The GEOSCOPE Program

State of the art in 2005

FDSN meeting, Santiago, Chile, Oct 2nd – 9th

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I - HISTORY

The GEOSCOPE program led by the Institute of Physics of the Earth of Paris (IPGP) was launched in 1982 by the National Institute of Sciences of Universe (INSU), a department of the French National Center of Scientific Research (CNRS). The purpose was the installation of about 25 seismic stations well distributed worldwide (in particular in the southern hemisphere), in the standard configuration defined by the FDSN (very broad-band 24 bit, continuous recording at 20 sps).

II - STATIONS

The GEOSCOPE program is operating 28 *digital 3-component very-broadband* stations (figure 1). Data from large events are teletransmitted from some stations (via dial-up phone line or through Internet) and become available to public within one day. A satellite transmission system is now working, in cooperation with the French agency CEA/DASE and with CTBTO (Dzumac in New Caledonia) the low-gain data are available continuously. A similar collaboration between CTBTO and GEOSCOPE has been extended to station ATD (Djibouti) since a few months.
In terms of site locations, the aim of the GEOSCOPE program is almost fulfilled. We re-installed the Chinese station **WUS** with modern equipment in October 2004. We also installed in December 2004 a new station **TAOE** in Marquesas Islands in cooperation with CEA/DASE and station **COYC** in Patagonia (Chile) in December 2004. We plan to install a second station **VOR** in **Russia** at high latitude inVorkuta. In the future, we will attempt to fill some geographical gaps in the southern hemisphere.

III – GEOSCOPE and the real-time: in 2005 SIX STATIONS IN NEAR REAL-TIME

The installation of new 24bit dataloggers (Q4128, Q330-6, DASE datalogger) allows us to receive data in near-real time from the following stations:
1- DZM Dzumac in New Caledonia
2- FDF Fort de France in French West Indies
3- SSB St Sauveur-Badole in France
4- RER Rivière de l'Est , La Réunion, Indian Ocean
5- KIP Kipapa, Hawaï, a joint USGS/IRIS/GEOSCOPE station
6- TRIS Tristan Da Cunha, a joint USGS/IRIS/GEOSCOPE station

The data are now available in near real-time in the Data Center in Paris and can be downloaded from: http://geoscope.ipgp.jussieu.fr/BUD_QUERY/bud_stuff/bud/bud_start.pl

IV- DATA AVAILABILITY

The GEOSCOPE Data Center has been completely reorganized around RAID disks system in 2000, where data from the period 1982-2005 are stored after data quality control. There are three main different media, CD-Roms for the data between 1982 and 1992, local disks for recently teletransmitted data, and RAID disks for all data from 1982 up to now. The most recent data are stored before quality control (Raw Data) and are accessible. The GEOSCOPE data can be obtained through following ways:

A) GEOSCOPE AutoDRM: the NETDC procedure (Networked Data Centers)

The necessity of distribution of large datasets to the seismic community leads to a new form of shared cooperative environment between different data centers. The NETDC idea makes the access to data transparent to users who should not bother about where to the data are actually located. The routing of data requests is solved by the coordination of the data centers.

Some Data Centers are currently networked (IRIS, GEOSCOPE, NCEDC (UC Berkeley) and ORFEUS) with the NETDC device. You can send a request (netdc@ipgp.jussieu.fr) and download the INVentory, the instrumental RESPonses and the DATA directly on your computer.

B) Anonymous ftp for recent events

Remote accessibility is possible from 15 teletransmitted stations by telephone line or through Internet link. You can get data for all recent events with magnitude Ms > 6.0 or with particular scientific interest (location, focal depth) within 1-2 days.

C) CDROM production (for data from 1982 to 1992)

All data from March 1982 (82.061) to July 1992 (92.189) are written on CD-Roms in old SEED format and the whole collection (37 CD-Roms) has been distributed worldwide without charge to about 200 users. After 1992, the CD-Rom production has been stopped because of the dominance of Internet as the data exchange tool.

V - OTHER PRODUCTS

A- THE GEOSCOPE STATION BOOK

The updated version of the station-book is available on the web site. It references the technical details for each station (http://geoscope.ipgp.jussieu.fr). The history of each station is described with information about the parent organization, the network affiliation, the vault conditions, the site description, the instrumentation, the sensors, the primary and auxiliary channels such as microbarometers and thermometers, the dates of upgrade, and the sensitivities in the flat part of the band-pass of the instrumental responses. The corresponding plots can be easily downloaded.

