Galileo Terrestrial Reference Frame (GTRF)- Status

Werner Enderle
on behalf of the GGSP Consortium
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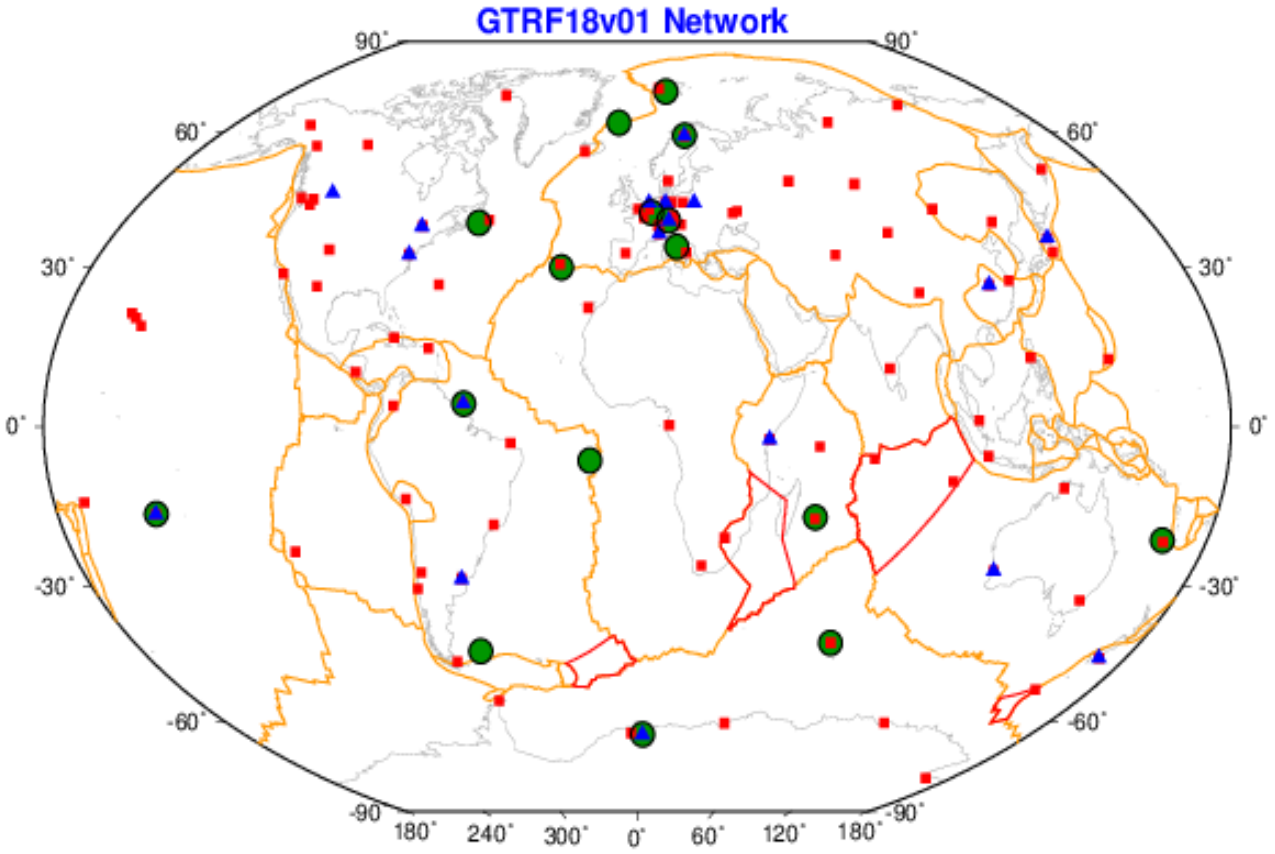
GTRF Generation
Latest realization: GTRF18v01

