Galileo Terrestrial Reference Frame (GTRF)- Status

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on behalf of the GGSP Consortium
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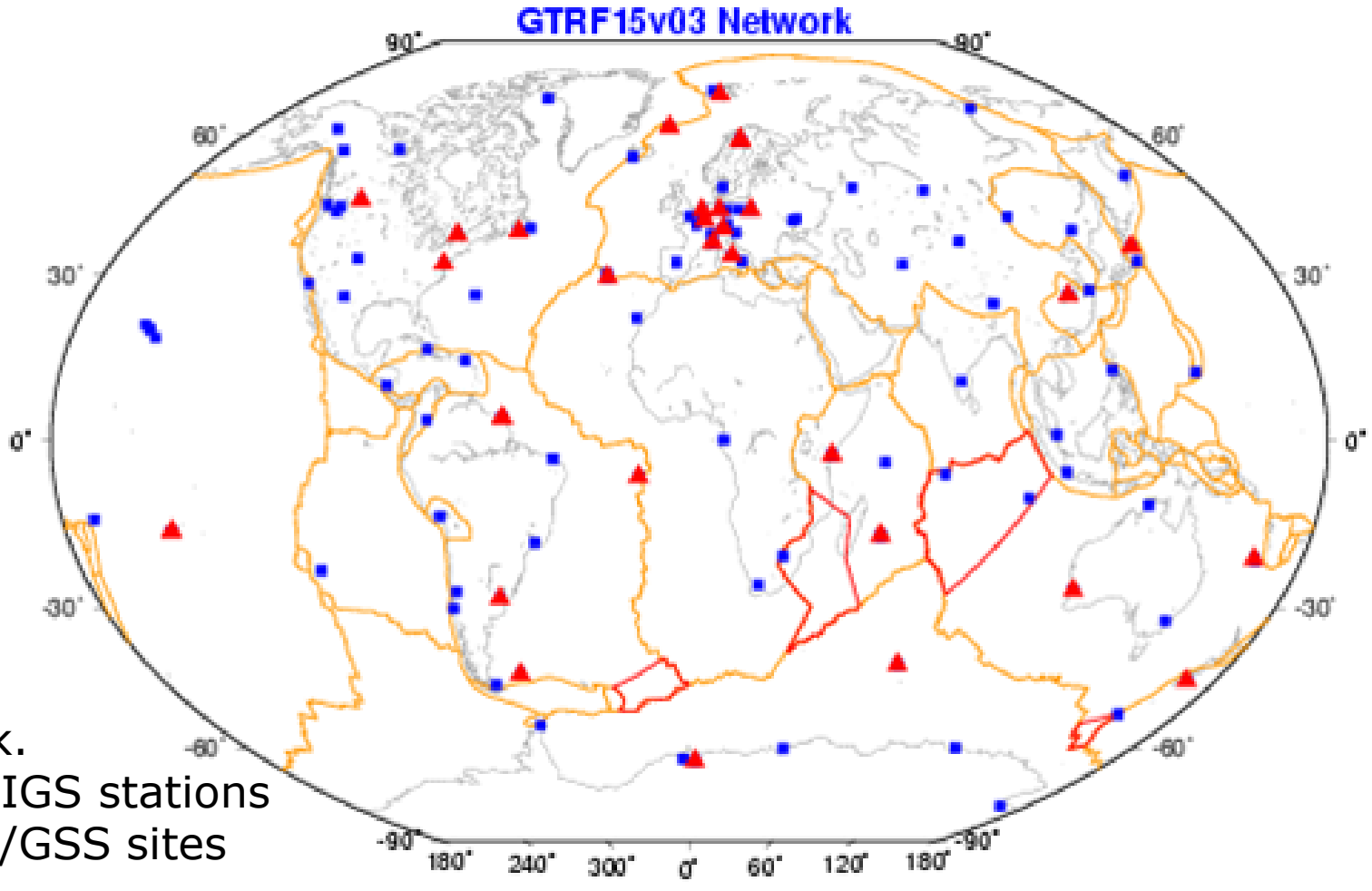
The GTRF15v03 is obtained by:

