

SLR systematics and TRF scale



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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

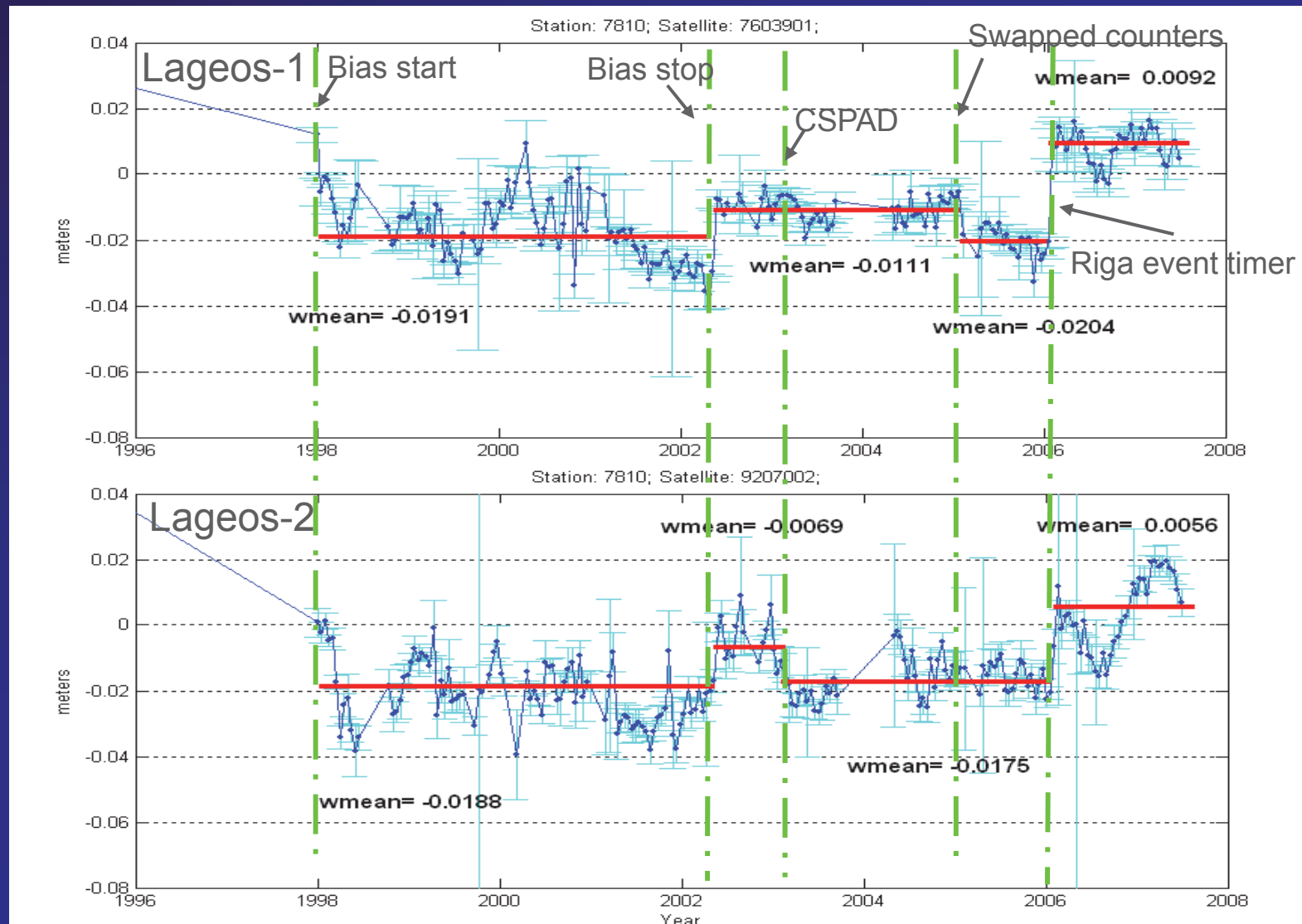
Rapid, daily QC analysis report from the ILRS ACs

Error time series estimated from a multi-year solution

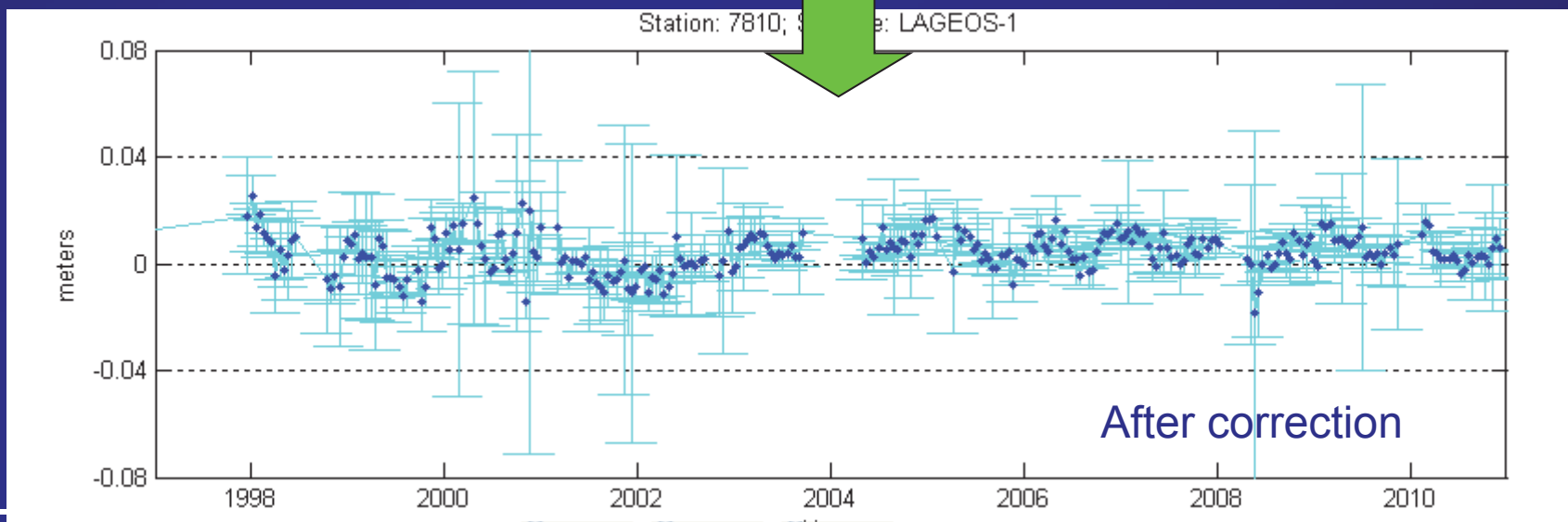
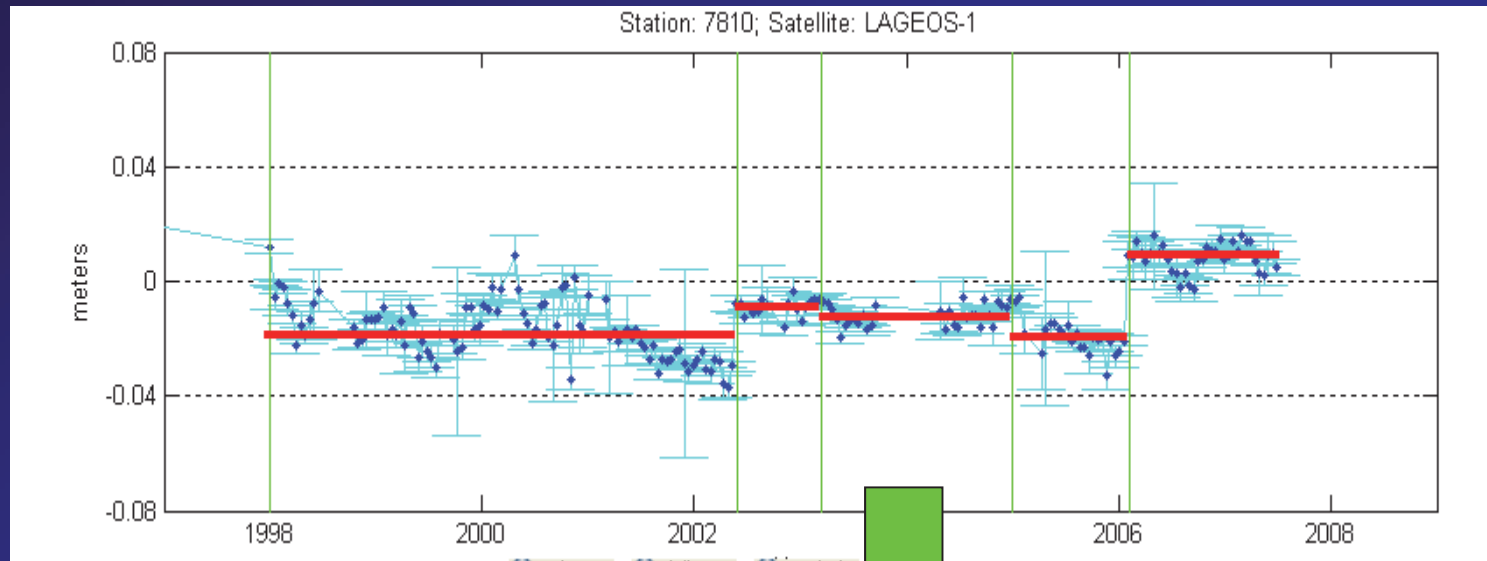
Using these sources of information, the AWG has defined:

