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**INTEGRATED VERIFICATION EXPERIMENT DATA COLLECTED
AS PART OF THE LOS ALAMOS NATIONAL LABORATORY'S
SOURCE REGION PROGRAM**

APPENDIX F

**REGIONAL DATA FROM LAWRENCE LIVERMORE
NATIONAL LABORATORY AND SANDIA NATIONAL LABORATORY
SEISMIC NETWORKS**

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June 11, 1993

LAUR-93-2150

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ABSTRACT

A dataset of regional seismograms assembled for a series of Integrated Verification Experiments conducted by the Los Alamos National Laboratory Source Region program is described. The seismic data has been assembled from networks operated by Lawrence Livermore National Laboratory and Sandia National Laboratory. Examples of the data are shown and basic recording characteristics of the network are described. The seismograms are available on a data tape in SAC format upon request.

INTRODUCTION

In order to perform studies investigating the effects of explosion source phenomenology on signals used for verifying nuclear test ban treaties, the Source Region Program at Los Alamos National Laboratory (LANL) has conducted 12 Integrated Verification Experiments (IVE) at the Nevada Test Site (NTS; Table 1). The data collected for the IVE's include ground motion, infrasound, remote ionospheric monitoring, local and near-regional seismic, and observations of surface effects, each of which is to be included in a separate appendix. The regional seismic data assembled for this appendix were not specifically collected for the IVE's, but was kindly provided by Lawrence Livermore National Laboratory (LLNL) and Sandia National Laboratory (SNL). We have included it for completeness and to compliment the other datasets.

REGIONAL IVE DATA

Figure 1 shows the locations of the SNL and LLNL regional seismic stations. The station locations are listed in Table 2. Recording characteristics of the LLNL and SNL seismic networks are described in Jarpe (1989) and Brady (1992). The LLNL seismic network consists of four broadband stations surrounding NTS at distances from approximately 180 to 400 km (Figure 1).

Figure 1. Map of the western U.S. showing location of LLNL (open triangles) and SNL (open circles) seismic stations and NTS (open square).

Included in this appendix are the vertical, north-south, and east-west components from the broadband (BB; 0.07 to 5 Hz; GS-13 seismometers) and high frequency (HF; 1 to 30 Hz; Sprengnether S-5100 seismometers) channels.

The SNL seismic network consists of five stations located around NTS at distances of about 144 to 379 km. The data included in this report are from three different frequency bands. Two short-period bands with a peak response near 1 Hz are provided using a GS-13 and Benioff seismometer (removed January 1991). Vertical and radial components are available for the short-period passbands. Three components (Z,N,E) from a long period channel (with peak response at slightly less than 0.1 Hz) using Teledyne-Geotech SL-210 and SL-220 seismometers are also included. For both systems, instrument corrections can be applied using the TRANSFER command in the Seismic Analysis Code (SAC; Tull, 1989).

Examples of the vertical component seismic data for each of the IVE's are shown in the Addendum. The vertical component data from the LLNL network for the HF band and the vertical component data from the SNL network for the SP band (either the GS-13 or the

Benioff, depending upon availability) are shown. The data are all stored in binary SAC format (Tull, 1989). A data tape with the available seismograms can be obtained from

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Unless specified, an exabyte tar tape containing SAC files in a self-explanatory UNIX directory structure will be sent.

ACKNOWLEDGMENTS

We wish to thank Carolyn Bailey and Ken Simerly at LLNL, Doug Seastrand and Leo Brady of SNL, and John Stewart for help in assembling this dataset. The manuscript was reviewed by Craig Pearson. This work is performed under the auspices of the U.S. Department of Energy by Los Alamos National Laboratory under contract W-7405-ENG-36.

REFERENCES

- Brady, L.F., The Sandia seismic network, EG&G Energy Measurements, Inc., Las Vegas, NV, EGG 10617-1167, UC-706, 11pp, 1992.
- Jarpe, S.P., Guide for using data from the LNN seismic monitoring network, *Lawrence Livermore National Laboratory, Livermore, CA*, UCID-21872, 5pp, 1989.
- Tull, J.E., SAC Command Reference Manual Revision 10.4c, *Lawrence Livermore National Laboratory, Livermore, CA*, 1989.

TABLE 1

Integrated Verification Experiments

Name	Hole	Date	Origin Time	Latitude (N)	Longitude (E)
Misty Echo	U12n.23	12/10/88	20:30:00.0	37.1990	-116.2094
Texarkana	U7ca	2/10/89	20:06:00.0	37.0768	-116.0006
Ingot	U2gg	3/9/89	14:05:00.0	37.1428	-116.0669
Tulia	U4s	5/26/89	18:07:00.0	37.0859	-116.0551
Contact	U20aw	6/22/89	21:15:00.0	37.2829	-116.4123
Amarillo	U19ay	6/27/89	15:30:00.0	37.2755	-116.3536
Hornitos	U20bc	10/31/89	15:30:00.0	37.2631	-116.4907
Metropolis	U2gh	3/10/90	16:00:00.0	37.1125	-116.0552
Bullion	U20bd	6/13/90	16:00:00.0	37.2616	-116.4201
Mineral Quarry	U12n.22	7/25/90	18:00:00.0	37.2069	-116.2143
Bexar	U19ba	4/4/91	19:00:00.0	37.2961	-116.3129
Junction	U19bg	3/26/92	16:30:00.0	37.2725	-116.3598

TABLE 2**Station Locations**

<u>Station</u>	<u>Latitude (N)</u>	<u>Longitude (E)</u>	<u>Station Name</u>
BTM	40.430	-117.221	Battle Mountain, NV
DRW	36.276	-117.595	Darwin, CA
ELK	40.744	-115.238	Elko, NV
KNB	37.016	-112.822	Kanab, UT
LAC	34.389	-116.411	Landers, CA
LDS	37.243	-113.351	Leeds, UT
MNV	38.342	-118.154	Mina, NV
NLS	37.712	-114.843	Nelson, NV
TON	38.043	-117.223	Tonopah, NV

ADDENDUM

Vertical component records from the IVE's for the LLNL seismic network HF band. Event and station name indicated on each seismogram plot. For the SNL seismic network stations, vertical component records from the IVE's for the SP band. Event name indicated on each seismogram plot, second letter corresponds to station name (e.g. b - Battle Mountain, NV; d - Darwin, CA; l - Leeds, UT; n - Nelson, NV; and t - Tonopah, NV). The next two letters indicate seismometer (gp - GS-13 and sp - Benioff).

Time (s)

Time (s)

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