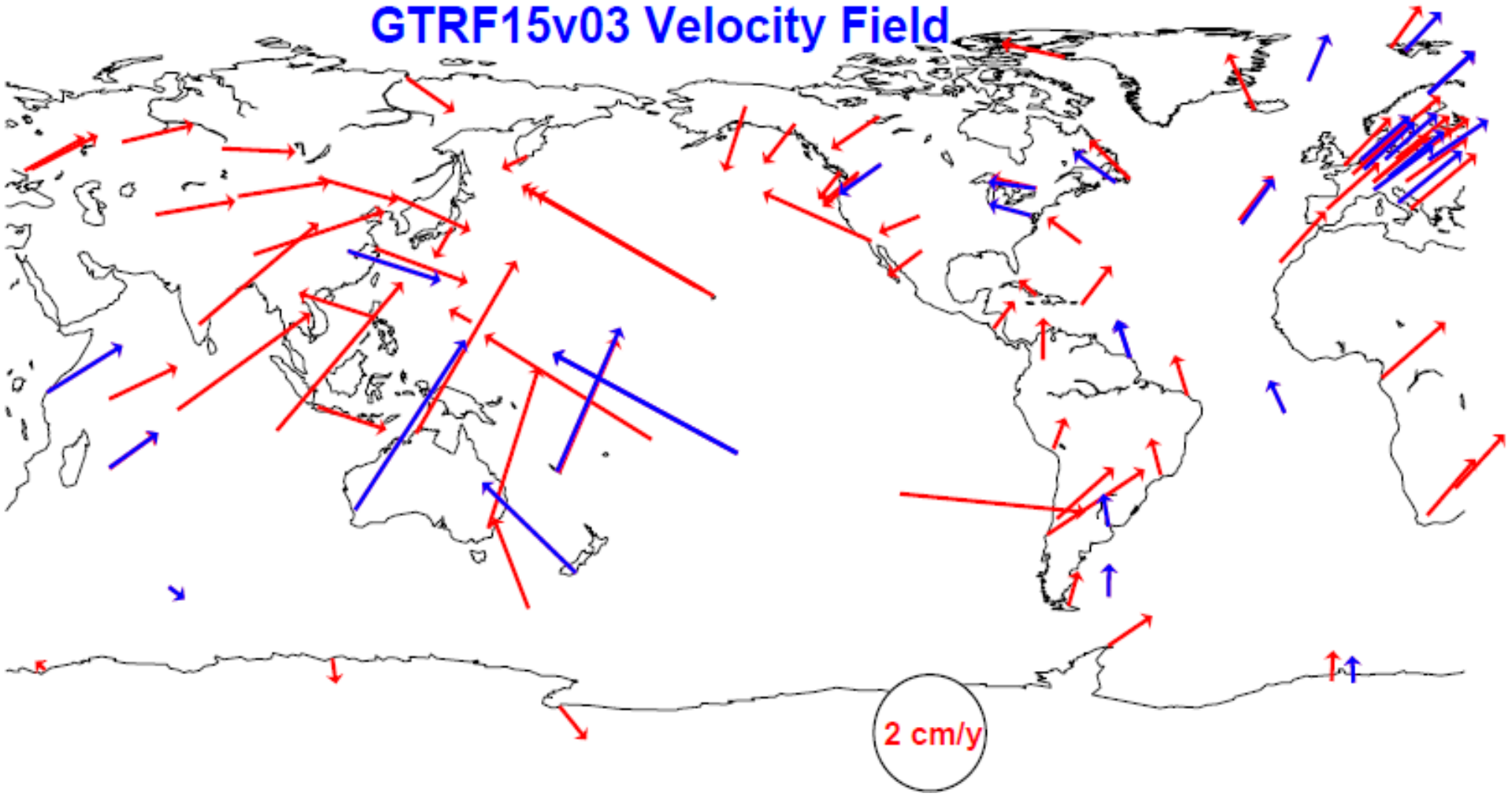
- accumulating (rigorously stacking) the 261 weekly GTRF combined solutions (since 2006)
- Contains 151 stations located in 112 sites
- Using minimum constraint approach
  - the GTRF15v03 solution is aligned to the IGb08 (ITRF2008) frame over a set of 83 IGS/ITRF stations
  - located in 59 sites
    - 41 in the northern hemisphere
    - 18 in the southern hemisphere

