GSN
FDSN REPORT

January 2009

Rhett Butler
GSN Program Manager

Summary since last FDSN Meeting in Perugia, Italy, in July 2007

GSN total 152 stations (see map)
- **80 IRIS/USGS**
- **40 IRIS/IDA**
- **12 IRIS/University Subnetwork**
- **20 GSN Affiliate (including USGS Caribbean Network -CU- of 9 stations)**

New Stations (7/2007 through 2008) all with real-time telemetry
- **ANWB – Willy Bob, Antigua and Barbuda – USGS Caribbean Network**
- **GTBY – Guantanamo Bay, Cuba – USGS Caribbean Network**
- **MTDJ – Mount Denham, Jamaica – USGS Caribbean Network**
- **GRTK – Grand Turk, Turks and Caicos Islands – USGS Caribbean Network**
- **KNTN – Kanton Atoll – IRIS/USGS**
- **MACI – Morro de la Arena, Canary Islands (replaces TBT) – IRIS/USGS**
- **SLBS – Sierra de la Laguna, Baja, Mexico – IRIS/USGS**

Closed Station
- **No new closures**

Telemetry Infrastructure (see map)
- **Internet or VSAT comms to 97% of the network (147 stations)**
- **New telemetry at MSVF, Fiji**
- **5 stations with no communications (ALE, NRIL, ABKT, MAKZ, KOWA)**

Other Geophysical Instrumentation (see map)
- **55 stations have microbarographs**
- **44 stations have GPS co-located**

Participation in CTBTO IMS: 32 GSN Core stations + 7 GSN Affiliates (see map)

Background

The Global Seismographic Network (GSN), managed by the Incorporated Research Institutions for Seismology (IRIS) in collaboration with the US Geological Survey, is a fundamental international system for seismic monitoring, research, and educational training. The entire network of 130 core stations transmits data in real-time to the US, where the data are openly available to all government, public, private researchers, and the international community.

Initiated in 1986 by the US scientific community, the GSN is a multi-use, multi-agency scientific resource essential to the achievement of many missions. The GSN:

- serves as key, first-warning element in US and international tsunami warning systems;
- provides core data for global earthquake monitoring, rapid hazard assessment and prompt response to natural disasters;
- is a cornerstone scientific facility for the study of earthquakes and the Earth's interior;
- supplies the single largest contribution (46 sites designated) to the international monitoring system for the Comprehensive Nuclear Test Ban Treaty (CTBT); and
- is crucial for the training and education of the next generation of earth scientists.

Network & Station Operators

ASL	USGS Albuquerque Seismological Laboratory
IDA	University of California, San Diego SIO/IGPP IDA Project

Installations

The map shows the current GSN station (red stars), planned sites (red-white stars) for completion, and the affiliate arrays (orange stars). FDSN Backbone Network stations are also shown (purple). Many GSN stations are cooperative with other networks, indicated by the symbol on the 'shoulder' of the star where our collaborators have provided equipment. Only one GSN site remains to be completed in 2009 by IRIS/IDA — WAHI United Arab Emirates. A proposed site on the West Antarctic Ice Sheet is being investigated.

The GSN continues to support the inclusion of additional sensors at GSN sites as part its Geophysical Observatory program. Recent installations include microbarographs on KNTN, Kanton Atoll and SLBS, Baja California, Mexico.

Telecommunications

The GSN uses a wide variety of telemetry systems coordinated with many organizations and hosts, illustrated in the GSN telemetry map. Eight new telemetry links have been implemented from 7/2007-2008, including new VSATs installed at the 7 new GSN sites. The Geophysical Survey of the Russian Academy of Sciences recently made provision for telemetry for 6 GSN sites in the Russian Far East. Cooperation with the Comprehensive Nuclear Test Ban Treaty Organization (CTBTO) in sharing their Global Communication Infrastructure system is an important component of GSN telemetry. CTBTO VSATs are now being used as the primary or backup links for GSN telemetry at 24 locations. Ten GSN stations in the Pacific Ocean are telemetered directly to the Pacific Tsunami Warning Center. Over 1 TByte/yr of GSN data are used by Tsunami Warning Centers internationally.

New Instrumentation

Next Generation Data Acquisition Systems (NGS). Systems integration of the NGS, based on the Quanterra Q330HR, has been completed by the USGS Albuquerque Seismological Laboratory and the UCSD IRIS/IDA group. Since July 2007, 14 NGS have been deployed in the GSN (see map).

