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Overview

The International DORIS Service was established in 2003 with the primary mission to provide a service to support geodetic and geophysical research activities through DORIS data and derived products.
The current report summarizes the different activities held by the IDS components from 2020 to 2023. More detailed information can be found in the IDS Reports available for reading and downloading from the IDS website at https://ids-doris.org/ids/reports-mails/governing-board.html#activity.

1 DORIS system

1.1 Satellites

During this report period, the number of DORIS satellites has increased of three (see **Table 1**). While the HY-2A mission ended in September 2020, four DORIS-equipped satellites were launched between that month and December 2022:

- HY-2C (21 September 2020)
- Sentinel-6A, the so-called Sentinel-6 Michael Freilich (21 November 2020)
- HY-2D (19 May 2021)
- Swot (16 December 2022).

As of now, nine DORIS instruments are simultaneously operational, all belonging to the same DGXX-S generation. These instruments are on board satellites launched between 2010 (Cryosat-2) and 2022 (SWOT), at altitudes of between 720 and 1336 km, with inclination ranging between 66 degrees (TOPEX-like inclination) and 92 to 98 degrees (near-polar orbits), with SWOT offering a 4th orbit plane at 78° (see **Figure 1**). This current configuration represents an unprecedented availability of DORIS instruments, since the number of embarked receivers currently in operation, nine, is as large as the total number of past missions that have contributed to the IDS over three decades, from the inaugural SPOT-2 mission in 1990 to the conclusion of the HY-2A mission in 2020.

Several missions scheduled after 2024 secure DORIS future until 2033 at least (Sentinel-3C, Sentinel-3D, Sentinel-6B, HY-2E, HY-2F…).

Satellite	Start	End	Mission
SPOT-2	31-MAR-90 04-NOV-92	04-JUL-90 15-JUL-09	Remote sensing
TOPEX/Poseidon	25-SEP-1992	01-NOV-2004	Altimetry
SPOT-3	01-FEB-1994	09-NOV-1996	Remote sensing
SPOT-4	01-MAY-1998	24-JUN-2013	Remote sensing
JASON -1	15-JAN-2002	21-JUN-2013	Altimetry
SPOT-5	11-JUN-2002	1-DEC-2015	Remote sensing
ENVISAT	13-JUN-2002	08-APR-2012	Altimetry, Environment
JASON -2	12-JUL-2008	10-OCT-2019	Altimetry
CRYOSAT-2	30-MAY-2010	-	Altimetry, ice caps
HY-2A	1-OCT-2011	14-SEP-2020	Altimetry
SARAL/ALTIKA	14-MAR-2013	-	Altimetry
JASON-3	19-JAN-2016	-	Altimetry
SENTINEL-3A	23-FEB-2016	-	Altimetry
SENTINEL-3B	25-APR-2018	-	Altimetry
HY-2C	21-SEP-2020	-	Altimetry
SENTINEL-6A	21-NOV-2020	-	Altimetry
HY-2D	19-MAY-2021	-	Altimetry
SWOT	16-DEC-2022	-	Interferometric altimetry

