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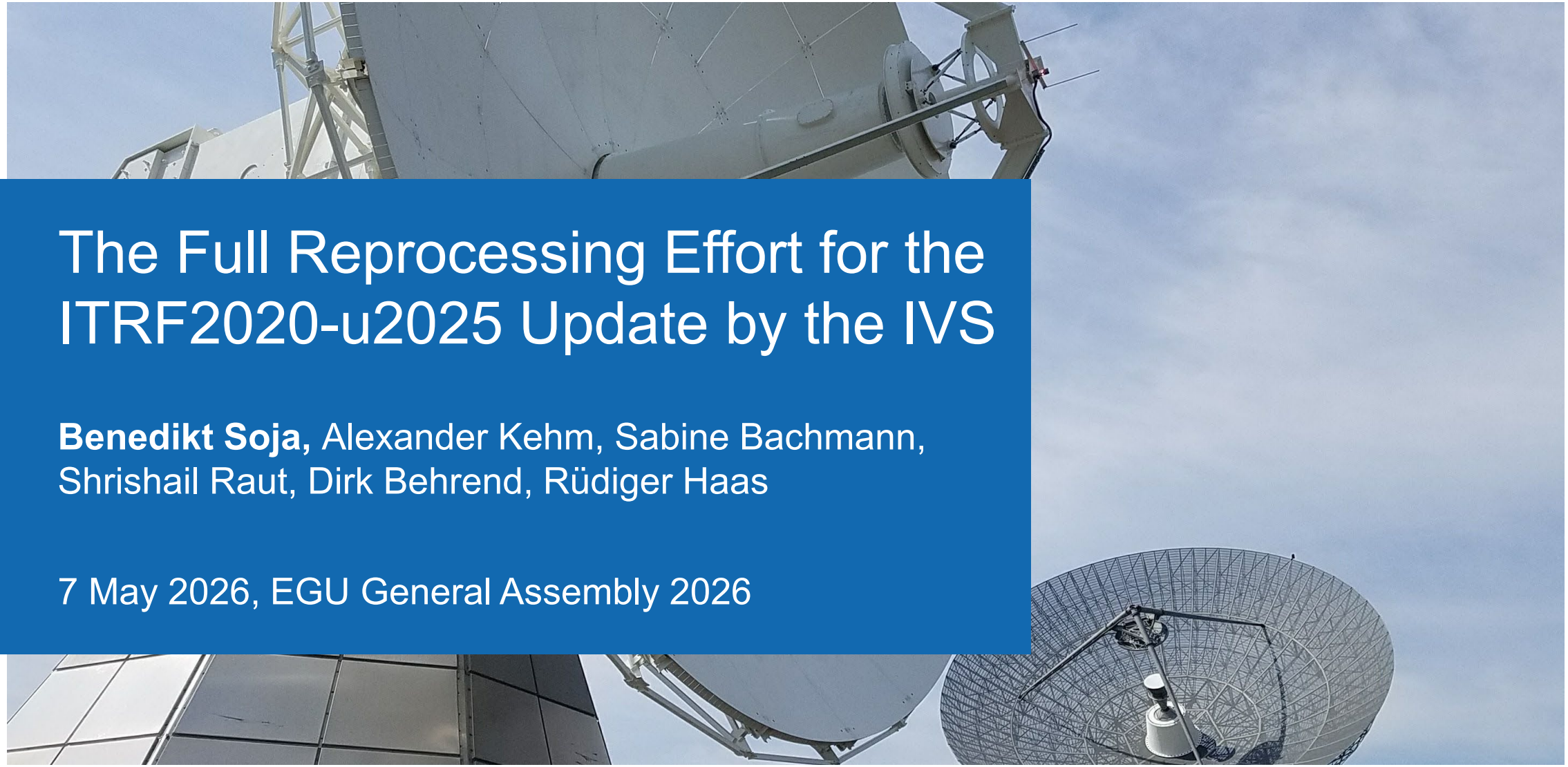
EGU26 GENERAL ASSEMBLY



