



# IDS 2010 campaign Current status

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& all IDS ACs



- Context of the IDS 2010 campaign
- SINEX series evaluation procedure
- Analysis of estimated parameters
- Identification of stations with high residuals

- What is the 2010 campaign ?

Single satellite (Envisat, Jason-2, Spot2, Spot4 and Spot5) solutions over 2009 from IDS Analysis Centers (ESA, GAU, GOP, GSC, IGN and LCA)

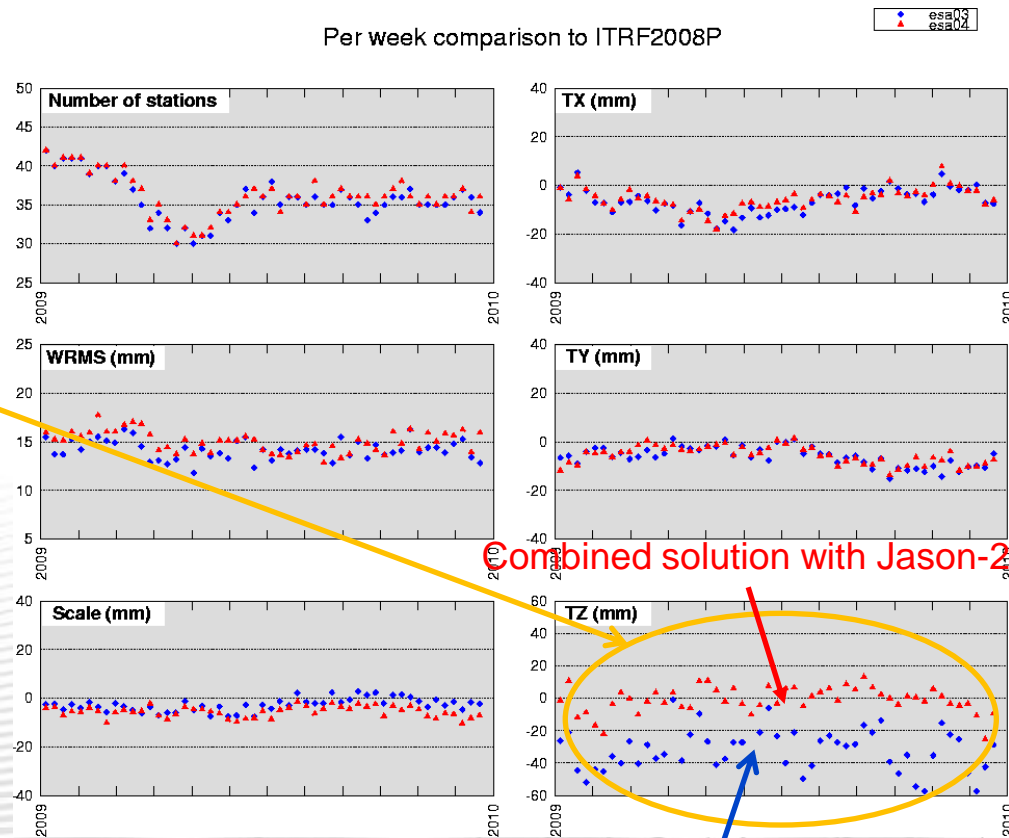
- Why such a campaign ?

To investigate on the positive impact of adding Jason-2 in the combined solutions by all the ACs as presented in the last AWG in Darmstadt.

Effect of the orbit ?

Benefit of 7 dual frequency measurement channels ?

Per week comparison to ITRF2008P



Combined solution without Jason-2

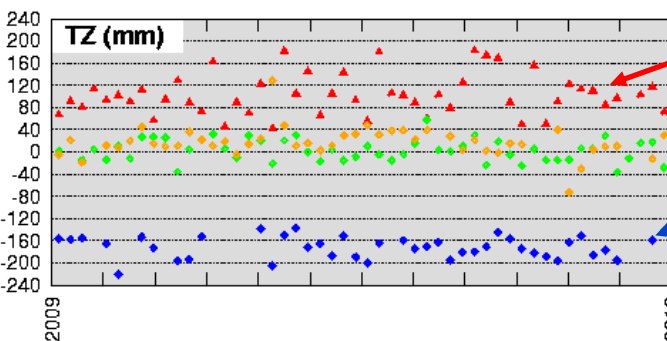
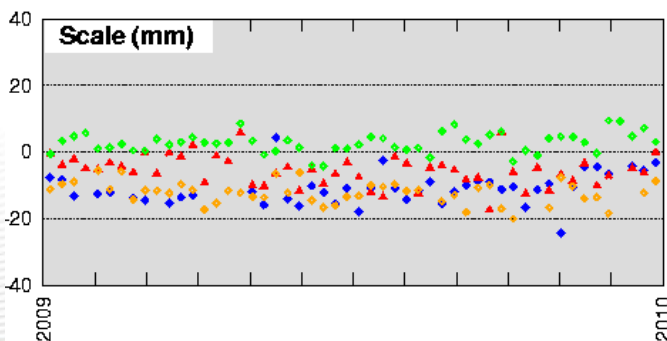
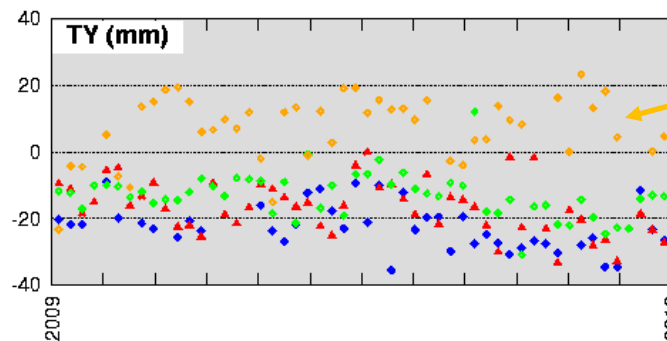
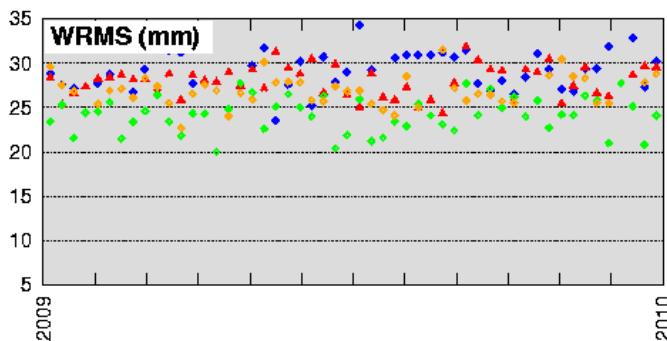
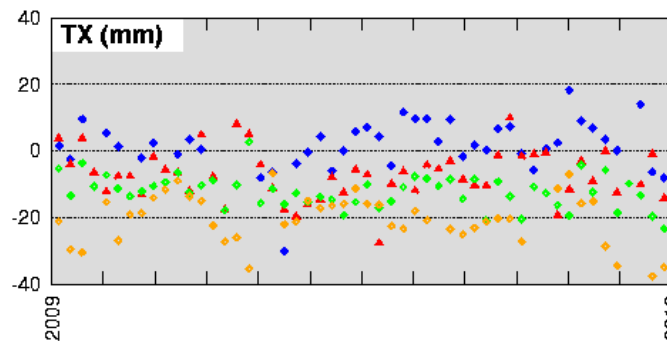
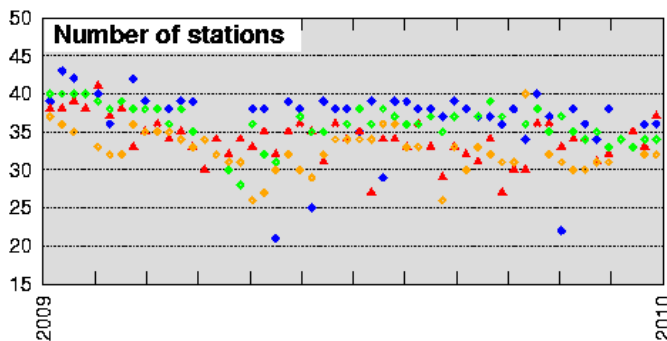
The processing of the SINEX weekly solutions is realized per AC and includes the following steps:

