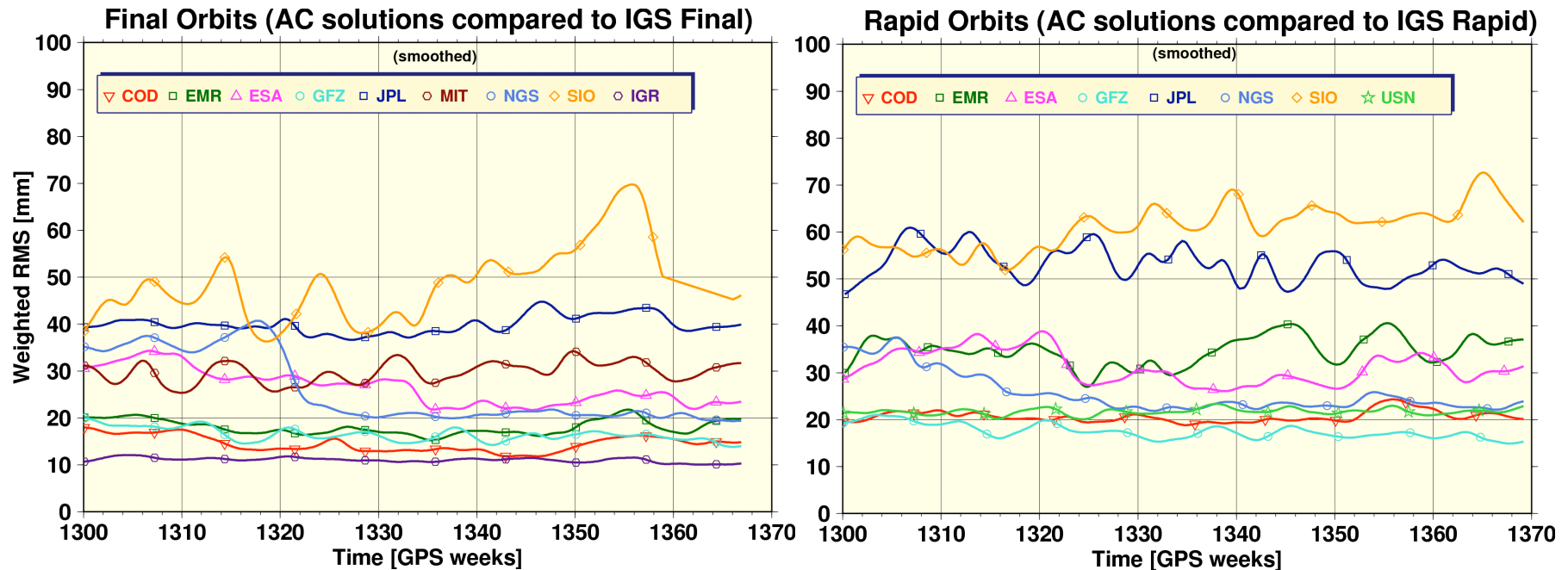


Quality and consistency of the IGS combined products

Gerd Gendt¹ and Jan Kouba²

¹GeoForschungsZentrum Potsdam

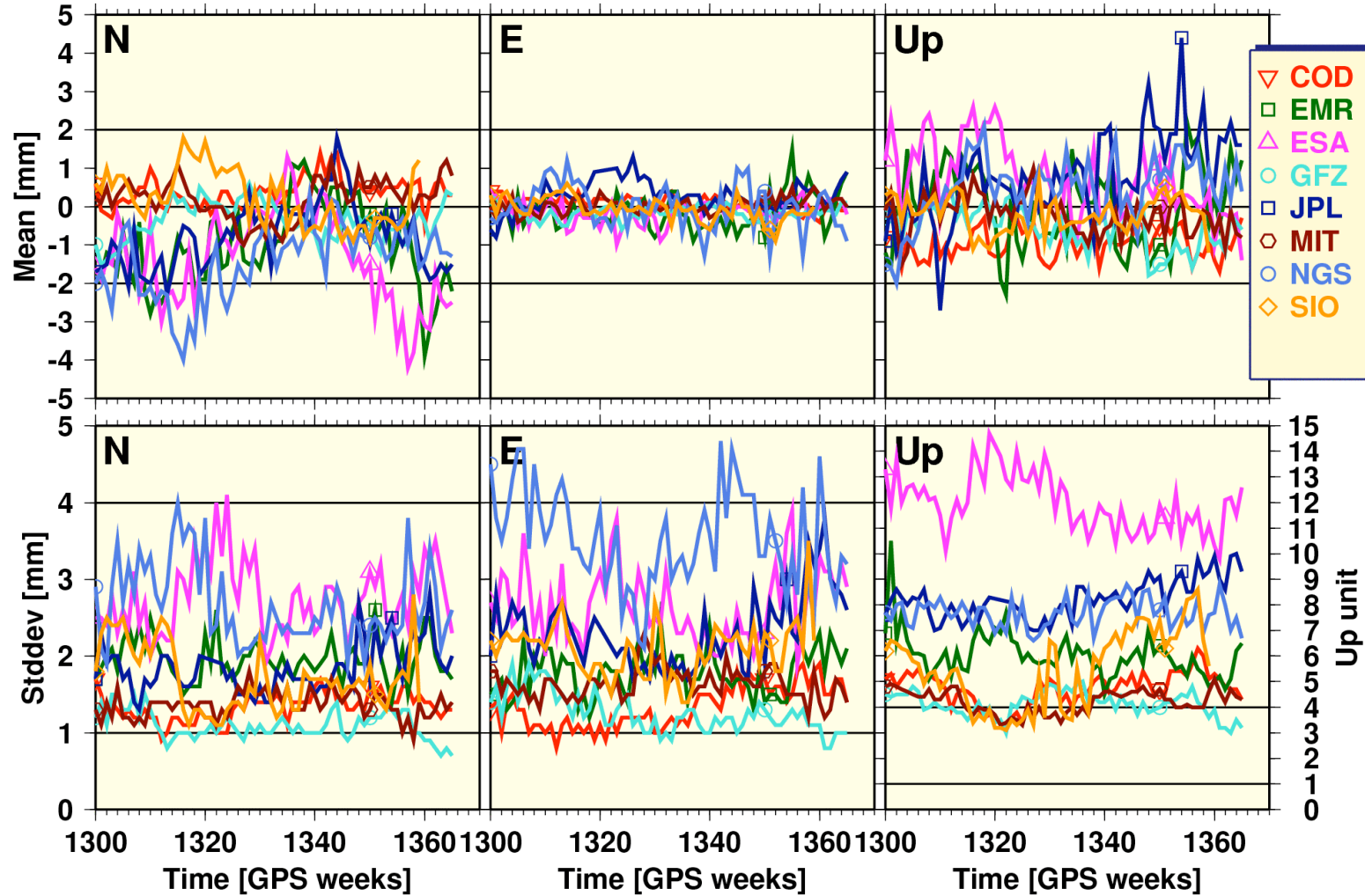
²Natural Resources Canada, Ottawa



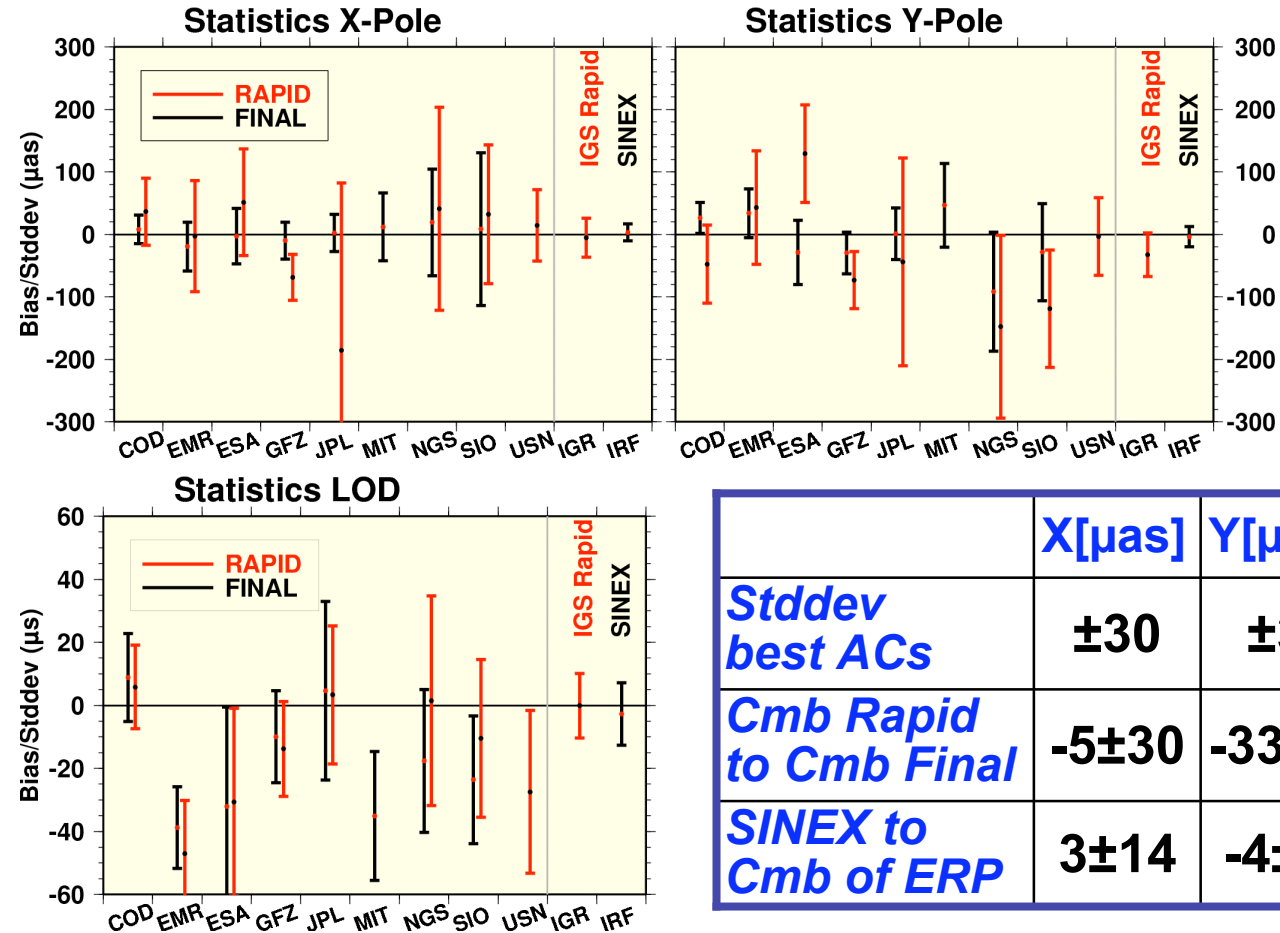
Remark

- Most of the following statistics from IGS products start at GPS week 1321 – May 2005 (after this date both ESA and NGS have significantly improved products).

SINEX Solution Residuals with respect to the Weekly Combination

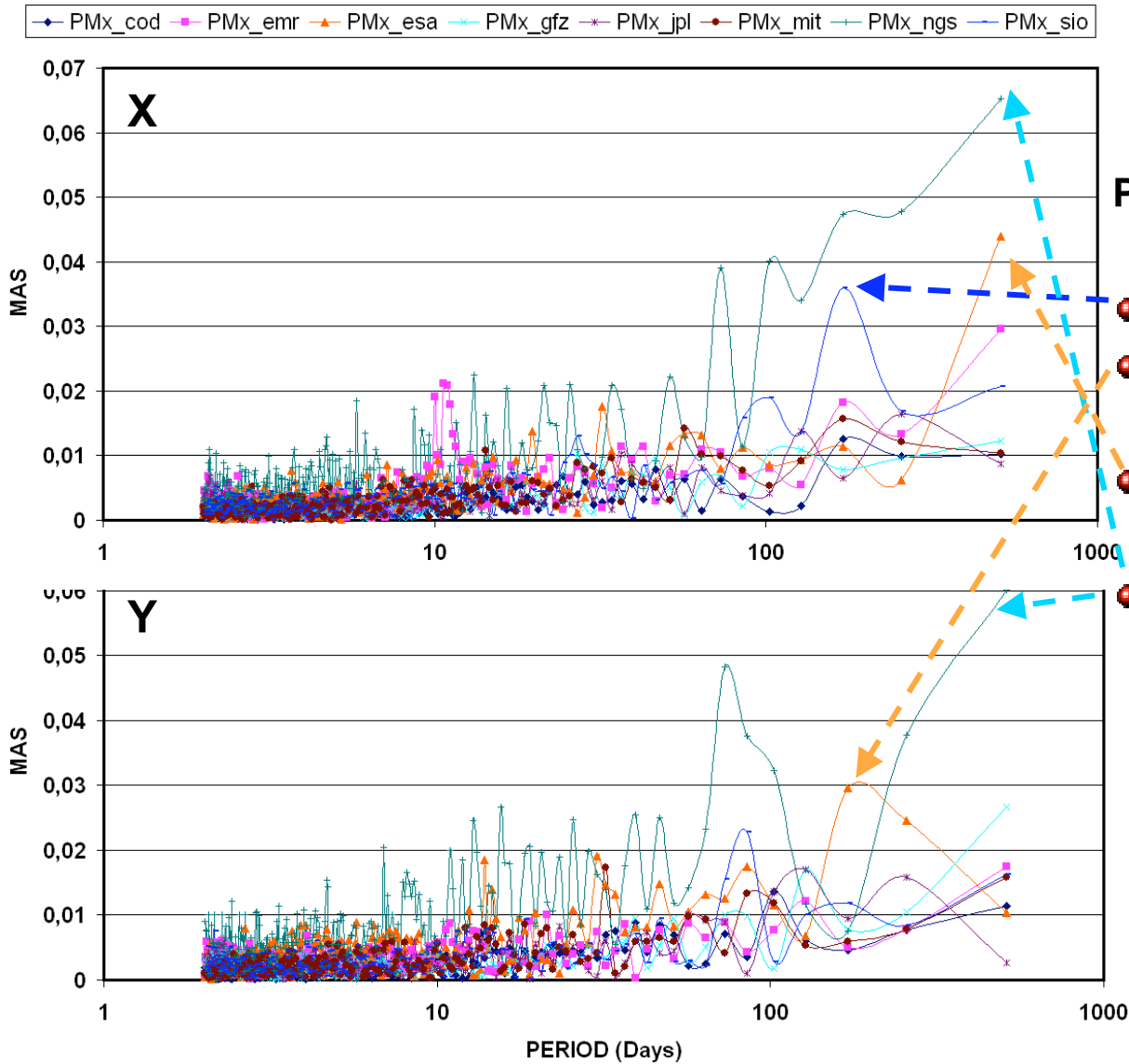


ERP from Final, Rapid and SINEX (igs00p02)
Differences to FINAL (igs95p02)