Antarctic Remote Autonomous Station Design. GSN has received NSF Office of Polar Programs funding (in collaboration with IRIS PASSCAL and UNAVCO) to develop the basic power and communications infrastructure needed to run remote observatories in the polar environments year-round through the polar winter. Developments arising from this grant will be utilized for installing autonomous stations in both Antarctica and Greenland. In particular, progress has been made in powering systems in Antarctica throughout the polar year, using a combination of solar panels and lithium batteries. Designed and tested environment enclosures incorporate R50 vacuum panels with ancillary foam packing and specialized cable routing to minimize heat leakage, intended to maximize heat retention of the low power acquisition and power control systems. Lightweight structural elements for solar panels with fold-down design have been tested for transport in light-aircraft/helicopter and easy deployment to minimize time on the ground. All components can be handled in extreme cold with heavy gloves. A power control system provides automatic switching between primary lithium thionyl chloride battery packs and photovoltaic system to assure continuous system operations in transition from day to night. Lithium battery packs may be scaled specifically to the power model of particular equipment deployed.

In application to semi-permanent deployments in Greenland, the seismic system field package is expected to weigh <250 kg for surface installations, plus additional weight for borehole seismic gear. Nominal power requirements are: 3ch seismic site (Q330+Guralp3T=1 watt), with options for telemetry systems based on the proximity of existing infrastructure (Iridium 5 watt, cell modem 1 watt, radio link 1.5 watt).

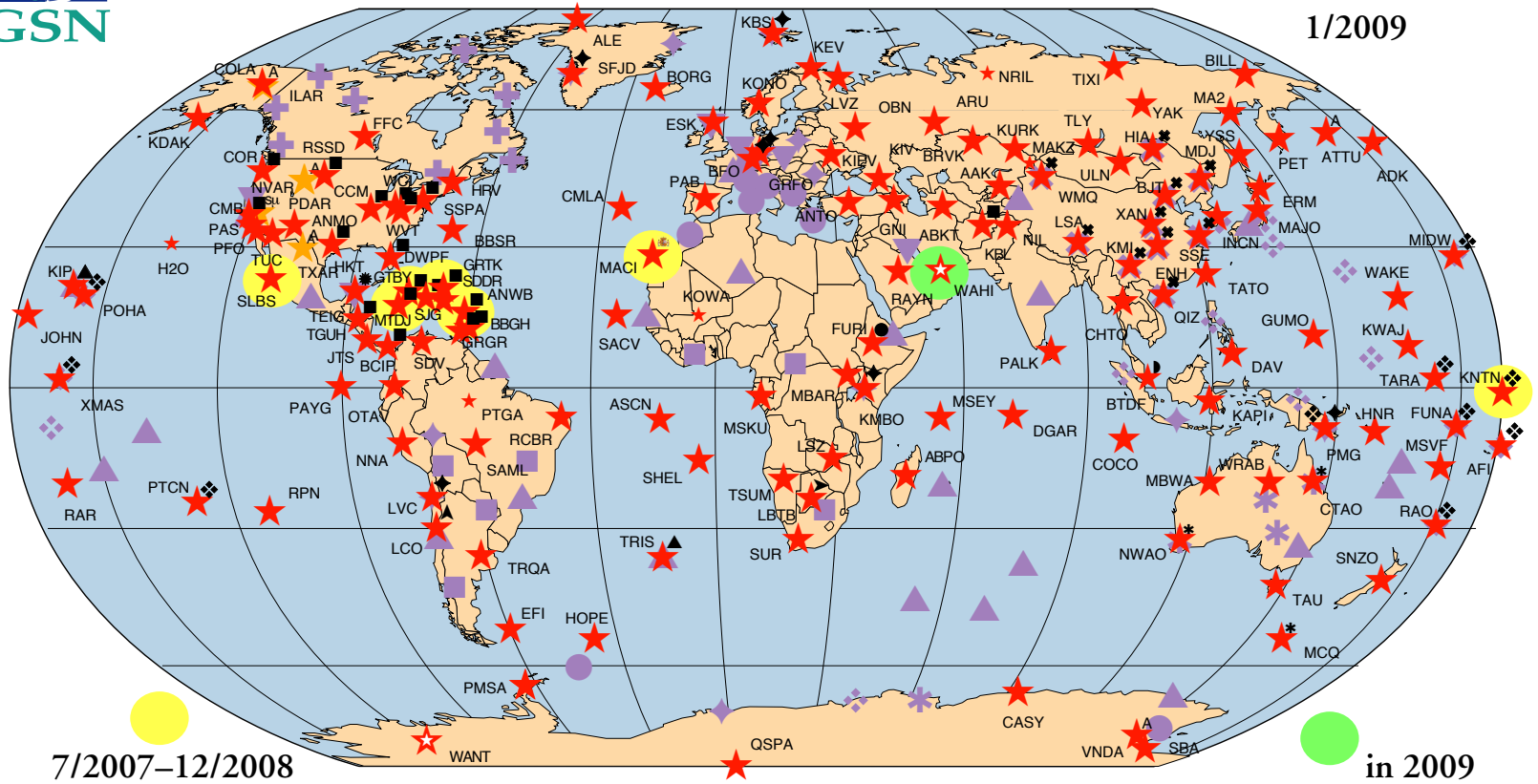
The first 20 instruments were deployed by PASSCAL during the 2007-2008 Austral Summer as part of International Polar Year (IPY) efforts of the NSF in the Antarctic, and were recently serviced during the current 08-09 Austral summer season. Preliminary results show a >88% data return which is comparable to standard PASSCAL deployments. Temperatures in the high Antarctic Plateau were typically -75C with ~6 months with no sun. Designs information may be found at http://www.passcal.nmt.edu/Polar/Design/.

