The International Terrestrial reference Frame: an update

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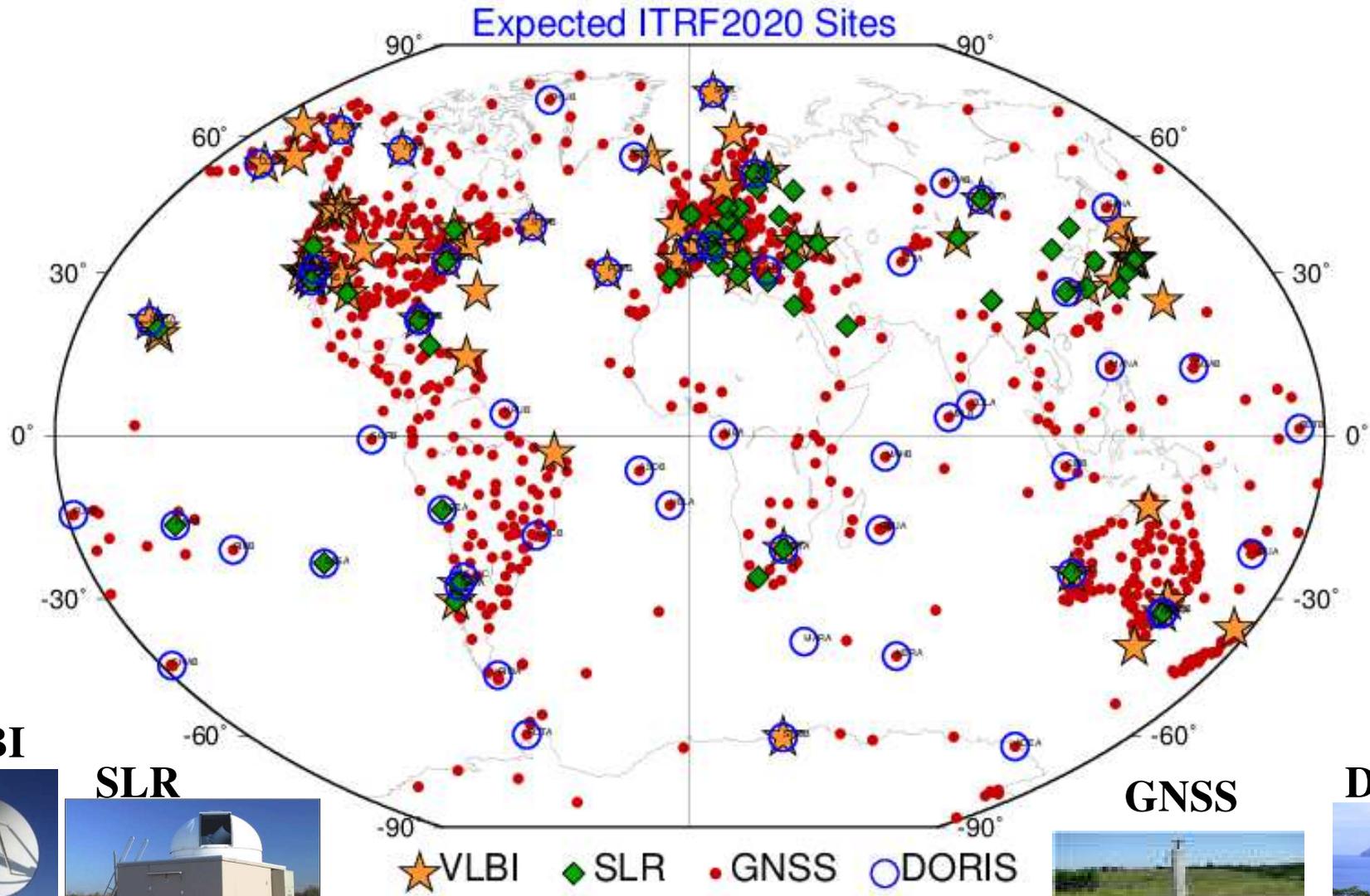**President International Association of Geodesy**

Outline

- **Key points of GNSS/IGS contribution to the ITRF**

- **ITRF2020 under development**

- **Expected sites & colocations**

- **ITRF2020: an augmented parametric frame**

- **Some preliminary results**

Key Points of the GNSS/IGS Contribution to the ITRF

1. **Inter-Technique link : reinforcing the ITRF definition (origin, scale & orientation)**

2. **Determination of Post-Seismic Deformation Models**

3. **ITRF Plate Motion Models**

4. **Polar Motion**

5. **ITRF Access & densification through the IGS Products:**
   - **Using IGS Products provides Universal access to and densification of the ITRF**
   - **More than 80% of National RFs are aligned to the ITRF**

