



# IDS REPORT 2017

*IERS Directing Board Meeting*

*Vienna, AUSTRIA*

*April 23, 2017*

DORIS

IDS IERS members:  
Hugues Capdeville (CLS)  
Jean-Michel Lemoine (CNES)  
Jérôme Saunier (IGN)

Guilhem Moreaux (CLS)  
Pascale Ferrage (CNES)

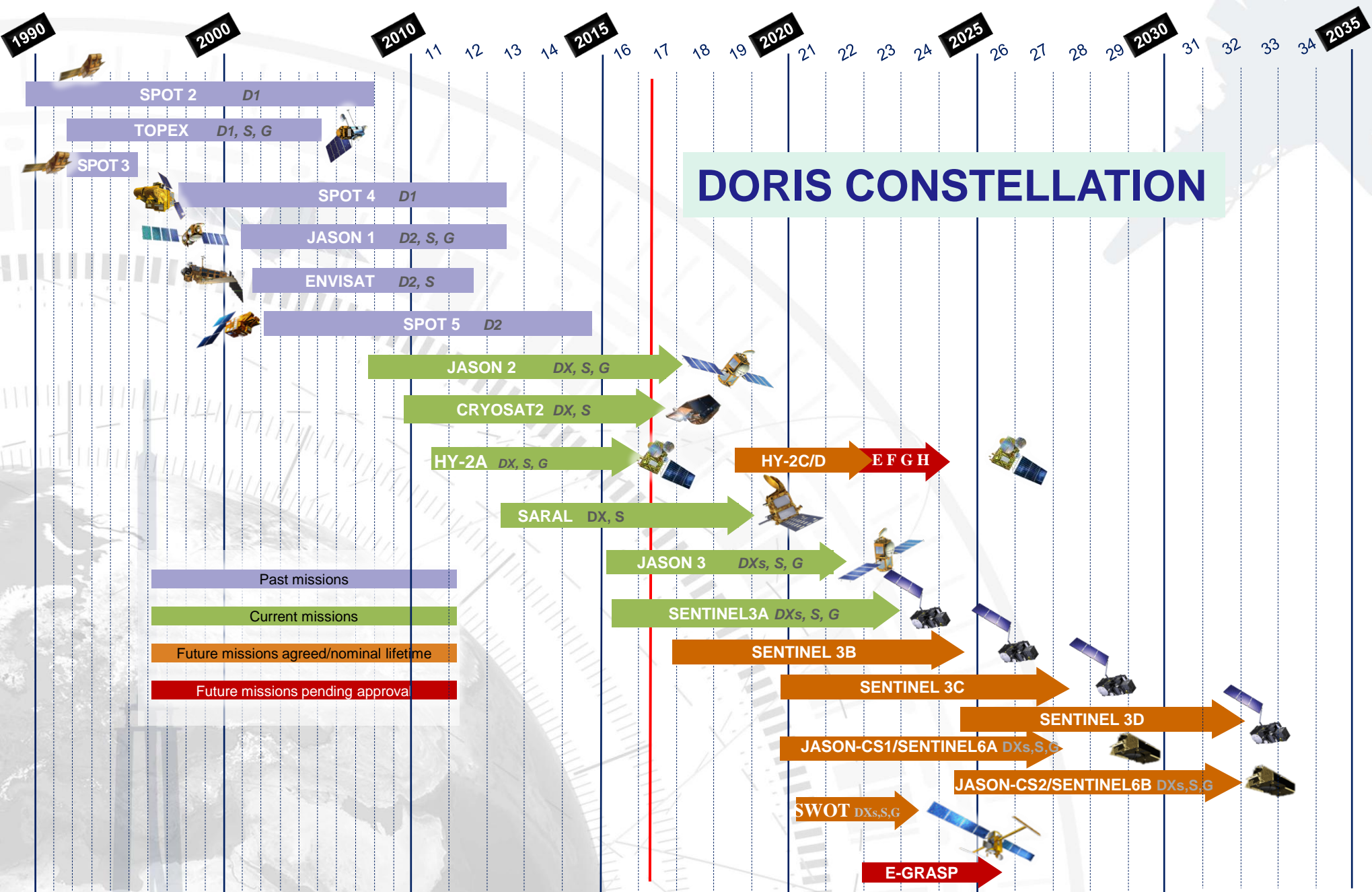
# DORIS Constellation Status - Current Missions (6)

