International DORIS Service (IDS)

http://ids-doris.org

Chairman : Pascal Willis (France)

Overview

The current report presents the different activities held by all components of the International DORIS Service (IDS). In a first step, we will present the current status of the DORIS system (available satellites and tracking network). In a second step, we will present the activities of the IDS Central Bureau (IDS Web site management and DORIS-related email distributions). We will then focus on the most recent activities conducted by the Analysis Centers (ACs) and the Analysis Coordination in preparation of ITRF2008. Finally, we will present other activities related to meetings and publications.

1 DORIS system

1.1 DORIS satellites

During this report period (2008-2009), the number of DORIS satellites has remained between five and six (see Table 1).

Table 1: DORIS data available at IGN. As August 2009

Satellite	Start	End	Type
SPOT-2	31-MAR-90 04-NOV-92	04-JUL-90 15-JUL-09	Remote sensing
TOPEX/Poseidon	25-SEP-92	01-NOV-04	Altimetry
SPOT-3	01-FEB-94	09-NOV-96	Remote sensing
SPOT-4	01-MAY-98	-	Remote sensing
SPOT-5	11-JUN-02	-	Remote sensing
Jason-1	15-JAN-02	-	Altimetry
ENVISAT	13-JUN-02	-	Altimetry, Environment
Jason-2	12-JUL-08	-	Altimetry

In mid 2008, a new DORIS satellite (Jason-2) was launched including a new generation receiver on-board: digital, 7-channel, allowing direct phase measurement like GPS (instead of Doppler data).

In the near future, several new DORIS satellites are already planned (and approved): CryoSat-2, SARAL, HY-2A, Jason-3,… This should increase or at least stabilize the number of DORIS satellites in the 2010-2016 time period. In July 2009, the SPOT-2 satellite was prepared for decommissioning. A series of maneuvers changed the orbit so the spacecraft will re-enter the Earth's atmosphere in less than 25 years. SPOT-2 was launched in 1990 with a

planned six-month test mission. After 19 years of successful operations, it has greatly exceeded the most optimistic expectations.

1.2 DORIS tracking network

The DORIS permanent tracking network remains very stable (Figure 1). About 50% of the DORIS stations are in co-location with other geodetic space techniques: GPS (38), SLR (9) and VLBI (6).

