



CNES/CLS Analysis Center (LCA) Status Report

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Data processing

Re-processing:

In the second half of 2011, the CNES/CLS Analysis Center has entirely re-processed the whole DORIS data set for orbit determination and tracking station coordinate estimation.

Motivations: upgrades brought to the GINS/DYNAMO software and availability of new models.

SPOT-2, -3, -4, -5, Topex/Poseidon, Envisat + Jason-2, Cryosat-2 are included in the products delivered to the IDS.

In addition, Jason-1 is also processed and orbits provided to IDS (not included in combined SINEX)

Routine processing (same configuration as the re-processing):

All satellites including HY-2A

Data analysis

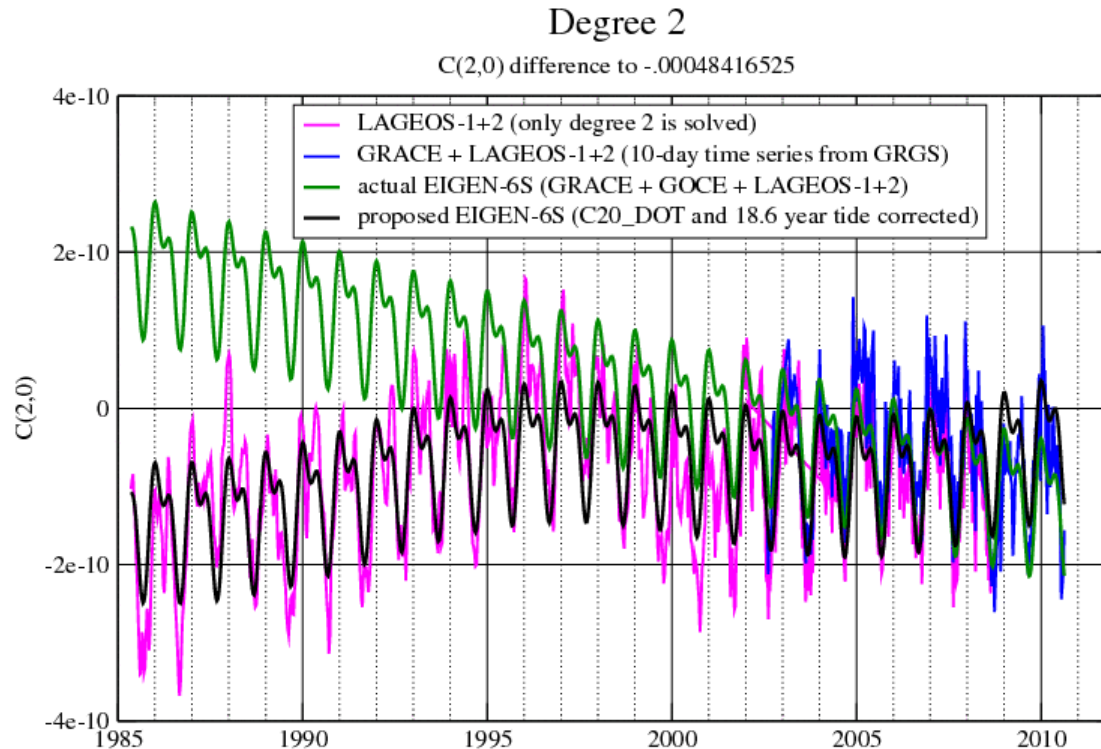
The GINS 11.2d1 version we used includes:

- revised attitude laws for TOPEX/JASON-1/JASON-2, Envisat and Cryosat-2
- fixed bug related to the frequency bias
- new macro-model tuned by GRGS for Jason-2
- phase wind-up effect implemented in GINS and used in the data processing

Changes with respect to the previous processing set up for the IDS-3 realization:

- DPOD2008 as a priori instead of DPOD2005
- IERS EOP series aligned on ITRF2008
- GMF/GPT tropospheric model instead of zenith delay derived from ECMWF meteorological model and Guo&Langley mapping function
- EIGEN-6S gravity model instead of EIGEN-GL04S

Correction of EIGEN-6 C20



EIGEN-6

Current Value

New Value

	Current Value	New Value
2 0	-4.8416529982000E-04	-4.8416529995630E-04
2 0 DOT	-1.2605993970900E-11	3.1827100000000E-12

Correction to be applied to the 18.6 year tide, in terms of Delta_C20:

$$\Delta_{C20} = a1 \cdot \sin(2 \cdot \arccos(-1) \cdot (t-2005)/18.6129) + a2 \cdot \cos(2 \cdot \arccos(-1) \cdot (t-2005)/18.6129)$$

with: $a1 = -9.01895e-12$ $a2 = -3.47674e-11$

Post-fit orbit residuals

DORIS and SLR orbit post-fit residuals are significantly reduced in the new processing.

Except for DORIS/Envisat: problem with phase wind-up. No longer applied.

Satellite	Previous processing	New processing
Spot-4	0.386 mm/s	0.381 mm/s
Spot-5	0.350 mm/s	0.347 mm/s
Envisat	0.376 mm/s	0.394 mm/s
	1.23 cm	1.03cm
Jason-2	0.316 mm/s	0.310 mm/s
	1.68 cm	1.28 cm
Cryosat-2	0.345 mm/s	0.342 mm/s
	1.30 cm	1.08 cm

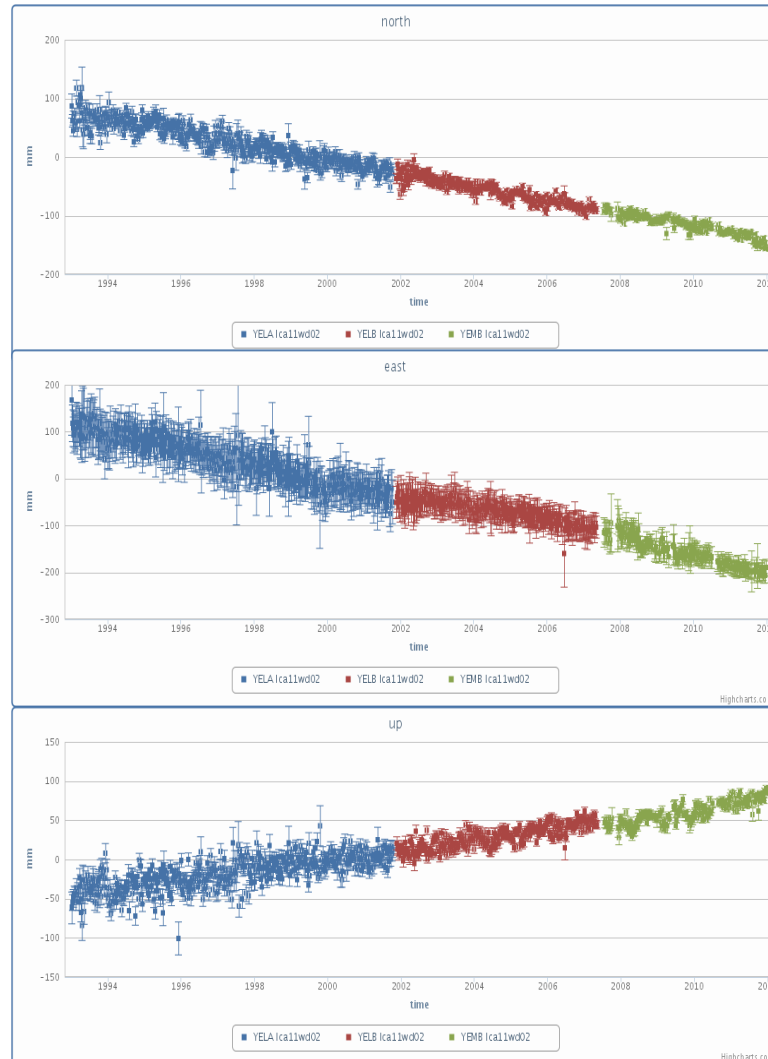
Mean values of DORIS and SLR residuals RMS determined over 6 months in 2010-2011

