# IDS 2010 campaign
# Current status

G. Moreaux, JJ Valette and L. Soudarin
**& all IDS ACs**

# Context of the IDS 2010 Campaign

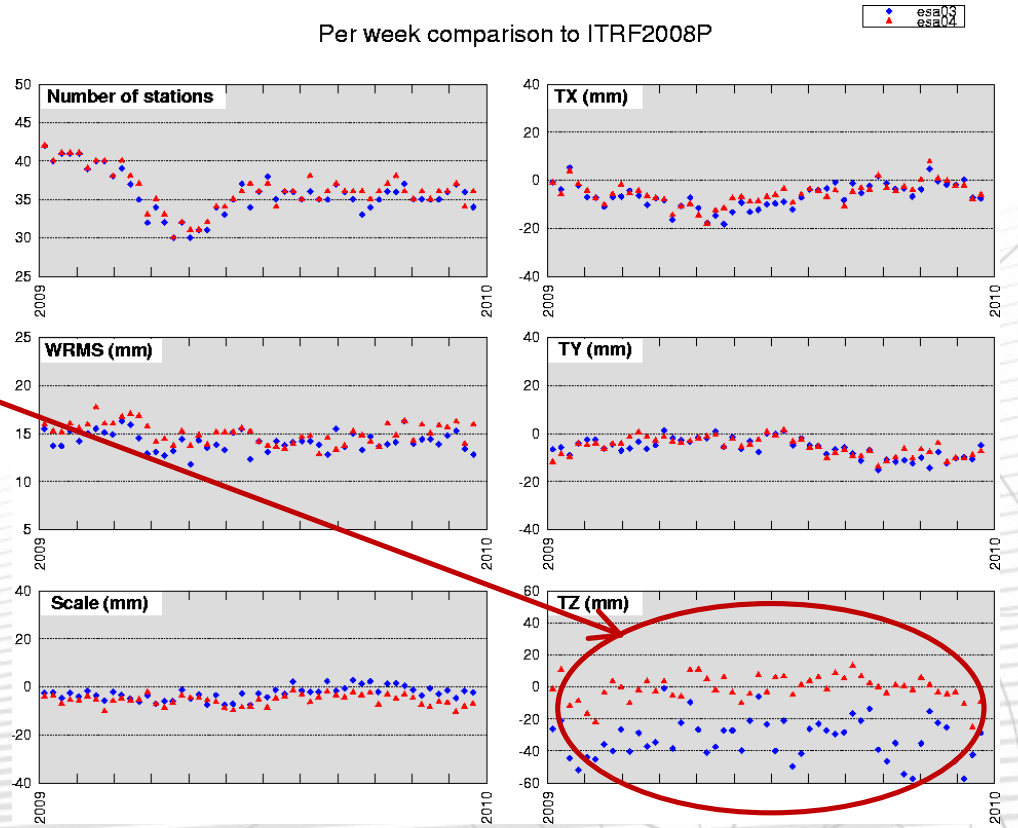


- What is the 2010 campaign ?

  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.



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# SINEX series preparation and evaluation



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 perturbating 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

...



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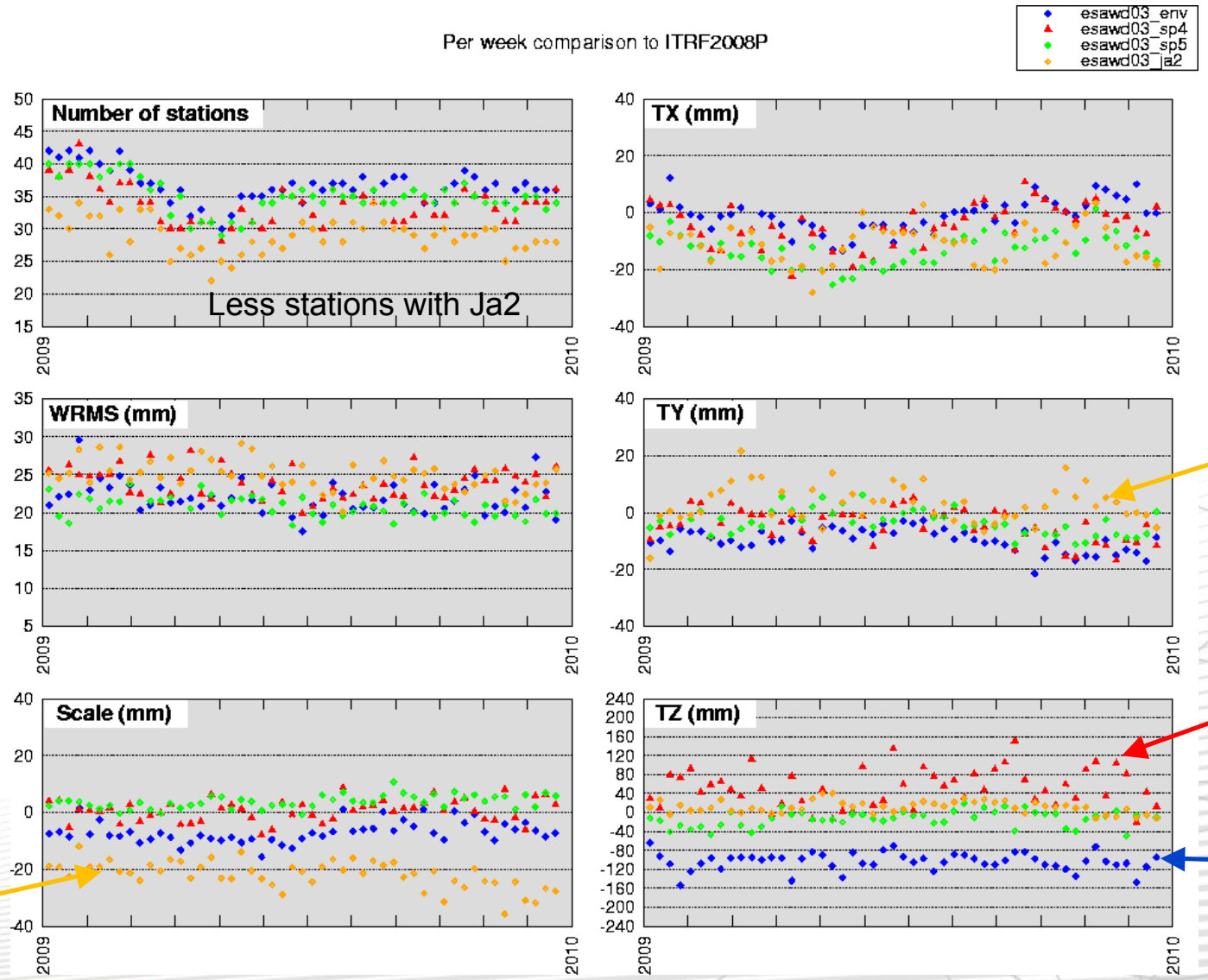
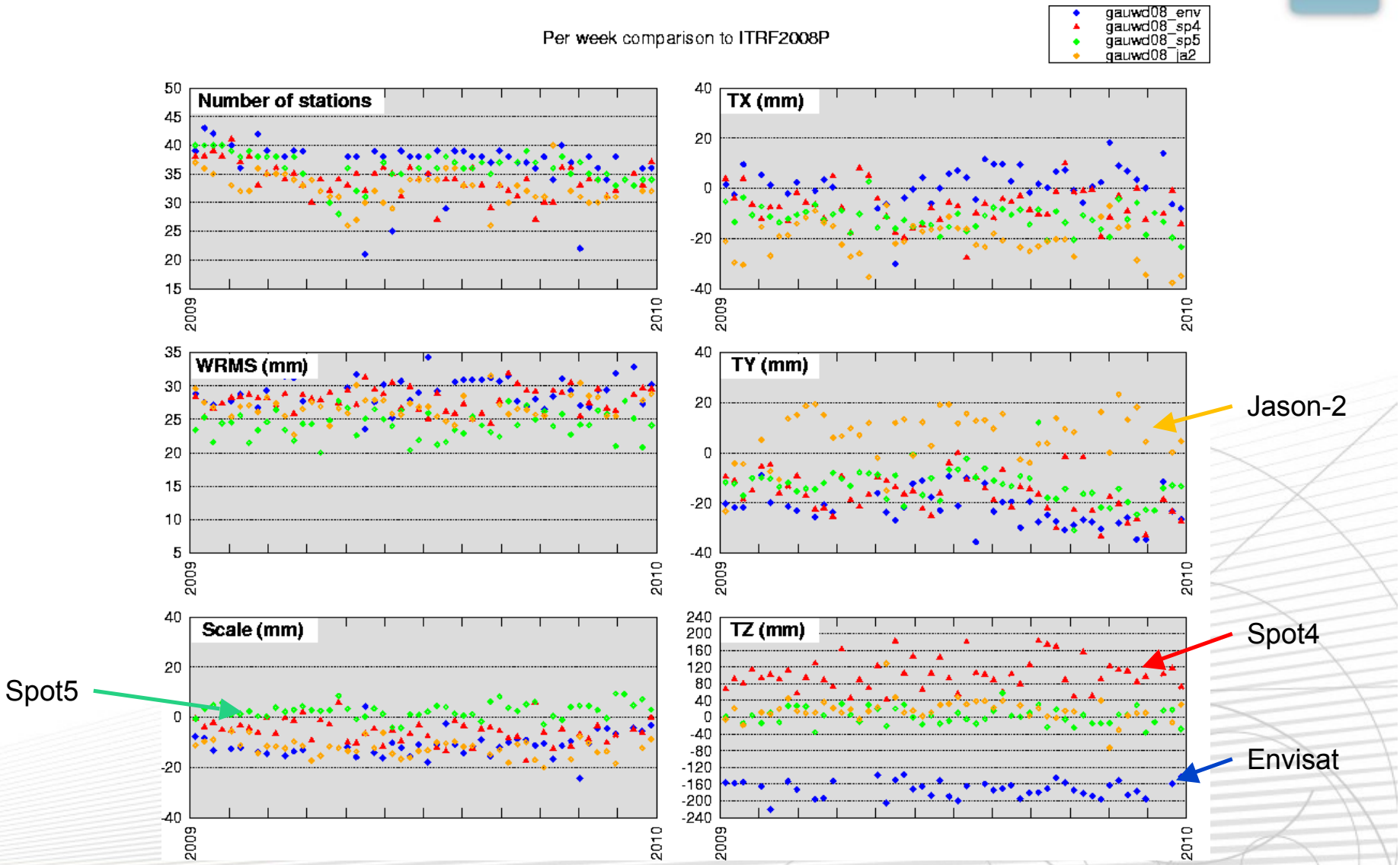
# ESA

