REPORT FROM NKG EPN AC AND SWE EPND AC

EUREF SYMPOSIUM 2025 IN COVILHÃ, PORTUGAL

LOTTI JIVALL, TINA KEMPE, TONG NING

LANTMÄTERIET

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NKG EPN AC

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- Final weekly processing
- Rapid daily processing
- Ultra rapid processing

- EPN Repro3

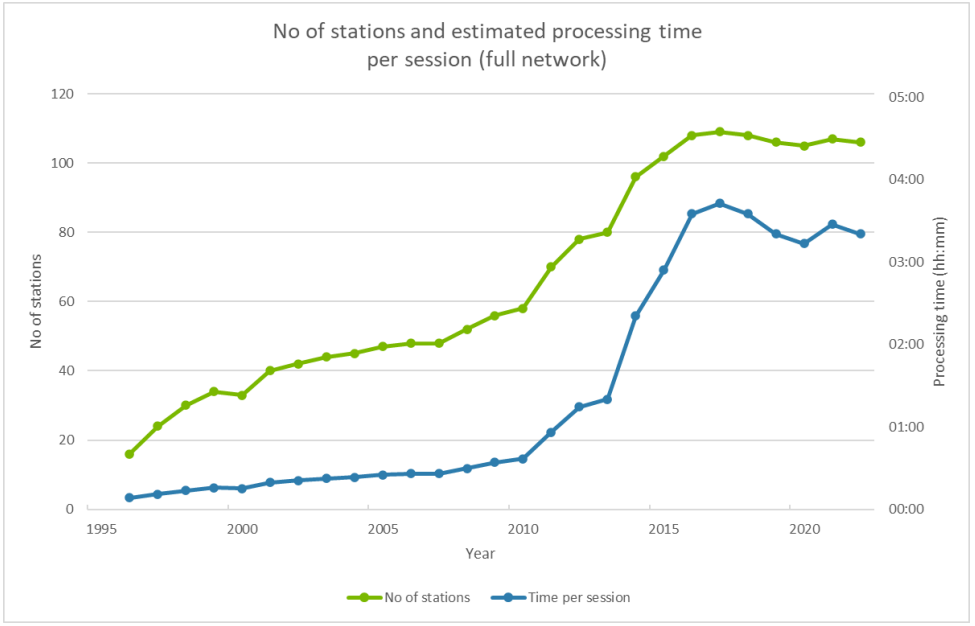
Bernese version 5.4 for all contributions

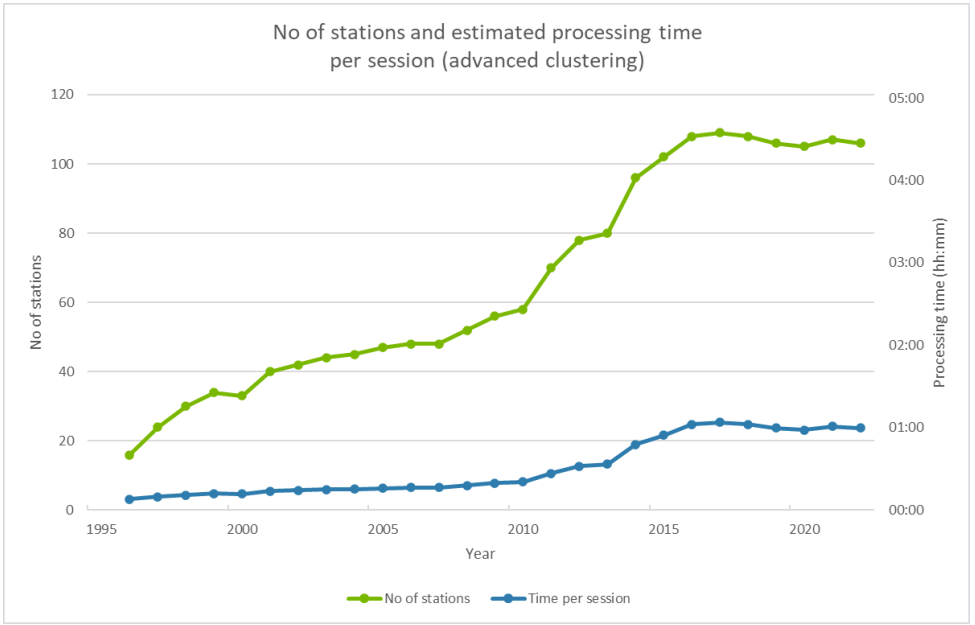
NKG EPN ULTRA-RAPID PRODUCT

- We are producing near real-time (NRT) hourly coordinates for all (~570) SWEPOS stations.
- The NKG EPN Ultra-rapid product is fetched from the NRT hourly coordinates to create hourly SINEX files including all EPN and EPN densification stations in Sweden (~100 stations, 28 EPN).
- In May 2025, hourly submission of the ultra-rapid solution was initiated and is currently undergoing validation by the EPN Analysis Coordinator (EPN ACC).