Tracking Network for the GTRF – All stations



GTRF15v03 network.
blue squares: ITRF/IGS stations
red triangles: GESS/GSS sites

GTRF Velocity Field



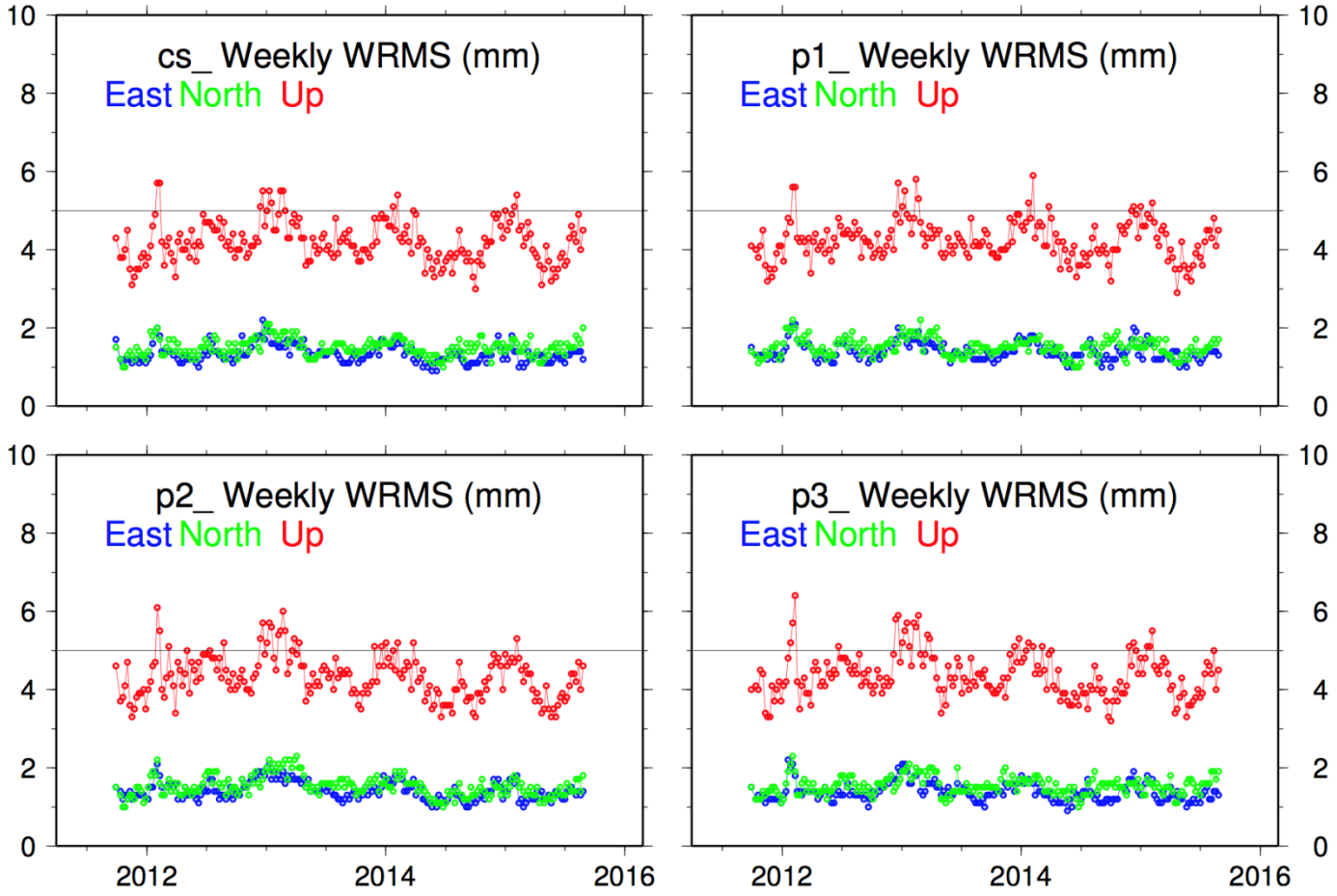
GTRF Releases in 2015

- GTRF15v03
  - Released 23 September 2015
  - Rigorously aligned to ITRF2008
  - In use by Galileo system
  - Next update is expected in 2016 after inclusion of new stations