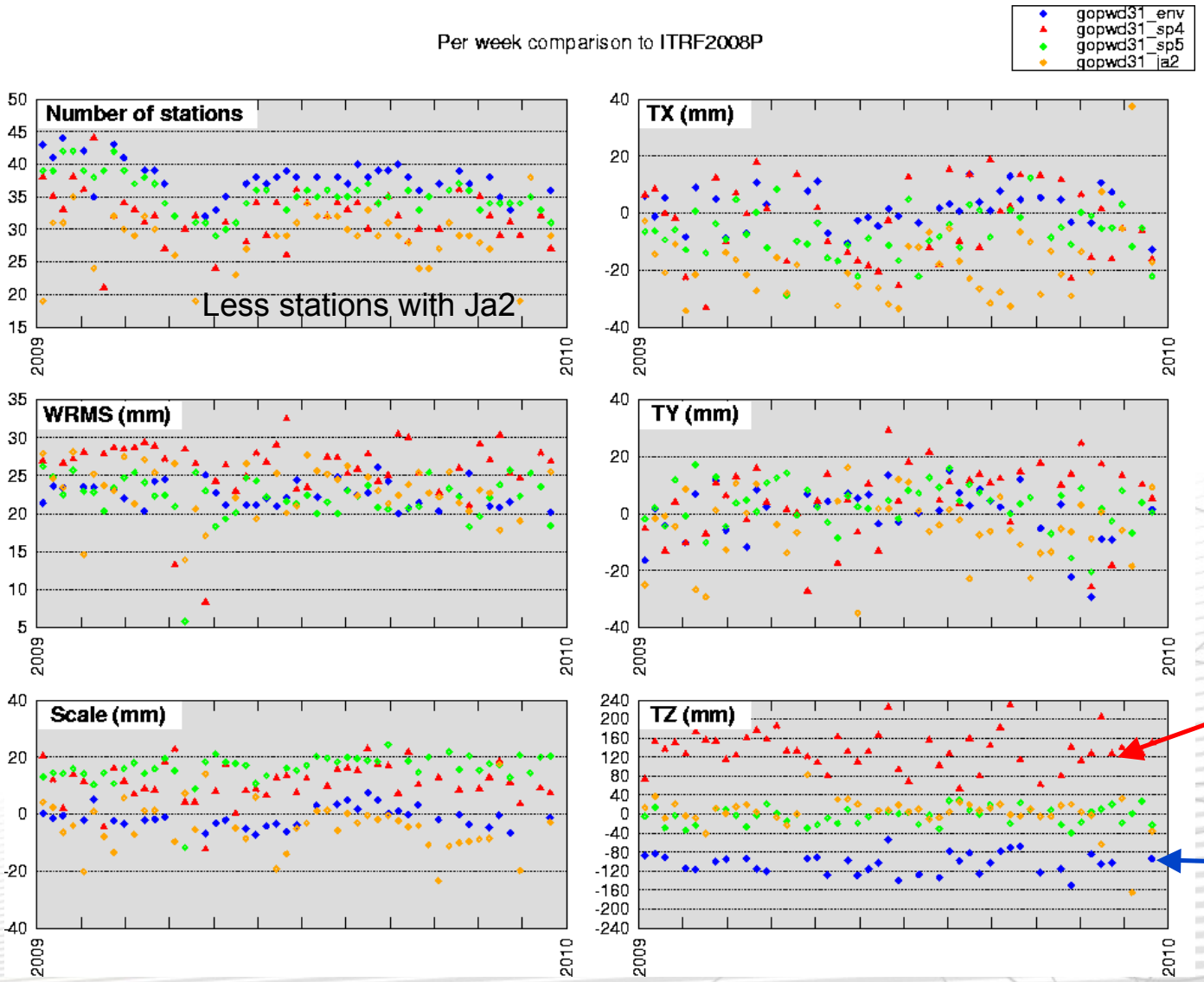

Per week comparison to ITRF2008P
esawd03_env
esawd03_sp4
esawd03_sp5
esawd03_ja2
Number of stations
Less stations with Ja2
TX (mm)
WRMS (mm)
TY (mm)
Scale (mm)
TZ (mm)
2009
2010
Jason-2
Spot4
Envisat
Jason-2

# GAU

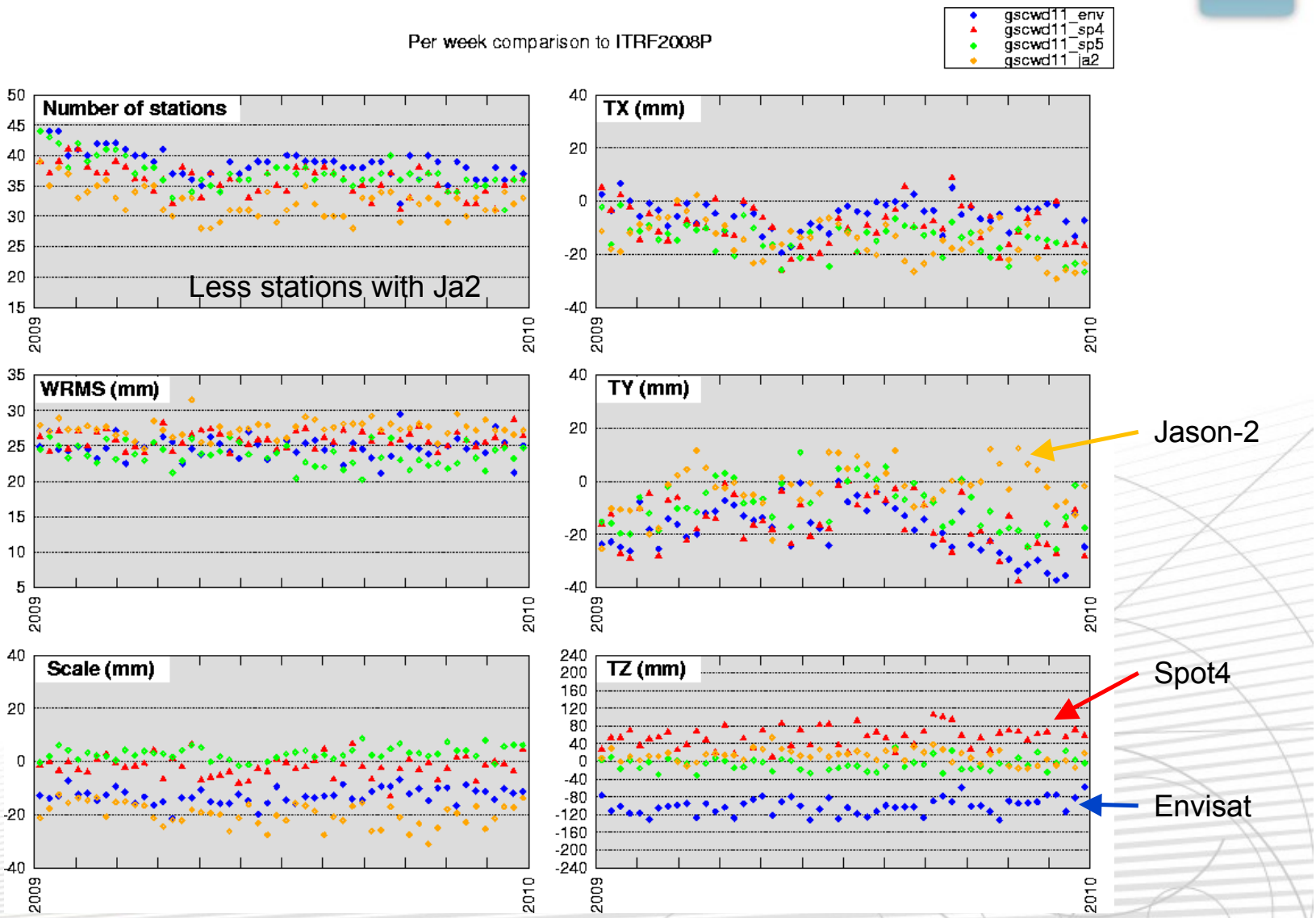

Per week comparison to ITRF2008P
gauwd08_env
gauwd08_sp4
gauwd08_sp5
gauwd08_ja2
Number of stations
TX (mm)
WRMS (mm)
TY (mm)
Scale (mm)
TZ (mm)
2009
2010
Jason-2
Spot4
Spot5
Envisat

