

# The Galileo Terrestrial Reference Frame (GTRF)

The GTRF is provided by the Galileo Geodetic Service Provider under the GSOp Contract (Prime Contractor Spaceopal)



Erik Schoenemann on behalf of the GGSP consortium

ESA/ESOC

23/05/2023

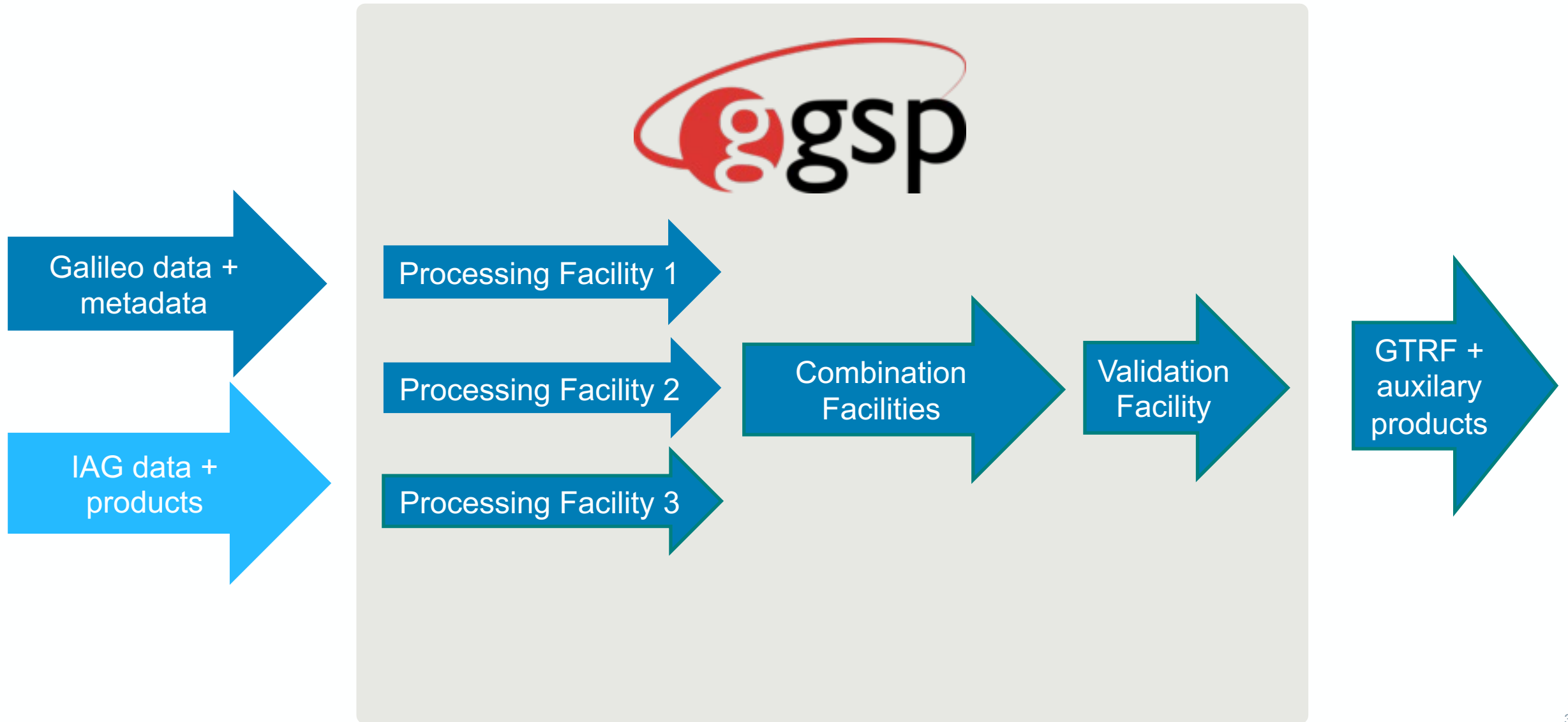
Tour de l'IGS 6<sup>th</sup> Stop - Galileo Constellation Spotlight

