



IDS REPORT 2015

*IERS Directing Board Meeting
San Francisco, California USA*

December 13, 2015



DORIS Constellation Status - Current Missions (4)

DGXX Receiver (7 channels)

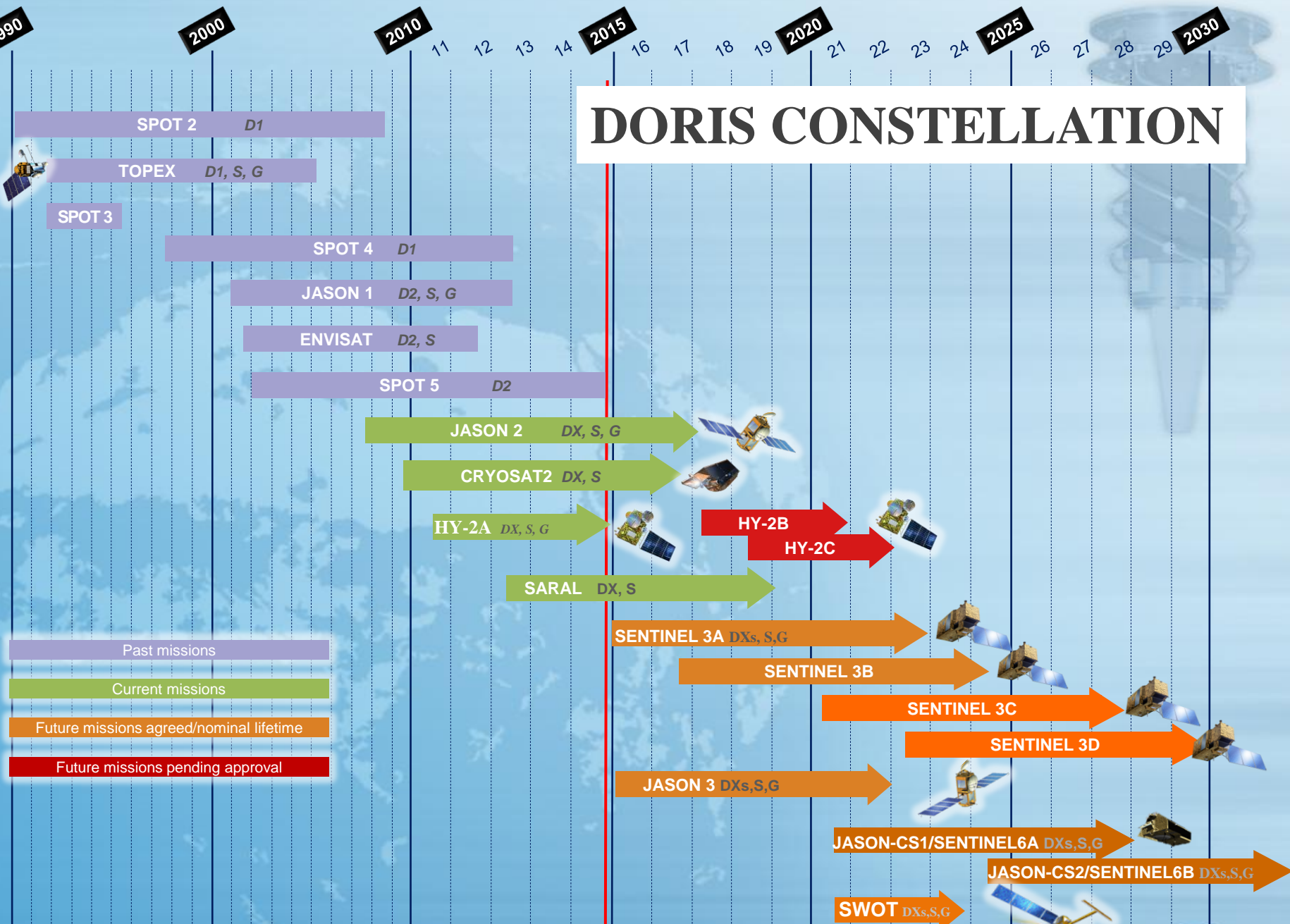
- ❑ SARAL (CNES/ISRO): 800km, 98.5° February 2013 → 2018 (+LR)
 - ❑ HY2-A (CNSA, NSOAS): 960km, 99° August 2011 → as long as possible (+LRA+GPS)
 - ❑ CRYOSAT-2 (ESA): 717 km, 92° April 2010 → end 2017 (+ LRA)
 - ❑ JASON2 (NASA/CNES): 1336 km, 66° June 2008 → 2017 (+LRA+GPS)
- SPOT5 DGM (CNES): 830 km, 98° May 2002 → November 2015***
→ Spot5 has just been de-orbited more than 13 years of service

