## Status of ITRF2013 Preparartion



Zuheir Altamimi Xavier Collilieux Laurent Métivier Daphné Lercier IGN, France





## **Next ITRF solution (ITRF2013)**

- To be ready by summer 2014
- All techniques to submit solutions by Jan-Feb, 2014, but some (hopefully small) delays are expected from the techniques
- Solutions with no load corrections
- Evaluation of NT-ATML (+) will be repeated with ITRF2013 input data



## **Preparation for ITRF2013**

- Expected Improvements & Developments:
  - Reprocessed solutions from the 4 techniques;
  - Revisiting the weighting of Local Ties and Space Geodesy solutions included in the ITRF combination;
  - Improving the process of detection of discontinuities in the time series;
  - Modeling the non-linear station motions
    - Seasonal signals
    - Co- & Post-seismic deformation

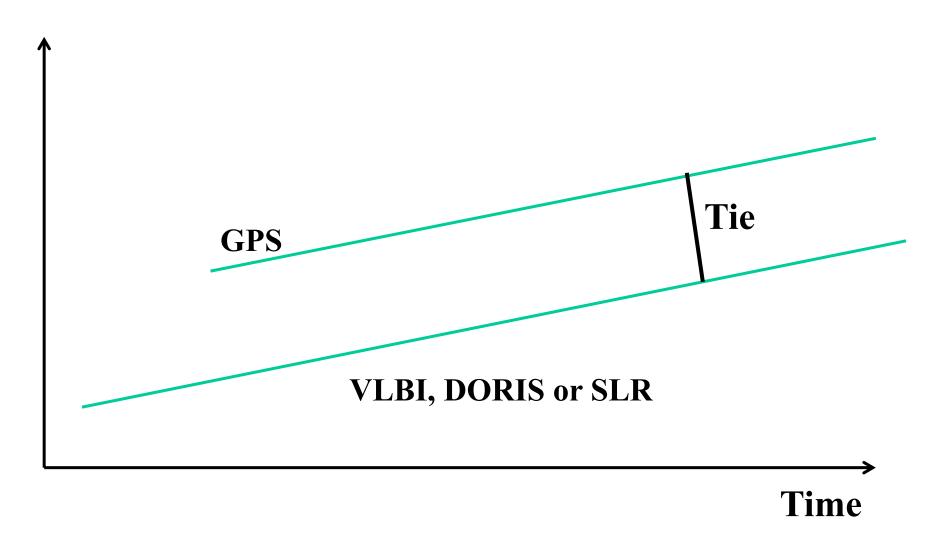


### **New ties since ITRF2008**

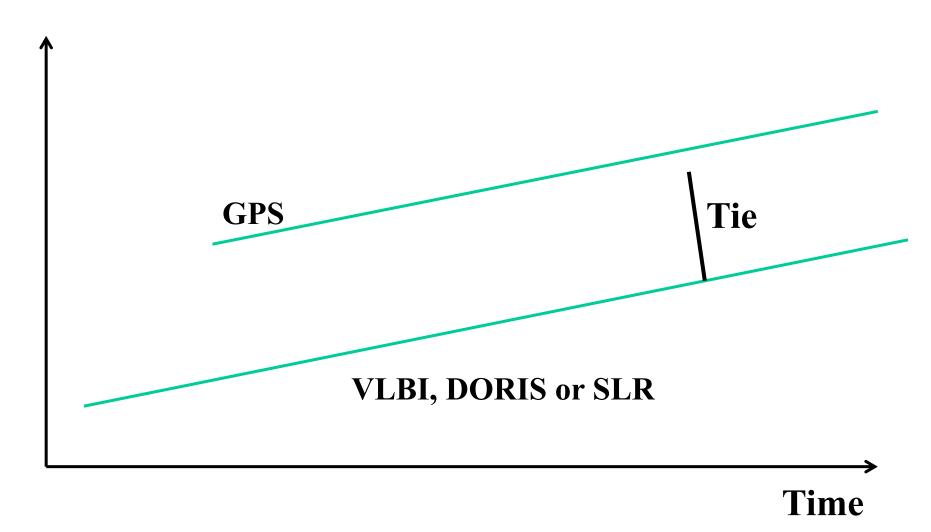
- Brewster : VLBA & GNSS
- Greenbelt (4 techniques)
- McDonald/Fort Davis (VLBI, SLR & GNSS)
- Warkworth (New Zealand): VLBI & GNSS
- 4 Australian Co-location sites (Hobart, Katherine, Mt. Stromlo, Yarragadee)
- Medicina: (VLBI & GNSS)
- Noto: (VLBI & GNSS)
- Riyadh: (SLR & GNSS)
- (GNSS & DORIS): (Rikitea, Papeete, Rothera, Kourou, Dionysos)