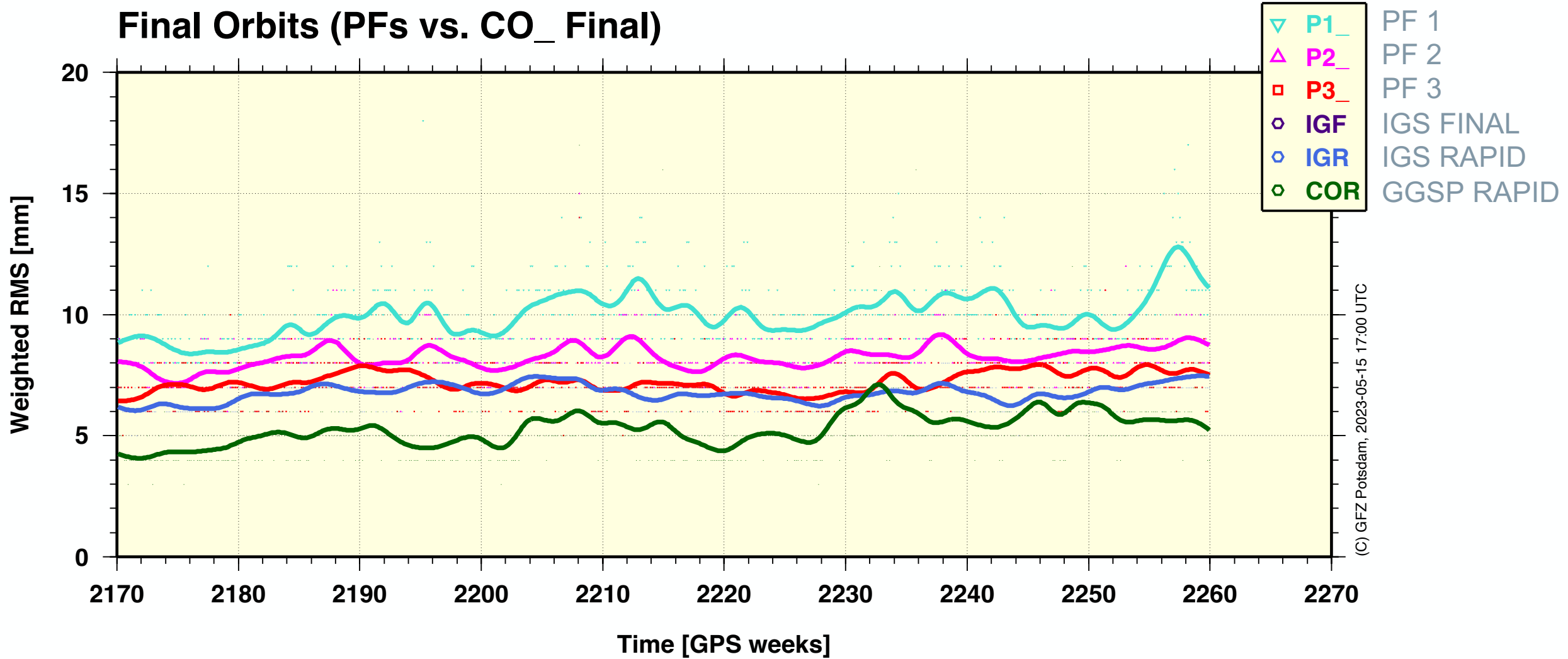
As per **EUROPEAN GNSS (GALILEO) OPEN SERVICE SERVICE DEFINITION DOCUMENT**:

“The GTRF is a highly accurate realisation of the ITRS. At any time, the alignment between the GTRF and the latest physical realisation of the ITRF is such that the difference between the ITRF and the GTRF coordinates of the ITRF stations/markers used in the realisation of the GTRF is less than 3 cm ( $2\sigma$ ). „