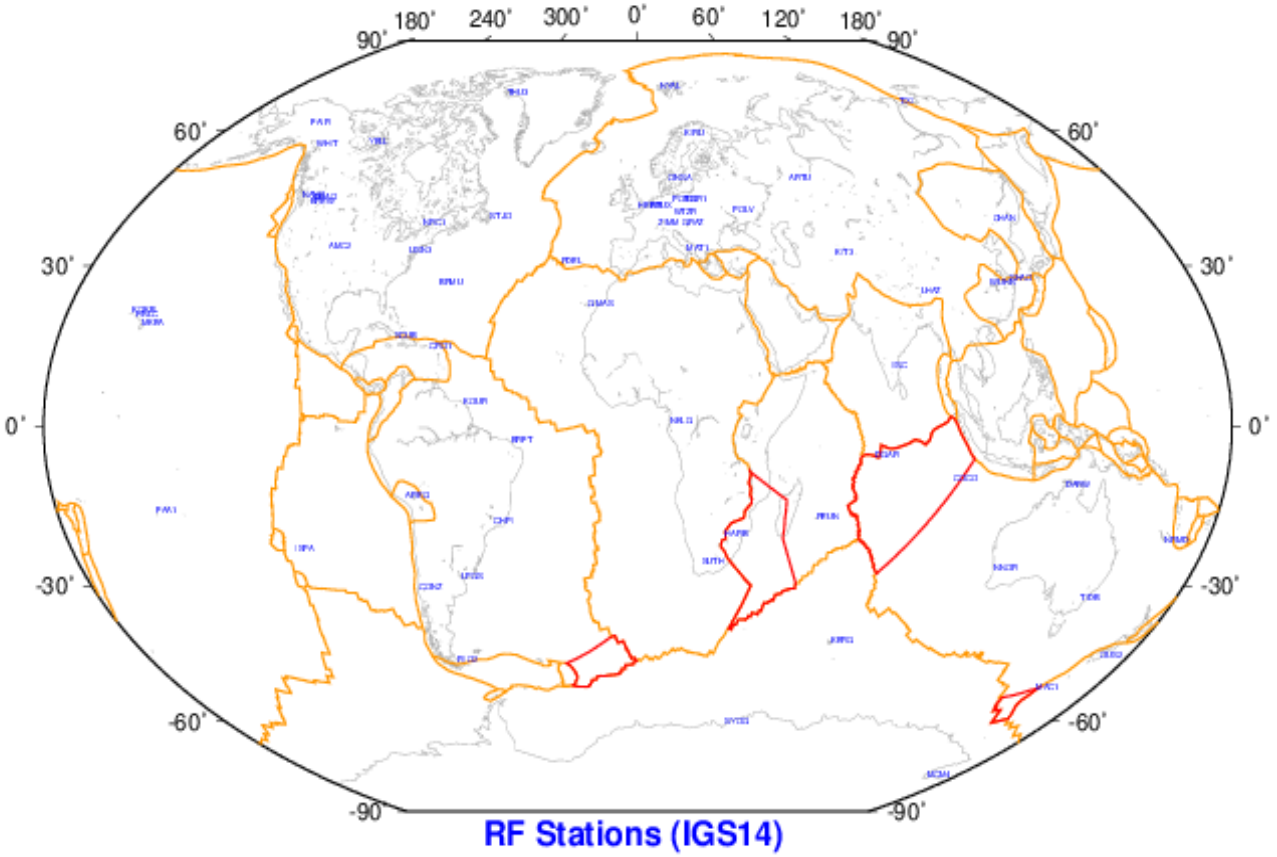
- The GTRF18v01 was obtained by accumulating (rigorously stacking) the 406 weekly GTRF combined solutions spanning 11.66 years
- GTRF18v01 is aligned to ITRF2014 (through IGS14) using the minimum constrains approach over a set of 83 IGS/ITRF stations, located in 63 sites
- The GTRF18v01 combination process makes use of:
    1. annual and semi-annual signals present in the station position time series were estimated during the stacking, and
    2. Post Deformation (PSD) parametric models were applied to the coordinates of stations that are subject to major earthquakes before stacking the time series.

Tracking Network for the GTRF – All stations



Latest GTRF Realisation: GTRF18v01 includes 193 stations in 111 sites
red squares: ITRF/IGS stations
Green/blue: GSS/GESS sites

