USGS
science for a changing world

Albuquerque Seismological Laboratory

50 years of global seismology

The U.S. Geological Survey Albuquerque Seismological Laboratory is about 15 miles southeast of Albuquerque on the Pueblo of Isleta, adjacent to Kirtland Air Force Base. The Albuquerque Seismological Laboratory supports the Global Seismographic Network Program and the Advanced National Seismic System through the installation, operation, and maintenance of seismic stations around the world and serves as the premier seismological instrumentation test facility for the U.S. Government.

The Albuquerque Seismological Laboratory (ASL) was established in 1961 by the U.S. Coast & Geodetic Survey (C&GS) to provide a seismically quiet place for developing and testing new and improved seismological instruments. Additionally, the ASL was envisioned as a resource for supporting the C&GS observatory network. The choice of the Pueblo of Isleta site followed extensive seismic noise surveys by C&GS employees Frank Werner, James Devine, and Joji Tomei. These surveys were conducted in 1959 at numerous locations across the United States. The choice of the Albuquerque site was based on the low seismic noise, access to universities and scientific support facilities, and suitable logistics and living environment. Construction of the facility started in 1960, when two 40-foot deep tunnels were blasted into Precambrian granite for instrument testing. During the same period, the World-Wide Standardized Seismograph Network (WWSSN) was in the design and planning stages. Funded by the Defense Advanced Research Projects Agency (DARPA), the WWSSN was envisioned as a network of 120 standardized seismograph stations in more than 60 countries and islands scattered across the globe. The ASL was identified as the logical choice to serve as an installation and maintenance center for the network, and DARPA provided funding for a building to house WWSSN activities. The ASL opened for business on June 19, 1961, and the first WWSSN station (ALQ) was installed in the underground tunnels. By 1965, 111 stations were installed, and by 1971, the final installation (BDF - Brasilia, Brazil) was completed. The WWSSN is considered one of the most important advances in observational seismology and produced usable data until the mid-1990s.

In addition to operating the WWSSN, the ASL conducted aftershock studies, including the study of the 1964 M9.2 Prince William Sound, Alaska, earthquake. Over 5,000 pounds of equipment and several seismologists from Albuquerque arrived in Anchorage 2 days after the earthquake to deploy equipment for recording aftershocks. The first portable system was deployed the next day.

Over the years, ASL staff also participated in numerous field experiments for earthquake and explosion studies and led the development of several seismic systems, including tsunami monitoring networks in Alaska and the Pacific and a regional network to monitor seismicity in the Rio Grande rift.

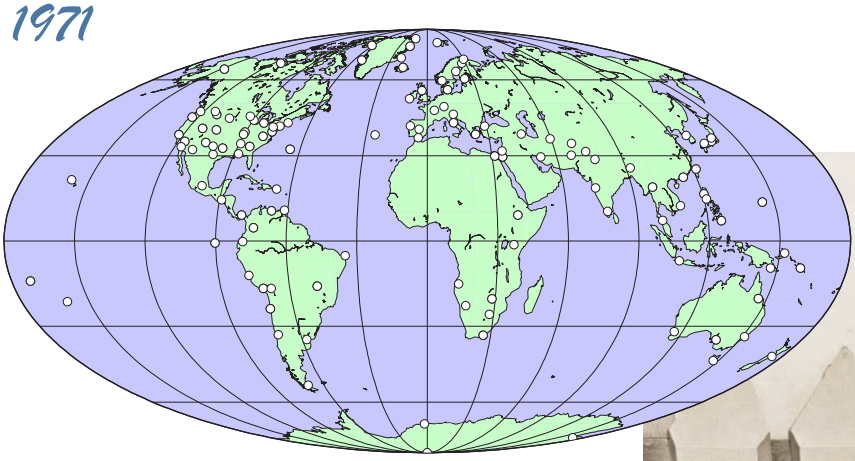
Albuquerque Seismological Laboratory

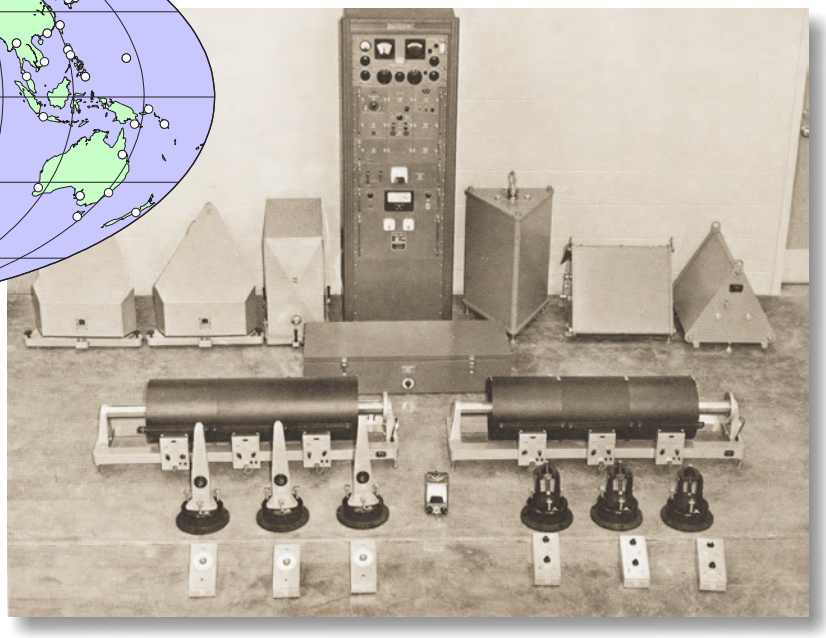
1962

2011

Stations and Equipment

1971





(**Top**) Stations of the World-Wide Standardized Seismograph Network (WWSSN), installed 1962–1971.

