

# Galileo Terrestrial Reference Frame (GTRF)- Status

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on behalf of the **GGSP Consortium**  
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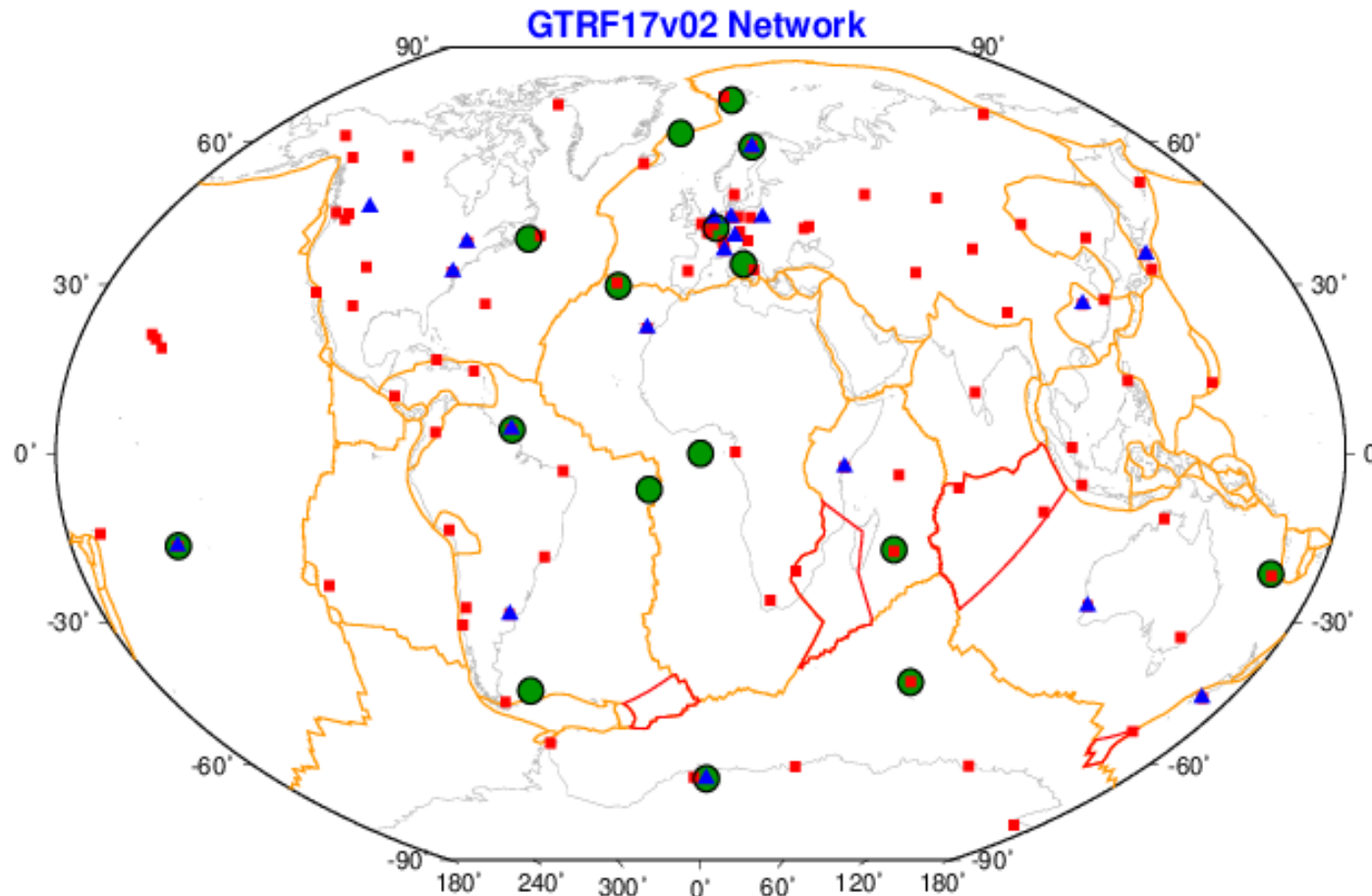
# GTRF Generation

## Latest realization: GTRF17v02



- The GTRF17v02 was obtained by accumulating (rigorously stacking) the 338 weekly GTRF combined solutions. Using minimum constrains approach, the GTRF17v02 solution is aligned to the IGS14 (ITRF2014) frame over a set of 83 IGS/ITRF stations, located in 63 sites (41 in the northern and 22 in the southern hemispheres, respectively).
- During the GTRF17v02 combination process, we introduced two major innovations compared to the past GTRF releases:
  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



