IDS REPORT 2017

IERS Directing Board Meeting

New Orleans, USA

December, 2017

DORIS

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

Guilhem Moreaux (CLS)
Pascale Ferrage (CNES)

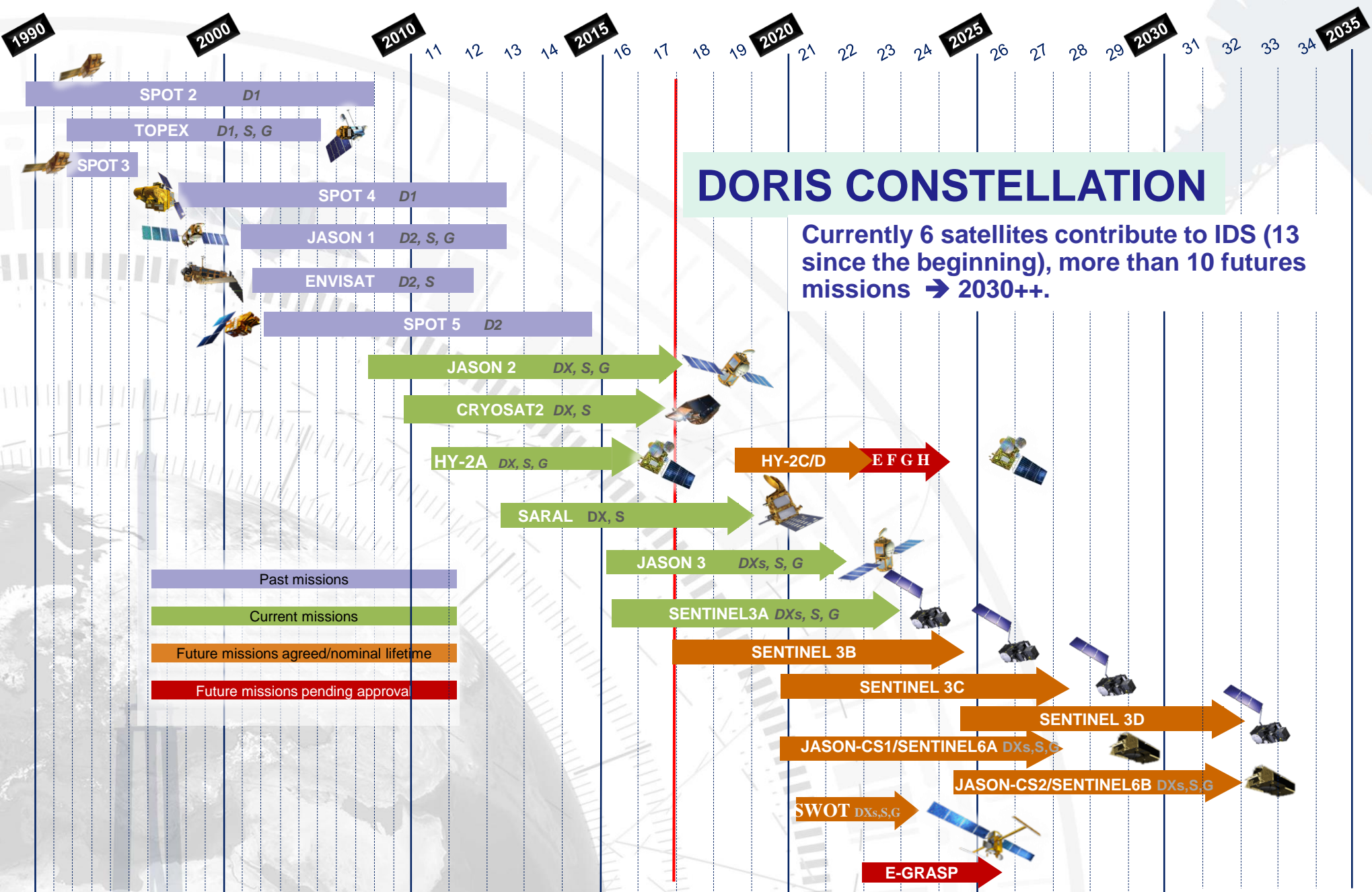# DORIS Constellation Status - Current Missions (6)

