

# Foulger Consulting

---

**1025 Paradise Way**  
**Palo Alto, CA 94306-2637, USA**  
Tel: 650/493-2553  
Cell: 650/996-8886  
FAX: 866/532-6907  
gillian@foulgerconsulting.com  
<http://www.foulgerconsulting.com/>

October 8, 2014

## **WEEKLY REPORT #1 TO ALTA ROCK ENERGY INC.**

### **PROCESSING OF INDUCED EARTHQUAKES ASSOCIATED WITH THE NEWBERRY EGS INJECTION STARTING SEPTEMBER 2014**

**GILLIAN R. FOULGER & BRUCE R. JULIAN**



### *Brief summary*

*Ten earthquakes with  $M \geq 1.0$  that occurred up to 4 October were carefully re-processed, located, and moment tensors derived. Despite some difficulties with the data, that are currently being resolved, interim results were obtainable and these are mostly of excellent quality.*

*To date, we have only briefly assessed the results. The moment tensors mostly fall in the +Dipole to -Dipole range. Such a distribution is commonly seen in sets of earthquakes associated with hydrofracturing. There may be some indication that crack opening was more extreme toward the beginning of the 4-day period studied. Individual source types are most easily appreciated from the source-type plots in the upper right-hand panel of the graphical results shown in Appendix 3.*

*The T-axes, which are displayed, for example, in the P polarity plots in the graphical summaries in Appendix 3, mostly plunge at  $\sim 45^\circ$  and trend in the range south through southwest.*

## **1 Task 1 – Planning, conference calls, discussion of work, correspondence, follow-up**

In addition to conference calls and planning correspondence earlier in the year, we participated in conference calls August 20, September 3 and 24 and October 1. From August onward,  $\sim 200$  emails were exchanged and we maintained close communication with AltaRock, LBNL (Ernie Majer) and ISTI (Paul Friberg and others).

## **2 Task 2 – System Setup**

The first waveforms were made available to us by AltaRock via Dropbox 30 September 2014, and by direct transfer from AltaRock's server via VPN 4<sup>th</sup> October, 2014. A few days were required to integrate the data provided into the Foulger Consulting workflow. Details of this work will be provided in a future report.

As the moment-tensor derivation work got into full swing, some residual glitches surfaced. Significant issues that had to be dealt with include:

1. For the waveforms for most earthquakes, a few channels had a timing error of a few seconds, and
2. Some channels were missing.

An example is the earthquake of 20141004\_1851:

1. Only 39 out of 48 channels were available;
2. Channels NM08\_Z and NM42\_Z had  $\sim 2$ -s timing errors;
3. Channel NM08\_Z was not working properly, and the two horizontals are also suspect
4. Channel NN09\_N recorded monochromatic noise.

We are working with ISTI to overcome the problems of missing data and faulty timing. In the meantime, we are obtaining preliminary results using work-arounds and the partial dataset.



### 3 Task 3 – Quality control of pre-picked MEQs and preparation for relocation and moment tensor calculation

At AltaRock’s request, during the reporting period we focused on obtaining high-quality locations and moment tensors for the largest earthquakes. We quality controlled and re-measured arrival times for individual earthquakes as follows. This process provides data for accurate individual locations, and moment tensors.

1. The waveforms were imported into the Foulger Consulting interactive seismogram processing program *epick*;
2. In a first sweep through the data, *P*- and *S*-wave arrival times were measured and an initial location calculated;
3. In a second sweep through the data, each channel was re-processed, rotating the *Z*, *E*, and *N* channels to the earthquake epicenter, and displaying *U*, *R* (radial) and *T* (transverse) seismograms;
4. The seismograms were filtered with a 5-Hz high-frequency cut-off, *P*- and *S*-wave polarities and amplitudes were measured, and additional *S*-wave measurements were added where enhancement by the rotation process made this possible;
5. The earthquake was relocated, the residuals examined, and arrival-time measurements with large residuals are checked and corrected where appropriate.

The earthquakes processed to date are listed in Table 1. Foulger Consulting relocations are given in Appendix 1.

Table 1: The 10 earthquakes with  $M \geq 1.0$ , for which moment tensors were obtained. Locations given below are from the ISTI catalog.

yr	jday	month	day	hour	minute	sec	lat	lon	depth	magnitude
2014	274	10	1	12	3	16.881	43.72658	-121.3158	1.587	1.086
2014	274	10	1	14	53	5.102	43.72545	121.31355	0.613	1.381
2014	275	10	2	6	47	52.916	43.72632	121.31322	1.323	1.117
2014	275	10	2	7	7	11.646	43.72488	121.31192	0.708	1.378
2014	275	10	2	11	1	48.042	43.72567	121.31168	0.666	1.22
2014	276	10	3	6	6	22.727	43.72528	121.31493	0.928	1.157
2014	276	10	3	18	54	54.199	43.72678	121.31125	0.647	1.021
2014	277	10	4	1	19	33.657	43.72008	121.32708	1.048	1.357
2014	277	10	4	17	32	52.716	43.72207	121.31693	0.376	1.521
2014	277	10	4	18	51	11.991	43.72295	121.31227	0.496	1.97



#### 4 Task 4 –Relative locations

Relative location of all the earthquakes in the ISTI catalog is currently in hand and we expect to have preliminary results within a few days.

#### 5 Task 5 - Moment tensor calculations

Moment tensors were derived for the 10 earthquakes with  $M \geq 1.0$  that occurred up to 4 October. We used our in-house program *eqmec*. The numerical results are given in

Table 2. Graphical results are shown in Appendix 3.

In addition to the problems with the data, some additional complexities presented challenges. For example, the event of 20141002 1101 was preceded by a small foreshock that corrupted the first *P*-wave arrival. Nevertheless, excellent moment tensors were obtained for most of the events (

Table 2).

Table 2: Numerical moment tensor results for the 10 earthquakes with  $M \geq 1.0$  that occurred up to 10 Oct.

2.00E-01	-1.41E-01	-1.46E-01	1.40E-01	-8.71E-03	7.41E-02	2014	10	1	12	3	16.94	good
1.58E-01	3.47E-02	6.67E-02	2.48E-01	6.32E-02	8.34E-02	2014	10	1	14	53	5.23	excellent
2.17E-01	-3.67E-02	-6.42E-02	2.35E-01	7.20E-02	3.18E-02	2014	10	1	19	5	16.54	excellent
-1.46E-02	9.64E-02	-3.98E-01	2.60E-02	1.69E-01	-4.69E-03	2014	10	2	6	47	52.94	excellent
-1.17E-01	1.71E-01	-1.99E-01	1.39E-01	-2.43E-02	1.64E-02	2014	10	2	7	7	4.16	excellent
2.41E-01	-7.30E-02	-9.79E-02	1.73E-01	4.30E-02	8.35E-02	2014	10	2	11	1	42.38	excellent
6.07E-03	-2.23E-01	-9.16E-02	1.94E-01	3.37E-02	-6.18E-04	2014	10	3	6	6	22.76	excellent
-5.77E-02	-1.66E-01	-1.43E-01	1.46E-01	7.81E-02	-1.95E-02	2014	10	3	18	54	53.93	fair
-1.03E-01	1.33E-01	-1.19E-01	1.48E-01	5.51E-02	1.07E-01	2014	10	4	17	32	52.76	excellent
8.71E-02	1.26E-01	-4.19E-02	1.81E-01	8.43E-02	8.72E-02	2014	10	4	18	51	12	excellent

#### 6 Brief summary statement

The moment tensors obtained to date mostly fall in the +Dipole to -Dipole range. Such a distribution is commonly seen in sets of earthquakes associated with hydrofracturing. There may be some indication that crack opening was more extreme toward the beginning of the 4-day period studied. Individual source types are most easily appreciated from the source-type plots in the upper right-hand panel of the graphical results shown in Appendix 3.

The T-axes, which are displayed, for example, in the P polarity plots in the graphical summaries in Appendix 3, mostly plunge at  $\sim 45^\circ$  and trend in the range south through southwest.



## Appendix 1: Locations of the 10 largest earthquakes up to 4 October.

2014 Oct 1 14:53:20.145 UTC

Lat: 43.72651 Lon: -121.30910 Depth: 0.824 km  
43:43.590 N 121:18.546 W

STA	CHN	DELTA	j0	i0	j1	i1	PHASE	TIME	RES	SIGMA	WT	IMP	P	AMPLITUDE	FREQ
di0/dN		di0/dE	dj0/dN		dj0/dE										
NM03	EHU	2.92	11	118	11	158	P	1.138	0.005	0.038	0.98	0.00	-1	-6.172e+01	1.726e+01
NM03	EHR	2.92	11	118	11	157	S	1.807	-0.063	0.117	0.98	0.00	1	7.757e+02	1.358e+01
NM06	EHU	0.75	107	160	107	171	P	0.817	0.016	0.020	0.98	0.00	1	7.309e+02	1.242e+01
NM06	EHR	0.75	107	160	107	171	S	1.391	0.069	0.109	0.98	0.00	-1	-2.305e+03	2.169e+01
NM06	EHT	0.75	107	160	107	171	S	1.405	0.083	0.109	0.98	0.00	-1	-1.024e+03	1.205e+01
NM08	EHR	2.90	170	118	170	157	S	1.931	0.089	0.117	0.98	0.00	0	0.000e+00	0.000e+00
NM22	EHU	0.14	175	176	175	178	P	0.753	-0.010	0.019	0.97	0.00	1	1.161e+03	1.517e+01
NM22	EHR	0.14	175	176	175	178	S	1.295	0.035	0.108	0.98	0.00	-1	-4.579e+03	8.849e+00
NM22	EHT	0.14	175	176	175	178	S	1.257	-0.003	0.108	0.98	0.00	-1	-3.184e+03	1.540e+01
NM40	EHU	2.54	111	124	111	159	P	1.151	0.040	0.103	0.98	0.00	1	0.000e+00	0.000e+00
NM40	EHN	2.54	111	124	111	159	S	1.797	-0.036	0.115	0.98	0.00	-1	-2.664e+02	2.138e+01
NM40	EHT	2.54	111	124	111	159	S	1.806	-0.027	0.115	0.98	0.00	-1	-1.971e+02	1.210e+01
NM42	EHU	3.60	42	111	42	156	P	1.333	0.001	0.030	0.98	0.00	-1	-2.990e+02	1.107e+01
NM42	EHR	3.60	42	111	42	156	S	2.295	0.096	0.122	0.97	0.00	1	1.575e+03	1.711e+01
NM42	EHT	3.60	42	111	42	156	S	2.177	-0.022	0.122	0.98	0.00	-1	-6.571e+02	8.230e+00
NN07	EHU	3.06	335	114	335	157	P	0.972	0.009	0.028	0.98	0.00	-1	-1.963e+02	1.424e+01
NN07	EHR	3.06	335	114	335	157	S	1.561	-0.030	0.120	0.98	0.00	-1	-2.727e+02	2.582e+01
NN07	EHT	3.06	335	114	335	157	S	1.612	0.020	0.120	0.98	0.00	1	3.397e+02	1.471e+01
NN09	EHU	2.03	291	129	291	160	P	0.785	0.020	0.024	0.98	0.00	-1	-1.509e+01	2.286e+01
NN09	EHR	2.03	291	129	291	160	S	1.254	-0.010	0.063	0.98	0.00	-1	-1.474e+03	2.406e+01
NN09	EHT	2.03	291	129	291	160	S	1.301	0.037	0.114	0.98	0.00	-1	-9.974e+02	2.743e+01
NN17	EHZ	1.62	247	137	247	163	P	0.727	-0.008	0.022	0.98	0.00	1	1.094e+02	1.985e+01
NN17	EHR	1.62	247	137	247	163	S	1.233	0.018	0.112	0.98	0.00	-1	-1.619e+03	2.047e+01
NN17	EHT	1.62	247	137	247	163	S	1.224	0.010	0.112	0.98	0.00	1	1.358e+03	1.572e+01
NN18	EHZ	1.35	25	144	25	165	P	0.749	-0.001	0.021	0.98	0.00	-1	-2.989e+02	1.647e+01
NN18	EHR	1.35	25	144	25	165	S	1.258	0.018	0.110	0.98	0.00	1	2.406e+03	1.462e+01
NN18	EHT	1.35	25	144	25	165	S	1.285	0.045	0.110	0.98	0.00	-1	-7.653e+01	3.256e+01
NN19	EHU	0.93	169	154	169	169	P	0.689	0.003	0.020	0.98	0.00	1	7.179e+02	1.713e+01
NN19	EHR	0.93	169	154	169	169	S	1.171	0.038	0.109	0.98	0.00	-1	-1.335e+03	1.708e+01
NN19	EHT	0.93	169	154	169	169	S	1.158	0.025	0.109	0.98	0.00	-1	-6.589e+02	3.136e+01
NN21	EHZ	1.72	64	137	64	163	P	0.841	-0.008	0.022	0.98	0.00	-1	-6.455e+01	1.485e+01
NN21	EHR	1.72	64	137	64	163	S	1.329	-0.072	0.111	0.97	0.00	1	4.239e+02	1.542e+01
NN21	EHT	1.72	64	137	64	163	S	1.432	0.030	0.111	0.98	0.00	-1	-3.783e+02	2.844e+01
NN24	EHU	0.62	2	162	2	172	P	0.665	-0.016	0.019	0.97	0.00	-1	-2.176e+02	1.867e+01
NN24	EHR	0.62	2	162	2	172	S	1.087	-0.039	0.108	0.98	0.00	-1	-3.159e+03	1.757e+01
NN24	EHT	0.62	2	162	2	172	S	1.093	-0.033	0.108	0.98	0.00	1	6.795e+02	2.426e+01
NN32	EHU	2.92	210	116	210	157	P	0.912	-0.010	0.028	0.98	0.00	-1	-8.134e+00	1.169e+01
NN32	EHR	2.92	210	116	210	157	S	1.469	-0.054	0.119	0.98	0.00	-1	-5.128e+02	3.119e+01
NN32	EHT	2.92	210	116	210	157	S	1.529	0.006	0.119	0.98	0.00	1	6.086e+02	1.366e+01

