Current Activity at CNES/CLS Analysis Center (LCA)

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Current activity

-Routine processing and product delivery
-Contribution to IDS 2010 single-satellite campaign:
  2009 sinex series for Spot-2, Spot-4, Spot-5, Envisat, Jason2
  (see G. Moreaux's presentation, session 3)
-Begin analysis of Cryosat-2 data

Issues:
-Is there an SAA effect on SPOT5? *(this presentation)*
-Origin of stations with jumps in vertical coordinates? *(this presentation)*
-Contribution of Cryosat-2 *(see presentation session 3)*
-Station position quality: who are the « bad » stations?
-DORIS/ITR2008 velocity field

Post-IDS3 product delivery

Routine processing re-started in July 2010

Spot-4, Spot-5, Envisat, Jason-2

We start the processing when one week of data is available for the 4 satellites

Same strategy as for IDS-3.

Products delivered:

- weekly combined SINEX w/o (wd24) and with (wd26) Jason-2
- SP3c orbits on 3.5-day arcs (nominal) for each satellite

Orbits of all satellites (except Jason-1) are on-line at DCs:

in sp1 format from 1993 to 2008

in sp3c format from 2009

Orbit residuals

Spot4 0.39 mm/s

Spot5 0.36 mm/s

Jason2 0.32 mm/s

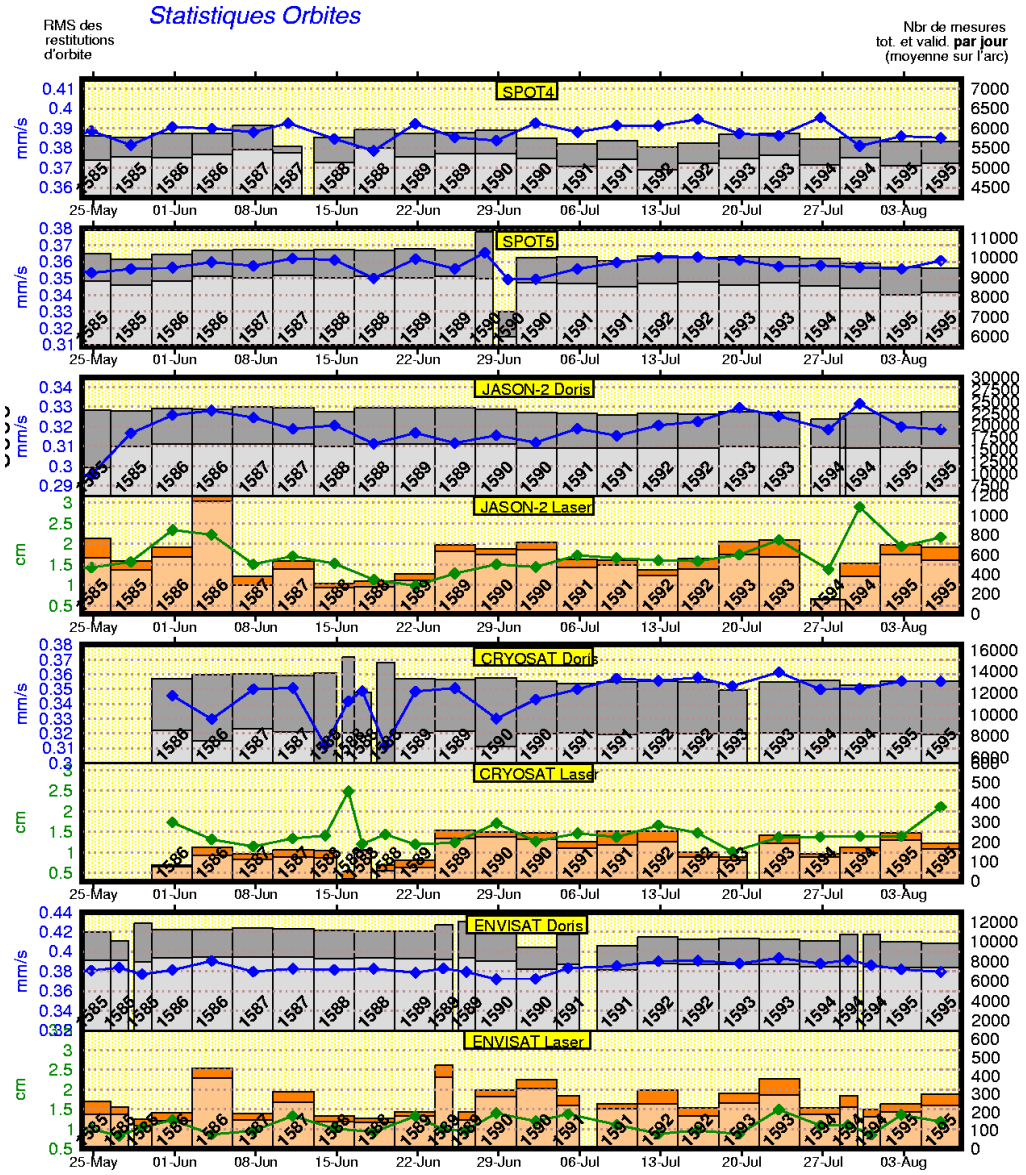
1.5 cm

Cryosat-2 0.36 mm/s

1.5 cm

Envisat 0.38 mm/s

1 cm

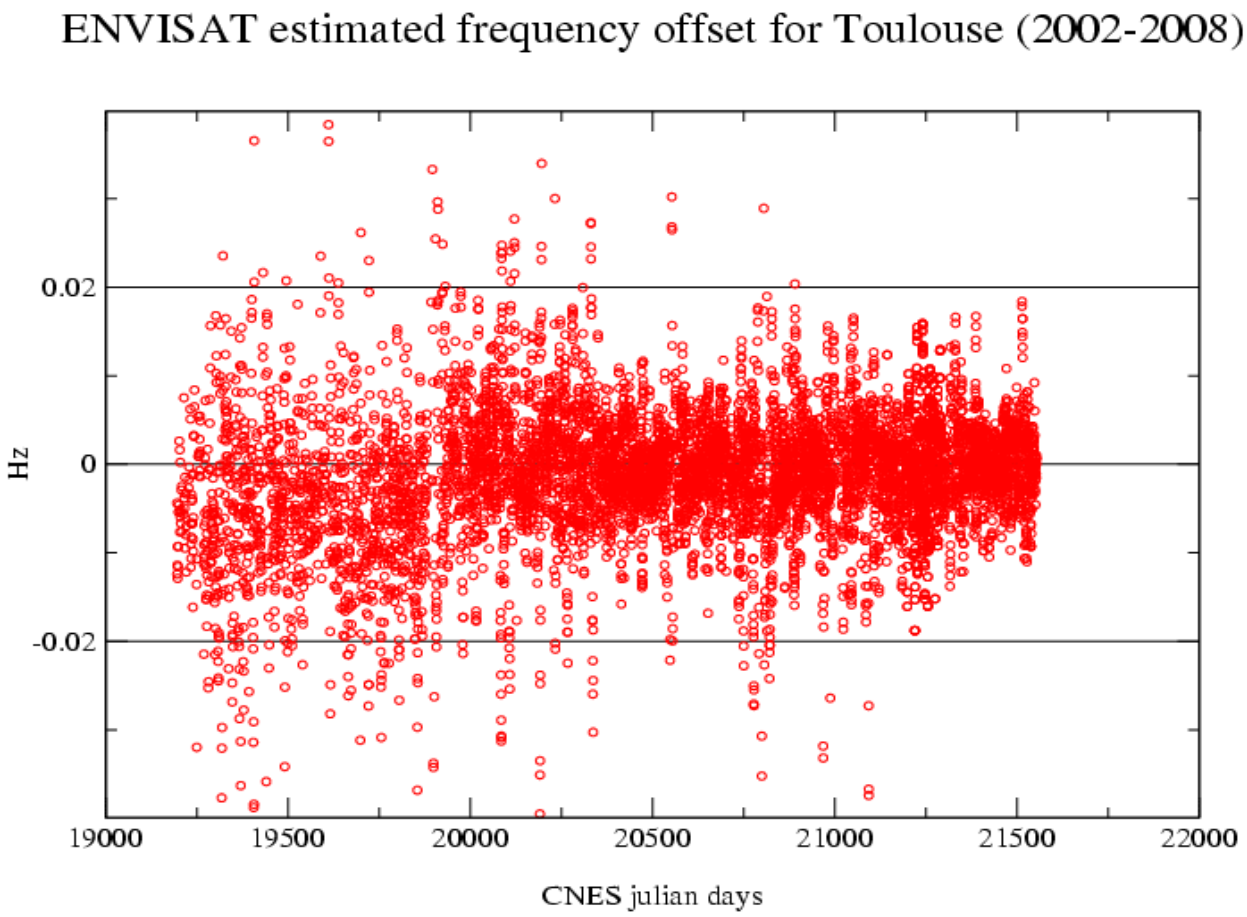


Cut-off 12 deg.

