Research activities for the DORIS contribution to the next International Terrestrial Reference Frame

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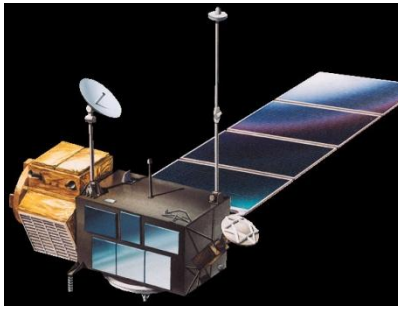
DORIS constellation

	TOPEX	SPOT-2	SPOT-3	SPOT-4	SPOT-5	ENVISAT	JASON-1	JASON-2	CRYOSAT-2	HY-2A
	1992-2004	1990-2009	1993-1996	1998	2002	2002	2001	2008	2010	2011
	1st generation (1 channel)				2nd generation (2 channels)			DGXX (7 channels)		
inclination (deg)	66.5	98.7	98.6	98.8	98.8	98.6	66.0	66.0	92.0	99.4
altitude (km)	1300	830	830	800	820	780	1330	1330	720	960



Topex/Poseidon

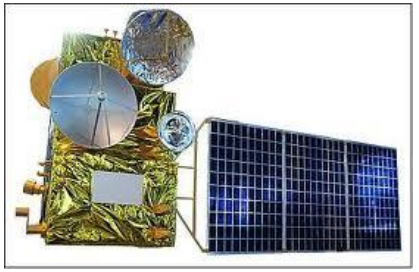
SPOT -2, -3, -4, -5

Jason-1 & Jason-2

Cryosat-2

DGXX instrument:
- 7-channel receiver → more data
- better quality (equivalent to 0.3 mm/s)
- access to raw DORIS phase measurement instead of Doppler data