B -GEOSCOPE CMT DETERMINATION

An inversion method for the fundamental mode Rayleigh wave spectra has made possible the quick determination of the mechanism and the seismic moments. It's been proved that a correct CMT can be retrieved using few stations (GEOSCOPE and IRIS). This determination is done for all events with Ms > 6.8 from the teletransmitted stations data
(http://geoscope.ipgp.jussieu.fr/CMT/cmt.html).

C- THE SEISMIC NOISE LEVEL PLOTS of all GEOSCOPE stations

The estimate Power Spectral Density plots have been computed for the year 1995 and are available on the Web site, for the 3 channels VH, LH and BH, and the 3 components. We are determining, for all our stations, the noise level plots for the year 2004 and some of them are already available on our Web site
(http://geoscope.ipgp.jussieu.fr/STATIONS/bruit.html).

VI – PRESENT DEVELOPMENTS

A – REAL TIME TRANSMISSION OF CONTINUOUS DATA

In order to be ready for the next step which will consist in gathering data towards our Data Center in real-time, we have been replacing old Streckeisen digitizers with new Quanterras. Main goal is to link the maximum number of stations to the Data Center for real time and continuous transmission of data in few years. We are able to upgrade 3 or 4 stations per year, giving priority to those with an easy permanent link to Paris.

B - GEOSCOPE AND THE DEVELOPMENT OF MULTIPARAMETERS STATIONS

We plan to equip all our stations with microthermometers, microbarometers, in order to clean the seismic signal and to study potential correlations between the seismic signal and these environmental parameters. Some of our stations have long seismic time series (going back as far as 1982). SSB (Saint-Sauveur-Badole) in France and TAM (Tamanrasset) in Algeria also have long-term pressure measurements (as far as 1988). Removing the atmospheric pressure effect is absolutely necessary for scientists using low frequency free oscillation modes.
We are planning to cooperate with the GGP network (Global Geodynamics Project), for comparing both a vertical STS1 seismometer and a SG superconducting gravimeter, first in J9 site (near Strasbourg) and then in PPT (Papeete). The SG data will be distributed by the french FOSF-ORE Data Center in Paris (see paragraph VIID).

C – GEOSCOPE and the STS1 seismometers

Most GEOSCOPE stations are equipped with STS1 seismometers, only a few ones with STS2 seismometers. Because we plan to move some stations from the northern hemisphere to the southern one, in order to fill a geographical instrumental gap, we are fixing or upgrading a lot of STS1 seismometers. We plan also to re-install 3 STS1 at BNG (Bangui, Republic Centrafrican.

D - GEOSCOPE AND THE CTBTO

In the framework of the CTBTO/IMS (Comprehensive Test Ban Treaty Organization/International Monitoring System), a few GEOSCOPE stations have been chosen as auxiliary stations, DZM (Dzumac) close to NOUC in New Caledonia, ATD in Djibouti, MBO in Senegal, MPG in French Guiana. Despite all four GEOSCOPE sites involved by CTBTO are all auxiliary stations (ASxx) the GEOSCOPE Data Center will obtain continuous low-gain data from these four stations.

Presently, DZM (Dzumac in New Caledonia) is providing data in real time since 2004 http://geoscope.ipgp.jussieu.fr/BUD_QUERY/bud_stuff/bud/bud_start.pl
The CTBTO/GEOSCOPE ATD station has been installed a few months ago and the data will be available in a near future at our Data Center.

E - GEOSCOPE AND FOSF-ORE (Fédération de l'Observation Sismologique Française)

A new portal has been created (http://ffosl.ipgp.jussieu.fr) that corresponds to an extension of the GEOSCOPE Data Center (http://geoscope.ipgp.jussieu.fr). The data of all French efforts in broad-band seismology will be made available through this web site.
The networks concerned by this project are presently:

1) The GEOSCOPE network
2) The broad-band component of the RéNaSS program (REseau National de Surveillance Sismique) maintained by EOST (Ecole et Observatoire des Sciences de la Terre) of Strasbourg
3) The RLBM program (Réseau Large-Bande Mobile) which corresponds to temporary regional seismological experiments all around the world
4) The CAVASCOPE Program in South-West Pacific Ocean
5) A few stations of the French agency CEA/DASE network
6) The SG superconducting gravimeter of ST (Strasbourg) site
7) The French OBS experiments

F – GEOSCOPE AND TSUNAMI WARNING

As part of a new French initiative CNATOI (Centre National d'Alerte de Tsunami dans l'Océan Indien), GEOSCOPE is planning to use continuous real time data from stations in the Indian Ocean to monitor the seismic activity in this region with a purpose to incorporate this information in the future tsunami warning system.

