ETH zürich

SPACE GEODESY

Introduction to new IVS Analysis Coordinator

Benedikt Soja

June 20, 2024, IVS AC & CC Meeting

John Gipson Ends His Tenure as IVS Analysis Coordinator

The date of March 8 has a special significance for John Gipson. It marks the boundaries for his 11-year stint as IVS Analysis Coordinator. On March 8, 2013, the Directing Board elected him to be the successor to Axel Nothnagel in this function, and on March 8, 2024, he presided over his last Analysis Workshop before being relieved by Benedikt Soja the next day. Newsletter editor Hayo Hase interviewed John to appraise his time as Coordinator and to provide some guidance for the future generation. The exchange was slightly edited for clarity.

John Gipson giving a talk at GM2024 in Tsukuba.

Thank you for your service, John!

IVS Newsletter, Issue 68, April 2024

Introducing myself

Prof. Dr. Benedikt Soja

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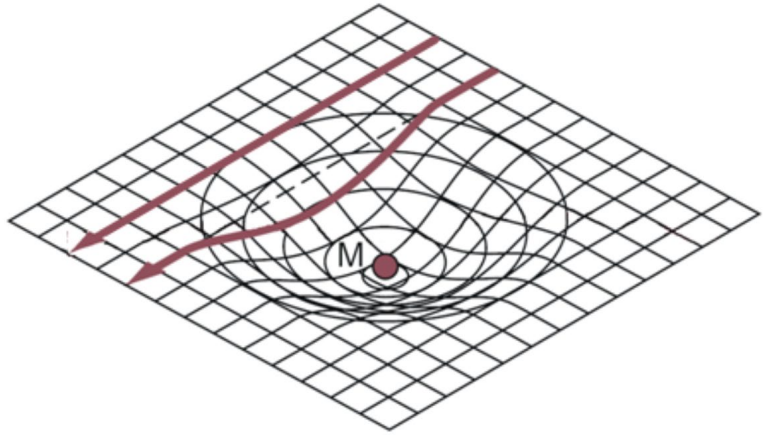
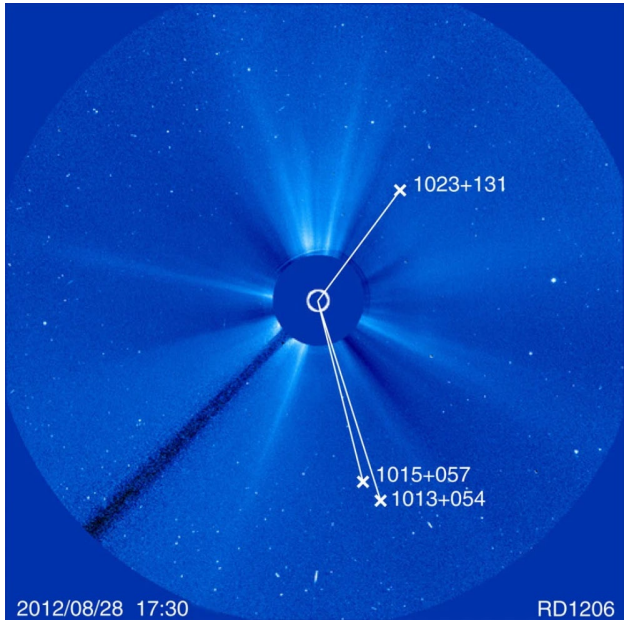
Research interests:

- VLBI
- Earth orientation, terrestrial and celestial reference frames
- Geodetic time series analysis and parameter estimation
- Machine learning in geodesy

Background in VLBI

- Bachelor thesis: Relativistic effects in VLBI
- Master thesis: Probing the Sun's corona with VLBI
- PhD thesis: Kalman filter for VLBI analysis
- Postdoc: Joint TRF, CRF & EOP determination with VLBI