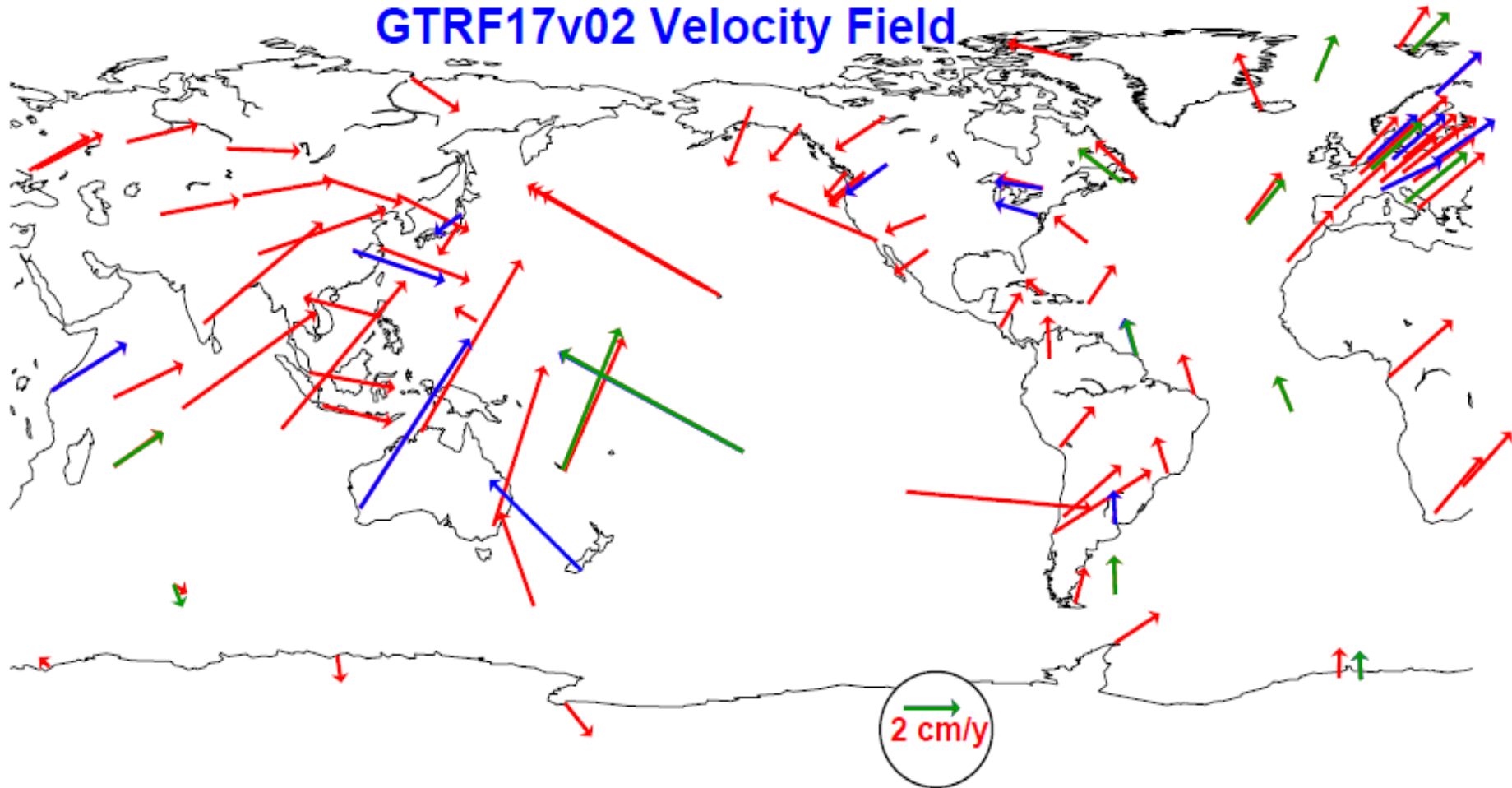
Latest GTRF Realisation: GTRF17v02

red squares: ITRF/IGS stations

Green/blue: GSS/GESS sites

# GTRF Velocity Field

## GTRF17v02 Velocity Field

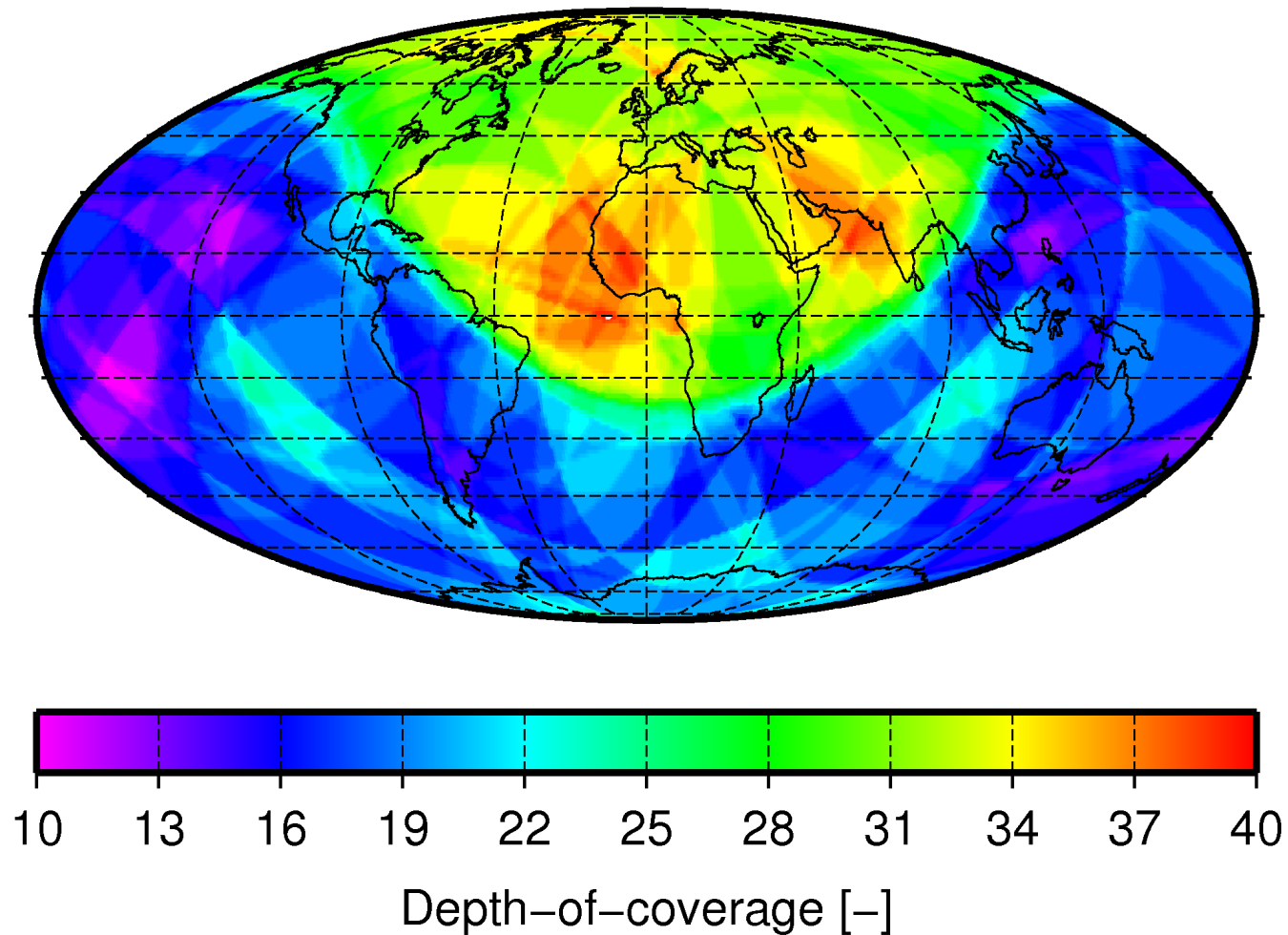


GTRF17v02 Velocity Field.  
Red: IGS/ITRF site  
Blue/Green: GESS/GSS site.

- GTRF17v01
  - Released January 2017
    - Alignment of GTRF16v01 to ITRF2014
    - Rigorously aligned to ITRF2014
- GTRF17v02
  - Released March 2017
    - Full release
- Next update is expected in 2018