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ITRF2020 Network

➢ **~1200 sites**

Expected ITRF2020 Sites

VLBI

SLR

GNSS

DORIS

☆ VLBI   ◆ SLR   • GNSS   ○ DORIS

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ITRF2020: GNSS Sites

➢ **~1100 GNSS/IGS sites**
➢ **93 co-location sites**

ITRF2020: Expected IGS Sites
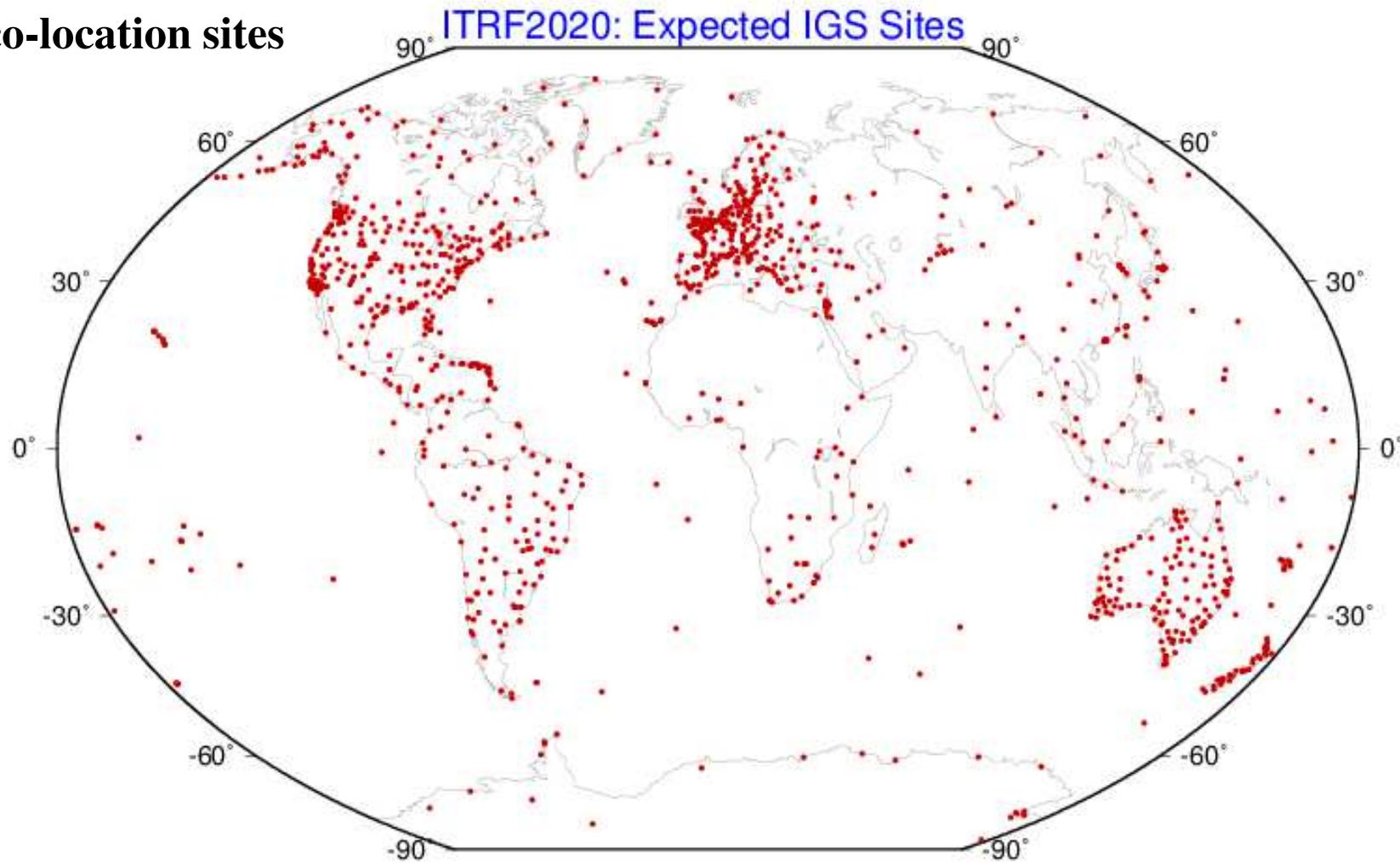
ITRF2020: Expected Colocation Sites