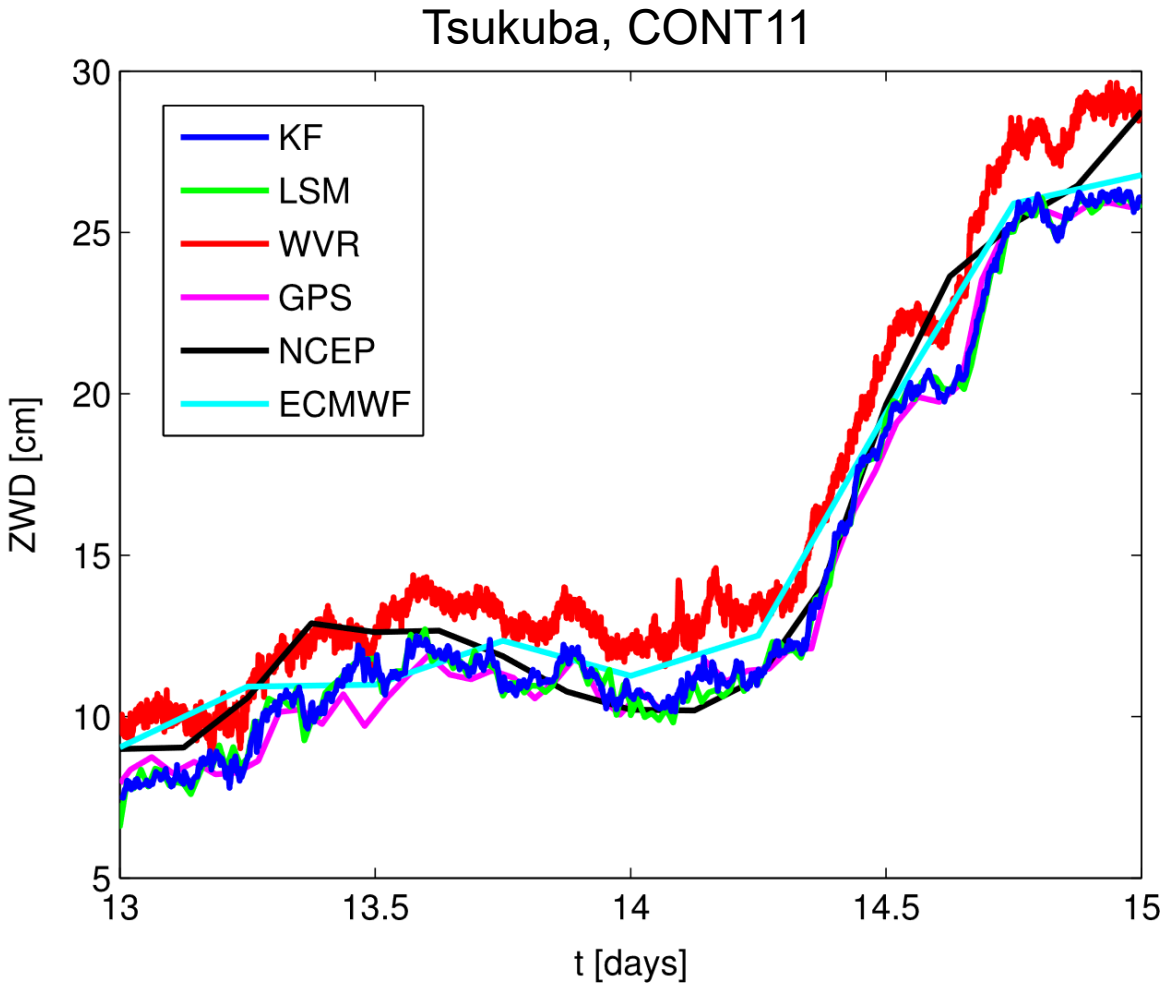


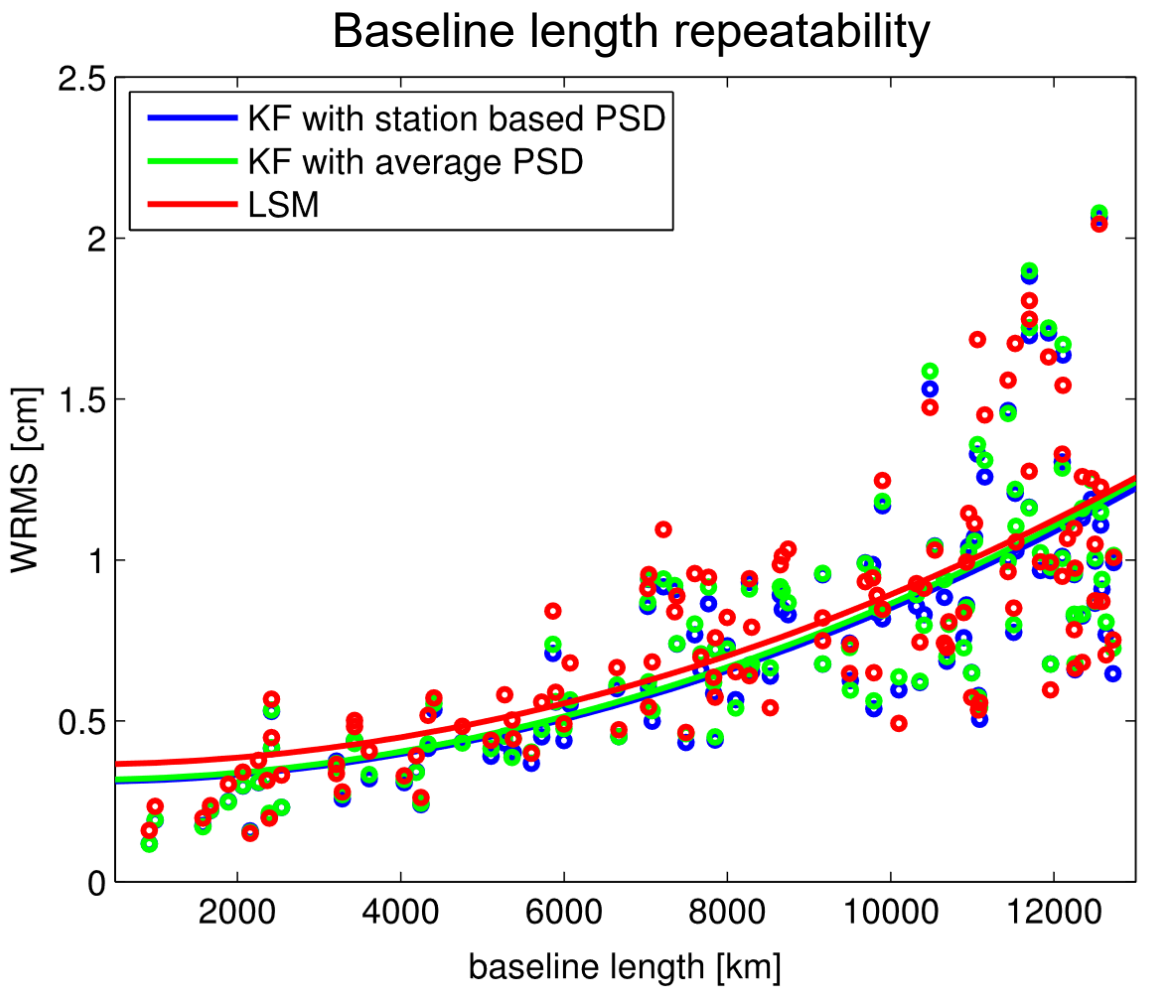