DORIS Constellation Status - Future Missions



- ❑ SENTINEL3A (GMES) : 814km, 98.6°
Sentinel 3B: Jan. 2016 (7.5 years + 5)
2017
- ❑ JASON-3 (Eumetsat/NOAA/NASA/CNES) : 1336 km, 66° Jan. 2016 (5 years)
- ❑ HY2B (NSOA, china) 2018 (3 years)
- ❑ JASON-CS1/SENTINEL6A (Eumetsat/NOAA) : 1336 km, 66°
Jason-CSB/SENTINEL6B: 2020 (7 years)
2022 (7 years)
- ❑ SWOT (NASA/CNES) : 970km, 78° post 2020 (3 years)

DORIS CONSTELLATION



On board instruments:

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



Current DORIS tracking network (Dec. 2015)



 GNSS (IGS)

 SLR

 VLBI

 No active co-location < 1 km

Network Operational Status



58 stations of which: 9 beacons are out of order (4 for over a year)

Out of order for over a year:

Yuzhno-Sakhalinsk (11/2005); Santa Cruz (06/2009); Santiago (05/2013); Port-Moresby (06/2013)

Network Evolution

- **RECENT Network EVENTS**

- Jun. 2015: Chichijima & Hokkaido (JA) new stations project was abandoned
- Jun. 2015: Port-Moresby (PNG) station was completely removed (site closure)
- Jul. 2015: reconnaissance in Northern Australia (PNG station re-location)
- Aug. 2015: reconnaissance at Ny-Ålesund, NO (new 4 techniques site)
- Oct. 2015: antenna re-location at Sal, CV (to get better visibility)

- **SHORT TERM (Next 6 Months):**

- Kitab, UZ: major renovation (station re-location to get better visibility)
- Managua, Nicaragua: new station in place of Miami.
- Wettzell, DE: new station installing (new 4 techniques site)

- **LONGER TERM:**

- San Juan, AR: new station installing in place of Santiago (3 techniques site)
- Katherine, AS: new station installing in place of Port-Moresby (3 techniques site)
- Easter Island, Chile: relocating to near IGS station, ISPA.
- Miami, FL: definitive shutdown (interference with mobile-TV relays).
- Guam, US: planning underway for new station, near IGS site.

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. Contributions of Analysis Centers for ITRF2014

Extension of DORIS data until December 21th, 2014 → SINEXs until 2014 doy 355.

Combination Center has delivered several successive iterations to the IERS ITRF

3. Evaluation of the ITRF2014P provided by IGN (Z.Altamimi)

4. Processing routine

IDS CC started the extension of combined series from 2014 doy 362 to 2015 doy 158

5. Work in progress

Implementations of the RINEX data processing (help of Analysis Coordinators)

