

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. Finally, we will present other activities related to meetings and publications.

1 DORIS system

1.1 DORIS satellites

During this report period (2013), the number of DORIS satellites has decreased to five (see Table 1).

Table 1: DORIS data available at IDS Data Centers. As of December 2013

In June 2013, SPOT-4 was decommissioned after 15 years of a successful mission. It was launched in 1998 and featured the first DORIS real time on-board orbit determination (DIODE).

Jason-1 was passivated and decommissioned on 01 July 2013, terminating the mission after 11.5 years of operations

SARAL-Altika Indian-French satellite (ISRO/CNES) was launched on February 25 2013 with a DORIS DGXX receiver onboard.

Some other DORIS missions are under development and should guarantee a constellation with at least 4 DORIS contributor satellites through 2030:

- SENTINEL3A (GMES/ESA) is planned for end 2015, then SENTINEL 3B 12 to 30 months later.
- Jason-3 (EUMETSAT/NOAA/CNES) is foreseen for march2015
- Jason CS (Eumetsat/ESA/CNES) is expected from 2020
- SWOT is foreseen for 2020

1.2 DORIS network

The DORIS network still provided a reliable service in 2013. The joint effort of CNES, IGN and all host agencies offered outstanding network availability with an annual mean of 88 % of operating stations. We were able to anticipate and respond in a timely way to the network events, and in parallel, we continue to carry out installation and renovation in order to keep up the network performance level.

The main events of the year are:

- new station at “Le Lamentin” in the French West Indies (Martinique) aiming at increasing the network density in this region and first DORIS station located on the Caribbean tectonic plate;
- renovation and local tie survey at St John’s, Yellowknife (Canada) and Grasse (France);
- with a view to installing a new station, Chatham Island (NZ), Nicaragua and Hokkaido Island (Japan) were also visited.

Grasse has been chosen as an experimental site. It is now equipped with geodetic control points in order to monitor the monument stability. The first observing campaign was carried out this summer.

Thanks to the REGINA network deployment (see IDS Activity Report 2011, section 5), co-locations with IGS GNSS stations stepped up to forty and a lot of high precision local tie surveys were carried out by IGN during the last three years as an important contribution to ITRF2013.

- The activity reports for 2012 were added (IDS Activity report, report for IERS) as well as the minutes of the IDS GB meetings held in 2013:

<http://ids-doris.org/report/governing-board.html>

- The list of the peer-reviewed publications related to DORIS has been enriched with 7 new references of articles published in 2013:

<http://ids-doris.org/report/publications/peer-reviewed-journals.html#2013>

- The pages Sitelogs have been upgraded.

<http://ids-doris.org/network/sitelogs.html>

- The previous codes of the stations have been added in the table of the main page. In addition, the URL links have been changed. The station's name is used instead of one of the station's codes.
 - Several updated versions of site logs has been provided by IGN, (among them the site logs for Le Lamentin and Grasse), as well as more than 70 photos of station monumentations and host agency staffs. (see also <http://ids-doris.org/gallery.html>)
- The letter from the International Council for Science (ICSU) World Data System (WDS) accepting IDS as a Network Member has been put on line:

http://ids-doris.org/documents/report/WorldDataSystem/WDS-NetworkMember_IDS_20131010.pdf

- Links to brochures and videos about DORIS available on AVISO website have been added:

<http://ids-doris.org/analysis-documents.html#general>

New documents and files were put on the IDS ftp site. They are listed hereafter:

- “DORIS system definition” is a new document describing the DORIS missions, then the DORIS system in details, with its external and internal connections. It applies to the DORIS system from the DGXX generation:

ftp://ftp.ids-doris.org/pub/ids/DORIS_System_Definition.pdf

- “Saral characteristics for DORIS calibration plan and POD processing” is a new document that describes the SARAL satellite characteristics:

ftp://ftp.ids-doris.org/pub/ids/satellites/Saral_CharacteristicsForDORISCalibrationPlanAndPODProcessing.pdf

- A note about “station equipment and impact on the frequency” which reminds the possible changes of emitting frequency in case of equipment changes for the three kinds of DORIS beacons (Orbitography, Master, and Time beacons):

<ftp://ftp.ids-doris.org/pub/ids/stations/AboutStationEquipmentAndFrequency.pdf>

- version #4.5 of the document describing the modelling of DORIS 2GM instruments (cleaned of any reference to Cryosat-1):

ftp://ftp.ids-doris.org/pub/ids/satellites/DORIS_instrument_modelling_2GM.pdf

- version #5 of the document describing the DORIS satellite models implemented in CNES POE processing; it includes SARAL and updates on SPOT-5 solar panel offsets:

<ftp://ftp.ids-doris.org/pub/ids/satellites/DORISatelliteModels.pdf>)

- updated version of the DORIS internal tie file

ftp://ftp.ids-doris.org/pub/ids/stations/DORIS_int_ties.txt

- The sitelogs were all gathered in:

<ftp://ftp.ids-doris.org/pub/ids/stations/sitelogs/>

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
- DORISstations: information about station events (data gap, positioning discontinuities)

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. 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). They are both exact mirrors of each other, and so, are 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.).

