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Supplementary Materials for

Discriminating between natural versus induced seismicity from long-term deformation history of intraplate faults

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This PDF file includes:

- table S1. USGS NEIC earthquake catalog.
- table S2. Seismic reflection data parameters for lines A, B, and C in Johnson County, Texas, and Irving, Texas.

Supplementary Materials

table S1. USGS NEIC earthquake catalog. The table reports the NEIC catalog for the Azle, Irving-Dallas and Venus seismic sequence used for the calculation of each sequence return interval.

Azle Seismic Sequence

time	latitude	longitude	depth	mag	magType
2015-12-17T22:29:55.700Z	32.9638	-97.3425	5	3.0	mb_lg
2014-01-28T17:54:44.300Z	32.9453	-97.5339	5	2.5	mb_lg
2014-01-13T17:40:21.580Z	32.9391	-97.5529	5	3.1	mb_lg
2014-01-11T20:55:25.250Z	32.9125	-97.4787	6.24	2.2	mb_lg
2013-12-23T13:11:34.040Z	32.9284	-97.5789	6.39	3.3	mb_lg
2013-12-22T17:31:54.990Z	32.9619	-97.5552	5	3.3	mb_lg
2013-12-17T20:09:04.870Z	32.9543	-97.5546	5	2.1	mb_lg
2013-12-15T04:54:16.010Z	32.9379	-97.6196	5.05	2.9	mb_lg
2013-12-10T15:39:49.450Z	32.8951	-97.5437	5	2.7	mb_lg
2013-12-09T09:23:14.340Z	32.9576	-98.0594	5	3.7	mb_lg
2013-12-08T06:10:04.010Z	32.9144	-97.5817	4.99	3.6	mb_lg
2013-12-03T15:44:32.210Z	32.9387	-97.5545	5	2.7	mb_lg
2013-11-29T06:14:09.070Z	32.9093	-97.5205	5	3.1	mb_lg
2013-11-28T08:41:07.600Z	33.0291	-98.2141	4.99	2.8	mb_lg
2013-11-28T07:58:35.690Z	32.9735	-98.0894	5	3.7	mb
2013-11-26T20:03:28.540Z	32.9594	-97.6176	2.27	2.8	mb_lg
2013-11-26T14:24:03.850Z	32.908	-97.5587	5	2.7	ml
2013-11-26T01:55:21.460Z	32.9479	-97.5353	5	2.8	mb_lg
2013-11-25T07:43:02.950Z	32.9195	-97.6182	5	3.4	mb_lg
2013-11-23T09:43:32.440Z	32.9152	-97.5983	5	2.9	mb_lg
2013-11-21T05:53:57.040Z	32.9232	-97.578	5	2.1	mb_lg
2013-11-20T00:40:34.950Z	32.9116	-97.5509	5	3.6	mb_lg
2013-11-19T18:03:37.000Z	32.9086	-97.5903	5	2.8	mb_lg
2013-11-19T17:57:18.940Z	32.9437	-97.5992	5	2.5	mb_lg
2013-11-13T09:01:33.890Z	32.9574	-97.5029	5	2.6	mb_lg
2013-11-11T08:30:54.280Z	32.9923	-97.5436	5	2.8	mb_lg
2013-11-09T19:54:31.820Z	32.9197	-97.6665	5	3.0	mb_lg
2013-11-09T03:34:07.100Z	32.8873	-97.618	5	2.3	mb_lg
2013-11-08T04:32:56.870Z	32.9556	-97.6719	5	2.8	mb_lg
2013-11-06T17:05:47.700Z	32.8884	-97.6784	5	2.6	mb_lg
2013-11-06T03:32:08.600Z	32.9194	-97.5175	5	2.6	mb_lg

