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INL Seismic Monitoring Annual Report: January 1, 2011 – December 31, 2011

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SUMMARY

During 2011, the Idaho National Laboratory Seismic Monitoring Program evaluated 21,928 independent triggers that included earthquakes from around the world, the western United States, and local region of the Snake River Plain. Seismologists located 2,063 earthquakes and man-made blasts within and near the 161-km (or 100-mile) radius of the Idaho National Laboratory. Of these events, 16 were small-to-moderate size earthquakes ranging in magnitude (M) from 3.0 to 4.4. Within the 161-km radius, the majority of 941 earthquakes ($M < 4.4$) occurred in the active regions of the Basin and Range Province with only six microearthquakes occurring in the Snake River Plain. In the northern and southeastern Basin and Range, eight earthquake swarms occurred and included over 325 events. Five of the Snake River Plain earthquakes were located within and near the northern and southern ends of the Great Rift volcanic rift zone. The five microearthquakes have anomalously deep focal depths (16 to 38 km) and waveforms indicative of fluid movement at mid- and lower-crustal levels. The 2011 events appear to be a continuation of activity observed at Craters of the Moon National Monument since 2007. During the 39 years of monitoring, the Idaho National Laboratory has recorded 55 small-magnitude microearthquakes ($M \leq 2.2$) within the eastern Snake River Plain and 25 deep microearthquakes ($M \leq 2.3$) in the vicinity of Craters of the Moon National Monument.

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ACKNOWLEDGEMENTS

We greatly appreciate the work and support of Seth Carpenter in developing the 2011 earthquake catalog. We also thank staff at the University of Utah Seismograph Stations, U. S. Geological Survey, and Montana Bureau of Mines and Geology for their earthworm data shares. We also appreciate the support of Incorporated Research Institutions in Seismology (IRIS). The research was funded in part by the Idaho National Laboratory through the U.S. Department of Energy Idaho Operations Office contract DE-AC07-05ID14517.

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ACRONYMS

ANL	Argonne National Laboratory
ATR	Advanced Test Reactor
BLM	Bureau of Land Management
CFA	Central Facilities Area
COM	Craters of the Moon National Monument and Preserve
DAAS	Data Acquisition/Analysis System
DOE	Department of Energy
DSL	Digital Subscriber Line
EFS	Experimental Field Station
ESRP	Eastern Snake River Plain
GPS	Global Positioning System
ICPP	Idaho Chemical Processing Plant
INL	Idaho National Laboratory
INTEC	Idaho Nuclear Technology and Engineering Center
IP	Internet Protocol
IRC	INL Research Center
LOFT	Loss of Fluid Test
MFC	Materials and Fuels Complex
M	Moment Magnitude
M_c	Coda Magnitude
M_L	Local Magnitude
M_s	Surface-wave Magnitude
NEIC	National Earthquake Information Center
NRF	Naval Reactor Facility

OFS	Old Fire Station
PBF	Power Burst Facility
PBO	Plate Boundary Observatory
P-wave	Compression Wave
RMS	Root Mean Square
RWMC	Radioactive and Waste Management Complex
S-wave	Shear Wave
SMC	Special Manufacturing Complex
SMA	Strong Motion Accelerograph
SSCs	Structures, Systems, and Components
STC	Science and Technology Complex
TAN	Test Area North
TRA	Test Reactor Area
USGS	United States Geological Survey

INL Seismic Monitoring Annual Report: January 1, 2011 – December 31, 2011

1. Introduction

The Idaho National Laboratory (INL) has accumulated 39 years of earthquake data (1972-2011). This report covers the earthquake activity from January 1, 2011 through December 31, 2011 and is a continuation of previous annual reports on earthquake activity surrounding the eastern Snake River Plain (ESRP) and within and near the INL. It discusses the earthquake activity that has occurred around the local region and within 100-miles of the INL (a 161-km radius around the INL centered at 43° 39.00' N, 112° 47.00' W (Figure 1). It discusses seismic station, strong-motion accelerograph (SMA), and continuous GPS (Global Positioning System) instrumentation used to record earthquake data and how the data are analyzed.

1.1 History of INL Seismic Monitoring Program

1.1.1 Purpose

The purpose of the INL Seismic Monitoring Program is to provide the INL with earthquake data and staff expertise to support the requirements set forth by Presidential executive orders, Department of Energy (DOE) directives, orders and standards, and the Nuclear Regulatory Commission for seismic safety of: Structures, Systems, and Components (SSCs); workers and the public; and operations at INL of reactors and waste management activities. The program supports safety of operations through continuous monitoring of earthquake activity, the development of INL seismic design criteria, assessments of seismic hazards for existing facilities and acquisition of major new programs, and early warning of potential future volcanic eruptions near INL. For example, the earthquake data are used to assess seismic hazards and develop seismic design criteria for the INL as required by DOE Order 420.1A “Facility Safety” (DOE, 2003).

The INL Seismic Monitoring Program operates 27 permanent seismic stations for the purpose of determining the time, location, and size of earthquakes occurring in the vicinity of the INL. The seismic data are compiled to develop an historical database that defines the zones and frequency of earthquake activity. Seismic stations are located within and around the INL near potential earthquake sources that include major range-bounding normal faults and volcanic rift zones (Figure 1). Additionally, GPS receivers are co-located at 16 seismic stations for the purpose of determining rates of crustal deformation. GPS velocities are used to identify regions of higher crustal deformation rates (such as Yellowstone, Wyoming) relative to regions of lower deformation rates (e.g. Snake River Plain, Idaho).

The INL Seismic Monitoring Program operates 20 SMAs for the purpose of recording strong ground motions from local moderate or major earthquakes. Half of the SMAs are located within INL buildings to determine the response of these buildings to ground motions in the event of a large earthquake. The other SMAs are located at “free-field” sites (not within buildings) at INL facility areas and are used to determine the levels of earthquake ground motions at the ground (rock or soil) surface. SMAs and accelerometers are also co-located with several INL seismic stations to record acceleration data and assess attenuation effects of small to large magnitude normal faulting earthquakes.

1.1.2 Seismic Stations

The INL seismic network has evolved from a single analog station to its current configuration of 27 digital seismic stations. The INL Seismic Monitoring Program also records data from seismic stations owned and operated by other seismic networks. The INL seismic network began with a single station in 1971 and expanded to three stations by October of 1972. In 1977, the INL began monitoring a station operated by BYU-Idaho in Rexburg, Idaho. The INL installed two additional stations in 1979 and from 1979 to 1985, the INL monitored earthquake activity using six seismic stations. In 1985, the INL installed a simulated Wood-Anderson system to improve the capabilities of measuring the magnitude of local earthquakes ($3.0 \leq M \leq 5.0$). During 1986, the INL began receiving seismic data from a station located in Pocatello, Idaho and operated by the University of Utah in Salt Lake City, Utah. Also in 1986, the INL began receiving data from a station located near Palisades Reservoir, Idaho that is operated by BYU-Idaho. A seismic station within the INL boundaries was added to the INL seismic network in 1987.

From 1990 to 1994, INL seismic network underwent a major expansion of seismic stations. During 1990, four seismic stations were installed within the INL boundaries. From 1991 to 1992, thirteen new stations were installed in support of construction and operation of the proposed New Production Reactor at INL. Shallow boreholes (<20 m) were drilled for seismic stations located within the ESRP. Also, monitoring of BYU-Idaho seismic station near Palisades Reservoir was terminated in 1991 to accommodate the addition of the new INL seismic stations. In 1994, two new INL seismic stations were installed near Gray's Lake, Idaho.

Several changes occurred to seismic stations from 1999 to 2003. During 1999, the INL Howe Scarp, Idaho (HWSI) seismic station was relocated further east to a new location now referred to as the Howe Fault, Idaho or HWFI because of a lawsuit filed against the Bureau of Land Management (BLM). With the implementation of the "EARTHWORM" computer software in 2000, up to 14 stations from several nearby networks were being recorded in real-time along with the INL seismic stations. During 2001-2003, analog seismic instruments at all INL seismic stations were replaced with digital instruments. In 2003, the University of Utah transferred ownership of the Pocatello, Idaho (PTI) seismic station to the INL Seismic Monitoring Program at which time a digital seismic station was installed. With addition of the PTI station, INL has operated 27 seismic stations from 2003 through 2011.

1.1.3 Strong Motion Accelerographs

The INL accelerograph network, which began by installing eleven SMAs in critical INL facilities, consists of SMAs installed in buildings at INL facility areas and at free-field sites for both rock and soil conditions. The original network was composed of three SMAs installed within buildings at the Idaho Nuclear Technology and Engineering Center (INTEC) (formerly referred to as Idaho Chemical Processing Plant - ICPP), two located within the Materials and Fuels Complex (MFC) facilities (formerly referred to as Argonne National Laboratory – ANL), three installed within the Power Burst Facility (PBF), two located within buildings at the Advanced Test Reactor (ATR) (formerly referred to as Test Reactor Area – TRA), and one located at the Old Fire Station (OFS). From 1978 to 1979, four SMAs were installed at Test Area North (TAN) within the Containment Test facility (formerly referred to as Loss of Fluid Test – LOFT facility). Just prior to the October 1983 surface-wave magnitude (M_s) 7.3 Borah Peak, Idaho earthquake, one SMA was installed at the INL Research Center (IRC), which is now part of the Science and Technology Complex (STC) in Idaho Falls, Idaho. Following the 1983 earthquake, two SMAs were installed within buildings at the Naval Reactor Facility (NRF). In 1984, two additional SMAs were placed within buildings at INTEC. During 1990, one SMA was installed at the Central Facilities Area (CFA). A digital SMA was co-located with an analog SMA at MFC in 1993. In 1996, two free-field SMA sites were installed, one at NRF and the other at PBF. In 1997, one SMA was installed as a free-field site at the Radioactive Waste Management Complex (RWMC). In 2003, the

SMAs were upgraded to digital NetDAS SMAs. At that time, one NetDAS digital SMA replaced two SMAs co-located at Building ANL-767 (Kinemetrics analog SMA-1 and digital SSA-2 accelerographs). The SMA on the crane beam at PBF-620 was not upgraded, but removed due to decommissioning activities.

Over the years, several SMAs have been relocated because buildings have been decommissioned and demolished. In 1995, the SMA at OFS was moved to a storage building directly behind the fire station because the fire station was decommissioned. In 1997, when the storage building was demolished, this SMA was relocated to the Experimental Field Station (EFS). In 1996, the Containment Test facilities, or LOFT facilities, were decommissioned. Three of the SMAs from LOFT were moved to the TAN Hot Shop and one was placed at the TAN Air Monitoring building. In 1997, the SMA at CFA was relocated to CFA-1607 Refueling Building. In 2004, the TAN Air Monitoring building was demolished so the SMA was removed and was reinstalled in 2005 as a free-field near the TAN Hot Shop. In 2004, the PBF building was demolished and the three SMAs were removed. The SMAs were reinstalled in 2005 as free-field sites near PBF and RWMC. In 2006, four SMAs at TAN were removed due to demolition of the TAN Hot Shop. In 2007, two of these SMAs were reinstalled; one was installed at the Special Manufacturing Complex (SMC) and the other at a free-field site east of SMC. In 2008, two SMAs were removed as a result of building demolition activities. One SMA at INTEC in building CPP-668 and one at ATR were removed. These SMAs were reinstalled at TAN and the New Production Reactor seismic station, NPRI. During 2009, two SMAs were removed at INTEC from building CPP-601 as a result of building demolition activities. In 2010, the SMA at CFA, called EFSF, was uninstalled, moved to the nearby pump house, and renamed to PHFF.

Three-component accelerometers and SMAs were added to some of the seismic stations. In 2002, accelerometers were added to four seismic stations: Bear Canyon (BCYI), Gray's Range (GRRI), NPRI, and HWFI. In 2003, accelerometers were added to seismic stations Telchick Spring, Idaho (TCSI), Split Crater (SPCI), and PTI. In 2004, the accelerometer at TCSI was uninstalled. In 2008, a free-field SMA was installed at the Craters of the Moon (COMI) seismic station. During 2011, the INL Accelerograph Network operated up to 20 SMAs within or near INL Site facility areas, two sites outside of the INL boundary (IRC and COMI), and five three-component accelerometers installed at seismic stations for a total of 27 sites with acceleration recording capabilities.

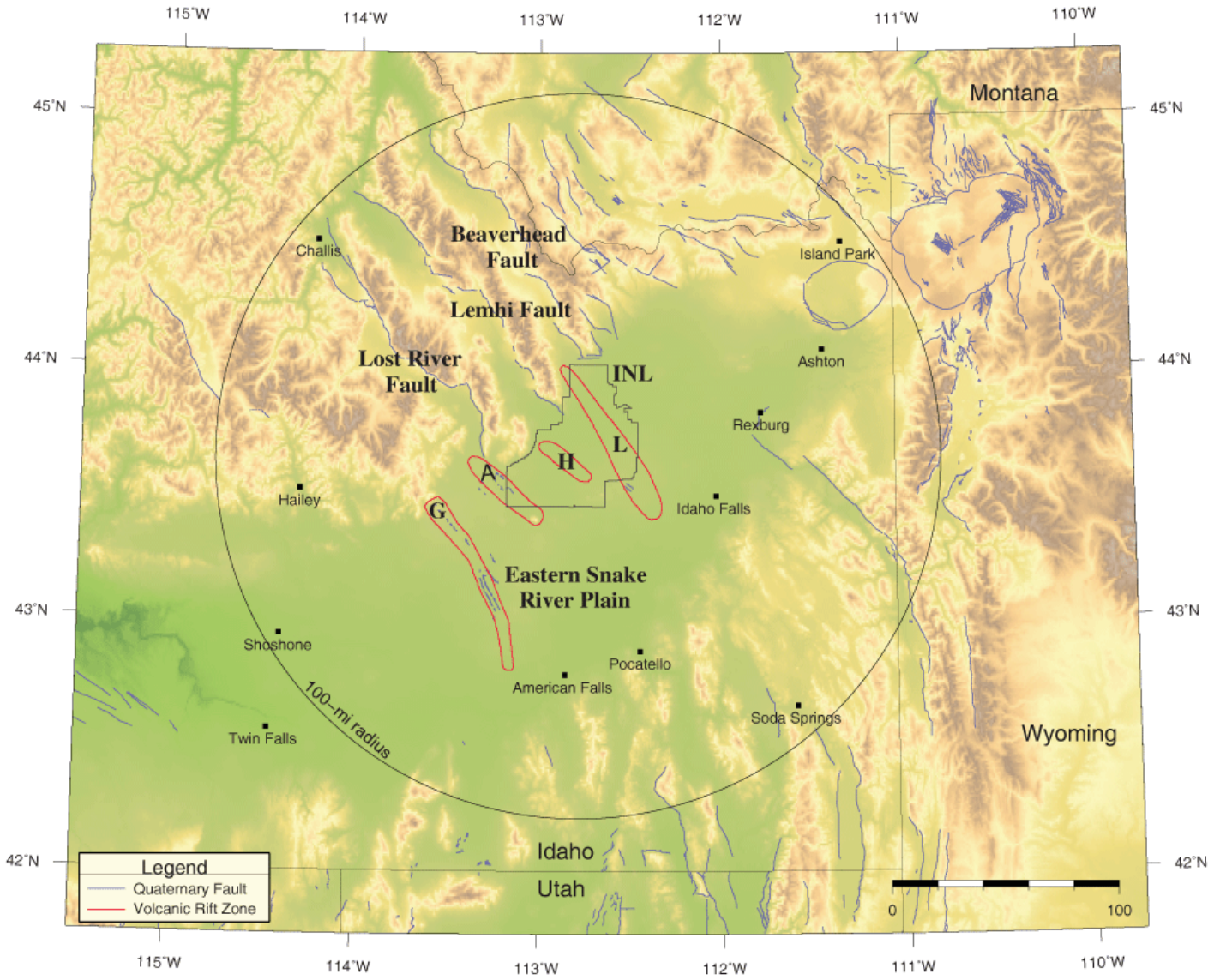

Figure 1. Map shows locations of the earthquake reporting area within a 161-km (100 mile) radius around the INL, Quaternary faults, and volcanic rift zones: G – Great Rift, A – Arco, H – Howe-East Butte, and L – Lava Ridge-Hell's Half Acre.

2. Instrumentation

2.1 Seismic Station Network

During 2011, the INL Seismic Monitoring Program operated 27 permanent seismic stations and monitored up to 50 seismic stations from other nearby seismic networks (Figure 2). Table 1 lists the name, location, and date of installation for the seismic stations owned and operated by the INL Seismic Monitoring Program. Table 2 lists the name, location, and operation dates of seismic stations owned by other agencies. The INL recorded seismic data from these other seismic stations to improve the quality of earthquake locations within the 161-km radius of INL.

Instrumentation for INL seismic stations consists of digital recorders, one- and three-component seismometers, and three-component accelerometers. The digital recorder is a DAQSystems NetDAS field unit, which is an embedded LINUX computer with a GPS clock and Symmetric Research 24 bit digitizer. The NetDAS units have from 22 to 24 bits of data resolution over ± 20 volts for a four-channel unit or ± 10 volts for an eight-channel unit. Four channel units (NetDAS-CH4) are located at seismic stations that have one or three sensors; eight channel units (NetDAS-CH8) are at seismic stations that have more than three sensors (such as three seismometers and three accelerometers). Some seismic stations have pre-amplifiers that improve signal-to-noise ratios. The NetDAS digitizes data at the seismic station and time stamps the data with accuracies of ± 0.001 seconds. The seismic signals are transmitted by FreeWave Technologies DGR115 900 MHz Wireless Modem radios. These radios use standard IP (Internet Protocol) networking features that are included in their embedded LINUX operating system.

The INL Seismic Monitoring program includes short-period and broadband seismometers and accelerometers. Single-component short-period seismic stations have vertically oriented velocity sensors (or seismometers) that are a Mark Products model L-4C, Teledyne Geotech (TG) model S-13, or TG model S-13 Jr. seismometer. All seismic stations located within the ESRP have their vertical-component seismometer located at the bottom of 18 m or greater borehole to help dampen wind and cultural noise (Seismic, 1993) and seismometers at stations outside of the ESRP are buried within 3 m of the ground surface. Seismic stations with horizontally-oriented velocity sensors have two Teledyne Geotech model S-13 seismometers located within a concrete vault, in addition to the vertically-oriented sensor. Seismic stations with acceleration sensors have Applied MEMs Inc. model SF1500A, SF2500A, or SF3000L tri-axial accelerometers.

Two INL stations include three-component broadband seismometers, the New Production Reactor, Idaho (NPRI) and Crow's Nest Canyon, Idaho (CNCI) seismic station. The INL acquired the broadband seismograph station I14A from the EarthScope project (Earthscope, 2007). The broadband sensor is still referred to as station I14A and is co-located with the CNCI short-period seismic station. Instrumentation at I14A consists of a Quanterra Q330 data acquisition system and Guralp CMG-3T broadband seismometer. The instrumentation remains in the original vault installed by USArray. The NPRI station was upgraded in 2011 to include broadband seismic monitoring capabilities as first step to upgrade additional INL seismic stations and install new stations at INL facility areas in support of seismic hazard analyses. The broadband instrumentation at NPRI consists of a Quanterra Q330 data acquisition system and a three-component, Nanometrics Trillium T120-PA broadband seismometer. The instrumentation is housed within a vault-like enclosure covered by native soils to dampen wind noise and reduce temperature fluctuations.

Where AC power is not available, seismic stations are powered by batteries, solar panels, and at some locations, small wind generators. Radio frequency compatible antennas transmit and receive the seismic signals. Several seismic stations are used as relay stations to allow transmission of seismic signals

to the IRC in Idaho Falls. The seismic data are relayed by digital radios or internet Digital Subscriber Line (DSL) links (Appendix A). The data are acquired through EARTHWORM software over the Internet (discussed in Section 2.5). Digital seismograms are continuously displayed on three of four computer monitors referred to as "Webicorders." The fourth monitor displays a map of current earthquakes located by the INL Seismic Monitoring Program.

2.2 Strong Motion Accelerographs

The INL accelerograph network currently consists of 20 strong-motion accelerographs. Twenty one (21) are at INL facilities with 20 located at the INL Site and one located in the IRC at the STC. There are one to three accelerographs at each INL Site facility area (Figure 3). Additionally, since 2008, INL has operated one SMA outside of the INL boundary co-located at the COMI seismic station. Table 3 lists the location and date of installation for each of the SMAs in operation. During 2011, earthquakes did not trigger SMAs located within INL facilities.

INL SMAs are DAQSystems NetDAS digital accelerographs that have Applied MEMS SiFlex SF2500 tri-axial accelerometers contained within the unit. Each accelerometer component of an SMA is set to trigger and record to compact flash when ground motions exceed ~0.005 g except for the SMA in the basement of ATR (TRA2) which is set to ~0.0005 g. The record lengths are set for 30 s of pre- and post-trigger thresholds. The tri-axial accelerometers have two horizontal components oriented in an orthogonal manner, generally aligned in the north-south and east-west directions. Appendix B lists the accelerometer orientation and instrument response for the horizontal and vertical components of each SMA. SMAs at free-field sites have GPS clocks to synchronize the internal clocks to an absolute time system. For some SMAs at free-field sites and locations within buildings, acceleration data are transmitted to the IRC via digital radios or the Internet. Other SMAs record data on compact flash disks that are retrieved by INL seismic personnel using a laptop computer.

2.3 Continuous GPS Stations

The INL Seismic Monitoring Program has a geodetic network for the purpose of monitoring crustal deformation in support of INL seismic hazards assessments. GPS data are used to investigate active crustal deformation that is on the order of millimeters of movement per year within the ESRP, the surrounding Basin and Range, and Yellowstone Plateau. GPS data help distinguish regions of high velocity gradients (or strain rates) having more frequent damaging earthquakes (e.g., Yellowstone – Hebgen Lake, Montana) from regions of low velocity gradients (e.g., eastern Snake River Plain). The regional spatial patterns of GPS data also help constrain the fundamental geodynamic processes that drive active continental deformation in the western United States.

During 2011, INL collected additional GPS phase data and teamed with Dr. Robert King at the Massachusetts Institute of Technology to process INL GPS phase data. As part of the Plate Boundary Observatory (PBO) under the EarthScope Science Program, there are currently 19 other continuous GPS sites near the Snake River Plain (Figure 4). One of these GPS receivers is co-located at INL's Great Rift, Idaho (GTRI) seismic station. In addition to continuously operating GPS sites, INL personnel collected GPS phase data at several campaign GPS sites. Dr. King processed all of INL's GPS phase data acquired up to 2011 and located within the ESRP and surrounding Basin and Range. He combined the INL GPS data with other data in the region to produce a horizontal GPS velocity field that encompasses the Pacific Northwest. Locally, the horizontal GPS velocities indicate the Basin and Range is rapidly extending at a rate greater than the very slowly deforming Snake River Plain, which is thought to explain its relative low seismicity (e.g., Payne et al. 2008; Payne et al. 2012).

An INL continuous GPS station consists of a Trimble NetRS GPS receiver connected to a Trimble L1/L2 dual frequency choke ring antenna. The antenna is attached to a 2.4 m steel rod that is drilled into a rock outcrop to a depth of about 1 m. The antenna is stabilized using a much larger PVC pipe filled with sand. This reduces the amount of wind noise within the GPS data, improving the accuracy. The NetRS receivers continuously collect GPS phase data. The phase data are relayed along with the seismic station data to DSL links, which are then accessed from the Internet at the IRC. Also, the phase data are downloaded daily from the Internet and archived by University NAVSTAR Consortium (UNAVCO).

2.4 Seismic Data Acquisition and Analysis System

The INL records earthquake data on a computer Data Acquisition/Analysis System (DAAS) at the IRC. INL began recording earthquake data on the DAAS June 8, 1991 using the U. S. Geological Survey (USGS) CUSP processing software. Since 2001, significant upgrades have been made to the DAAS as a result of computer hardware and software advances. The USGS CUSP data acquisition and analysis software that supported use of the TIMIT program were replaced with the earthquake analysis program SEISAN (developed by the University of Bergen, Norway) in 2002 and the USGS EARTHWORM processing software in 2003. From June 1991 to November 2002, earthquake data were analyzed using the USGS TIMIT program. As of December 2002, earthquake data are now being analyzed using the SEISAN program. Use of the SEISAN and EARTHWORM programs facilitated the upgrades of seismic stations and SMAs to the digital NetDAS data loggers, allowing concurrent waveform analyses of both velocity and acceleration data. Instrument responses of the NetDAS units at seismic stations and SMAs are now routinely determined and are integrated into the SEISAN database (see Appendices B and C). All digital earthquake data are also routinely archived to removable media after analysis.

Earthquake detection by the DAAS is carried out by the EARTHWORM program, which constantly monitors the ratios of the short-term average divided by the long-term average (STA/LTA) of incoming data amplitudes. This involves comparing the short-term root-mean square (RMS) average (1-s window) of the seismic data to a longer-term RMS average, which is the background noise or voltage level determined over a time interval of 20 s. The program determines that an earthquake has occurred when the STA/LTA ratios for several stations exceed a threshold value. When an earthquake is detected, seismograms are saved in a file on a disk. This file is labeled with a sequential number based on the date and time of the trigger for later reference to the earthquake in the SEISAN database. Each seismogram has 30 s of pre-event data and 20 s of post-event data stored within the file. This ensures capture of the entire earthquake waveform as in some instances, earthquakes have low-amplitude, emergent compression (P) waves with larger amplitude shear (S) waves. When this occurs the DAAS may trigger on the S-waves instead of the P-waves, thus, saving 30 s of pre-event time allows recording of the P-waves also.

The earthquake detection software is configured to trigger on earthquakes detected by several stations within a subnet. Subnets contain several stations that are likely to detect the same local earthquake. All INL seismic stations usually detect local earthquakes of magnitude 1.5. Subnets are specified for stations in close proximity to each other and their relationship to known seismic sources. For the ESRP though, a subnet was created for detection of small magnitude ($M < 0.5$) microearthquakes.

The EARTHWORM software also enables data sharing with other seismic networks in near real time over the Internet. The INL provides data from various seismic stations to the University of Utah, Montana Bureau of Mines and Geology, and National Earthquake Information Center (NEIC), which in return provide data to INL (Table 2). EARTHWORM records seismic data from INL and these other agencies, which are analyzed using the SEISAN program. These data enhance the magnitude determinations and azimuth coverage resulting in earthquake location and size with reduced uncertainties within the 161-km radius of INL.

Table 1. Seismic stations operated by INL.

Code	Station Name	Types of Sensors	Latitude North (º)	Longitude West (º)	Elevation (m)	Date Installed (Month/Year)
ARNI	Argonne North, Idaho	Borehole Vertical Seismometer; GPS Receiver	43.6667	112.6235	1533	09/1990
BCYI	Bear Canyon, Idaho	Vertical Seismometer; Three-component Accelerometers; GPS Receiver	44.3108	113.4052	2194	05/1992
CBTI	Cedar Butte, Idaho	Borehole Vertical Seismometer	43.3875	112.9115	1734	07/1986
COMI	Craters of the Moon, Idaho	Three-component Seismometers; Strong-Motion Accelerograph	43.4618	113.5938	1890	03/1992
CNCI	Crows Nest Canyon, Idaho	Vertical (Short-period) Seismometer; Three-component Broadband Seismometers	43.9283	113.4522	1914	05/1992
CRBI	Circular Butte, Idaho	Borehole Vertical Seismometer; GPS Receiver	43.8303	112.6345	1520	11/1987
ECRI	Eagle Creek, Idaho	Vertical Seismometer	43.0535	111.3705	2086	08/1994
EMI	Eightmile Canyon, Idaho	Vertical Seismometer; GPS Receiver	44.0742	112.9262	1963	04/1992
GBI	Big Grassy Butte, Idaho	Borehole Vertical Seismometer; GPS Receiver	43.9875	112.0633	1541	10/1981
GRRI	Grays Range, Idaho	Vertical Seismometer; Three-component Accelerometers; GPS Receiver	42.9380	111.4217	2207	08/1994
GTRI	Great Rift, Idaho	Borehole Vertical Seismometer; GPS Receiver*	43.2440	113.2410	1522	05/1992

Table 1. Continued.

Code	Station Name	Types of Sensors	Latitude North (º)	Longitude West (º)	Elevation (m)	Date Installed (Month/Year)
HHAI	Hell's Half Acre, Idaho	Borehole Vertical Seismometer	43.2950	112.3795	1371	06/1992
HPI	Howe Peak, Idaho	Vertical Seismometer; GPS Receiver	43.7113	113.0983	2597	10/1972
HWFI	Howe Fault, Idaho	Three-component Seismometers; Three-component Accelerometers; GPS Receiver	43.9257	113.0973	1743	10/1999
ICI	Italian Canyon, Idaho	Vertical Seismometer; GPS Receiver	44.3293	112.9412	2463	04/1992
IRCI	INL Research Center, Idaho	Low-gain Three-component Seismometers	43.5153	112.0333	1442	11/1988
JGI	Juniper Gulch, Idaho	Three-component Seismometers	44.0927	112.6768	1657	11/1979
KBI	Kettle Butte, Idaho	Borehole Vertical Seismometer	43.5907	112.3767	1678	05/1992
LJI	Lemhi Junction, Idaho	Vertical Seismometer	43.8208	112.8440	1643	05/1990
LLRI	Little Lost River, Idaho	Three-component Seismometers	43.7230	112.9330	1476	05/1990
NPRI	New Production Reactor, Idaho	Three-component Short-period & Broadband Seismometers; Three-component Accelerometers	43.5975	112.8272	1495	09/1990
PTI	Pocatello, Idaho	Vertical Seismometer; Three-component Accelerometers; GPS Receiver	42.8703	112.3702	1670	10/1984
PZCI	Patelzick Creek, Idaho	Vertical Seismometer; GPS Receiver	44.3410	112.3172	2073	12/1991
SMBI	Sixmile Butte, Idaho	Borehole Vertical Seismometer	43.5022	113.2677	1716	05/1992

Table 1. Continued.

Code	Station Name	Types of Sensors	Latitude North (º)	Longitude West (º)	Elevation (m)	Date Installed (Month/Year)
SPCI	Split Crater, Idaho	Three-component Seismometers; Three-component Accelerometers	43.4500	112.6370	1553	06/1992
TCSI	Telchick Spring, Idaho	Vertical Seismometer; GPS Receiver	43.6193	113.4783	1731	05/1992
TMI	Taylor Mountain, Idaho	Three-component Seismometers; GPS Receiver	43.3057	111.9182	2179	10/1972

* - GPS instrumentation is owned by the Plate Boundary Observatory under the EarthScope Science Program.

Table 2. Agencies and stations from which INL receives data shares.

Code	Station Name	Latitude North (º)	Longitude West (º)	Elevation (m)
National Earthquake Information Center, Golden, Colorado				
AHID	Auburn, Idaho	42.7653	111.1003	1960
BMO	Baker City, Oregon	44.8525	117.3060	1154
BW06	Boulder, Wyoming	42.7667	109.5582	2224
DLMT	Dillon, MT	45.3625	-112.5964	1569
FLWY	Flagg Ranch, WY	44.0827	-110.6993	2078
FXWY	Fox Creek, WY	43.6381	-111.0268	2254
HLID	Hailey, Idaho	43.5625	114.4063	1498
IMW	Indian Meadows, Wyoming	43.8970	-110.9392	2646
LOHW	Long Hollow, Wyoming	43.6123	-110.6037	2121
MFID	Camas Ranch, Mayfield, ID	43.4151	-115.8278	1302
PLID	Pearl Lake, ID	45.0877	-116.0002	2164
REDW	Red Top Meadow, Wyoming	43.3642	-110.8518	2322
TPAW	Teton Pass, Wyoming	43.4902	-110.9507	2512
University of Utah, Salt Lake City, Utah				
BEI	Bear River Range, Idaho	42.1167	111.7823	1859
BMUT	Black Mountain, Utah	41.9582	111.2342	2243
H17A	Transportable Array Site	44.3951	-110.5762	2400
MCID	Moose Creek, Idaho	44.1903	111.1827	2149
MLI	Malad Range, Idaho	42.0268	112.1255	1896
NPI	North Pocatello, Idaho	42.1473	112.5183	1640
YMC	Maple Creek, Wyoming	44.7593	111.0062	2073
YPP	Pitchstone Plateau, Wyoming	44.2710	110.8045	2707
Montana Bureau of Mines and Geology, Butte, Montana				
MCMT	McKenzie Canyon, Montana	44.8277	112.8488	2323
MOMT	Monida, Montana	44.5933	112.3943	2220
TPMT	Teepee Creek, Montana	44.7298	111.6657	2518

Table 3. Strong-motion accelerographs operating in 2011.