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

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

DORIS Constellation Status - Future Missions

- SENTINEL3B (ESA) , 3C, 3D   **March 2018**, 2020, 2025 (7 years + 3)
- HY2-C, 2-D (CNSA, NSOAS): 960km, 99°   2019, 2020 (3 years)
  - HY-2 E…H To be confirmed   2024
- JASON-CS1/SENTINEL6A (Eumetsat/NOAA) : 1336 km, 66°   2021   (7 years)
  - *Jason-CSB/SENTINEL6B:*   *2025   (7 years)*
- SWOT (NASA/CNES) : 970km, 78°   post 2021 (3 years)
- E-GRASP :not selected as ESA Earth Explorer-9 mission in October   post 2023
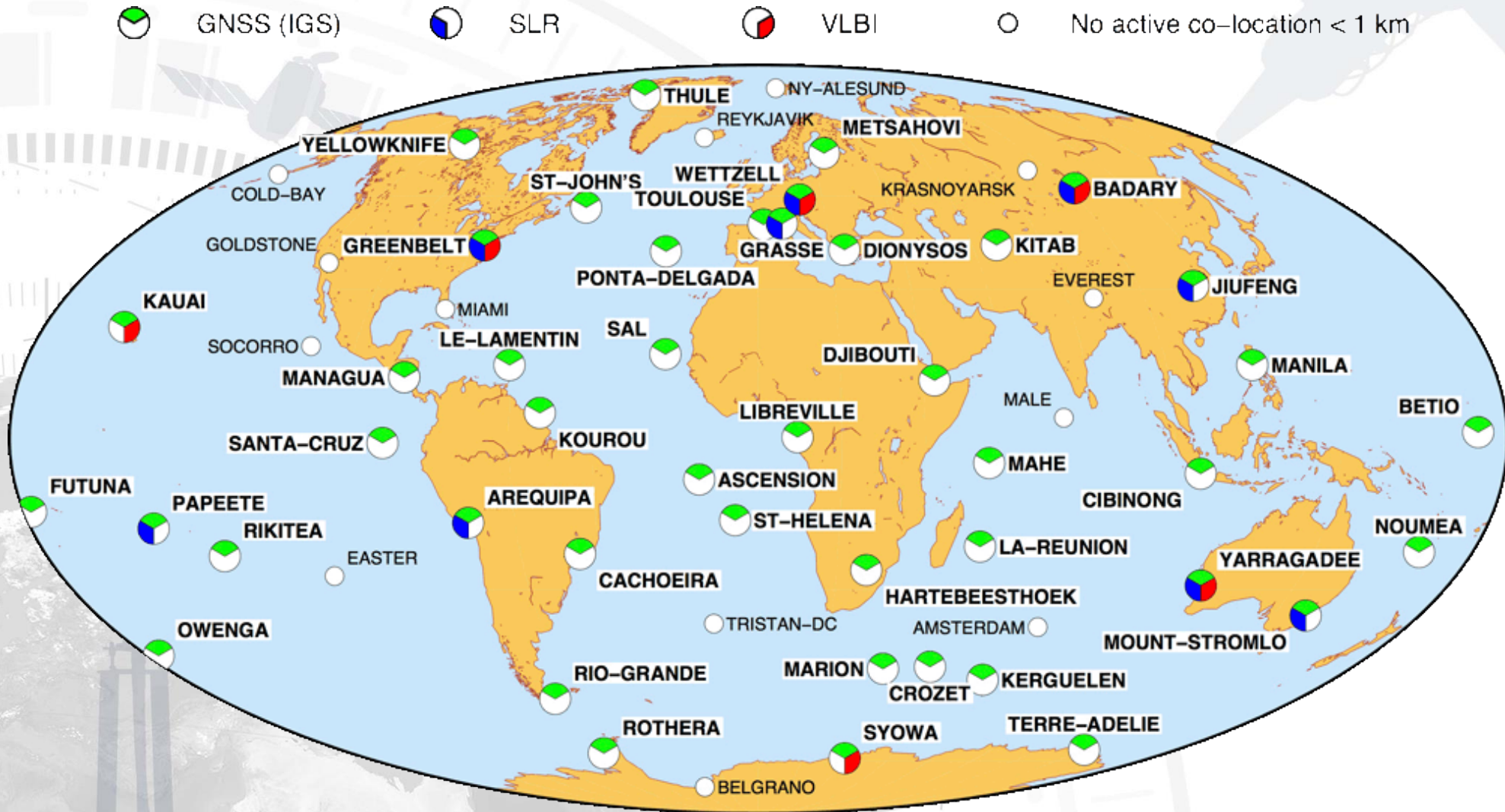 → will be re-submitted to EOEP-5

DORIS CONSTELLATION

Currently 6 satellites contribute to IDS (13 since the beginning), more than 10 futures missions ➔ 2030++.

