

Lessons from ITRF2005 & Post Analysis



Zuheir Altamimi
ITRS PC



Lessons from ITRF2005

- **Datum Definition**
 - Origin
 - Scale
 - No Net Rotation Condition (not discussed here!)
- **Technique-Specific Problems**
- **EOPs**
- **Velocity agreement btw techniques**

Datum Specification (ITRF2005)

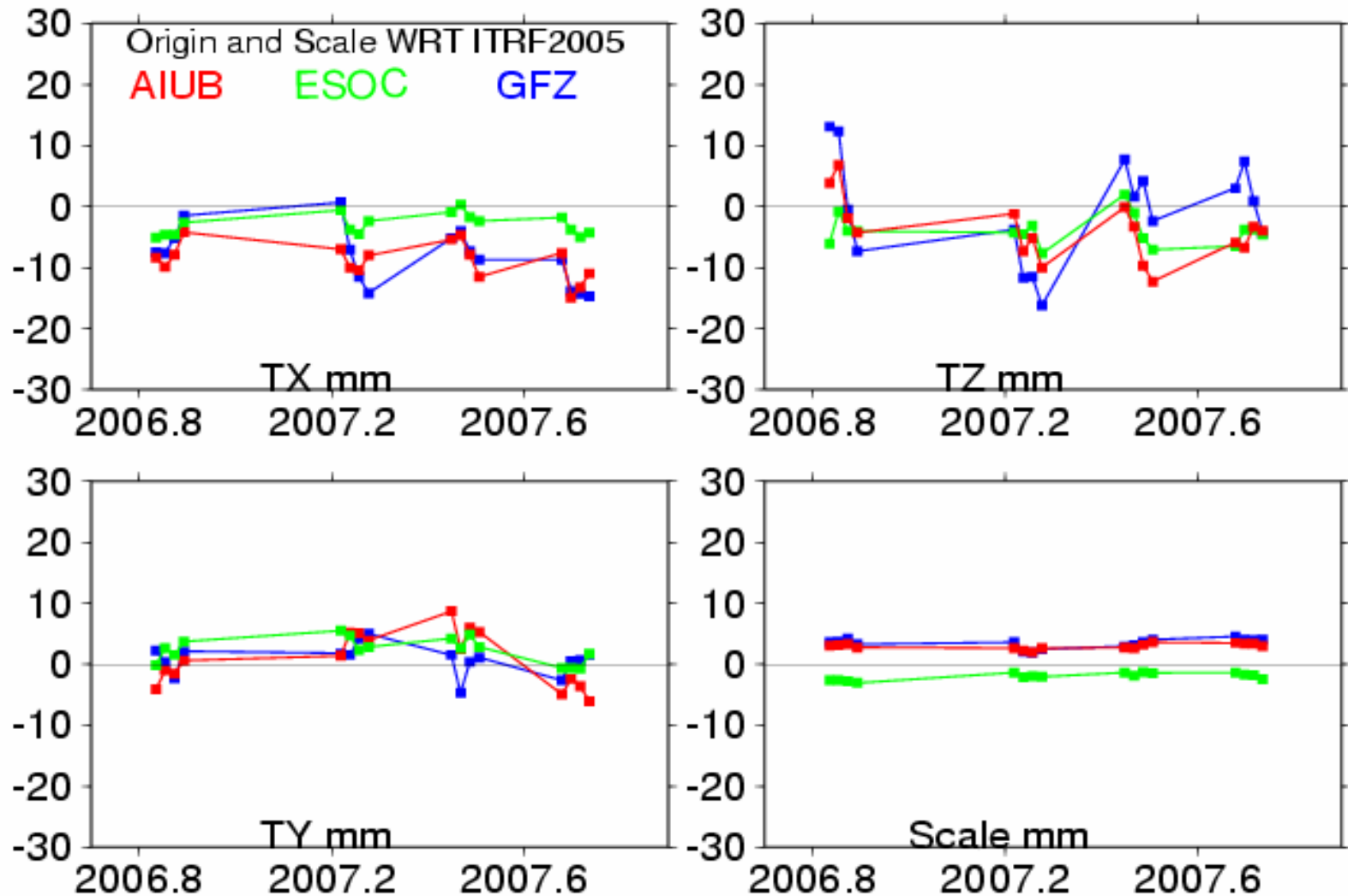
- **Origin:**
 - No net translation & rates btw ITRF2005 and ILRS/SLR time series (13 years)
 - Seasonal "Apparent Geocenter Motion" removed via estimation of translation components
- **Scale:**
 - No net scale & rate btw ITRF2005 and IVS/VLBI time series (26 years)
 - Biased by 0.5 ppb due to non-zero pole tide correction not applied by IVS for ITRF2005 submission
 - Consider SLR back after ILRS reprocessing
- **Orientation and rate:**
 - No net rotation and rate btw ITRF2005 and ITRF2000

Origin & Scale from GPS and DORIS ?

- What are the limiting factors ?
- How to mitigate these factors ?
- For both GPS and DORIS, the Z-component seems to be the most scattered
- Should we forget for ever to have reliable origin and scale from both techniques?