Reports Available at the ITRF WEBSITE

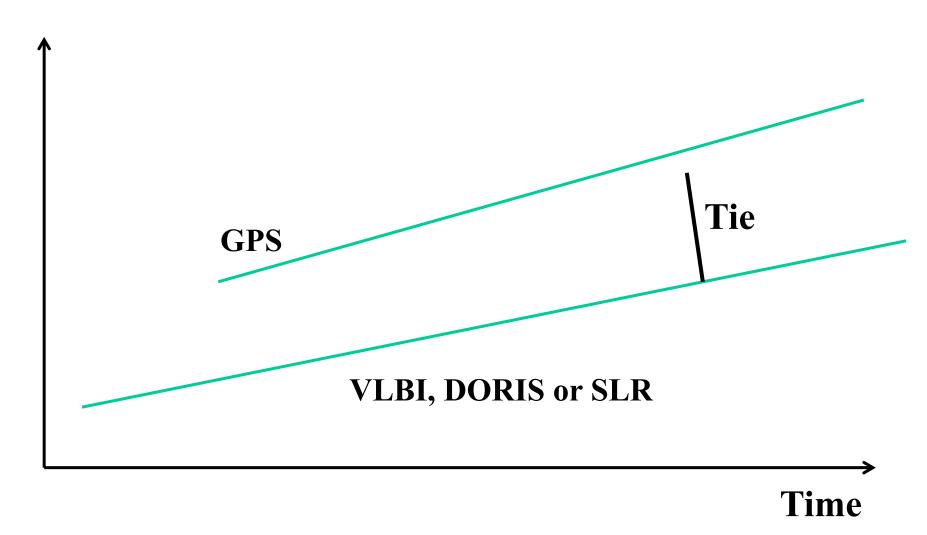




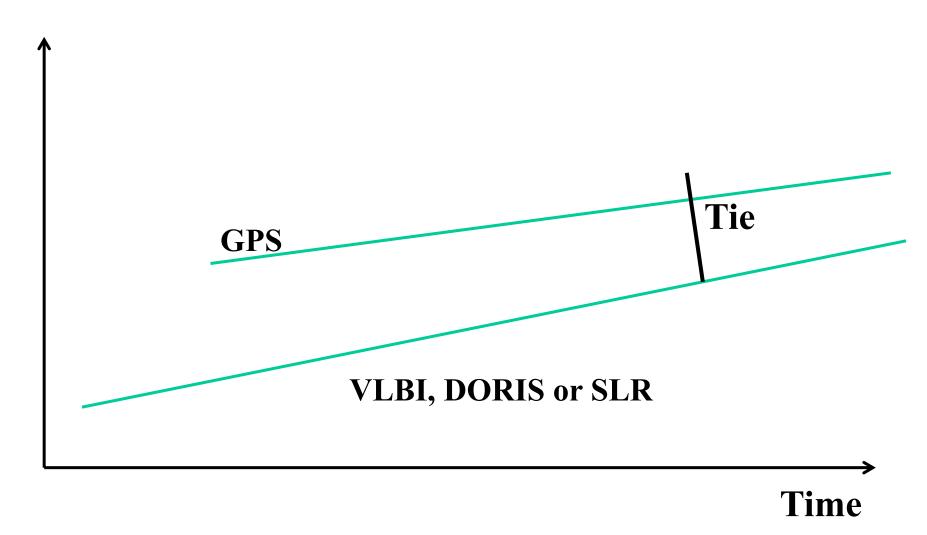




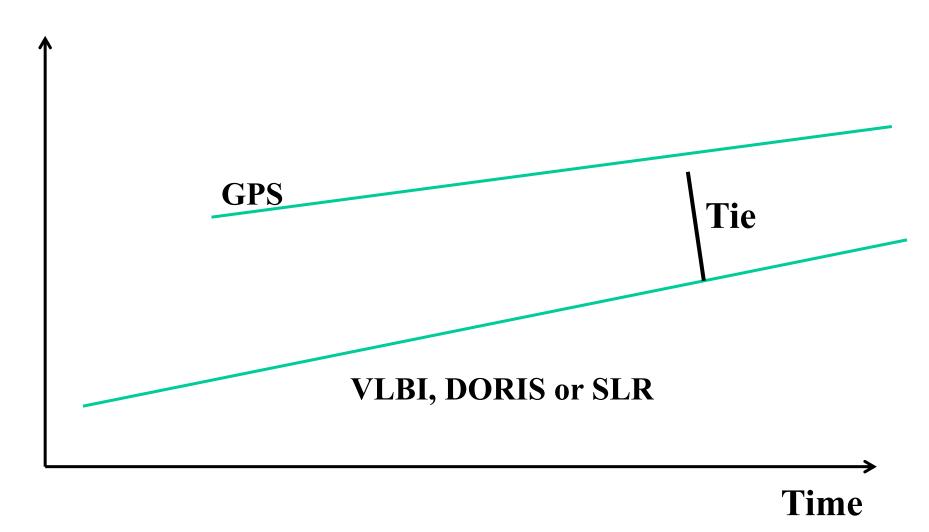




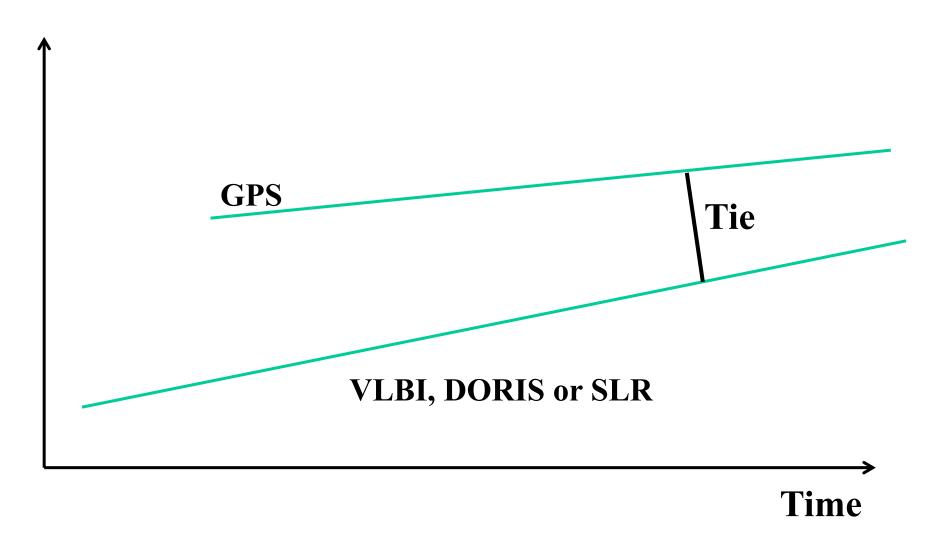














# Data used for this presentation in preparation for ITRF2013

Space Geodesy:

**SLR**: ILRS contribution to ITRF2008, extended up to 2013.96 by ILRS operational weekly SNX solutions

**VLBI**: GSFC 2011b session-wise solutions: 1983-2013.9

**GNSS**: IGS operational weekly solutions: 1994-2013.9

**DORIS:** Not used here

- Local ties:
  - ITRF2008 local ties
  - New ties...



