

# Status of ITRF2014 Analysis

## Work is still in progress

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IGN, France

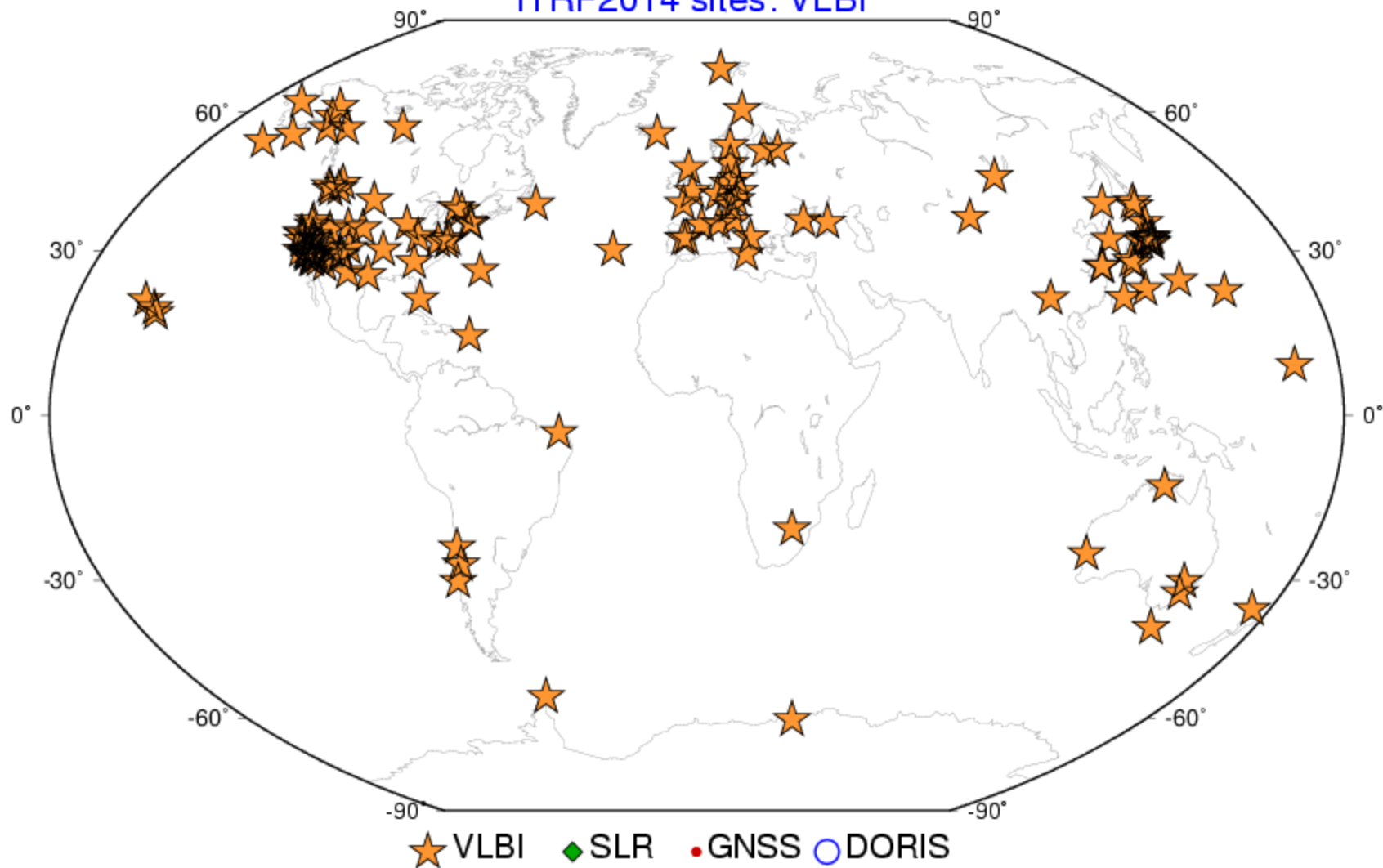


**IGN**  
INSTITUT NATIONAL  
DE L'INFORMATION  
GÉOGRAPHIQUE  
ET FORESTIÈRE