## 6 DORIS missions in flight with DGXX(S) Receiver (7 channels)

- |   |  |
|---|--|
| <input type="checkbox"/> SENTINEL3A (ESA): 814km, 98.65°  | February 16, 2016 → 2023 (+LR)               |
| <input type="checkbox"/> JASON3 (NASA/CNES): 1336km, 66°  | January 17, 2016 → 2021 (+LR)                |
| <input type="checkbox"/> SARAL (CNES/ISRO): 800km, 98.5°  | February 2013 → 2018 (+LR)                   |
| <input type="checkbox"/> HY2-A (CNSA, NSOAS): 960km, 99°  | August 2011 → as long as possible (+LRA+GPS) |
| <input type="checkbox"/> CRYOSAT-2 (ESA): 717 km, 92°     | April 2010 → end 2019 (+ LRA)                |
| <input type="checkbox"/> JASON2 (NASA/CNES): 1336 km, 66° | June 2008 → 2019 (+LRA+GPS)                  |

# DORIS Constellation Status - Future Missions

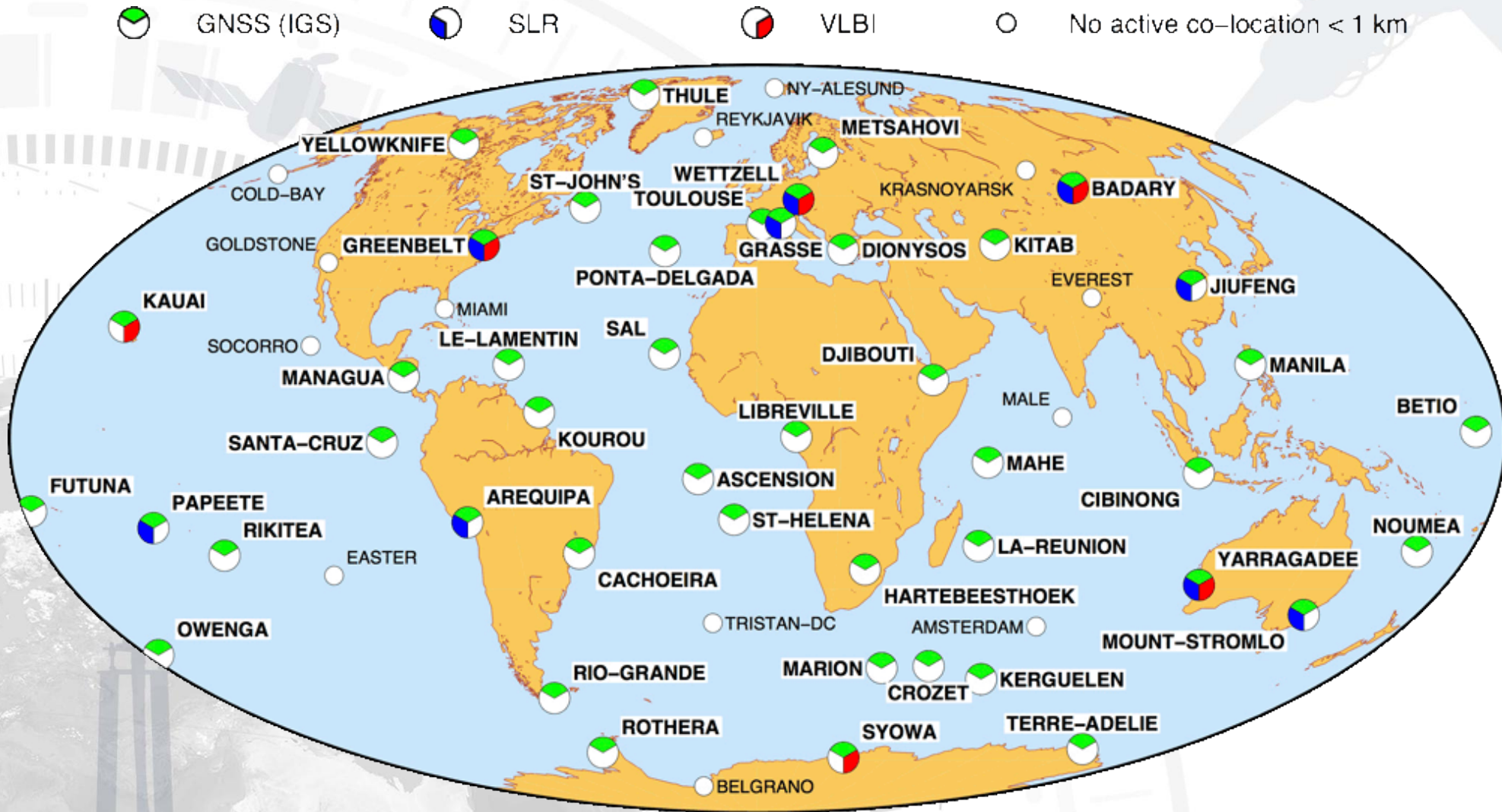
- |  |                                |
|--|--------------------------------|
| <input type="checkbox"/> SENTINEL3B (ESA) , 3C, 3D                                     | 2018, 2020, 2025 (7 years + 3) |
| <input type="checkbox"/> HY2-C, 2-D (CNSA, NSOAS): 960km, 99°                          | 2019, 2020 (3 years)           |
| . HY-2 E...H To be confirmed   | 2024                           |
| <input type="checkbox"/> JASON-CS1/SENTINEL6A (Eumetsat/NOAA) : 1336 km, 66°           | <u>2021</u> (7 years)          |
| . <i>Jason-CSB/SENTINEL6B:</i>   | <u>2025</u> (7 years)          |
| <input type="checkbox"/> SWOT (NASA/CNES) : 970km, 78°                                 | post <u>2021</u> (3 years)     |
| <input type="checkbox"/> E-GRASP/Eratosthenes (ESA Earth Explorer-9 mission) : Phase 0 | 2023                           |



