Supporting Information

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SI Text

This file includes a table of earthquake epicenters located in this investigation, a comparison of these epicenters to those reported by the Array Network Facility (ANF), and figures showing monthly injection rates at all injection wells within 5 km of these located epicenters not already presented in Fig. 3.

Epicenters Located in This Investigation. ***Comparison with epicenters reported by the ANF.*** The ANF is the organization tasked with managing data transmission, archival, and quality control for USArray seismograph stations. As part of this effort their analysts identify phase arrivals at USArray stations and use these to produce a catalog of epicenters. Although the ANF catalog is not as user-friendly or as widely used as the National Earthquake Information Center (NEIC) catalog, it is of interest here because, unlike NEIC's locations, the ANF locations routinely include arrivals from USarray stations. During the study period, the ANF reported 120 epicenters occurring in the region mapped in Fig. 1.

Whereas only eight of the 67 earthquakes in Table S1 were reported by the NEIC, 22 are in the ANF catalog. Thus, the present investigation found 45 earthquakes not identified by the ANF. All but one of these 22 ANF epicenters were within 7 km of corresponding epicenters reported in Table S1, with a median difference of 4.2 km. In addition, 97 of the ANF epicenters originated from sites this study identified as quarries; these epicenters produced signals with prominent surface waves (Fig. S1), and origin times never occurring on nights or weekends. The sole remaining ANF epicenter not among the 67 determined in this investigation occurred at 1924 h on May 26, 2010. My analysis identified this event and attempted to determine a location, but concluded the available phase arrivals were too weak to determine a reliable location.

Monthly Injection Rates at Wells Within 5 km of Earthquakes. Detailed monthly injection rates are given in Figs. S2 and S3.

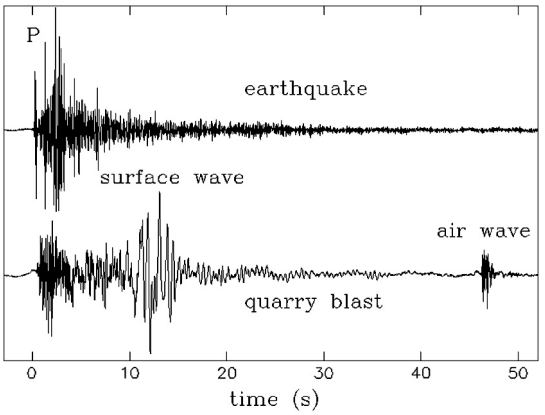

Fig. S1. Vertical-component seismograms for an earthquake (*Top*) and a quarry blast (*Bottom*) located in Wise County, each approximately 15 km from USArray station Z34 (Fig. 1). Note the prominent surface wave and visible air wave for the quarry blast, and the impulsive P-wave signal for the earthquake. This quarry blast and this earthquake occurred at 2131 h Universal Time (UT) on December 1, 2009 and 1031 h UT on July 30, 2010, respectively.

