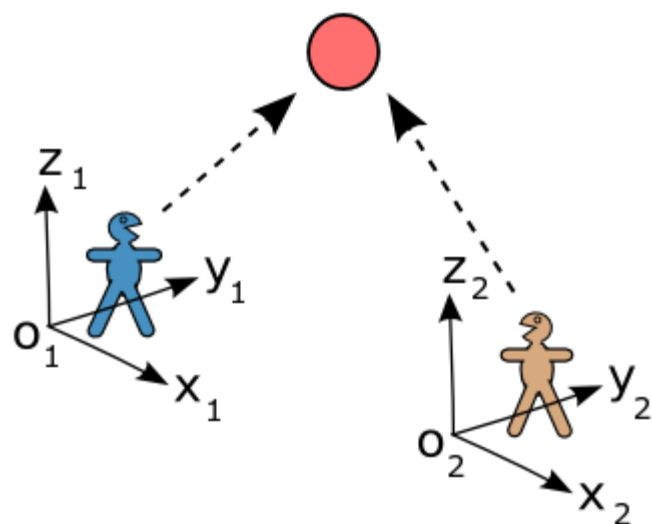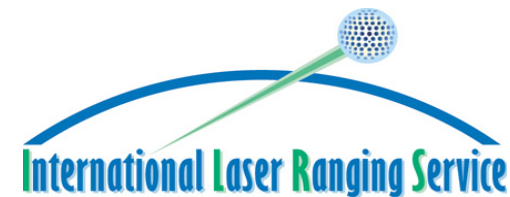# The ILRS contribution to the development of ITRF2013

V. Luceri, B. Pace
e-GEOS S.p.A., ASI/CGS
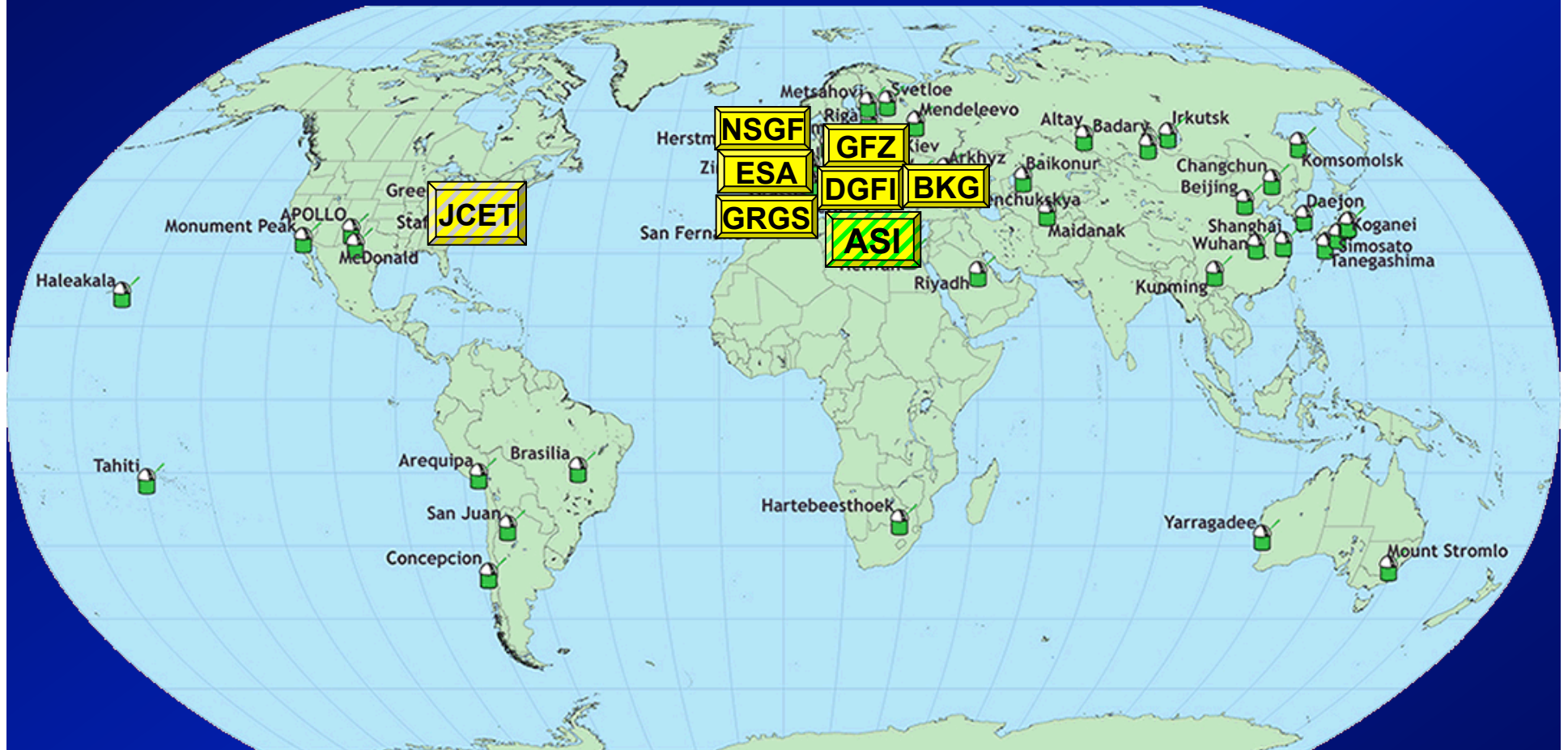
E. Pavlis, D. König, M. Kuzmicz-Cieslak
GEST/UMBC - Baltimore