Products

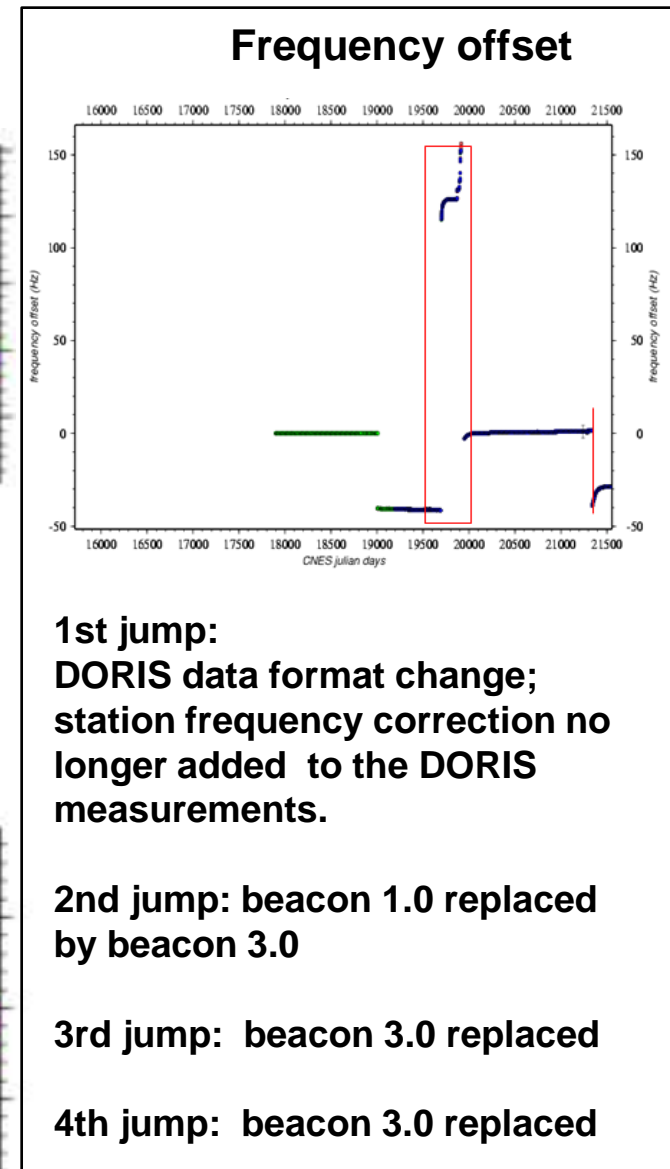
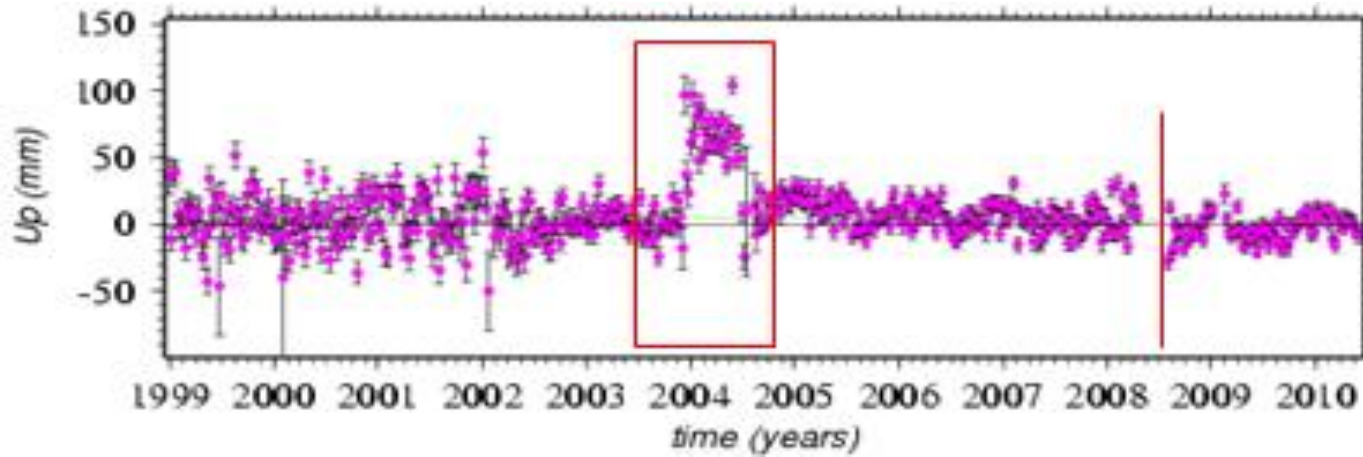
Product	Series	Data span	
SINEX files of free-network solutions of weekly station coordinates and daily EOP	lcawd30 (including Jason2 and Cryosat2)	1993 - ...	
STCD files of time series of station coordinates	lca11wd02	1993 - ...	
SP3c files of orbit	lca02.sp3	TOPEX: 1993 – 2004 SPOT-3: 1993 – 1996 SPOT-5: 2002 - ... JASON-1: 2001 - ... CRYOSAT-2: 2010 - ...	SPOT-2: 1993 – 2009 SPOT-4: 1998 - ... ENVISAT: 2002 -... JASON-2: 2008 -

List of the CNES/CLS products supplied in 2012, and the total data span of each series

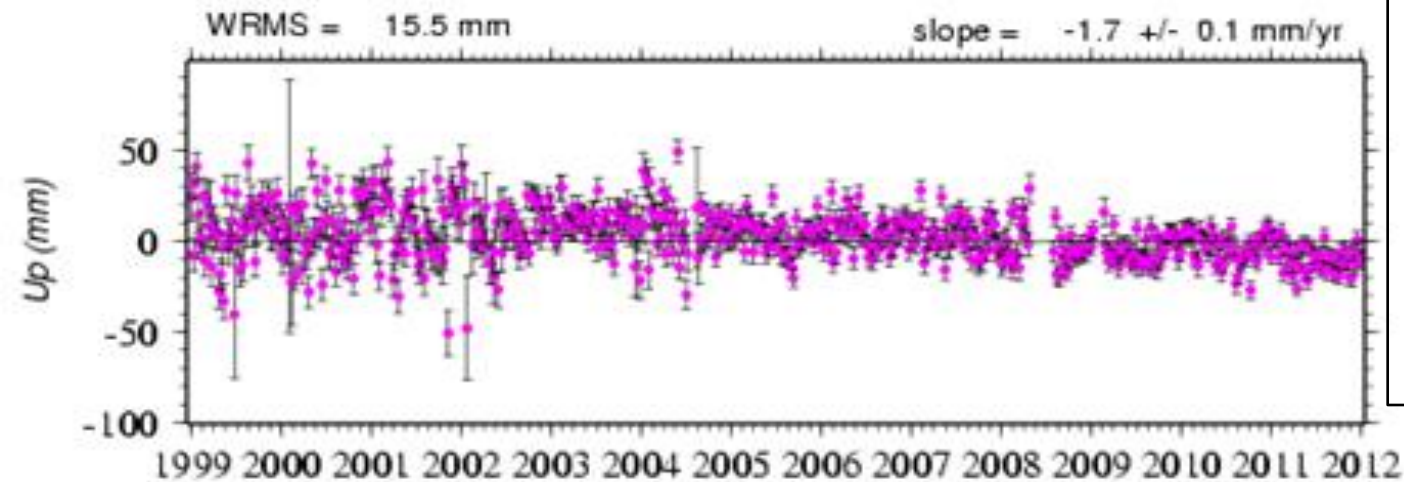
Exemple of coordinate time series for the 3 successive stations (YELA/YELB/YEMB) installed in Yellowknife (cf STCDtool)



Previous series (La Réunion, vertical component)



New series lcawd30



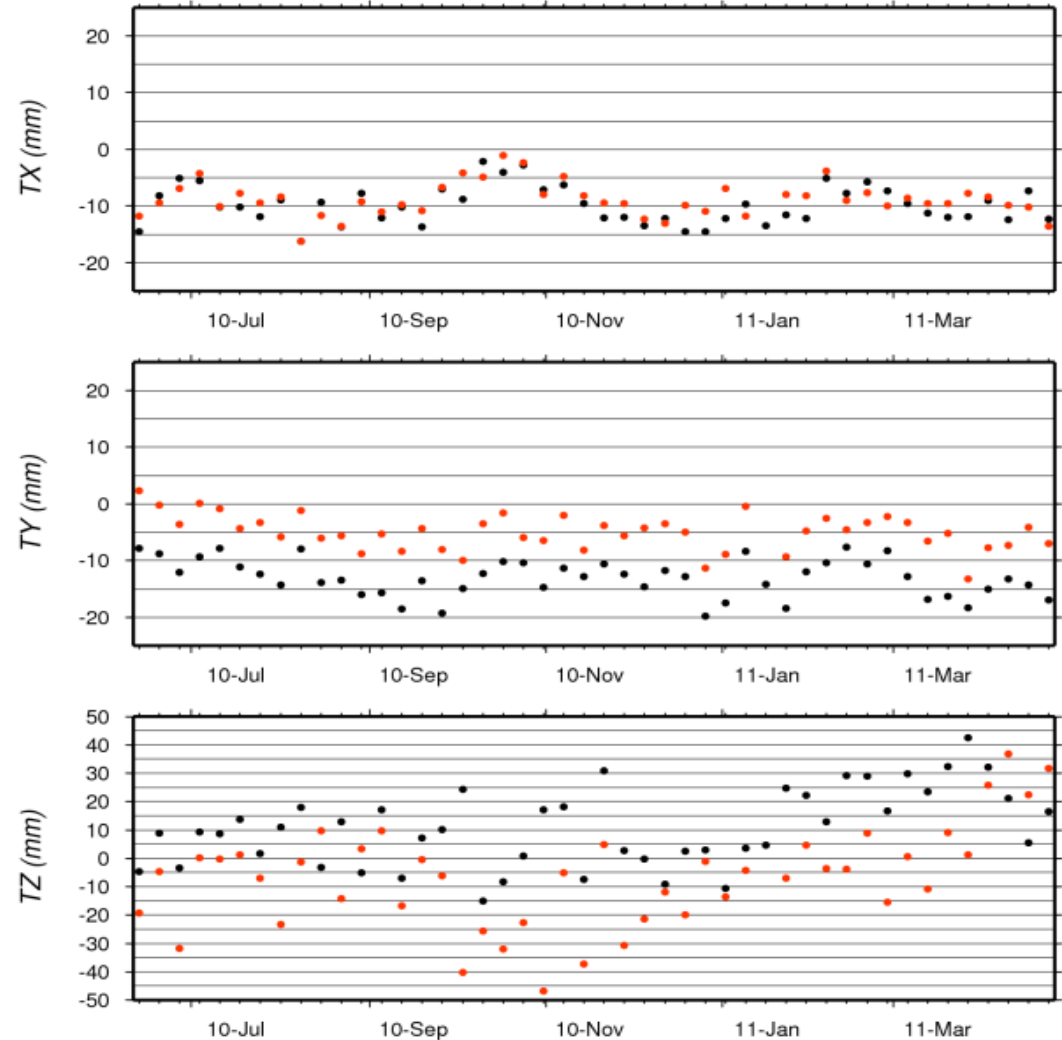
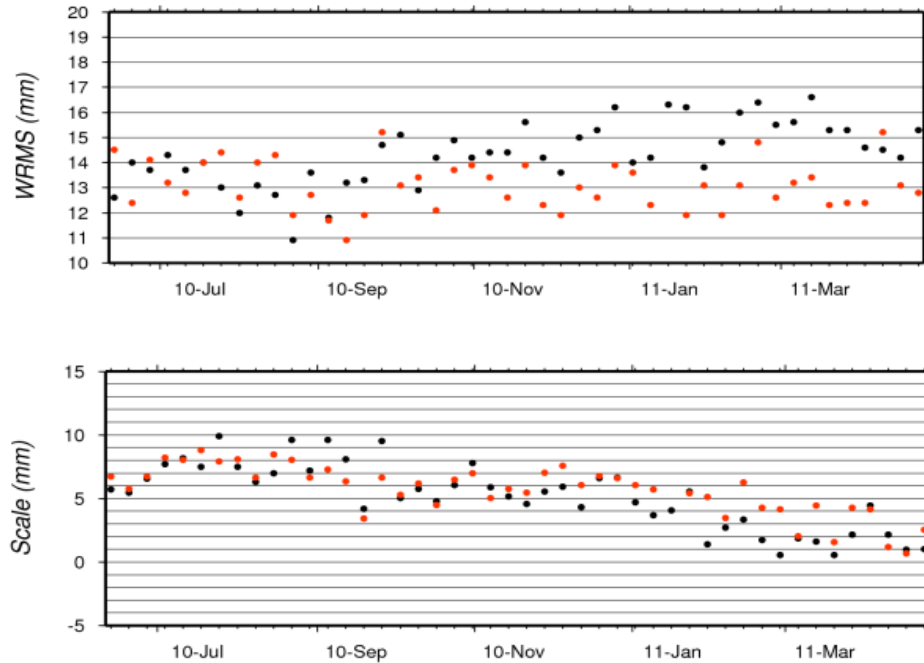
Positioning performances improved

The positioning performance is improved with the new processing.