1. Verification of DORIS station identification (domes #, acronym)
2. Rejection of selected stations over the whole time period (never used)
3. Rejection of selected stations over specific periods (partially used)
4. Verification/update of position discontinuities
5. Inversion of free singular normal equations for ESA and GSC
6. Projection using minimal constraints and rejection of perturbing stations
7. Weekly comparisons with ITRF2008P at epoch of each solution
8. Analysis and rejection of stations with high residuals

**Processing = processing of IDS-3 + thresholds of step 8 adapted to single satellites**

Per week comparison to ITRF2008P

- ◆ gauwd08\_env
- ▲ gauwd08\_sp4
- ◆ gauwd08\_sp5
- ◆ gauwd08\_a2



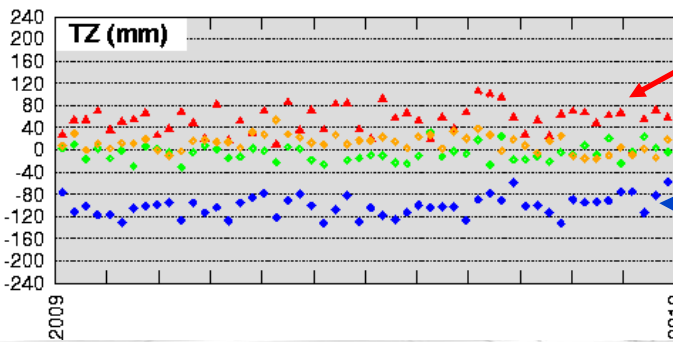
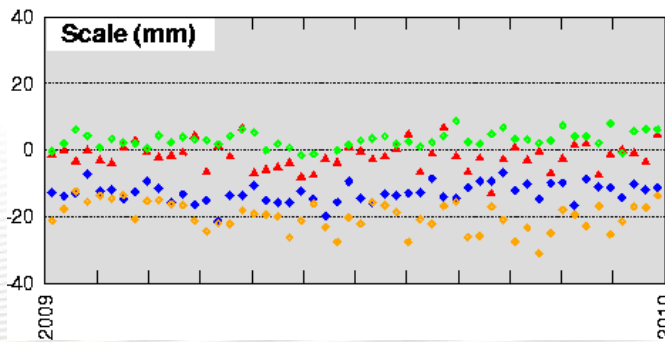
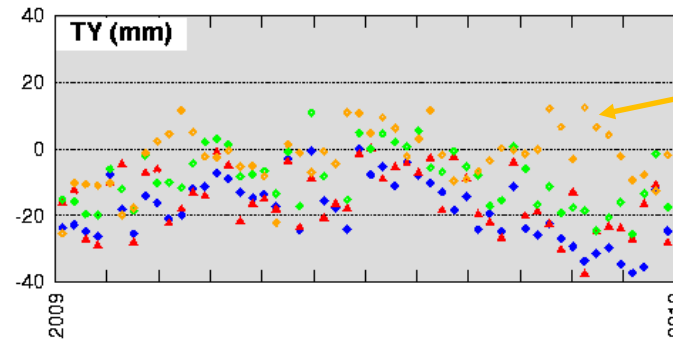
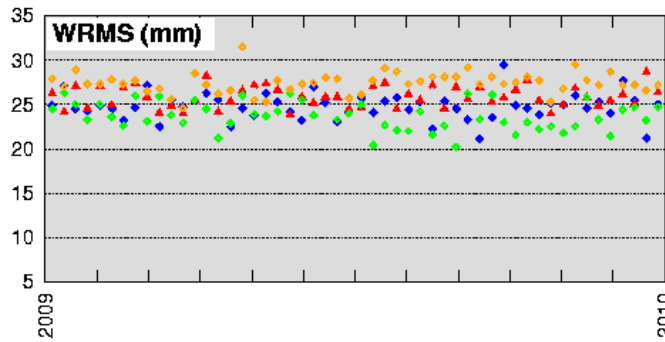
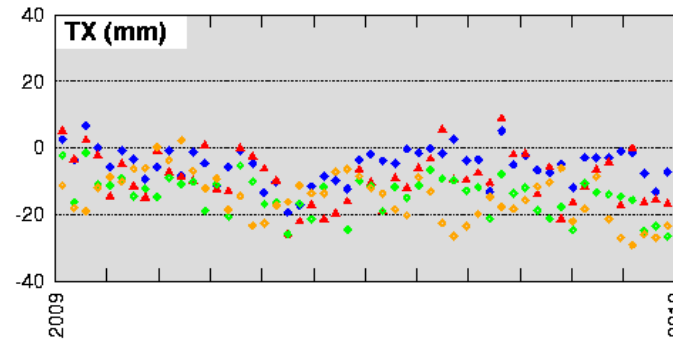
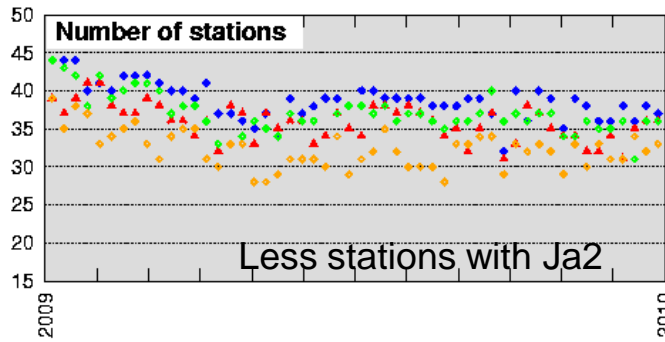
Jason-2