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

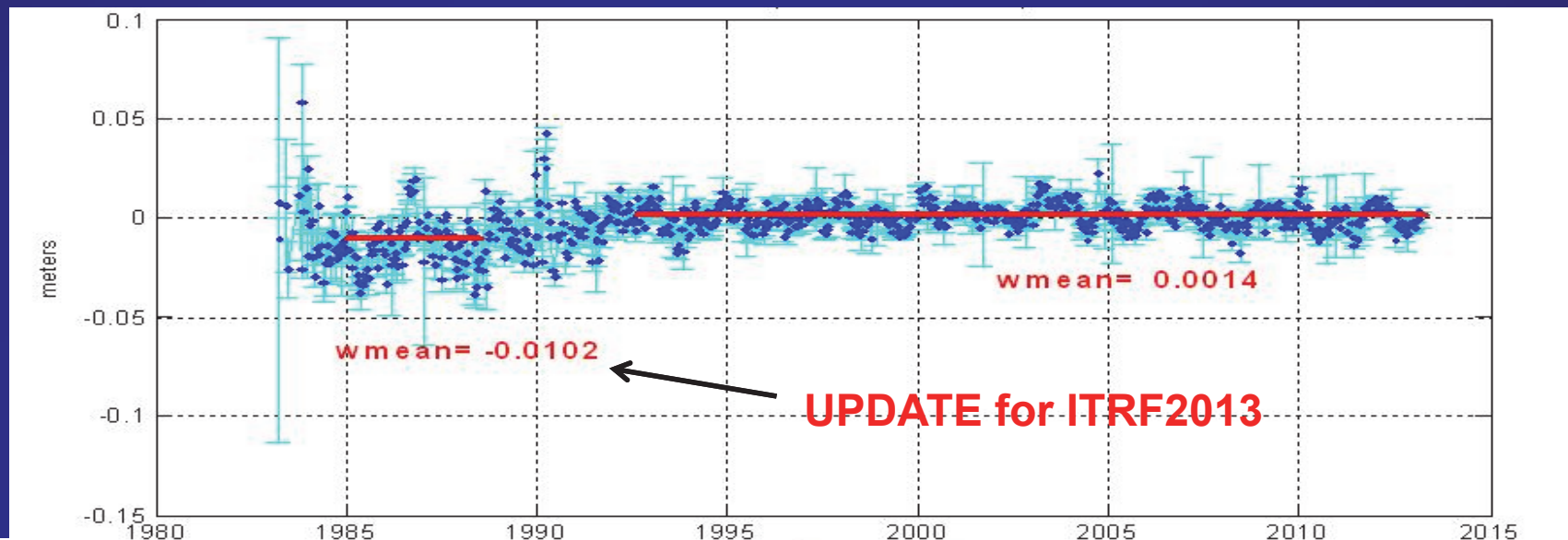
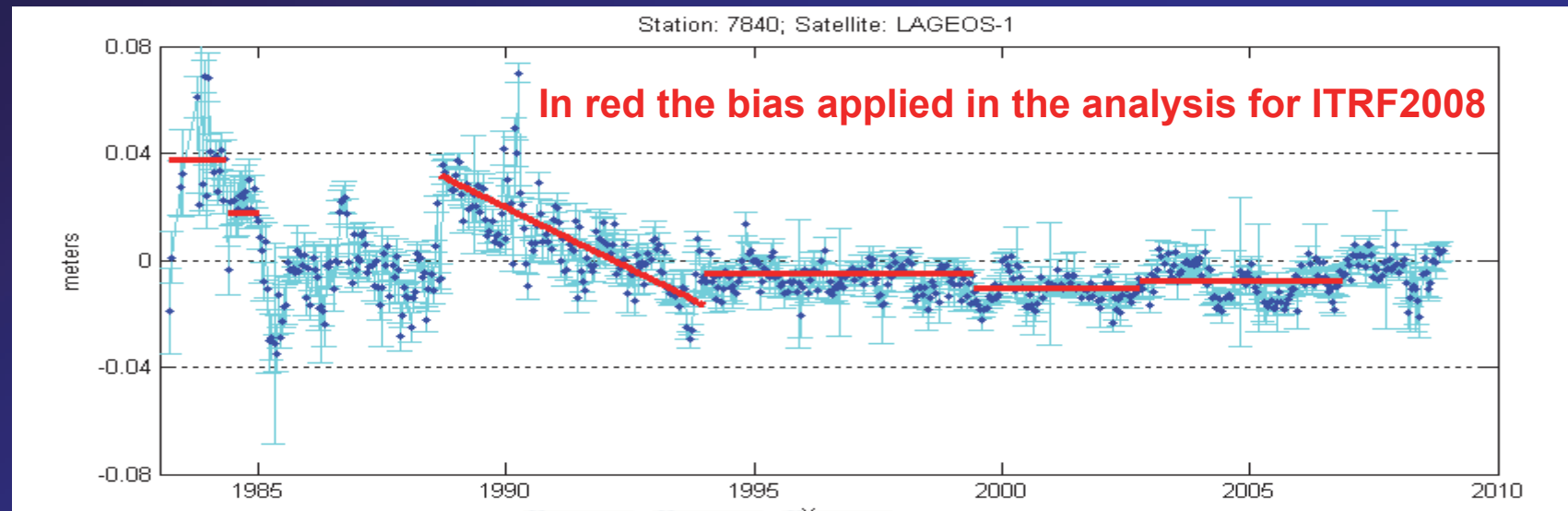
Zimmerwald biases



Zimmerwald biases

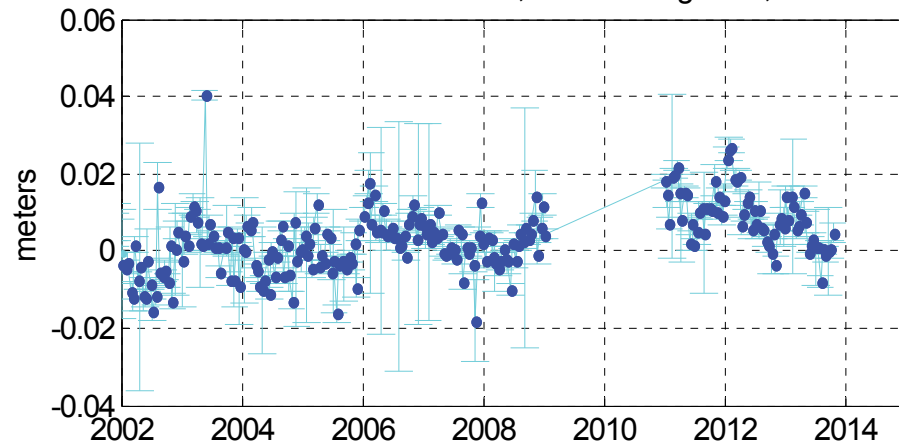


Herstmonceux biases



Routine error estimation

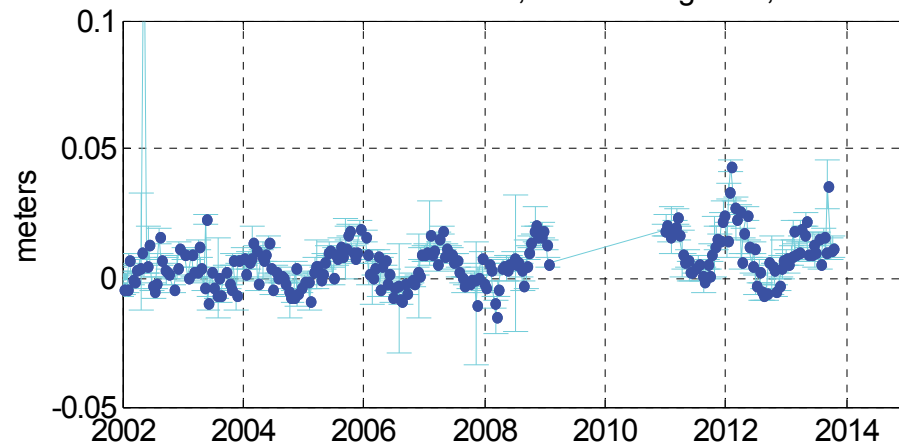
Station: Wettzell 8834; Satellite: Lageos-1;