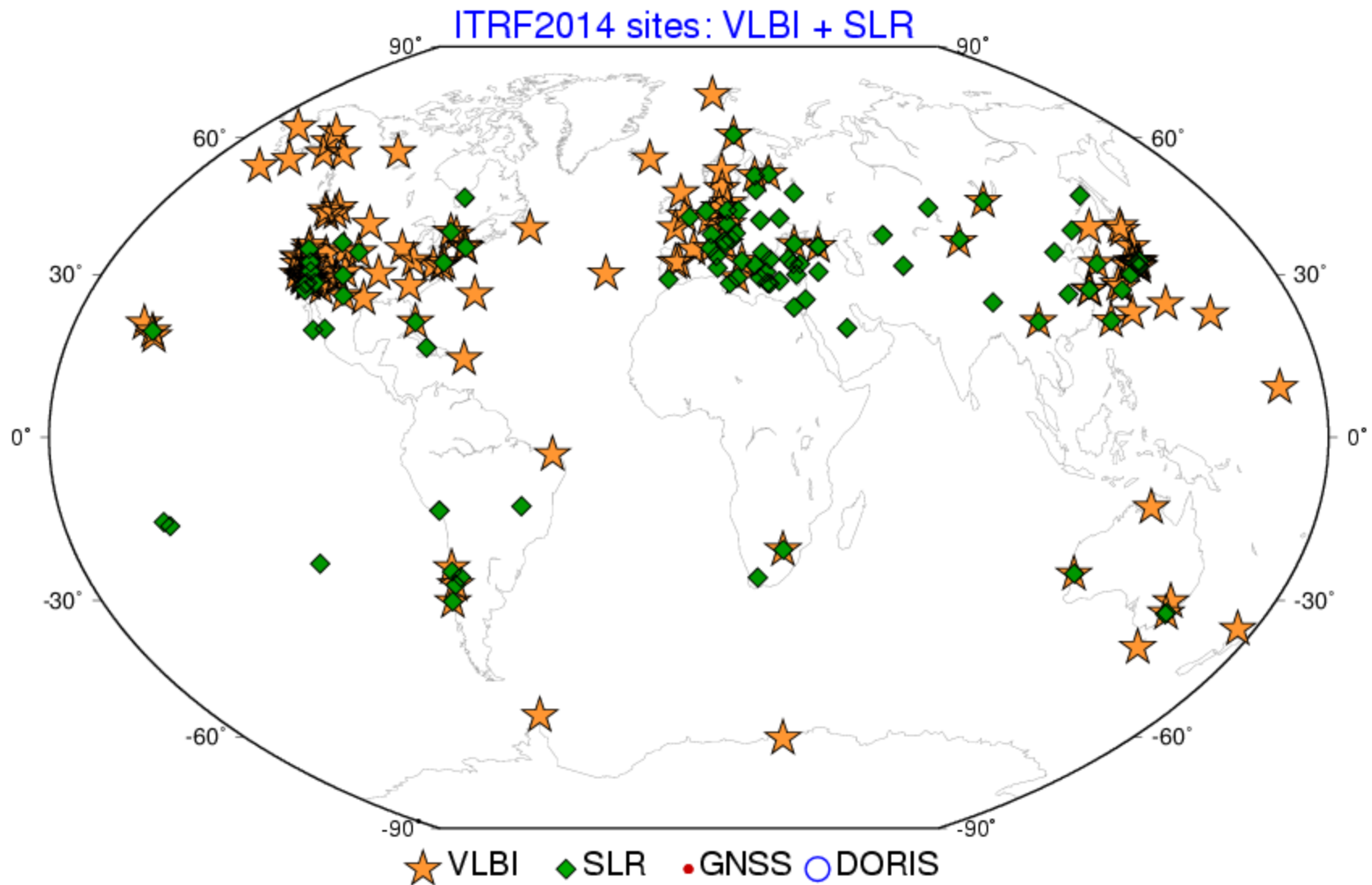
# ITRF2014 Network

# ITRF2014 Network : VLBI

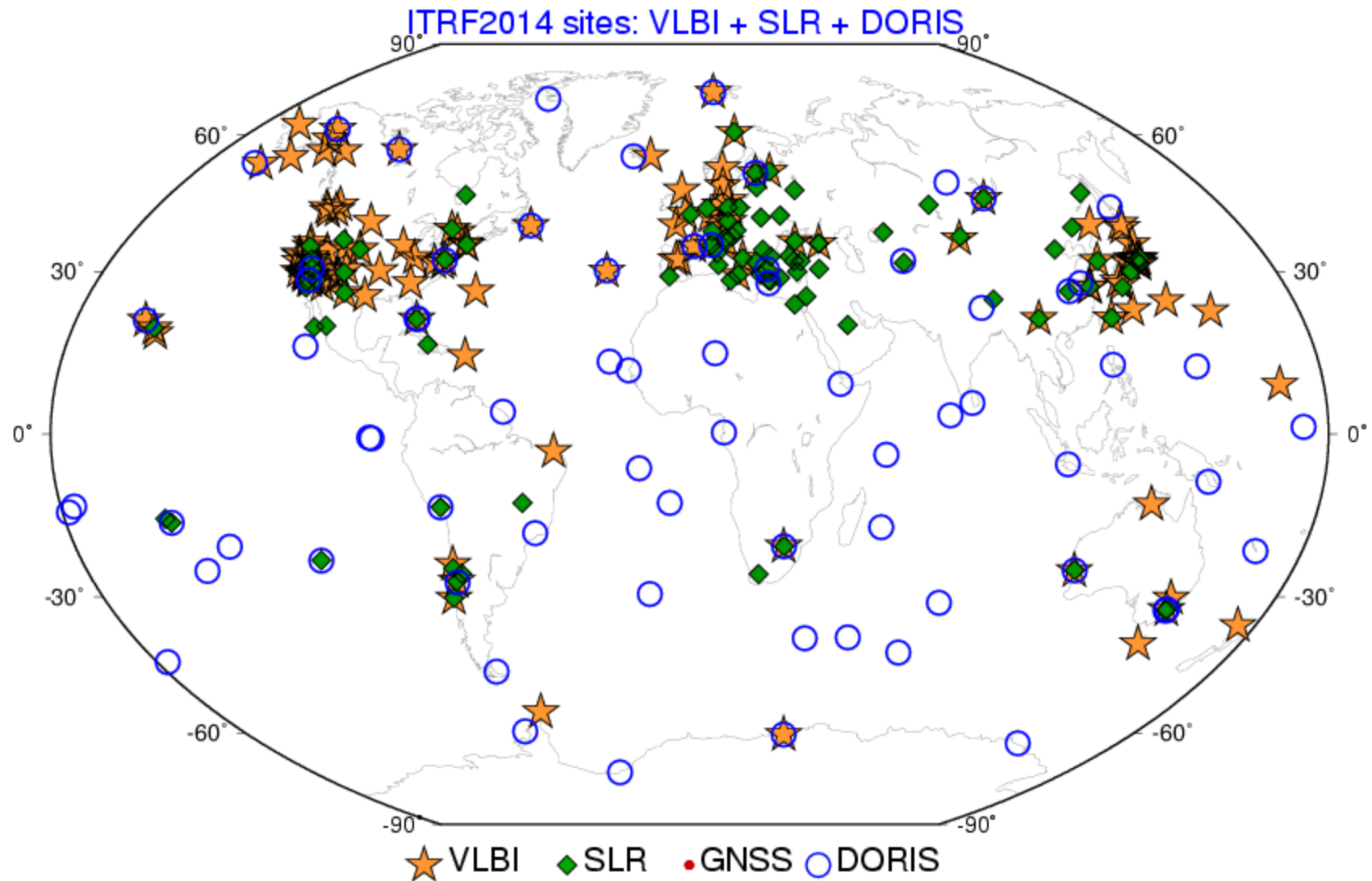
ITRF2014 sites: VLBI



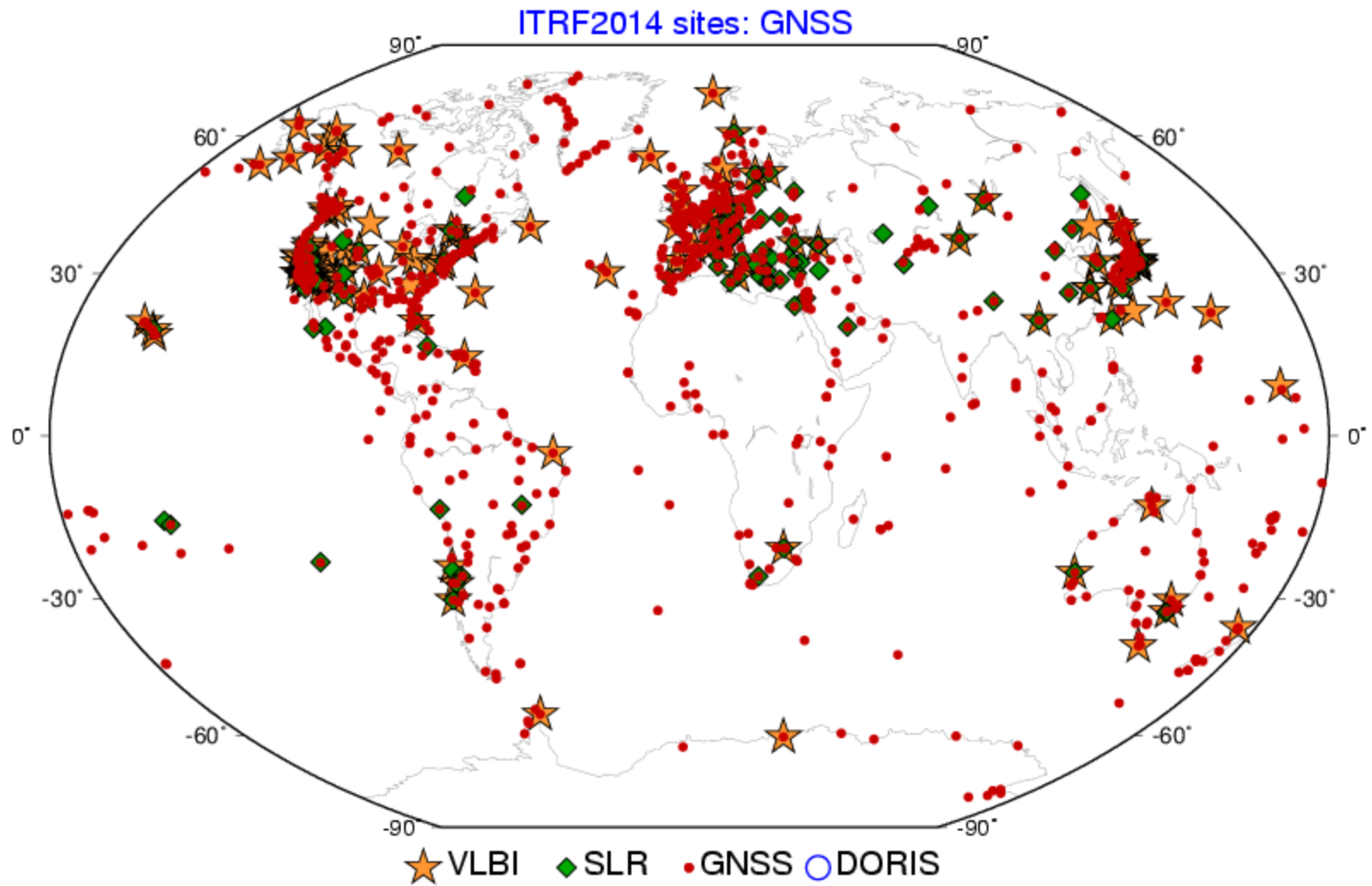
# ITRF2014 Network: VLBI + SLR



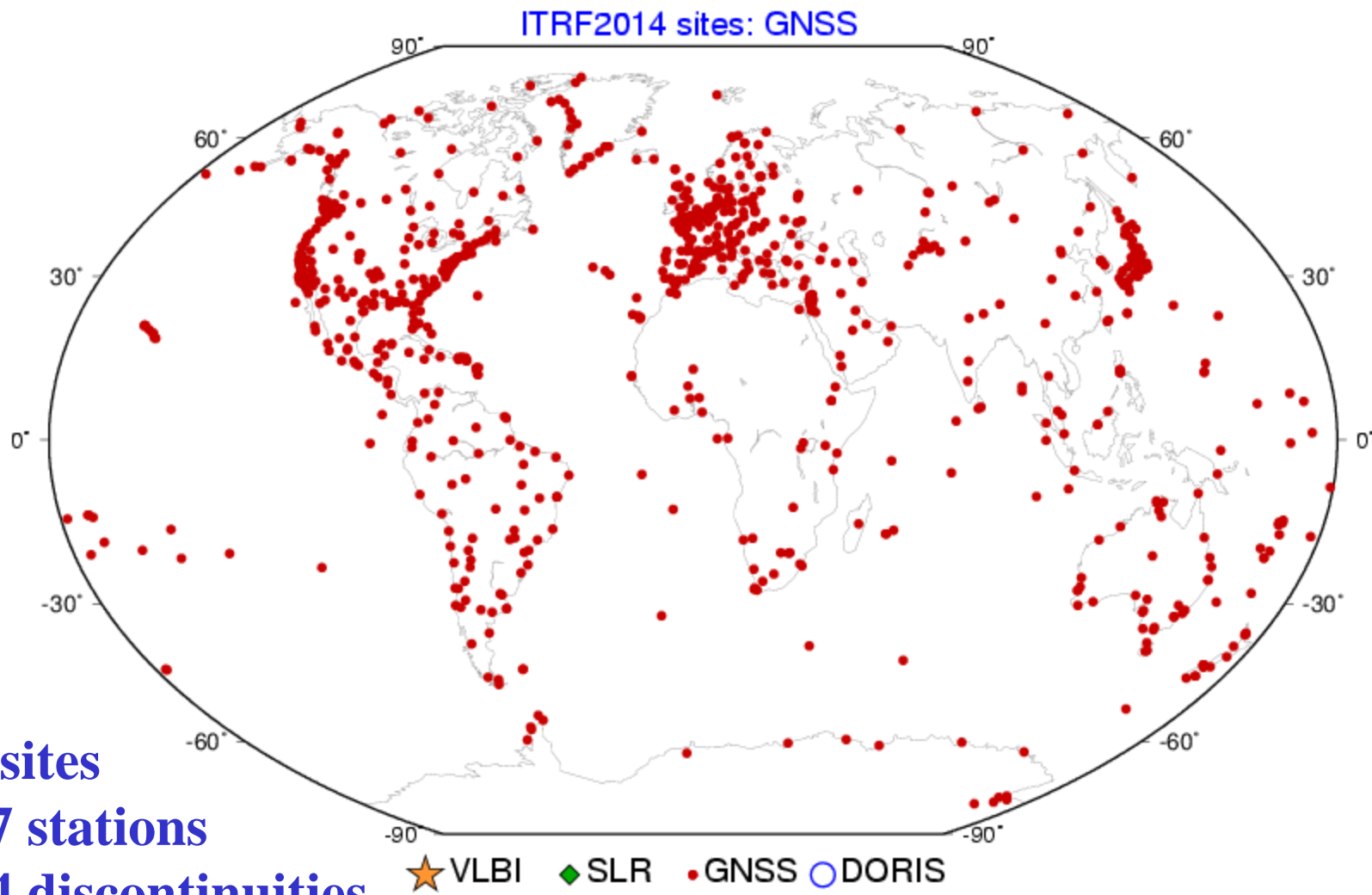