Spot4

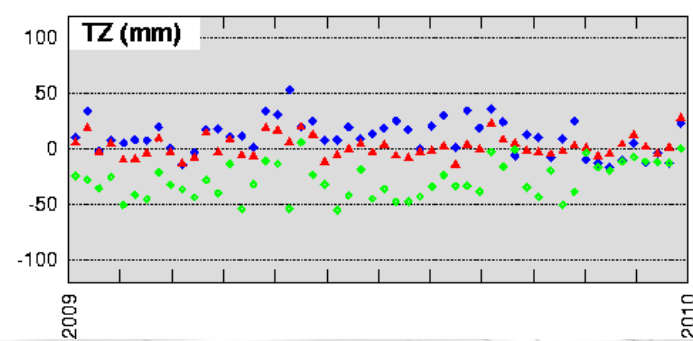
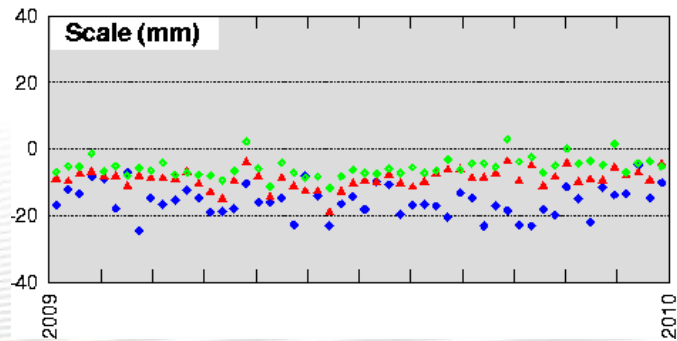
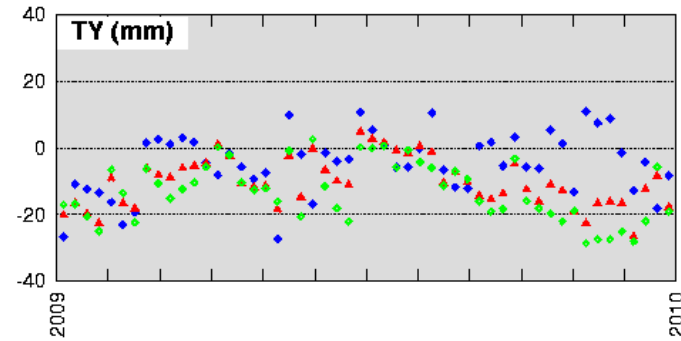
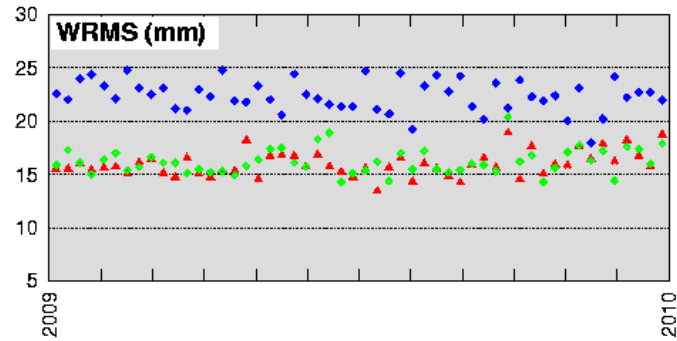
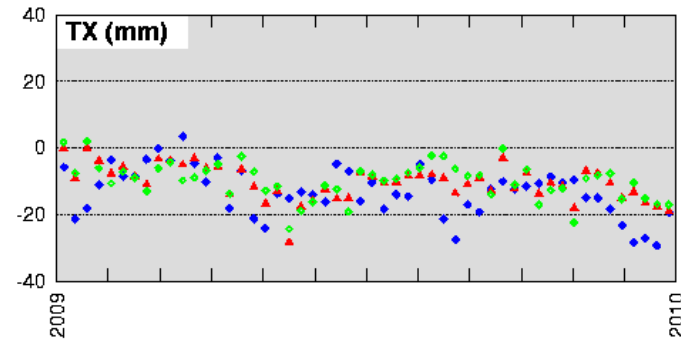
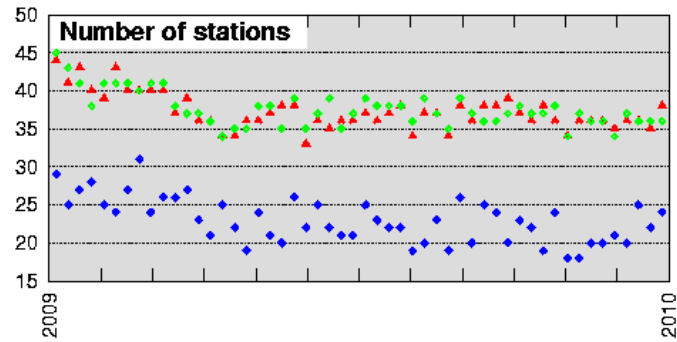
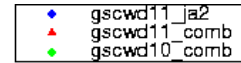
Envisat

Per week comparison to ITRF2008P

- ◆ gscwd11\_env
- ▲ gscwd11\_sp4
- ◆ gscwd11\_sp5
- ◆ gscwd11\_ja2

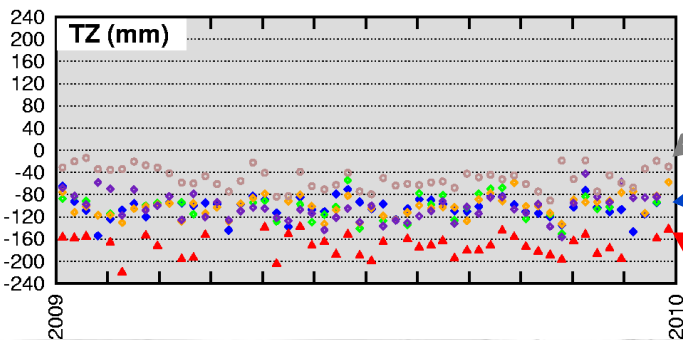
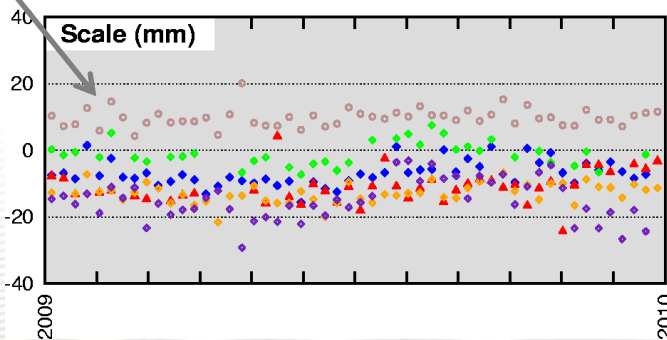
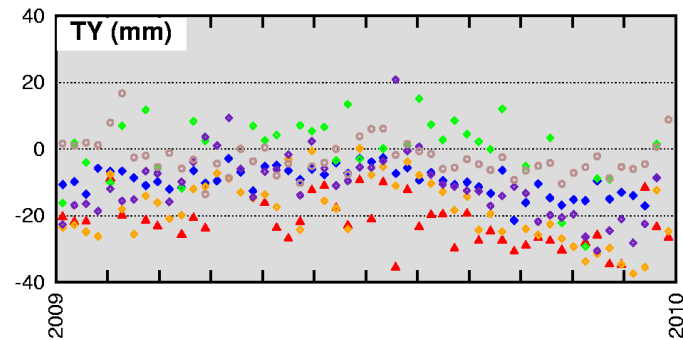
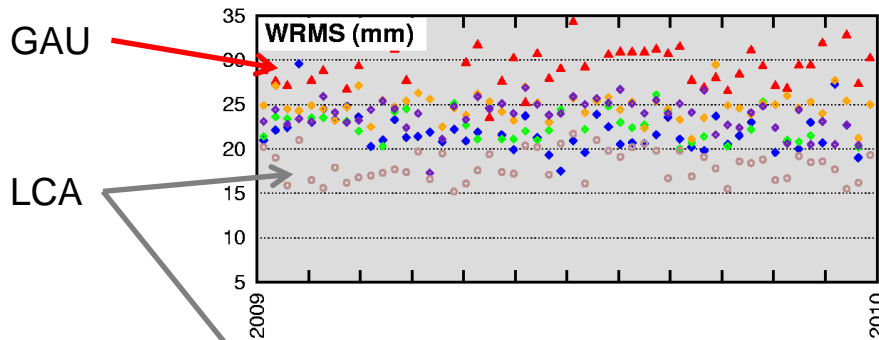
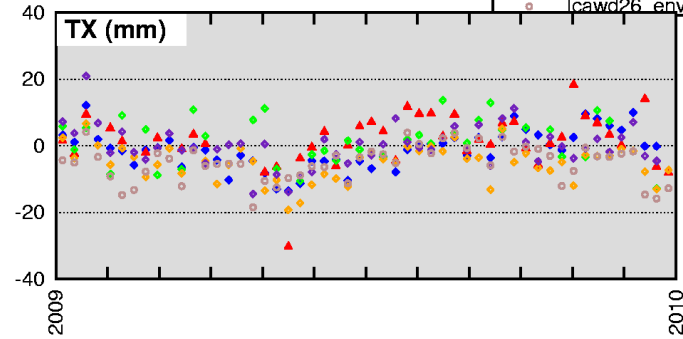
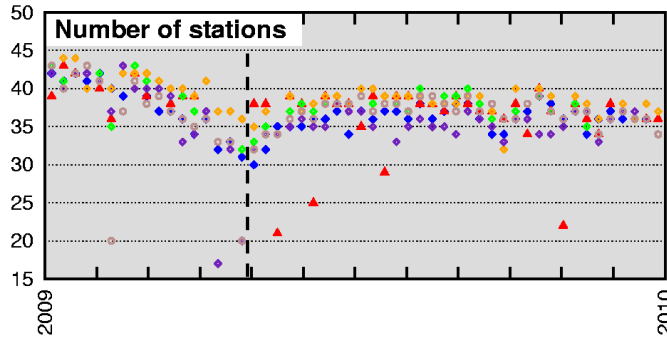