	X[μ s]	Y[μ s]	LOD[μ s]
<i>Stddev best ACs</i>	± 30	± 35	± 20
<i>Cmb Rapid to Cmb Final</i>	-5 ± 30	-33 ± 35	-1 ± 10
<i>SINEX to Cmb of ERP</i>	3 ± 14	-4 ± 16	-3 ± 10

- **Because of the high quality of the IGS Products even small inconsistencies will be seen between the products.**
- **The combined IGS products can only benefit from new models if inconsistencies among the ACs and product lines can be resolved.**

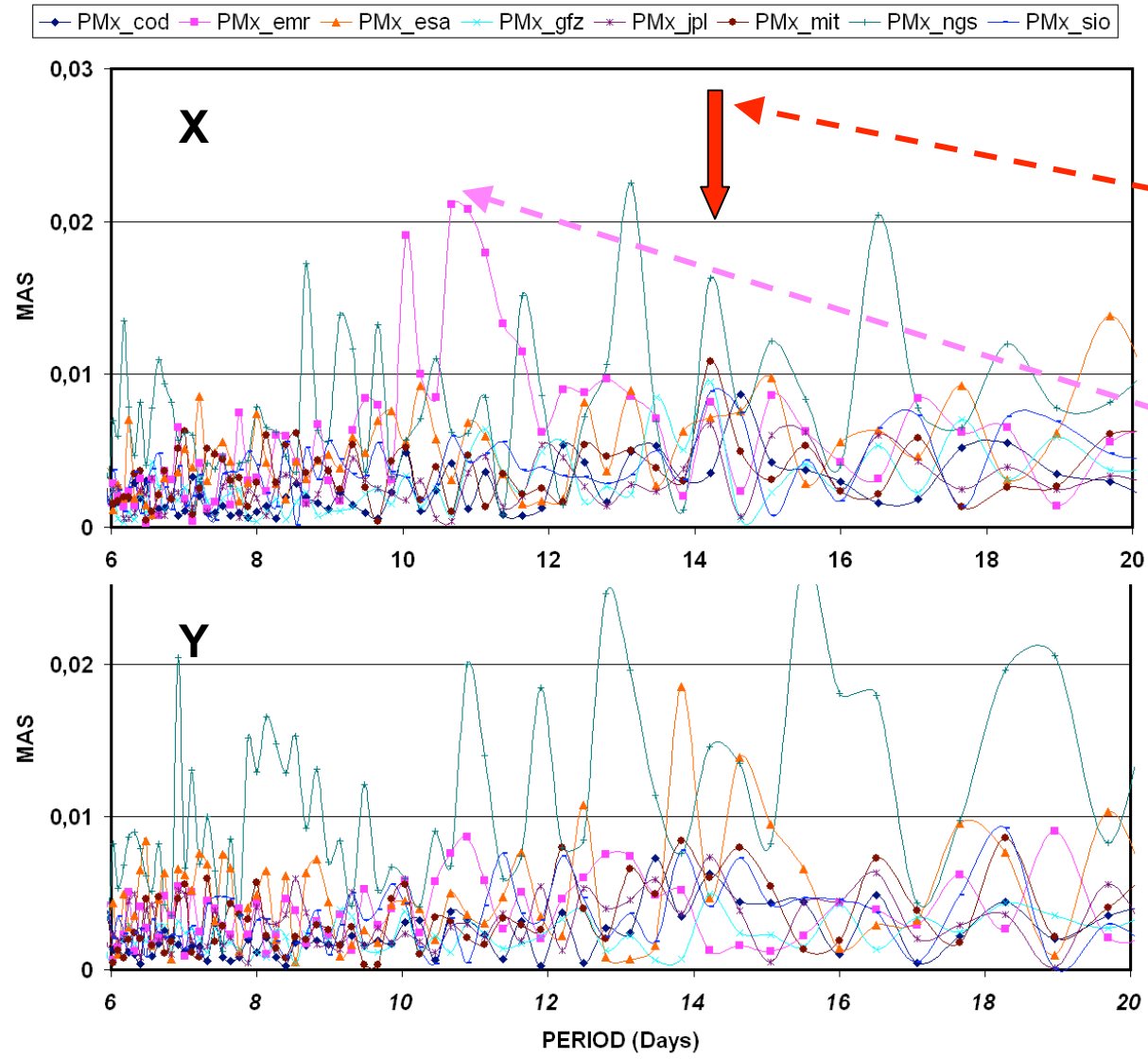


● Jul 2004 - Dec 2005

Problems

- SIO: semi-annual (X)
- ESA: semi-annual (Y)
- ESA: seasonal (X)
- NGS: Stability for longer periods
(*sign. Improvements after May 2005*)