Table 1. DORIS data available at IDS Data Centers. As of September 2023

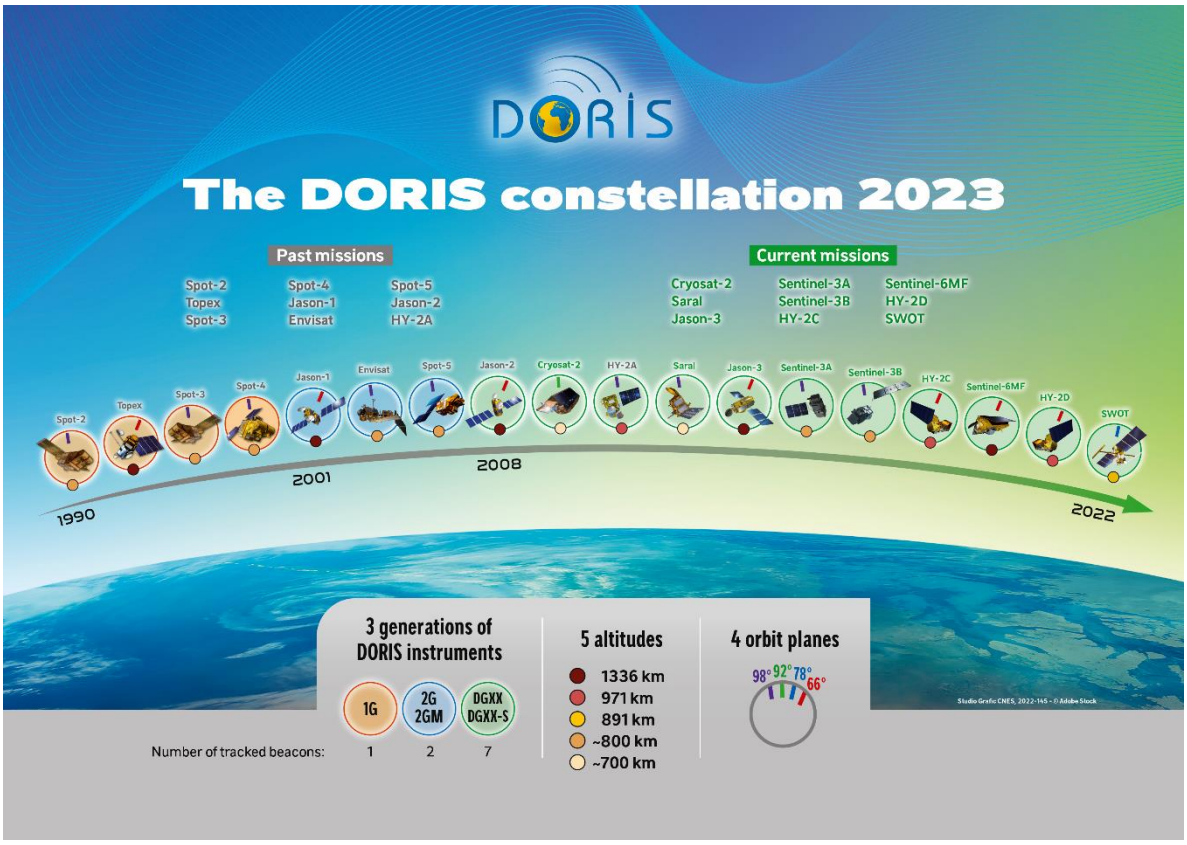

Figure 1. DORIS satellite constellation and evolution. As of December 2023.

1.2 Network

The current DORIS network consists of 60 stations including 4 master beacons (Toulouse, Papeete, Hartebeesthoek, Kourou), 1 time beacon (Terre-Adelie) and 2 experimental beacons for scientific purposes (Wettzell and Gavdos). (**Figure 2**)

2020 and 2021 were marked by the Covid-19 sanitary crisis that considerably complicated field operations and maintenance. The main challenge was to maintain the network stations in operational condition. The maintenance teams managed to handle the situation very well while continuing to deploy the 4th generation beacon where possible. On the other hand, it has been more difficult to push forward projects for network development.

2022 marked a return to order. All the projects for the network development that were put on hold restarted. The continuation of the 4th generation beacon deployment while prioritizing stations out of order or showing signs of a fault, enabled the network to retrieve high level of service, with a mean of 88% of active sites over the year. However, the Russo-Ukrainian conflict resulted in the decommissioning of the two Russian DORIS stations (Badary and Krasnoyarsk) from April 2022.

2023 was a very busy year for the DORIS Network's field operations. Two new sites were added, bringing the total number of stations to 60, a record in the network's history. The densification of the network, which was recommended in the IDS strategic plan established in 2019, has begun.

The network's main events during this 4-year period were the following:

- 2020: Relocation of the Icelandic DORIS station in Höfn
- 2021: Antenna relocation at Malé (Maldives)
- 2022: 7 on-site maintenance operations and recommissioning after long outage
- 2023: Installation of new DORIS site in Hanga Roa (Easter Island, Chile)
- 2023: Reconnaissance at Ulaanbaatar (Mongolia) with a view to installing new station
- 2023: Installation of new DORIS site in Gavdos Island (Crete, Greece)
- 2023: Reconnaissance at Kanpur (India) with a view to installing new station
- 2023: Major renovation at Rikitea (French Polynesia)

In 2024, the overall objectives are:

- Continuation of the deployment of the 4th generation beacon
- Installation of new DORIS site at Ulaanbaatar (Mongolia)

- Station renovation at Cachoeira Paulista (Brazil)
- Station renovation at Everest (Nepal)
- Installation of new DORIS site at Kanpur (India)
- Installation of new DORIS site at Katherine (Australia)

The DORIS network includes a large number of stations co-located with other IERS techniques - GNSS (50), SLR (10), VLBI (8), thanks to an ongoing effort during network development to select sites with a view to contribute to the construction of the ITRF. Co-location surveys are carried out at each DORIS co-located site by IGN following installation or maintenance operations, or with the help of other local survey teams, providing the ITRF product center with essential tie vectors for combining the independent reference frames of each technique:
https://ids-doris.org/documents/BC/stations/DORIS_ext_ties.txt .

Co-location with tide gauges is another feature of the DORIS network: around half (29) of the current stations are located on islands or in coastal areas close to tide gauges, to help estimate vertical land motion and monitor sea level.