G. Bianco
Agenzia Spaziale Italiana, CGS - Matera

The ILRS Analysis&Combination Centers

The ILRS processing flow

- The official ILRS analysis centers (ACs) produce daily and weekly solutions that are combined by the two combination centers (CCs)
- Solutions contain SSC and daily EOP, using Lageos and Etalon data, according to the **ILRS/AWG guidelines**
- Same processing strategy has been adopted for the ITRF2013 solutions

ASI	
BKG	
DGFI	
ESA	
GFZ	
GRGS	
JCET	
NSGF	

CDDIS EDC

ASI/CGS
ILRSA Primary

JCET
ILRSB Backup

CDDIS EDC

ILRS ACs   **Database**   **ILRS CCs**   **Database**

The quality of the final product

The final combined product quality is affected by different factors, such as:
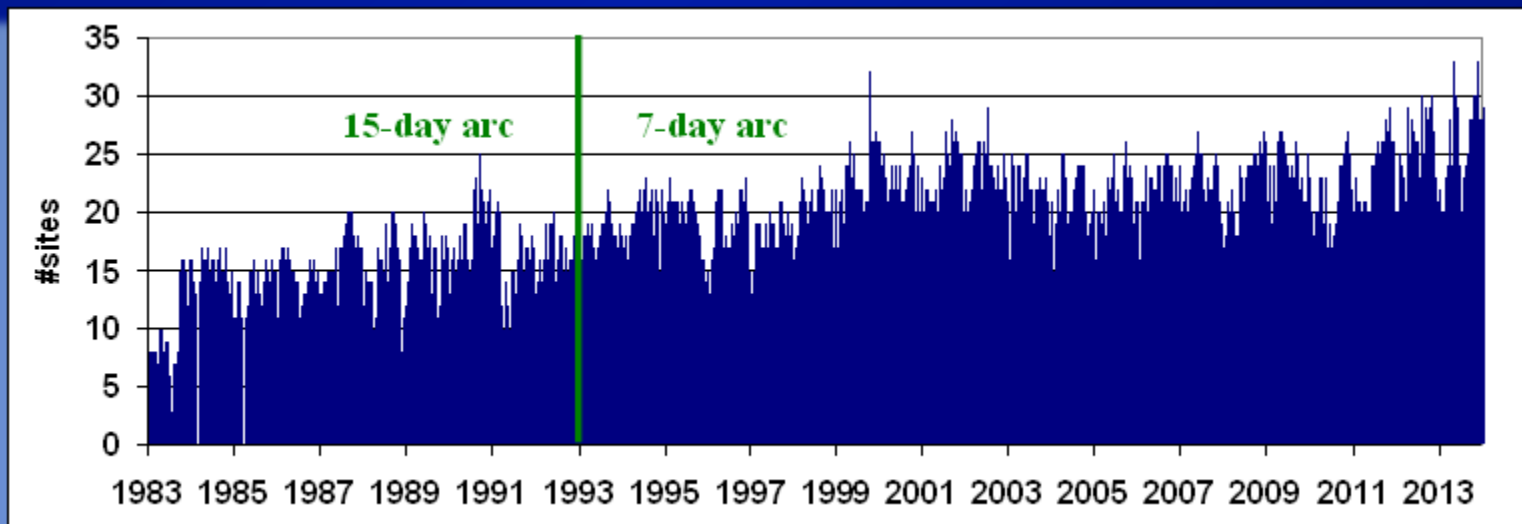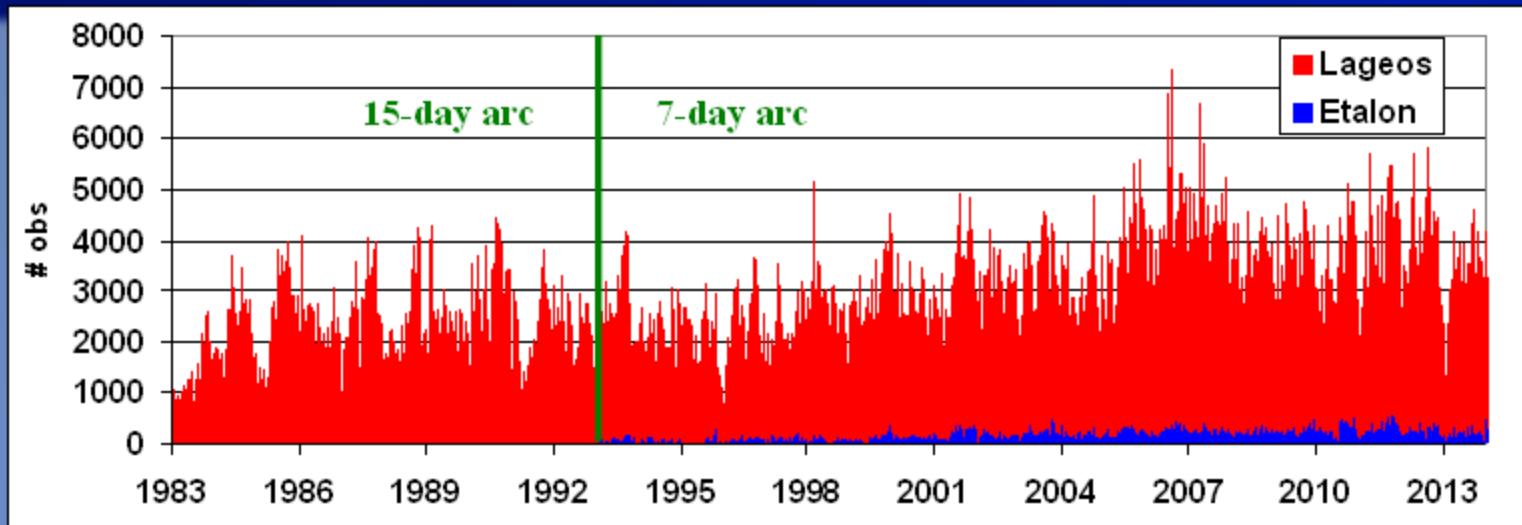
data analysis