# GOP



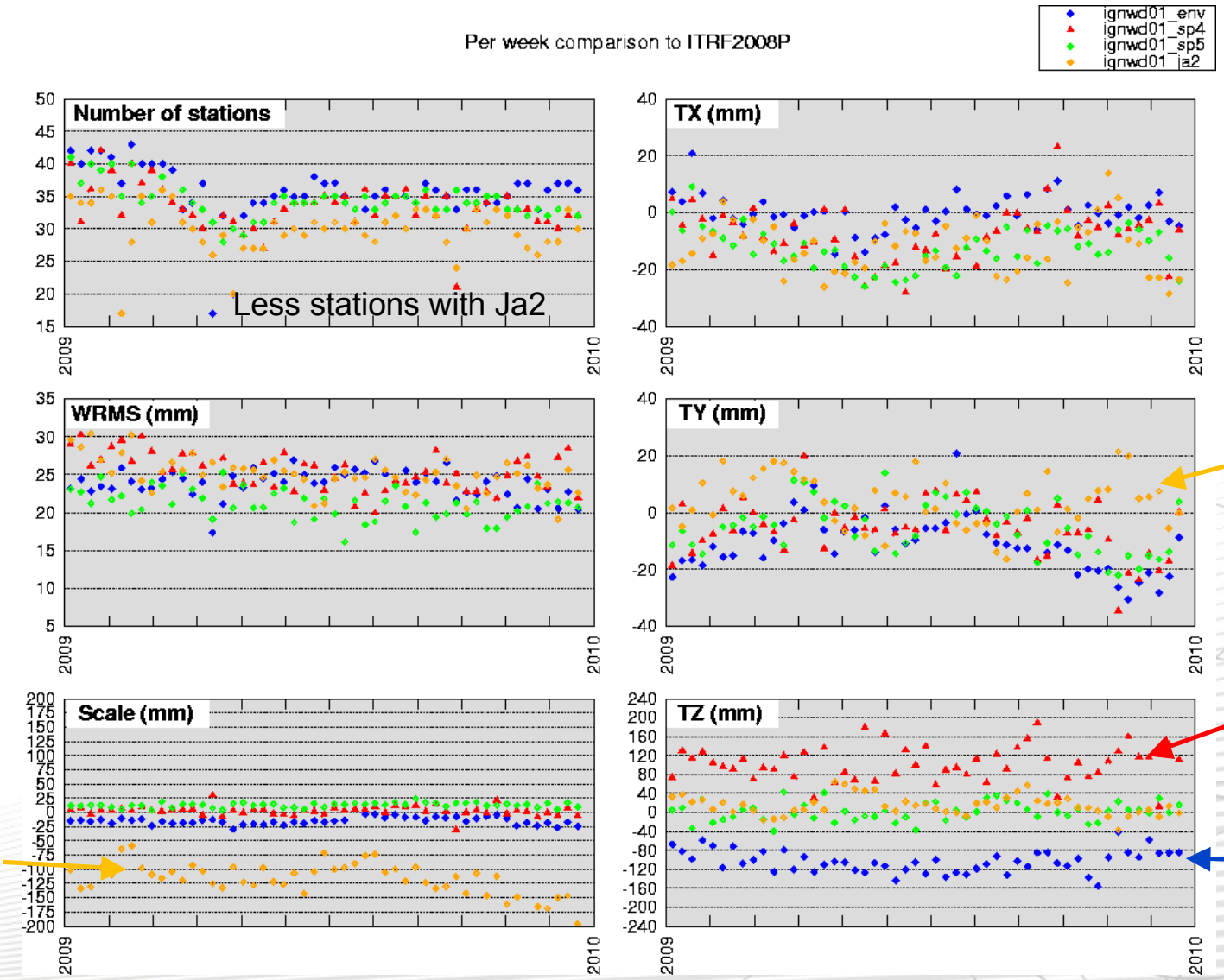

Per week comparison to ITRF2008P
gopwd31_env
gopwd31_sp4
gopwd31_sp5
gopwd31_ja2
Number of stations
Less stations with Ja2
TX (mm)
WRMS (mm)
TY (mm)
Scale (mm)
TZ (mm)
Spot4
Envisat
2009
2010

# GSC


Per week comparison to ITRF2008P
gscwd11_env
gscwd11_sp4
gscwd11_sp5
gscwd11_ja2
Number of stations
Less stations with Ja2
TX (mm)
WRMS (mm)
TY (mm)
Jason-2
Scale (mm)
TZ (mm)
Spot4
Envisat
2009
2010

# IGN





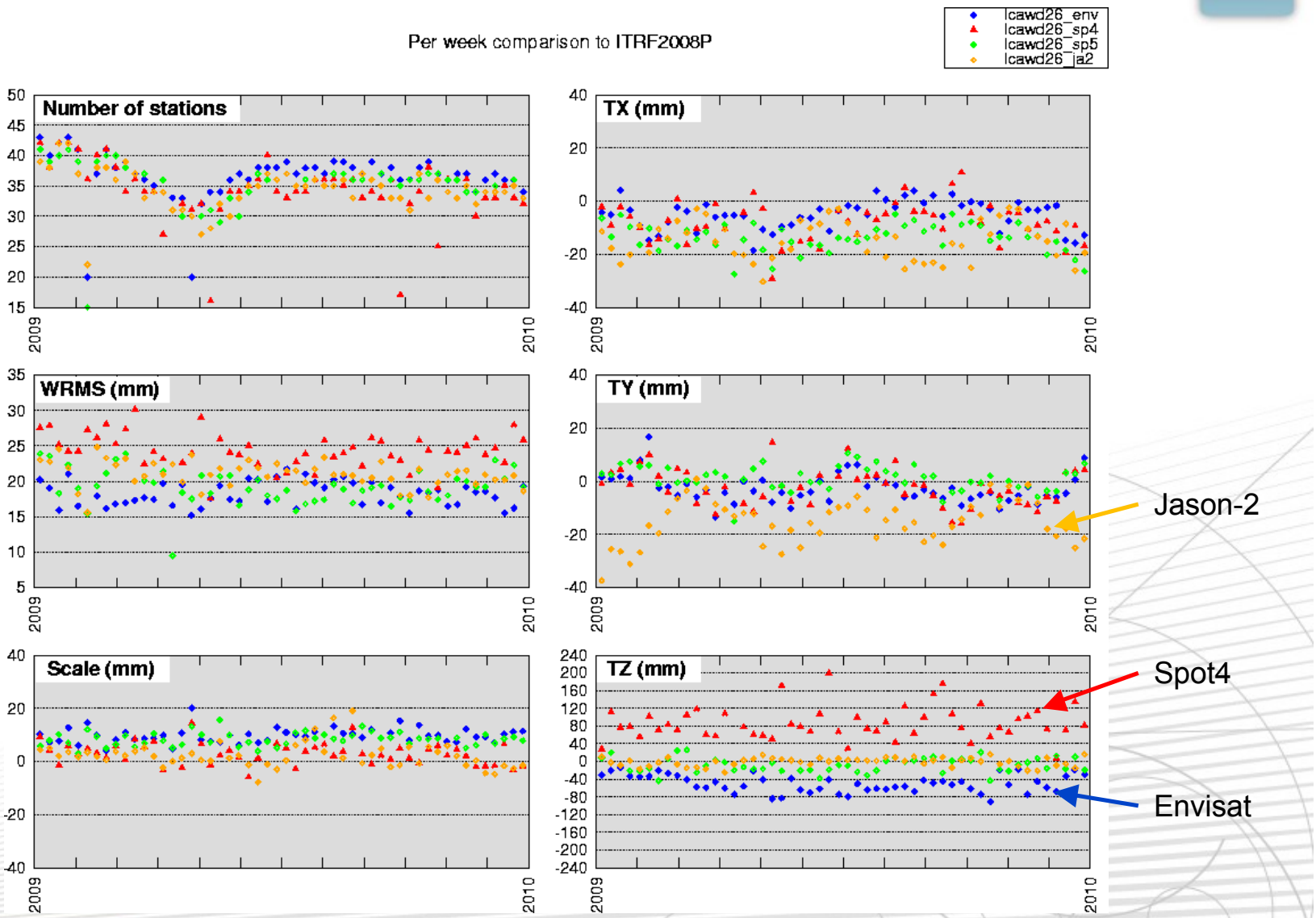

Jason-2

Spot4

Envisat

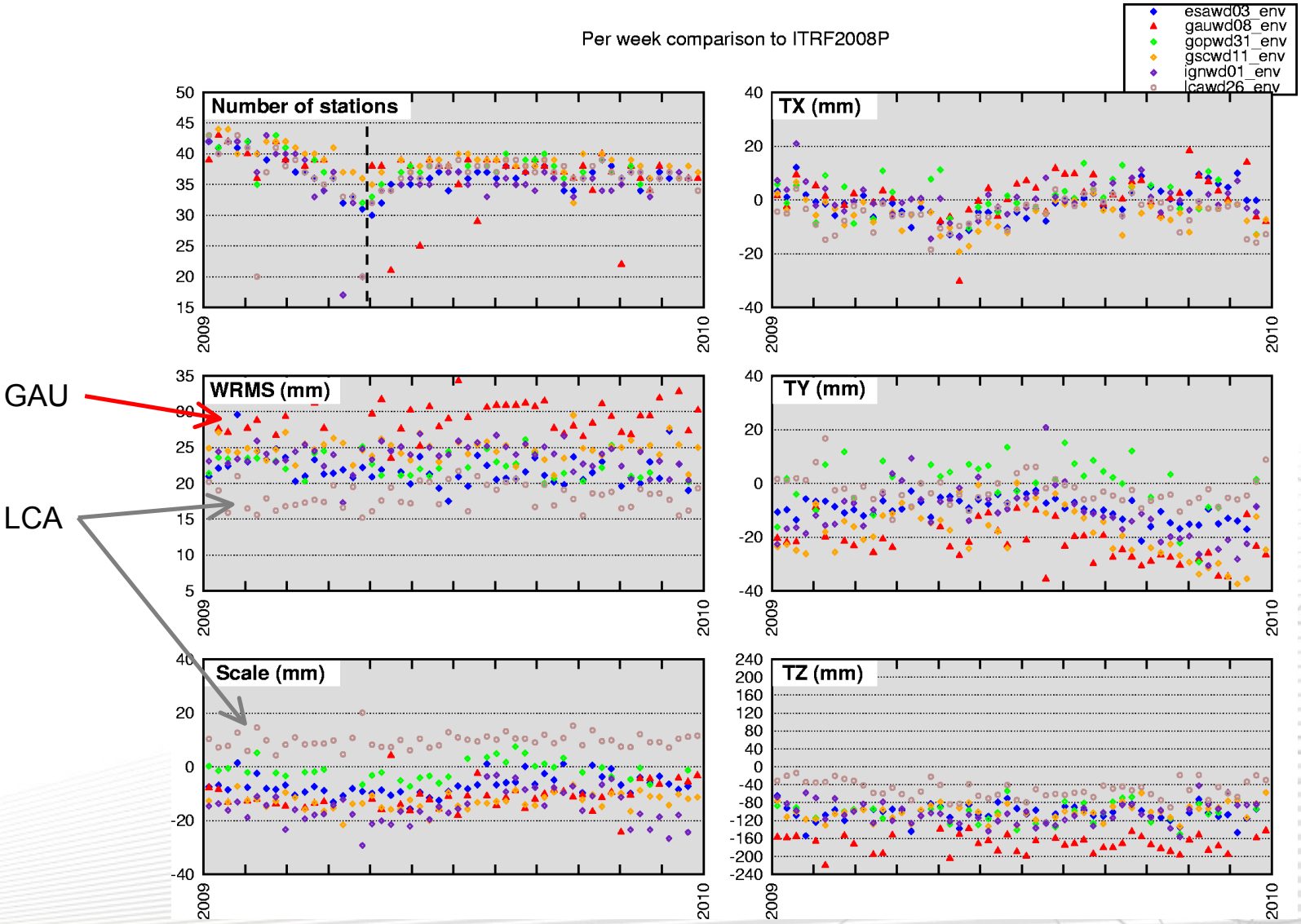
Jason-2
(no correction of phase center – mass center)

# LCA


Per week comparison to ITRF2008P
lcawd26_env
lcawd26_sp4
lcawd26_sp5
lcawd26_ja2
Number of stations
TX (mm)
WRMS (mm)
TY (mm)
Scale (mm)
TZ (mm)
2009
2010
Jason-2
Spot4
Envisat