The Full Reprocessing Effort for the ITRF2020-u2025 Update by the IVS

Benedikt Soja, Alexander Kehm, Sabine Bachmann, Shrishail Raut, Dirk Behrend, Rüdiger Haas

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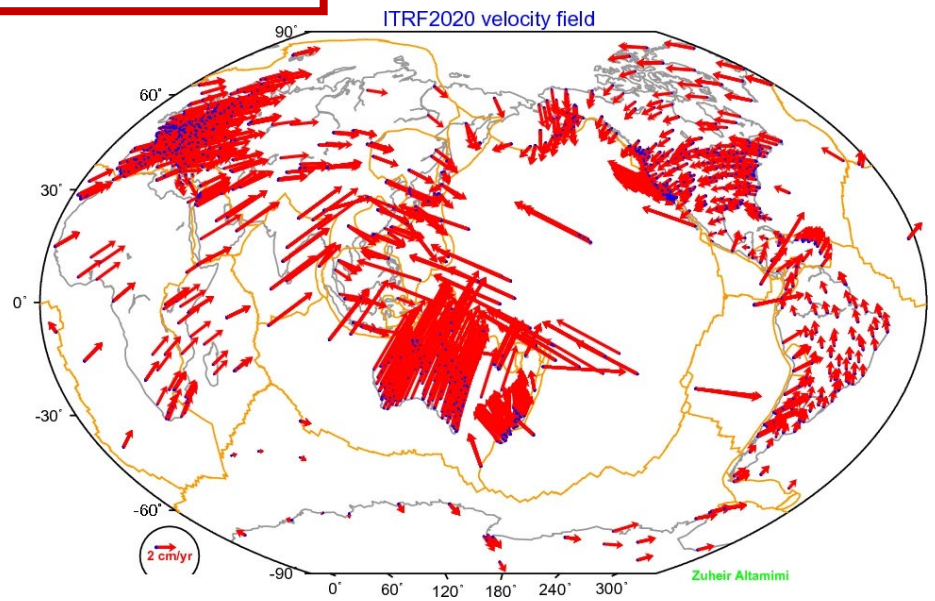
Background

- The International VLBI Service for Geodesy and Astrometry (IVS) coordinates the VLBI contribution to ITRS realizations
- Last full reprocessing effort: ITRF2020
- Yearly updates starting with ITRF2020-u2023
- IVS decided to submit a fully reprocessed solution for ITRF2020-u2025

1979–2026.0



Altamimi et al., 2023

Why a full reprocessing?

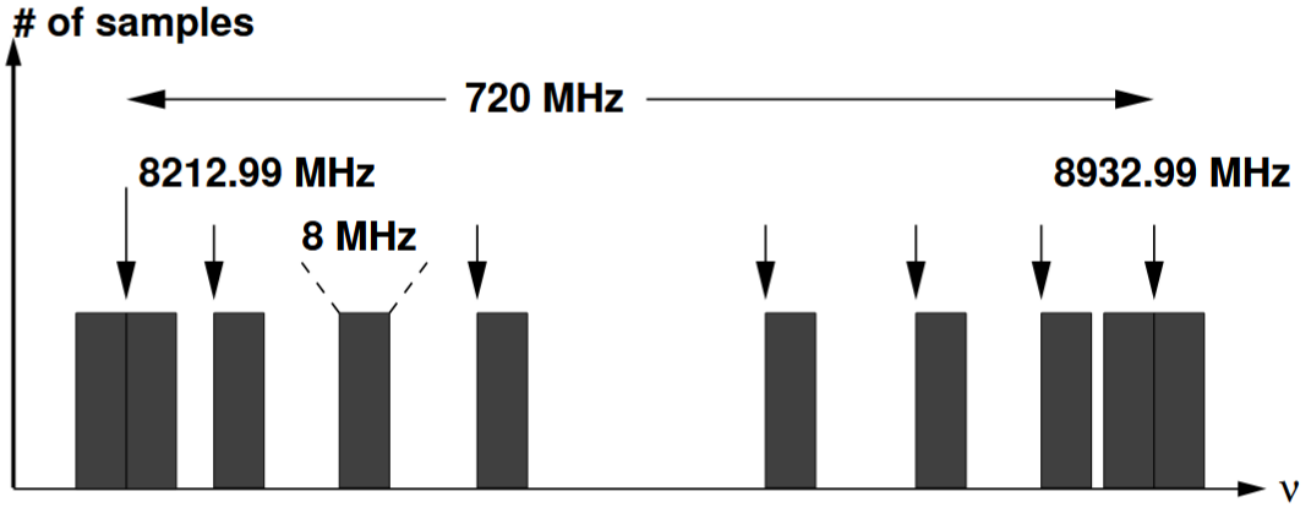
- Main takeaway from the IVS Analysis Workshop in Matera (April 2025)
- Issues with the VLBI data archive (whole history)
  - Naming inconsistencies
  - Issues with ionospheric information
- Opportunity to include K-band VLBI data
- Several Analysis Centers (ACs) were ready to tackle a full reprocessing