NKG EPN REPRO3

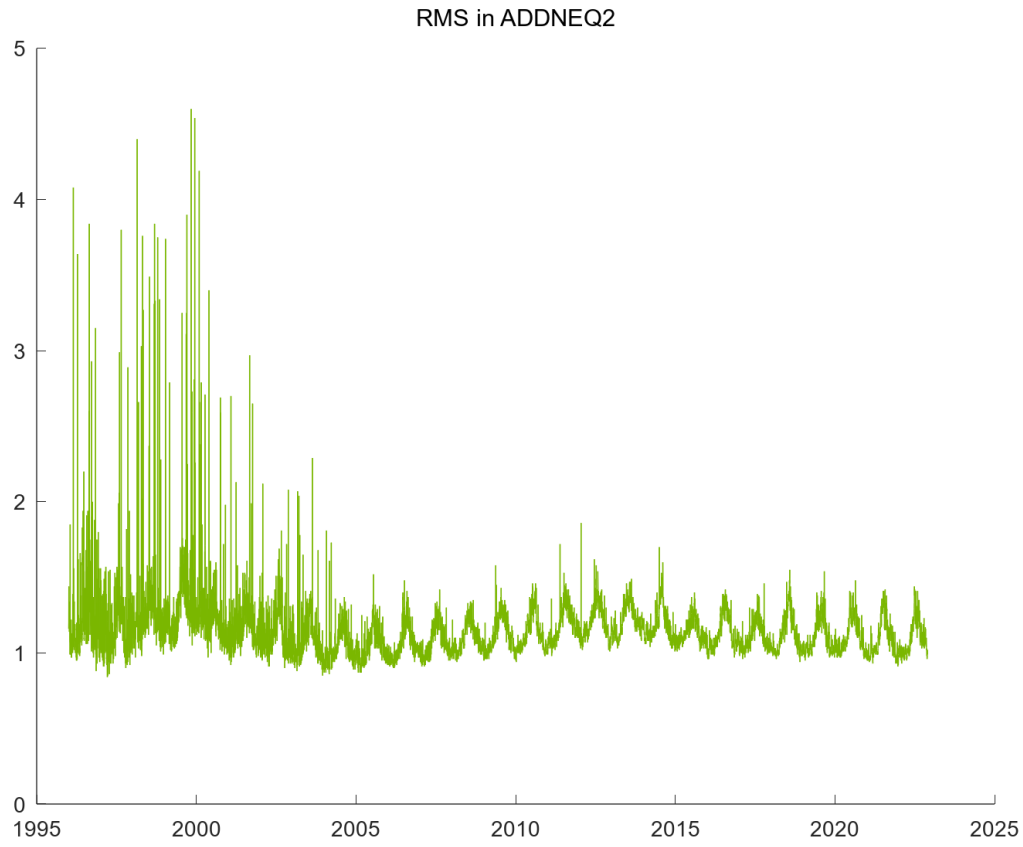
- 1996–2022
- Totally 125 stations, up to 111 simultaneously
- RINEX from EPN HDC fetched June 2023, Aug 2023, Nov 2023 (THU2 BKG) , April 2024
- VMF3_E1 until 2007 and then VMF3_OP
- I20.atx + epnc_20_r3.atx
- Clustering (estimated effective processing time: full net ~1.5 year, clustering: ~0.5 year)
- Additional solution for BIFROST Bernese solution
  - GPS, 7 deg cut-off