2014 Oct 1 19:05:32.707 UTC

Lat: 43.72725 Lon: -121.30803 Depth: 0.900 km  
43:43.635 N 121:18.482 W

STA	CHN	DELTA	j0	i0	j1	i1	PHASE	TIME	RES	SIGMA	WT	IMP	P	AMPLITUDE	FREQ
di0/dN		di0/dE	dj0/dN		dj0/dE										
NM03	EHU	2.83	9	121	9	158	P	1.153	0.031	0.026	0.96	0.00	-1	-4.743e+01	1.728e+01
NM03	EHR	2.83	9	121	9	158	S	1.797	-0.057	0.117	0.98	0.00	1	6.583e+02	1.412e+01
NM03	EHT	2.83	9	121	9	158	S	1.802	-0.052	0.117	0.98	0.00	1	2.721e+02	2.117e+01
NM06	EHN	0.70	115	162	115	172	S	1.486	0.145	0.109	0.95	0.00	0	0.000e+00	0.000e+00
NM06	EHE	0.70	115	162	115	172	S	1.442	0.101	0.109	0.97	0.00	0	0.000e+00	0.000e+00
NM42	EHN	3.48	42	114	42	157	S	2.257	0.086	0.122	0.97	0.00	0	0.000e+00	0.000e+00
NM42	EHE	3.48	42	114	42	157	S	2.275	0.104	0.122	0.97	0.00	0	0.000e+00	0.000e+00
NN07	EHN	3.02	333	116	333	157	S	1.592	0.001	0.120	0.98	0.00	0	0.000e+00	0.000e+00
NN07	EHE	3.02	333	116	333	157	S	1.631	0.040	0.120	0.98	0.00	0	0.000e+00	0.000e+00
NN09	EHU	2.08	288	130	288	160	P	0.795	0.011	0.024	0.98	0.00	-1	-2.800e+00	9.547e+00
NN09	EHR	2.08	288	130	288	160	S	1.266	-0.030	0.115	0.98	0.00	-1	-1.013e+03	1.899e+01
NN09	EHT	2.08	288	130	288	160	S	1.312	0.016	0.115	0.98	0.00	-1	-9.672e+02	2.598e+01
NN17	EHU	1.73	245	136	245	163	P	0.741	-0.022	0.023	0.98	0.00	1	7.857e+01	2.055e+01



NN17	EHR	1.73	245	136	245	163	S	1.246	-0.015	0.112	0.98	0.00	-1	-1.158e+03	2.363e+01
NN17	EHT	1.73	245	136	245	163	S	1.234	-0.028	0.112	0.98	0.00	-1	-2.241e-05	1.600e+01
NN18	EHU	1.24	23	147	23	167	P	0.762	0.011	0.021	0.98	0.00	-1	-2.046e+02	1.561e+01
NN18	EHR	1.24	23	147	23	166	S	1.201	-0.039	0.110	0.98	0.00	-1	-2.856e+02	2.470e+01
NN18	EHT	1.24	23	147	23	166	S	1.313	0.073	0.110	0.97	0.00	1	9.706e+02	1.812e+01
NN19	EHU	1.00	175	153	175	169	P	0.701	-0.005	0.020	0.98	0.00	1	4.539e+02	1.708e+01
NN19	EHR	1.00	175	153	175	169	S	1.133	-0.035	0.110	0.98	0.00	1	2.710e+02	2.470e+01
NN19	EHT	1.00	175	153	175	169	S	1.170	0.002	0.110	0.98	0.00	-1	-4.846e+02	3.397e+01
NN21	EHE	1.61	66	140	66	164	S	1.297	-0.098	0.111	0.97	0.00	0	0.000e+00	0.000e+00
NN24	EHU	0.54	353	165	353	174	P	0.678	-0.015	0.020	0.98	0.00	-1	-1.542e+02	1.837e+01
NN24	EHR	0.54	353	165	353	174	S	1.103	-0.041	0.109	0.98	0.00	-1	-1.866e+03	1.910e+01
NN24	EHT	0.54	353	165	353	174	S	1.066	-0.078	0.109	0.98	0.00	1	4.470e+02	1.815e+01
NN32	EHU	3.04	211	116	211	157	P	-2.171	-3.121	inf	0.98	0.00	1	7.262e+01	1.822e+01
NN32	EHR	3.04	211	116	211	157	S	-1.974	-3.545	inf	0.98	0.00	-1	-7.399e+02	2.900e+01
NN32	EHT	3.04	211	116	211	157	S	-1.932	-3.503	inf	0.98	0.00	1	4.947e+02	2.459e+01

2014 Oct 4 17:33:07.355 UTC  
 Lat: 43.72660 Lon: -121.30958 Depth: 0.792 km  
 43:43.596 N 121:18.575 W

STA	CHN	DELTA	j0	i0	j1	i1	PHASE	TIME	RES	SIGMA	WT	IMP	P	AMPLITUDE	FREQ
di0/dN		di0/dE		dj0/dN		dj0/dE									
NM03	EHU	2.92	12	117	12	157	P	1.130	0.001	0.026	0.98	0.00	-1	-1.171e+02	1.573e+01
NM03	EHR	2.92	12	117	12	157	S	1.800	-0.064	0.117	0.98	0.00	1	2.296e+03	1.365e+01
NM03	EHE	2.92	12	117	12	157	S	1.873	0.009	0.117	0.98	0.00	0	0.000e+00	0.000e+00
NM08	EHN	2.91	169	117	169	157	S	1.880	0.039	0.117	0.98	0.00	1	1.639e+02	1.668e+01
NM22	EHU	0.16	161	175	161	178	P	0.744	-0.013	0.019	0.97	0.00	1	3.020e+03	1.368e+01
NM22	EHR	0.16	161	175	161	178	S	1.316	0.067	0.108	0.98	0.00	-1	-1.434e+04	1.288e+01
NM22	EHT	0.16	161	175	161	178	S	1.264	0.015	0.108	0.98	0.00	1	4.666e+03	2.083e+01
NM42	EHU	3.62	43	111	43	156	P	1.334	0.001	0.030	0.98	0.00	-1	-8.149e+02	1.070e+01
NM42	EHR	3.62	43	111	43	156	S	2.263	0.062	0.122	0.98	0.00	1	4.240e+03	1.209e+01
NM42	EHT	3.62	43	111	43	156	S	2.182	-0.019	0.122	0.98	0.00	-1	-1.455e+03	9.471e+00
NN07	EHU	3.03	336	114	336	157	P	0.961	0.006	0.028	0.98	0.00	-1	-5.471e+02	1.370e+01
NN09	EHU	1.99	292	129	292	160	P	0.764	0.010	0.024	0.98	0.00	-1	-1.125e+02	2.025e+01
NN09	EHR	1.99	292	129	292	160	S	1.241	-0.006	0.114	0.98	0.00	-1	-4.595e+03	1.013e+01
NN17	EHU	1.58	246	137	246	163	P	0.717	-0.008	0.022	0.98	0.00	1	4.758e+02	1.840e+01
NN17	EHR	1.58	246	137	246	163	S	1.214	0.015	0.111	0.98	0.00	-1	-3.737e+03	1.630e+01
NN17	EHT	1.58	246	137	246	163	S	1.209	0.011	0.111	0.98	0.00	1	3.781e+03	1.708e+01
NN18	EHU	1.36	26	143	26	165	P	0.749	0.003	0.021	0.98	0.00	-1	-6.821e+02	1.582e+01
NN18	EHR	1.36	26	143	26	165	S	1.265	0.032	0.110	0.98	0.00	1	5.113e+03	1.515e+01
NN18	EHT	1.36	26	143	26	165	S	1.301	0.068	0.110	0.98	0.00	1	3.982e+03	1.973e+01
NN19	EHU	0.94	167	153	167	169	P	0.689	0.008	0.020	0.98	0.00	1	1.717e+03	1.749e+01
NN19	EHR	0.94	167	153	167	169	S	1.193	0.067	0.109	0.98	0.00	-1	-1.457e+03	1.964e+01
NN19	EHT	0.94	167	153	167	169	S	1.152	0.026	0.109	0.98	0.00	-1	-1.126e+03	2.097e+01
NN21	EHU	1.75	65	135	65	162	P	0.845	-0.003	0.022	0.98	0.00	-1	-1.804e+02	1.423e+01
NN21	EHT	1.75	65	135	65	162	S	1.408	0.007	0.111	0.98	0.00	-1	-1.286e+03	2.413e+01
NN24	EHU	0.61	5	162	5	172	P	0.668	-0.007	0.019	0.98	0.00	-1	-4.371e+02	2.169e+01
NN24	EHR	0.61	5	162	5	172	S	1.098	-0.017	0.108	0.98	0.00	-1	-8.308e+03	2.140e+01
NN24	EHT	0.61	5	162	5	172	S	1.092	-0.022	0.108	0.98	0.00	1	1.793e+03	2.207e+01
NN32	EHU	2.91	210	115	210	157	P	-5.115	-6.032	inf	0.98	0.00	-1	-8.797e+01	1.532e+01