Per week comparison to ITRF2008P



Per week comparison to ITRF2008P

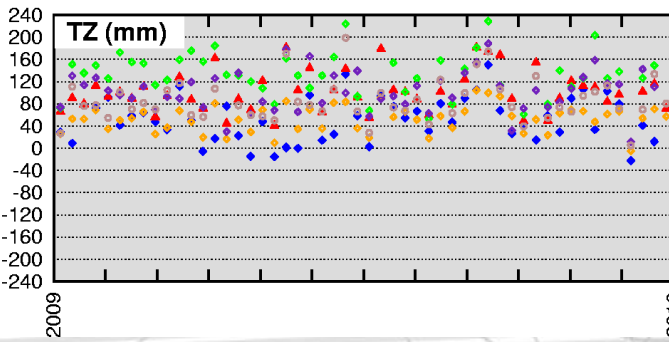
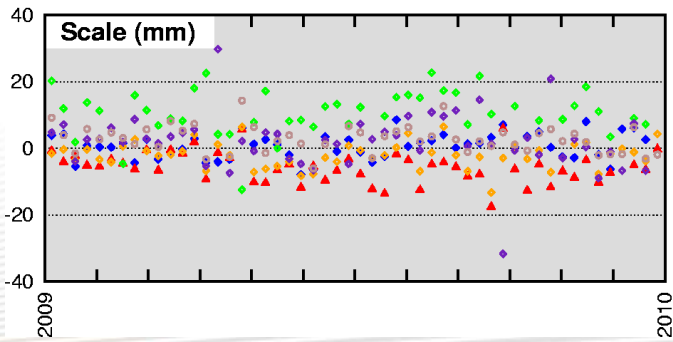
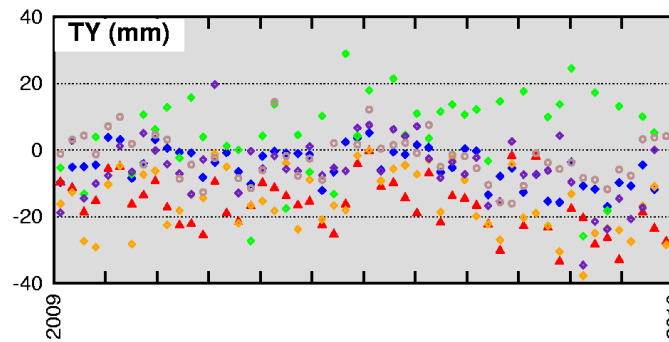
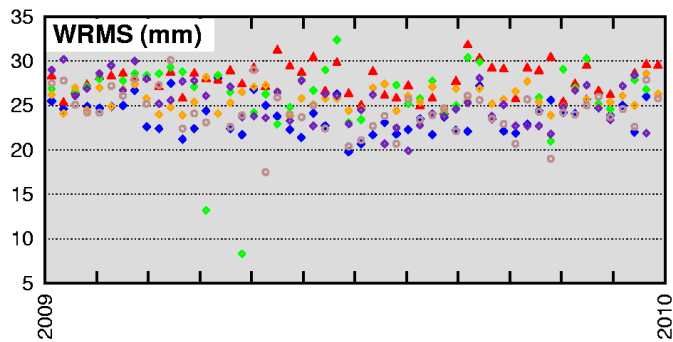
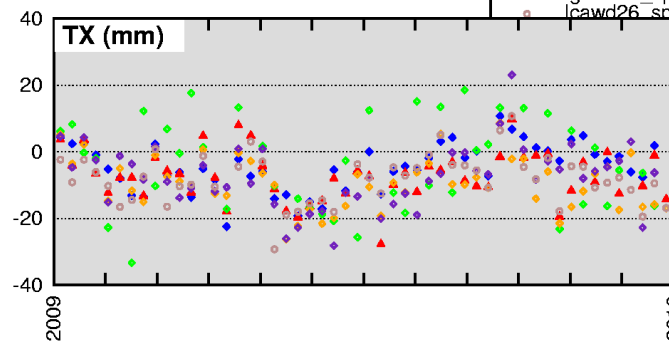
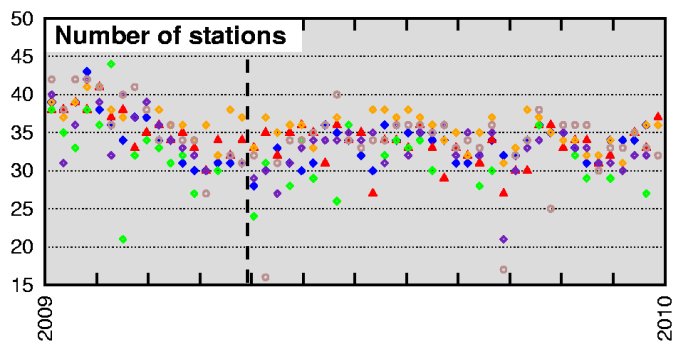
- ◆ esawd03\_env
- ▲ gauwd08\_env
- ◆ gopwd31\_env
- ◆ gscwd11\_env
- ◆ ignwd01\_env
- lcawd26\_env