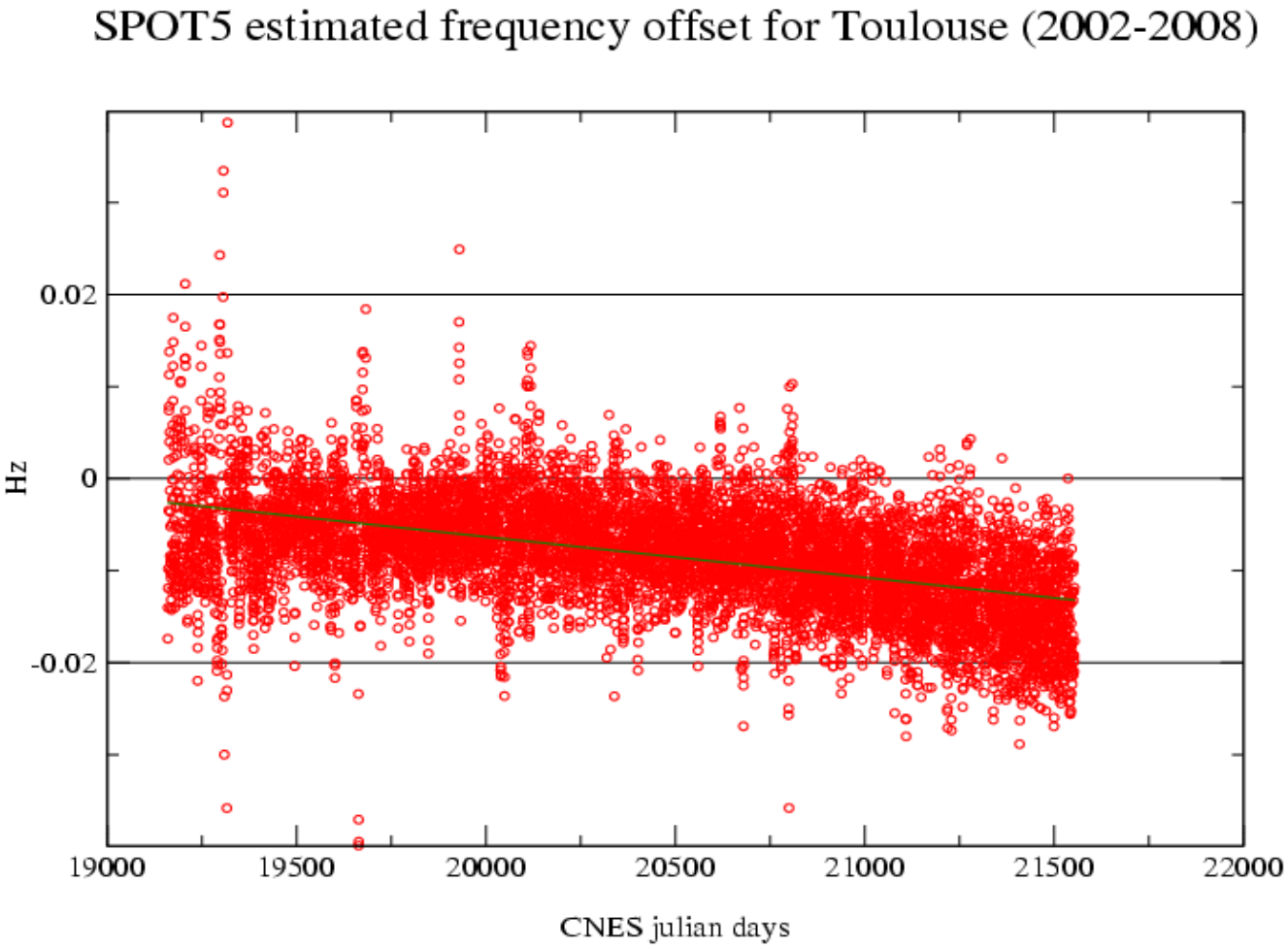
DORIS/Cryosat2: ~8000 validated data per day as for Spot-5 and Envisat

SPOT-5: SAA EFFECT?

Envisat: Toulouse MB frequency offset

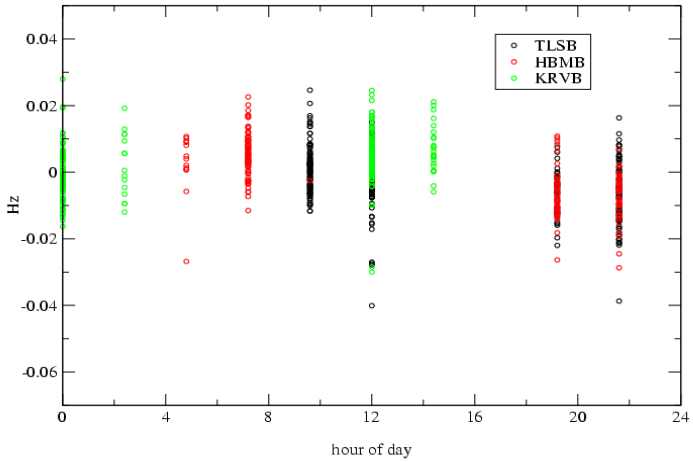


SPOT-5: Toulouse MB frequency offset

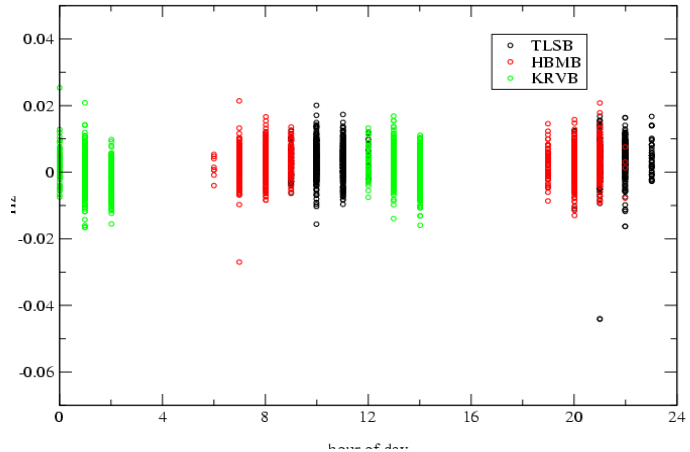


Hourly frequency offset of the Master Beacons SPOT-2, SPOT-4, Jason-2, Envisat

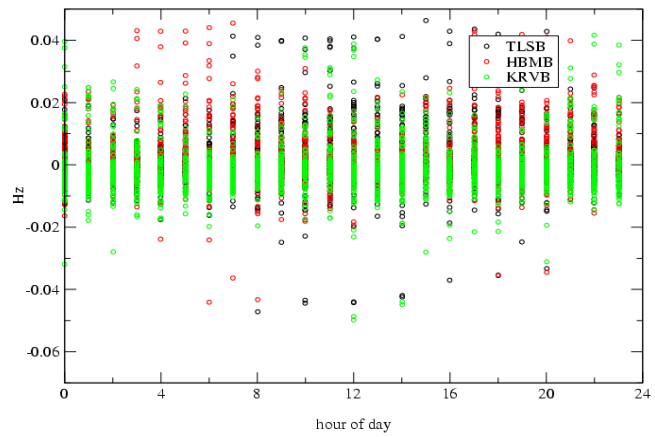
SPOT2 estimated frquency offset (2009/01-2010/04)