2014 Oct 4 18:51:27.825 UTC  
 Lat: 43.72602 Lon: -121.30946 Depth: 0.836 km  
 43:43.561 N 121:18.568 W

STA	CHN	DELTA	j0	i0	j1	i1	PHASE	TIME	RES	SIGMA	WT	IMP	P	AMPLITUDE	FREQ
di0/dN		di0/dE		dj0/dN		dj0/dE									
NM03	EHU	2.98	11	118	11	157	P	1.148	0.003	0.026	0.98	0.00	-1	-6.094e+02	1.656e+01
NM03	EHR	2.98	11	118	11	157	S	1.795	-0.095	0.117	0.97	0.00	1	1.075e+04	1.330e+01
NM22	EHU	0.10	155	177	155	179	P	0.759	-0.006	0.019	0.98	0.00	1	1.385e+04	1.326e+01
NM22	EHR	0.10	155	177	155	179	S	1.244	-0.020	0.108	0.98	0.00	1	2.015e+04	1.140e+01
NM22	EHT	0.10	155	177	155	179	S	1.279	0.016	0.108	0.98	0.00	-1	-3.239e+04	2.507e+01
NM41	EHU	2.26	139	128	139	160	P	1.016	-0.005	0.037	0.98	0.00	1	1.202e+03	1.273e+01
NM41	EHR	2.26	139	128	139	160	S	1.604	-0.081	0.114	0.98	0.00	-1	-1.021e+04	1.486e+01
NM41	EHT	2.26	139	128	139	160	S	1.659	-0.026	0.062	0.98	0.00	-1	-1.358e+04	1.757e+01
NM42	EHZ	3.66	42	111	42	156	P	-0.649	-1.994	inf	0.98	0.00	-1	0.000e+00	0.000e+00
NM42	EHE	3.66	42	111	42	156	S	2.346	0.126	0.123	0.97	0.00	0	0.000e+00	0.000e+00
NN07	EHZ	3.10	336	114	336	157	P	0.971	0.001	0.028	0.98	0.00	0	0.000e+00	0.000e+00
NN07	EHN	3.10	336	114	336	157	S	1.590	-0.014	0.120	0.98	0.00	0	0.000e+00	0.000e+00



NN09	EHU	2.02	293	129	293	160	P	0.773	0.008	0.024	0.98	0.00	-1	-3.764e+02	1.765e+01
NN09	EHR	2.02	293	129	293	160	S	1.255	-0.010	0.114	0.98	0.00	-1	-1.997e+04	1.255e+01
NN09	EHT	2.02	293	129	293	160	S	1.272	0.007	0.114	0.98	0.00	1	5.707e+03	2.665e+01
NN17	EHU	1.57	248	139	248	163	P	0.727	-0.004	0.022	0.98	0.00	1	4.084e+03	1.514e+01
NN17	EHR	1.57	248	139	248	163	S	1.224	0.018	0.112	0.98	0.00	-1	-1.603e+04	1.540e+01
NN17	EHT	1.57	248	139	248	163	S	1.219	0.013	0.058	0.98	0.00	1	1.663e+04	1.621e+01
NN18	EHU	1.41	25	143	25	165	P	0.760	-0.001	0.021	0.98	0.00	-1	-3.027e+03	1.542e+01
NN18	EHR	1.41	25	143	25	165	S	1.200	-0.057	0.110	0.98	0.00	-1	-3.240e+03	1.996e+01
NN18	EHT	1.41	25	143	25	165	S	1.300	0.044	0.110	0.98	0.00	-1	-2.704e+03	2.998e+01
NN19	EHU	0.88	167	155	167	170	P	0.700	0.016	0.020	0.97	0.00	1	7.953e+03	1.591e+01
NN19	EHR	0.88	167	155	167	170	S	1.179	0.049	0.109	0.98	0.00	-1	-9.036e+03	4.231e+01
NN19	EHT	0.88	167	155	167	170	S	1.163	0.033	0.109	0.98	0.00	-1	-5.832e+03	2.413e+01
NN21	EHU	1.77	63	136	63	162	P	0.863	0.005	0.022	0.98	0.00	-1	-7.856e+02	1.451e+01
NN21	EHR	1.77	63	136	63	162	S	1.396	-0.021	0.111	0.98	0.00	-1	-5.525e+03	9.318e+00
NN21	EHT	1.77	63	136	63	162	S	1.455	0.039	0.111	0.98	0.00	-1	-6.254e+03	2.733e+01
NN24	EHU	0.67	4	161	4	172	P	0.679	-0.008	0.019	0.98	0.00	-1	-2.073e+03	2.068e+01
NN24	EHR	0.67	4	161	4	172	S	1.115	-0.021	0.109	0.98	0.00	-1	-3.766e+04	1.996e+01
NN24	EHT	0.67	4	161	4	172	S	1.107	-0.029	0.109	0.98	0.00	1	8.479e+03	3.556e+01
NN32	EHU	2.86	211	117	211	157	P	0.895	-0.016	0.027	0.98	0.00	-1	-3.243e+02	1.513e+01
NN32	EHR	2.86	211	117	211	157	S	1.559	0.053	0.119	0.98	0.00	1	2.281e+04	1.093e+01
NN32	EHT	2.86	211	117	211	157	S	1.567	0.061	0.119	0.98	0.00	1	7.876e+03	1.652e+01

2014 Oct 1 12:03:31.644 UTC

Lat: 43.72540 Lon: -121.30867 Depth: 1.207 km  
43:43.524 N 121:18.520 W

STA	CHN	DELTA	j0	i0	j1	i1	PHASE	TIME	RES	SIGMA	WT	IMP	P	AMPLITUDE	FREQ
di0/dN		di0/dE		dj0/dN		dj0/dE									
NM03	EHU	3.04	10	124	10	159	P	1.196	0.001	0.028	0.98	0.00	-1	-3.100e+01	2.007e+01
NM03	EHR	3.04	10	124	10	159	S	1.989	0.014	0.120	0.98	0.00	1	7.964e+02	2.881e+01
NM06	EHZ	0.69	98	164	98	173	P	0.929	0.054	0.021	0.52	0.00	1	0.000e+00	0.000e+00
NM22	EHN	0.03	230	179	230	180	S	1.368	-0.026	0.110	0.98	0.00	-1	0.000e+00	0.000e+00
NM40	EHN	2.47	109	132	109	161	S	1.898	0.002	0.117	0.98	0.00	-1	0.000e+00	0.000e+00
NM42	EHU	3.67	40	118	40	158	P	1.380	-0.000	0.032	0.98	0.00	1	-2.451e+02	1.313e+01
NM42	EHR	3.67	40	118	40	158	S	2.381	0.102	0.125	0.97	0.00	-1	-1.137e+03	1.440e+01
NM42	EHT	3.67	40	118	40	158	S	2.368	0.090	0.125	0.97	0.00	1	1.098e+03	1.132e+01
NN07	EHU	3.19	335	121	335	158	P	1.028	0.004	0.030	0.98	0.00	-1	-6.976e+01	1.670e+01
NN07	EHR	3.19	335	121	335	158	S	1.728	0.034	0.123	0.98	0.00	-1	-4.112e+02	1.480e+01
NN09	EHU	2.11	294	135	294	162	P	0.848	0.016	0.026	0.97	0.00	-1	-4.984e+01	1.934e+01
NN09	EHR	2.11	294	135	294	162	S	1.364	-0.011	0.117	0.98	0.00	-1	-4.659e+02	2.544e+01
NN09	EHT	2.11	294	135	294	162	S	1.400	0.025	0.117	0.98	0.00	-1	-8.397e+02	1.551e+01
NN17	EHU	1.60	251	144	251	165	P	0.800	0.003	0.024	0.98	0.00	1	1.402e+01	2.620e+01
NN17	EHR	1.60	251	144	251	165	S	1.293	-0.024	0.114	0.98	0.00	1	1.879e+02	2.925e+01
NN17	EHT	1.60	251	144	251	165	S	1.293	-0.023	0.114	0.98	0.00	1	4.852e+02	1.185e+01
NN18	EHU	1.45	21	147	21	166	P	0.820	-0.010	0.023	0.98	0.00	-1	-1.371e+02	1.876e+01
NN18	EHR	1.45	21	147	21	166	S	1.368	-0.003	0.112	0.98	0.00	1	4.544e+02	1.869e+01
NN19	EHU	0.80	170	161	170	172	P	0.764	0.013	0.021	0.97	0.00	1	1.866e+02	1.808e+01
NN19	EHR	0.80	170	161	170	172	S	1.232	-0.008	0.111	0.98	0.00	1	7.447e+02	1.798e+01
NN21	EHZ	1.74	60	142	60	165	P	0.892	-0.022	0.023	0.97	0.00	-1	-5.902e+01	1.513e+01
NN24	EHU	0.74	359	162	359	172	P	0.748	-0.019	0.021	0.98	0.00	-1	-1.402e+02	1.831e+01
NN24	EHR	0.74	359	162	359	172	S	1.221	-0.047	0.111	0.98	0.00	-1	-7.148e+02	1.890e+01
NN24	EHT	0.74	359	162	359	172	S	1.216	-0.052	0.111	0.98	0.00	1	4.442e+02	2.181e+01
NN32	EHU	2.84	212	125	212	159	P	0.925	-0.022	0.029	0.98	0.00	1	5.945e+01	1.130e+01
NN32	EHR	2.84	212	125	212	159	S	1.541	-0.025	0.121	0.98	0.00	-1	-1.743e+02	1.837e+01
NN32	EHT	2.84	212	125	212	159	S	1.556	-0.009	0.121	0.98	0.00	1	1.398e+02	1.722e+01

2014 Oct 2 06:48:07.652 UTC

Lat: 43.72574 Lon: -121.30813 Depth: 1.175 km  
43:43.544 N 121:18.488 W

STA	CHN	DELTA	j0	i0	j1	i1	PHASE	TIME	RES	SIGMA	WT	IMP	P	AMPLITUDE	FREQ
di0/dN		di0/dE		dj0/dN		dj0/dE									
NM03	EHU	2.99	9	124	9	159	P	1.188	0.004	0.028	0.98	0.00	-1	-3.579e+01	1.906e+01
NM03	EHR	2.99	9	124	9	159	S	1.984	0.028	0.119	0.98	0.00	1	7.658e+02	1.035e+01
NM06	EHZ	0.66	101	165	101	173	P	0.888	0.022	0.021	0.97	0.00	-1	-5.268e+01	1.729e+01
NM06	EHN	0.66	101	165	101	173	S	1.499	0.070	0.110	0.98	0.00	-1	-7.360e+02	1.247e+01
NM22	EHZ	0.09	229	178	229	179	P	0.835	-0.003	0.020	0.98	0.00	1	1.257e+02	1.419e+01
NM22	EHN	0.09	229	178	229	179	S	1.368	-0.014	0.110	0.98	0.00	-1	-5.255e+02	1.350e+01
NM41	EHE	2.16	141	136	141	162	S	1.730	-0.010	0.115	0.98	0.00	-1	0.000e+00	0.000e+00