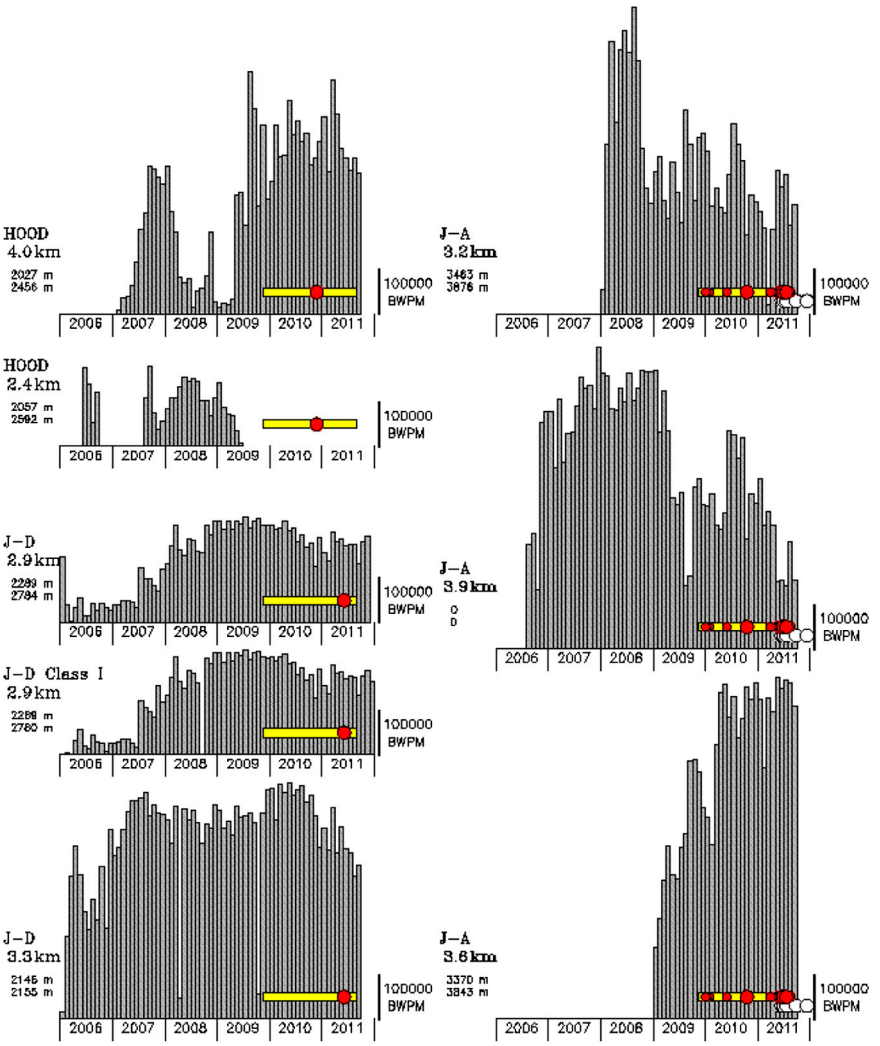

Fig. S2. Monthly injection volumes for wells within 5 km of earthquake groups identified in this study. The scale bar at the right of each histogram is 100,000 barrels of water per month (BWPM; 100,000 BWPM = 16,000 m^3/mo). The yellow rectangle shows the time period of study; red circles indicate earthquakes located in this study; white circles are NEIC-reported epicenters. Labels at *Left* identify the well (Table 1 and Fig. 2), distance to nearest epicenter, and depth interval of injection.

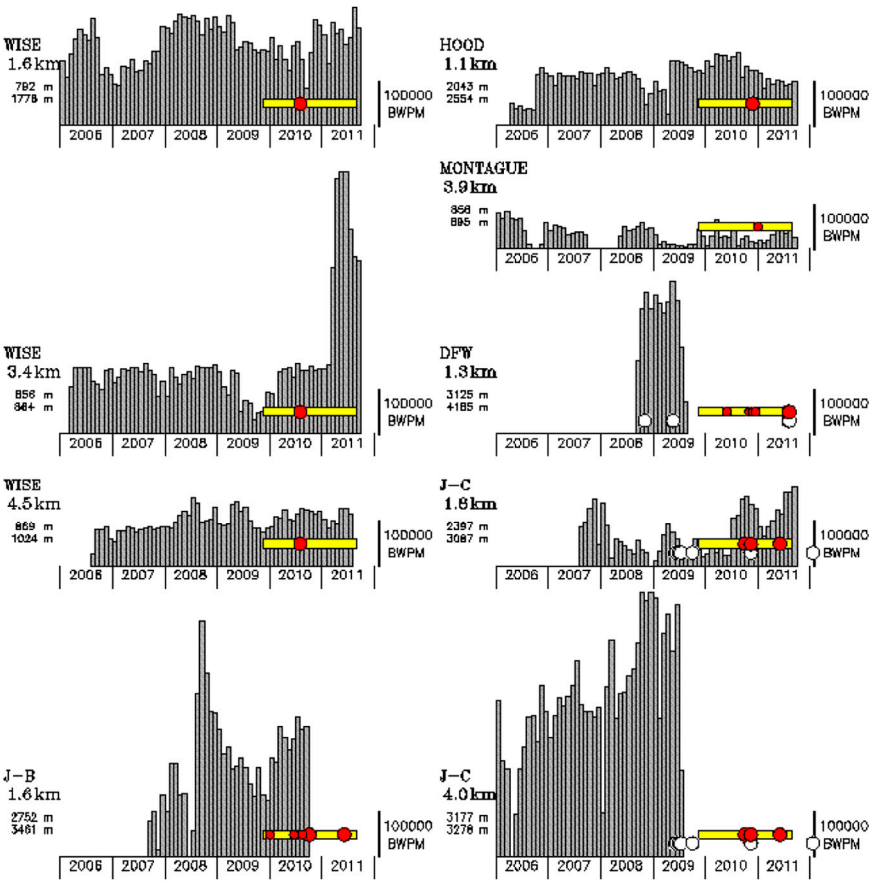

Fig. S3. Monthly injection volumes for wells within 5 km of earthquake groups identified in this study. Symbols and labels are as in Fig. S2.