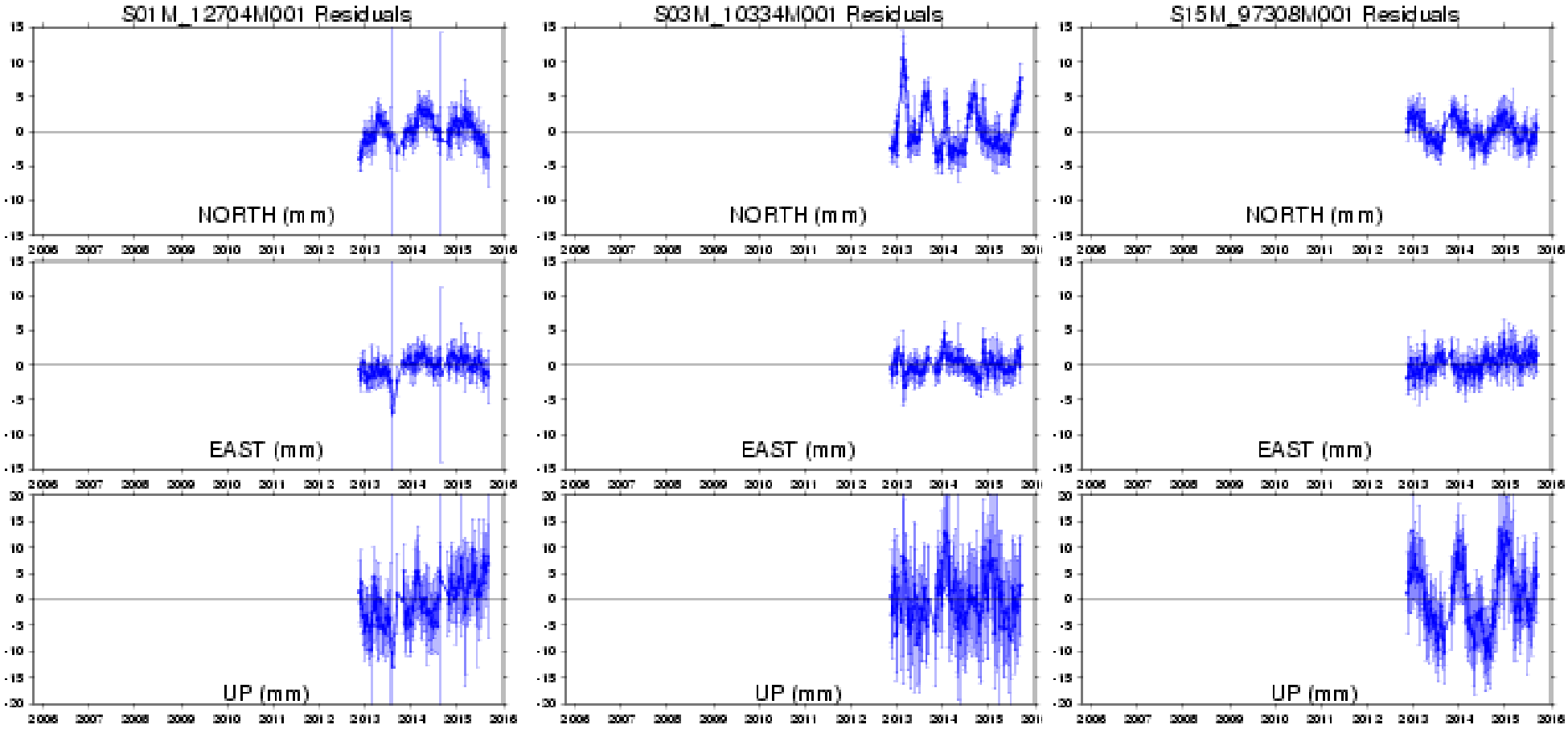
GTRF - Station Coordinates – Repeatability Assessment

Weekly WRMS of all PF's and Combined Solutions station positions is at the level of