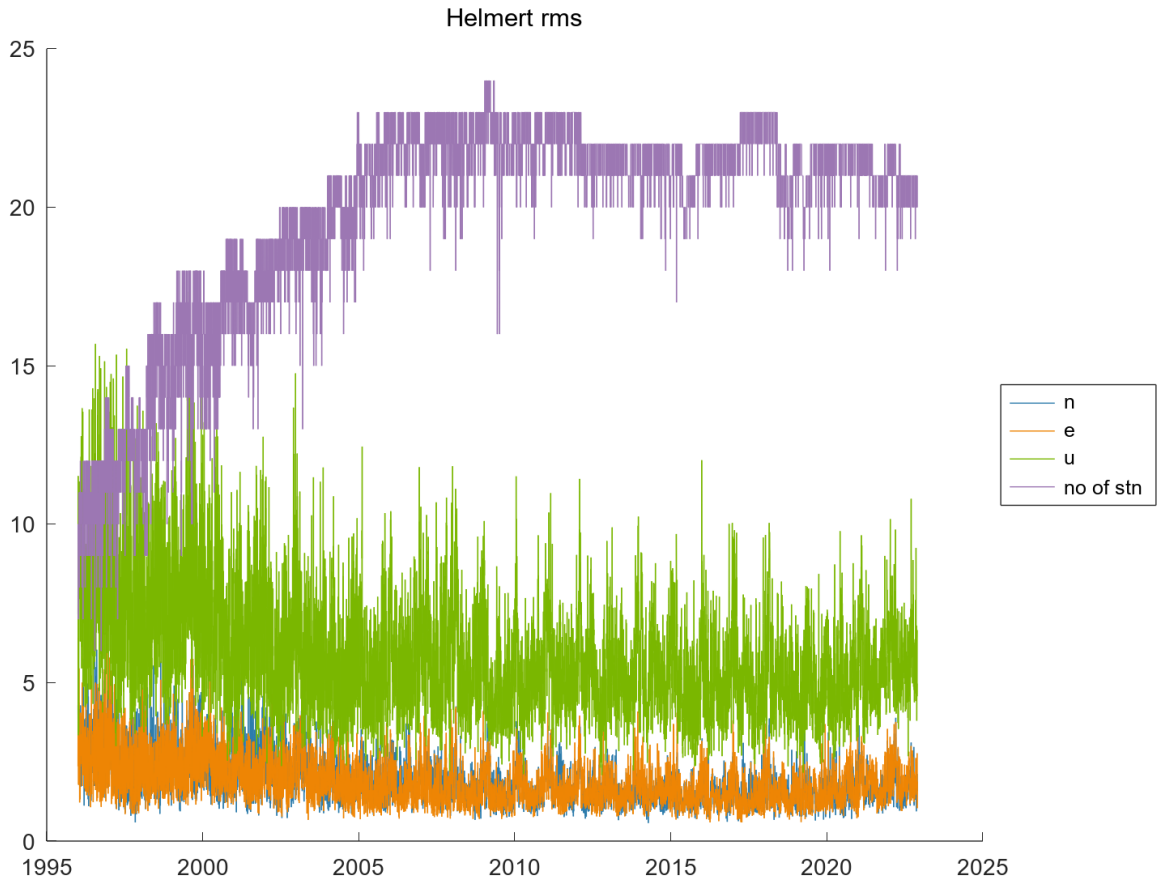


TROUBLESHOOTING AND REPROCESSING

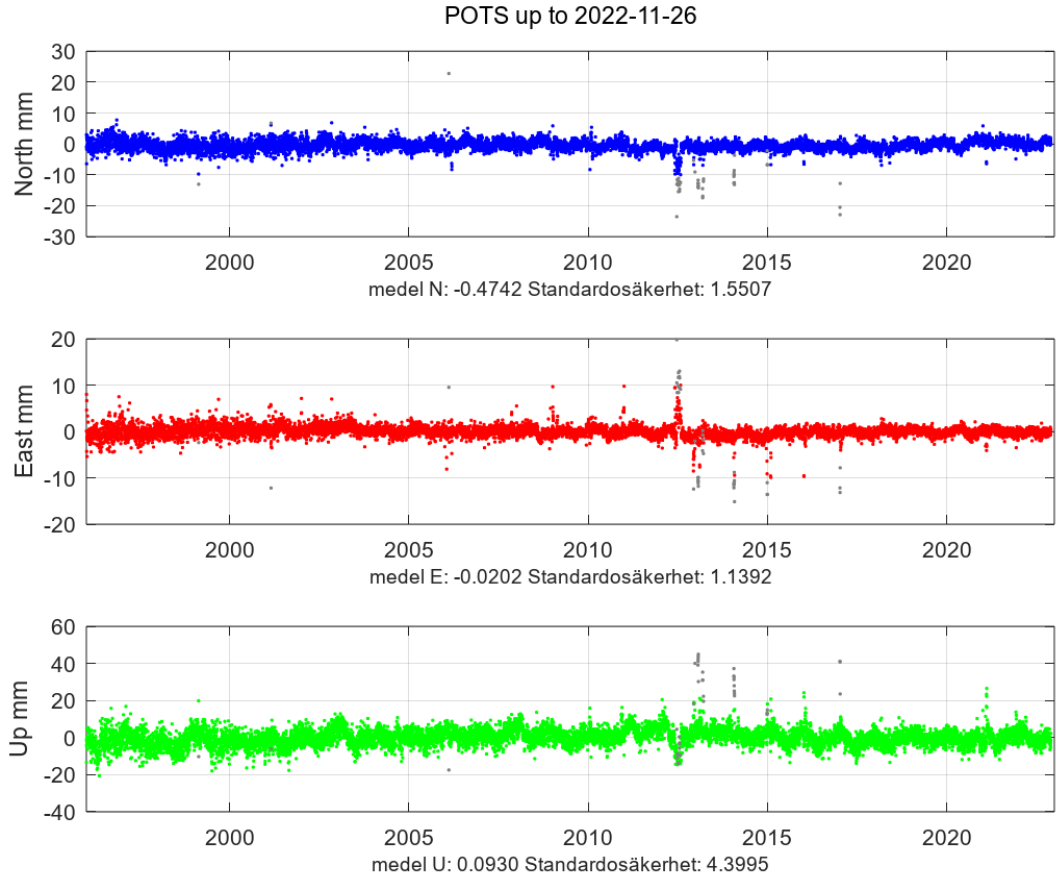
- Large RMS in final solution – BASTST.PCF very useful
- Large coordinate deviations – 30 sessions (mainly with risk for propagation to other stations)
- Data affected by snow still included
- SPT000SWE reprocessed without Glonass data 2008-128 – 2012-015
- Reprocessing to include stations with event flags and with drifting receiver clocks



NKG EPN REPRO3 RESULTS – HELMERT (3 P) TO IGS20

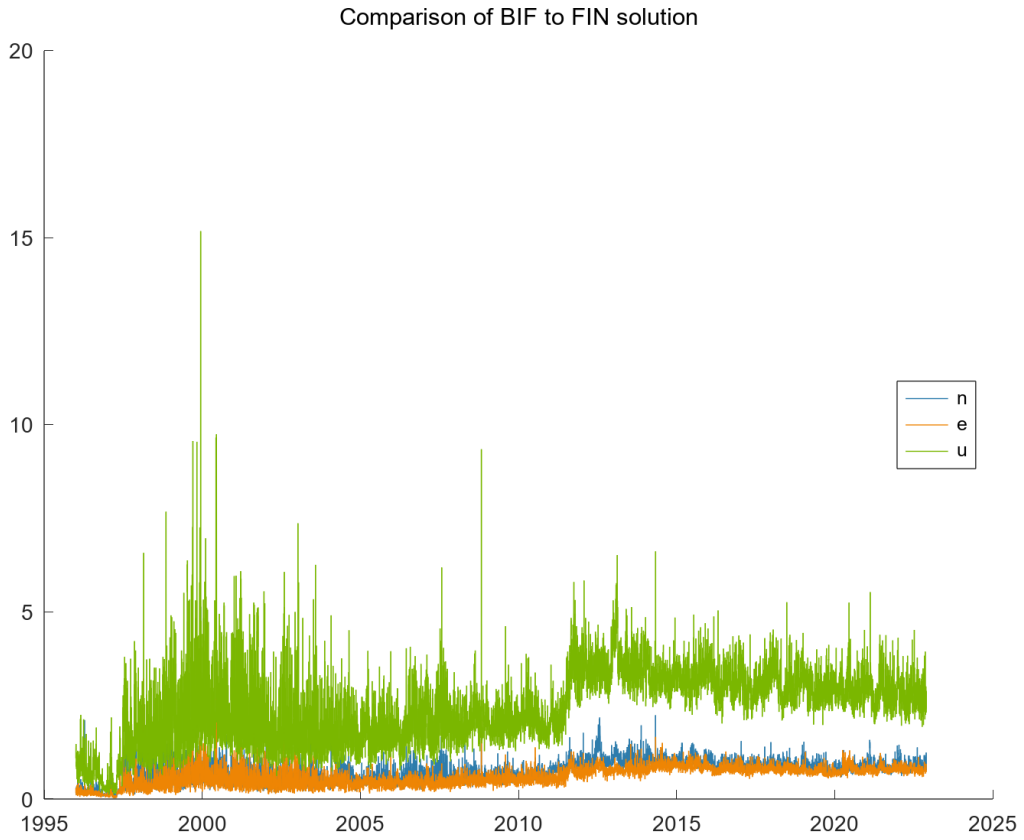


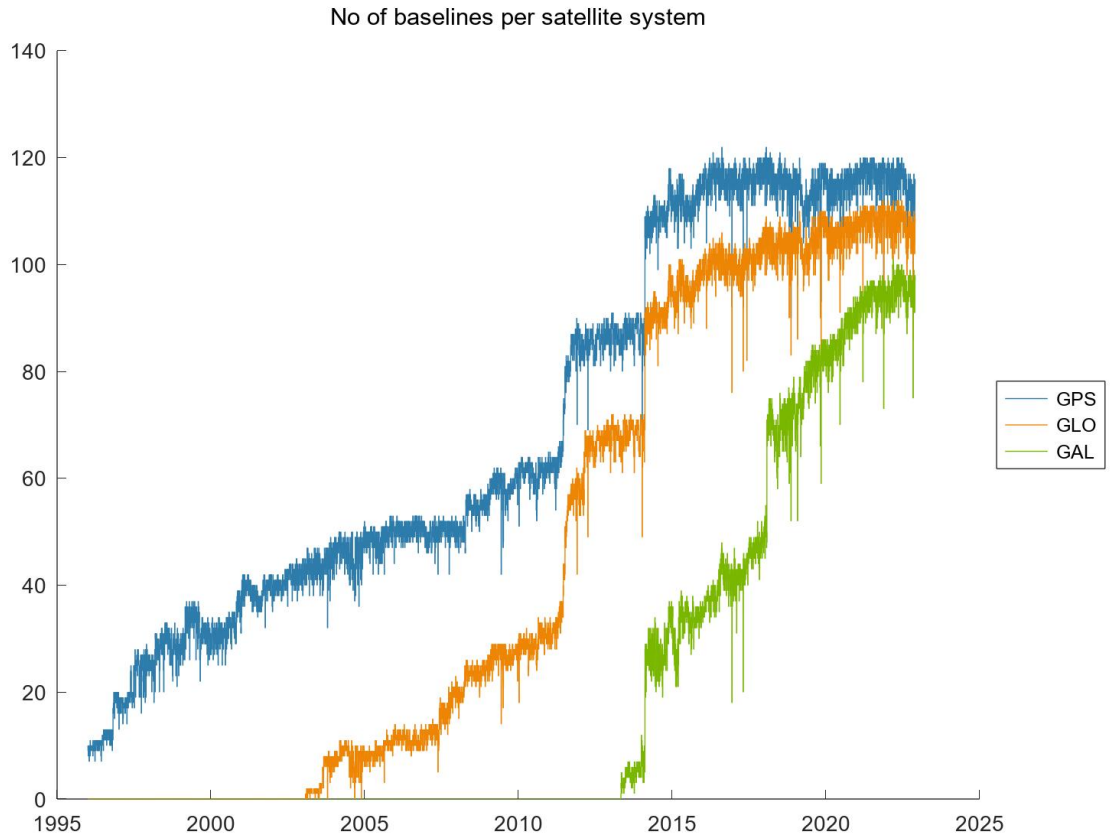
rms for the daily 3-par Helmert to fiducial stations