#### BL Tie Discrepancies GPS-VLBI Tie Residuals GNSS & VLB 15 North 10 5 mm 0 -5 MADR WTZR SHAO HRAO BREW ONSA MATE KOKB WES2 MKEA SYOG MD01 HOB2 METS CR01 TSKB VYA1 MEDI VOT1 FAIR NLIB TIDB OH12 PIE1 -10 -15 15 East 10 mm 5 0 -5 MADR WTZR HRAO BREW MKEA ONSA MATE SHAO KOKB WES2 HOB2 SYOG METS TSKB CR01 NOT1 FAIR MD01 NYA1 MEDI TIDB NLIB OHI2 PIE1 -10 -15 15 Up 10 5 mm 0 -5 BREW MADR WTZR SHAO HRAO WES2 SYOG ONSA METS MATE KOKB MD01 MKEA **HOB2 TSKB** CR01 NYA1 MEDI NOT1 FAIR NLIB TIDB OHI2 PIE1 -10 -15

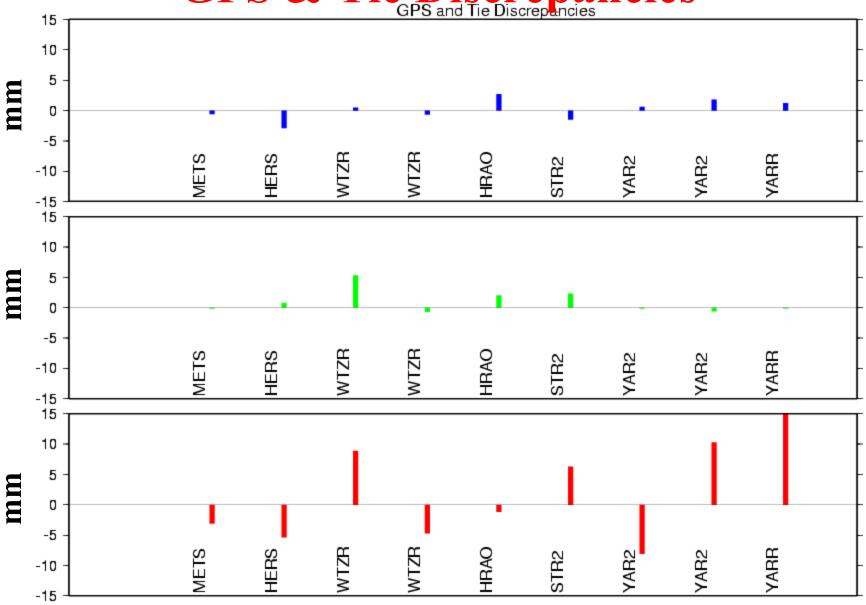
#### GNSS & SLR Tie Discrepancies 15 North 10 5 mm 0 -5 WTZR GODE MONP GRAS MATE HERS POTS SHAO HRAO AREQ SFER YAR2 METS ZIMM MD01 GRAZ BOR1 MAUI BJFS MAUI STR1 Ħ -10 -15 15 East 10 mm 5 0 -5 WTZR HRAO GODE MONP GRAS METS MATE HERS SHAO AREQ GRAZ SFER POTS MD01 YAR2 BOR1 ZIMM MAU MAU BJFS STR1 H -10 -15 15 Up 10 mm 5 0 -5 MONP GRAS WTZR SHAO HRAO GODE AREQ METS GRAZ MATE HERS SFER POTS MD01 YAR2 BOR1 ZIMM BJFS MAU MAU STR<sub>1</sub> H -10

