6132	0.5584	-206.16814	217.72873	-17.83230	403.63041	-52.74893	-24.49638	
22	0.6141	0.5638	-144.53460	150.54515	-11.05910	331.57653	-44.78274	-20.95722	
23	0.6149	0.5665	-126.30698	129.78409	-8.35448	331.02461	-46.59675	-21.84150	
24	0.6099	0.5656	-113.27195	114.18026	-5.54057	321.79664	-44.99350	-21.65724	
25	0.6118	0.5687	-102.50705	102.21298	-4.06913	319.28722	-46.76672	-22.40966	
clrn	-1	0.279537	0.279537	0.935693	0.982770				
frb	2	0.568980	0.627612	0.510349	0.964527				
tule	-5	0.787901	0.850524	0.725278	0.970249				

2014-11-09 04:42

1	0.6738	0.4579	86.68978	-348.40988	264.01717	-667.14758	2323.58270	-2263.62470
2	0.5911	0.2451	137.08210	-401.62344	291.76112	-794.84070	695.14997	-1093.71609

3	0.5496	0.2285	194.34185	-474.53088	325.72498	-883.30744	535.23780	-292.12520
4	0.5210	0.2197	249.01851	-604.90518	390.78114	-925.00765	289.82967	-198.34482
5	0.4676	0.2133	321.26979	-780.06952	473.68640	-1001.64594	184.25836	-122.97230
6	0.4367	0.2186	451.07463	-912.86700	459.83456	-1069.22187	124.26225	-126.55556
7	0.4166	0.2188	594.00302	-1093.92280	459.15740	-1151.65334	41.24282	-84.11815
8	0.4010	0.2380	840.32547	-1313.67402	380.83512	-1305.33899	-7.55580	-65.20791
9	0.4186	0.2634	1117.45670	-1454.71241	200.93292	-1446.36084	-39.68716	-41.88902
10	0.4298	0.2923	1412.38577	-1596.32742	4.98301	-1623.20069	-72.79474	-25.44260
11	0.4514	0.3216	1692.76502	-1724.06571	-190.89168	-1851.89580	-109.98512	10.02943
12	0.4830	0.3648	1892.00223	-1726.13122	-440.85196	-2057.05653	-146.37402	32.87158
13	0.5171	0.4059	1591.33175	-1241.29147	-621.70195	-1820.57646	-141.94690	51.95432
14	0.5011	0.4172	1316.62859	-765.05803	-841.12078	-1693.76596	-144.67395	58.54485
15	0.5033	0.4424	879.05507	-190.76198	-969.22541	-1431.97011	-124.43761	68.15988
16	0.5264	0.4562	472.07003	342.68210	-1073.63146	-1181.33465	-134.89603	82.15001
17	0.5458	0.4590	-73.50160	927.17880	-1080.00366	-872.06501	-115.77920	96.37078
18	0.5096	0.4357	-508.72985	1373.35147	-1062.71323	-637.28127	-101.75973	97.94451
19	0.5053	0.4418	-796.42837	1592.68910	-957.00036	-441.45127	-78.28823	104.93038
20	0.4967	0.4446	-1037.40695	1818.65608	-923.13446	-332.60268	-67.98757	108.09497
21	0.4864	0.4560	-1141.67727	1849.54314	-825.48250	-246.17646	-50.82083	117.03910
22	0.4750	0.4695	-1144.57497	1759.23978	-709.23023	-182.66740	-35.88433	120.28530
23	0.4637	0.4584	-1196.29996	1777.52719	-664.47993	-150.81843	-30.74972	121.47341
24	0.4550	0.4493	-1275.44109	1848.74722	-649.03464	-137.58786	-25.64173	117.08725
25	0.4452	0.4413	-1295.42943	1842.38242	-614.62871	-122.32501	-23.36827	118.83030

ink	4	0.231072	0.172810	0.289334	1.000000
res	3	0.279538	0.052011	0.432005	0.354598
tule	1	0.129193	0.024372	0.240832	0.122375

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6	0.7231	0.5285	-367.52377	134.03718	281.49038	54.12518	-140.89675	338.42276
7	0.7045	0.5343	-511.29857	77.27521	477.73409	62.07340	-99.88065	263.84668
8	0.6779	0.5426	-601.31729	42.63197	564.94196	65.45814	-70.77449	210.55605