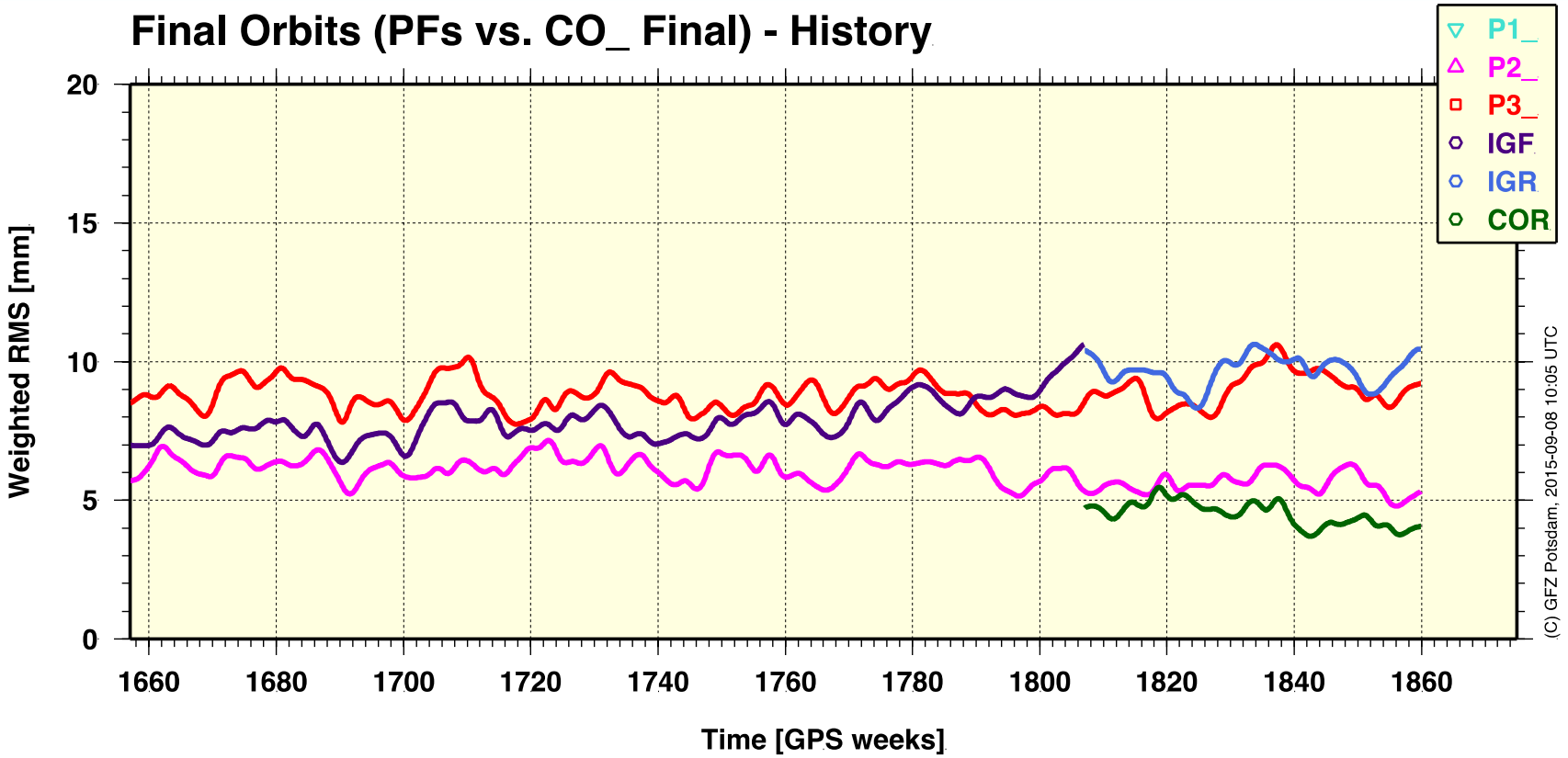
- **1 to 2 mm for horizontal components and 3 to 6 mm for the height**