On board instruments:

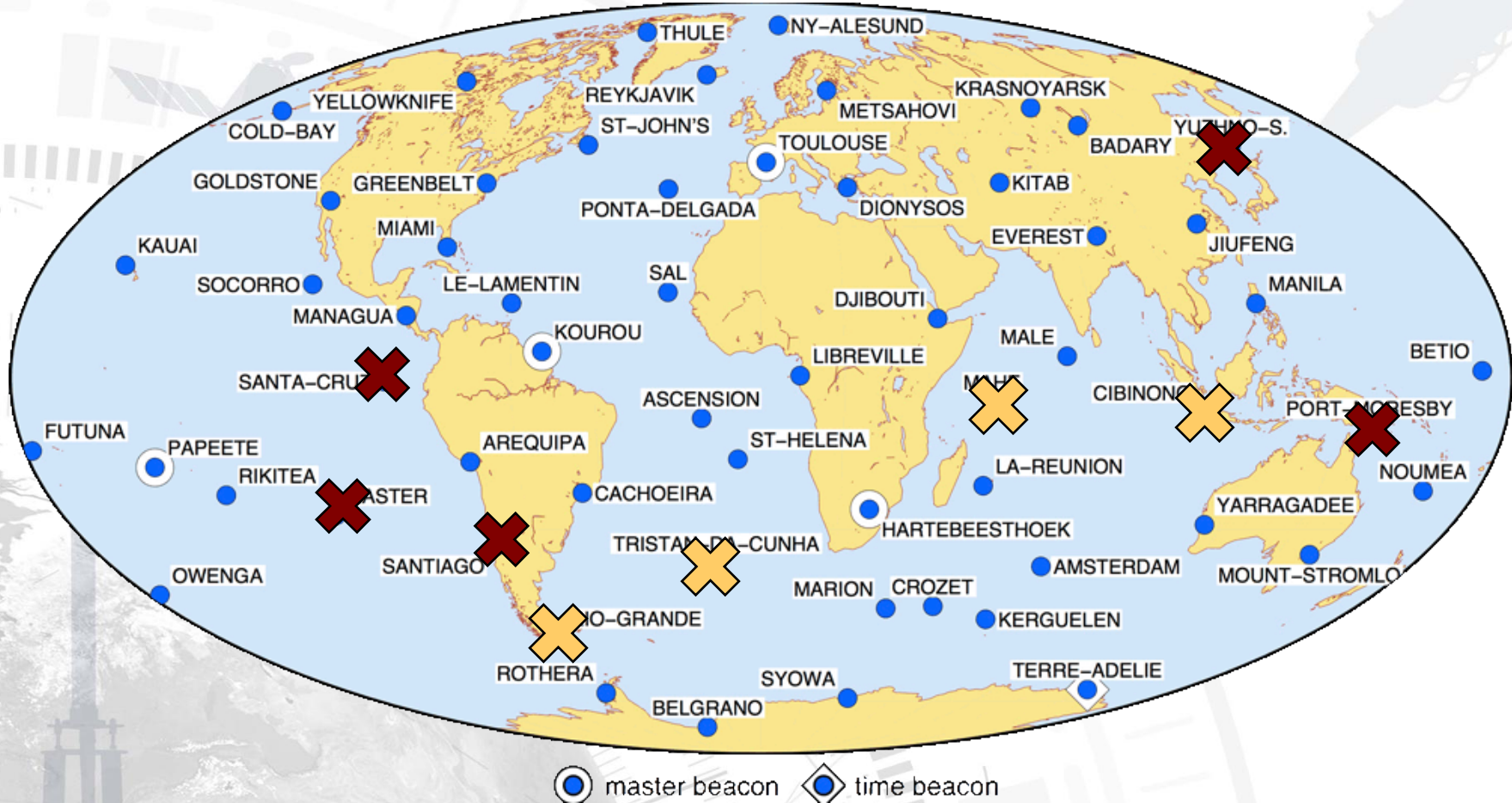
**D1, D2, DX, DXs:** DORIS/versions, **S:**SLR, **G:**GNSS