Site Location (INL Facility Abbreviation or Seismic Station Code)	Building Number	Location	SMA Code	Year Installed
MFC	ANL-767	Basement	EBR	1973
MFC	ANL-768	Basement	FCF	1973
CFA	CFA-1607	Free-field	CFAF	1996
CFA	EFS	Free-field	PHFF	2010
COMI[a]	NA	Free-field	COMF	2008
INTEC	CPP-666	Second Floor	FAS1	1984
INTEC	CPP-666	Second Basement	FAS2	1984
NRF	NRF-768	Free-field	NRFF	1996
NRF	NRF-A1W	First Floor	A1W	1983
NRF	NRF-S1W	First Floor	S1W	1983
PBF	NA	Free-field	PBFF	2005
PBF	NA	Free-field	ARAF	2005
ATR	TRA-602	Free-field	TRAF	2003
ATR	TRA-670	Basement	TRA2	1996
RWMC	NA	Free-field	RWMC	1997
RWMC	NA	Free-field	RWME	2005
STC	IRC-602	First Floor	IRC	1983
TAN	NA	Free-field	TANF	2007
TAN	TAN-601	First Floor	TAN4	2008
TAN	SMC	First Floor	SMC	2007

NA – Not within a building.

[a] - Located at seismic station COMI, see Table 1.

Table 4. Continuous GPS sites co-located with INL seismic stations.

Code	Station Name	Latitude North (º)	Longitude West (º)	Elevation (m)	Year Installed
ARNG	Argonne North, Idaho	43.6667	112.6235	1533	2005
BCYI	Bear Canyon, Idaho	44.3108	113.4052	2194	2003
CRBG	Circular Butte, Idaho	43.8303	112.6345	1520	2007[a]
EMIG	Eightmile Canyon, Idaho	44.0742	112.9262	1963	2005
GBIG	Big Grassy Butte, Idaho	43.9875	112.0633	1541	2007 [a]
GRRG	Grays Range, Idaho	42.9380	111.4217	2207	2007 [a]
GTRG	Great Rift, Idaho	43.2440	113.2410	1522	1998[b]
HPIG	Howe Peak, Idaho	43.7113	113.0983	2597	2005
HWFG	Howe Fault, Idaho	43.9257	113.0973	1743	2007 [a]
ICIG	Italian Canyon, Idaho	44.3293	112.9412	2463	2007
LLRG	Little Lost River, Idaho	43.7230	112.9330	1476	2009
NPRG	New Production Reactor, Idaho	43.5975	112.8272	1495	2009
PTIG	Pocatello, Idaho	42.8703	112.3702	1670	2007 [a]
PZCG	Patelzick Creek, Idaho	44.3410	112.3172	2073	2007 [a]
TCSG	Telchick Spring, Idaho	43.6193	113.4783	1731	2005
TMIG	Taylor Mountain, Idaho	43.3057	111.9182	2179	2007 [a]

a - Although hardware was installed for the GPS receiver in 2007, the receiver began acquiring phase data in 2008.

b - Co-located at INL's seismic station GTRI, but operated by the Plate Boundary Observatory under the EarthScope Science Program.

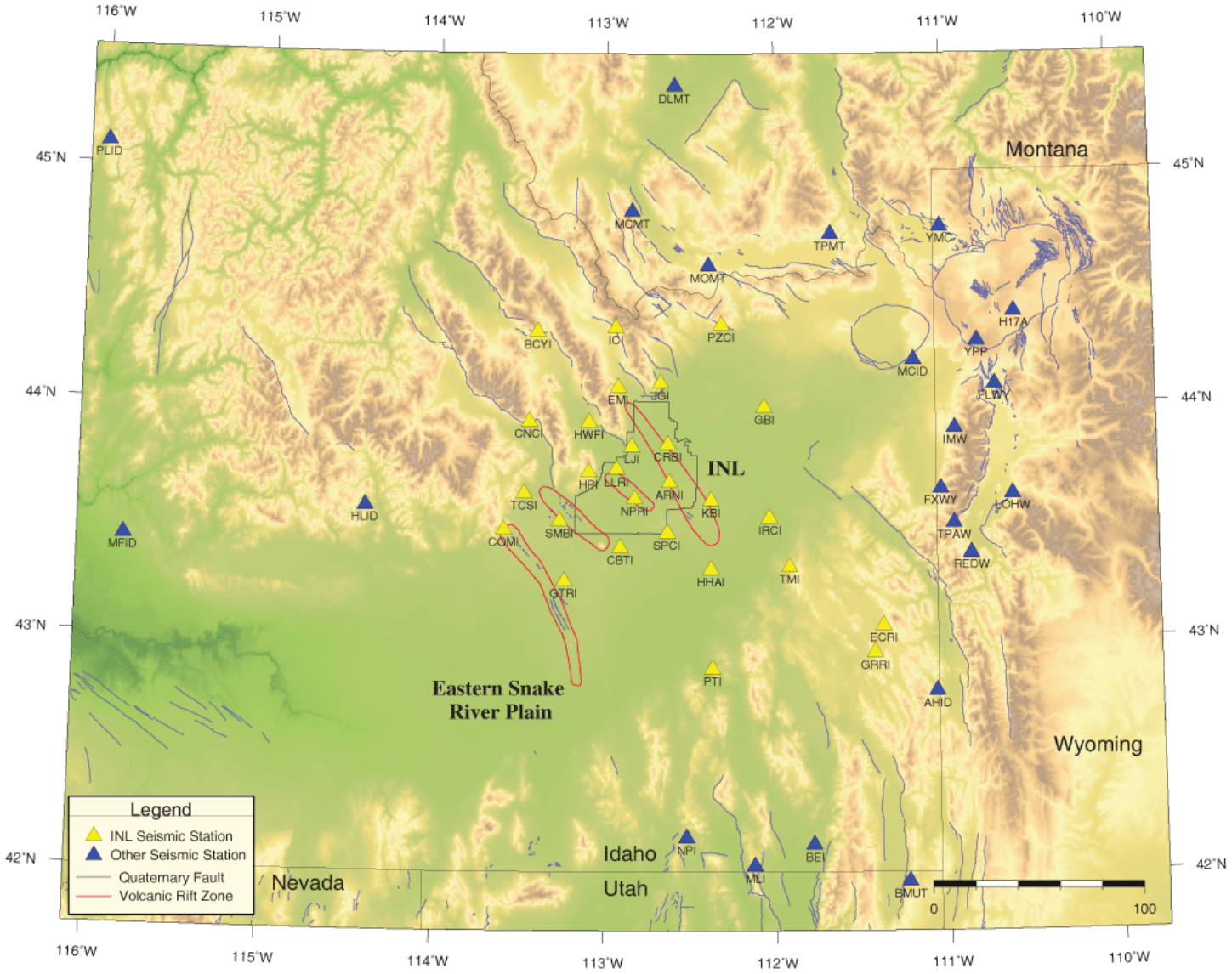

Figure 2. Map shows the locations of INL seismic stations and stations monitored by INL that are operated by other institutions. See Figure 1 for names of normal faults and volcanic rift zones. Stations BMO and BWO6 are not shown (see Table 2 for locations).

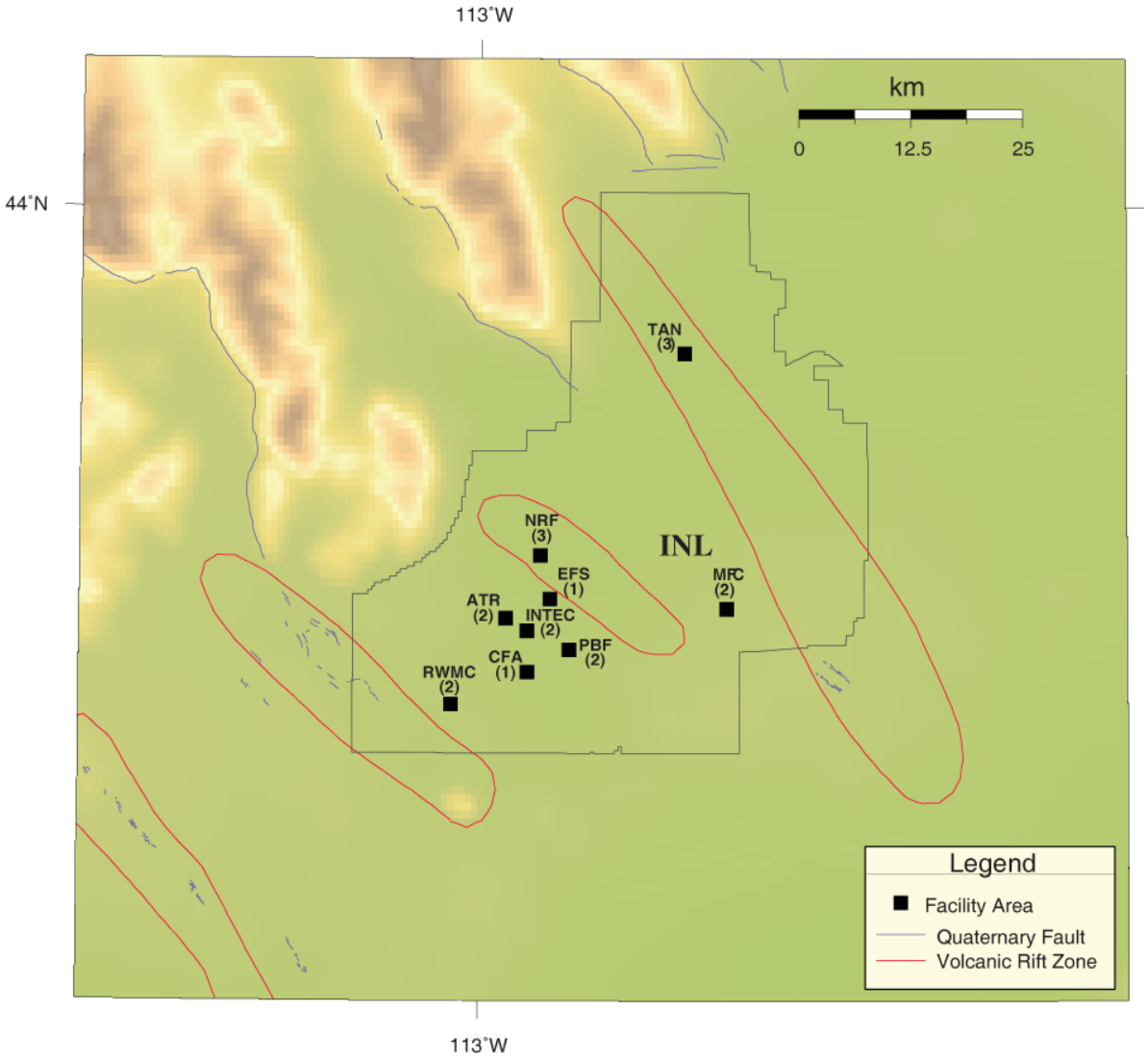

Figure 3. Map shows the number (in parentheses) of strong-motion accelerogaphs located at INL facility areas or other locations: Advanced Test Reactor (ATR), Central Facilities Area (CFA), Experimental Field Station (EFS), Idaho Nuclear Technology and Engineering Center (INTEC), Materials and Fuel Complex (MFC), Naval Reactors Facility (NRF), Radioactive Waste Management Complex (RWMC), and Test Area North (TAN). See Figure 1 for names of normal faults and volcanic rift zones.

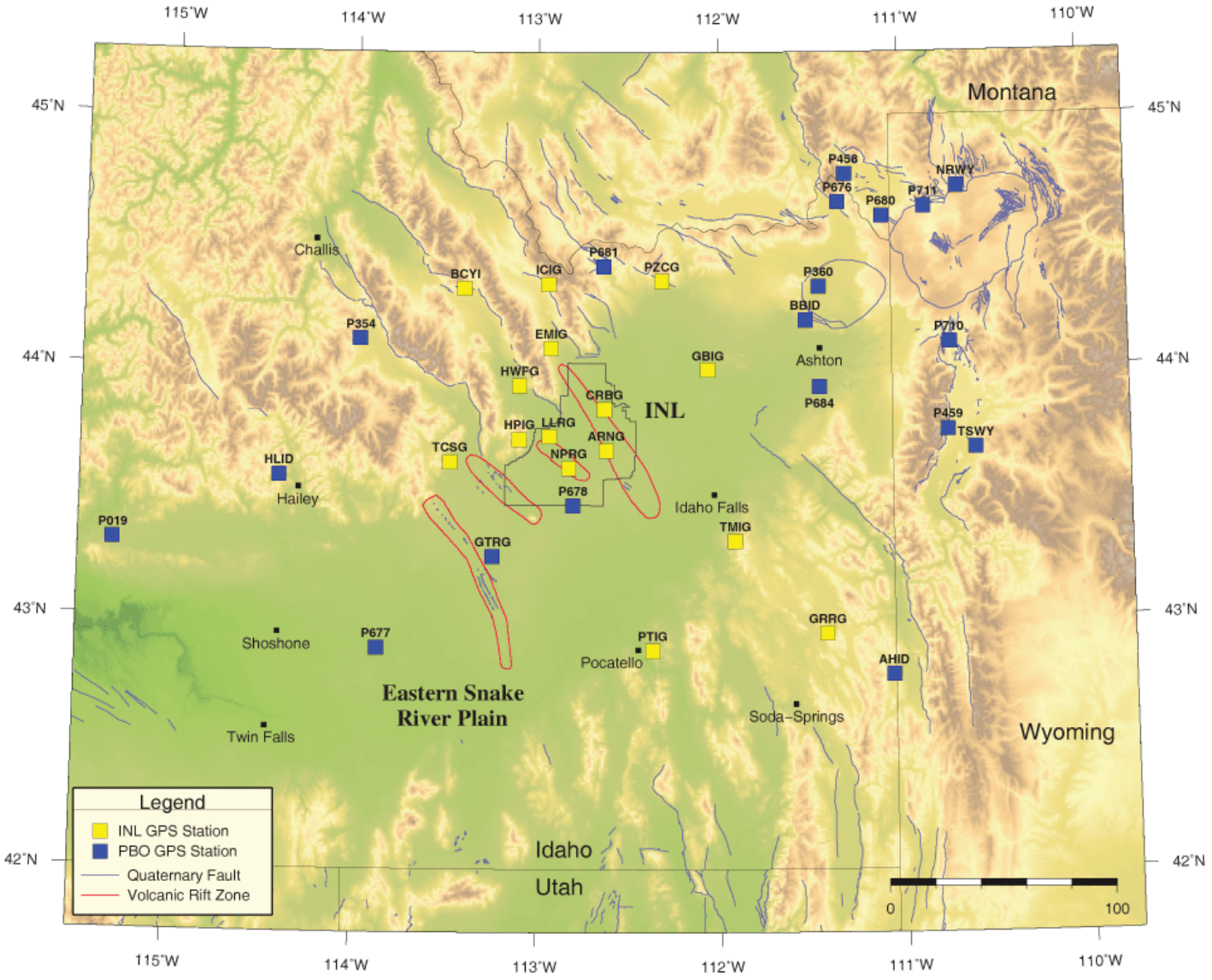

Figure 4. Map shows locations of continuous GPS stations co-located at INL seismic stations and those operated by the Plate Boundary Observatory (PBO) under the EarthScope Science Program. See Figure 1 for names of normal faults and volcanic rift zones.

3. Data Analysis

Digital seismograms are analyzed using the SEISAN program to determine the earthquake's location, magnitude, and peak ground accelerations. SEISAN displays multiple seismograms on a computer screen with corresponding time codes having accuracy of ± 0.001 s. P- and S-wave arrival times in the seismograms are selected at an accuracy of up to ± 0.01 s. Durations and amplitudes of seismic signals are selected and then used to calculate earthquake magnitudes. The arrival times, durations, and amplitudes measured for an earthquake are saved in a computer file directly from the SEISAN program. The HYPOINVERSE-2000 program is used to compute the location. Two methods may be used to calculate the final magnitude of an earthquake depending on its size. The locations and magnitudes of the earthquakes are plotted on maps to assess seismically active regions near the INL. Amplitudes of the accelerograms are also measured using the SEISAN program, and can be processed using a separate program to determine peak horizontal and vertical accelerations.

3.1 Location Method

The HYPOINVERSE-2000 computer program (Klein, 2002) is used to determine locations for all local earthquakes recorded. Phase data files (arrival times of the earthquake) from the output of SEISAN are input into the HYPOINVERSE-2000 location program. According to Zollweg and Sprenke (1995), stable locations are usually obtained from about seven to ten arrival times (P- and S-waves combined) for recorded events that are not surrounded by INL seismic stations. Within the INL network, stable locations can be obtained with a minimum of six arrival times. Because of the density and sensitivity of the INL seismic network, the majority of earthquakes located within the 161-km radius have a minimum of six arrival times. However, some earthquakes are located with fewer than six arrival times and, thus, their locations are less accurate. Seismic stations from other agencies monitored by the INL provide coverage outside the INL network and phase arrivals from these stations supplement phase data from INL stations in an attempt to reduce location errors.

Four P-wave velocity models are used in the HYPOINVERSE-2000 location program depending on the location of the earthquakes (Table 5). The "ESRP" velocity model is used for locating earthquakes that occur within the ESRP including the mountainous terrain on the northern and eastern edge of the Plain (Olsen et al., 1979; Sparlin et al., 1979; Braile and Smith, 1979; and Ackerman, 1979). The "INL ESRP" velocity model is used to locate earthquakes that occur on the ESRP and are near or within the INL Site boundaries. This model was developed from Sparlin et al. (1982) and Braile et al. (1982) and checked with respect to a few microearthquakes located within the ESRP (Jackson et al., 1989). The "BPEAK" velocity model is used for locating earthquakes that occur in the Borah Peak aftershock area and the mountainous terrain northwest of the Plain (Richins et al., 1987). Finally, the "SMT" velocity model is used to locate earthquake in southwestern Montana (Stickney, 1997). For all velocity models, a P-wave velocity to S-wave velocity ratio of 1.75 is used (Bones, 1978; Greensfelder and Kovach, 1982; and Richins et al., 1987).

Other notable parameters used in the HYPOINVERSE-2000 location program are the starting focal depth, set to 5 km, and the distance cutoff for arrival weighting, set to 50 km. Zollweg and Sprenke (1995) evaluated the parameters chosen for the HYPOINVERSE-2000 program used by INL. They determined that the parameters chosen yield good location results despite the poor coverage in azimuth of earthquakes outside the network. An evaluation of the difference between actual and computed locations showed that HYPOINVERSE-2000 location error was less than 0.25 km for test events located by the INL seismic stations.

3.2 Magnitude Calculations

Magnitudes are determined using two methods 1) coda magnitudes using signal duration of digital seismograms and 2) local magnitudes using amplitudes from digital seismograms. A coda magnitude (M_c) is calculated for an earthquake using several signal durations measured from the seismograms of different seismic stations. A local magnitude (M_L) is calculated using the largest peak-to-peak trace amplitude measured from digital waveforms and the Richter magnitude equation. If a magnitude cannot be determined for a local earthquake, then magnitudes determined by other seismic networks may be used including, for example, the University of Utah, Montana Bureau of Mines and Geology, NEIC, Boise State University, and the U.S. Bureau of Reclamation. The summary list of earthquakes in Appendix D lists the type of magnitude calculated and what institution reported the magnitude.

For the signal duration method, the following expression is used to calculate the coda magnitude at a station (Arabasz et al., 1979):

$$M_c = -3.13 + 2.74 \log \tau + 0.0012 \Delta \quad [1]$$

Where:

τ = Total signal duration recorded at the station in seconds;

Δ = Epicentral distance from the station in km.

The duration is measured at the start of the earthquake signature (P-wave arrival) to the end of the coda, where the signal fades into the background noise of the trace. The final magnitude is determined from the mean of the coda magnitude calculated for each seismogram. When the P-wave arrival time is selected the signal duration of the earthquake can be automatically selected by the SEISAN program or manually selected by a seismologist at INL. Equation (1) is usually used to estimate magnitudes for events located by the HYPOINVERSE-2000 location program.

Local magnitudes calculated from the digital seismograms are based on the Richter magnitude scale. Richter (1958) defined the local magnitude scale from the following equation:

$$M_L = \text{Log } A - \text{Log } A_o \quad [2]$$

Where:

A = Recorded maximum trace amplitude from the zero-line measured in millimeters on a standard, Wood-Anderson seismogram;

A_o = Maximum trace amplitude from the zero-line in millimeters for a selected standard earthquake.

The Richter magnitude scale was developed for a standard earthquake of magnitude 3.0 at 100 km for A_o = 0.001 mm and amplitude of 1.0 mm measured on the standard seismogram. He constructed a table of magnitudes based on distance and -Log A_o for maximum trace amplitudes recorded on the standard Wood-Anderson seismogram.

SEISAN has a program that uses equation [2] with amplitudes measured on a synthetic Wood-Anderson digital seismogram. The program allows the user to convert waveforms recorded on the horizontal channels of accelerometers and seismometers at INL seismic stations to synthetic Wood-

Anderson seismograms. The SEISAN program uses the instrument response information contained in Appendix B for accelerograms (or acceleration time histories) and Appendix C for seismograms to calculate synthetic Wood-Anderson seismograms at a magnification of 2800. The SEISAN program can automatically select or the user can select the largest peak-to-peak amplitude (or A) in millimeters from the digital display of the synthetic Wood-Anderson seismogram. The SEISAN program then uses the distance of the simulated Wood-Anderson station to the earthquake's epicenter and one-half the peak-to-peak amplitude to determine local magnitude using Richter's table. The program determines the local magnitude for the amplitude selected.

3.3 Peak Accelerations

Peak horizontal and vertical accelerations are determined from accelerograms using the SEISAN program (Section 2.4). SEISAN displays the horizontal and vertical accelerograms for some free-field SMAs located at the INL and accelerometers co-located with the seismic stations. The SEISAN program allows the user to correct the accelerograms by removing the instrument responses listed in Appendices B and C. A separate program is used to measure the largest zero-to-peak acceleration amplitude from the corrected acceleration time history.

3.4 Location Quality

Comparisons between earthquake locations determined by the INL and locations determined by other temporary networks or NEIC have been used to approximate locations errors of earthquake epicenters (Jackson et al., 1993a). This method was very general and yielded an approximation of the quality of the INL earthquake locations. In 1995, the State of Idaho requested Zollweg and Sprenke (1995) to perform an independent assessment of the INL Seismic Monitoring Program. Zollweg and Sprenke (1995) evaluated the location accuracy of the INL seismic network by two methods: 1) directly comparing INL locations to well-located earthquakes; and 2) indirectly by evaluating the network bias or non-random error through varying independent permutations (or combinations) of recording stations.

For the first method, twenty-two earthquakes having high-quality locations determined from a temporary seismic network installed near Challis, Idaho from July 1, 1992 to July 12, 1992 (by Boise State University) were compared to INL locations for these earthquakes. The earthquakes were located about 120 km from the center of INL, had varying magnitudes ranging from 1.9 to 4.5, and had absolute errors less than 1 km. The epicenters determined by INL seismic stations for these events differed by 1.6 to 11.5 km with an average of 7.1 km. The differences in locations were dependent on magnitude, with the smaller magnitude earthquakes tending to have greater differences in locations (Zollweg and Sprenke, 1995). These results are similar to the earlier estimates of an error radius of 5 km for a comparison to high-quality locations of the aftershocks from the surface-wave magnitude (M_s) 7.3 October 28, 1983 earthquake (Jackson et al., 1993a). However it is noted that this estimate for an error radius was based on having five stations in the INL seismic network at that time. The closest station to the aftershocks was at a distance of 50 km or more.

The second method used by Zollweg and Sprenke (1995) evaluates the network bias. Unless all earthquakes are located using exactly the same groups of stations and phases (P- and S-wave arrivals), the relative locations will be affected by a non-random error or network bias. The network bias is important for the smaller earthquakes that make up the majority of the events in a catalog since fewer stations usually record smaller earthquakes. Five earthquakes located northwest of the INL seismic network and ranging in magnitude from 1.8 to 3.8 were used in the analysis. Because INL operated 26 seismic stations at the time of the assessment, there were millions of possible combinations of recording stations. Zollweg and Sprenke (1995) chose to vary the combination of the ten most influential phase arrivals for the

permutation analysis. The locations for most of the permutations clustered about radii ranging from 6.5 to 11 km. For the magnitude 3.8 earthquake, 8% of the permutations resulted in a linear band extending 100 km. Zollweg and Sprenke (1995) suggested that earthquakes located with fewer S-wave arrival times have less well-constrained locations. Some of the larger earthquakes, like the magnitude 3.8 earthquake, have fewer S-wave arrival times because the signals saturate the instrumentation and onset of the S- wave is indistinguishable from the P-waves. Earthquakes with more than three S-wave-arrival times resulted in better-constrained locations.

3.5 Depth Quality

The HYPOINVERSE-2000 location program also calculates depth to the hypocenter. Focal depths calculated by this program are not accurate for many of the earthquakes recorded by the INL seismic network for two reasons: 1) the station spacing is usually greater than twice the focal depth of the earthquake recorded; and 2) the earthquake usually occurs outside of the network. To calculate accurate focal depths, the earthquake ideally should occur within the seismic network and at a distance equal to or less than its focal depth, and/or have S-arrivals from one or more stations within a distance of 1.4 focal depths of the epicenter (Gomberg et al., 1990). Although focal depths are listed in Appendix D, they should be interpreted within the context of the limitations discussed in this section unless otherwise indicated.

3.6 Data Completeness

Local earthquakes are easily discriminated from other seismic data such as local mine blasts, air blasts (or sonic booms), and distant (worldwide) and regional earthquakes occurring far outside of the INL seismic network. For example, man-made blasts are easily discriminated from earthquakes on the basis of waveform characteristics, the time the event occurred, and the location and depth of the event. The NEIC earthquake website listing is regularly inspected to confirm consistency with the INL earthquake catalog for magnitudes 2.5 and greater.

Detection threshold can provide a measure of completeness for the INL earthquake catalog. It is defined as the magnitude level at which the seismic network will nearly always detect and locate an earthquake. Zollweg and Sprenke (1995) evaluated the detection threshold by plotting the cumulative number of earthquakes as a function of magnitude to determine the lowest magnitude point that the curve begins to flatten. Zollweg and Sprenke (1995) determined the detection threshold to be a magnitude 1.3 anywhere within a 161-km (100-mile) radius around INL. Their conclusion was based on a plot of 1360 earthquakes for an 18-month period. Since the seismic stations are all located within 90 km of the center of INL, they suggested that the detection threshold is magnitude 0.8 within the network on the ESRP. The analysis of Zollweg and Sprenke (1995) suggests that the INL earthquake catalog is complete for magnitudes above 1.3 within a 161-km (100-mile) radius of INL and may be complete for magnitudes as low as 0.8 within the network. Hardware and software upgrades for the current DAAS have increased detection sensitivities on the order of magnitude 0.0 which allow recording of small magnitude microearthquakes within ESRP.

Table 5. P-wave velocity models used in location programs.

Velocity Model Code	Velocity (km/sec)	Depth to Top of Layer (km)	Layer Thickness (km)	References
ESRP	4.90	0.00	2.00	Olsen et al., 1979; Sparlin et al., 1979; Braile & Smith, 1979; Ackerman, 1979.
	6.00	2.00	15.00	
	6.70	17.00	23.00	
	7.90	40.00	Half-space	
INL ESRP	3.30	0.00	1.00	Sparlin et al., 1982; Braile et al., 1982; Jackson et al., 1989.
	4.90	1.00	2.00	
	5.30	3.00	2.00	
	6.15	5.00	2.00	
	6.53	7.00	10.00	
	6.80	17.00	23.00	
	8.00	40.00	Half-space	
BPEAK	4.75	0.00	1.64	Richins et al., 1987.
	5.59	1.64	5.31	
	6.16	6.95	11.05	
	6.80	18.00	22.00	
	8.00	40.00	Half-space	
SMT	5.52	0.00	5.86	Stickney, 1997.
	6.12	5.86	12.78	
	6.74	18.64	20.05	
	8.00	38.69	Half-space	

4. 2011 Earthquake Activity

During 2011, INL recorded 21,928 independent triggers from earthquakes and blasts that occurred in the local region, in the western United States, and worldwide. Within the local region, INL located 2,063 earthquakes and man-made blasts outside and within a 161-km (or 100-mile) radius of INL. Of these, 16 were small to moderate size earthquakes ranging in magnitude (M) from 3.0 to 4.4, 941 occurred within the 161-km radius of INL, and 6 microearthquakes were located within the ESRP.

4.1 Regional Earthquake Activity

Eleven earthquakes of M≥3.0 earthquakes occurred outside of the 161-km radius around INL in central and southeastern Idaho, southern Montana, and western Wyoming (Figure 5). Five events occurred in Idaho. On February 1, 2011, a M 3.1 occurred north of Challis, Idaho. Four small earthquakes occurred near Bear Lake in southeastern Idaho near the Utah border. The largest earthquake of M 3.7 occurred on January 26, 2011 at the northwestern end of the lake and was felt by at least 70 people (U.S. Geological Survey, 2012a). The second largest event of M 3.6 occurred on July 26, 2011 near the southwestern end of the lake. At least 235 people responded that they felt the earthquake (U.S. Geological Survey, 2012a). Two other events of M 3.0 occurred on January 12, 2011 at the southwestern end and on December 1, 2011 at the northeastern end of the lake. The January earthquake was felt by a few residents, but the December event was not reported felt. On the western side of Bear Lake, the January earthquakes were part of a swarm of activity that beginning with the M 3.0 of the 12th and ending after the M 3.7 on the 26th.

Throughout 2011, earthquake activity occurred west and south of Jackson, Wyoming that included two M 3 and one M 4 events (Figure 5). On April 1, 2011, an earthquake of M 4.1 occurred southeast of Jackson. Over 200 people felt the earthquake in western Wyoming (U.S. Geological Survey, 2012a). On July 18, 2011 a M 3.2 occurred east of Jackson Wyoming near the location that also had four other earthquakes M > 2.0 throughout the year. Only a few people felt the event (U.S. Geological Survey, 2012a). The earthquake of M 3.5 that happened on July 19, 2011 and located south of Jackson near the Idaho border occurred just east of a swarm of activity within the 161-km radius (S-6; Figure 6). It may or may not be associated with the nearby swarm (S-6; Figure 6).

Three earthquakes M > 3.0 occurred in southern Montana (Figure 5). An earthquake of M 3.0 occurred on November 22, 2011 near West Yellowstone, Montana and was felt by a few residents (U.S. Geological Survey, 2012a). North of this event, an earthquake of M 3.2 occurred on May 8, 2011 near Hebgen Lake, Montana. This event occurred near earthquake activity that peaked in September with five events (M 2.2-2.6) within six days of each other. Further west near Dillon, Montana, an earthquake M 3.0 occurred on July 12, 2011 and was felt by at least eight people (U.S. Geological Survey, 2012a). Earthquake activity occurred throughout the year near the M 3.0 event and is within the aftershock zone of the 2005 body-wave magnitude (m_b) 5.7 Dillon earthquake.

4.2 Earthquake Activity within 161-km Radius of INL

During 2011, 941 earthquakes occurred within 161-km radius of INL; five of these earthquakes exceeded M 3. Earthquakes occurred in Idaho northwest of the INL, near Island Park, Idaho, in southern Montana, and in southeast Idaho near the Wyoming border (Figure 6). Throughout 2011, >95 microearthquakes of M < 2.8 occurred northwest of INL near and in the former aftershock zone of the 1983 surface-wave magnitude (Ms) 7.3 earthquake, which ruptured the central segment of the Lost River fault. South of Leadore, Idaho at the Idaho-Montana border, a swarm of sixteen microearthquakes (M < 2.1) occurred on October 16, 2011 in a five hour span. Other microearthquakes to the south in Idaho

occurred throughout the year. From February to November, fifteen microearthquakes (M < 1.5) occurred near Island Park, Idaho.

Three M > 3.0 earthquakes occurred in southern Montana. An intense swarm of earthquakes took place in southern Montana in April and was associated with two of the three M > 3.0 earthquakes (Figure 6). On March 13, 2011 an earthquake of M 3.2 was followed by an earthquake with moment magnitude (**M**) 4.4 on April 5, 2011. The latter earthquake was felt by at least 84 people in southern Montana and Idaho (see Figure A-2, Appendix A; U.S. Geological Survey, 2012b). The swarm began with seven microearthquakes preceding the M 3.2 event, continued with five events prior to the **M** 4.4, and was followed by 46 events within 30 days. Swarm activity continued periodically, totaling 84 events in all, from March to December. Northeast of this swarm, a M 3.1 earthquake occurred south of Dillon and was not reported felt by residents. Over the year, other microearthquakes occurred throughout southern Montana.

Over 220 earthquakes including two of M > 3.0 were associated with six earthquake swarms occurring in southeastern Idaho during 2011 (labeled S-# in Figure 6). Discussed in order of their labels, the S-1 swarm included 47 microearthquakes (M < 2.0) that occurred from April to September and was located southeast of Ashton (S-1; Figure 6). The S-2 swarm, located south of Ashton, included a M 3.0 earthquake on August 5, 2011 and twelve other events (S-2; Figure 6). To the south, the S-3 swarm started with seven events in early September then peaked with 42 microearthquakes (M < 1.8) occurring from October 3 to 27, 2011 (S-3; Figure 6). Further south, the S-4 swarm occurred from June 5, 2011 to July 7, 2011 and included 39 microearthquakes with M < 2.1 (S-4; Figure 6). Within the same day, nine microearthquakes (M < 2.1) in swarm S-5 occurred in association with a M 3.0 that happened on March 10, 2011, which was not reported felt by residents. Five additional events (M < 2.3) occurred on October 30, 2011 in the same location of the S-5 swarm. All fifteen events were located east of Pocatello, Idaho (S-5; Figure 6). The easternmost swarm, S-6, included >55 events of M < 3 and was located southwest of the Jackson, Wyoming (S-6; Figure 6). It began with 40 events in March, flared up again with 8 events in June, and continued sporadically from August to December with three or four events clustered within < 4 days of each other each time. Overall, this was an active year for earthquakes in southeastern Idaho (555), which makes up 59% percent of the 941 earthquakes within the 161-km radius of INL.