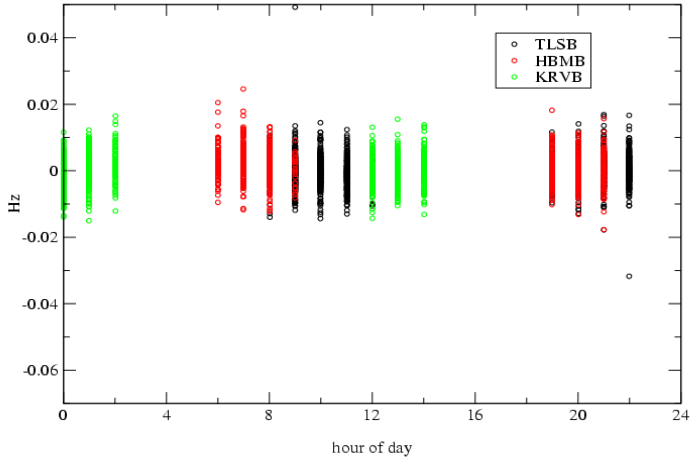
SPOT4 estimated frequency offset (2009/01-2010/04)



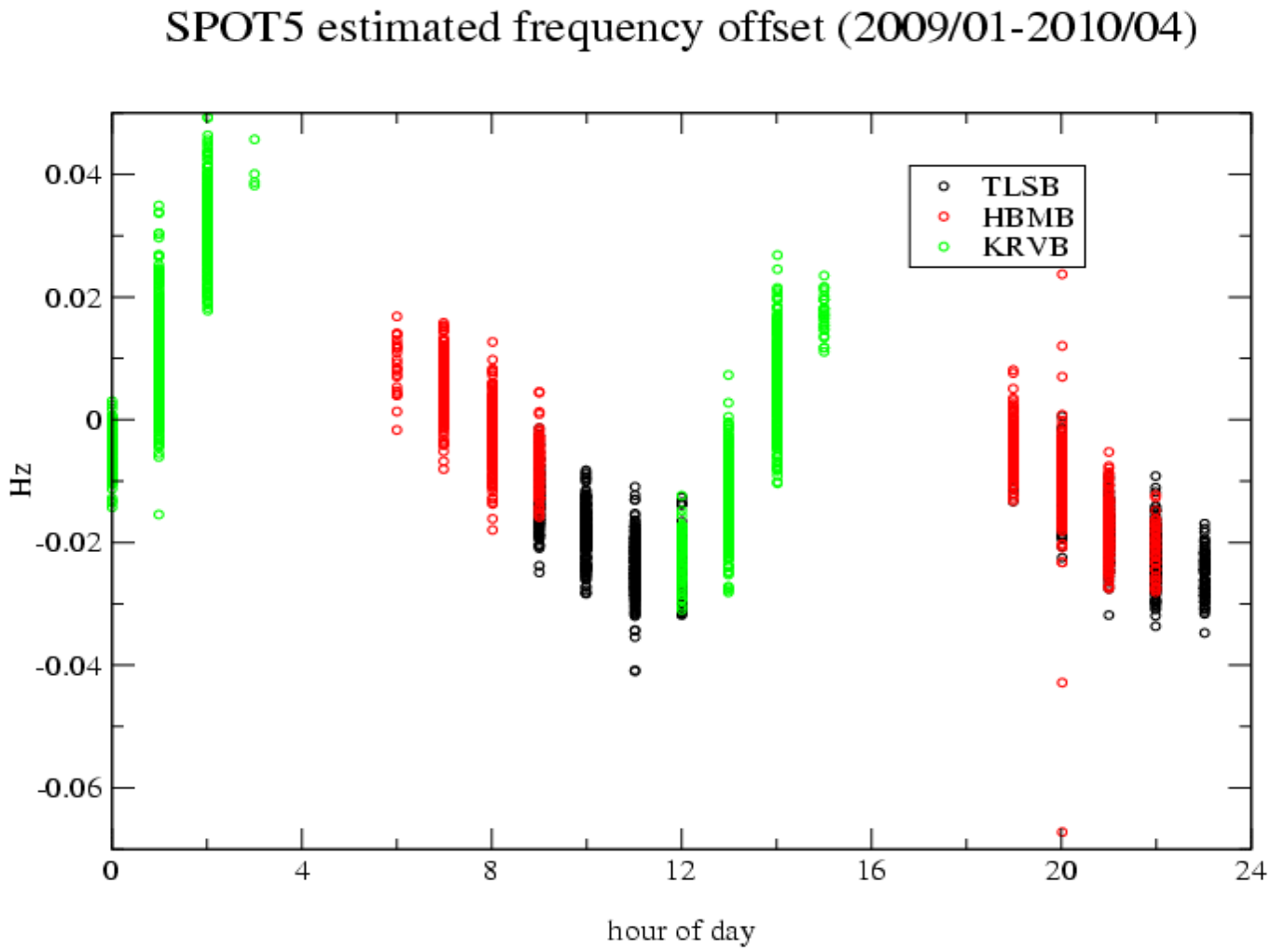
JASON2 estimated frequency offset (2009/01-2010/04)



ENVISAT estimated frequency offsets (2009/01-2010/04)