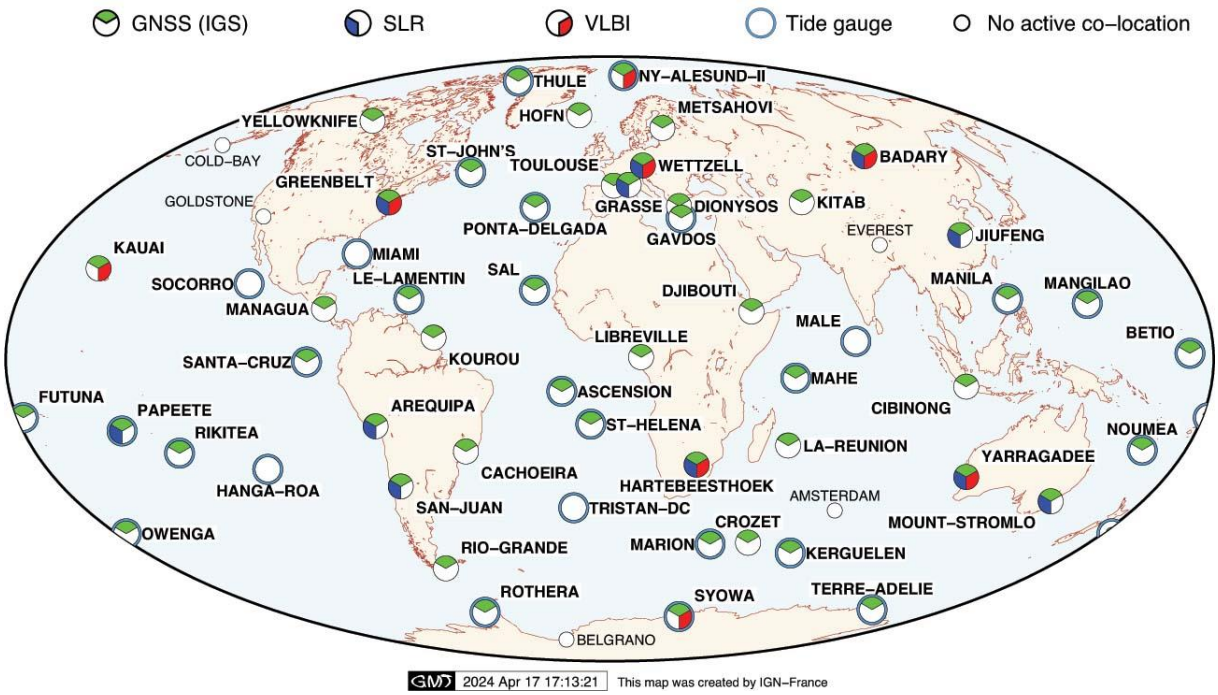

Figure 2. The permanent DORIS network and co-location with other IERS techniques (as of April 2024).

2 IDS organization and activities

2.1 Governing Board

The principal role of the Governing Board (GB) is to set policy and to exercise broad oversight of all IDS functions and components. It also controls general activities of the Service, including restructuring, when appropriate, to maintain Service efficiency and reliability.

The GB consists of eleven voting members and a number of nonvoting members. The membership is chosen to try to strike the right balance between project specialists and the general community.

The elected members have staggered four-year terms, with elections every two years. There is no limit to the number of terms that a person may serve, however he or she may serve only two terms consecutively as an elected member. The Analysis Centers' representative, the Data Centers' representative, and one Member-at-Large are elected during the first two-year election. The Analysis Coordinator and the other Member-at-Large are elected in the second two-year election.

The current GB composition (**Table 2**) and the list of GB members since 2003 can be seen at the web page https://ids-doris.org/ids/organization/governing-board.html

Elected members

In accordance with the Terms of Reference of the IDS, the GB was partially renewed in January 2021 and January 2023.

The new members elected by the IDS Associates to serve for 2021-2024 are:

- Patrick Michael (NASA/GSFC, USA) as Data Centers' representative
- Karine Le Bail (Chalmers University of Technology, Sweden) as a Member-at-Large
- Frank Lemoine (NASA/GSFC, USA) as Analysis Centers' representative

The new members elected to serve for 2023-2026 are:

- Petr Štěpánek (Geodetic Observatory Pecný, Czech Republic) as Analysis coordinator
- Laura Sanchez (DGFI/TUM, Germany) as a Member at large

The Board elected Frank Lemoine as the Chairman for a second term (2021-2024).

Note that Taylor Yates is Patrick Michael's substitute from September 2023

Appointed members

The changes of appointed members between January 2020 and December 2023 are as follows:

- In 2021, Tonie van Dam (IERS Directing Board Chair) was appointed by IERS as its new representative within the IDS GB.

- In June 2022, Pascale Ferrage, CNES/DIS project manager and representative of the DORIS system within the IDS since 2013, changed of activity. She was replaced by Arnaud Selle (CNES), who held this position and this representation until September 2023. Claude Boniface succeeded him temporarily.

Ex-officio members

Fron Nov. 2016 to Nov. 2023, Denise Dettmering was an ex officio and non-voting member of the IDS GB, in the role of Chair of the IDS Working Group on Near Real Time Data.

Representatives and delegates

Karine Le Bail proposed as the IDS representative of the GGOS Governing Board in September 2023 for a four-year term.
The other IDS representatives are:

- IDS representatives to the IERS:
  Analysis Coordinators: Petr Štěpánek
  Network representative: Jérôme Saunier

- IDS representatives to GGOS consortium: Frank G. Lemoine, Laurent Soudarin

- IDS representative to GGOS Bureau of Networks and Observations: Jérôme Saunier

- IDS representative to GGOS Bureau of Products and Standards: Petr Štěpánek

Governing Board meetings

The Governing Board met eleven times between January 2020 and December 2023, but only twice in person at the IDS Workshop in November 2022 and the AWG meeting in November 2023. The other nine meetings were held remotely,

six of which were ordinary meetings like the two face-to-face meetings (Nov. 2020; Jan., June and Oct. 2021, July 2022; Feb. 2023). The GB also met three times to discuss specific issues (IAG statement on Ukraine, IDS station selection).