# Current DORIS tracking network



45 co-locations out of 57 DORIS sites

# Network Operational Status



9 beacons are currently out of order (5 for over a year)

**Reliable service: annual mean of 89% of active sites in 2016**

# Network Evolution

## • RECENT Network EVENTS

- *Sep. 2016: new station at Wettzell observatory, DE (becoming 4 techniques site)*
- *Feb. 2017: local tie survey at Papeete, Tahiti, FR*
- *Mar. 2017: reconnaissance and RF compatibility tests at Papenoo, Tahiti, FR (future core site)*
- *Mar. 2017: restarting (equipment replacement) at Socorro Island, MX*

## • SHORT TERM (2017):

- *San Juan, AR: new station installing in place of Santiago (3 techniques site)*
- *Guam, US: new station to near IGS station, GUUG.*
- *Easter Island, Chile: relocating (hosting migration)*

## • LONGER TERM:

- *Rothera, Antarctic: station re-location (site refurbishment)*
- *Ny-Ålesund, Spitzberg, Norway: relocating (new 4 techniques site)*
- *Katherine, AS: new station installing in place of Port-Moresby (3 techniques site) TBC*
- *Changchun, CN: new station installing in place of Yuzhno-Sakhalinsk TBC*
- *Papenoo, Tahiti, FR: new 4 techniques site TBC*

# Analysis Update

## 1. Six active DORIS Analysis Centers (ESA, GOP, GSC, IGN, INA, GRG)

*from 6 different institutions with 5 different software packages for orbit determination*

## 2. Processing routine

*IDS Combination Center is finalizing the extension of combined series until 2016 doy 360*