TECHNISCHE UNIVERSITÄT WIEN

GFZ Helmholtz Centre POTSDAM

NASA JPL

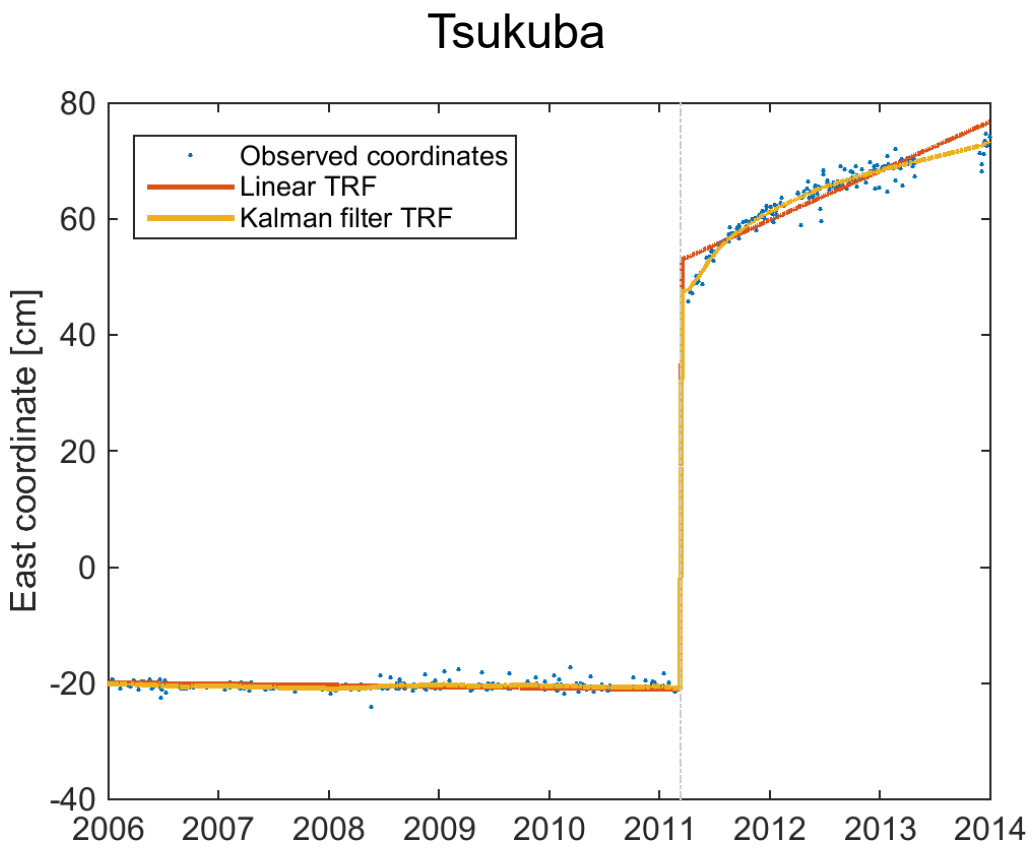
Kalman filter for VLBI tropospheric delay determination