# Depth of coverage (Galileo)

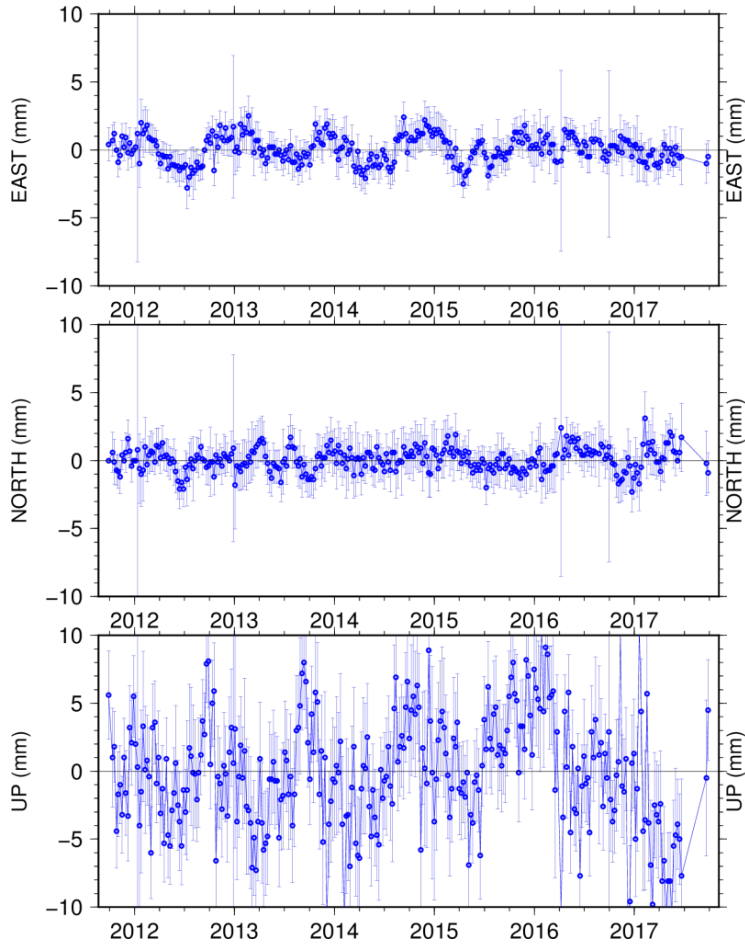
Galileo



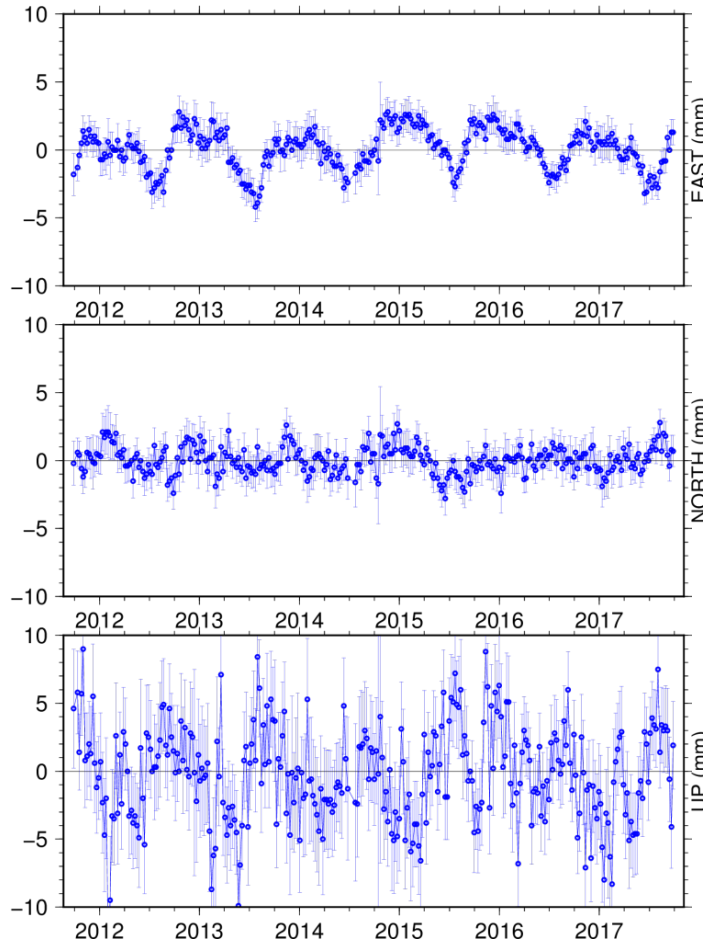
# GESS station time series - Examples



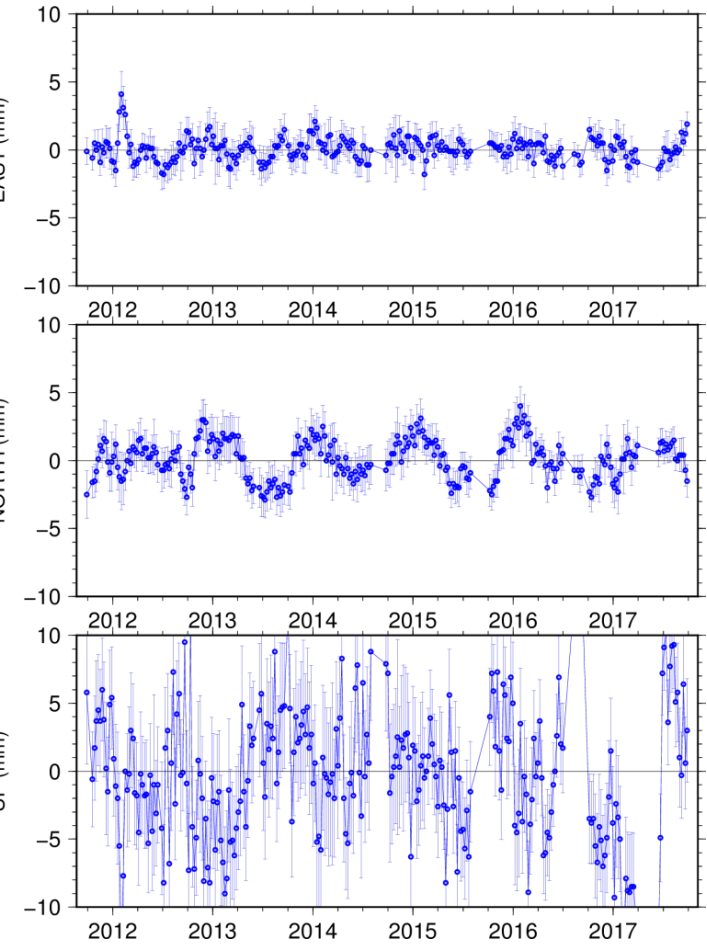
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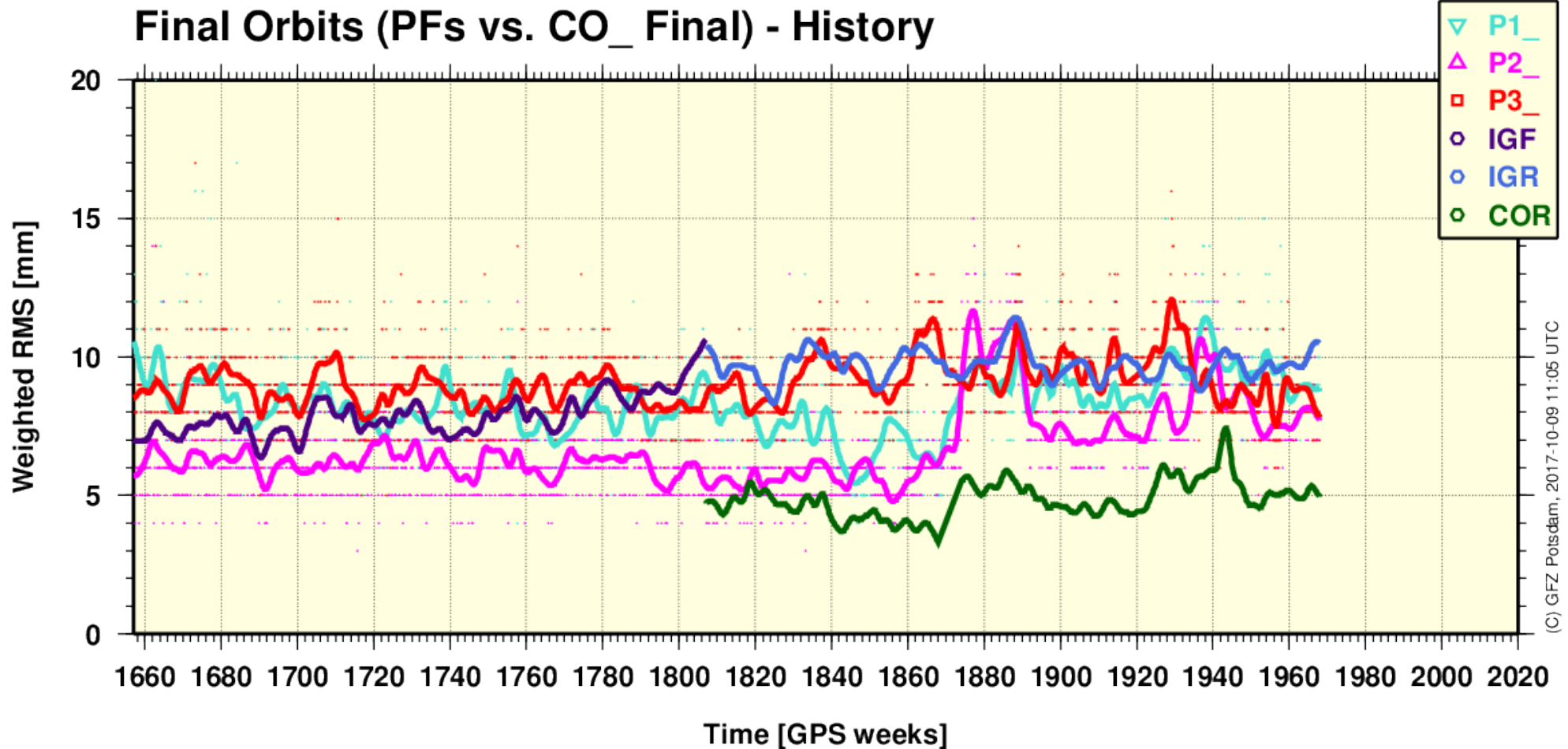