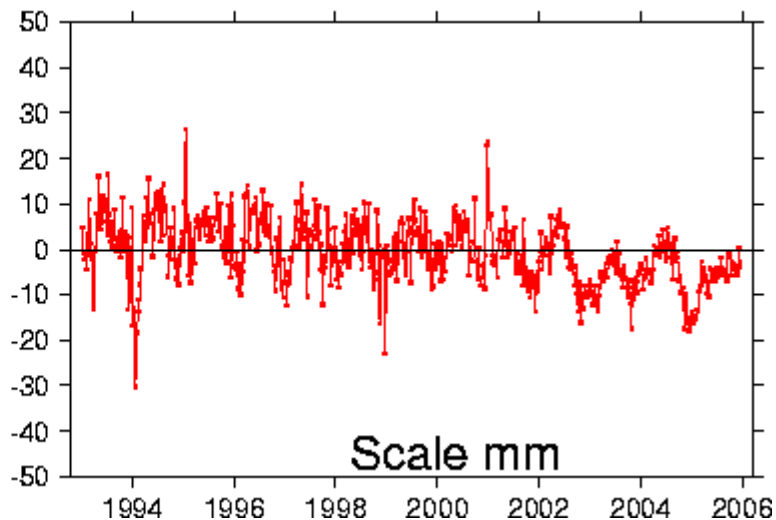
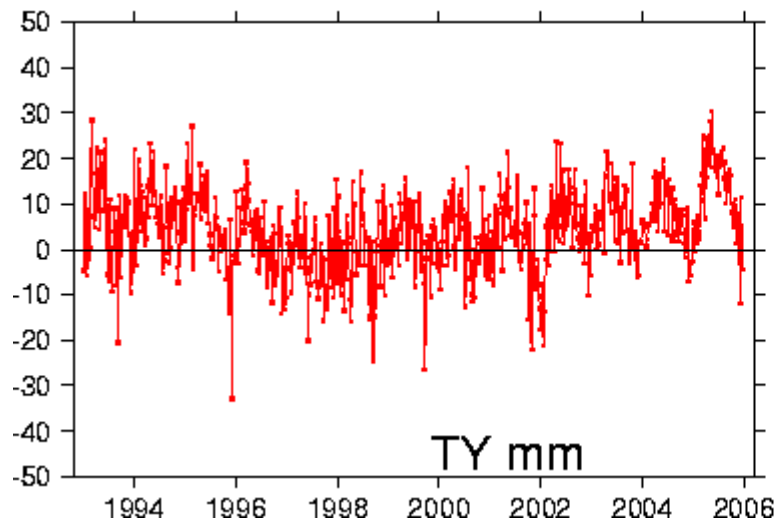
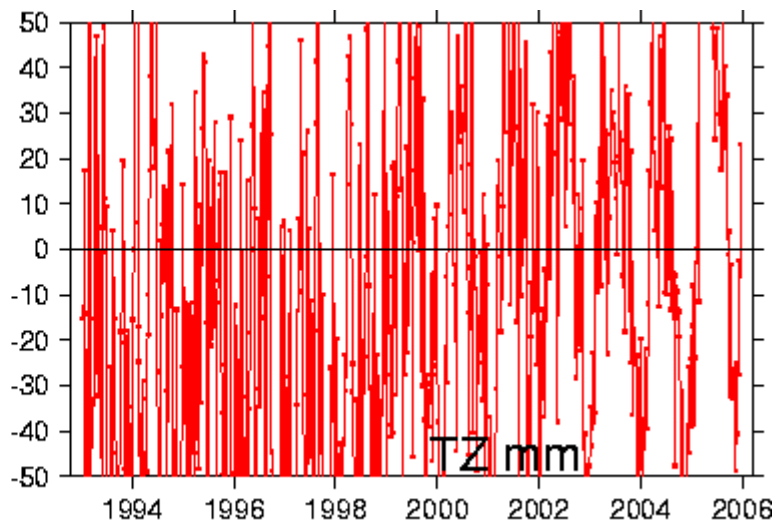
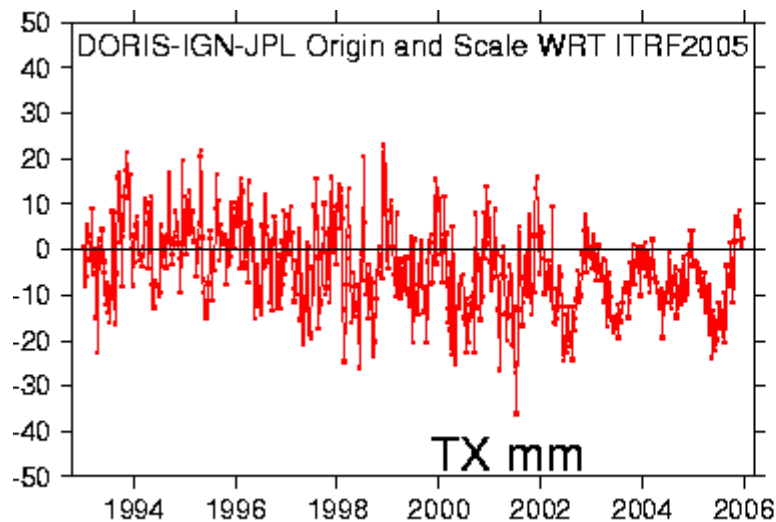
Origin & Scale from GPS ?

