

Systematic errors in SLR data



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SLR systematics

- ❑ SLR is a clean, absolute ranging technique with the potential of *a very limited number of errors* due to various sources at the stations e.g. calibration and/or synchronization issues, hardware malfunctioning.
- ❑ The range error is the most critical, being highly correlated with height over short periods
- ❑ The presence of intermittent errors can introduce jumps in the coordinate time series
- ❑ A non homogeneous treatment of errors among the Analysis Centers affects the combined product, i.e. the ILRS contribution to ITRF

ILRS systematic errors information sources

Engineering error report from CDDIS database and from the stations through SLRMail

Rapid, daily QC analysis report from the ILRS ACs

Error time series estimated from a multi-year solution

Using these sources of information, the AWG has defined:

- error correction to be applied
- errors to be estimated (to be kept at minimum)
- unrecoverable data to be edited

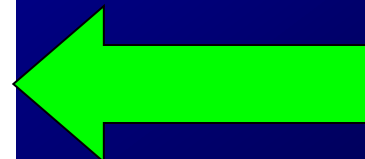
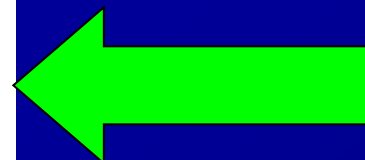
ILRS AWG data handling file

Available on the ILRS website

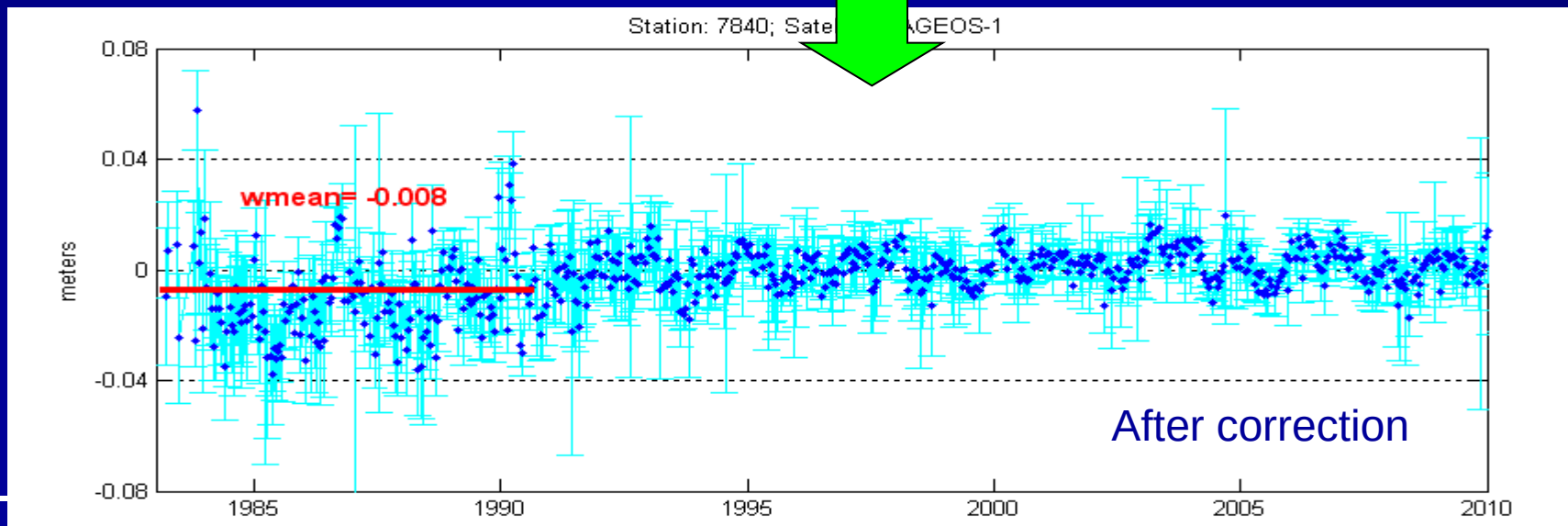
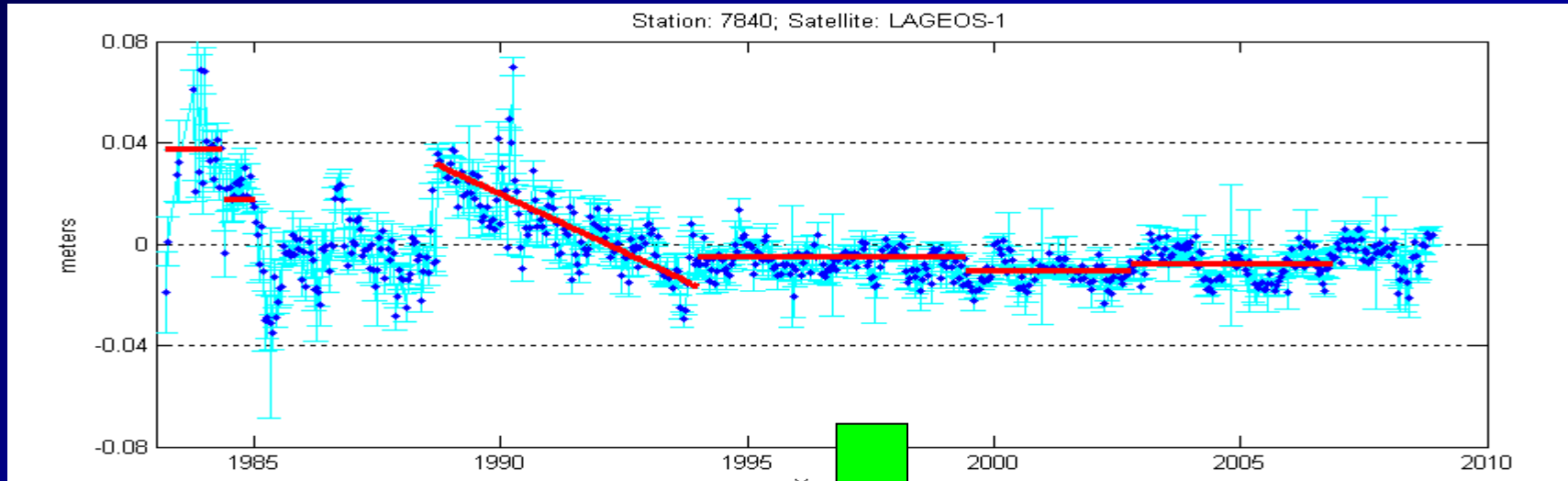
```
=SNX 2.00 DGF 10:322:00000 ALL 76:120:00000 00:000:00000 L 00000 2
*-----
+FILE/REFERENCE
RELEASE DATE      2010/04/23
*-----
CONTACT          Horst Mueller <mueller@dgfi.badw.de>
CONTACT          Margarita Vei <vei@gfz-potsdam.de>
-FILE/REFERENCE
*-----
+FILE/COMMENT

Last Updated:   Nov. 18 2010  mandatory Bias correction for Wettzell (starting March 2009)
                Nov. 12 2010  Bias correction for Arequipa (7403) added
                Sep. 15 2010  -20cm range bias for Haleakala July and August 2010
                Aug. 12 2010  100 ms time bias for MLRO from doy 221 to 223 2010 included
                Apr. 23 2010  corrections of errors detected by F. Deleflie
                Apr. 15 2010  all corrections from Van's tables at cddis added
*-----
"M" Models codes:
X = Exclude/delete data
E = Estimation of range bias, known a priori values are given
R = Range bias to be applied, no estimation of bias
S = Stanford event counter bias
T = Time bias in msec. to be applied, but not estimated
U = Estimation of time bias in msec
C = Target signature bias, Center-of-mass correction different to standard

estimate values where provided must be substracted from the one-way observations
-FILE/COMMENT
*-----
+SOLUTION/DATA_HANDLING
*-----
*-----
* list of sites with mandatory arc dependent biases to be estimated
*-----
1864 --- mm    A 00:000:00000 00:000:00000 E
*-----
8834 --- mm    A 09:050:00000 00:000:00000 E                                laser problems
*-----
* list of mandatory range biases to be applied on observation (ILRS/AWG Oct 2007)
* with updates from ILRS/AWG reprocessing results
*-----
7080 --- mm    A 90:094:00000 93:031:00000 R      25.00      source CDDIS
*-----
7119 --- ms    A 10:182:00000 10:273:86400 X                                uncorrected range bias
*-----
* list of data to be deleted
*-----
1863 ---      A 00:000:00000 94:001:00000 X
*-----
8834 L52      A 99:308:80649 99:308:80650 X
-SOLUTION/DATA_HANDLING
*-----
%ENDSNX
```