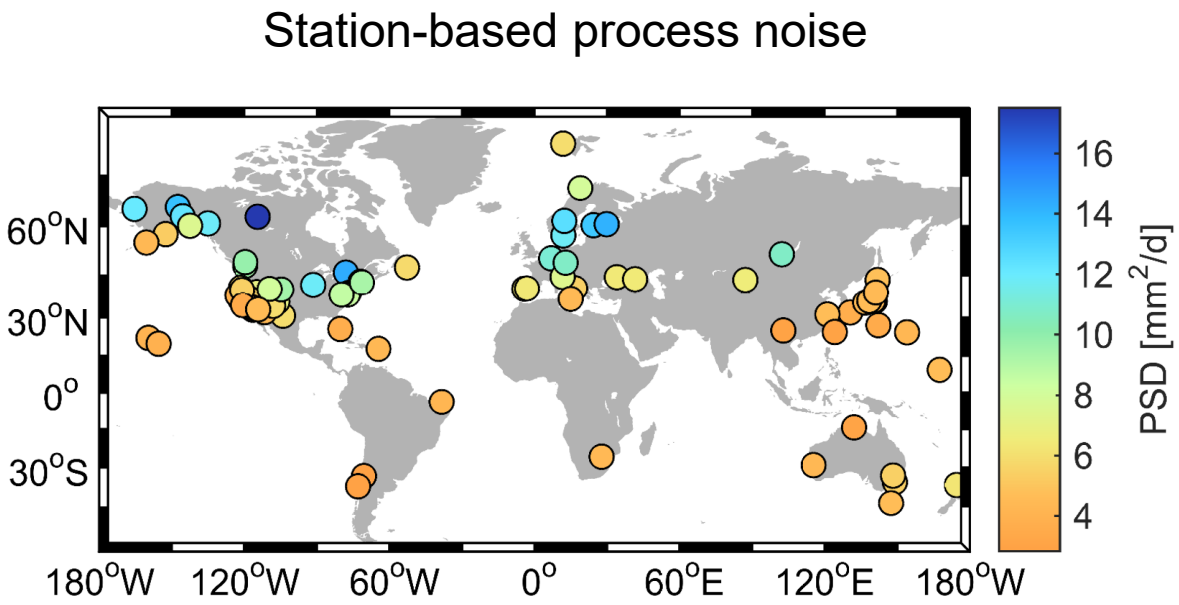




Soja et al., 2015

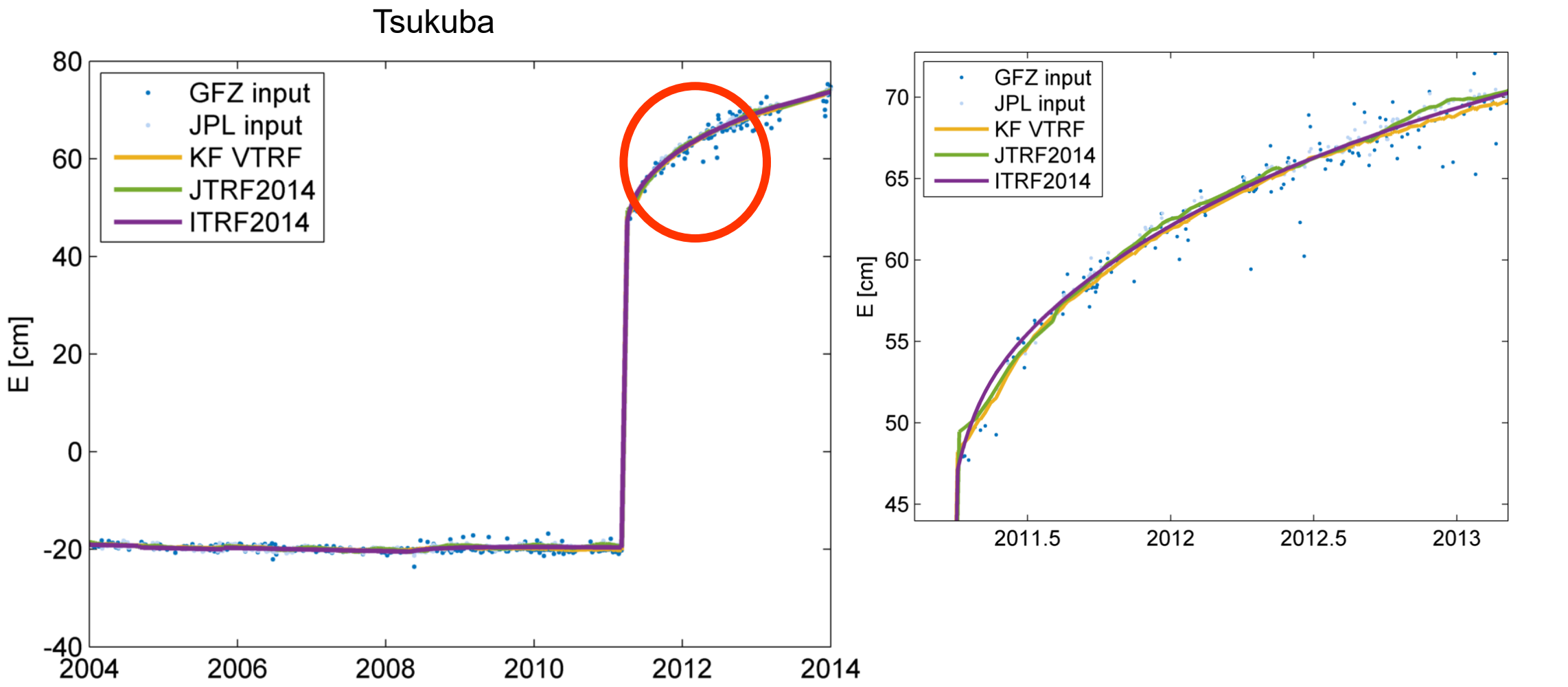
Kalman filter for VLBI terrestrial reference frames