GGSP Experience

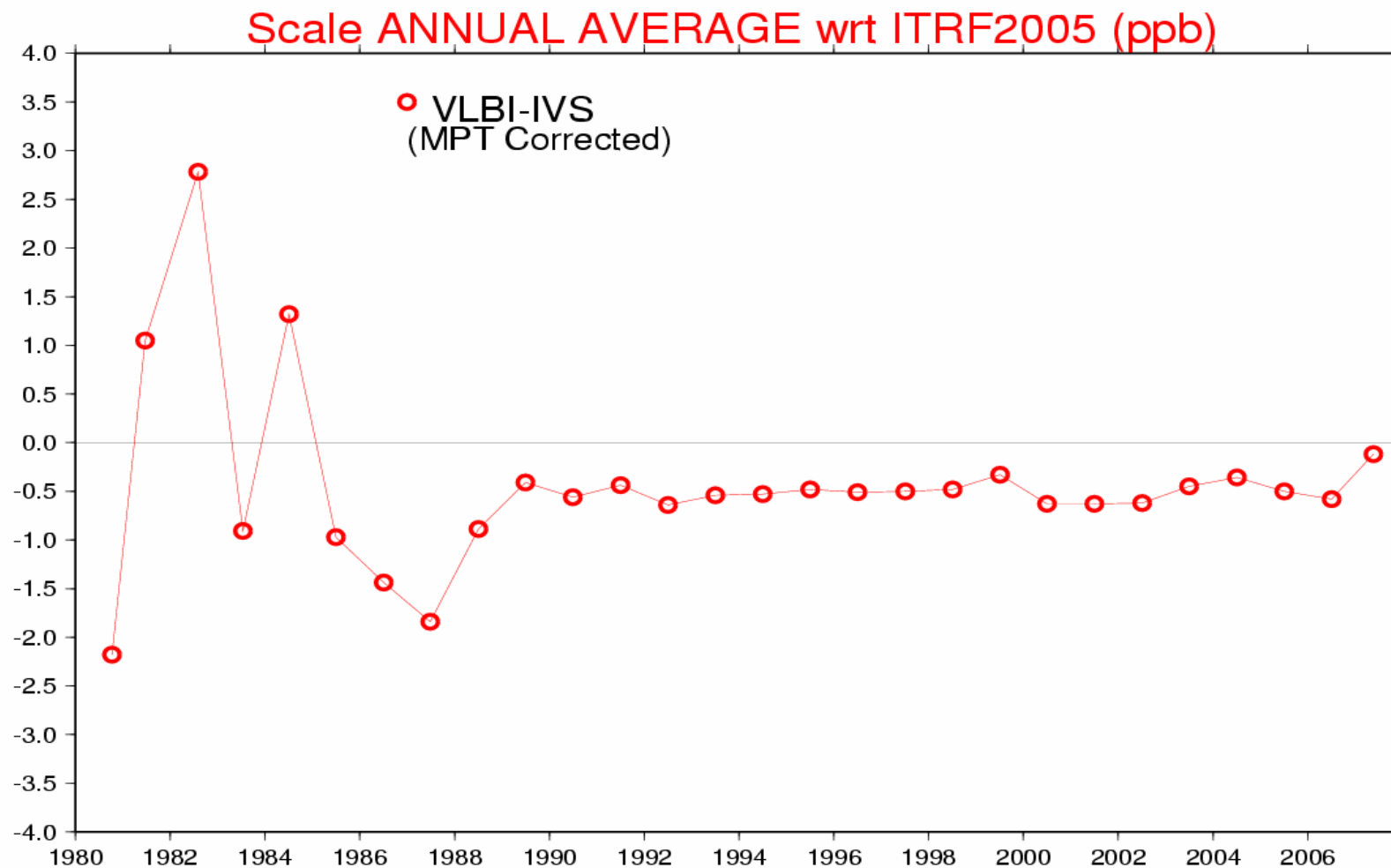


DORIS Origin and Scale WRT ITRF2005

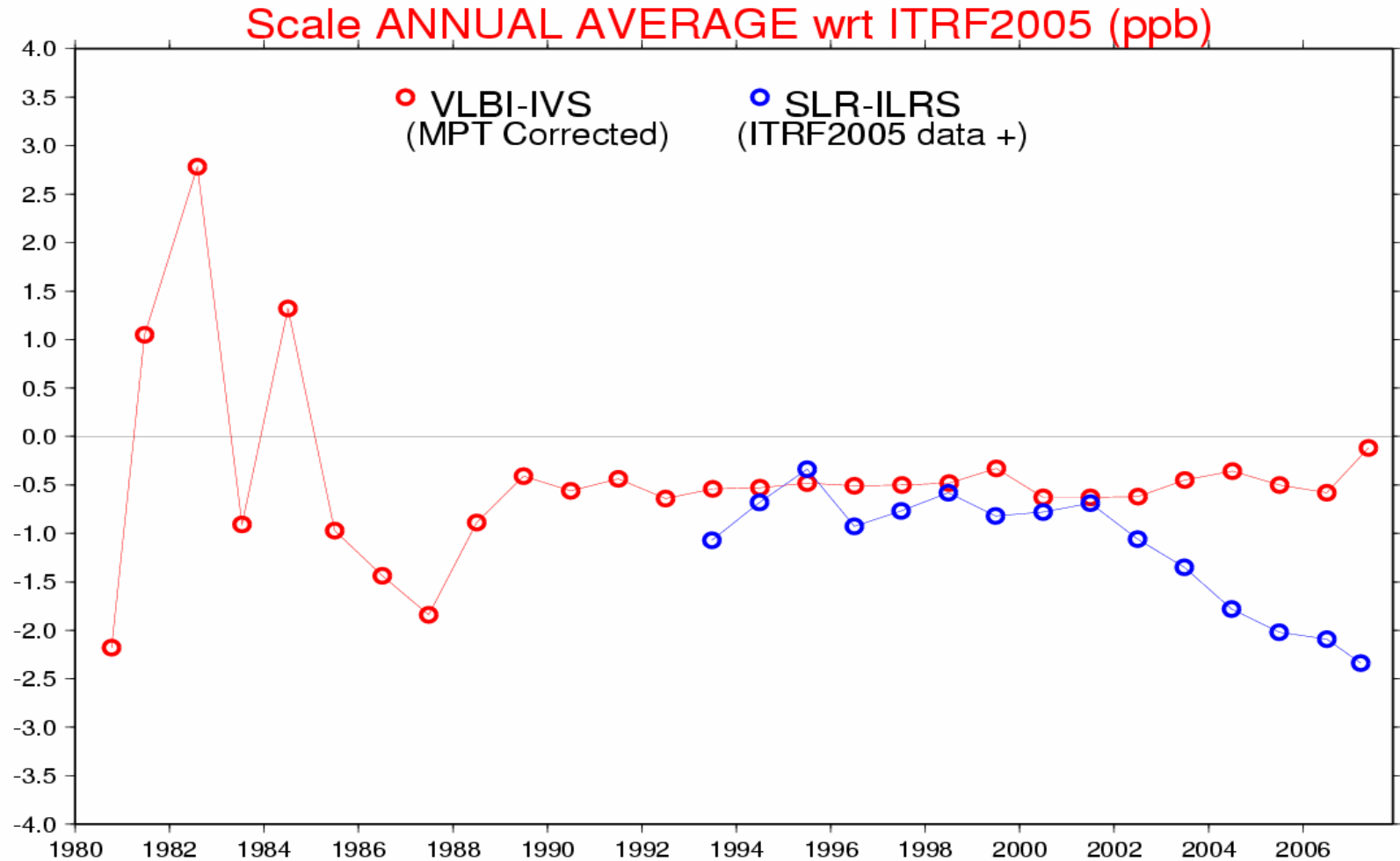
IGN-JPL Solution



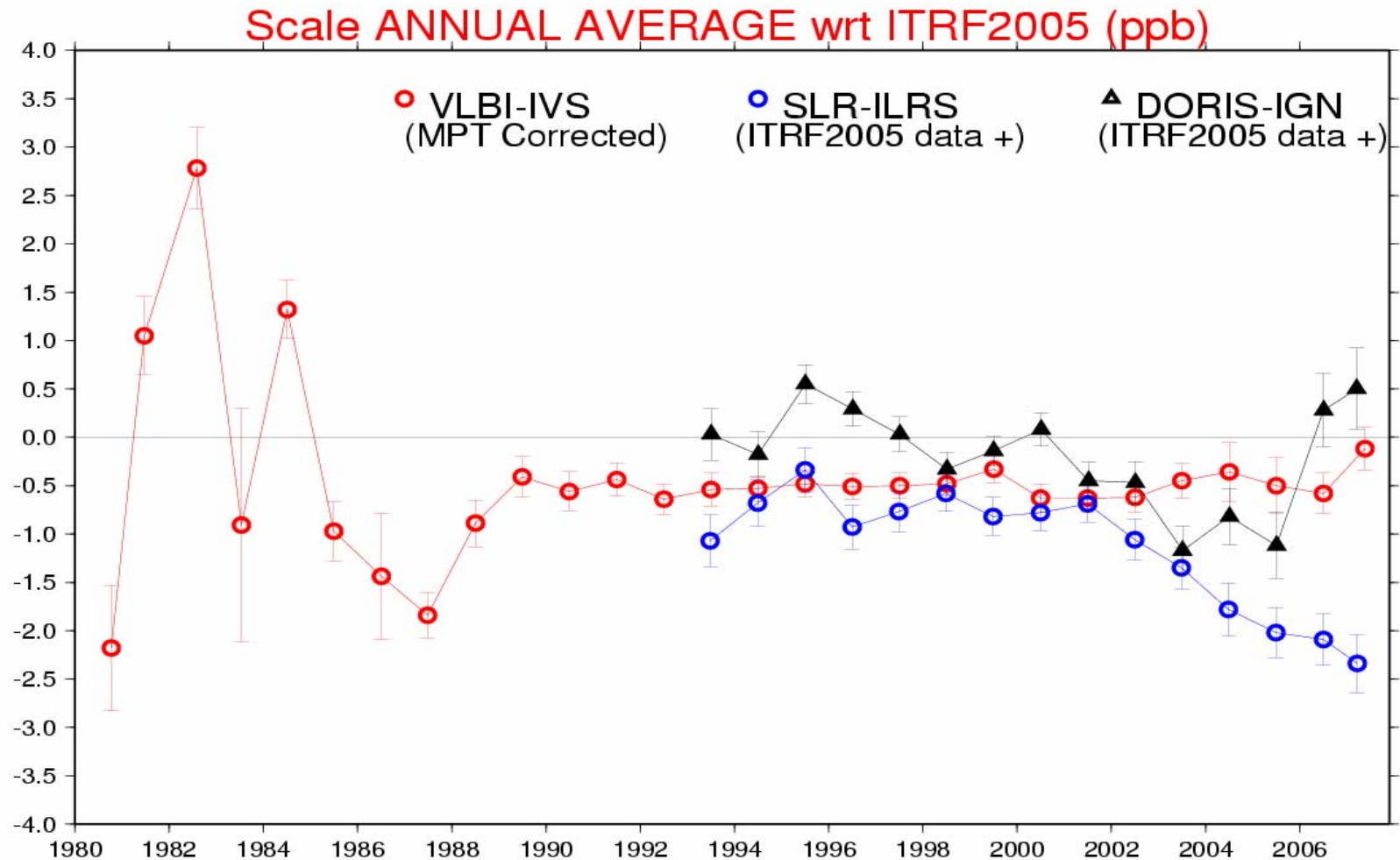