# Envisat

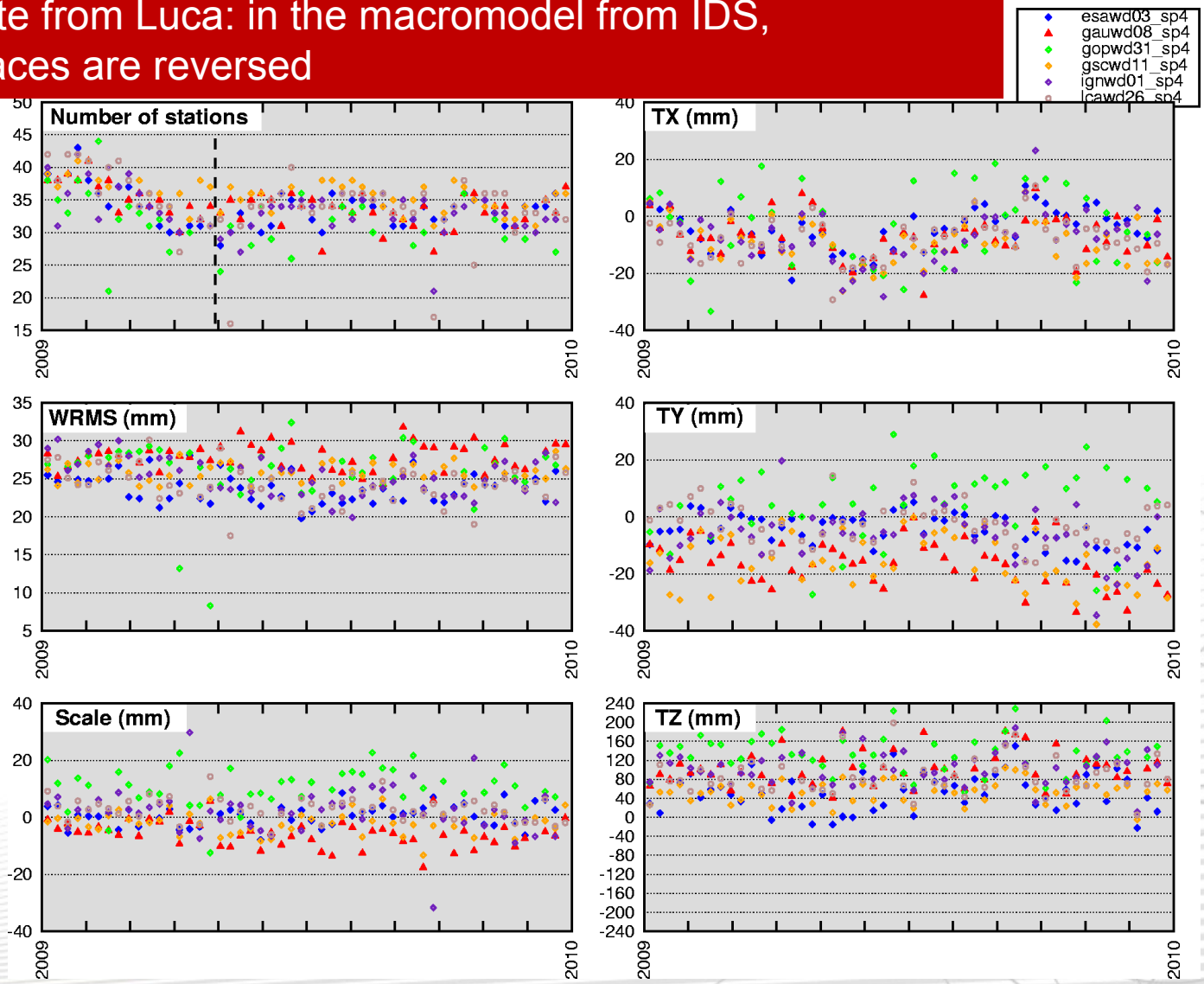



Per week comparison to ITRF2008P
esawd03_env
gauwd08_env
gopwd31_env
gscwd11_env
ignwd01_env
lcawd26_env
Number of stations
TX (mm)
WRMS (mm)
TY (mm)
Scale (mm)
TZ (mm)
2009
2010
GAU
LCA

# Spot4

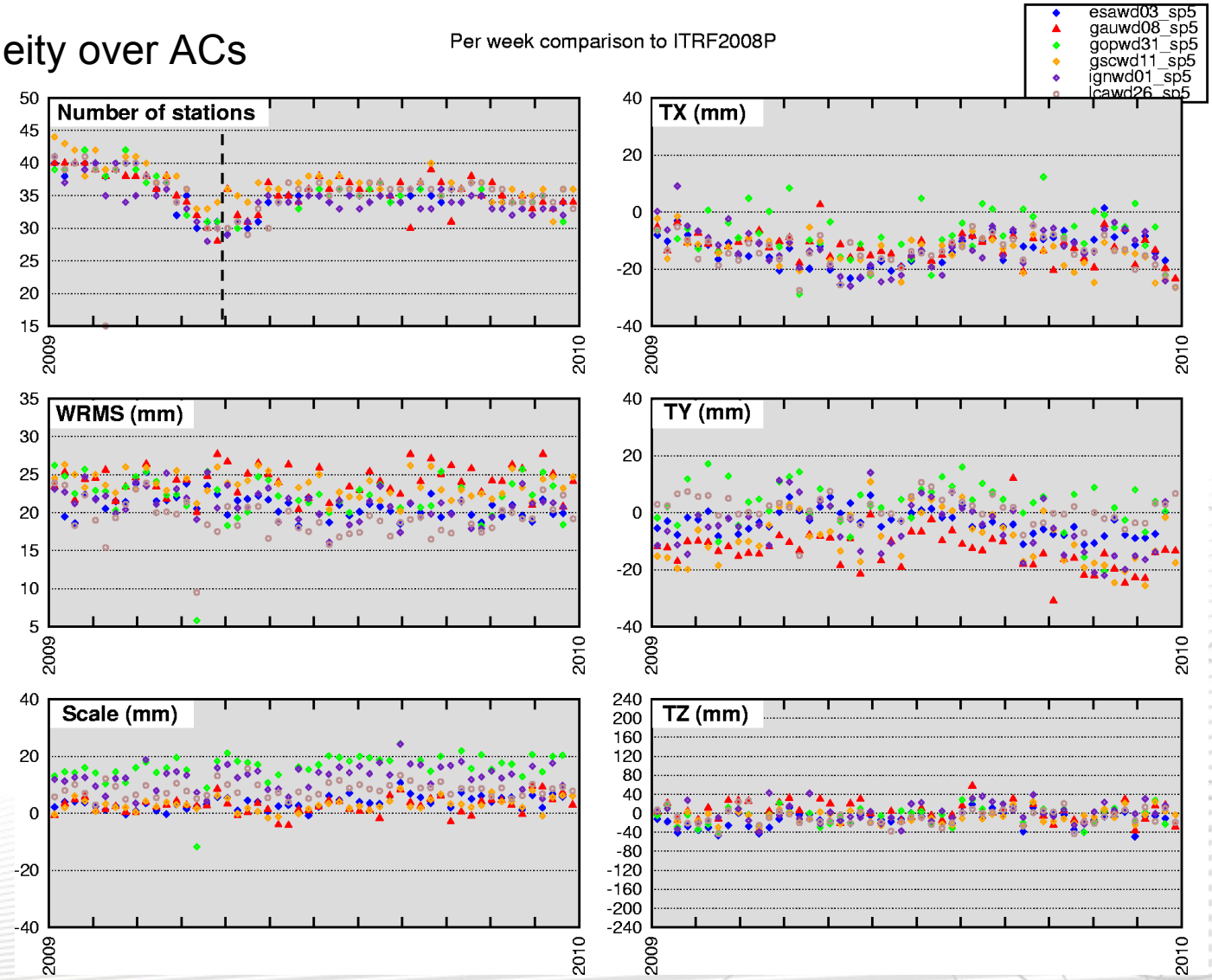


Last minute from Luca: in the macromodel from IDS,
X and Z faces are reversed



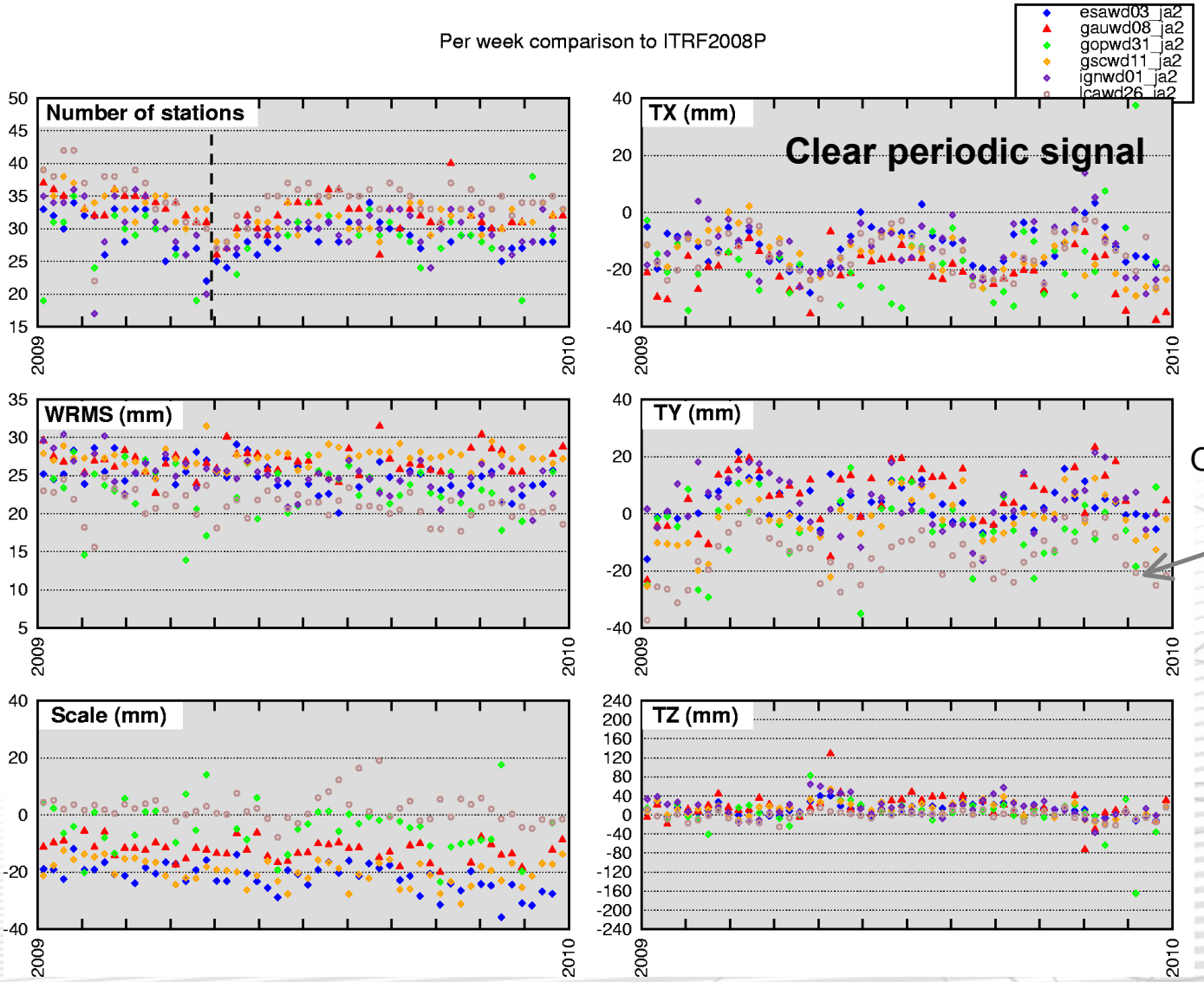
## Homogeneity over ACs

Per week comparison to ITRF2008P



# Jason-2






Offset for LCA (~-15mm)