Table S1. Epicenters located in this investigation. ID is the identification number used by the author to catalog event data; dep is focal depth (fixed at 5 km); mag is magnitude—values marked with * are magnitudes reported by the NEIC; rms in sec is root mean square residual for location; gap is azimuthal gap in degrees of stations used in location; Q is location quality (*Materials and Methods*); events marked with * in the ANF column appear in the Array Network Facility catalog; group is epicentral cluster as labeled in Fig. 3 and Table 1.

ID	year	mo	d	hr	min	sec	lat	lon	dep	mag	rms	gap	Q	ANF	group
115	2009	12	05	5	30	13.07	32.368	−97.082	5	2.9*	0.62	229	B	*	J-E
240	2009	12	22	5	20	26.55	32.454	−97.193	5		0.80	312	C		J-A
300	2009	12	30	9	6	50.89	32.263	−97.161	5		0.24	258	B		J-B
325	2010	01	01	23	47	30.67	32.416	−97.222	5		0.97	314	C		J-A
330	2010	01	02	8	6	47.05	32.474	−97.164	5	2.1	0.42	276	B		J-A
570	2010	01	27	9	20	22.30	32.614	−97.161	5	1.9	0.46	327	C		J-A
680	2010	02	06	3	53	2.94	32.552	−97.128	5		0.53	295	C		J-A
1725	2010	05	25	4	35	45.06	32.531	−97.121	5	2.1	0.46	292	B		J-A
1735	2010	05	26	5	54	55.73	32.858	−97.038	5		0.70	174	B		DFW
2025	2010	06	17	8	2	9.04	32.270	−97.279	5		0.47	136	B		J-B
2290	2010	07	11	10	33	5.31	32.966	−97.505	5		1.46	209	C		Tarrant W
2565	2010	07	30	10	31	11.54	33.416	−97.787	5		0.69	96	A	*	Wise
2830	2010	08	16	20	23	52.32	32.263	−97.218	5		0.45	102	B		J-B
3220	2010	09	30	10	48	44.77	32.288	−97.372	5		0.26	82	A	*	J-C
3240	2010	10	01	4	21	10.17	32.259	−97.213	5		0.47	104	A		J-B
3255	2010	10	03	11	25	44.64	32.270	−97.220	5		0.43	101	A		J-B
3400	2010	10	15	11	36	1.74	32.511	−97.148	5		0.61	72	A	*	J-A
3510	2010	11	01	11	1	15.67	32.822	−97.042	5		0.51	181	B	*	DFW
3580	2010	11	08	4	5	55.46	32.293	−97.372	5	2.5*	0.28	83	A	*	J-C
3585	2010	11	08	7	29	49.49	32.290	−97.374	5		0.30	82	A	*	J-C
3635	2010	11	12	9	3	51.86	32.290	−97.374	5	2.1*	0.34	82	A		J-C
3710	2010	11	20	15	35	57.79	33.158	−97.242	5	2.3	0.34	142	B		Denton
3720	2010	11	21	9	24	12.93	33.155	−97.252	5	2.1	0.58	112	B	*	Denton
3761	2010	11	23	19	59	54.05	32.334	−97.895	5		0.09	115	A	*	Hood
3765	2010	11	23	20	2	25.62	32.848	−97.018	5	2.4	0.80	156	B		DFW
3775	2010	11	24	0	49	23.90	33.156	−97.264	5		0.57	111	B	*	DFW