- Conventions adopted
- Application/estimation of system biases
- Satellite Center of Mass correction
- Data coverage
- SW
- Hidden constraints

combination

- Balance in the contribution of all the ACs solutions
- Outlier editing, which affects the iterative computation of the solution scaling factors in the combination process

Input SLR data

ILRSA solution basic facts

- Coverage: 1983-2013, Lageos and Etalon data

- 8 ACs have submitted several versions of their SLR SSC/EOP 7-day arc solutions covering the period 1993 – 2013 during April-September 2014

- The combined ILRSA has been issued in its final version on October 10th

- 7 ACs have submitted their 15-day arc time series covering the period 1983 – 1992 , the last one was submitted a few days ago

- The final time series for 1983-1992 was delivered on October 24th

The ILRSA combination approach

The ASI-CGS combination procedure is based on the direct combination of loose constrained solutions ("*Methodology for global geodetic time series estimation: A new tool for geodynamics*", Davies and Blewitt, 2000).

Translations
Translations

Rotations
Rotations

Scale
Scale
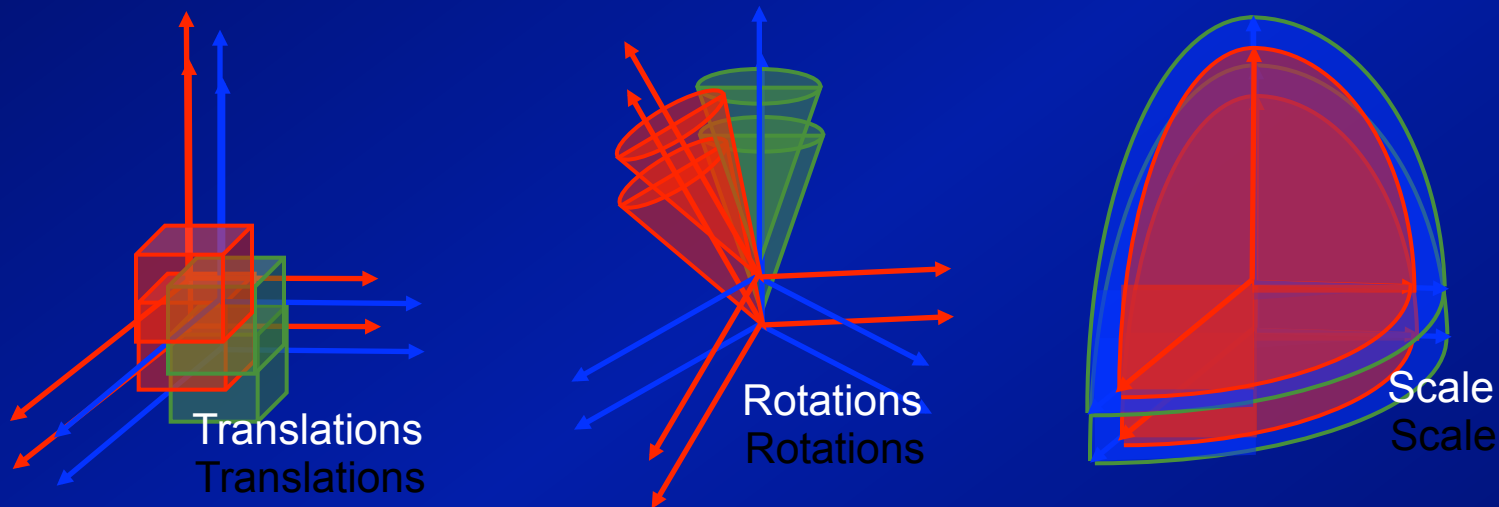
The combination is performed along the lines of the iterative **Weighted Least Square** technique: each contributing solution plays the role of a '**pseudo-observation**' whose residuals with respect to the combined solution must be minimized; each solution is stacked using its full covariance matrix rescaled by a factor to reach convergence and to balance the contributions; for each combination step proper editing criteria are applied
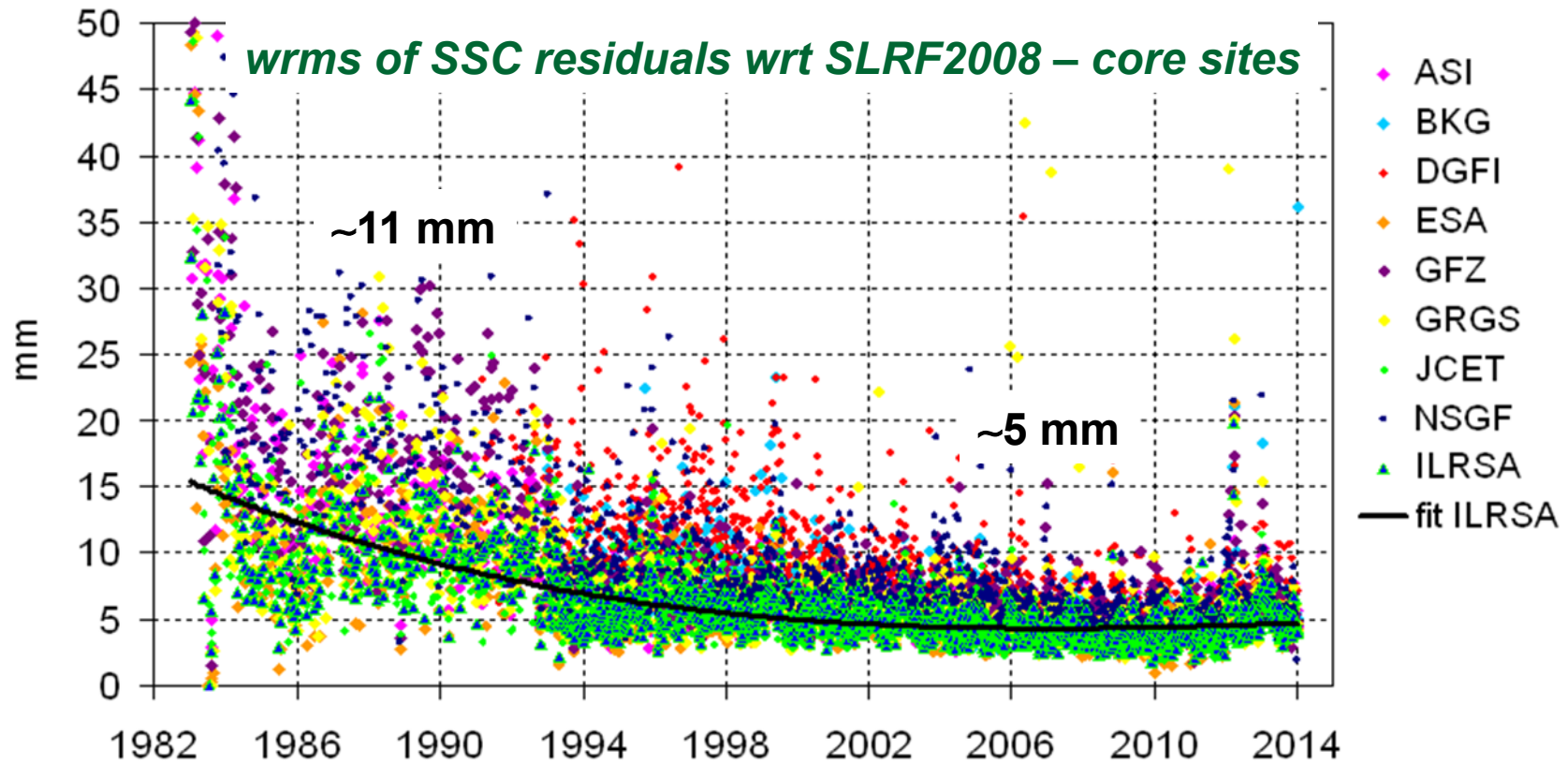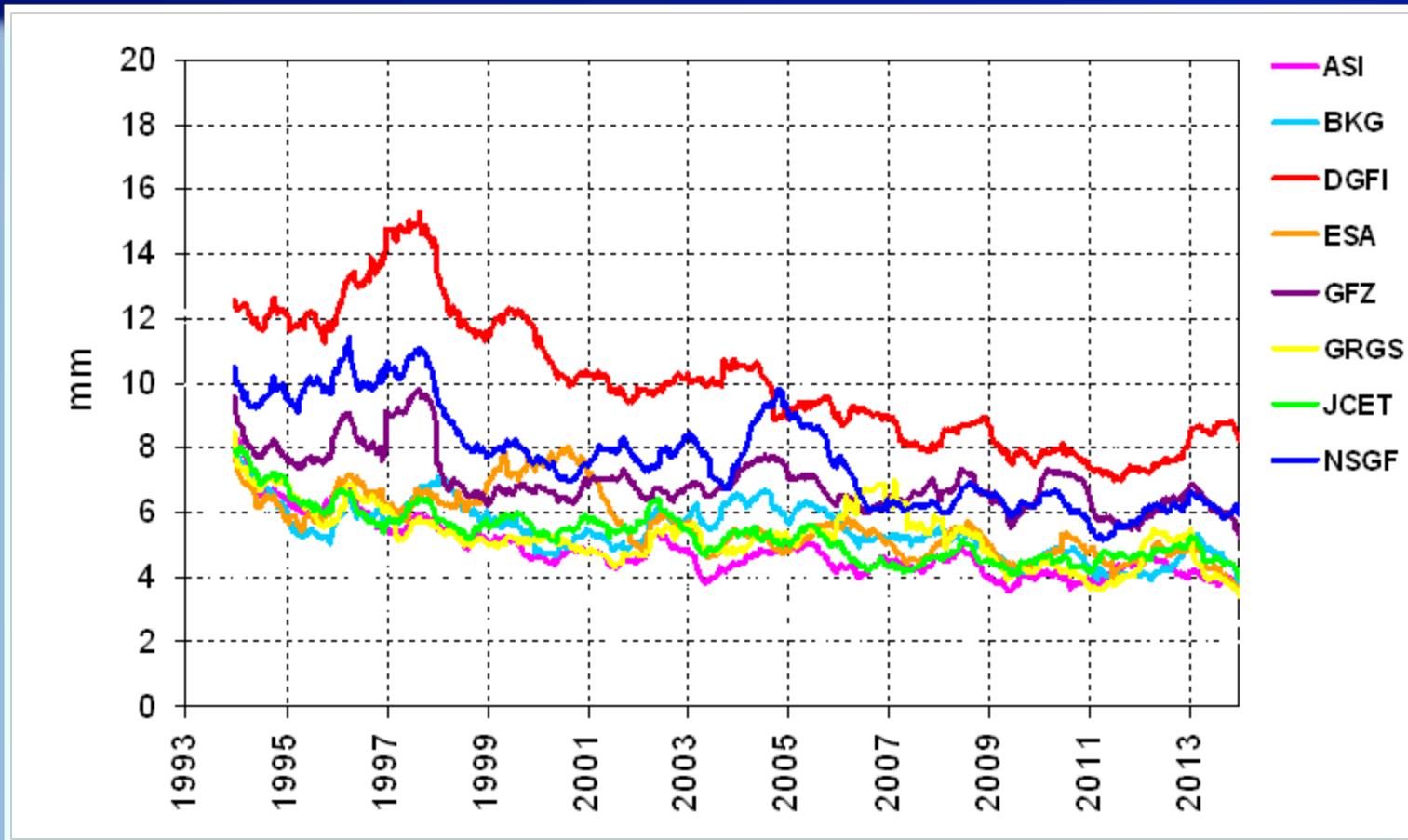
Looseness of the SLR solutions