Work on the open points following ITRF reprocessing

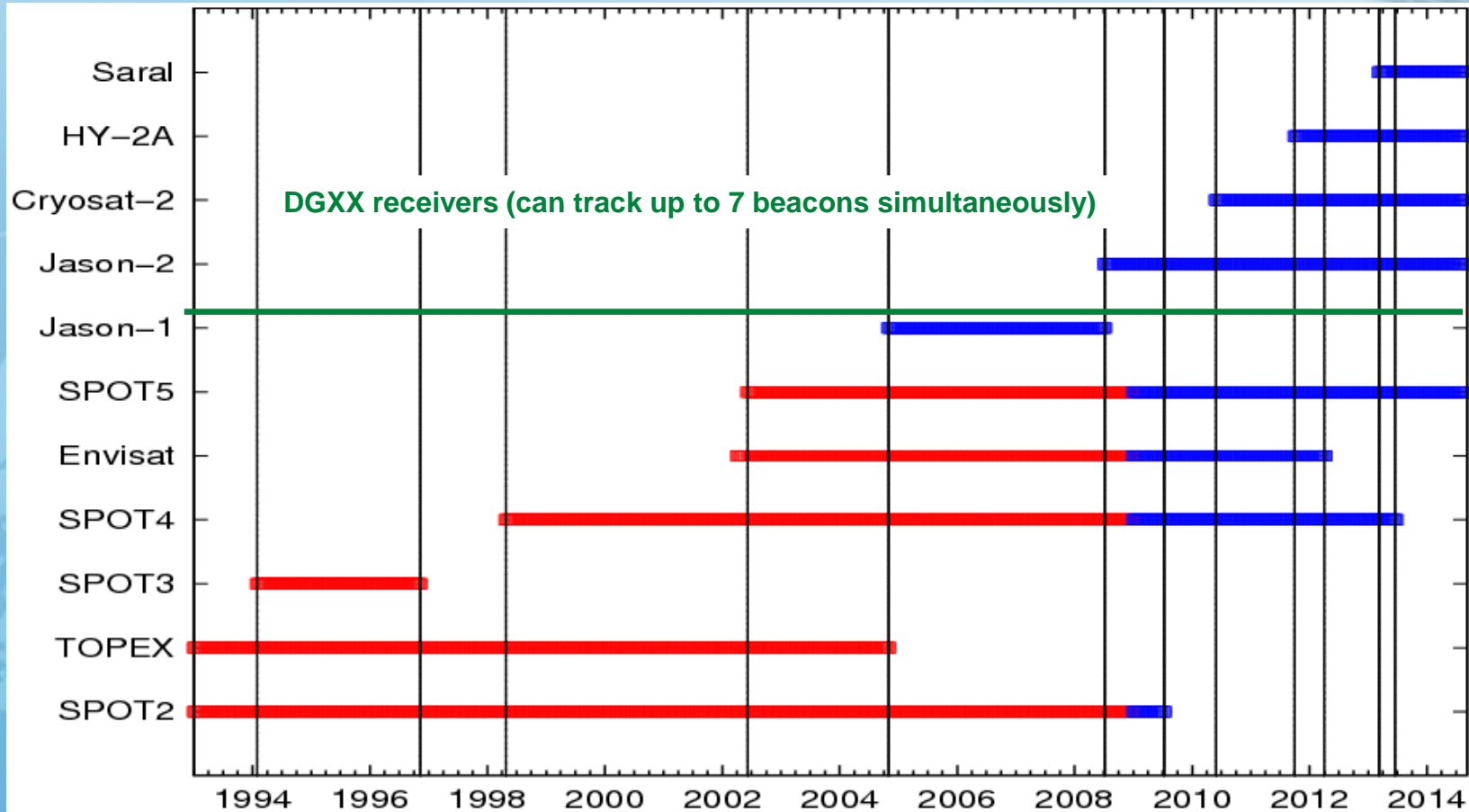
6. DORIS Special Issue (Adv. Space Research)

Theme: ITRF2014-related analysis and results. Co-editors (F. Lemoine and EJO Schrama).

Follow-on to special issue in Adv. Space Res (2010).