4.3 Earthquakes within the Eastern Snake River Plain

There were six microearthquakes within the ESRP during 2011 (Figure 6). A microearthquake of coda magnitude (M_c) 1.0 occurred on May 31, 2011 and was located along the eastern physiographic boundary of the ESRP northeast of Idaho Falls, Idaho. Five microearthquakes occurred within and near the Great Rift volcanic rift zone, which includes Craters of the Moon National Monument at its northern end and Wapi Lava Field at its southern end (Figure 6). Three microearthquakes occurred in January with M_c 1.0 on the 6th, M_c 2.1 on the 19th, and M_c 1.4 on the 23rd, and were located within and near the Craters of the Moon National Monument (Figure 7). The three events are well-located and have uncharacteristic deep depths of 37.5, 19.7, and 16.0 km, respectively, which are thought to be volcanic related. They are a continuation of the on-going, low-rate micro-seismicity at Craters of the Moon National Monument that began in 2007 (Carpenter and Payne, 2009). Two earthquakes in October, M_c 1.7 on the 14th and M_c 0.7 on the 17th, occurred at ~16 km depth near the Wapi Lava Field at the southern end of the Great Rift (Figure 6). These two events were located near a microearthquake that occurred on July 2, 2010, which had a depth of 8.9 km (Figure 8).

5. 1972 – 2011 Earthquake Activity

Earthquakes in 2011 were located in areas around and within the ESRP that have been active in the past 39 years. Figure 8 shows that the majority of 2011 earthquakes occurred in regions of the Basin and Range Province surrounding the ESRP that have been active since 1972. Even though 70 microearthquakes ($M \leq 2.2$) have occurred within the ESRP, monitoring by the INL seismic network indicates that at present the ESRP is relatively seismically inactive when compared to surrounding Basin and Range Province (see also Jackson et al., 1993b). 25 of the ESRP microearthquakes may be associated with potential volcanic processes within and near the Great Rift. Nearly 2,200 years ago, the entire 80-km length of the Great Rift was volcanically active (Kuntz et al., 2002).

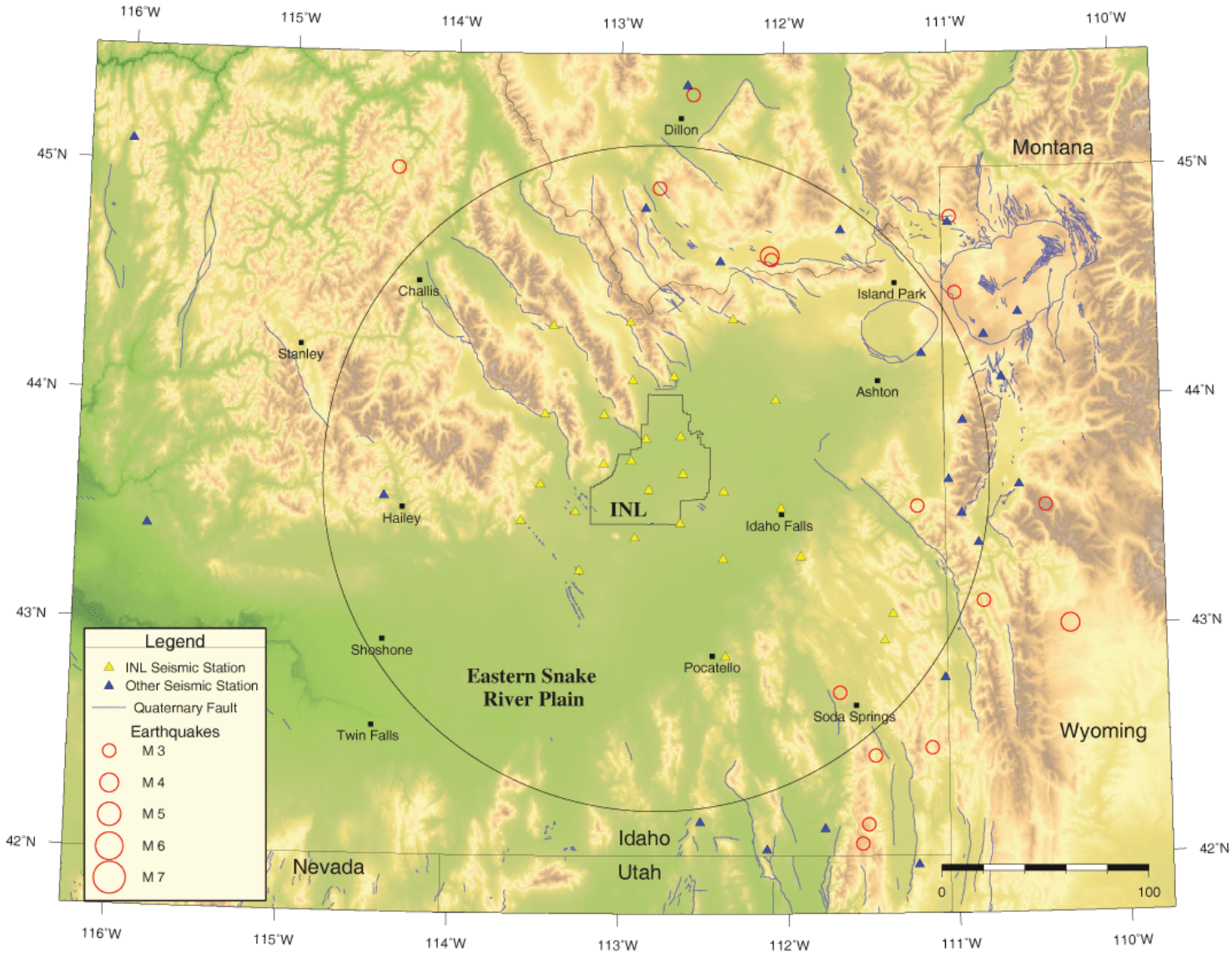

Figure 5. Map of epicenters of earthquakes for magnitudes greater than 3.0 during 2011.

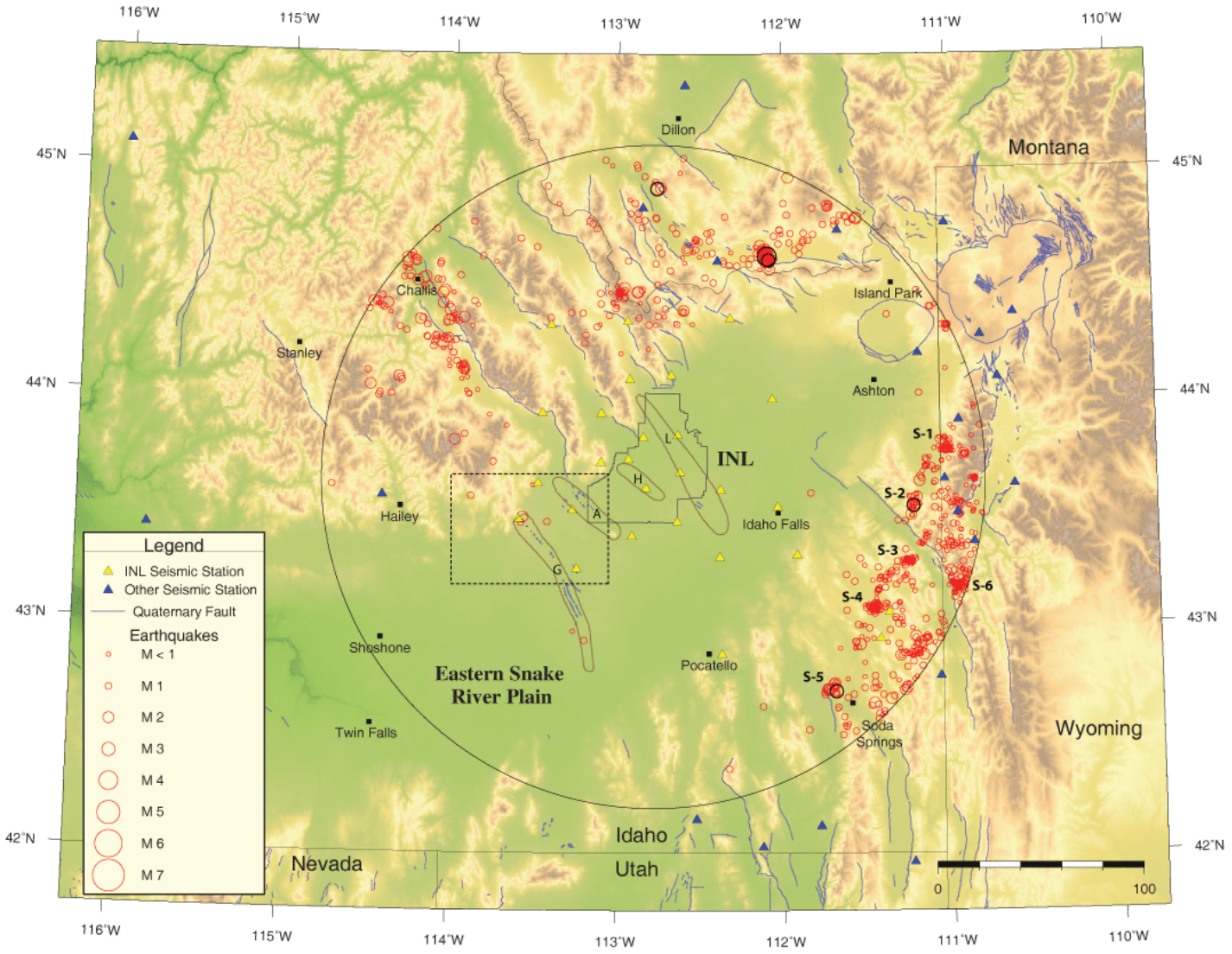

Figure 6. Map of epicenters of earthquakes within the 161-km radius around the INL from January 1, 2011 to December 31, 2011. Dashed box shows the region for Figure 7. Earthquake swarms are identified as S-#. Earthquakes of magnitude ≥3.0 are outlined in dark blue. See Figure 1 for abbreviations.

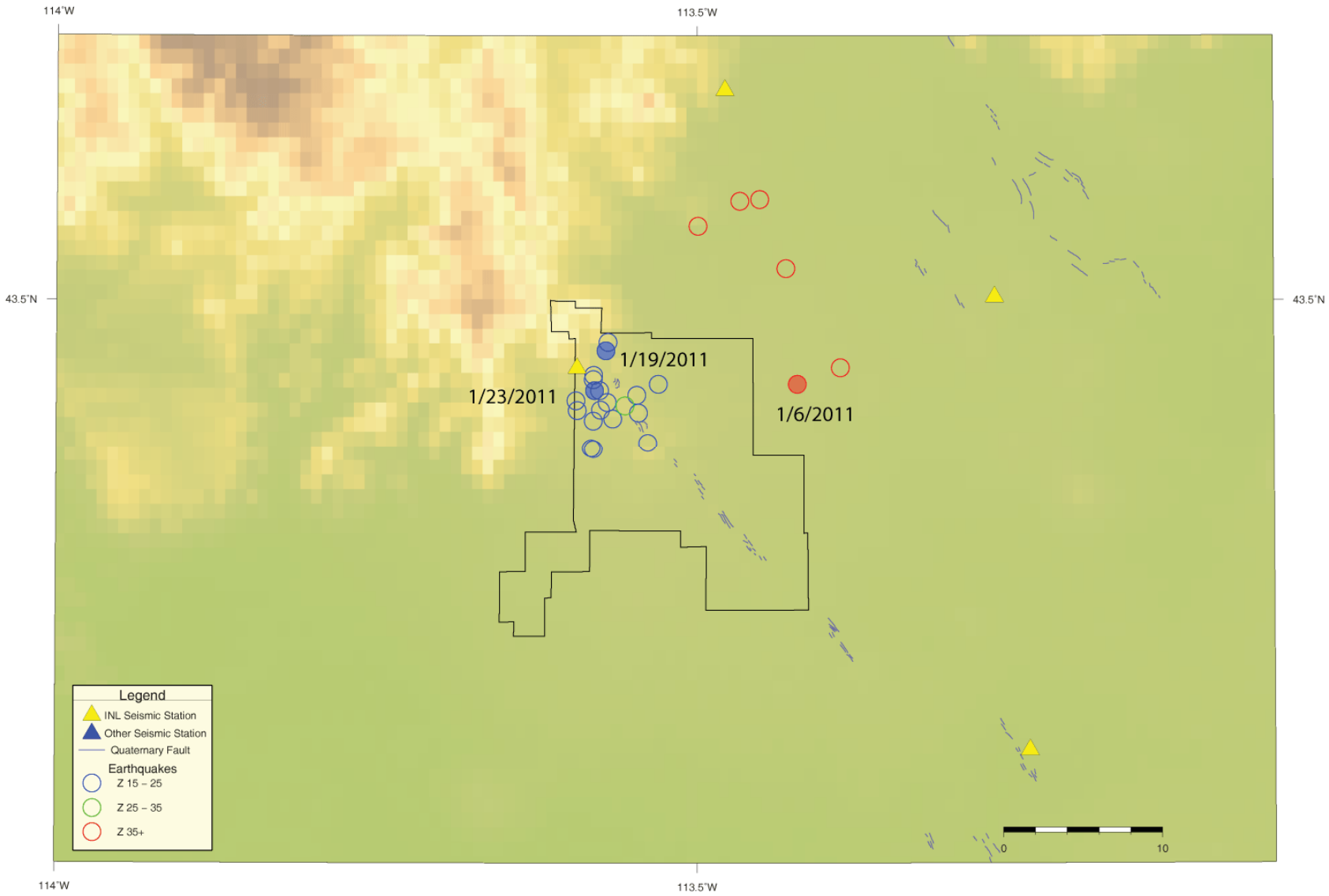

Figure 7. Map shows epicenters of earthquakes (colored by focal depth) at Craters of the Moon National Monument (black polygon) from 1999-2011 (Carpenter and Payne 2009). The three earthquakes are shown with dates and solid circles colored coded by depth.

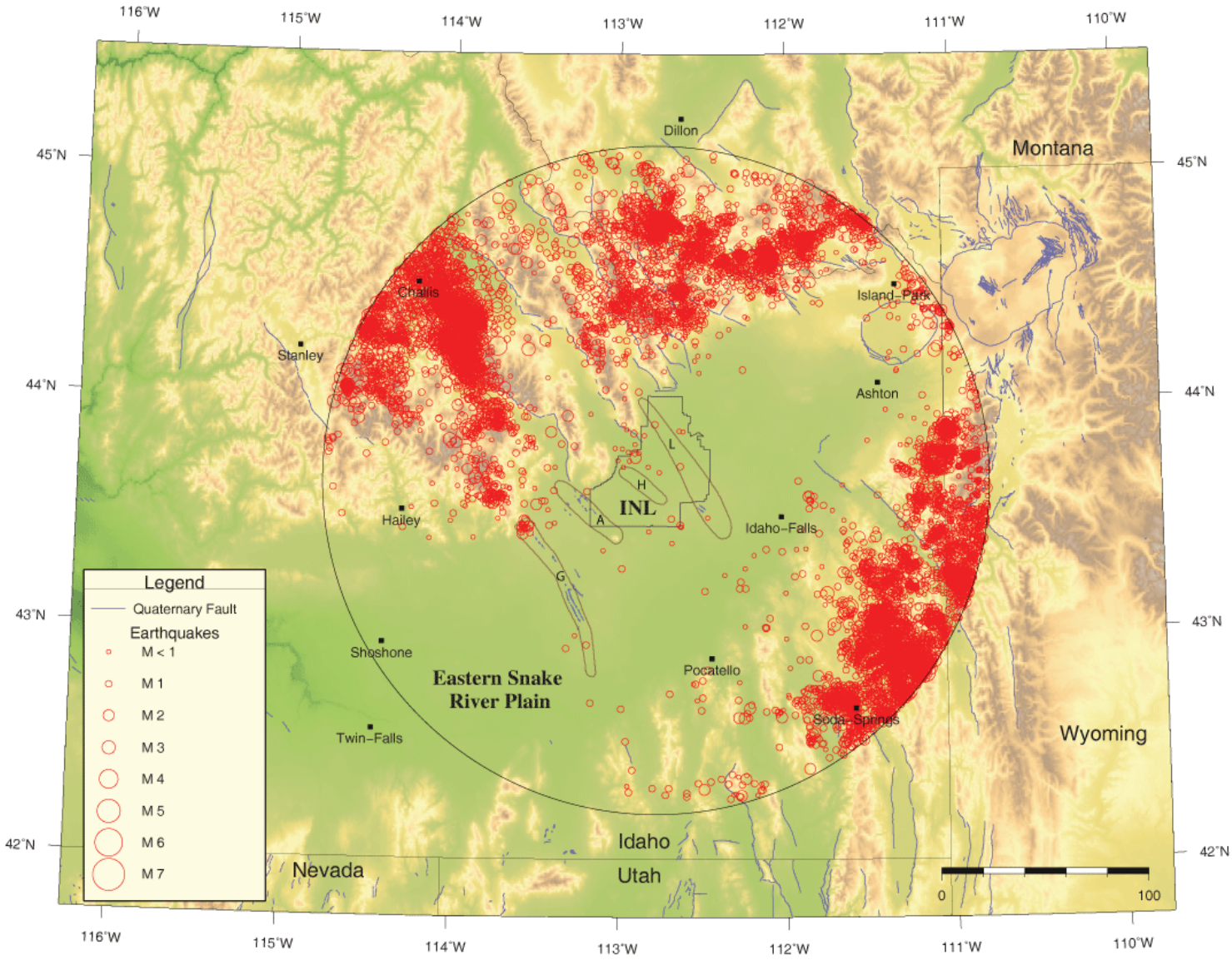

Figure 8. Map of epicenters of earthquakes from 1972 to 2011 within the 161-km radius around the INL. See Figure 1 for abbreviations.

6. References

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Appendix A

Seismic Network and Earthquake Information

A-1. INL Seismic Network Telemetry

Digital radios, Internet, or DSL links transmit seismic data from INL seismic stations and free-field SMAs to the IRC. Some seismic stations are used as relay links to transmit several seismic stations to a DSL drop point or directly to the IRC. Figure A-1 shows the telemetry configuration during 2011.

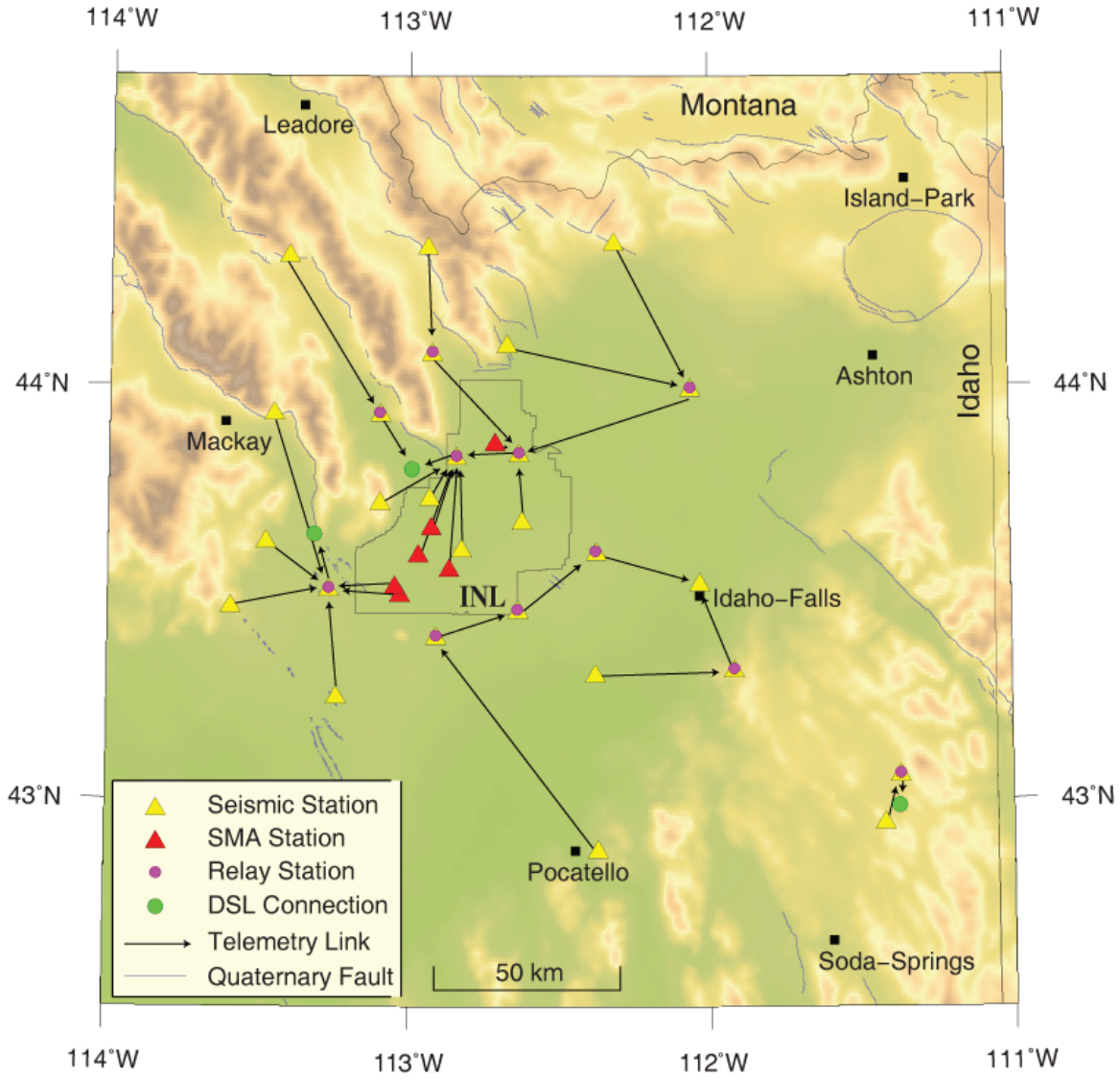

Figure A-1. Telemetry configuration of INL seismic stations and free-field SMAs during 2011.

A-2. Earthquake Intensity Map

The U.S. Geological Survey with the cooperation of various regional seismic networks provide a web page where people who experience an earthquake can go online and share information about its effects to help create a map of shaking intensities and damage. The "Community Internet Intensity Maps" contribute toward the quick assessment of the scope of an earthquake emergency and provide valuable data for earthquake research (U.S. Geological Survey, 2012a). The Web site is called "Did You Feel It?" and is the place where a person can enter their ZIP Code and answer a list of questions about what they felt and what damage occurred. Figure A-2. shows an example of the Community Internet Intensity Map for the April 5, 2011 earthquake in southern Montana.

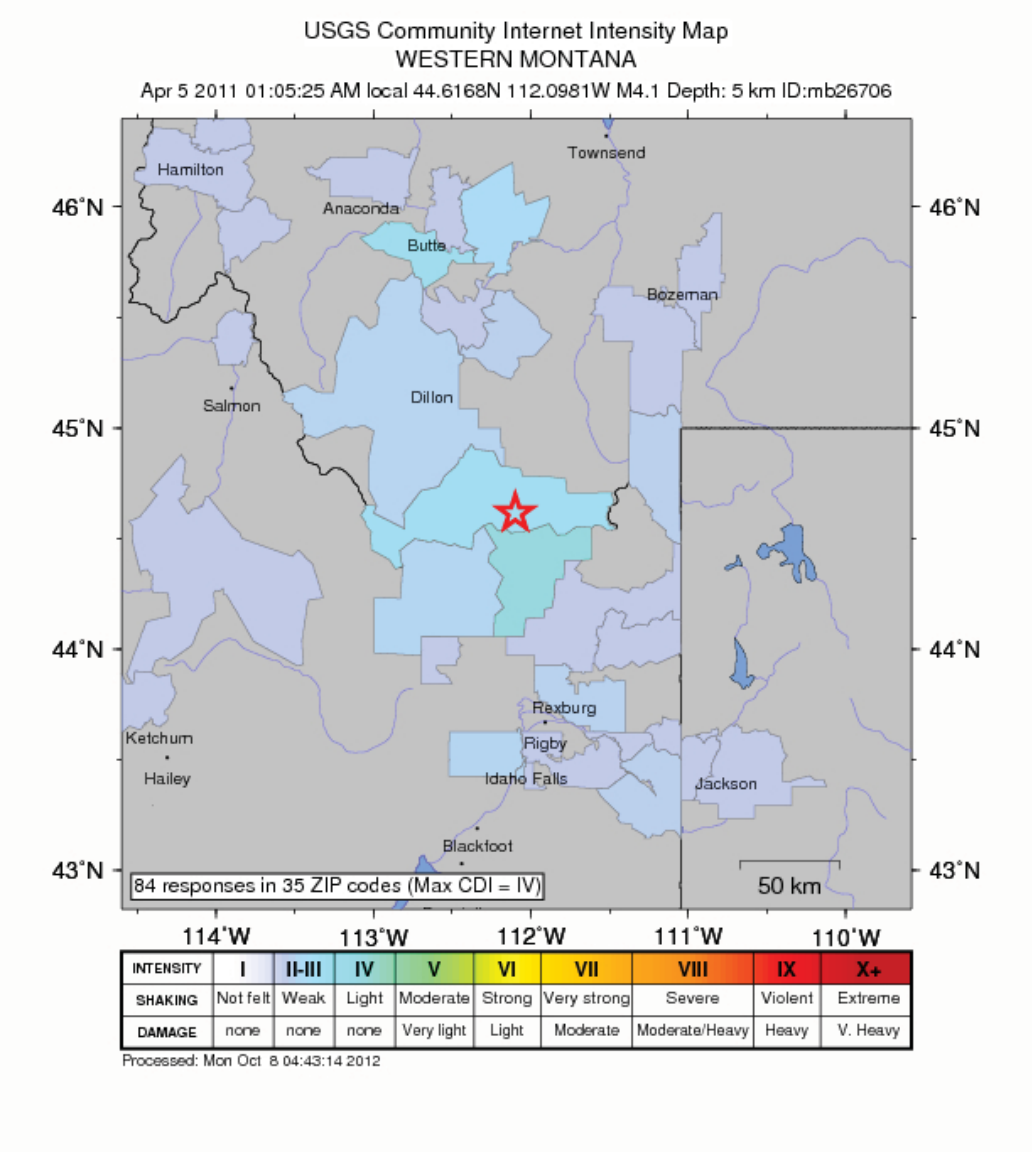

Figure A-2. Map of earthquake intensity based on 84 responses of people who felt the April 5, 2011 **M** 4.4 earthquake located in southern Montana (U.S. Geological Survey, 2012b).

Appendix B

Instrument Response of NetDAS SMAs

B.1 Method for Determining Amplitude Response

The instrument response (otherwise known as sensitivity) of the NetDAS-SMA is used to convert the measured counts of ground motion amplitude to units of g. Instrument responses for NetDAS units that have accelerometers mounted within the unit are determined by conducting 1-g (acceleration of gravity) tilt tests. These tests are done on a leveled pad at the IRC seismic lab or on the actual leveled pad at their physical location listed in Table 3. These 1-g tilt tests provide a relationship between the number of digitizer counts and the 1-g offset. Equation B-1 provides the conversion from the measured count level to actual g level for the recorded motion. Trigger threshold accelerations and counts/g are listed for NetDAS units with SMAs in Table B-1 using equation:

$$\text{Acceleration (g)} = \text{Counts}_{\text{(Measured or target)}} / \text{(Counts/g)} \qquad \text{[B-1]}$$

For accelerographs without internally installed accelerometers within the NetDAS units, Equation B-1 does not apply due to an inability to perform analogous tilt tests. For all systems, however, there is a frequency dependent amplitude response, which is discussed further in Appendix C. Table B-2 lists the instrument response for these accelerometers using the methods discussed in Appendix C.

Tables B-1 and B-2 list the beginning and ending dates for the time periods that the instrument responses are applicable. If changes occurred to SMA or seismic station instrumentation (such as accelerometer or NetDAS unit) during the year, then more than one range of dates are listed for a location. Also, note that the building numbers and locations for the SMA codes are listed in Table 3.

Table B-1. Instrument responses for strong-motion accelerographs.

Location / INL Site Facility Area	SMA Code	Instrument Response		NetDAS Serial #	Accelerometer				Trigger Level (g)
		Begin Date	End Date		Model	Serial #	Orientation	Counts/g	
ATR	TRAF	9/1/2005	11/15/2010	1094	SF2500A	41	Vertical	526114	0.0048
							North	574035	0.0044
							East	549477	0.0045
ATR	TRAF	11/15/2010	12/31/2011	1094	SF2500A	41	Vertical	542429	0.0046
							North	559600	0.0045
							East	552564	0.0045
ATR	TRA2	5/6/2004	11/15/2010	1085	SF2500A	38	Vertical	543172	0.0005
							North	556212	0.0004
							East	568860	0.0004
ATR	TRA2	11/15/2010	12/31/2011	1085	SF2500A	38	Vertical	551948	0.0005
							North	556780	0.0004
							East	504501	0.0005
CFA	CFAF	10/21/2008	10/20/2010	1097	SF2500A	37	Vertical	553558	0.0045
							North	544446	0.0046
							East	558342	0.0045
CFA	CFAF	10/20/2010	12/31/2011	1097	SF2500A	37	Vertical	551532	0.0045
							North	544061	0.0046
							East	558387	0.0045

Table B-1. Continued.

Location / INL Site Facility Area	SMA Code	Instrument Response		NetDAS Serial #	Accelerometer				Trigger Level (g)
		Begin Date	End Date		Model	Serial #	Orientation	Counts/g	
CFA	PHFF	8/17/2010	12/31/2011	1096	SF2500A	49	Vertical	561102	0.0045
							North	530779	0.0047
							East	535983	0.0047
COMI	COMF*	8/20/2008	12/31/2011	1080	SF2500A	NA	Vertical	549804	0.0045
							North	567877	0.0044
							East	553058	0.0045
INTEC	FAS1	2/2/2006	12/31/2011	1084	SF2500A	48	Vertical	573249	0.0044
							North	573389	0.0044
							East	546041	0.0046
INTEC	FAS2	2/2/2006	12/31/2011	1083	SF2500A	52	Vertical	544357	0.0046
							North	549370	0.0046
							East	565218	0.0044
MFC	EBR	2/8/2006	12/31/2011	1095	SF2500A	46	Vertical	533228	0.0047
							North	555864	0.0045
							East	543393	0.0046
MFC	FCF	6/2/2003	12/31/2011	1079	SF2500A	61	Vertical	549212	0.0046
							North	559404	0.0045
							East	558307	0.0045
NRF	NRFF	1/31/2005	11/08/2010	1098	SF2500A	55	Vertical	540182	0.0046
							North	553738	0.0045
							East	551745	0.0045

Table B-1. Continued.

Location / INL Site Facility Area	SMA Code	Instrument Response		NetDAS Serial #	Accelerometer				Trigger Level (g)
		Begin Date	End Date		Model	Serial #	Orientation	Counts/g	
NRF	NRFF	11/08/2010	12/31/2011	1098	SF2500A	609	Vertical	473979	0.0053
							North	491200	0.0051
							East	489358	0.0051
NRF	A1W	1/31/2005	11/08/2010	1091	SF2500A	53	Vertical	541217	0.0046
							North	570002	0.0044
							East	564995	0.0044
NRF	A1W	11/08/2010	12/31/2011	1091	SF2500A	53	Vertical	548654	0.0046
							North	571896	0.0044
							East	555972	0.0045
NRF	S1W	1/31/2005	12/31/2011	1088	SF2500A	45	Vertical	561125	0.0045
							North	558488	0.0045
							East	558473	0.0045
PBF	PBFF	11/12/2008	12/31/2011	1089	SF2500A	50	Vertical	559649	0.0045
							North	550303	0.0045
							East	559707	0.0045
PBF	ARAF	12/04/2008	10/20/2010	1086	SF2500A	35	Vertical	526920	0.0047
							North	562795	0.0044
							East	550302	0.0045
PBF	ARAF	10/20/2010	12/31/2011	1086	SF2500A	35	Vertical	527786	0.0047
							North	564825	0.0044
							East	547053	0.0046

Table B-1. Continued.