Reference Frame Network for the GTRF



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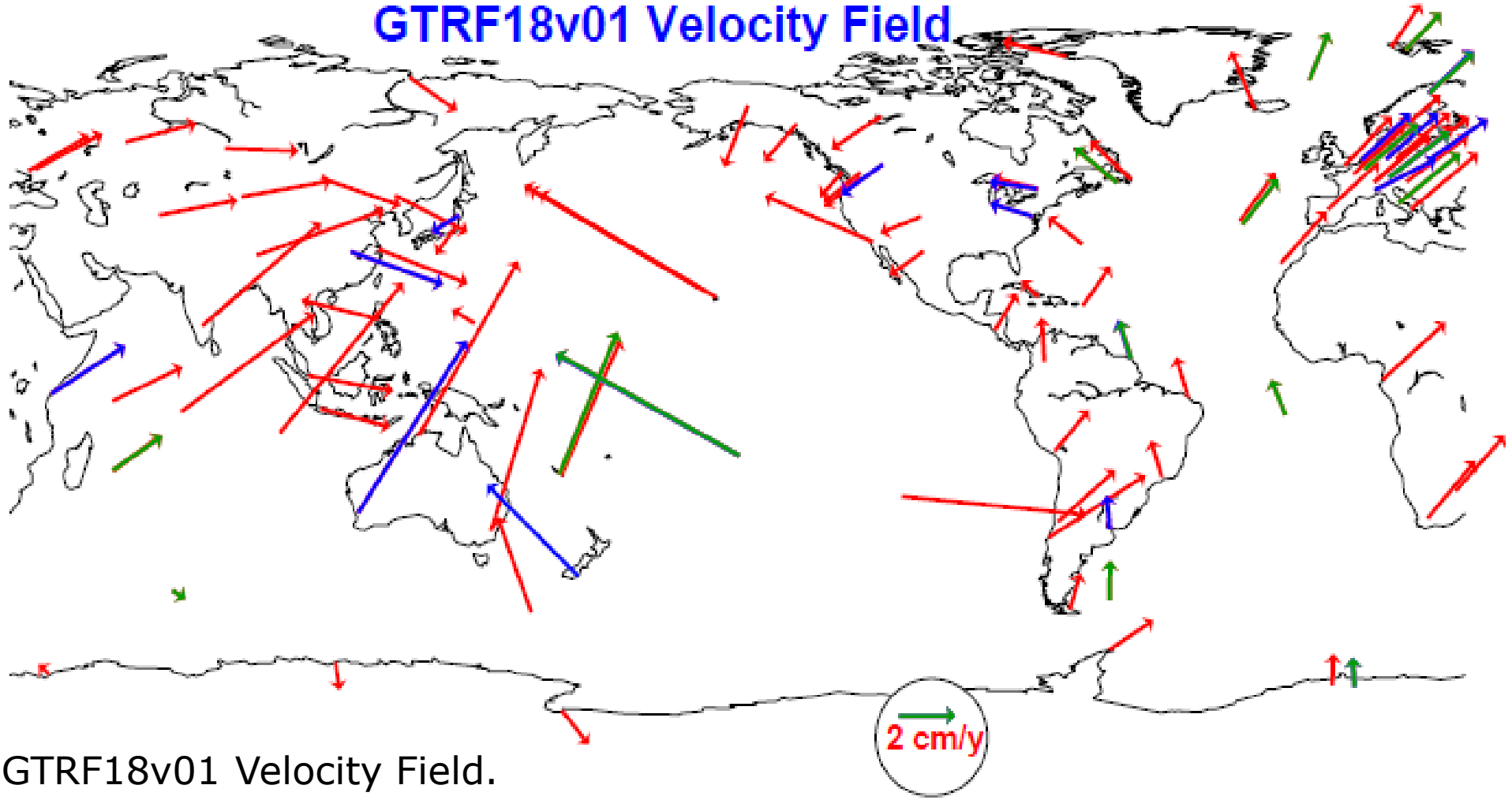
GTRF Velocity Field