# ITRF2014 Network: VLBI + SLR + DORIS



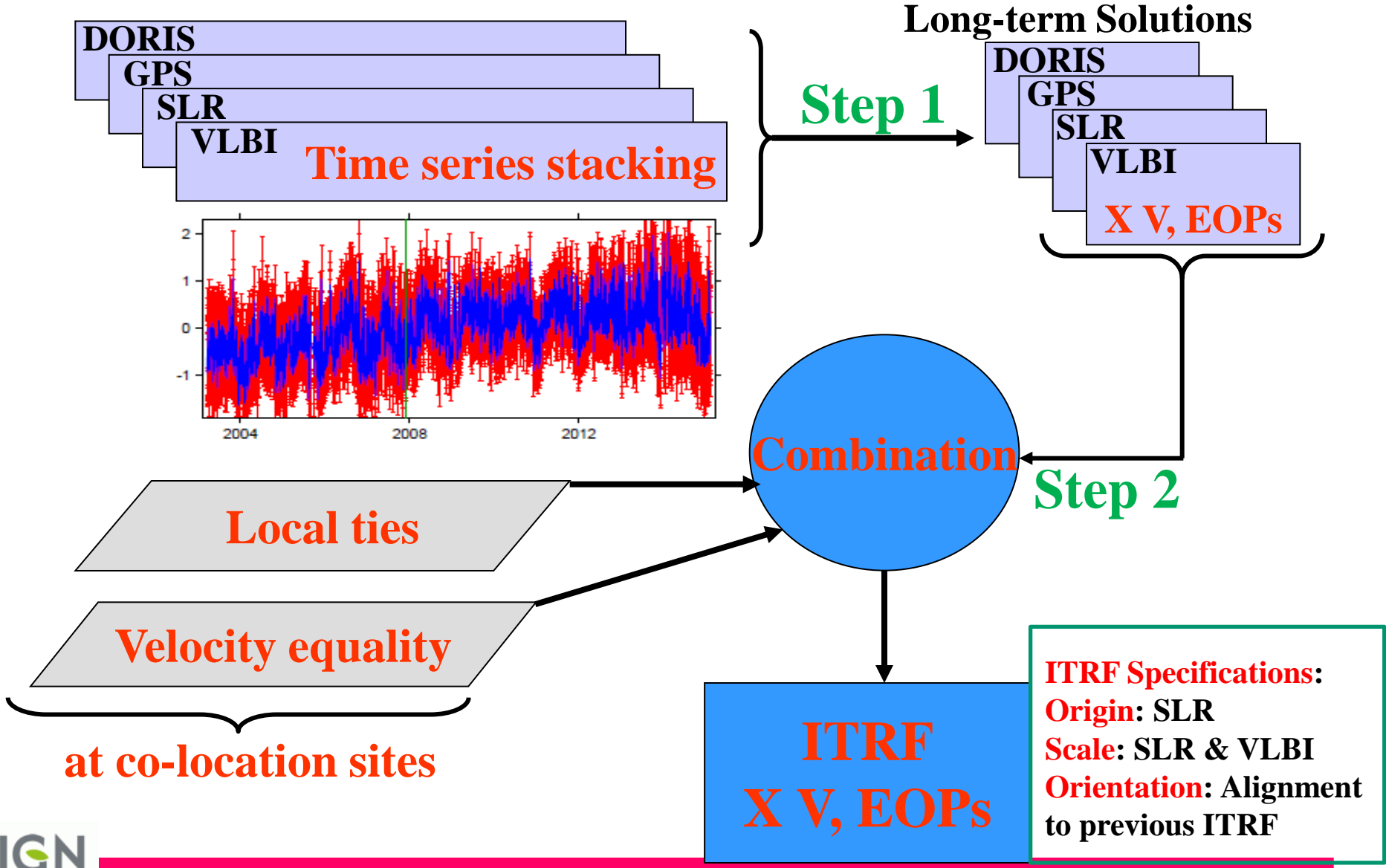
# ITRF2014 Network



# ITRF2014 Network: GNSS



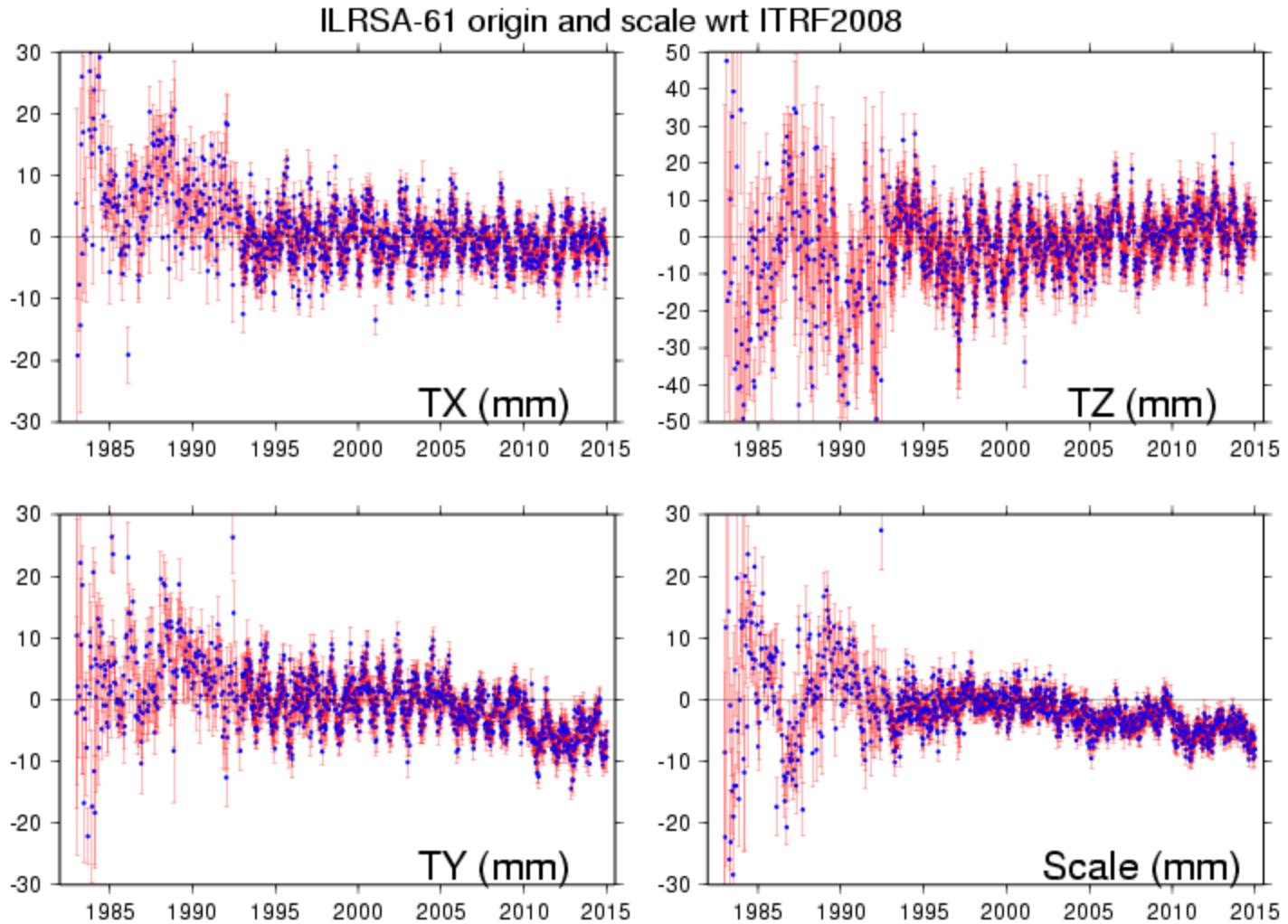
# ITRF Construction





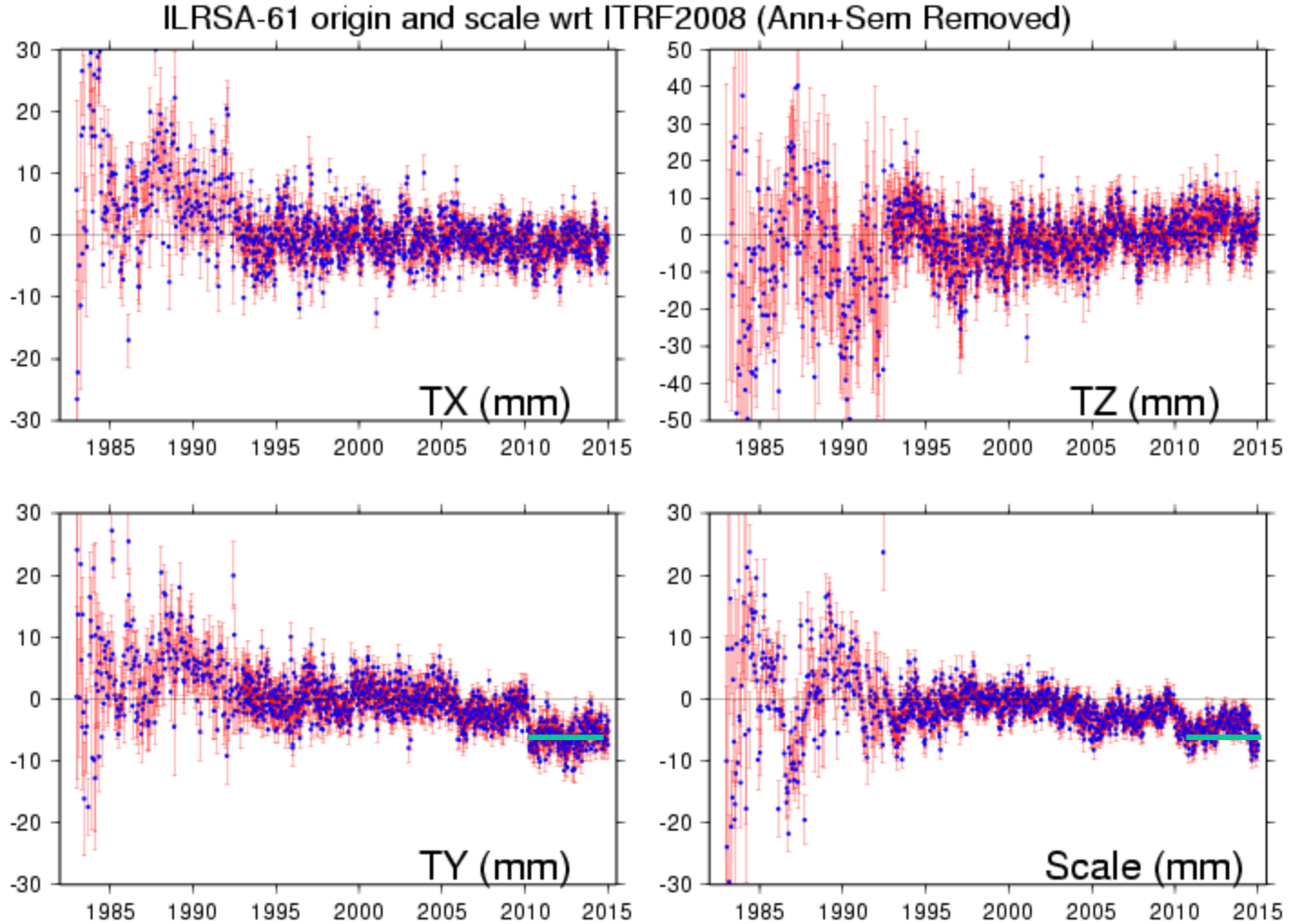
# Origin & Scale stability with time ?