NM42	EHU	3.62	40	118	40	158	P	1.364	-0.002	0.031	0.98	0.00	-1	-3.035e+02	1.111e+01
NM42	EHR	3.62	40	118	40	157	S	2.362	0.107	0.125	0.97	0.00	-1	-1.597e+03	1.544e+01
NM42	EHT	3.62	40	118	40	157	S	2.360	0.105	0.125	0.97	0.00	1	1.464e+03	1.247e+01
NN07	EHU	3.17	334	120	334	158	P	1.022	0.004	0.030	0.98	0.00	-1	-9.658e+01	1.680e+01
NN07	EHR	3.17	334	120	334	158	S	1.722	0.039	0.123	0.98	0.00	-1	-4.929e+02	1.484e+01
NN09	EHU	2.13	293	134	293	162	P	0.848	0.017	0.026	0.98	0.00	-1	-5.880e+01	2.072e+01
NN09	EHR	2.13	293	134	293	162	S	1.356	-0.017	0.116	0.98	0.00	-1	-6.693e+02	2.666e+01
NN09	EHT	2.13	293	134	293	162	S	1.399	0.025	0.116	0.98	0.00	-1	-1.119e+03	1.975e+01
NN17	EHU	1.66	251	142	250	165	P	0.795	-0.003	0.024	0.98	0.00	1	1.753e+01	2.555e+01
NN17	EHR	1.66	251	142	250	165	S	1.329	0.010	0.114	0.98	0.00	-1	-6.313e+02	2.666e+01
NN17	EHT	1.66	251	142	250	165	S	1.301	-0.017	0.114	0.98	0.00	1	6.554e+02	1.760e+01
NN18	EHU	1.40	20	148	20	167	P	0.808	-0.010	0.022	0.98	0.00	-1	-1.796e+02	1.579e+01
NN18	EHR	1.40	20	148	20	167	S	1.364	0.013	0.112	0.98	0.00	1	6.117e+02	1.573e+01
NN19	EHU	0.83	173	160	173	171	P	0.757	0.010	0.021	0.98	0.00	1	2.424e+02	1.638e+01
NN19	EHR	0.83	173	160	173	171	S	1.223	-0.010	0.111	0.98	0.00	1	7.866e+02	2.710e+01
NN21	EHZ	1.69	61	143	61	165	P	0.887	-0.015	0.023	0.98	0.00	-1	-5.488e+01	1.539e+01
NN24	EHU	0.71	355	163	355	173	P	0.744	-0.014	0.021	0.97	0.00	-1	-1.750e+02	1.799e+01
NN24	EHR	0.71	355	163	355	173	S	1.201	-0.052	0.110	0.98	0.00	-1	-9.444e+02	2.226e+01
NN24	EHT	0.71	355	163	355	173	S	1.212	-0.041	0.110	0.98	0.00	1	5.084e+02	2.011e+01
NN32	EHU	2.89	213	123	213	159	P	0.931	-0.021	0.029	0.97	0.00	1	7.103e+01	1.293e+01
NN32	EHR	2.89	213	123	213	159	S	1.537	-0.038	0.121	0.98	0.00	-1	-2.267e+02	2.150e+01
NN32	EHT	2.89	213	123	213	159	S	1.557	-0.018	0.121	0.98	0.00	1	2.025e+02	1.354e+01

2014 Oct 2 07:07:19.637 UTC

Lat: 43.72629 Lon: -121.30910 Depth: 0.885 km  
43:43.578 N 121:18.546 W

STA	CHN	DELTA	j0	i0	j1	i1	PHASE	TIME	RES	SIGMA	WT	IMP	P	AMPLITUDE	FREQ
di0/dN		di0/dE	dj0/dN		dj0/dE										
NM03	EHU	2.95	11	119	11	158	P	1.154	0.011	0.040	0.98	0.00	-1	-5.387e+01	1.751e+01
NM03	EHR	2.95	11	119	11	158	S	1.936	0.048	0.117	0.98	0.00	1	1.427e+03	9.593e+00
NM06	EHU	0.75	105	160	105	172	P	0.843	0.031	0.029	0.97	0.00	1	6.534e+02	1.550e+01
NM06	EHR	0.75	105	160	105	172	S	1.439	0.097	0.109	0.97	0.00	-1	-2.334e+03	2.112e+01
NM06	EHT	0.75	105	160	105	172	S	1.483	0.142	0.052	0.55	0.00	1	6.989e+03	1.221e+01
NM22	EHU	0.12	174	177	174	179	P	0.763	-0.013	0.026	0.98	0.00	1	1.020e+03	1.532e+01
NM22	EHT	0.12	174	177	174	179	S	1.267	-0.015	0.108	0.98	0.00	-1	-2.707e+03	1.901e+01
NM41	EHT	2.26	140	129	140	160	S	1.645	-0.052	0.114	0.98	0.00	-1	-1.348e+03	1.377e+01
NM42	EHU	3.62	42	113	42	156	P	1.351	0.011	0.046	0.98	0.00	-1	-3.058e+02	1.144e+01
NM42	EHR	3.62	42	113	42	156	S	2.290	0.077	0.123	0.98	0.00	1	1.402e+03	1.811e+01
NM42	EHT	3.62	42	113	42	156	S	2.193	-0.020	0.123	0.98	0.00	-1	-6.947e+02	1.118e+01
NN07	EHU	3.08	335	116	335	157	P	0.983	0.011	0.029	0.98	0.00	-1	-1.919e+02	1.340e+01
NN07	EHR	3.08	335	116	335	157	S	1.571	-0.036	0.120	0.98	0.00	-1	-2.787e+02	2.112e+01
NN09	EHU	2.04	292	130	292	161	P	0.787	0.013	0.025	0.98	0.00	-1	-2.743e+01	1.983e+01
NN09	EHR	2.04	292	130	292	161	S	1.272	-0.008	0.114	0.98	0.00	-1	-1.448e+03	2.377e+01
NN09	EHT	2.04	292	130	292	161	S	1.311	0.031	0.114	0.98	0.00	-1	-1.108e+03	1.483e+01
NN17	EHU	1.61	247	139	247	163	P	0.743	-0.000	0.023	0.98	0.00	1	1.734e+02	2.042e+01
NN17	EHR	1.61	247	139	247	163	S	1.234	0.006	0.112	0.98	0.00	-1	-1.843e+03	2.238e+01
NN17	EHT	1.61	247	139	247	163	S	1.235	0.006	0.112	0.98	0.00	1	1.542e+03	1.407e+01
NN18	EHU	1.38	24	144	24	165	P	0.759	-0.005	0.024	0.98	0.00	-1	-3.199e+02	1.565e+01
NN18	EHR	1.38	24	144	24	165	S	1.200	-0.062	0.110	0.98	0.00	-1	-5.999e+02	2.080e+01
NN18	EHT	1.38	24	144	24	165	S	1.311	0.049	0.110	0.98	0.00	1	1.579e+03	1.380e+01
NN19	EHU	0.90	169	155	169	170	P	0.695	-0.000	0.021	0.98	0.00	1	7.141e+02	1.628e+01
NN19	EHR	0.90	169	155	169	170	S	1.148	-0.001	0.109	0.98	0.00	1	4.578e+02	2.516e+01
NN19	EHT	0.90	169	155	169	170	S	1.167	0.018	0.109	0.98	0.00	-1	-7.297e+02	2.240e+01
NN21	EHU	1.73	64	137	64	163	P	0.851	-0.008	0.025	0.98	0.00	-1	-9.752e+01	1.372e+01
NN21	EHR	1.73	64	137	64	163	S	1.296	-0.124	0.111	0.96	0.00	1	5.541e+02	1.356e+01
NN24	EHU	0.64	2	162	2	172	P	0.675	-0.020	0.021	0.97	0.00	-1	-2.630e+02	1.823e+01
NN24	EHR	0.64	2	162	2	172	S	1.095	-0.055	0.109	0.98	0.00	-1	-2.942e+03	1.606e+01
NN24	EHT	0.64	2	162	2	172	S	1.063	-0.087	0.109	0.97	0.00	1	6.421e+02	0.000e+00
NN32	EHU	2.90	211	117	211	157	P	0.911	-0.012	0.035	0.98	0.00	-1	-1.222e+01	2.118e+01
NN32	EHT	2.90	211	117	211	157	S	1.539	0.012	0.120	0.98	0.00	1	5.951e+02	1.119e+01

2014 Oct 2 11:01:58.257 UTC

Lat: 43.72671 Lon: -121.31007 Depth: 0.794 km  
43:43.603 N 121:18.604 W

STA	CHN	DELTA	j0	i0	j1	i1	PHASE	TIME	RES	SIGMA	WT	IMP	P	AMPLITUDE	FREQ
di0/dN		di0/dE	dj0/dN		dj0/dE										
NM03	EHU	2.92	13	117	13	157	P	1.151	0.022	0.026	0.97	0.00	-1	-4.089e+01	3.112e+01





NM06	EHU	0.84	107	157	107	170	P	0.822	0.020	0.020	0.97	0.00	1	7.520e+02	1.473e+01
NM06	EHR	0.84	107	157	107	170	S	1.396	0.073	0.109	0.98	0.00	-1	-1.609e+03	1.206e+01
NM06	EHT	0.84	107	157	107	170	S	1.466	0.143	0.109	0.96	0.00	1	3.586e+03	1.242e+01
NM08	EHN	2.93	169	117	169	157	S	1.957	0.109	0.117	0.97	0.00	-1	0.000e+00	0.000e+00
NM22	EHU	0.19	151	175	151	178	P	0.738	-0.020	0.019	0.97	0.00	1	9.007e+02	1.440e+01
NM42	EHZ	3.64	43	110	43	156	P	-0.667	-2.004	inf	0.98	0.00	0	0.000e+00	0.000e+00
NM42	EHR	3.64	43	110	43	156	S	2.241	0.034	0.123	0.98	0.00	1	1.513e+03	1.269e+01
NM42	EHT	3.64	43	110	43	156	S	2.243	0.036	0.123	0.98	0.00	1	1.662e+03	5.736e+00
NN07	EHU	3.01	336	114	336	157	P	0.955	0.005	0.028	0.98	0.00	-1	-1.242e+02	1.610e+01
NN07	EHT	3.01	336	114	336	157	S	1.508	-0.062	0.119	0.98	0.00	1	4.503e+02	6.950e+00
NN09	EHU	1.95	292	130	292	161	P	0.761	0.013	0.024	0.98	0.00	1	6.596e+01	1.857e+01
NN09	EHR	1.95	292	130	292	160	S	1.222	-0.014	0.114	0.98	0.00	-1	-1.183e+03	1.095e+01
NN09	EHT	1.95	292	130	292	160	S	1.262	0.027	0.114	0.98	0.00	-1	-5.299e+02	1.617e+01
NN17	EHU	1.55	245	138	245	163	P	0.719	-0.002	0.022	0.98	0.00	1	4.322e+01	2.780e+01
NN17	EHR	1.55	245	138	245	163	S	1.215	0.022	0.111	0.98	0.00	-1	-7.004e+02	2.187e+01
NN17	EHT	1.55	245	138	245	163	S	1.203	0.011	0.111	0.98	0.00	1	1.605e+03	1.927e+01
NN18	EHU	1.37	28	143	28	165	P	0.738	-0.009	0.021	0.98	0.00	-1	-1.542e+02	1.837e+01
NN18	EHR	1.37	28	143	28	165	S	1.241	0.006	0.110	0.98	0.00	1	1.887e+03	1.302e+01
NN19	EHU	0.97	165	153	165	168	P	0.687	0.003	0.020	0.98	0.00	1	4.202e+02	2.131e+01
NN19	EHR	0.97	165	153	165	168	S	1.136	0.006	0.109	0.98	0.00	-1	-3.790e+02	3.788e+01
NN19	EHT	0.97	165	153	165	168	S	1.169	0.039	0.109	0.98	0.00	-1	-1.876e+02	4.374e+01
NN21	EHU	1.78	66	135	66	162	P	0.837	-0.016	0.022	0.97	0.00	-1	-5.218e+01	1.436e+01
NN21	EHR	1.78	66	135	66	162	S	1.392	-0.017	0.111	0.98	0.00	-1	-4.966e+02	1.927e+01
NN21	EHT	1.78	66	135	66	162	S	1.396	-0.013	0.111	0.98	0.00	-1	-2.787e+02	1.624e+01
NN24	EHU	0.60	9	163	9	173	P	0.667	-0.008	0.019	0.98	0.00	-1	-1.230e+01	4.208e+01
NN24	EHR	0.60	9	163	9	173	S	1.086	-0.028	0.108	0.98	0.00	-1	-2.422e+03	2.430e+01
NN24	EHT	0.60	9	163	9	173	S	1.094	-0.020	0.108	0.98	0.00	-1	-7.408e+02	1.747e+01
NN32	EHU	2.90	209	115	209	157	P	0.894	-0.022	0.039	0.98	0.00	-1	-4.346e+01	1.787e+01
NN32	EHT	2.90	209	115	209	157	S	1.503	-0.010	0.119	0.98	0.00	1	3.635e+02	1.482e+01