IGN out of plot (~-120mm)

# Some Statistics (1/2)



Mean (Standard deviation)

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



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# Some Statistics (2/2)



Mean (Standard deviation)

| Satellite | AC | Scale [mm] | Tx [mm] | Ty [mm] | Tz [mm] |
|---|---|---|---|---|---|
| JASON-2 | 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) |
| | | | | | |
| SPOT5 | 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) |



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# General comments (1)



- **Number of stations:**
  - Less stations with Jason-2
- **WRMS:**
  - Most of solutions are comparable excepted for Envisat
- **Scale:**
  - 2 groups (Spot4,Spot5/Envisat-Jason-2)
  - Bias for IGN Jason-2 (no correction of phase center – mass center)
- **Tx:**
  - For each AC, all solutions are comparable
  - Clear periodic signal for Jason-2 solutions
  - Jason-2 : Higher variations for GOP and GAU
- **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
  - Jason-2 is centred and weight of Jason-2 = weight of all other missions

    ➔ combined solution is centred



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# Stations with high residuals



– Idea :

- Analysis of weekly series of stations with highg residuals, i.e. 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

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



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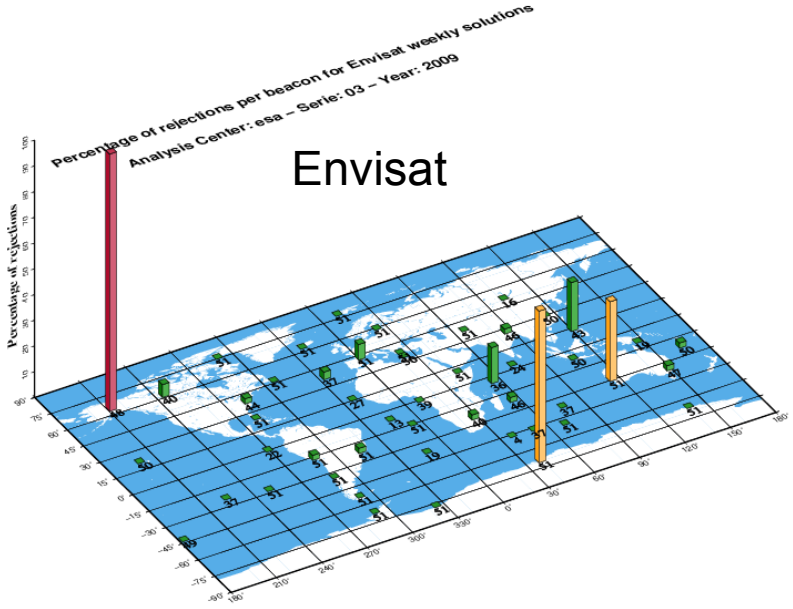
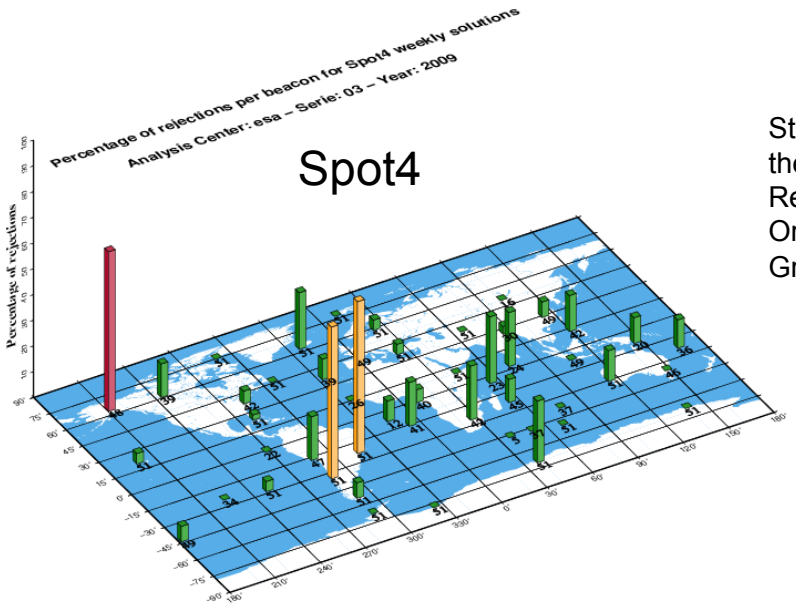
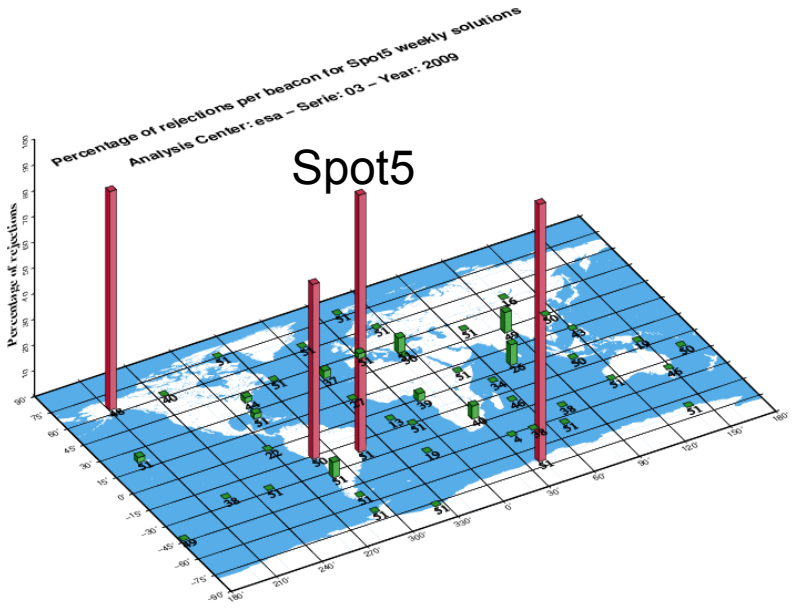
# ESA – Stations with high residuals

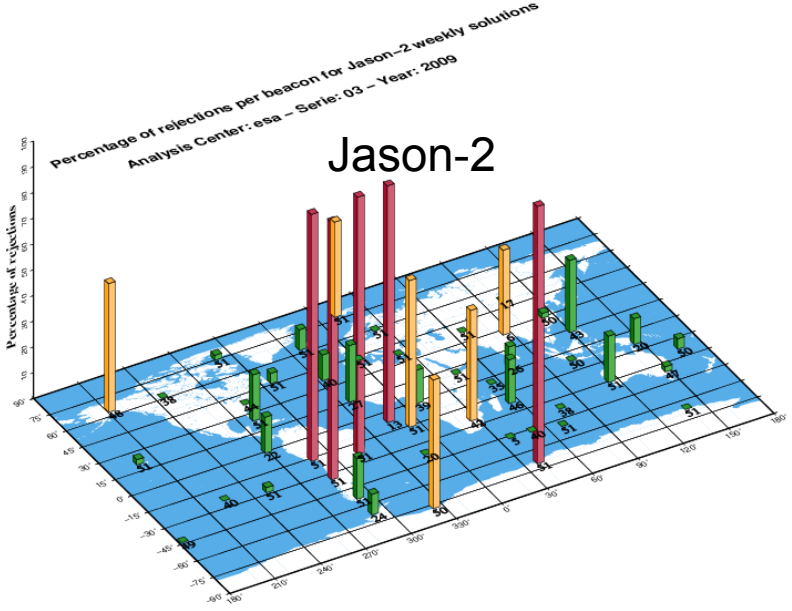





Stations not used for the 7P estimation
Red 60 ≤ % ≤ 100
Orange 30 ≤ % < 60
Green 0 ≤ % < 30