The main events of the year are listed hereafter:

- Data from SARAL launched in February 2013 are now archived in the IDS Data Centers, in data format 2.1 and in RINEX version 3.0 (phase data), as it is the case for the DGXX receivers on Jason-2, Cryosat-2, and HY-2A.
- The Jason-1 satellite suffered a system failure in June 2013; the satellite was decommissioned shortly thereafter. The SPOT-4 satellite was de-orbited in June 2013. The number of operational satellites with a DORIS beacon is now at five.
- In the fall of 2012, the IDS Analysis Working Group requested a test data set where data from stations in the South Atlantic Anomaly (SSA) were reprocessed by applying corrective models. Data from 2011 in DORIS V2.2 format from the Jason-1 satellite (cycles 331 through 368) were submitted to the IDS data centers in late 2012; a set of SPOT-5 data (cycles 138 through 432, 2006 through 2013) were provided in 2013. These files were submitted to the IDS data centers and archived in dedicated directories.

- A solution (designated “ids”) produced by the IDS combination center from the individual IDS AC solutions started production in 2012.

5 IDS Analysis Centers

Geoscience Australia has ceased its activities as an IDS Analysis Center in December 2012. The other six Analysis Centers continue to remain active, participating in the IDS activities, with a very important commitment in the Analysis Working Group (AWG) and the preparation of the DORIS contribution to ITRF2013.

Table 3: List of IDS Analysis Centers participating in the analysis activities in 2013.

6 IDS Combination

In addition to its operational activities of evaluation and combination of all the individual ACs weekly solutions, the IDS Combination Center has been involved in several studies related to the forthcoming DORIS contribution to ITRF2013. Conclusions of the two main studies are briefly developed hereafter. For more details on the IDS CC activities, we refer to the 2013 IDS annual activity report.

Based on the IDS Combination Center presentation done during AGU 2012 Fall meeting, ESA and GSC started 2013 by implementing beacon frequency variations. As depicted by Figure 2 and Figure 3, the updated series ESA 07 and GSC 18 have no longer scale jumps early 2002 while DORIS data format has changed. These corrections should improve the homogeneity of the combined scale.

With the delivery by CNES of both Starec and Alcatel DORIS antennas phase laws (PCVs), the two last quarters of 2013 were devoted to the evaluation by IDS CC of the impact of including these phase laws. Based on the evaluation of GOP, GSC and LCA tests series presented during the AWG in Washington (October 2013), and as expected, the major impact of the phase laws is on the scale (Figure 4). So far, some additional tests have to be performed in order to precisely understand the influence of these laws, notably to see any dependence with the time evolution of the network in terms of antennas type as well as any correlation with arrival of new DGXX missions. Nevertheless, due

to the impact of the phase laws on the scale, all the IDS ACs agreed in Washington that those who will not use the phase law, will participate in the combination but not for the combined scale from DORIS.

Last but not least, in 2013, the IDS Combination Center joined both EGU and AGU fall meetings where it presented two oral presentations respectively titled “Impact of beacon frequency changes on the DORIS contribution to ITRF2008” and “Status of DORIS contribution to ITRF2013”.

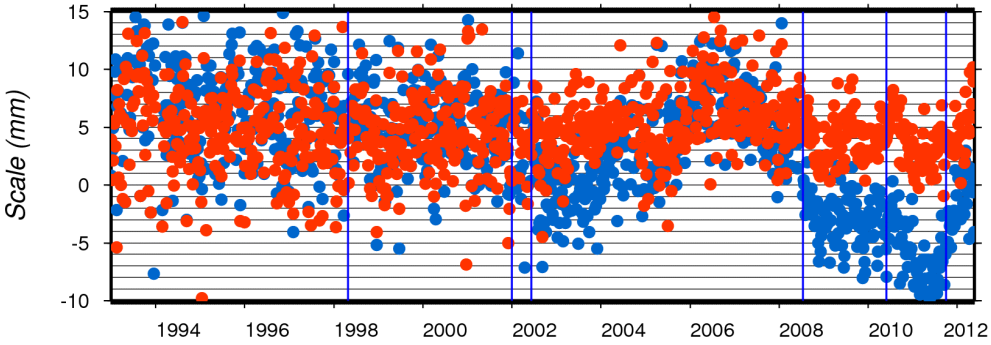


Figure 2 – Scale wrt ITRF2008 of ESA series 06 (blue) and 07 (red, 06 + beacon frequency variations).