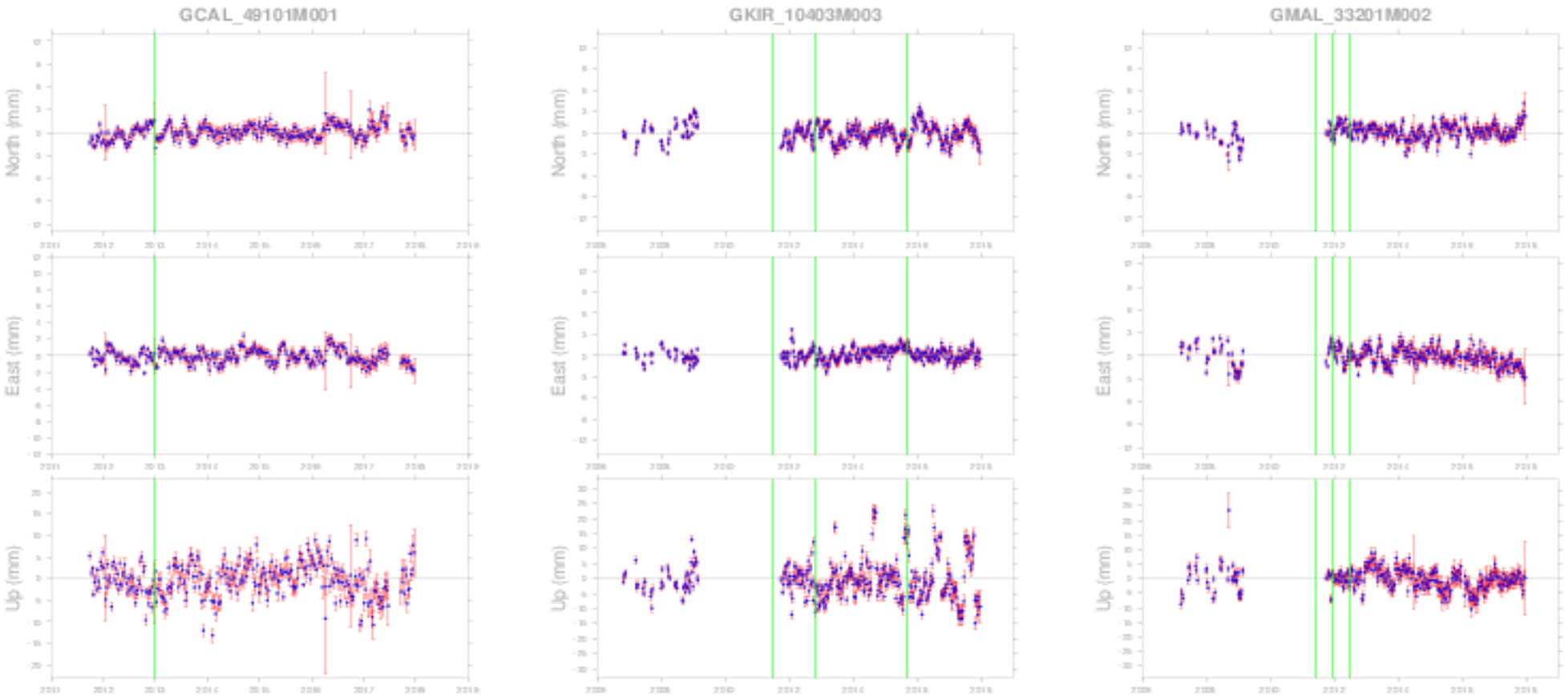


GTRF18v01 Velocity Field.
Red: IGS/ITRF site
Blue/Green: GESS/GSS site.