Position	Term	Status	Name	Affiliation	Country
Analysis coordinator	**2023-2026**	Elected	**Petr Štěpánek**	Geodetic Observatory Pecný	Czech Republic
Data Centers' representative	**2021-2024**	Elected	**Patrick Michael***	NASA/GSFC	USA
Analysis Centers' representative	**2021-2024**	Elected	**Frank Lemoine (chair)**	NASA/GSFC	USA
Member at large	**2023-2026**	Elected	**Laura Sanchez**	DGFI/TUM	Germany
Member at large	**2021-2024**	Elected	**Karine Le Bail**	Chalmers University of Technology	Sweden
Director of the Central Bureau	Since 2003	Appointed	**Laurent Soudarin**	CLS	France
Combination Center representative	Since 2013	Appointed	**Guilhem Moreaux**	CLS	France
Network representative	**2021-2024**	Appointed	**Jérôme Saunier**	IGN	France
DORIS system representative	**2023-2024**	Appointed	**Claude Boniface**	CNES	France
IAG representative	**2023-2027**	Appointed	**Ernst Schrama**	TU Delft	The Netherlands
IERS representative	**2021-2024**	Appointed	**Tonie van Dam**	University of Utah	USA

* Taylor Yates is Patrick's substitute from September 2023.

Table 2. Current composition of the IDS Governing Board

2.2 Meetings

Due to the global Covid-19 pandemic, no event was organized in 2020.

From 2021 to 2023, the **Analysis Working Group** held online **meetings** annually. The group met in person in Saint-Mandé, France, in November, for the first time in 4 years. The meeting was co-organized by the IGN teams. It was the opportunity to celebrate the 20th anniversary of the IDS with the Analysis Centers, Associate Analysis Centers and other groups involved in DORIS data analysis. Speeches were delivered by CNES and IGN representatives.

Initially scheduled for October 2021, and after two postponements, an **IDS Workshop** took place in Venice from October 31 to November 2, 2022, in conjunction with the meeting of the Ocean Surface Topography Science Team (OSTST).

In addition, for the first time, the IDS organized a special event called “DORIS Days" on November 16, 17 and 18, 2021. This event held online was an introductory course to give non-practitioners in DORIS the opportunity to broaden their knowledge of the DORIS technique as well as to provide information on IDS products.

All the presentations at these meetings are made available by the Central Bureau on the IDS website on the pages given in **Table 3**.

Date	Event	Location
2021	Analysis Working Group Meeting https://ids-doris.org/ids/reports-mails/meeting-presentations/ids-awg-04-2021.html	online
	DORIS days 2021 https://ids-doris.org/ids/reports-mails/meeting-presentations/doris-day-2021.html	online
2022	Analysis Working Group Meeting http://ids-doris.org/ids/reports-mails/meeting-presentations/ids-awg-06-2022.html	online
	IDS workshop http://ids-doris.org/ids/reports-mails/meeting-presentations/ids-workshop-2022.html	Venice Italy
2023	Analysis Working Group Meeting http://ids-doris.org/ids/reports-mails/meeting-presentations/ids-awg-04-2023.html	online
	Analysis Working Group Meeting http://ids-doris.org/ids/reports-mails/meeting-presentations/ids-awg-11-2023.html	Saint-Mandé France

Table **3**. List of IDS events organized between 2021 and 2023.

2.3 DORIS 30th Anniversary

The DORIS system turned in February 2020, 30 years of continuous operations at the heart of the of altimetry mission performance for oceanography and geodetic applications. The first DORIS measurement was recorded on 3 February 1990 by the first DORIS instrument embarked on the SPOT-2 satellite, as a trial version in preparation for the Franco-American TOPEX/Poseidon altimetry mission. Scheduled to last six months, the instrument operated until July 29, 2009.

The December 2020 newsletter looks back at the 30-year history of the system. https://ids-doris.org/images/documents/newsletters/IDS-Newsletter8.pdf#page=1

2.4 DORIS days 2021

The IDS organized online “DORIS Days" on November 16, 17 and 18, 2021. This event was an introductory course to give non-practitioners in DORIS the opportunity to broaden their knowledge of the DORIS technique as well as to provide information on IDS products.

Three sessions were given online:

- "Introduction to DORIS and the International DORIS Service" (118 participants)
- "Overview of Products Derived from DORIS" (90 participants)
- "Description DORIS Station Installation and Operations Requirements" (70 participants)

The complete program is available on the IDS website at https://ids-doris.org/ids/reports/mails/meeting-presentations/doris-day-2021.html.

This event widely mobilized the members of the Governing Board and the Central Bureau. The organization committee was composed of Pascale Ferrage, Karine Le Bail, Frank Lemoine, Guilhem Moreaux, Jérôme Saunier, Ernst Schrama, Laurent Soudarin. Several external speakers gave presentations in the form of ppt slides or pre-recorded videos.