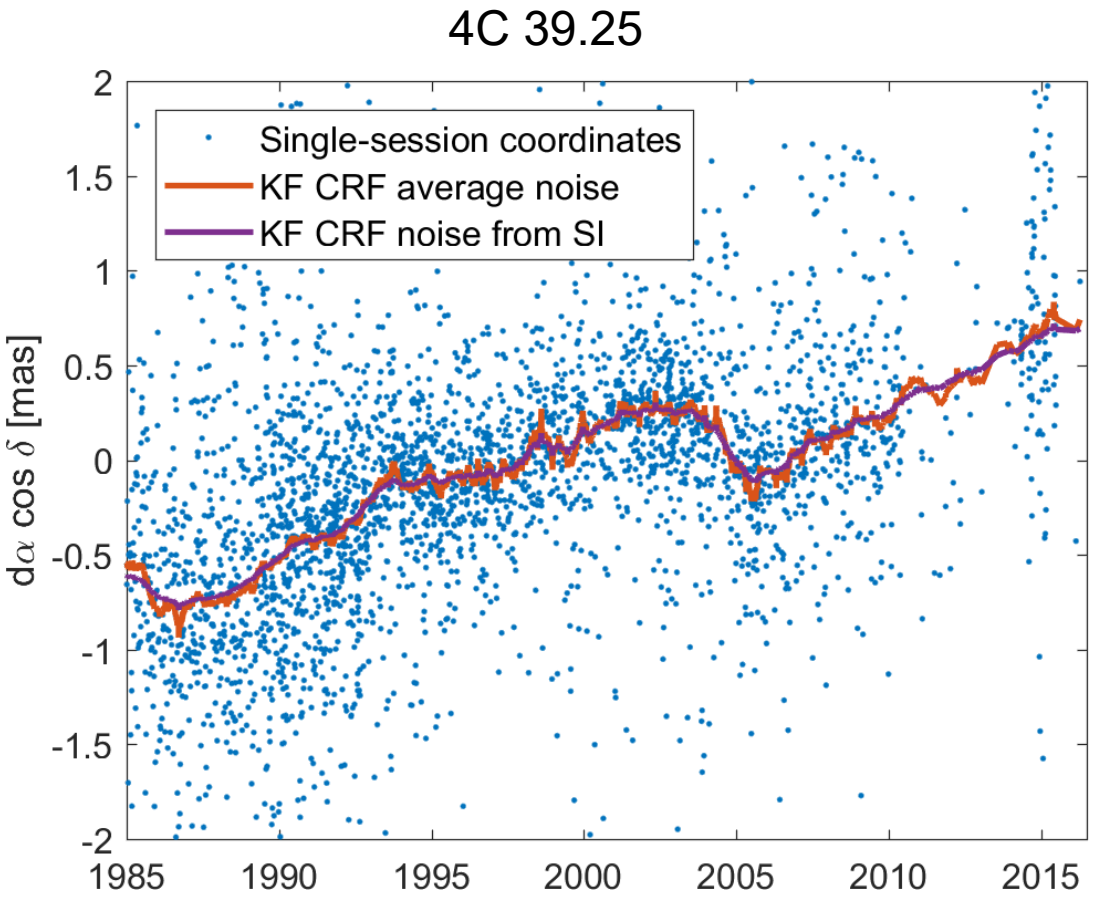
Soja et al., 2016

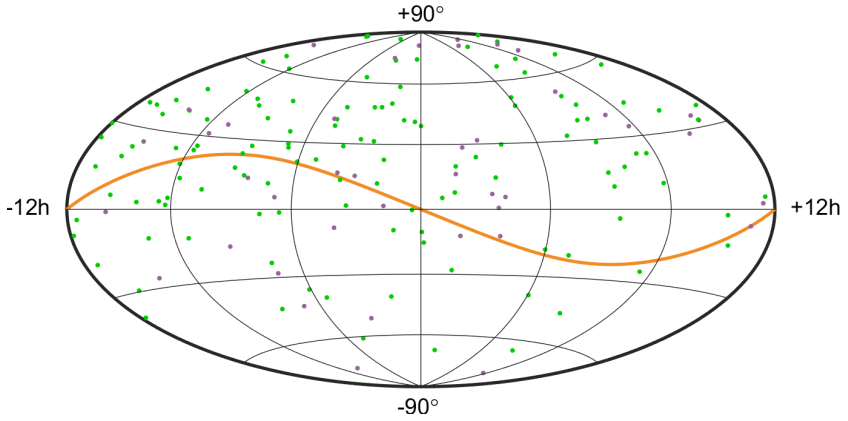
VLBI-only and multi-technique terrestrial reference frames