GIEN\_12724M003



GKIR\_10403M003

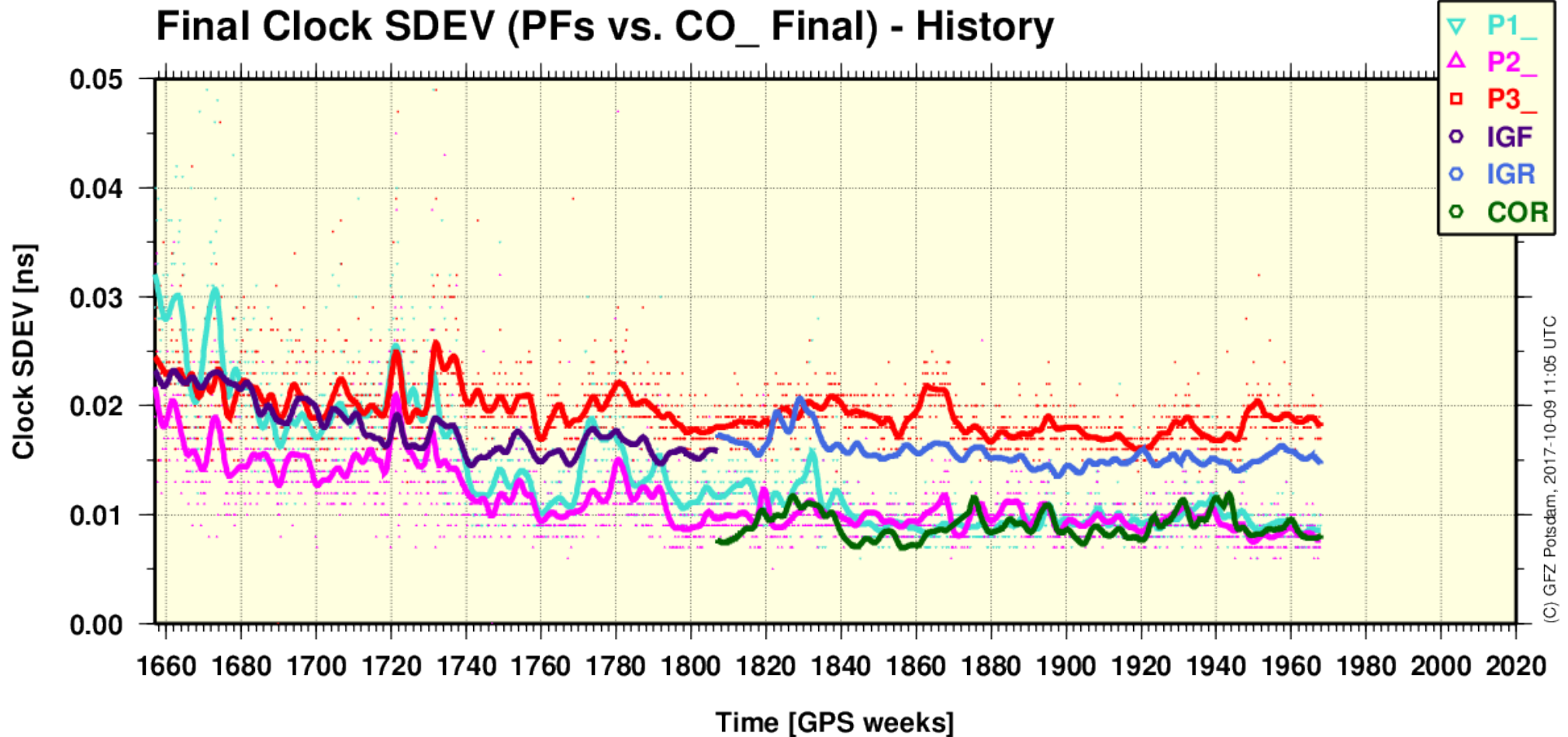




- **Orbit RMS agreement btw PFs and combined (co\_) orbits for GPS satellites**
  - Agreement mostly at the level of 5-10 mm
- **COR is combined rapid product, IGF is IGS Final and IGR is IGS Rapid**