Irving-Dallas Seismic Sequence

time	latitude	longitude	depth	mag	magType
2016-09-22T12:36:59.930Z	32.8613	-96.9176	7.85	2.4	mb_lg
2016-01-31T06:06:21.580Z	32.8012	-96.9859	5	2.1	mb_lg
2015-12-17T04:24:08.780Z	32.8458	-96.961	5	2.1	mb_lg
2015-12-07T00:27:25.290Z	32.8596	-96.9551	5	2.8	mb_lg
2015-12-06T00:44:08.510Z	32.8752	-96.921	5.7	2.1	ml
2015-12-04T14:22:58.660Z	32.8653	-96.9184	5	2.1	ml
2015-12-04T06:56:03.350Z	32.8659	-96.9024	5.58	2.6	mb_lg
2015-12-03T21:35:58.920Z	32.8525	-96.9218	5	2.8	mb_lg
2015-11-16T03:09:03.020Z	32.8492	-96.9204	9.66	2.4	mb_lg
2015-11-15T22:07:51.780Z	32.8452	-96.948	5	2.0	ml
2015-11-03T02:37:41.520Z	32.86	-96.9426	5	2.2	mb_lg
2015-10-29T22:24:39.360Z	32.8435	-96.9109	8.67	2.5	mb_lg
2015-10-28T01:33:37.110Z	32.8608	-96.9495	5	2.2	mb_lg
2015-10-27T13:01:07.520Z	32.8725	-96.924	5	2.3	mb_lg
2015-10-19T23:12:03.180Z	32.8659	-96.9394	5	2.3	mb_lg
2015-10-19T22:39:47.980Z	32.8755	-96.9134	5	2.7	mb_lg
2015-10-18T00:17:37.060Z	32.8733	-96.9165	6.53	2.4	mb_lg
2015-10-04T05:57:09.220Z	32.8633	-96.9174	5	2.1	ml
2015-10-01T21:28:26.140Z	32.8119	-96.922	5	2.7	mb_lg
2015-09-22T10:18:43.020Z	32.8838	-96.9187	5	2.4	mb_lg
2015-09-20T23:25:08.930Z	32.8279	-96.9556	5	2.6	mb_lg
2015-09-16T21:55:24.080Z	32.8411	-96.9448	5	2.1	ml
2015-09-14T21:04:59.040Z	32.8785	-96.901	5	2.0	ml
2015-09-12T12:16:16.840Z	32.8281	-96.933	5	2.2	mb_lg
2015-09-12T09:34:20.660Z	32.8427	-96.9185	5	2.5	mb_lg
2015-08-31T08:15:37.160Z	32.8379	-96.9038	5	1.8	ml
2015-08-25T20:59:47.930Z	32.8552	-96.9412	5	2.2	mb_lg
2015-08-25T20:18:31.760Z	32.8363	-96.9467	5	2.1	mb_lg
2015-08-12T11:13:28.340Z	32.8465	-96.9122	9.78	2.7	mb_lg
2015-07-18T15:30:09.260Z	32.8484	-96.9172	10.69	2.6	mb_lg
2015-07-16T00:17:49.460Z	32.8533	-96.9417	5	1.8	ml
2015-07-13T11:03:56.270Z	32.8351	-96.939	5	2.4	mb_lg
2015-06-27T10:19:02.930Z	32.8723	-96.907	5	2.3	mb_lg
2015-06-13T13:34:47.480Z	32.8726	-96.9038	5	2.3	mb_lg
2015-05-18T18:14:29.920Z	32.8675	-96.9566	5	3.3	mb_lg
2015-05-09T16:12:38.390Z	32.854	-96.8903	5	2.7	mb_lg
2015-05-04T13:57:59.870Z	32.8613	-96.8716	5	2.7	mb_lg
2015-05-04T08:49:27.750Z	32.8589	-96.852	5	2.1	mb_lg
2015-05-03T16:12:04.480Z	32.8561	-96.891	5	2.5	mb_lg