Scale Annual Average



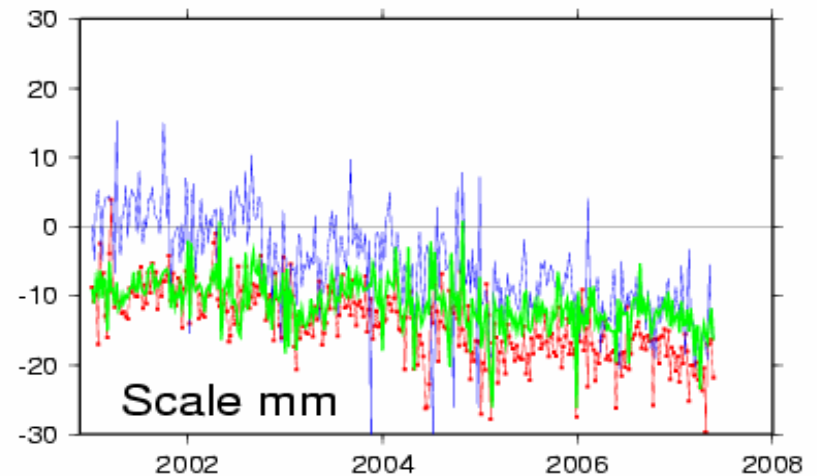
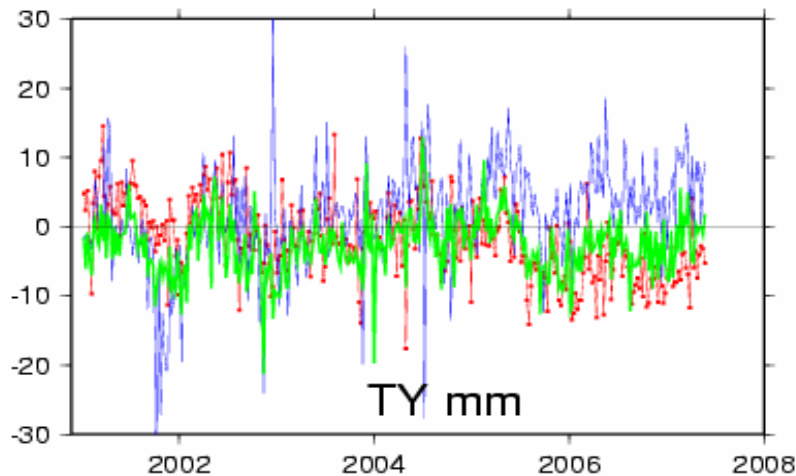
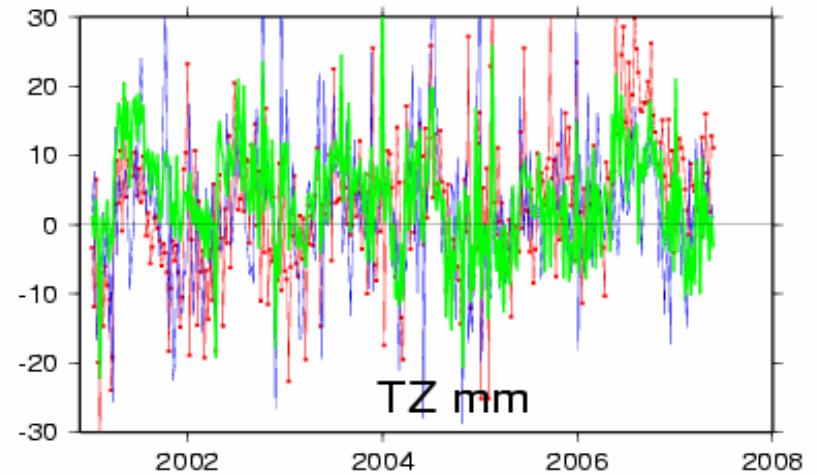
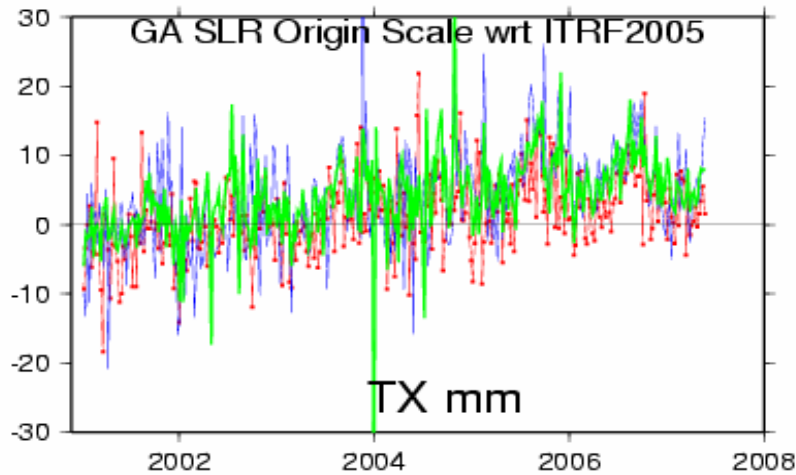
Scale Annual Average