(**Right**) The WWSSN System, including seismometers, galvanometers, drum recorders, and timing console.

As technology advanced, the ASL began its first installations of digital seismographs in 1971 with the High Gain Long Period (HGLP) network. This advance was followed by several other digital-recording networks, including the Seismic Research Observatories (SRO), the modified HGLP (ASRO), the Digital WWSSN (DWWSSN), and the China Digital Seismograph Network. These networks, known together as the Global Digital Seismic Network (GDSN), produced high quality, mostly narrow-band (peaking near 1-second and 25- second period) digital data that were collected, quality-controlled, and distributed by ASL's Data Collection Center. These early experiments with digital systems were funded by DARPA; experience gained from working with these early systems laid the groundwork for today's modern broadband networks. The GDSN efforts often were conducted in partnership with other organizations, including universities and the U.S. Air Force.

In the mid- and late-1960s, efforts to modernize and realign government operations led to the formation of the U.S. Environmental Science Services Administration (ESSA) within the U.S. Department of Commerce and then to the formation of the National Oceanic and Atmospheric Administration (NOAA) in 1970. The C&GS was first transferred into ESSA and then reorganized under NOAA. The seismology division was moved under the Environmental Research Laboratories in 1971 and then transferred to the U.S. Geological Survey (USGS) in the U.S. Department of the Interior in 1973.

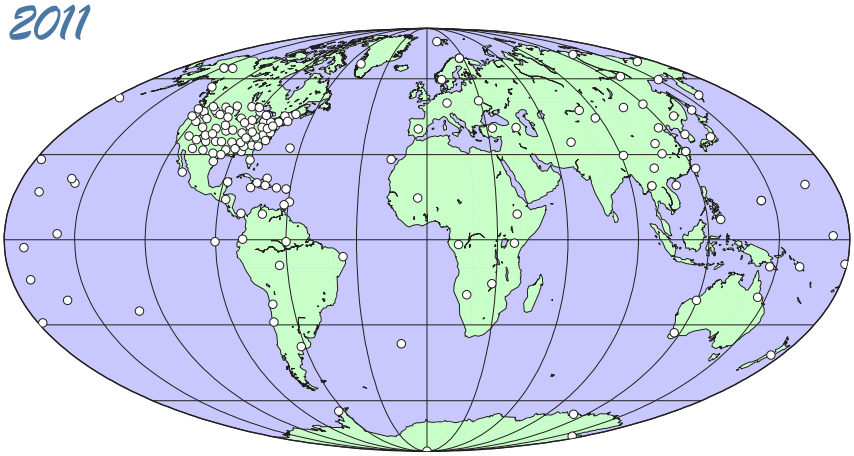
1970s

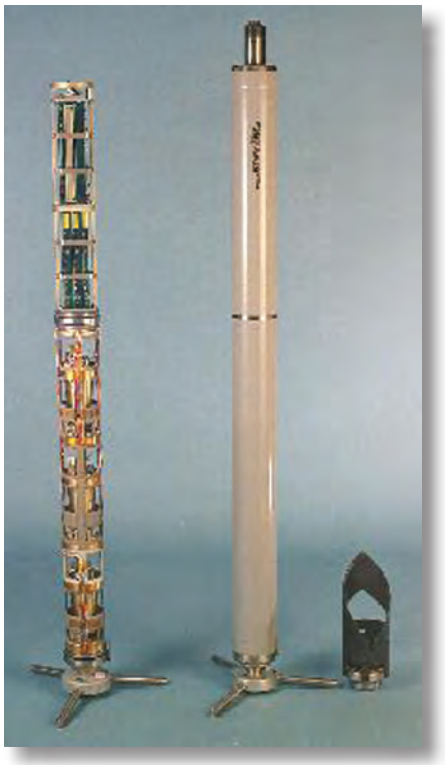
Russ Wilson repairing a WWSSN module in the early 1970s.

2011

ASL senior field engineer Gary Gyure with the ANMO digital data acquisition system.

2011





(**Top**) Stations for which the ASL was responsible in June 2011, including the Global Seismographic Network, the Caribbean Network, and the Advanced National Seismic System backbone network.