Timeline (1990–2035):

- SPOT 2 — *D1* (Past mission)
- TOPEX — *D1, S, G* (Past mission)
- SPOT 3 (Past mission)
- SPOT 4 — *D1* (Past mission)
- JASON 1 — *D2, S, G* (Past mission)
- ENVISAT — *D2, S* (Past mission)
- SPOT 5 — *D2* (Past mission)
- JASON 2 — *DX, S, G* (Current mission)
- CRYOSAT2 — *DX, S* (Current mission)
- HY-2A — *DX, S, G* (Current mission)
- HY-2C/D — E F G H (Future mission agreed/nominal lifetime)
- SARAL — *DX, S* (Current mission)
- JASON 3 — *DXs, S, G* (Current mission)
- SENTINEL3A — *DXs, S, G* (Current mission)
- SENTINEL 3B (Future mission agreed/nominal lifetime)
- SENTINEL 3C (Future mission agreed/nominal lifetime)
- SENTINEL 3D (Future mission agreed/nominal lifetime)
- JASON-CS1/SENTINEL6A — *DXs,S,G* (Future mission agreed/nominal lifetime)
- JASON-CS2/SENTINEL6B — *DXs,S,G* (Future mission agreed/nominal lifetime)
- SWOT — *DXs,S,G* (Future mission agreed/nominal lifetime)
- E-GRASP (Future mission pending approval)

Legend:
- Past missions
- Current missions
- Future missions agreed/nominal lifetime
- Future missions pending approval

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

7 beacons are currently out of order (6 for over a year)

Coverage gaps in South Pacific but reliable service of the network on the whole

Network Evolution

- **RECENT Network EVENTS**
  - *Nov. 2017: antenna verticality adjustment at Sal Island, Cape Verde*

- **SHORT TERM (2018):**
  - *San Juan, AR: new station installation in place of Santiago (3 techniques site)*
  - *Rothera, Antarctic: relocating 100 m away (site refurbishment)*
  - *Guam, US: new station to near IGS station, GUUG.*
  - *Ny-Ålesund, Spitzberg, Norway: relocating (new 4 techniques site)*
  - *Easter Island, Chile: relocating (hosting migration)*

- **LONGER TERM:**
  - *Katherine, AS: new station installation in place of Port-Moresby (3 techniques site) TBC*
  - *Changchun, CN: new station installation in place of Yuzhno-Sakhalinsk TBC*
  - *Reykjavik, IS: relocating to improve performance*
  - *Papenoo, Tahiti, FR: new 4 techniques site TBC*

Analysis Update

Processing routine

6 DORIS Analysis Centers (ESA, GOP, GSC, IGN, INA, GRG) provide their SINEX solution to IDS CC
IDS Combination Center has finalized the extension of combined series until 2017 183

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
Introduction of Jason-3 and Sentinel-3A in the IDS combined solution
(An evaluation of these satellites is in progress by GRG ACs and IDS CC)

☐ *DORIS scale issue*
DORIS scale increase in 2012 (understood and can be removed)
The high scale level of HY-2A increased the scale of the DORIS solution.
The HY2A scale is significantly reduced when GRG AC used the new position of the CoM given by the Chinese Project
→*ACs have to use this new position*
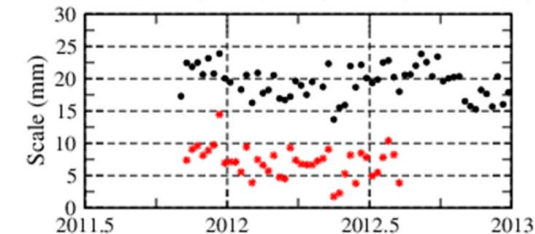
☐ *Jason-2 and Jason-3 USOs are sensitive to the SAA*
While awaiting a more precise DORIS data corrective model, different strategies are proposed to minimize the SAA effect