# SLR/ILRS Origin & Scale WRT ITRF2008

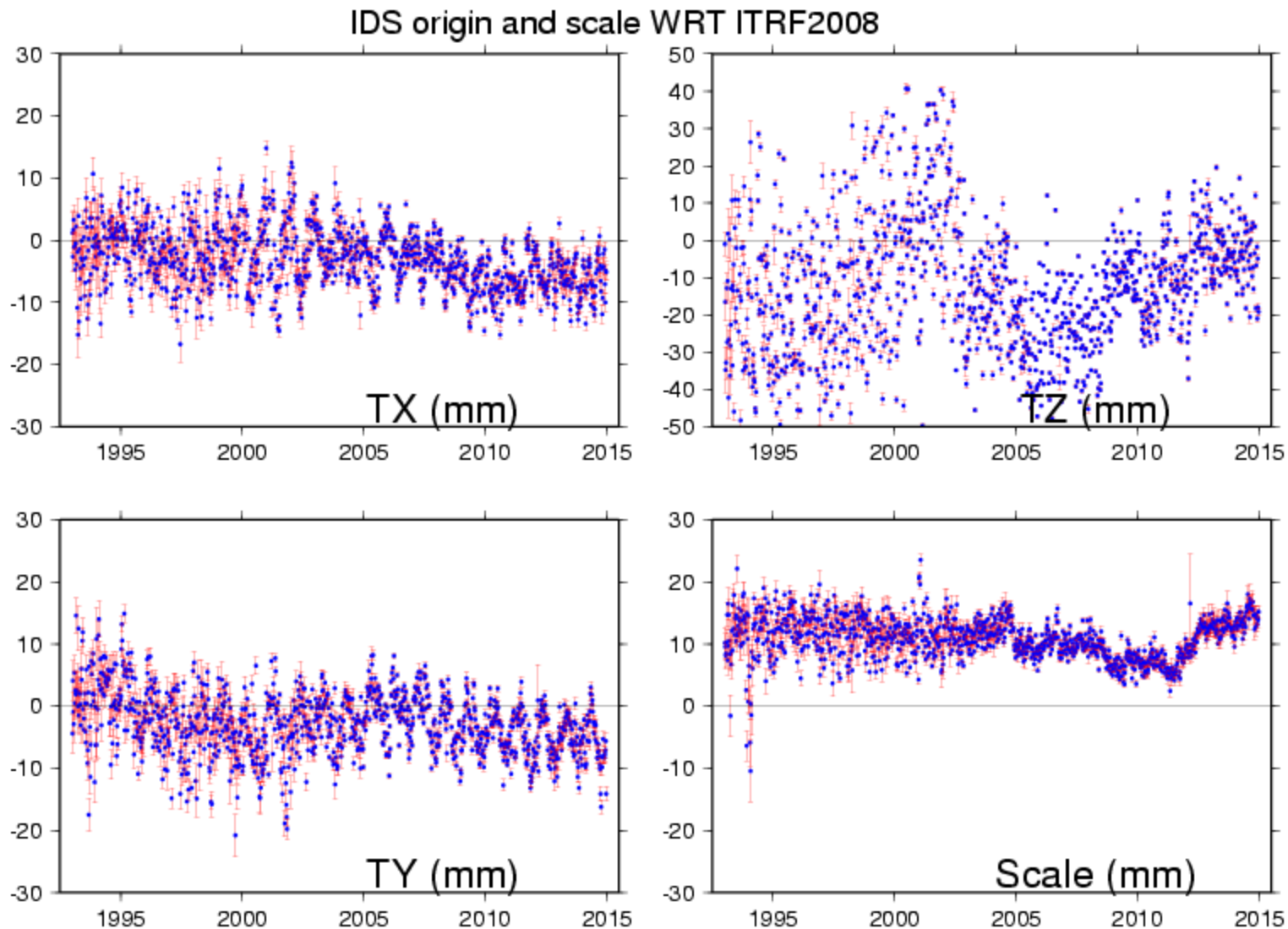


# SLR/ILRS Origin & Scale WRT ITRF2008

## Remove Annual + Semi-annual + Post-seismic deformation



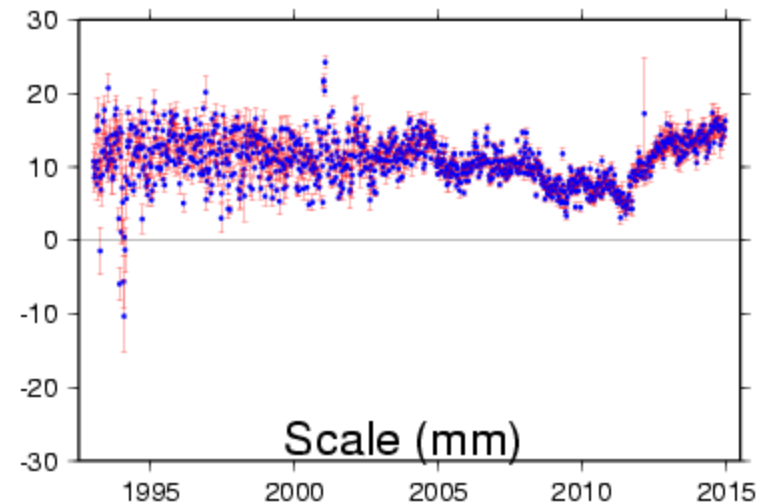
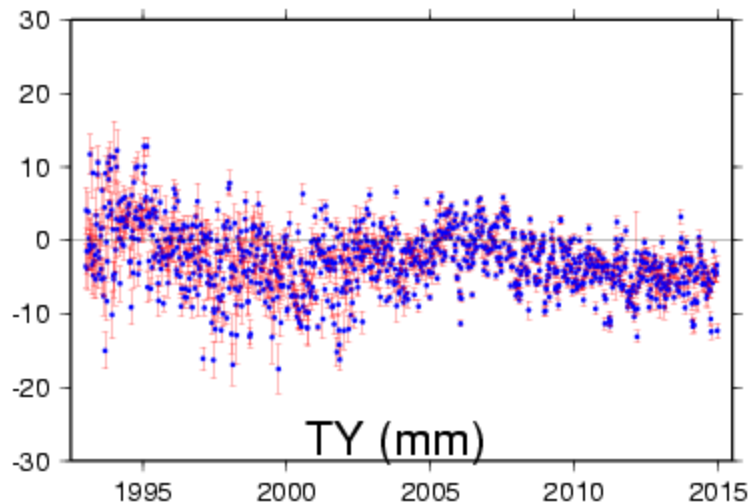
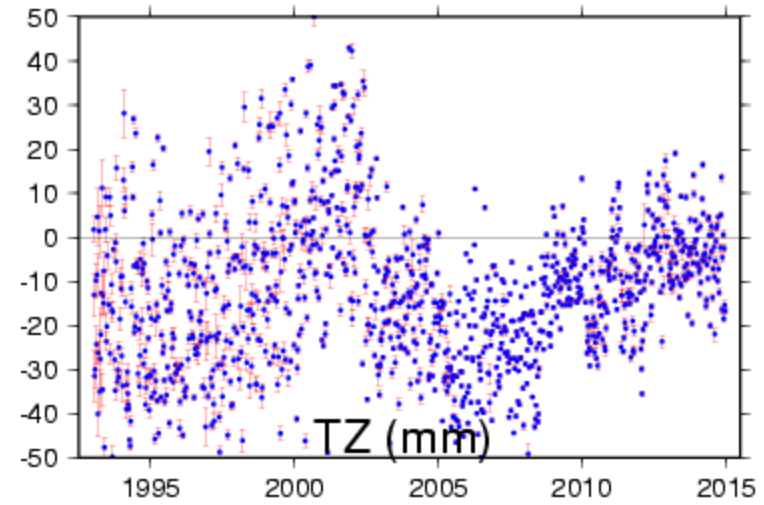
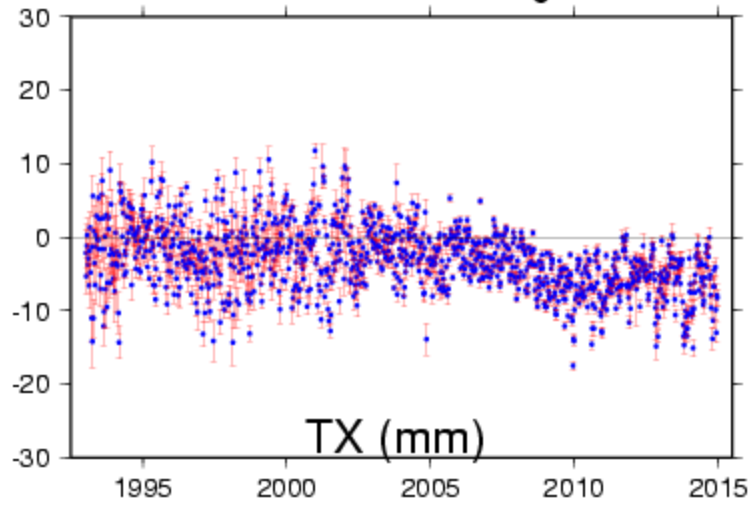
# DORIS/IDS Origin & Scale WRT ITRF2008