GTRF Releases in 2018

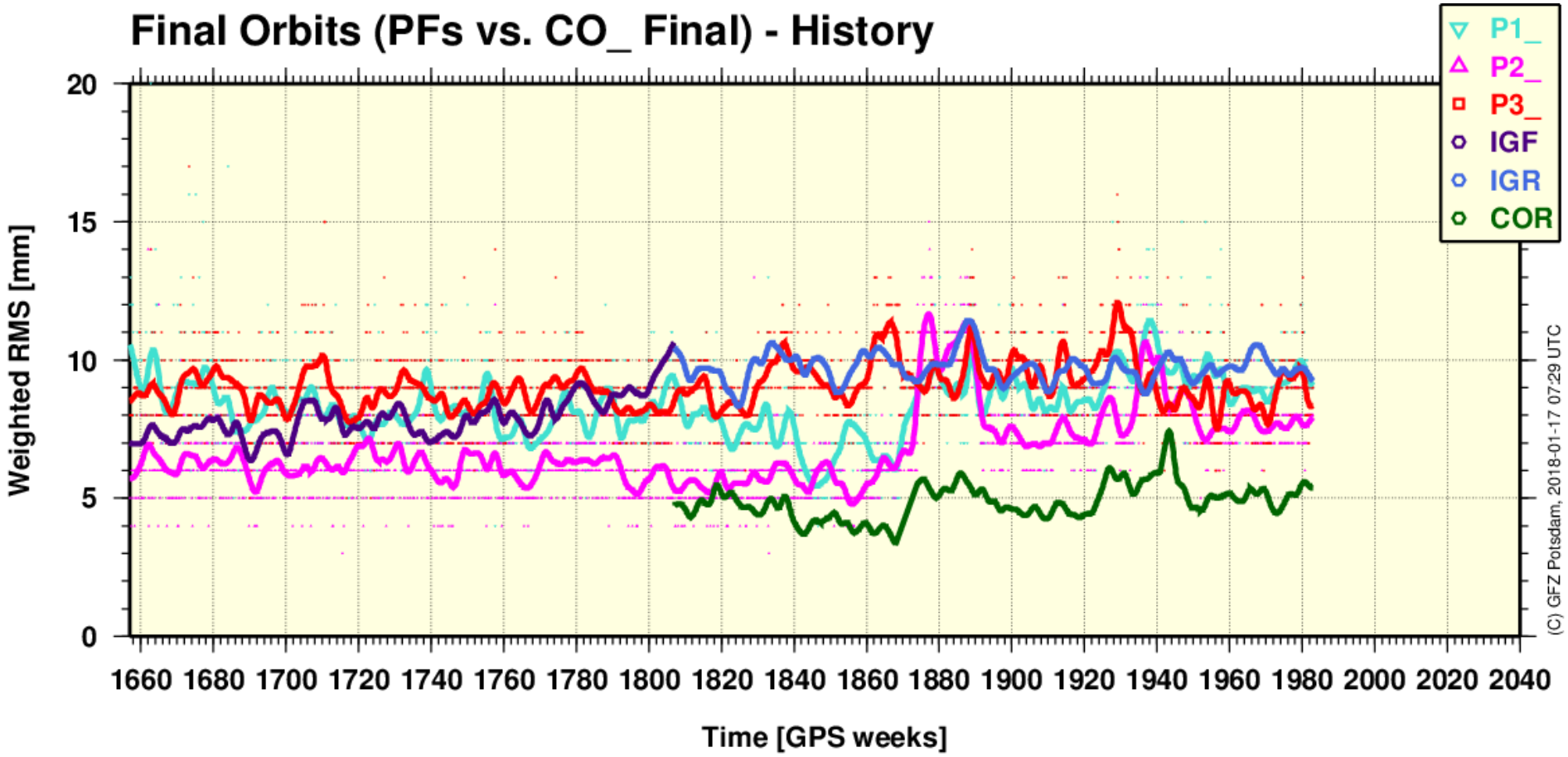
- GTRF18v01
  - Released July 2018
  - Rigorously aligned to ITRF2014
  - Next update is expected in 2019

GESS station time series - Examples



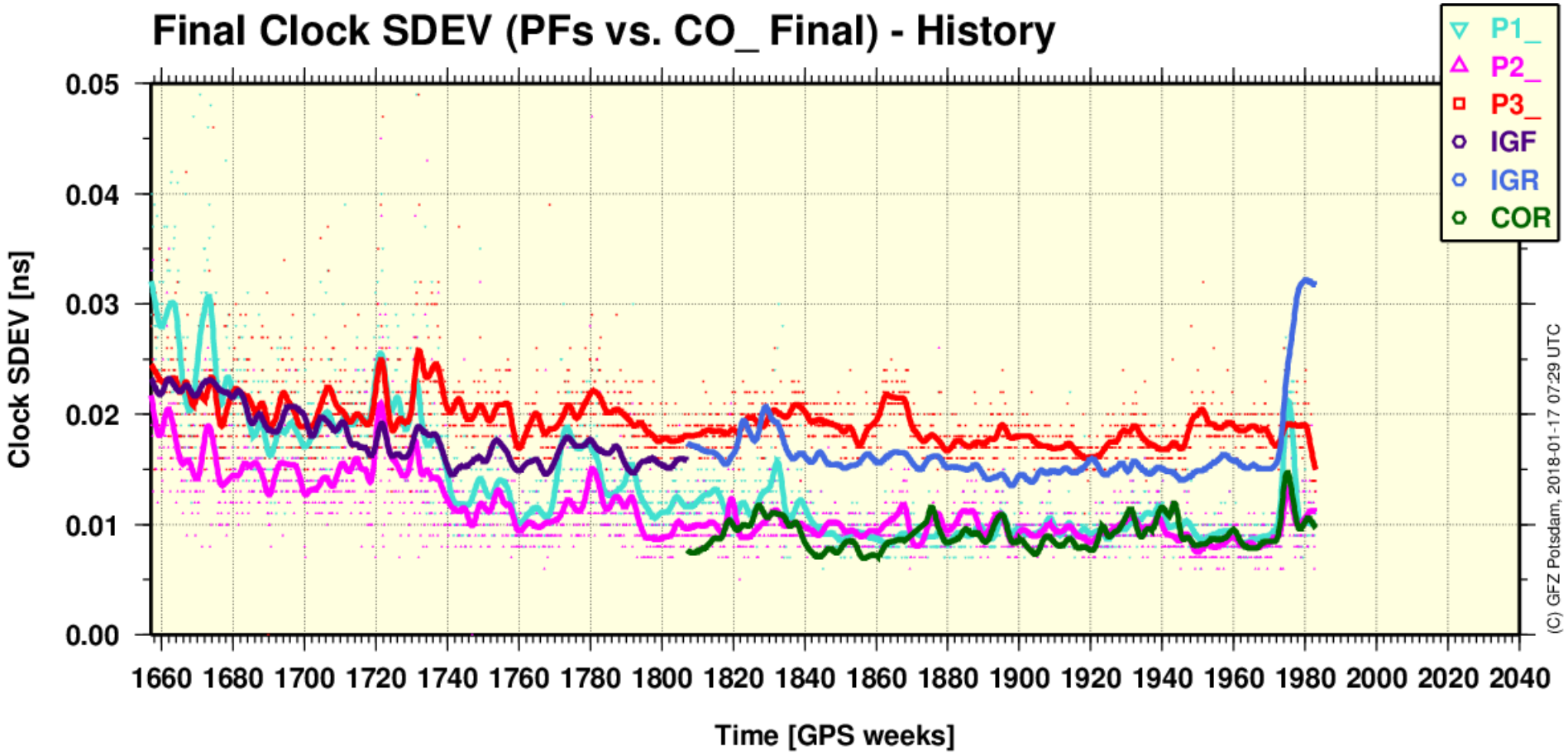
Green lines: Estimated discontinuities
Red bars: formal error of weekly solutions