2.5 Call for hosting one IDS station

In 2022, the IDS launched a call for proposals for an IDS station. The purpose of this call was to describe how institutions and host agencies can express their interest in hosting a DORIS or “IDS Station”. An “IDS station” is distinct from the general network dedicated to orbit determination and may have a specific scientific focus. This call described the system requirements for the installation, the expectations in terms of scientific outcomes and the benefits for the DORIS

system and for the IDS. It also described how proposals are to be submitted and evaluated.
The call was sent out on April 27. Eight proposals were received from groups in Europe, Latin America and Asia. All the proposals were evaluated by the IDS Selection Committee and given a grade with regard to eight different criteria:

- Location (network coverage / plate motion contribution / access)
- Co-location with other instruments (geodetic techniques, gravimeter, clocks…)
- Indoor equipment housing conditions
- Antenna environment
- Monument stability
- Maintenance and security
- Host agency abilities (reliability / site surveys / motivation)
- Scientific collaboration

The results were presented to the Governing Board on September 15, who selected two proposals for the second stage of the evaluation. This includes simulations carried out by CNES to see the impact of adding the proposed sites to the existing DORIS network, requesting further information, and online meetings to get to know the candidate teams.
Of the eight proposals received, an initial analysis led to the selection of two: La Plata (Argentina) and Kânpur (India). Following discussions with Argentina's National Council for Scientific and Technological Research (CONICET) and the Indian Institute of Technology in Kânpur (IITK) in March 2023, the evaluation committee (J. Saunier, F. Lemoine, G. Moreaux) chose the Kânpur site in India as the future 4-technique geodetic observatory. This choice was validated by the Governing Board of IDS on April 19, 2023, then presented to CNES on June 15, 2023.
Kânpur better met IDS's objectives (strategic plan resulting from the IDS Retreat 2018): to expand the DORIS community, develop DORIS community and develop scientific collaborations with host organizations. The great motivation of the IITK team and the fact that one of their students is already working on a thesis on DORIS attracted IDS.

2.6 DORIS special issue in Advances in Space Research

A fourth special issue on DORIS (after 2006, 2010, and 2016) was published in 2023 in Advances in Space Research (Elsevier) dedicated to new advances in terms of measurement techniques and applications. Ernst Schrama and Denise Dettmering are the Guest Editors. There are eight papers covering the DORIS ground network and equipment, precise orbit determination, DORIS contributions to references frames, in particular to ITRF2020, and the

application to ionospheric modelling and validation. The special issue appears in Volume 72, Issue 1 of the journal. The reference is:
New Results from DORIS for Science and Society, E.J.O. Schrama and D. Dettmerig (Eds.), ADVANCES IN SPACE RESEARCH, 72(1):1-128 (1 July 2023) https://www.sciencedirect.com/journal/advances-in-space-research/vol/72/issue/1

2.7 IDS 20th anniversary

The IDS was implemented in 2003 under the umbrella of the International Association of Geodesy (IAG) and since then it has guaranteed access to DORIS data and derived products for the user community thanks to a reinforced structure with two Data Centers, six Analysis Centers, four Associated Analysis Center, a Combination Center, and several partner groups. For some years now, the IDS has aimed to grow the community, extend the DORIS applications, and improve the technology, the infrastructure and the processing.
On 1 July 2023, the IDS turned 20. To celebrate this anniversary, a special event was organized in Berlin on the occasion of the general assembly of the International Union of Geodesy and Geophysics (IUGG; 11-20 July 2023, https://www.iugg2023berlin.org/). A second celebration was held with the IDS community in Saint-Mandé, France, in November. As an introduction to the AWG meeting, representatives from CNES and IGN praised the active role played by IDS in improving and promoting the DORIS system.

2.8 Working Groups (WG)

(see https://ids-doris.org/ids/organization/working-groups.html)

The IDS Governing Board created the **Working Group "NRT DORIS data"** on 1 November 2016, and appointed Denise Dettmering (DGFI-TUM) as chair.
The general objective of this working group is a thorough assessment on applications, benefits, requirements and prospects of DORIS data with improved data latency.
From 2021, the WG had access to DORIS NRT data (observation data in RINEX format and orbit information in sp3 format) for the Jason-3 mission with a latency of about three hours. The WG then focused on the use of these data for the evaluation of GNSS-based ionospheric real-time maps and demonstrated the value of the NRT DORIS data for ionospheric applications.

On 29 November 2023, the GB decided the end of the current WG “NRT DORIS data” whose objectives have been achieved and initiated the creation of a new **Working Group “NRT ionospheric application”** with a new focus on the

application of NRT DORIS data for ionosphere modelling. The GB agreed on Ningbo Wang (AIR-CAS) as the new chair of the WG and asked him to propose Terms of Reference, goals and members.
In addition to Jason-3, the dissemination of NRT DORIS data from other missions (such as Sentinel-3) is planned for 2024, which will extend the coverage of DORIS ionospheric observations and benefit the ionosphere-related analysis.

In November 2023, the Governing Board has also initiated the creation of a **Working Group "Integrated Clock Correction Strategies for DORIS"** to deal with the behaviour of DORIS clocks, exploiting DORIS clock co-locations both in space and on ground. The goal is to derive methods to better model DORIS USO behaviour and reduce a source of systematic error in the DORIS technique.

3 Data Centers

Two data centers currently support the archiving and distribution of data and products for the IDS:

- Crustal Dynamics Data Information System (CDDIS), funded by NASA and located in Greenbelt, Maryland USA (https://cddis.gsfc.nasa.gov/)
- Institut National de l'Information Géographique et Forestière (IGN) in Saint-Mandé France (ftp://doris.ign.fr)

The delivery of Near-Real-Time DORIS data and products was implemented at the beginning of 2021 at IGN Data Center: Jason-3 RINEX data and Diode orbits are distributed with a latency of about 2-3 hours. This enables contributing to the ultra-rapid ionosphere VTEC modeling. More NRT DORIS Data from other missions with different orbits (altitude, inclination) should be implemented in 2024 as requested by the IDS WG "NRT DORIS Data".