# DORIS/IDS Origin & Scale WRT ITRF2008

Annual + Semi-annual signals removed

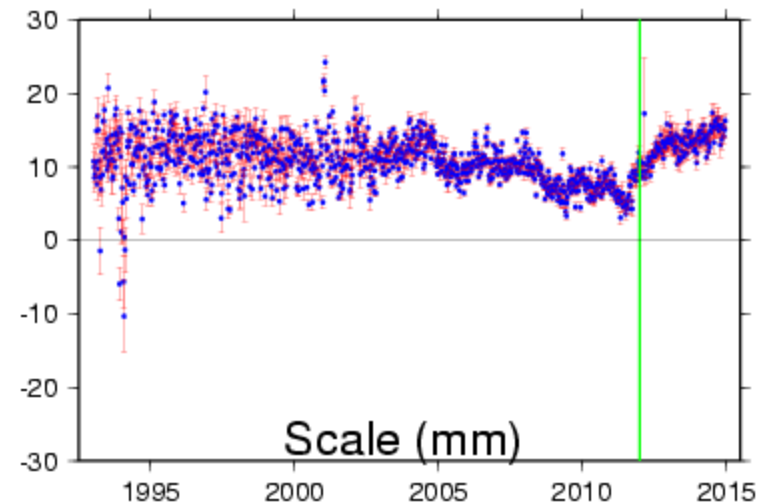
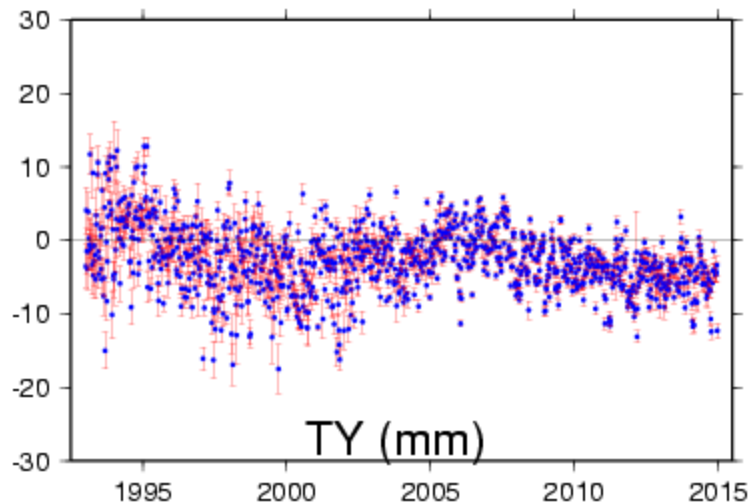
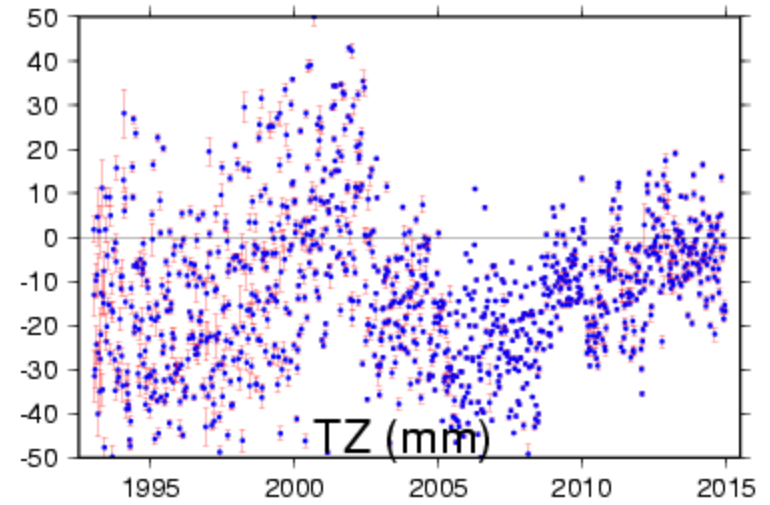
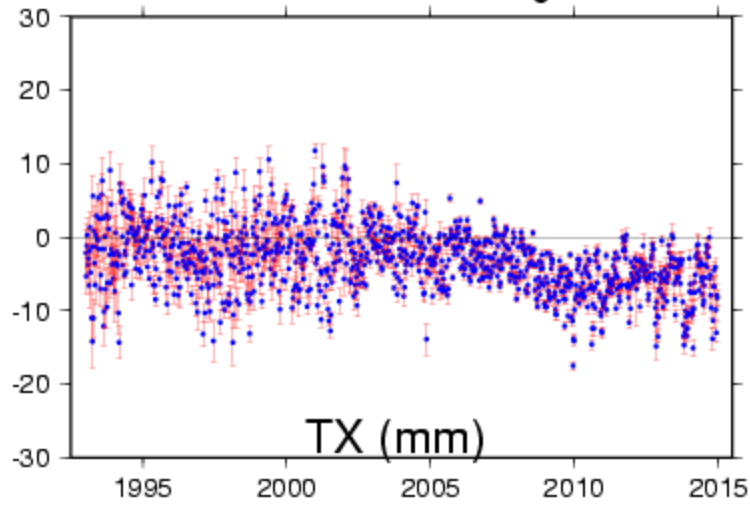
IDS origin and scale WRT ITRF2008