ASI Looseness, ; (Coordinates/EOP)

Looseness of the SLR solutions
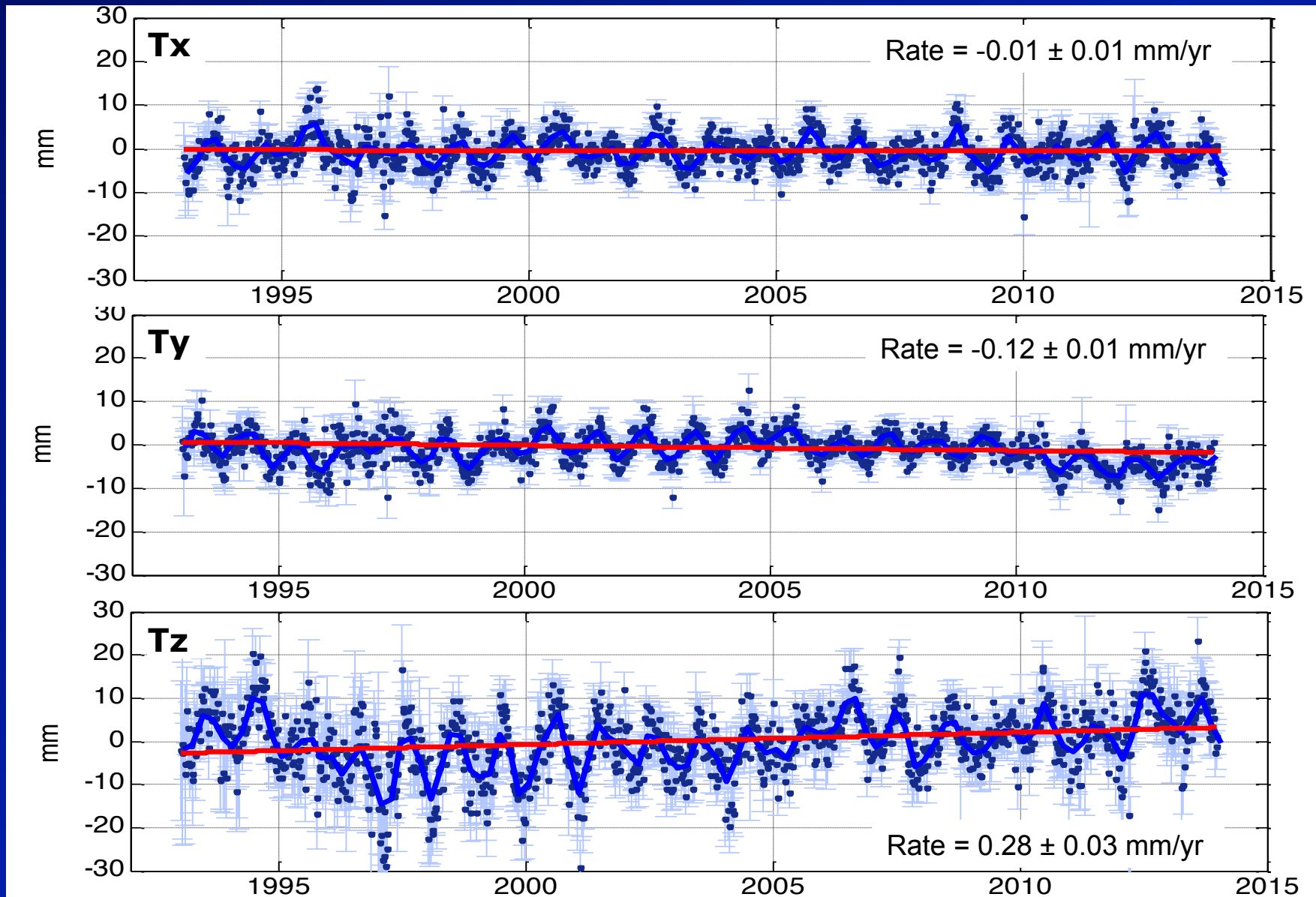