99% sign. level <0.01,
NGS factor 2-3



● Jul 2004 - Dec 2005

Problems/Remarks

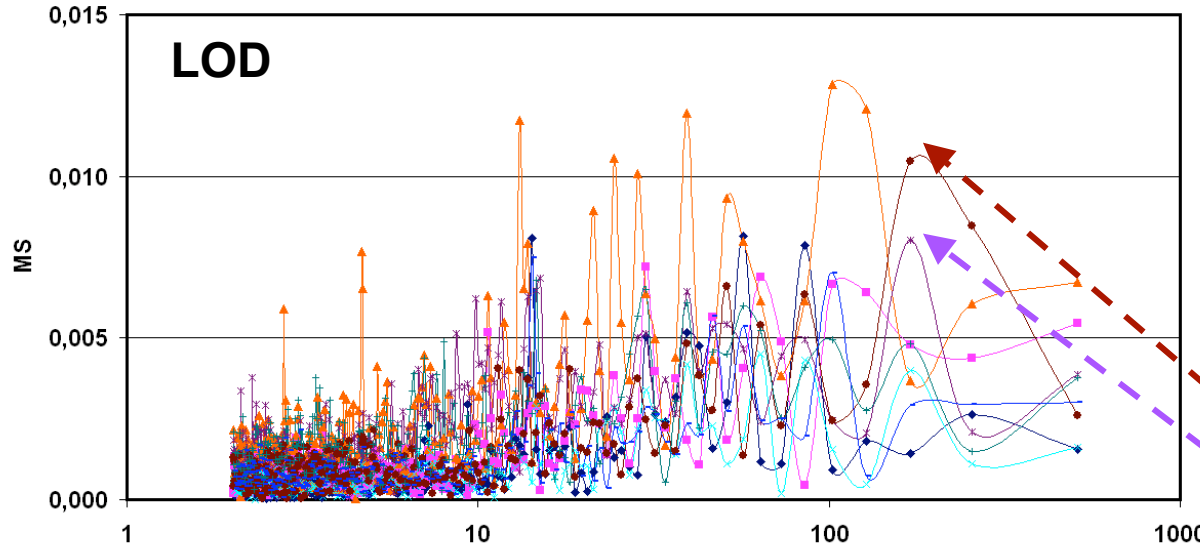
- Only small peaks at 14.2d (O1 subdaily , 25.8h beats against 24h - 14.2d)
- EMR: peak at ~10.7d

99% sign. level <0.01,
NGS factor 2-3

AC SINEX ERP Amplitudes wrt IGS

◆ LOD_cod
 ◆ LOD_emr
 ▲ LOD_esa
 ◆ LOD_gfz
 ◆ LOD_jpl
 ◆ LOD_mit
 ◆ LOD_ngs
 ◆ LOD_sio

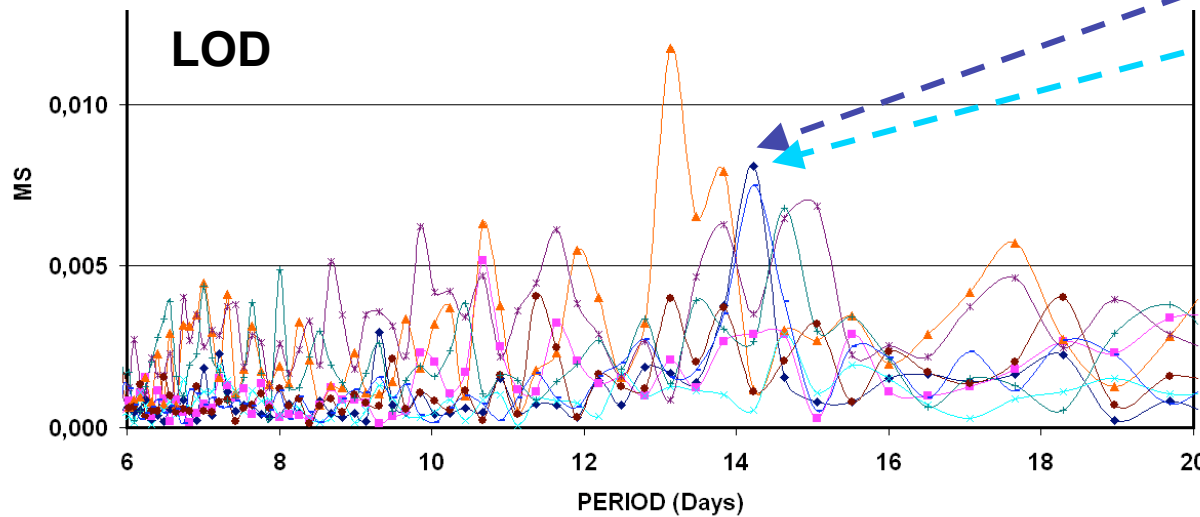
● Jul 2004 - Dec 2005



All ACs good stability
(no annual signal)

Problems

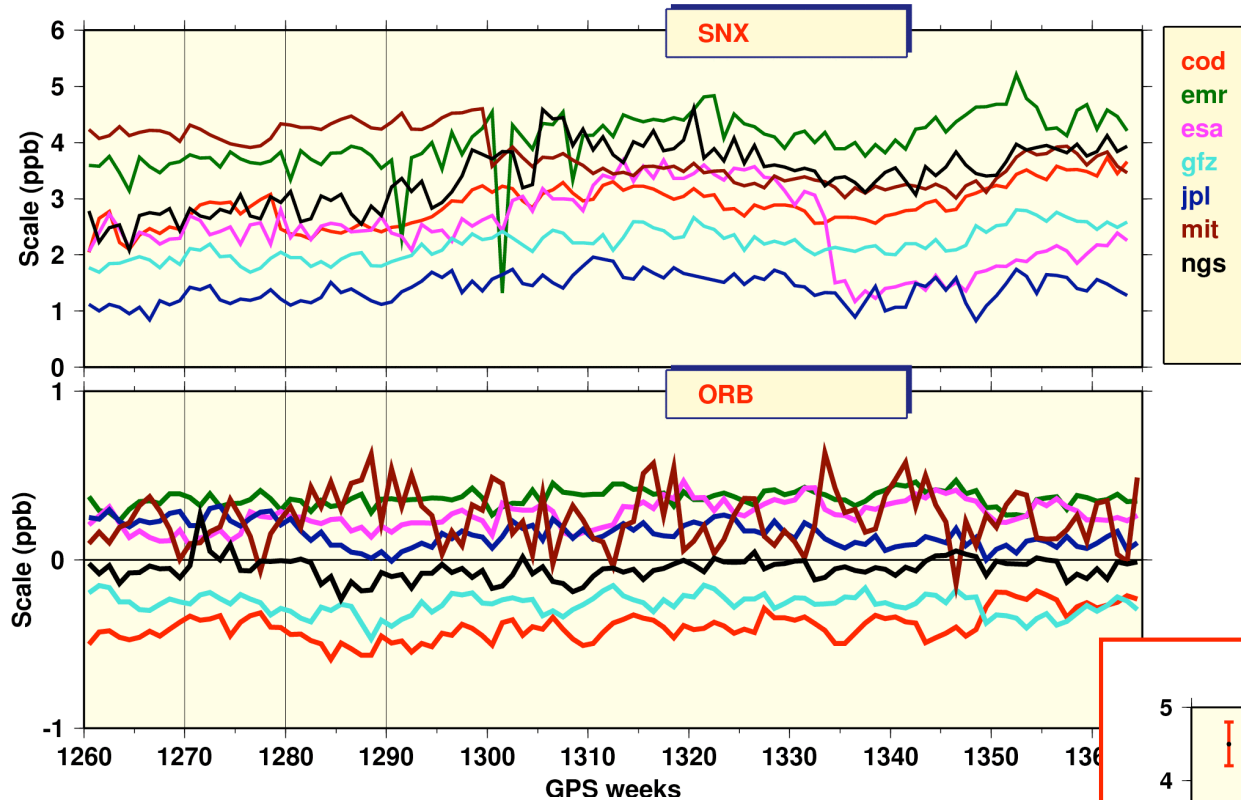
- MIT: semi-annual
- JPL: semi-annual
- COD: peak at 14.2d
- SIO : peak at 14.2d
- ESA: a few peaks