2015-05-03T15:11:16.150Z	32.8511	-96.9514	5	3.2	mb_lg
2015-04-03T08:58:11.070Z	32.8826	-96.8772	5	2.2	mb_lg
2015-04-03T04:28:37.020Z	32.8678	-96.934	5.74	2.3	mb_lg
2015-04-03T03:04:49.640Z	32.8614	-96.9087	5	2.5	mb_lg
2015-04-02T22:36:21.040Z	32.8588	-96.9356	7.67	3.3	mb_lg
2015-04-02T10:38:06.000Z	32.8543	-96.9392	5	2.7	mb_lg
2015-03-14T07:31:16.290Z	32.8565	-96.9251	5	2.7	mb_lg
2015-03-12T14:41:14.790Z	32.8839	-96.9075	5	2.0	ml
2015-03-12T01:55:02.270Z	32.8775	-96.9129	8.17	2.4	mb_lg
2015-03-08T03:12:22.340Z	32.8364	-96.9026	5	2.2	mb_lg
2015-02-27T12:18:21.710Z	32.8336	-96.9098	7.93	3.1	mb_lg
2015-01-23T15:16:01.500Z	32.8904	-96.8967	8.74	2.2	mb_lg
2015-01-20T20:50:02.540Z	32.8526	-96.9265	8.32	2.5	mb_lg
2015-01-20T20:43:17.470Z	32.8536	-96.9029	10.4	2.4	mb_lg
2015-01-20T20:25:49.390Z	32.8221	-96.9055	9.04	3.0	mb_lg
2015-01-20T19:37:04.150Z	32.8615	-96.9093	8.77	2.6	mb_lg
2015-01-20T14:04:03.170Z	32.8492	-96.9152	9.83	2.3	mb_lg
2015-01-18T02:00:04.200Z	32.852	-96.9378	5	2.2	ml
2015-01-14T19:02:34.140Z	32.8396	-96.8998	5	1.9	mb_lg
2015-01-12T01:46:06.570Z	32.8175	-96.8769	5	2.4	mb_lg
2015-01-09T17:39:14.500Z	32.8418	-96.8936	5.03	2.4	mb_lg
2015-01-08T13:24:31.750Z	32.8282	-96.9008	5	2.3	mb_lg
2015-01-08T10:08:24.730Z	32.8408	-96.9143	5	2.1	mb_lg
2015-01-07T15:57:30.110Z	32.8464	-96.9171	7.24	2.7	mb_lg
2015-01-07T14:34:02.760Z	32.8367	-96.9063	5	2.7	mb_lg
2015-01-07T07:24:29.160Z	32.8473	-96.8896	4.27	2.3	mb_lg
2015-01-07T06:59:03.320Z	32.8417	-96.9131	5	3.1	mb_lg
2015-01-07T05:02:52.910Z	32.8512	-96.8844	5	1.6	ml
2015-01-07T04:05:14.350Z	32.8588	-96.9174	5	2.4	mb_lg
2015-01-07T03:54:17.460Z	32.8564	-96.8819	5	1.7	ml
2015-01-07T02:12:16.390Z	32.8485	-96.9375	5	2.7	ml
2015-01-07T02:11:17.810Z	32.8085	-96.8962	8.24	2.9	mb_lg
2015-01-07T00:52:09.050Z	32.847	-96.8922	5	3.6	mb_lg
2015-01-06T21:10:31.550Z	32.835	-96.9027	5.93	3.5	mb_lg
2015-01-06T13:37:15.180Z	32.8487	-96.8883	5	2.3	mb_lg
2015-01-02T02:29:03.610Z	32.8438	-96.9034	2.25	2.4	mb_lg
2014-12-30T14:10:09.220Z	32.8372	-96.9132	3.09	2.7	mb_lg
2014-12-20T05:08:11.390Z	32.8304	-96.9188	3.18	2.4	mb_lg
2014-12-19T16:38:30.010Z	32.8245	-96.9317	8.13	2.4	mb_lg
2014-12-17T22:19:00.790Z	32.8507	-96.9193	5	2.6	mb_lg
2014-12-15T12:00:59.380Z	32.8412	-96.9009	4.16	2.7	mb_lg
2014-12-12T03:25:38.030Z	32.8501	-96.8902	3.02	2.7	mb_lg

2014-12-10T04:44:48.610Z	32.8621	-96.9338	5	2.0	ml
2014-12-02T15:36:21.880Z	32.836	-96.893	5	2.7	mb_lg
2014-11-25T22:39:22.980Z	32.8404	-96.8922	2.58	2.7	mb_lg
2014-11-25T05:47:54.460Z	32.8481	-96.9013	5	2.2	mb_lg
2014-11-24T13:06:36.030Z	32.846	-96.8955	5	2.4	mb_lg
2014-11-23T21:40:46.520Z	32.8449	-96.9343	8.01	2.5	mb_lg
2014-11-23T03:15:47.770Z	32.8346	-96.8932	3.96	3.3	mb_lg
2014-11-15T19:19:46.410Z	32.8481	-96.9576	5	2.6	mb_lg
2014-11-10T09:04:05.600Z	32.8183	-96.8902	5	2.3	mb_lg
2014-10-28T07:15:01.840Z	32.8431	-96.9058	5	2.4	mb_lg
2014-10-01T21:32:18.700Z	32.8499	-96.9824	6.56	2.1	mb_lg
2014-09-11T08:21:58.780Z	32.8153	-96.9178	5	2.8	mb_lg
2014-07-20T11:43:55.460Z	32.8386	-96.8669	3.23	2.2	mb_lg
2014-04-17T19:44:20.040Z	32.8634	-96.9079	5	2.4	mb_lg