☐ *DORIS orbit comparison campaign by Analysis Coordinators: On voluntary basis and for test purpose ACs and associated may deliver their sp3 orbit*

Strategies to minimize the impact of the South Atlantic Anomaly effect on the DORIS station position estimation

❑ **Test of the SAA corrective model for Jason-2 DORIS data developed by A. Belli and P. Exertier from T2L2 instrument on-board Jason-2**

The use of the corrective model improves slightly and not fully the single satellite station position estimation.

❑ **Strategy of Estimation of the beacon frequency Polynomial on SAA station per pass**

The DORIS residuals are lower when this strategy is applied for SAA stations. The impact is significant for SAA stations and the number of measurements is higher.

The strategy brings an improvement in the station position estimation for the SAA stations, especially for the vertical component. But the problem is not fully resolved.

❑ **Strategy to add single satellite solution affected by the SAA in the multi-satellite solution**

For Jason-1, the method we implemented, tested and adopted for ITRF2014 is:

before combining Jason-1 solution to the other single satellite solutions, we rename the SAA stations (and all their adjusted parameters) so these SAA stations from Jason-1 do not contribute to the realization of the combined solution.

The IDS solution provided for the ITRF2014 was worsened by the Jason-2 solution for the SAA stations. The strategy brings an improvement in the station position estimation for the SAA stations.

(See Poster: **Strategy to minimize the impact of the South Atlantic Anomaly effect on the DORIS station position estimation**
Session Date and Time: **Monday, 11 December 2017; 08:00 - 12:20** Session Number and Title: **G11B: Reference Frames)**

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DPOD2014: DORIS extension of the ITRF for Precise Orbit Determination Version 2.0 Online

- ❑ Version 2.0 available for download from the IDS Data Centers (CDDIS & IGN) since October 31st.
- ❑ Available in both SINEX and text format.
- ❑ Solution is mostly based on the latest DORIS position and velocity cumulative from 1993.0 to 2017.0.
- ❑ Tested by the POD validation group (P. Willis, F. Lemoine, A. Couhert, N. Zelensky).
- ❑ 2 new sites: **Managua and Wettzell.**
- ❑ For more information, see http://ids-doris.org/analysis-coordination/combination/dpod.html