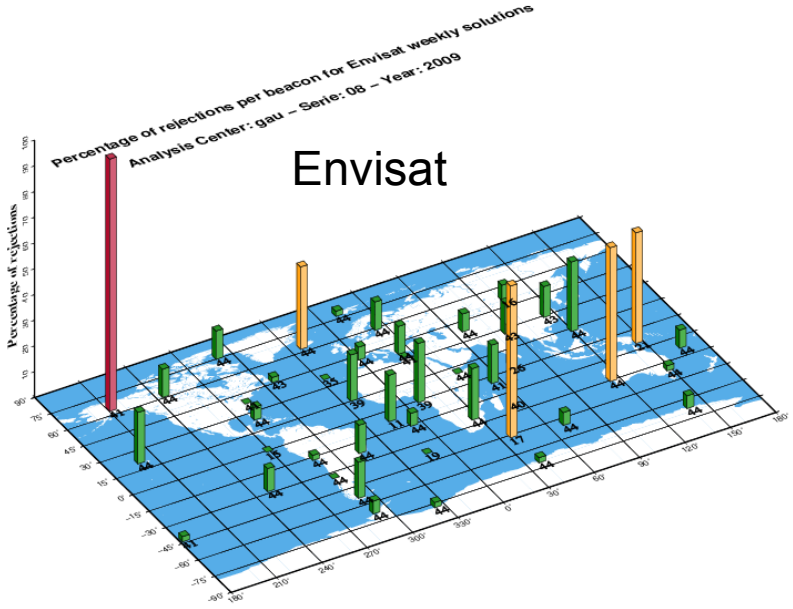


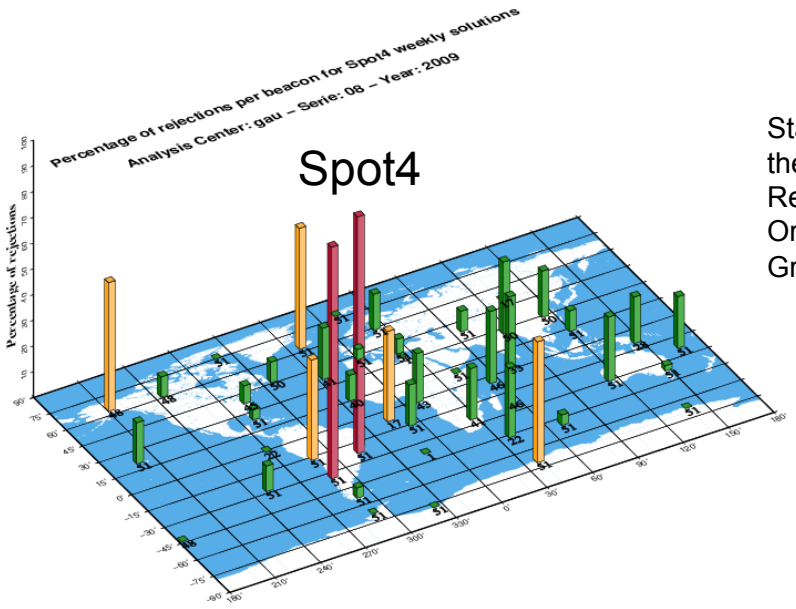
# GAU – Stations with high residuals



Envisat




Spot4



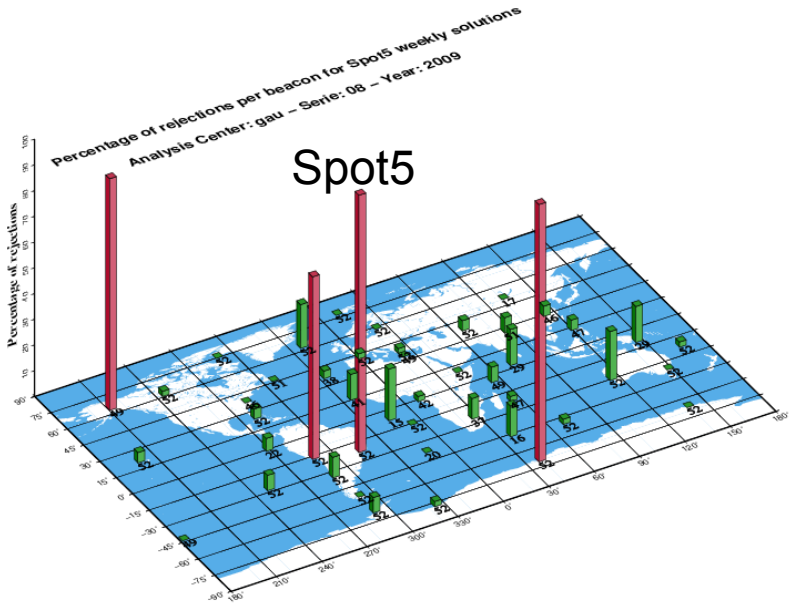

Stations not used for the 7P estimation

Red 60 ≤ % ≤ 100

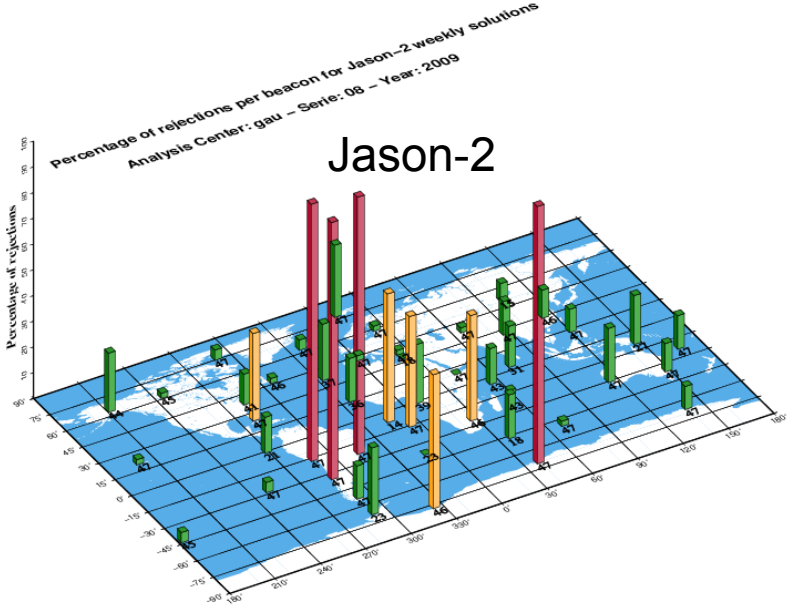
Orange 30 ≤ % < 60

Green 0 ≤ % < 30

Spot5

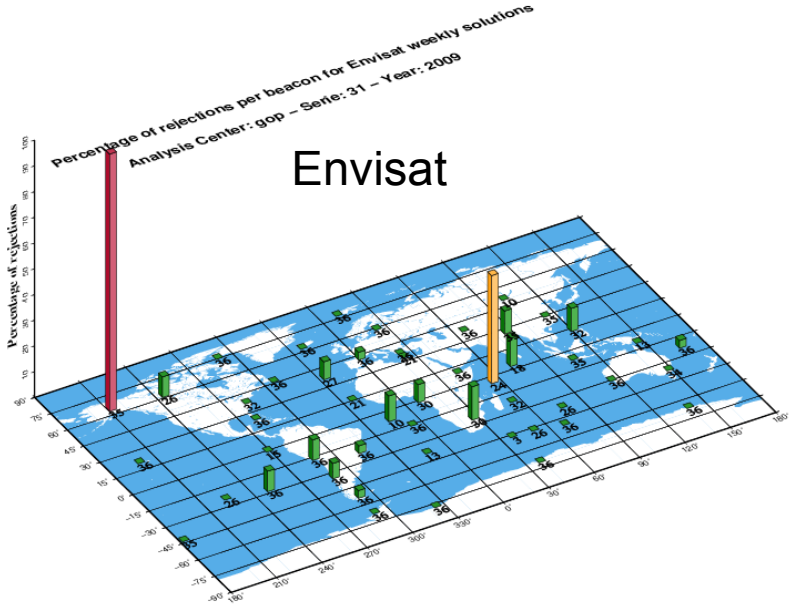


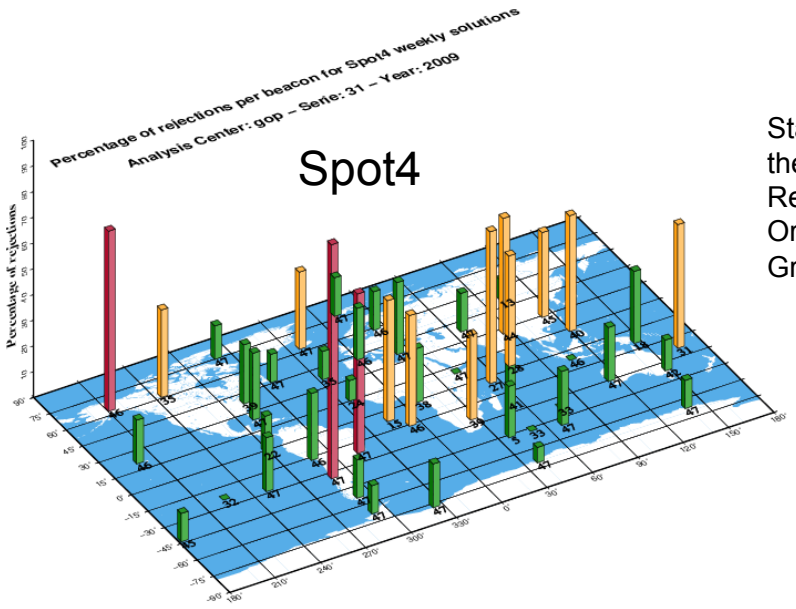

Jason-2



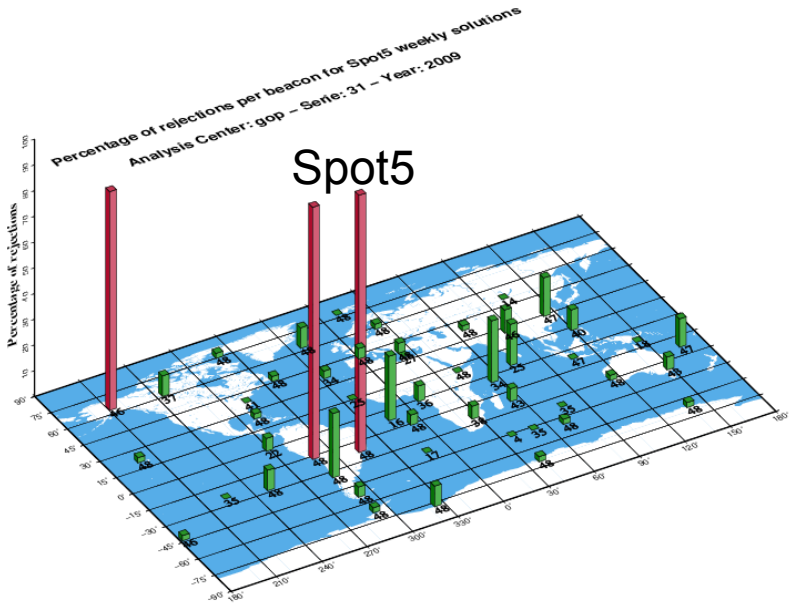
# GOP – Stations with high residuals

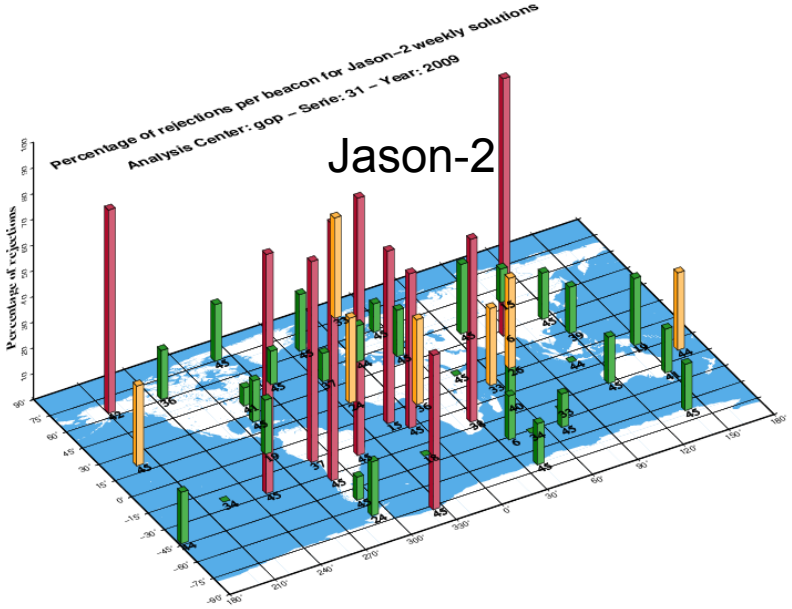