Location / INL Site Facility Area	SMA Code	Instrument Response		NetDAS Serial #	Accelerometer				Trigger Level (g)
		Begin Date	End Date		Model	Serial #	Orientation	Counts/g	
RWMC	RWMC	9/21/2007	12/31/2011	1081	SF2500A	42	Vertical	552610	0.0045
							North	554529	0.0045
							East	572590	0.0044
RWMC	RWME	9/21/2007	12/31/2011	1077	SF2500A	NA	Vertical	552358	0.0045
							North	540927	0.0046
							East	556424	0.0045
STC	IRC	10/20/2010	12/31/2011	1093	SF2500A	NA	Vertical	578185	0.0043
							North	570966	0.0044
							East	543190	0.0046
TAN	TANF	10/31/2008	10/20/2011	1090	SF2500A	40	Vertical	558999	0.0045
							North	557465	0.0045
							East	531326	0.0047
TAN	TANF	10/20/2010	12/31/2011	1090	SF2500A	40	Vertical	554009	0.0045
							North	556780	0.0045
							East	531537	0.0047
TAN	TAN4	7/28/2008	12/31/2011	1085	SF2500A	38	Vertical	631860	0.0040
							North	514585	0.0049
							East	655111	0.0038

Table B-1. Continued.

Location / INL Site Facility Area	SMA Code	Instrument Response		NetDAS Serial #	Accelerometer				Trigger Level (g)
		Begin Date	End Date		Model	Serial #	Orientation	Counts/g	
TAN	SMC	NA	12/31/2011	1087	SF2500A	39	Vertical	NIR	NA
							North	NIR	NA
							East	NIR	NA

NIR – No instrument response due to problems with the SMA.

NA – Not available.

* - SMA co-located at an INL seismic station

Table B-2. Instrument responses of accelerometers located at seismic stations.

Seismic Station	Instrument Response		NetDAS Serial #	Accelerometer			Datalogger Counts/Volt	Sensor Volt/g	Station Counts/g
	Begin Date	End Date		Model #	Serial #	Orientation			
BCYI	5/06/2009	12/31/2011	1068	SF3000L	185	Vertical	2841402	1.220	3466510
						North	2834135	1.200	3400962
						East	2838854	1.220	3463402
GRRI	11/04/2008	12/31/2011	1013	SF2500A	57	Vertical	3932869	1.396	5490285
						North	4014708	1.345	5399782
						East	3980407	1.412	5620335
HWFI	9/09/2008	12/31/2011	1069	SF2500A	62	Vertical	1757768	1.378	2422204
						North	1173136	1.371	1608369
						East	19243242	1.352	26016863
NPRI	10/21/2005	12/31/2011	1065	SF2500A	36	Vertical	810927	1.427	1157193
						North	802533	1.376	1104285
						East	808520	1.371	1108481
PTI	10/22/2008	12/31/2011	1071	SF3000L	188	Vertical	835018	1.230	1027072
						North	835559	1.194	997657
						East	835957	1.244	1039931
SPCI	8/28/2007	12/31/2011	1070	SF3000L	186	Vertical	834485	1.216	1014734
						North	834508	1.237	1032286
						East	835579	1.215	1015228

Appendix C

Instrument Response of Seismic Stations

C.1 Method for Determining Instrument Gain

The INL determines instrument responses (otherwise known as sensitivity) for both the four (4CH) and eight channel (8CH) NetDAS units. The INL establishes a DC counts/volt level by inputting a known voltage level for a specified duration of time for each channel on the NetDAS units and recording the mean and standard deviation in counts for this duration. The input voltage polarity is often reversed in order to obtain a greater measurement range. The mean provides the method to produce the DC counts/volt level (Equation C-1a and C-1b) and the standard deviation quantifies the measurement uncertainty and system noise.

Single ended:

$$\text{Counts/Volt} = \mu / v_i \qquad \text{[C-1a]}$$

Reversed Polarity:

$$\text{Counts/Volt} = (\mu^{+} - \mu^{-}) / (v_i^{+} - v_i^{-}) \qquad \text{[C-1b]}$$

Where:

μ is mean counts

v_i is input voltage

Subscript "+" is positive polarity

Subscript "– " is negative polarity

C.2 NetDAS-4CH Frequency Response

The response of the Symmetric Research PAR4CH (4CH) digitizer used in the NetDAS-4CH was calculated at the INL to establish the instrument response of NetDAS units and the methods incorporated vendor information. The DAQSystems, Inc., manufacturer of the NetDAS units, reviewed INL's frequency response results and methods, which is discussed in the following steps.

The NetDAS-4CH frequency response was determined empirically by measuring the output counts resulting from a known input signal. Trials were conducted using a constant-amplitude sine wave with frequencies varying between 0.1, 5, 10, 15, 20, 25, 30, and 35 Hz. The frequency sweep was performed twice for those frequencies. The averages of the measured counts at each frequency were then converted into decibel responses relative to the average response at 0.1 Hz, because the vendor data sheets list a gain of 1 at this frequency. A 2nd order polynomial was then fit to the data creating a simple amplitude response in frequency. The perfectly matched response (R-squared of one) is shown here as described by Equations C-2 and C-3 (conversion to decibels).

$$Y_{dB} = -0.0045f^2 + 0.0074f - 0.014 \qquad \text{[C-2]}$$

$$dB = 20 \log (E_2/E_1) \qquad \text{[C-3]}$$

Where:

f – frequency (Hz)

E_1 – original signal level

E_2 - modified signal level

E_2/E_1 – commonly referred to as gain

This relationship was then used to calculate the gains out to the Nyquist frequency (1/2 the sample rate). The INL samples all data at 100 samples per second or 0.01 Hz. The information was then entered into MATLAB, which has a function to determine poles and zeros. Poles and zeros are the instrument response format that many seismic applications use to correct seismograms for instrument response. The NetDAS-4CH frequency response in dB and poles and zeros are shown in Figure C-1.

Equations C-2 and C-3 can be used in conjunction with the DC counts/volt measurement to generate a count-based frequency response for short hand calculations or spectral deconvolution to remove the frequency response.

$$Ycounts = Counts/Volt \times 10^{((-0.0045f^2 + 0.0074f - 0.014)/20)} \quad [C\text{-}4]$$

Where:

^ - Indicates 10 to the power of the number calculated in parentheses.

However, the preferred method for removing the frequency response from a recorded waveform is to use a seismic analysis package, such as SEISAN. This program recognizes the poles and zeros representation of instrument response, which quickly and accurately corrects recorded waveforms to actual ground motions.

C.3 NetDAS-8CH Frequency Response

The response of the Symmetric Research PAR24B (8CH) digitizer used in the NetDAS-8CH was based on vendor provided information, and calculated in the same method as described above for the PAR4CH. A 2nd order polynomial was fit to the data creating a simple amplitude response in frequency that matched the amplitude response (R-squared of 0.999). Equation C-5, listed below, is similar to Equation C-3 used for the response of the NetDAS-4CH. The NetDAS-8CH frequency response in dB and poles and zeros are shown in Figure C-2.

$$Y_{dB} = -0.0045f^2 + 0.0071f - 0.0158 \quad [C\text{-}5]$$

C.4 Short-period seismic station frequency response data

In the fall of 2002, INL seismic personnel began tracking instrument response of the seismic stations. These response values, in combination with the instrument frequency responses (see C.2 and C.3), are used to create site- and date-specific system response files for the INL seismic stations. These response files are used in SEISAN to correct waveforms for further analyses such as calculating magnitudes by measuring amplitudes. Table C-1 lists the measured responses (including any system amplification) for the seismic stations that have been measured for instrument responses (in counts/volt).

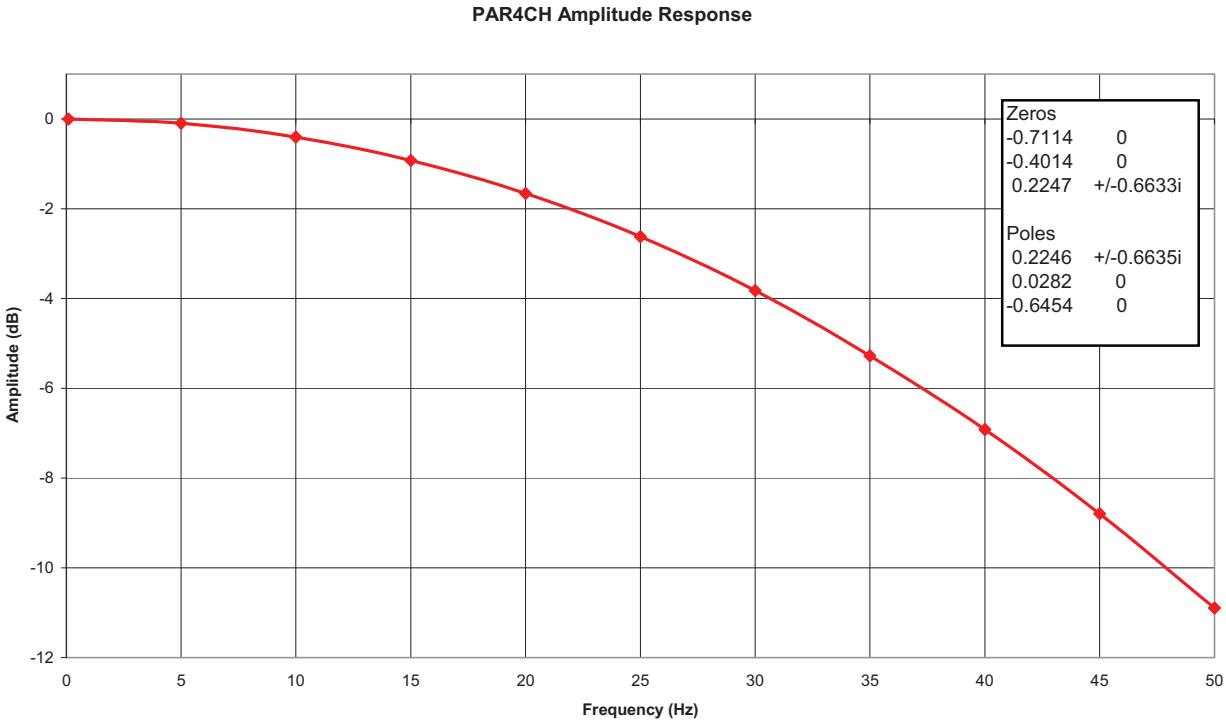

Figure C-1. Amplitude verses frequency system response of the Symmetric Research PAR4CH digitizer used in the NetDAS-4CH.

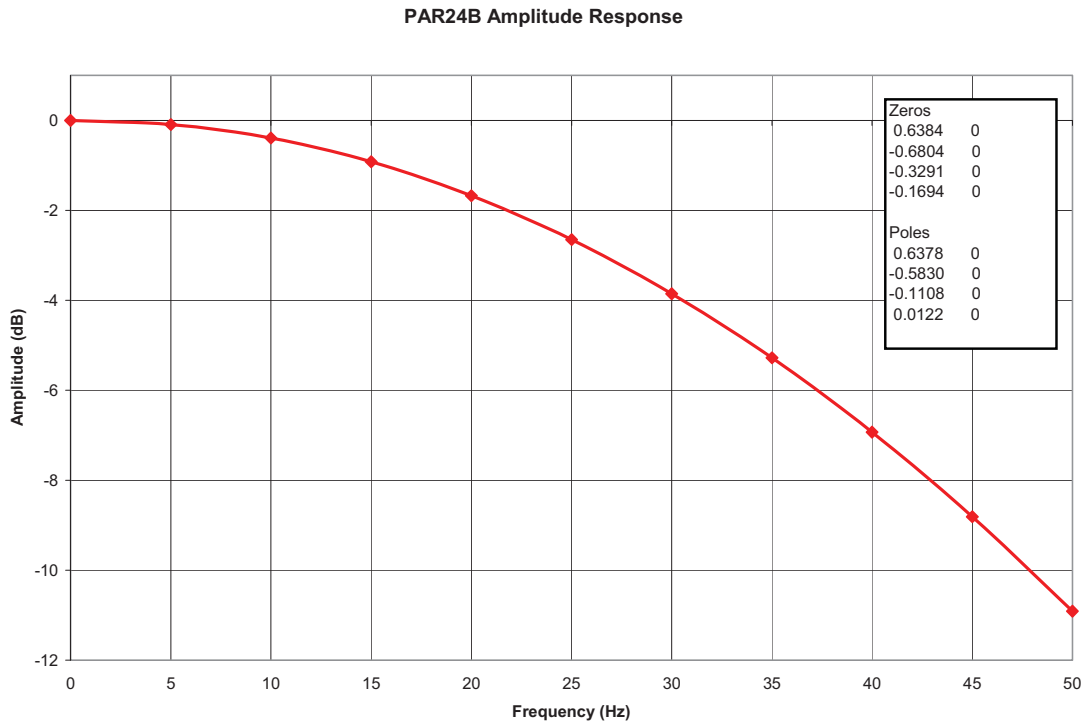

Figure C-2. Amplitude verses frequency system response of the Symmetric Research PAR24B digitizer used in the NetDAS-8CH.

Table C-1. Instrument responses of seismometers located at seismic stations.

Seismic Station	Instrument Response Begin Date	End Date	NetDAS Serial #	Digitizer Model	Orientation	Datalogger Counts/Volt	Seismometer Model
Single-component seismic stations							
ARNI	8/28/2007	12/31/2011	1017	4CH	Vertical	47977741	S13J
BCYI	5/06/2009	12/31/2011	1068	24USB5V	Vertical	2840730	S13J
CBTI	8/29/2007	12/31/2011	1024	4CH	Vertical	48948934	S13J
CNCI	9/29/2009	12/31/2011	1066	24USB5V	Vertical	2851620	L4C
COMI	9/21/2007	12/31/2011	2005	4CH	Vertical	36022837	S13
CRBI	8/28/2006	12/31/2011	1027	4CH	Vertical	401458	S13J
COMI	12/03/2008	12/31/2011	1025	24USB5V	Vertical	2834323	S13
ECRI	10/23/2009	12/31/2011	1051	4CH	Vertical	46797192	S13
EMI	9/13/2007	12/31/2011	1019	4CH	Vertical	48487157	L4C
GBI	12/01/2009	12/31/2011	30802	24USB5V	Vertical	2838478	S13J
GRRI	11/04/2008	12/31/2011	1013	24USB5V	Vertical	2831677	L4C
GTRI	11/24/2008	12/31/2011	9001	24USB5V	Vertical - borehole	2776147	L4C
	11/24/2008	12/31/2011	9001	24USB5V	Vertical - surface	2949858	L4C
HHAI	10/22/2008	12/31/2011	1014	4CH	Vertical	458174	L4C
HPI	9/13/2007	12/31/2011	1015	4CH	Vertical	47682925	L4C
ICI	9/13/2007	12/31/2011	1020	4CH	Vertical	48888117	L4C
KBI	8/28/2007	12/31/2011	1018	4CH	Vertical	45839400	S13J
LJI	9/09/2008	12/31/2011	1052	4CH	Vertical	48429387	S13J

Table C-1. Continued.

Seismic Station	Instrument Response Begin Date	Instrument Response End Date	NetDAS Serial #	Digitizer Model	Orientation	Datalogger Counts/Volt	Seismometer Model
PTI	10/22/2008	12/31/2011	1071	8CH	Vertical	86459806	S13
PZCI	9/11/2008	12/31/2011	1023	4CH	Vertical	47216457	S13J
SMBI	9/10/2008	12/31/2011	1064	24USB5V	Vertical	2835711	L4C
TCSI	9/10/2008	12/31/2011	1010	24USB5V	Vertical	2873122	L4C
Three-component seismic stations							
HWFI	9/09/2008	12/31/2011	1069	8CH	Vertical	86375959	S13
					North	86381403	S13
					East	84982876	S13
IRCI	6/3/2005	4/22/2011	1012	4CH	Vertical	469890	S13
					North	461125	S13
					East	467680	S13
	4/22/2010	12/31/2011	1012	4CH	Vertical	456044	S13
					North	459462	S13
					East	462104	S13
JGI	9/11/2008	12/31/2011	30801	24USB5V	Vertical	2856927	S13
					North	2887634	S13
					East	2867169	S13

Table C-1. Continued.

Seismic Station	Instrument Response Begin Date	Instrument Response End Date	NetDAS Serial #	Digitizer Model	Orientation	Datalogger Counts/Volt	Seismometer Model
LLRI	9/20/2007	12/31/2011	1029	4CH	Vertical	48337000	S13J
					North	48888449	S13
					East	48725117	S13
NPRI	10/21/2005	12/31/2011	1065	8CH	Vertical	836486	S13J
					North	837155	S13
					East	839175	S13
SPCI	8/28/2007	12/31/2011	1070	8CH	Vertical	83330000	S13J
					North	83376700	S13
					East	83485300	S13
TCSI	9/10/2008	12/03/2011	1010	24USB5V	Vertical	2873122	L4C
					North	2887077	S13
					East	2868820	S13
TMI	11/6/2007	9/22/2009	2004	24USB5V	Vertical	2837736	S13
					North	2843957	S13
					East	2839995	S13
	9/22/2009	12/31/2011	2004	24USB5V	Vertical	2849495	S13
					North	2848510	S13
					East	2844713	S13

C.5 Broadband seismometer frequency response

The INL seismic network has two broadband seismic stations (I14A and NPRI; see Section 2.1) which have two different types of sensors. Seismic station I14A has the three-component, Guralp CMG-3T (serial #T3413) broadband seismometer with a power consumption of 60 mA at 12 V input and a calibration resistor of 51,000 Ω. Table C-2 lists the seismometer sensitivity data and Table C-3 lists the seismometer frequency response data (in poles and zeros) for each component as determined on 12/20/2006 by EarthScope. The data acquisition system is a Quanterra Q330 (ID tag # 1554), the frequency is unity within the sampling rates employed at this station. The NPRI seismic station has the three-component, Nanometrics Trillium T120-PA broadband seismometer has the combined sensitivity response nominal parameters listed in Table C-4. Table C-5 list the response for seven poles and five zeros (Trillium 120P/PA User Guide, 2009). The data acquisition system is a Quanterra Q330 (ID tag # 1554), the frequency is unity within the sampling rates employed at this station.

Table C-2. EarthScope-determined seismometer sensitivity data for I14A.

Component	Velocity Output (V/m/s) (Differential)	Mass Position Output (V/m/s2) (Acceleration output)	Feedback Coil Constant(Amp/m/s2)
Vertical	2 x 741	1887	0.02516
North/South	2 x 750	2023	0.02697
East/West	2 x 745	2010	0.0268

Note: A factor of 2 x must be used when the sensor outputs are used differentially (also known as push-pull or balanced output).

Table C-3. EarthScope-determined seismometer frequency response data for I14A.

Component	Poles (Hz)	Zeros (Hz)	Normalizing factor at 1 Hz
Vertical	$-5.89 \times 10^{-3} \pm j5.89 \times 10^{-3}$	0	2304000
	-180	0	
	-160		
	-80		
Horizontal (N-S and E-W)	$-5.89 \times 10^{-3} \pm j5.89 \times 10^{-3}$	0	2304000
	-180	0	
	-160		
	-80		

Table C-4. Combined calibration response nominal parameters for Nanometrics Trillium T120-PA broadband seismometer at NPRI.

Parameter*	Nominal Values
Zeros (z_n in radians/second)	0 0 -90.0
Poles (p_n in radians/second)	-0.03852 ± 0.03658i -178 -135 ± 160i -671 ± 1154i
Normalization factor (κ in radians/second)	1.540×10^{11}
Normalization Frequency (f_0 in Hz)	1
Combined calibration sensitivity at f_0 (radians/second)	12.28

* The units of the nominal values are rad/s because the calibration input produces an equivalent acceleration, while the seismometer passband is flat to velocity. Therefore, to determine the expected gain for a sinusoidal calibration, you must divide the sensitivity listed above by 2πf, where f is the frequency of the sinusoid.

Table C-5. Poles and zeros for the Nanometrics Trillium T120-PA broadband seismometer at NPRI.

Poles	
-3.852×10^{-2}	3.658×10^{-2}
-3.852×10^{-2}	-3.658×10^{-2}
-1.78×10^{-2}	0.000
-1.35×10^{2}	1.60×10^{2}
-1.35×10^{2}	-1.60×10^{2}
-6.71×10^{2}	11.54×10^{2}
-6.71×10^{2}	-11.54×10^{2}
Zeros	
0.00	0.00
0.00	0.00
-0.90×10^{2}	0.00
-1.607×10^{2}	0.00
-31.080×10^{2}	0.00

Appendix D

2011 Earthquake List

The summary list of earthquakes includes those located within a 161-km (100-mile) radius of the INL centered at 43.0° 39.00' N, 112° 47.00' W. Table D-1 provides an explanation of the headings listed in Table D-2 for the earthquake list. The format for this table has been modified from previous years. The earthquake identification number is no longer reported since the SEISAN analysis package identification number is simply the origin data and time. The listing also includes the distance of the earthquake epicenter from the center of INL.

Table D-1. Explanation of the earthquake summary table headings.

Heading	Example	Explanation
ORIGIN	1/1/2011 4:14:51	Date of the earthquake: month/day/year; origin time of the earthquake: hour, minute, and second in UTC
LAT N	44.7850	Latitude of epicenter in degrees North
LONG W	-113.7733	Longitude of epicenter in degrees West
MAG-	1.7	Magnitude of the earthquake. NM signifies that no magnitude was determined for this earthquake.
TYPE	Mc IE	Type of magnitude reported and reporting agency. Magnitude types: Coda magnitude (Mc); Local magnitude (ML); Moment magnitude (Mw); and Body wave magnitude (mb). Reporting agencies include: Idaho National Laboratory (IE); NEIC (US); University of Utah (UU); and Montana Bureau of Mines and Geology (MB); Wyoming (WY). NM with a magnitude of 0.00 indicates that no magnitude was calculated as a result of multiple earthquakes, which obscures the coda of the first event or the record length was insufficient to include the full coda of the earthquake.
DIST	126.3	Distance in km from center of INL at: 43° 39.00' N, 112° 47.00' W.
Z	13.9	Calculated focal depth in km. Not all earthquakes have appropriate seismic station geometry for calculating a reliable focal depth, thus the errors (ERZ) are typically large.
NO	14	Number of station readings used in locating the earthquake with weights above 0.1. P- and S-wave arrival times for the same station are regarded as two readings.
GAP	113	Largest azimuthal separation in degrees between stations.
DMIN	7.6	Distance in km from the epicenter to the nearest station.
RMS	0.02	Root mean square error of arrival time residuals in second using all weights as calculated by: $RMS=SQRT(\Sigma W_i*R_i^2/N)$ Where: SQRT is the square root; ΣW_i*R_i is the sum of the time residuals for the i^{th} arrival times the weight assigned to that arrival time; and N is the number of residuals.
ERH	0.38	Standard horizontal error of the epicenter in km.
ERZ	0.58	Standard vertical error of the focal depth in km.

Table D-2. Earthquakes located within 161-km radius of INL in 2011.

ORIGIN TIME	LAT N	LONG W	MAG-TYPE	DIST	Z	NO	GAP	DMIN	RMS	ERH	ERZ
1/1/2011 4:14:51	44.7850	-112.7733	1.7 Mc IE	126.3	13.94	14	113	7.6	0.02	0.4	0.6
1/3/2011 20:00:48	44.3680	-113.2872	1.0 Mc IE	89.5	8.29	4	157	11.4	0.01	0.7	2.0
1/6/2011 19:26:31	43.4527	-113.4220	1.0 ML IE	56.1	37.48	15	181	13.6	0.12	0.8	0.7
1/7/2011 21:28:39	44.7575	-113.1592	1.4 Mc IE	126.8	4.36	6	230	25.8	0.07	6.0	12.1
1/8/2011 0:08:15	44.6360	-112.1192	2.2 Mc IE	121.9	12.83	25	97	22.4	0.12	0.6	1.4
1/9/2011 13:40:48	43.1737	-110.9220	1.6 Mc IE	159.7	7.41	12	94	21.7	0.03	1.0	3.1
1/9/2011 15:08:08	44.2098	-114.0232	0.5 ML IE	117.4	8.14	5	209	50.6	0.18	2.4	6.4
1/10/2011 23:13:00	44.7175	-112.4588	1.5 Mc IE	121.6	14.56	10	96	14.7	0.06	0.6	1.1
1/11/2011 6:40:39	45.0173	-112.8892	1.9 Mc IE	152.4	5.20	12	182	21.3	0.02	1.5	1.7
1/11/2011 23:32:02	43.9197	-113.7752	0.6 Mc IE	85.3	8.06	8	161	26.0	0.06	1.0	11.1
1/14/2011 0:36:36	44.1378	-113.9447	1.6 Mc IE	107.9	10.96	8	214	45.8	0.05	1.0	11.3
1/15/2011 14:16:56	44.1398	-113.9325	1.3 Mc IE	107.2	7.73	5	214	45.1	0.01	1.0	12.5
1/18/2011 13:31:28	44.7202	-112.4358	1.5 Mc IE	122.3	6.87	5	208	72.5	0.09	2.4	4.2
1/18/2011 23:10:13	44.3855	-112.7148	1.3 Mc IE	82.0	5.01	7	158	34.4	0.03	0.8	12.7
1/19/2011 6:38:27	43.4717	-113.5713	2.1 Mc IE	66.7	19.76	20	106	2.1	0.07	0.7	0.6
1/20/2011 0:19:30	43.1372	-110.9882	0.8 Mc IE	156.1	5.00	6	163	27.3	0.04	1.0	10.3
1/21/2011 0:48:01	44.2073	-114.0612	0.4 ML IE	119.9	7.13	5	235	53.6	0.01	0.9	12.5
1/21/2011 11:49:00	42.9217	-111.3803	0.3 ML IE	139.7	11.53	4	172	3.8	0.05	1.4	1.8
1/21/2011 23:00:43	43.0808	-111.3367	1.3 Mc IE	133.2	0.34	8	188	4.1	0.02	0.9	1.1
1/22/2011 12:24:02	44.7282	-114.1145	1.5 Mc IE	160.3	5.30	7	227	73.0	0.04	3.3	11.4
1/23/2011 13:06:00	43.4490	-113.5803	1.4 Mc IE	68.2	16.05	8	152	1.8	0.10	0.6	0.4
1/24/2011 3:58:06	43.1237	-110.9380	0.9 Mc IE	160.5	3.28	8	173	27.4	0.08	1.1	12.1
1/25/2011 20:38:14	43.4382	-110.9803	1.2 ML IE	147.5	10.50	9	222	13.4	0.05	1.4	3.0
1/26/2011 6:27:14	43.7120	-113.7508	1.6 Mc IE	78.3	1.41	10	151	30.5	0.07	0.5	3.1
1/26/2011 18:33:56	44.7708	-113.1782	1.5 Mc IE	128.6	8.20	6	219	26.8	0.25	8.0	4.9
1/28/2011 7:12:36	42.8637	-111.2285	0.9 ML IE	153.5	9.37	6	162	15.1	0.06	1.0	4.5
1/30/2011 8:36:32	42.6932	-111.4125	1.1 ML IE	154.1	12.53	8	140	26.8	0.07	0.9	1.7
1/31/2011 6:26:00	43.2595	-111.5153	0.9 Mc IE	111.4	6.41	8	226	25.7	0.09	1.4	11.5
1/31/2011 13:55:16	42.9927	-111.0425	1.1 ML IE	158.9	12.16	10	164	25.7	0.06	0.9	2.9
2/1/2011 5:27:47	44.3122	-110.9985	1.3 Mc WY	161.0	4.93	9	206	16.1	0.02	0.8	6.2
2/1/2011 5:31:58	44.1537	-114.0283	0.5 ML IE	114.6	10.12	7	225	52.5	0.25	1.8	20.9
2/1/2011 17:45:47	44.0770	-114.3188	1.9 Mc IE	132.2	8.01	9	275	57.6	0.14	2.7	17.1
2/1/2011 21:52:46	44.4260	-112.7638	1.6 Mc IE	86.3	7.28	14	142	34.8	0.12	0.6	5.1
2/1/2011 23:06:39	42.7265	-111.2692	2.0 Mc IE	160.3	9.90	14	106	14.5	0.07	0.6	1.0
2/2/2011 1:34:08	44.2580	-114.1630	1.5 Mc IE	129.7	9.07	7	223	60.8	0.03	1.5	5.2
2/2/2011 6:39:34	44.2553	-114.1610	1.2 Mc IE	129.5	6.99	5	248	60.6	0.04	1.3	12.9
2/2/2011 16:26:36	43.2757	-111.3198	1.0 Mc IE	125.5	5.01	5	193	25.0	0.22	2.1	20.9
2/4/2011 2:33:39	43.2095	-111.3948	0.8 Mc IE	122.6	8.11	8	206	17.4	0.06	1.2	4.5
2/4/2011 18:13:47	44.3305	-113.9878	1.1 Mc IE	122.7	7.11	5	250	46.5	0.03	1.1	12.8
2/4/2011 19:17:27	44.3783	-114.0265	2.2 Mc IE	128.4	5.10	14	222	50.1	0.08	1.3	4.4
2/5/2011 1:45:45	43.0082	-111.0492	1.2 Mc IE	157.6	9.49	9	161	26.7	0.04	0.5	4.3
2/5/2011 13:55:42	44.4595	-112.8835	2.3 Mc IE	90.4	6.31	19	114	41.0	0.12	0.4	2.8
2/5/2011 14:21:32	44.4602	-112.8787	2.0 ML IE	90.5	11.47	23	114	40.9	0.05	0.3	1.0
2/5/2011 19:37:33	42.7133	-111.2827	2.5 ML IE	160.4	10.46	29	109	16.0	0.07	0.5	0.8
2/5/2011 19:53:00	42.7198	-111.2835	1.8 Mc IE	159.9	8.37	15	141	15.8	0.07	0.7	1.3
2/5/2011 19:59:47	42.7333	-111.2730	1.7 Mc IE	159.5	10.79	12	102	14.6	0.09	0.6	1.3
2/5/2011 22:37:55	44.4693	-112.8550	1.1 Mc IE	91.3	7.36	13	161	39.8	0.14	0.7	7.4
2/6/2011 1:20:42	43.1890	-111.5772	1.5 Mc IE	110.3	12.50	13	111	22.6	0.06	0.6	1.6