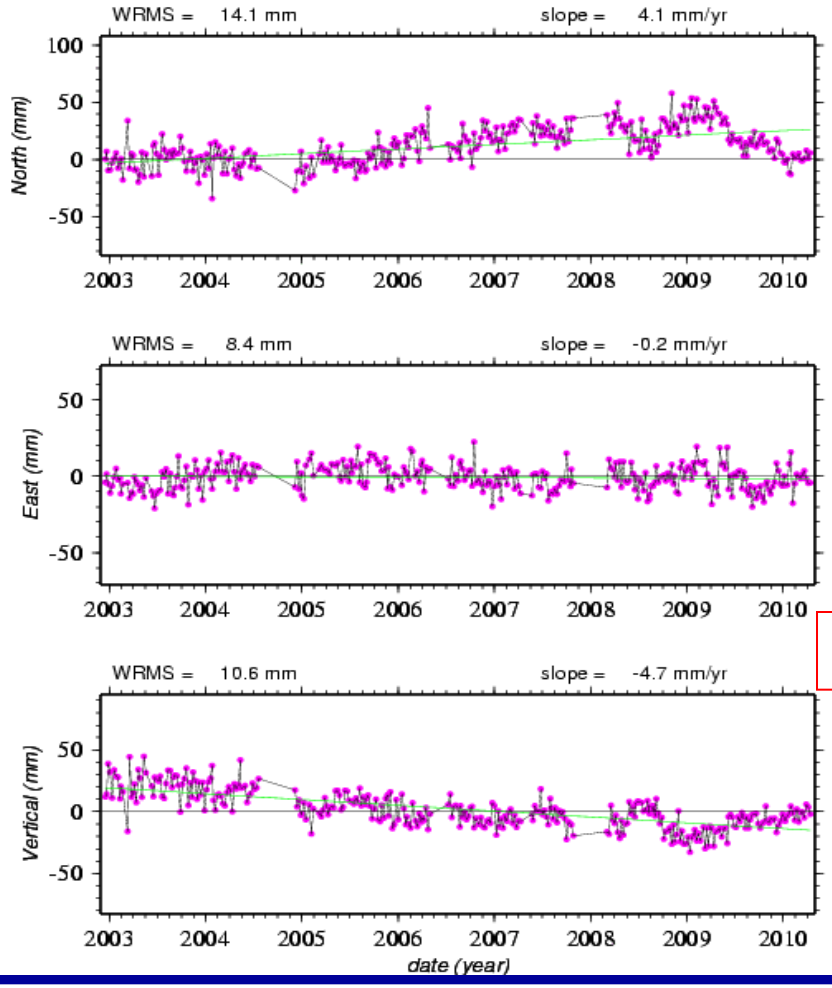


Hourly frequency offset of the Master Beacons SPOT-5

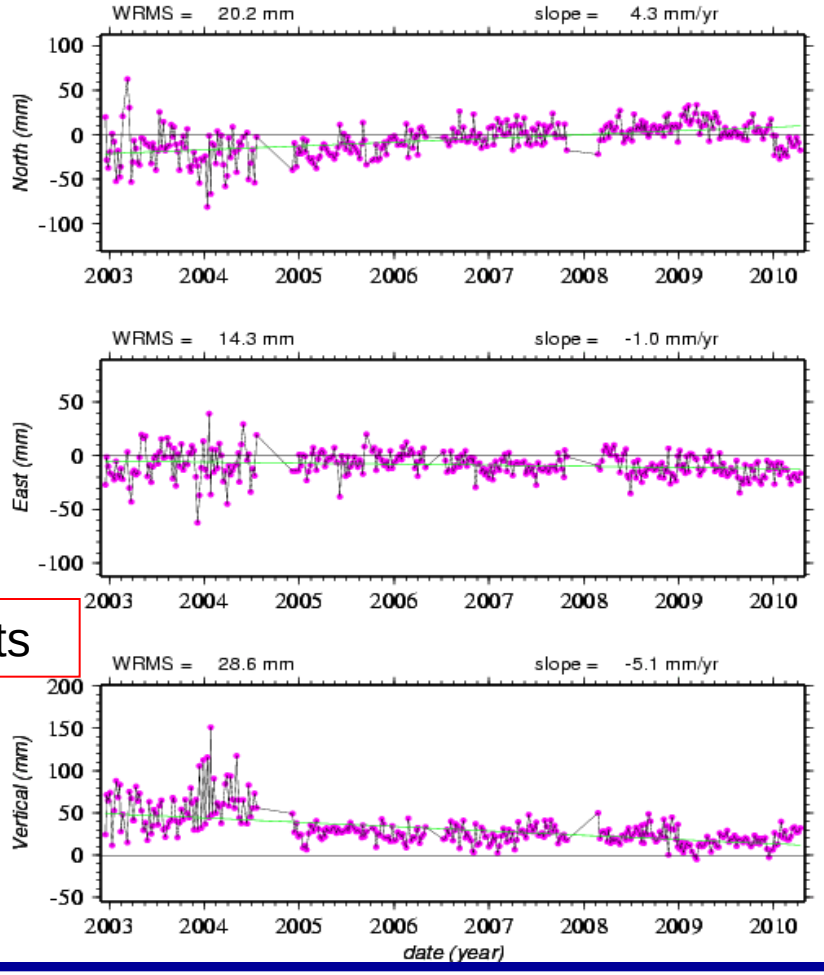


Single-satellite weekly positioning Thule

SPOT-5



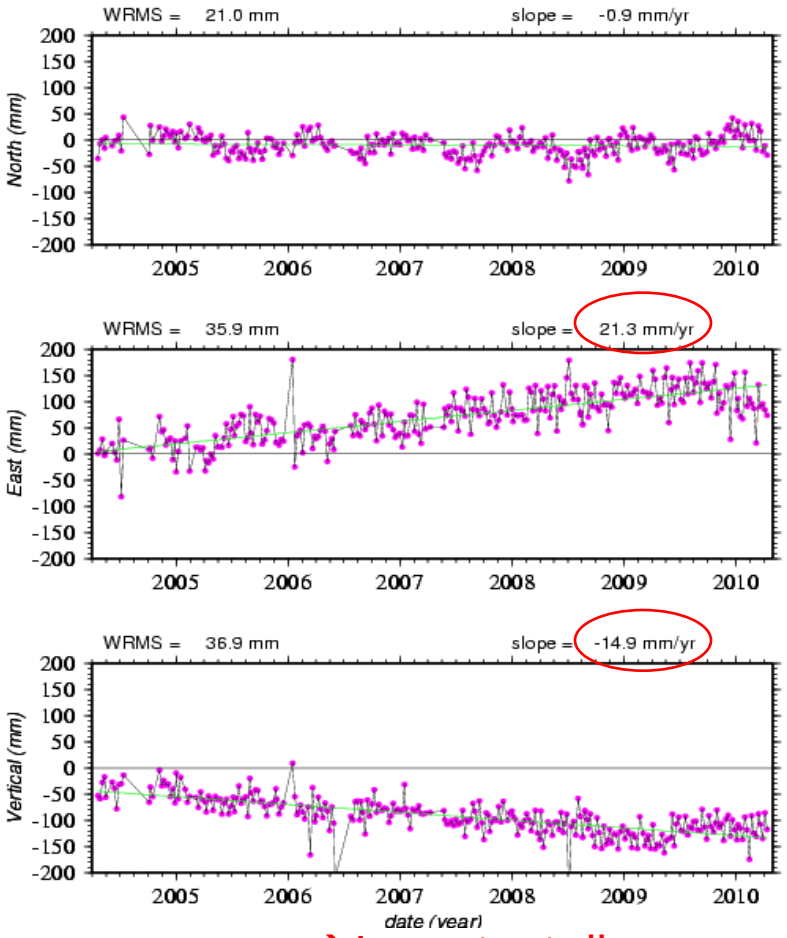
ENVISAT



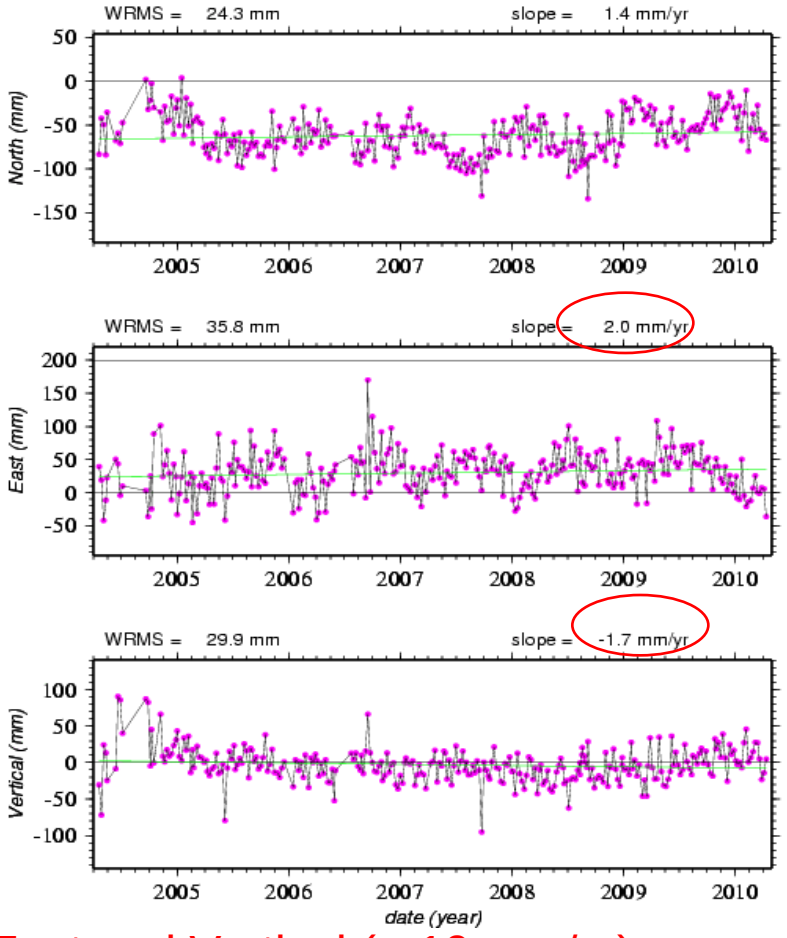
Same results

Single-satellite weekly positioning Cachoeira