ENVISAT

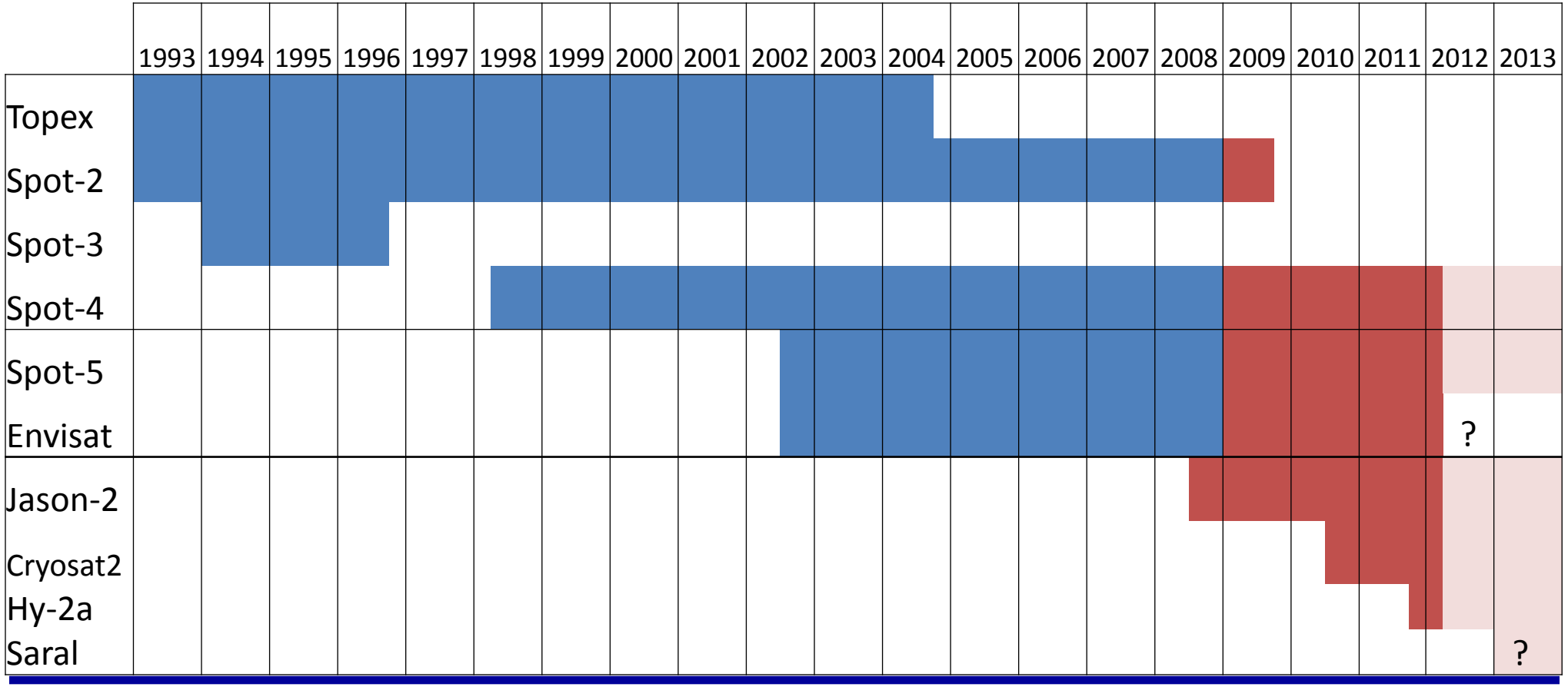


HY-2A

DORIS data for ITRF

Next ITRF ⟶

ITRF2008 ⟶



Establishment of an operational processing

Components:

7 Analysis Centers: ESA, Geoscience Australia, NASA/GSFC, Geodetic Observatory Pecny, INASAN, IGN, CNES/CLS (LCA)

1 Combination Center (CNES/CLS)

2 Data Centers: IGN, CDDIS

Analysis Coordinator: Frank Lemoine

Operational processing:

Every 3 months, **Analysis Centers** deliver to the DCs 3 months of cumulated weekly SINEX solutions (including all the satellites) with a 3-month latency.

The **Combination Center** uses IGN CATREF software to:

- evaluate the ACs individual series w.r.t. ITRF2008
- combine the ACs weekly sinex
- evaluate the ACs individual series w.r.t. the weekly combined solutions
- produce and supply reports to the ACs

