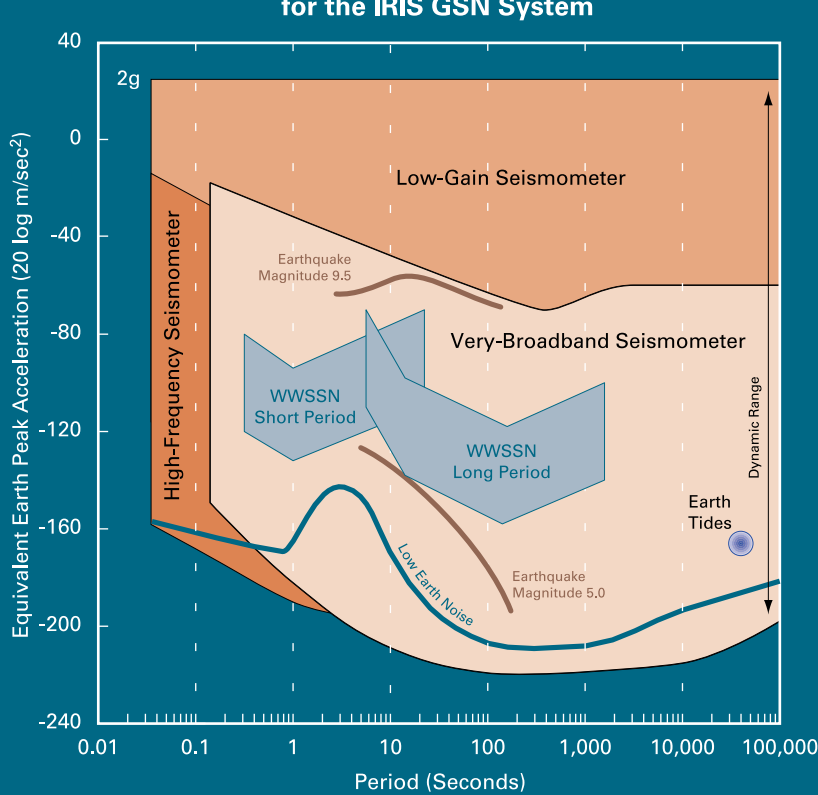




# Global Seismographic Network

Bandwidth and Dynamic Range for the IRIS GSN System

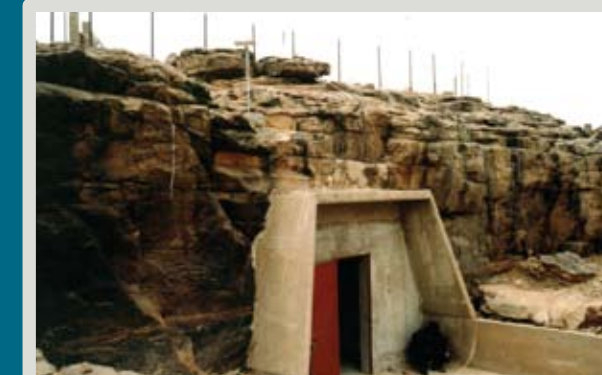


The Global Seismographic Network (GSN) is a multi-use facility that provides data for scientific research, education, earthquake hazard mitigation, tsunami warning, and the international monitoring system for the Comprehensive Nuclear Test-Ban Treaty. In addition, real-time GSN data are broadcast to museum displays that are seen by over 10 million visitors each year. More than 125 GSN stations are located around the world with near-uniform spacing - from the South Pole to Siberia and from the Amazon Basin to the seafloor of the Northeast Pacific Ocean. The GSN coordinates its activities with the international Federation of Broadband Digital Seismic Networks. The GSN is supported by the National Science Foundation and operated through the IRIS Consortium in partnership with the US Geological Survey, the University of California at San Diego, and individual universities. More than 105 organizations host GSN stations in 62 nations around the world.



Kent Anderson (ASU) preparing to test a KSS4000 for deployment in the ice at the South Pole.

The GSN began with the installation of three stations in the conterminous United States in 1986. By June 1996, the GSN had grown to 89 stations. The rapid growth was achieved when the US Congress identified the program as an item of special Congressional interest and provided additional funding to expand the program for nuclear verification in anticipation of the September 1996 signing of the Comprehensive Nuclear Test-Ban Treaty. In 1998, the GSN obtained a retired undersea telecommunications cable and installed its first seafloor station, the Hawaii-2 Observatory (H2O) between Hawaii and California.



Vault at station KOWA in Mali, Africa

GSN station sites provide near-uniform global coverage and are chosen to achieve the best possible quiet noise conditions. In general, underground sites are best, avoiding wind-generated and diurnal temperature influences. Hard rock provides for the best coupling of the sensor to the Earth. Boreholes work effectively to reduce long-period (>20 s) horizontal noise on continents and larger islands. Noise level in the microseism band from about 2 Hz to 20 sec is generated by the oceans and is not mitigated by installation depth. Here the distance from the sea is the determining factor. The quietest sites are those located within the continental interiors.