VII – The GEOSCOPE Group

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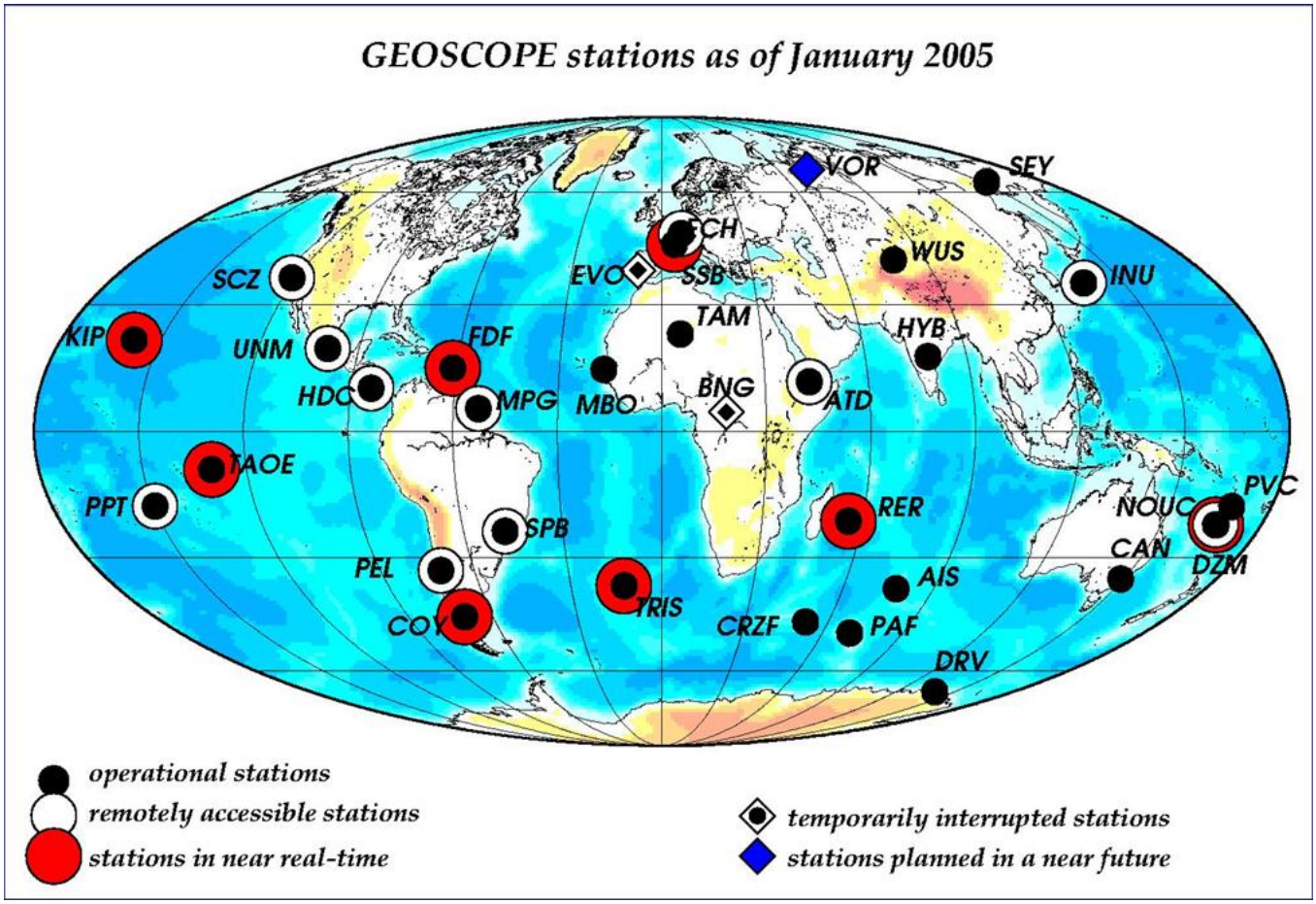
GEOSCOPE stations as of January 2005
VOR
SEY
CCH
WUS
INU
SCZ
EVO
SSB
TAM
HYB
KIP
UNM
FDF
HDC
MPG
MBO
BNG
ATD
TAOE
PPT
RER
PVC
NOUC
SPB
CAN
DZM
PEL
AIS
TRIS
COY
CRZF
PAF
DRV
operational stations
remotely accessible stations
stations in near real-time
temporarily interrupted stations
stations planned in a near future