The comparison of the weekly station solutions lcawd28 (previous processing) and lcawd30 (new processing) with ITRF2008 for the period 2010/06-2011/04 (with Cryosat-2) shows that:

- A gain of 1-2 mm is obtained on the weighted RMS of the network coordinate differences.**
- The scale is more stable .**
- The impact on the geocenter (translations) is small for the TX.
The bias on TY is reduced by 5 mm.
TZ remains however very scattered.**

● lcawd28 ● lcawd30

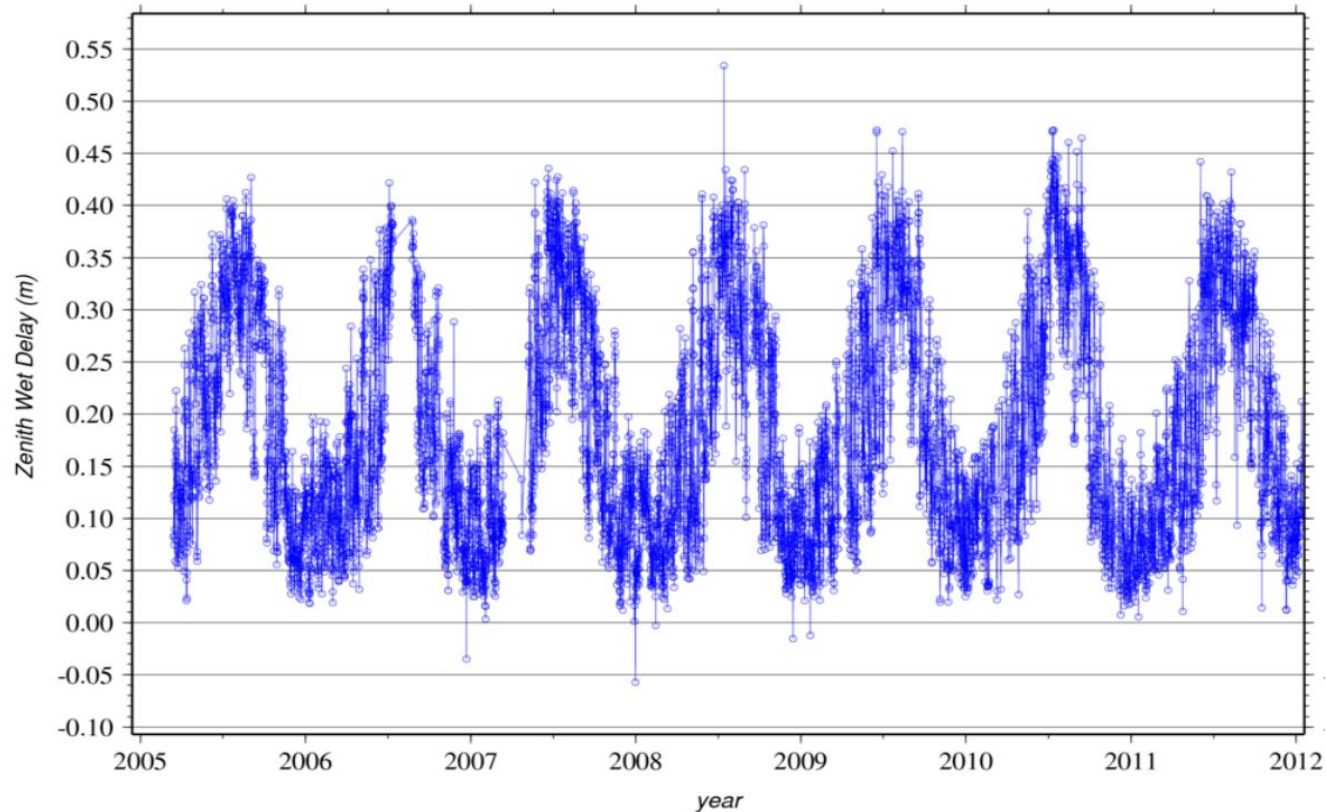


Weekly 3D wrms, scale and geocenter for the previous series lcawd28 (black dots) and the new series lcawd30 (red dots) over 2010/06-2011/04 (Moreaux G. , personal communication)

Estimation of ZWD

Tropospheric model: GPT/GMF

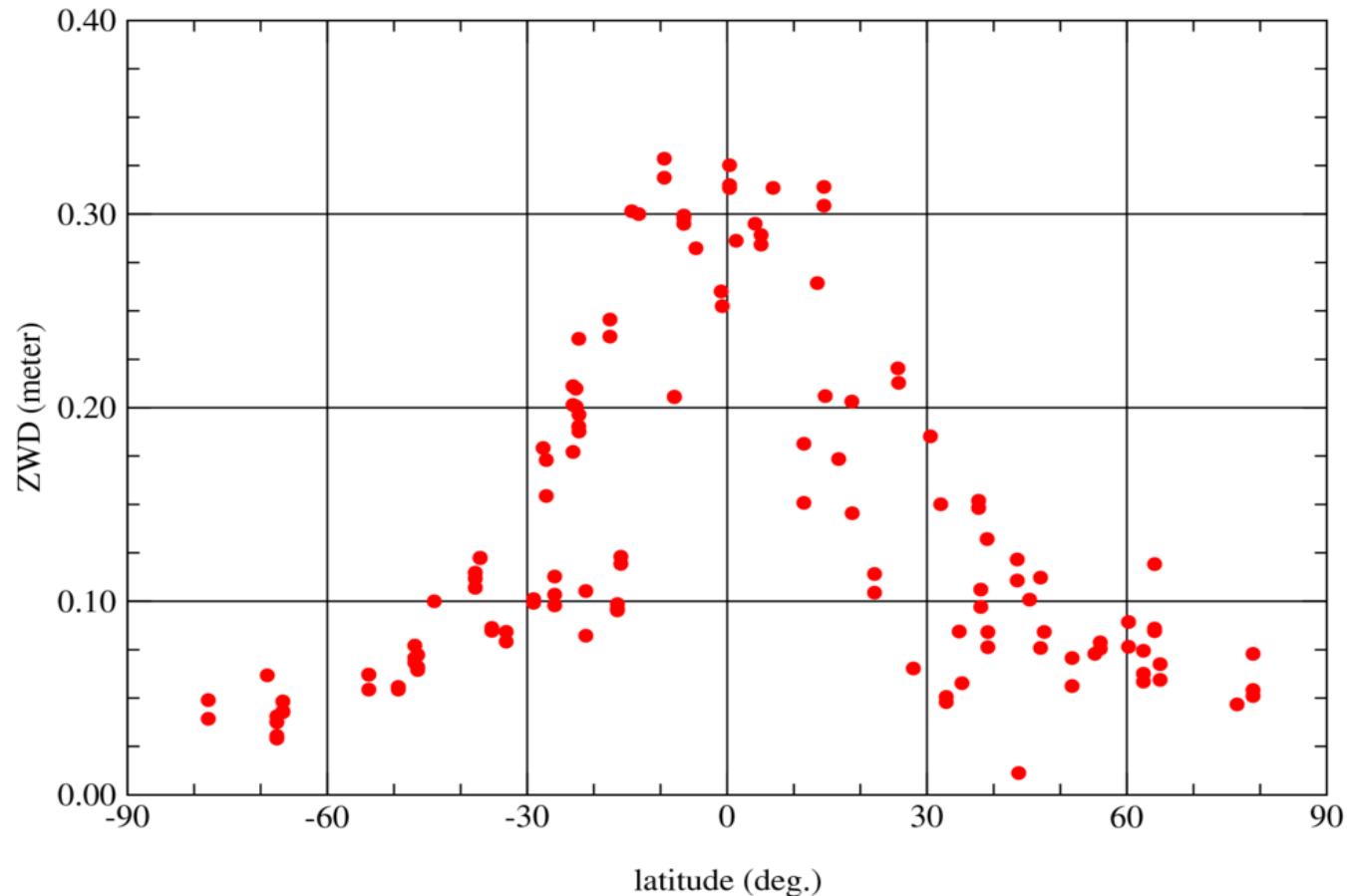
A bias is estimated for each satellite pass over each station = ZWD (+ error in GPT ZHD)
(*partial derivatives for Wet component only*)



ZWD estimates for the DORIS station in Jiufeng (Spot4)

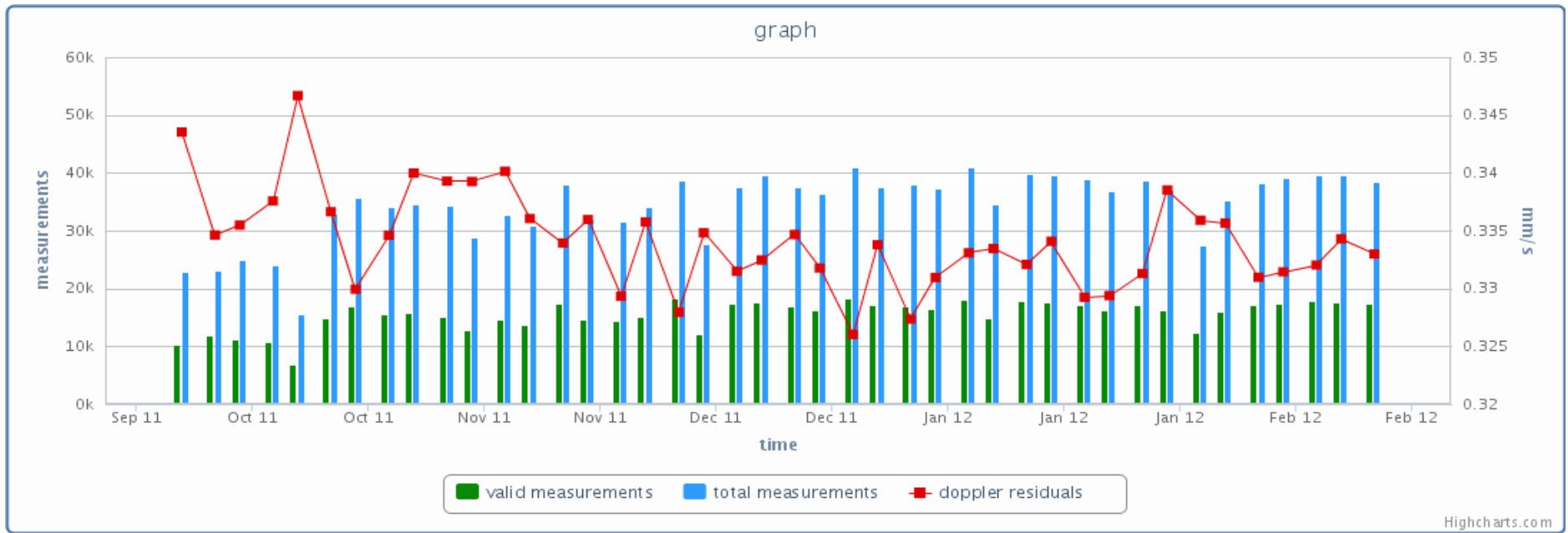
ZWD mean values

- ZWD mean values as a function of the latitude of the stations:
→ about 5 cm at high latitudes, 35 cm at the equator