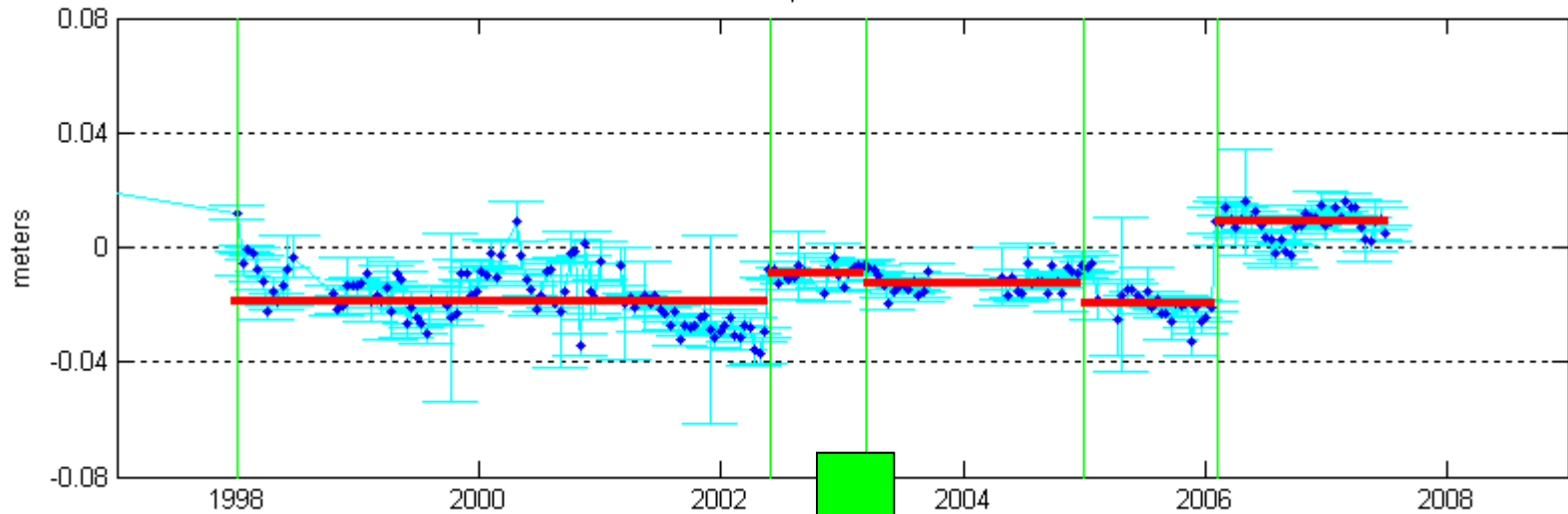


Herstmonceux

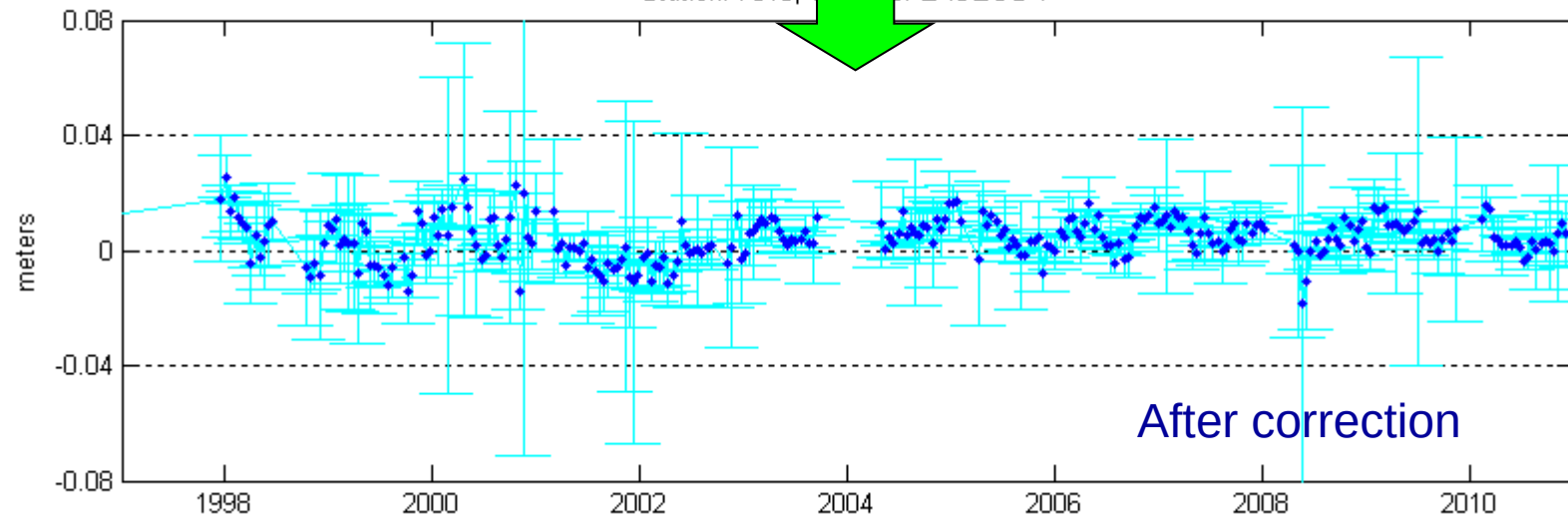


Zimmerwald

Station: 7810; Satellite: LAGEOS-1



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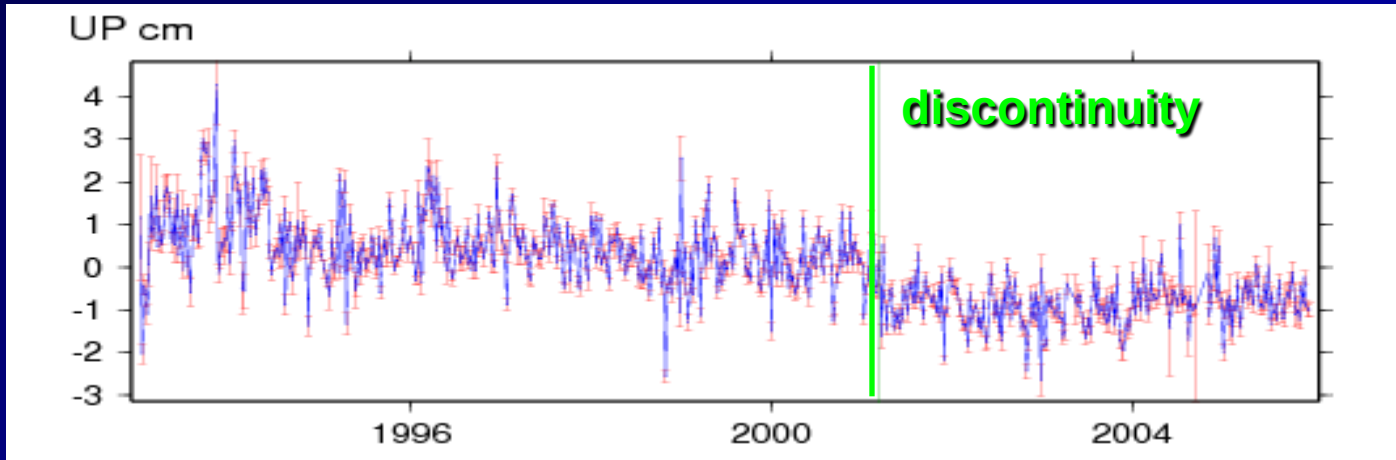
The ILRS contribution to ITRF

- The ILRS contribution to ITRF2008 is a time series of loose solutions containing SSC and EOP, from 1983.0 to 2009.0. Each weekly solution is obtained through the combination of weekly solutions submitted by the official ILRS Analysis Centers