SPOT-5



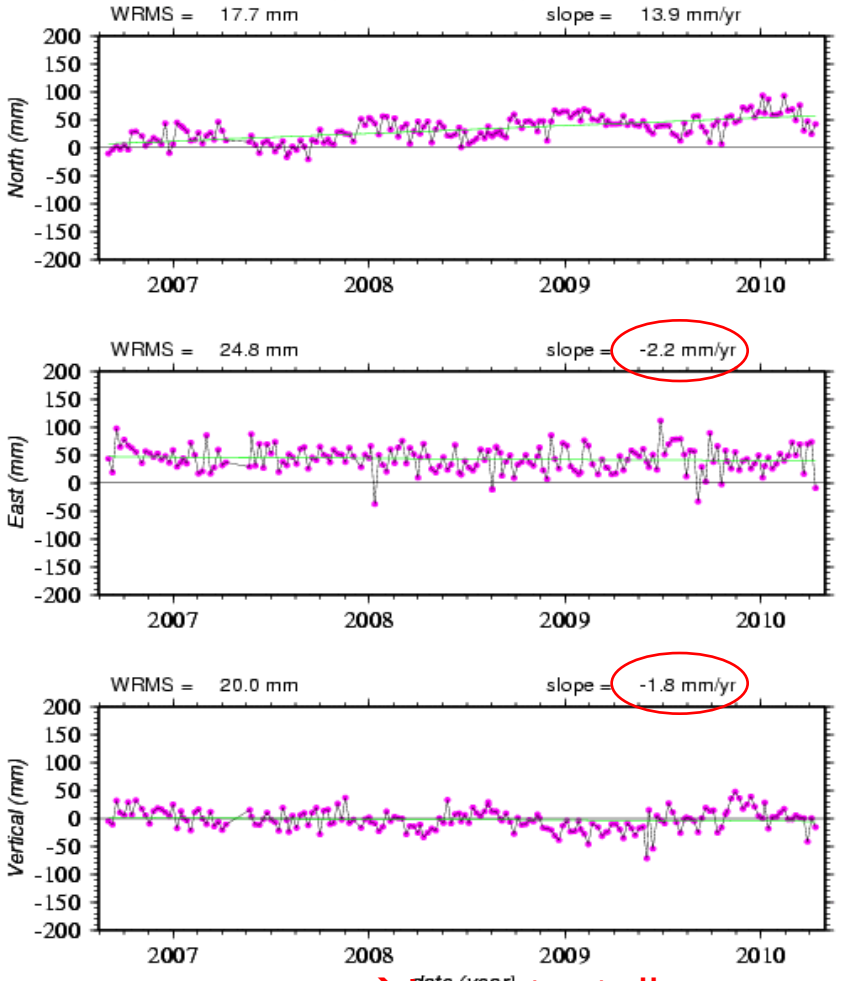
ENVISAT



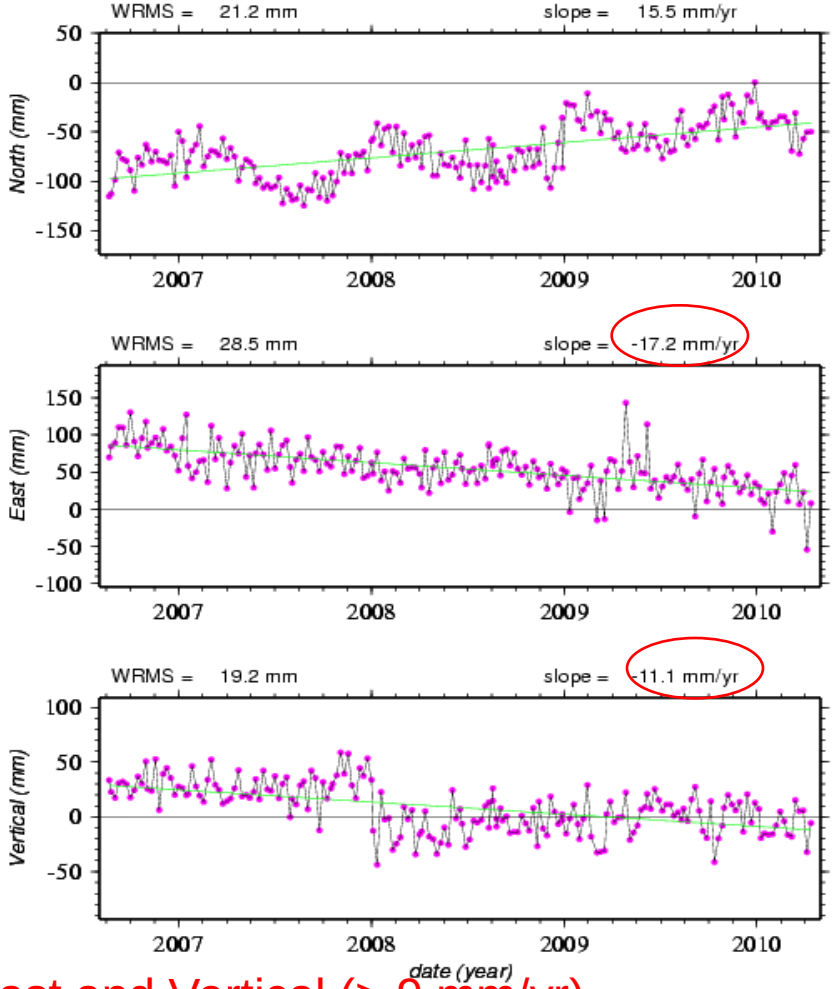
→Important discrepancies in East and Vertical (> 10 mm/yr)

Single-satellite weekly positioning Arequipa

SPOT-5



ENVISAT

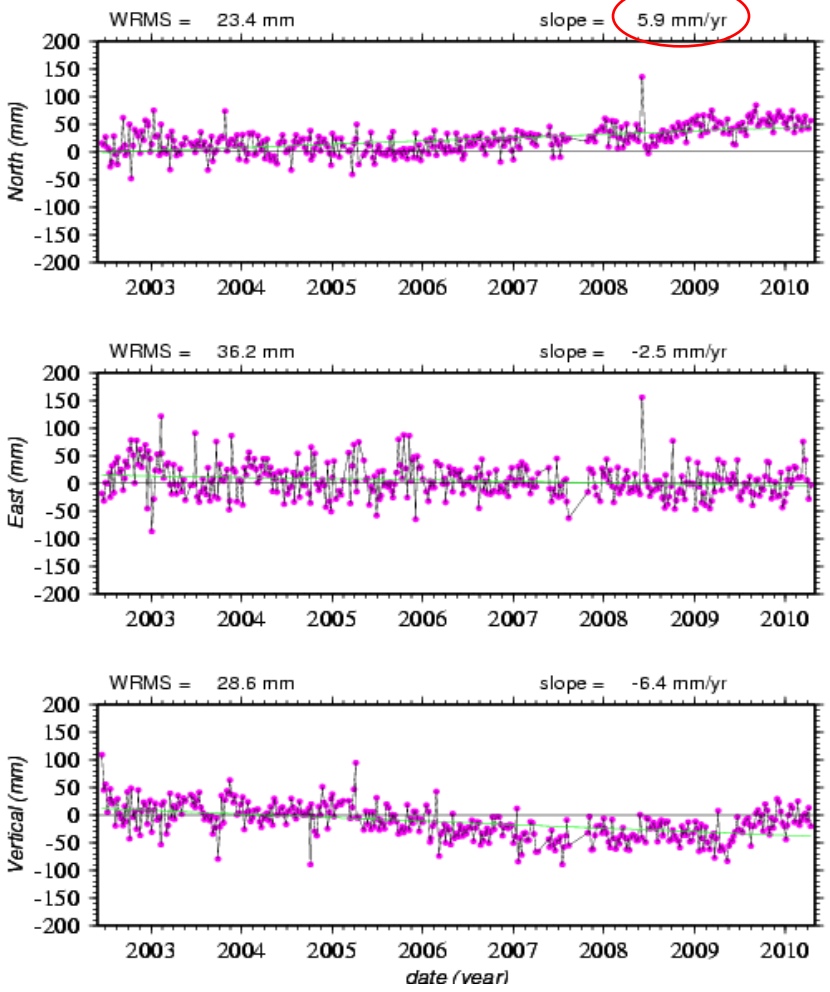


→ Important discrepancies in East and Vertical (> 9 mm/yr)