Remark

- IGS LOD (1997-2000) show also a 14.2d peak against AAM+OAM (Kouba,Vondrak 2005, J Geod)

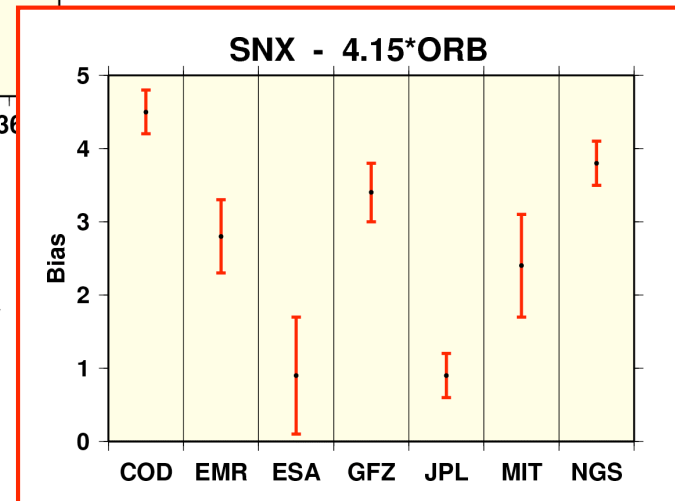
99% sign.level ~0.003



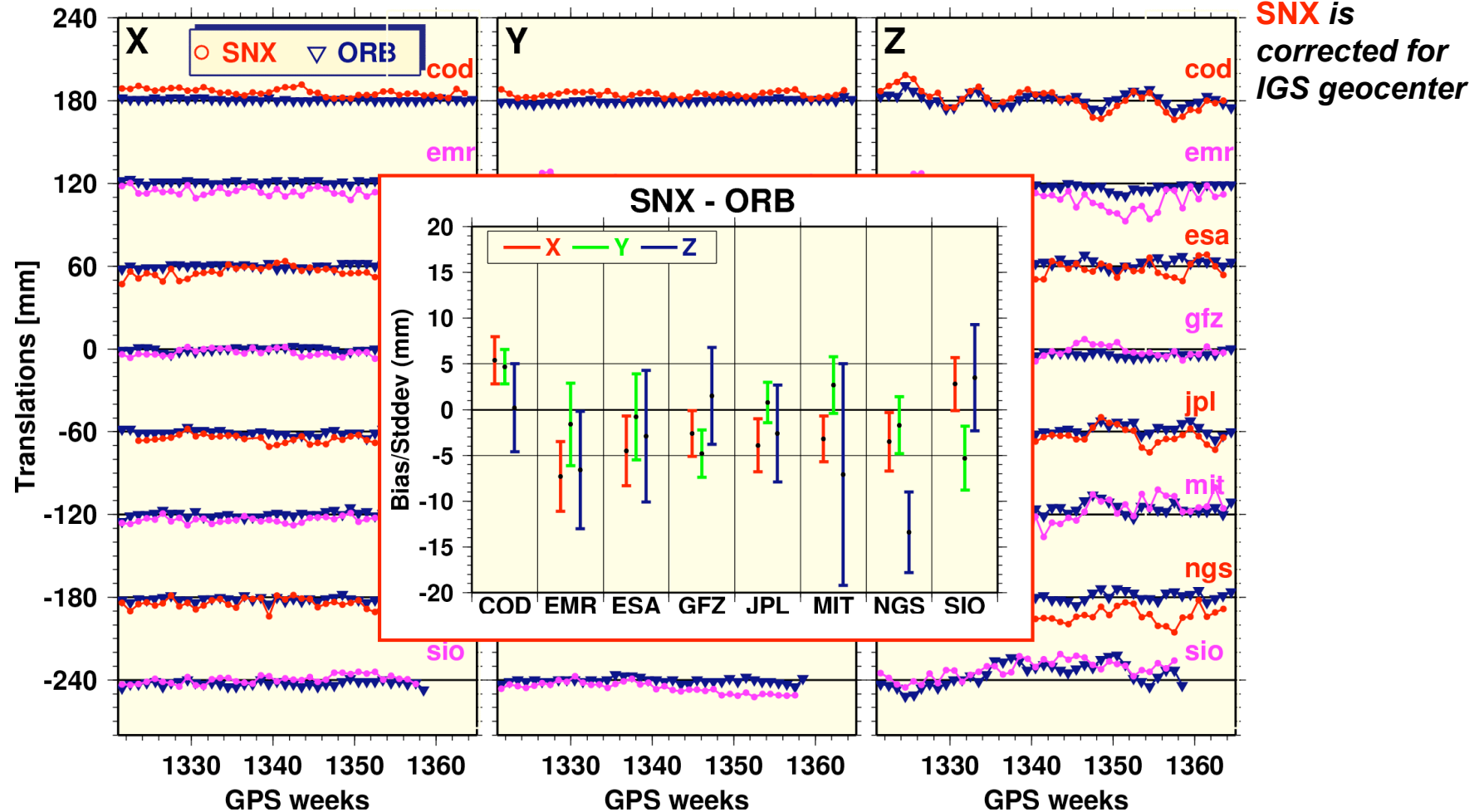
● Each AC has its “own scale” in SNX

● The AC orbit scales are different from AC SNX scales

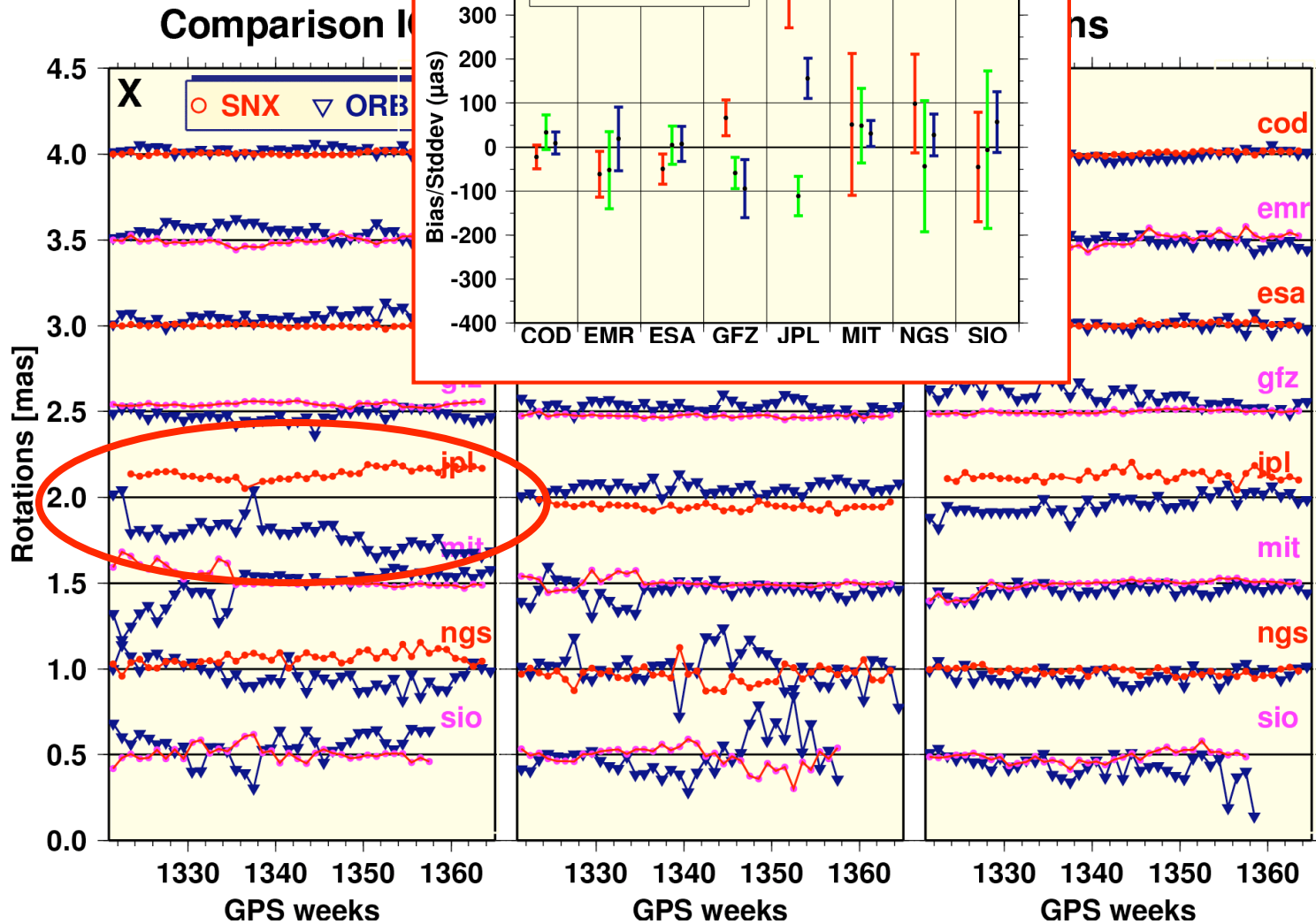
● The scale difference between SNX and ORB varies from AC to AC, but with a small scatter