Routine Combination

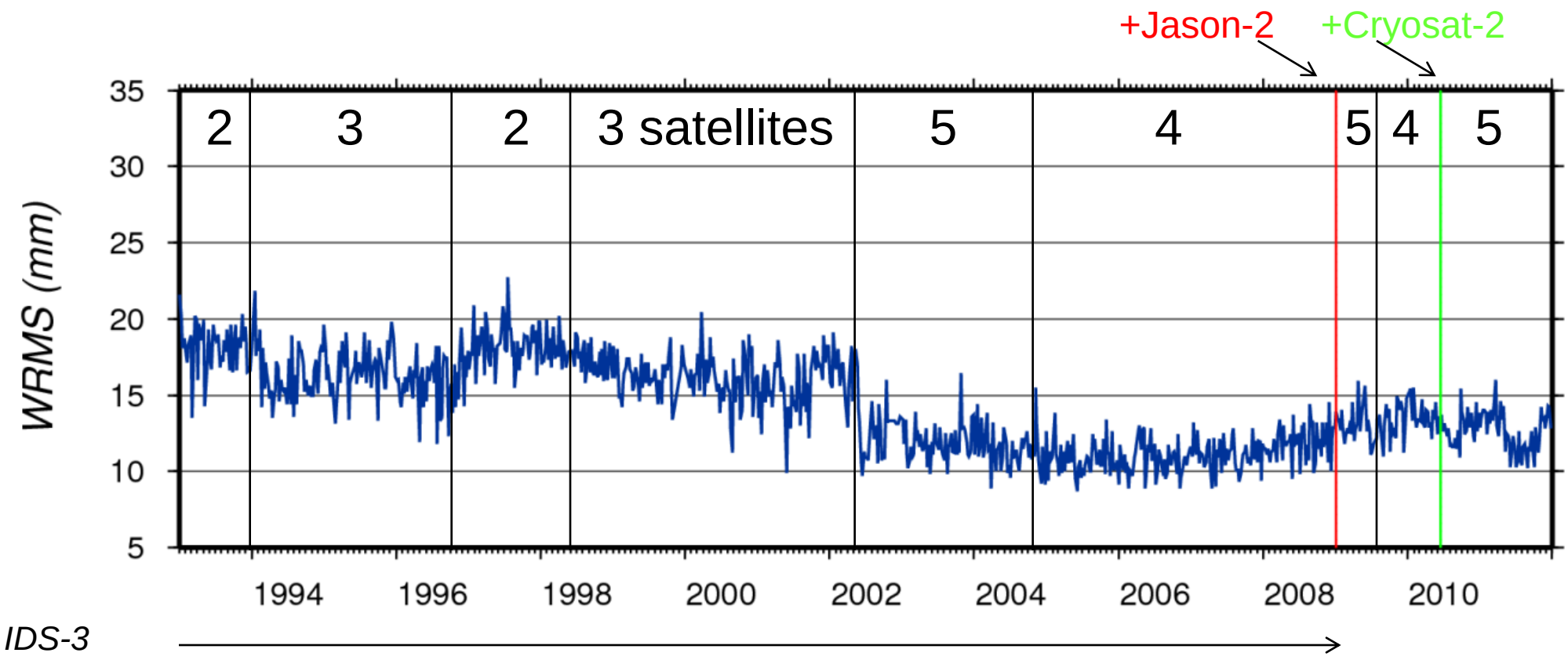
Current Status

- The processing chain is now considered as operational for position combination (evaluation/combination reports, position residuals maps, network maps…)
- IDS weekly combined series delivered for ITRF2008 (IDS-3) has been extended until end of 2011
- Files of station coordinates time series (STCD) are on the way

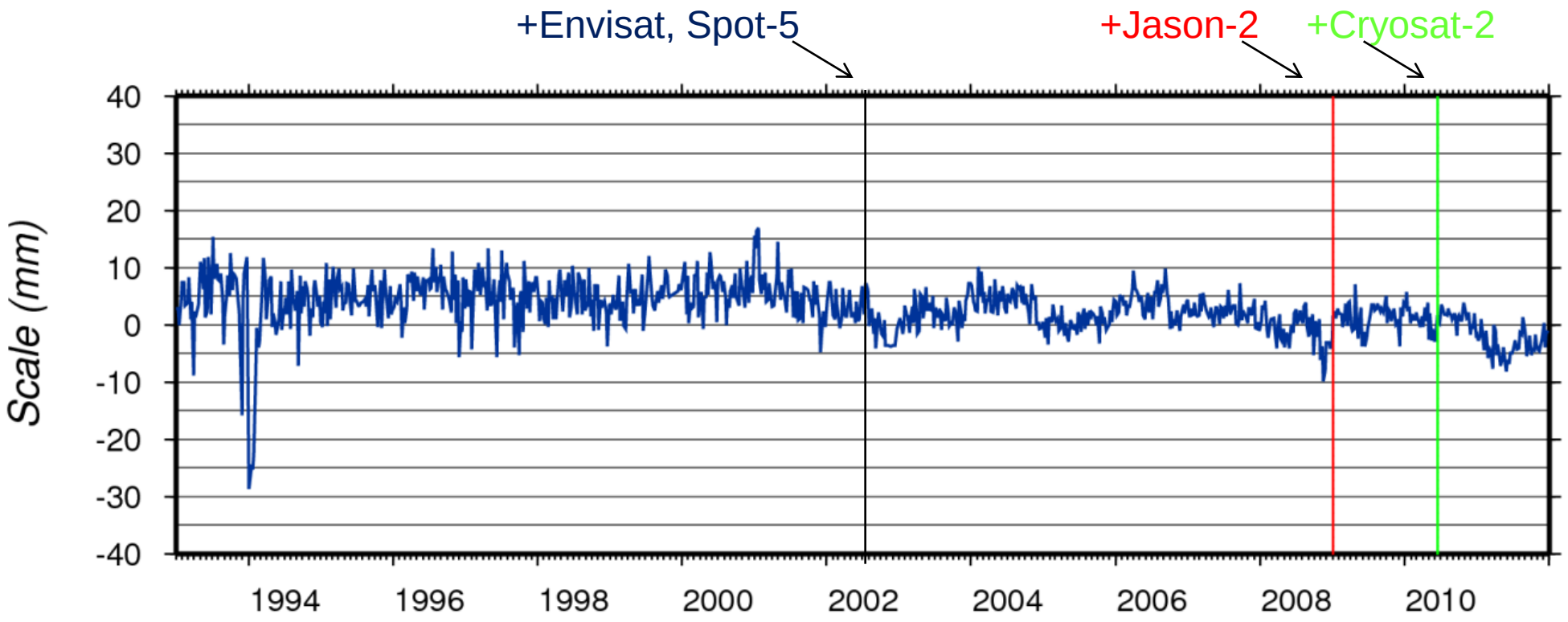
What's next?