Available in 2016, 14 papers submitted + 2 soon

DORIS data in ITRF2014



➔ ITRF2014 = **ITRF2008**

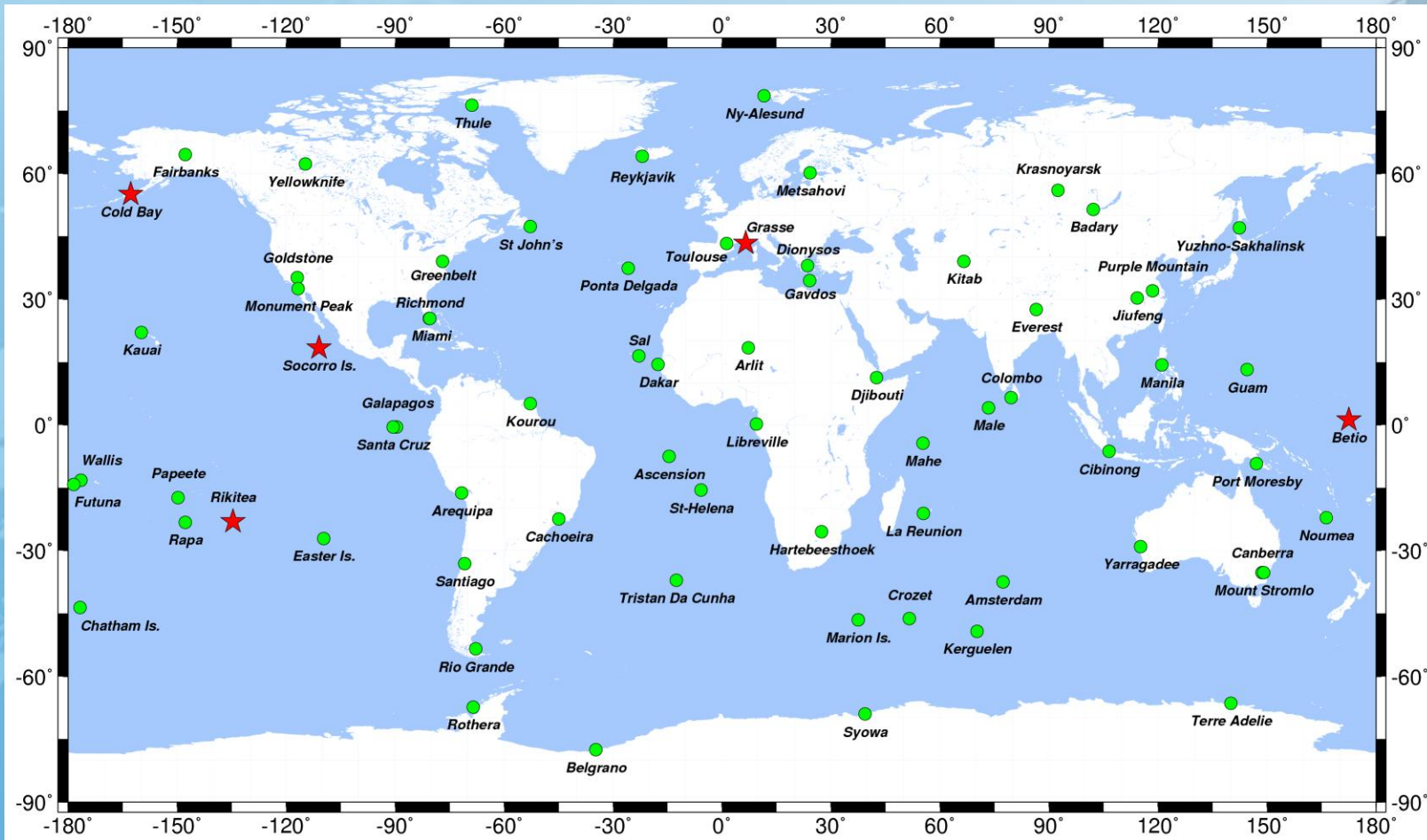
+ **Jason-1** (SAA corrected data) **between Topex and Jason-2 only**

+ **Spot-5 SAA corrected from 2006**

+ **new missions (Jason-2, Cryosat-2, HY-2A*, Saral*)**

*not processed by all the ACs

DORIS Network for ITRF2014



➔ 160 stations over 71 sites (38 in northern hemisphere).

➔ 5 new sites wrt ITRF2008: Betio, Cold-Bay, Grasse, Rikitea and Socorro.

Evaluation of the ITRF2014P by IDS



1. Contribution for ITRF2014P evaluation

- two DORIS Analysis Centers (GSC and GRG)
- CNES POD team
- IDS Combination Center

2. IDS Evaluation status

7 DORIS sites have a post-seismic model

The ITRF2014P gives good results after some minor problems as:

- Overlaps period of one day in block epoch for 7 stations
- Station with same DOMES number and 2 Four Character ID different

Comparison of DORIS residuals obtained from ITRF2014P and DPOD2008:

- GSC has tested ITRF2014P without post-seismic model for Jason-2 from 2008

Residuals are lower for all stations except for post-seismic stations

- GRG has now tested ITRF2014P with post-seismic model applied for 3 satellites from 2012 for Jason-2, CRYOSAT-2, and HY-2A the residuals are slightly lower with ITRF2014P

- CNES POD has tested ITRF2014P with post-seismic model for Jason-2 from 2012: very slight improvement in DORIS RMS residuals