Per week comparison to ITRF2008P

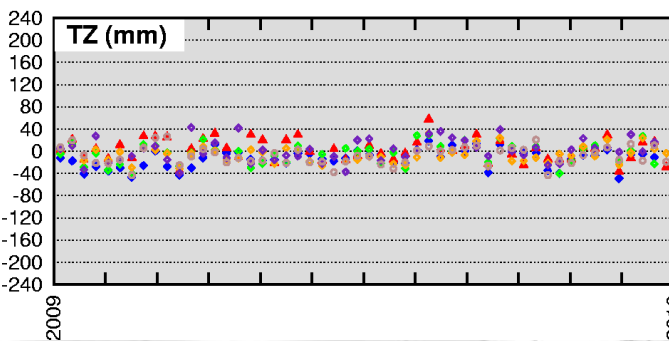
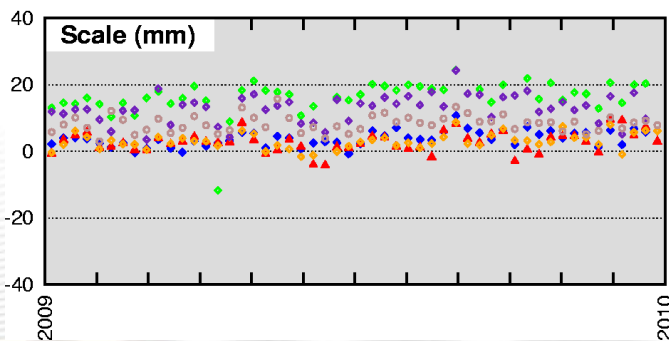
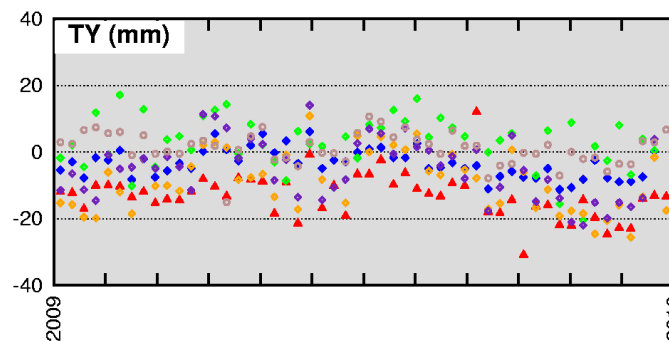
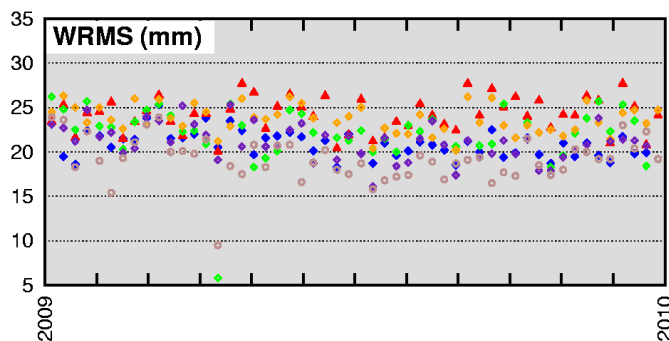
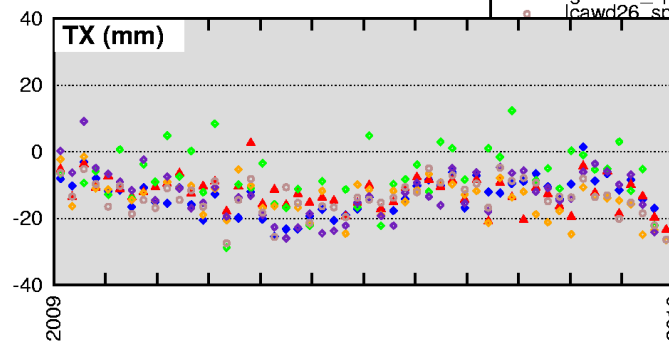
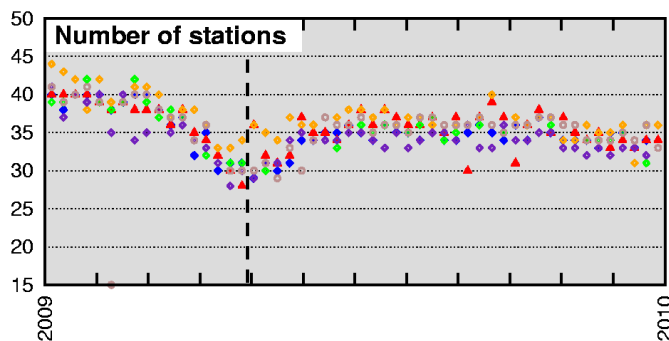
- ◆ esawd03\_sp4
- ▲ gauwd08\_sp4
- ◇ gopwd31\_sp4
- ◇ gscwd11\_sp4
- ◆ ignwd01\_sp4
- lcawd26\_sp4



## Homogeneity over ACs

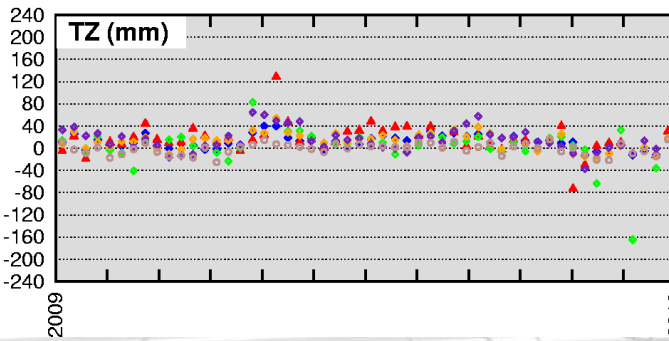
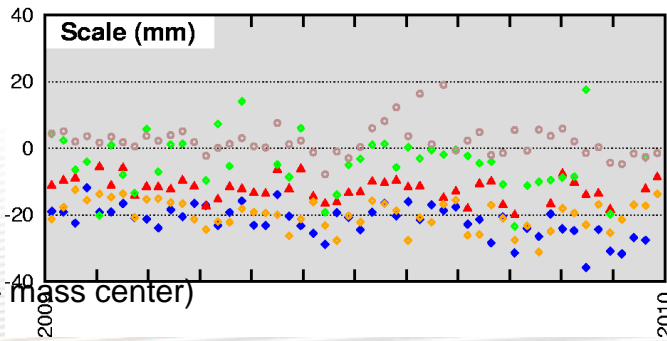
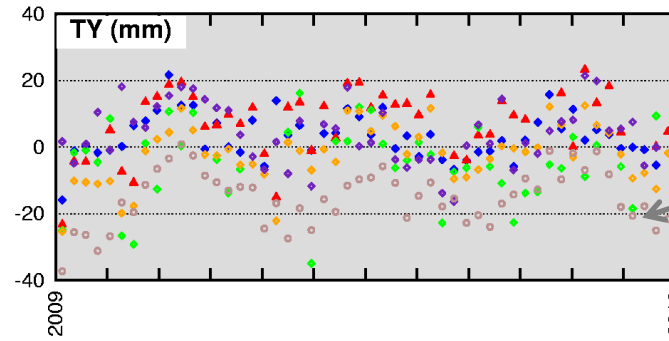
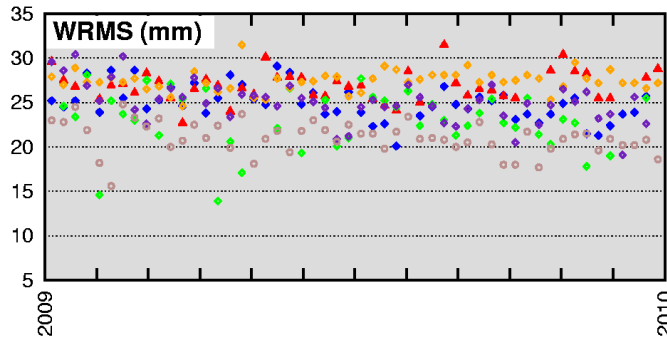
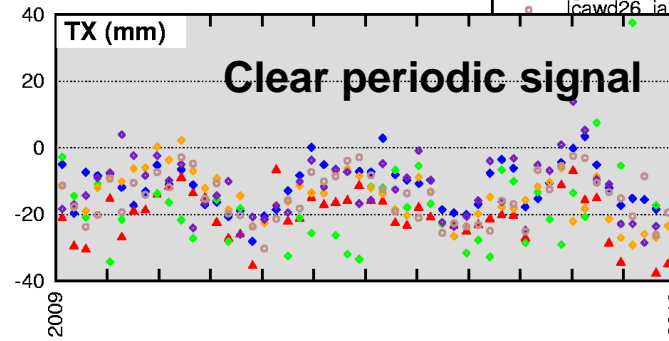
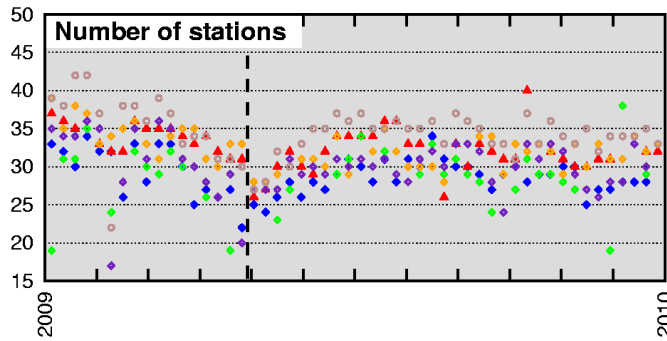
Per week comparison to ITRF2008P