Scale Annual Average



GA SLR Analysis



— Lageos I+II

— Stella + Starlette

— L1 + L2+ Stella +
Starlette

GPS Specific Problems

- **Relative to Absolute PCV**

Time series inconsistency between pre and post week1400 : mean shift of 1.5 cm in height component for all stations

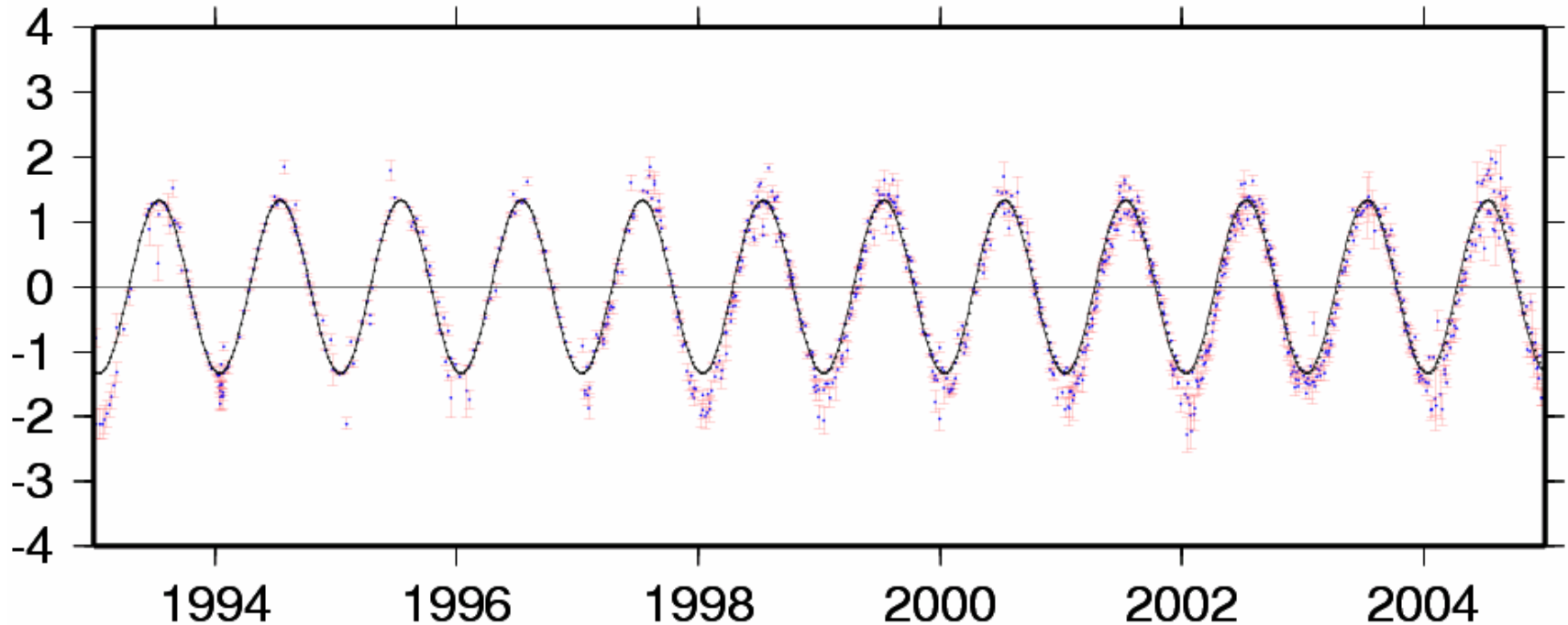
- **Discontinuities:**

- 50 % of IGS stations
- Might disturb VLBI & SLR tie

VLBI Specific Problems

- **Antenna thermal expansion: Amplitude larger than 1 mm (see next)**
- **Antenna gravitational sag (effect might exceed 1 mm)**
- **==> Impact individual stations (height component) ?**
- **EOPs: VLBI is penalized when mapping EOPs to noon : WRMS degradation**

Annual model of the contribution of thermal expansion to VLBI scale



$$A_{MODEL} = 1.34 \text{ mm} \pm 0.01 \quad \Phi_{MODEL} = 194^\circ \pm 1$$

Collilieux et al., 2005

See also: Tesmer, 2006, Wresnik, 2007

SLR Specific Problems

- **Poor Network (ILRS can do nothing for this)**
- **Range Biases and timer event**
- **Z-translation drift btw ITRF2005 & ITRF2000**
- **Need a reanalyzed solution with ALL data**
- **Include data from additional satellites (?)**
- **EOPs: PM-rates ?**