ORIGIN TIME	LAT N	LONG W	MAG-TYPE	DIST	Z	NO	GAP	DMIN	RMS	ERH	ERZ
2/6/2011 12:59:57	42.9632	-111.0802	0.6 Mc IE	157.8	10.35	6	157	22.0	0.03	0.7	5.4
2/6/2011 19:15:15	43.3367	-111.0312	0.9 Mc IE	145.9	13.22	11	138	14.8	0.08	1.0	3.6
2/7/2011 0:06:20	44.3280	-113.9683	1.2 Mc IE	121.3	2.61	6	214	45.0	0.04	1.4	2.4
2/7/2011 1:47:13	44.6325	-112.3157	0.9 Mc MB	115.5	7.64	7	221	7.6	0.03	1.9	1.0
2/8/2011 4:06:09	42.9137	-111.5460	2.2 Mc IE	129.5	1.63	22	101	10.5	0.09	0.4	2.1
2/8/2011 4:12:47	42.9008	-111.5745	0.8 Mc IE	128.7	0.06	5	293	13.1	0.12	4.0	6.1
2/10/2011 10:49:47	44.5952	-112.9387	1.2 Mc MB	105.9	5.46	5	145	26.8	0.07	1.2	2.7
2/11/2011 13:49:56	42.5190	-111.6528	1.0 ML IE	155.9	4.99	9	92	50.3	0.11	0.7	13.3
2/11/2011 23:42:45	44.7157	-112.6467	1.2 Mc MB	119.1	4.92	11	176	20.3	0.06	6.5	10.0
2/12/2011 17:29:05	43.3425	-110.9812	1.0 Mc IE	149.6	2.09	8	147	10.7	0.04	0.9	12.9
2/13/2011 0:27:39	44.9228	-113.4358	1.3 Mc IE	150.9	4.86	4	281	47.6	0.27	12.0	22.0
2/14/2011 17:41:44	44.6857	-112.4465	1.0 ML IE	118.3	13.57	5	221	11.1	0.03	2.1	1.9
2/20/2011 5:00:18	44.1313	-113.9643	1.8 Mc IE	108.9	4.29	10	198	46.8	0.06	0.7	2.5
2/20/2011 15:15:21	44.4160	-113.8775	1.0 ML IE	122.3	7.32	6	273	39.4	0.02	2.9	12.5
2/21/2011 1:00:59	42.9002	-111.2300	0.7 ML IE	151.1	10.39	6	142	16.2	0.05	0.7	3.4
2/21/2011 1:01:18	42.9015	-111.2288	0.6 ML IE	151.1	10.77	6	140	16.3	0.03	0.6	2.7
2/21/2011 14:16:30	44.1890	-114.0027	1.8 Mc IE	114.8	7.80	8	227	49.6	0.10	1.0	14.7
2/22/2011 18:45:00	44.3348	-114.2053	2.4 Mc IE	137.1	7.15	12	261	63.9	0.03	1.0	12.2
2/23/2011 4:22:38	43.0903	-110.9505	0.9 Mc IE	161.0	4.23	8	174	31.3	0.20	1.5	14.9
2/23/2011 7:47:08	44.5947	-114.2282	0.9 ML IE	156.2	7.57	6	227	72.7	0.08	1.9	3.9
2/23/2011 11:27:13	44.5783	-112.3240	1.4 Mc MB	109.6	8.87	10	234	5.8	0.07	1.9	0.6
2/25/2011 23:05:31	44.0820	-113.9142	0.9 Mc IE	102.8	8.18	5	202	40.8	0.22	1.3	21.4
2/26/2011 7:57:55	44.5752	-114.0882	1.1 ML IE	146.6	6.58	8	289	61.8	0.02	3.0	3.4
2/26/2011 11:20:35	45.0463	-112.6060	1.2 ML IE	156.0	11.86	11	142	31.0	0.08	1.1	2.6
2/26/2011 13:18:16	42.5405	-111.8545	1.1 ML IE	144.7	4.05	9	140	47.5	0.09	0.5	6.9
2/28/2011 14:23:46	44.3968	-114.0290	1.0 ML IE	129.9	7.03	7	261	50.6	0.04	1.1	13.0
2/28/2011 20:40:08	44.4288	-112.9942	0.7 Mc IE	88.3	12.62	8	145	11.8	0.09	0.6	1.3
3/1/2011 18:36:10	44.6452	-112.5810	2.1 Mc MB	111.9	12.74	25	128	15.9	0.09	0.3	1.0
3/1/2011 18:37:53	44.6442	-112.5802	1.3 ML IE	111.8	13.32	15	156	15.8	0.06	0.6	1.7
3/1/2011 20:11:31	43.1935	-111.4693	0.9 ML IE	117.8	8.46	9	118	17.5	0.05	0.9	2.8
3/2/2011 9:54:03	44.3350	-113.9848	0.7 ML IE	122.9	7.16	6	251	46.3	0.05	1.1	13.1
3/3/2011 0:49:26	43.9992	-114.4500	1.2 ML IE	139.5	6.63	9	252	48.6	0.04	1.7	3.4
3/3/2011 9:37:58	43.1510	-111.4378	0.6 ML IE	122.3	5.58	6	129	12.1	0.03	0.9	4.0
3/3/2011 9:38:31	43.1143	-111.4478	0.9 ML IE	123.5	2.49	4	127	9.2	0.09	0.9	12.3
3/3/2011 9:41:24	43.1538	-111.4360	0.9 ML IE	122.2	6.09	9	129	12.4	0.07	0.6	2.8
3/3/2011 9:46:02	43.1562	-111.4325	1.4 ML IE	122.4	7.02	10	116	12.5	0.06	0.5	2.3
3/3/2011 9:53:33	43.1497	-111.4380	1.5 Mc IE	122.3	6.34	13	119	12.0	0.05	0.5	2.1
3/3/2011 9:54:45	43.1395	-111.4475	0.3 ML IE	122.2	2.74	5	248	11.4	0.07	1.6	10.4
3/3/2011 9:55:56	43.1638	-111.4260	0.7 Mc IE	122.5	4.71	6	132	13.1	0.04	1.1	4.7
3/3/2011 12:26:09	42.6432	-112.1250	1.6 Mc IE	124.1	7.07	8	141	32.3	0.08	0.6	4.0
3/4/2011 15:07:47	44.7173	-111.8688	1.8 Mc IE	139.4	6.37	14	122	16.2	0.08	0.8	6.4
3/4/2011 22:19:33	44.3172	-113.1133	0.7 ML IE	78.8	4.79	7	175	13.8	0.03	1.9	2.3
3/5/2011 1:36:55	44.8473	-112.9027	1.4 Mc IE	133.5	10.66	5	306	57.6	0.05	5.4	3.6
3/5/2011 9:57:36	42.5647	-111.6427	0.8 ML IE	152.3	4.99	7	131	45.3	0.06	0.6	10.9
3/5/2011 10:16:38	42.5533	-111.6398	0.9 ML IE	153.4	4.98	6	131	46.3	0.05	0.6	9.4
3/6/2011 16:41:50	44.8613	-112.9308	0.7 ML IE	135.3	7.22	4	267	7.5	0.01	2.6	2.7
3/7/2011 3:37:31	44.6038	-112.1150	2.0 Mc IE	118.8	12.46	18	92	22.2	0.07	0.4	1.3
3/8/2011 6:11:11	44.7850	-111.5483	2.4 Mc IE	160.2	15.48	18	144	11.1	0.06	0.6	0.5
3/10/2011 16:50:12	42.7392	-111.7038	2.1 ML IE	134.0	0.02	17	69	31.9	0.18	0.5	2.2

ORIGIN TIME	LAT N	LONG W	MAG-TYPE	DIST	Z	NO	GAP	DMIN	RMS	ERH	ERZ
3/10/2011 16:50:43	42.7335	-111.7017	1.8 ML IE	134.6	0.03	11	201	32.3	0.14	0.8	1.8
3/10/2011 16:55:38	42.7052	-111.6915	1.0 ML IE	137.5	5.42	9	208	34.0	0.08	0.8	5.3
3/10/2011 16:56:44	42.6992	-111.6947	1.6 ML IE	137.9	5.06	5	209	34.7	0.09	1.4	12.8
3/10/2011 16:57:09	42.7257	-111.7007	1.7 ML IE	135.3	5.01	10	203	32.8	0.14	0.9	13.0
3/10/2011 17:12:49	42.6930	-111.6925	1.5 ML IE	138.5	8.45	9	210	35.1	0.17	1.4	5.4
3/10/2011 17:28:52	42.7440	-111.6977	2.0 ML IE	133.9	0.02	10	99	31.2	0.10	0.7	3.0
3/10/2011 17:33:14	42.7140	-111.6922	3.0 ML IE	136.7	10.76	23	133	33.3	0.11	0.5	1.3
3/10/2011 17:34:40	42.7290	-111.6957	1.9 ML IE	135.3	12.11	9	202	32.3	0.08	0.7	1.5
3/10/2011 19:15:20	42.7448	-111.6957	1.3 ML IE	134.0	9.58	13	69	31.0	0.17	0.6	2.7
3/11/2011 2:17:31	45.0378	-113.0837	1.6 Mc MB	156.2	2.69	7	208	29.8	0.02	1.7	3.0
3/12/2011 4:15:04	43.1767	-111.3288	1.8 Mc IE	129.0	9.55	19	96	14.1	0.08	0.3	1.4
3/12/2011 11:27:10	43.1612	-110.9568	1.1 Mc IE	157.5	6.32	8	166	23.9	0.03	1.0	5.6
3/12/2011 12:34:12	43.1642	-110.9618	1.1 Mc IE	157.0	5.19	9	165	23.8	0.02	0.8	6.8
3/12/2011 12:41:56	43.1540	-110.9383	0.7 ML IE	159.2	11.40	9	171	24.2	0.06	1.3	2.6
3/12/2011 12:42:10	43.2020	-111.0005	1.2 Mc IE	152.6	13.85	9	195	21.5	0.10	3.4	1.8
3/12/2011 13:01:21	43.1633	-110.9607	1.2 ML IE	157.2	7.55	11	166	23.8	0.03	0.9	3.5
3/12/2011 13:02:26	43.1692	-110.9700	1.2 Mc IE	156.2	11.37	10	206	23.5	0.04	1.8	2.2
3/12/2011 13:23:41	43.1528	-110.9520	0.7 ML IE	158.2	10.04	10	168	24.7	0.08	1.2	2.4
3/12/2011 16:48:47	43.1842	-110.9817	0.3 ML IE	154.7	13.03	8	201	22.4	0.02	1.2	2.4
3/12/2011 16:50:01	43.1670	-110.9673	0.9 ML IE	156.5	10.58	10	164	23.6	0.08	1.0	2.5
3/12/2011 17:02:21	43.1853	-110.9900	0.3 ML IE	154.1	14.29	10	200	22.6	0.06	1.4	2.1
3/12/2011 17:11:27	43.1812	-110.9847	0.5 ML IE	154.6	14.92	8	201	22.8	0.06	1.5	2.7
3/12/2011 17:32:37	43.1773	-110.9777	1.1 Mc IE	155.3	12.35	9	203	22.9	0.06	1.3	2.5
3/12/2011 17:36:23	43.1633	-110.9528	1.2 ML IE	157.8	12.01	13	167	23.6	0.05	0.8	1.5
3/12/2011 17:40:50	43.1690	-110.9683	1.3 ML IE	156.4	7.61	15	164	23.5	0.07	0.6	3.8
3/12/2011 18:06:56	43.1602	-110.9577	2.9 ML IE	157.5	10.04	29	166	24.0	0.11	0.6	1.4
3/12/2011 18:13:54	43.1822	-110.9993	0.5 ML IE	153.5	16.12	8	199	23.3	0.07	1.7	0.8
3/12/2011 18:15:49	43.1608	-110.9513	0.5 ML IE	158.0	7.62	8	167	23.8	0.08	1.3	5.5
3/12/2011 18:22:17	43.1653	-110.9598	1.5 ML IE	157.2	9.51	17	165	23.6	0.10	0.7	2.4
3/12/2011 18:23:23	43.1657	-110.9637	1.3 ML IE	156.8	5.40	14	165	23.7	0.07	0.7	5.2
3/12/2011 18:49:13	43.1648	-110.9535	0.2 ML IE	157.6	10.74	8	208	23.5	0.07	1.4	4.4
3/12/2011 20:30:30	43.1797	-110.9713	0.4 ML IE	155.7	13.94	6	209	22.5	0.10	1.9	4.7
3/12/2011 22:26:29	43.1587	-110.9592	1.0 ML IE	157.5	12.44	11	166	24.3	0.09	1.0	2.4
3/12/2011 22:29:17	43.1593	-110.9507	0.7 ML IE	158.1	7.11	9	167	23.9	0.09	1.0	5.0
3/12/2011 23:35:57	43.1662	-110.9580	0.9 ML IE	157.3	10.17	10	208	23.4	0.04	1.5	3.2
3/12/2011 23:38:18	43.1617	-110.9582	1.5 ML IE	157.4	9.32	15	166	23.9	0.08	0.8	2.3
3/12/2011 23:39:33	43.1672	-110.9612	1.3 ML IE	157.0	9.95	14	165	23.4	0.08	0.7	2.8
3/12/2011 23:53:28	43.1768	-110.9692	0.3 ML IE	156.0	11.45	10	204	22.7	0.08	1.2	2.5
3/13/2011 0:21:16	44.3992	-111.0760	0.6 ML IE	160.2	14.71	4	166	24.7	0.05	1.2	3.0
3/13/2011 2:20:05	43.1670	-110.9555	0.8 Mc IE	157.4	9.75	8	166	23.3	0.07	1.5	4.8
3/13/2011 2:48:55	43.1845	-110.9715	0.5 ML IE	155.5	14.61	8	216	22.0	0.07	1.2	2.1
3/13/2011 3:08:15	43.1732	-110.9673	0.1 ML IE	156.3	12.05	7	204	23.0	0.08	1.4	2.9
3/13/2011 3:42:10	43.1838	-110.9882	0.3 ML IE	154.3	3.66	9	159	22.7	0.09	1.1	11.6
3/13/2011 9:00:45	43.2480	-110.9455	0.9 ML IE	155.2	7.69	8	160	14.8	0.07	1.6	2.3
3/13/2011 13:54:06	43.1613	-110.9575	1.2 Mc IE	157.5	6.28	8	166	23.9	0.06	1.1	5.7
3/13/2011 14:21:54	42.9470	-111.5395	0.6 Mc IE	127.6	0.06	5	290	9.7	0.13	3.2	1.1
3/13/2011 19:49:37	42.5353	-111.5773	1.1 ML IE	158.1	6.20	8	133	46.5	0.12	0.9	14.3
3/14/2011 5:20:46	43.1695	-110.9673	1.6 Mc IE	156.4	7.44	15	164	23.4	0.06	0.9	3.1
3/15/2011 5:02:13	43.1765	-110.9780	0.8 ML IE	155.3	15.58	6	162	23.0	0.06	1.0	0.8

ORIGIN TIME	LAT N	LONG W	MAG-TYPE	DIST	Z	NO	GAP	DMIN	RMS	ERH	ERZ
3/15/2011 5:04:40	43.1627	-110.9580	1.4 ML IE	157.4	9.38	12	166	23.8	0.06	0.7	2.7
3/15/2011 5:05:39	43.1605	-110.9535	0.8 ML IE	157.8	7.11	6	167	23.9	0.04	1.5	5.2
3/16/2011 3:34:00	42.6112	-111.4352	1.0 ML IE	159.3	8.76	5	153	32.3	0.06	0.8	6.4
3/16/2011 14:45:10	44.6085	-112.0852	2.2 Mc IE	120.4	13.92	20	92	24.6	0.08	0.6	0.6
3/16/2011 14:48:08	44.6050	-112.0755	1.3 Mc MB	120.4	5.95	7	138	25.3	0.02	2.1	12.6
3/16/2011 15:42:11	44.6230	-112.0938	2.1 Mc IE	121.5	13.49	14	95	24.1	0.12	0.6	0.7
3/16/2011 16:16:56	44.5972	-112.0790	1.8 Mc IE	119.5	14.45	12	151	25.0	0.06	0.6	0.8
3/16/2011 17:46:41	44.6077	-112.0723	1.3 ML IE	120.8	12.28	6	176	25.6	0.01	1.6	3.9
3/16/2011 18:31:11	44.6365	-112.0910	2.0 Mc IE	122.9	12.56	16	98	24.5	0.04	1.0	1.3
3/16/2011 19:09:36	44.6038	-112.0845	3.2 ML IE	119.9	14.08	29	91	24.6	0.07	0.5	0.5
3/16/2011 22:27:08	43.0242	-111.3035	0.6 ML IE	138.7	1.99	5	105	6.4	0.04	0.6	12.9
3/21/2011 10:03:07	42.8637	-111.2367	0.9 ML IE	153.0	11.72	6	165	15.6	0.07	1.4	2.4
3/22/2011 4:53:19	43.6053	-114.7220	1.6 Mc IE	156.5	8.46	6	330	25.9	0.03	8.1	6.5
3/23/2011 14:45:30	44.1175	-113.9435	0.9 ML IE	106.7	6.58	8	211	44.7	0.03	0.8	12.7
3/23/2011 19:49:42	44.6115	-112.6097	0.6 ML IE	107.9	5.88	5	134	17.2	0.05	0.8	13.2
3/26/2011 1:52:38	44.6222	-114.2568	1.5 ML IE	160.0	7.92	9	280	76.1	0.09	1.3	2.3
3/27/2011 23:23:54	44.2095	-112.8168	0.9 Mc IE	62.3	4.65	7	247	16.6	0.09	1.9	1.1
3/28/2011 1:54:27	44.5973	-112.0693	0.9 ML IE	119.9	13.47	9	144	25.8	0.01	0.8	2.2
3/28/2011 7:31:43	44.3467	-113.4090	1.7 Mc IE	92.3	7.81	13	210	4.0	0.09	1.2	0.6
3/29/2011 4:34:00	44.3068	-113.8867	0.4 ML IE	114.8	12.21	5	242	38.4	0.13	3.8	7.8
3/29/2011 13:26:18	44.1090	-114.5210	1.3 Mc IE	148.7	7.27	6	264	61.4	0.04	2.6	12.5
3/29/2011 23:57:22	44.5847	-112.3597	1.0 Mc IE	109.4	7.35	7	226	2.9	0.09	2.0	1.1
3/30/2011 17:55:38	43.3417	-110.9050	1.0 ML IE	155.7	9.73	8	133	4.9	0.10	2.0	1.5
3/31/2011 1:27:53	44.5923	-112.0723	1.0 Mc MB	119.3	12.68	8	153	25.6	0.02	2.0	6.7
3/31/2011 15:23:06	44.5843	-114.2857	2.1 Mc MB	158.9	8.18	16	251	76.4	0.13	1.1	2.4
3/31/2011 15:30:13	44.6007	-114.2900	2.8 ML US	160.4	11.27	18	232	77.4	0.09	0.9	1.4
3/31/2011 19:53:16	44.5530	-114.2838	1.3 ML IE	156.6	2.14	8	284	75.0	0.26	3.0	6.2
4/1/2011 10:42:17	44.6010	-112.0767	1.3 Mc IE	119.9	13.64	10	137	25.2	0.09	0.8	1.9
4/2/2011 15:00:44	44.3543	-114.0025	0.6 ML IE	125.3	7.01	6	254	47.9	0.06	1.5	13.4
4/2/2011 21:38:20	42.7208	-111.4685	1.2 ML IE	148.6	7.24	8	289	24.4	0.06	1.5	2.2
4/3/2011 4:17:40	44.3108	-114.1632	1.2 ML IE	132.9	6.59	7	255	60.5	0.22	3.3	8.2
4/3/2011 9:12:50	44.2358	-114.0082	0.5 ML IE	118.0	7.45	5	235	48.9	0.08	1.2	14.3
4/3/2011 10:21:19	44.3533	-112.7567	1.8 Mc IE	78.3	6.69	22	100	15.0	0.12	0.6	0.9
4/3/2011 15:11:34	44.6547	-112.1008	1.0 ML IE	124.4	10.55	9	190	38.9	0.12	1.5	1.9
4/4/2011 7:36:47	42.8948	-111.3072	0.2 ML IE	146.3	13.16	4	168	10.5	0.05	1.1	2.1
4/4/2011 10:42:44	43.5687	-111.0418	2.1 ML IE	140.8	10.60	27	103	27.6	0.09	0.3	1.7
4/4/2011 17:38:52	44.8033	-112.9267	1.2 Mc MB	128.8	1.75	5	211	6.7	0.04	3.3	9.0
4/5/2011 6:07:08	44.6278	-112.0957	1.1 Mc MB	121.9	10.27	7	130	36.4	0.09	0.7	2.3
4/5/2011 7:05:26	44.6207	-112.0958	4.4 Mw US	121.2	12.61	40	104	35.7	0.12	0.3	0.7
4/5/2011 7:11:56	44.6282	-112.1053	2.4 ML IE	121.6	11.93	26	105	36.1	0.14	0.4	0.9
4/5/2011 7:15:23	44.6552	-112.1220	1.0 ML IE	123.7	5.81	6	192	38.2	0.12	1.2	4.0
4/5/2011 7:15:52	44.6307	-112.1570	1.2 ML IE	120.0	10.42	5	151	34.6	0.07	1.0	1.8
4/5/2011 7:18:33	44.6265	-112.1190	1.5 Mc MB	120.9	7.14	10	104	35.4	0.20	0.8	4.9
4/5/2011 7:21:28	44.6388	-112.1178	1.3 Mc MB	122.2	10.40	6	189	36.7	0.14	9.2	11.0
4/5/2011 7:25:25	44.6267	-112.1165	1.6 Mc MB	121.0	9.89	13	104	35.5	0.24	0.8	2.4
4/5/2011 7:51:14	44.6372	-112.1240	1.6 Mc MB	121.8	6.27	7	126	36.3	0.16	1.5	17.5
4/5/2011 8:02:11	44.6180	-112.1190	1.6 Mc MB	120.1	13.88	13	141	34.6	0.09	0.6	1.2
4/5/2011 8:23:23	44.5955	-112.0943	0.8 ML IE	118.7	2.14	7	183	33.4	0.03	1.1	1.3
4/5/2011 9:10:17	44.6420	-112.1103	1.7 Mc MB	122.8	9.83	14	106	37.3	0.07	0.4	1.3

ORIGIN TIME	LAT N	LONG W	MAG-TYPE	DIST	Z	NO	GAP	DMIN	RMS	ERH	ERZ
4/5/2011 9:19:12	44.6315	-112.0920	1.6 Mc MB	122.4	6.18	12	105	36.9	0.17	0.5	4.1
4/5/2011 9:39:32	44.6318	-112.1415	0.9 ML IE	120.7	9.70	5	227	35.2	0.07	3.2	12.0
4/5/2011 17:09:12	44.6317	-112.0993	2.5 Mc IE	122.1	12.76	23	97	23.8	0.08	0.4	1.2
4/5/2011 17:24:44	42.5668	-111.6187	0.6 Mc IE	153.3	4.98	5	177	47.9	0.13	1.7	15.2
4/5/2011 21:12:58	44.6080	-112.0932	1.0 Mc MB	120.0	9.14	7	171	24.0	0.03	0.8	6.0
4/5/2011 22:16:24	44.6110	-112.1177	0.5 Mc IE	119.4	10.37	4	215	22.1	0.09	1.9	11.9
4/6/2011 3:14:58	44.6358	-112.1008	1.7 Mc IE	122.5	10.98	12	141	23.8	0.11	0.7	2.3
4/6/2011 15:08:46	44.6230	-112.0908	2.5 Mc MB	121.6	13.47	30	95	24.3	0.10	0.3	0.8
4/6/2011 15:59:17	44.5952	-112.0827	1.5 Mc IE	119.2	6.09	11	155	24.8	0.06	0.6	13.1
4/6/2011 18:44:30	44.2477	-114.0375	1.5 ML IE	120.6	7.31	9	307	51.0	0.06	10.6	3.2
4/7/2011 7:39:26	42.9113	-111.2088	1.0 ML IE	151.9	8.30	6	129	17.6	0.06	0.7	4.4
4/7/2011 7:54:13	44.5582	-114.3058	0.8 ML IE	158.3	6.60	5	249	76.8	0.06	1.6	5.5
4/7/2011 8:10:56	44.6298	-112.0952	1.6 Mc MB	122.1	14.35	15	140	24.1	0.03	0.6	1.2
4/7/2011 8:17:56	44.6547	-112.1147	0.4 ML IE	123.9	11.46	7	147	23.2	0.05	1.2	3.7
4/7/2011 20:14:26	44.0825	-114.3285	2.2 Mc IE	133.2	7.07	15	243	58.1	0.17	1.9	6.2
4/7/2011 21:26:43	43.3443	-110.9792	1.6 Mc IE	149.7	9.42	12	111	10.5	0.07	0.7	1.7
4/8/2011 9:09:15	44.6287	-112.0922	0.9 Mc IE	122.1	7.62	9	96	24.3	0.09	0.8	11.4
4/8/2011 18:01:43	44.5890	-113.7462	0.9 ML IE	129.8	16.62	5	223	41.1	0.01	1.7	0.8
4/8/2011 18:48:33	44.1260	-113.9458	0.5 ML IE	107.4	7.13	6	213	45.3	0.04	0.8	12.9
4/9/2011 9:45:58	44.6313	-112.4297	1.1 Mc IE	112.8	11.53	6	155	5.1	0.03	1.2	1.4
4/9/2011 9:51:11	43.7747	-110.9993	1.8 Mc IE	144.4	12.25	16	136	36.7	0.04	0.5	2.3
4/9/2011 16:43:33	43.8235	-110.8643	0.3 Mc IE	155.7	7.18	6	206	31.5	0.05	2.3	10.9
4/9/2011 18:26:40	44.6138	-112.1118	1.0 Mc MB	119.9	16.45	8	136	22.5	0.04	0.7	1.0
4/9/2011 19:18:25	44.5962	-112.3623	1.5 Mc IE	110.5	9.42	12	248	2.6	0.05	1.2	0.7
4/10/2011 4:07:01	44.0243	-113.9165	0.7 Mc IE	100.2	7.35	8	193	38.8	0.07	0.7	13.5
4/10/2011 14:54:30	43.7668	-111.0155	1.5 Mc IE	143.0	8.08	11	117	37.4	0.03	1.0	4.3
4/10/2011 19:42:43	43.7613	-111.0218	1.7 Mc IE	142.4	2.00	15	109	13.7	0.13	0.4	16.7
4/10/2011 23:31:21	44.0263	-113.8513	0.4 ML IE	95.5	5.00	5	223	33.8	0.19	5.5	8.5
4/11/2011 3:14:11	44.6748	-111.9580	1.3 Mc MB	131.7	3.16	12	151	24.0	0.08	0.9	2.5
4/11/2011 13:27:27	44.5808	-112.1105	1.1 Mc MB	116.7	6.09	7	184	22.6	0.04	1.0	12.0
4/11/2011 14:18:25	44.6087	-112.1192	1.6 Mc IE	119.1	13.15	14	135	21.9	0.07	0.5	1.4
4/11/2011 14:46:07	42.8180	-111.1750	1.1 ML IE	160.0	9.82	10	171	8.5	0.06	0.6	1.6
4/11/2011 21:32:51	44.5745	-112.0795	0.6 ML IE	117.3	4.69	4	199	25.1	0.00	6.0	3.5
4/12/2011 11:43:08	44.5868	-112.5963	0.5 ML IE	105.3	9.99	5	123	16.1	0.02	3.1	11.9
4/12/2011 14:50:36	43.8677	-110.8132	1.5 ML IE	160.4	10.98	19	129	10.6	0.07	0.4	1.1
4/12/2011 15:22:19	44.6000	-112.1095	0.9 ML IE	118.6	6.91	9	133	22.6	0.07	0.7	9.5
4/12/2011 15:46:41	44.6037	-112.1133	1.1 ML IE	118.9	13.19	8	134	22.3	0.06	0.8	2.0
4/12/2011 15:47:03	44.6032	-112.1083	1.0 Mc IE	119.0	7.02	4	160	22.7	0.06	0.6	11.8
4/12/2011 16:22:26	44.6025	-112.1107	1.2 Mc IE	118.8	6.28	11	160	22.5	0.04	0.5	12.1
4/12/2011 19:45:23	44.6270	-112.1057	1.4 Mc IE	121.4	13.03	13	139	23.2	0.07	0.5	1.6
4/12/2011 22:43:59	43.7662	-111.0200	1.0 ML IE	142.6	0.03	11	109	14.2	0.16	0.7	2.7
4/13/2011 0:03:16	42.9023	-111.5527	0.8 Mc IE	129.9	0.03	9	156	11.4	0.11	0.6	1.1
4/13/2011 4:07:09	44.6145	-112.1237	1.9 Mc IE	119.6	13.43	17	93	21.6	0.08	0.5	1.0
4/14/2011 21:07:58	43.2515	-111.4360	1.0 Mc IE	117.7	9.42	10	192	22.6	0.09	1.2	3.3
4/15/2011 10:17:08	44.2588	-114.0392	0.2 ML IE	121.4	6.94	7	242	50.9	0.03	1.6	12.8
4/15/2011 13:23:45	44.6127	-112.1200	1.1 ML IE	119.5	13.10	15	136	21.9	0.09	0.5	1.2
4/15/2011 14:57:26	44.6150	-112.1150	0.6 ML IE	119.9	13.53	10	166	22.3	0.04	0.6	1.6
4/15/2011 18:40:05	44.6232	-112.0997	0.9 ML IE	121.3	6.18	9	138	23.6	0.05	0.7	12.1
4/16/2011 4:45:57	42.5982	-111.6447	1.0 Mc IE	149.2	9.93	6	231	41.9	0.08	2.0	10.2

ORIGIN TIME	LAT N	LONG W	MAG-TYPE	DIST	Z	NO	GAP	DMIN	RMS	ERH	ERZ
4/16/2011 17:13:36	43.1773	-110.9157	0.5 Mc IE	160.1	4.97	6	185	21.2	0.10	1.4	11.3
4/16/2011 22:32:17	43.8705	-110.9925	0.7 Mc IE	146.2	8.88	6	217	5.2	0.09	4.6	1.2
4/17/2011 0:44:51	44.5830	-112.1057	0.5 Mc IE	117.1	6.46	4	184	23.0	0.05	1.9	12.3
4/17/2011 9:52:17	42.7243	-111.5228	1.0 ML IE	145.2	7.82	4	296	25.1	0.05	3.2	11.4
4/18/2011 3:31:02	44.6202	-112.0993	1.2 Mc IE	121.0	13.32	12	138	23.6	0.07	0.5	2.3
4/18/2011 6:03:25	43.0600	-111.2937	0.8 ML IE	137.4	7.96	8	113	6.3	0.06	0.9	2.1
4/19/2011 2:38:29	44.4708	-114.1558	2.0 Mc IE	142.9	4.17	13	251	62.4	0.09	2.0	4.9
4/20/2011 12:28:46	44.6250	-112.0953	1.4 Mc IE	121.6	13.42	13	95	24.0	0.07	0.6	1.1
4/20/2011 13:57:25	44.6312	-112.1012	1.5 Mc IE	122.0	11.12	17	97	23.7	0.07	0.4	1.6
4/20/2011 18:12:00	43.0292	-111.2962	1.1 ML IE	138.9	0.03	9	107	6.6	0.12	0.9	1.8
4/21/2011 4:33:24	42.8790	-111.1925	0.9 ML IE	155.0	7.05	13	119	14.7	0.10	0.6	3.7
4/21/2011 14:00:16	44.6113	-112.0950	0.9 ML IE	120.3	6.35	7	162	23.8	0.05	0.9	13.0
4/21/2011 17:25:53	42.6113	-111.4047	0.6 Mc IE	161.0	11.53	6	303	30.2	0.02	1.5	2.2
4/21/2011 20:01:22	43.5630	-113.8823	1.3 ML IE	89.2	5.10	13	156	25.9	0.04	0.8	1.5
4/22/2011 8:20:26	44.6045	-112.1295	1.1 ML IE	118.4	17.37	8	140	21.1	0.01	1.5	0.8
4/22/2011 16:23:45	43.0255	-111.3372	0.8 ML IE	136.2	8.87	9	100	4.1	0.04	0.6	1.0
4/22/2011 17:07:53	43.0313	-111.3322	1.1 Mc IE	136.3	10.30	9	101	4.0	0.05	0.6	1.1
4/22/2011 21:24:54	44.3325	-114.0288	2.2 Mc IE	125.5	6.82	16	204	49.8	0.17	0.9	3.6
4/23/2011 3:28:08	42.8960	-111.5755	0.9 ML IE	129.0	2.49	6	219	13.4	0.11	1.6	14.1
4/23/2011 4:04:38	42.6222	-111.4057	1.1 Mc IE	160.1	6.18	7	153	29.6	0.08	0.8	6.5
4/23/2011 6:03:11	43.7740	-111.0405	0.1 ML IE	141.0	2.48	8	215	15.1	0.07	0.9	12.3
4/24/2011 7:33:38	43.1897	-110.9908	0.7 Mc IE	153.8	10.65	9	199	22.3	0.06	1.5	2.8
4/24/2011 8:48:28	44.6085	-112.0993	1.6 Mc IE	119.8	16.67	13	133	23.5	0.11	0.6	0.9
4/24/2011 12:51:41	44.6558	-112.1647	0.7 ML IE	122.3	15.12	7	148	19.5	0.03	0.6	1.5
4/25/2011 8:33:44	43.5780	-111.0503	0.6 ML IE	140.0	5.75	7	228	28.8	0.08	1.1	8.6
4/25/2011 10:31:28	43.3338	-111.0735	1.0 Mc IE	142.6	9.59	8	151	18.2	0.05	1.3	4.2
4/25/2011 13:31:55	44.6577	-111.8923	1.5 Mc IE	132.8	13.44	8	140	19.7	0.05	1.1	2.4
4/26/2011 23:51:33	44.6005	-112.1182	1.0 Mc IE	118.4	10.63	7	159	21.9	0.03	0.8	4.6
4/27/2011 4:31:22	43.3380	-111.0327	0.1 ML IE	145.7	14.59	6	281	14.9	0.01	2.4	2.4
4/27/2011 11:27:23	44.3410	-114.0250	1.9 Mc IE	125.8	6.87	9	219	49.6	0.06	1.0	3.3
4/28/2011 1:58:55	44.6535	-112.7543	1.2 Mc MB	111.7	9.75	5	124	20.7	0.03	1.3	3.3
4/28/2011 11:18:50	43.1912	-111.3908	0.5 ML IE	123.7	10.31	5	253	15.4	0.00	3.6	4.2
4/29/2011 15:28:51	44.2568	-114.0722	1.8 Mc IE	123.5	7.11	7	216	53.6	0.14	1.2	10.6
4/30/2011 1:20:18	43.2395	-110.9333	0.3 ML IE	156.5	8.74	8	199	15.2	0.06	1.0	1.9
4/30/2011 9:47:07	43.1562	-110.9503	0.8 Mc IE	158.2	6.23	9	168	24.3	0.05	0.9	4.3
5/1/2011 1:17:15	44.6388	-112.1047	1.1 Mc IE	122.7	11.95	5	143	23.5	0.01	1.7	3.4
5/1/2011 15:44:11	43.5177	-110.8790	0.0 Mc IE	154.4	6.05	5	178	17.4	0.01	1.5	5.6
5/2/2011 7:04:41	44.3218	-112.6485	0.5 Mc IE	75.5	7.75	5	153	25.6	0.10	1.1	14.5
5/2/2011 9:47:08	42.6310	-111.6838	0.8 ML IE	144.4	14.93	5	316	40.3	0.00	1.9	3.5
5/2/2011 17:54:51	44.7812	-112.7678	1.2 Mc IE	125.9	7.93	11	84	8.2	0.03	0.6	1.7
5/3/2011 14:58:30	44.5585	-112.1378	0.6 ML IE	113.5	1.68	5	178	20.7	0.09	1.5	1.1
5/3/2011 19:53:52	43.4783	-111.2312	0.8 Mc IE	126.8	15.69	6	290	24.2	0.03	1.3	3.1
5/4/2011 2:59:59	44.6187	-112.0888	0.9 ML IE	121.2	12.99	10	140	24.4	0.01	0.5	1.7
5/4/2011 8:34:25	44.3137	-111.0127	1.4 Mc IE	160.0	7.39	9	135	19.3	0.03	0.5	3.1
5/4/2011 10:29:44	44.3117	-111.0155	0.6 Mc IE	159.7	7.23	7	135	19.0	0.04	0.8	5.5
5/5/2011 3:03:21	44.3517	-112.7193	0.8 Mc IE	78.2	15.57	6	137	29.0	0.05	0.4	1.3
5/5/2011 8:13:31	43.7753	-111.0068	0.7 Mc IE	143.8	0.03	9	180	14.6	0.11	0.9	1.8
5/5/2011 8:30:51	43.7745	-111.0037	2.0 Mc IE	144.0	2.08	21	91	14.6	0.13	0.7	16.3
5/5/2011 8:55:28	43.7778	-111.0138	0.6 ML IE	143.2	2.45	9	180	14.5	0.05	1.0	11.3