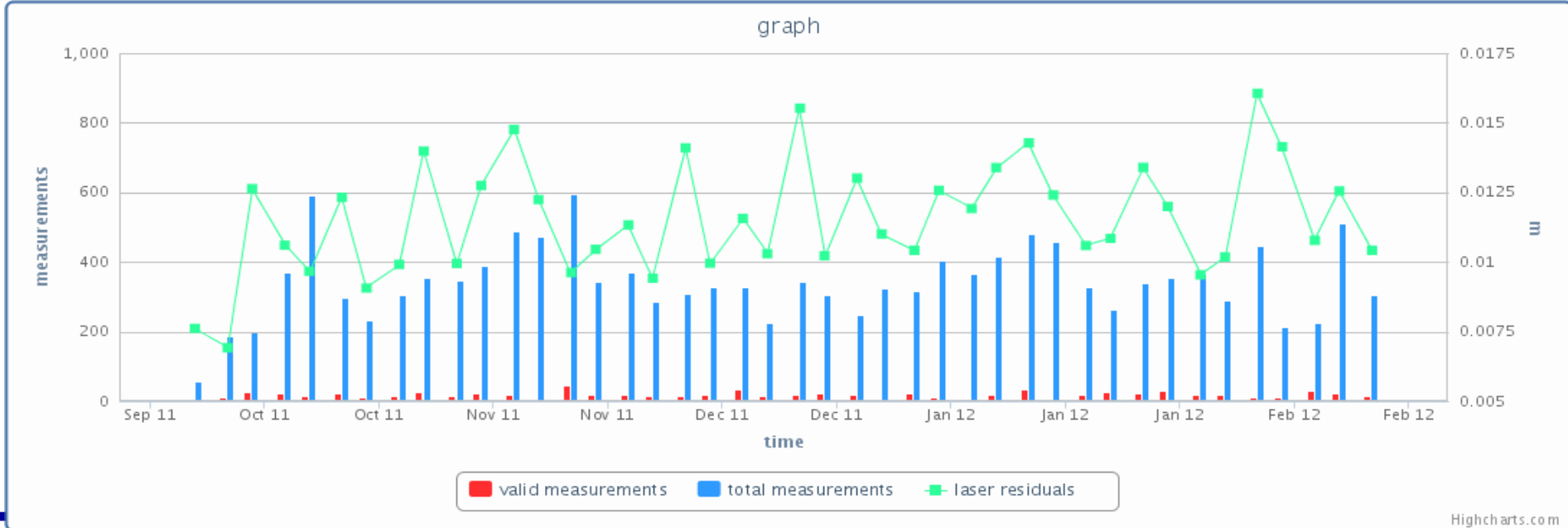


First results for HY-2A

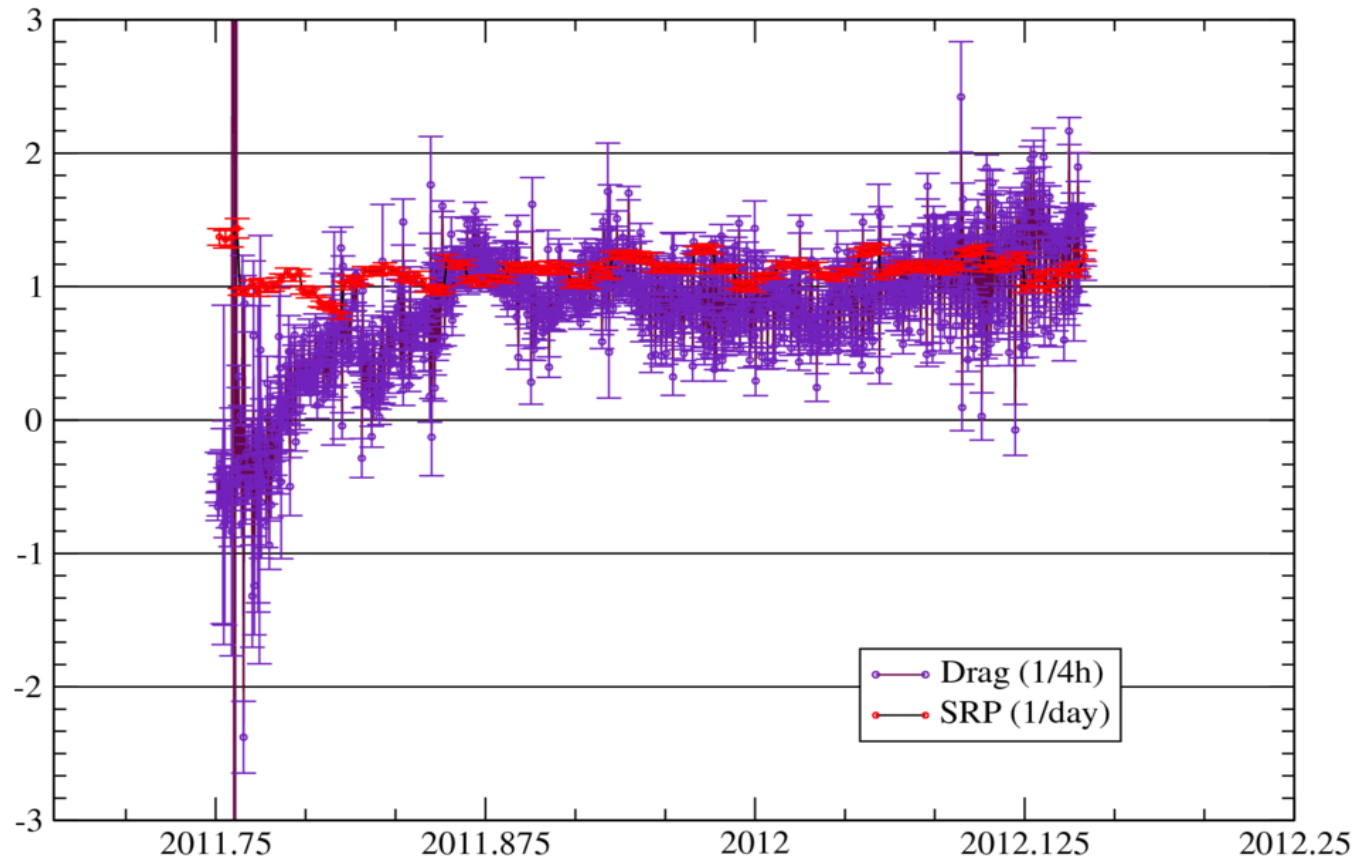
- All available data have been processed (from Oct. 2011) on 3.5-day arcs using the macromodel provided by CNES.
- HY-2A is now included in the routine processing.
- Post-fit residuals are around
0.33 mm/s for DORIS
1.15 cm for SLR
- A new series lcawd32 is performed
= Spot4 + Spot5 + (Envisat) + Jason2 + Cryosat2 + HY2a



DORIS residuals, data available and data processed for HY-2A from Oct. 2011 to Feb. 2012



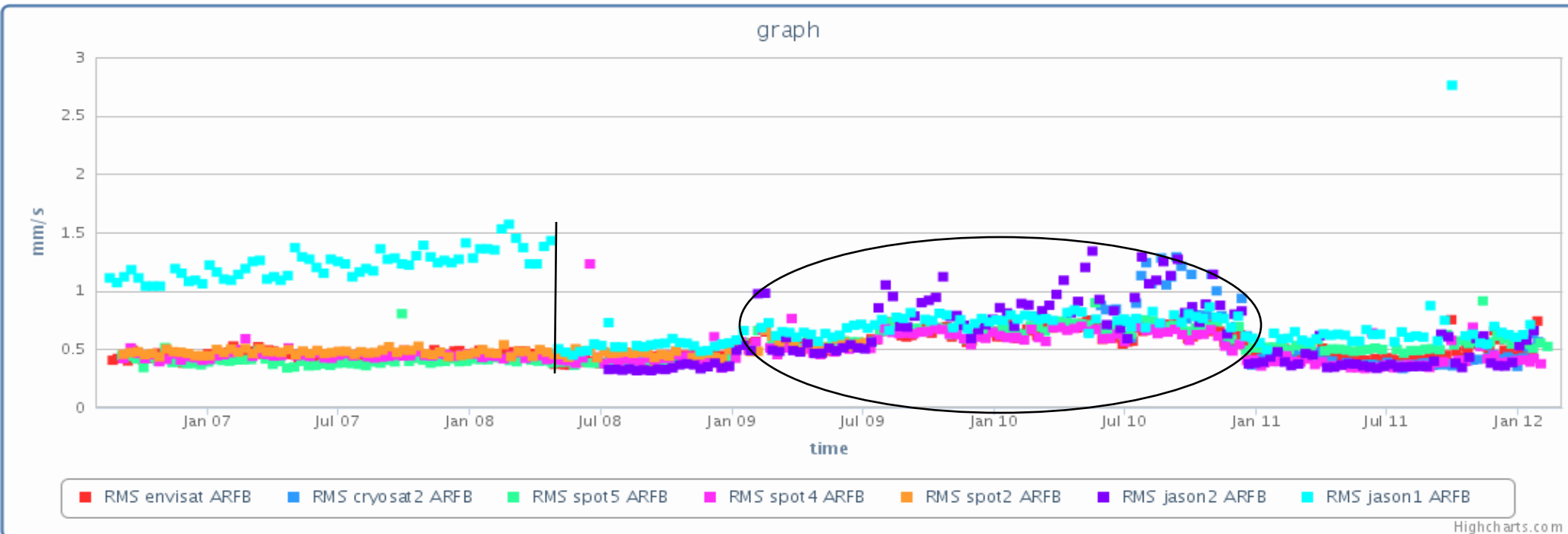
Drag and SRP coefficients estimated for HY-2A over 5 months