- EOPs estimations
- Cumulative combined solution of station positions and velocities
- Make available outputs on IDS ftp site (ftp://ftp.ids-doris.org/pub/ids)

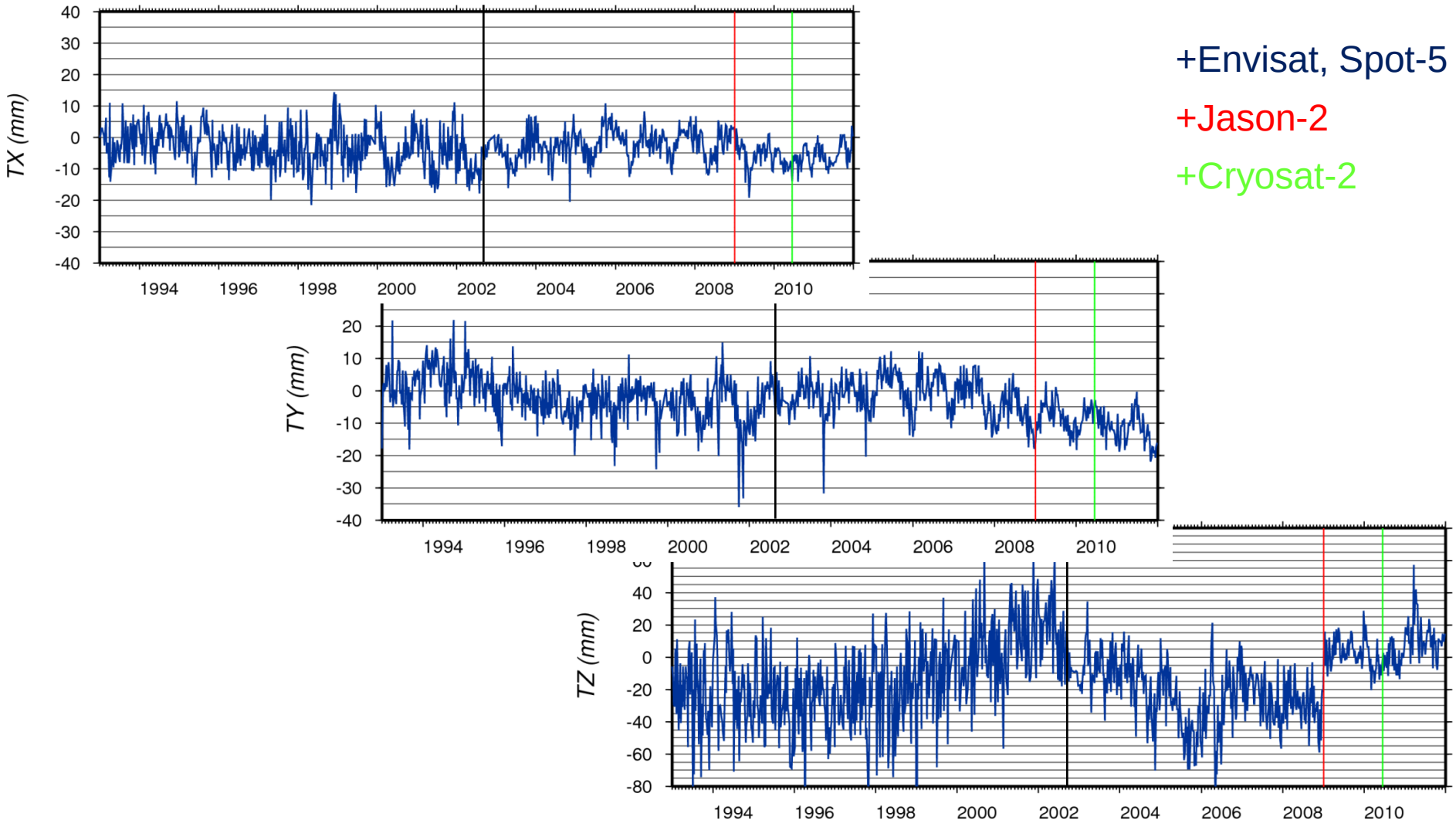
Weighted RMS of the weekly combined solutions wrt ITRF2008 (1993-2011)



