Annual Project Summary

Project Period October 1, 2000-September 20, 2001

Title: Operation of a Strong Ground Motion Array in the New Madrid Seismic Zone

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Program Element: I

Key Words: Strong Motion, New Madrid Seismic Zone

Investigations Undertaken

Field activity and transfer of LDEO stations

One of the founding person of the LDEO NMSZ strong-motion network, Douglas Johnson, retired from LDEO in 1999. Starting in February, 2000, Dr. Jiakang Xie served as the principal investigator of this project. With this personnel change and the new initiative of the Advanced National Seismic System (ANSS), key personnel at LDEO met to decide the future of the LDEO NMSZ strong-motion network. It was decided that no new research proposal to the USGS, to continue the operation of the network, would be submitted at the end of this project. Instead, an orderly transfer of the operation of stations to other institutions participating the ANSS initiatives were to be arranged. In coordination with the ANSS efforts, principal investigators at LDEO engaged in substantial discussions about future of the stations with principal investigators at the Center for Earthquake Information and Research (CERI) of University of Memphis, and at the Kentucky Geological Survey (KGS). It was decided that LDEO would transfer the operation and maintenance of the stations to CERI and KGS at the end of this project.

The transfer of operation of the stations took place during a final trip by John Armbruster in January, 2001. Operation of all stations in Table 1, with the exception for stations HNBK and RITN, was transferred to CERI. Stations HNBK and RITN were transferred to the KGS. The transfer was achieved by co-visits of John Armbruster (LDEO)

Table 1. Digital Accelerographs Operated by LDEO in the NMSZ as of June 1999 to Feburary 2001

Station Code	Location City/State	Latitude °N	Longitude °W	Elevation (M)	Type	Program
WEIL	Marion, Il.	37.7228	-89.0002		SSA-1	USGS
OLAP	Appleton Mo.	37.5858	-89.7055	180	SSA-1	NCEER/NSF
VIEN	Vienna, Il.	37.415	-88.8917	120	SSA-1	NCEER/NSF
ATMO	Advance, Mo	37.0953	-89.9062	190	SSA-1	NCEER/NSF
HOLD	Holliday Landing, Mo	37.0362	-90.4223	123	SSA-2	USGS
TFMO	Charleston, Mo.	36.923	-89.371	92	SSA-1	NCEER/NSF
BROS	Broseley, Mo.	36.6767	-90.2450	29	SSA-2	USGS
JTMO	New Madrid. Mo	36.5742	-89.5847	113	SSA-1	USGS
MSMO	Malden, Mo	36.5688	-89.9728	60	SSA-2	USGS
RIMO	Risco, Mo.	36.5549	-89.7732	85	SSA-1	NCEER/NSF
HNBK	Hornbeak, Tn.	36.3335	-89.3027	140	SSA-1	NCEER/NSF
HYMO	Hayti, Mo.	36.2375	-89.7433	248	SSA-1	USGS
RITN†	Ridgeley, Tn.	36.2642	-89.4806	87	K2	NCEER/NSF
BRAD	Bradford, Tn	36.0753	-88.8045	131	SSA-2	USGS
YBAR	Blythville, Ar	35.9815	-89.9112	77	SSA-2	USGS
DHTN	Huntingdon, Tn	35.907	-88.399		SSA-1	NCEER/NSF
HATN	Halls, Tn.	35.896	-89.431	120	SSA-2	USGS
FTPL	Fort Pillow S.P.,Tn.	35.6533	-89.8350	117	SSA-1	NCEER/NSF
MTAR	Marked Tree, Ar.	35.5453	-90.3922	67	SSA-2	USGS
SHFT	Shelby Forest, Tn.	35.3567	-90.0182	102	SSA-2	USGS

All stations except RITN have 12 bit A/D’s, operated at 200 SPS. Data bandwidth is 50hz.

† RITN has a six channel K2, with 3 components at a 30m depth. The signal is digitized with a 19 bit resolution at 100 sps and 40hz bandwidth.