- AC solutions have strictly followed the **ILRS/AWG guidelines, including the systematic errors treatment**

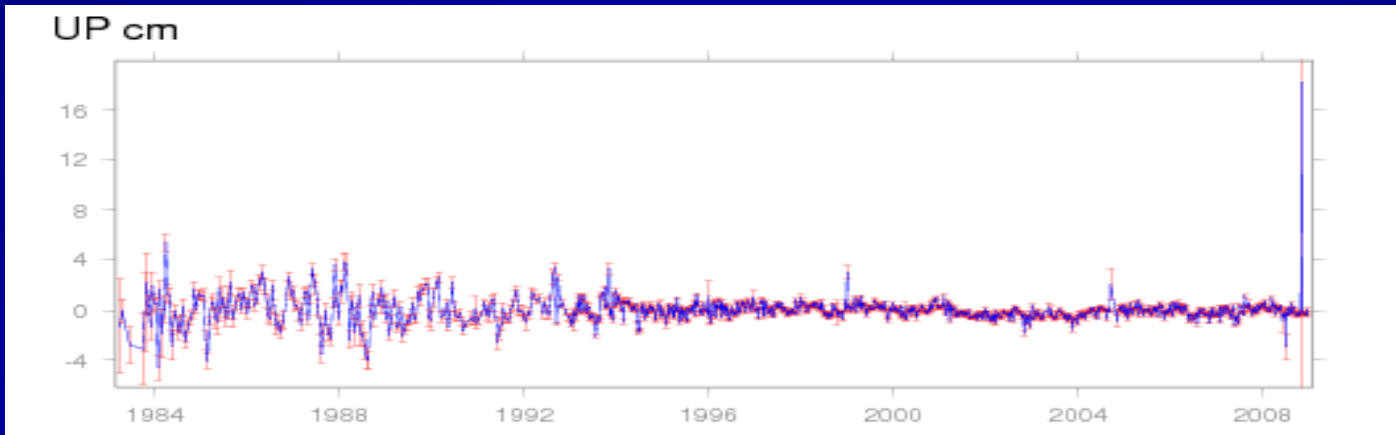
AC	Period
ASI	1983.0 -2009.0
DGFI	1983.0 -2009.0
GA	1983.0 -2009.0
GFZ	1983.0 -2009.0
GRGS	1993.0 -2009.0
JCET	1983.0 -2009.0
NSGF	1983.0 -2009.0



SSC/SSV: Herstmonceux

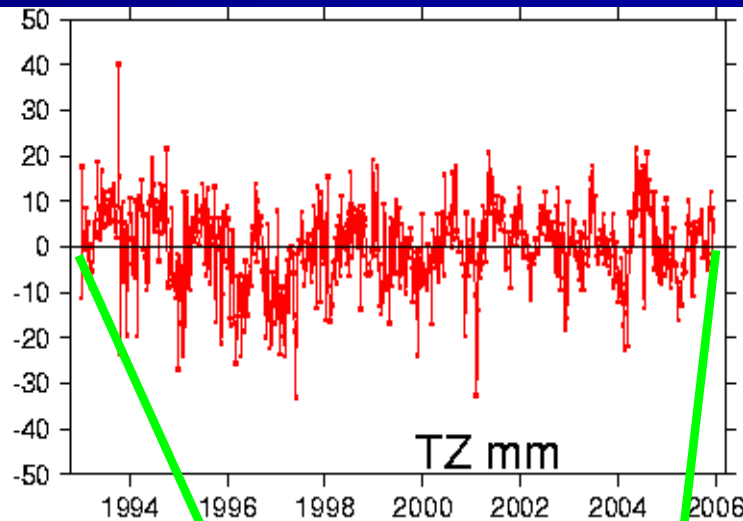
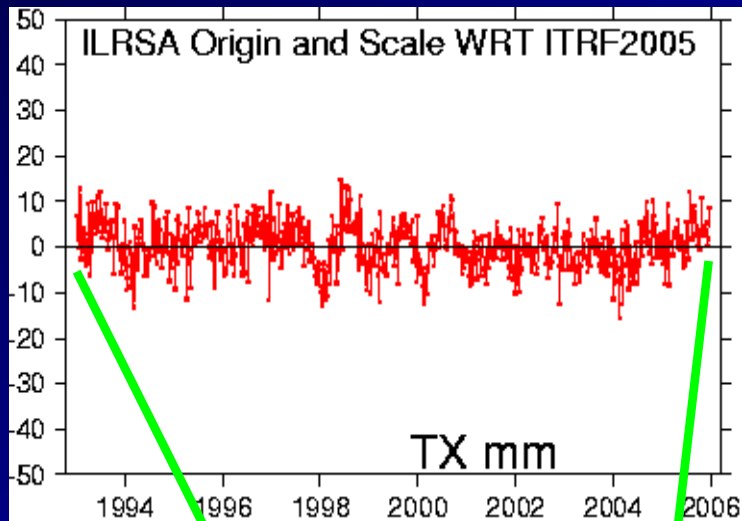