Scale from the weekly combined solutions wrt ITRF2008 (1993-2011)



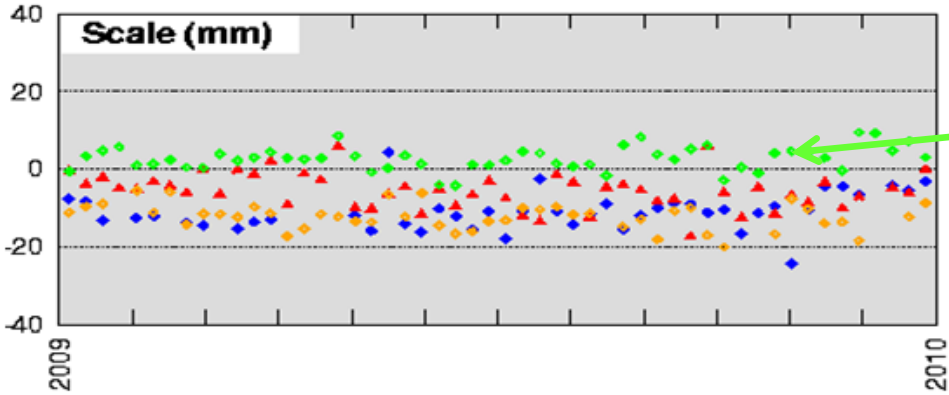
Geocenter from the weekly combined solutions wrt ITRF2008 (1993-2011)



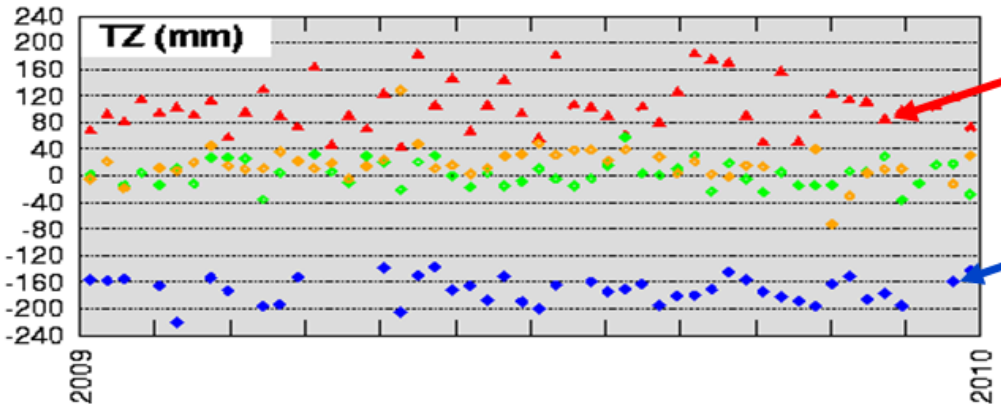
Contribution of each satellite to the combined TRF