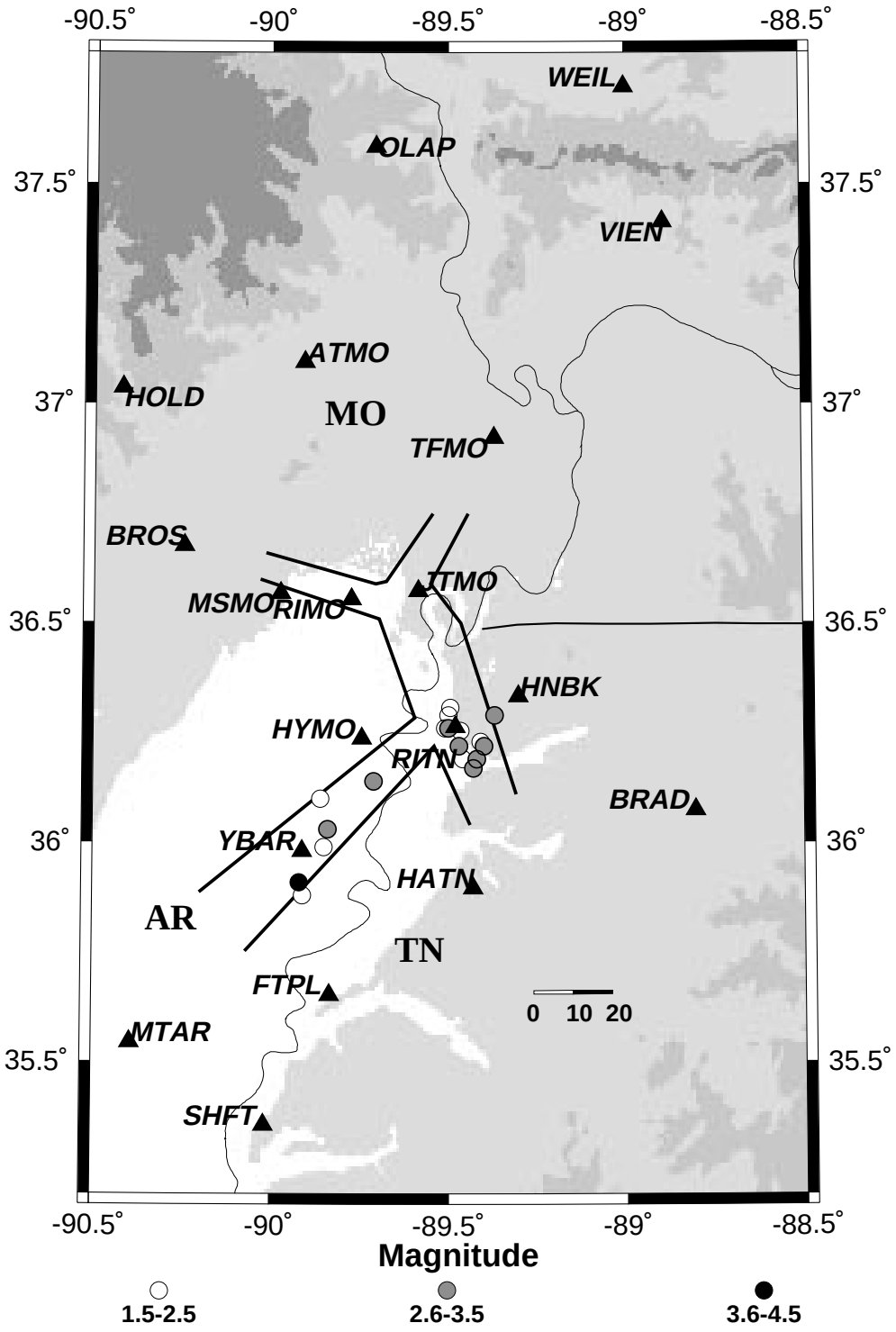

Figure 1 Map showing events (circles) recorded by the LDEO strong motion network stations (triangles) between 1995-2001. Topography is coded with a gray scale with white representing areas lower than 85 M above sea level. Areas with successively increasing darkness have elevations of 85-150M, 150-200M and 200-500M, respectively. Thick lines mark boundaries of the most active portion of the NMSZ in terms of the current microearthquake activity (e.g., Xie et al., 1997).

Table 2. Events recorded by the LDEO Strong Motion Network (1995-2000)