Example: Residuals for POTS00DEU. Limits for the residuals (10, 10, 30) mm in (N, E, U).

EPN REPRO3 COMPARED TO BIFROST





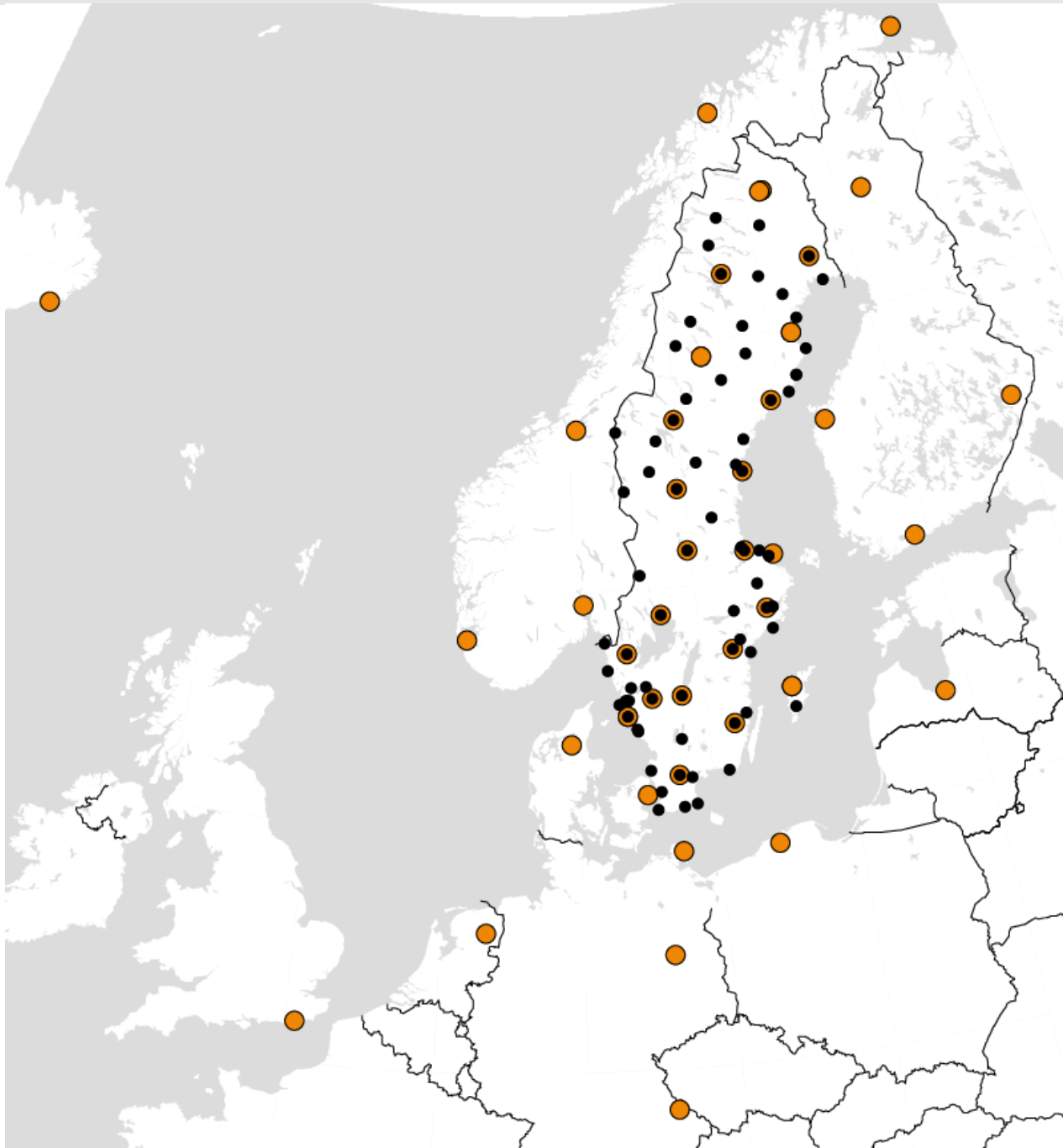
LANTMÄTERIET

SWE EPND AC

SWE EPND

Part of the NKG GNSS AC project, using Bernese ver. 5.4

- Station selection from GW2238
- 118 stations today
- 48 EPN (28 in Sweden)
- 70 national non-EPN stations
  - → 37 class A
  - → 33 class B
- Multi-GNSS-model for JNSCR_C146-22-1
- Own clustering