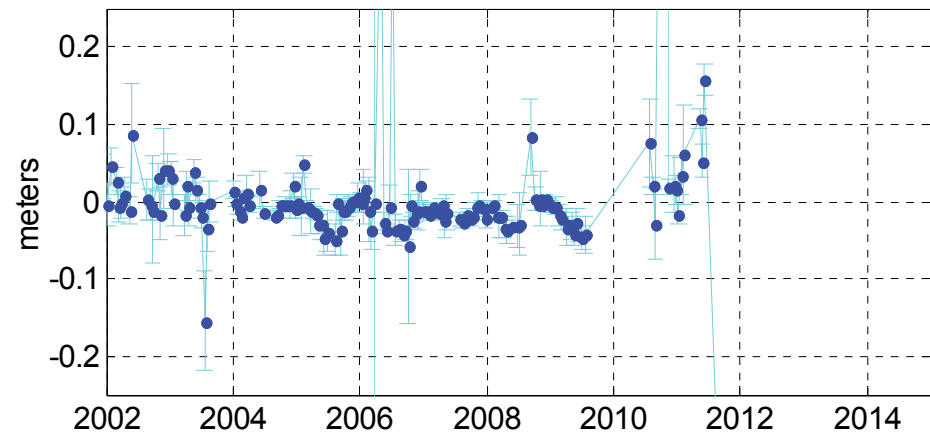
Active stations requiring estimation of a correction:

```
1864 --- mm  A 00:000:00000 00:000:00000
1868 --- mm  A 00:000:00000 00:000:00000
7249 --- mm  A 12:067:00000 00:000:00000
7308 --- mm  A 00:000:00000 00:000:00000
7403 --- mm  A 10:265:00000 00:000:00000
7820 --- mm  A 12:001:00000 00:000:00000
7821 --- mm  A 09:148:00000 10:069:00000
8834 --- mm  A 10:319:00000 00:000:00000
```

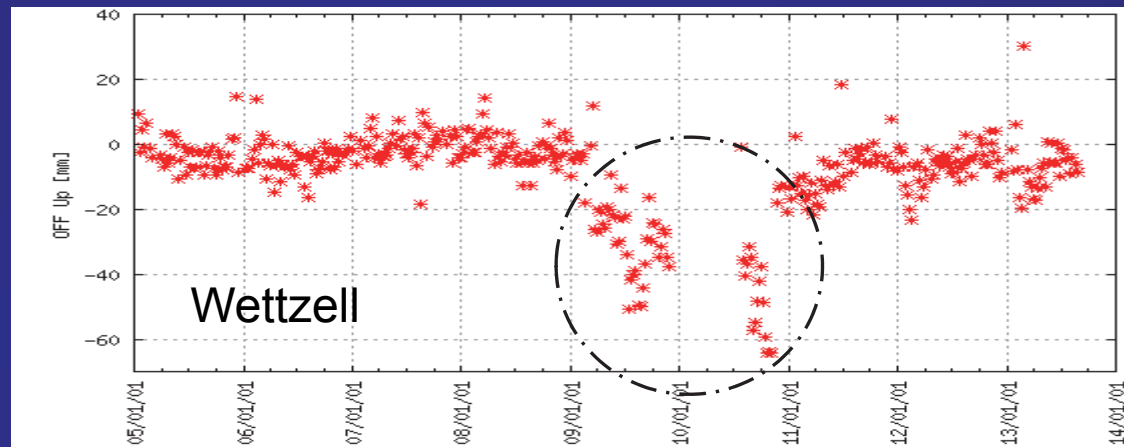
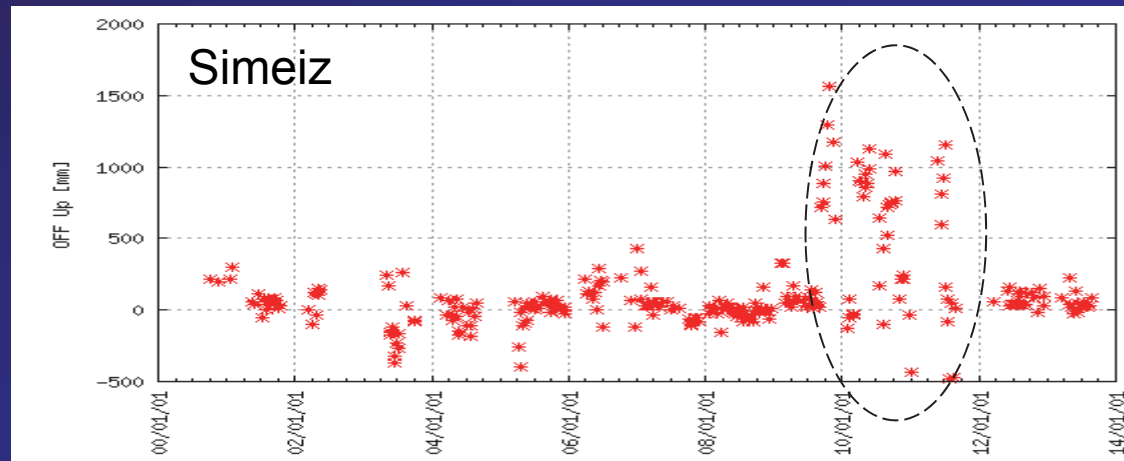
Station: Wettzell 8834; Satellite: Lageos-2;



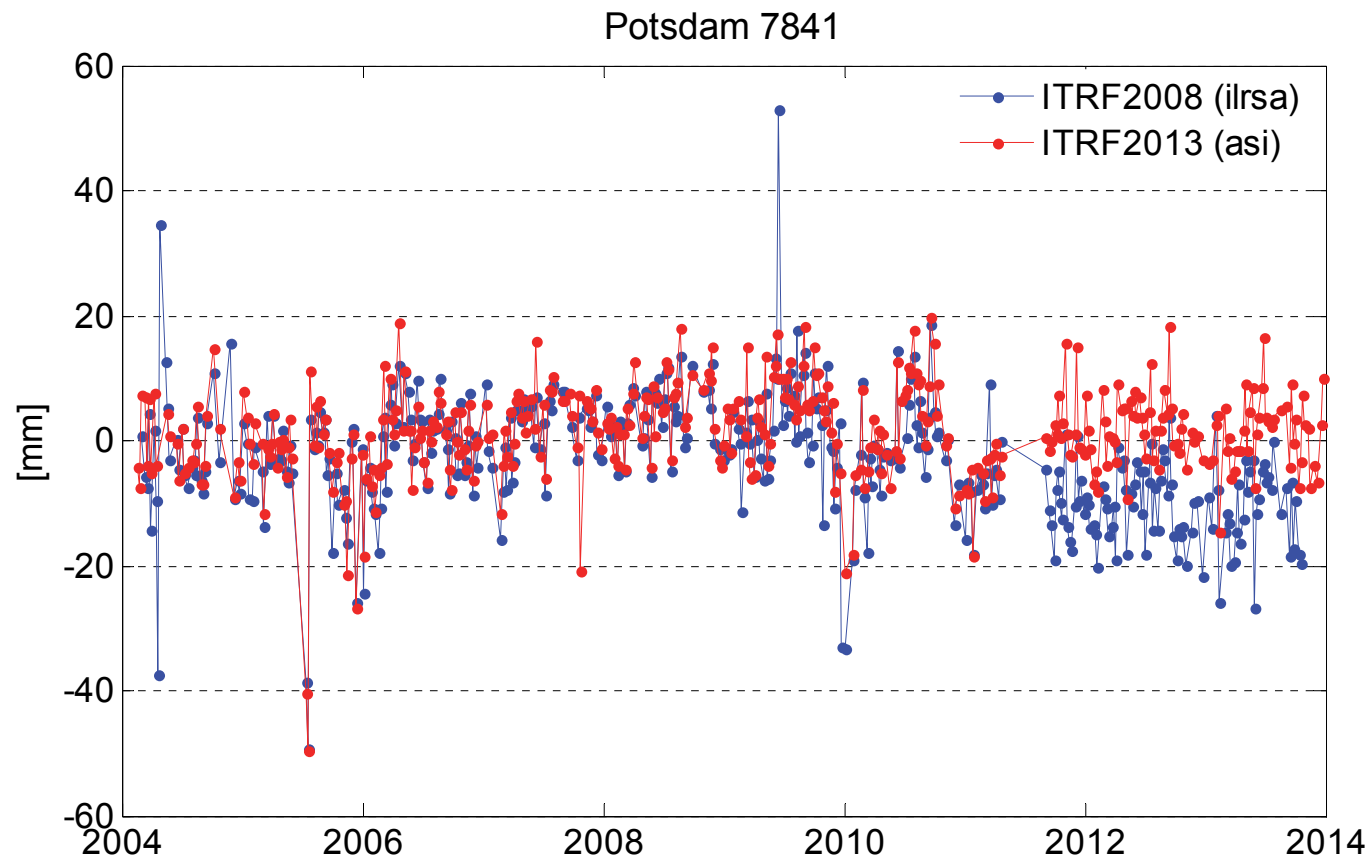
Station: Beijing 7249; Satellite: Lageos-2;