- HY-2A has reached a stable configuration only in November. Over the first month, the drag coefficients vary indeed between from -1 to 1.
- SRP mean value = 1.13 (now fixed to this value)

CNES POE orbit residuals for SAA stations

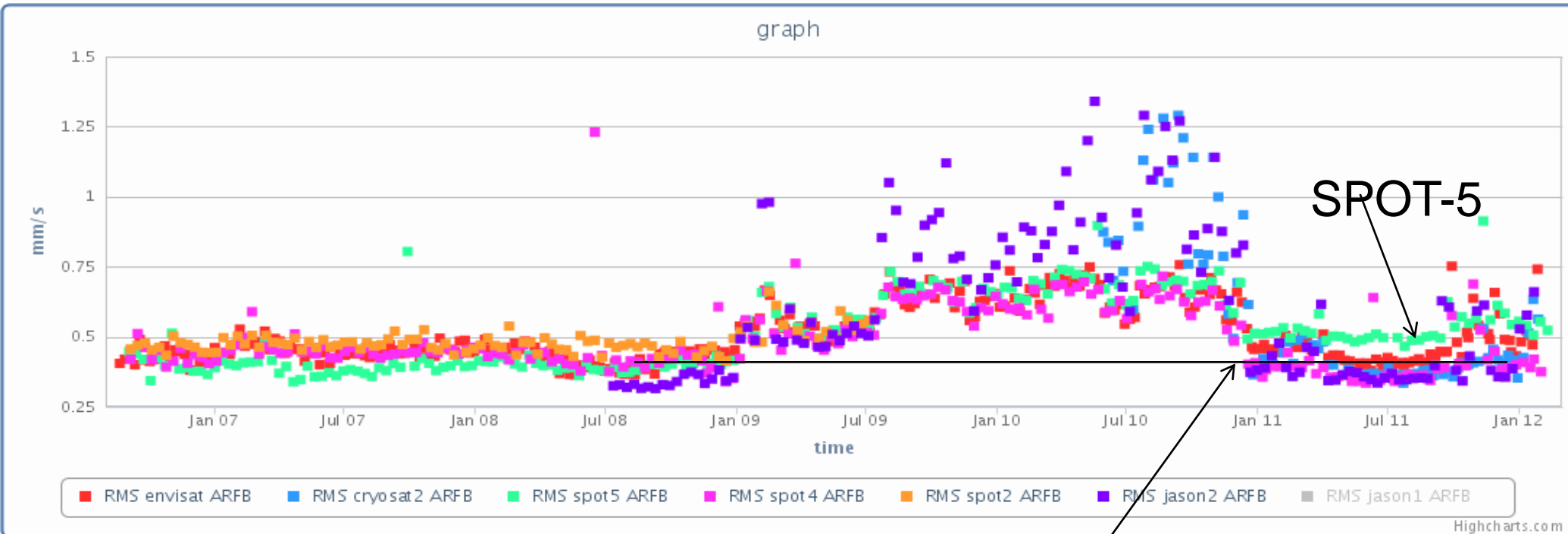
POE residuals ARFB (Aréquiapa)



- Jason-1: switch to GDR-C standards on 10/07/2008 (introduction of SAA model)

-strong degradations between early 2009 and end of 2010: cause?

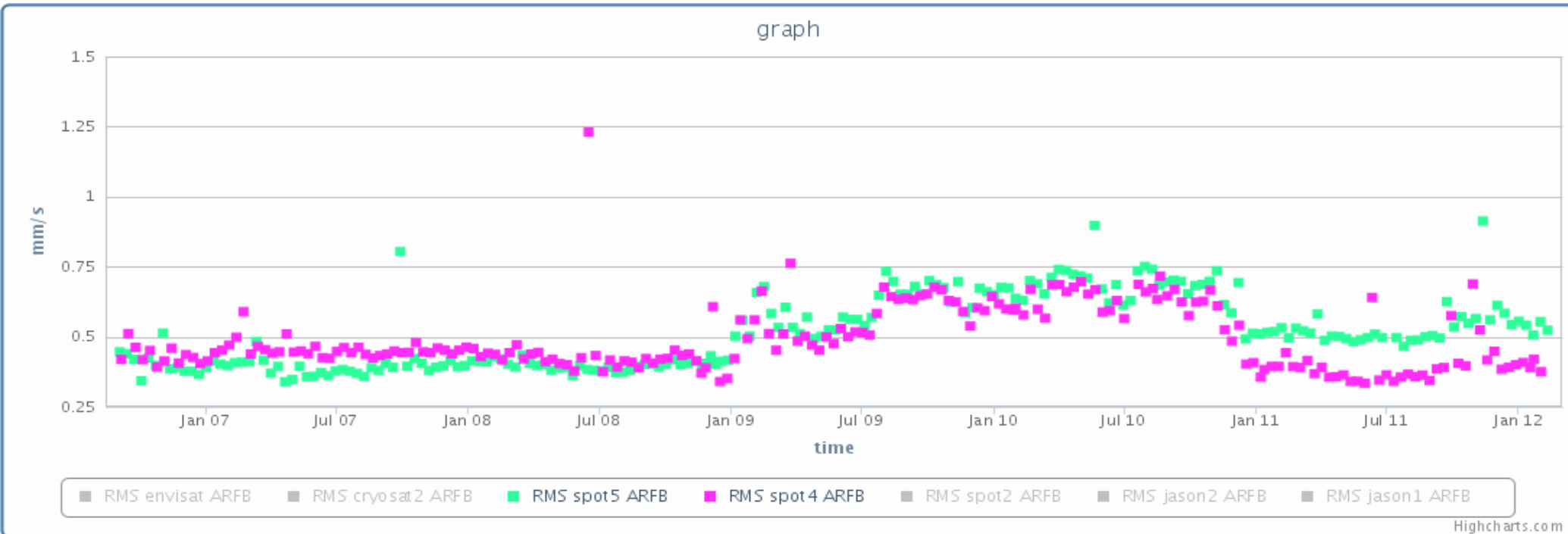
POE residuals ARFB (Aréquiapa) *Without Jason-1*



Back to « normal » level for all instruments except SPOT-5

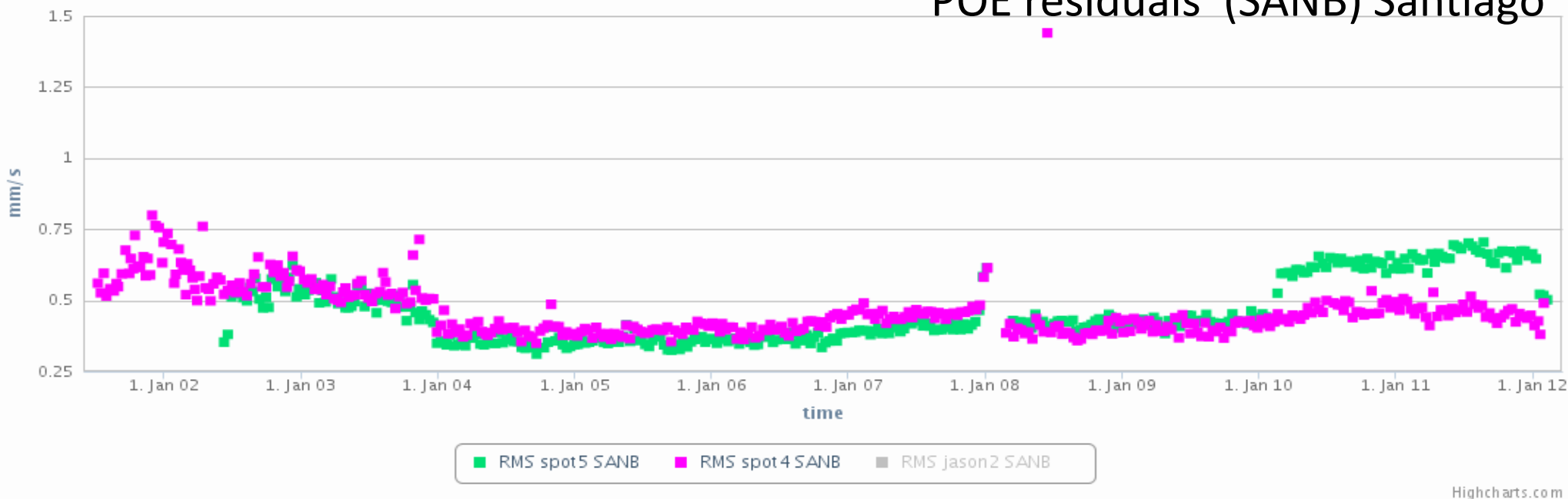
POE residuals ARFB (Arequipa)

Spot4 (pink), Spot5 (green)