- **Goal:** the next state-of-the-art VLBI solution

Matera, Italy

Issues with ionosphere information

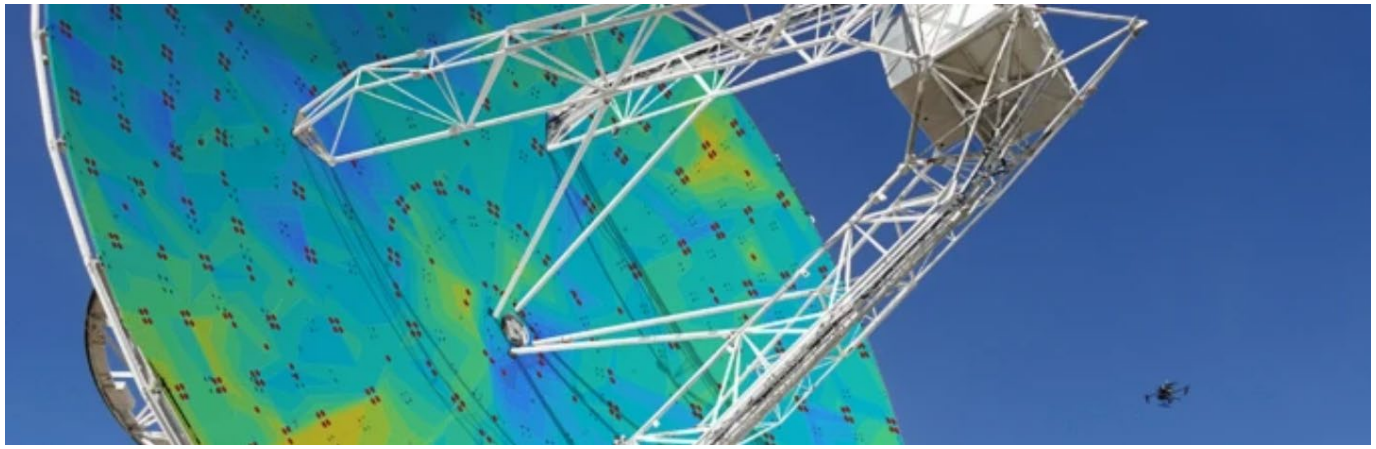
- Effective frequencies for S/X VLBI sessions calculated from individual channels
- Software for calculation fixed, now properly accounting for channel bandwidth
- Ionospheric information in vgosDB files modified back to 2022
  - 2022-2026 most critical, but also earlier years are affected



Bolotin et al., 2026

Up-to-date correction models

- ITRF2020-u2024 and ICRF3 as a priori
- Thermal deformation: new information for 10 telescopes
- New antenna axis offset at SEJONG
- Gravitational deformation: new model for HOBART26