ITRF2005

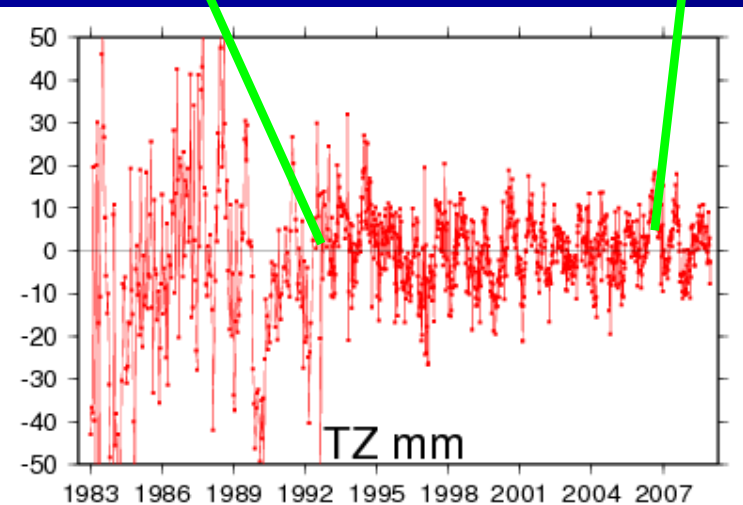
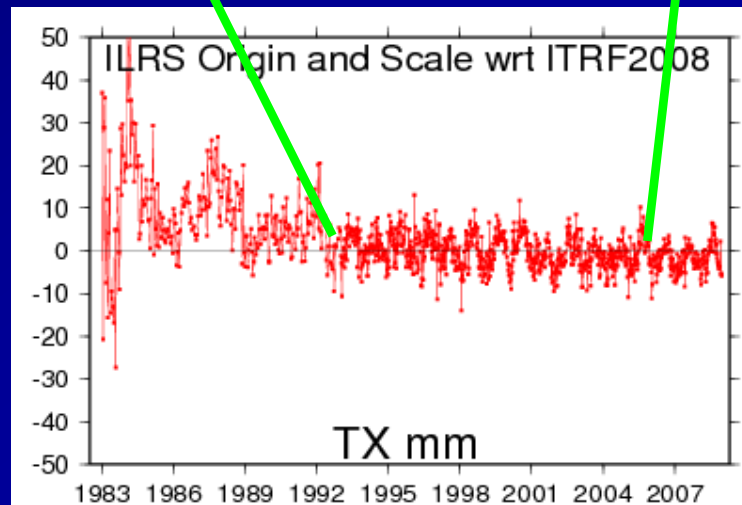


ITRF2008

ILRSA origin & scale (1/2)