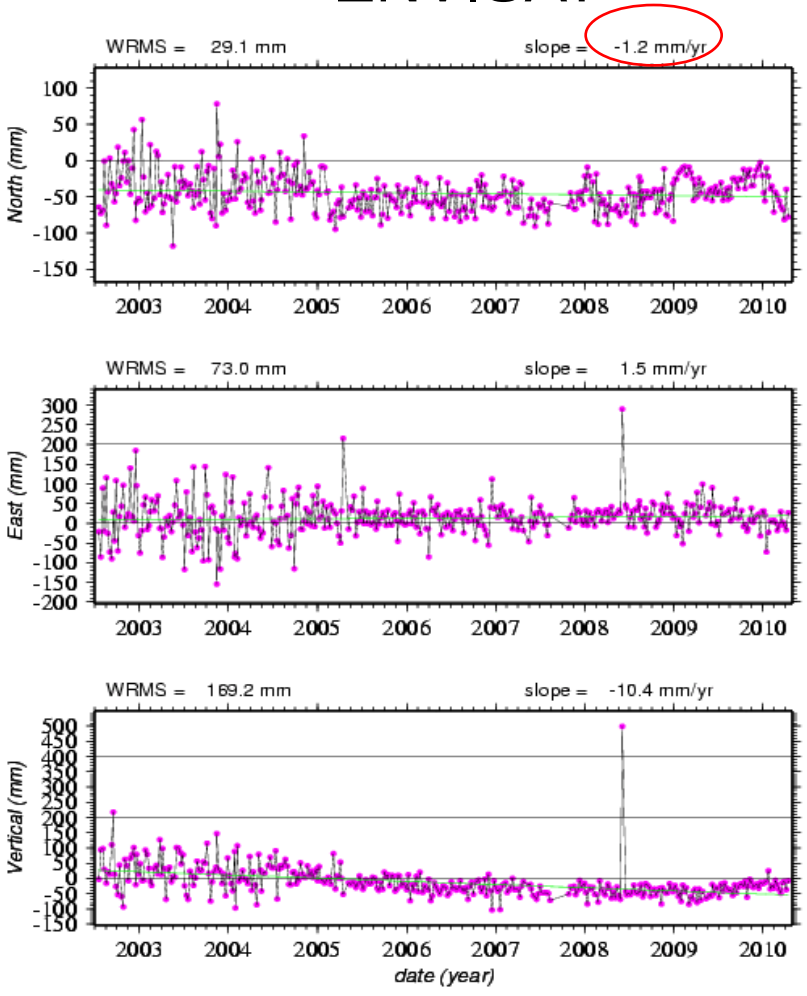
Single-satellite weekly positioning Kourou

→discrepancy in North (> 5 mm/yr)

SPOT-5



ENVISAT

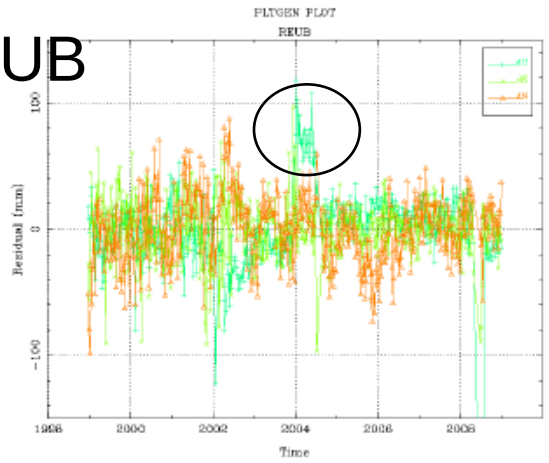


STATION VERTICAL JUMPS

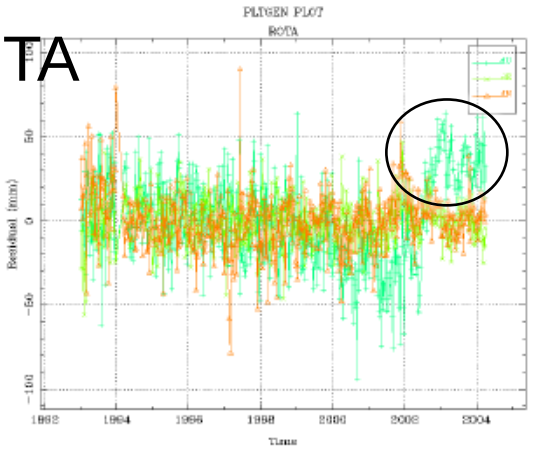
Vertical positioning jumps observed by ESA