Comparison IGS Final Orbits and SINEX - Translations



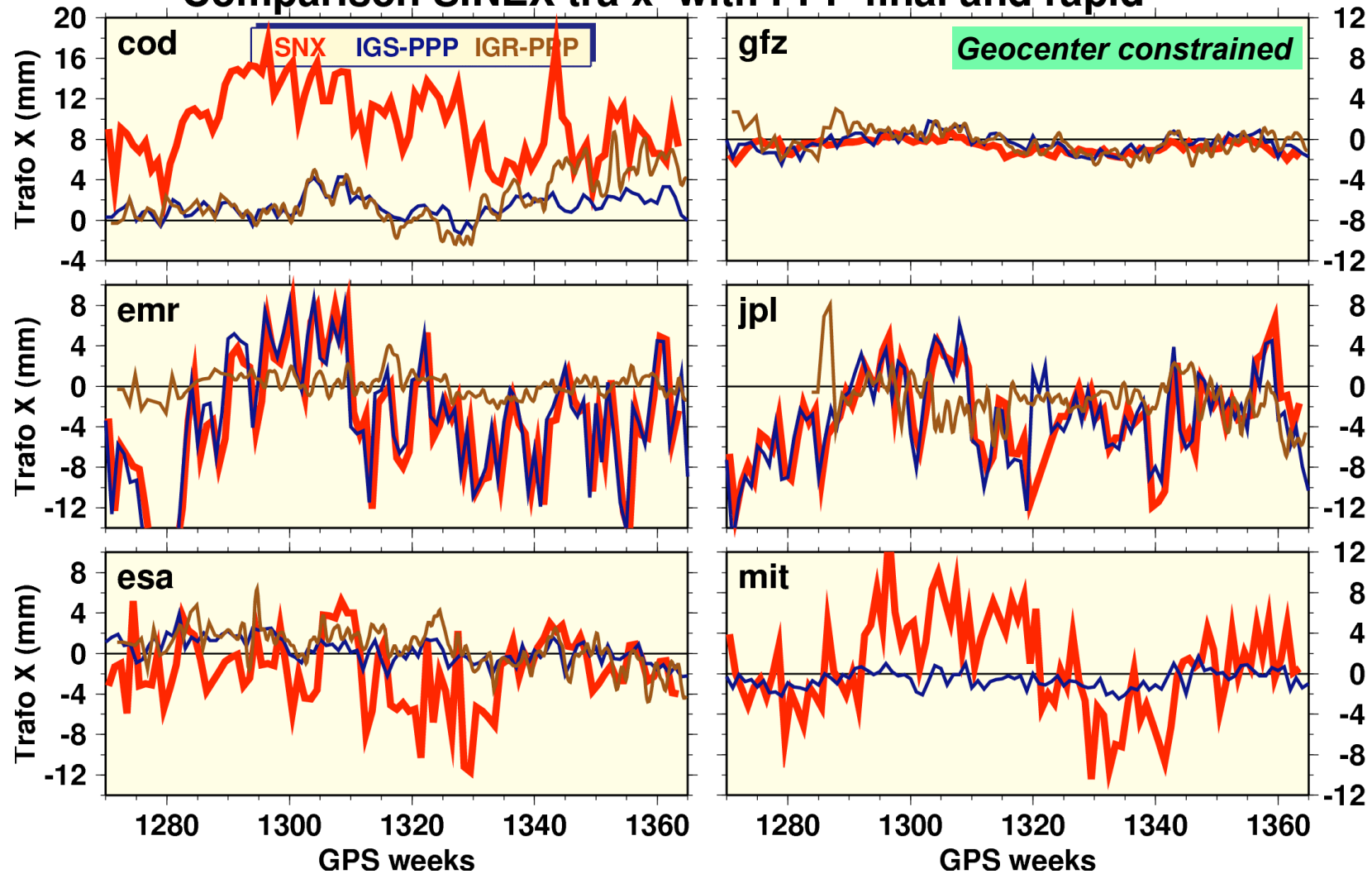
● Consistency at ~ 5 mm level



● Consistency < 0.1mas level; JPL larger biases, especially in ROT-X

PPP – Trans X (to IGb00)

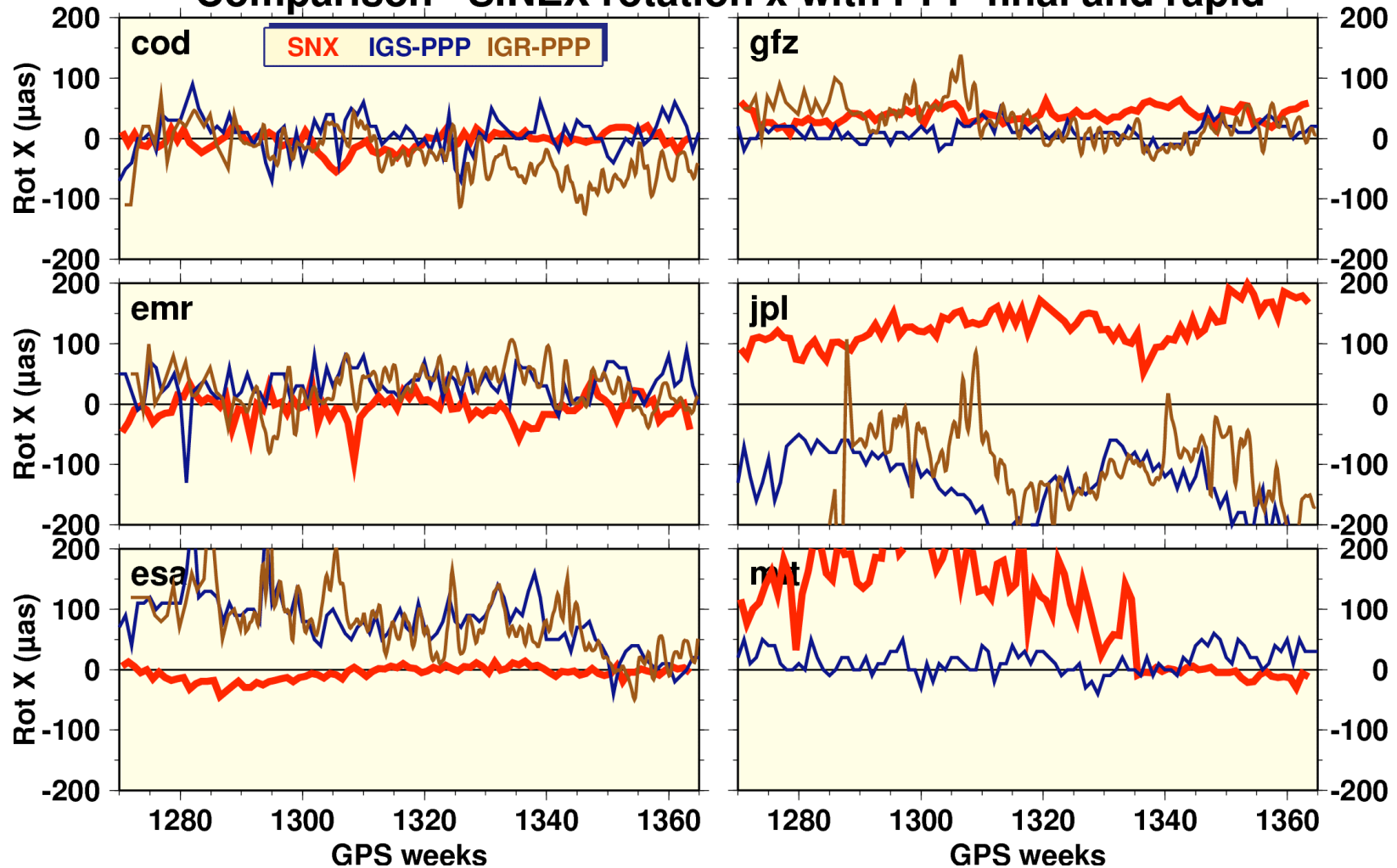
Comparison SINEX tra x with PPP final and rapid



- Good agreement btw AC Final & AC Rapid (near CoN);
Exceptions EMR, JPL – consistent to their SNX → effects on IGS combi !