4 Analysis Centers and Coordination

The activities of all the DORIS analysts of the year 2020 have been dominated by the realization of the ITRF2020 reprocessing. All AWG meetings as well as the IDS workshop were cancelled due to the COVID pandemic.
Four analysis centers (ACs) participated in the ITRF2020 reprocessing: GSC, GRG, GOP and ESA. GOP completely excluded Jason-1 data. IGN and INA were not able to fully contribute. During the ITRF data re-processing, the following new issues raised:

- Alcatel phase law: the new model has an impact on the station estimated height (scale of the solution). However, AC tests confirmed improvement

in post-fit observation residuals and better agreement between DORIS-estimated station height differences and vertical components of DORIS/DORIS local ties for pairs of the Alcatel/Starec stations
- SPOT-5 scale sawtooth pattern: GSC and GRG removed SPOT-5 from the scale contribution
- HY-2A Tz offset: eliminated by GSC thanks to a tuned satellite micromodel

The ITRF2020 processing has been followed by extension campaign processing the data from period 2021-2023 (in the process).
Four ACs fully participate in operational solutions (ESA, GSC, GRG, GOP). The IGN center has been restarted routine solution delivery after the retirement of its long-time responsible Pascal Willis and its representatives are active and working on a return to operational status. The INA center has problems with the new software package development. The Associate Analysis centers (AACs) GFZ and DGFI-TUM are active in specific DORIS tasks, while evaluation process to update GFZ from AAC to AC has been started. CNES AAC continues with the POD solutions.
In 2020-2023, data from satellites Sentinel-6, HY-2C and HY-2D have been included in the operational series and in the extensions of ITRF2020 processing. For SWOT, initial results from CNES AAC are available. The contribution of new satellites to the scale factor of the solution is in discussion.
The combination center (CC) provides routine weekly IDS SINEX series each three months and analyses special campaigns. In 2023 a processing of data 2020.0-2023.0 has been performed to generate a DORIS contribution to ITRF2020 extension.

Table 4 displays the list of the recent analysis centers (AC) and the associated analysis centers (AAC).

The geographical distribution of ACs, AACs and CC is displayed in **Figure 3**.

Name	AC	AAC	Location	Contact	Software	Multi-technique
ESA	✓		Germany	Michiel Otten	Napeos	SLR, GNSS
GOP	✓		Czech Republic	Petr Stepanek	Bernese	
GRG	✓		France	Hugues Capdeville	Gins	SLR, GNSS
GSC¶	✓		USA	Frank Lemoine	Geodyn	SLR
IGN	✓		France	Arnaud Pollet, Samuel Nahmani	GipsyX	
INA	✓		Russia	Sergei Kuzin	Gipsy/own development	
CNES		✓	France	Alexandre Couhert	Zoom	SLR, GNSS
GFZ		✓	Germany	Patrick Schreiner	EPOS-OC	SLR, GNSS
TU Delft		✓	The Netherlands	Ernst Schrama	Geodyn	SLR
DGFI-TUM		✓	Germany	Mathis Bloßfeld, Sergei Rudenko	DOGS	SLR

Table 4. IDS analysis and associated analysis centers

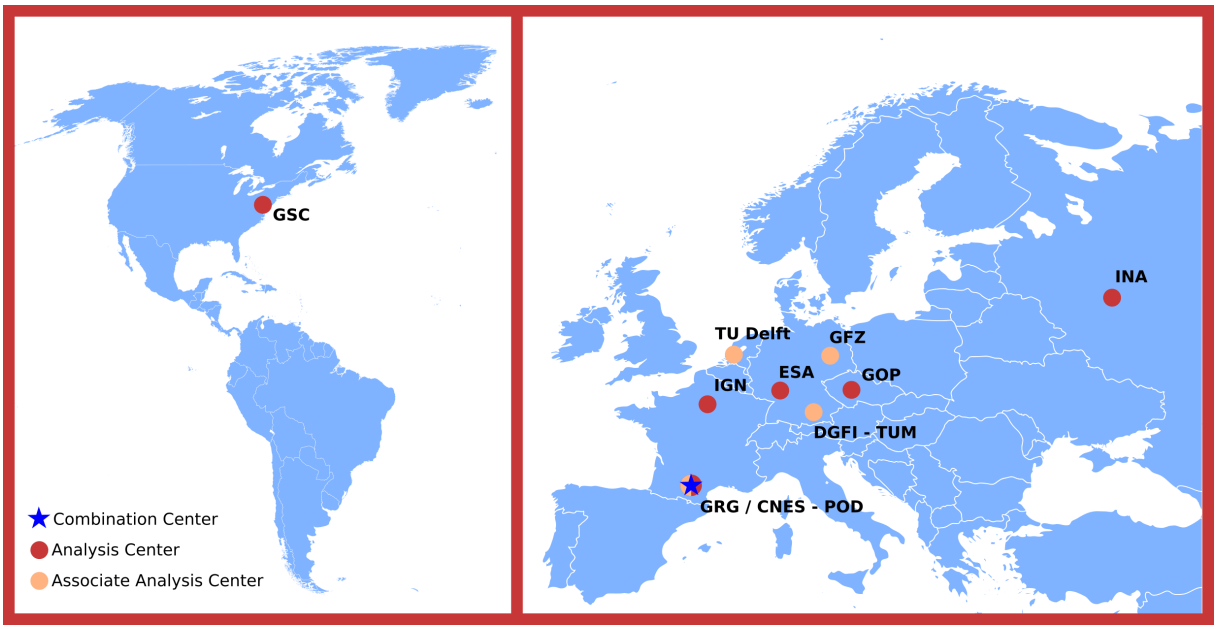

Figure 3. DORIS analysis centers, Associated analysis centers and combination center worldwide.