Expected ITRF2020 Colocations

★ VLBI   ◆ SLR   ○ DORIS

Colocated with GNSS

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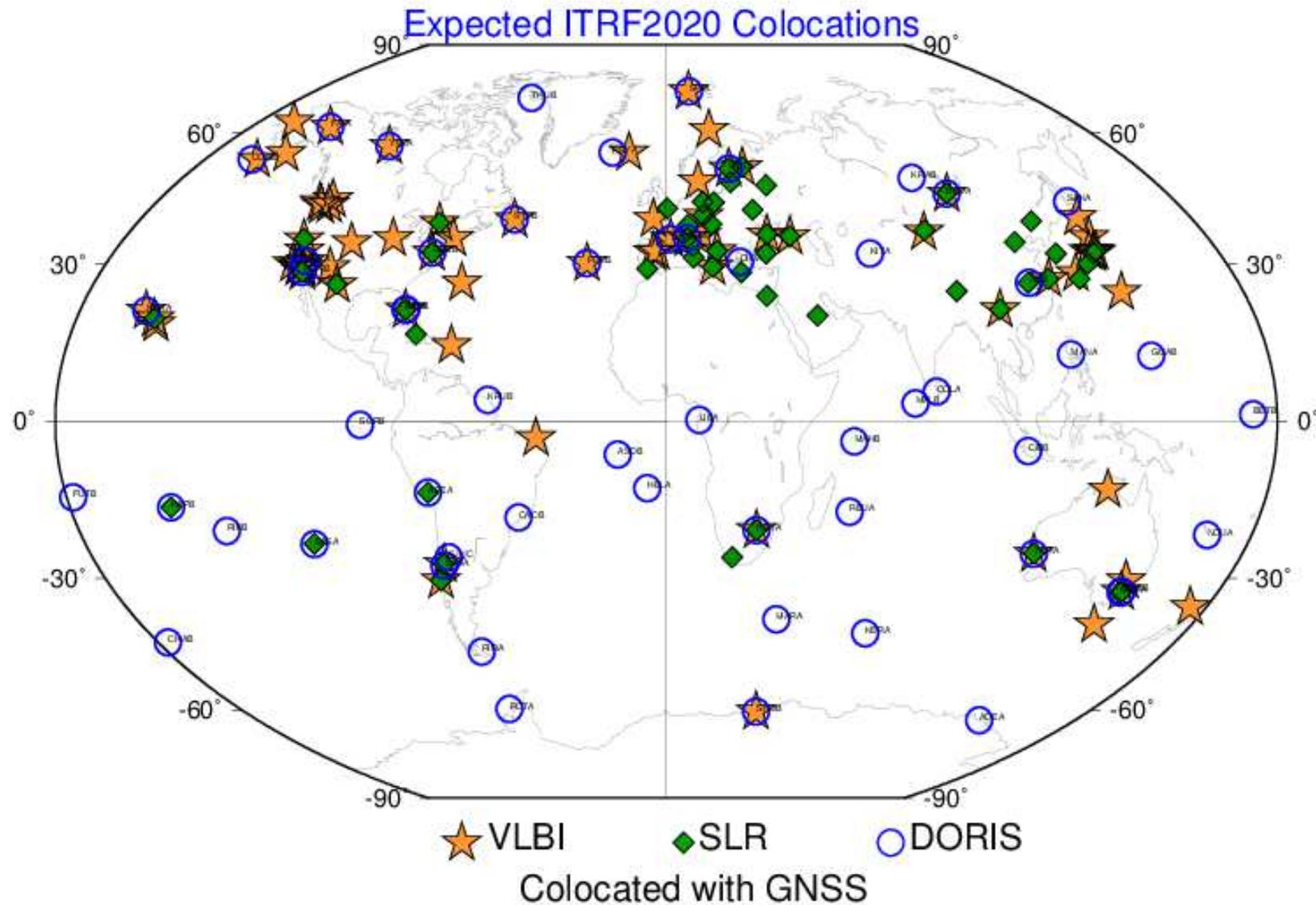
ITRF2020: Augmented Parametric Reference Frame