ORIGIN TIME	LAT N	LONG W	MAG-TYPE	DIST	Z	NO	GAP	DMIN	RMS	ERH	ERZ
5/5/2011 9:06:57	43.7727	-111.0182	0.6 ML IE	142.8	2.50	9	182	15.2	0.13	0.9	13.6
5/5/2011 10:17:38	43.7802	-111.0177	0.8 Mc IE	142.9	3.09	7	181	14.4	0.07	0.9	10.1
5/5/2011 10:26:11	44.5782	-112.1063	0.6 ML IE	116.6	13.20	5	184	22.9	0.06	1.2	3.1
5/5/2011 11:32:50	43.7757	-111.0152	0.0 ML IE	143.1	4.67	4	226	14.8	0.12	3.9	13.1
5/5/2011 13:53:26	43.7618	-111.0430	0.5 ML IE	140.7	2.51	7	233	17.2	0.12	1.3	13.5
5/5/2011 16:01:27	43.7580	-110.9765	0.8 Mc IE	146.0	4.07	6	157	13.9	0.02	1.6	5.0
5/5/2011 16:44:30	43.7702	-111.0177	2.0 Mc IE	142.8	2.00	13	110	14.7	0.18	0.9	19.4
5/5/2011 22:17:27	44.6235	-112.1018	1.6 ML IE	121.2	14.20	15	95	23.5	0.06	0.4	0.8
5/6/2011 3:40:50	44.6132	-113.8283	1.7 ML IE	135.9	0.16	9	274	47.6	0.03	1.1	2.2
5/6/2011 6:41:58	43.5563	-111.2338	1.9 Mc IE	125.5	11.01	22	96	37.7	0.10	0.3	1.4
5/6/2011 6:45:09	43.5652	-111.2445	0.6 ML IE	124.5	7.33	5	239	39.0	0.05	1.6	10.4
5/6/2011 8:15:56	43.5662	-111.2047	0.7 ML IE	127.7	14.80	6	233	36.4	0.09	2.8	3.1
5/6/2011 8:39:40	42.8688	-111.1660	2.0 Mc IE	157.4	8.13	15	126	12.7	0.05	0.5	1.6
5/7/2011 7:23:40	44.4910	-112.7608	1.5 Mc MB	93.6	10.81	11	101	23.0	0.07	0.5	2.1
5/7/2011 10:57:58	43.7752	-111.0077	0.3 ML IE	143.7	9.44	7	180	14.6	0.04	1.0	3.1
5/7/2011 11:01:23	43.7798	-111.0035	0.6 Mc IE	144.1	2.49	8	178	14.0	0.12	0.8	13.0
5/8/2011 17:31:27	44.6252	-112.1015	1.3 Mc IE	121.4	13.17	13	139	23.5	0.02	0.6	2.0
5/9/2011 0:08:05	42.9523	-111.0537	0.6 Mc IE	160.3	4.95	7	165	21.1	0.07	0.8	9.9
5/9/2011 2:06:47	43.7620	-111.0217	1.9 Mc IE	142.4	2.00	14	163	13.8	0.13	0.8	16.3
5/9/2011 2:59:08	43.7795	-111.0633	0.2 ML IE	139.3	0.24	7	180	16.0	0.10	1.1	2.3
5/9/2011 23:32:23	44.5055	-114.0803	1.3 ML IE	140.9	0.08	7	268	58.0	0.05	2.4	4.0
5/11/2011 14:52:46	44.6328	-112.0982	1.8 Mc IE	122.3	12.70	12	141	23.9	0.07	0.5	2.1
5/11/2011 16:26:57	43.7583	-110.9875	0.1 ML IE	145.2	2.39	4	180	13.7	0.07	1.6	12.9
5/11/2011 17:32:33	42.8745	-111.2148	1.3 ML IE	153.8	4.68	7	130	15.3	0.05	0.6	5.8
5/11/2011 17:32:48	42.8748	-111.1932	1.2 ML IE	155.2	10.14	6	163	14.3	0.18	1.4	6.2
5/11/2011 17:33:31	42.8730	-111.1890	0.9 ML IE	155.6	6.05	10	162	14.0	0.05	0.8	5.5
5/11/2011 17:34:25	42.8683	-111.1870	0.9 ML IE	156.0	11.63	10	162	13.5	0.09	0.7	1.5
5/11/2011 17:39:05	42.8677	-111.2087	0.7 ML IE	154.6	9.46	9	169	14.4	0.07	0.7	2.8
5/11/2011 20:41:42	44.6422	-112.1042	1.1 Mc IE	123.0	11.16	7	144	23.7	0.01	1.4	3.3
5/12/2011 3:25:05	43.5542	-111.1995	0.9 Mc IE	128.2	8.98	8	261	16.8	0.03	1.1	2.2
5/12/2011 6:28:10	44.3853	-113.0162	1.4 Mc IE	83.9	6.88	15	119	8.6	0.11	0.5	0.5
5/12/2011 9:40:37	44.6407	-112.1023	1.5 Mc IE	122.9	13.17	10	98	23.8	0.03	0.9	1.5
5/13/2011 4:38:28	43.7665	-111.0157	1.0 Mc IE	143.0	2.50	9	161	14.3	0.10	0.7	11.1
5/13/2011 12:39:27	44.7435	-112.8560	1.5 Mc IE	121.8	1.13	6	140	9.4	0.03	1.2	2.0
5/13/2011 14:00:41	44.6702	-112.0260	1.4 Mc IE	128.6	16.98	6	150	29.3	0.08	0.9	0.8
5/14/2011 9:04:48	43.8115	-111.0625	1.6 Mc IE	139.7	15.69	7	103	43.2	0.10	1.3	1.1
5/15/2011 5:18:31	44.0743	-113.9477	0.6 ML IE	104.8	7.16	4	204	42.9	0.09	0.8	14.8
5/16/2011 22:02:52	43.7632	-110.9990	0.5 Mc IE	144.3	2.49	6	153	14.1	0.11	1.0	12.2
5/18/2011 2:12:26	43.7643	-111.0238	0.7 Mc IE	142.3	6.22	9	163	14.0	0.06	0.8	2.6
5/18/2011 5:33:59	43.6113	-113.5110	0.8 Mc IE	58.9	9.85	15	165	2.8	0.09	0.6	0.5
5/18/2011 11:58:59	44.3180	-112.5495	0.4 ML IE	76.6	5.13	9	108	18.7	0.09	0.8	2.0
5/18/2011 22:16:42	43.7640	-110.9998	1.1 Mc IE	144.2	2.50	10	154	14.1	0.13	0.8	11.8
5/19/2011 15:23:14	43.1493	-110.9197	1.0 ML IE	160.8	0.16	8	174	24.3	0.08	1.1	2.5
5/19/2011 23:51:55	43.4732	-111.0280	0.3 ML IE	143.1	6.27	6	230	6.5	0.04	6.8	6.4
5/22/2011 1:38:13	43.7723	-111.0220	0.6 Mc IE	142.5	2.41	7	176	15.4	0.08	0.9	13.3
5/22/2011 4:33:00	43.7740	-111.0215	0.9 Mc IE	142.6	6.27	7	176	15.2	0.03	1.0	4.9
5/22/2011 5:51:56	43.7262	-111.1438	1.1 Mc IE	132.4	3.51	10	208	25.1	0.04	1.1	9.7
5/22/2011 6:40:32	43.7322	-111.1225	0.7 Mc IE	134.1	8.40	6	246	23.5	0.04	1.3	5.0
5/22/2011 9:10:25	43.7697	-111.0328	0.4 Mc IE	141.6	0.17	8	179	16.0	0.05	0.6	1.1

ORIGIN TIME	LAT N	LONG W	MAG-TYPE	DIST	Z	NO	GAP	DMIN	RMS	ERH	ERZ
5/22/2011 11:47:08	42.8682	-111.2277	0.7 ML IE	153.3	11.64	6	194	15.5	0.07	0.9	2.5
5/22/2011 13:37:59	44.8272	-111.8167	1.6 Mc MB	152.0	3.96	8	185	16.1	0.02	1.4	1.4
5/22/2011 18:18:24	43.2405	-110.9332	0.6 Mc IE	156.5	9.65	8	319	15.1	0.10	1.2	2.1
5/22/2011 18:37:05	43.4435	-111.1053	0.1 Mc IE	137.5	6.42	6	263	13.5	0.08	4.2	10.0
5/22/2011 21:37:04	42.8667	-111.2353	1.6 ML IE	152.9	11.86	13	163	15.8	0.10	0.7	1.4
5/23/2011 3:32:04	42.7558	-111.3178	0.9 ML IE	155.1	9.51	5	252	17.8	0.02	1.4	2.2
5/23/2011 7:00:05	44.8043	-112.8805	1.3 Mc IE	128.7	6.66	7	161	3.6	0.04	1.1	0.5
5/23/2011 18:37:50	43.8335	-113.9272	1.3 Mc IE	94.4	6.44	13	165	39.6	0.08	0.6	2.8
5/23/2011 23:02:54	42.9188	-111.2038	1.0 ML IE	151.8	6.16	8	124	17.9	0.07	0.5	5.2
5/24/2011 5:01:55	43.2337	-110.9117	0.8 Mc IE	158.3	8.91	8	212	15.1	0.05	1.1	2.4
5/24/2011 9:44:29	42.6032	-111.4202	0.9 ML IE	160.8	10.74	6	237	31.8	0.10	1.8	2.7
5/24/2011 20:33:12	44.6140	-112.5050	0.6 ML IE	109.5	11.05	5	152	9.1	0.03	1.8	3.5
5/25/2011 12:58:04	43.5332	-110.9825	1.0 Mc IE	145.9	6.14	6	214	21.7	0.06	1.0	7.9
5/25/2011 19:59:09	43.7873	-111.0188	0.7 Mc IE	142.9	8.76	7	174	13.8	0.10	0.7	2.4
5/28/2011 4:55:03	43.3348	-110.9913	0.9 ML IE	149.0	8.26	9	167	11.7	0.07	1.4	2.9
5/29/2011 14:24:03	44.3742	-114.5177	1.6 Mc IE	160.7	10.33	7	280	89.0	0.11	2.0	2.0
5/31/2011 4:52:29	44.5995	-112.1107	1.0 Mc IE	118.5	15.47	6	133	22.5	0.17	1.3	2.5
5/31/2011 7:26:41	44.5868	-114.2357	1.8 Mc IE	156.1	5.58	9	228	72.9	0.07	0.8	2.1
5/31/2011 8:07:08	43.1680	-111.2343	0.8 ML IE	136.4	5.03	9	210	37.8	0.04	1.2	10.9
5/31/2011 13:31:25	44.2503	-114.0608	1.2 Mc IE	122.4	9.57	6	241	52.8	0.08	1.2	13.3
5/31/2011 13:48:58	42.9757	-111.3665	1.0 ML IE	137.2	6.91	9	127	31.9	0.26	1.0	5.2
5/31/2011 18:41:49	43.5793	-111.8348	1.0 Mc IE	76.9	12.21	12	150	17.5	0.21	2.2	1.7
6/1/2011 15:22:21	44.6238	-112.1067	1.1 Mc IE	121.1	14.85	6	139	23.1	0.04	1.1	1.8
6/2/2011 6:01:33	44.3935	-111.1100	1.5 Mc WY	157.5	8.68	9	176	23.3	0.07	0.7	5.5
6/2/2011 9:54:18	44.1533	-113.9802	1.4 Mc IE	111.3	10.05	8	220	49.2	0.07	0.9	11.2
6/2/2011 10:37:10	44.3905	-111.0985	1.1 ML IE	158.1	9.37	5	173	23.2	0.04	0.9	3.2
6/3/2011 4:02:53	42.8877	-111.1727	0.9 ML IE	155.8	11.79	5	212	14.8	0.05	8.3	5.7
6/3/2011 4:03:09	42.8877	-111.1925	1.7 ML IE	154.4	7.32	12	120	15.5	0.09	0.8	2.9
6/3/2011 4:04:23	42.8880	-111.1908	0.8 ML IE	154.5	11.13	5	218	15.5	0.11	5.9	7.9
6/3/2011 12:22:43	42.8758	-111.2265	1.0 ML IE	152.9	10.13	6	239	16.0	0.01	2.6	2.9
6/3/2011 20:03:01	43.5573	-110.9702	0.8 Mc IE	146.7	8.13	10	165	7.6	0.05	0.8	1.7
6/5/2011 6:00:32	44.5155	-114.1915	2.3 Mc IE	148.3	6.72	17	222	88.0	0.11	0.6	2.2
6/5/2011 9:55:54	44.6207	-112.0745	1.7 Mc IE	122.0	12.78	13	95	25.6	0.02	0.4	1.5
6/5/2011 10:08:14	45.0042	-112.8853	1.2 Mc MB	150.9	10.44	5	218	19.8	0.03	4.9	2.7
6/5/2011 10:09:28	44.6208	-112.0813	1.5 Mc IE	121.7	13.78	11	95	25.0	0.06	0.6	1.1
6/5/2011 13:12:36	43.0947	-111.3817	NM	129.2	9.98	6	251	43.2	0.08	2.6	11.3
6/5/2011 13:12:42	43.0917	-111.3920	1.2 ML IE	128.7	9.64	10	128	43.4	0.04	0.8	3.6
6/6/2011 8:51:21	44.3608	-111.3677	1.3 ML IE	138.3	1.85	7	246	24.0	0.26	2.2	5.1
6/7/2011 4:00:17	42.3688	-112.3275	1.1 ML IE	147.3	6.21	6	125	29.2	0.02	0.8	5.6
6/7/2011 12:25:22	44.4078	-113.1065	1.4 Mc IE	88.2	12.44	7	175	15.8	0.02	1.1	2.7
6/7/2011 18:08:48	44.3145	-112.8132	1.0 Mc IE	74.0	12.42	10	110	10.3	0.06	0.5	1.1
6/8/2011 14:08:37	44.2523	-114.0732	0.4 ML IE	123.3	8.71	6	242	53.7	0.10	1.1	3.7
6/9/2011 15:34:51	43.7725	-111.0218	0.7 ML IE	142.5	0.03	8	176	15.3	0.17	1.2	2.9
6/9/2011 15:46:47	43.7728	-111.0010	0.7 Mc IE	144.2	0.02	7	178	14.7	0.08	0.9	2.5
6/9/2011 15:54:49	43.7717	-110.9903	0.7 Mc IE	145.0	0.06	5	168	14.5	0.09	1.9	5.5
6/9/2011 21:01:26	43.1697	-111.1147	0.9 ML IE	145.3	11.86	5	323	30.2	0.23	19.3	9.7
6/11/2011 7:41:53	44.6463	-112.1307	1.2 Mc IE	122.5	13.74	10	123	21.7	0.03	0.6	1.3
6/12/2011 2:47:44	43.0490	-111.4593	1.7 Mc IE	126.4	8.39	18	153	43.0	0.09	0.3	2.0
6/13/2011 10:39:19	43.7770	-111.0475	0.8 Mc IE	140.5	0.96	8	181	15.9	0.08	0.9	1.8

ORIGIN TIME	LAT N	LONG W	MAG-TYPE	DIST	Z	NO	GAP	DMIN	RMS	ERH	ERZ
6/13/2011 18:30:40	42.7095	-111.7310	1.2 ML IE	135.1	4.99	5	137	52.0	0.04	0.8	11.9
6/13/2011 21:33:02	43.8030	-111.0160	0.6 Mc IE	143.3	4.26	5	160	12.1	0.01	2.4	8.5
6/14/2011 16:40:40	42.9212	-111.1827	2.3 ML IE	153.1	1.94	28	127	18.6	0.07	0.4	0.9
6/14/2011 18:54:02	44.5048	-114.2228	2.1 Mc IE	149.4	9.04	9	223	68.6	0.09	2.0	2.1
6/15/2011 6:53:28	43.7668	-111.0373	0.5 Mc IE	141.2	2.42	7	171	14.3	0.06	1.7	11.6
6/15/2011 7:05:45	43.7640	-111.0380	0.0 ML IE	141.2	2.47	7	171	14.0	0.13	1.9	12.8
6/15/2011 7:39:52	43.8563	-110.9730	0.2 ML IE	147.5	2.11	7	199	5.3	0.06	1.2	13.1
6/16/2011 6:01:39	44.9795	-112.6258	0.8 Mc MB	148.4	12.74	5	153	24.4	0.09	0.7	1.6
6/16/2011 11:48:28	43.7720	-111.0185	0.8 ML IE	142.8	8.02	9	175	15.3	0.09	0.7	3.1
6/16/2011 12:42:11	42.8160	-111.2667	1.6 Mc IE	154.2	8.15	12	169	14.7	0.05	1.5	3.4
6/16/2011 14:57:52	44.5205	-114.1748	2.0 Mc IE	147.6	9.45	11	222	65.6	0.03	0.9	1.7
6/17/2011 7:31:23	42.6767	-111.3638	2.4 ML IE	158.2	13.71	24	107	23.7	0.10	0.6	0.7
6/17/2011 10:06:12	43.2907	-111.5420	1.2 Mc IE	108.0	10.89	6	167	52.8	0.11	2.0	3.9
6/17/2011 16:05:22	44.3450	-112.8735	1.2 Mc IE	77.7	10.57	11	244	5.7	0.08	0.9	0.9
6/18/2011 0:39:06	43.0612	-111.4247	0.7 Mc IE	128.1	5.00	8	164	42.2	0.16	0.7	14.7
6/18/2011 1:59:20	43.2328	-111.3520	1.0 Mc IE	124.8	11.84	6	314	43.1	0.10	3.3	13.2
6/18/2011 4:23:05	43.1515	-110.9672	0.6 Mc IE	157.1	8.50	8	166	25.2	0.06	1.4	4.6
6/18/2011 12:46:12	43.1622	-110.9665	0.7 Mc IE	156.8	8.99	7	167	24.1	0.06	1.9	4.0
6/18/2011 14:37:44	43.1627	-110.9628	1.0 ML IE	157.0	10.60	9	165	23.9	0.09	1.5	2.7
6/18/2011 14:49:28	43.1630	-110.9592	0.8 ML IE	157.3	11.93	8	166	23.8	0.02	1.7	2.9
6/18/2011 14:55:27	43.1622	-110.9627	1.1 ML IE	157.1	9.00	11	166	24.0	0.05	1.2	2.8
6/18/2011 15:34:42	43.1660	-110.9690	0.5 ML IE	156.4	9.98	7	168	23.8	0.05	1.6	3.1
6/18/2011 15:44:25	43.1707	-111.0125	0.6 Mc IE	152.9	9.62	9	169	25.0	0.07	1.2	4.2
6/18/2011 16:15:37	43.1567	-110.9467	0.5 ML IE	158.5	12.92	9	169	24.1	0.05	1.2	2.4
6/18/2011 22:34:55	43.0688	-111.4207	1.4 Mc IE	127.9	13.85	12	113	42.7	0.09	0.9	1.6
6/18/2011 23:23:30	43.0787	-111.4888	1.1 ML IE	122.6	5.04	9	152	43.1	0.08	0.9	12.9
6/19/2011 0:39:26	43.0808	-111.4693	1.7 Mc IE	123.8	0.04	12	114	46.2	0.33	1.0	4.0
6/19/2011 2:51:00	44.1887	-112.9830	0.1 ML IE	62.0	12.11	8	101	13.5	0.04	0.5	1.4
6/19/2011 6:14:20	43.0853	-111.4463	1.4 Mc IE	125.2	6.93	6	131	45.4	0.07	0.8	11.7
6/19/2011 6:18:08	43.0853	-111.4372	1.4 Mc IE	125.8	5.21	11	86	44.9	0.09	0.5	9.4
6/19/2011 10:00:02	42.5893	-111.4388	1.2 ML IE	160.9	8.96	6	155	33.9	0.06	1.7	3.7
6/19/2011 13:31:24	43.0690	-111.4652	1.6 Mc IE	124.8	6.78	9	95	45.0	0.02	0.5	3.5
6/19/2011 15:02:03	43.0793	-111.4943	0.8 ML IE	122.2	11.22	6	170	42.7	0.05	0.7	2.7
6/19/2011 15:19:17	43.0785	-111.4780	1.3 ML IE	123.4	6.50	11	115	43.8	0.12	0.4	5.9
6/19/2011 15:22:43	43.0672	-111.4708	1.1 ML IE	124.5	4.98	9	117	45.0	0.11	0.5	13.5
6/19/2011 15:23:03	43.0693	-111.4622	2.1 ML IE	125.0	13.99	15	116	44.9	0.07	0.4	1.4
6/19/2011 15:24:16	43.0825	-111.4528	1.5 ML IE	124.9	1.15	12	113	45.2	0.08	0.4	1.8
6/19/2011 15:29:29	43.0870	-111.5148	0.8 ML IE	120.3	0.12	5	171	40.8	0.14	1.0	4.4
6/19/2011 15:29:45	43.0692	-111.4593	1.6 ML IE	125.2	11.00	11	150	44.7	0.06	0.5	2.7
6/19/2011 15:30:29	43.0718	-111.4665	1.1 ML IE	124.6	12.19	6	168	45.0	0.07	0.8	3.0
6/19/2011 15:43:21	43.0883	-111.4525	1.4 ML IE	124.6	1.91	12	147	44.9	0.11	0.7	4.1
6/19/2011 15:51:09	43.0700	-111.4555	1.0 ML IE	125.4	6.85	7	115	44.6	0.10	0.7	10.9
6/19/2011 16:14:42	43.0865	-111.4497	2.0 Mc IE	124.9	13.27	15	112	45.2	0.05	0.5	1.1
6/19/2011 16:19:46	43.0807	-111.4515	1.4 ML IE	125.1	2.50	13	113	45.3	0.06	0.4	13.4
6/19/2011 16:23:29	43.0953	-111.4382	0.8 ML IE	125.2	0.03	6	160	45.5	0.08	0.5	2.1
6/19/2011 16:24:35	43.1000	-111.4427	0.8 ML IE	124.6	6.51	7	110	44.9	0.08	0.6	10.2
6/19/2011 16:24:58	43.0755	-111.4583	1.3 ML IE	124.9	0.48	11	115	45.2	0.09	0.5	1.7
6/19/2011 16:25:22	43.0748	-111.4670	1.3 ML IE	124.4	6.88	5	116	44.8	0.09	1.0	10.8
6/19/2011 19:10:40	43.0738	-111.4663	1.2 ML IE	124.5	10.79	10	116	44.9	0.06	0.5	3.5

ORIGIN TIME	LAT N	LONG W	MAG-TYPE	DIST	Z	NO	GAP	DMIN	RMS	ERH	ERZ
6/19/2011 19:11:18	43.0702	-111.4553	0.8 ML IE	125.4	4.98	6	166	44.6	0.15	0.7	13.4
6/19/2011 23:56:33	43.0657	-111.4755	1.2 ML IE	124.3	14.61	11	117	44.8	0.11	0.5	1.2
6/20/2011 9:21:44	44.4752	-114.1818	1.0 ML IE	144.8	3.49	6	220	64.5	0.06	1.7	6.7
6/21/2011 4:48:07	43.1615	-111.3950	1.0 ML IE	124.8	4.98	6	155	49.4	0.22	1.2	20.4
6/21/2011 4:49:23	43.0610	-111.4460	1.9 Mc IE	126.6	16.62	16	116	43.3	0.13	1.3	2.2
6/21/2011 5:26:32	43.0713	-111.4482	1.4 Mc IE	125.9	2.13	13	114	44.3	0.09	0.4	14.6
6/21/2011 16:57:46	43.0743	-111.5070	1.0 ML IE	121.6	4.99	6	269	47.8	0.22	1.9	21.8
6/23/2011 8:13:56	43.4950	-110.8613	0.9 Mc IE	156.1	9.85	7	119	7.2	0.02	1.5	2.6
6/23/2011 22:50:07	44.4062	-114.0688	2.0 Mc IE	133.0	7.84	7	210	90.3	0.05	1.3	2.2
6/25/2011 23:11:47	44.2652	-114.1065	1.4 ML IE	126.3	10.27	6	205	81.7	0.08	5.2	12.4
6/26/2011 7:45:13	43.5583	-111.1995	2.1 Mc IE	128.2	13.00	20	122	21.5	0.11	0.4	1.9
6/26/2011 9:11:14	44.6152	-112.1012	1.1 Mc IE	120.4	7.21	6	131	35.0	0.11	1.0	13.8
6/26/2011 11:43:15	44.7968	-111.9717	1.9 Mc MB	143.1	15.30	10	129	25.3	0.06	0.7	0.9
6/29/2011 11:44:01	44.0450	-114.4992	2.2 Mc MB	144.8	7.78	12	286	54.1	0.09	1.2	4.5
7/1/2011 5:08:00	42.6512	-111.4402	1.3 ML IE	155.8	8.71	8	102	30.6	0.14	0.8	3.4
7/2/2011 14:09:41	42.5540	-111.6323	1.3 Mc IE	153.7	7.67	7	106	49.5	0.07	0.5	5.0
7/3/2011 8:36:54	44.0073	-114.3715	1.4 Mc IE	133.8	9.96	7	242	49.5	0.04	1.9	11.9
7/5/2011 2:57:15	44.2852	-114.2898	1.2 ML IE	140.0	6.96	7	234	70.7	0.03	0.8	3.6
7/5/2011 5:02:55	43.0802	-111.4372	1.2 ML IE	126.1	3.76	9	112	6.2	0.06	0.7	1.7
7/5/2011 5:33:32	43.0665	-111.4552	1.8 Mc IE	125.7	6.13	17	86	7.0	0.08	0.4	0.9
7/5/2011 5:45:27	43.0788	-111.4498	1.0 ML IE	125.3	3.09	6	162	7.0	0.04	1.2	4.8
7/5/2011 6:03:01	43.0790	-111.4735	1.3 ML IE	123.7	0.64	9	125	8.9	0.04	0.5	0.7
7/5/2011 6:32:29	43.0928	-111.4662	0.8 Mc IE	123.4	2.19	5	250	8.9	0.06	2.3	12.3
7/5/2011 10:25:53	44.2993	-114.3272	1.7 Mc IE	143.4	7.02	10	263	73.6	0.05	1.5	13.2
7/6/2011 1:49:15	42.7473	-111.4598	1.0 ML IE	147.1	7.78	6	166	21.4	0.06	0.8	3.2
7/6/2011 4:56:07	43.0832	-111.4945	1.3 ML IE	122.0	3.56	10	152	10.6	0.08	0.8	4.2
7/7/2011 0:30:11	43.0583	-111.4855	1.0 ML IE	124.0	6.60	6	266	9.4	0.08	1.1	1.3
7/8/2011 6:20:42	44.6263	-111.8990	1.9 Mc IE	129.6	10.40	11	131	21.8	0.12	0.8	3.6
7/8/2011 13:22:56	44.6053	-112.2370	1.3 Mc IE	114.9	3.50	7	274	12.6	0.09	1.7	0.7
7/10/2011 13:53:43	42.6885	-111.3483	1.2 ML IE	158.2	7.04	11	143	22.0	0.10	0.8	4.2
7/11/2011 2:34:49	44.3113	-111.0052	1.1 ML IE	160.4	7.11	8	133	16.6	0.07	0.7	3.4
7/11/2011 2:49:08	44.7372	-113.1322	1.1 Mc MB	124.1	1.90	3	186	24.6	0.02	1.8	3.2
7/11/2011 3:11:49	44.3103	-111.0065	1.4 Mc WY	160.3	5.72	9	105	16.7	0.04	0.5	3.8
7/11/2011 3:32:46	44.7753	-112.8808	1.6 ML IE	125.4	7.70	6	163	6.3	0.03	4.7	7.9
7/11/2011 9:20:36	44.6137	-112.1033	0.9 ML IE	120.2	11.99	8	93	23.2	0.02	0.7	2.4
7/11/2011 9:25:25	42.8763	-111.2848	1.4 ML IE	149.0	9.22	11	173	13.1	0.11	1.5	3.5
7/11/2011 9:29:25	42.8653	-111.3008	1.2 ML IE	148.6	9.00	9	186	12.7	0.03	1.2	3.1
7/11/2011 12:17:48	44.6223	-112.1098	1.4 Mc MB	120.8	12.77	8	130	22.8	0.02	0.9	2.7
7/12/2011 16:56:07	43.2498	-111.3252	1.3 Mc IE	126.1	12.89	11	190	22.1	0.09	0.9	1.4
7/12/2011 17:04:13	43.2122	-111.2750	0.5 ML IE	131.4	2.49	5	196	19.3	0.22	2.7	21.9
7/13/2011 5:03:30	44.6265	-112.1065	1.8 Mc MB	121.4	15.56	14	96	23.1	0.03	0.4	0.7
7/14/2011 1:18:14	44.4122	-112.8667	0.6 Mc IE	85.1	0.11	4	155	11.0	0.05	0.6	1.6
7/14/2011 12:18:26	44.6260	-112.1092	2.3 ML IE	121.2	12.72	18	139	22.9	0.01	0.9	3.3
7/15/2011 9:50:53	44.3953	-113.0097	0.5 ML IE	84.9	13.44	9	125	9.1	0.06	0.5	1.2
7/16/2011 8:34:29	42.9263	-111.5695	1.8 ML IE	127.2	0.92	17	151	12.1	0.14	0.5	1.9
7/17/2011 13:09:52	43.2788	-111.0432	0.8 ML IE	146.7	6.82	9	168	18.1	0.06	0.9	4.3
7/18/2011 13:00:32	44.3788	-112.6017	2.2 Mc IE	82.4	11.10	24	82	23.1	0.11	0.3	1.4
7/19/2011 6:02:49	44.5817	-112.2042	1.8 Mc MB	113.5	9.59	10	109	15.2	0.03	1.3	1.9
7/19/2011 6:28:37	43.5707	-111.1987	0.8 ML IE	128.1	4.15	7	232	21.9	0.10	1.3	11.6