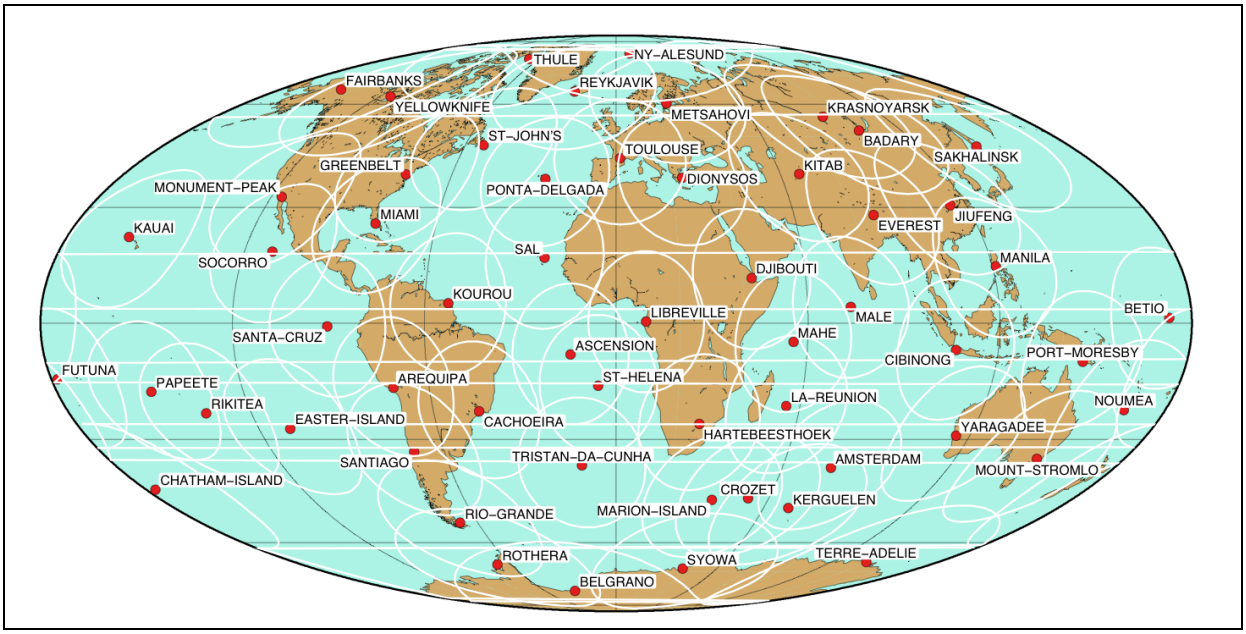

Figure 1: DORIS permanent tracking network. July 2009.

The renovation of the DORIS network is now complete. Most of the DORIS beacons (55) are third generation beacons (except two), and use a stable geodetic mount (cf. Fagard, 2006).

2 IDS Governing Board

Following the IDS status, a new Governing Board was elected at the end of 2008 (see Table 2).

Table 2: IDS Governing Board following elections in December 2008

Name	Institution	Country	Mandate
Hervé Fagard	IGN	France	Network representative
Pascale Ferrage	CNES	France	Member at large
Frank Lemoine	GSFC	USA	Analysis Coordinator
Chopo Ma	GSFC	USA	IERS representative
Carey Noll	GSFC	USA	Network representative
Michiel Otten	ESOC	Germany	IAG representative
John Ries	U. Texas/CSR	USA	Member at large
Laurent Soudarin	CLS	France	Director IDS Central Bureau
Pascal Willis (chair)	IGN/IPGP	France	Analysis Center representative

3 IDS Central Bureau

3.1 IDS Web site

The IDS Central Bureau maintains the IDS website. In 2009, the URL was changed to http://ids-doris.org. Users were asked to use the new address (DORISmail 624). The IDS website archives information of direct interest to the IDS Analysis Centers and to the DORIS community in general:
- DORIS results such as plots and data of DORIS station coordinate time series at http://ids-doris.org/network/ids-station-series.html
- DORIS station site logs at http://ids-doris.org/network/sitelogs.html
- daily statistics of Precise Orbit Determination (POD) residuals per station
- specific events affecting DORIS satellites (maneuvers, change of on-board software,..) or stations (discontinuity, data gap or temporary failures,…)

In particular, a kml file was created to allow a virtual tour of DORIS tracking stations on GoogleEarth.

Access to the IDS website is still steadily increasing from month to month since spring 2000. In early 2009, this website was accessed about 2000 times each month on a regular basis.

3.2 IDS Mail system

Several types of emails are distributed by the IDS Central Bureau:
- DORISMail: general DORIS interest
- DORISReports: reports related to DORIS data and products
- AWG and IDS Analysis Forum: technical discussion between analysis centers, combination and coordination

Everyone is welcome to subscribe to any of these emails. See more details on http://ids-doris.org/report/mails.html

4 IDS Data Centers

The IDS data flow organization remains the same, but is now more robust. It is based on two data centers: one on the East Coast of the U.S. (CDDIS at NASA GSFC) and one in Europe (IGN in France). Recently, the two data centers were gradually upgraded in order to be exact mirrors of each other and to be able to continue on an operational basis, even if one of them is inaccessible due to a temporary failure.

These two data centers archive the DORIS data as well as the IDS products (station coordinates and velocity, geocenter motion, earth orientation parameters, ionosphere data, etc.).

5 IDS Analysis Centers

Like the other technique-services in IAG, IDS has now a large number of independent Analysis Centers.