Unrecoverable errors



Apparent systematic errors



ILRS AWG data handling file

```
=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 <m 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 subtracted 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
```

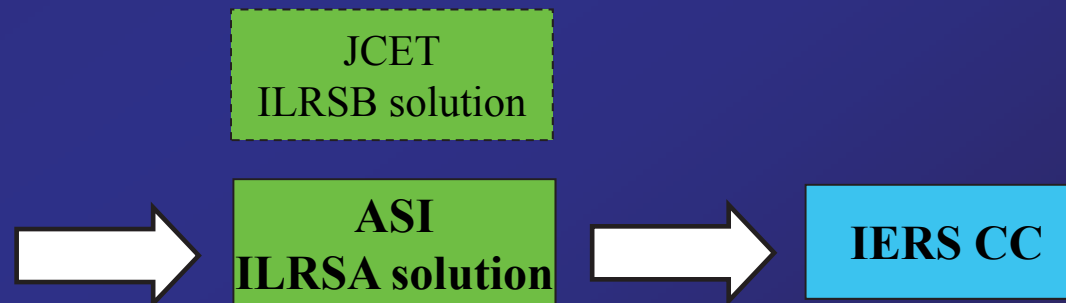
Available on the ILRS website



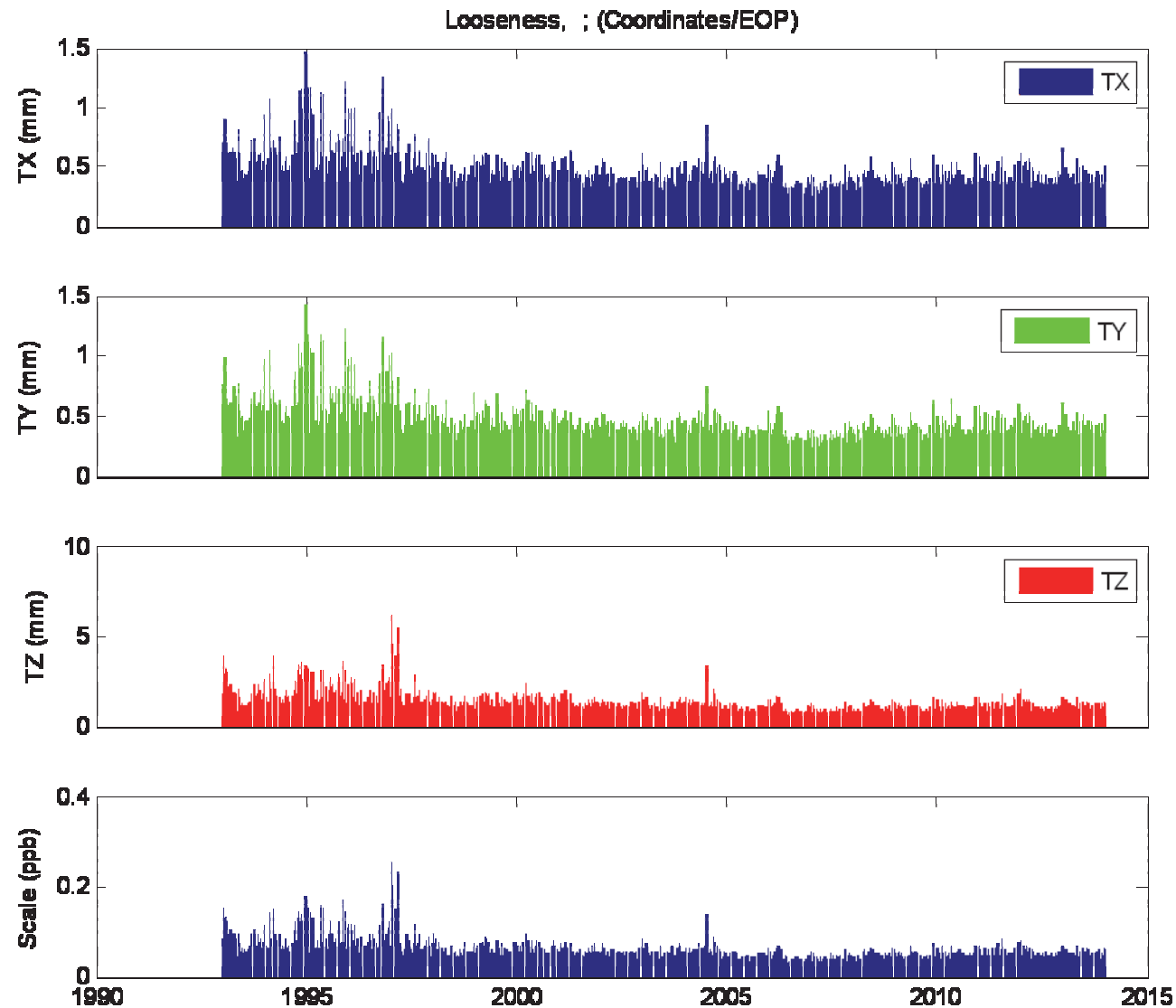
The ILRS contribution to ITRF

- The ILRS contribution to ITRF2013 will be a time series of loose solutions containing SSC and EOP, from 1983.0 to 2014.0. 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**