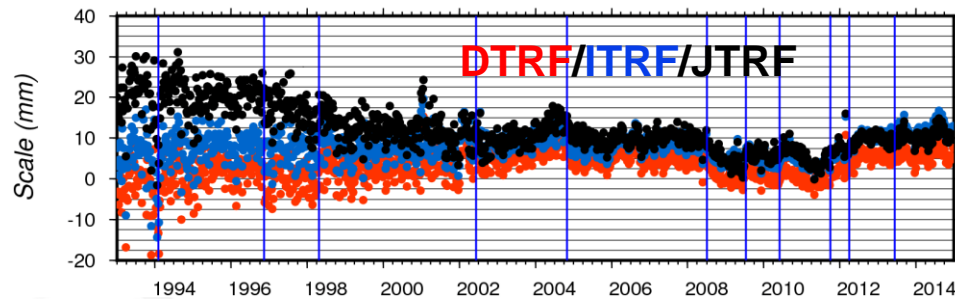
## 3. Work in progress

- ❑ *Another requirement for IDS Analysis Centers, is to implement DORIS RINEX data processing since the launch of Jason-3, Sentinel-3A. (help of Analysis Coordinators)  
DORIS data is only delivered in RINEX-like format*
- ❑ *Work on the open points following ITRF reprocessing  
DORIS scale increase in 2012 (understood and can be removed)  
Increase of DORIS residuals from Jan. 2013 for all missions  
...*
- ❑ *Jason-2 and Jason-3 USOs are sensitive to the SAA  
While awaiting a more precise DORIS data corrective model, a solution was proposed to minimize the SAA effect*
- ❑ *Switch to ITRF2014 for IDS operational products*

# Comparison of the DTRF2014, ITRF2014 and JTRF2014 solutions using DORIS

## □ Evaluation of TRF solutions by IDS CC

The IDS09 scale differences between DTRF2014, ITRF2014, and JTRF2014 must be explained by the definitions of the scale of these three reference frames. For JTRF2014, the differences may also result from the fact that the JPL used a different combination technique with different modeling issues. The mean scale offset between the DTRF2014 and the ITRF2014 solution as seen from the DORIS evaluation are about 4-5~mm.

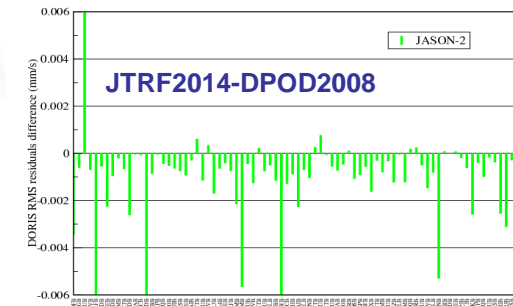
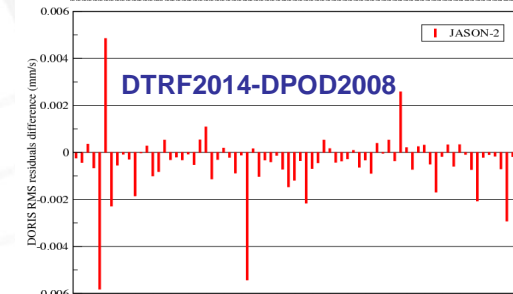
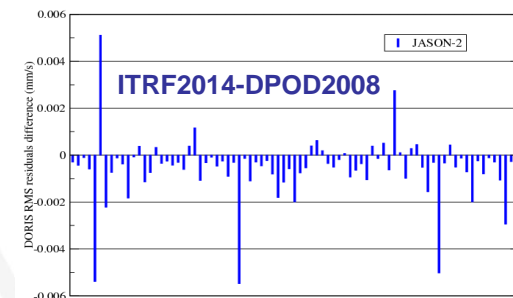


## □ Evaluation of TRF solutions in POD by CNES/CLS IDS AC

For Jason-2 (2008-2014) an improvement is obtained for all TRFs except for about 10 stations (the differences are at a very low level).

Globally, all TRF realizations represent a low but significant improvement over the previous realization, ITRF/DPOD2008.

For ITRF2014 and DTRF2014, the most significant improvements are obtained for years 1992-1998 and 2010-2014, probably due to the improvement of the estimation of the station velocities compared to those estimated in the DPOD2008 realization. The ITRF2014 which presents the best overall performance will be used for the DPOD2014 which will be used for the operational processing of DORIS data.



**Writing in progress of an article on this subject which could be used as a reference for the IERS technical note devoted to the inter-comparisons of the ITRF, DTRF and JTRF 2014 solutions**