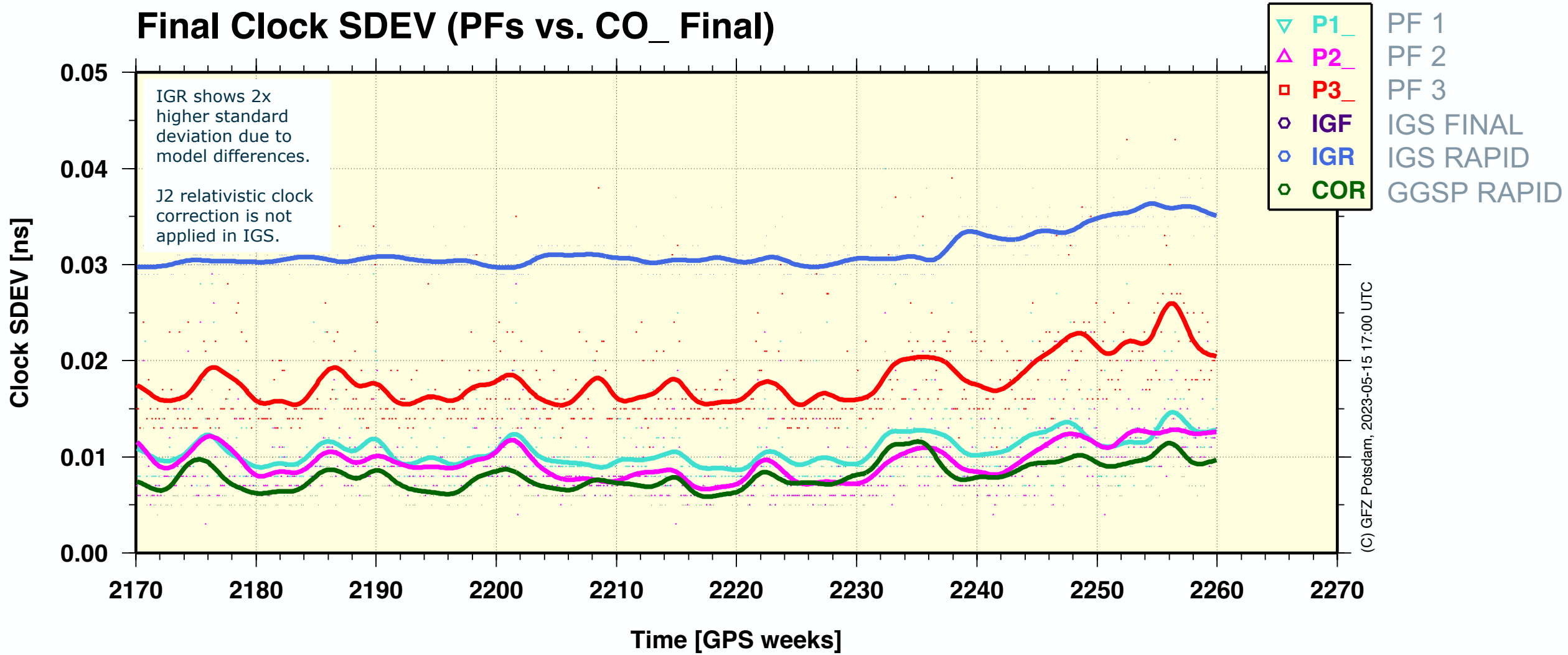
## Important note:

The current GTRF is based on ITRF/IGS 2020 models except for the Galileo Phase Centre Offsets where Galileo, in contrast to the International GNSS Service (IGS), which decided to adjust the Galileo Phase Centre Offsets (PCO) to compensate the ITRF scale difference, is using the calibrated PCOs published European GNSS Service Centre (see also presentation on Galileo Metadata).