5 Combination Center

The Combination Center performs the routine evaluation and combination of the IDS AC solutions. In addition, the Combination Center had the activities listed hereafter.

In 2020, in addition to the routine evaluation and combination of the IDS AC solutions, the IDS Combination Center delivered to the IDS Data Centers its fifth version of the DPOD2014 (DORIS extension of the ITRF2014 for Precise Orbit Determination) based on the fifth version of the DORIS cumulative position and velocity solutions. Most of 2020 was devoted to the analysis, combination and stacking of the contributions from the four IDS Analysis Centers involved in the realization of the IDS contribution to the ITRF2020. In 2021, apart from the operational evaluation and combination of the IDS AC routine solutions, the IDS CC realized and delivered to the IERS (as well as to the IDS Data Centers) the IDS contribution to the ITRF2020. Then, the following two years were almost dedicated to the computation of, respectively, the first and second versions of the DORIS extension of the ITRF2020 for Precise Orbit Determination (DPOD2020). That second version includes estimation of periodic signals (annual and semi-annual) as well as post-seismic corrections from the DORIS observations at Socorro Island."

6 User service

6.1 Data information service

The Central Bureau works with the SSALTO multi-mission ground segment and the Data Centers to coordinate the data and products archiving and the dissemination of the related information.
Data, metadata, and documentation of the missions HY-2C and Sentinel-6A in 2020, HY-2D in 2021, Swot in 2022, were put online the IDS data and information sites as they become available.
In 2022, Sentinel-6A CNES POE orbits in POE-F standards have been reprocessed based on several improvements and made available at IDS Data Centers.

The Central Bureau interfaced with the Combination Center for making available combined products:

- DPOD2014 version 5 and DPOD2020 version 1
- IDS16 solution contributing to ITRF2020 (DOI: 10.24400/312072/i01-2021.001)

- time series for the webservice.

The Central Bureau also interacts with the IDS network representative to provide the users with the tie vectors between DORIS and the other IERS technics from the co-location surveys carried out at each DORIS co-located site by IGN following installation or maintenance operations, or with the help of other local survey teams, as well as the DORIS-to-DORIS surveyed ties.

6.2 Web and ftp sites

Address: https://ids-doris.org

The Central Bureau maintains the web resources of the IDS. Besides the IDS website, dedicated sub-sites have been created on the Aviso+ Meetings portal (https://meetings.aviso.altimetry.fr):

• https://dorisdays2021.aviso.altimetry.fr/
This sub-site has been created for the needs of the DORIS 2021 days. It offers a forum space with the possibility of questions/answers for each presentation (authenticated access with user account) Its configuration includes:
- creation of an account for all persons registered for the event
- deposit of course materials (pdf, videos, ...)

• https://idsworkshop.aviso.altimetry.fr/
It is dedicated to the IDS Workshop. It offers the following functionalities:
- registration for a user account
- abstract submission (authenticated access with user account)
- management of abstracts and organization of the program (administration part)
- organization of the forum area (administration part)
- forum area with possibility of questions/answers for each presentation (authenticated access with user account)

• https://idsawg.aviso.altimetry.fr/
This sub-site is reserved for the members of the analysis Working Group. It offers a space for discussion on topics of interest to the group. In particular, the presentations and exchanges of the AWG meeting of 6 and 7 April 2021 are accessible there.

6.3 DOR-O-T, the IDS Webservice

Address: https://ids-doris.org/webservice

The IDS Web service provides tools to browse time series of DORIS-related products. Besides products provided by the CNES Orbitography Team and the IDS components (Analysis Centers and Combination Center), this service allows comparing time evolutions of coordinates for DORIS and GNSS stations in co-location, thanks to a collaboration with the IGS Terrestrial Frame Combination Center. With the network viewer (https://apps.ids-doris.org/apps/map.html), the users can display DORIS sites since network deployment start, IGS, ILRS and IVS sites colocated with DORIS, boundaries of the tectonic plates (Bird, 2003), large Earthquakes (magnitude greater or equal to 6) within a 500 km radius of the DORIS stations (source USGS), horizontal and vertical velocity vectors of the DPOD solution, as well as rates (North, East and Up; in mm/yr) and local events, i.e., the events of the station (dates of installation, change of beacon equipment, Earthquakes in the vicinity)

6.4 DOI assignation

The Central Bureau has the possibility to rely on the CNES DOI service to assign DOIs to IDS documents and products. DOIs have been assigned to the IDS16 solution contributing to ITRF2020, the annual activity reports since the IDS AR 2021, and to the abstract of presentations given at IDS Workshops since 2022.
The Central Bureau also participates in the GGOS DOI Working Group.