2014 Oct 3 06:06:37.324 UTC

Lat: 43.72613 Lon: -121.31028 Depth: 0.944 km  
43:43.568 N 121:18.617 W

STA	CHN	DELTA	j0	i0	j1	i1	PHASE	TIME	RES	SIGMA	WT	IMP	P	AMPLITUDE	FREQ
di0/dN		di0/dE		dj0/dN		dj0/dE									
NM03	EHU	2.98	13	120	13	158	P	1.164	0.008	0.027	0.98	0.00	-1	-3.058e+01	1.865e+01
NM03	EHT	2.98	13	120	13	158	S	1.891	-0.018	0.118	0.98	0.00	1	7.108e+02	1.195e+01
NM06	EHU	0.84	102	159	102	171	P	0.847	0.017	0.020	0.98	0.00	1	4.173e+02	1.323e+01
NM06	EHR	0.84	102	159	102	171	S	1.506	0.134	0.109	0.96	0.00	1	2.825e+03	9.570e+00
NM06	EHT	0.84	102	159	102	171	S	1.499	0.128	0.109	0.96	0.00	1	3.058e+03	1.123e+01
NM22	EHU	0.15	133	176	133	178	P	0.752	-0.037	0.019	0.91	0.00	1	6.829e+02	1.136e+01
NM22	EHT	0.15	133	176	133	178	S	1.447	0.145	0.109	0.96	0.00	-1	-3.942e+03	1.001e+01
NM42	EHU	3.70	43	113	43	157	P	1.370	0.010	0.031	0.98	0.00	-1	-1.913e+02	1.291e+01
NM42	EHR	3.70	43	113	43	156	S	2.316	0.070	0.124	0.98	0.00	1	9.174e+02	1.266e+01
NM42	EHT	3.70	43	113	43	156	S	2.370	0.124	0.124	0.97	0.00	1	8.188e+02	1.264e+01
NN07	EHZ	3.06	337	117	337	157	P	0.978	0.005	0.028	0.98	0.00	-1	-8.978e+01	1.382e+01
NN09	EHU	1.96	294	133	294	161	P	0.787	0.017	0.024	0.98	0.00	1	1.356e+01	1.658e+01
NN09	EHR	1.96	294	133	294	161	S	1.259	-0.013	0.114	0.98	0.00	-1	-5.092e+02	2.642e+01
NN09	EHT	1.96	294	133	294	161	S	1.287	0.015	0.114	0.98	0.00	-1	-4.948e+02	2.613e+01
NN17	EHU	1.51	247	142	247	164	P	0.743	0.003	0.022	0.98	0.00	1	3.209e+01	2.571e+01
NN17	EHR	1.51	247	142	247	164	S	1.239	0.016	0.112	0.98	0.00	-1	-6.754e+02	1.262e+01
NN17	EHT	1.51	247	142	247	164	S	1.231	0.008	0.112	0.98	0.00	1	8.922e+02	1.556e+01
NN18	EHU	1.43	27	144	27	165	P	0.776	-0.005	0.021	0.98	0.00	-1	-8.830e+01	1.826e+01
NN18	EHR	1.43	27	144	27	165	S	1.259	-0.031	0.111	0.98	0.00	1	1.191e+03	1.170e+01
NN19	EHU	0.91	163	156	163	170	P	0.715	0.008	0.020	0.98	0.00	1	3.789e+02	1.732e+01
NN19	EHR	0.91	163	156	163	170	S	1.274	0.106	0.110	0.97	0.00	1	5.767e+02	1.913e+01
NN19	EHT	0.91	163	156	163	170	S	1.123	-0.045	0.110	0.98	0.00	-1	-2.248e+02	9.095e+00
NN21	EHZ	1.82	65	137	65	163	P	0.872	-0.011	0.022	0.97	0.00	-1	-3.862e+01	1.564e+01
NN21	EHN	1.82	65	137	65	163	S	1.432	-0.025	0.112	0.98	0.00	-1	-2.572e+02	1.913e+01
NN24	EHU	0.67	10	162	10	172	P	0.695	-0.014	0.020	0.97	0.00	-1	-3.319e+01	3.106e+01
NN24	EHR	0.67	10	162	10	172	S	1.119	-0.052	0.109	0.98	0.00	-1	-1.682e+03	2.010e+01
NN32	EHZ	2.84	209	119	209	158	P	0.908	-0.010	0.028	0.98	0.00	-1	-2.207e+01	1.345e+01
NN32	EHE	2.84	209	119	209	158	S	1.601	0.084	0.119	0.98	0.00	-1	0.000e+00	0.000e+00

2014 Oct 3 18:55:09.929 UTC

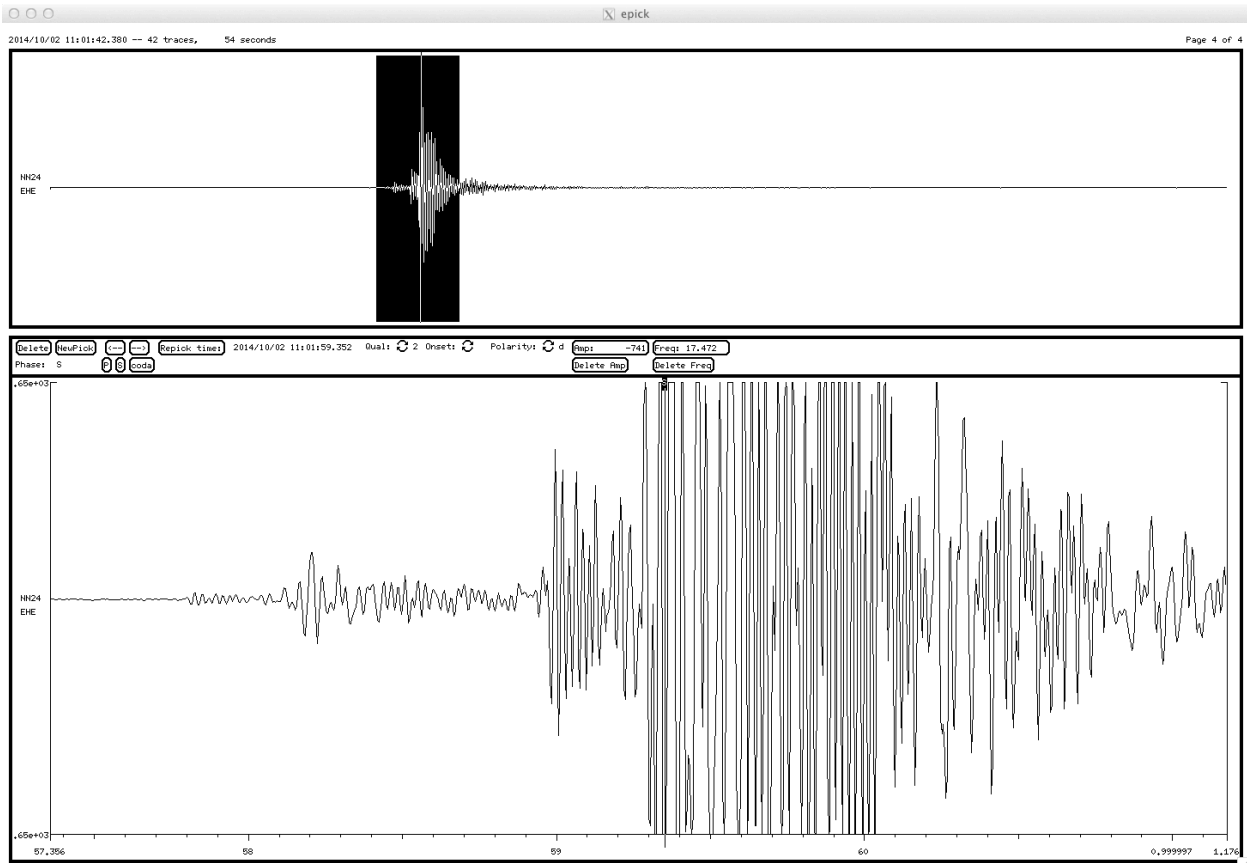
Lat: 43.72644 Lon: -121.31005 Depth: 0.943 km  
43:43.586 N 121:18.603 W



STA	CHN	DELTA	j0	i0	j1	i1	PHASE	TIME	RES	SIGMA	WT	IMP	P	AMPLITUDE	FREQ
di0/dN		di0/dE		dj0/dN		dj0/dE									
NM03	EHZ	2.95	12	120	12	158	P	-0.806	-1.955	inf	0.98	0.00	0	0.000e+00	0.000e+00
NM42	EHZ	3.66	43	114	43	157	P	1.383	0.030	0.104	0.98	0.00	0	0.000e+00	0.000e+00
NN07	EHU	3.04	336	117	336	157	P	-1.007	-1.976	inf	0.98	0.00	-1	-5.663e+01	1.675e+01
NN07	EHT	3.04	336	117	336	157	S	1.621	0.019	0.120	0.98	0.00	1	1.100e+02	2.314e+01
NN09	EHU	1.96	292	132	292	161	P	0.779	0.008	0.024	0.98	0.00	1	1.033e+01	1.266e+01
NN09	EHR	1.96	292	132	292	161	S	1.257	-0.016	0.114	0.98	0.00	-1	-5.076e+02	1.198e+01
NN09	EHT	1.96	292	132	292	161	S	1.295	0.022	0.114	0.98	0.00	-1	-4.008e+02	4.320e+01
NN17	EHU	1.54	246	141	246	164	P	0.744	0.000	0.022	0.98	0.00	1	1.747e+01	2.457e+01
NN17	EHR	1.54	246	141	246	164	S	1.244	0.015	0.112	0.98	0.00	-1	-4.403e+02	1.369e+01
NN17	EHT	1.54	246	141	246	164	S	1.237	0.007	0.112	0.98	0.00	1	4.919e+02	1.767e+01
NN18	EHU	1.39	27	145	27	166	P	0.773	-0.003	0.021	0.98	0.00	-1	-7.628e+01	1.733e+01
NN18	EHR	1.39	27	145	27	165	S	1.210	-0.072	0.111	0.98	0.00	-1	-2.079e+02	1.721e+01
NN19	EHU	0.94	165	155	165	170	P	0.720	0.010	0.020	0.98	0.00	1	2.188e+02	1.907e+01
NN19	EHT	0.94	165	155	165	169	S	1.192	0.020	0.110	0.98	0.00	-1	-9.710e+01	4.981e+01
NN21	EHZ	1.79	65	137	65	163	P	0.881	0.003	0.022	0.98	0.00	0	0.000e+00	0.000e+00
NN24	EHZ	0.63	9	163	9	173	P	0.701	-0.006	0.020	0.98	0.00	0	0.000e+00	0.000e+00
NN24	EHN	0.63	9	163	9	173	S	1.125	-0.043	0.109	0.98	0.00	0	0.000e+00	0.000e+00
NN32	EHZ	2.88	209	119	209	158	P	0.907	-0.018	0.028	0.98	0.00	0	0.000e+00	0.000e+00