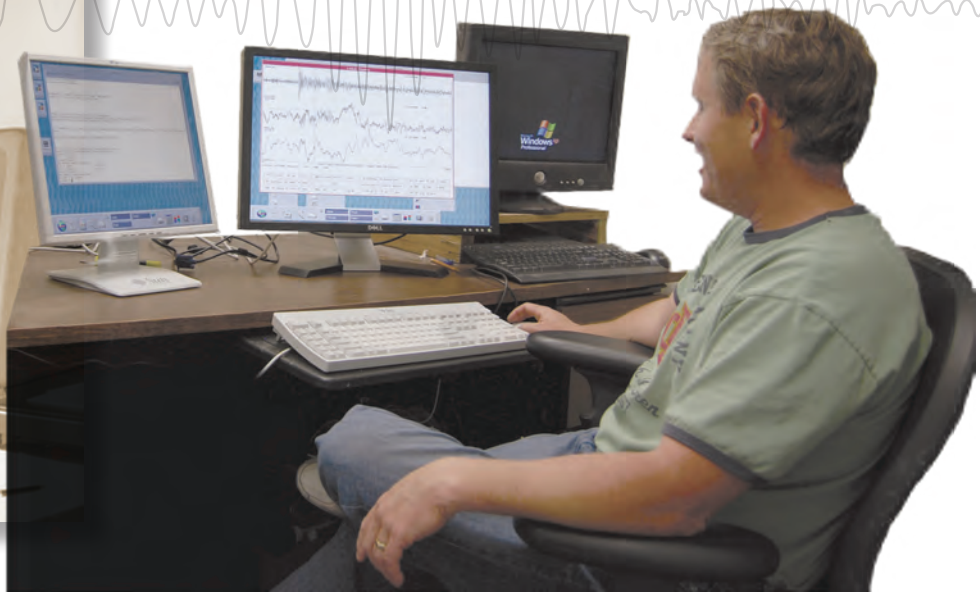
(**Right**) Two of the seismometers used in the GSN: Geotech KS-54000 borehole seismometer (far right) and Streckeisen STS-1 vertical seismometer.

In 1984, the USGS formed a partnership with the National Science Foundation and the Incorporated Research Institutions for Seismology to establish a new broadband digital seismological network known as Global Seismographic Network (GSN). The ASL played a key role in performing design studies and developing site plans, technical plans, and instrument specifications for the GSN, and in testing the new systems. The GSN was built on the footprint of earlier global networks, including the WWSSN and the University of California's International Deployment of Accelerometers. The initial deployment began in 1991, and currently (2011) the network spans more than 150 stations.

1970s

Viewing seismic data for quality control and analysis. Larry Jaksha scaling an earthquake waveform on a Develocorder viewscreen.

2011



Tyler Storm performing quality control on digital data.

1960s

Larry Jaksha working in a shallow seismometer vault.

2000s

Shallow seismometer vault at station ANWB (Barbuda) of the Caribbean Network. Shown are the station operator, Devon Warner, and helpers.

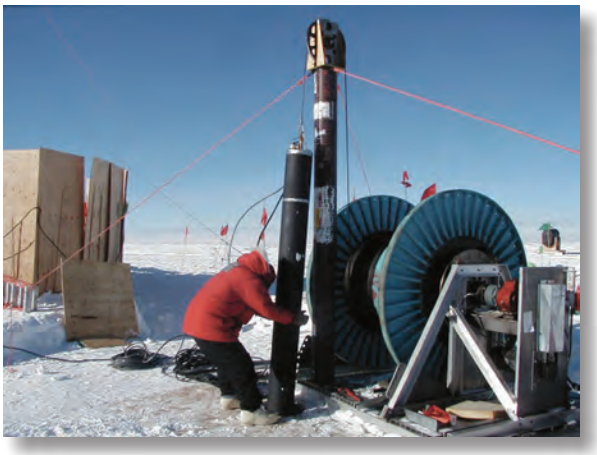
The ASL Today

The ASL today is part of the USGS Geologic Hazards Science Center based in Golden, Colorado. The facility consists of 15 structures, including the two previously mentioned subsurface tunnels, five boreholes, and several surface vaults. Thanks to its remote location, the site continues to be an extremely low-noise environment, still suitable for its original mission of calibration, testing, and development of new instruments.

The ASL staff support the operation and maintenance of more than 180 stations in nearly 60 countries around the world. The ASL supports the operation and maintenance of the GSN—as well as the backbone of the Advanced National Seismic System (ANSS)—and ensures the quality and integrity of the data. The GSN and ANSS data are used for real-time seismic monitoring by the USGS National Earthquake Information Center and by the NOAA Tsunami Warning Centers; for nuclear test monitoring by the Comprehensive Test Ban Treaty Organization and the U.S. Air Force; and for research on earthquake processes, earth structure, and other geophysical problems by a broad community of international users.

The ASL also supports ANSS networks through the operation of an equipment depot. The depot serves both USGS and non-USGS networks in the ANSS by providing equipment spares, tracking equipment failures, and performing or overseeing equipment repair.

ASL seismometer test engineers Gary Holcomb and Leo Sandoval in the ASL underground test vault in granite. They are testing a rotational seismometer built at ASL.



Installing a KS54000 seismometer in a special heated/insulated package in a 270-meter deep borehole at GSN station QSPA at the South Pole, Antarctica.

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