GSS station residuals time series - Examples

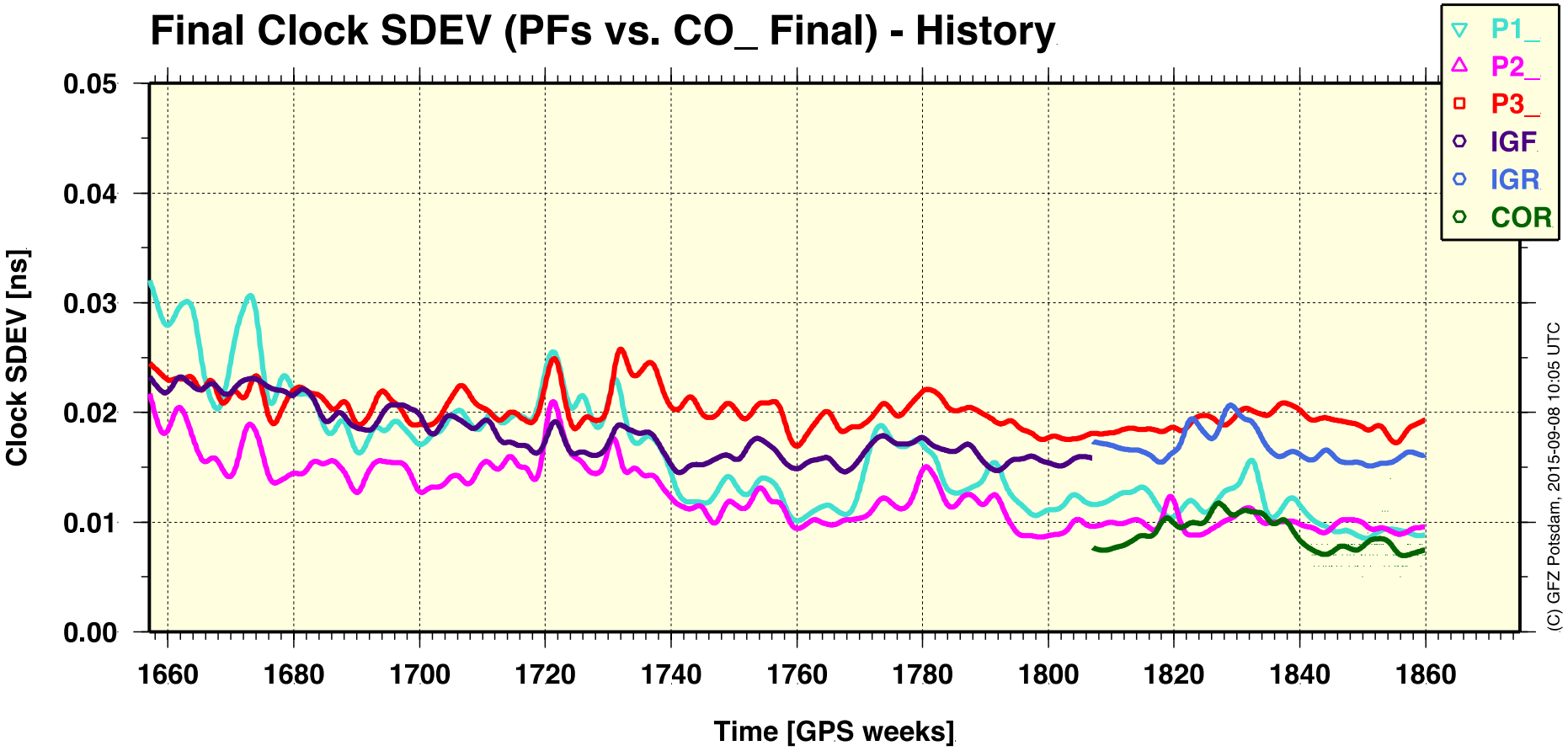


Orbit Combination



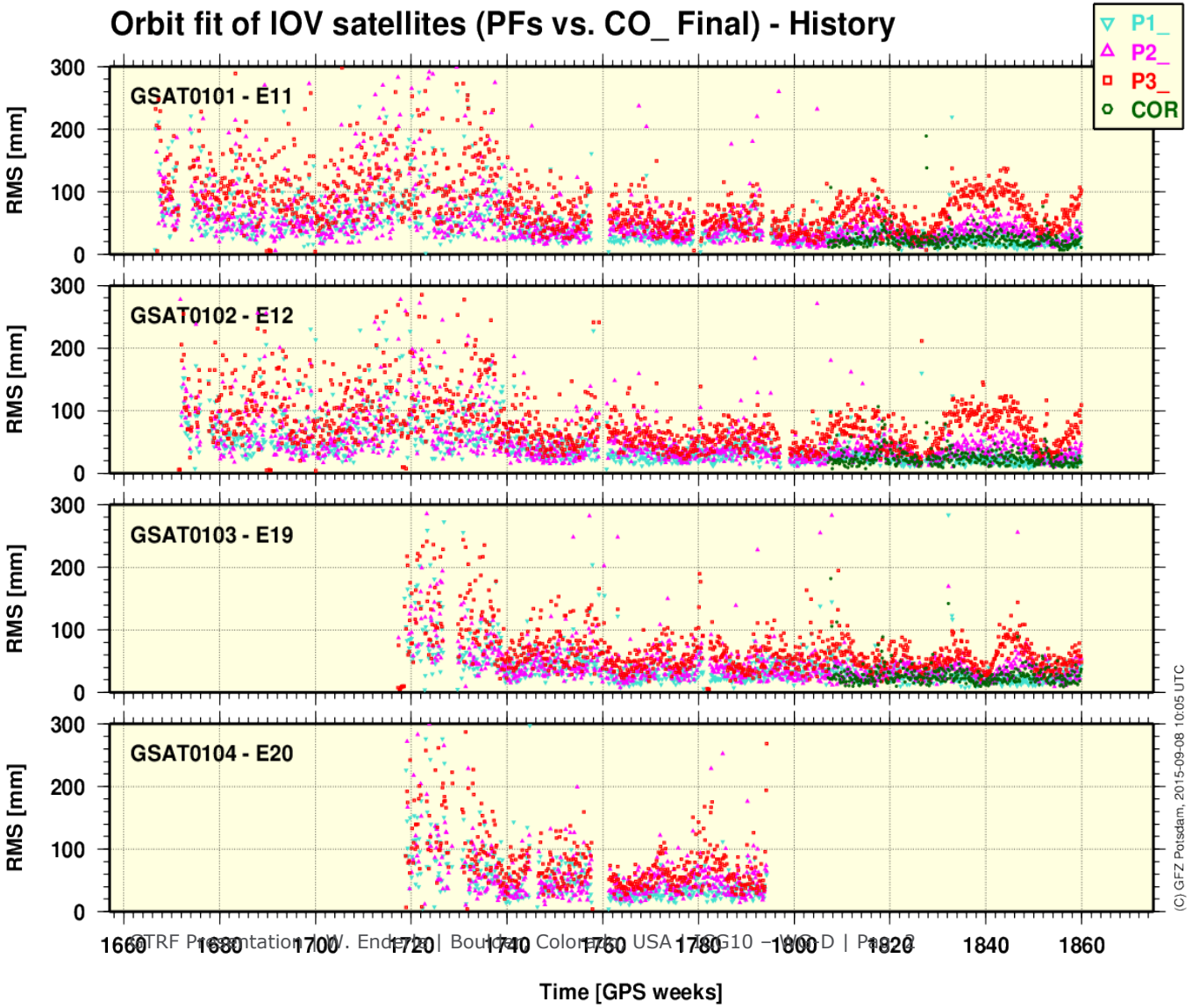
- Orbit RMS agreement btw PFs and combined (co_) orbits for GPS satellites
  - COR is combined rapid product (within 12 hours after end of the day)
  - Agreement mostly at the level of 5-10 mm
  - Combination difference to the IGS Final (IGF) and IGS Rapid (IGR) is at the same level