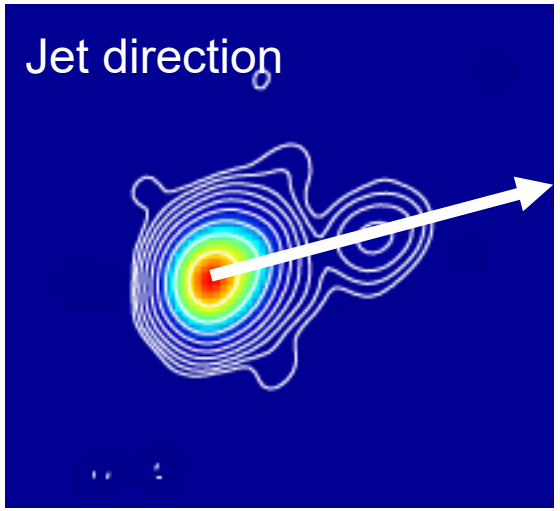


Soja et al., 2016

Kalman filter for celestial reference frames







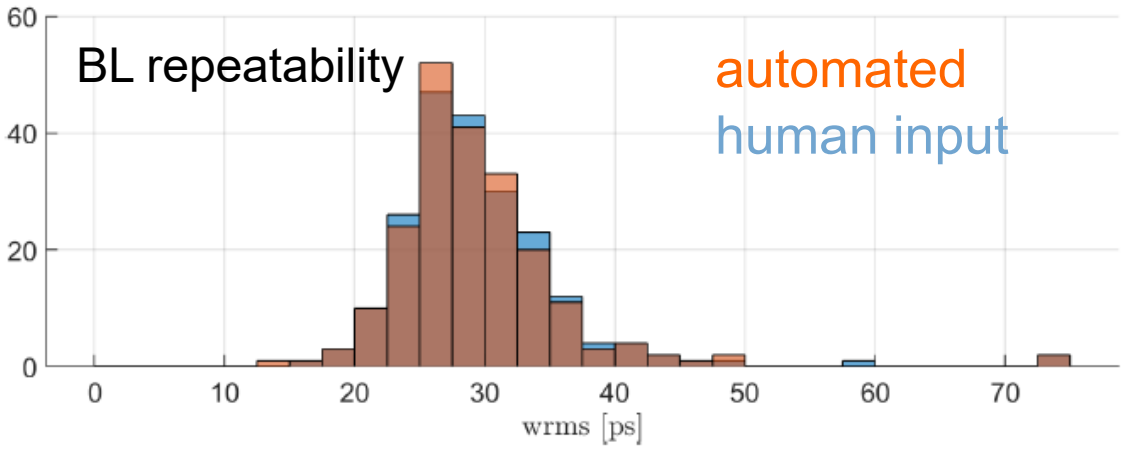
Soja et al., 2017

VLBI @ ETH Zurich

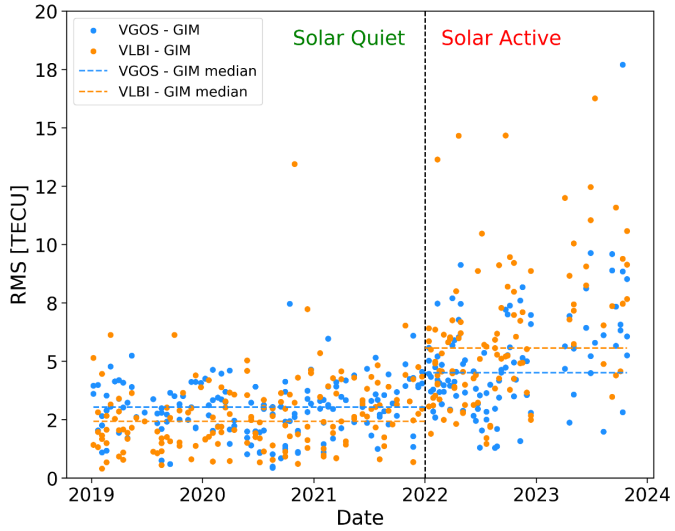
Group retreat, September 2023

VLBI @ ETH Zurich

- Associated Analysis Center
- Operation Center
- VLBI research topics
  - VLBI & VGOS for ionospheric parameters
  - Automated VLBI data analysis
  - VLBI scheduling