GLOBAL SEISMOGRAPHIC NETWORK

& INTERNATIONAL FEDERATION OF DIGITAL SEISMOGRAPHIC NETWORKS

GSN

1/2009



7/2007–12/2008

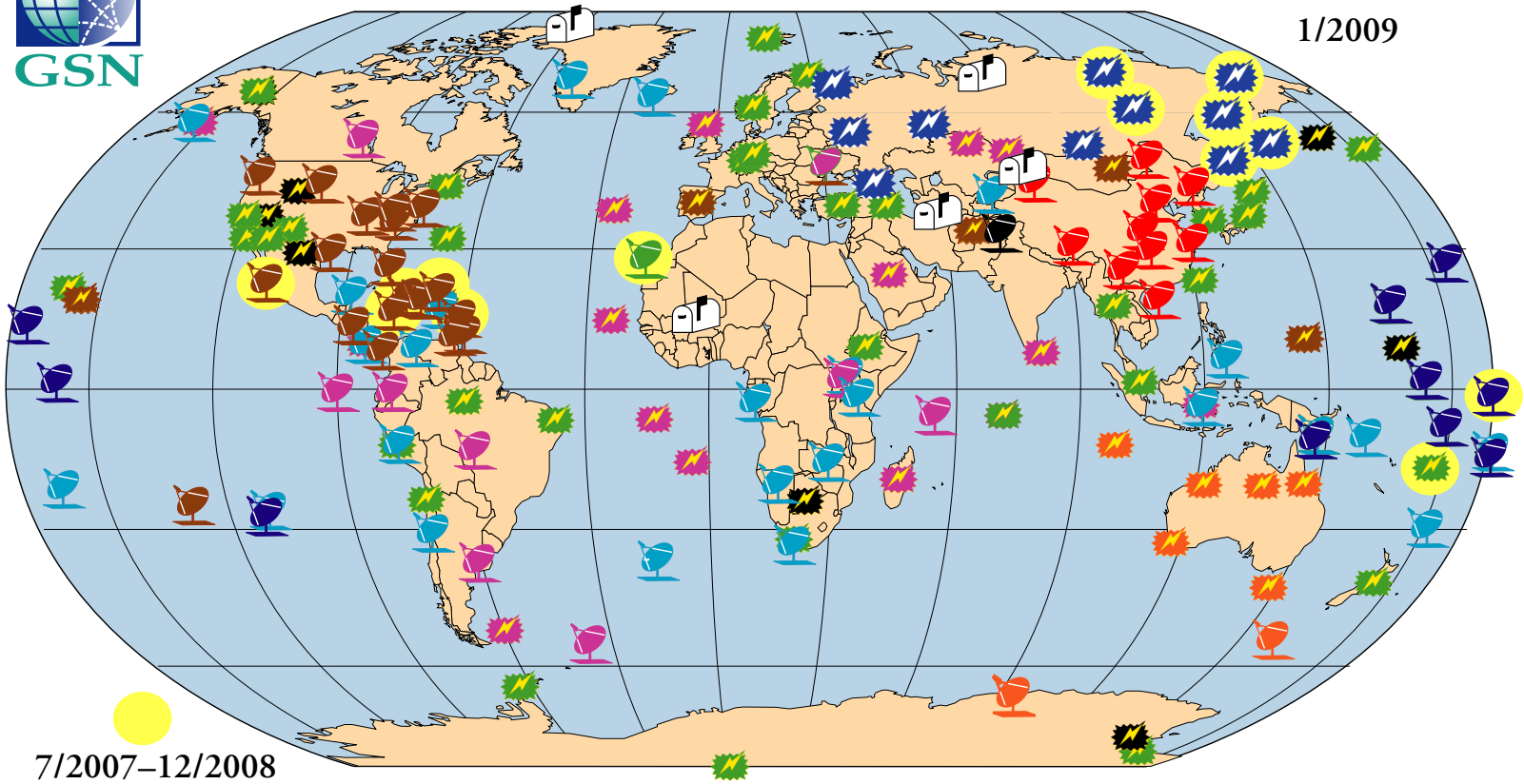
in 2009

IRIS Current	Affiliate Array	IRIS International & National Cooperative Sites: Geoscope	Japan	Mednet	Geofon/AWI/BGR/BFO	China/USGS	Mexico	Singapore	Botswana	Spain	Australia	USGS	AFTAC	SMU
★	★	▲	✤	●	✦	✖	✸	◗	➤	▣	✱	■	A	SU