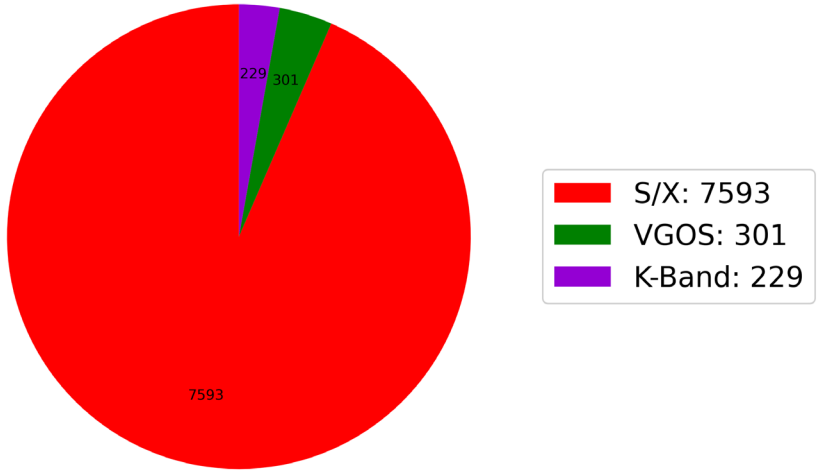
Lösler et al., 2025

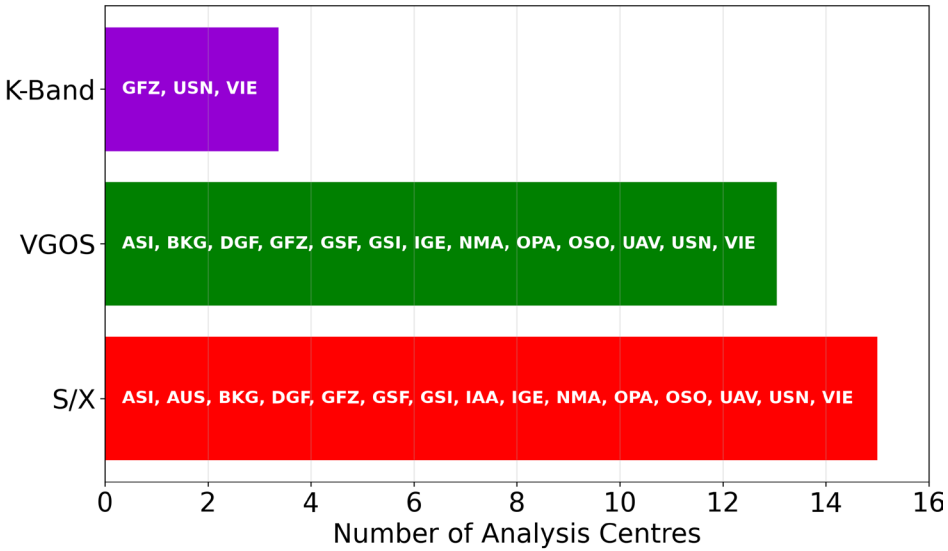
Solutions submitted by VLBI Analysis Centers

- Contributions by **15 VLBI ACs**
  - **New record participation**: +3 ACs from ITRF2020-u2024
  - Most ACs with > 90% submission rate

- **K-band sessions** included for the first time
  - 3 K-band ACs submitted >200 sessions (2002–2026.0)
  - 4 Korean KVN stations participated (not yet in the ITRF)

- Output: AC- and session-specific normal equations





Combined solution by the IVS Combination Center

- Session-wise combination at the normal equation (NEQ) level
- AC weights determined by variance component estimation
- Output: test combination submitted to the ITRS Combination Centres in April 2026

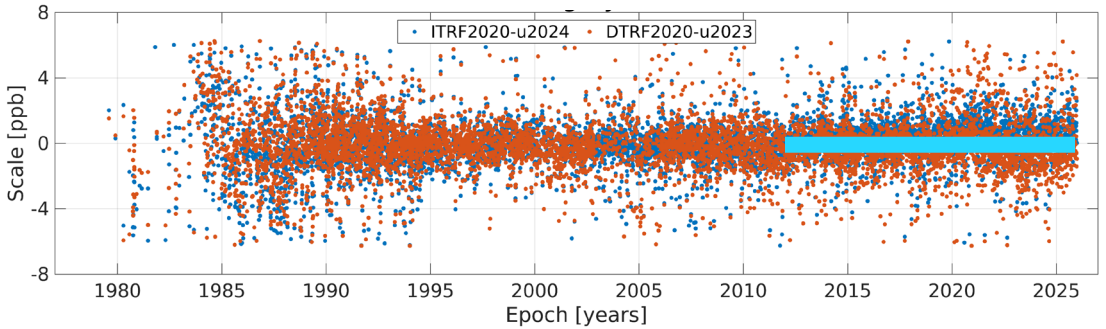
Sessions	S/X	VGOS	K-Band
Submitted	7593	301	229
Combined	7464	239	210