Stations with Jumps

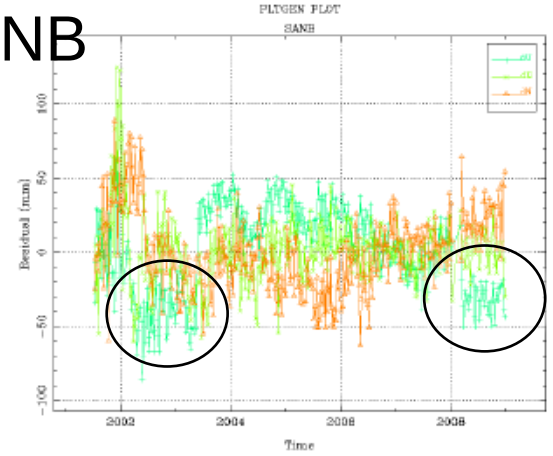
REUB



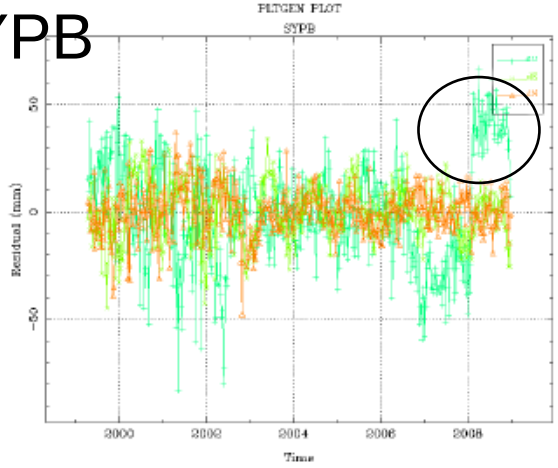
ROTA



SANB



SYPB



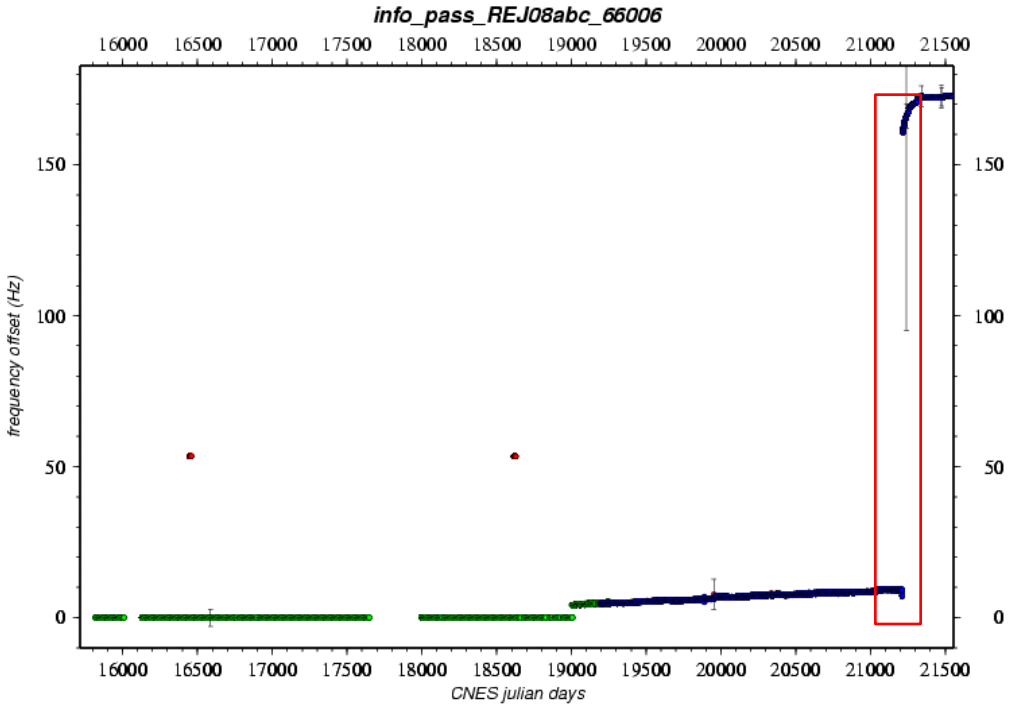
European Space Agency
Agence spatiale européenne

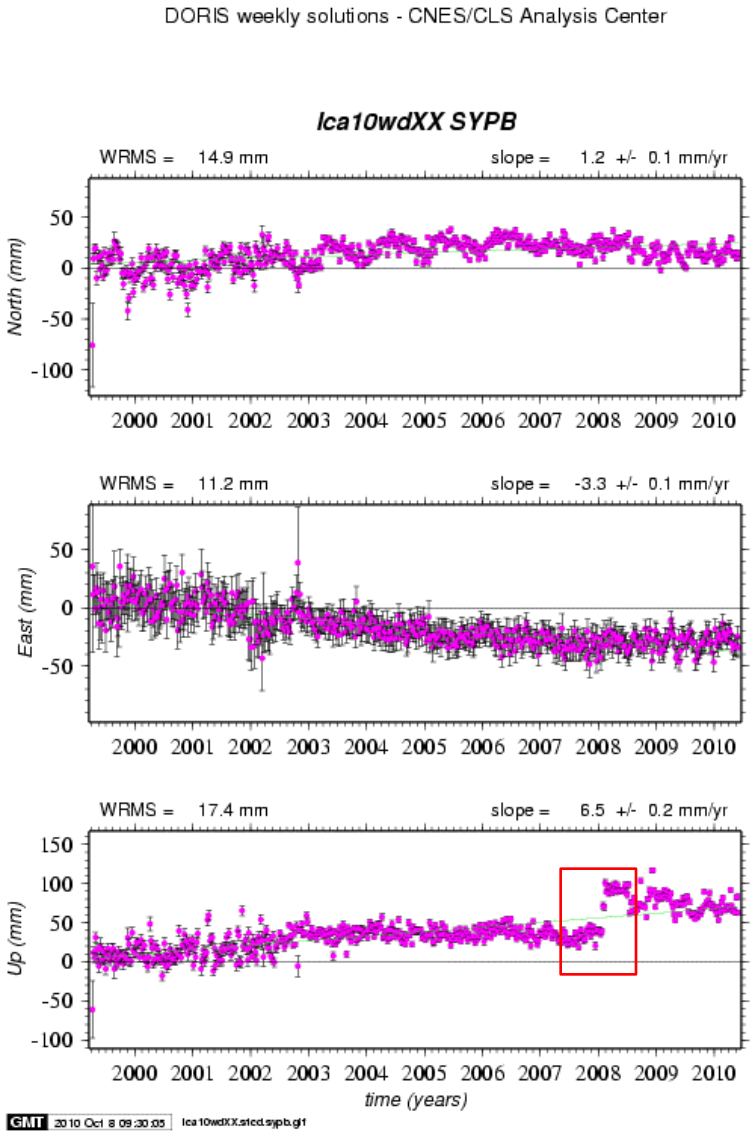
IDS AWG Meeting – Paris March 2009

M. Otten

The Living Planet

Frequency jumps: SYPB (Syowa)