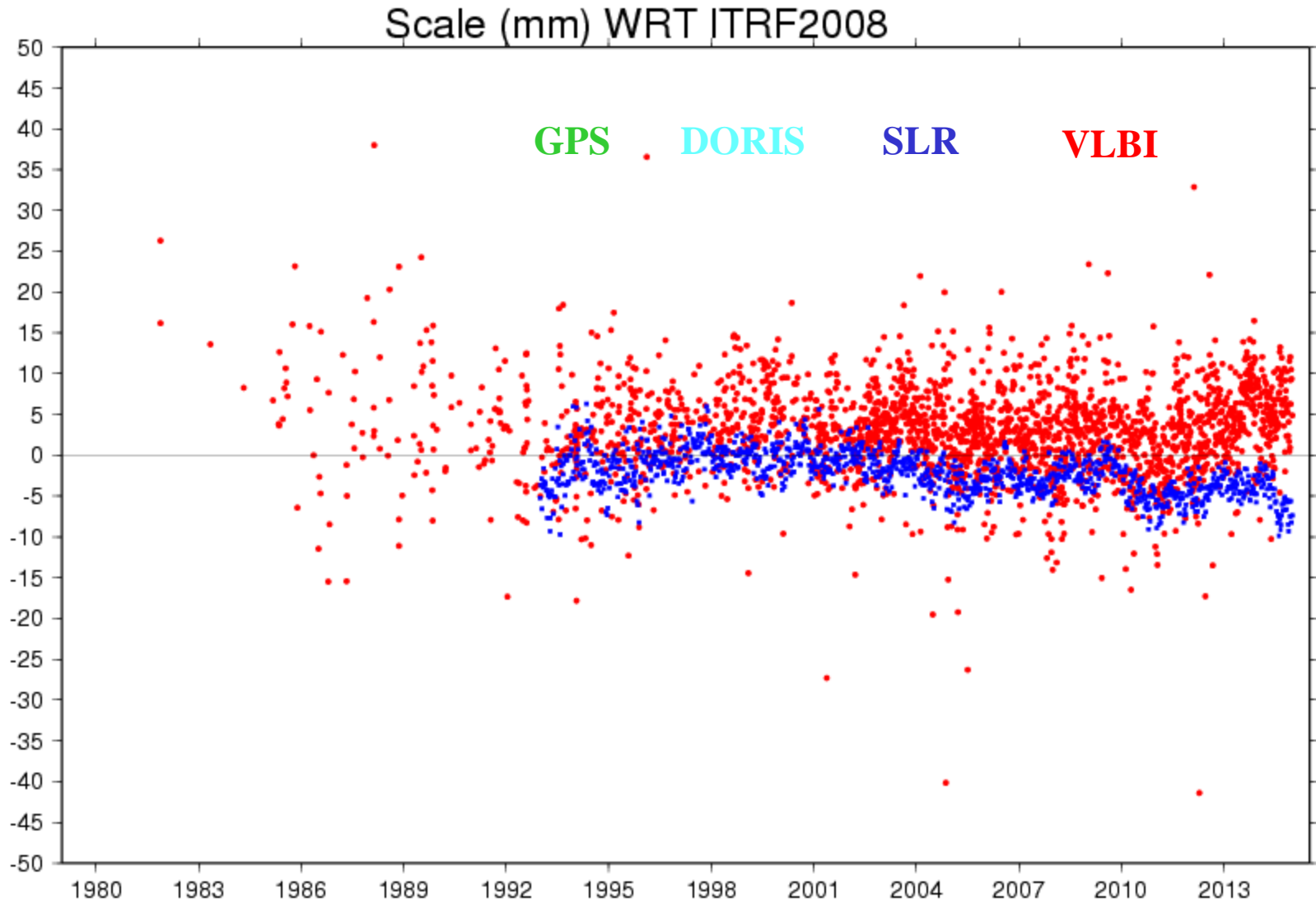
# DORIS/IDS Origin & Scale WRT ITRF2008

Annual + Semi-annual signals removed

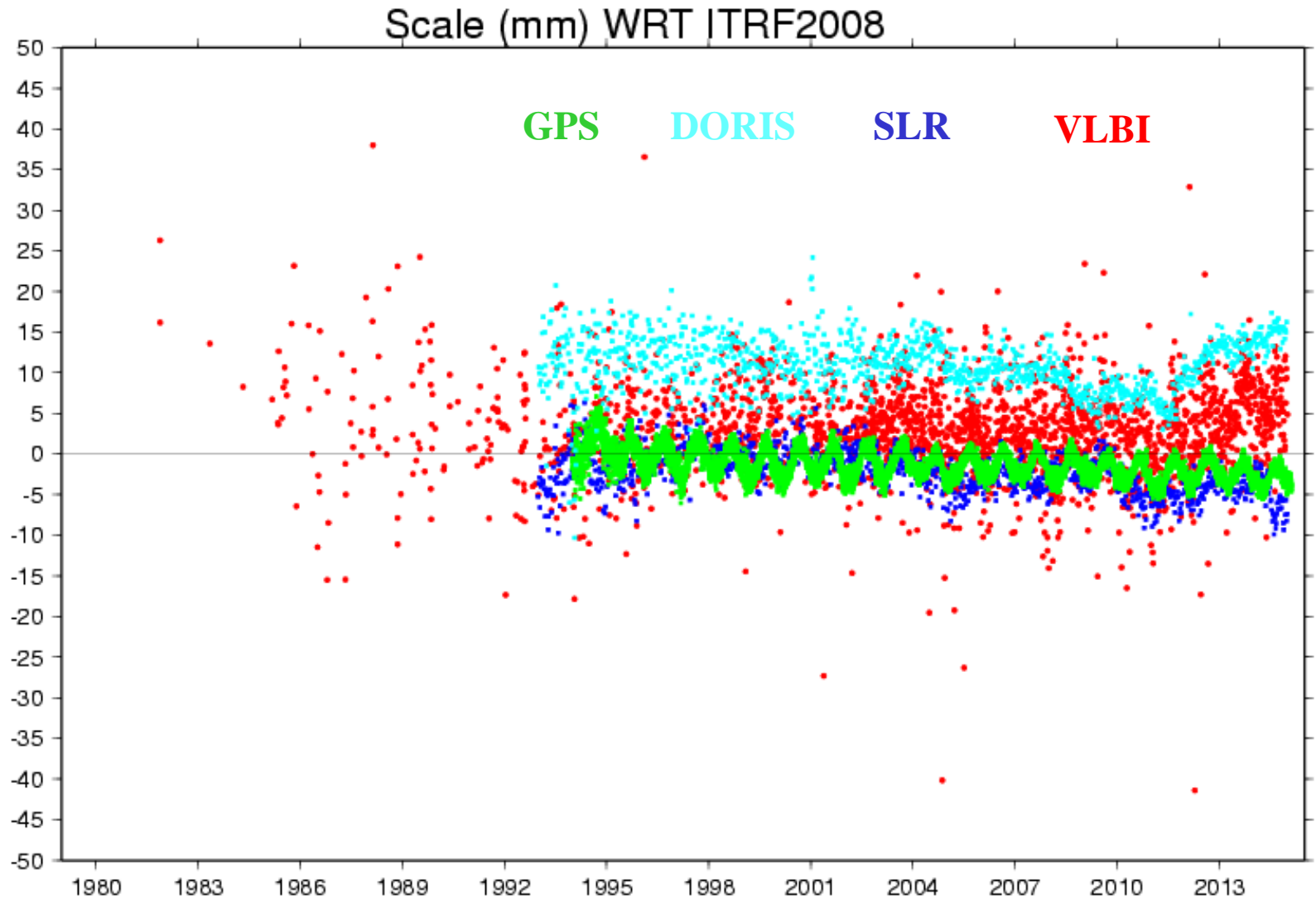
IDS origin and scale WRT ITRF2008



# VLBI, SLR, DORIS & GPS Scales wrt ITRF2008

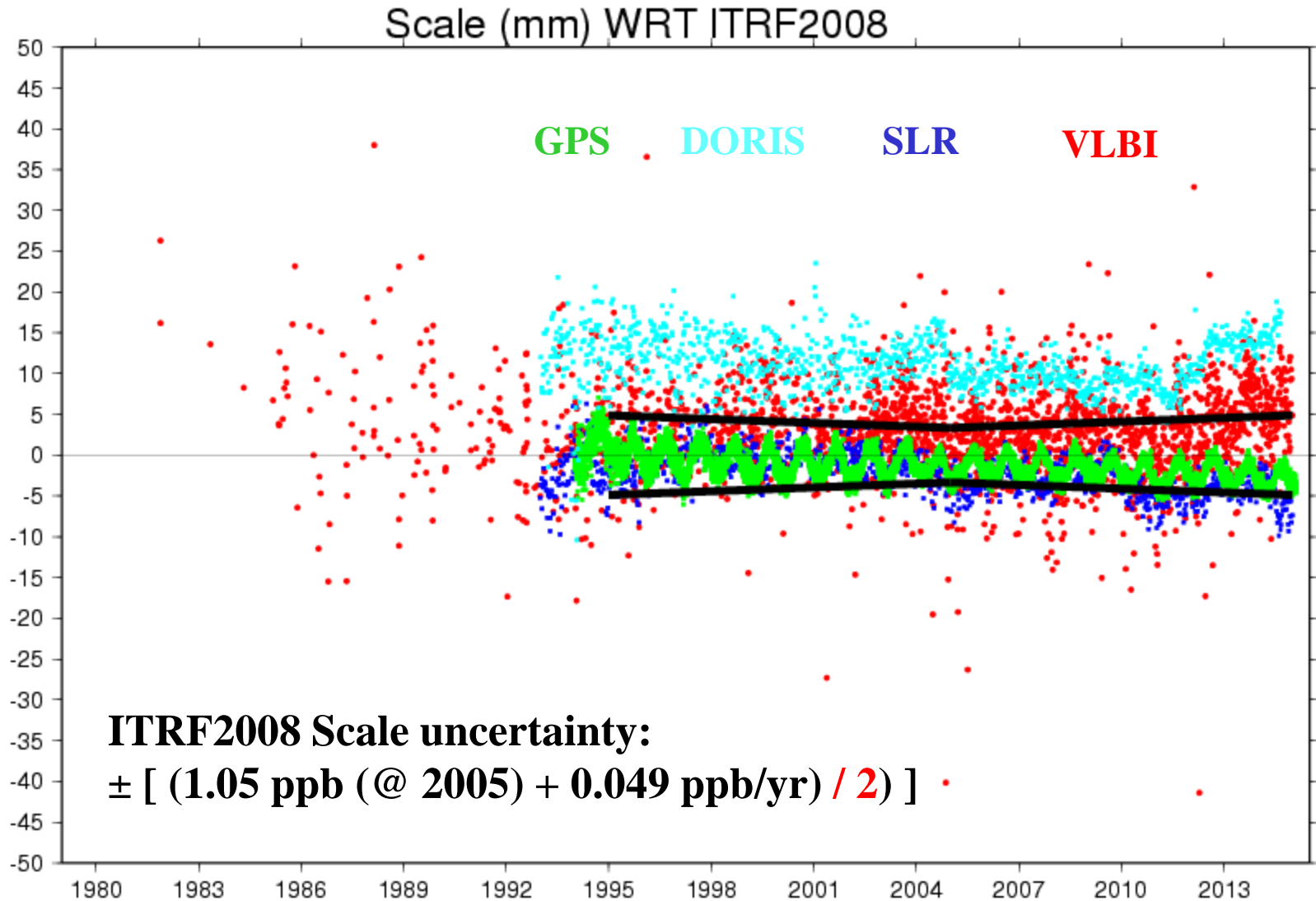


# VLBI, SLR, DORIS & GPS Scales wrt ITRF2008





# VLBI, SLR, DORIS & GPS Scales wrt ITRF2008



# Post-seismic deformations

# Parametric post seismic models

Parametric models for postseismic displacements :

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

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

Parametric postseismic models use logarithmic or exponential functions :

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

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

or

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

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

or

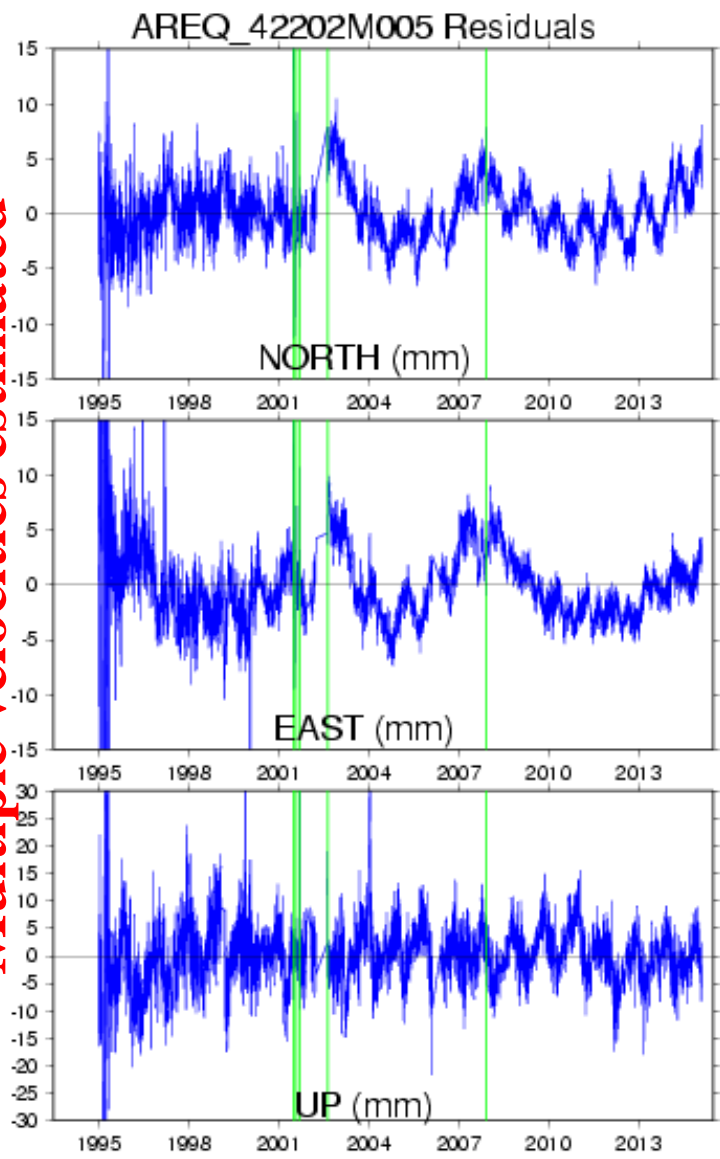
$$D(t - t_{eqk}) = A_1 \log\left(1 + \frac{t - t_{eqk}}{\tau_1}\right) + A_2 \left(1 - e^{-\frac{t - t_{eqk}}{\tau_2}}\right) \quad (3)$$

or

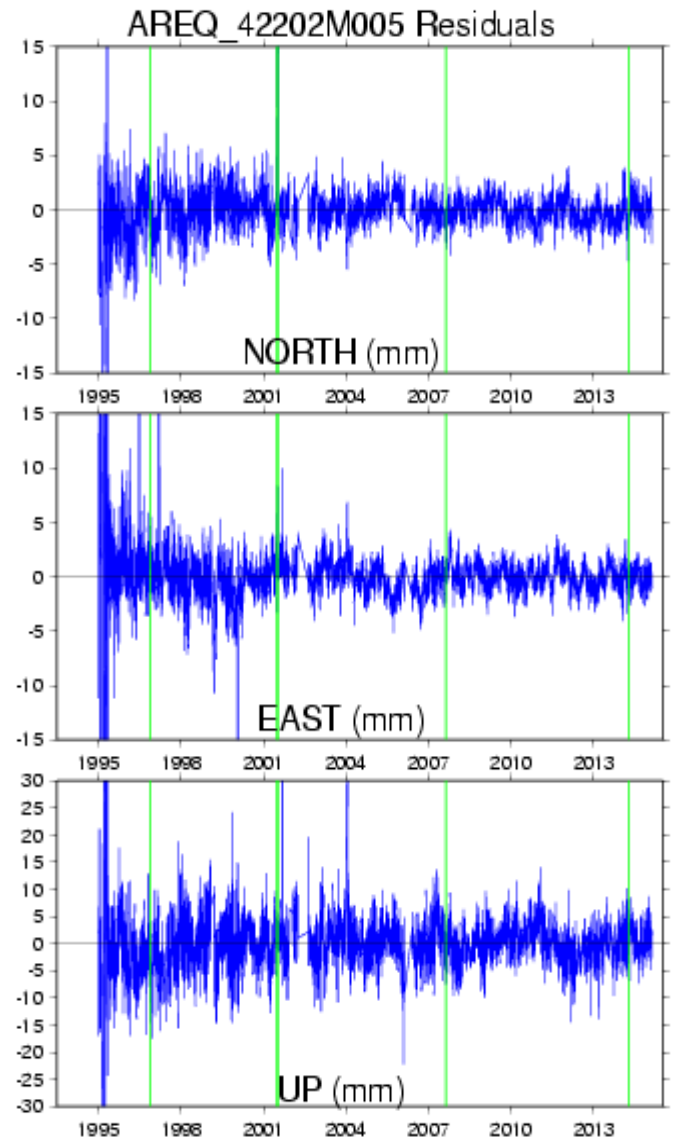
$$D(t - t_{eqk}) = A_1 \left(1 - e^{-\frac{t - t_{eqk}}{\tau_1}}\right) + A_2 \left(1 - e^{-\frac{t - t_{eqk}}{\tau_2}}\right) \quad (4)$$