GSN COMMUNICATIONS

GSN

1/2009



7/2007–12/2008

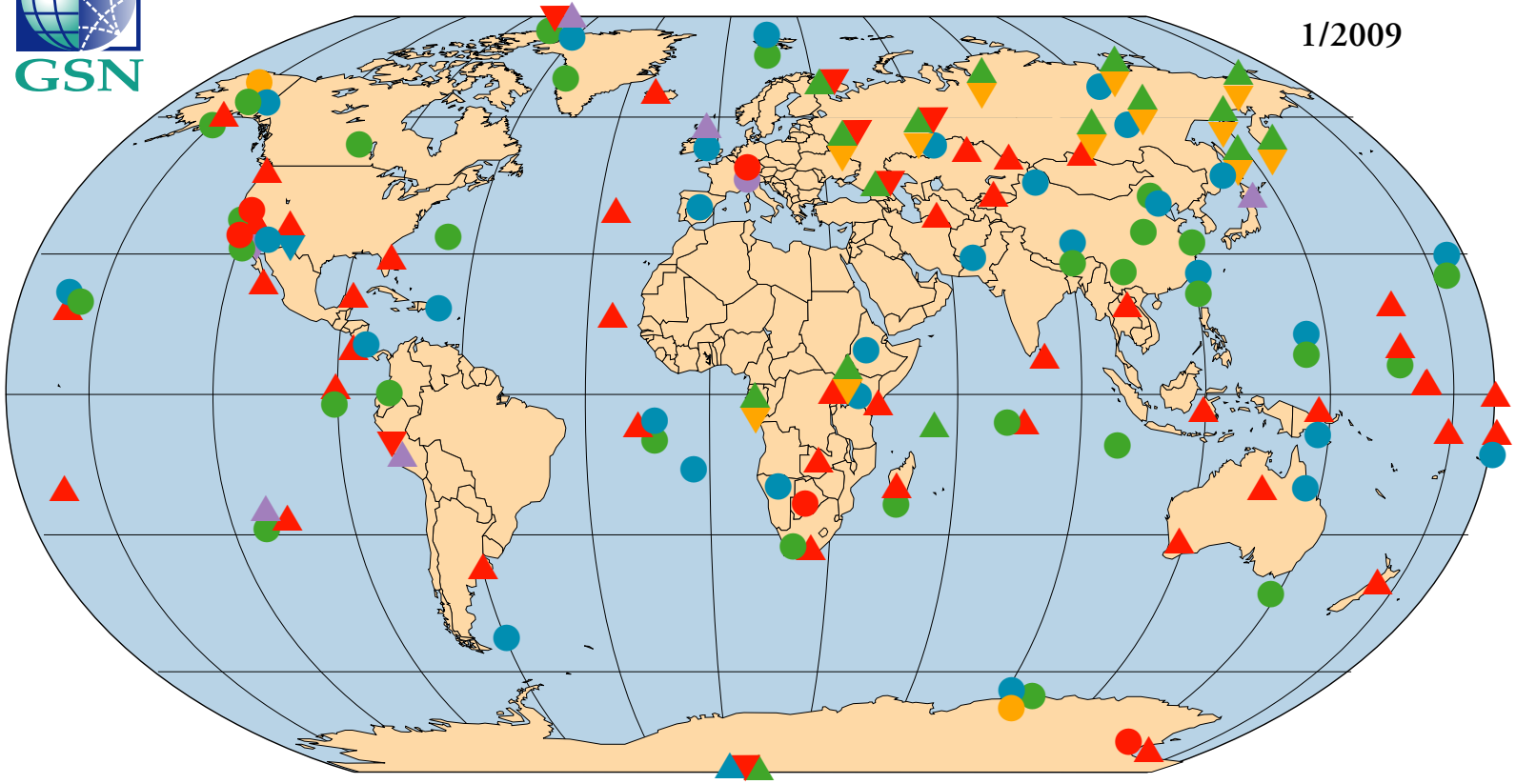
	IRIS/NSF	NWS	USGS	China	Australia	Russia	AFTAC/DoD	CTBTO	GSN Host
VSAT									
Internet				Delayed or blocked					

Data shipped via mail

GSN & GEOPHYSICAL OBSERVATORIES

GSN

1/2009



Co-located sensor
GSN sensor
Gravimeter
Magnetometer
GPS
Meteorological
Barograph

GLOBAL SEISMOGRAPHIC NETWORK

& INTERNATIONAL MONITORING SYSTEM (IMS)