Looseness, ; (Coordinates/EOP)
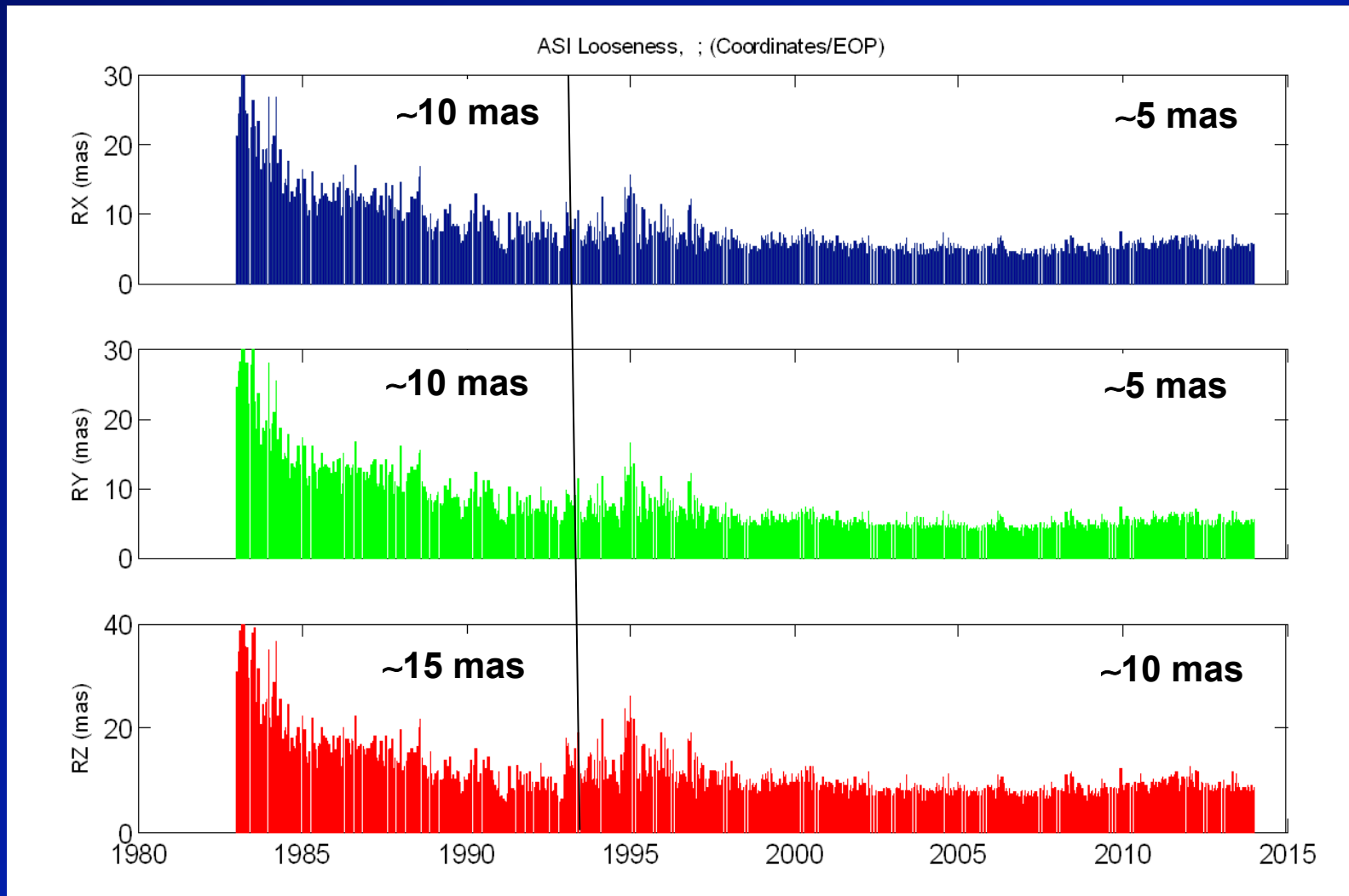