- ◆ esawd03\_sp5
- ▲ gauwd08\_sp5
- ◇ gopwd31\_sp5
- ◇ gscwd11\_sp5
- ◆ ignwd01\_sp5
- lcawd26\_sp5



Per week comparison to ITRF2008P

- ◆ esawd03\_ja2
- ▲ gauwd08\_ja2
- ◆ gopwd31\_ja2
- ◆ gscwd11\_ja2
- ◆ ignwd01\_ja2
- ◆ lcawd26\_ja2



IGN out of plot (~-120mm (no correction of phase center - mass center))

# Some Statistics (1/2)

Mean (Standard deviation)

Satellite	AC	Scale [mm]	Tx [mm]	Ty [mm]	Tz [mm]
<b>ENVISAT</b>	ESA	-6.96 (03.75)	-1.08 (05.79)	-9.69 (04.15)	<b>-103.58</b> (18.72)
	GAU	-10.98 (04.87)	1.61 (07.75)	<b>-23.41</b> (08.81)	<b>-175.32</b> (25.83)
	GOP	-1.13 (03.63)	<b>1.68</b> (06.88)	<b>0.16</b> (09.71)	<b>-103.14</b> (21.89)
	GSC	-12.89 (02.90)	-5.18 (05.31)	-18.16 (09.29)	<b>-101.26</b> (18.44)
	IGN	<b>-19.41</b> ( <b>30.96</b> )	-0.01 (06.05)	-11.16 (09.69)	<b>-103.13</b> (23.75)
	LCA	<b>9.76</b> (02.73)	<b>-5.21</b> (05.47)	-2.70 (05.41)	<b>-50.07</b> (19.57)
<b>SPOT4</b>	ESA	0.60 (03.83)	<b>-4.53</b> (07.16)	-4.85 (05.63)	<b>51.36</b> (39.69)
	GAU	<b>-5.80</b> (04.63)	-7.35 (07.44)	<b>-16.79</b> (07.96)	<b>101.92</b> (36.74)
	GOP	<b>14.20</b> ( <b>20.53</b> )	<b>-5.83</b> ( <b>41.29</b> )	<b>3.88</b> ( <b>20.30</b> )	<b>133.53</b> (39.20)
	GSC	-2.12 (03.89)	<b>-9.36</b> (07.72)	-15.73 (09.21)	<b>52.84</b> (24.14)
	IGN	2.14 (08.51)	-7.50 (09.34)	-4.52 (13.71)	<b>102.09</b> (36.49)
	LCA	1.43 (10.08)	-6.37 (14.63)	-4.84 (18.57)	<b>85.29</b> (37.41)

# Some Statistics (2/2)

Mean (Standard deviation)

Satellite	AC	Scale [mm]	Tx [mm]	Ty [mm]	Tz [mm]
<b>JASON-2</b>	ESA	-21.88 (04.82)	-11.31 (06.74)	3.05 (06.76)	10.77 (12.81)
	GAU	-12.30 (03.39)	-21.12 (08.26)	7.13 (09.88)	17.18 (27.26)
	GOP	-5.96 (13.22)	-20.98 (17.81)	-6.04 (13.35)	2.83 (34.12)
	GSC	-20.03 (04.34)	-14.85 (07.28)	-2.22 (08.78)	12.07 (14.99)
	IGN	-118.61 (31.76)	-12.00 (09.05)	4.02 (08.99)	14.88 (20.84)
	LCA	2.22 (04.73)	-14.85 (07.24)	-15.22 (08.38)	-1.16 (10.17)
<b>SPOT5</b>	ESA	3.72 (02.33)	-13.34 (05.50)	-3.47 (04.31)	-13.49 (16.44)
	GAU	2.69 (03.06)	-12.28 (04.93)	-13.19 (06.74)	3.15 (19.93)
	GOP	16.18 (05.25)	-7.20 (08.23)	3.02 (07.83)	-4.53 (18.87)
	GSC	3.04 (02.36)	-14.39 (05.89)	-8.95 (08.78)	-5.97 (14.57)
	IGN	12.84 (04.19)	-12.57 (07.26)	-5.18 (08.94)	1.81 (20.26)
	LCA	8.30 (02.52)	-13.81 (05.28)	1.10 (04.78)	-8.05 (16.49)

– **Number of stations:**

- Less stations with Jason-2 (cut-off angle ?)