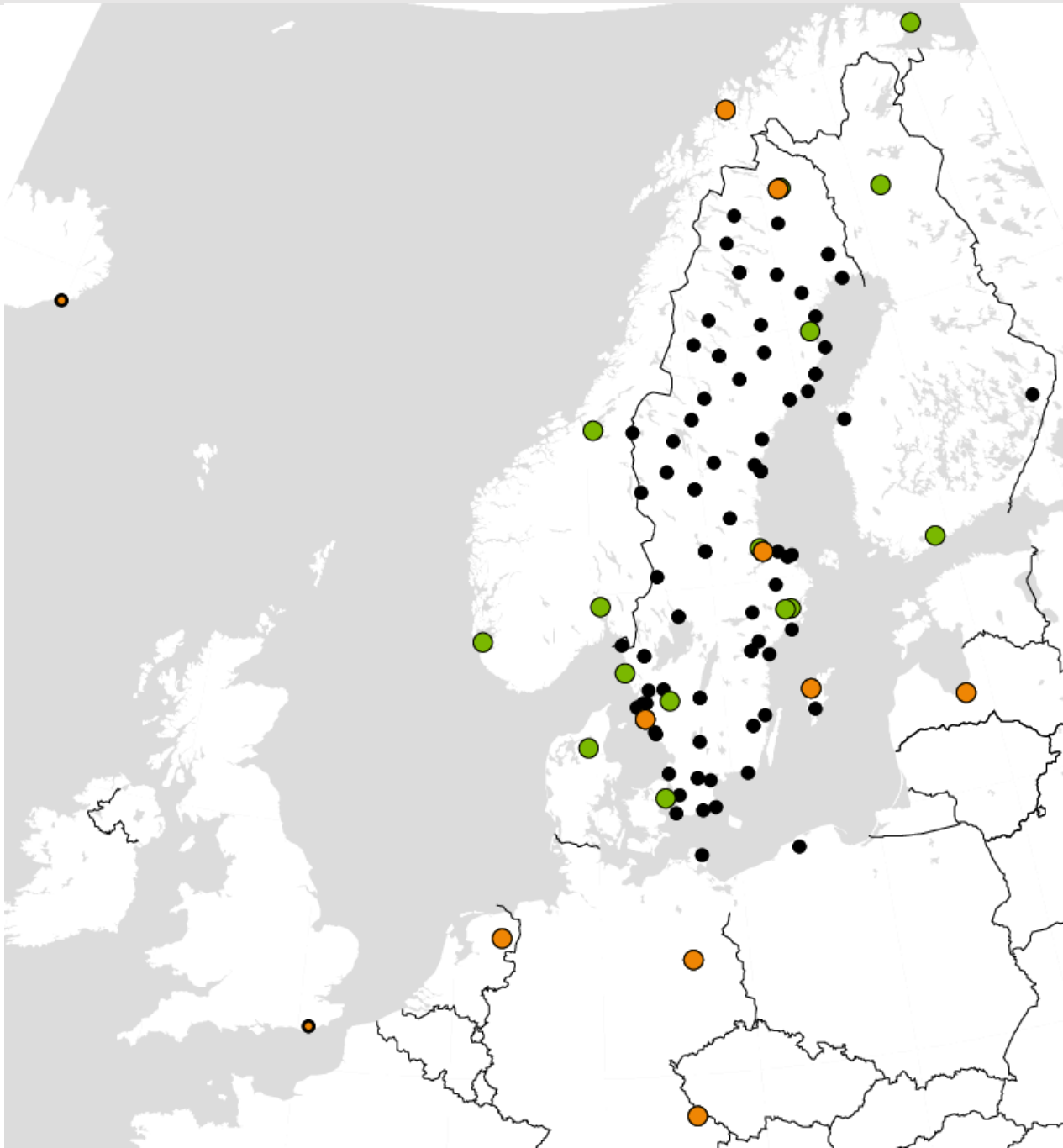


REFERENCE FRAME FIXING

Operational since week 2352:

- 9 IGB20
- 18 ITRF2020u2023

Why METG instead of MET3 in IGB20?



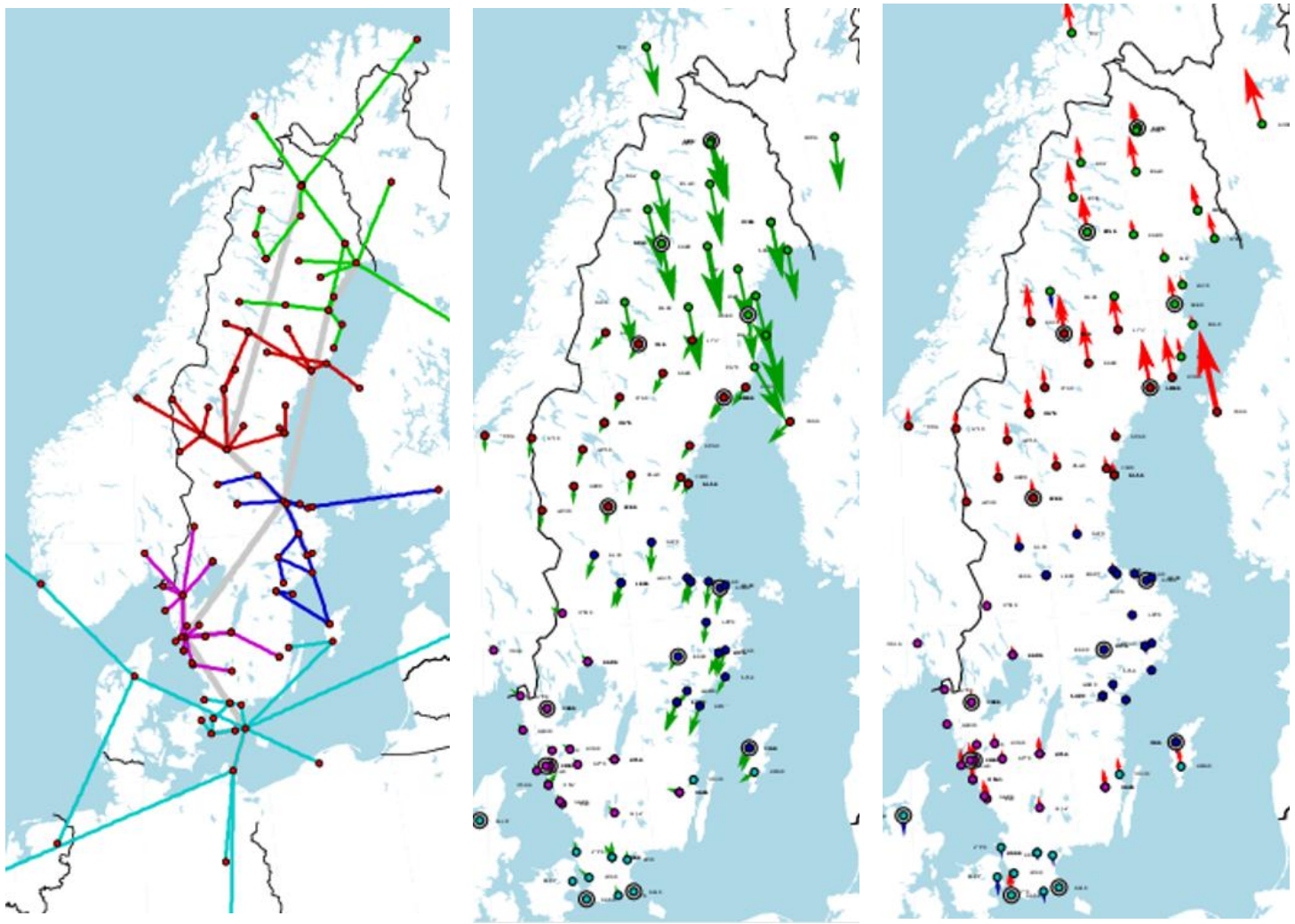
CLUSTERING – OWN STRATEGY

1. The stations are divided in clusters with MKCLUS
2. Baselines are defined within each cluster using OBSMAX
3. An extra cluster is formed based on the stations with most baselines in each cluster