### Appendix 2: Event 20141002\_110148 – preceded by a small foreshock.





### Appendix 3: Moment tensors of the 10 largest earthquakes up to 4 October.

2014 Oct 1 12: 3:31.644 UTC  
 Lat: 43.7254 Lon: -121.309 Depth: 1.207  
 43:43.524 N 121:18.5202 W

Solve

Sta	Dist	Az	i	Chan	Phase	Resid	Polarity	Penalty	Amp	Freq
1	NM03	3.04	10	124	EHU	P	0.001	<input checked="" type="checkbox"/> -	<input checked="" type="checkbox"/> -3.10e+01	2.01e+01
2	NM03	3.04	10	124	EHR	SV	0.014	<input checked="" type="checkbox"/> -	<input checked="" type="checkbox"/> -7.96e+02	2.88e+01
3	NM06	0.69	98	164	EHZ	P	0.054	<input checked="" type="checkbox"/> +		
4	NM22	0.03	230	179	EHN	SN	-0.026	<input checked="" type="checkbox"/> -		
5	NM40	2.47	109	132	EHN	SN	0.002	<input checked="" type="checkbox"/> -		
6	NM42	3.67	40	118	EHU	P	0.000	<input type="checkbox"/> +	<input checked="" type="checkbox"/> -2.45e+02	1.31e+01
7	NM42	3.67	40	118	EHR	SV	0.102	<input checked="" type="checkbox"/> +	<input checked="" type="checkbox"/> 1.14e+03	1.44e+01
8	NM42	3.67	40	118	EHT	SH	0.090	<input checked="" type="checkbox"/> -	<input checked="" type="checkbox"/> -1.10e+03	1.13e+01
9	NN07	3.19	335	121	EHU	P	0.004	<input type="checkbox"/> -	<input checked="" type="checkbox"/> -6.98e+01	1.67e+01
10	NN07	3.19	335	121	EHR	SV	0.034	<input type="checkbox"/> +	<input checked="" type="checkbox"/> 4.11e+02	1.48e+01
11	NN09	2.11	294	135	EHU	P	0.016	<input checked="" type="checkbox"/> -	<input checked="" type="checkbox"/> -4.98e+01	1.93e+01
12	NN09	2.11	294	135	EHR	SV	-0.011	<input checked="" type="checkbox"/> +	<input checked="" type="checkbox"/> 4.66e+02	2.54e+01
13	NN09	2.11	294	135	EHT	SH	0.025	<input checked="" type="checkbox"/> +	<input checked="" type="checkbox"/> 8.40e+02	1.55e+01
14	NN17	1.60	251	144	EHU	P	0.003	<input checked="" type="checkbox"/> +	<input checked="" type="checkbox"/> 1.40e+01	2.62e+01
15	NN17	1.60	251	144	EHR	SV	-0.024	<input type="checkbox"/> -	<input checked="" type="checkbox"/> -1.88e+02	2.92e+01

North East Down  
 North 2.00e-01 -1.41e-01 1.40e-01  
 East -1.41e-01 -1.46e-01 -8.71e-03  
 Down 1.40e-01 -8.71e-03 7.41e-02

Scalar M0 = 2.703e-01  
 T = -0.255 k = 0.132

Total Penalty = 0.152

**POLARITIES**

**AMPLITUDE RATIOS**

Sta	Type	Penalty
1	<input checked="" type="checkbox"/> P:SV	0.004
2	<input type="checkbox"/> P:SV	
3	<input checked="" type="checkbox"/> P:SH	
4	<input type="checkbox"/> SV:SH	
5	<input checked="" type="checkbox"/> P:SV	0.016
6	<input checked="" type="checkbox"/> P:SV	0.008
7	<input checked="" type="checkbox"/> P:SH	
8	<input checked="" type="checkbox"/> SV:SH	0.020
9	<input checked="" type="checkbox"/> P:SV	0.049
10	<input checked="" type="checkbox"/> P:SH	
11	<input type="checkbox"/> SV:SH	
12	<input type="checkbox"/> P:SV	
13	<input checked="" type="checkbox"/> P:SV	
14	<input type="checkbox"/> P:SV	
15	<input checked="" type="checkbox"/> P:SH	0.052



/Users/foulger/SeismicProcessing/Newberry/Data/2014/10/01/20141001\_145305.23.or

---

2014 Oct 1 14:53:20.145 UTC  
 Lat: 43.7265 Lon: -121.309 Depth: 0.824  
 43:43.5906 N 121:18.546 W

Solve

North East Down  
 North 1.58e-01 3.47e-02 2.48e-01  
 East 3.47e-02 6.67e-02 6.32e-02  
 Down 2.48e-01 6.32e-02 8.34e-02

Scalar M0 = 2.915e-01  
 T = -0.331 k = 0.266

Total Penalty = 0.166

Sta	Dist	Az	i	Chan	Phase	Resid	Polarity	Penalty	Amp	Freq
1	NM03	2.92	11	118	EHU	P	0.005	<input checked="" type="checkbox"/> -	-6.17e+01	1.73e+01
2	NM03	2.92	11	118	EHR	SV	-0.063	<input checked="" type="checkbox"/> -	-7.76e+02	1.36e+01
3	NM06	0.75	107	160	EHU	P	0.016	<input checked="" type="checkbox"/> +	7.31e+02	1.24e+01
4	NM06	0.75	107	160	EHR	SV	0.069	<input checked="" type="checkbox"/> +	2.30e+03	2.17e+01
5	NM06	0.75	107	160	EHT	SH	0.083	<input checked="" type="checkbox"/> +	1.02e+03	1.21e+01
6	NM08	2.90	170	118	EHR	SV	0.089	<input checked="" type="checkbox"/> +		
7	NM22	0.14	175	176	EHU	P	-0.010	<input checked="" type="checkbox"/> +	1.16e+03	1.52e+01
8	NM22	0.14	175	176	EHR	SV	0.035	<input type="checkbox"/> +	4.58e+03	8.85e+00
9	NM22	0.14	175	176	EHT	SH	-0.003	<input checked="" type="checkbox"/> +	3.18e+03	1.54e+01
10	NM40	2.54	111	124	EHU	P	0.040	<input checked="" type="checkbox"/> +		
11	NM40	2.54	111	124	EHN	SN	-0.036	<input checked="" type="checkbox"/> -	-2.66e+02	2.14e+01
12	NM40	2.54	111	124	EHT	SH	-0.027	<input checked="" type="checkbox"/> +	1.97e+02	1.21e+01
13	NM42	3.60	42	111	EHU	P	0.001	<input checked="" type="checkbox"/> -	-2.99e+02	1.11e+01
14	NM42	3.60	42	111	EHR	SV	0.096	<input checked="" type="checkbox"/> -	-1.58e+03	1.71e+01
15	NM42	3.60	42	111	EHT	SH	-0.022	<input checked="" type="checkbox"/> +	6.57e+02	8.23e+00

Sta	Type	Penalty
1	<input checked="" type="checkbox"/> P-SV	
2	<input type="checkbox"/> P-SV	
3	<input type="checkbox"/> P-SH	
4	<input type="checkbox"/> SV-SH	
5	<input type="checkbox"/> P-SV	
6	<input checked="" type="checkbox"/> P-SH	
7	<input type="checkbox"/> SV-SH	
8	<input type="checkbox"/> P-SV	
9	<input checked="" type="checkbox"/> P-SH	
10	<input type="checkbox"/> SV-SH	
11	<input checked="" type="checkbox"/> P-SV	0.037
12	<input checked="" type="checkbox"/> P-SH	0.027
13	<input type="checkbox"/> SV-SH	
14	<input type="checkbox"/> P-SV	
15	<input type="checkbox"/> P-SH	

POLARITIES

AMPLITUDE RATIOS



/Users/foulger/SeismicProcessing/Newberry/Data/2014/10/01/20141001\_190516.54.or

2014 Oct 1 19: 5:32.705 UTC  
 Lat: 43.7273 Lon: -121.308 Depth: 0.911  
 43:43.6374 N 121:18.48 W

Solve

Sta	Dist	Az	i	Chan	Phase	Resid	Polarity	Penalty	Amp	Freq
1	NM03	2.82	9	121	EHU	P	0.033	<input checked="" type="checkbox"/> -	<input checked="" type="checkbox"/> -4.74e+01	1.73e+01
2	NM03	2.82	9	121	EHR	SV	-0.055	<input checked="" type="checkbox"/> -	<input checked="" type="checkbox"/> -6.58e+02	1.41e+01
3	NM03	2.82	9	121	EHT	SH	-0.050	<input checked="" type="checkbox"/> -	<input checked="" type="checkbox"/> -2.72e+02	2.12e+01
4	NM06	0.70	116	162	EHN	SN	0.143			
5	NM06	0.70	116	162	EHE	SE	0.099			
6	NM42	3.48	42	115	EHN	SN	0.088			
7	NM42	3.48	42	115	EHE	SE	0.106			
8	NN07	3.02	333	117	EHN	SN	0.003			
9	NN07	3.02	333	117	EHE	SE	0.041			
10	NN09	2.08	288	130	EHU	P	0.011	<input checked="" type="checkbox"/> -	<input checked="" type="checkbox"/> -2.80e+00	9.55e+00
11	NN09	2.08	288	130	EHR	SV	-0.031	<input checked="" type="checkbox"/> +	<input checked="" type="checkbox"/> 1.01e+03	1.90e+01
12	NN09	2.08	288	130	EHT	SH	0.015	<input checked="" type="checkbox"/> + 0.072	<input checked="" type="checkbox"/> 9.67e+02	2.60e+01
13	NN17	1.73	245	137	EHU	P	-0.023	<input checked="" type="checkbox"/> +	<input checked="" type="checkbox"/> 7.86e+01	2.06e+01
14	NN17	1.73	245	137	EHR	SV	-0.017	<input checked="" type="checkbox"/> +	<input checked="" type="checkbox"/> 1.16e+03	2.36e+01
15	NN17	1.73	245	137	EHT	SH	-0.030	<input checked="" type="checkbox"/> +	<input checked="" type="checkbox"/> 2.24e+05	1.60e+01

North East Down  
 North 2.17e-01 -3.67e-02 2.35e-01  
 East -3.67e-02 -6.42e-02 7.20e-02  
 Down 2.35e-01 7.20e-02 3.18e-02

Scalar M0 = 2.962e-01  
 T = -0.453 k = 0.163

Total Penalty = 0.180

POLARITIES

AMPLITUDE RATIOS

Sta	Type	Penalty
1	<input checked="" type="checkbox"/> P:SV	
2	<input checked="" type="checkbox"/> P:SH	
3	<input checked="" type="checkbox"/> SV:SH	
4	<input checked="" type="checkbox"/> P:SV	0.000
5	<input checked="" type="checkbox"/> P:SH	0.001
6	<input checked="" type="checkbox"/> SV:SH	0.093
7	<input type="checkbox"/> P:SV	
8	<input type="checkbox"/> P:SH	
9	<input type="checkbox"/> SV:SH	
10	<input checked="" type="checkbox"/> P:SV	
11	<input type="checkbox"/> P:SH	
12	<input type="checkbox"/> SV:SH	
13	<input type="checkbox"/> P:SV	
14	<input checked="" type="checkbox"/> P:SH	
15	<input type="checkbox"/> SV:SH	



/Users/foulger/SeismicProcessing/Newberry/Data/2014/10/02/Old/20141002\_064752\_94.or

---

2014 Oct 2 6:48: 7.652 UTC  
 Lat: 43.7257 Lon: -121.308 Depth: 1.175  
 43:43.5444 N 121:18.4878 W

Solve

North East Down  
 North -1.46e-02 9.64e-02 2.59e-02  
 East 9.64e-02 -3.98e-01 1.69e-01  
 Down 2.59e-02 1.69e-01 -4.69e-03