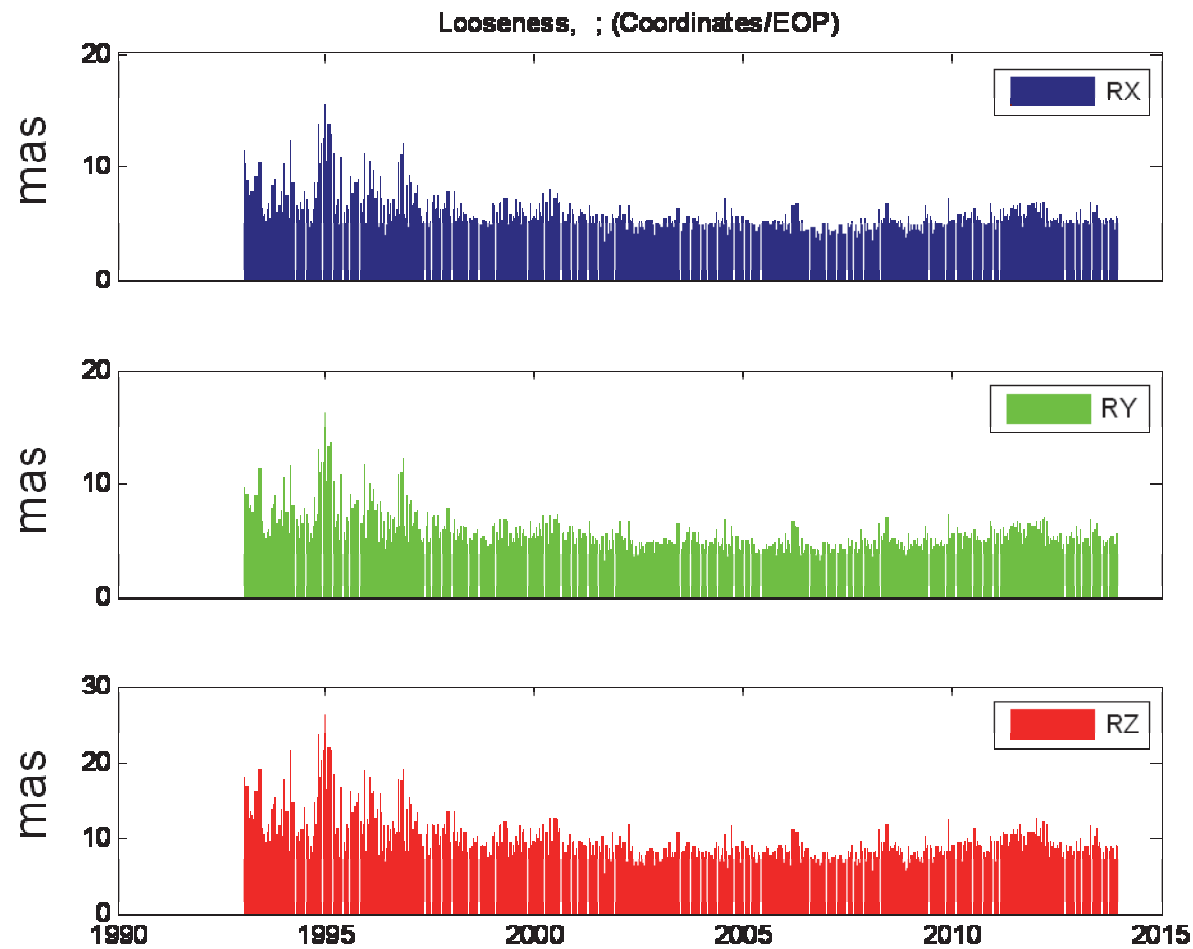
AC	Period
ASI	1983.0 -2014.0
BKG	1993.0 -2014.0
DGFI	1983.0 -2014.0
ESA	1983.0 -2014.0
GFZ	1983.0 -2014.0
GRGS	1993.0 -2014.0
JCET	1983.0 -2014.0
NSGF	1983.0 -2014.0