ORIGIN TIME	LAT N	LONG W	MAG-TYPE	DIST	Z	NO	GAP	DMIN	RMS	ERH	ERZ
7/19/2011 14:12:11	44.4512	-114.0037	0.8 ML IE	132.3	2.15	6	226	50.2	0.11	1.7	6.8
7/21/2011 1:28:54	44.9668	-112.8408	1.9 Mc IE	146.6	6.94	8	171	15.5	0.05	1.3	12.6
7/21/2011 3:14:37	44.3588	-114.0012	1.1 Mc IE	125.5	7.36	6	255	47.8	0.04	2.5	12.9
7/21/2011 7:26:47	44.3712	-112.6013	1.6 Mc MB	81.5	4.66	19	84	22.9	0.05	0.3	1.0
7/21/2011 7:28:41	44.3737	-112.6093	1.3 Mc MB	81.7	5.78	11	84	23.6	0.05	0.5	1.2
7/22/2011 5:39:46	43.9487	-110.8458	0.5 ML IE	159.3	7.81	7	152	9.4	0.06	1.0	2.0
7/22/2011 11:50:20	43.5197	-110.8900	0.7 ML IE	153.5	8.56	10	106	5.9	0.07	0.6	1.8
7/23/2011 3:55:05	44.2947	-111.0085	1.1 Mc WY	159.4	4.63	5	228	16.5	0.04	2.5	12.4
7/23/2011 22:49:58	44.3145	-112.7738	0.6 Mc IE	73.9	7.30	5	167	13.5	0.02	1.3	11.1
7/24/2011 20:22:09	44.6067	-114.2552	1.4 Mc IE	158.7	6.41	7	250	75.2	0.10	4.8	12.3
7/25/2011 1:44:17	44.7892	-112.3525	1.0 Mc MB	131.3	14.94	8	112	22.0	0.07	0.9	1.1
7/25/2011 7:51:56	42.9252	-111.5740	1.0 ML IE	127.0	0.06	8	151	12.5	0.20	1.1	4.5
7/25/2011 9:39:56	43.2345	-111.3275	1.1 Mc IE	126.5	0.05	8	176	20.4	0.15	1.3	2.6
7/25/2011 10:07:19	43.7213	-111.1342	1.1 Mc IE	133.1	2.50	9	248	25.0	0.12	1.5	14.0
7/25/2011 12:46:10	42.8970	-111.6660	0.9 Mc IE	123.4	2.50	5	304	20.5	0.10	3.3	14.4
7/25/2011 12:49:37	44.2453	-114.1078	1.3 Mc IE	125.2	6.95	6	244	56.6	0.04	1.3	5.1
7/25/2011 19:02:18	44.7398	-112.6708	1.4 Mc MB	121.6	14.64	7	122	17.1	0.07	0.6	0.9
7/26/2011 2:19:36	44.7557	-111.7512	1.5 Mc IE	148.1	9.92	6	156	7.4	0.03	2.5	1.8
7/26/2011 3:05:42	43.4380	-110.9575	0.6 ML IE	149.3	9.29	8	227	5.8	0.06	0.8	1.3
7/26/2011 5:24:55	43.5260	-110.9422	2.2 Mc IE	149.2	10.15	20	88	4.0	0.04	0.4	0.6
7/26/2011 5:27:53	43.5348	-110.9380	0.2 ML IE	149.5	8.73	6	240	5.1	0.07	1.1	1.6
7/26/2011 5:30:10	43.5303	-110.9400	1.2 ML IE	149.4	9.31	9	154	4.5	0.05	0.6	1.1
7/26/2011 5:33:06	43.5298	-110.9700	0.4 ML IE	147.0	12.35	6	203	4.7	0.02	1.5	1.5
7/26/2011 5:34:01	43.5368	-110.9338	0.4 ML IE	149.8	7.80	5	165	5.4	0.06	3.9	3.4
7/26/2011 5:34:43	43.5263	-110.9400	1.1 ML IE	149.4	9.18	12	146	4.1	0.04	0.5	0.9
7/26/2011 5:55:29	43.5388	-110.9522	0.5 Mc IE	148.3	10.30	7	183	5.4	0.02	0.6	1.1
7/26/2011 14:40:27	44.6290	-112.7365	1.3 Mc MB	109.0	7.33	8	102	23.8	0.07	0.5	12.0
7/27/2011 10:43:11	44.6365	-112.0893	1.1 Mc MB	123.0	7.04	9	98	24.7	0.07	1.0	11.2
7/28/2011 3:51:34	44.6193	-112.1158	1.0 Mc MB	120.3	14.15	10	138	22.3	0.04	0.6	1.2
7/28/2011 21:57:15	43.6502	-111.1780	1.0 Mc IE	129.4	7.22	8	227	25.6	0.09	1.0	7.1
7/29/2011 0:28:56	44.8470	-111.9933	1.4 Mc MB	147.3	7.93	5	135	29.0	0.05	1.3	10.2
7/29/2011 14:10:14	44.6443	-111.9238	1.3 Mc IE	130.2	2.93	7	98	22.6	0.13	0.8	2.4
7/29/2011 15:53:28	44.7950	-111.6462	1.7 Mc MB	156.4	5.89	9	143	7.4	0.03	0.6	1.6
7/29/2011 20:33:49	42.9943	-111.5378	0.5 Mc IE	124.6	10.67	5	299	11.4	0.01	2.3	1.8
7/29/2011 20:39:42	42.9977	-111.5220	0.7 Mc IE	125.4	7.15	6	295	10.5	0.04	1.6	1.7
7/30/2011 4:40:30	43.5297	-110.9997	0.8 Mc IE	144.6	4.73	9	219	5.9	0.04	1.0	1.3
7/31/2011 8:31:55	44.5838	-112.7702	1.0 Mc MB	103.9	15.59	8	108	27.8	0.12	0.6	2.6
8/1/2011 7:42:20	44.0090	-113.9010	NM	98.4	11.36	6	189	37.1	0.00	0.9	4.9
8/1/2011 7:42:21	44.0088	-113.9042	1.4 Mc IE	98.6	7.10	9	189	37.4	0.10	0.7	15.1
8/1/2011 19:00:25	43.4903	-110.8628	0.9 ML IE	156.1	8.09	10	120	7.1	0.11	0.6	2.1
8/2/2011 21:04:18	42.6573	-111.4643	2.0 ML IE	153.9	0.82	14	123	31.4	0.09	0.8	2.3
8/2/2011 21:04:57	42.7727	-111.5228	NM	141.4	11.95	6	290	20.1	0.01	2.7	4.1
8/2/2011 21:15:49	42.9152	-111.3173	1.0 ML IE	144.3	14.06	4	154	8.9	0.02	1.3	2.4
8/3/2011 4:16:38	44.4147	-114.4707	1.0 ML IE	159.8	5.19	6	253	85.7	0.05	1.7	3.8
8/4/2011 10:28:27	44.4095	-114.4892	2.2 Mc IE	160.7	5.42	10	239	87.1	0.06	0.9	2.8
8/4/2011 12:47:33	44.6620	-112.1352	2.2 Mc IE	123.9	14.37	18	102	21.9	0.12	0.5	1.1
8/4/2011 12:51:28	43.3640	-110.9893	0.8 ML IE	148.4	5.00	5	140	11.1	0.19	1.4	8.9
8/4/2011 13:06:02	43.3588	-111.0043	1.0 ML IE	147.4	8.99	7	134	12.4	0.06	0.7	2.9
8/4/2011 23:12:09	43.3580	-110.9962	1.2 Mc IE	148.0	11.89	5	277	11.7	0.01	3.8	2.1

ORIGIN TIME	LAT N	LONG W	MAG-TYPE	DIST	Z	NO	GAP	DMIN	RMS	ERH	ERZ
8/4/2011 23:48:36	43.3472	-111.0450	1.4 ML IE	144.5	4.98	11	182	15.7	0.10	0.7	3.8
8/5/2011 19:56:32	43.5215	-111.2142	2.0 ML IE	127.4	11.53	22	91	21.6	0.08	0.3	1.0
8/5/2011 19:57:25	43.5257	-111.2193	3.0 ML IE	127.0	11.21	28	80	22.1	0.11	0.3	1.5
8/5/2011 20:01:02	43.5347	-111.1983	1.0 ML IE	128.6	14.73	6	263	20.6	0.05	2.3	2.8
8/5/2011 20:07:46	43.5167	-111.2145	0.9 ML IE	127.5	11.76	8	241	21.5	0.04	1.5	2.8
8/5/2011 22:08:01	43.6062	-110.8982	0.2 ML IE	152.1	14.06	5	177	11.0	0.02	4.1	4.8
8/6/2011 0:23:50	43.5357	-111.1927	0.8 Mc IE	129.0	13.86	8	262	17.6	0.03	2.0	1.9
8/6/2011 6:21:12	43.5147	-111.2262	0.5 ML IE	126.6	10.31	9	140	21.2	0.07	0.7	3.4
8/6/2011 14:01:58	44.3895	-114.4410	1.2 ML IE	156.3	2.39	6	250	83.1	0.04	2.3	3.9
8/6/2011 19:58:09	42.9310	-111.1532	2.7 ML IE	154.5	14.17	17	140	18.9	0.10	0.4	0.8
8/6/2011 19:59:16	42.9420	-111.1447	1.6 ML IE	154.5	4.99	7	139	20.0	0.04	0.7	9.3
8/6/2011 21:11:25	43.2997	-110.8805	1.0 ML IE	158.7	6.66	9	311	7.3	0.05	1.4	1.2
8/6/2011 22:48:22	42.9382	-111.1518	1.1 ML IE	154.2	8.26	9	137	19.6	0.06	0.7	3.8
8/7/2011 0:43:01	43.6358	-110.8565	0.6 Mc IE	155.4	16.06	5	267	13.8	0.06	9.2	8.3
8/7/2011 2:03:47	43.3810	-110.9373	0.7 Mc IE	152.1	14.89	5	240	7.2	0.01	6.5	2.8
8/7/2011 4:35:18	43.5145	-111.2273	0.6 Mc IE	126.5	3.55	8	140	21.2	0.07	0.9	10.5
8/7/2011 4:49:28	43.8730	-113.6702	0.4 ML IE	75.6	6.37	5	159	46.4	0.01	1.2	4.3
8/7/2011 18:34:39	42.9852	-111.4928	1.0 ML IE	128.1	12.35	6	184	7.8	0.03	1.4	1.9
8/7/2011 19:38:31	43.6412	-110.8745	0.2 ML IE	153.9	2.48	6	171	12.3	0.04	1.2	12.9
8/8/2011 5:22:29	43.2600	-111.2740	1.6 Mc IE	129.6	9.77	12	104	24.2	0.09	0.7	3.6
8/8/2011 5:40:30	44.6455	-112.1188	0.6 Mc IE	122.8	5.14	5	181	22.6	0.07	2.7	4.1
8/8/2011 9:04:02	43.3922	-110.8495	0.5 Mc IE	158.9	8.38	7	145	3.3	0.02	1.2	2.2
8/8/2011 9:18:28	45.0138	-113.0415	0.8 ML IE	153.1	1.32	5	200	52.2	0.11	3.3	11.6
8/8/2011 16:13:02	44.4035	-114.4067	2.0 Mc IE	154.8	0.02	8	233	80.5	0.02	1.8	3.3
8/8/2011 17:06:33	44.4350	-114.4408	1.0 ML IE	158.9	7.21	5	281	83.7	0.06	1.5	13.5
8/9/2011 5:16:41	44.3988	-113.8562	0.5 ML IE	119.7	7.73	6	212	37.3	0.05	1.8	12.5
8/9/2011 13:45:10	43.5225	-111.1970	1.5 Mc IE	128.8	13.26	12	184	18.8	0.08	1.2	0.9
8/10/2011 11:10:25	43.5237	-111.2207	1.4 Mc IE	126.9	13.42	15	140	20.2	0.09	0.5	0.8
8/10/2011 14:06:18	43.7133	-111.0442	0.3 ML IE	140.3	3.34	6	186	22.1	0.07	1.6	11.0
8/11/2011 10:06:40	44.3975	-114.4602	NM	158.0	3.34	5	236	84.7	0.06	1.5	3.8
8/12/2011 0:43:55	44.6080	-112.0778	0.9 Mc IE	120.6	5.00	5	146	25.2	0.14	1.5	16.9
8/12/2011 2:50:04	43.2637	-111.2763	0.8 ML IE	129.2	4.99	6	186	24.6	0.05	2.1	11.6
8/12/2011 6:45:19	43.3198	-111.0238	0.8 Mc IE	146.9	13.73	6	289	14.7	0.02	3.7	2.3
8/12/2011 9:27:58	42.7768	-111.4597	1.1 Mc IE	144.9	5.96	7	277	18.2	0.05	2.6	4.9
8/12/2011 10:24:07	44.5522	-112.6850	1.7 Mc IE	100.7	10.53	7	92	23.5	0.04	0.6	4.2
8/12/2011 11:36:46	43.2632	-111.2857	0.7 Mc IE	128.5	14.79	6	189	24.3	0.01	2.1	5.6
8/12/2011 14:23:33	44.0667	-114.3100	1.4 Mc IE	131.2	0.08	7	241	56.5	0.06	1.8	2.6
8/12/2011 18:18:27	44.9615	-111.9665	2.2 Mc MB	159.8	3.93	20	153	35.0	0.12	0.6	13.7
8/12/2011 22:20:31	44.7038	-112.0500	1.5 Mc IE	131.1	13.88	11	124	29.9	0.02	0.7	1.5
8/13/2011 5:46:55	44.3992	-114.4640	0.9 ML IE	158.4	1.20	8	236	85.0	0.06	1.8	2.8
8/14/2011 3:08:37	43.4822	-110.8030	0.3 Mc IE	161.0	13.36	6	149	12.0	0.03	1.0	2.5
8/14/2011 17:29:49	44.4560	-113.0462	0.9 ML IE	92.1	5.32	8	138	16.4	0.03	1.3	2.4
8/14/2011 21:00:17	43.4110	-110.9303	0.7 ML IE	152.0	8.29	9	213	8.4	0.05	1.0	1.3
8/15/2011 0:32:38	44.2890	-111.0035	0.4 ML IE	159.5	6.07	6	260	18.0	0.07	1.9	5.6
8/15/2011 6:52:09	43.2170	-110.9210	0.8 Mc IE	158.2	2.59	6	167	17.1	0.03	1.8	11.0
8/15/2011 10:59:45	43.3233	-110.8565	0.6 ML IE	160.0	7.86	10	306	4.3	0.04	2.2	0.9
8/15/2011 12:20:40	43.5232	-111.2252	0.3 Mc IE	126.5	5.41	5	291	20.5	0.03	2.3	12.3
8/15/2011 22:20:28	44.3628	-114.3865	0.0 Mc IE	151.0	0.04	5	229	78.5	0.26	3.1	4.6
8/16/2011 0:11:09	43.6927	-111.1050	1.4 ML IE	135.3	4.90	12	157	8.7	0.09	0.7	2.2

ORIGIN TIME	LAT N	LONG W	MAG-TYPE	DIST	Z	NO	GAP	DMIN	RMS	ERH	ERZ
8/16/2011 5:16:37	43.6920	-111.1463	1.4 Mc IE	132.0	3.39	10	211	11.3	0.08	1.7	7.3
8/16/2011 11:26:37	44.3835	-114.4297	1.2 ML IE	155.2	0.02	6	234	82.1	0.06	3.0	3.9
8/16/2011 15:21:12	43.3532	-110.8445	0.9 ML IE	160.1	13.65	8	297	1.2	0.11	1.7	2.1
8/16/2011 19:33:29	43.0005	-111.5568	1.4 ML IE	122.9	7.32	4	304	13.0	0.01	3.6	2.5
8/16/2011 22:19:10	44.2440	-113.9898	1.1 Mc IE	117.2	16.57	5	236	47.3	0.05	4.5	8.1
8/17/2011 7:11:27	43.4862	-110.8095	0.4 Mc IE	160.4	9.56	9	145	11.4	0.11	0.5	2.4
8/18/2011 10:16:23	44.7158	-111.9500	1.2 Mc IE	136.0	6.21	12	120	22.6	0.04	0.5	11.5
8/19/2011 11:15:44	43.5145	-111.2217	1.3 Mc IE	126.9	11.06	14	129	20.9	0.05	0.7	1.8
8/20/2011 2:32:24	44.2353	-113.2047	1.1 Mc IE	73.4	12.93	12	87	18.1	0.02	0.6	3.8
8/20/2011 18:28:27	42.8350	-111.5197	0.9 ML IE	136.9	2.20	8	281	14.0	0.24	2.6	21.5
8/21/2011 3:12:40	43.5267	-111.1780	0.4 Mc IE	130.3	12.88	6	282	17.4	0.02	2.5	3.4
8/21/2011 11:24:02	44.9415	-112.7778	1.6 Mc MB	143.7	3.83	13	160	13.8	0.04	1.6	2.5
8/22/2011 1:27:13	43.8137	-111.0240	0.8 Mc IE	142.8	2.08	8	215	11.5	0.09	1.3	14.7
8/22/2011 8:14:51	43.6955	-111.1442	0.3 Mc IE	132.2	5.76	6	251	11.4	0.02	2.6	4.9
8/22/2011 8:22:07	43.8162	-111.0280	0.2 ML IE	142.5	2.33	8	165	11.5	0.07	1.4	11.5
8/22/2011 8:39:44	43.8180	-111.0568	0.7 Mc IE	140.3	2.24	9	231	12.9	0.06	1.2	12.2
8/22/2011 18:17:37	44.0148	-111.1775	1.2 ML IE	135.3	11.93	11	196	19.5	0.10	0.7	1.5
8/23/2011 10:53:59	43.3627	-111.0693	0.7 Mc IE	142.2	11.47	9	276	17.1	0.05	0.9	2.3
8/23/2011 11:12:49	44.8330	-111.7205	1.9 Mc MB	156.6	3.29	20	146	12.3	0.05	0.4	0.7
8/23/2011 12:18:56	44.8353	-111.7222	2.1 Mc IE	156.7	3.18	17	147	12.5	0.03	0.5	0.7
8/23/2011 13:25:06	44.8282	-111.7272	1.7 Mc IE	155.8	3.84	13	145	12.0	0.06	0.4	0.6
8/23/2011 14:23:45	44.5743	-112.2777	1.4 Mc IE	110.5	9.16	15	117	9.5	0.03	0.5	0.9
8/23/2011 14:25:29	43.3915	-111.1458	0.4 ML IE	135.4	6.06	8	279	19.2	0.02	2.7	9.4
8/23/2011 14:57:01	43.8098	-113.9845	2.7 ML US	98.4	6.74	25	167	43.7	0.11	0.4	2.6
8/24/2011 0:40:27	43.1963	-111.4328	0.4 Mc IE	120.4	14.91	5	231	16.7	0.06	1.2	2.6
8/24/2011 4:38:02	43.1965	-110.9683	0.6 ML IE	155.3	11.20	12	161	20.7	0.07	1.0	2.4
8/24/2011 10:00:50	43.4135	-110.9417	0.8 Mc IE	151.1	8.89	11	217	8.5	0.10	1.1	1.2
8/24/2011 12:59:35	44.5915	-114.2380	2.4 Mc IE	156.6	6.55	19	122	73.3	0.13	0.6	2.5
8/24/2011 14:24:31	44.6812	-112.5052	1.4 Mc IE	116.9	12.81	12	90	13.1	0.04	0.6	1.6
8/24/2011 15:51:57	44.6857	-111.8690	1.4 Mc IE	136.4	3.37	8	110	16.8	0.03	1.7	2.9
8/25/2011 3:37:22	42.9323	-111.1618	0.3 ML IE	153.8	16.32	6	145	19.2	0.03	3.5	3.7
8/25/2011 14:17:13	44.8430	-111.7165	1.4 Mc MB	157.7	2.64	6	148	13.2	0.01	1.2	1.9
8/25/2011 23:39:53	44.5180	-114.2728	1.2 Mc IE	153.5	11.71	6	172	72.8	0.07	1.3	3.0
8/25/2011 23:45:35	44.5165	-114.3090	1.2 ML IE	155.6	6.85	8	171	75.5	0.06	0.7	3.1
8/26/2011 6:22:01	42.9368	-111.1532	1.2 Mc IE	154.2	12.86	8	137	19.5	0.09	0.8	3.6
8/26/2011 13:32:51	43.5608	-110.9600	0.8 Mc IE	147.4	9.73	8	156	7.9	0.04	2.4	1.9
8/27/2011 2:23:01	43.7452	-110.9025	1.0 ML IE	151.9	2.23	10	130	15.6	0.11	0.6	14.6
8/27/2011 19:59:46	43.3280	-111.2698	1.4 Mc IE	127.5	9.45	14	186	31.5	0.06	0.7	1.8
8/28/2011 1:30:47	43.2275	-111.3702	0.8 Mc IE	123.6	3.12	9	203	19.3	0.05	1.1	12.2
8/28/2011 1:36:31	43.2215	-111.3648	0.4 Mc IE	124.3	12.46	8	202	18.7	0.08	1.1	2.0
8/28/2011 2:01:14	43.2228	-111.3638	1.1 Mc IE	124.3	2.50	12	185	18.8	0.06	0.9	13.3
8/28/2011 2:46:39	43.2278	-111.3822	0.6 Mc IE	122.7	9.98	6	322	45.5	0.05	2.4	12.9
8/29/2011 9:45:16	43.1788	-110.9388	0.9 Mc IE	158.2	2.50	9	178	21.6	0.07	1.0	12.6
8/29/2011 12:15:26	44.6338	-112.5422	0.8 Mc IE	111.1	2.14	4	158	12.6	0.06	6.4	11.6
8/29/2011 12:45:07	43.3560	-111.1902	0.9 Mc IE	132.8	3.16	9	290	24.5	0.08	1.2	13.6
8/29/2011 14:00:40	43.4583	-111.0532	0.3 Mc IE	141.3	3.72	7	243	9.0	0.03	3.1	9.2
8/29/2011 18:55:39	43.1722	-110.9308	2.0 ML IE	159.1	12.87	18	170	22.1	0.09	0.9	1.2
8/30/2011 9:43:33	44.3188	-112.6428	1.3 Mc IE	75.3	4.41	13	94	23.8	0.08	0.4	1.1
8/31/2011 6:23:01	44.4615	-114.0578	2.6 Mc IE	136.3	6.54	14	130	54.6	0.10	0.9	3.6

ORIGIN TIME	LAT N	LONG W	MAG-TYPE	DIST	Z	NO	GAP	DMIN	RMS	ERH	ERZ
8/31/2011 17:47:32	43.4570	-111.3115	1.7 ML IE	120.8	15.87	15	286	29.4	0.05	1.6	0.5
9/1/2011 1:08:34	43.2185	-110.8867	0.2 ML IE	160.8	2.53	5	320	16.2	0.04	3.3	11.0
9/1/2011 10:32:07	42.7702	-111.2108	0.9 ML IE	160.9	7.55	5	225	9.1	0.02	2.3	3.6
9/1/2011 17:24:37	44.6175	-112.1042	1.6 Mc IE	120.6	9.13	15	94	23.2	0.07	0.5	3.9
9/2/2011 0:49:17	43.6938	-111.1348	1.1 Mc IE	133.0	6.16	8	246	10.7	0.03	1.3	1.9
9/2/2011 9:50:01	43.2842	-111.2308	0.0 ML IE	132.0	5.02	5	308	31.9	0.13	2.2	16.5
9/2/2011 10:03:18	43.2777	-111.2228	0.4 ML IE	132.8	15.19	7	306	31.5	0.08	1.3	0.7
9/2/2011 10:28:11	43.6405	-111.1655	1.1 Mc IE	130.4	11.15	11	219	11.2	0.05	0.8	1.0
9/2/2011 10:34:12	43.6852	-111.0688	0.1 Mc IE	138.2	16.79	5	351	6.2	0.09	11.8	1.9
9/2/2011 10:36:44	43.6318	-111.1810	2.2 Mc IE	129.2	11.05	19	100	12.5	0.12	0.5	1.2
9/2/2011 10:38:13	43.6720	-111.1628	0.3 Mc IE	130.7	11.18	7	252	11.6	0.04	3.9	2.2
9/2/2011 15:18:35	43.0787	-111.3762	0.2 ML IE	130.5	8.09	3	214	2.8	0.14	16.8	3.4
9/2/2011 18:33:49	43.2790	-111.2412	1.1 ML IE	131.4	9.12	10	180	27.2	0.06	1.0	5.0
9/2/2011 19:01:43	43.2797	-111.2533	1.4 Mc IE	130.4	12.92	11	183	26.9	0.06	0.9	3.1
9/2/2011 19:03:48	43.2735	-111.2225	0.8 Mc IE	133.0	16.11	8	174	27.3	0.13	1.1	1.5
9/2/2011 19:06:17	43.2947	-111.2105	0.7 Mc IE	133.2	12.31	5	210	30.0	0.05	2.2	9.6
9/3/2011 3:39:39	43.1842	-110.9290	1.7 Mc IE	158.8	8.19	10	221	20.8	0.04	1.3	3.2
9/3/2011 8:19:41	44.6842	-112.5265	1.5 Mc MB	116.9	16.67	12	89	14.5	0.07	0.6	0.6
9/3/2011 9:41:23	43.2337	-111.0028	2.0 Mc IE	151.3	10.94	17	187	18.8	0.05	0.8	1.5
9/3/2011 21:39:56	44.6788	-112.5430	0.9 Mc IE	116.1	7.30	4	183	15.1	0.11	2.2	9.2
9/4/2011 4:55:59	43.2820	-111.2565	1.1 Mc IE	130.1	5.95	10	179	27.0	0.07	0.8	7.7
9/4/2011 11:01:15	44.4505	-114.0702	2.5 Mc IE	136.2	0.04	10	112	55.2	0.35	2.0	4.1
9/5/2011 1:10:12	42.9213	-111.0993	0.9 ML IE	158.8	11.70	6	282	26.5	0.00	1.6	2.4
9/5/2011 14:04:17	44.5210	-112.4733	1.3 Mc IE	100.0	0.86	6	111	10.2	0.05	0.9	3.5
9/7/2011 10:15:14	43.1847	-111.2325	1.7 Mc IE	135.8	0.04	15	153	18.4	0.12	1.1	1.5
9/7/2011 10:24:35	44.2153	-114.1237	1.3 Mc IE	124.6	4.01	7	217	58.3	0.05	1.0	3.5
9/8/2011 0:11:38	43.3605	-110.8948	0.5 Mc IE	156.0	7.50	5	257	3.5	0.13	3.4	2.4
9/8/2011 1:43:36	44.7793	-111.5477	2.2 Mc MB	159.8	13.72	17	143	10.8	0.06	0.8	0.4
9/9/2011 1:13:37	43.1975	-111.2707	1.0 Mc IE	132.4	2.09	7	171	17.9	0.10	1.9	15.0
9/9/2011 15:17:51	43.7167	-111.0448	0.8 Mc IE	140.3	3.60	7	219	21.8	0.03	1.0	10.6
9/10/2011 5:33:00	43.2190	-111.6267	1.0 Mc IE	105.1	5.00	4	197	27.8	0.52	4.4	44.3
9/10/2011 11:40:11	42.9402	-111.4678	0.5 ML IE	132.7	8.81	5	172	3.8	0.02	2.5	2.4
9/10/2011 22:46:52	44.3672	-113.2165	1.3 Mc IE	87.0	12.90	15	141	16.3	0.07	0.5	1.1
9/11/2011 9:31:02	42.7272	-111.7277	1.2 Mc IE	133.8	9.79	8	138	34.3	0.05	0.5	2.1
9/12/2011 2:54:10	44.7302	-112.0173	1.1 Mc MB	134.9	5.00	4	169	27.9	0.11	1.6	6.6
9/12/2011 7:55:53	44.4073	-114.4778	1.6 Mc IE	159.8	0.36	5	253	86.2	0.03	4.2	4.0
9/12/2011 14:01:08	43.4082	-111.0210	0.9 Mc IE	144.9	9.45	9	150	10.7	0.07	0.8	1.5
9/12/2011 22:46:35	43.2750	-110.9257	1.9 Mc IE	155.9	6.13	16	194	11.4	0.07	1.0	2.4
9/13/2011 2:30:04	44.6760	-111.8782	1.4 ML IE	135.1	6.21	5	147	17.9	0.01	1.7	12.3
9/13/2011 14:20:11	42.9443	-111.1385	1.3 ML IE	154.8	0.04	9	243	22.5	0.16	1.6	4.6
9/15/2011 7:50:29	44.6232	-112.0843	1.9 Mc IE	121.8	12.38	13	95	24.8	0.07	0.5	1.9
9/15/2011 12:24:30	42.7228	-111.4540	1.4 Mc IE	149.3	6.66	10	133	24.1	0.07	1.2	3.2
9/15/2011 16:41:34	44.7780	-111.5683	1.7 Mc IE	158.6	11.74	7	240	9.4	0.03	2.2	0.7
9/16/2011 15:48:12	44.1192	-113.9312	1.3 Mc IE	106.0	5.27	8	210	43.9	0.05	0.9	3.0
9/16/2011 16:12:10	44.5325	-114.2772	2.0 Mc IE	154.7	9.90	9	119	94.1	0.01	0.6	1.7
9/17/2011 1:38:13	44.1162	-113.9320	2.0 Mc IE	105.9	6.87	13	195	43.8	0.23	0.9	2.7
9/17/2011 3:15:56	44.1215	-113.9365	2.2 ML IE	106.5	7.01	23	195	44.4	0.10	0.6	6.0
9/17/2011 3:47:07	43.5492	-111.0160	1.1 Mc IE	143.0	7.42	6	222	8.4	0.04	1.1	2.1
9/17/2011 5:49:16	44.1107	-113.9282	1.9 Mc IE	105.3	5.11	12	208	43.2	0.05	0.6	1.7

ORIGIN TIME	LAT N	LONG W	MAG-TYPE	DIST	Z	NO	GAP	DMIN	RMS	ERH	ERZ
9/17/2011 12:38:54	42.7777	-111.3553	1.0 Mc IE	151.2	4.54	5	312	18.6	0.07	3.6	11.8
9/17/2011 19:27:21	42.8647	-111.3055	2.2 ML IE	148.4	5.89	17	237	12.5	0.04	1.3	3.1
9/18/2011 8:23:41	43.7720	-111.0900	0.8 Mc IE	137.1	10.68	8	194	18.4	0.06	0.9	3.0
9/19/2011 4:34:00	43.5007	-111.0595	0.7 Mc IE	140.1	6.93	8	240	8.9	0.08	1.1	1.8
9/19/2011 10:19:09	43.3373	-110.9342	1.6 Mc IE	153.5	9.07	10	162	7.2	0.08	0.8	1.2
9/20/2011 4:22:34	44.6248	-112.4628	1.0 Mc MB	111.4	4.01	3	175	6.5	0.04	8.6	9.5
9/20/2011 19:10:06	44.7317	-112.0180	1.1 ML IE	135.0	10.08	3	170	27.9	0.02	1.2	9.6
9/21/2011 0:40:56	43.7458	-110.9143	1.0 Mc IE	150.9	10.08	9	126	16.9	0.09	0.7	2.7
9/21/2011 2:39:24	43.7443	-110.9130	2.3 Mc IE	151.0	5.11	24	131	17.1	0.07	0.5	3.3
9/21/2011 2:42:53	43.7435	-110.9102	1.1 Mc IE	151.3	3.11	10	150	17.2	0.04	0.7	10.8
9/21/2011 13:06:08	44.7133	-112.0063	0.9 Mc IE	133.6	12.30	5	163	27.1	0.00	1.5	5.8
9/21/2011 17:34:37	42.6813	-111.6233	1.9 Mc IE	143.2	2.49	12	119	32.9	0.23	1.2	18.1
9/21/2011 18:24:09	43.1167	-110.9767	1.1 ML IE	157.9	12.02	9	230	29.1	0.01	2.0	1.3
9/21/2011 21:46:40	43.4547	-111.2683	1.2 ML IE	124.3	8.36	9	258	26.0	0.09	1.0	5.6
9/21/2011 22:00:40	43.7453	-110.9122	1.4 ML IE	151.1	6.36	7	150	17.0	0.03	0.8	3.3
9/21/2011 23:14:49	44.5852	-114.0868	1.6 Mc IE	147.3	6.21	9	143	62.2	0.04	0.7	2.6
9/21/2011 23:54:37	43.8077	-110.9973	1.4 ML IE	144.9	4.76	8	168	11.0	0.05	0.7	3.8
9/22/2011 1:59:59	43.8228	-111.0267	0.7 Mc IE	142.7	8.75	6	230	10.8	0.07	2.0	3.3
9/22/2011 2:11:30	43.4775	-111.2267	0.8 ML IE	127.1	12.87	8	140	22.4	0.05	0.7	2.3
9/22/2011 3:04:57	43.4815	-111.2327	2.4 Mc IE	126.6	9.54	21	130	22.8	0.06	0.3	1.9
9/22/2011 3:14:46	43.3862	-111.1392	1.1 ML IE	136.0	5.99	10	112	19.1	0.05	0.6	3.4
9/22/2011 11:34:29	42.9360	-111.5050	0.5 ML IE	130.6	2.87	5	177	6.8	0.03	2.2	12.2
9/22/2011 18:24:13	44.2348	-114.1155	1.7 Mc IE	125.2	3.22	15	218	57.3	0.04	0.9	2.3
9/23/2011 0:40:47	43.7467	-110.8973	0.7 Mc IE	152.3	5.69	7	147	17.0	0.08	0.8	4.9
9/23/2011 2:13:46	42.7632	-111.6220	0.9 Mc IE	136.5	7.99	6	148	38.2	0.04	0.9	4.3
9/23/2011 13:05:21	43.0998	-111.3102	0.8 Mc IE	134.1	2.00	5	169	7.1	0.07	4.1	13.7
9/24/2011 9:46:08	44.6053	-112.1915	1.1 Mc IE	116.3	12.42	9	219	16.2	0.09	1.0	1.0
9/24/2011 21:20:51	43.1597	-110.9322	0.9 ML IE	159.5	8.13	5	225	23.4	0.04	2.3	5.1
9/24/2011 21:41:19	43.1865	-110.9100	1.9 Mc IE	160.1	10.57	8	210	20.1	0.04	1.8	2.5
9/25/2011 15:59:53	44.6867	-111.8442	1.4 Mc IE	137.6	14.69	10	149	14.9	0.22	1.1	1.5
9/25/2011 16:22:44	43.5310	-111.2138	1.6 Mc IE	127.4	11.86	16	101	21.8	0.05	0.5	1.6
9/25/2011 23:25:19	43.1930	-111.4005	0.7 ML IE	122.9	2.49	6	214	15.7	0.07	1.6	13.5
9/25/2011 23:27:17	43.2035	-111.4220	1.6 Mc IE	120.8	4.70	10	204	17.2	0.03	1.2	9.0
9/25/2011 23:29:29	44.1272	-114.0225	0.9 ML IE	112.8	9.09	9	202	50.8	0.12	0.9	6.6
9/26/2011 9:47:06	43.8028	-111.0002	0.9 ML IE	144.6	2.72	8	169	11.6	0.04	0.8	9.8
9/28/2011 5:39:03	43.3837	-110.9987	0.4 ML IE	147.2	0.03	6	144	12.1	0.11	0.6	1.3
9/28/2011 19:08:47	42.9158	-111.1743	1.4 ML IE	154.0	8.41	9	238	20.3	0.07	1.4	3.0
9/30/2011 6:10:28	43.2057	-111.2858	0.1 ML IE	130.9	4.98	5	180	18.3	0.09	1.4	11.1
9/30/2011 12:54:28	43.7623	-111.0553	0.4 ML IE	139.7	2.47	8	221	14.0	0.07	1.2	11.6
10/2/2011 12:49:03	44.6317	-112.1145	1.3 Mc IE	121.6	12.98	12	122	22.6	0.05	0.5	2.1
10/2/2011 21:19:12	43.8057	-111.0173	0.4 Mc IE	143.3	2.01	6	208	11.9	0.04	1.2	13.0
10/3/2011 8:42:52	42.7612	-111.2233	0.9 Mc IE	160.7	11.77	5	313	34.6	0.05	10.6	1.6
10/3/2011 8:46:13	43.9608	-110.8503	0.6 Mc IE	159.2	14.29	7	286	10.1	0.03	1.3	1.7
10/3/2011 10:06:18	44.6222	-112.1078	1.5 Mc IE	120.9	13.98	14	95	23.0	0.05	0.5	0.9
10/3/2011 11:54:32	43.2785	-111.2677	0.7 Mc IE	129.3	13.18	7	181	26.4	0.03	1.3	3.7
10/3/2011 11:57:04	43.2812	-111.2535	1.0 Mc IE	130.3	13.58	9	179	27.0	0.08	0.9	1.6
10/3/2011 11:59:40	43.2925	-111.2320	0.6 Mc IE	131.6	11.14	8	179	28.8	0.08	1.0	4.2
10/3/2011 12:01:46	43.2778	-111.2525	1.1 Mc IE	130.5	8.56	9	161	26.7	0.07	0.8	3.9
10/3/2011 12:17:10	43.2812	-111.2555	1.2 Mc IE	130.2	6.20	11	179	27.0	0.06	0.8	6.0