Scalar M0 = 3.432e-01  
 T = 0.619 k = -0.293

Total Penalty = 0.198

Sta	Dist	Az	i	Chan	Phase	Resid	Polarity	Penalty	Amp	Freq
1	NM03	2.99	9	124	EHU	P	0.004		-3.58e+01	1.91e+01
2	NM03	2.99	9	124	EHR	SV	0.028		-7.66e+02	1.03e+01
3	NM06	0.66	101	165	EHZ	P	0.022		-5.27e+01	1.73e+01
4	NM06	0.66	101	165	EHN	SN	0.070		-7.36e+02	1.25e+01
5	NM22	0.09	229	178	EHZ	P	-0.003		1.26e+02	1.42e+01
6	NM22	0.09	229	178	EHN	SN	-0.014		-5.26e+02	1.35e+01
7	NM41	2.16	141	136	EHE	SE	-0.010			
8	NM42	3.62	40	118	EHU	P	-0.002		-3.04e+02	1.11e+01
9	NM42	3.62	40	118	EHR	SV	0.107		1.60e+03	1.54e+01
10	NM42	3.62	40	118	EHT	SH	0.105		-1.46e+03	1.25e+01
11	NN07	3.17	334	120	EHU	P	0.004		-9.66e+01	1.68e+01
12	NN07	3.17	334	120	EHR	SV	0.039		4.93e+02	1.48e+01
13	NN09	2.13	293	134	EHU	P	0.017		-5.88e+01	2.07e+01
14	NN09	2.13	293	134	EHR	SV	-0.017		6.69e+02	2.67e+01
15	NN09	2.13	293	134	EHT	SH	0.025	0.011	1.12e+03	1.98e+01

Sta	Type	Penalty
1	<input checked="" type="checkbox"/> P-SV	0.040
2	<input checked="" type="checkbox"/> P-SN	0.025
3	<input type="checkbox"/> P-SV	
4	<input checked="" type="checkbox"/> P-SH	0.018
5	<input type="checkbox"/> SV-SH	
6	<input checked="" type="checkbox"/> P-SV	
7	<input checked="" type="checkbox"/> P-SV	
8	<input type="checkbox"/> P-SH	
9	<input type="checkbox"/> SV-SH	
10	<input checked="" type="checkbox"/> P-SV	0.037
11	<input checked="" type="checkbox"/> P-SH	0.035
12	<input checked="" type="checkbox"/> SV-SH	0.011
13	<input type="checkbox"/> P-SV	
14	<input checked="" type="checkbox"/> P-SV	0.004
15	<input checked="" type="checkbox"/> P-SV	

POLARITIES

AMPLITUDE RATIOS



/Users/foulger/SeismicProcessing/Newberry/Data/2014/10/02/Old/20141002\_070704.16.or

---

2014 Oct 2 7: 7:19.637 UTC  
 Lat: 43.7263 Lon: -121.309 Depth: 0.885  
 43:43.5774 N 121:18.546 W

Solve

North East Down  
 North -1.16e-01 1.71e-01 1.39e-01  
 East 1.71e-01 -1.99e-01 -2.43e-02  
 Down 1.39e-01 -2.43e-02 1.64e-02

Scalar M0 = 2.753e-01  
 T = 0.306 k = -0.274

Total Penalty = 0.184

Sta	Dist	Az	i	Chan	Phase	Resid	Polarity	Penalty	Amp	Freq
1	NM03	2.95	11	119	EHU	P	0.011		-5.39e+01	1.75e+01
2	NM03	2.95	11	119	EHR	SV	0.048		-1.43e+03	9.59e+00
3	NM06	0.75	105	160	EHU	P	0.031		6.53e+02	1.55e+01
4	NM06	0.75	105	160	EHR	SV	0.097		2.33e+03	2.11e+01
5	NM06	0.75	105	160	EHT	SH	0.142		-6.99e+03	1.22e+01
6	NM22	0.12	174	177	EHU	P	-0.013		1.02e+03	1.53e+01
7	NM22	0.12	174	177	EHT	SH	-0.015	0.000	2.71e+03	1.90e+01
8	NM41	2.26	140	129	EHT	SH	-0.052		1.35e+03	1.38e+01
9	NM42	3.62	42	113	EHU	P	0.011		-3.06e+02	1.14e+01
10	NM42	3.62	42	113	EHR	SV	0.077		-1.40e+03	1.81e+01
11	NM42	3.62	42	113	EHT	SH	-0.020		6.95e+02	1.12e+01
12	NN07	3.08	335	116	EHU	P	0.011		-1.92e+02	1.34e+01
13	NN07	3.08	335	116	EHR	SV	-0.036		2.79e+02	2.11e+01
14	NN09	2.04	292	130	EHU	P	0.013		-2.74e+01	1.98e+01
15	NN09	2.04	292	130	EHR	SV	-0.008		1.45e+03	2.38e+01

Sta	Type	Penalty	
1	NM03	<input type="checkbox"/> P-SV	
2	NM03	<input checked="" type="checkbox"/> P-SV	0.034
3	NM06	<input checked="" type="checkbox"/> P-SH	0.054
4	NM06	<input checked="" type="checkbox"/> SV-SH	0.080
5	NM42	<input checked="" type="checkbox"/> P-SV	
6	NM42	<input checked="" type="checkbox"/> P-SH	
7	NM42	<input checked="" type="checkbox"/> SV-SH	
8	NN07	<input type="checkbox"/> P-SV	
9	NN09	<input type="checkbox"/> P-SV	
10	NN09	<input type="checkbox"/> P-SH	
11	NN09	<input type="checkbox"/> SV-SH	
12	NN17	<input checked="" type="checkbox"/> P-SV	0.000
13	NN17	<input type="checkbox"/> P-SH	
14	NN17	<input type="checkbox"/> SV-SH	
15	NN18	<input checked="" type="checkbox"/> P-SV	0.000

POLARITIES

AMPLITUDE RATIOS





2014 Oct 2 11: 1:58.257 UTC  
 Lat: 43.7267 Lon: -121.31 Depth: 0.794  
 43:43.6026 N 121:18.6042 W

North East Down  
 North 2.41e-01 -7.30e-02 1.73e-01  
 East -7.30e-02 -9.79e-02 4.30e-02  
 Down 1.73e-01 4.30e-02 8.35e-02

Scalar M0 = 2.727e-01  
 T = -0.402 k = 0.212

Total Penalty = 0.171

Sta	Dist	Az	i	Chan	Phase	Resid	Polarity	Penalty	Amp	Freq
1	NM03	2.92	13	117	EHU	P	0.022	0.025	-4.09e+01	3.11e+01
2	NM06	0.84	107	157	EHU	P	0.020		7.52e+02	1.47e+01
3	NM06	0.84	107	157	EHR	SV	0.073		1.61e+03	1.21e+01
4	NM06	0.84	107	157	EHT	SH	0.143		-3.59e+03	1.24e+01
5	NM08	2.93	169	117	EHN	SN	0.109	0.006		
6	NM22	0.19	151	175	EHU	P	-0.020		9.01e+02	1.44e+01
7	NM42	3.64	43	110	EHZ	P	-2.004			
8	NM42	3.64	43	110	EHR	SV	0.034		-1.51e+03	1.27e+01
9	NM42	3.64	43	110	EHT	SH	0.036		-1.66e+03	5.74e+00
10	NN07	3.01	336	114	EHU	P	0.005		-1.24e+02	1.61e+01
11	NN07	3.01	336	114	EHT	SH	-0.062	0.026	-4.50e+02	6.95e+00
12	NN09	1.95	292	130	EHU	P	0.013		6.60e+01	1.86e+01
13	NN09	1.95	292	130	EHR	SV	-0.014		1.18e+03	1.09e+01
14	NN09	1.95	292	130	EHT	SH	0.027		5.30e+02	1.62e+01
15	NN17	1.55	245	138	EHU	P	-0.002		4.32e+01	2.78e+01

Sta	Type	Penalty
1	<input checked="" type="checkbox"/> P-SV	
2	<input type="checkbox"/> P-SH	
3	<input type="checkbox"/> SV-SH	
4	<input checked="" type="checkbox"/> SV-SH	0.066
5	<input type="checkbox"/> P-SH	
6	<input checked="" type="checkbox"/> P-SV	
7	<input checked="" type="checkbox"/> P-SH	
8	<input checked="" type="checkbox"/> SV-SH	
9	<input type="checkbox"/> P-SV	
10	<input type="checkbox"/> P-SH	
11	<input checked="" type="checkbox"/> SV-SH	
12	<input type="checkbox"/> P-SV	
13	<input type="checkbox"/> P-SV	
14	<input type="checkbox"/> P-SH	
15	<input type="checkbox"/> SV-SH	

+Crack  
+Dipole  
+CLVD  
+Dipole  
+Crack

POLARITIES

P

SH

SV

SN

SE

AMPLITUDE RATIOS

P:SH

P:SV

SV:SH



/Users/foulger/SeismicProcessing/Newberry/Data/2014/10/03/Old/20141003\_060622.76.or

---

2014 Oct 3 6: 6:37.324 UTC  
 Lat: 43.7261 Lon: -121.31 Depth: 0.944  
 43:43.5678 N 121:18.6168 W

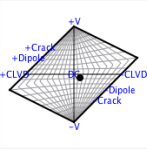
Solve

Sta	Dist	Az	i	Chan	Phase	Resid	Polarity	Penalty	Amp	Freq
1	NM03	2.98	13	120	EHU	P	0.008	<input checked="" type="checkbox"/> -	<input checked="" type="checkbox"/> -3.06e+01	1.86e+01
2	NM03	2.98	13	120	EHT	SH	-0.018	<input checked="" type="checkbox"/> -	<input checked="" type="checkbox"/> -7.11e+02	1.19e+01
3	NM06	0.84	102	159	EHU	P	0.017	<input checked="" type="checkbox"/> +	<input checked="" type="checkbox"/> 4.17e+02	1.32e+01
4	NM06	0.84	102	159	EHR	SV	0.134	<input checked="" type="checkbox"/> -	<input checked="" type="checkbox"/> -2.82e+03	9.57e+00
5	NM06	0.84	102	159	EHT	SH	0.128	<input checked="" type="checkbox"/> -	<input checked="" type="checkbox"/> -3.06e+03	1.12e+01
6	NM22	0.15	133	176	EHU	P	-0.037	<input checked="" type="checkbox"/> +	<input checked="" type="checkbox"/> 6.83e+02	1.14e+01
7	NM22	0.15	133	176	EHT	SH	0.145	<input checked="" type="checkbox"/> +	<input checked="" type="checkbox"/> 3.94e+03	1.00e+01
8	NM42	3.70	43	113	EHU	P	0.010	<input checked="" type="checkbox"/> -	<input checked="" type="checkbox"/> -1.91e+02	1.29e+01
9	NM42	3.70	43	113	EHR	SV	0.070	<input checked="" type="checkbox"/> -	<input checked="" type="checkbox"/> -9.17e+02	1.27e+01
10	NM42	3.70	43	113	EHT	SH	0.124	<input checked="" type="checkbox"/> -	<input checked="" type="checkbox"/> -8.19e+02	1.26e+01
11	NN07	3.06	337	117	EHZ	P	0.005	<input checked="" type="checkbox"/> -	<input checked="" type="checkbox"/> -8.98e+01	1.38e+01
12	NN09	1.96	294	133	EHU	P	0.017	<input checked="" type="checkbox"/> +	<input checked="" type="checkbox"/> 1.36e+01	1.66e+01
13	NN09	1.96	294	133	EHR	SV	-0.013	<input checked="" type="checkbox"/> +	<input checked="" type="checkbox"/> 5.09e+02	2.64e+01
14	NN09	1.96	294	133	EHT	SH	0.015	<input checked="" type="checkbox"/> +	<input checked="" type="checkbox"/> 4.95e+02	2.61e+01
15	NN17	1.51	247	142	EHU	P	0.003	<input checked="" type="checkbox"/> +	<input checked="" type="checkbox"/> 3.21e+01	2.57e+01

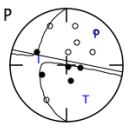
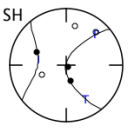
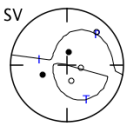
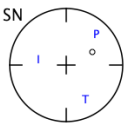
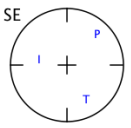
North East Down  
 North 6.07e-03 -2.23e-01 1.94e-01  
 East -2.23e-01 -9.16e-02 3.37e-02  
 Down 1.94e-01 3.37e-02 -6.18e-04