-15

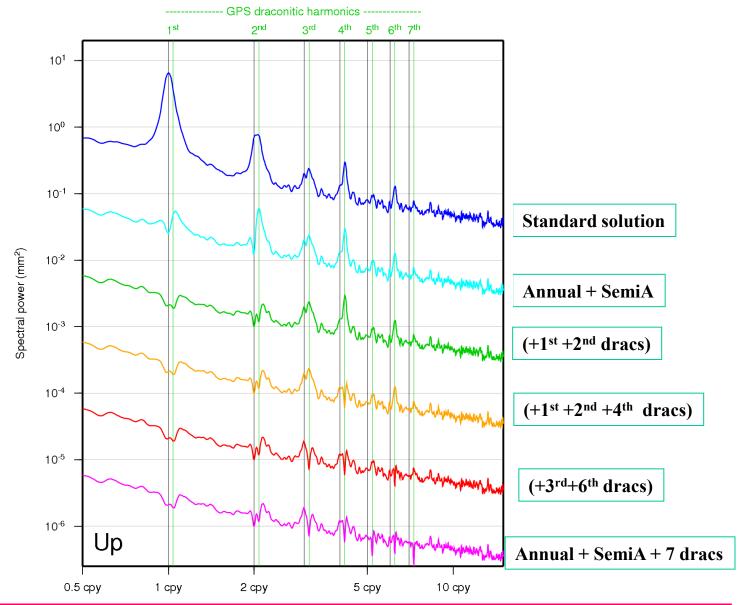
#### GNSS & SLR Tie Discrepancies 15 North 10 5 mm 0 -5 WTZR GODE MONP GRAS MATE HERS POTS SHAO HRAO SFER YAR2 AREQ METS ZIMM MD01 STR2 GRAZ BOR1 MAUI BJFS MAUI Ħ -10 -15 15 East 10 mm 5 0 -5 WTZR HRAO GODE MONP GRAS METS MATE HERS SHAO AREQ GRAZ SFER POTS MD01 YAR2 STR2 BOR1 ZIMM MAU BJFS MAU Ξ -10 -15 15 Up 10 5 mm 0 -5 MONP GRAS WTZR SHAO HRAO GODE AREQ METS GRAZ MATE HERS SFER POTS MD01 YAR2 STR2 ZIMM BOR1 BJFS MAU MAU H -10