SLR sensitivity to the TRF datum

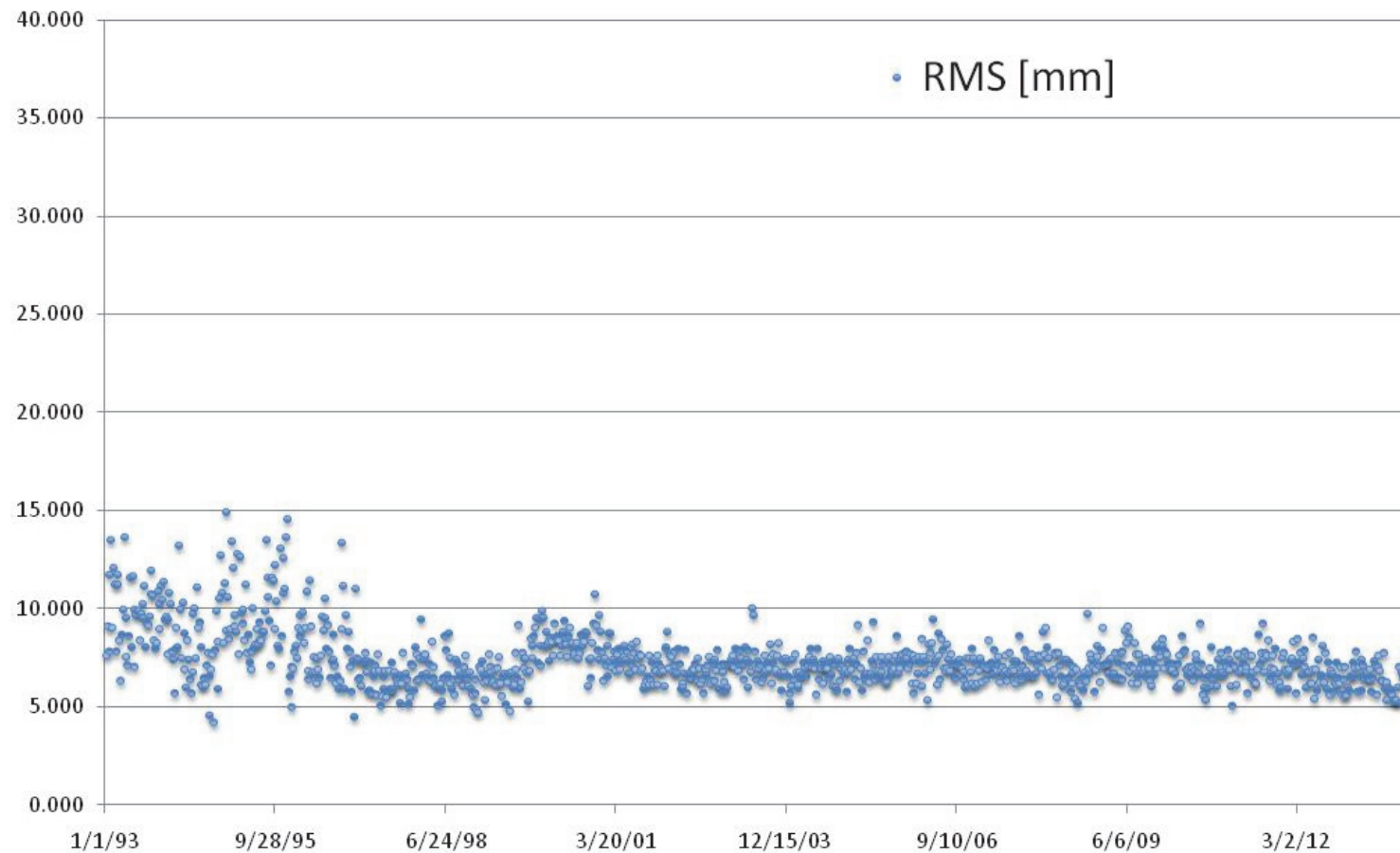


Looseness of the SLR solutions

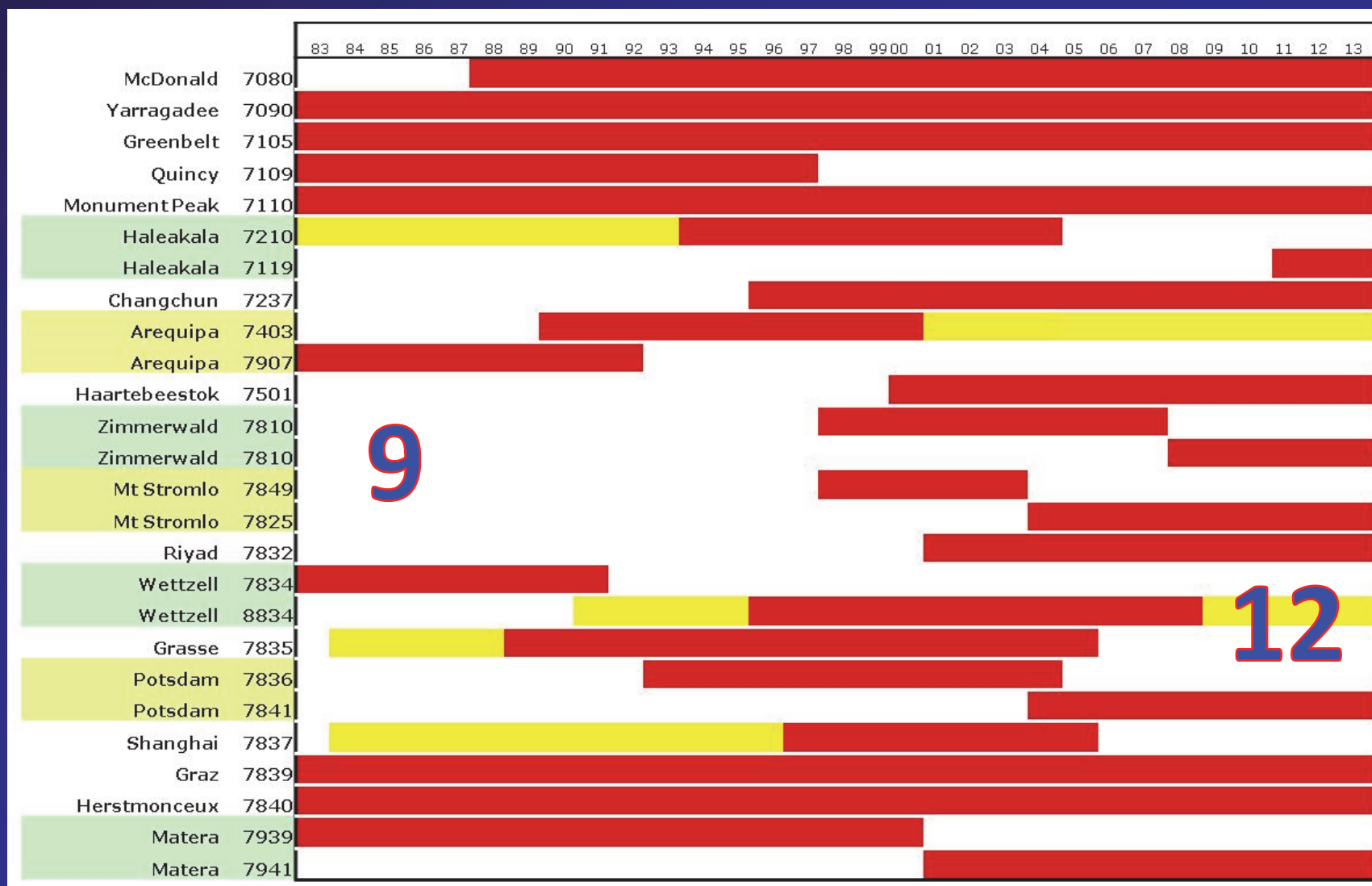


ITRF2013 Reanalysis SINEX RMS

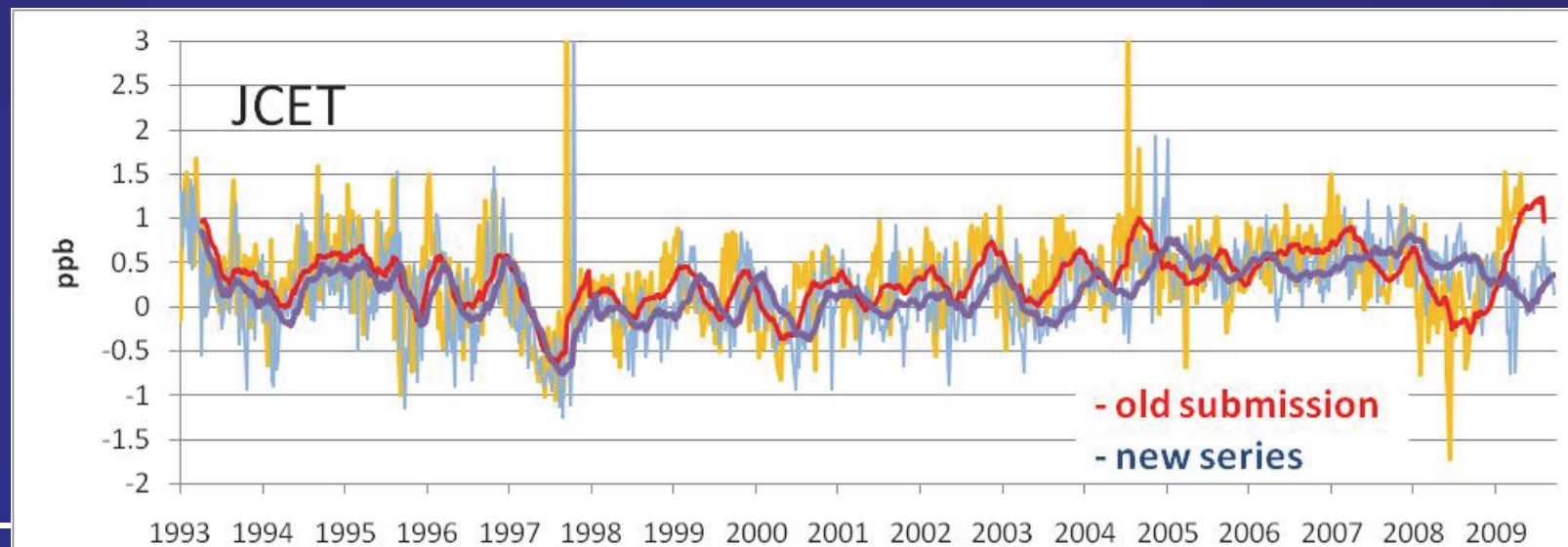
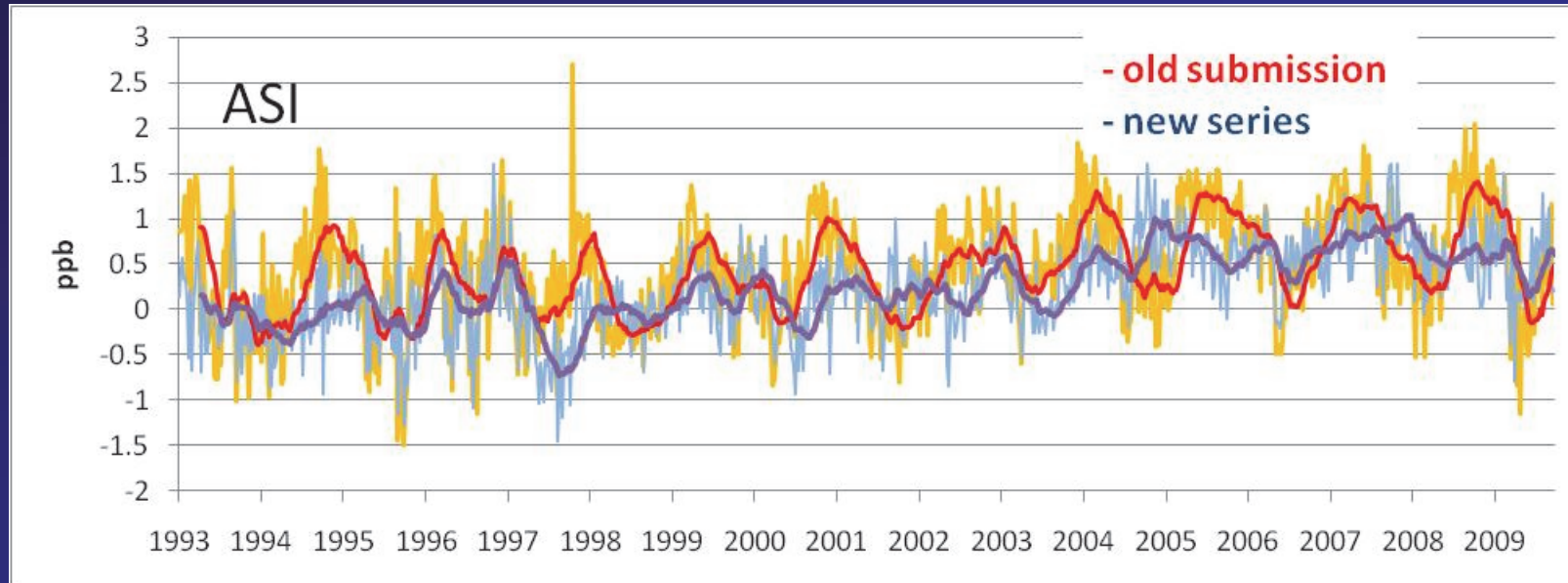
7^d Arc JCET SINEX RMS [mm]