6.5 Newsletter

IDS published four Newsletter over the period 2020-2023.

#7 was published in January 2020. It contains the following articles:

- DORIS in Latin America: more sun, more warmth, and more rythm (J. Saunier, IGN
- The host agencies in short: San Juan (R. C. Podestá, OAFA) and Santa Cruz (J. Carrión, CDF)
- IDS life
- IDS & DORIS quick reference list

#8 was published in December 2020. It contains the following articles:

- 2020 celebrates 30 years of the DORIS system
- 2020, two new missions have joined the DORIS constellation
- IDS and DORIS milestones
- IDS life
- Pascal Willis retires

#9 was published in September 2021. It contains the following articles:

- A new method for monitoring the geocenter motion using DORIS observations (A. Couhert, CNES)
- Doppler crossings on-board DORIS receiver carrier satellites (C. Jayles, CNES, J.P. Chauveau, CLS, P. Yaya, CLS)
- Major renovation at Réunion Island (J. Saunier, IGN)
- La Réunion: the host agency in short (P. Kowalski, OVPF)
- The 4th generation of DORIS beacon (J. Saunier, IGN)
- IDS life
- HY-2D, a new DORIS carrier satellite

#10 was published in April 2023. It contains the following articles:

- DORIS is on SWOT
- Using Near-Real-Time DORIS data for validating real-time GNSS ionospheric maps (D. Dettmering, DGFI-TUM, N. Wang, AIR-CAS)
- IDS contribution to the 2020 realization of the International Terrestrial Reference Frame (G. Moreaux, CLS)
- Höfn, new DORIS site in Iceland (J. Saunier, IGN)
- The host agency in short: Höfn (G.H. Kristinsson, LMI)
- IDS life
- The DORIS constellation 2023

The issues are distributed via email and are also available at https://ids-doris.org/ids/reports-mails/newsletter.html.

6.6 IDS activity reports

IDS published three activity reports over the period 2020-2023:

- IDS activity report 2019-2020 (L. Soudarin and P. Ferrage editors)
  https://ids-doris.org/documents/report/IDS_Report_2019-2020.pdf
- IDS activity report 2021 (L. Soudarin and P. Ferrage editors)
  DOI: 10.24400/312072/i02-2023.001
- IDS activity report 2022 (L. Soudarin and A. Sellé editors)
  DOI: 10.24400/312072/i02-2024.001

They are broadly distributed to all DORIS participants and relevant services (see https://ids-doris.org/ids/reports-mails/governing-board.html#activity).

6.7 DORIS bibliography

The IDS Central Bureau maintains a list of DORIS related articles published in international peer-reviewed journals. It is available on the IDS Web site https://ids-doris.org/ids/reports-mails/doris-bibliography/peer-reviewed-journals.html.

A new web-based tool for the management and consultation of the DORIS bibliography has been implemented on the IDS website in 2021. All references are stored in a database. The web component of the tool deployed on the web page allows dynamic display of the references and offers search functionalities by filter. The administration part of the tool consists of an input interface for ingesting references and a dashboard providing statistics on the content of the database.

6.8 IDS channel

New videos have been added to the IDS channel:
https://www.youtube.com/@internationaldorisservice-7170

DORIS missions:

- DORIS constellation 2022 (Cryosat-2, Saral, Jason-3, Sentinel-3A, Sentinel-3B, HY-2C, Sentinel-6A, HY-2D
- The satellites HY-2C and Sentinel-6A Michael Freilich on their orbits

DORIS Days 2021:

- Interview of Christian Jayles (CNES, France; DORIS System Engineer): Focus on some specific features of the DORIS system
- Interview of Alexandre Couhert (CNES, France; POD Team Leader): Application of DORIS for the geocenter

Conclusions

During this report period marked by the Covid-19 sanitary crisis, the DORIS constellation lost HY-2A in 2020, but was joined by four new satellites, HY-2C and Sentinel-6A in 2020, HY-2D in 2021, and Swot in 2022. So, with nine DORIS instruments simultaneously in operation from 2023, the current configuration represents an unprecedented availability of DORIS instruments.

Considerably slowed in 2020 and 2021, many field operations and network maintenance were carried out from 2022 onwards. Two new sites at Hanga Roa

(Easter Island, Chile) and Gavdos Island (Crete, Greece) were added, bringing the total number of stations to 60, a record in the network's history.
Although its organization was disrupted during the planetary episode linked to Covid, IDS discovered online meetings and was able to ensure the continuity of its service. In four years, IDS has organized several events, celebrated 30 years of DORIS and then 20 years of IDS, launched a call for proposals to host an IDS-labelled DORIS station, and held its first DORIS days training course. It set up several Working Groups with the aim of improving IDS products and proposing new applications based on NRT data, the distribution of which will increase from 2024 onwards.
The major achievement of the analysis group was the reprocessing of DORIS data and the production of the combined DORIS solution for ITRF2020. Subsequently, the Combination Centre produced two versions of the DORIS extension of the ITRF2020 for Precise Orbit Determination (DPOD2020). That second version includes estimation of annual and semi-annual signals as well as post-seismic corrections.
In conclusion, the period 2020-2023 has been a rich one for IDS. The service is continuing its efforts to develop the community, extend DORIS applications and improve technology, infrastructure and processing.

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