Orbit Combination (Final, full history)



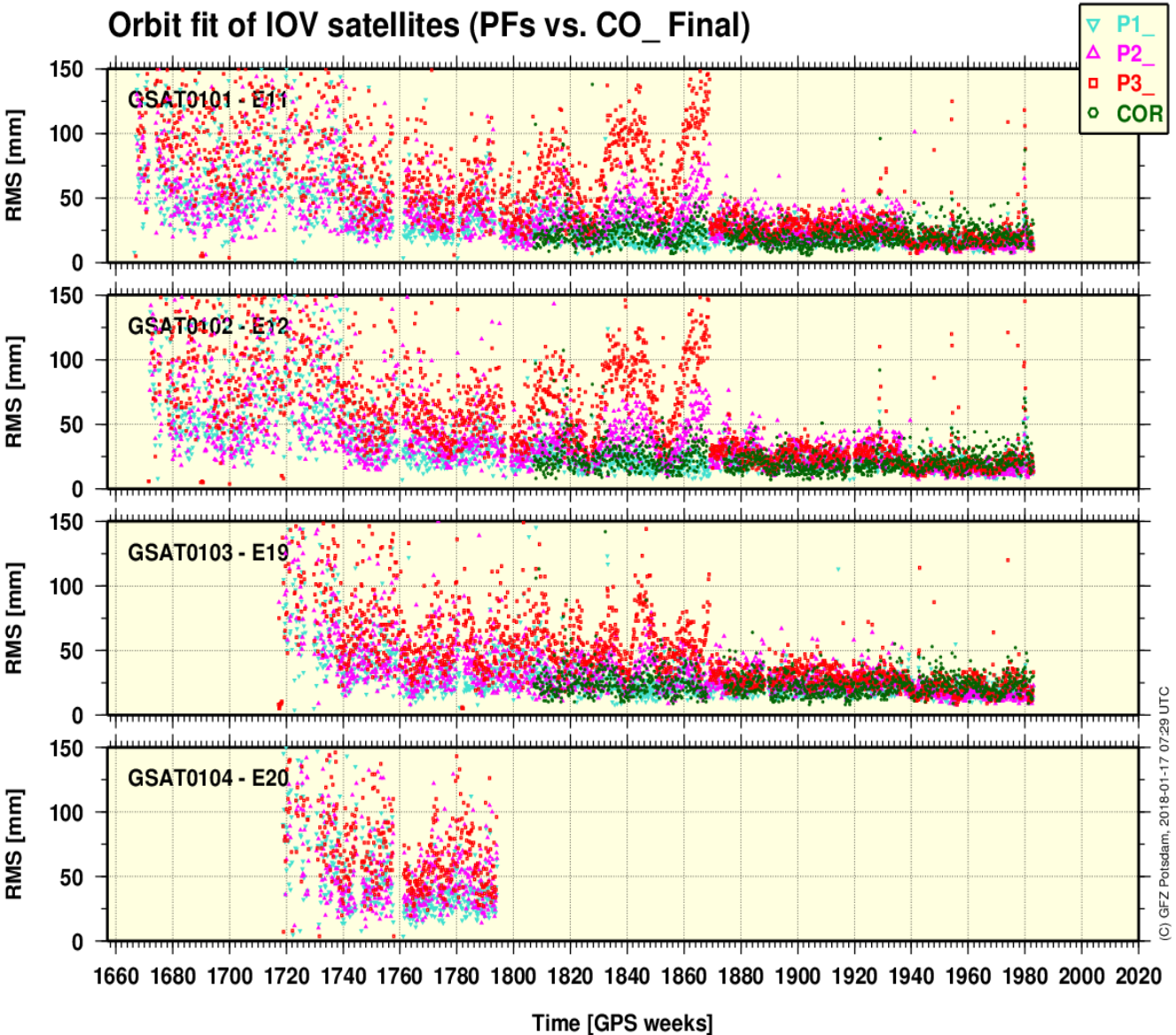
- **Orbit RMS agreement btw PFs and combined (co_) orbits for GPS satellites**
  - **Agreement mostly at the level of 5-10 mm**
- **COR is combined rapid product, IGF is IGS Final and IGR is IGS Rapid**