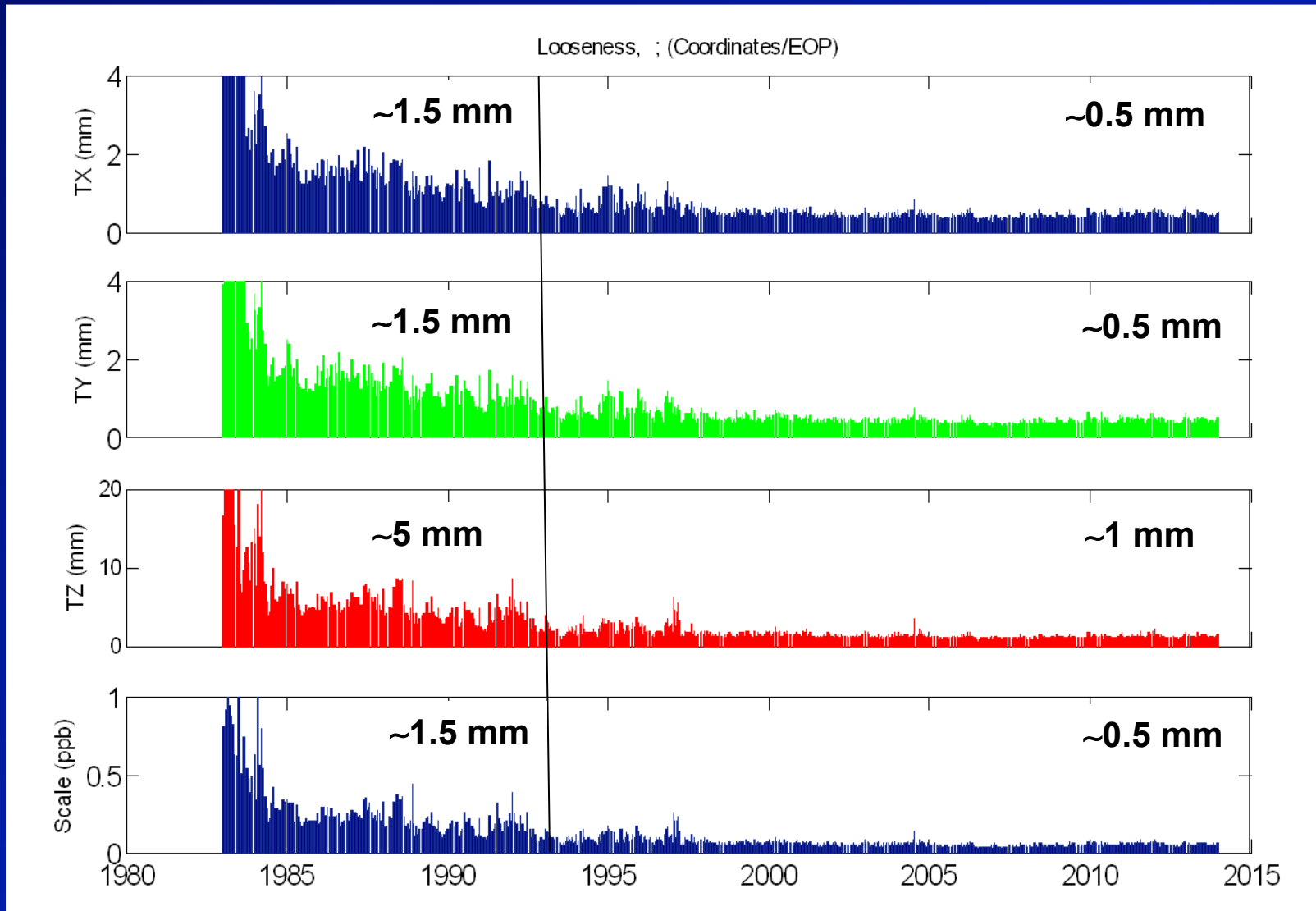
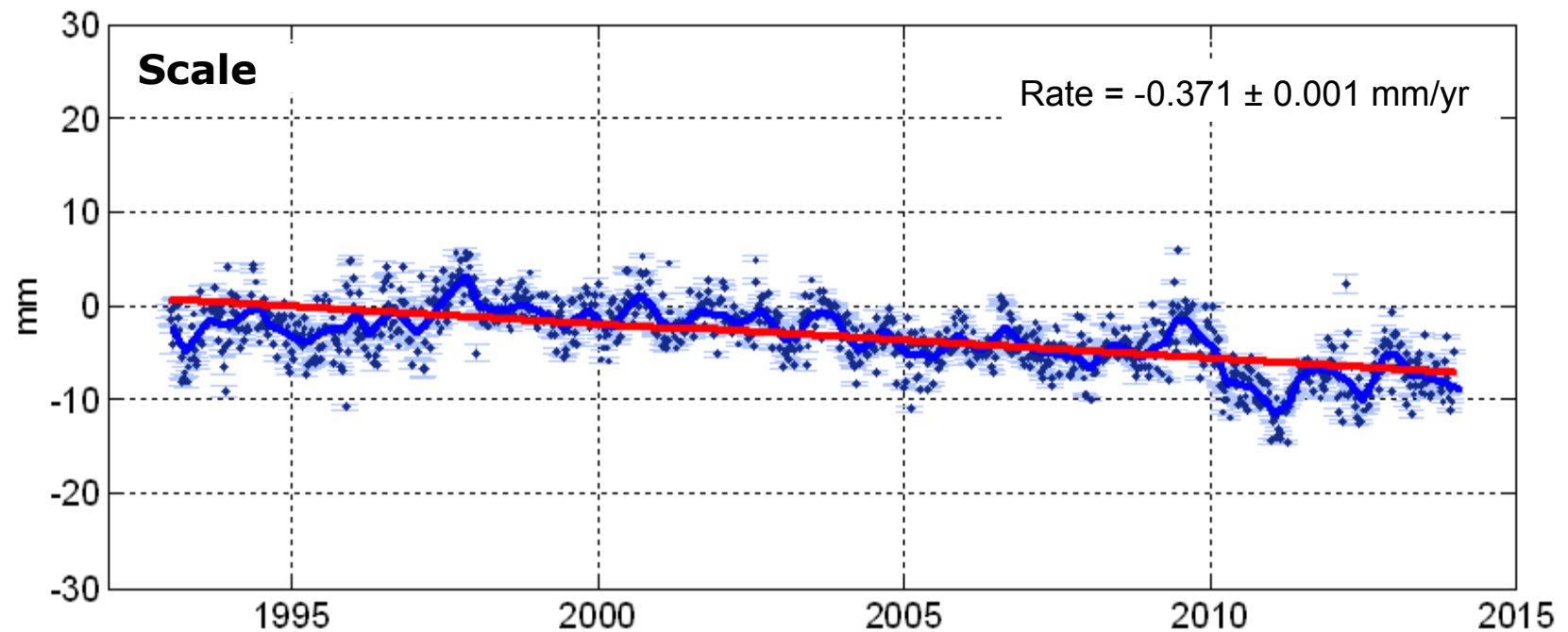# ILRSA solution overall quality