9	0.6411	0.5290	-551.37575	131.95365	394.09593	66.95647	-53.57524	174.42522
10	0.6294	0.5170	-551.70122	260.66595	255.20668	79.75180	-47.43015	169.89217
11	0.6293	0.5057	-598.97693	390.60424	170.00390	98.84815	-43.28158	175.62489
12	0.6320	0.4976	-642.41946	496.05781	109.62108	115.77010	-37.05214	175.83544
13	0.6341	0.4939	-672.70019	572.61038	66.71726	128.55404	-29.71794	170.77654
14	0.6351	0.4905	-727.51423	662.17642	34.98385	151.82645	-17.05971	161.48761
15	0.6359	0.4849	-765.75499	725.49079	11.97582	163.30400	-9.90928	156.02271
16	0.6303	0.4666	-747.73012	719.22132	7.26407	163.52032	-12.10887	178.97531
17	0.6216	0.4497	-751.19981	736.36919	-2.20465	168.37940	-8.54734	172.73889
18	0.6352	0.4336	-1035.54777	1028.98227	-13.21400	229.52512	-16.41633	246.60890
19	0.6164	0.4195	-939.43084	947.00261	-22.61572	212.67872	-10.18186	216.35096
20	0.5940	0.4121	-903.96433	922.19580	-30.52483	208.57919	-5.23155	201.07331
21	0.5729	0.4026	-900.36155	927.78142	-37.90436	211.54503	-0.55783	192.83219
22	0.5569	0.3973	-894.23151	929.32151	-44.02853	213.76686	4.11067	183.79798
23	0.5445	0.3945	-846.01115	885.61942	-46.82744	205.30177	5.85753	167.13115
24	0.5334	0.3946	-875.19850	920.37157	-51.68983	218.23687	13.37792	159.33463
25	0.5238	0.3955	-907.45458	959.44104	-57.75936	229.33523	18.07000	156.80871
26	0.5214	0.3953	-842.54617	893.67572	-55.80928	211.03700	14.84767	148.03781
27	0.5167	0.3968	-831.98288	885.55001	-57.49935	209.90025	17.28445	138.16754
28	0.5124	0.3991	-867.73475	926.65170	-62.36482	221.36104	21.06908	135.13887
29	0.5084	0.4027	-905.71147	970.72168	-67.90146	234.50108	25.26733	131.42651
30	0.5065	0.4074	-894.12860	961.89958	-69.82710	235.53895	28.33470	119.64344

cb31 1 0.146800 0.154971 0.101981 0.183448
clrn -8 0.616818 0.616818 0.974982 0.995295
res 0 0.356505 0.278979 0.708538 0.434031
tule 3 0.457910 0.297426 0.777930 0.618394

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1	0.7391	0.6687	-34.44040	11.43154	22.75784	-13.50611	158.21291	-50.96455
2	0.6730	0.5731	-34.81223	-9.74563	52.56963	-18.70266	92.78643	17.06965

3	0.6492	0.5433	-45.24150	-14.91041	69.79850	-19.16342	58.95558	11.07134
4	0.6215	0.5112	-62.51274	-23.49494	95.59252	-20.70020	42.95645	8.50258
5	0.5797	0.4683	-86.70099	-33.52844	124.93739	-25.67483	34.14062	6.09460
6	0.5688	0.4590	-97.94579	-28.37392	126.79242	-33.63016	33.36573	5.59818
7	0.5771	0.4988	-108.63379	-21.64430	118.67247	-53.57360	26.70152	3.44874
8	0.6114	0.5390	-113.71372	2.90059	85.39543	-98.96592	25.81356	1.03494
9	0.6115	0.5178	-113.00355	46.08812	31.46978	-168.15134	27.53239	-1.79084
10	0.6115	0.5061	-93.85975	82.12576	-20.88380	-206.55734	24.21669	-3.84850
11	0.6205	0.5001	-82.51927	108.31653	-53.79206	-236.36608	20.29462	-5.19347
12	0.6269	0.4955	-67.90385	112.52803	-65.74406	-229.51762	15.78649	-5.42158
13	0.6271	0.5009	-60.95106	120.87556	-78.68190	-242.83450	13.89636	-6.02200
14	0.6275	0.5141	-49.45160	121.99803	-90.67053	-252.87535	12.47222	-6.62080
15	0.6273	0.5232	-32.55695	118.90718	-105.90575	-266.17443	11.65351	-7.53148
16	0.6344	0.5397	5.01826	96.19937	-121.38768	-254.43330	10.54123	-9.91306
17	0.6448	0.5607	36.86619	62.00415	-119.38981	-211.40943	8.21716	-8.82711
18	0.6603	0.5845	60.23120	33.14557	-114.11448	-167.01060	6.52049	-8.79464
19	0.6683	0.6006	72.36815	12.86521	-105.30636	-125.64698	5.74089	-8.70660
20	0.6762	0.6103	78.73238	-1.37465	-96.46092	-91.77572	4.18733	-8.70862
21	0.6830	0.6166	83.94331	-10.72261	-91.78992	-68.92554	2.90264	-9.10937
22	0.6874	0.6208	90.15041	-17.69448	-90.93049	-53.50613	1.72706	-9.90908
23	0.6889	0.6226	92.81427	-22.50227	-88.03231	-40.35466	0.47435	-10.47665
24	0.6938	0.6238	90.89229	-24.36645	-82.91852	-29.54634	0.18665	-10.87726
25	0.6959	0.6234	93.08471	-27.11936	-81.61982	-21.96564	-1.20525	-10.66589

frb	-3	0.570062	0.570062	0.976449	0.686675
kajq	0	0.534789	0.514516	0.555063	1.000000
nanl	-2	0.232857	0.231595	0.234119	0.990185
nwrl	2	0.479234	0.479234	0.968268	0.991066
schq	2	0.477815	0.477815	0.965674	1.000000