Table 3: List of IDS Analysis Centers submitting time series of weekly station coordinates in preparation of ITRF2008. July 2009.

Acronym	Analysis Center	Country	Software package
ESA	ESOC	Germany	NAPEOS
GAU	Geoscience Australia	Australia	GEODYN
GOP	Geodetic Observatory Pecny	Czech Rep.	Bernese
GSC	GSFC	USA	GEODYN
IGN	IGN	France	GIPSY/OASIS
INA	INASAN	Russia	GIPSY/OASIS
LCA	CNES/CLS	France	GINS/DYNAMO

In preparation for ITRF2008, seven AC's submitted long time series of DORIS results in SINEX format from 1993.0 to 2009.0 (Table 3). Besides these operational groups, several other groups are also considering to join in the future, such as NCL in Newcastle, UK. Even for those using the same software packages (IGN-INASAN for GIPSY/OASIS and GSFC-Geoscience Australia for GEODYN), great care was taken to define the processing strategies to be at the same level of quality but using different approaches (e.g., Gravity field model, tropospheric mapping functions, etc.).

This approach is a complete change for IDS, as in the past only two independent solutions were regularly submitted to the previous ITRF combinations. Several meetings were held by the Analysis Coordinator (Frank Lemoine), inviting all AC's to make them benefit from the experience of the other groups, to compare results, and to prepare for the AC submissions for ITRF2008.

6 IDS Combination

For the first time, IDS made a combined time series of all available weekly solutions (from 1993.0 to 2009.0).

For the first time, DORIS satellites orbits derived from the seven AC's were systematically inter-compared. This allowed us to isolate processing anomalies and assured that the processing of the DORIS data was at a comparable level for all the AC's. The results were excellent, showing agreement at the 1-2 cm level in the radial component, even without trying to select compatible data processing strategies for models or parameter estimation.

Following the availability of ITRF2005, a new DPOD2005 coordinate data set was derived, expanding to new DORIS stations or to stations not considered in the original ITRF2005, due to non-linear displacements. DORIS stations' discontinuities were also analyzed. A dedicated Web page was created: http://www.ipgp.fr/~willis/DPOD2005.htm

7 Meetings

In 2008 and 2009 years the IDS organized the following meetings:
- DORIS Analysis Working Group Meeting, Paris, France, 13-14 March, 2008
- DORIS Analysis Working Group Meeting, Paris, France, 5-6 June, 2008
- IDS Workshop, Nice, France, 12-14 November, 2008
- DORIS Analysis Working Group Meeting, Paris, France, 23-24 March, 209

All presentations from these meetings are made available by the Central Bureau on the IDs website at http://ids-doris.org/meetings/ids-meetings.html

8 Publications

In 2006, a DORIS Special Issues was published in the Journal of Geodesy 80(8-11), including 17 peer-reviewed articles.

A second DORIS Special Issue is currently in preparation in Advances in Space Research.

IDS published a 2006-2008 activity report and a 2009 activity report that were broadly distributed to all DORIS participants and relevant services (see http://ids-doris.org/report/governing-board.html#activity)

All DORIS related articles published in international peer-reviewed journals are available on the IDS Web site at http://ids-doris.org/report/publications/peer-reviewed-journals.html

Conclusions

In conclusion, even if the DORIS context is rather stable in terms of network and satellite constellation, a major change happened to the IDS as seven Analysis Centers now actively participate in operational DORIS data processing and as a combined IDS solution is now available in preparation of ITRF2008. The launch of the new Jason-2 satellite should also open some new opportunities in the IDS, as it brings more data (7-channel receiver), better quality (equivalent to 0.3 mm/s) and the possibility to process these data using a GPS-type technique (access to raw DORIS phase measurement instead of Doppler data). In the near future several new satellites of this type should be launched, insuring a minimum of four DORIS satellites for the 2010-2016 time period.