Scalar M0 = 3.046e-01  
 T = 0.144 k = -0.084

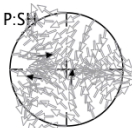
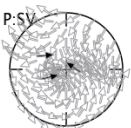
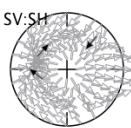
Total Penalty = 0.117



POLARITIES

AMPLITUDE RATIOS

Sta	Type	Penalty
1	NM03 <input type="checkbox"/> P-SH	
2	NM06 <input checked="" type="checkbox"/> P-SV	
3	NM06 <input type="checkbox"/> P-SH	
4	NM06 <input type="checkbox"/> SV-SH	
5	NM42 <input type="checkbox"/> P-SV	
6	NM42 <input checked="" type="checkbox"/> P-SH	
7	NM42 <input checked="" type="checkbox"/> SV-SH	
8	NN09 <input checked="" type="checkbox"/> P-SV	0.005
9	NN09 <input checked="" type="checkbox"/> P-SH	0.001
10	NN09 <input checked="" type="checkbox"/> SV-SH	0.055
11	NN17 <input checked="" type="checkbox"/> P-SV	0.008
12	NN17 <input checked="" type="checkbox"/> P-SH	0.003
13	NN17 <input checked="" type="checkbox"/> SV-SH	0.046
14	NN18 <input type="checkbox"/> P-SV	
15	NN19 <input type="checkbox"/> P-SV	



/Users/foulger/SeismicProcessing/Newberry/Data/2014/10/03/Old/20141003\_185453.93.or

2014 Oct 3 18:55: 9.929 UTC  
 Lat: 43.7264 Lon: -121.31 Depth: 0.943  
 43:43.5864 N 121:18.603 W

Solve

Sta	Dist	Az	i	Chan	Phase	Resid	Polarity	Penalty	Amp	Freq
1	NM03	2.95	12	120	EHZ	P	-1.955			
2	NM42	3.66	43	114	EHZ	P	0.030			
3	NN07	3.04	336	117	EHU	P	-1.976	<input checked="" type="checkbox"/>	-5.66e+01	1.68e+01
4	NN07	3.04	336	117	EHT	SH	0.019	<input checked="" type="checkbox"/>	-1.10e+02	2.31e+01
5	NN09	1.96	292	132	EHU	P	0.008	<input checked="" type="checkbox"/>	1.03e+01	1.27e+01
6	NN09	1.96	292	132	EHR	SV	-0.016	<input checked="" type="checkbox"/>	5.08e+02	1.20e+01
7	NN09	1.96	292	132	EHT	SH	0.022	<input checked="" type="checkbox"/>	4.01e+02	4.32e+01
8	NN17	1.54	246	141	EHU	P	0.000	<input checked="" type="checkbox"/>	1.75e+01	2.46e+01
9	NN17	1.54	246	141	EHR	SV	0.015	<input checked="" type="checkbox"/>	4.40e+02	1.37e+01
10	NN17	1.54	246	141	EHT	SH	0.007	<input checked="" type="checkbox"/>	-4.92e+02	1.77e+01
11	NN18	1.39	27	145	EHU	P	-0.003	<input checked="" type="checkbox"/>	-7.63e+01	1.73e+01
12	NN18	1.39	27	145	EHR	SV	-0.072	<input checked="" type="checkbox"/>	2.08e+02	1.72e+01
13	NN19	0.94	165	155	EHU	P	0.010	<input checked="" type="checkbox"/>	2.19e+02	1.91e+01
14	NN19	0.94	165	155	EHT	SH	0.020	<input checked="" type="checkbox"/>	9.71e+01	4.98e+01
15	NN21	1.79	65	137	EHZ	P	0.003			
16	NN24	0.63	9	163	EHZ	P	-0.006			
17	NN24	0.63	9	163	EHN	SN	-0.043			
18	NN32	2.88	209	119	EHZ	P	-0.018			

North East Down  
 North -5.77e-02 -1.65e-01 1.46e-01  
 East -1.65e-01 -1.43e-01 7.81e-02  
 Down 1.46e-01 7.81e-02 -1.95e-02

Scalar M0 = 2.588e-01  
 T = 0.541 k = -0.213

Total Penalty = 0.072

POLARITIES

AMPLITUDE RATIOS

Sta	Type	Penalty
1	<input type="checkbox"/> P:SH	
2	<input checked="" type="checkbox"/> P:SV	
3	<input checked="" type="checkbox"/> P:SH	
4	<input checked="" type="checkbox"/> SV:SH	
5	<input checked="" type="checkbox"/> P:SV	
6	<input checked="" type="checkbox"/> P:SH	0.012
7	<input checked="" type="checkbox"/> SV:SH	0.060
8	<input checked="" type="checkbox"/> P:SV	
9	<input type="checkbox"/> P:SH	



/Users/foulger/SeismicProcessing/Newberry/Data/2014/10/04/20141004\_173252.76.or

2014 Oct 4 17:33: 7.355 UTC  
 Lat: 43.7266 Lon: -121.31 Depth: 0.792  
 43:43.596 N 121:18.5748 W

Solve

Sta	Dist	Az	i	Chan	Phase	Resid	Polarity	Penalty	Amp	Freq
1	NM03	2.92	12	117	EHU	P	0.001	✓ -	-1.17e+02	1.57e+01
2	NM03	2.92	12	117	EHR	SV	-0.064	✓ -	-2.30e+03	1.37e+01
3	NM03	2.92	12	117	EHE	SE	0.009			
4	NM08	2.91	169	117	EHN	SN	0.039	✓ +	1.64e+02	1.67e+01
5	NM22	0.16	161	175	EHU	P	-0.013	✓ +	3.02e+03	1.37e+01
6	NM22	0.16	161	175	EHR	SV	0.067	✓ +	1.43e+04	1.29e+01
7	NM22	0.16	161	175	EHT	SH	0.015	✓ -	-4.67e+03	2.08e+01
8	NM42	3.62	43	111	EHU	P	0.001	✓ -	-8.15e+02	1.07e+01
9	NM42	3.62	43	111	EHR	SV	0.062	✓ -	-4.24e+03	1.21e+01
10	NM42	3.62	43	111	EHT	SH	-0.019	✓ +	1.46e+03	9.47e+00
11	NN07	3.03	336	114	EHU	P	0.006	✓ -	-5.47e+02	1.37e+01
12	NN09	1.99	292	129	EHU	P	0.010	✓ -	-1.12e+02	2.02e+01
13	NN09	1.99	292	129	EHR	SV	-0.006	✓ +	4.60e+03	1.01e+01
14	NN17	1.58	246	137	EHU	P	-0.008	✓ +	4.76e+02	1.84e+01
15	NN17	1.58	246	137	EHR	SV	0.015	✓ +	3.74e+03	1.63e+01

North East Down  
 North -1.03e-01 1.33e-01 1.48e-01  
 East 1.33e-01 -1.18e-01 5.51e-02  
 Down 1.48e-01 5.51e-02 1.07e-01

Scalar M0 = 2.461e-01  
 T = -0.316 k = -0.128

Total Penalty = 1.108

POLARITIES

AMPLITUDE RATIOS

Sta	Type	Penalty
1	<input type="checkbox"/> P:SV	
2	<input checked="" type="checkbox"/> P:SV	
3	<input checked="" type="checkbox"/> P:SH	
4	<input checked="" type="checkbox"/> SV:SH	
5	<input checked="" type="checkbox"/> P:SV	0.069
6	<input type="checkbox"/> P:SV	
7	<input checked="" type="checkbox"/> P:SH	0.072
8	<input type="checkbox"/> SV:SH	
9	<input type="checkbox"/> P:SV	
10	<input type="checkbox"/> P:SH	
11	<input checked="" type="checkbox"/> SV:SH	0.025
12	<input checked="" type="checkbox"/> P:SV	
13	<input type="checkbox"/> P:SH	0.724
14	<input type="checkbox"/> SV:SH	
15	<input type="checkbox"/> P:SH	



/Users/foulger/SeismicProcessing/Newberry/Data/2014/10/04/20141004\_185112.00.or

2014 Oct 4 18:51:27.825 UTC  
 Lat: 43.726 Lon: -121.309 Depth: 0.836  
 43:43.5612 N 121:18.5676 W

Solve

Sta	Dist	Az	i	Chan	Phase	Resid	Polarity	Penalty	Amp	Freq
1	NM03	2.98	11	118	EHU	P	0.003	<input checked="" type="checkbox"/> -	<input checked="" type="checkbox"/> -6.09e+02	1.66e+01
2	NM03	2.98	11	118	EHR	SV	-0.095	<input checked="" type="checkbox"/> -	<input checked="" type="checkbox"/> -1.08e+04	1.33e+01
3	NM22	0.10	155	177	EHU	P	-0.008	<input checked="" type="checkbox"/> +	<input checked="" type="checkbox"/> 1.38e+04	1.33e+01
4	NM22	0.10	155	177	EHR	SV	-0.020	<input checked="" type="checkbox"/> -	<input checked="" type="checkbox"/> -2.02e+04	1.14e+01
5	NM22	0.10	155	177	EHT	SH	0.018	<input checked="" type="checkbox"/> +	<input checked="" type="checkbox"/> 3.24e+04	2.51e+01
6	NM41	2.26	139	128	EHU	P	-0.005	<input checked="" type="checkbox"/> +	<input checked="" type="checkbox"/> 1.20e+03	1.27e+01
7	NM41	2.26	139	128	EHR	SV	-0.081	<input checked="" type="checkbox"/> +	<input checked="" type="checkbox"/> 1.02e+04	1.49e+01
8	NM41	2.26	139	128	EHT	SH	-0.026	<input checked="" type="checkbox"/> +	<input checked="" type="checkbox"/> 1.36e+04	1.76e+01
9	NM42	3.66	42	111	EHZ	P	-1.994	<input checked="" type="checkbox"/> - 0.018		
10	NM42	3.66	42	111	EHE	SE	0.126			
11	NN07	3.10	336	114	EHZ	P	0.001			
12	NN07	3.10	336	114	EHN	SN	-0.014			
13	NN09	2.02	293	129	EHU	P	0.008	<input checked="" type="checkbox"/> -	<input checked="" type="checkbox"/> -3.76e+02	1.76e+01
14	NN09	2.02	293	129	EHR	SV	-0.010	<input checked="" type="checkbox"/> +	<input checked="" type="checkbox"/> 2.00e+04	1.26e+01
15	NN09	2.02	293	129	EHT	SH	0.007	<input checked="" type="checkbox"/> -	<input checked="" type="checkbox"/> -5.71e+03	2.66e+01

Sta	Type	Penalty
1	<input checked="" type="checkbox"/> P-SV	0.008
2	<input checked="" type="checkbox"/> P-SV	
3	<input checked="" type="checkbox"/> P-SH	0.013
4	<input checked="" type="checkbox"/> SV-SH	0.025
5	<input checked="" type="checkbox"/> P-SV	0.018
6	<input checked="" type="checkbox"/> P-SH	0.015
7	<input type="checkbox"/> SV-SH	
8	<input type="checkbox"/> P-SV	
9	<input checked="" type="checkbox"/> P-SH	
10	<input type="checkbox"/> SV-SH	
11	<input checked="" type="checkbox"/> P-SV	
12	<input checked="" type="checkbox"/> P-SH	
13	<input checked="" type="checkbox"/> SV-SH	
14	<input type="checkbox"/> P-SV	
15	<input type="checkbox"/> P-SH	

North 8.71e-02 East 1.26e-01 Down 1.81e-01  
 East 1.26e-01 -4.19e-02 8.43e-02  
 Down 1.81e-01 8.43e-02 8.72e-02

Scalar M0 = 2.538e-01  
 T = -0.805 k = 0.134

Total Penalty = 0.155

POLARITIES

AMPLITUDE RATIOS