TSKB_21730S005 trajectory

Trajectory: Blue: Raw, Green: Linear, Red: PSD model
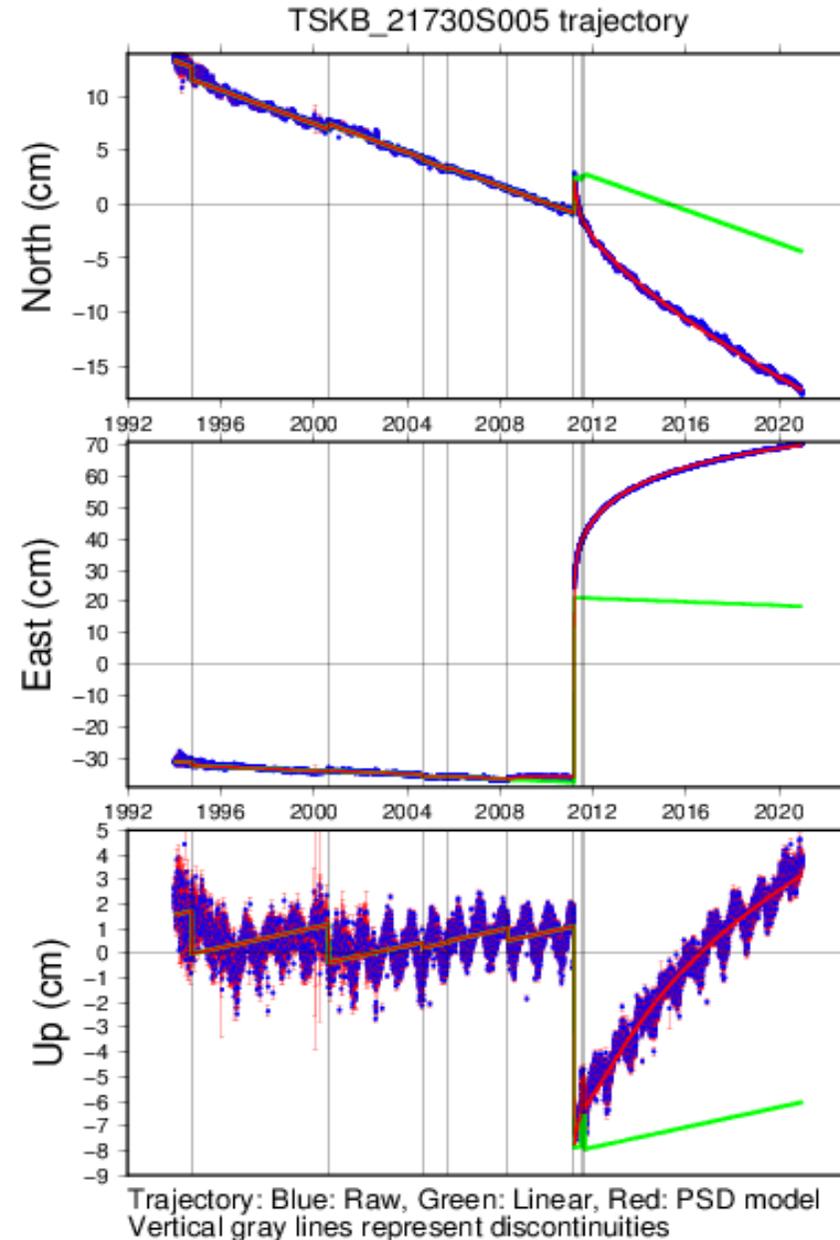