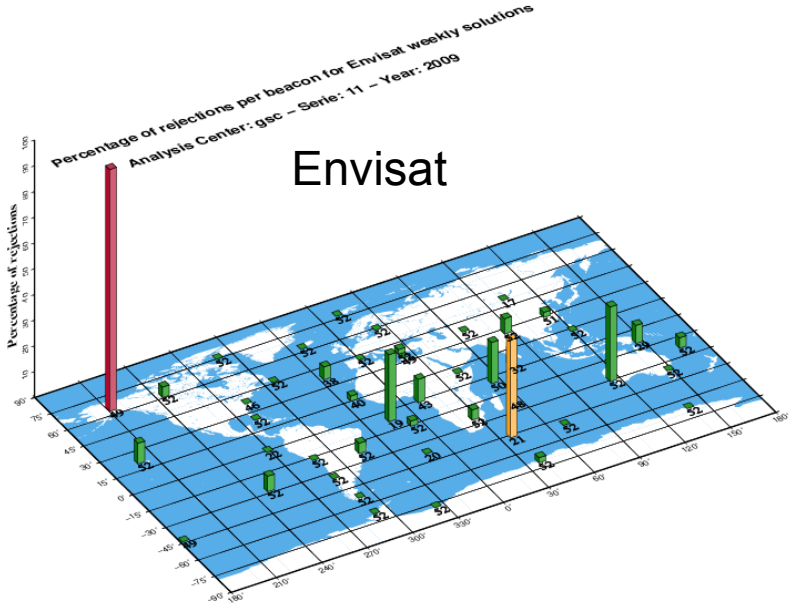

Stations not used for the 7P estimation
Red 60 ≤ % ≤ 100
Orange 30 ≤ % < 60
Green 0 ≤ % < 30

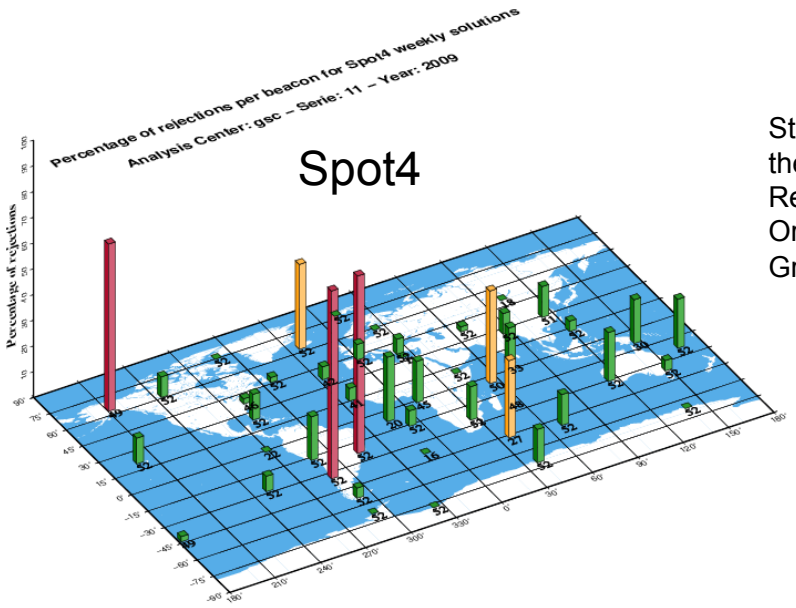


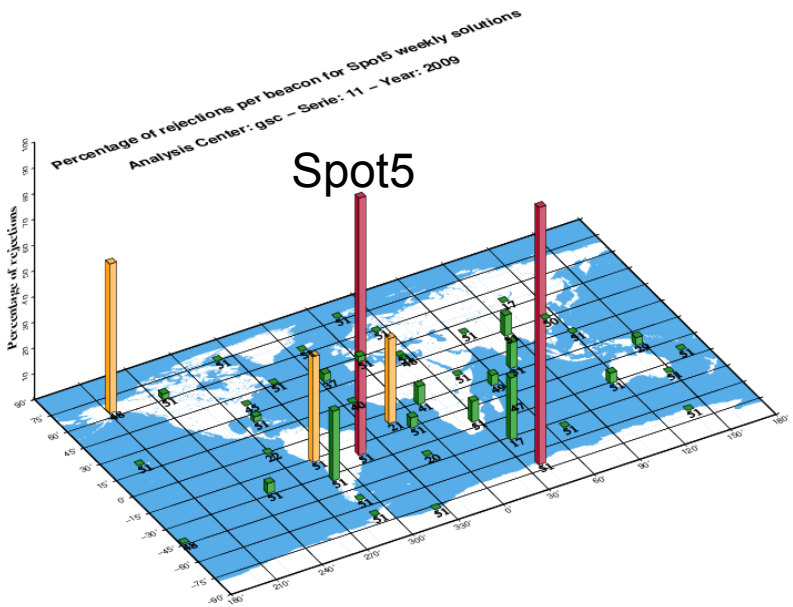



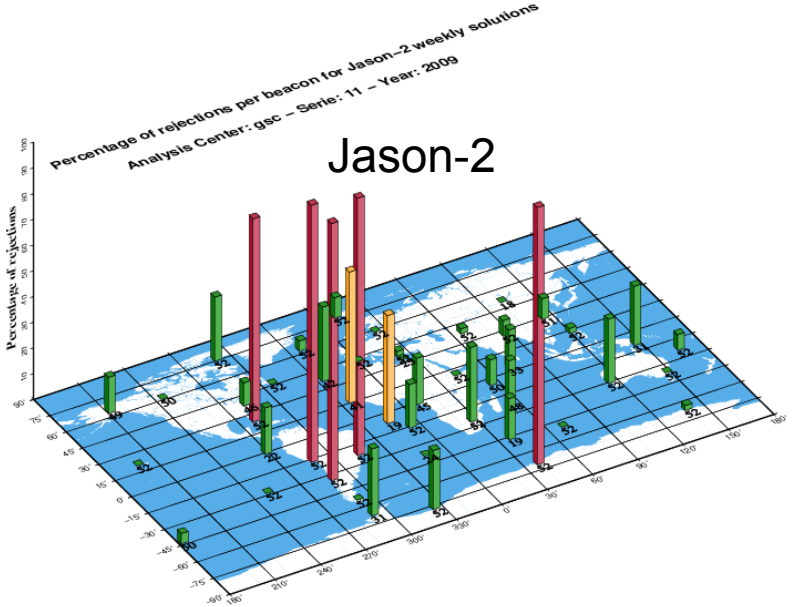
# GSC – Stations with high residuals





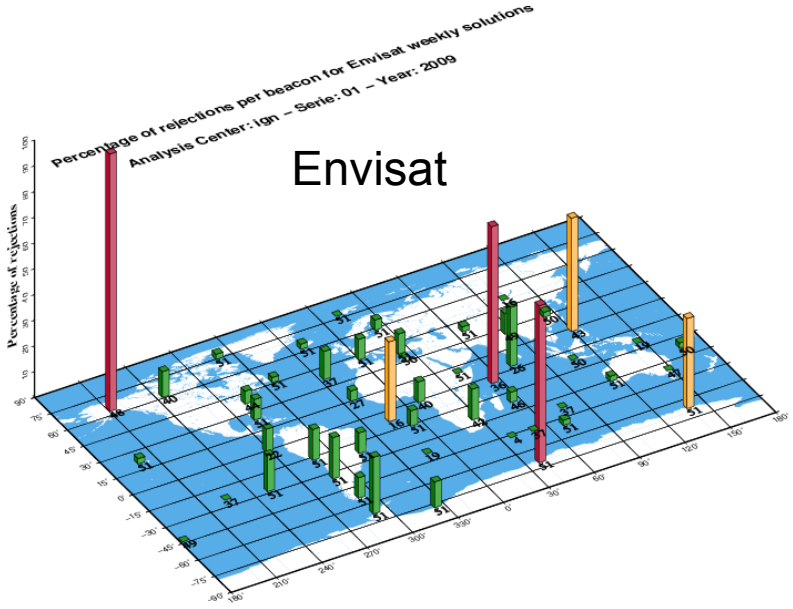



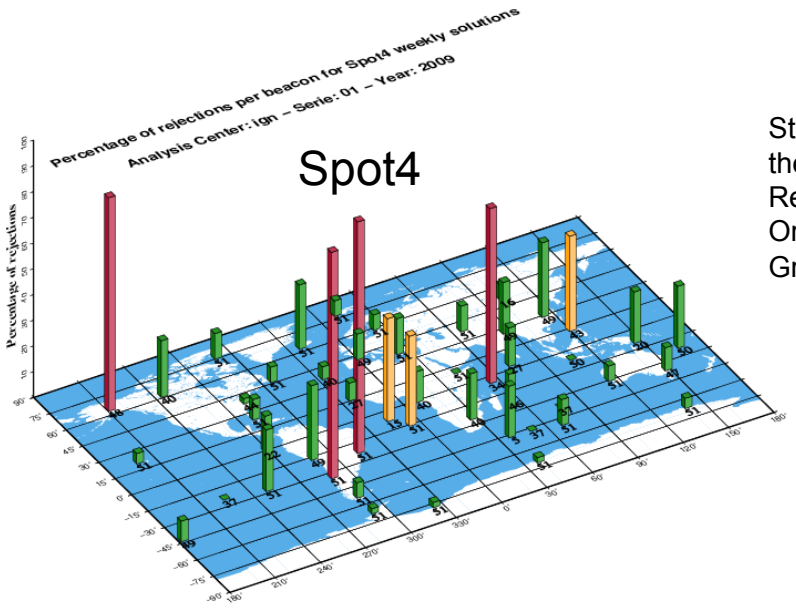




Stations not used for the 7P estimation
Red 60 ≤ % ≤ 100
Orange 30 ≤ % < 60
Green 0 ≤ % < 30