Clock Combination (Final, full history)



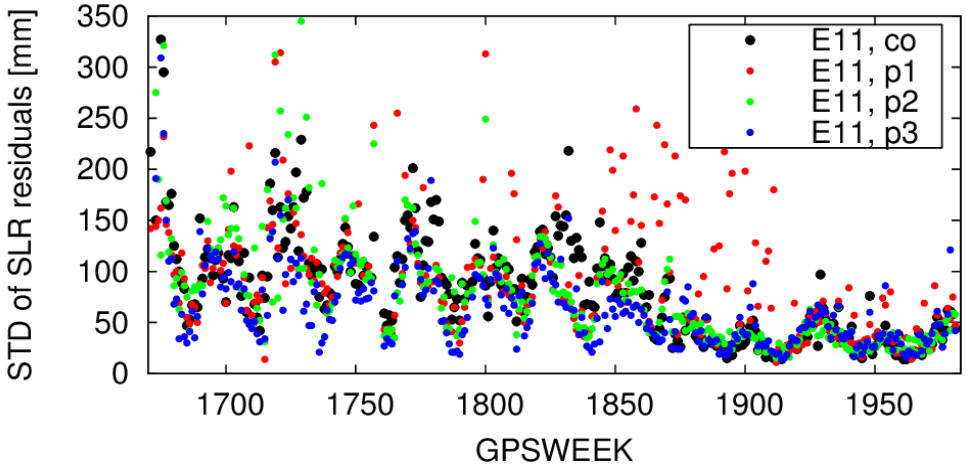
- **Agreement for the clocks shows RMS of about 8 to 25 ps**
  - **all biases subtracted**

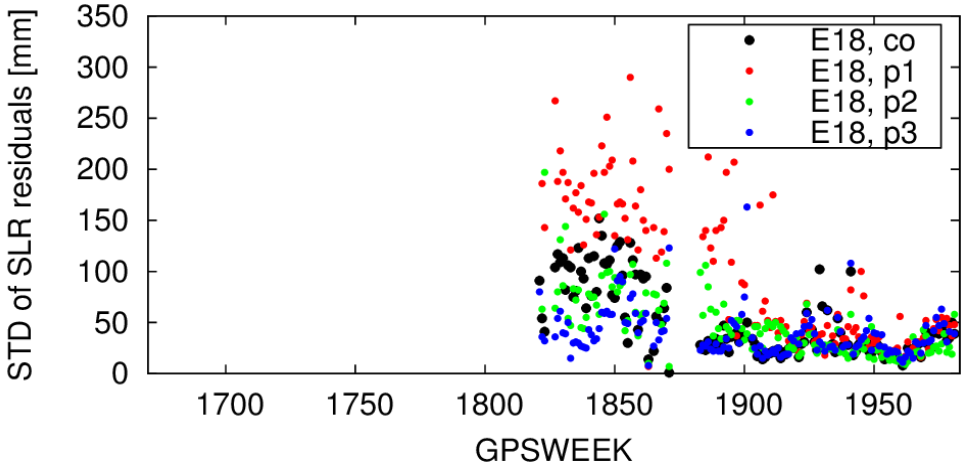
Galileo final PF and OVF rapid orbit solutions compared to OVF final