Satellite dish at station PTCN, Pitcairn Island, South Pacific

GSN uses state-of-the-art instrumentation to measure and record all of Earth's vibrations from high-frequency, strong ground motion near an earthquake to its slowest free oscillations. GSN instrumentation includes the STS-1 and the borehole KSS4000 as the standard very-broadband sensors. For installations with high-frequency signals, the GSN uses the STS-2, CMG-3T, and the GS-13 seismometers in vault deployments, and the CMG-3TB in boreholes. FA-23 sensors are used to record strong ground motion from local earthquakes.



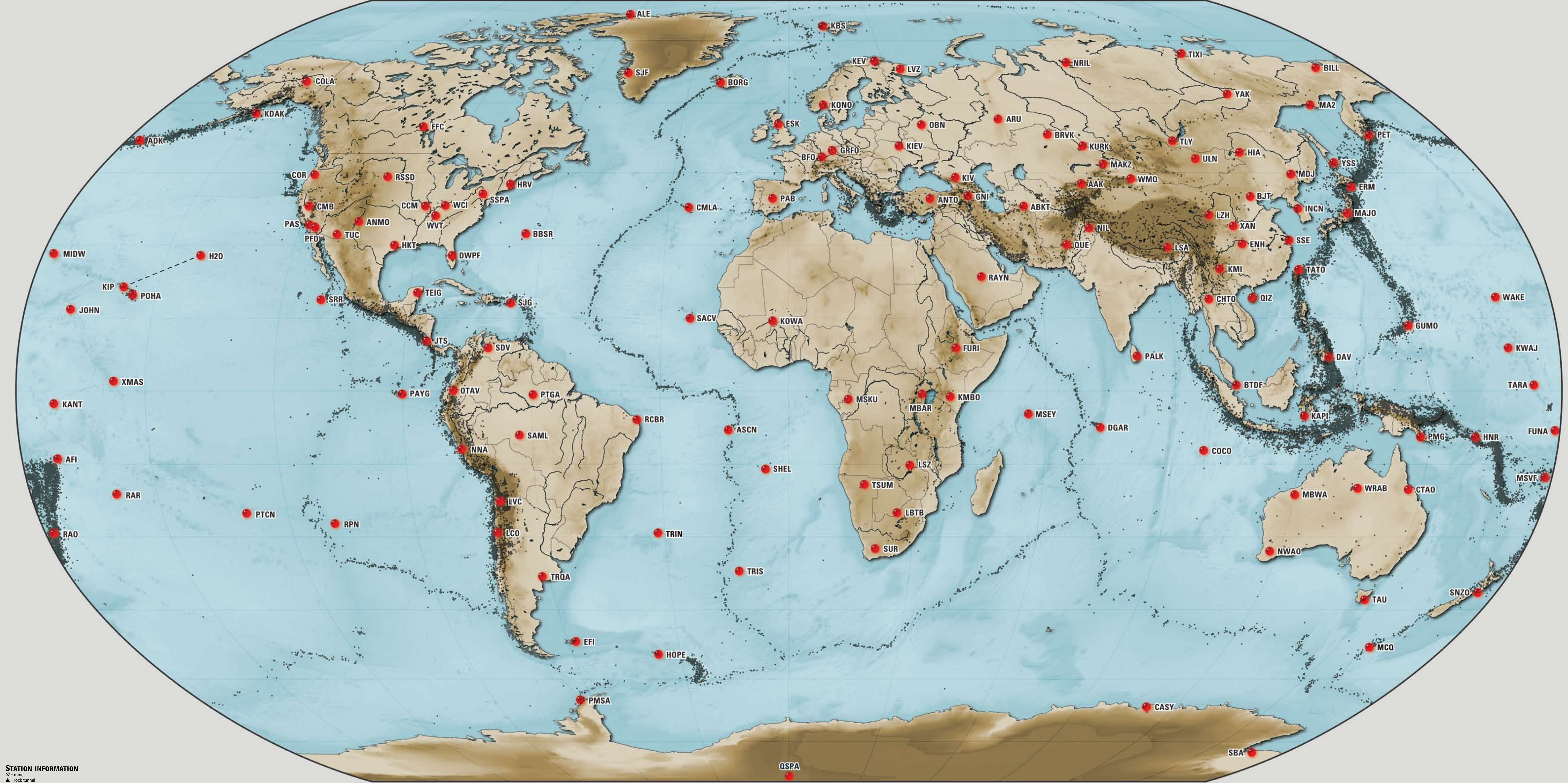
50 GSN stations are designated for participation in the International Monitoring System for the Comprehensive Nuclear Test-Ban Treaty that President Bill Clinton signed in 1996

Continuous, real-time telemetry of all GSN data is a fundamental goal. Over the past 15 years, GSN data access has transitioned from air-mailed media, dial-up telephone, and slow-speed internet access to broadband VSAT satellite links and high-speed Internet. As of 2002, 75% of the GSN is on-line via Internet and VSAT links. All GSN data are openly available without restriction, delay, or cost, through the IRIS Data Management System.