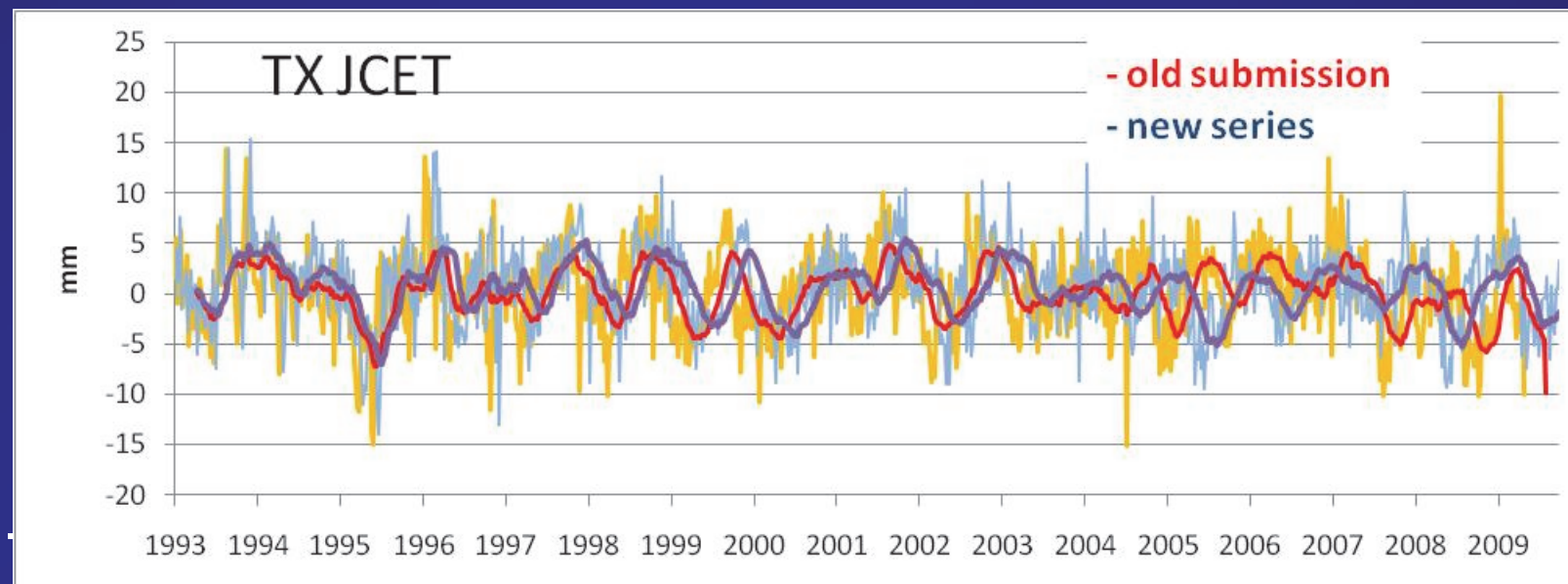
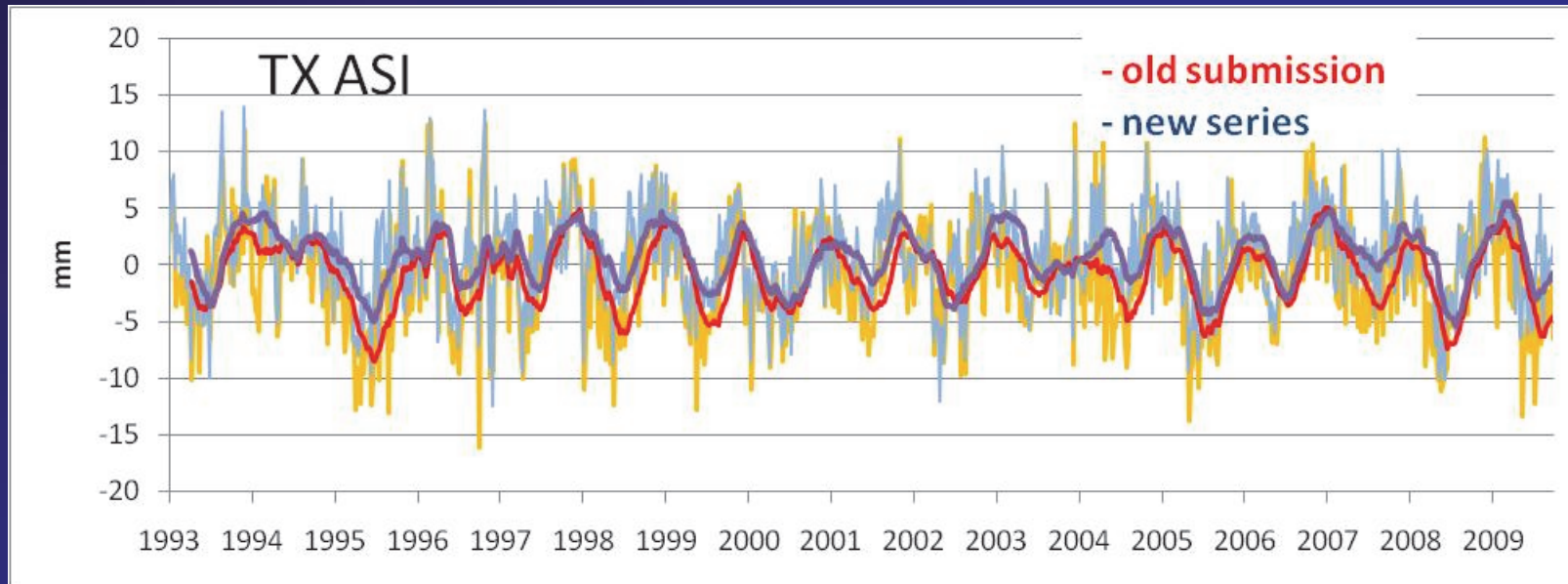
Core sites



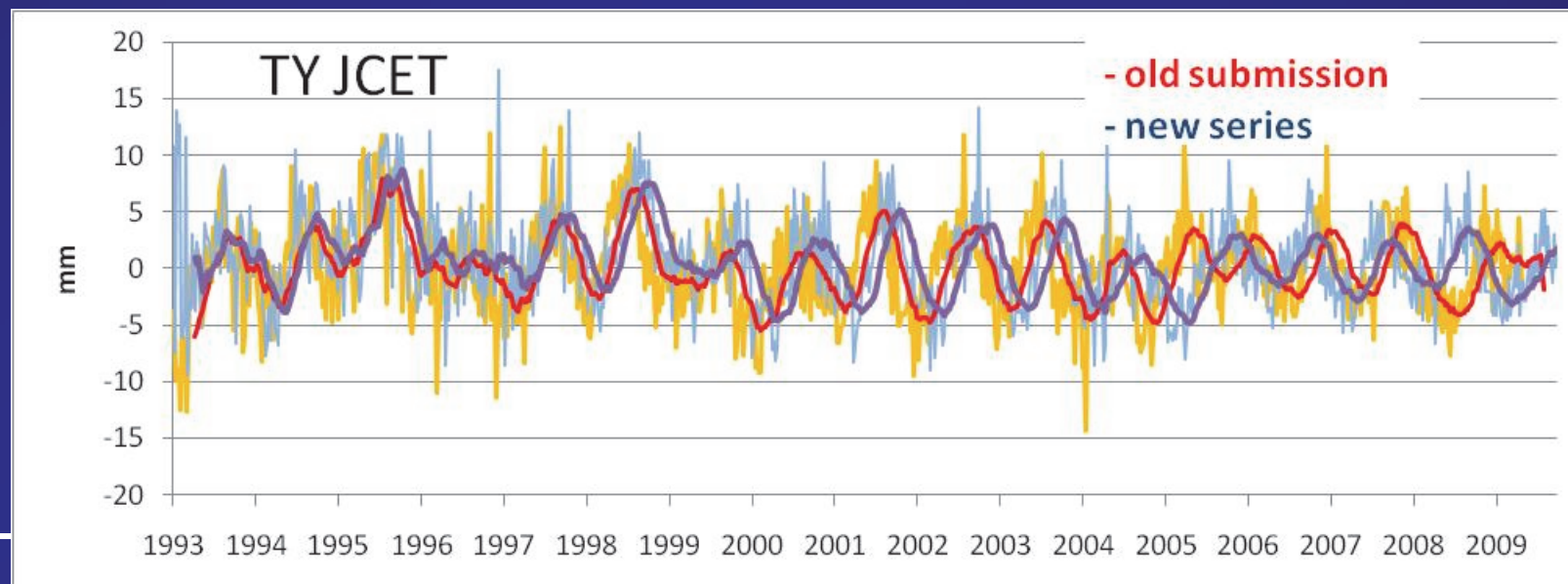
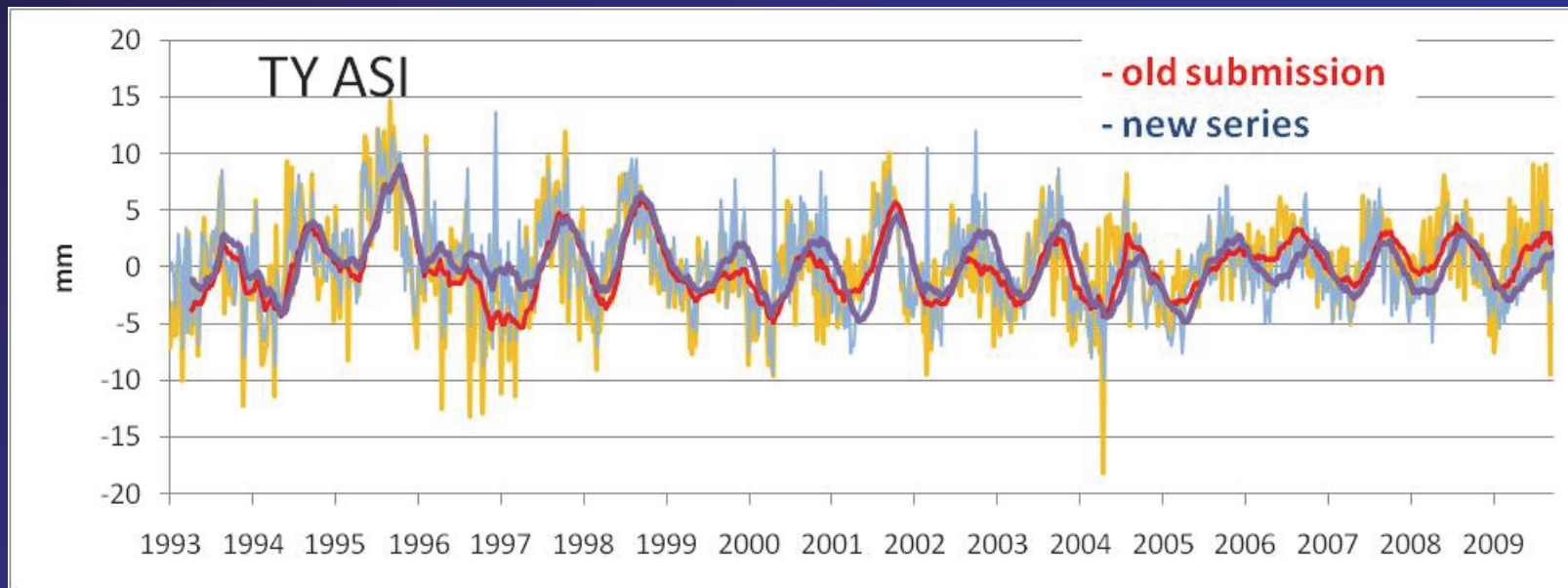
Preliminary single AC Scale to ITRF2008