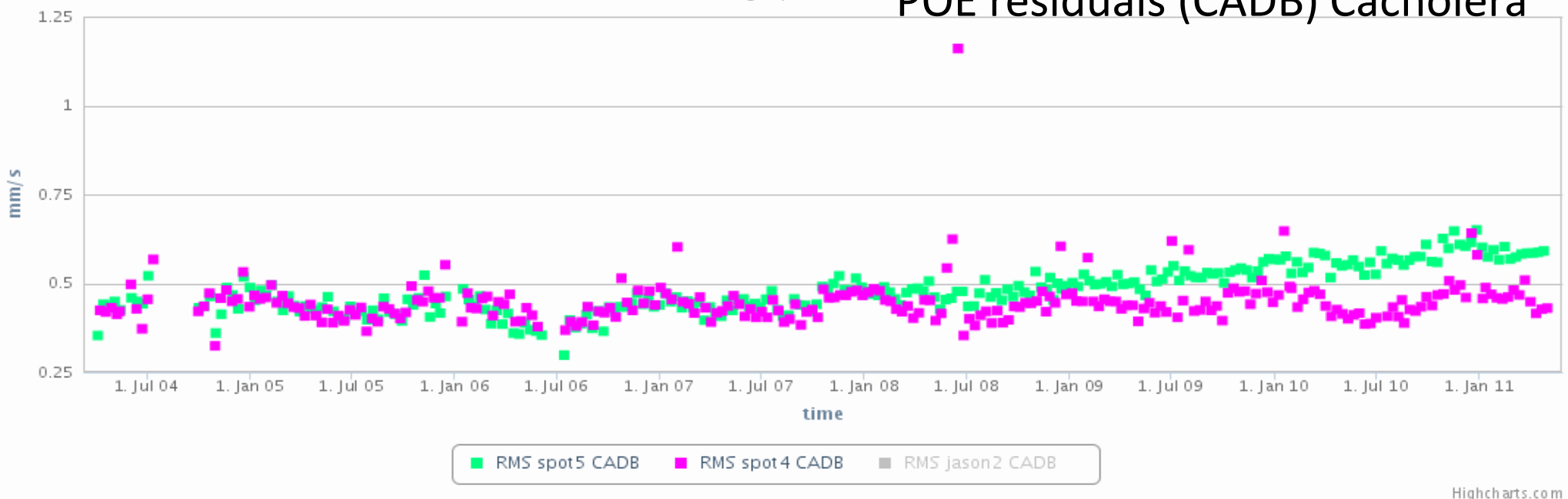
graph

POE residuals (SANB) Santiago



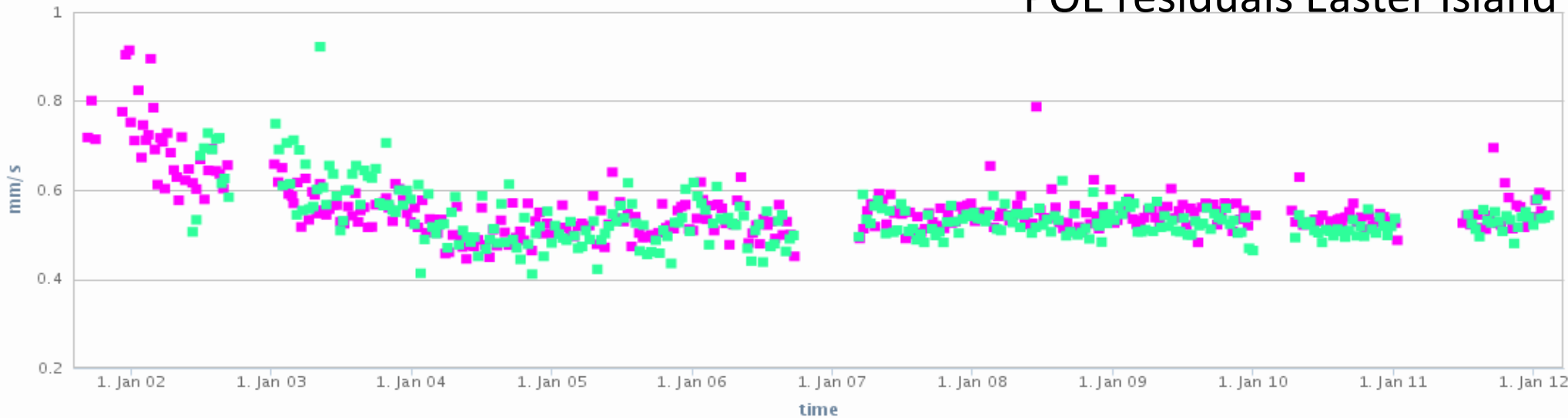
graph

POE residuals (CADB) Cachoiera



graph

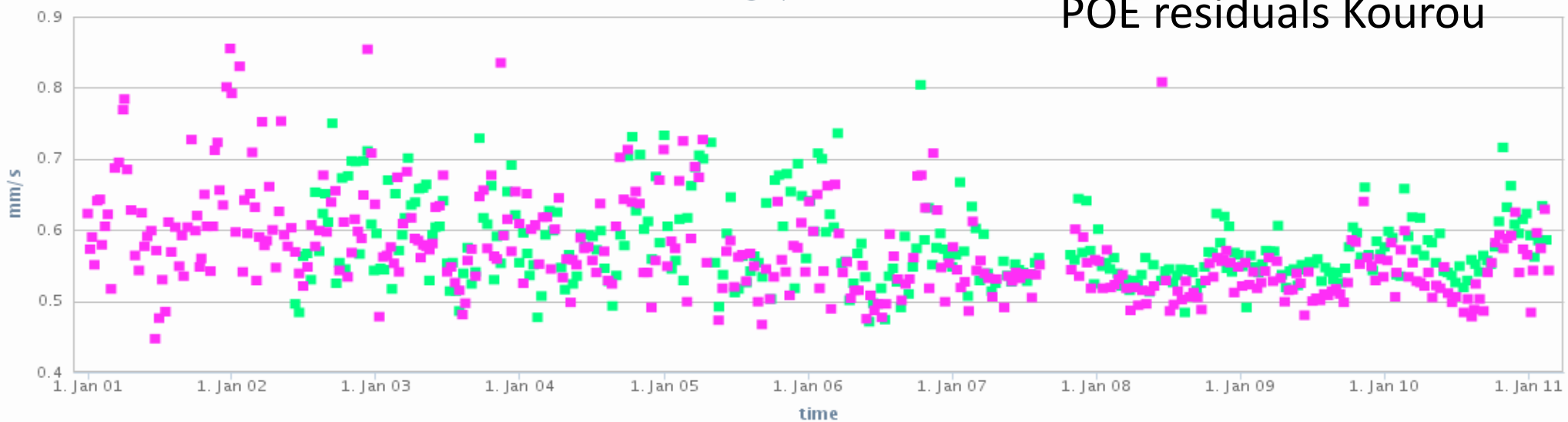
POE residuals Easter Island



■ RMS spot4 SANB ■ RMS spot4 EASB ■ RMS spot5 EASB ■ RMS spot5 SANB

graph

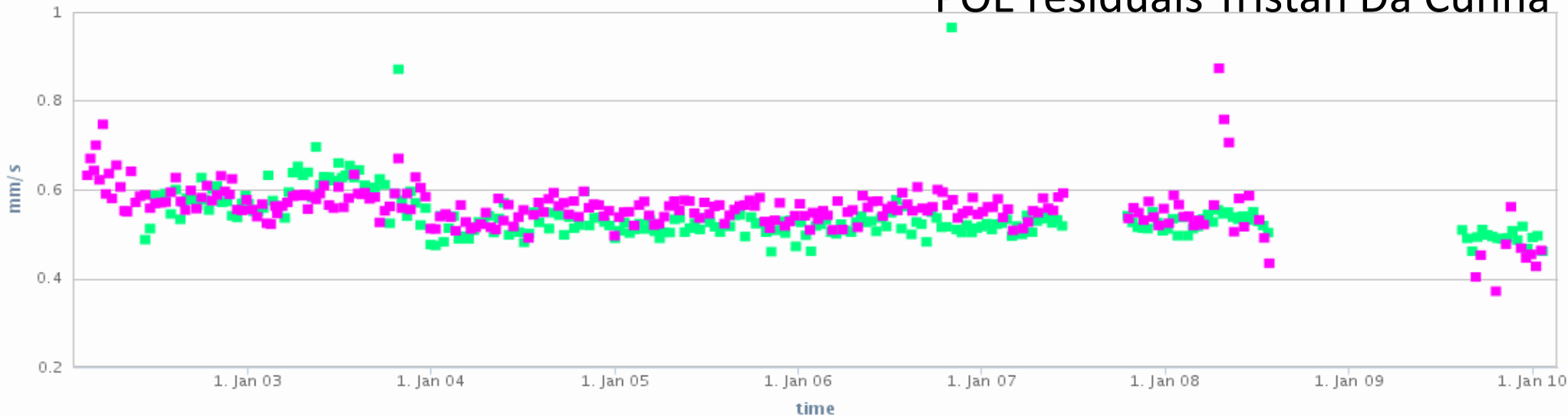
POE residuals Kourou



■ RMS jason2 KRVB ■ RMS spot5 KRVB ■ RMS spot4 KRUB ■ RMS spot4 KRVB

graph

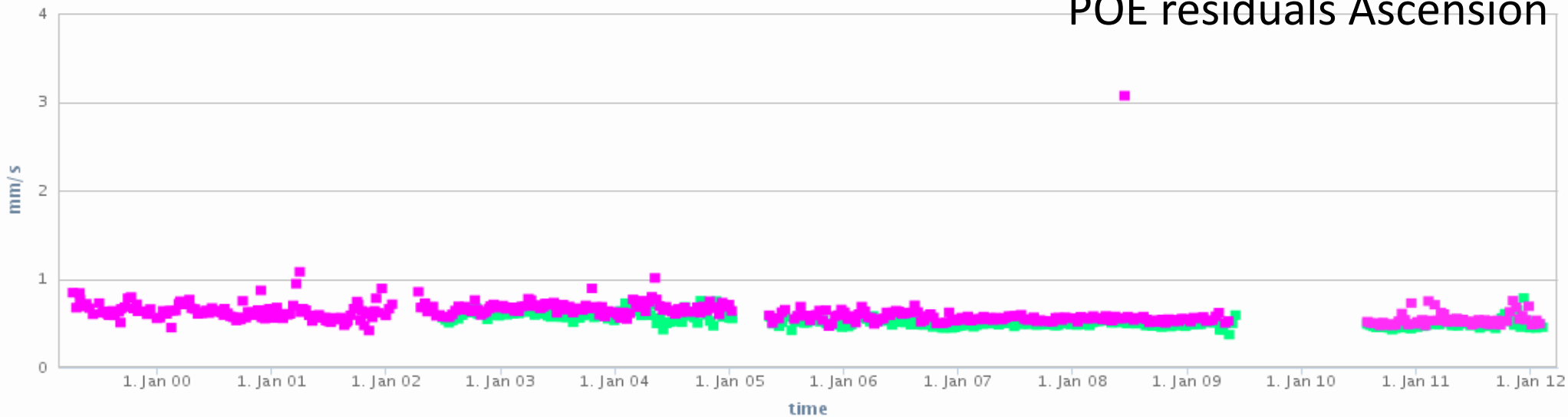
POE residuals Tristan Da Cunha



■ RMS spot5 TRIB ■ RMS spot4 TRIB

graph

POE residuals Ascension



■ RMS spot5 ASDB ■ RMS spot4 ASDB ■ RMS spot5 ASEB ■ RMS spot4 ASEB