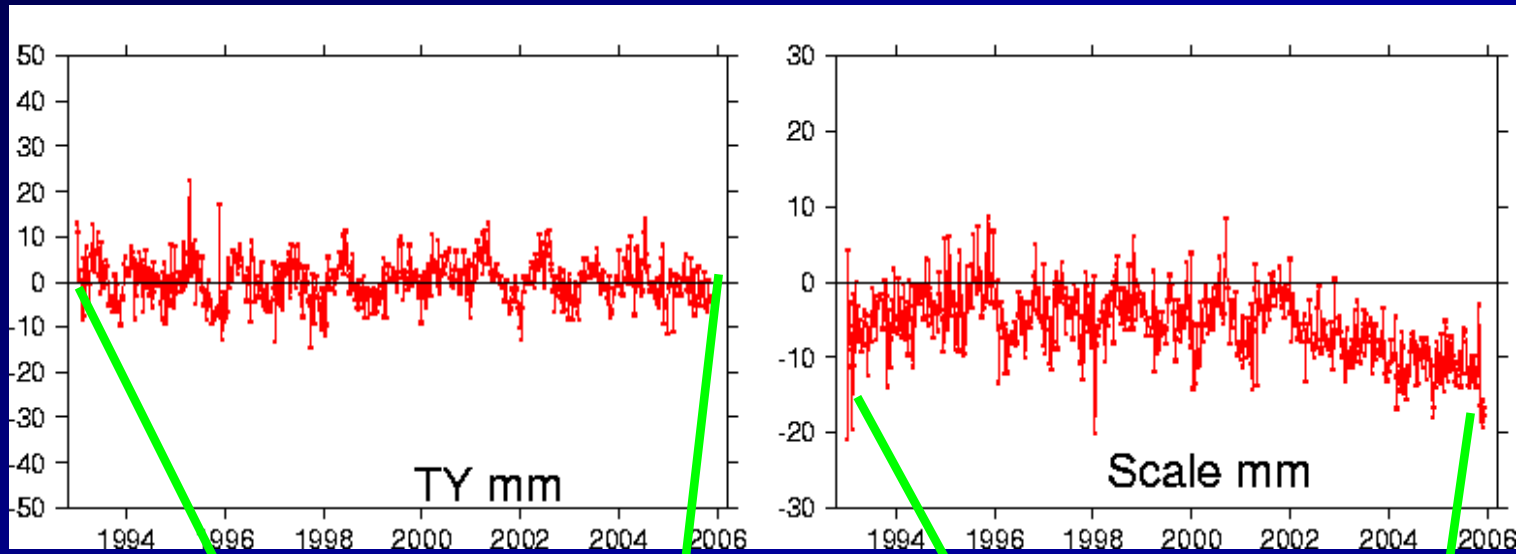


ITRF2005

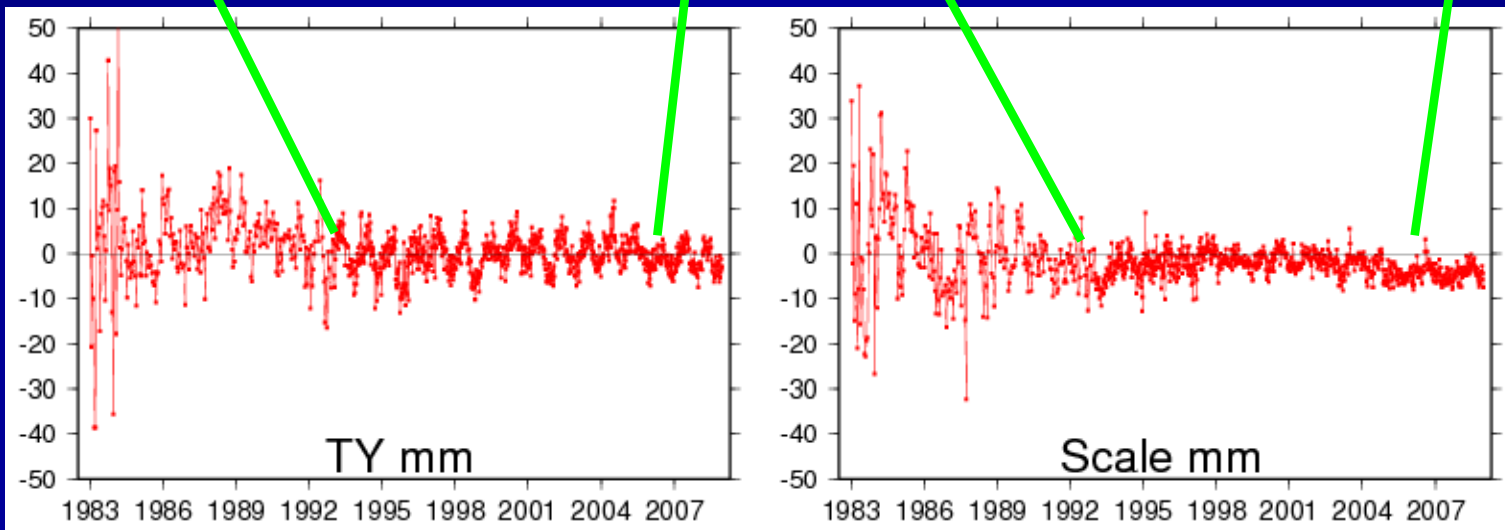


ITRF2008

ILRSA origin & scale (2/2)