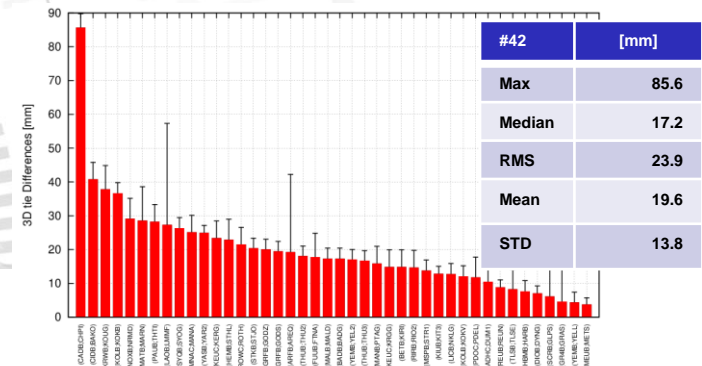**DPOD2014 v2.0 Network** (86 sites / 197 stations)
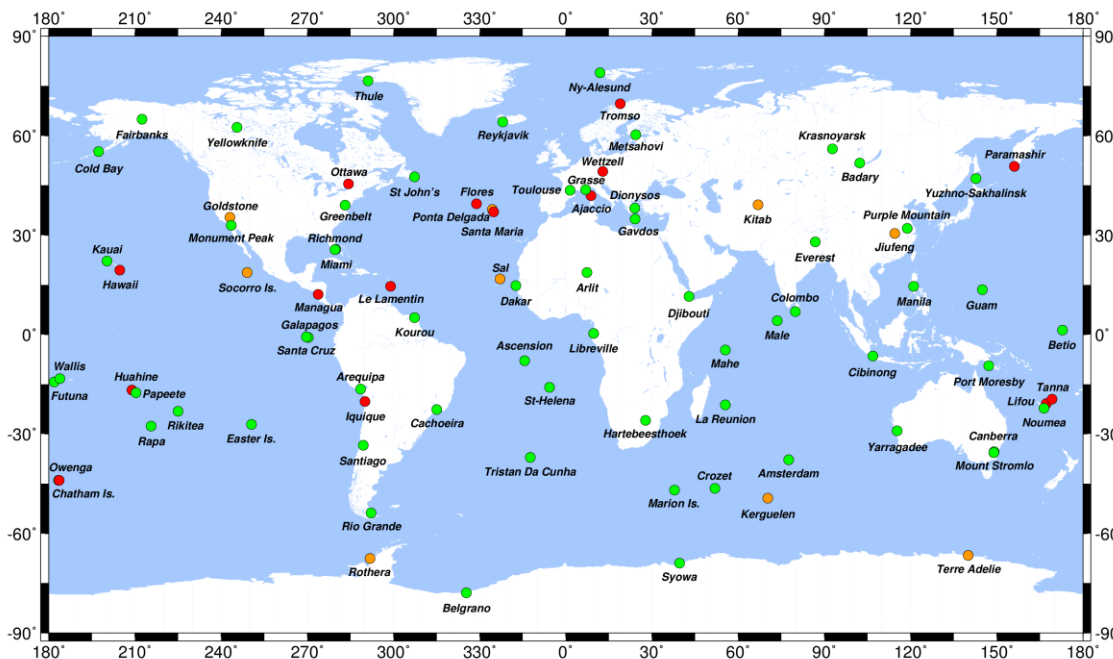
Site not included ITRF2014 (# 15) – Site with new station(s) since ITRF2014 (# 8)

DPOD2014 v02 vs DPOD2014 v01 – 2D position differences at mean epoch

	[mm]
Median	2.5
RMS	5.2
Mean	3.4
STD	3.9
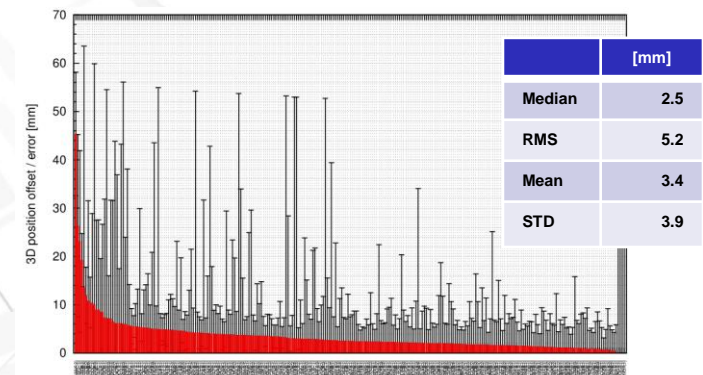
DPOD2014 v02 vs DORIS-GNSS IGN DORIS ties

#42	[mm]
Max	85.6
Median	17.2
RMS	23.9
Mean	19.6
STD	13.8

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IDS NEWS

- IDS website and webservice upgraded,
- Next IDS AWG meeting in Toulouse, May or June 2018, in conjunction with POD QWG Sentinel-3A
- IDS Retreat is planned in 2018 to define the activities of the service for the next 5-10 years.
- Next IDS workshop in Ponta Delgada 24-29 September 2018

(in conjunction with the Symposium on "25 Years of Pro-gress in Radar Altimetry")

IDS NewsLetter # 4:
- Kitab (Uzbekistan), station re-location,
- DPOD2014 a new DORIS extension of ITRF2014 for POD
- IDS life

> Users NEWSLETTER   #4 November 2017

« View log »

« Center »

« Trace position »

TOULOUSE - FRANCE

Station re-location at Kitab (Uzbekistan) to get better visibility

Jérôme Saunier (IGN)

The good reception of DORIS signal requires an unobstructed path from the transmitting stations to the orbiting satellites. The visibility at the DORIS ground stations is a key element of how well they contribute to the precise orbit determination. The DORIS network performance is evaluated on an ongoing basis. A loss of performance for the DORIS station at Kitab has been observed for a number of years. The antenna environment has been getting progressively worse: nearby trees mask the view of the sky as seen from the DORIS antenna. It was decided in 2013 to re-locate the station to get better visibility.