PPP – Rotation X (to IGb00)

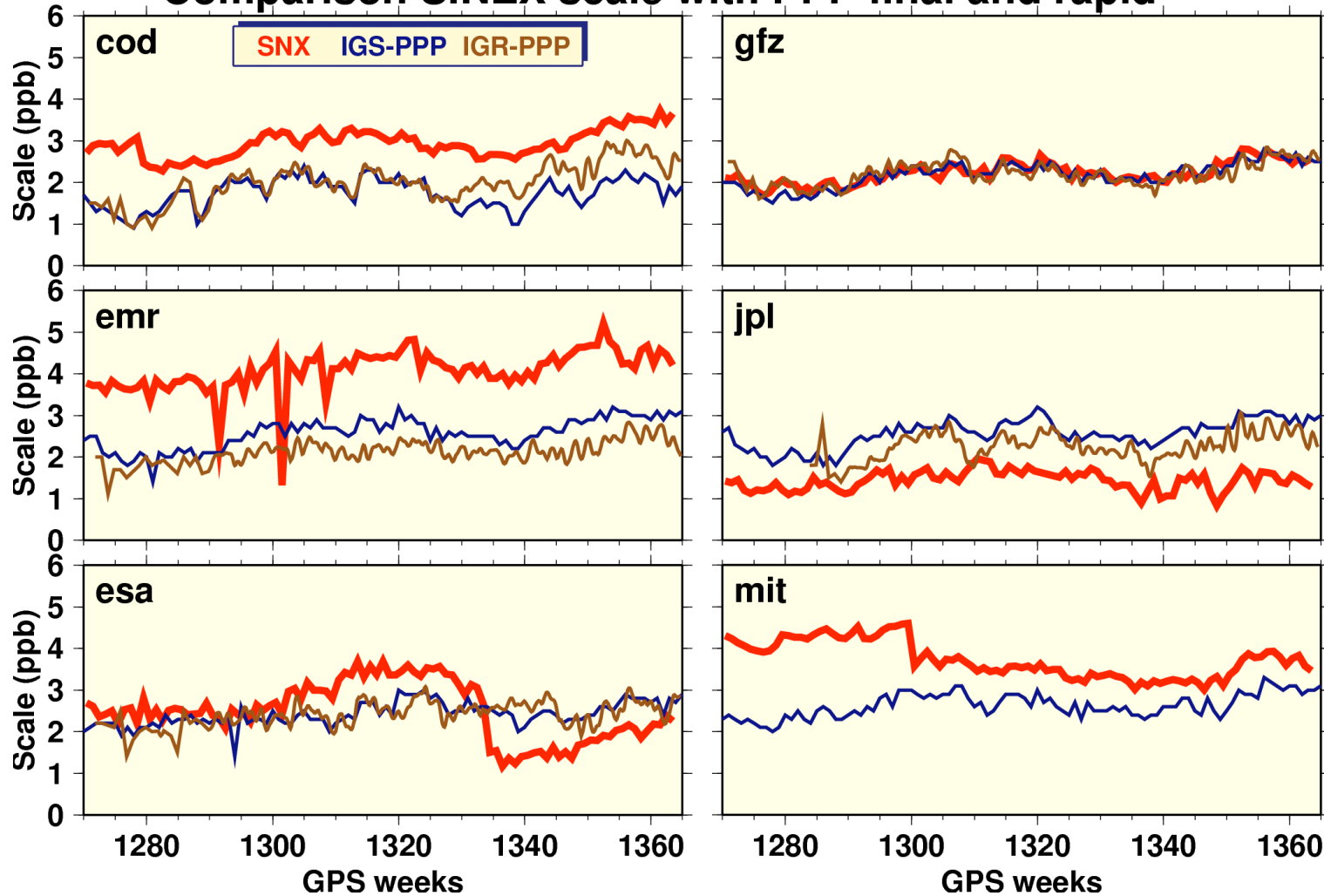
Comparison SINEX rotation x with PPP final and rapid



- Good agreement btw AC Final & AC Rapid in general
Some biases, especially for JPL (as seen in comp SNX to ORB)

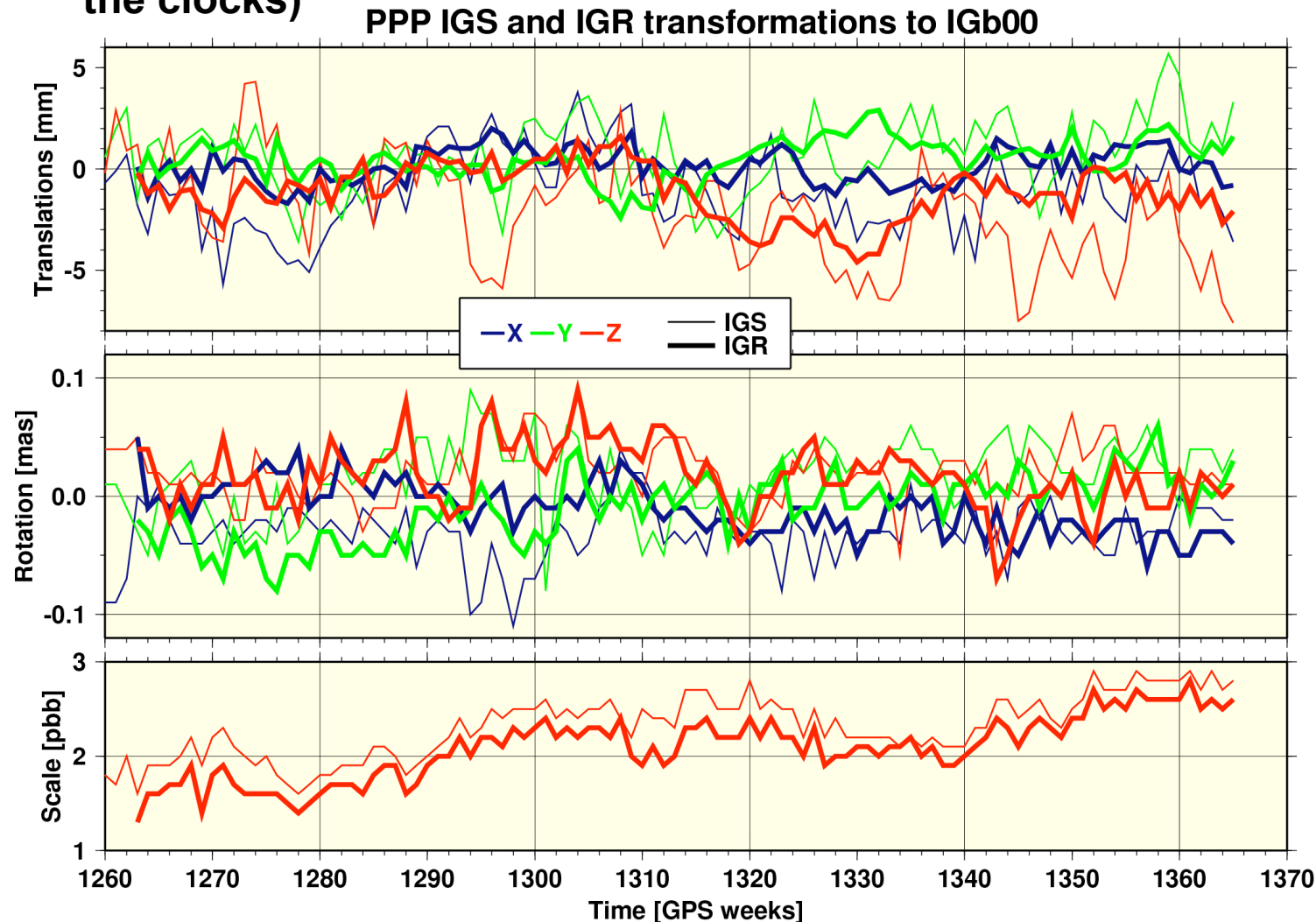
PPP – Scale (to IGb00)