➢ The baselines in each cluster are connected and the clusters are connected by the ”best” stations

Parameters:

- Max stations per cluster (25)
- Number of common stations per cluster (3)

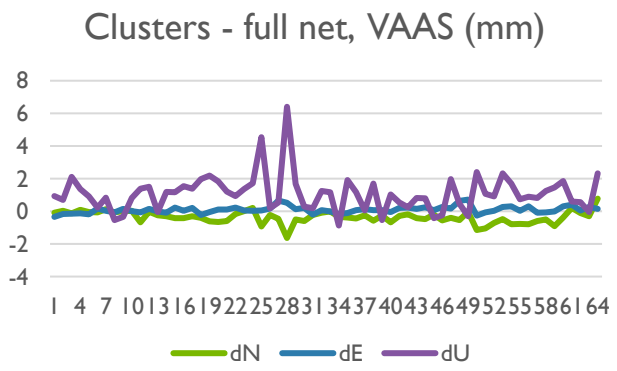


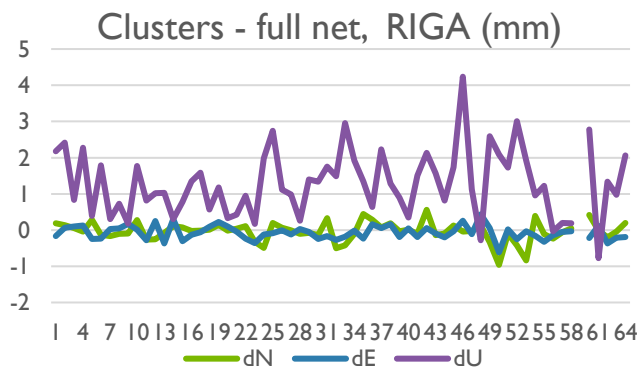
Worst case day 2022-333 (Scale:VAAS 2 mm in up)

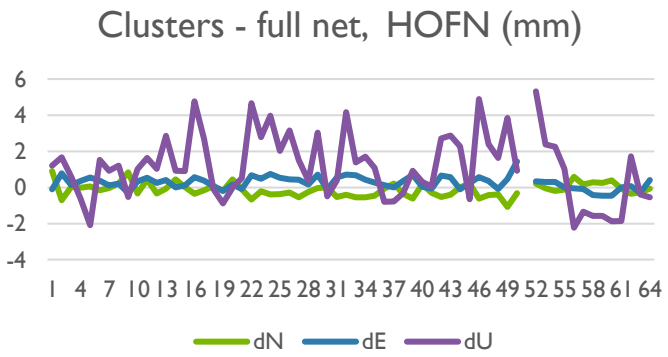
FULL NETWORK – CLUSTERING

Conclusions from comparison between full network and clustering (25+3) for the period Dec 2022 – Jan 2023:

- Daily repeatabilty similar for both processing settings
- The full network agrees slightly better with NKG EPN sol (rms 1.4 mm cmp 1.6 mm in up)
- Small bias between full network and clustering,
  max 0.5 mm horizontally and 1.4 mm in height. (Three stations > 1 mm in height: RIGA, HOFN, VAAS.)

