The GEOSCOPE Program
status of the art in 2003

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I - INTRODUCTION

The GEOSCOPE program was launched in 1982 by the National Institute of Sciences of Universe (INSU), a department of the French National Center of Scientific Research (CNRS), at the instigation of the Institute of Physics of the Earth of Paris (IPGP). The purpose of the GEOSCOPE program was the installation of about 25 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 20sps).

II - STATIONS

The GEOSCOPE program is operating 28 *digital 3-component very- broadband* stations. The updated version of the station-book is available on the web site. It references any technical detail for each station (http://geoscope.ipgp.jussieu.fr). The location of all present and future GEOSCOPE stations is presented on the joint figure. Data from large events are teletransmitted for some stations (by phone line or through internet) and made available within one day. A satellite transmission system is now working, in cooperation with the french military agency CEA/DASE, in cooperation with CTBTO (Dzumac in New Caledonia). An agreement between GEOSCOPE and CTBTO allows us to get data continuously and with a low gain. The next CTBTO stations to be installed are ATD (Djibouti) and MBO (Senegal) in 2004.
In terms of siting locations, the aim of the GEOSCOPE program is almost fulfilled; we plan to install a new station in **MARQ** (Marquesas Islands), one in **Russia** at high latitude at VOR (Vorkouta), one in Patagonia (**COY** in Chile), a joint station with IRIS at **TRIS** (Tristan Da Cunha) in order to fill some geographical gaps in the southern hemisphere. DCC in Antarctica is a joint EOST/Concordia station. Our goal is now to replace our old digitizers by Quanterra ones, and to transmit all data in near real-time.

III - DATA AVAILABILITY

The GEOSCOPE Data Center has been completely reorganized around a RAID disks system. All incoming data are stored after data quality control. The media on which the data are stored depend on the date; there are three different media, CD-Rom for data spanning time from 1982 to 1992, a disk for recent teletransmitted data, and RAID disks for all data from 1982 up to now. Different ways for getting the GEOSCOPE data are available :

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

This is actually *the only way for getting the data*. The necessity for dissemination of large datasets to the seismic community lead to a new form of distribution with cooperative environment between the different data centers. The NETDC idea makes the access to data transparent to users, who should not bother about where to ask for data. The routing of the data request should be solved by the coordinating data centers.
Some Data Centers are currently networked (IRIS, GEOSCOPE, NCEDC (UC Berkeley) and ORFEUS) with the NETDC device. You can retrieve the INVentory, the instrumental RESPonses and the DATA directly on your disk.

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B) Anonymous ftp for recent events

The remote accessibility is possible in 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. Because the easier way of doing provided with Internet, the CD-Rom production is now stopped.

IV - OTHER PRODUCTS

A- THE GEOSCOPE STATION BOOK

On our Web site (http://geoscope.ipgp.jussieu.fr) the GEOSCOPE station-book is provided and very often updated. 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 as microbarometers and thermometers, the dates of upgrade, the sensitivities in the flat part of the band-pass of the instrumental responses. You can easily download the corresponding plots.

B -GEOSCOPE CMT DETERMINATION

An inversion method for the fundamental mode Rayleigh wave spectra has made possible the rapid determination of the mechanism and the seismic moments. The demonstration is done that a correct CMT can be retrieved by using few stations, and that in a laterally heterogeneous Earth. This determination is done routinely for all events with Ms > 6.8 from the teletransmitted stations data.

C- THE SEISMIC NOISE LEVEL PLOTS of all GEOSCOPE stations

The estimate Power Spectral Density plots have been computed for year 1995 and are available on the Web site, for the 3 channels VH, LH and BH, and the 3 components. We are determining the same plots for year 2003.

D - THE FRENCH SSB STATION RECORDED IN QUASI REAL-TIME DATA

Data are received from the french SSB station at our Data Center in quasi real-time. Every hour we get MH channel data for three 20 minutes length files. These data are automatically stored on a disk (during 2 days), and the corresponding plots available on the Web site. This station will be transmitted in real-time with an internet link through satellite next September.

E - DETERMINATION OF 'OVERLOOKED' EVENTS IN THE SOUTHERN HEMISPHERE

Some small to medium earthquakes are not detected and thus are not referenced in the earthquake catalogues. Most of these events are in the southern hemisphere where the lack of seismic stations creates a detection sensitivity gap. We estimate that more than a hundred southern hemisphere events per year with magnitude between 4.5 and 5.5 go undetected by the worldwide networks. We use a surface wave analysis method to effectively detect and locate these earthquakes, particularly near-ridge events.

V - NEW OR PROPOSED DEVELOPMENTS

A - GEOSCOPE AND THE DEVELOPMENT OF MULTIPARAMETERS STATIONS

We plan to equip all stations with seismometers but also with microthermometers, microbarometers, inclinometers, short period seismometers, 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.

B – 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 to install them in COY (Patagonia) in cooperation with Chile, at TRIS (Tristan da Cunha) in cooperation with IRIS/GSN, and in other African countries.

C -- GEOSCOPE AND THE CTBTO

In the frame of the CTBTO (Comprehensive Test Ban Treaty Organization), at least three GEOSCOPE stations have been chosen as auxiliary stations, DZU (Dzumac) close to NOUC in New Caledonia, ATD in Djibouti, MBO in Senegal. Dzumac in New Caledonia is providing data in real time (low gain continuous data). We are interested by doing the same in French Guiana (MPG) and Russia (SEY). These 5 sites are auxiliary stations of CTBTO.
Other GEOSCOPE stations will be teletransmitted by satellite with help of the french agency LDG/DASE in particular the stations located in the Indian Ocean).
WUS station teletransmission will be performed through a direct cooperation between GEOSCOPE and the Chinese Seismological Bureau (CSB) of Beijing in China.

GEOSCOPE stations as of May 2003