The Program Manager for the Global Seismographic Network is Rhett Butler, IRIS Consortium, Chinese GSN Consulting Committee member Adam Dziewonski, Harvard University (1984-97), Sean Solomon, MIT (1988-90), Don Forsyth, Brown University (1991-92), Terry Wallace, University of Arizona (1993-94), Lane Johnson, University of California, Berkeley (1995), Gábor Ekström, Harvard University (1995-98), Barbara Romanowicz, University of California, Berkeley (1999-2002), Thorne Lay, University of California, Santa Cruz (2003)

IRIS is a university research consortium dedicated to monitoring the Earth and its interior through the collection and distribution of geophysical data. IRIS programs are conducted in partnership with the US Geological Survey, and are supported by the National Science Foundation and other federal agencies, universities, and private foundations. Copies of this poster can be obtained from the IRIS Consortium 1200 New York Avenue, NW, Suite 800 Washington, DC 20005 (1-202) 462-2222 • www.iris.edu



### STATION INFORMATION

- X - mine
▲ - rock tunnel
● - cave
○ - borehole
■ - vault
SR - ocean bottom

STATION OPERATOR
USA - USA Group of Institutions of California, San Diego
ASU - Arizona Seismological Center, University of California, Berkeley
USU - Utah Seismological Center, Utah State University
CIT - California Institute of Technology
AFRC - Air Force Technical Applications Center
CSB - China Seismological Bureau
UH - University of Hawaii
MSS - Meteorological Service Washington
CIW - Carnegie Institute of Washington

STATION AFFILIATION
G - Global Seismographic Network
AU - Australian Seismological Centre
BC - Berkeley Digital Seismic Network
CD - China Digital Seismic Network
CI - Coast
CN - Canadian National Seismic Network
CTBT - Comprehensive Nuclear Test Ban Treaty
DK - Danish Seismological Network
DW - Digital World Wide Standardized Seismograph Network
GE - GEONet - Germany
GOS - GOSSENE - France
GR - German Regional Seismic Network
GI - Global Instrumented Seismic Network
H2 - Hawaii-2 Observatory
H3 - High Gain Long Period Network
HV - Harvard University
IC - IRIS Consortium Seismic Network (China)
ID - Project IDA University of California
IR - IRIS/IDA Network
ME - MEDNET - Singapore Seismological Network
MK - Mexican National Network
NEE - National Research Institute for Earth Science and Disaster Prevention (Japan)
OSU - Oregon State University
PSU - Pacific (Japan)
RUS - Regional Seismic Test Network
SLU - SLU University
SR - Seismic Research Observatory
TS - TERRACORE
UL - US National Seismic Network
UT - University of Texas
WW - World-Wide Standardized Seismograph Network

AAK Aka Acha, Kyrgyzstan
ADK Adak, Alaska, USA
ABKT Abkhaz, Turkmenistan
AAK Aka Acha, Kyrgyzstan
ADK Adak, Alaska, USA
ABKT Abkhaz, Turkmenistan
AAK Aka Acha, Kyrgyzstan
ADK Adak, Alaska, USA
ABKT Abkhaz, Turkmenistan

BBSR Bermuda
COR Chang Mai, Thailand
CMB Columbia College, California, USA
CMB Columbia College, California, USA
CMB Columbia College, California, USA
CMB Columbia College, California, USA

DWPF Disney Wilderness Preserve, Florida, USA
GRFO Garmisch-Partenkirchen, Germany
JTS La Juntas de Abasco, Costa Rica
GIMO Garmisch-Partenkirchen, Germany
JTS La Juntas de Abasco, Costa Rica
GIMO Garmisch-Partenkirchen, Germany
JTS La Juntas de Abasco, Costa Rica

HOPE Hope, Oregon, USA
KBS Kyushu, Japan
KBS Kyushu, Japan
KBS Kyushu, Japan
KBS Kyushu, Japan

LSZ Lusaka, Zambia
MDJ Muanjari, Henan Province, China
OTAV Otavak, Ecuador
LSZ Lusaka, Zambia
MDJ Muanjari, Henan Province, China
OTAV Otavak, Ecuador

PTCN Pitcairn Island, South Pacific
RSD Back Hills, South Dakota, USA
SACV San Pablo, Spain
PTCN Pitcairn Island, South Pacific
RSD Back Hills, South Dakota, USA
SACV San Pablo, Spain

SBA Scott Base, Antarctica
SUR Sutherland, South Africa
TARA Kribia, Cameroon
SBA Scott Base, Antarctica
SUR Sutherland, South Africa
TARA Kribia, Cameroon

WWT Waverly, Tennessee, USA
XAN Xian, China
XMAS Christmas Island, Republic of Kiribati
WWT Waverly, Tennessee, USA
XAN Xian, China
XMAS Christmas Island, Republic of Kiribati

YAK Yakutsk, Russia
ZS South Pole, Antarctica
WWT Waverly, Tennessee, USA
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Robinson Projection • Historic Seismicity: all events, magnitude 4 and larger, over a 10 year time period (source: National Earthquake Information Center, US Geological Survey, Denver, Colorado)