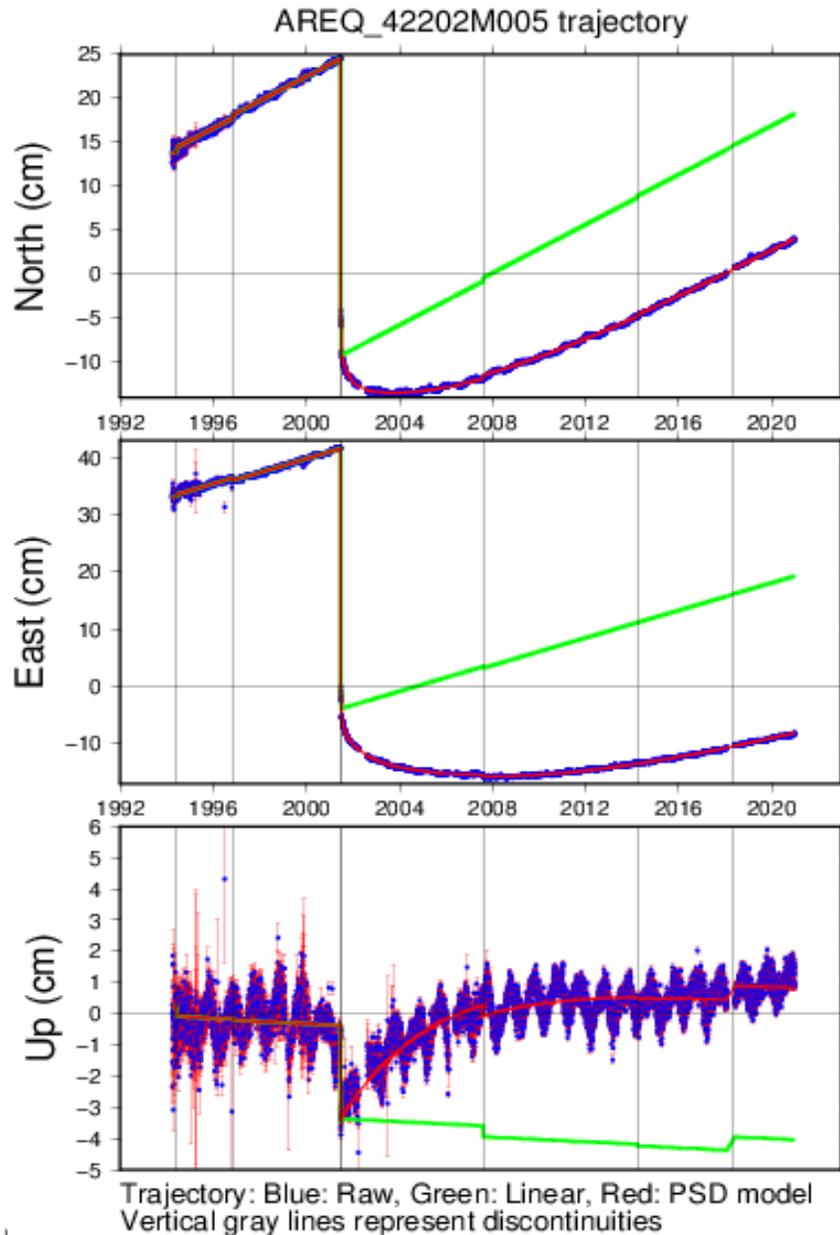Vertical gray lines represent discontinuities
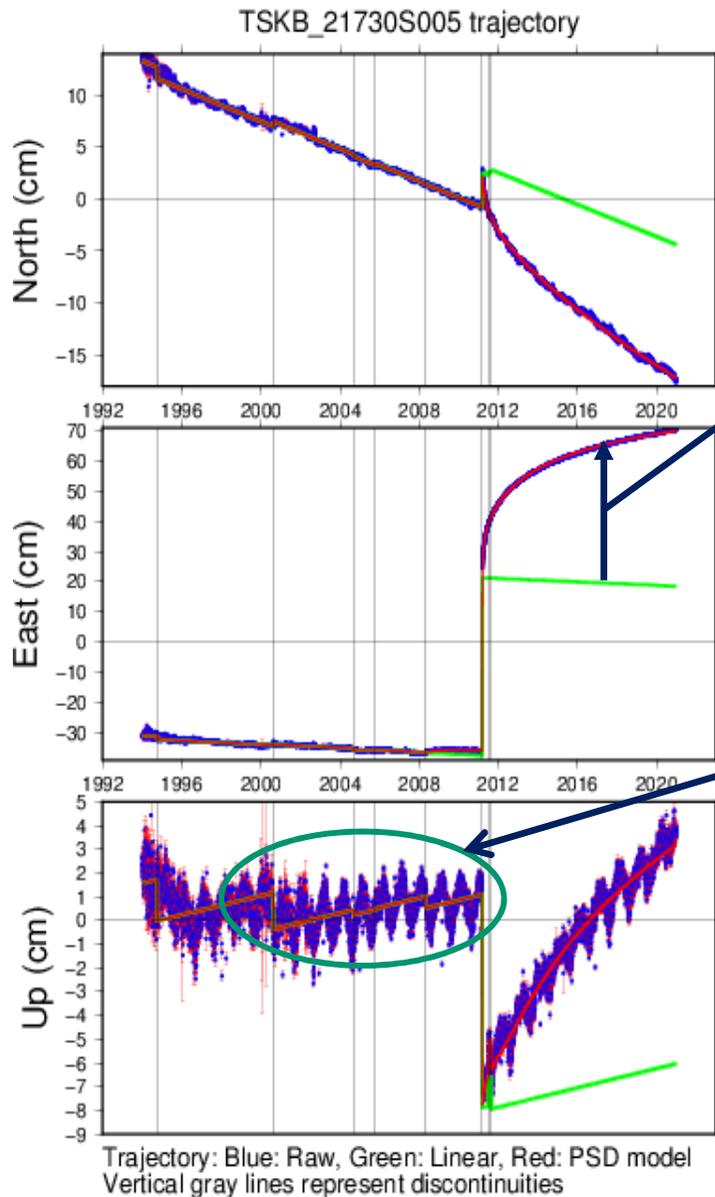
Regularized position