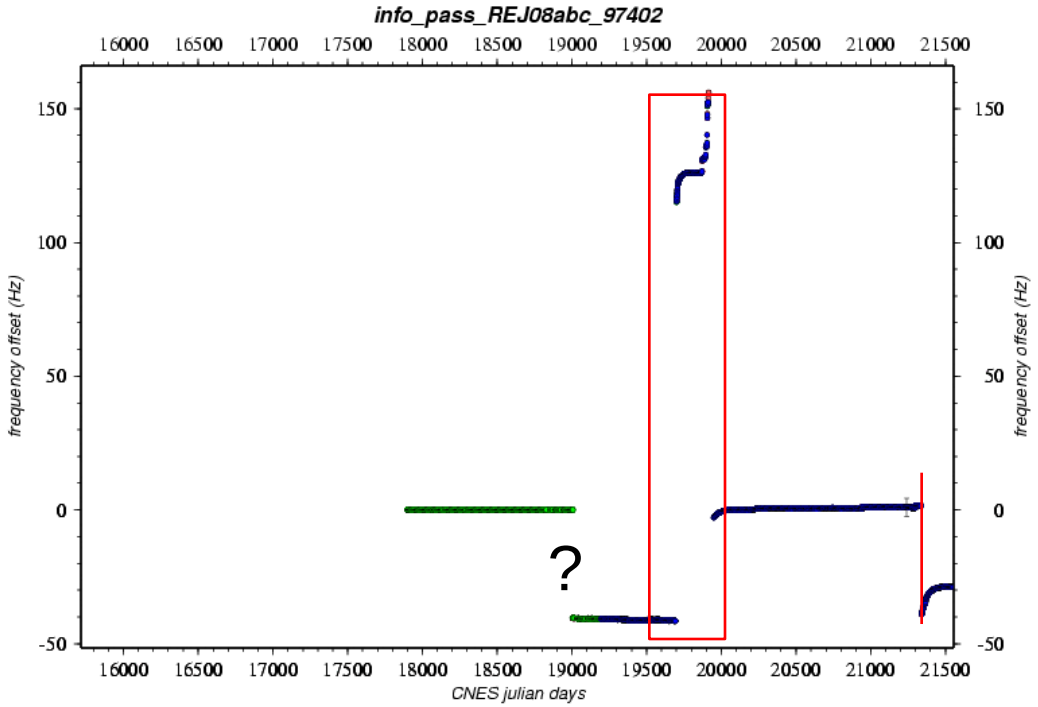
Beacon change on 2008/01/28

1.0 → 3.0

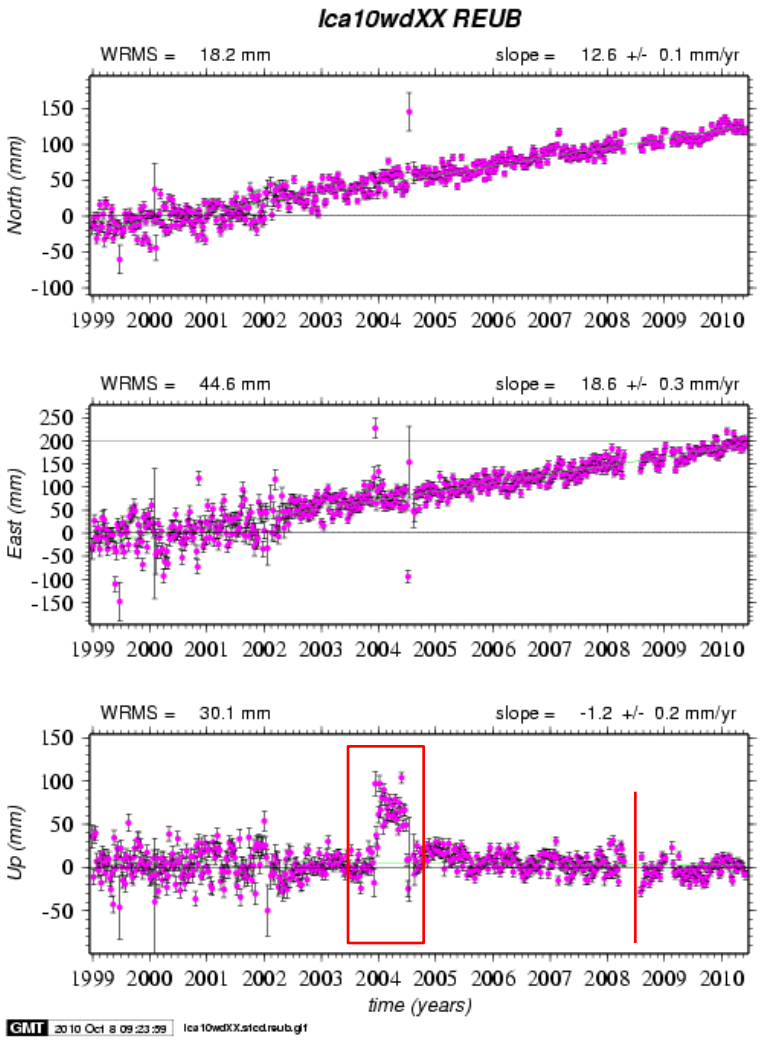
Frequency jump: 160 Hz

Vertical coordinate jump: >50 mm

Frequency jumps: REUB (La Réunion)



DORIS weekly solutions - CNES/CLS Analysis Center



Beacon model : 1.0 Date installed : 16/12/1998 Date removed : 30/11/2003
Beacon model : 3.0 Date installed : 01/12/2003 Date removed : 09/07/2004
Beacon model : 3.0 Date installed : 13/08/2004 Date removed : 02/06/2008
Beacon model : 3.0 Date installed : 02/06/2008

First jump in 2001; related event? Not a beacon change. Beacon restart?
2nd jump: 1.0 replaced by 3.0
3rd jump: 3.0 replaced
4th jump: 3.0 replaced

Station frequency

The station frequency is used to convert radial velocity measurements to Doppler measurements but the true station frequency is not known.

Velocity measurement (m/s)

$$\frac{\rho_2 - \rho_1}{\Delta t} = \frac{c}{f_e}\left[(f_e - f_b) - \frac{N}{\Delta t}\right]$$

Doppler measurement (cycles)

$$\longrightarrow N = \underbrace{(f_e - f_b)}(t_2 - t_1) - \underbrace{\frac{f_e}{c}}(\rho_2 - \rho_1)$$

Adjusted
→ freq. bias estimated

Constant
fe=nominal freq.

For station-satellite = 1000km, dFe=100 Hz induces dp=5cm

Acces to real station frequency

Station frequency supposed not too far from nominal value →effect on station position neglected (up to ?). But this is not always true!

Note also that such vertical jumps not seen in IGN time series on line. Different approch?

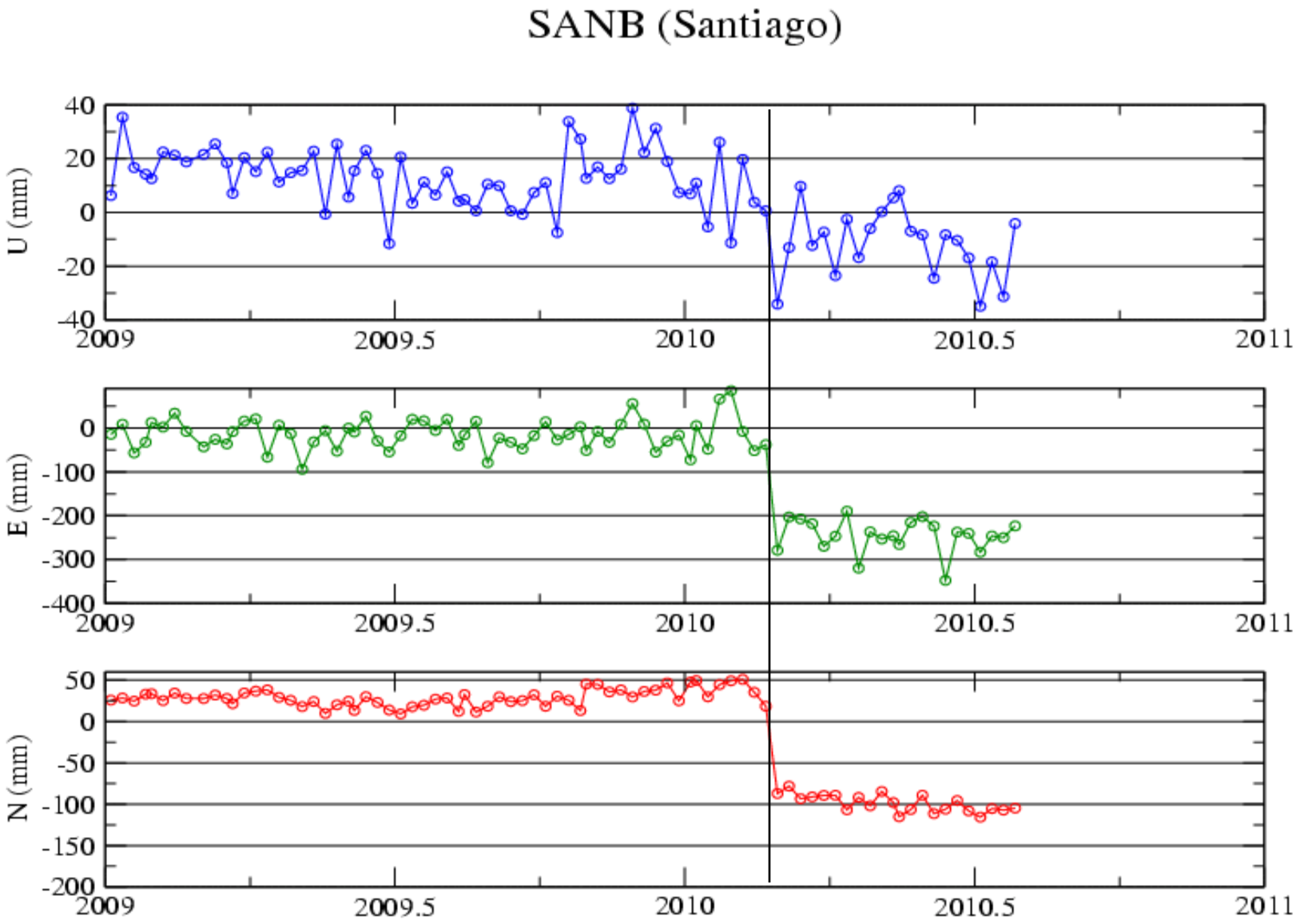
- → Check the ACs time series and the IDS-3 time series and look at correlations with beacon changes and frequency jumps. Impact ?
- → Beacon changes are announced via « dorisstations » mailing list; informations on beacon restart needed also.

Next tests:

- apply frequency offset to station nominal frequency

(frequency offset includes both station and satellite but USO satellite trend model obtained from MBs included in GINS)

- use the RINEX files (pseudo- range and phase measurements)



Chili Earthquake (2010/02)

THANK YOU