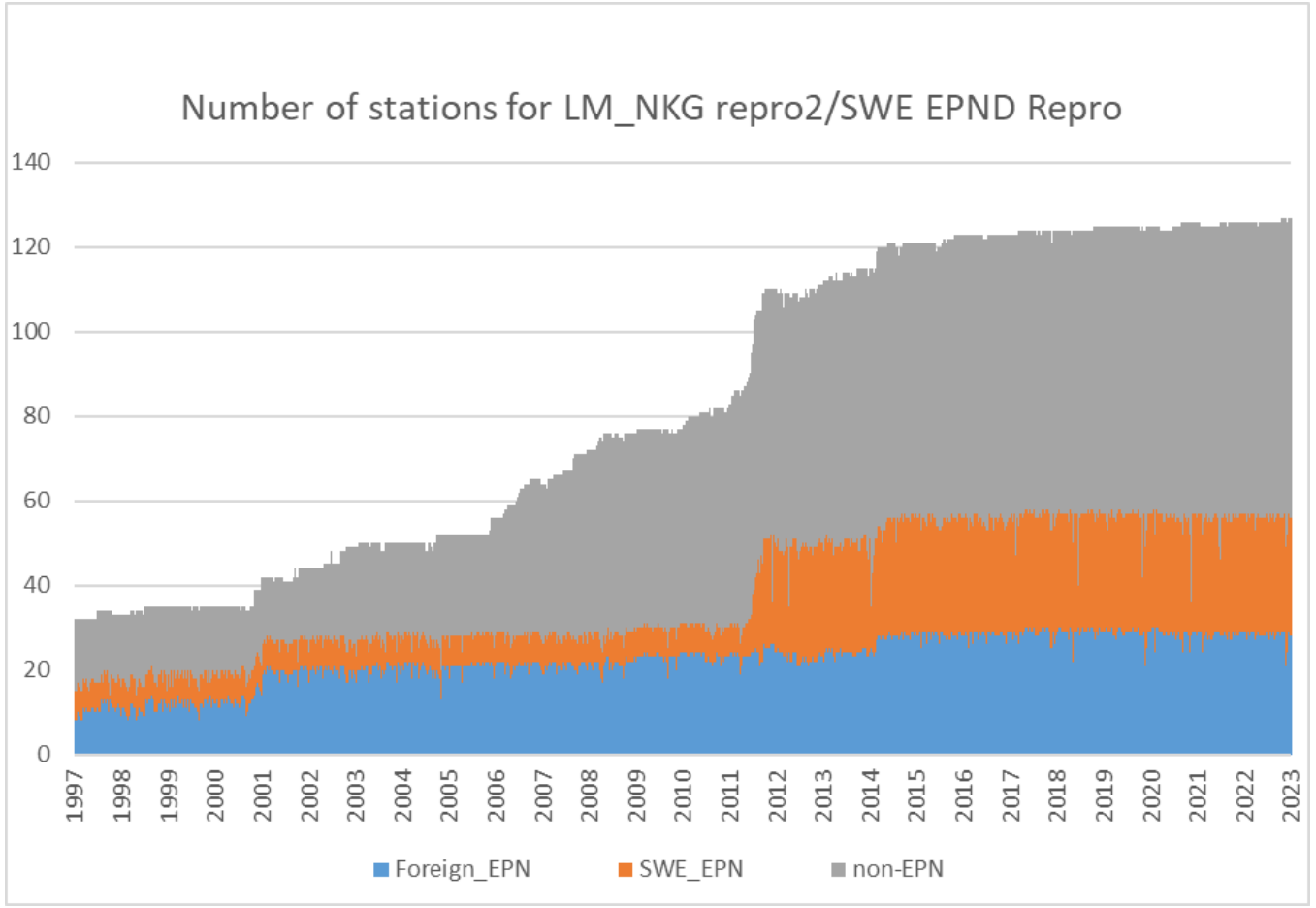






SWE/LM REPRO

- 1997–2022
- Totally 132 stations, up to 125 simultaneously
- EPN RINEX and input – same as for NKG EPN Repro3
- I20.atx + epnc_20_r3.atx + JNSCR_C146-22-1 (multi-GNSS)
- Clustering
- Additional solution for BIFROST Bernese solution
  - GPS, 7 deg cut-off

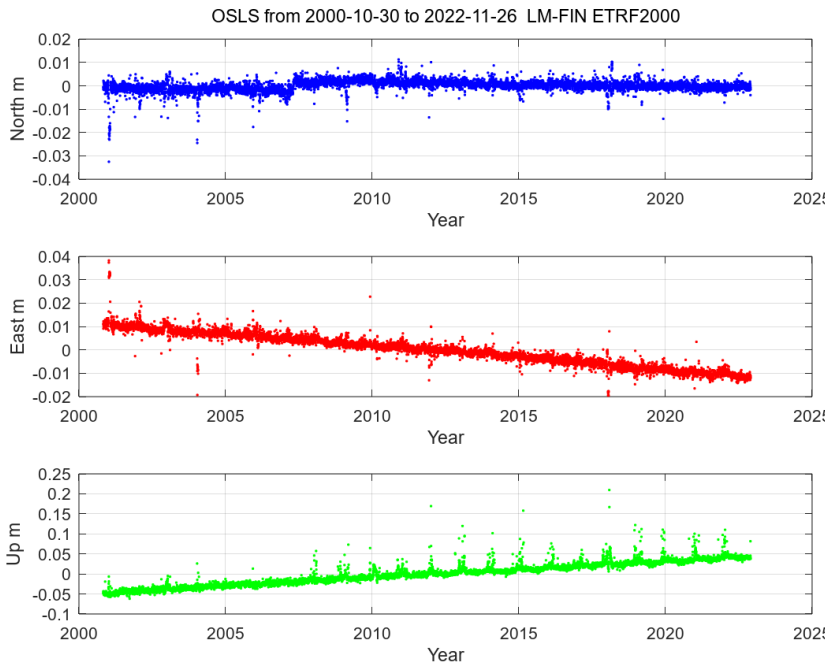


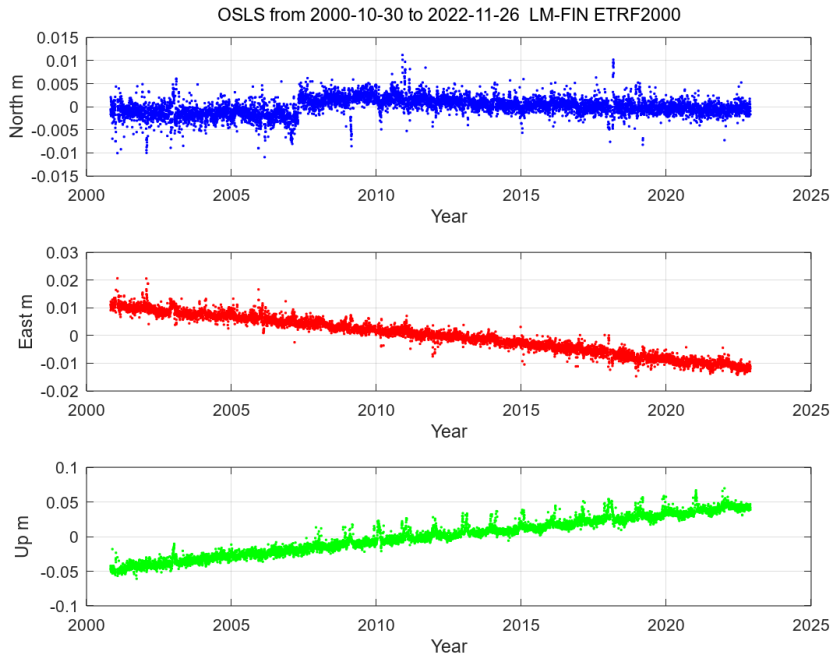
TROUBLESHOOTING AND REPROCESSING

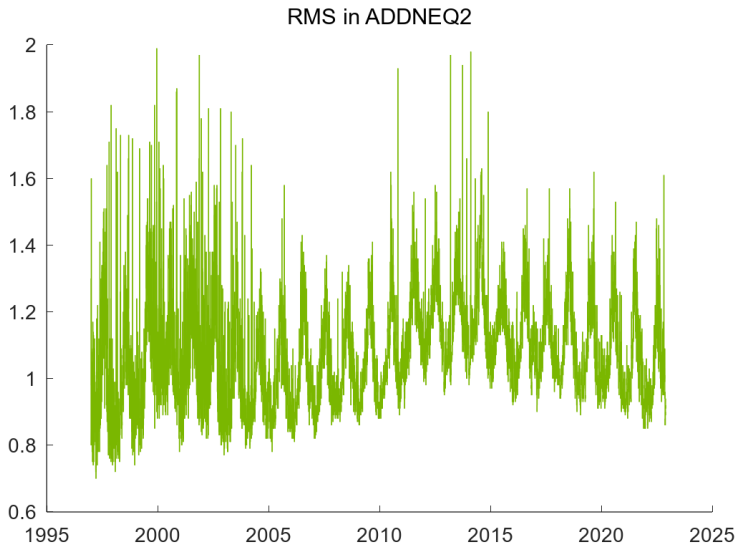
193 sessions reprocessed because of large rms in the final solution (> 2mm)