ORIGIN TIME	LAT N	LONG W	MAG-TYPE	DIST	Z	NO	GAP	DMIN	RMS	ERH	ERZ
10/3/2011 13:19:35	43.2882	-111.2047	0.4 Mc IE	133.9	5.00	5	172	29.4	0.05	1.3	11.4
10/3/2011 13:59:45	43.2827	-111.2552	1.0 Mc IE	130.2	4.96	9	179	27.1	0.04	0.8	10.1
10/3/2011 18:47:42	43.2852	-111.2618	0.9 ML IE	129.6	5.00	7	186	27.2	0.07	1.0	10.1
10/3/2011 19:54:39	43.2855	-111.2638	1.2 ML IE	129.4	7.85	8	186	27.2	0.05	1.0	7.6
10/3/2011 20:26:12	43.2675	-111.2297	0.8 Mc IE	132.7	13.03	10	172	26.4	0.07	1.0	3.5
10/3/2011 20:30:50	43.2803	-111.2600	1.9 ML IE	129.9	11.71	16	180	26.8	0.04	0.7	3.0
10/3/2011 20:35:14	43.2680	-111.2417	1.6 Mc IE	131.7	10.26	10	158	26.0	0.09	0.9	4.9
10/3/2011 20:37:08	43.2888	-111.2272	0.8 ML IE	132.1	8.45	7	308	31.5	0.08	1.6	8.5
10/3/2011 21:40:39	43.3635	-110.8532	0.4 ML IE	159.2	10.40	7	193	0.2	0.05	2.8	1.5
10/4/2011 1:00:27	43.2827	-111.2540	1.8 Mc IE	130.2	8.23	15	126	27.2	0.08	0.8	4.2
10/4/2011 3:00:14	43.2700	-111.2375	0.9 Mc IE	132.0	14.81	9	177	26.4	0.11	1.1	2.4
10/4/2011 6:45:02	43.2810	-111.2553	1.0 Mc IE	130.2	7.13	8	179	27.0	0.13	1.3	8.0
10/4/2011 7:55:58	43.0427	-111.0613	1.1 Mc IE	155.0	9.45	6	243	25.2	0.06	3.2	9.1
10/4/2011 11:17:27	43.2740	-111.2332	0.6 Mc IE	132.2	9.97	7	310	32.5	0.11	3.8	14.3
10/5/2011 10:59:57	43.2817	-111.2533	0.7 Mc IE	130.3	4.99	8	183	27.1	0.07	1.0	10.1
10/5/2011 17:10:47	42.9497	-111.2150	2.1 Mc IE	149.1	12.92	17	233	16.9	0.13	1.4	0.8
10/6/2011 2:25:27	44.3580	-113.0547	1.6 Mc IE	81.7	10.83	15	117	9.6	0.09	0.5	1.0
10/6/2011 2:32:38	43.2813	-111.2680	0.7 Mc IE	129.2	8.21	7	182	26.7	0.04	1.1	7.4
10/6/2011 3:26:22	42.9420	-111.2158	1.1 ML IE	149.5	13.71	10	236	16.8	0.08	1.6	2.0
10/6/2011 12:09:59	42.9317	-111.2028	0.8 Mc IE	151.1	11.80	7	241	17.9	0.05	1.7	3.7
10/6/2011 14:44:57	43.2813	-111.2548	1.7 Mc IE	130.2	7.00	15	126	27.0	0.08	0.6	4.4
10/6/2011 14:48:26	43.2853	-111.2615	0.7 Mc IE	129.6	9.51	5	185	27.2	0.06	1.8	8.7
10/7/2011 12:46:08	44.7130	-111.8112	1.3 Mc MB	141.5	10.00	7	219	48.1	0.07	1.6	1.7
10/8/2011 6:31:16	43.2812	-111.2568	1.1 Mc IE	130.1	6.92	12	126	26.9	0.07	0.8	6.7
10/8/2011 6:31:55	43.2848	-111.2822	0.1 ML IE	128.0	2.32	7	191	26.7	0.08	1.0	14.3
10/8/2011 10:49:19	43.1340	-110.9737	0.9 ML IE	157.4	9.68	12	211	27.2	0.06	1.3	2.7
10/8/2011 22:37:34	43.2785	-111.2520	0.9 Mc IE	130.6	9.00	10	129	26.8	0.05	0.6	4.5
10/9/2011 1:09:34	43.2820	-111.2468	0.6 Mc IE	130.8	14.32	8	177	27.3	0.08	0.9	1.9
10/9/2011 2:15:51	44.3398	-114.1890	1.9 Mc IE	136.4	1.39	13	109	62.6	0.06	0.8	1.8
10/9/2011 2:30:53	43.1948	-111.3698	0.4 ML IE	125.1	6.37	6	208	15.7	0.10	1.6	8.6
10/9/2011 4:14:11	43.2117	-111.4162	0.6 Mc IE	120.9	10.22	6	225	18.0	0.06	2.1	5.7
10/9/2011 4:46:16	44.6932	-113.5985	1.5 Mc MB	133.1	11.80	8	198	45.2	0.08	3.4	4.3
10/9/2011 15:18:59	42.9513	-111.1442	1.1 Mc IE	154.0	6.51	6	272	21.7	0.02	5.2	11.7
10/10/2011 1:31:11	44.2305	-114.0668	2.1 Mc IE	121.6	3.30	15	214	53.6	0.07	0.7	2.9
10/10/2011 2:43:40	44.2577	-114.1145	1.6 Mc IE	126.4	1.37	8	246	56.9	0.05	1.4	2.4
10/10/2011 5:29:33	43.2220	-111.2633	0.9 Mc IE	131.9	9.97	8	173	20.6	0.09	1.1	3.3
10/10/2011 6:17:53	43.7008	-111.1317	0.7 Mc IE	133.2	6.11	8	247	11.0	0.06	1.2	2.1
10/10/2011 8:41:13	42.7418	-111.2597	0.6 ML IE	159.8	10.82	6	304	25.5	0.07	3.5	3.3
10/10/2011 13:32:08	43.1400	-110.9732	0.6 ML IE	157.2	9.61	9	225	26.6	0.07	1.6	5.2
10/10/2011 20:39:11	43.5112	-110.9908	0.0 ML IE	145.5	8.06	5	224	4.0	0.00	5.0	2.1
10/10/2011 23:39:16	43.5570	-111.0930	1.0 Mc IE	136.8	9.25	10	241	10.5	0.05	0.8	0.9
10/11/2011 0:11:01	44.3125	-111.0318	1.1 Mc IE	158.6	4.68	5	242	18.1	0.02	2.8	12.0
10/11/2011 0:58:25	43.3692	-111.0202	0.0 Mc IE	145.9	4.90	5	266	13.7	0.05	3.5	11.7
10/11/2011 7:27:21	43.5930	-111.0075	0.0 Mc IE	143.4	14.41	5	185	5.2	0.06	10.5	1.5
10/11/2011 9:53:07	44.4532	-113.1098	1.2 Mc IE	93.1	9.07	9	149	19.2	0.13	0.6	4.4
10/11/2011 11:24:38	43.3567	-111.1695	0.8 Mc IE	134.4	7.66	8	289	23.1	0.07	1.3	5.7
10/11/2011 11:31:36	43.3503	-111.1668	0.5 Mc IE	134.8	11.75	5	293	23.4	0.08	5.4	12.1
10/11/2011 11:33:24	43.3615	-111.1613	1.5 Mc IE	135.0	12.02	13	169	22.3	0.05	0.6	2.3
10/12/2011 5:51:39	43.3527	-111.1748	0.4 Mc IE	134.1	9.80	6	293	23.7	0.04	1.0	4.5

ORIGIN TIME	LAT N	LONG W	MAG-TYPE	DIST	Z	NO	GAP	DMIN	RMS	ERH	ERZ
10/12/2011 14:45:12	43.3475	-110.9648	0.7 ML IE	150.8	15.59	8	147	9.3	0.02	1.1	0.6
10/12/2011 17:41:31	43.2820	-111.2610	0.9 ML IE	129.7	8.12	9	180	26.9	0.04	0.9	5.2
10/13/2011 12:10:09	42.7313	-111.4348	0.7 ML IE	149.8	5.00	6	170	36.2	0.24	1.9	19.6
10/13/2011 15:06:42	44.3400	-114.0095	1.6 Mc IE	124.7	9.99	12	203	48.3	0.09	0.7	2.0
10/14/2011 2:53:28	43.2167	-111.0020	0.5 Mc IE	152.0	4.91	5	322	20.3	0.03	3.1	7.9
10/14/2011 14:48:30	42.9313	-113.1965	1.7 Mc IE	86.7	16.40	14	211	34.9	0.11	1.2	0.5
10/14/2011 21:27:47	43.1682	-110.9285	0.7 ML IE	159.4	13.30	7	235	22.5	0.10	1.2	3.0
10/14/2011 23:15:07	43.3980	-110.8720	0.1 Mc IE	156.9	11.05	7	172	4.3	0.05	1.0	1.4
10/16/2011 5:56:49	42.9608	-111.0773	1.1 Mc IE	158.2	8.63	7	267	26.0	0.03	2.5	4.0
10/16/2011 7:58:37	43.3463	-110.9307	0.4 ML IE	153.5	4.95	8	273	6.6	0.05	1.1	1.8
10/16/2011 10:04:49	44.4572	-112.9910	1.9 Mc IE	91.3	9.22	14	131	14.8	0.05	0.4	1.5
10/16/2011 10:26:36	44.4557	-112.9935	1.5 Mc MB	91.2	8.98	14	130	14.6	0.05	0.4	1.5
10/16/2011 10:27:00	44.4107	-113.0310	0.9 ML IE	86.9	5.22	6	127	11.5	0.07	0.5	0.9
10/16/2011 10:29:01	44.4500	-112.9863	0.7 Mc IE	90.5	9.45	8	133	13.9	0.08	0.7	2.8
10/16/2011 11:41:09	44.4655	-112.9877	1.6 Mc IE	92.2	9.14	9	133	15.6	0.02	0.5	1.9
10/16/2011 12:34:48	44.4378	-112.9593	1.2 Mc IE	88.8	6.62	7	122	12.1	0.10	0.7	1.2
10/16/2011 12:38:03	44.4537	-112.9947	1.6 Mc IE	91.0	9.07	10	130	14.5	0.07	0.5	2.1
10/16/2011 12:50:56	44.4605	-112.9890	1.0 Mc MB	91.7	4.72	7	131	15.1	0.04	0.7	1.1
10/16/2011 13:50:10	44.4557	-112.9668	1.4 Mc IE	90.8	11.63	7	126	14.2	0.06	0.6	1.6
10/16/2011 13:52:17	44.4622	-112.9730	0.3 ML IE	91.6	5.77	5	136	15.0	0.07	1.4	0.8
10/16/2011 13:52:36	44.4555	-113.0023	1.7 Mc MB	91.3	7.76	16	132	14.8	0.09	0.4	2.2
10/16/2011 13:55:43	44.4843	-113.0055	0.5 Mc IE	94.5	5.69	5	138	18.0	0.15	0.8	1.5
10/16/2011 14:44:24	44.4590	-112.9970	0.6 Mc IE	91.6	6.40	5	132	15.1	0.05	0.7	0.8
10/16/2011 14:47:47	44.4142	-113.0328	0.0 Mc IE	87.3	4.97	4	128	11.9	0.04	0.9	1.1
10/16/2011 14:48:03	44.4438	-112.9947	1.1 Mc IE	89.9	9.06	10	129	13.4	0.09	0.4	1.7
10/16/2011 14:53:41	44.4538	-112.9972	0.9 Mc IE	91.1	6.79	7	132	14.5	0.09	0.8	0.7
10/17/2011 15:15:34	42.9722	-113.2642	0.7 ML IE	84.9	16.24	10	243	30.3	0.09	1.2	0.4
10/18/2011 7:39:06	43.3952	-111.1453	0.2 Mc IE	135.3	10.82	6	281	19.0	0.24	9.2	17.5
10/18/2011 8:42:15	43.3982	-111.1222	0.5 Mc IE	137.1	12.23	6	276	17.2	0.02	1.6	3.8
10/18/2011 12:01:05	44.5075	-114.1032	1.4 Mc IE	142.4	6.77	8	135	82.7	0.10	0.7	3.3
10/19/2011 3:28:23	43.2858	-111.2618	0.9 Mc IE	129.5	8.28	9	181	27.3	0.06	0.8	5.9
10/19/2011 5:12:52	43.0227	-111.1535	1.0 Mc IE	149.4	17.77	7	248	18.0	0.09	4.1	5.9
10/19/2011 20:48:06	44.6198	-112.1008	0.5 ML IE	120.9	8.68	5	149	23.5	0.01	1.3	5.3
10/20/2011 3:46:59	44.2518	-114.0373	2.3 Mc IE	120.9	7.49	18	213	50.9	0.09	0.6	2.7
10/20/2011 5:00:59	43.4053	-111.1502	0.9 Mc IE	134.7	9.54	10	276	18.7	0.06	1.0	2.9
10/20/2011 9:18:49	43.3597	-110.9335	0.6 Mc IE	152.9	3.54	9	260	6.6	0.11	1.5	4.7
10/21/2011 4:55:17	43.0623	-111.6247	1.5 Mc IE	114.4	13.81	11	145	20.7	0.07	2.1	1.5
10/21/2011 20:37:02	43.3562	-111.1645	0.7 ML IE	134.9	15.70	6	288	22.8	0.01	1.5	0.8
10/22/2011 7:17:37	43.2830	-111.2567	0.6 ML IE	130.0	9.48	7	180	27.1	0.09	1.8	5.5
10/22/2011 21:33:36	43.2832	-111.2532	1.1 ML IE	130.3	10.71	10	179	27.2	0.05	0.8	4.4
10/23/2011 7:47:31	43.2813	-111.2823	1.0 Mc IE	128.1	4.97	7	191	26.3	0.06	1.2	11.3
10/24/2011 3:40:01	44.7623	-113.8847	1.1 ML IE	151.9	0.16	9	133	82.3	0.20	1.2	15.1
10/24/2011 4:01:18	43.2040	-110.9175	0.1 ML IE	158.9	10.51	5	321	18.4	0.08	1.6	3.4
10/24/2011 7:15:46	43.1977	-110.9133	0.6 Mc IE	159.5	10.37	7	322	19.0	0.04	1.3	2.6
10/24/2011 12:07:04	42.6378	-111.6790	1.6 Mc IE	144.0	12.21	11	256	52.6	0.05	1.5	1.0
10/25/2011 0:03:58	43.2797	-111.2552	0.7 ML IE	130.3	9.35	7	183	26.8	0.04	0.8	6.2
10/26/2011 11:54:33	42.7047	-111.7598	1.1 ML IE	134.1	5.00	8	106	37.9	0.15	1.3	14.7
10/26/2011 21:43:53	44.2690	-113.1997	1.1 Mc IE	76.6	6.25	11	152	21.7	0.04	0.7	1.3
10/26/2011 22:17:01	43.2848	-111.2652	0.8 ML IE	129.3	6.91	7	187	27.1	0.02	1.1	7.8

ORIGIN TIME	LAT N	LONG W	MAG-TYPE	DIST	Z	NO	GAP	DMIN	RMS	ERH	ERZ
10/27/2011 1:28:52	43.2815	-111.2635	1.3 ML IE	129.6	8.42	11	181	26.8	0.03	0.9	6.0
10/27/2011 1:30:11	43.2943	-111.2348	0.5 Mc IE	131.3	16.07	6	180	28.9	0.05	1.1	4.6
10/27/2011 1:48:20	43.2803	-111.2617	1.3 ML IE	129.7	7.11	8	185	26.7	0.03	0.9	8.1
10/27/2011 1:58:33	43.2852	-111.2567	0.7 Mc IE	130.0	10.17	7	185	27.3	0.06	1.2	4.8
10/27/2011 14:48:10	44.5007	-112.4208	1.8 Mc IE	99.0	8.72	16	89	10.5	0.10	0.4	1.1
10/27/2011 14:56:24	43.2892	-111.2610	0.8 Mc IE	129.5	10.44	6	186	27.7	0.03	1.0	6.9
10/27/2011 17:46:57	43.2805	-111.2632	0.8 Mc IE	129.6	8.53	11	180	26.7	0.06	0.7	5.1
10/28/2011 3:43:43	43.2375	-110.8850	0.9 Mc IE	160.3	7.02	8	215	14.1	0.14	1.2	2.4
10/28/2011 16:01:46	43.0025	-111.3167	1.0 Mc IE	139.0	14.80	5	188	7.2	0.01	2.5	1.0
10/28/2011 16:02:24	42.9980	-111.2900	0.4 ML IE	141.1	14.90	6	213	9.0	0.02	3.8	1.5
10/28/2011 16:07:07	42.9842	-111.2343	0.4 ML IE	145.8	5.11	6	216	13.5	0.04	2.8	11.7
10/30/2011 20:33:38	42.7162	-111.7390	1.4 ML IE	134.1	7.80	15	107	35.8	0.13	0.6	3.9
10/30/2011 20:39:44	42.7170	-111.7338	2.0 Mc IE	134.3	3.25	14	107	35.4	0.11	0.6	14.4
10/30/2011 21:46:57	42.7155	-111.7382	2.3 Mc IE	134.2	7.16	14	107	35.8	0.14	0.5	4.4
10/30/2011 21:54:31	42.7185	-111.7417	2.3 ML IE	133.8	6.91	18	137	35.8	0.14	0.5	3.8
10/31/2011 2:25:51	44.5647	-112.0835	1.0 Mc IE	116.1	13.36	7	89	24.9	0.06	0.9	2.2
10/31/2011 6:51:25	44.5578	-112.0782	2.4 Mc MB	115.7	14.05	20	83	25.4	0.08	0.4	0.7
10/31/2011 12:40:13	44.6052	-112.0532	1.6 Mc IE	121.3	14.57	10	93	27.1	0.06	0.8	1.7
11/1/2011 22:54:17	43.2808	-111.2650	1.1 ML IE	129.5	9.84	9	186	26.7	0.03	0.9	5.1
11/2/2011 9:53:29	44.7738	-112.8395	1.8 Mc IE	125.1	7.30	14	131	6.0	0.04	0.6	0.8
11/2/2011 17:06:40	42.6455	-111.4795	1.1 ML IE	154.0	11.33	7	194	32.8	0.02	1.6	2.2
11/2/2011 19:22:34	42.6948	-111.5875	1.1 ML IE	144.0	4.53	8	157	30.2	0.15	1.9	13.3
11/2/2011 22:23:22	43.0782	-111.3962	1.2 Mc IE	129.1	10.52	6	130	3.4	0.01	2.1	0.8
11/3/2011 14:02:33	43.3798	-111.1502	0.5 Mc IE	135.3	9.44	8	285	20.3	0.04	1.3	4.9
11/3/2011 22:45:19	42.8912	-111.1248	2.4 Mc IE	158.8	8.71	16	186	24.8	0.10	1.2	2.1
11/4/2011 23:08:20	43.3527	-110.9588	1.2 ML IE	151.1	11.07	10	144	8.7	0.07	1.4	2.0
11/6/2011 17:13:08	43.2272	-110.8943	0.6 ML IE	159.9	11.63	9	216	15.4	0.06	1.4	2.2
11/6/2011 19:18:23	43.4990	-110.8548	0.3 Mc IE	156.6	4.37	5	220	7.8	0.03	5.1	11.7
11/7/2011 2:36:41	43.4265	-111.0600	0.0 Mc IE	141.4	16.27	6	254	11.3	0.09	9.1	6.1
11/7/2011 9:34:47	43.2093	-111.4248	0.6 Mc IE	120.4	2.50	9	121	17.9	0.21	1.1	20.6
11/7/2011 23:15:41	43.2367	-110.9280	0.7 ML IE	157.0	6.87	7	209	15.3	0.01	1.4	3.0
11/8/2011 8:50:06	44.5277	-113.9632	1.6 Mc MB	135.9	10.12	8	209	50.6	0.08	1.5	2.2
11/10/2011 12:05:33	43.6735	-111.0957	0.8 Mc IE	136.1	6.21	7	236	6.8	0.05	1.8	1.2
11/11/2011 18:35:41	43.2343	-110.9773	1.7 ML IE	153.3	5.01	10	193	17.5	0.08	0.9	4.9
11/11/2011 20:57:57	43.1852	-110.9940	0.0 Mc IE	153.8	13.08	6	324	22.8	0.07	1.3	3.6
11/11/2011 21:32:25	44.6105	-112.0747	1.0 ML IE	121.0	6.22	7	135	25.5	0.07	1.0	13.4
11/12/2011 1:41:08	43.6778	-111.0867	1.0 Mc IE	136.8	5.52	9	233	6.5	0.07	0.9	1.0
11/12/2011 4:40:26	43.2183	-110.9098	1.0 Mc IE	159.0	6.28	5	216	16.7	0.02	2.0	4.8
11/13/2011 17:22:15	44.7767	-111.5720	1.6 ML IE	158.3	10.85	13	259	9.1	0.08	2.1	0.5
11/14/2011 9:29:21	42.9382	-111.0652	1.3 ML IE	160.3	10.89	11	245	28.0	0.06	2.0	3.2
11/14/2011 13:46:36	44.0108	-114.4422	1.8 Mc IE	139.3	1.44	9	187	49.9	0.04	2.5	3.1
11/14/2011 21:04:46	44.6290	-112.1065	1.7 Mc IE	121.6	12.43	15	97	23.2	0.10	0.5	1.6
11/16/2011 9:51:05	43.7658	-110.8528	0.6 Mc IE	156.0	6.12	5	155	16.1	0.11	0.7	5.5
11/16/2011 12:05:33	43.0197	-111.0642	0.9 Mc IE	156.0	7.56	6	224	25.2	0.06	2.3	10.5
11/18/2011 5:38:56	44.3442	-113.9390	2.1 Mc IE	120.6	6.90	10	213	42.7	0.12	0.9	15.5
11/18/2011 8:14:16	44.6162	-112.0903	2.0 Mc IE	120.9	13.89	16	94	24.3	0.09	0.4	0.8
11/18/2011 20:35:21	43.4797	-110.9432	1.0 ML IE	149.8	10.61	11	183	1.3	0.04	0.6	1.0
11/19/2011 1:24:34	43.6242	-111.0863	1.2 ML IE	136.9	11.64	9	153	5.0	0.07	1.7	0.8
11/19/2011 1:36:58	43.6167	-111.0932	0.7 Mc IE	136.4	10.01	6	236	5.9	0.08	3.8	1.7

ORIGIN TIME	LAT N	LONG W	MAG-TYPE	DIST	Z	NO	GAP	DMIN	RMS	ERH	ERZ
11/19/2011 3:19:47	42.8812	-111.2737	0.6 ML IE	149.4	12.66	6	266	13.6	0.02	2.0	2.4
11/19/2011 3:50:01	43.4833	-110.9365	1.3 ML IE	150.3	9.67	11	91	1.4	0.06	0.5	1.1
11/19/2011 13:19:24	43.4842	-110.9357	1.4 ML IE	150.3	10.14	10	92	1.4	0.06	0.6	1.0
11/19/2011 15:02:43	43.4830	-110.9365	1.2 ML IE	150.3	10.00	12	91	1.4	0.06	0.4	0.8
11/19/2011 17:15:45	43.5270	-110.8403	0.0 ML IE	157.4	4.94	4	233	9.8	0.03	4.5	11.9
11/22/2011 5:15:25	43.4820	-110.9348	0.6 Mc IE	150.4	11.21	9	153	1.6	0.08	0.8	1.6
11/23/2011 6:26:29	44.9152	-112.7662	3.1 Mc MB	140.8	7.13	22	156	11.7	0.09	0.4	1.1
11/23/2011 20:14:31	44.9147	-112.7445	2.9 Mc MB	140.7	5.08	24	152	12.7	0.06	0.9	1.4
11/23/2011 20:55:15	43.2827	-111.2637	1.5 ML IE	129.5	6.41	13	164	26.9	0.07	0.7	5.1
11/24/2011 13:27:27	44.6453	-112.5295	1.5 Mc MB	112.6	12.96	9	121	12.2	0.02	0.6	1.6
11/25/2011 14:36:17	43.6422	-110.8487	0.9 ML IE	156.0	7.70	9	113	14.4	0.07	0.5	2.7
11/25/2011 16:49:15	43.6378	-110.8483	1.4 ML IE	156.0	3.77	8	112	14.4	0.03	0.5	7.6
11/26/2011 19:13:12	43.6392	-110.8470	NM	156.1	4.94	8	112	14.5	0.04	0.5	5.0
11/26/2011 19:13:18	43.6398	-110.8627	0.1 Mc IE	154.9	8.92	5	216	13.2	0.01	1.4	3.9
11/28/2011 18:11:56	43.6412	-110.8425	0.6 Mc IE	156.5	6.38	10	114	14.9	0.05	0.4	3.4
11/28/2011 18:56:04	43.6280	-110.8502	0.0 Mc IE	155.9	5.06	4	179	14.3	0.00	1.0	7.0
11/29/2011 8:04:30	44.4660	-112.9583	1.9 Mc IE	91.9	6.41	14	158	41.1	0.18	0.8	18.6
11/29/2011 8:23:37	44.4783	-112.9608	2.1 Mc IE	93.2	10.63	13	159	39.8	0.02	0.8	1.4
11/29/2011 11:19:46	44.6090	-114.2703	1.6 Mc IE	159.8	6.93	9	251	99.9	0.06	1.2	2.1
11/30/2011 6:36:12	44.1205	-111.0162	0.8 ML IE	151.3	4.17	5	345	25.6	0.03	2.7	12.4
11/30/2011 23:06:37	44.4648	-111.1848	1.0 Mc WY	156.8	21.40	5	279	30.5	0.08	1.5	2.3
12/1/2011 4:31:52	43.6390	-110.8488	1.2 ML IE	156.0	6.28	10	112	14.4	0.03	0.4	3.8
12/1/2011 16:36:24	44.7640	-111.5960	1.5 Mc MB	156.1	7.75	6	258	6.7	0.00	3.2	0.6
12/1/2011 19:37:30	43.6363	-110.8482	1.1 ML IE	156.0	5.56	8	111	14.4	0.03	0.5	4.6
12/2/2011 5:37:03	43.6343	-110.8525	0.0 Mc IE	155.7	8.25	6	111	14.1	0.03	0.6	3.2
12/2/2011 20:53:03	43.2302	-111.0158	1.8 ML IE	150.4	9.25	11	171	19.8	0.07	0.9	3.0
12/3/2011 9:37:04	43.1973	-110.9372	1.7 ML IE	157.7	7.57	8	166	19.6	0.06	1.2	4.4
12/3/2011 16:04:26	43.2052	-110.9418	1.7 ML IE	157.0	7.40	9	164	18.9	0.06	1.2	4.0
12/3/2011 16:43:32	43.1955	-110.9105	1.5 ML IE	159.8	9.10	7	171	19.1	0.05	1.3	4.0
12/4/2011 17:50:54	43.7255	-111.0025	0.8 ML IE	143.7	4.76	6	182	9.9	0.02	1.0	3.5
12/5/2011 11:20:13	44.7718	-111.6843	1.8 Mc MB	152.6	5.05	10	195	4.9	0.02	1.3	0.3
12/6/2011 5:26:37	44.7920	-111.6150	1.5 Mc MB	157.6	8.78	9	197	8.0	0.08	1.8	0.9
12/6/2011 5:27:16	44.7630	-111.6647	0.8 Mc MB	152.7	11.19	8	195	3.7	0.03	7.1	0.5
12/6/2011 11:22:27	42.8705	-111.2545	0.9 Mc IE	151.4	10.96	9	167	15.6	0.03	1.5	4.0
12/6/2011 19:28:09	44.5973	-112.0767	2.7 Mc MB	119.6	14.92	24	139	25.2	0.05	0.4	0.6
12/7/2011 1:09:28	44.4287	-112.9658	1.8 Mc IE	87.9	11.73	16	121	11.2	0.08	0.5	0.8
12/7/2011 14:37:26	44.9098	-112.7330	1.4 Mc IE	140.2	0.02	4	146	12.9	0.07	1.4	3.0
12/7/2011 15:49:41	44.7530	-111.6802	1.4 Mc IE	151.1	9.11	5	193	2.8	0.09	11.1	0.5
12/7/2011 16:17:03	44.7878	-111.6103	1.7 Mc IE	157.5	8.95	6	201	7.8	0.07	2.1	1.0
12/8/2011 7:14:54	43.1867	-111.3100	0.5 Mc IE	129.9	14.39	5	185	15.6	0.02	1.6	5.0
12/9/2011 0:36:03	44.3075	-113.1270	1.1 Mc IE	78.2	5.40	8	228	15.0	0.06	1.9	2.4
12/11/2011 0:10:47	42.8792	-111.2390	1.7 ML IE	151.8	9.85	15	156	16.3	0.08	0.6	1.3
12/11/2011 0:45:07	42.8718	-111.2597	0.8 ML IE	150.9	12.02	7	168	15.1	0.09	1.4	3.0
12/11/2011 2:15:28	44.3198	-114.0460	1.3 ML IE	125.7	9.31	13	204	64.4	0.05	0.5	1.2
12/11/2011 7:52:23	43.6932	-111.1427	0.6 ML IE	132.3	11.35	9	248	11.2	0.11	1.1	1.3
12/18/2011 7:28:25	43.1465	-111.2182	0.5 Mc IE	138.5	7.48	8	144	16.1	0.03	0.7	4.3
12/18/2011 15:30:20	43.7760	-110.9352	0.0 Mc IE	149.5	9.68	5	153	13.4	0.02	0.8	2.9
12/19/2011 0:44:44	44.6553	-113.4977	1.1 Mc IE	125.6	0.94	7	252	39.0	0.01	3.6	1.8
12/19/2011 6:37:50	44.6807	-112.5310	0.8 ML IE	116.4	11.21	6	134	14.5	0.02	1.3	2.8

ORIGIN TIME	LAT N	LONG W	MAG-TYPE	DIST	Z	NO	GAP	DMIN	RMS	ERH	ERZ
12/19/2011 6:52:34	44.6898	-112.5302	1.3 Mc IE	117.4	7.69	9	88	15.2	0.02	0.6	3.9
12/19/2011 7:30:34	43.5930	-110.8547	0.0 Mc IE	155.7	10.03	5	249	13.8	0.05	6.7	9.1
12/19/2011 7:30:45	43.5122	-111.0907	1.0 ML IE	137.5	9.71	9	245	11.6	0.03	1.1	1.4
12/23/2011 23:33:21	43.0975	-111.3078	0.8 Mc IE	134.4	0.02	5	153	7.1	0.10	1.2	1.9
12/24/2011 23:48:45	42.6933	-111.7560	1.3 Mc IE	135.3	7.08	8	106	38.6	0.12	0.8	13.3
12/28/2011 4:37:03	44.8455	-113.3665	0.8 ML IE	140.9	4.30	5	265	41.0	0.09	7.8	11.5
12/29/2011 4:32:19	42.8373	-111.2300	1.0 ML IE	155.1	11.00	6	180	13.3	0.01	1.4	2.9
12/29/2011 5:47:06	44.6257	-112.0963	1.4 Mc MB	121.7	11.02	8	129	23.9	0.05	0.9	2.1
12/30/2011 6:56:41	43.1348	-110.9730	0.5 Mc IE	157.4	4.97	7	174	27.1	0.07	1.3	10.8
12/30/2011 21:06:45	44.6048	-112.1093	1.0 Mc IE	119.1	14.80	5	206	22.7	0.12	2.8	1.9
12/31/2011 6:02:26	43.0088	-111.2965	0.9 ML IE	140.0	8.67	5	107	7.8	0.02	1.1	4.0