Clock Combination



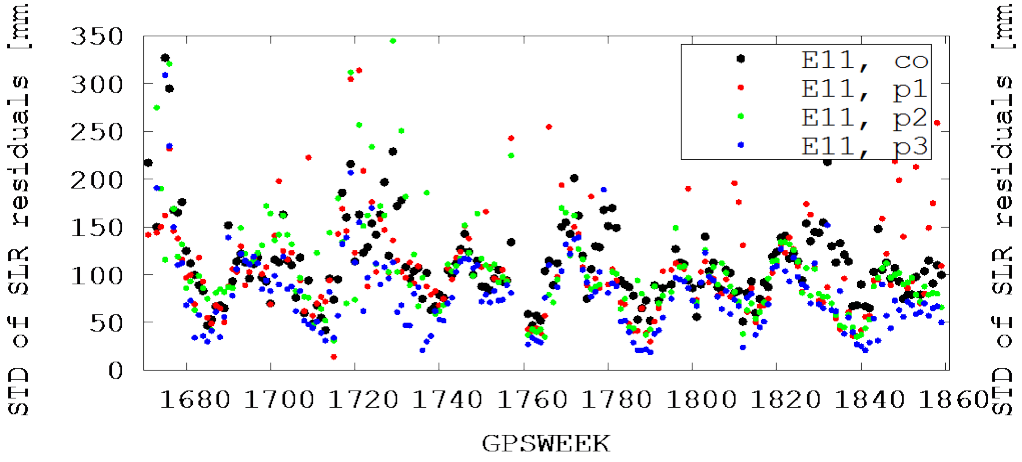
- **Agreement for the clocks shows RMS of about 15 to 25 ps (all biases subtracted)**

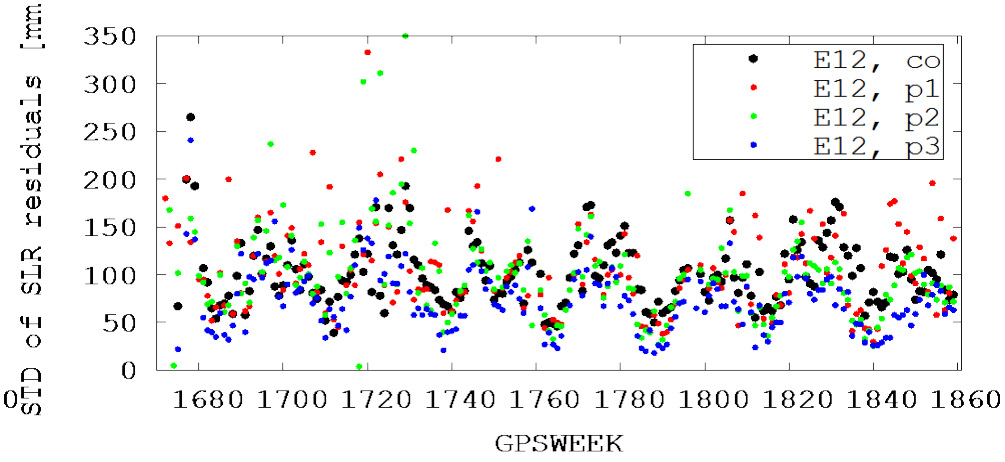
Galileo final PF and OVF rapid orbit solutions compared to OVF final (IOV)