– **WRMS:**

- Most of solutions are comparable excepted for Envisat

– **Scale:**

- 2 groups (Spot4,Spot5/Envisat-Jason-2)

– **Tx:**

- For each AC, all solutions are comparable
- Clear periodic signal for Jason-2 solutions

– **Ty:**

- Higher values for Jason-2 except for LCA

– **Tz:**

- Spot5, Jason-2 and combined solutions are centred
- Envisat and Spot4 solutions are appart from 0 → **Origin ? Source of improvements**
- Jason-2 is centred

weight of Jason-2 =  $\Sigma$  weight of all other missions → combined solution is centred (TBC)

## – Idea

- Analysis of weekly series of stations with high residuals, so not used for the estimation of the 7 transformation parameters

## – Objectives

- To see some geographical patterns (SAA ?)
- To isolate some stations with coordinate offsets
- To deduce some sources of improvements

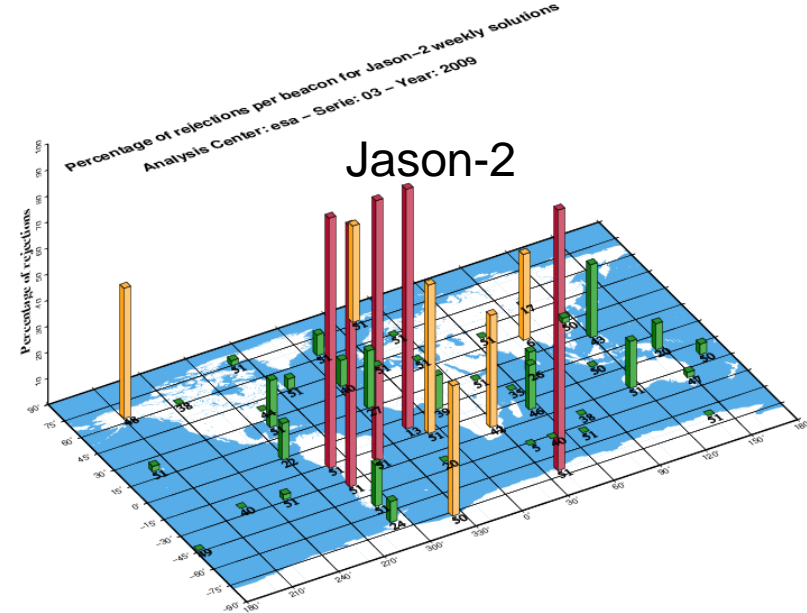
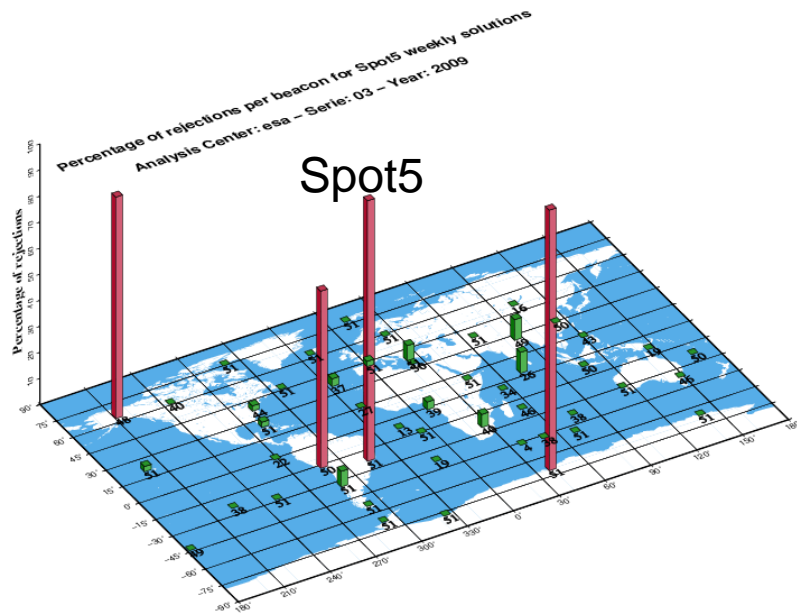
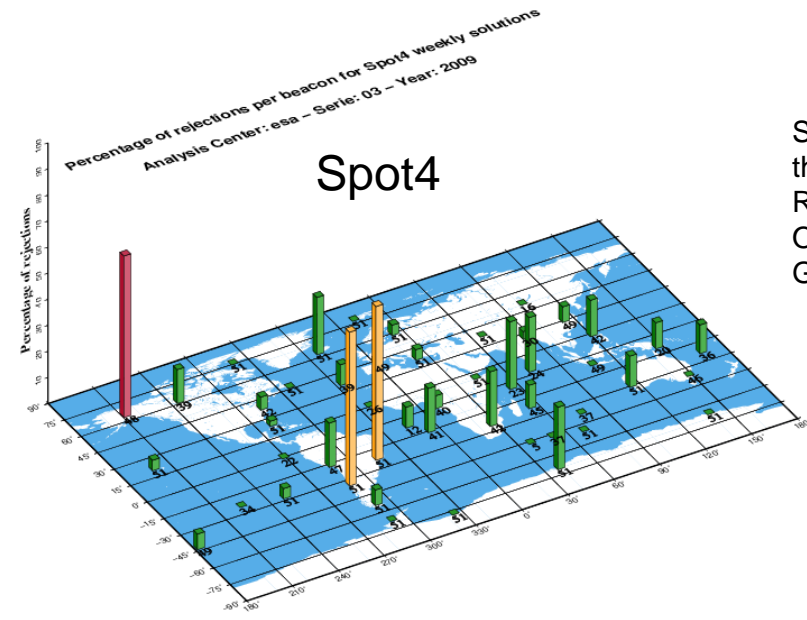
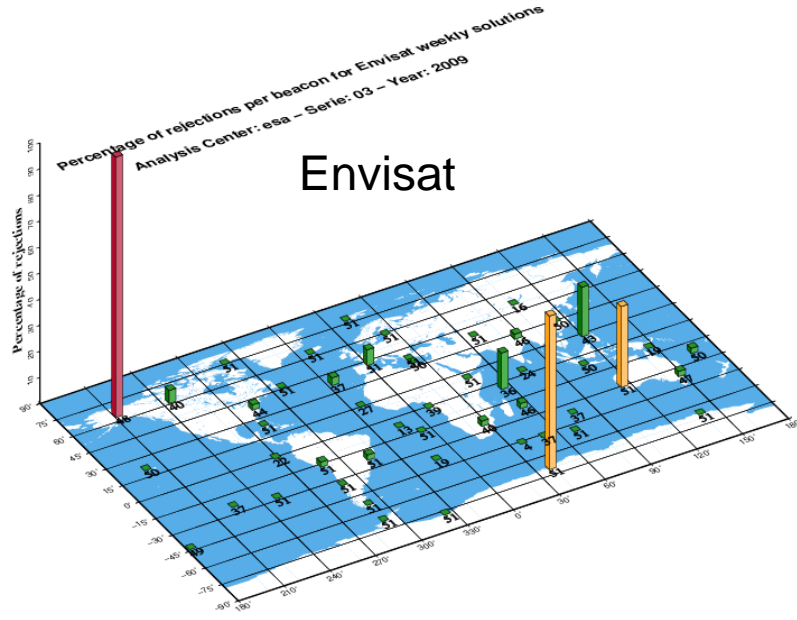
## – Method

- Geographical plot of the ratio

$$\frac{\text{nb of times where the station is not used for the 7P estimation}}{\text{nb of times where the station is in the SINEX weekly files}}$$

# ESA – Stations with high residuals

Stations not used for the 7P estimation  
 Red  $60 \leq \% \leq 100$   
 Orange  $30 \leq \% < 60$   
 Green  $0 \leq \% < 30$