# Linear Function **Arequipa-GPS** Parametric Model

Multiple velocities estimated



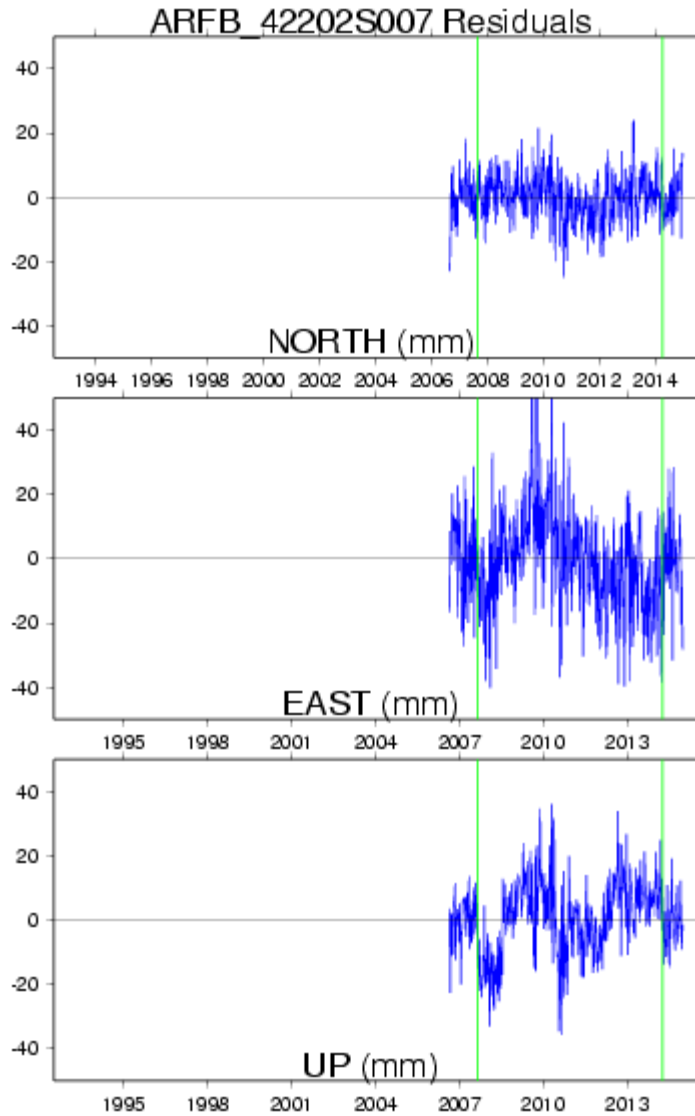
Post-fit residuals



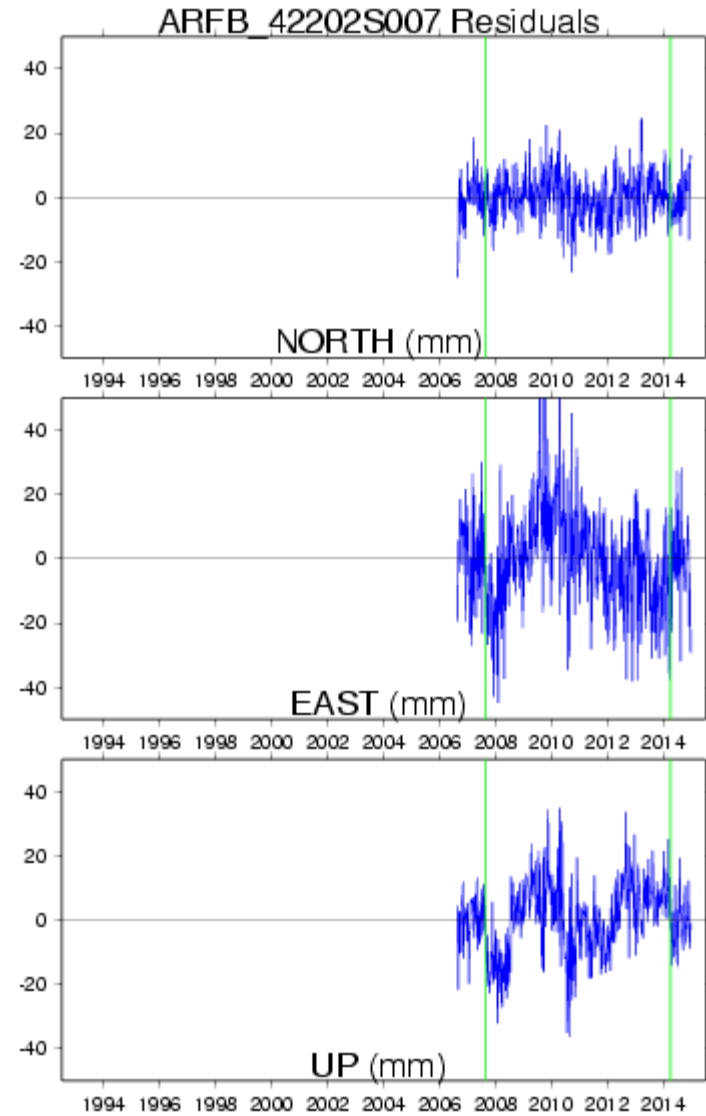
One velocity estimated

# Linear Function **Arequipa-DORIS** Parametric Model

One velocity estimated



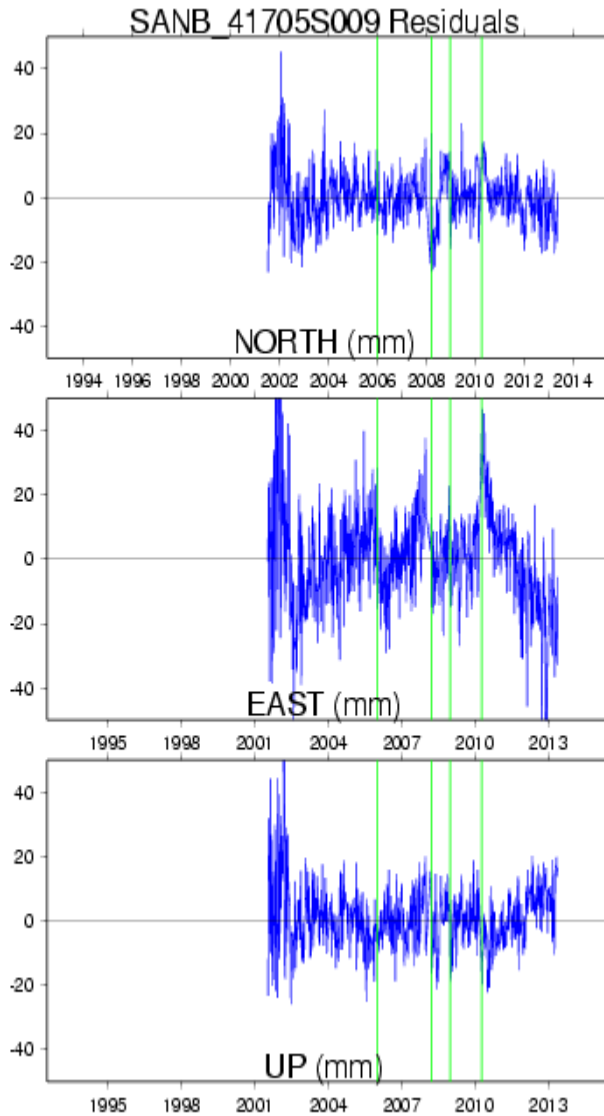
Post-fit residuals



One velocity estimated

# Santiago (SANB) - DORIS

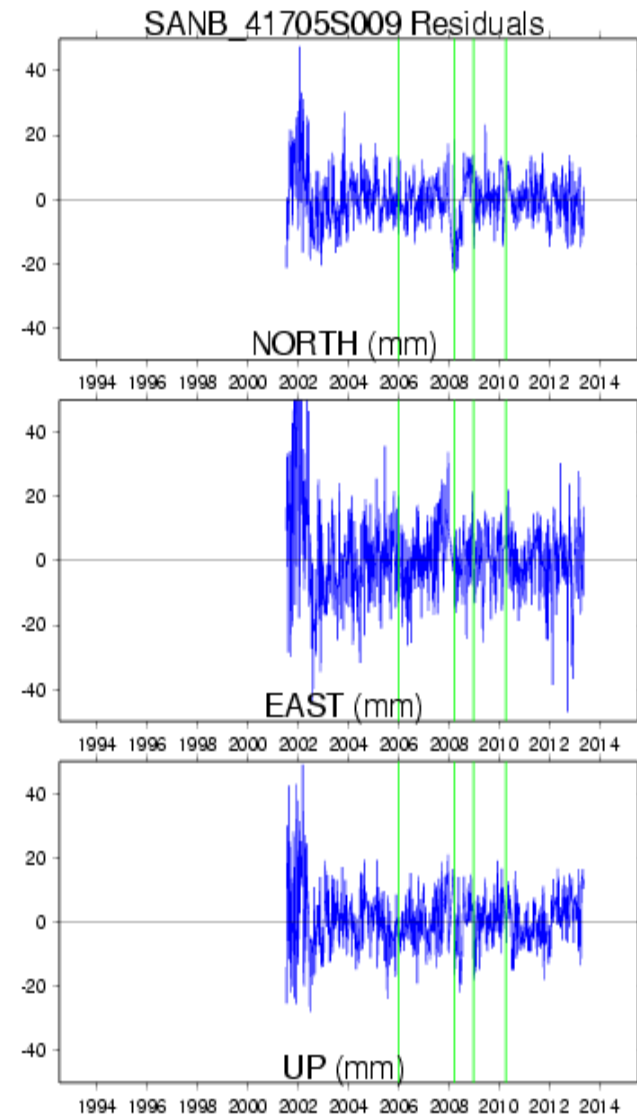
## Linear Function



One velocity estimated

Post-fit residuals

## Parametric Model



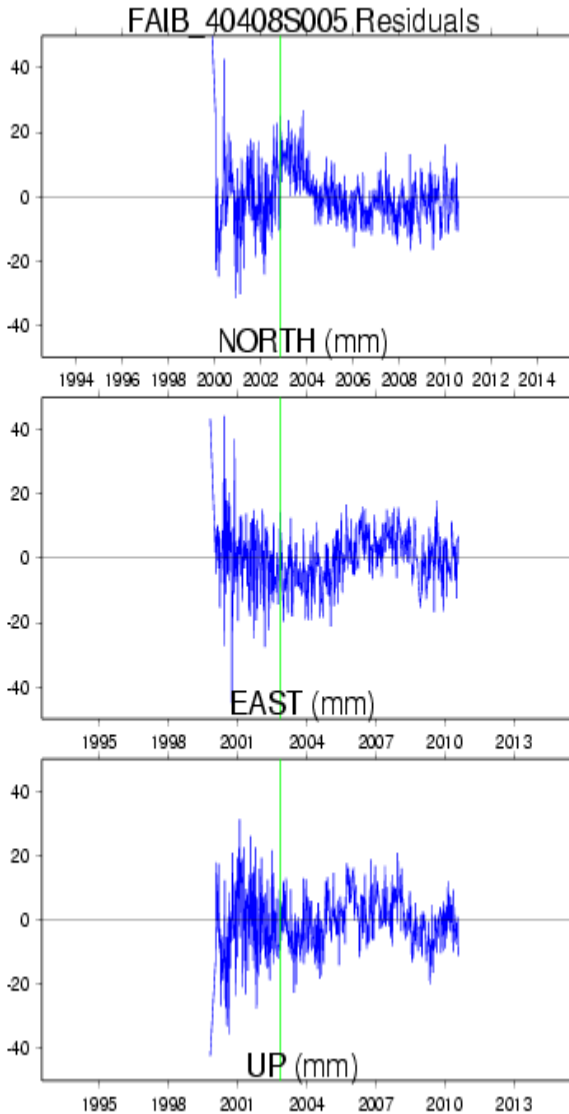
One velocity estimated

# Fairbanks (FAIB) - DORIS

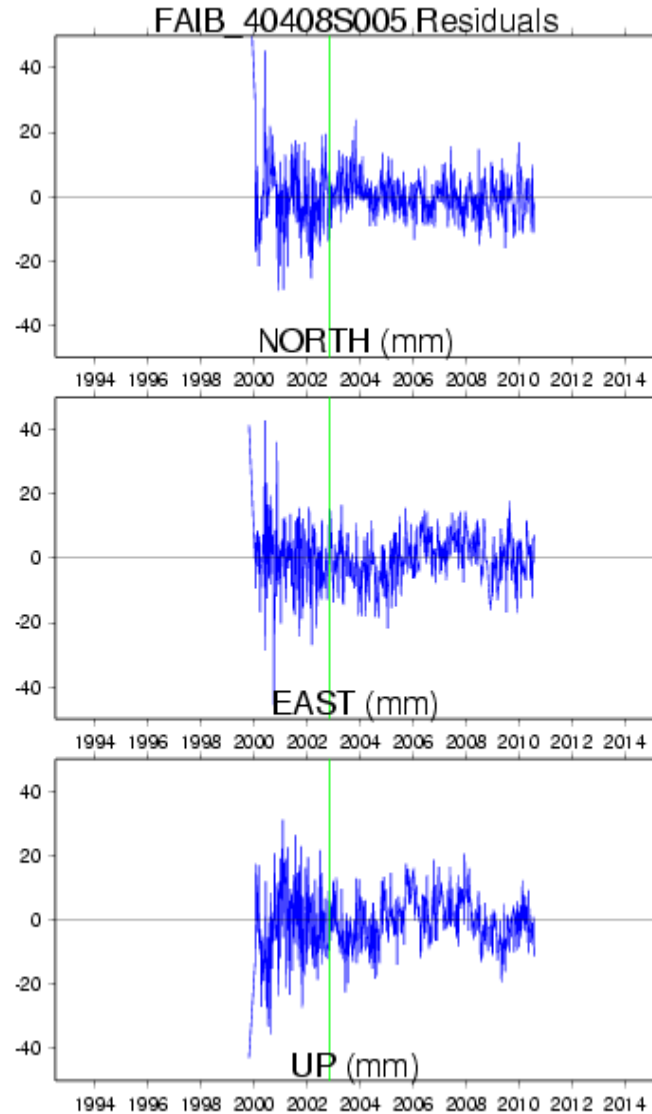
## Linear Function

## Parametric Model

One velocities estimated



Post-fit residuals



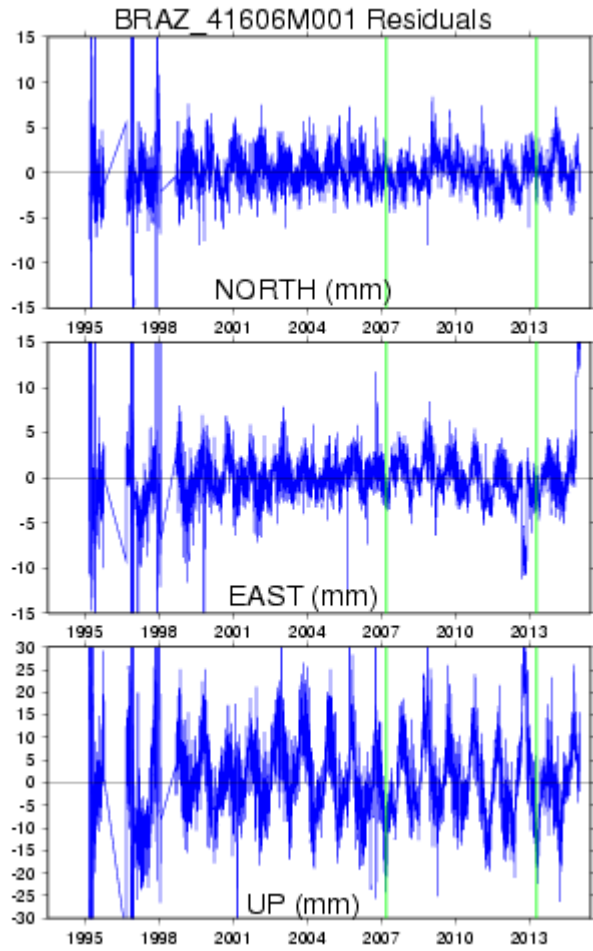
One velocity estimated

**Estimating seasonal signals  
vs  
applying NATML model ?**

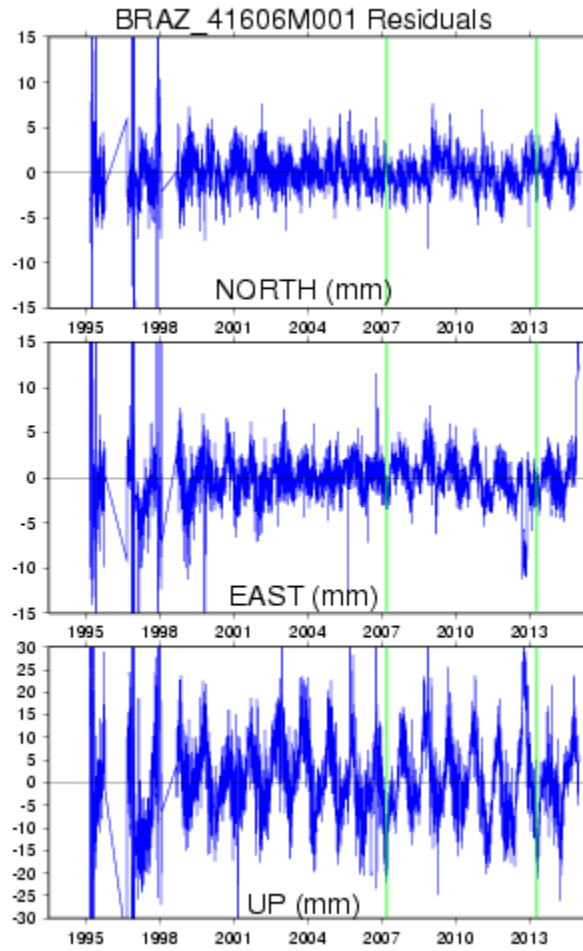


# Brasilia GNSS site

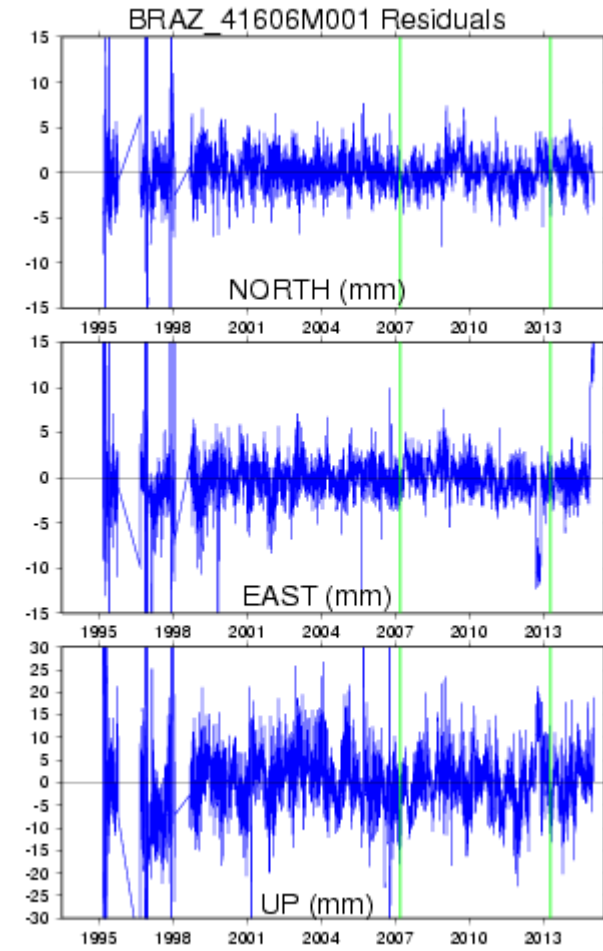
## Standard residuals



## ATML-corrected before stacking



## Annual & semi-annual estimated



# WRMS Averages

## GNSS (co-location sites), daily

Solution	East	North	Up