Initial external validation: scale parameter

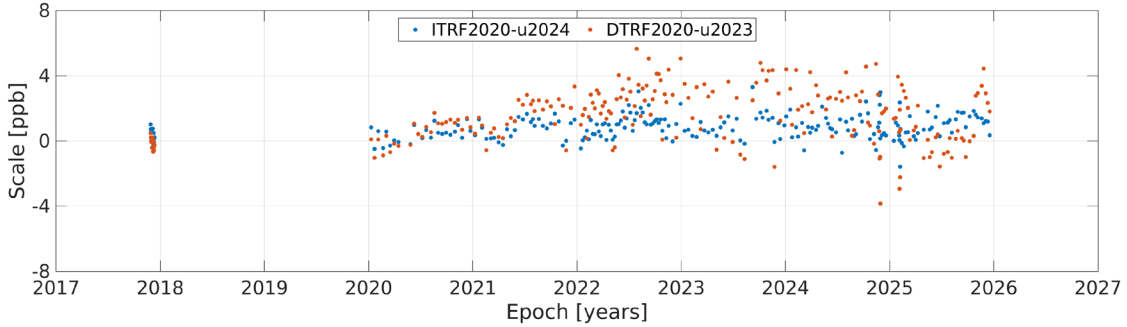
- Session-wise solution of the IVS-combined NEQs
  - A priori coordinates: ITRF2020-u2024
  - Datum conditions (NNR/NNT)
    - S/X & VGOS: core stations
    - K-Band: all stations
- Estimate Helmert transformation parameters w.r.t. ITRF2020-u2024 and DTRF2020-u2023

Mean (RMS) [ppb]	S/X	VGOS	K-Band
ITRF	0.0 (1.5)	0.8 (1.1)	-1.7 (2.0)
DTRF	-0.1 (1.6)	1.5 (2.3)	-2.2 (2.9)