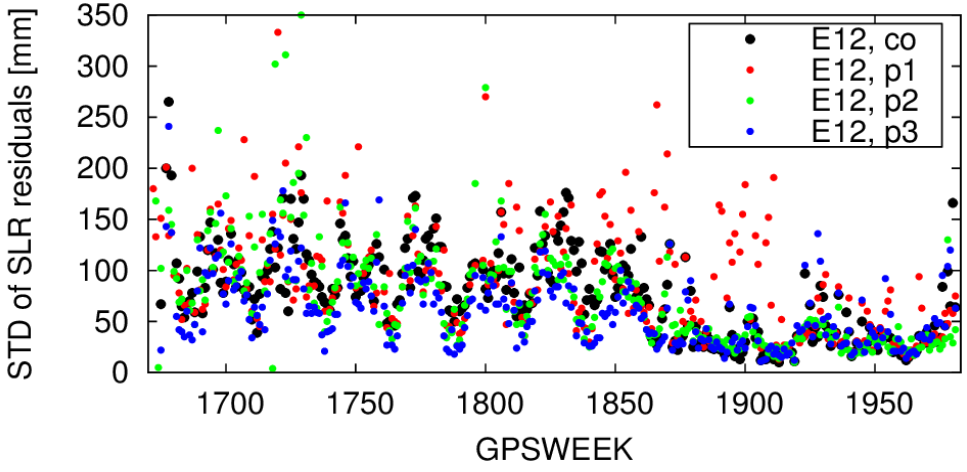


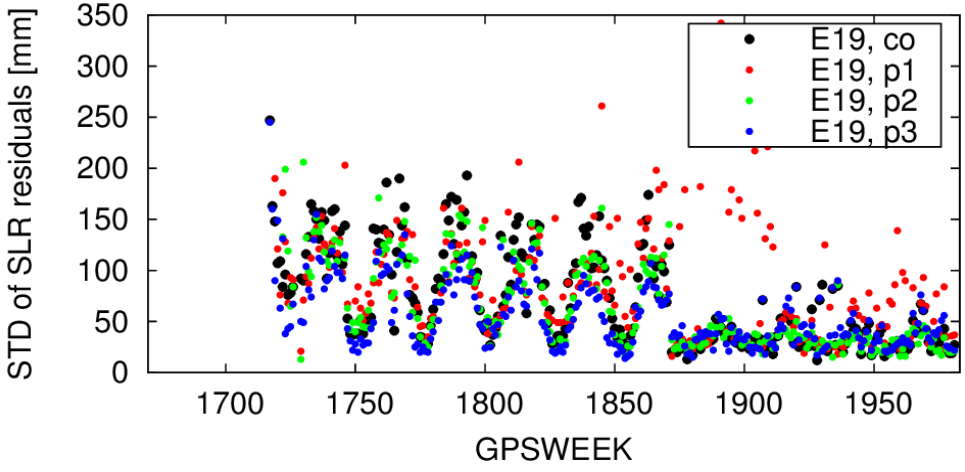
- Difference between PF and co_ Galileo orbits are in the range of 50 to 150 mm (with outliers in case of data problems)
- From week 1873: Improved modeling with ECOM2 (PF1 and PF3) and Box-Wing (PF2) significantly improved agreement to 10 to 60 mm level.

SLR Residuals
Standard deviation









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

Notice improvement thanks to improved modelling starting week 1873

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_19817.sum)
- High quality, demonstrated by the RMS of Helmert-transformation (see table below)

		#sites	North [mm]	East [mm]	Up [mm]
IGS14	RMS / COMPONENT	71	2.63	2.53	6.43
IGS14week	RMS / COMPONENT	117	1.88	1.96	5.10
GTRF17V0e	RMS / COMPONENT	111	2.16	1.82	5.33

THANK YOU

Werner Enderle
Werner.Enderle@esa.int