DORIS Specific Problems

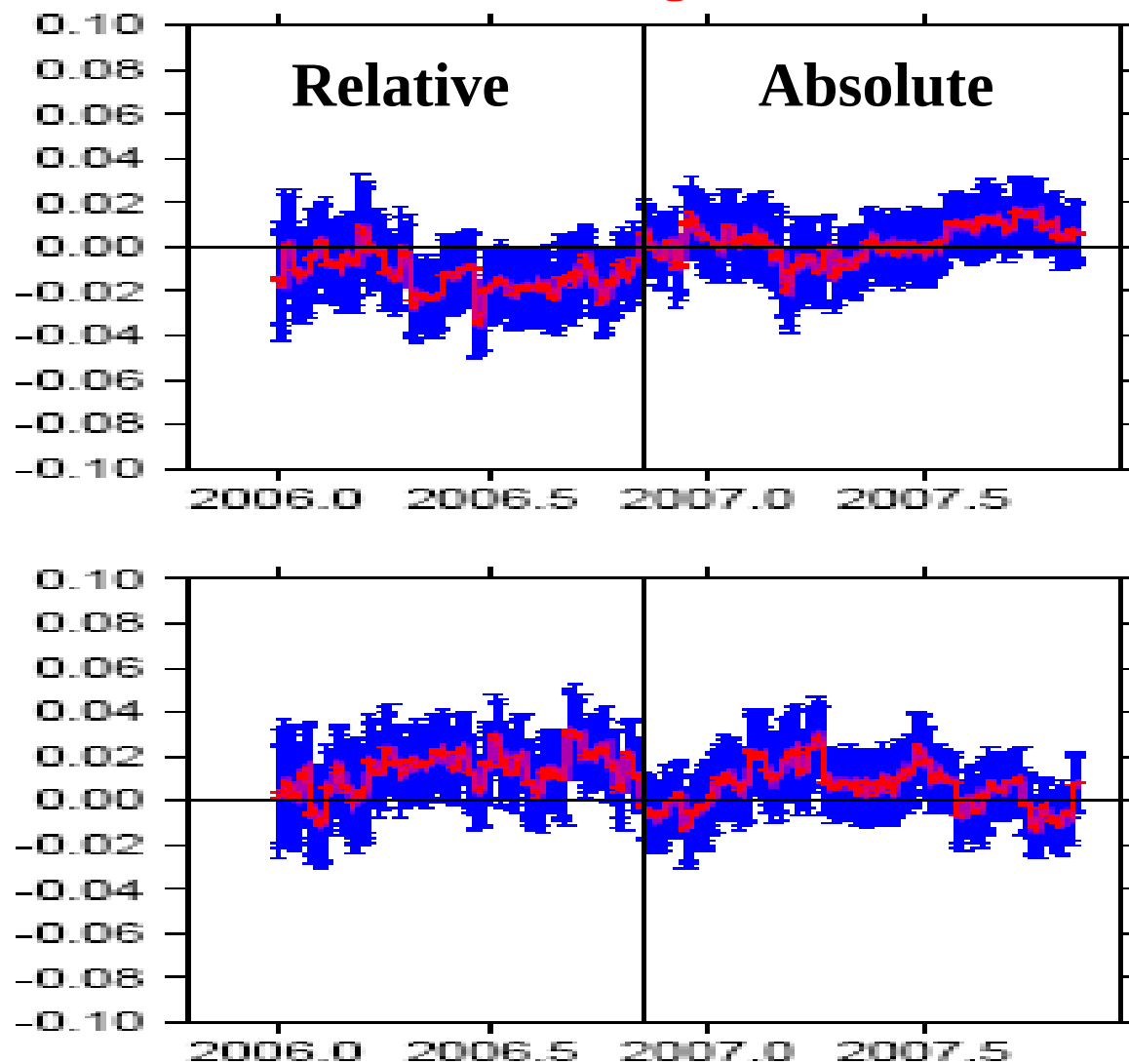
- No combination Center
- DORIS Beacon effect is not clear (?)
- EOPs: PM-rates from 1 AC

EOPs in ITRF2005

	Polar Motion	PMrate	LOD	UT1
IVS	YES	YES	YES	YES
IGS	YES	YES	YES Not Used	NO
ILRS	YES	NO	YES Not Used	NO
DORIS-IGN	YES	YES	YES Not Used	NO
DORIS-LCA	YES	NO	YES Not Used	NO

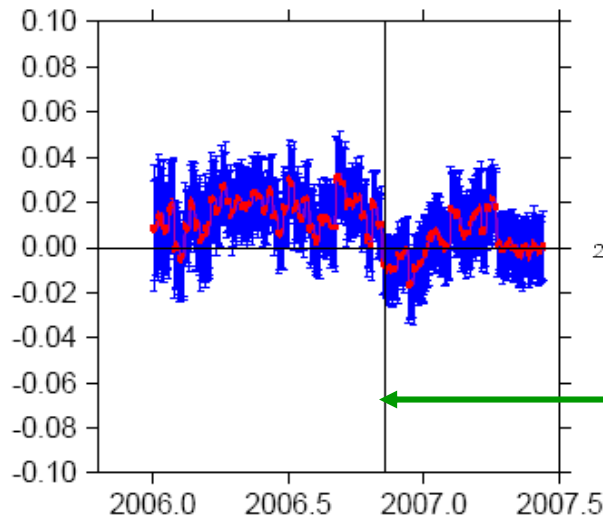
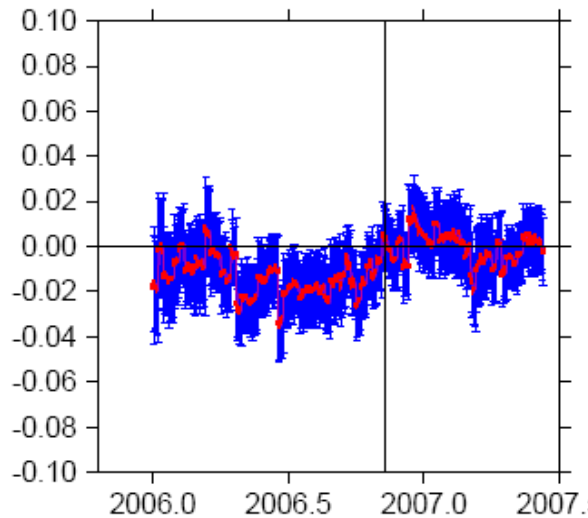
Impact of PCV on EOPs