ID	year	mo	d	hr	min	sec	lat	lon	dep	mag	rms	gap	Q	ANF	group
3785	2010	11	26	9	33	1.95	33.159	−97.252	5		0.53	81	A		Denton
3950	2010	12	11	2	29	50.08	33.160	−97.251	5	2.3	0.58	81	A	*	Denton
3976	2010	12	13	7	48	14.01	32.855	−97.064	5	2.5	0.32	117	B	*	Denton
3990	2010	12	13	21	7	32.76	33.167	−97.262	5		0.51	79	A	*	Denton
3995	2010	12	14	10	31	19.10	33.198	−97.256	5		0.44	139	B		Denton
4121	2010	12	29	4	32	38.64	33.463	−97.525	5		0.41	134	B	*	Montague
4126	2010	12	29	12	5	26.97	33.471	−97.514	5		0.43	130	B		Montague
4170	2011	01	04	0	17	36.42	33.162	−97.259	5		0.48	124	C		Denton
4900	2011	03	25	7	49	7.05	32.540	−97.209	5		0.45	217	B		J-A
5515	2011	05	23	3	57	25.66	32.469	−97.020	5		0.72	164	C		J-A
5595	2011	06	01	21	0	25.03	32.292	−97.368	5		0.37	120	A		J-C
5615	2011	06	03	0	54	7.82	32.425	−97.401	5		0.24	89	A		J-D
5620	2011	06	03	20	27	55.72	32.274	−97.187	5		0.49	104	A		J-B
5630	2011	06	06	10	23	54.51	32.271	−97.443	5		1.30	183	C		J-C
5636	2011	06	06	10	28	6.04	32.462	−97.187	5		0.26	151	A		J-A
5650	2011	06	06	23	55	5.24	32.513	−97.146	5		0.63	173	B	*	J-A
5660	2011	06	07	0	27	55.58	32.491	−97.145	5	2.2	0.66	207	B		J-A
5655	2011	06	07	0	15	44.39	32.582	−97.195	5		0.45	227	C		J-A
5661	2011	06	07	0	31	50.74	32.470	−97.178	5	2.2	0.60	210	B		J-A
5665	2011	06	07	7	41	36.08	32.465	−97.187	5		0.78	102	B		J-A
5670	2011	06	07	7	44	51.92	32.484	−97.157	5		0.62	162	B		J-A
5705	2011	06	07	21	19	24.48	32.454	−97.289	5		1.03	310	C		J-A
5712	2011	06	07	21	47	38.71	32.496	−97.130	5	2.2	0.71	284	C		J-A
5715	2011	06	07	21	51	20.97	32.504	−97.143	5	2.4	0.56	170	B		J-A
5720	2011	06	07	22	10	42.93	32.547	−97.127	5		0.47	186	B		J-A
5721	2011	06	07	22	11	36.50	32.502	−97.149	5		0.62	169	B		J-A
5722	2011	06	07	22	19	4.25	32.511	−97.140	5		0.61	116	A		J-A
5725	2011	06	07	23	35	17.90	32.493	−97.145	5	2.4	0.66	111	A		J-A
5730	2011	06	09	6	6	54.74	32.500	−97.146	5		0.60	168	B		J-A
5740	2011	06	10	6	32	17.21	32.828	−97.455	5		0.73	81	B	*	Tarrant W
5760	2011	06	12	16	51	49.80	32.495	−97.151	5	2.7*	0.58	74	A	*	J-A
5840	2011	06	25	5	38	52.62	32.480	−97.151	5	2.4*	0.71	76	A	*	J-A
5970	2011	07	09	3	14	56.84	32.483	−97.149	5		0.29	162	B		J-A
6005	2011	07	13	11	51	23.25	32.520	−97.029	5		1.05	180	C		J-A
6045	2011	07	17	6	58	1.08	32.488	−97.171	5	3.0*	0.63	94	A	*	J-A
6050	2011	07	17	8	23	56.10	32.494	−97.161	5		0.61	114	A	*	J-A
6055	2011	07	17	10	29	51.56	32.593	−97.147	5		0.22	194	B		J-A
6206	2011	08	01	4	33	30.80	32.865	−97.049	5	2.2*	0.24	115	A	*	DFW
6296	2011	08	07	4	45	31.87	32.864	−97.050	5	2.6*	0.27	115	A	*	DFW
6380	2011	08	12	18	50	59.75	32.728	−97.382	5		1.17	214	C		Tarrant W
6395	2011	08	14	7	14	51.83	32.483	−97.215	5		1.21	186	B		J-A