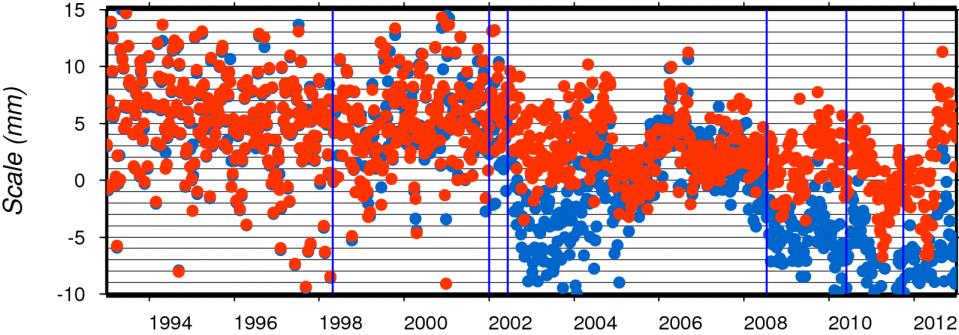


Figure 3 - Scale wrt ITRF2008 of GSC series 15 (blue) and 18 (red, 15 + beacon frequency variations).

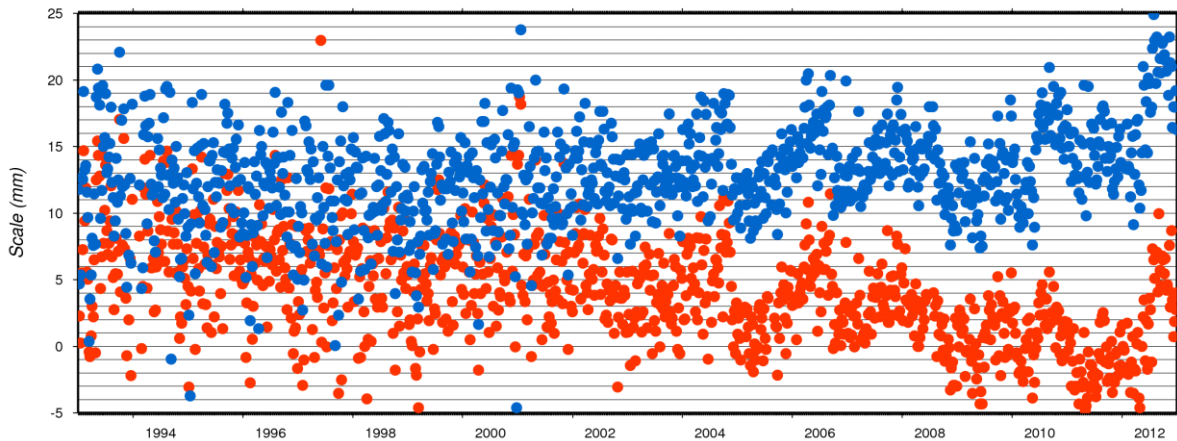


Figure 4- Scale impact of DORIS antennas phase laws as observed by GSC (red=series 20 without phase laws, blue = series 21 == series 20 + phase laws).

7 Meetings

In 2013, the IDS organized two DORIS Analysis Working Group (AWG) meetings, first in Toulouse, France, on April 4 and 5, then in Greenbelt, Maryland, USA, on October 15 and 16.

All the presentations from these meetings are made available by the Central Bureau on the IDS website at:

<http://ids-doris.org/report/meeting-presentations/ids-awg-04-2013.html>

<http://ids-doris.org/report/meeting-presentations/ids-awg-10-2013.html>

8 Publications

IDS published a 2012 activity report that was 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 <http://ids-doris.org/report/publications/peer-reviewed-journals.html>.

Conclusions

In conclusion, the DORIS community had a productive year in 2013. The IDS has continued validation studies in preparation for ITRF2013 and started the

processing of 20 years of DORIS data (1993-2013), involving the Analysis Centers and the Combination Center.

Despite the missions of Spot-4 and Jason-1 have stopped in 2013, the IDS gladly noted the successful launch of SARAL. This means that to ensure its mission, IDS can rely on a constellation of five DORIS receivers since July 2013: SPOT-5 with a 2nd generation DORIS receiver, and Jason-2, Cryosat-2, HY-2A and Saral equipped with the last generation of DGXX receiver. In addition, several new satellites equipped with DGXX instruments should be launched in the near future, starting with Jason-3 and Sentinel-3A in 2015.