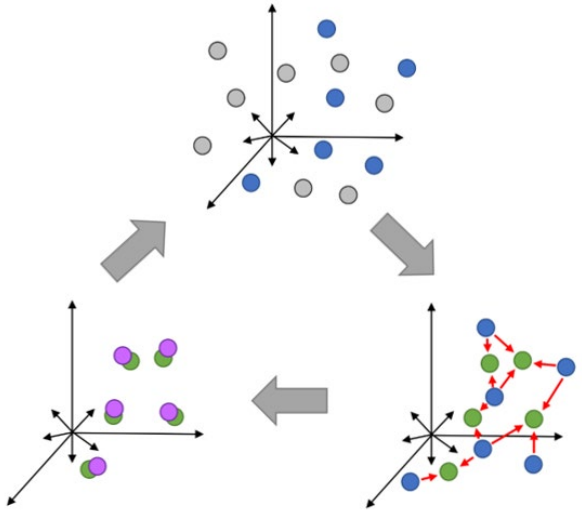


Ionospheric VTEC from VLBI & VGOS



Rüegg et al. in prep.

Evolutionary strategies for VLBI scheduling



Schartner et al., 2021

IVS Analysis Coordinator – official definition

3.2 Analysis Coordinator

The IVS Analysis Coordinator is selected by the Directing Board from responses to an open solicitation to the IVS Analysis Centers. The Analysis Coordinator is responsible for coordinating the analysis activities of IVS and for stimulating VLBI product development and delivery. The Analysis Coordinator performs the following functions:

- fosters comparisons of results from different VLBI analysis software packages and different analysis strategies,
- encourages documentation of analysis and combination software,
- participates in comparisons of results from different space geodetic techniques,
- monitors Analysis Centers' products for high quality results and for adherence to IVS standards and IERS Conventions,
- ensures that IVS analysis and combination products are archived and are available to the scientific community, and
- supervises the formation of the official IVS products specified by the IVS Directing Board.

The Analysis Coordinator plays a leadership role in the development of methods for generation and distribution of VLBI products so that the products reach the users in a timely manner. The Analysis Coordinator interacts with GGOS and the IERS and promotes the use of VLBI products by the broader scientific community. The Analysis Coordinator works closely with the astronomical communities who are using some of the same analysis methods and software.

IVS Terms of Reference

Primary objective

- Ensure the delivery of **high-quality VLBI products**
  - Earth orientation parameters (EOP)
  - Station coordinate time series
  - Radio source coordinate time series

  - Operational products (most important: dUT1)
  - Reprocessing efforts
    - Terrestrial Reference Frames (TRF)
    - Celestial Reference Frames (CRF)

Primary duties

- **Coordination of analysis activities** of the IVS
  - Monitoring quality of products
  - Comparisons (inter- and intra-technique)
  - Encourage new developments to improve IVS products
- **Coordination of interactions** between various institutions related to VLBI analysis
  - IVS (in particular: ACs & CC)
  - IERS (in particular: Analysis Coordinator, Product Centres, ITRS Combination Centres)
  - GGOS (in particular: Bureau of Products & Standards)
  - IAU (in particular: ICRF working groups)
- Organization of **IVS Analysis Workshops**
- Coordinating the IVS contribution to **Unified Analysis Workshops**
- **Promotion** of VLBI products to broader community

Challenges and opportunities

- Transition toward the VLBI Global Observing System (**VGOS**)
  - Unprecedented precision and high temporal resolution
  - Operational issues, affecting timely delivery of products
  - Model improvements (source structure)
- **ITRF** developments
  - Transition to regular updates
  - VLBI scale issue & GNSS providing scale information
- **ICRF** developments
  - Increased complexity & competition with multi-frequency and Gaia CRFs
- **EOP** developments
  - Advancements in EOP prediction and combination
- **Inconsistencies** between TRF, CRF and EOP
  - Efforts toward multi-technique combination at the observation level

Challenges and opportunities: Genesis

- VLBI, GNSS, SLR, DORIS on a single satellite
- Detect inter-technique biases and improve ITRF

- ESA relies heavily on the cooperation and support of the IVS!

- VLBI analysis for Genesis
  - satellite observations (near-field model required)
  - orbit determination
  - multi-technique combination

Next steps

- Organize IVS AC & CC Meetings together with Minghui & Sabine

- New website of the IVS Analysis Coordinator
  - https://space.igp.ethz.ch/services/services-to-iag/ivs.html

- Listening tour
  - Meet IVS ACs, IVS CC, IERS Analysis Coordinator, IERS ITRS CCs, etc.

- First IVS DB meeting in October 2024

Thanks for your attention!

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