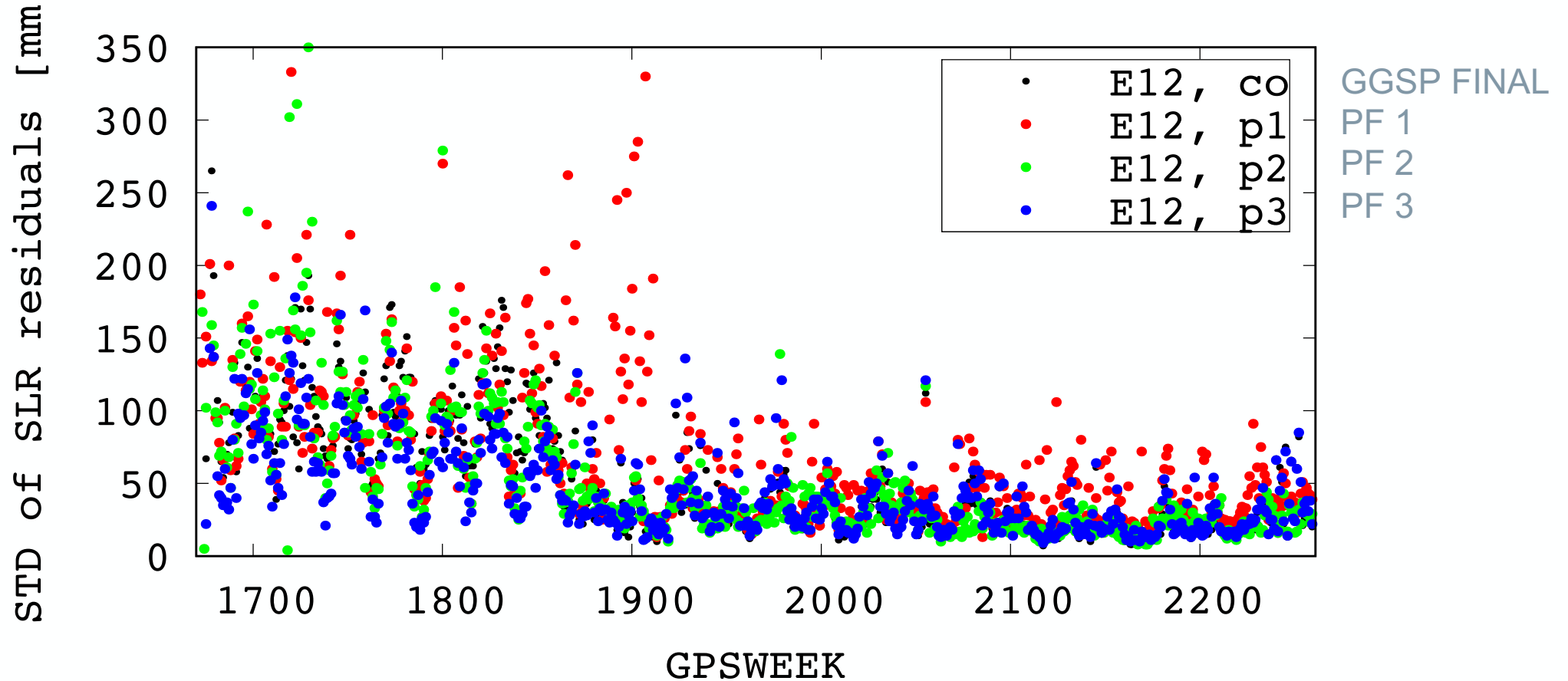


## Final Clock SDEV (PFs vs. CO\_Final)



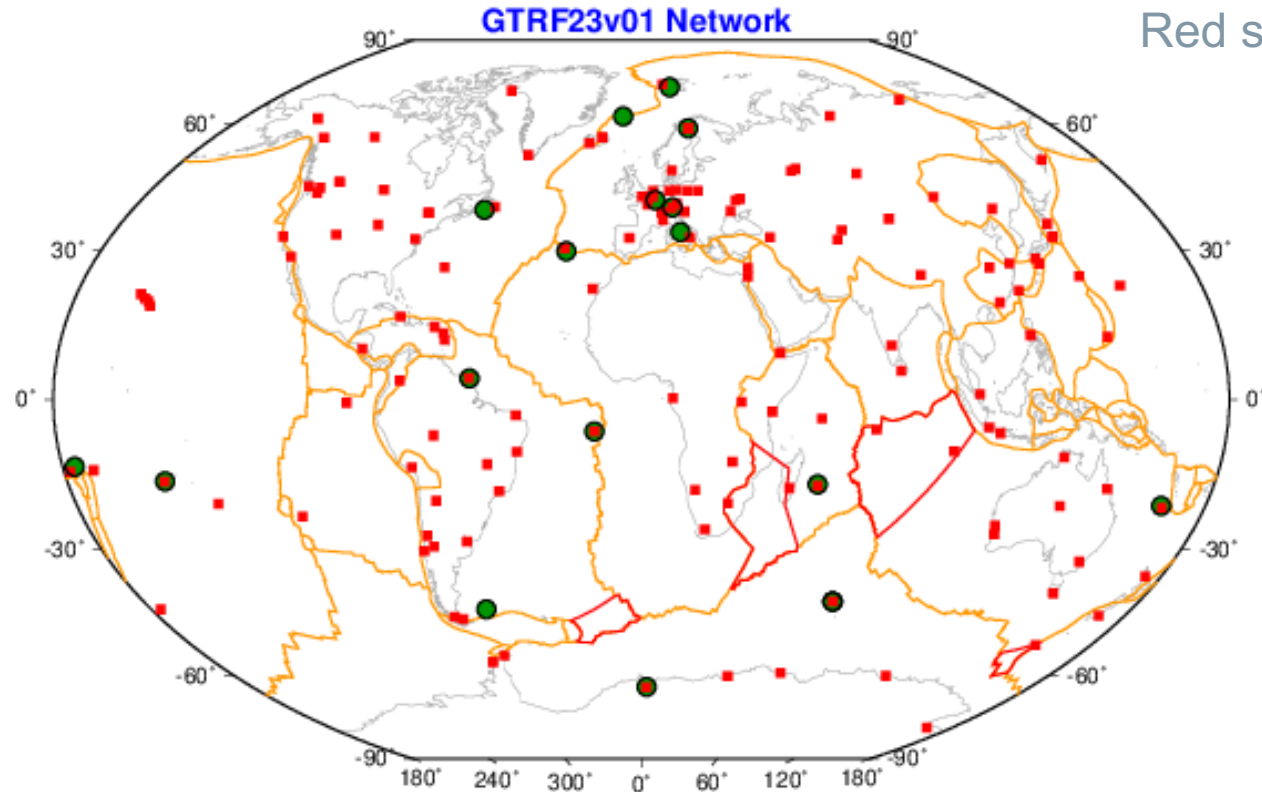
# GRSP Orbit accuracy

## Standard deviation SLR Residuals



Notice improvement thanks to improved modelling starting week 1873

# The GTRF Reference Frame Network

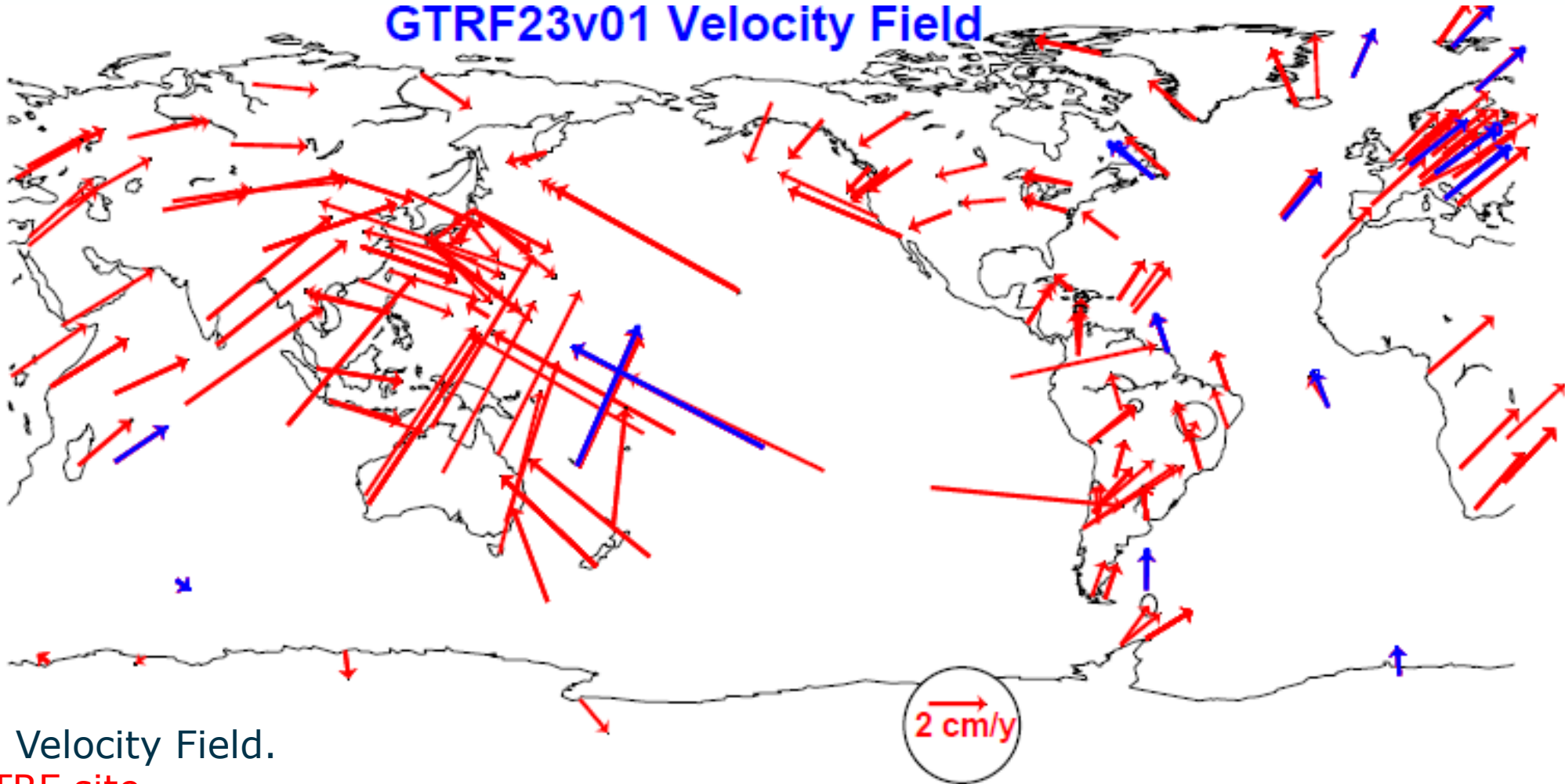


Red squares: ITRF/IGS stations

The latest GTRF23v01 is:

- aligned to ITRF2020, is applicable since 05 May 2023
- obtained by a rigorous stacking of 648 weekly GTRF combined solutions
- using minimum constraints approach over a set of 90 IGS/ITRF stations

# The GTRF23v01 Velocity Field



GTRF23v01 Velocity Field.  
Red: IGS/ITRF site  
Blue: GSS site



A GTRF validation is carried out on a weekly basis.

Weekly GRSP solution are compared vs different Reference Frames.

Example for week 2260 in table below:

		#sites	North [mm]	East [mm]	Up [mm]
		-----	-----	-----	-----
IGS20	RMS / COMPONENT	82	2.04	2.10	5.48
IGS23P2260	RMS / COMPONENT	129	0.85	0.77	3.02
GTRF23V01	RMS / COMPONENT	179	2.27	1.91	5.48

IGS ITRF 2020 realisation

IGS Weekly Solution

GTRF23v01

- GTRF is a state of art realisation of the ITRS for Galileo
- GTRF23v01 is rigorously aligned to ITRF2020 over the 14 parameters
- GTRF is updated on a yearly basis taking into account linear and nonlinear station motions
- GTRF has the same high accuracy as the ITRF, but it is more frequently updated
- The current GTRF is based on ITRF/IGS 2020 models except for the Galileo Phase Centre Offsets where Galileo uses the calibrated PCOs provided on the European GNSS Service Centre (see also presentation on Galileo Metadata).

# Thank you very much for your attention

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