$$X(t) = X(t_0) + \dot{X}.(t - t_0) + \delta X(t)_{PSD} + \delta X(t)_S$$

$\sum$ **Post-Seismic Deformations (PSD) Parametric models will be refined**

$\sum$ **Periodic Signals will be provided in the CM-SLR frame**

But there are discrepancies in the annual signal between techniques at some colocation sites.

Arequipa & Tsukuba trajectories:
Repro3 data + PSD models of ITRF2014

AREQ_42202M005 trajectory

TSKB_21730S005 trajectory

Trajectory: Blue: Raw, Green: Linear, Red: PSD model
Vertical gray lines represent discontinuities

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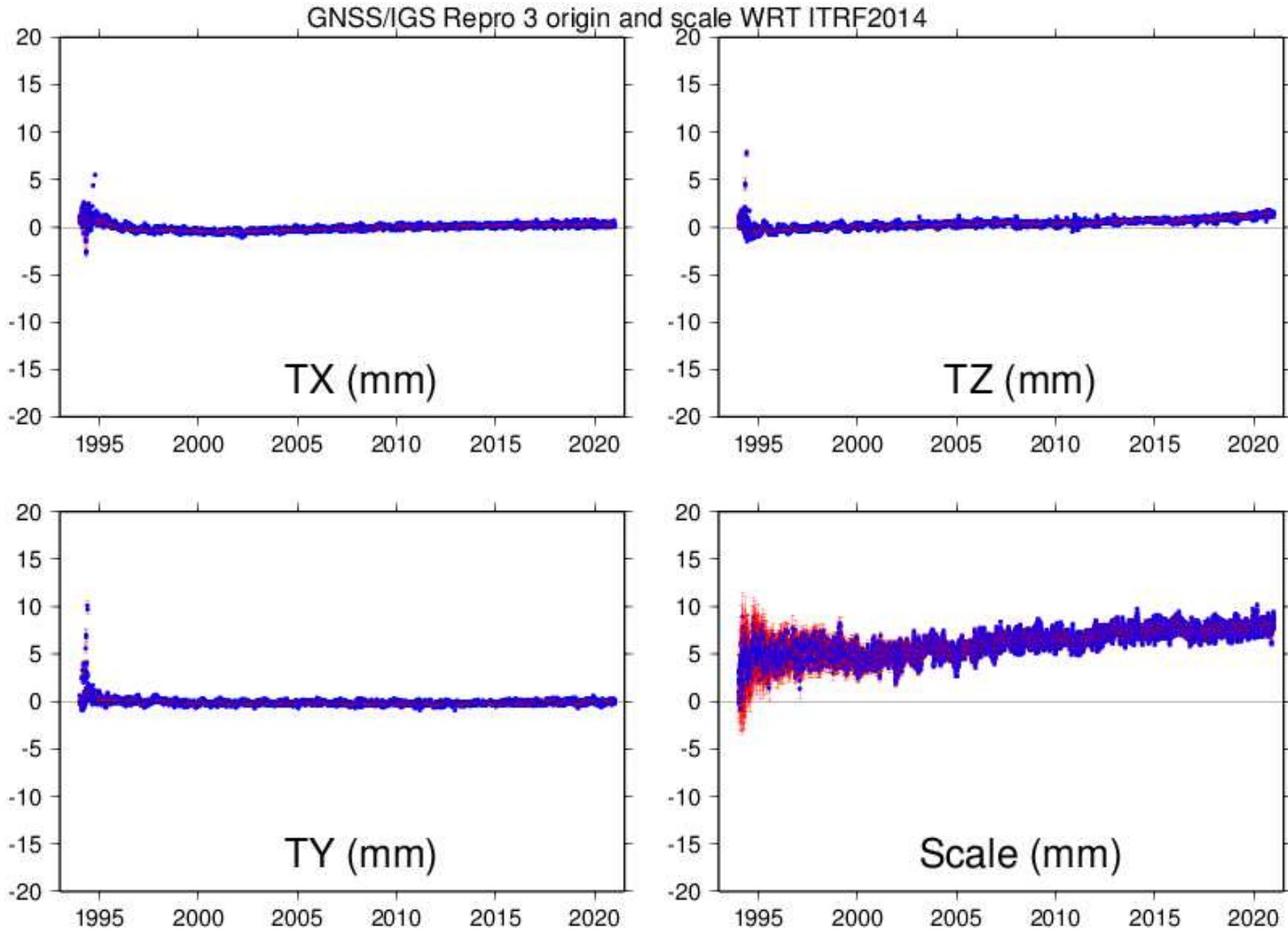DE L'INFORMATION
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Scale of ITRF2020?

- **This is the first time of ITRF history where we have 4 independent and competitive scales stemming from the 4 techniques (DORIS, GNSS, SLR and VLBI)**

- **IGS / GNSS scale is based on z-PCOs for Galileo Satellites, using 3.7 yrs of Galileo data**