+ 20 for other degraded quality measures

779 sessions reprocessed because of outliers in time series ~> (15, 15, 40) in (N, E, U) except obvious snow





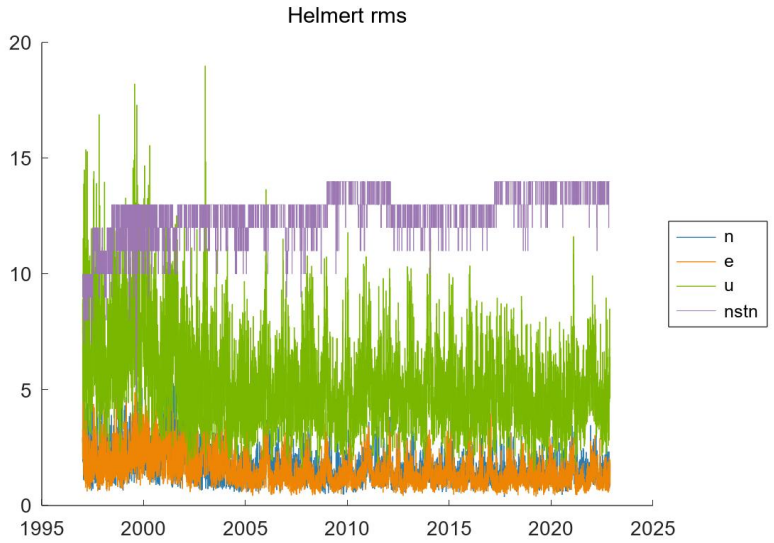


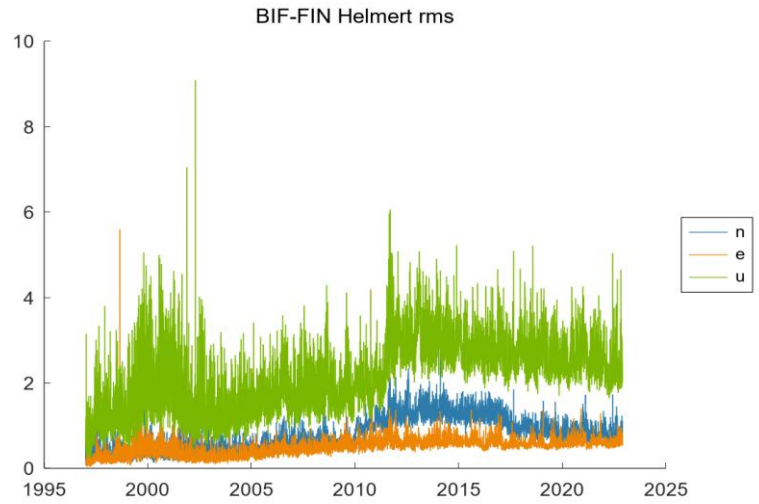
Example OSLS00NOR

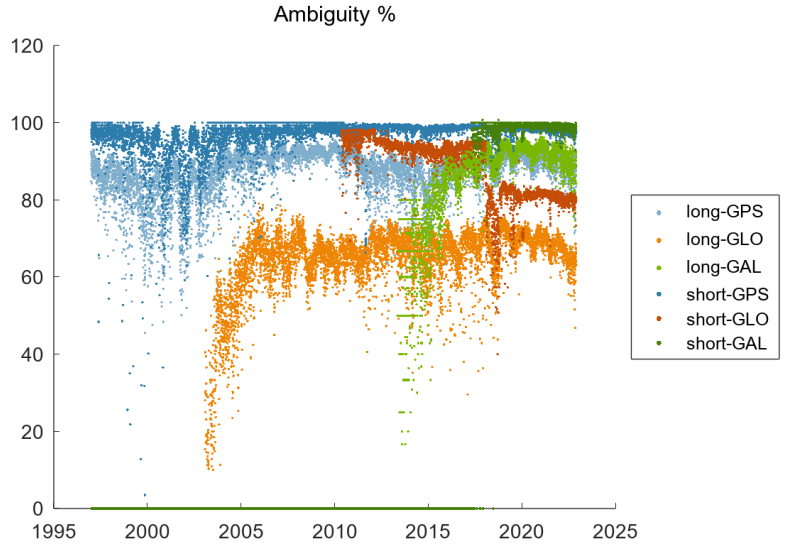
182 sessions reprocessed because of outliers ~> (15, 15, 40) in (N, E, U).

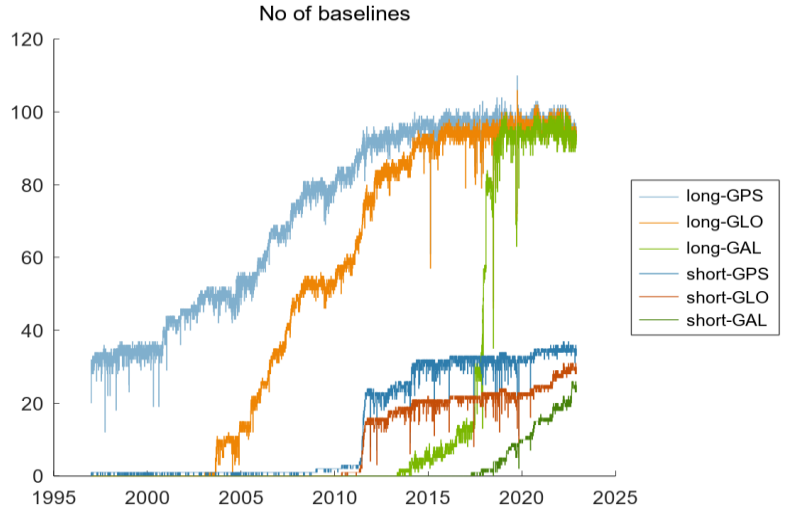
Snow affected data remain.

SWE REPRO RESULTS









TROPOSPHERE PRODUCTS

Hourly ZTD and daily gradients constrained on weekly coordinates

(additionally also based on daily coordinates).

For operational and Repro and for EPND.

SUMMARY

- Large effort with the Repros – taking long time
- New Bernese version
- More troubleshooting and re-processing than in earlier Repros
- Larger final rms around 2001 and 2011-15, ionosphere?
- Larger difference to BIFROST-solution (only GPS) around 2001 and from 2011
- Trop solutions from EPND

THANKS FOR YOUR ATTENTION!

Lotti Jivall, Tina Kempe and Tong Ning

Geodata Division

Department of Geodetic Infrastructure

Lantmäteriet, the Swedish mapping, cadastral and land registration authority

CONTACT lotti.jivall@lm.se, christina.kempe@lm.se, tong.ning@lm.se

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