→ Single-satellite campaign initiated by the Analysis Coordination

Series of SINEX solutions for each satellite over 2009



Jason-2



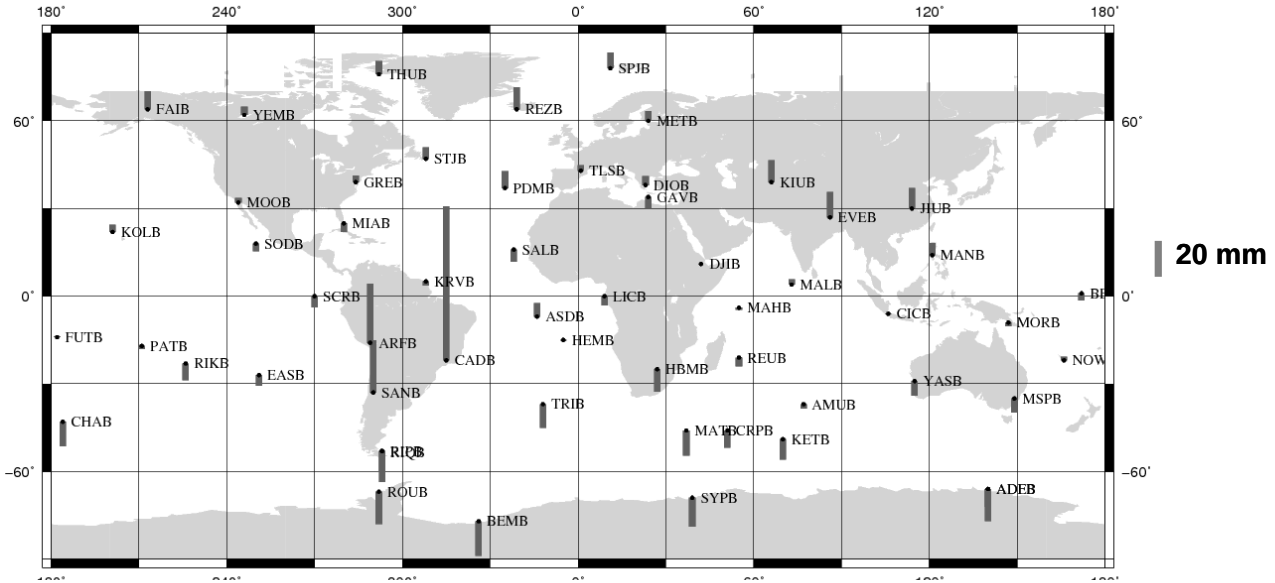
Spot4

Envisat

South Atlantic Anomaly effect on SPOT-5

Up component: Coordinates differences

SPOT-5 single satellite solution vs. Combination
(Stepanek, IDS Workshop, 2010)



See poster of Stepanek et al. XL 67, GGOS poster session G2.1, Th 26 Apr

« Different approaches how to deal with the South Atlantic Anomaly effect on the SPOT-5 DORIS measurement »

Evaluation of non-tidal atmospheric station loading

First results of the atmospheric loading testing on SLR/DORIS Jason-2 POD with GEODYN at NASA GSFC.