-15

## GPS & Tie Discrepancies GPS and Tie Discrepancies

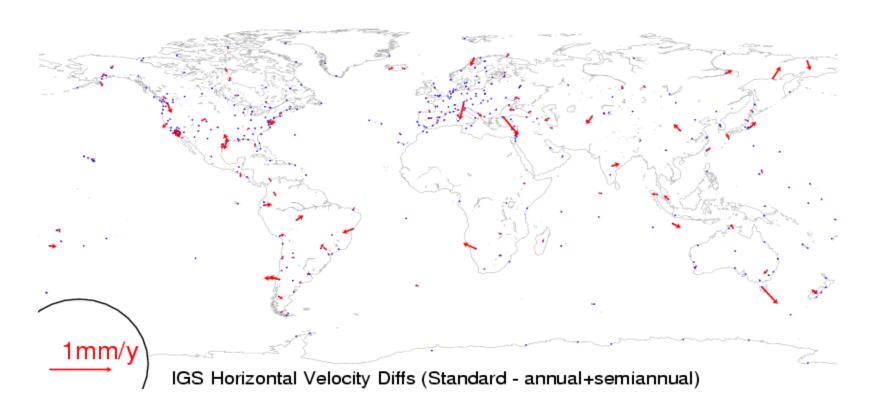


## IGS station position Up residuals: stacked periodogram



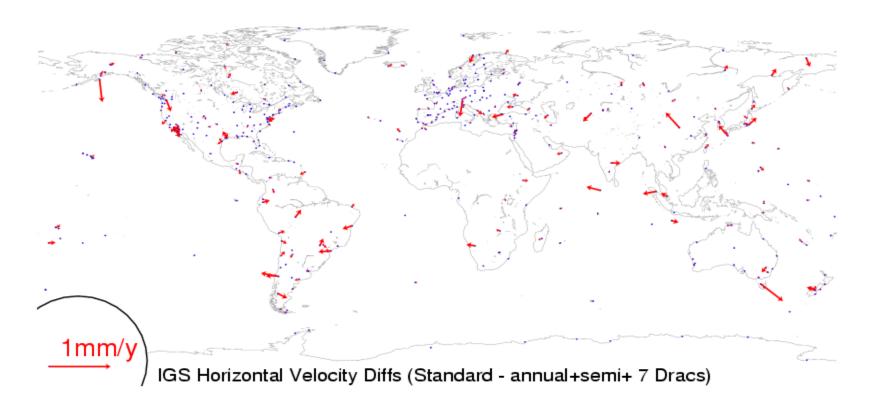


## IGS Horizontal velocity differences (Standard – Annual+Semi-Annual)



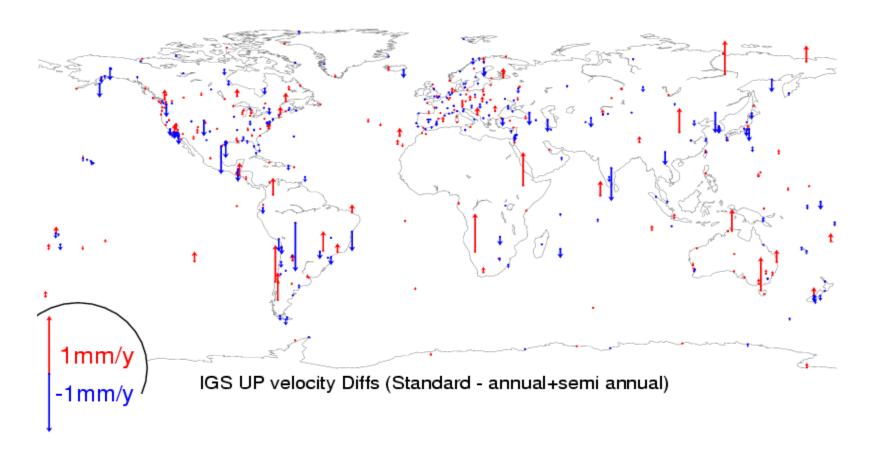


## IGS Horizontal velocity differences (Standard – Annual+Semi-A+7 dracs)



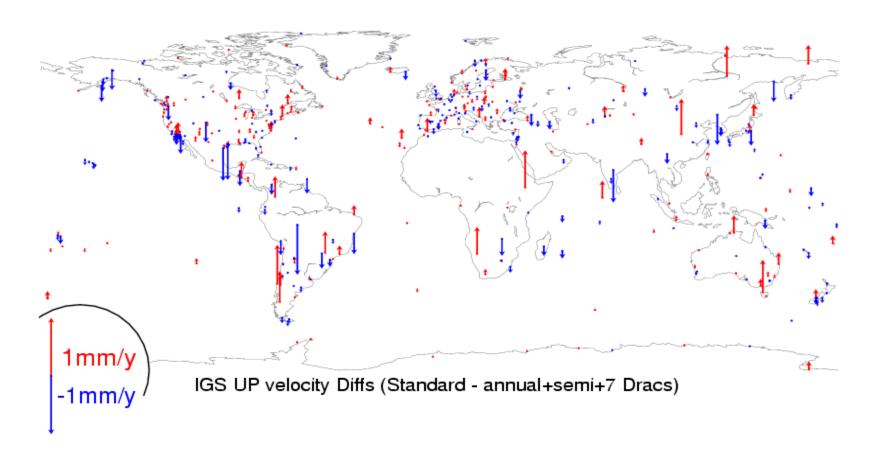


## IGS Vertical velocity differences (Standard – Annual+Semi-Annual)





## IGS Vertical velocity differences (Standard – Annual+Semi-A+ 7 dracs)





### Parametric post seismic models

Parametric models for postseismic displacements :

$$\forall i \in \{E, N, U\}, X_i(t) =$$

$$\begin{cases} X_1(t_0) + V_1 \times (t - t_0) &, t < t_{eq} \\ X_2(t_{eq}) + V_2 \times (t - t_{eq}) + D(t - t_{eq}), t > t_{eq} \end{cases}$$