Yr/Mo/Day	hr:min:sec	Lat (°)	Lon (°)	Depth (km)	Mag	Sta-tions	Location
1995/ 5/27	19:51:10.0	36.17	-89.43	6.4	3.0	4	Miston,TN
1995/ 6/ 6	21:27:11.0	36.22	-89.47	5.0	3.1	2	Miston,TN
1995/ 6/28	6:28:**.*	*	*			1	not reported
1995/ 8/25	0:50:11.0	36.19	-89.46	5.3	2.5	1	Miston,TN
1995/ 9/13	5:54:46.0	36.10	-89.86	5.4	2.4	1	Steele,MO
1996/ 4/ 4	23:55:05.0	35.52	-90.51	9.9	3.0	1	Payneway,AR
1996/10/13	11:11:24.0	35.88	-89.91	8.3	2.5	1	Dogwood,AR
1996/11/29	5:41:33.0	35.91	-89.92	20.5	4.3	4	Blythesville,AR
1996/11/29	10:47:09.0	36.29	-89.37	10.0	3.4	1	Lake Isom Nwr,TN
1996/12/15	7:19:57.0	36.03	-89.84	4.4	2.8	1	Pemiscot Co.,MO
1997/ 3/ 7	23:38:58.0	36.26	-89.51	7.5	2.0	1	Ridgely,TN
1997/ 8/21	19:29:35.0	35.99	-89.85	13.6	2.3	1	Blytheville,AR
1997/ 9/27	12:14:11.0	36.19	-89.42	6.6	2.9	1	Cloverdale,TN
1998/ 2/12	9:37:49.0	36.14	-89.71	9.6	3.0	1	Caruthersville,MO
1998/12/ 6	12:56:**.*	*	*			1	not reported
1998/12/27	19:34:**.*	*	*			1	not reported
1999/ 3/16	13:10:57.0	36.23	-89.41	10.1	2.0	1	E. of Ridgely,TN
1999/ 8/23	12:12:41.0	36.26	-89.50	9.0	3.1	1	W. of Ridgely,TN
1999/10/21	08:18:**.*	*	*			2	not reported
1999/10/30	12:18:**.*	*	*			1	not reported
2000/ 1/ 7	21:07:00.0	36.29	-89.50	8.8	1.7	1	N. of Ridgely,TN
2000/ 1/26	00:21:00.0	36.22	-89.40	8.3	2.6	1	SE of Ridgely,TN
2000/ 5/13	09:57:15.0	36.255	-89.466	9.2	2.4	1	ESE of Ridgely,TN
2000/ 5/25	02:23:06.0	36.308	-89.495	5.2	1.8	1	N of Ridgely,TN

NOTES:

- Event parameters are as reported in the CERI, University of Memphis catalog; "Stations" are the number of strong motion stations recording the event.
- Data are in ah format scaled as cm/sec/sec with a directory for each event containing the ah files. IP• For station information and data prior to 1995 go to the web site:
  http://www.ldgo.columbia.edu/cgi-bin/strongmo-cgi-bin/smdb_startStrongmo.pl

and Chris McGoldrick (CERI) to all stations except HNBK and RITN, which were visited by Armbruster and Edward Woolery of the KGS.

Transfer of the hardware, phone and power utilities, and the arrangements with site-owners was generally smooth. There are two minor complications that were dealt with. First, station BROS had been destroyed in a building fire. This resulted in a cleanup effort and the loss of the external FBA instrument. Second, the SSA instrument at FTPL was damaged, and removed for repair by CERI.

Data archiving

In addition to network operation and expansion, another part of work in this project is data collection and archiving. During the period of February 1997 - February 2001 there have been 14 events that triggered the network, resulting in 81 traces of three-component data. Additionally, there were 10 events recorded in 1995 and 1996, resulting in 54 traces that had not been archived prior to this reporting period. In all, 135 traces from 24 events are archived. Table 2 and Figure 1 contain detailed information about events that are recorded. All traces archived are passed directly to a web-based strong motion database at LDEO, known as "**Strongmo**". The website for **Strongmo** is:
" http://www.ldeo.columbia.edu/cgi-bin/strongmo-cgi-bin/smdb_startStrongmo.pl ". (click on "New Madrid Seismic Zone Data 1995-2000: NMSZ_DATA_95_00.tar.gz"). Earlier data, for events prior to May, 1995, are also available at the website. For reference on **Strongmo** development prior to this project, see Friberg & Jacob (1990) and Friberg *et al.* (1994).

Under the constraint of funding level, the new data set is only made available as a gziped Unix tar file. Users need to gunzip it and tar it on a Unix machine. The data files are in *.ah format. The total size of the tar file is about 1.3 Mb after compression.

References

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NON-TECHNICAL SUMMARY

In early 2001, the Lamont-Doherty Earth Observatory (LDEO) transferred the operation and maintenance of the strong-motion network stations in the New Madrid

Seismic Zone to the University of Memphis and Kentucky Geological Survey. Data recorded prior to the transfer consist of 135 waveforms from 24 earthquakes between 1995 and 2000, with magnitudes between 1.7 and 4.3. These waveform data were integrated into a web-based database at the LDEO.

Reports Published

None.

DATABASE

The new data generated by this project can be retrieved at the following website : "http://www.ldeo.columbia.edu/cgi-bin/strongmo-cgi-bin/smdb_startStrongmo.pl ".

The data volume is assembled in a Unix tar file (gziped), with data files in *.ah format. A README file explains details. Questions regarding the data should be directed to John Armbruster (armb@ldeo.columbia.edu), or Jiakang Xie (xie@ldeo.columbia.edu).