STD	2.07	2.02	5.88
ATML/CF	2.02	1.97	5.29
F2	1.97	1.90	5.32
<b>F6</b>	<b>1.92</b>	<b>1.85</b>	<b>5.21</b>

## VLBI, session-wise

Solution	East	North	Up
STD	4.20	4.34	8.98
ATML/CF	4.18	4.32	8.80
F2	4.17	4.28	8.81

## SLR, weekly

Solution	East	North	Up
STD	9.10	10.97	8.28
ATML/CM	9.09	10.82	8.22
F2	8.98	10.55	8.08

## DORIS, weekly

Solution	East	North	Up
STD	14.09	10.64	12.58
ATML/CM	14.08	10.64	12.61
ATML/CF	14.08	10.62	12.61
F2	13.94	10.35	12.23

**STD:** Standard solution

**ATML:** Atmospheric load model applied/CM(F): Center of Mass (Figure)

**F2:** Annual and semi-annual signals removed

**F6:** F2 + **4 draconitics**

# ITRF2014 Products

- **The usual products:**
  - Station positions, velocities and residuals;
  - EOPs
- **Additional/new products**
  - Geocenter motion model (amplitude & phase per component: X, Y, Z), probably from SLR only
  - Post-seismic parametric models (amplitude  $A$  & relaxation time  $\tau$ ) Necessary to propagate coordinates at any epoch
  - **On request:** periodic signals (amplitudes & phases), per technique