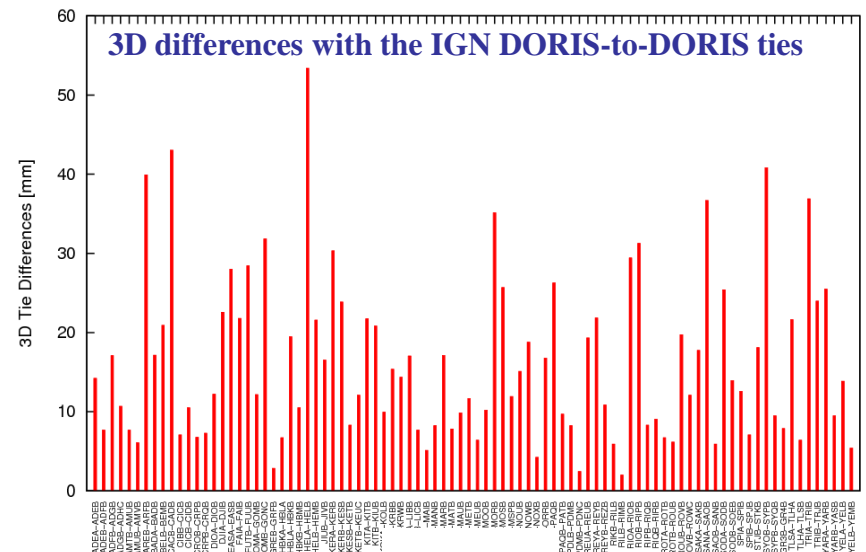
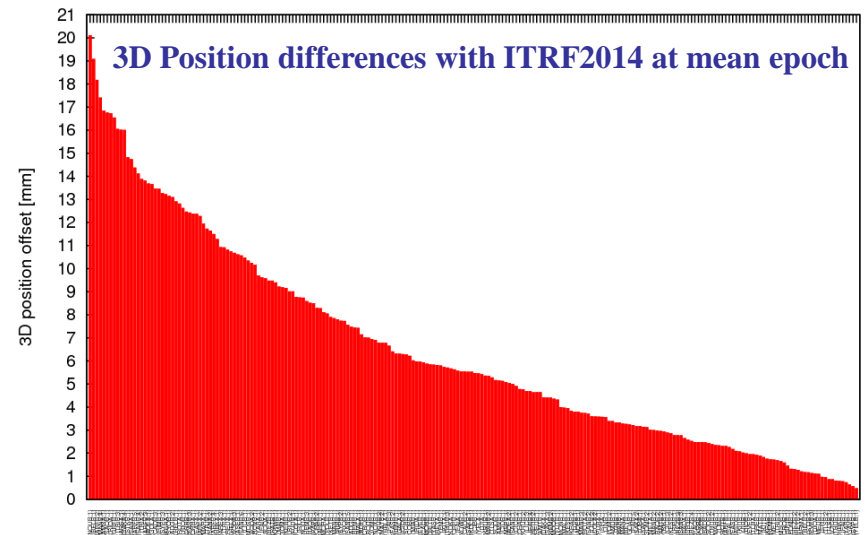
*A comparison of the DTRF2014, ITRF2014 and JTRF2014 solutions using DORIS (G. Moreaux, H. Capdeville, C. Abbondanza, M. Bloßfeld, JM. Lemoine and P. Ferrage)*