Comparison SINEX scale with PPP final and rapid

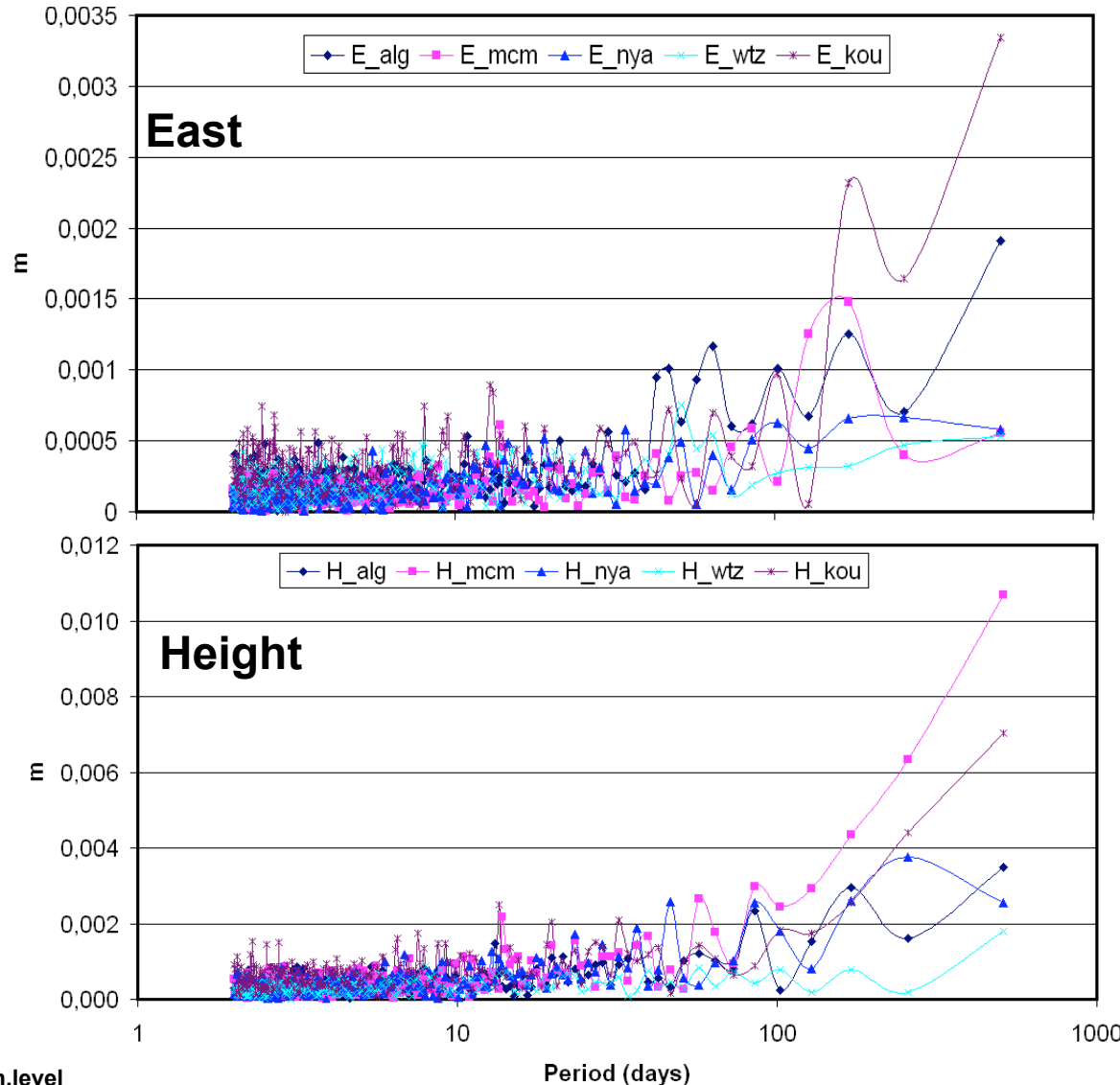


● Offset of ~ 1 ppb for some ACs is not understood yet

- IGR performs better than IGS for tra x-y-z, because more consistent clocks from the ACs (all ACs fix the stations to IGb00 while computing the clocks)

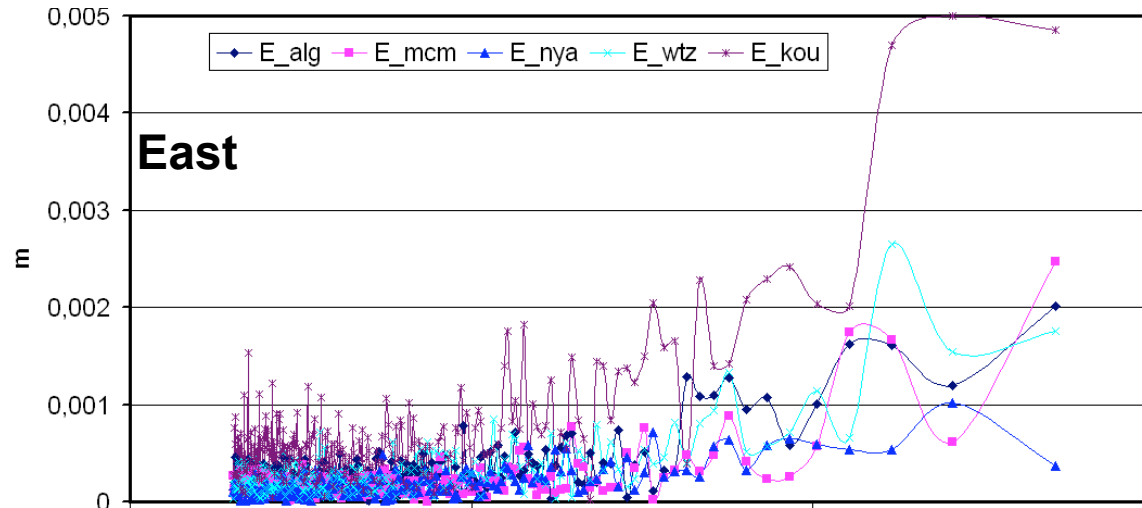


IGS Final orbits/clocks (July 2004 – Dec 2005)



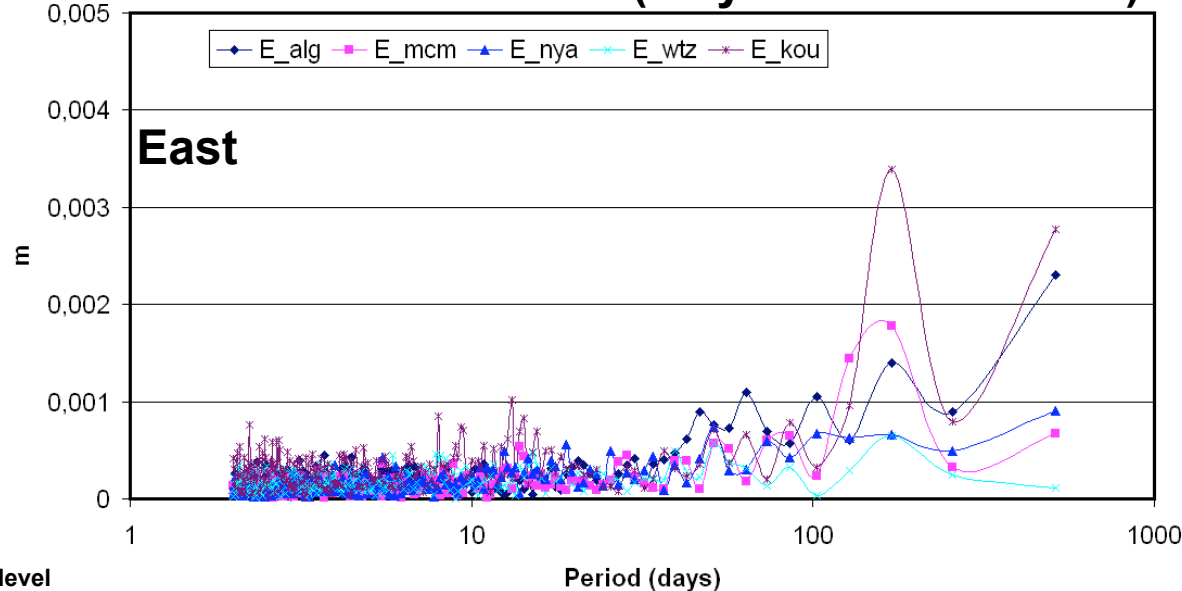
- The seasonal period could be real, but
- a test with VMF1 had shown smaller seasonal amplitudes in the Antarctic

COD Final orbits/clocks (July 2004 – Dec 2005)