CATREF stacking – IGS00P03

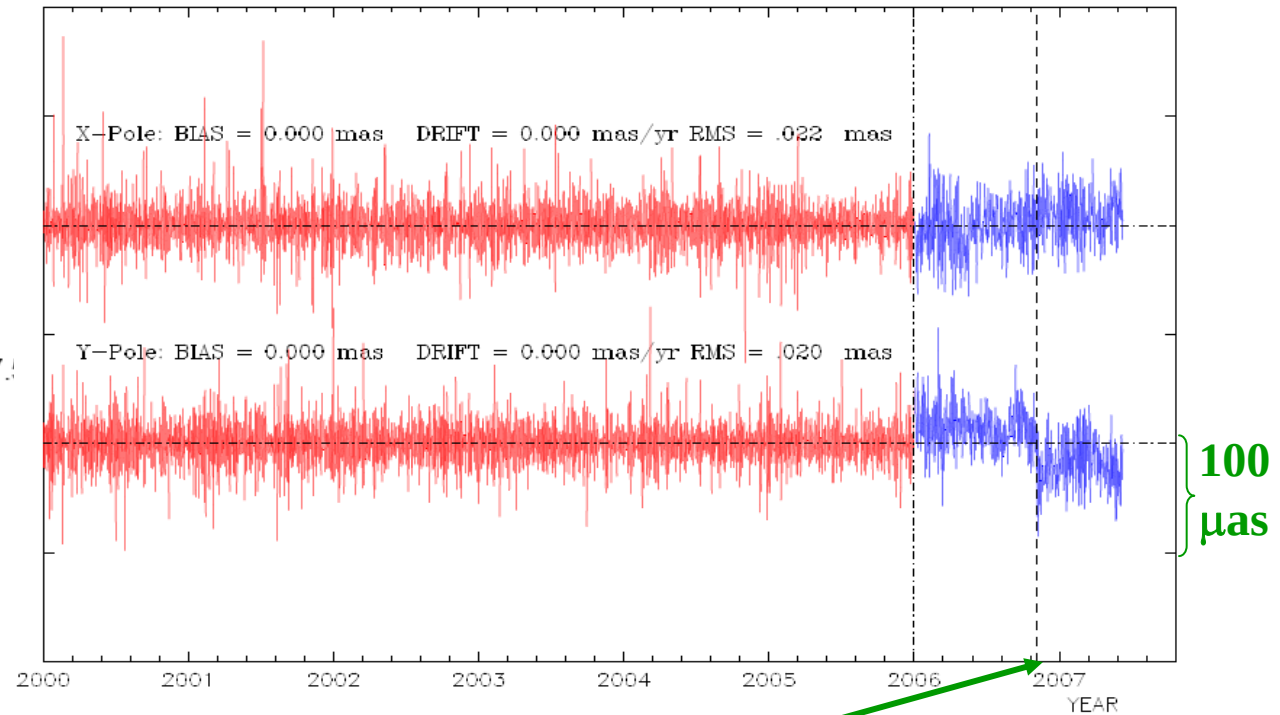


ITRF2005 IERS 05 C04 consistency over time

CATREF GPS stacking
minus IGS00P03 (mas)

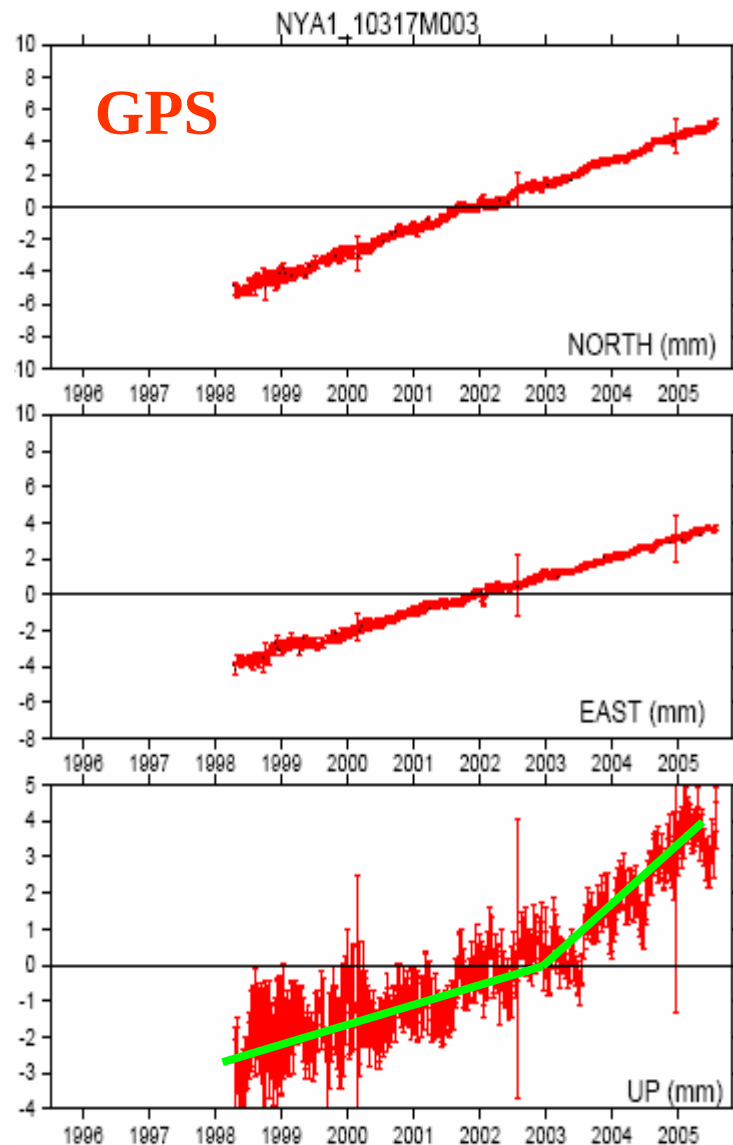
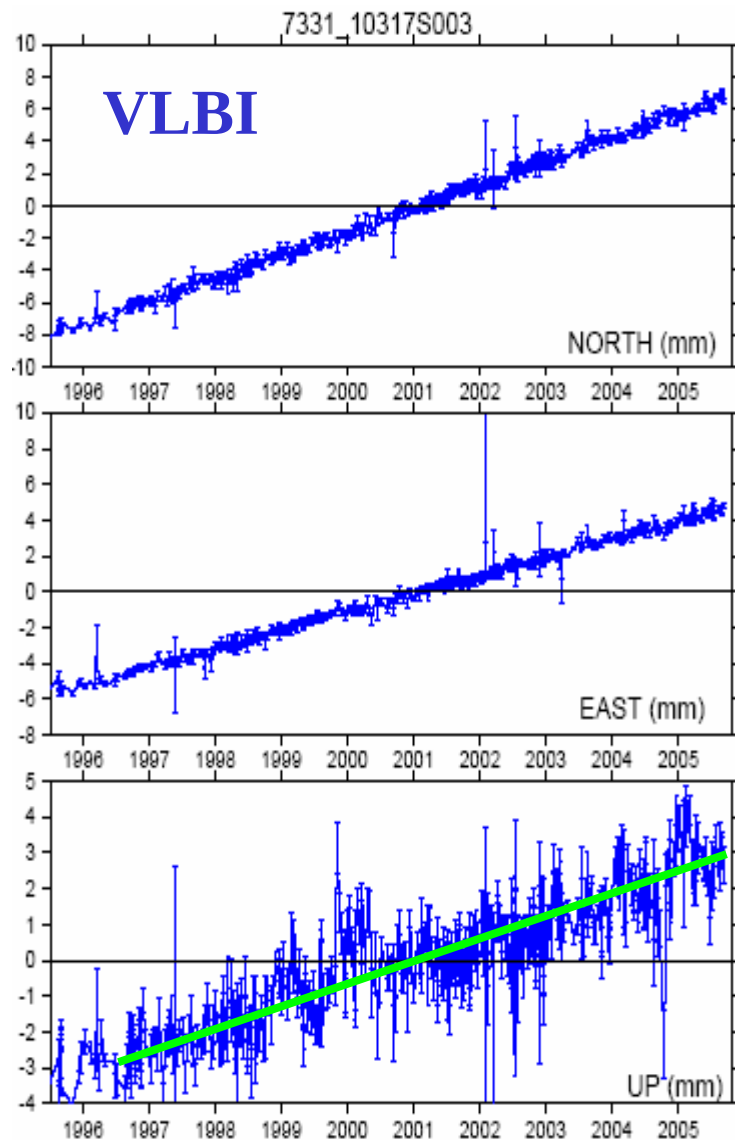