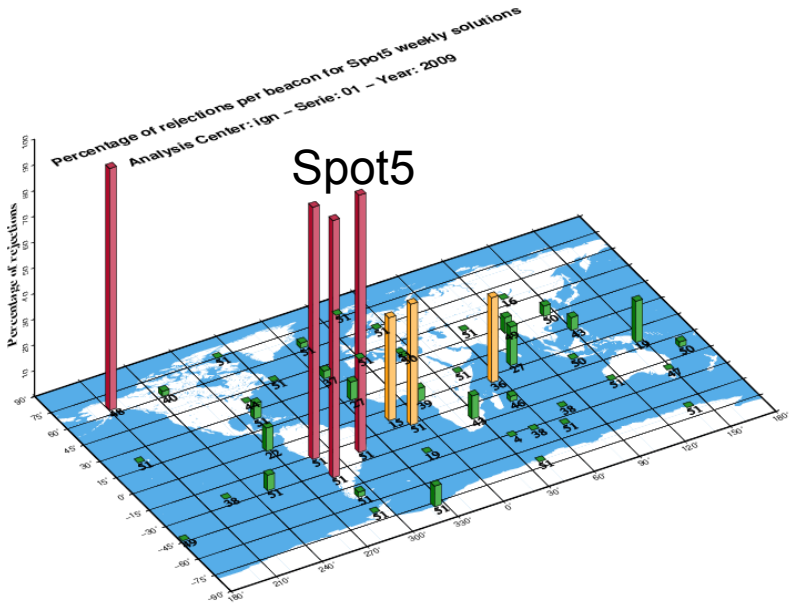
# IGN – Stations with high residuals

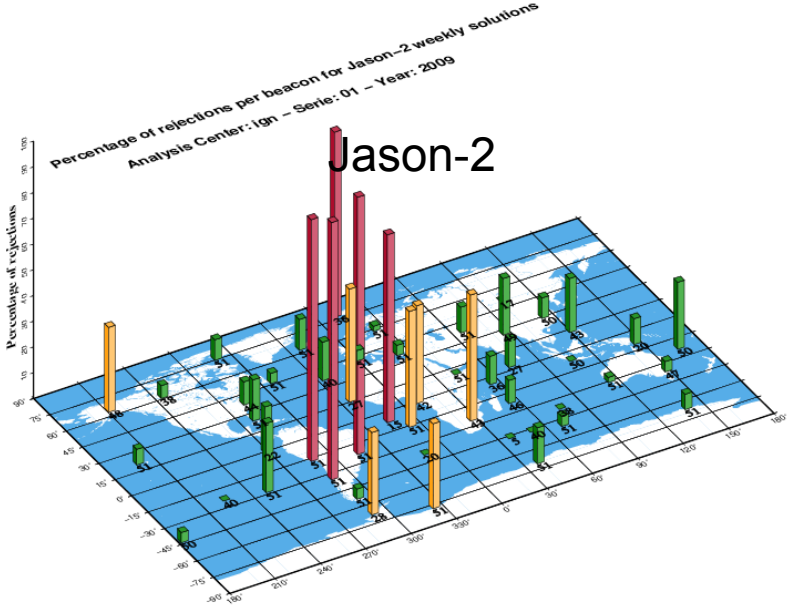




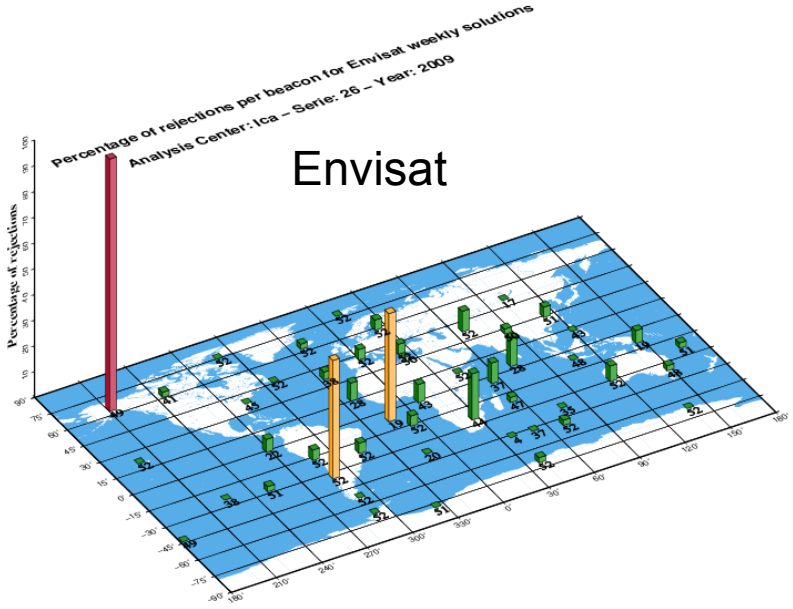

Stations not used for the 7P estimation
Red 60 ≤ % ≤ 100
Orange 30 ≤ % < 60
Green 0 ≤ % < 30

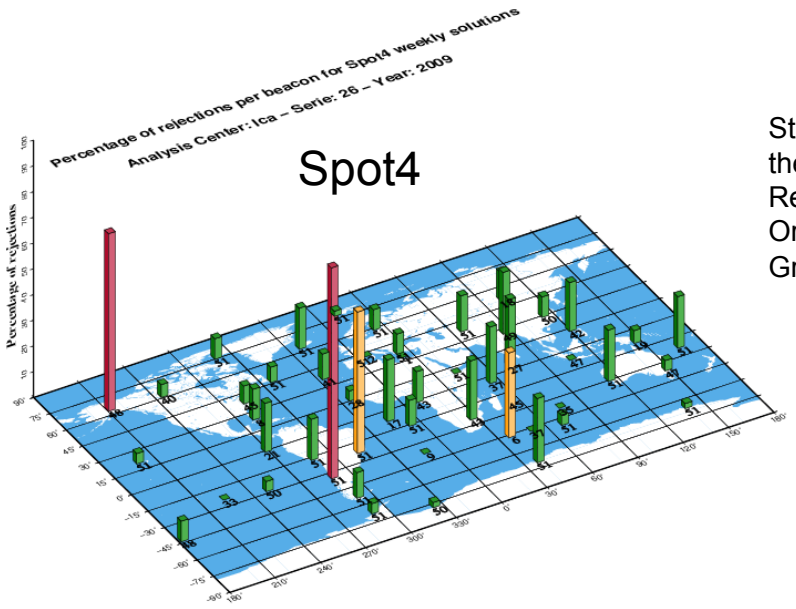


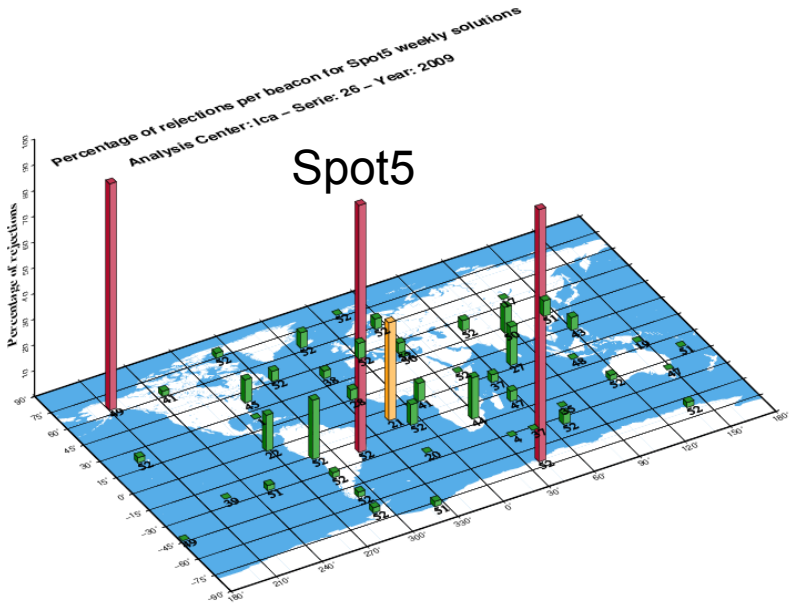



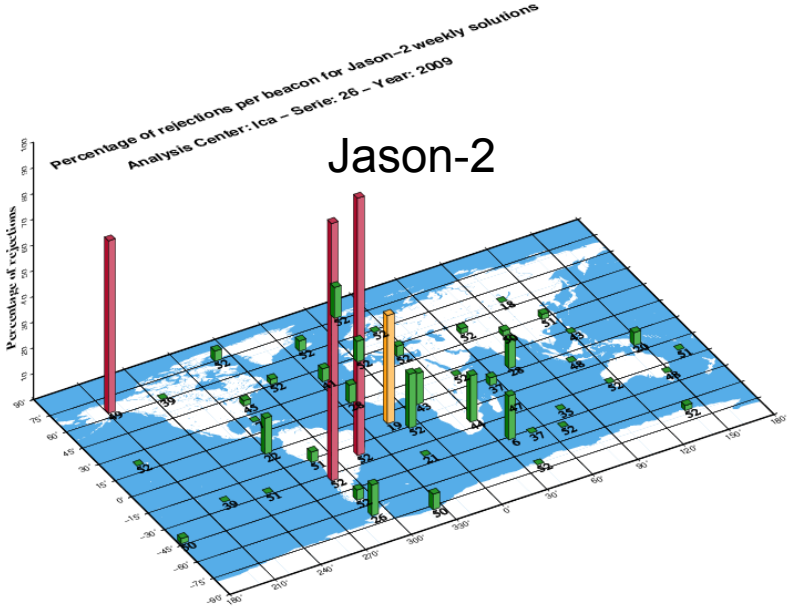
# LCA – Stations with high residuals






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

# General comments (2)



- **Fairbanks**
  - Origin of systematic high residuals must be investigated
- **Arequipa, Cachoiera and Santiago are most of time rejected (excepted for Envisat)**
  - Cut-off angle ?
  - SAA ?
  - 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**

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# Conclusions - What's next ?



## – Conclusions :

- **Spot4 and Envisat are sources of improvements**
- **Origin of stations with high residuals has to be explored**

## – What's next ?

- **Delivery and analysis of Jason-2 2 TUs solutions**
- **EOP analysis**



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