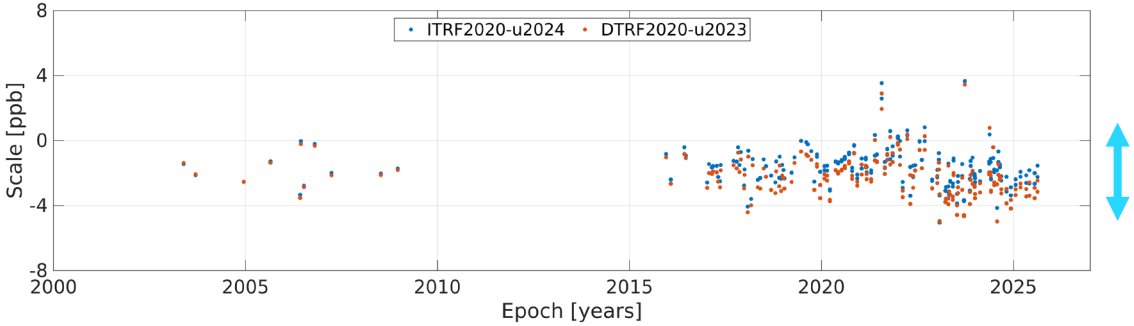
S/X



VGOS

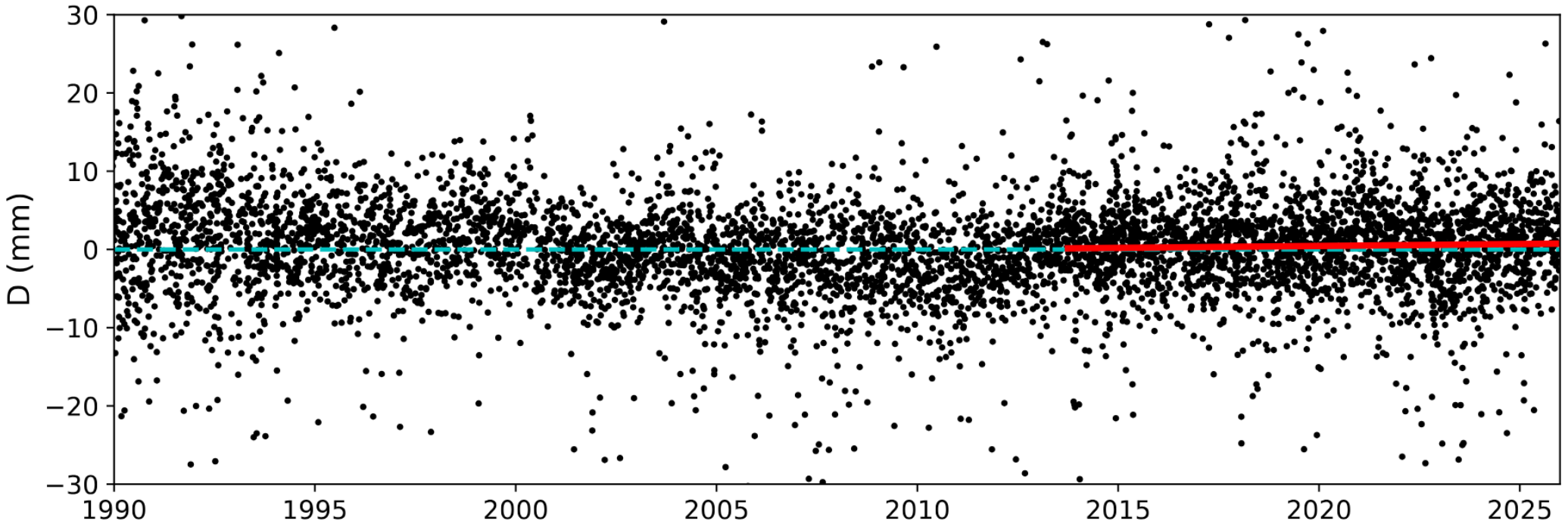


K-Band



Initial external validation: scale parameter

- Estimated scale drift for 2013.75–2026.0: 0.05 +/- 0.04 mm/year

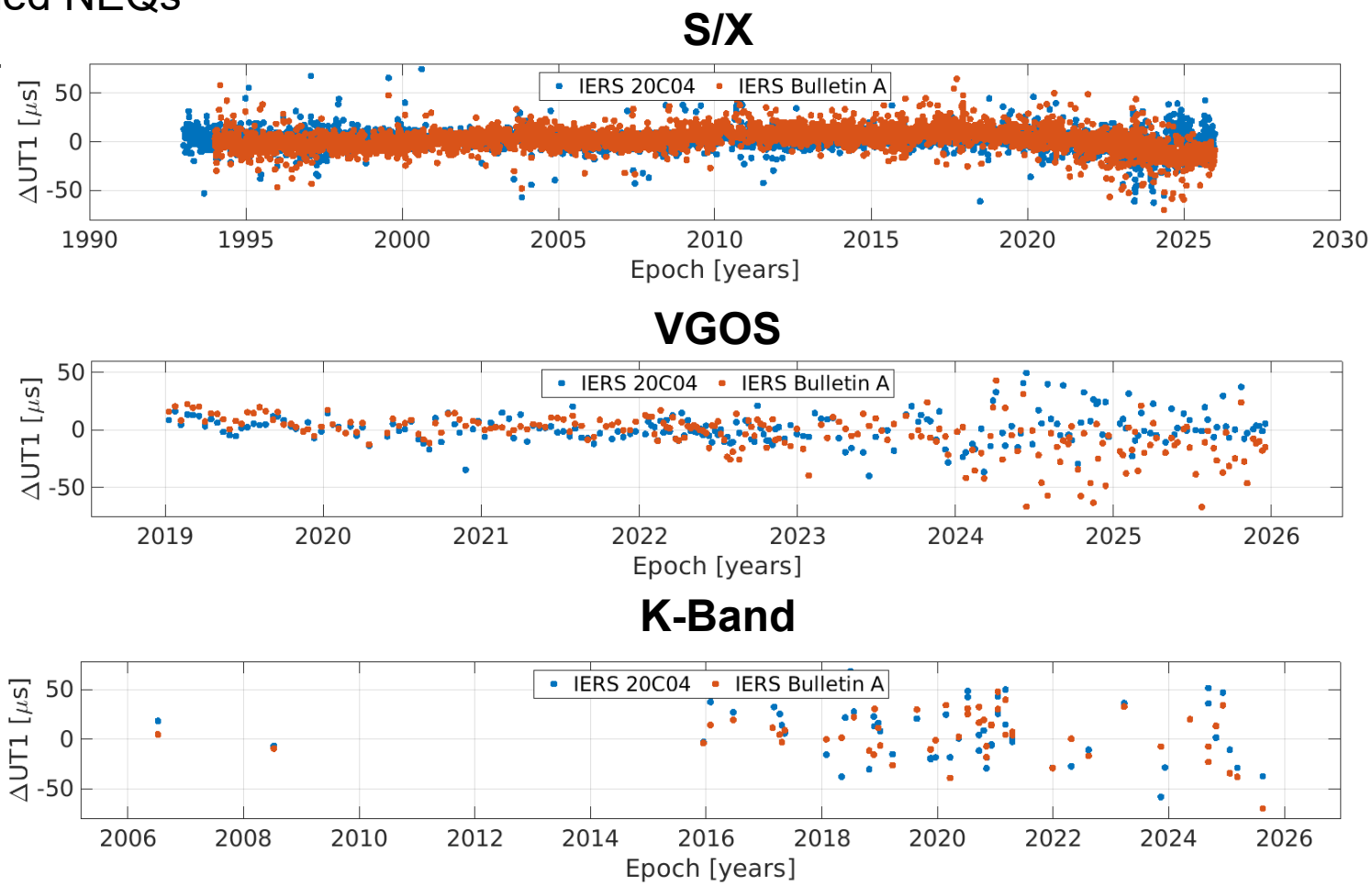


Karine le Bail, pers. comm.

Initial external validation: UT1-UTC

- Session-wise solution of the IVS-combined NEQs
  - A priori coordinates: ITRF2020-u2024
  - Datum conditions (NNR/NNT)
    - S/X & VGOS: core stations
    - K-Band: all stations
- Compare EOP estimates against IERS 20u24 C04 and IERS Bulletin A

Mean (RMS) [µs]	S/X	VGOS	K-Band
C04	1.6 (8.9)	1.4 (3.3)	7.0 (28.6)
Bull A	2.4 (11.3)	-4.0 (18.0)	6.3 (25.7)



Conclusions

- **Full reprocessing** of VLBI data to support ITRF2020-u2025
- Issues with ionospheric information mostly addressed
- Highlights:
  - **15 AC** contributions
  - **K-band** sessions combined for the first time
- Test solution submitted & external validation performed

1979–2026.0

+3 ACs

K-Band

Further details:
Poster by Raut et al.
EGU26-20186

Thanks to the great efforts of the VLBI community in this reprocessing effort!

References

- Altamimi, Z., Rebischung, P., Collilieux, X. *et al.* ITRF2020: an augmented reference frame refining the modeling of nonlinear station motions. *J Geod* 97, 47 (2023). https://doi.org/10.1007/s00190-023-01738-w
- Lösler, M., Eschelbach, C., Greiwe, A., Zhou, B., & McCallum, L. (2025). Innovative approach for modelling gravity-induced signal path variations of VLBI radio telescopes. *Earth, Planets, and Space*, *77*(1). https://doi.org/10.1186/s40623-024-02110-8
- Bolotin, S., Krásná, H., & Nothnagel, A. (2026). Inconsistencies between correlator metadata and vgosDB ionospheric parameters. Fourteenth IVS General Meeting, Garmisch-Partenkirchen, Germany.