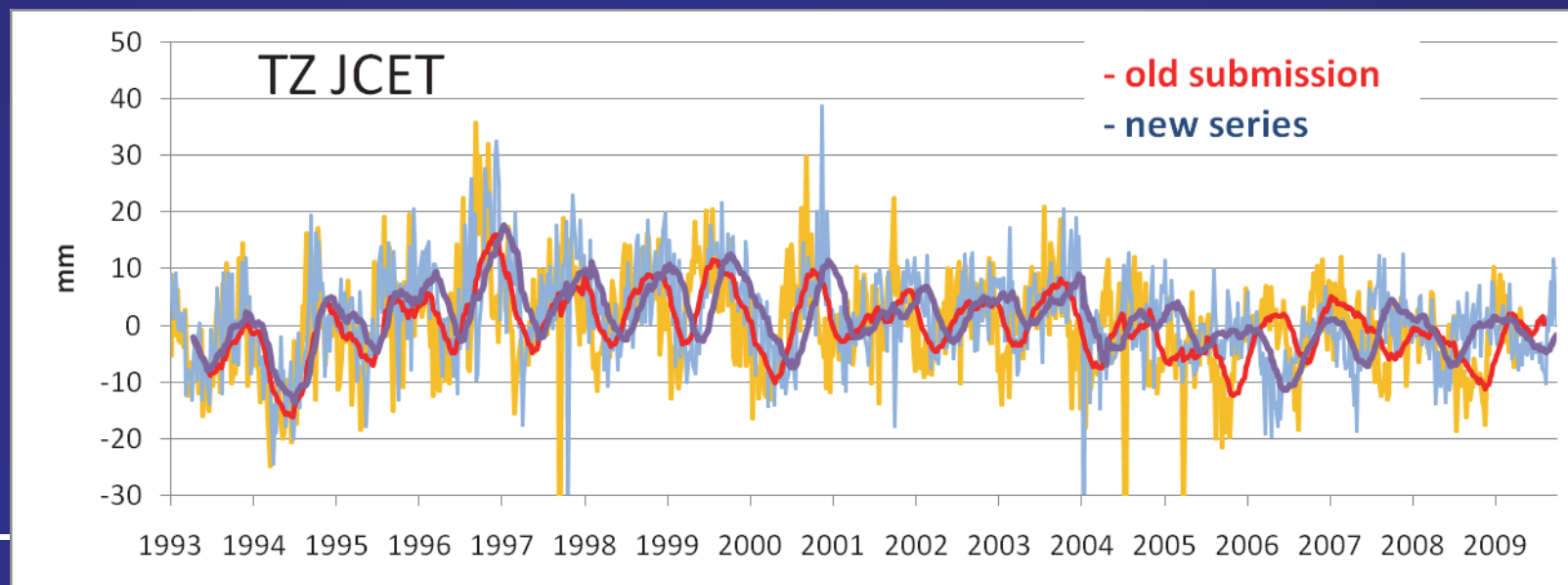
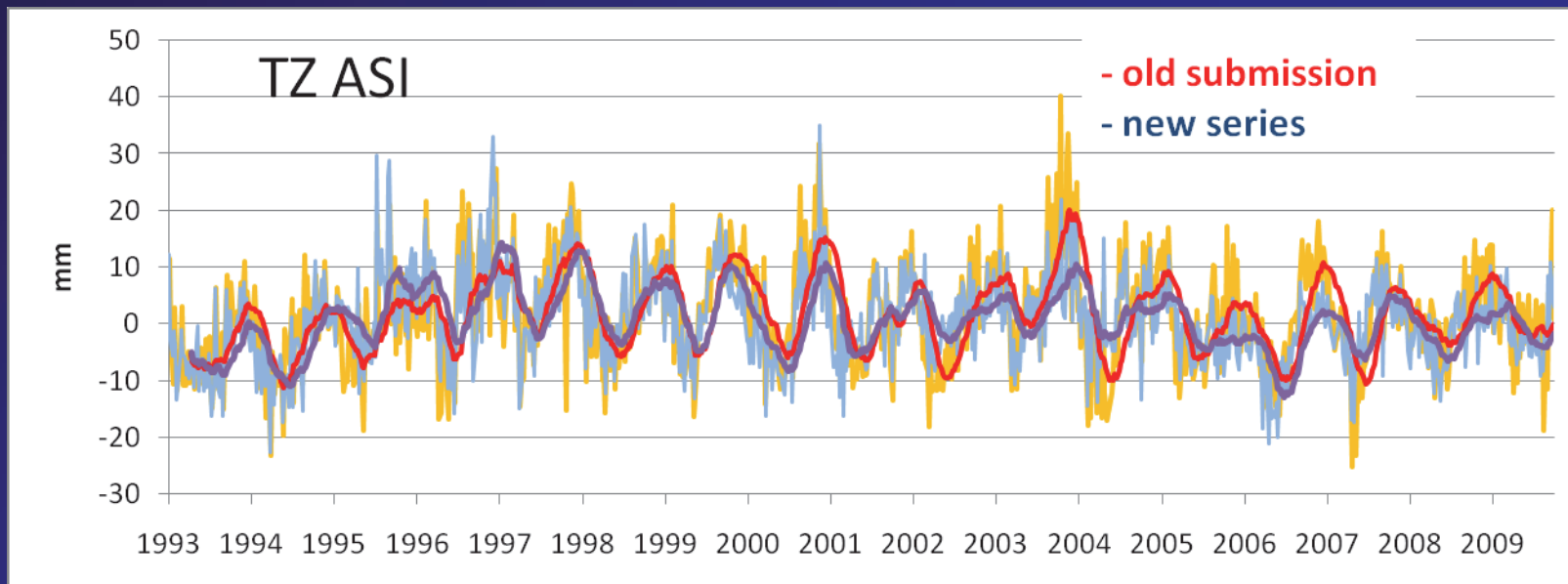
Preliminary single AC origin to ITRF2008



Preliminary single AC origin to ITRF2008



Preliminary single AC origin to ITRF2008



Remarks and future perspective

- ❑ The systematic error monitoring is an ongoing work to keep the ILRS routine product to a high quality standard, in close contact with the site engineers
- ❑ A pilot project will soon start to verify a robust and reliable estimate of coordinates and systematic errors in the routine weekly products
- ❑ The generation of systematic errors time series for each station as a standard ILRS product is under evaluation within the ILRS AWG