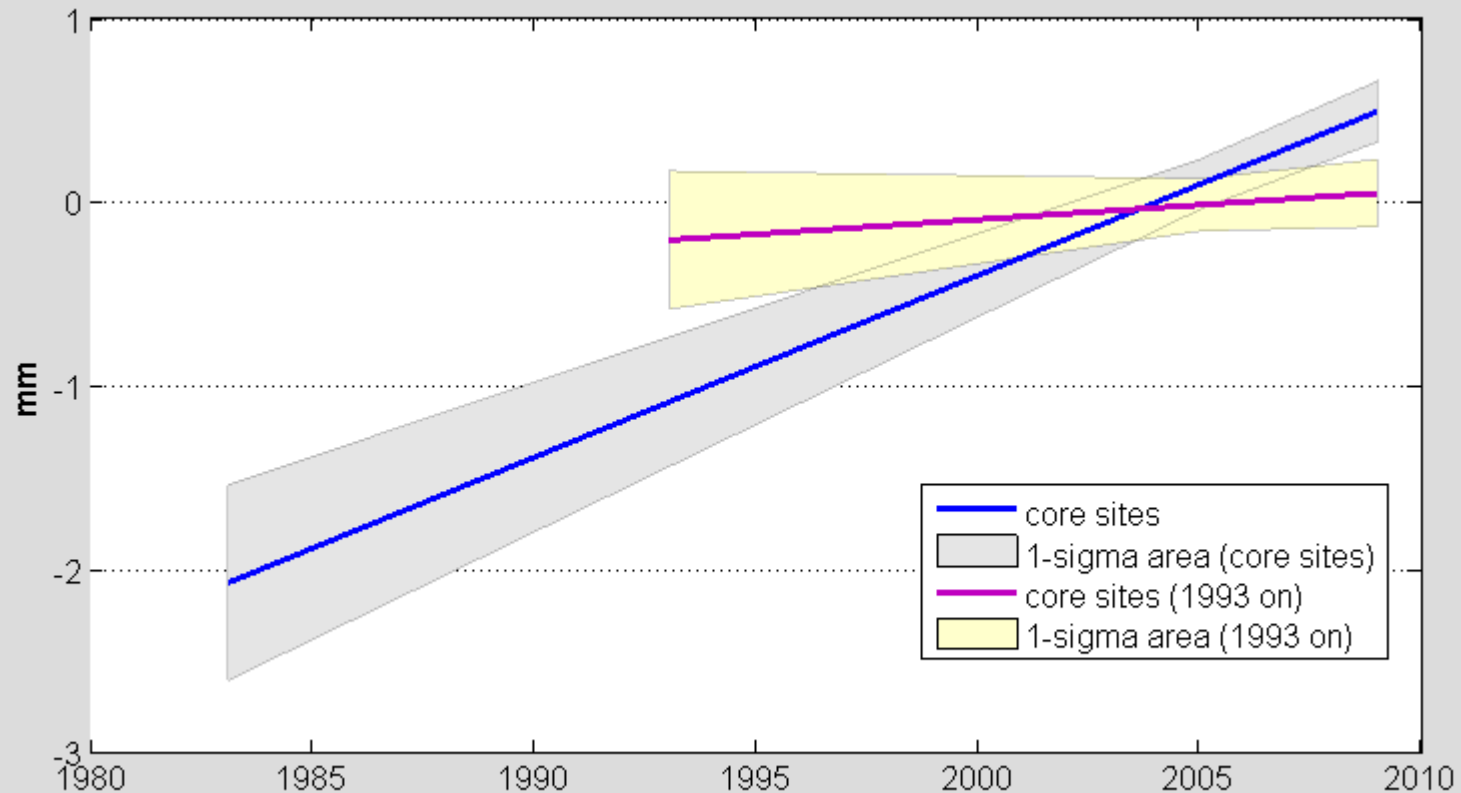


ITRF2005



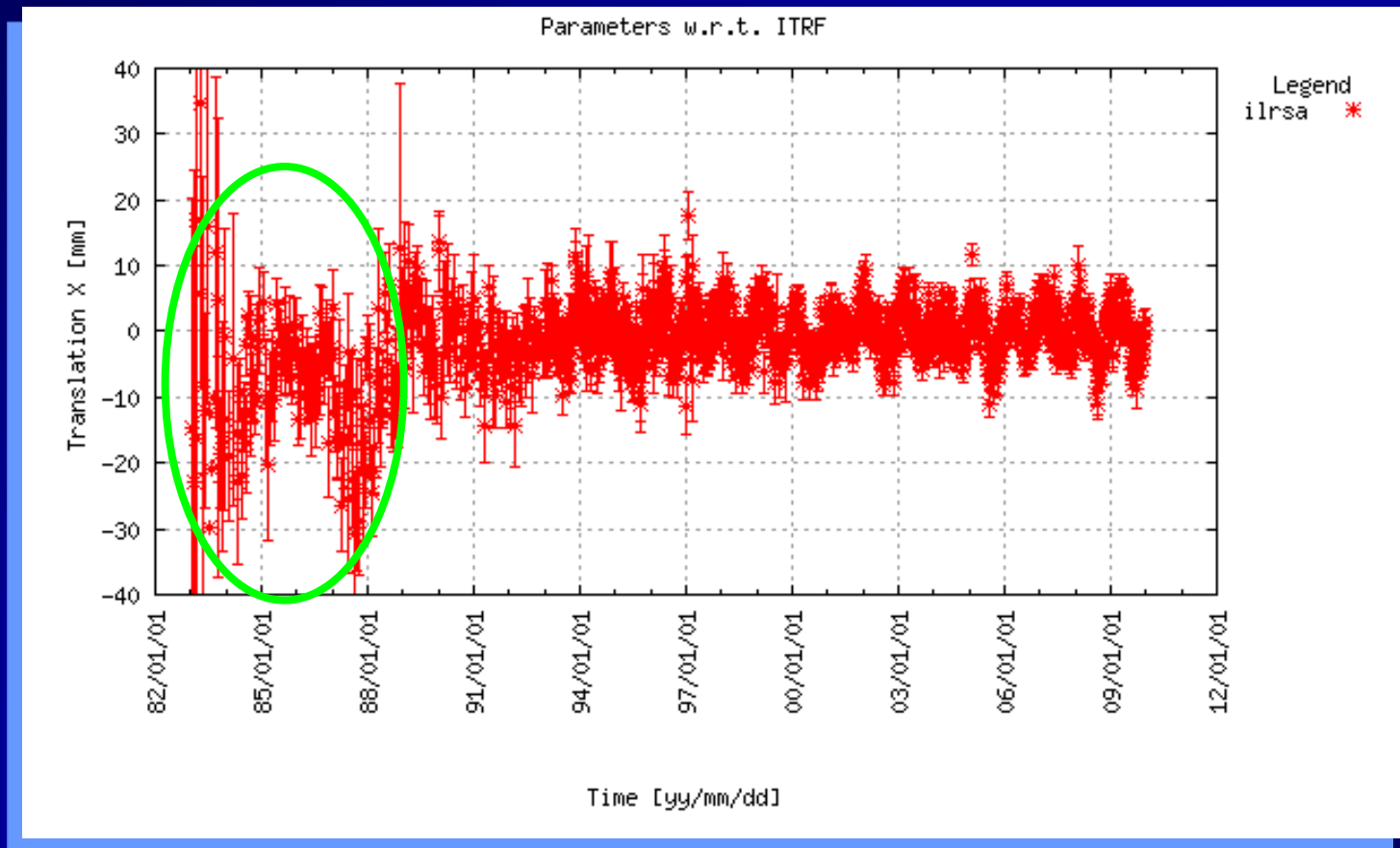
ITRF2008

ILRSA offset and rate to ITRF2008: TX



	Offset (mm)@2005	Slope (mm/y)
TX (1983-2009)	0.09 ± 0.14	0.10 ± 0.02

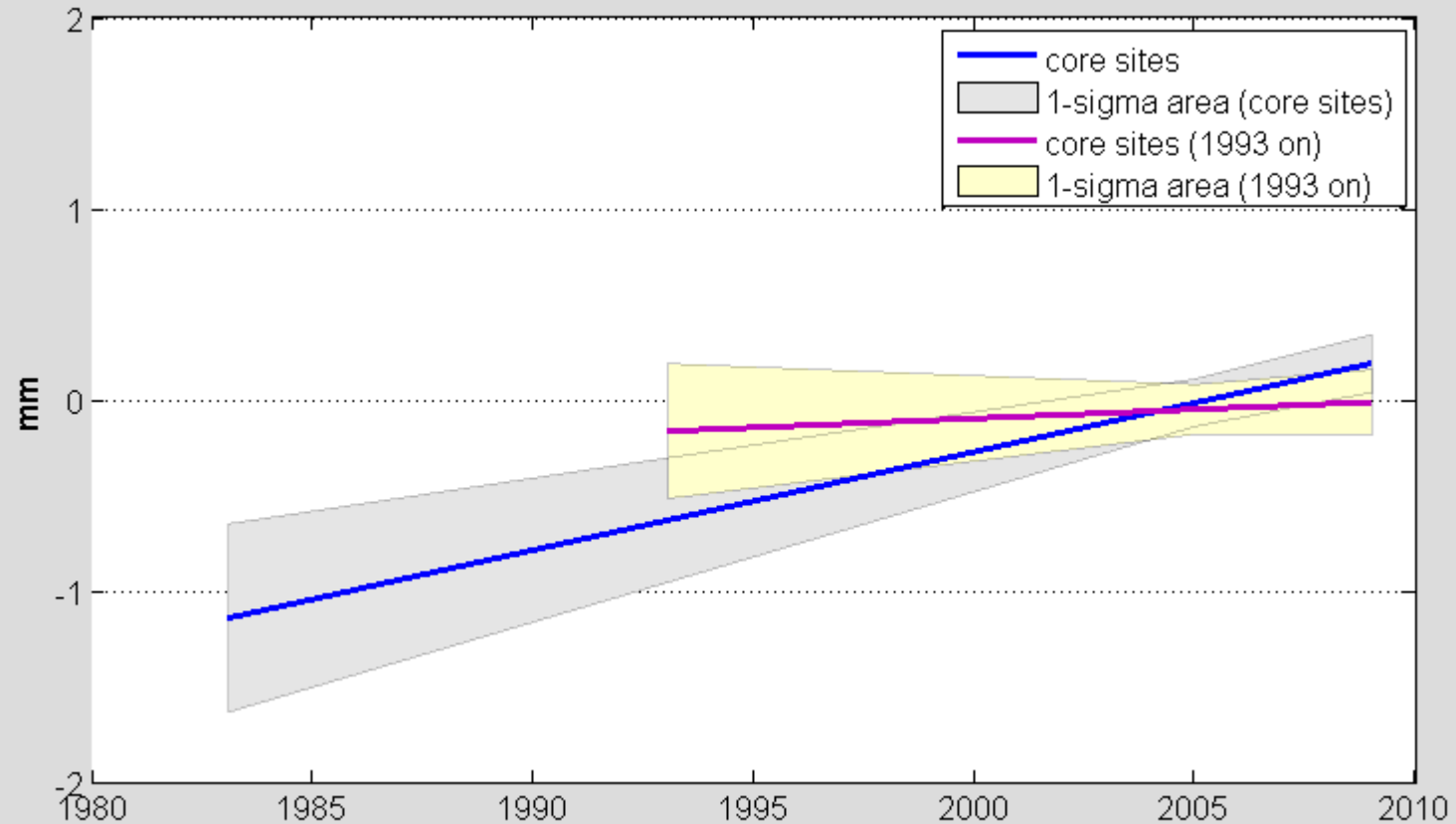
ILRSA X-Translation to ITRF2008



The translations have been estimated according to the following formula
$$\text{ITRF2008} = T + SF \cdot R \cdot AC$$