- **Improved ILRS / SLR scale determination with enhanced handling of range biases**
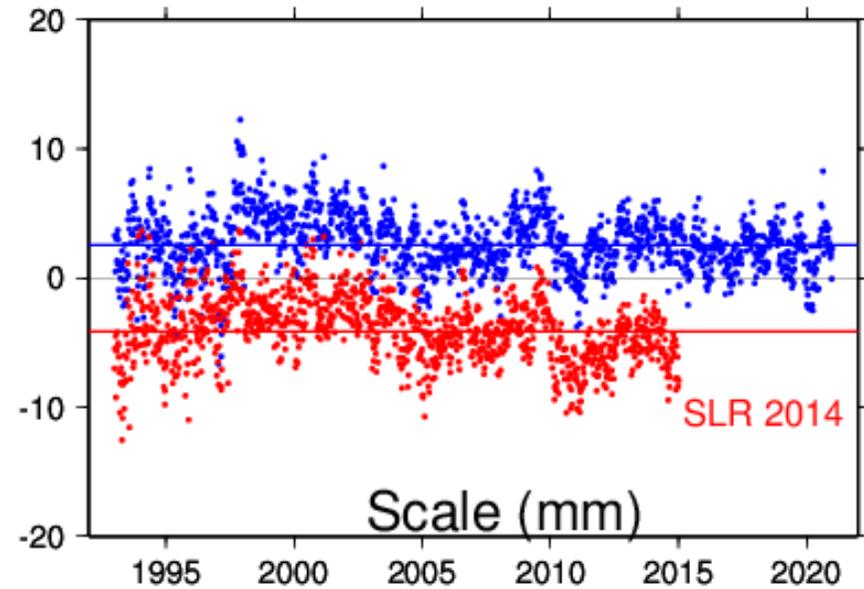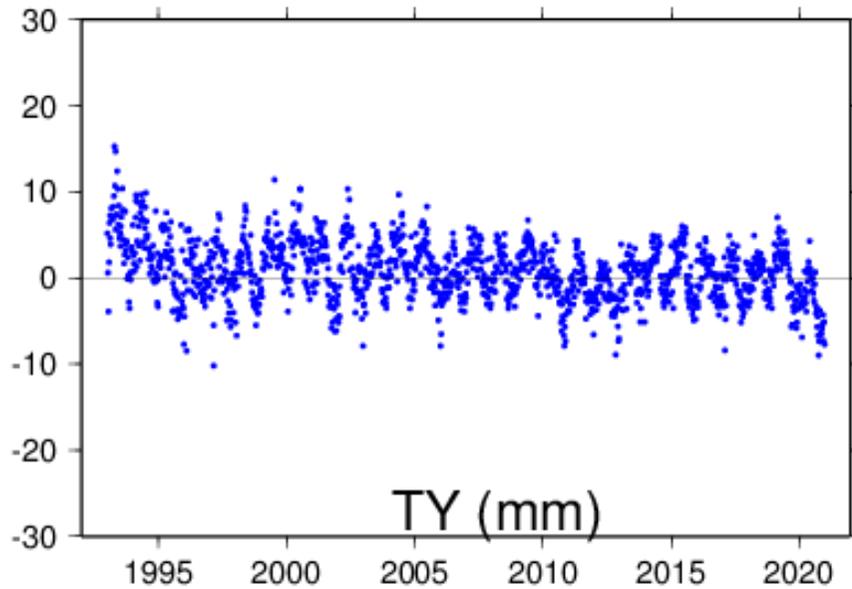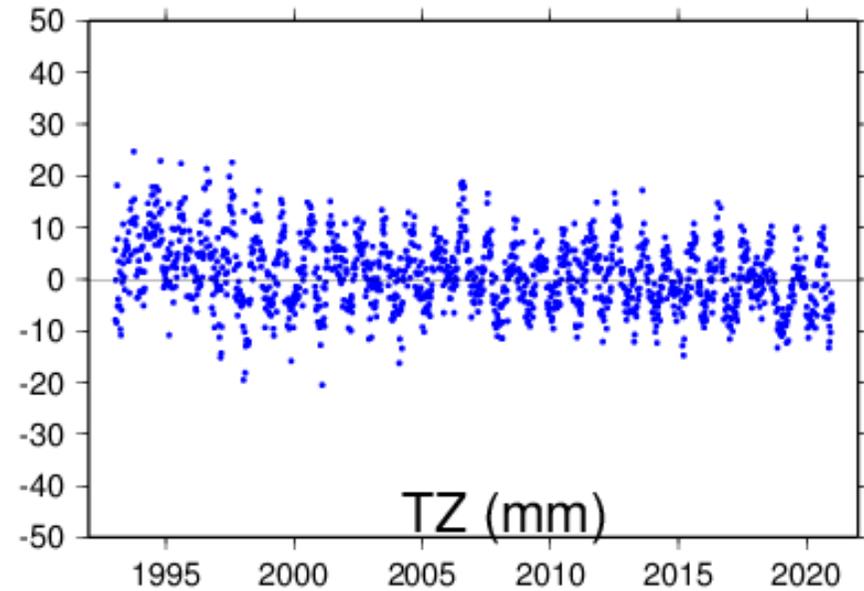
IGS Repro3 origin & Scale wrt ITRF2014

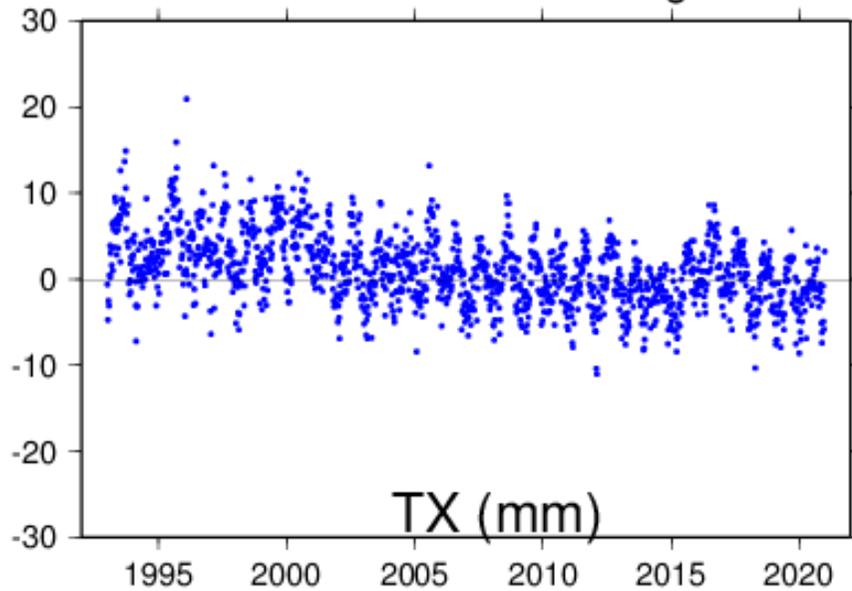GNSS/IGS Repro 3 origin and scale WRT ITRF2014