SAA impact on SPOT-5 POE residuals



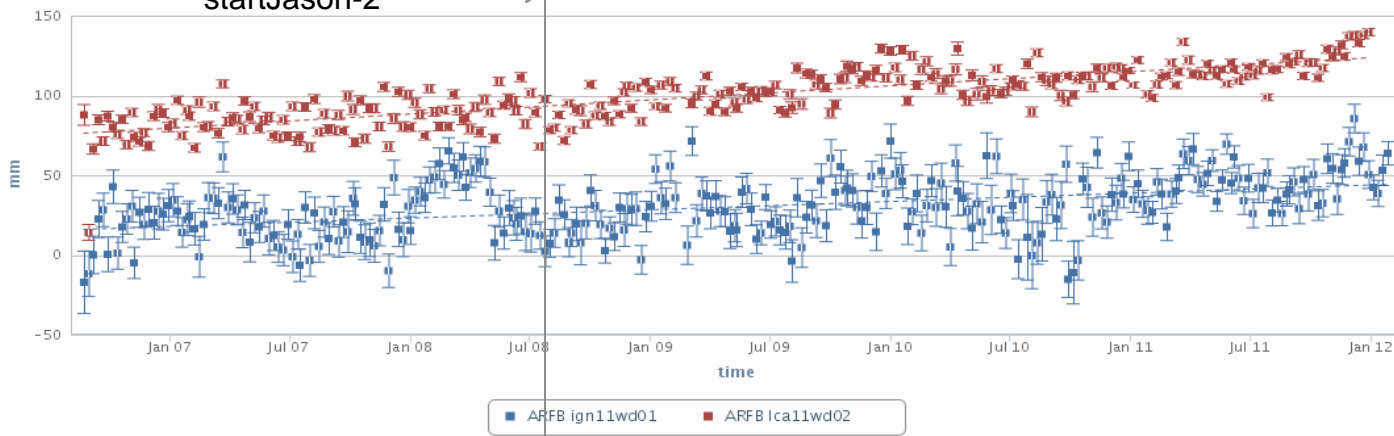
- Impact on Santiago, Arequipa, Santiago
- None for Easter Island, Kourou, Tristan da Cunha, Ascension, Sainte Hélène

Position time series for SAA stations

LCA (including SPOT5) vs IGN (SPOT5 not included for SAA stations)

startJason-2 →

north

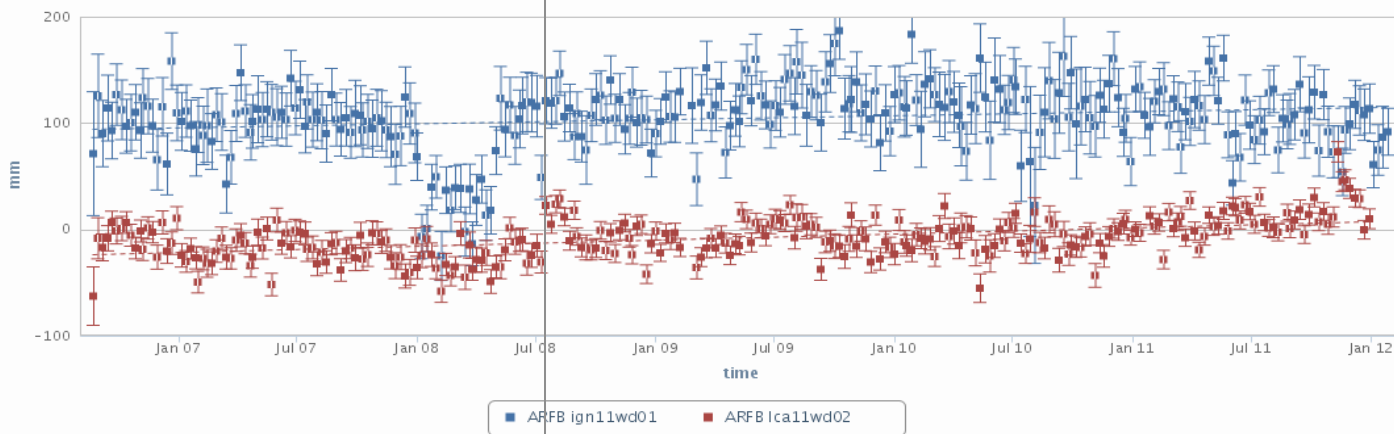


Arequipa (ARFB)

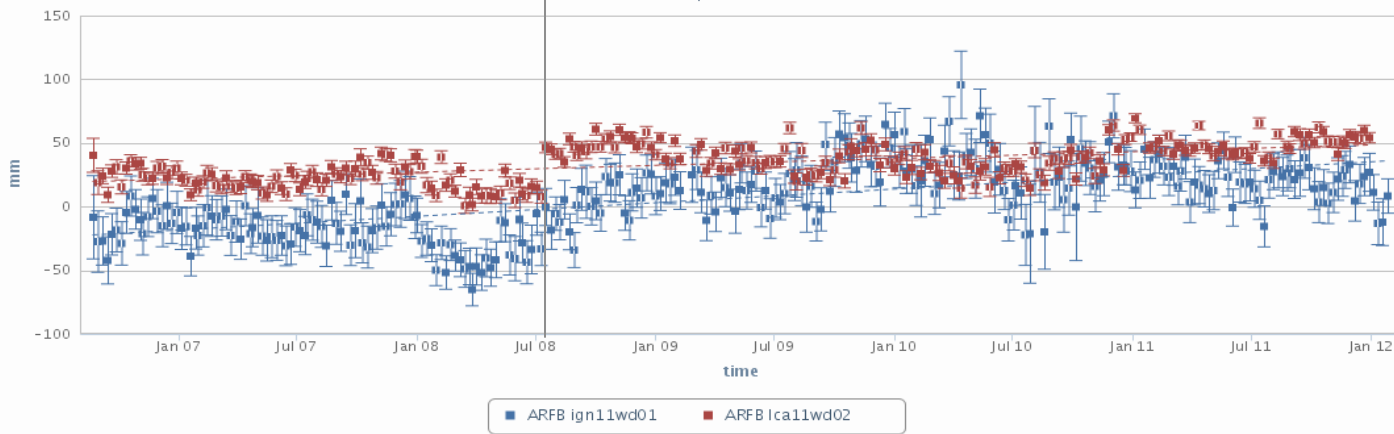
LCA with SPOT5 (red)

IGN without SPOT5 (blue)

east



up

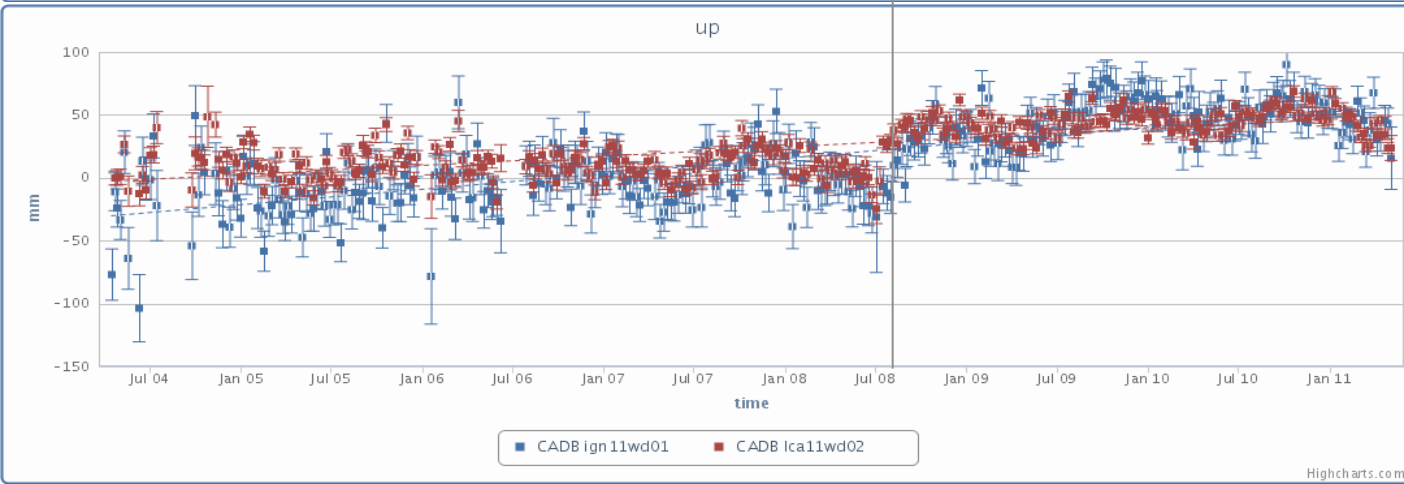
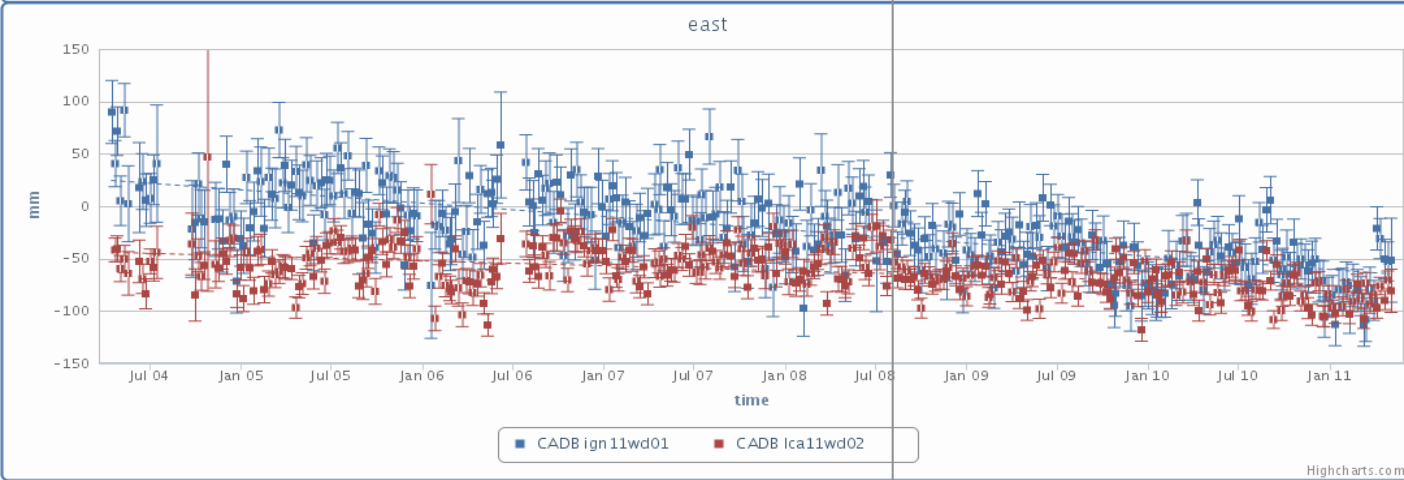
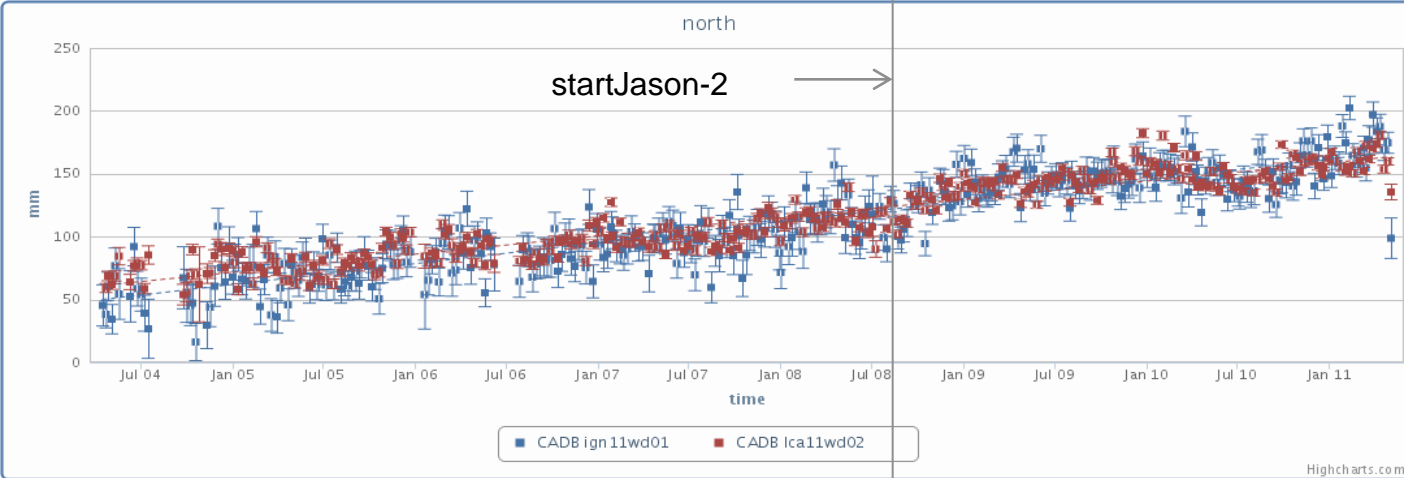