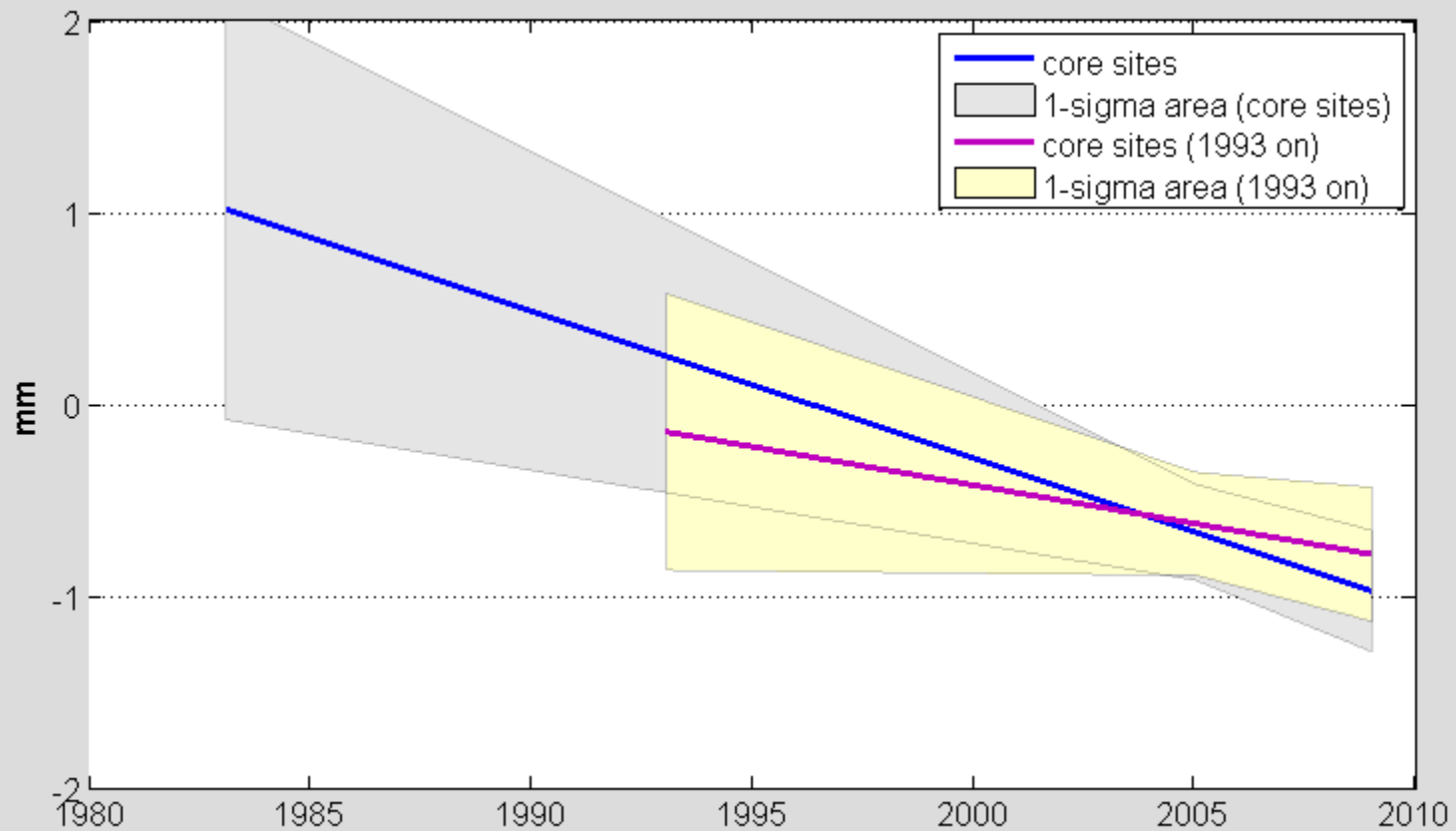
where T is the translation vector, SF the scale factor and R the rotation matrix.

ILRSA offset and rate to ITRF2008: TY



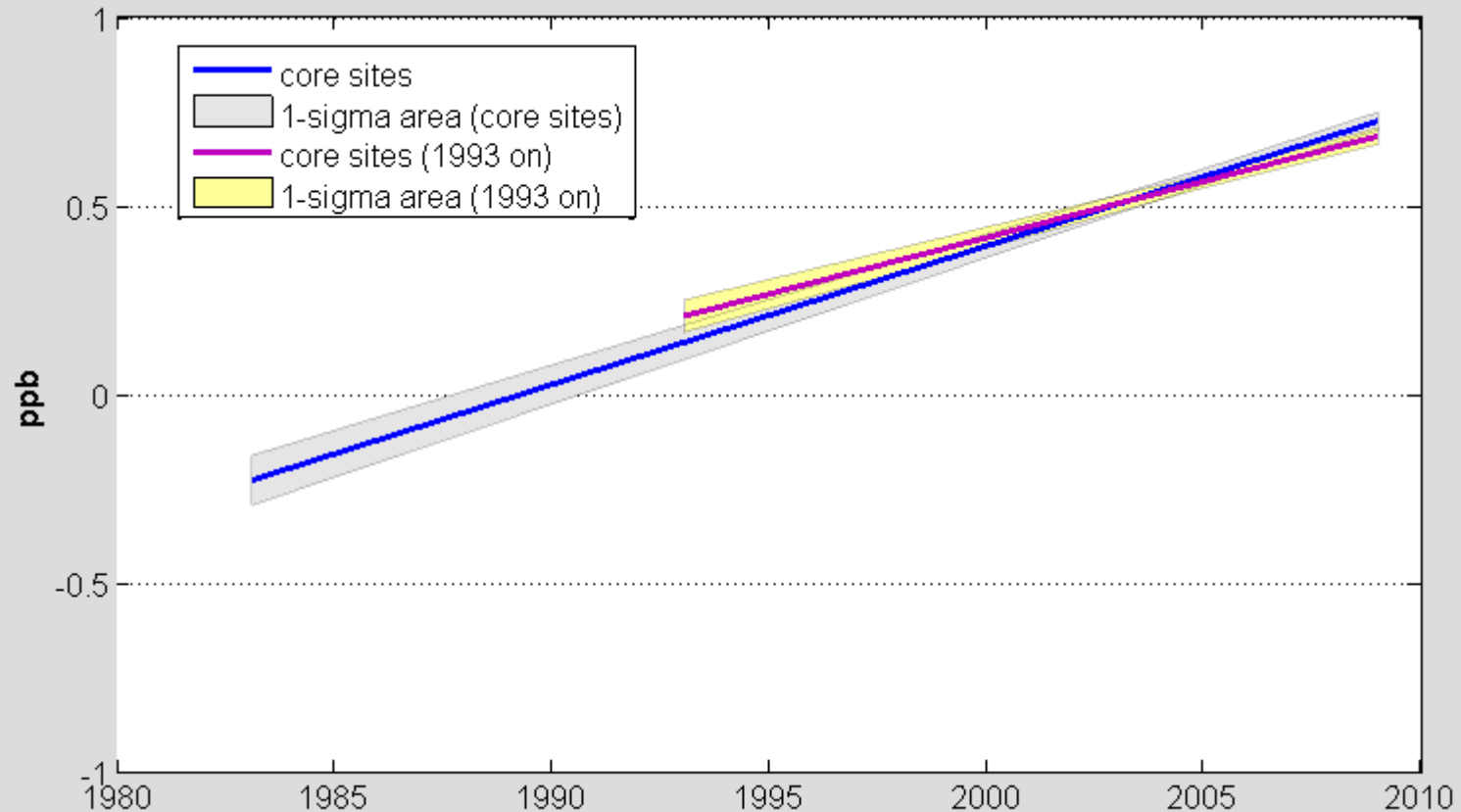
	Offset (mm)@2005	Slope (mm/y)
TY (1983–2009)	-0.01 ± 0.12	0.05 ± 0.02