Preliminary

Preliminary

Altamimi, ICG-15, Sep 27 – Oct 1st, 2021

ILRSA 2020 origin & Scale wrt ITRF2014

ILRSA origin and scale wrt ITRF2014

Relative scales

Scales (mm) WRT ITRF2020P

VLBI   GNSS   SLR   DORIS

Altamimi, ICG-15, Sep 27 – Oct 1st, 2021
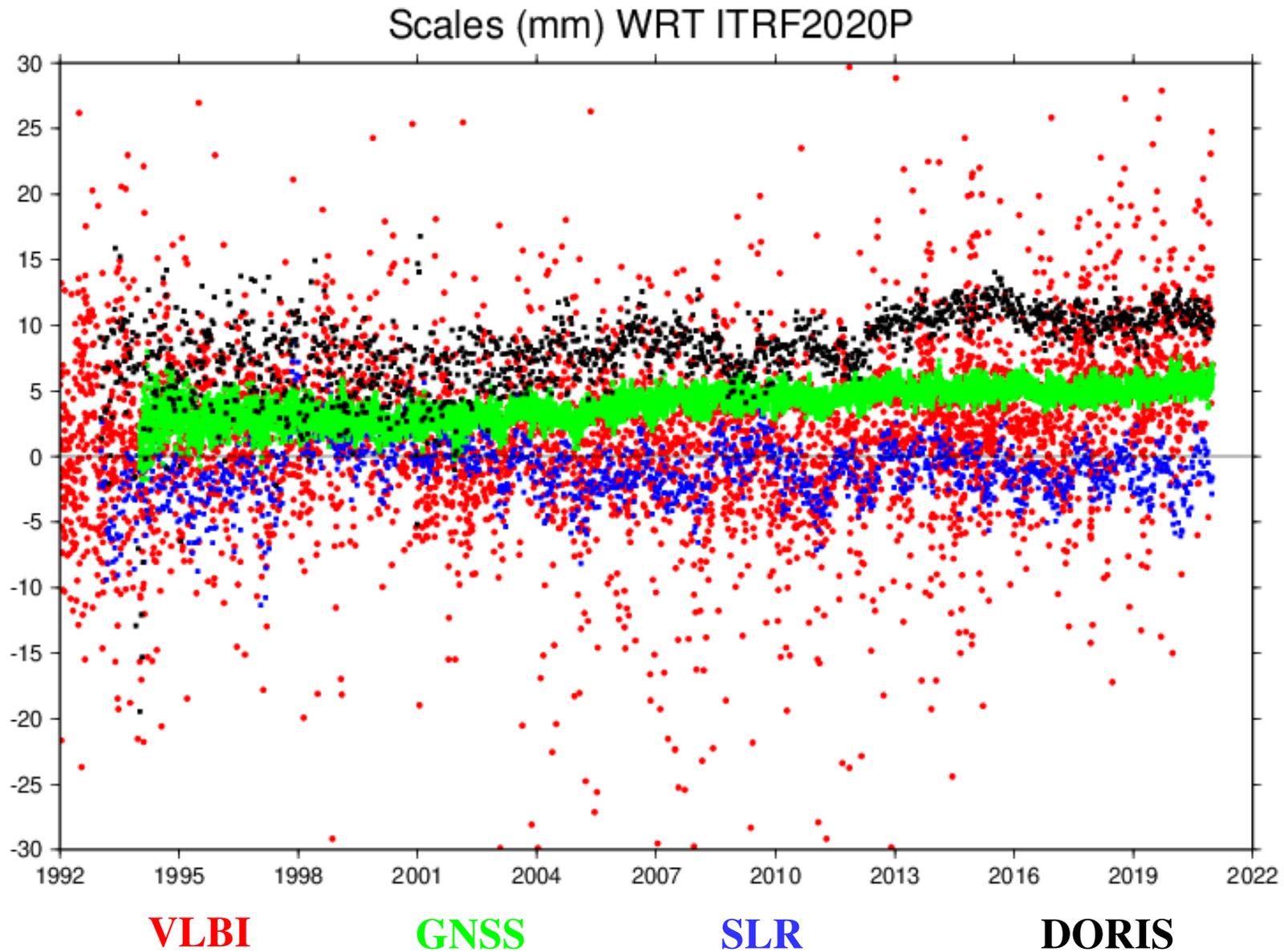
Conclusion

- **ITRF2020: an augmented parametric frame**

- **GNSS/IGS Contribution is fundamental to the ITRF**

- **Analysis of ITRF2020 input data is still ongoing:**
  - **IGS apparent scale offset/drift with respect to ITRF2014 needs to be understood: probably due to the assumption of constant z-PCOs**
  - **1 ppb offset of SLR 2020 compared with 2014 data**
  - **Expected scale difference between SLR & VLBI:**
    $\leq$ **0.5 ppb (~3mm), versus 1.37 ppb (~8.2 mm) in ITRF2014**

- **ITRF2020 Scale ? : too early to know**

- **ITRF2020 Release: End 2021**

- **The GNSS Providers are solicited to publish satellite metadata**