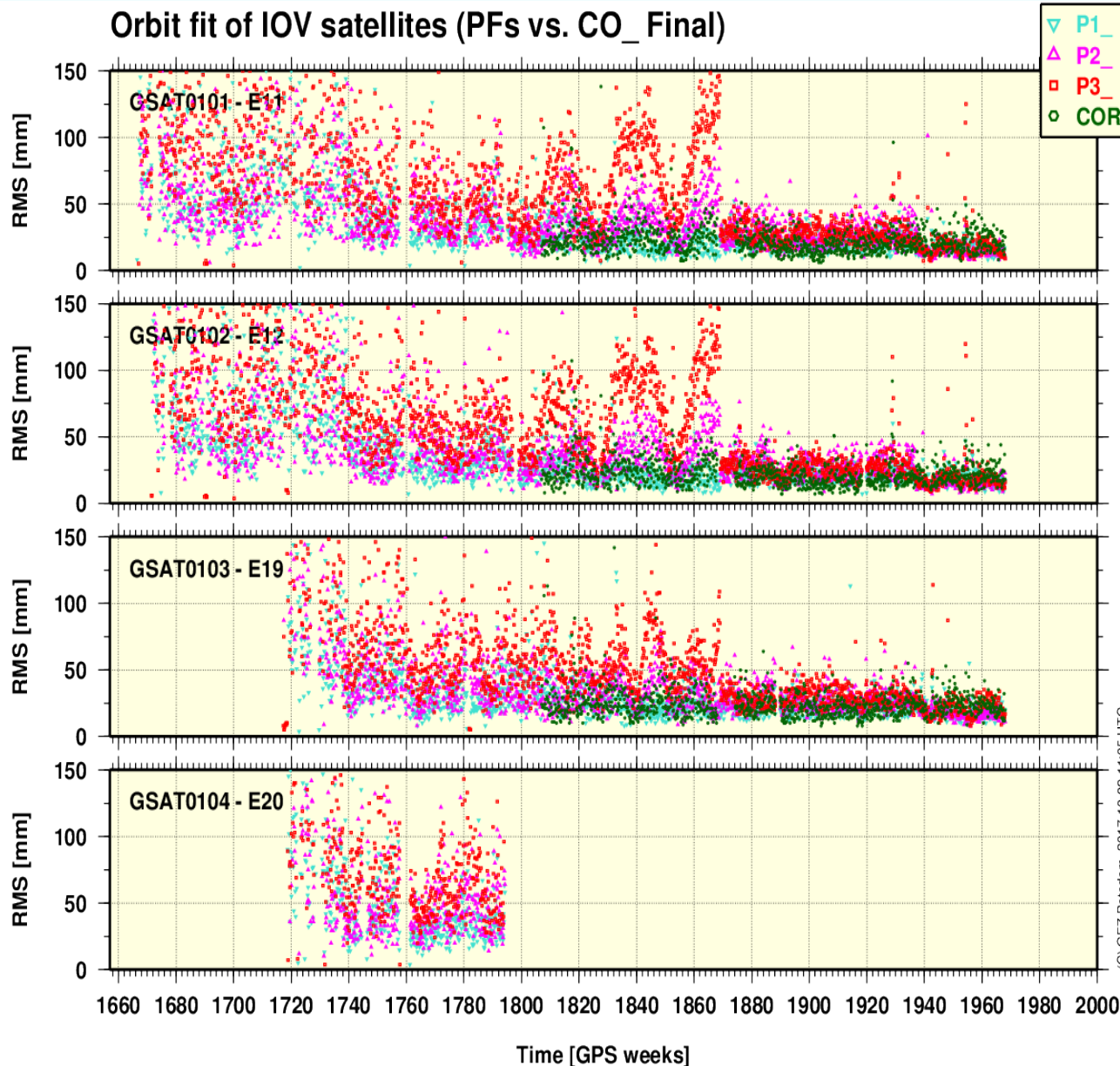


# Clock Combination (Final, full history)



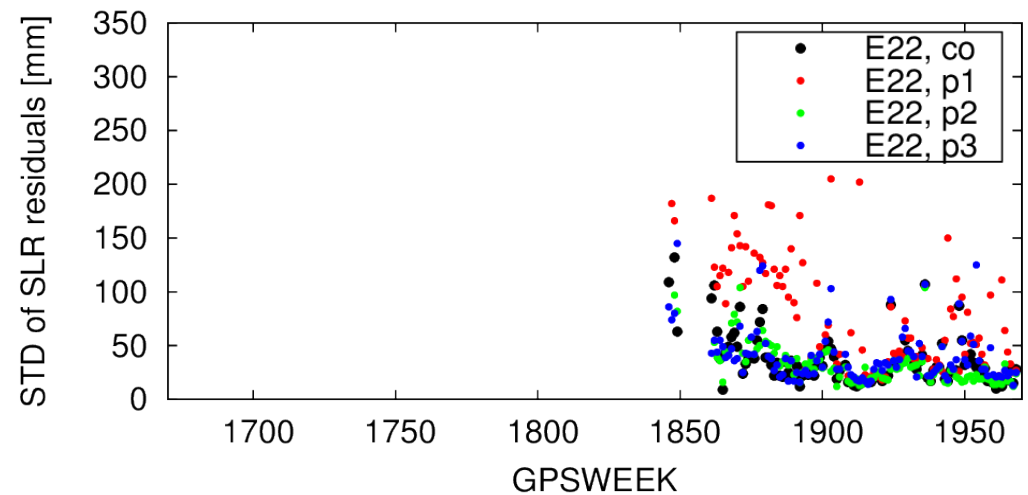
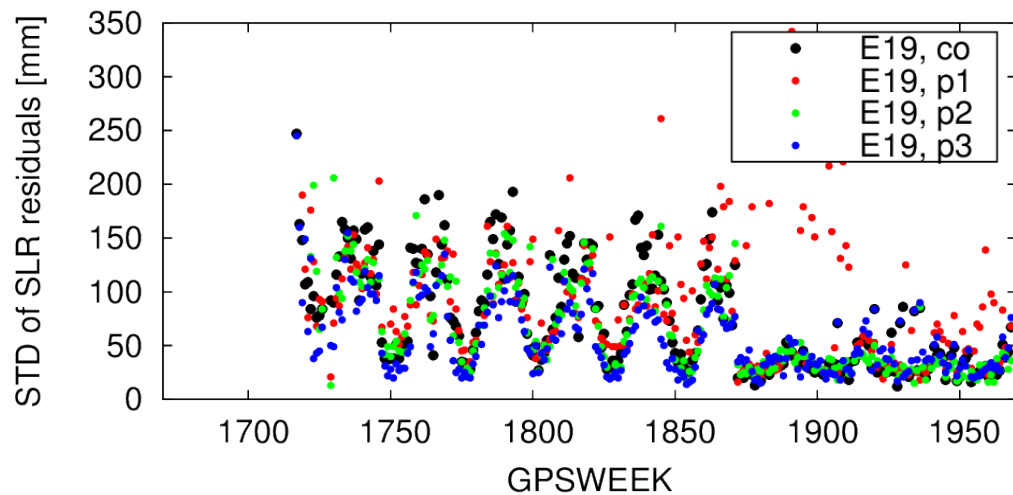
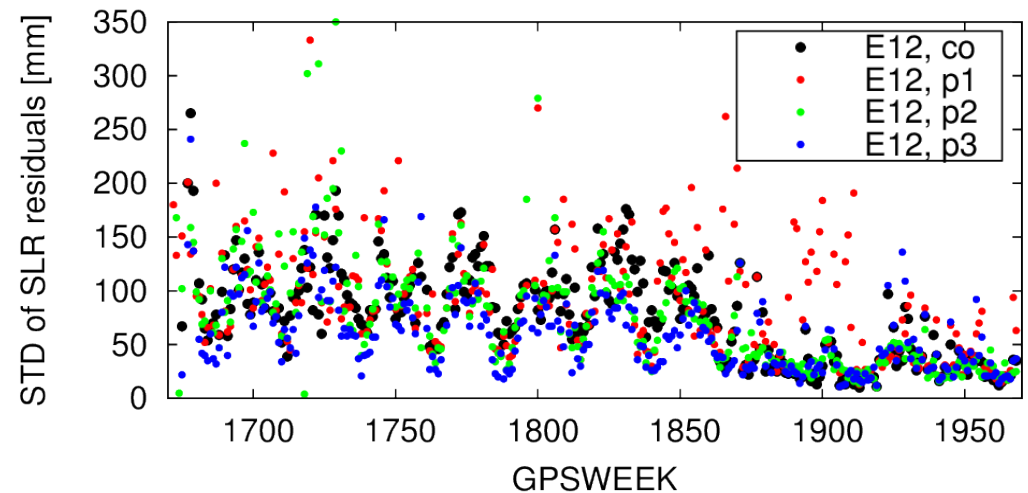
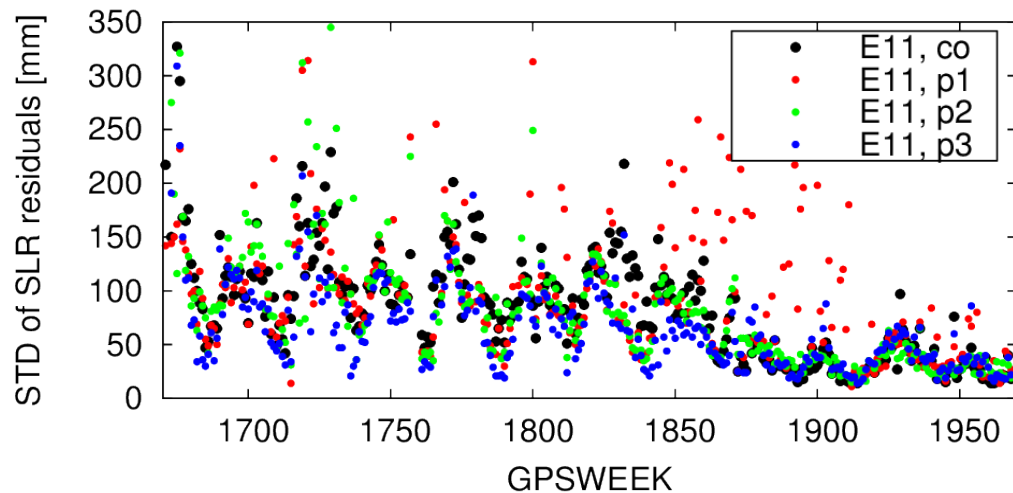
- Agreement for the clocks shows RMS of about 8 to 25 ps
  - all biases subtracted

# 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 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\_www7.sum)
- Example from summary file (vf\_19687.sum)
- High quality, demonstrated by the RMS of Helmert-transformation (see table below)

		#sites	North [mm]	East [mm]	Up [mm]
IGS14	RMS / COMPONENT	73	2.76	2.38	5.75
IGS14week	RMS / COMPONENT	117	2.04	1.60	4.30
GTRF17V02	RMS / COMPONENT	112	2.08	1.88	5.19

**THANK YOU**

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