ITRF2005-extended minus 05 C04

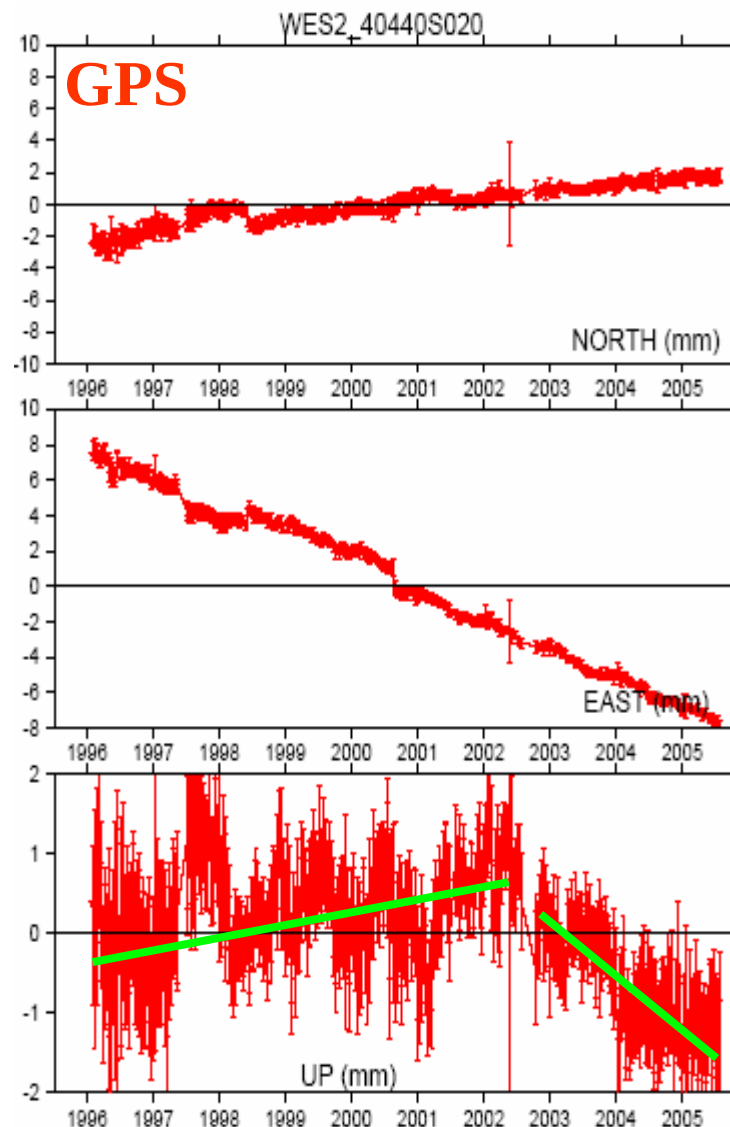
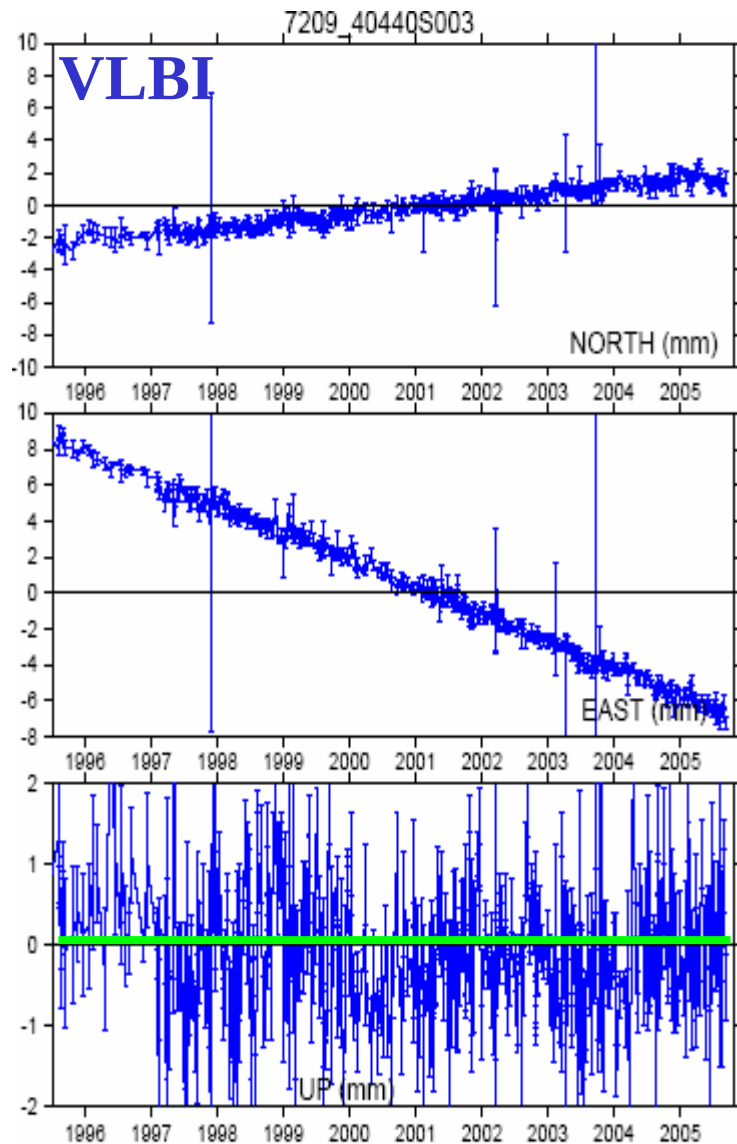


(week 1400)

Vertical Velocities ?, E.g. Ny_Alsund



Vertical Velocities ?, E.g. Westford



Summary

- **Origin:**
 - Only one technique used: SLR
 - Impact of the Tz drift between ITRF2005 and ITRF2000 ?
 - GPS & DORIS ??
- **Scale:**
 - ITRF2005: VLBI
 - ITRF200X : ???
 - Wait for SLR reprocessing of ALL data
 - Inclusion of More SLR satellites ?
 - GPS & DORIS ??
- **EOP:**
 - PMrate from all techniques ???
 - LOD from satellite techniques should be used and their deviation from VLBI should be evaluated
- **Velocity agreement btw techniques: ???**