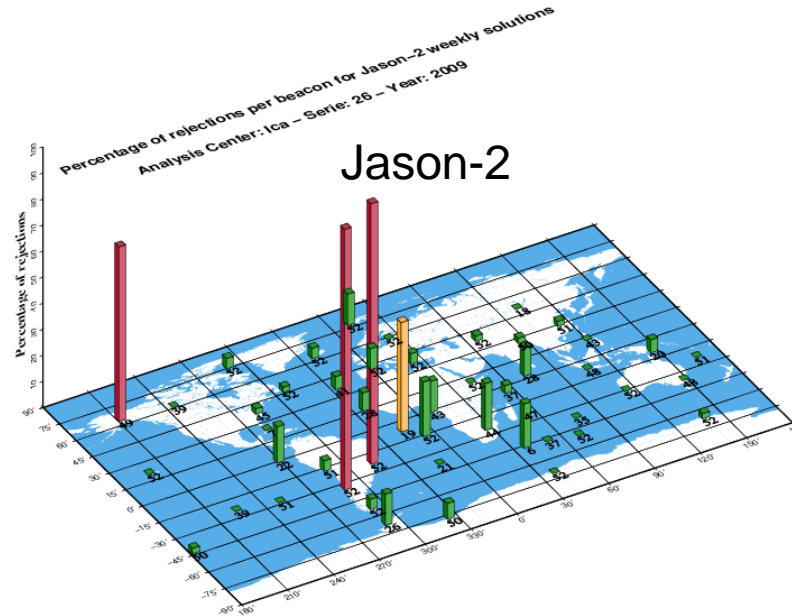
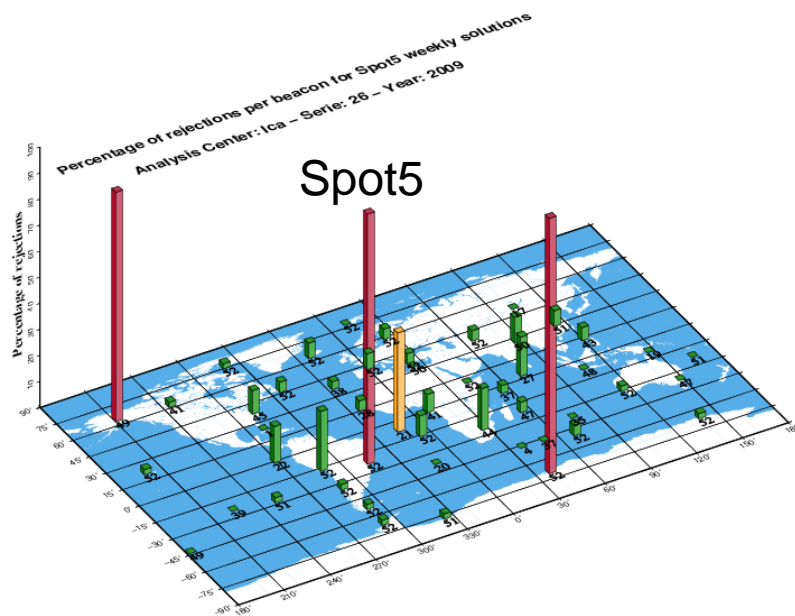
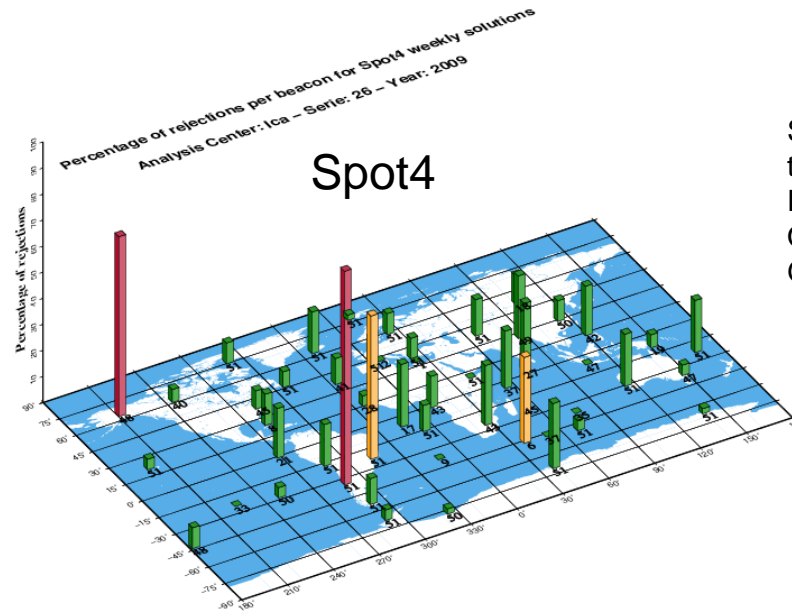
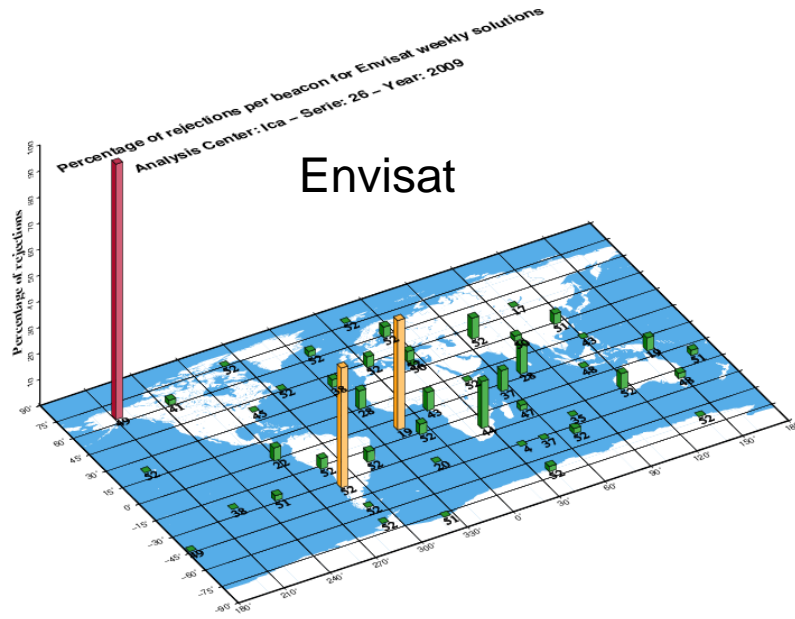




# LCA – Stations with high residuals

Stations not used for the 7P estimation

- Red  $60 \leq \% \leq 100$
- Orange  $30 \leq \% < 60$
- Green  $0 \leq \% < 30$



- **Fairbanks**
  - Origin of systematic high residuals must be investigated
  
- **Arequipa, Cachoiera and Santiago are most of time rejected (excepted for Envisat)**
  - SAA ?
  - USO ?
  - Tropospheric correction (mapping function) at low latitude ?
  
- **Syowa ?**
  
- **If we had to sort the satellites with respect with the number of stations with high residuals :**
  1. Envisat
  2. Spot5
  3. Spot4
  4. Jason-2



## – **Conclusions:**

- **Spot4 and Envisat: potential improvements**
- **Origin of stations with high residuals has to be investigated**
- **Such a campaign should be renewed for forthcoming DORIS missions (Cryosat-2...)**

## – **What's next ?**

- **Delivery and analysis of Jason-2 with only 2 dual frequency measurement channels**
- **Analysis of stations coordinates time series**
- **EOP analysis**
- **...**