Venus Seismic Sequence

time	latitude	longitude	depth	mag	magType
2016-09-12T14:03:51.210Z	32.4775	-97.1199	5	2.6	mb_lg
2016-02-04T15:46:56.370Z	32.4952	-97.1583	9.56	2.7	mb_lg
2015-10-23T12:30:04.520Z	32.4429	-97.1262	5.13	2.6	mb_lg
2015-10-23T12:11:07.710Z	32.4889	-97.1324	7.57	2.1	mb_lg
2015-06-15T09:37:14.520Z	32.5299	-97.101	5	2.4	mb_lg
2015-05-10T01:59:31.750Z	32.5005	-97.0942	4.94	2.4	mb_lg
2015-05-07T22:58:05.200Z	32.4817	-97.1006	2.54	4	mwr
2015-03-25T04:57:14.320Z	32.4633	-97.143	7.71	2.6	mb_lg
2015-01-08T20:12:44.010Z	32.4778	-97.0944	5	2.6	mb_lg

table S2. Seismic reflection data parameters for lines A, B, and C in Johnson County, Texas, and Irving, Texas. The table reports the acquisition and processing parameters for the seismic reflection data in Johnson Co., TX (Line A, Line B and Line C) and in the Irving, TX area.

Line A, Johnson Co., TX

ACQUISITION PARAMETERS

Record length (s)	6
N. Channels	24
Group Interval (ft)	250
Normal Spread	OFFEND *-750-6500
Array	Inline
Source Interval (ft)	500
Energy Source	Dynamite
Shot Depth (ft)	82
Source Pattern	Single Hole
Charge Size (lb)	25

PROCESSING SEQUENCE

<u>Process</u>	<u>Parameters</u>
Reformat	
Geometry Application and QC	
Trace Edit	
Elevation Statics	Floating Datum, Velocity 7000 ft/s
Spherical Divergence	
Deconvolution: Surface Consistent	Operator 180 ms
Spectral Whitening	
CDP Sort	
Velocity Analysis	1 every 2 miles
Residual Statics	First Pass
Normal Moveout Correction	1 per mile
Residual Statics	Second Pass
Mute Application	
Amplitude Scaling	
Stack	
Noise Reduction	
Filter	Time Variant
Amplitude Scaling	
Datum Shift	Floating to Flat Datum 350 ft

Line B, Johnson Co., TX

ACQUISITION PARAMETERS

Record length (s)	6
Sample rate (s)	0.002
N. Channels	24
Group Interval (ft)	250
Normal Spread	OFFEND *-750-6500
Array	Inline
Source Interval (ft)	500
Energy Source	Dynamite
Shot Depth (ft)	82
Source Pattern	Single Hole
Charge Size (lb)	25

PROCESSING SEQUENCE

Amplitude
recovery

Static Corrections

Velocity Analysis

Dynamic
Corrections

Initial Muting

6-Fold CDP Stack

Time Variant Filter

Line C, Johnson Co., TX

ACQUISITION PARAMETERS

Record length (s)	7
N. Channels	24
Group Interval (ft)	400
Normal Spread	OFFEND *-400-9600
Array	Inline
Source Interval (ft)	400
Energy Source	Dynamite
Shot Depth (ft)	56
Source Pattern	Single Hole
Charge Size (lb)	60

PROCESSING SEQUENCE

<u>Sequence Process</u>	<u>Parameters</u>
Reformat	2 ms processing samp rate
Geometry Definition	

Datum Statics	To a floating datum
RMS Stacking Velocity Analysis	
Trace Edit and Noise Attenuation	including 60 Hz noise removal
Surface-Consistent Decon	Predictive
Velocity Analysis and S-C statics	2 Passes at least; QC stack at each step
Trim Statics	" \pm 2 samples for refinement"
Scale and Stack	
Bandpass Filter	
Post Stack Migration	
Coherency Enhancement	
Final Scaling	
Datumization	To a fixed datum

Irving, TX

ACQUISITION PARAMETERS

Sample Rate (s)	0.002
N. Channels	839
Freq. Start (Hz)	10
Freq. End (Hz)	110
Sweep Length (s)	10
N. Sweep	8
Record Length (s)	4
N. Vib	3
N. Chan/Group (pattern)	6 (6 ft circle)
Station Interval (ft)	220
Line Interval (ft)	860