ILRSA offset and rate to ITRF2008: TZ



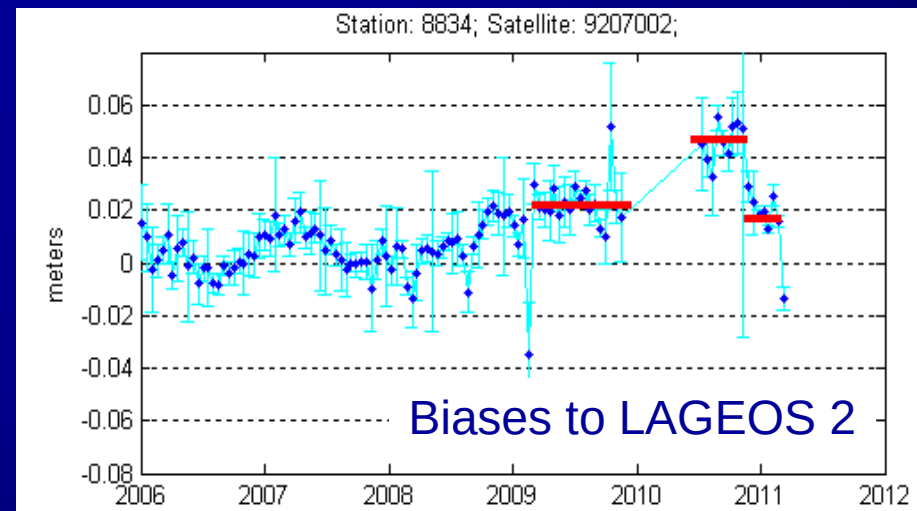
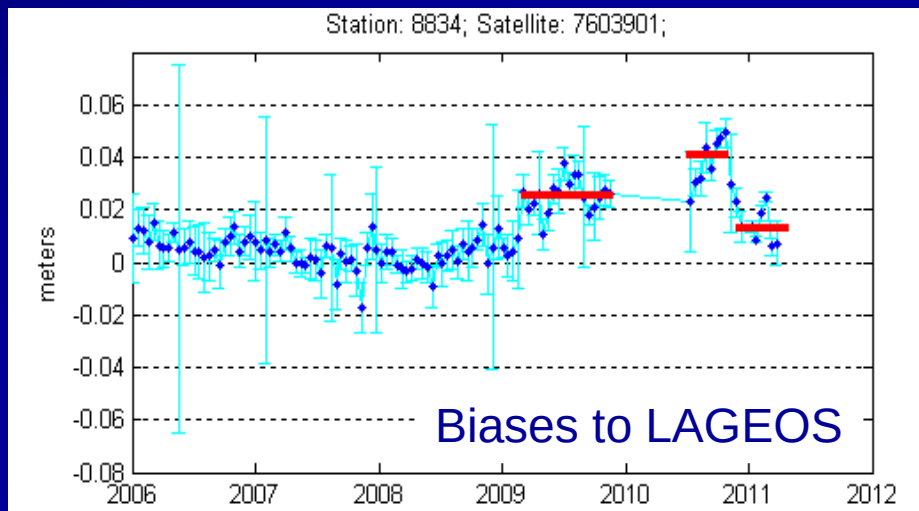
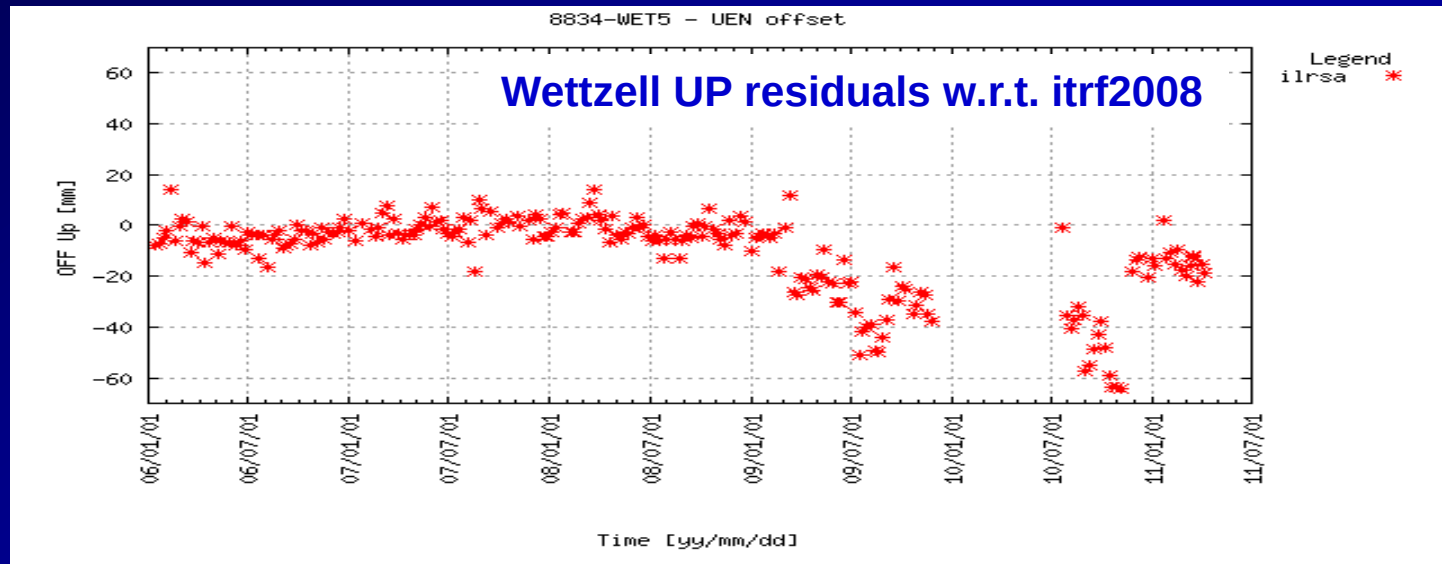
	Offset (mm)@2005	Slope (mm/y)
TZ (1983-2009)	-0.66 ± 0.25	-0.08 ± 0.05

ILRSA offset and rate to ITRF2008: Scale



	offset (ppb)@2005	Slope (ppb/y)
SC (1983-2009)	0.58 ± 0.02	0.04 ± 0.0

Never ending work....



Remarks

- ❑ The latest ILRS official product for ITRF2008 has adopted a common strategy to minimize the impact of the systemac errors in the single AC solutions (data handling sinex file available)
- ❑ The error monitoring is an ongoing work to keep the ILRS routine product to a high quality standard, in close contact with the site engineers

The update of the system change file, system configuration file and site log is essential