The new DORIS antenna "KIVC" and the new GNSS antenna "KITG"

The DORIS station has been hosted at the Kitab observatory of the Ulugh Beg Astronomical Institute (see insert on page 3) since 1991. Originally installed on the roof of the main building, the DORIS station was moved in 2001 to a pillar to get better stability. But since then, the antenna environment has gradually deteriorated over the years causing disruption and loss of low-site measurements.

DORIS has been co-located with the GNSS station "KIT3", part of the IGS network, since 1994. During the reconnaissance, it was im-
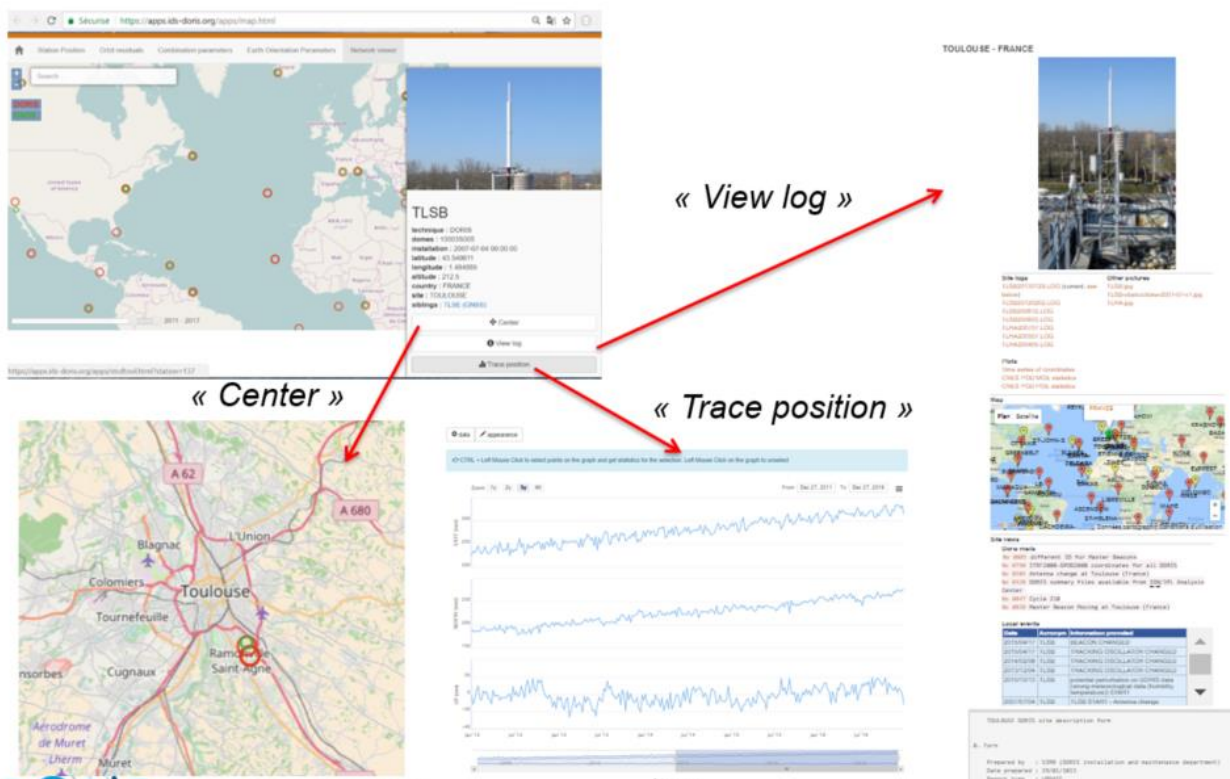
portant to find a location close enough to the GNSS station in order to maintain a good co-location in the geodetic meaning of the term, but also sufficiently near the former DORIS location to be able to determine with high accuracy the tie vector between the two antenna reference points and thus allow the connection of the time series of station positions.

The new site is located at around 200 m southeast of the GNSS station that allows the carrying out of a high precision local tie survey. The relatively open ground offers a good antenna environment.

Kitab station "KIUB" before re-location

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