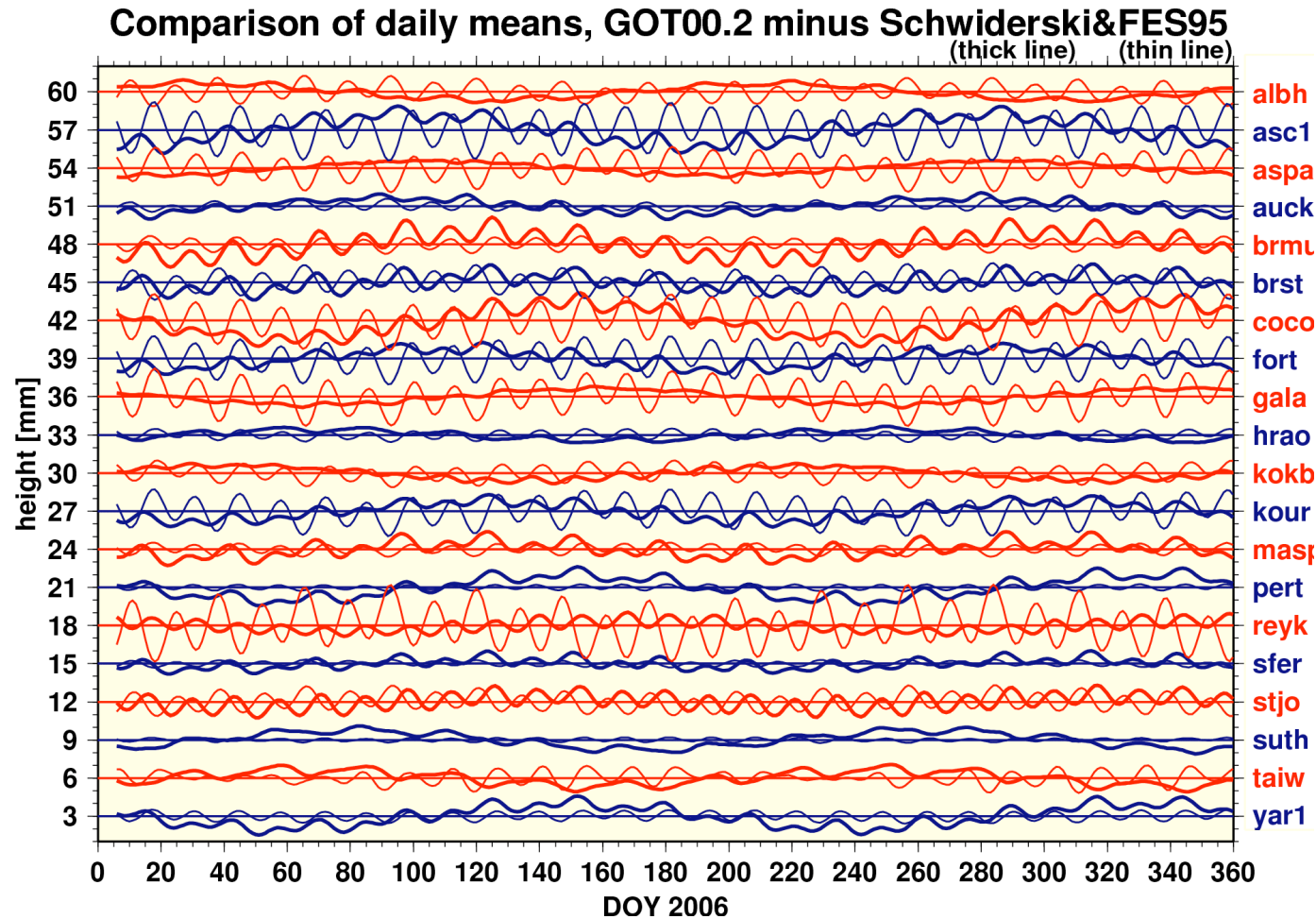


Differences in seasonal and longer (semi-annual) periods between IGS, COD, GFZ

GFZ Final orbits/clocks (July 2004 – Dec 2005)



- Differences of daily mean (24h) values btw GOT00.2 and older models used by ESA, GFZ, MIT, SIO



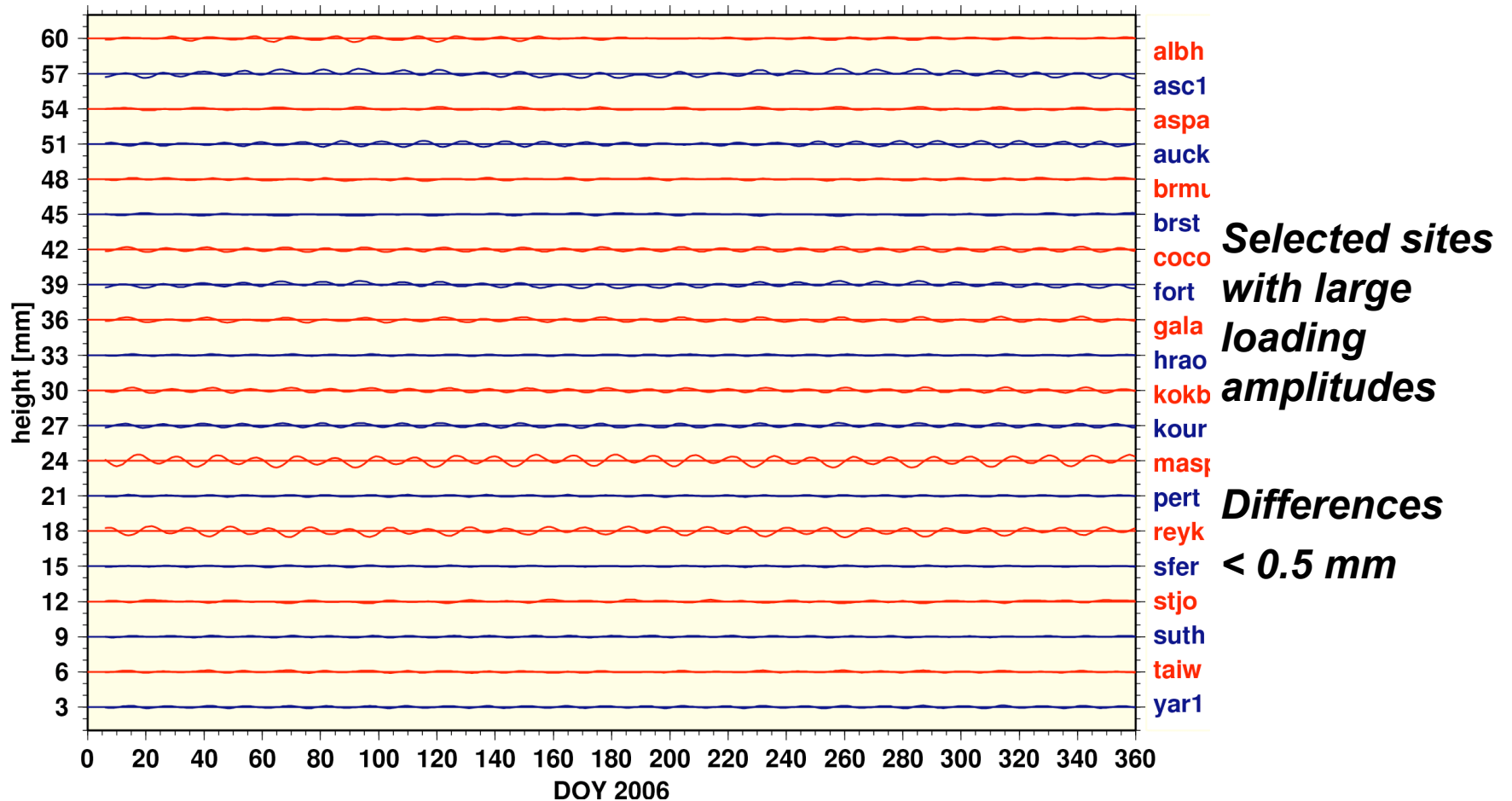
**Selected sites
with large
loading
amplitudes**

**Differences
up to 3 mm**

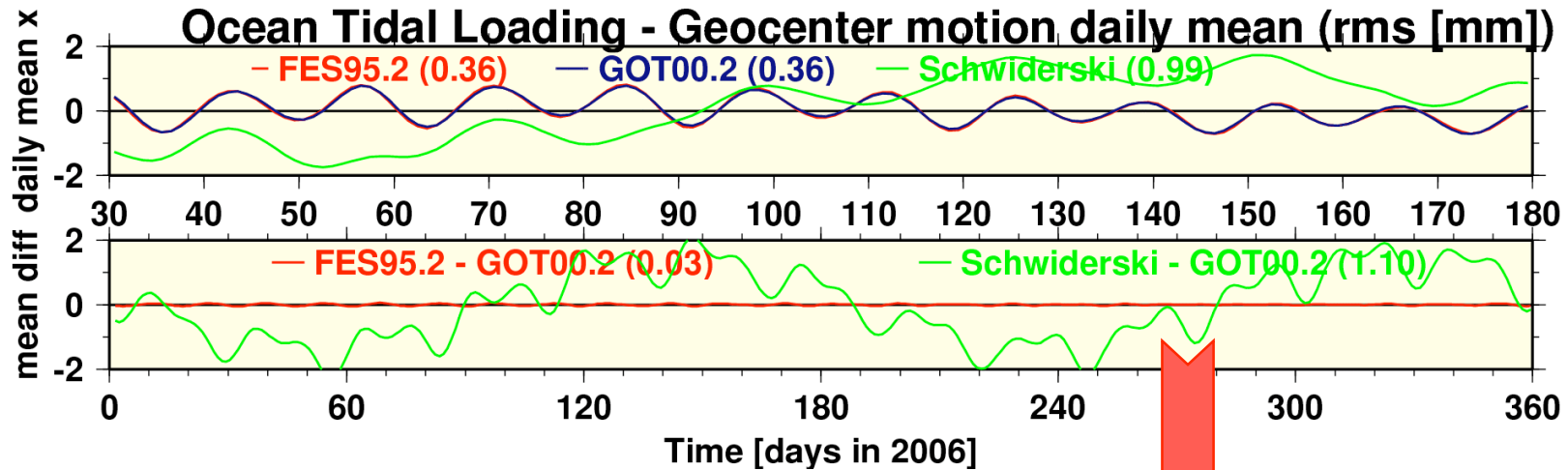
Ocean Tidal loading -Height

- Differences of daily mean (24h) values btw GOT00.2 and FES2004

Comparison of daily means, GOT00.2 minus FES2004



- Presently used models: GOT00.2 FES95.2 Schwiderski



New models

FES04-GOT	0.14mm
TPXO-GOT	0.15mm
TPXO-FES04	0.10mm

- **Quality (precision) of IGS products has further improved**
- **Hence consistency within products (lines) of each AC and between ACs has to be improved too.**
 - ◆ **Especially, consistency between the AC SNX and AC orbits**
- **Reason for “AC dependent scale” and its inconsistency to orbit scale has to be studied (models, elevation cut off, mapping functions, radiation pressure)**
- **Consistency of used loading models (ocean loading) is important for stability of IGS RF (proposal: FES2004+CMC+HARPOS)**
- **All ACs have to check if the latest subdaily ERP model is used**

No new recommendation :

- ➔ **- Implementation and check of recomb WS Bern 2004**
- Recommendations for Reprocessing**