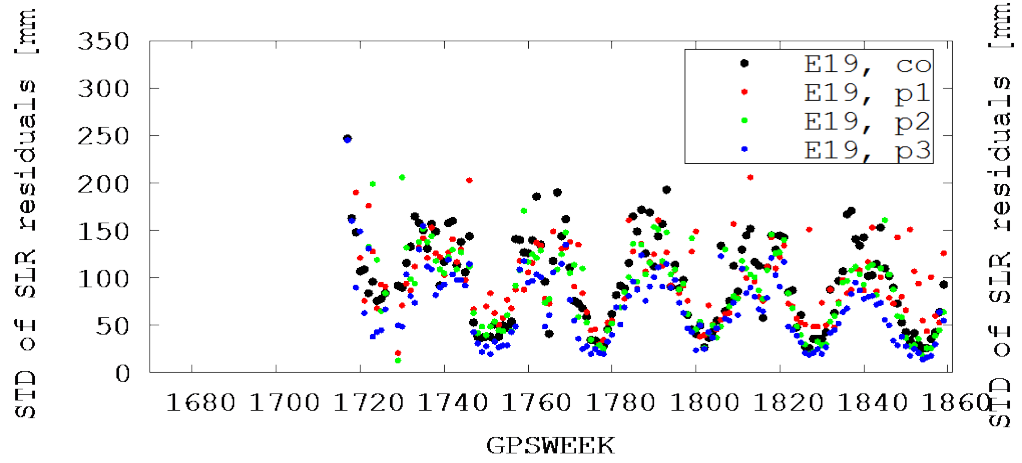


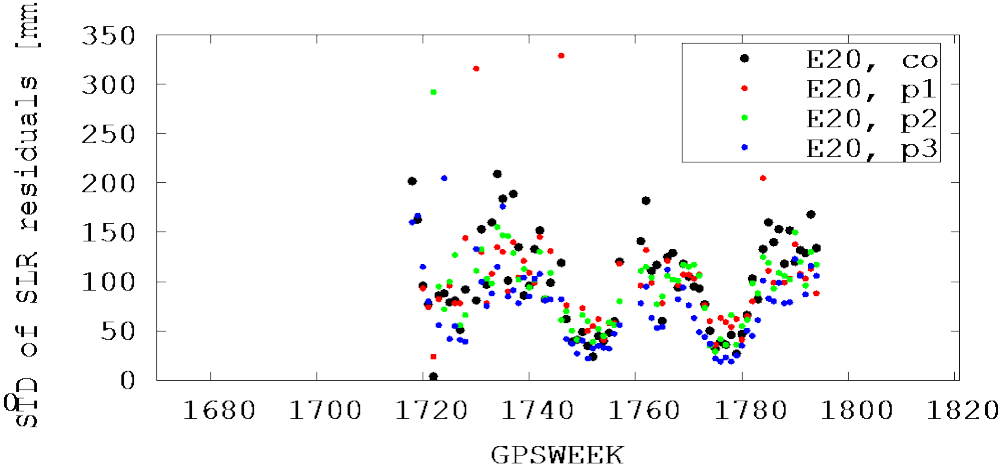
- Difference between PF and co_ Galileo orbits are in the range of 5 to 15 cm (with outliers in case of data problems)
- MGEX included since week 1739
- Week 1821/1822: Extension of MGEX station list

SLR Residuals
Standard deviation (IOV)









The SLR residuals are confirming the overall orbit accuracy (3D – 1 Sigma) of 10 – 20 cm.

Validation

- Validation is carried out on a weekly basis when the last reference product is available (in general, the IGS troposphere solution)
- Validation result is a weekly summary file (vf_wwww7.sum)
- Example from summary file (vf_18597.sum)
- High quality, demonstrated by the RMS of Helmert-transformation (w1859)

		#sites	North [mm]	East [mm]	Up [mm]
GTRF15V02	RMS / COMPONENT	113	2.34	1.80	5.53
IGb08	RMS / COMPONENT	54	4.10	3.41	6.29
IGb08week	RMS / COMPONENT	111	2.14	2.02	5.31

THANK YOU

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