# DPOD2014: DORIS extension of the ITRF for Precise Orbit Determination

## Switch to ITRF2014 for IDS operational products

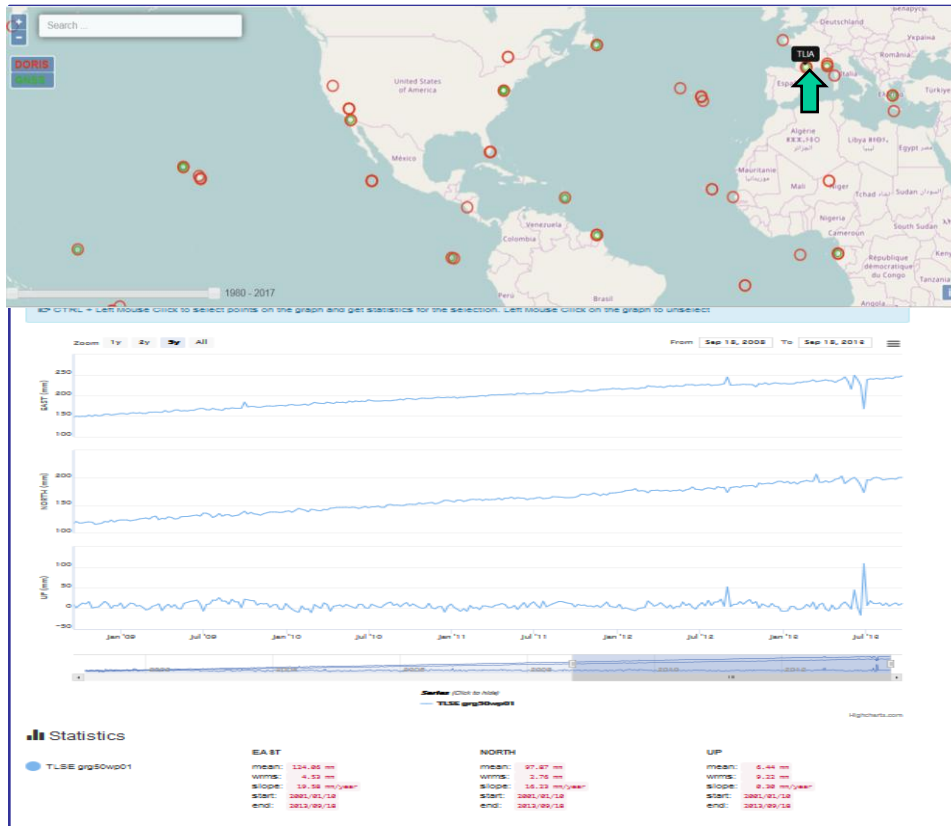
- ❑ Version 1.0 available for download from the IDS Data Centers (CDDIS & IGN) since March 15<sup>th</sup>.
- ❑ Available in both SINEX and text format.
- ❑ SINEX version includes two unofficial blocks:
  - SOLUTION/DISCONTINUITY: origin of the position discontinuities
  - SOLUTION/DATA\_REJECT: periods of time not included in the combination.
- ❑ The DPOD2014 solution is mostly based on the latest DORIS position and velocity cumulative.
- ❑ Mean positions and velocities of the very old stations are extracted from DPOD2008 v1.14
- ❑ Positions and velocities of the newest stations not included in the IDS combined series are deduced from either the DORIS local ties or the DORIS mails from IGN.
- ❑ Tested by the POD validation group (P. Willis, F. Lemoine, A. Couhert, N. Zelensky).
- ❑ Will be updated 2 times a year.
- ❑ The switch to ITRF14 will be adopted when the ACs will use this DPOD2014 for their next submission to IDS CC (from 2017.0)



*For more information see <http://ids-doris.org/analysis-coordination/combination/dpod.html>*

# IDS NEWS

- Next IDS AWG meeting in London (UCL), May 2017 22-24
- IDS website upgraded
- New version of the webservice: time series visualization tool
- New products from the Combination Center: DPOD (Cumulative solution)



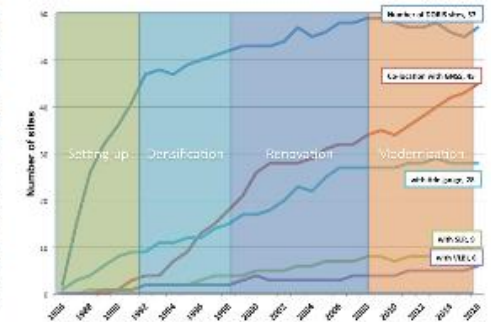
## IDS NewsLetter # 3:

- Workshop 2016 in La Rochelle,
- Looking back over 30 years of DORIS network
- Six DORIS receivers operating in orbit

### Looking back over 30 years of DORIS network development

Jérôme Saunier (IGN)

The latest IDS workshop was an occasion to look back over the last 30 years since the start of the DORIS network deployment. There are four main phases in the network evolution. After the setting-up, densification and renovation phases, we are today in the modernization phase, with a number of ongoing actions to make the DORIS network even more robust and maintain the desired level of performance. They include constant monitoring, standardization of monumentation, regular assessment of performance and enhancements to equipment.



DORIS network development

At the same time, we have continuously increased the number of stations co-located with other space geodetic techniques, this being a permanent objective throughout the network's development. Today, 45 DORIS stations out of 57 are co-

located with GNSS, nine with SLR and six with VLBI, with a good North-South distribution. Wettzell (Germany) is the fourth geodetic site that includes all four techniques following the installation of DORIS last September. The other geodetic sites occu-

ried by the four techniques are Badary in Russia, Greenbelt in the USA, and Yarragadee in Australia. Co-located sites are essential for International Terrestrial Reference Frame determination.



Co-locations with other geodetic techniques



<http://ids-doris.org>