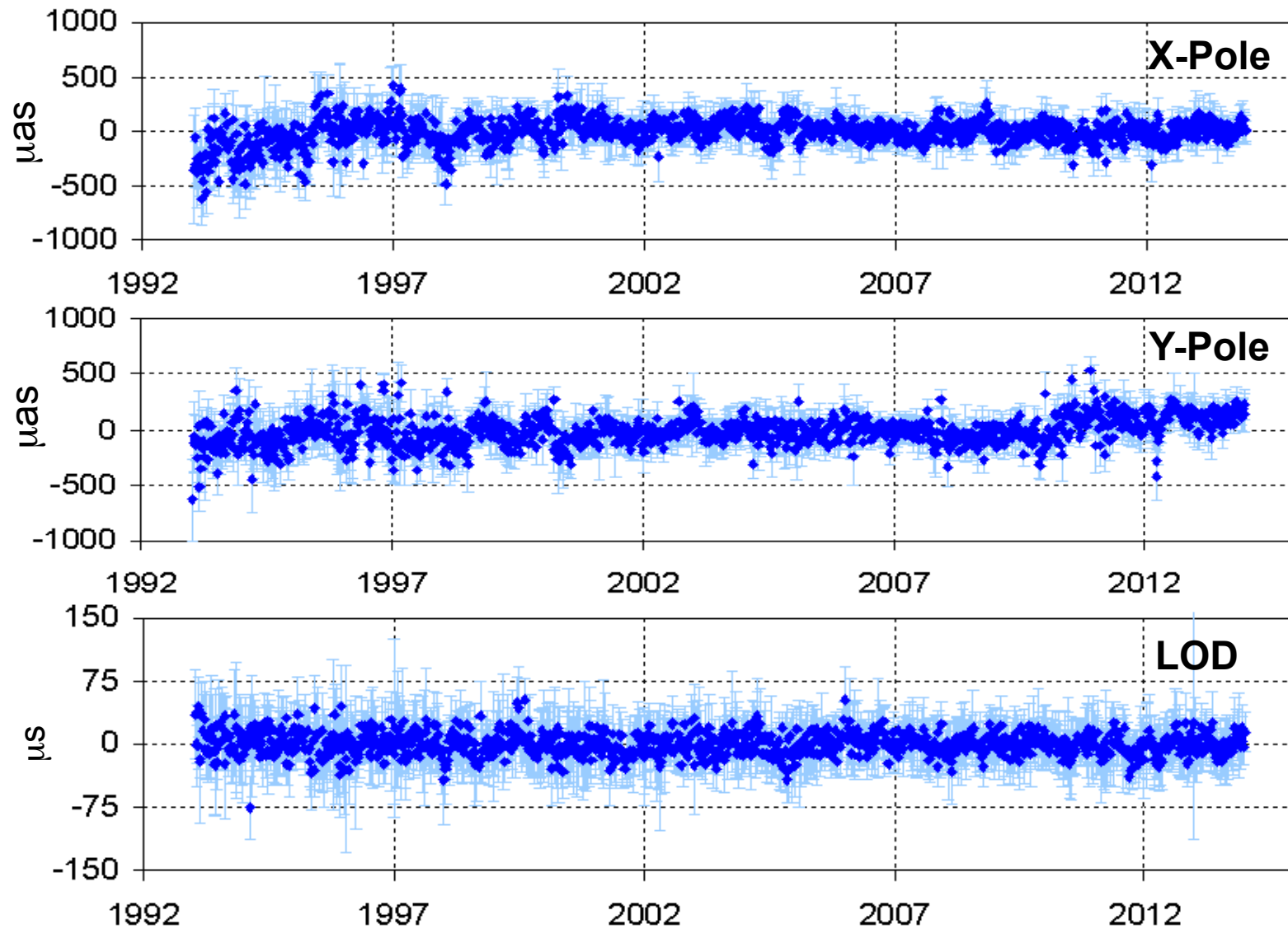# Intra-technique consistency

Origin with respect to SLRF2008

Scale with respect to SLRF2008

EOP vs USNO: arc weighted mean

Remarks

- The ILRS contribution to ITRF2013 followed updated guidelines for both ACs and CCs (conventions adopted, application/ estimation of system biases, data editing, treatment of hidden constraints);

- The analysis of the data span 1983-2013 for the final official ILRS combined solution, ILRSA v60, has been delivered on October 24th

- The ILRS time series shows:
  - overall coherence of all the final AC contributing solutions
  - 5mm WRMS of the Core Site residual w.r.t. SLRF2008
  - Very neat Helmert parameter time series, allowing to detect small secular and periodic components. T_z is noisier, as expected
  - A signature in the T_y and scale is visible in 2010 and needs deeper investigation

Acknowledgement

Credit is due to

- the ILRS Analysis Centers for their big effort in reprocessing the 30 year long data set

- the ILRS Data Centers for their prompt response to all our requests