Parametric postseismic models use logarithmic or exponential functions :

$$D(t - t_{eqk})$$
 with

$$D(t - t_{eqk}) = A \log(1 + \frac{t - t_{eqk}}{\tau})$$
 (1)

or

$$D(t - t_{eqk}) = A \left(1 - e^{-\frac{t - t_{eqk}}{\tau}}\right) \tag{2}$$

[e.g.: Kreemer et al., 2006]

or

$$D(t - t_{eqk}) = A_1 \log(1 + \frac{t - t_{eqk}}{\tau_1}) + A_2 \left(1 - e^{-\frac{t - t_{eqk}}{\tau_2}}\right)$$
(3)

or

$$D(t - t_{eqk}) = A_1 \left( 1 - e^{-\frac{t - t_{eqk}}{\tau_1}} \right) + A_2 \left( 1 - e^{-\frac{t - t_{eqk}}{\tau_2}} \right) \tag{4}$$



### **Linear Function**

## Arequipa

#### **Parametric Model**

2010

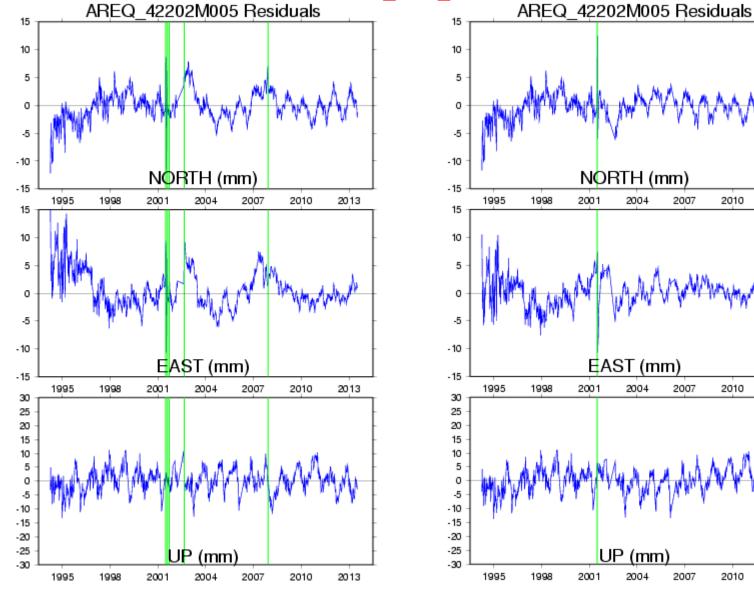
2010

2010

2013

2013

2013





## ITRF2013: Schedule

| • | Feb 10, 2014   | Deadline for solution submissions by Technique.   |
|---|--|---|
| • | End of April   | First results and discussions at the EGU2014  |
| • | End of May   | Inter comparisons of the ITRF CCs solutions   |
| • | June   | Preliminary ITRF2013 solutions available for evaluation by the Technique/Analysis Centers |
|   | (One ITRF2013P solution provided by the ITRS Center) |   |

• July-Aug, 2014 Final ITRF2013 solution released by the ITRS Center.



## Status of submissions

No official solution was submitted so far

• IDS: ???

- IGS:
  - Some ACs are ready: ESA, GFZ, CODE
  - Others need about one month ==> Mid April

\_

- ILRS: Promised to deliver a first solution by end of March
- IVS: by end of March

