Participation of LEGOS-GRGS and CLS as an Analysis Center in the future IDS

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Purpose

LEGOS-GRGS and CLS intent to participate tightly to the IDS start-up, and propose their contribution as an Analysis Center. In that aim, they join their effort to regularly process the DORIS data and provide products required by the IDS.

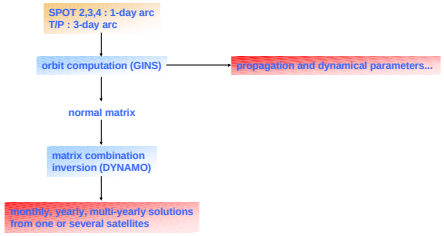
Processing of the DORIS data is performed using the GINS/DYNAMO software developed at GRGS for precise orbit computation.

The Analysis Center will contribute to the data processing of the DORIS campaigns proposed in the frame of the IDS.

The parameterisation possibilities of GINS/DYNAMO allow orbit simulation for new missions (ex. micro satellite with DORIS and accelerometer onboard).

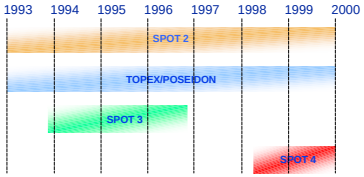
A web site is currently being developed to provide information relative to the products performed by the Analysis Center. It will include various graphic outputs (position time series, plots and statistics of the estimated coefficients...), information on the processing and on the day-to-day system operations from the CLS DORIS Control and Processing Center (daily reports, lists of events, data calendar, meteorological data...).

Processing Method



The method of analysis is a dynamical one which consists of computing the satellite's orbit, beacon positions and velocities, and Earth orientation parameters, in a single inversion, together with a number of selected parameters required to improve the acceleration model and corrections to the measurements. Orbit computation is performed on a daily basis for SPOT-2, SPOT-3 and SPOT-4, and on 3-day arcs for TOPEX/Poseidon.

Analysed Data



Because the geodetic performances are growing with the number of satellites, we chose to use the DORIS data over the common period of Spot2 and TOPEX/Poseidon.

At this date, we have analysed all the DORIS data from January 1993 to December 1999 as well as the Laser data on Topex. Data of year 1999 were processed with the last adopted strategy (GRIM5).

We plan to re-analyse the years 1993-1998 in the same way.

Processing strategy

Along the years, various evolutions have been brought to the computation strategy and to the software.
The main recent evolutions are the use of: density atmospheric model DTM94, atmospheric gravitational and loading effects, laser data on TOPEX/POSEIDON, geopotential model GRIM5.
The last adopted strategy is described below.

Reference system
J2000, origin at the Earth's centre of mass, precession, nutation
Daily earth orientation parameters from IERS EOP 97C04 series

Dynamical model

R, 1/f, w, GM	: IERS96 standards
Gravitational potential	: **GRIM5** up to degree 99 and order 95
Terrestrial tides	: Wahr's model
Ocean tides	: derived from the GRIM5 computation
Polar tide	: Gegout's model with correction of Love's numbers
Atmospheric density	: **DTM94**
Relativity	: Schwarzschild's model

Gravitational perturbations of Moon , Sun, Mars, Venus, Jupiter, Saturn and Mercury
Direct and reflected radiation pressure
Atmospheric gravitational effect

Geometrical model

Tropospheric refraction	: CNET model for Doppler ; Marini model for Laser
Ionospheric refraction	: dual-frequency correction at 1st order
3D positions and velocities	: "1993-1998" DORIS solution for the DORIS stations GRIM5 solution for the Laser stations

Solid Earth tides, Ocean and atmospheric loading effect
Geometric model of each satellite

Adjusted parameters

Satellite orbit	: 3-day arcs for Topex and 1-day arcs for Spot
Atmospheric drag coefficients	: 1 constant / 5 hours and 2 at orbital period for Spots 1 constant / 0.5 day for Topex
Solar pressure coefficients	: 1 constant / arc for Spots and Topex
Hill's coefficients	: 2 at orbital period in normal direction for Spots and Topex 2 at orbital period in tangential direction for Topex
Bias per pass and per station	: 1 zenithal and 1 frequency for DORIS ; 1 range for Laser

Products

Various products are generated with the GINS/DYNAMO software. They are indicated below (✓). The other listed products could additionally be performed.

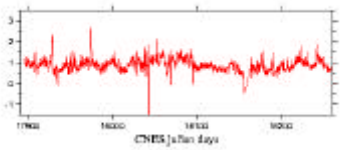
These basic products may be completed at some specific occasions; for example analysis of ionospheric corrections during a strong solar activity period or calculations for tectonic investigations on a DORIS temporary site (ex. DORIS campaigns at Dome Concordia).

	Per satellite	Multi-satellite
3D Positions		
Weekly		
Monthly	✓	✓
Yearly	✓	✓
Multi-Yearly	✓	✓
3D Velocities		
Multi-yearly		✓
Earth Orientation Parameters		
Daily	✓	✓
Coordinate time series		
Weekly		
Monthly	✓	✓
Geocenter		
Weekly		
Monthly	✓	✓
Gravity field coefficients : Constant terms, temporal derivatives		
Weekly		
Monthly		
Multi-yearly		
Ephemeris		
Per arc	✓	
Ancillary products : tropospheric bias, drag coefficient...		
Per arc	✓	

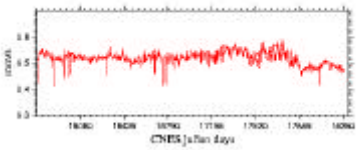
✓ = existing products

Some products soon on line

Drag coefficients - SPOT2 - 1999

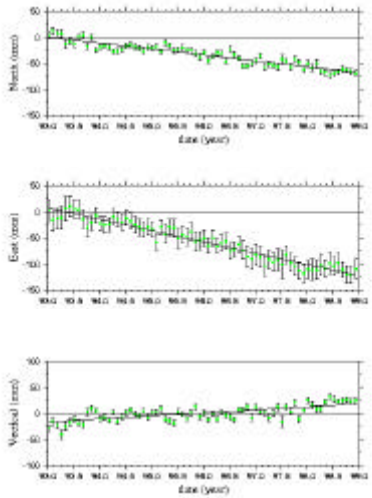


Orbit residuals - TOPEX - 1993 to 1999



YELLOWKNIFE Coordinate time series

SPOT2,SPOT3,TOPEX - 1993 to 1998



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Contacts and links

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IDS http://ids.cls.fr
CNES http://www-projet.cst.cnes.fr:8060/DORIS/index.html
CLS http://www.cls.fr
LEGOS-GRGS http://www.omp.obs-mip.fr/omp/legos