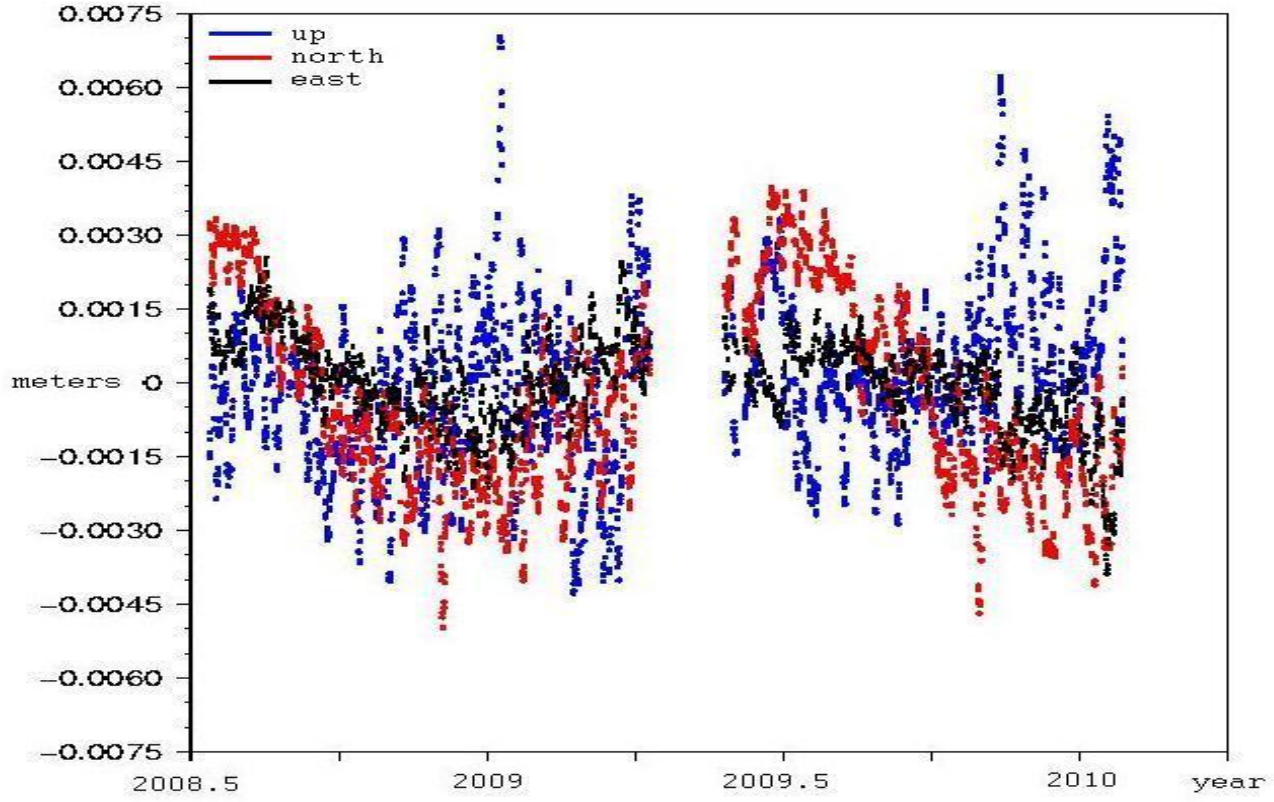
Non-tidal atmospheric station surface displacements from ECMWF 6-hour pressure data (*from Jean-Paul Boy, EOST/Strasbourg, 2012*).

Corrections applied at the observation level on Jason-2, for 57 cycles (~2008.5-2010)

S1, S2 loading correction excluded. They will be applied separately later.