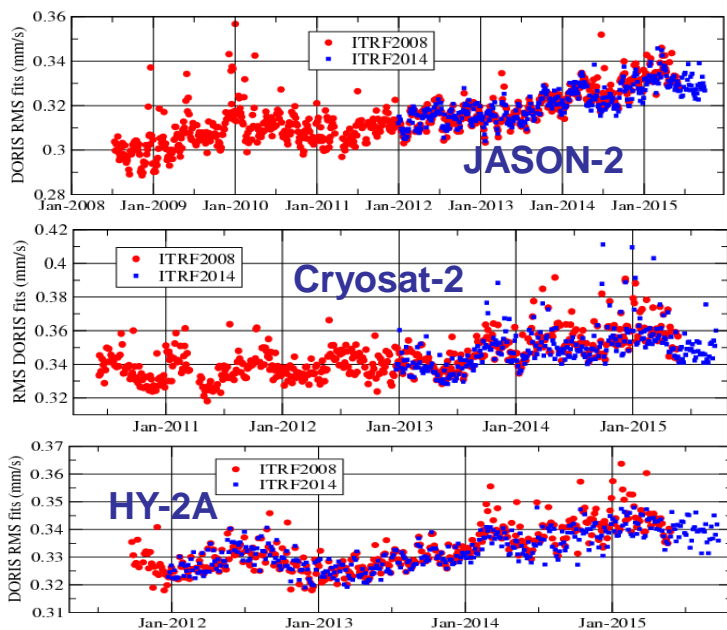
DORIS+SLR orbits closer to GPS-only orbits

Evaluation of the ITRF2014P by IDS

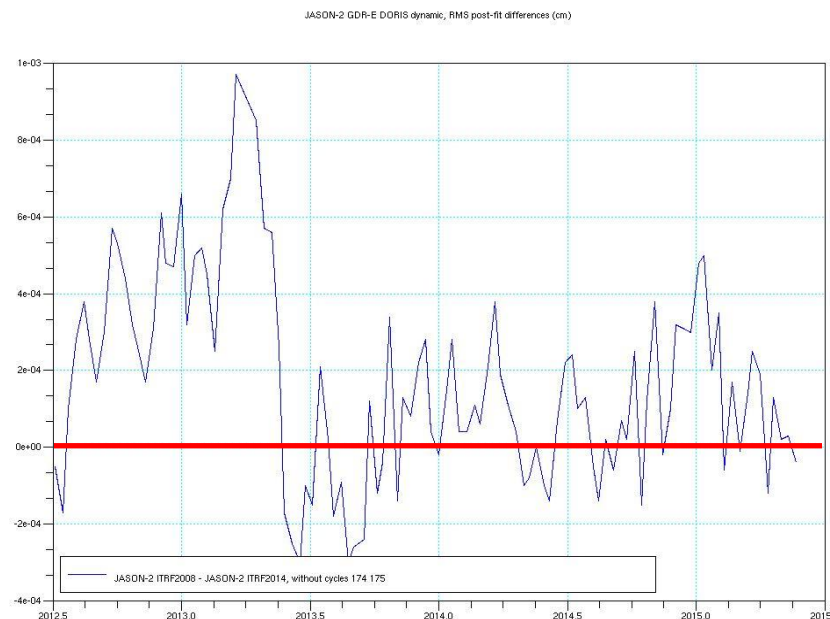
2. IDS Evaluation status

ACs Results

GRG DORIS RMS residuals
With ITRF2014P and DPOD2008



JASON-2 GDR-E DORIS-only dynamic orbits,
differences of DORIS RMS residuals
positive values mean improvement



IDS CC evaluation

- IDS CC suggests to reconsider velocity constraints in Easter Island and Manila.
- Unused of PSD corrections → centimetric differences even several years after the Earthquake.
- IDS CC proposes to make available to the IDS ACs XYZ and NEU corrections in Ascii file. One file per station and one line per week until 2020.0.
- After some minors corrections the ITRF2014P gives good results

What's Next

1. Another requirement for IDS Analysis Centers, is to prepare for upcoming launch of Jason-3, Sentinel-3A.

DORIS data will only be delivered in RINEX-like format – The ACs must all verify their processing of these observables as well as verify the content of their SINEX files.

2. We are working to answer questions related to the ITRF2014 submission

the scale issue with the DORIS solution starting in mid-2012

the Spot-5 Scale factor has an atypical behaviour

an increase of DORIS residuals from Jan. 2013 for all missions ...

Next IDS Meetings

IDS AWG, May 2016 26-27. at TU Delft (The Netherlands).

IDS WORKSHOP, October 2016 (31 October 31 - 01 November), before Ocean Surface Topography Science Team meeting in France (La Rochelle).

<http://ids-doris.org>