May – 1 June 2012 Prague

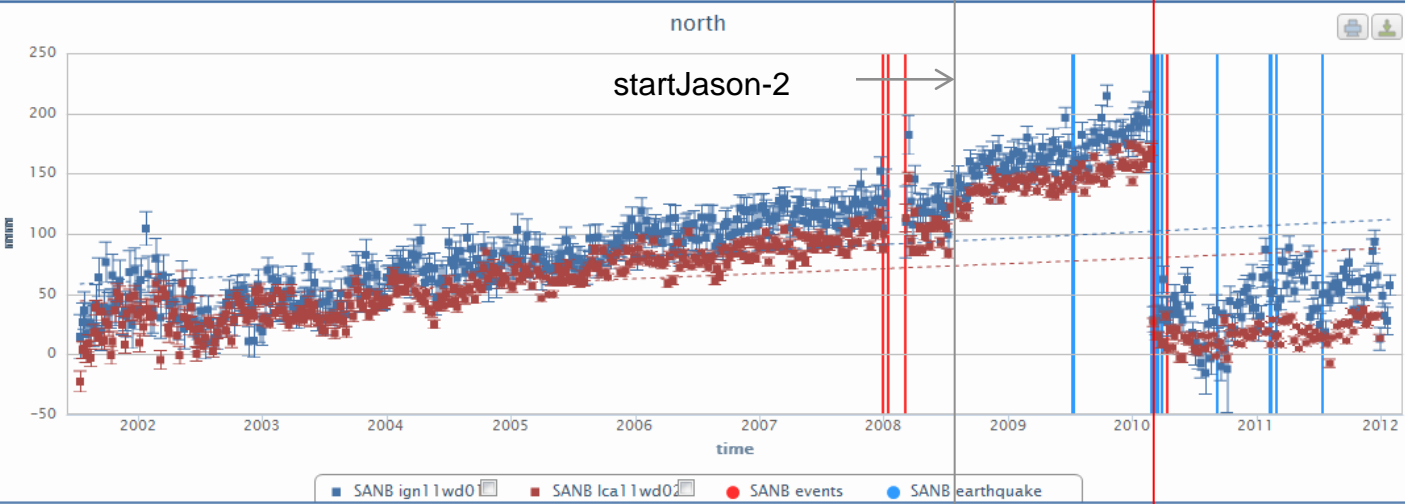
Cachoeira (CADB)

LCA with SPOT5 (red)

IGN without SPOT5 (blue)



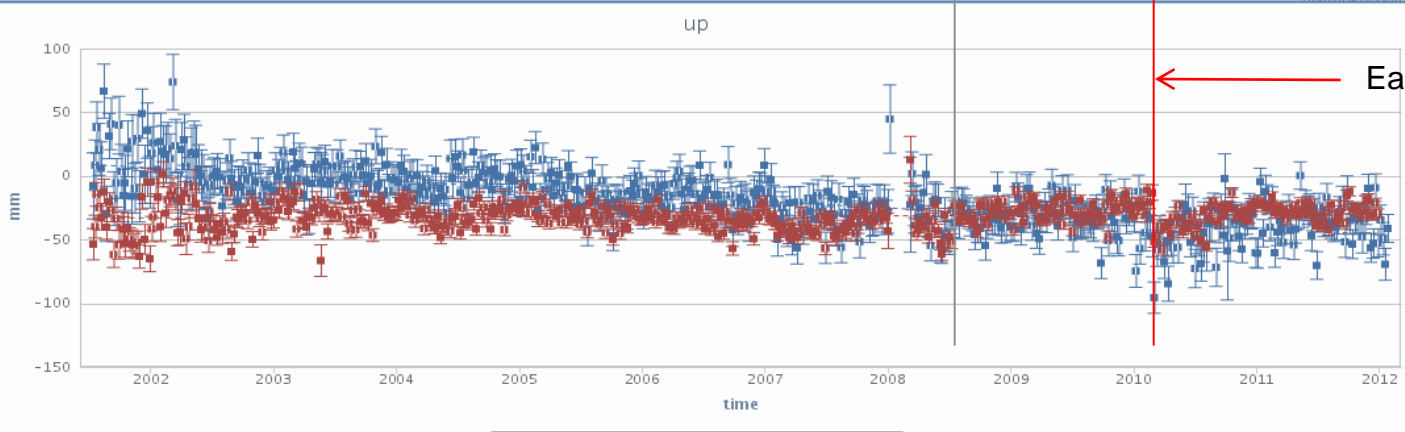
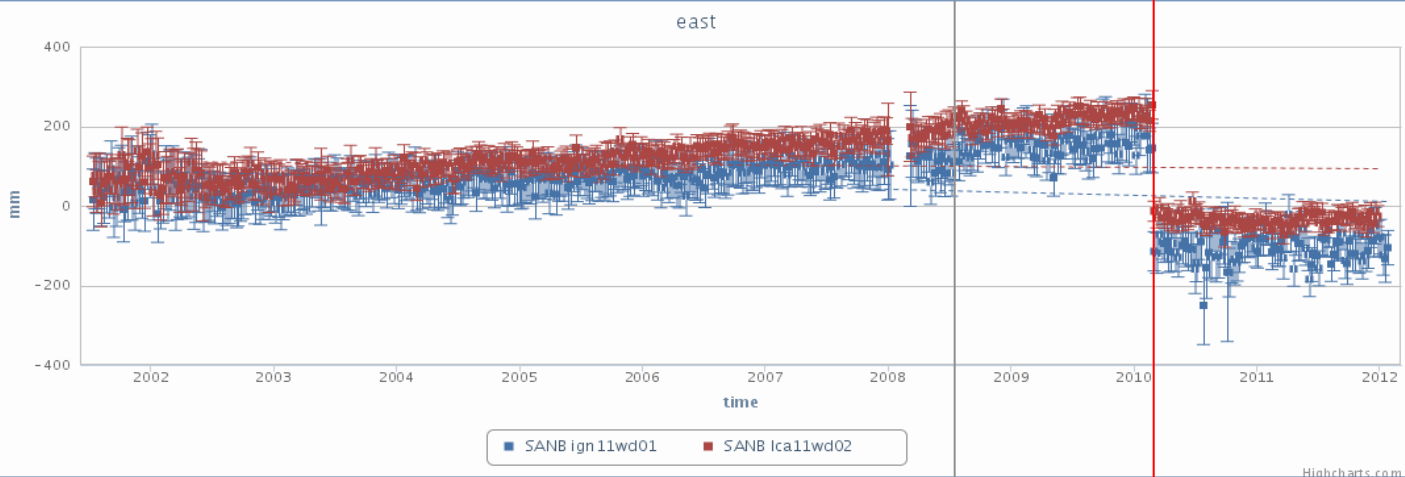
31 May – 1 June 2012 Prague



Santiago (SANB)

LCA with SPOT5 (red)

IGN without SPOT5 (blue)



May – 1 June 2012 Prague

SAA impact on station positions

On multi-satellite time series of positions:

- No clear SAA SPOT5 effect
- Positive contribution of SPOT5 data on time series quality: better precision
- Positive contribution of Jason-2 data, but discontinuities

→ Compare single-satellite series