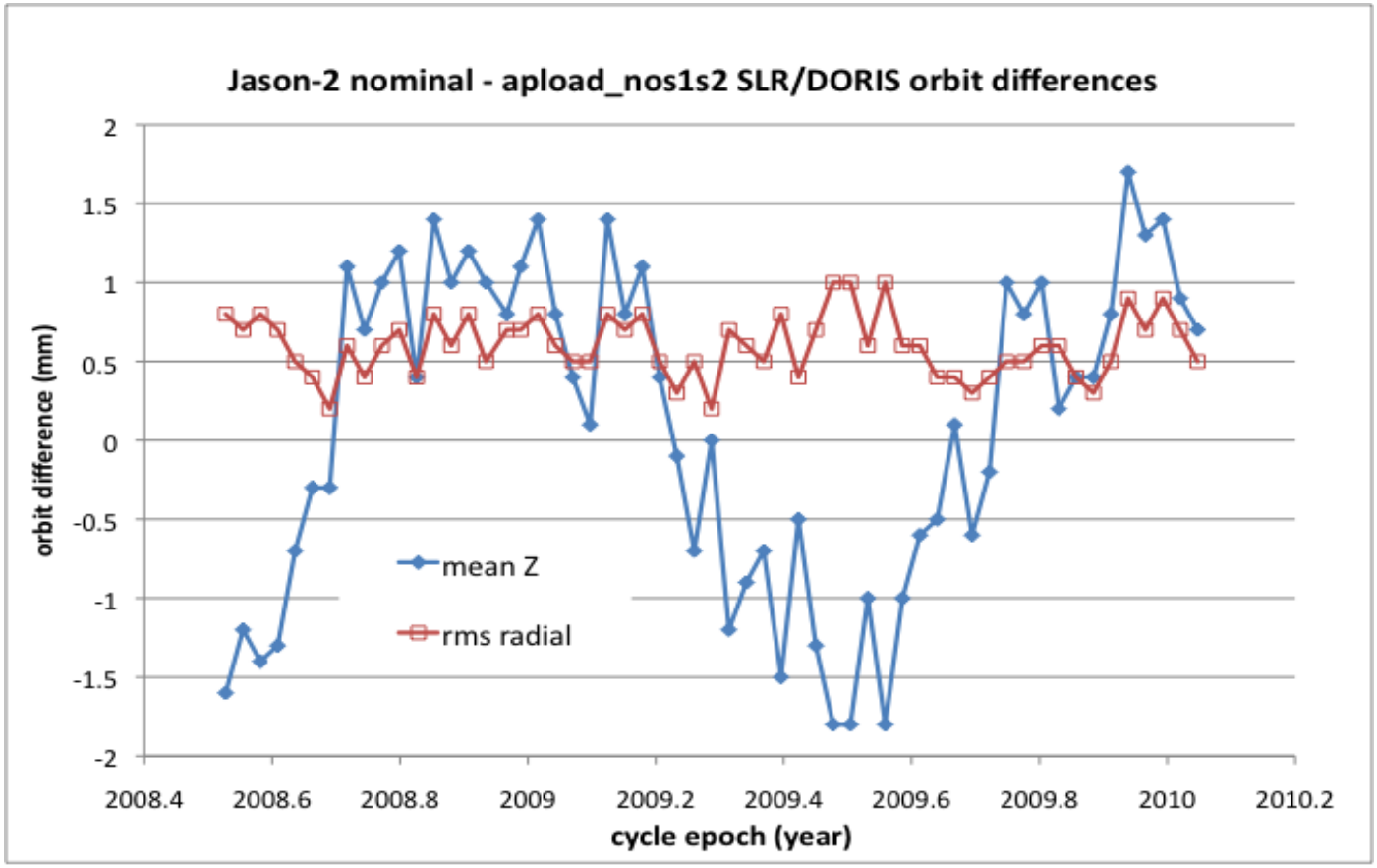
Evaluation of the differences between the “nominal” orbit and the “atm. Loading corrected” orbit.

Atmospheric loading correction at Greenbelt for Jason-2 over ~570 days (cycles 1-57)



-correction Up is not the largest
-displacements in North: 6 mm peak-to-peak
-means not equal to 0 over this period

Impact on the orbit



-rms radial difference = 0.5 mm (total error budget is of 10 mm)
-annual Z-shift of 3 mm peak-to-peak

Summary

- IDS has established an operationnal processing

- More data from the new DGXX instruments on Jason-2, Cryosat-2, Hy-2a

- Still some issues to be discussed
  -How to manage the satellites affected by the SAA (SPOT-5, Jason-1)?
  -Contribution of the new satellites (HY-2A, SARAL?)
  -New standards and models (atm. loading, troposphere, gravity field…)
  -Ground antenna calibration (position of the 2GHz center of phase)

Forthcoming meetings:

Analysis Working Group meeting, May 31 2012, Prague, Czech Republic

IDS workshop, September 2012, Venice, Italy