

Report of the EPN Troposphere Coordinator

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- Operational Solutions:
 - Final weekly combination
 - Rapid daily combination
- Summary and next steps

Operational Solutions: Final and Rapid

AC	Solution Type		Software	GNSS
ASI Italy	F	R	GipsyX-2.1	GRE
BEK Germany	F	R	BSW 5.4	GRE
BEV Austria	F		BSW 5.4	GRE
BKG Germany	F	R	BSW 5.4	GRE
COD Switzerland	F		BSW 5.5	GRE
GFZ Germany	F		EPOS.P8	GRE
IGE Spain	F	R	BSW 5.4	GRE
IGN France	F	–	BSW 5.4	GRE
LPT Switzerland	F		BSW 5.3	GRE
MUT Poland	F	R	GG 10.71	GE
NKG Sweden	F	R	BSW 5.4	GRE
RGA Serbia	F		BSW 5.4	GRE
ROB Belgium	F	R	BSW 5.4	GRE
SGO Hungary	F		BSW 5.4	GRE
SUT Slovakia	F	R	BSW 5.4	GRE
UPA Italy	F	R	BSW 5.4	GRE
WUT Poland	F	R	BSW 5.4	GRE

- **17 ACs** are providing daily final solutions
- **10 ACs** are providing daily rapid solutions
- **Processing Options:** refer to 'Guidelines for EPN Analysis Centres'
- **Distributed Processing:** The EPN stations are distributed among the ACs in such a way that each station is analyzed by at least three ACs. This ensures the reliability of the EPN products

June 2025: 424 EPN stations

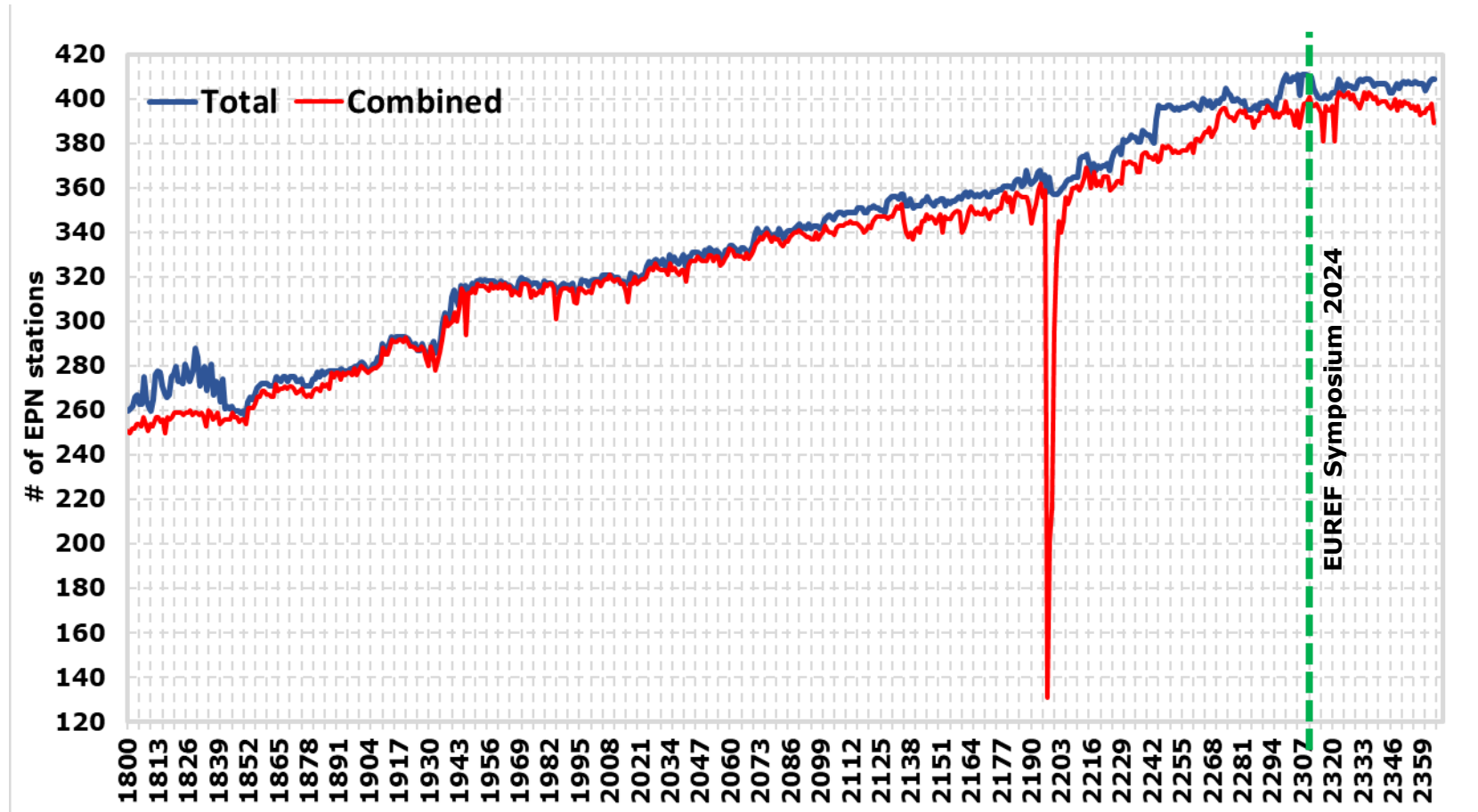
	7 ACs	6 ACs	5 ACs	4 ACs	3 ACs
%	0,5%	3,3%	35%	54%	8%
#	2	14	147	229	32

Final weekly combination

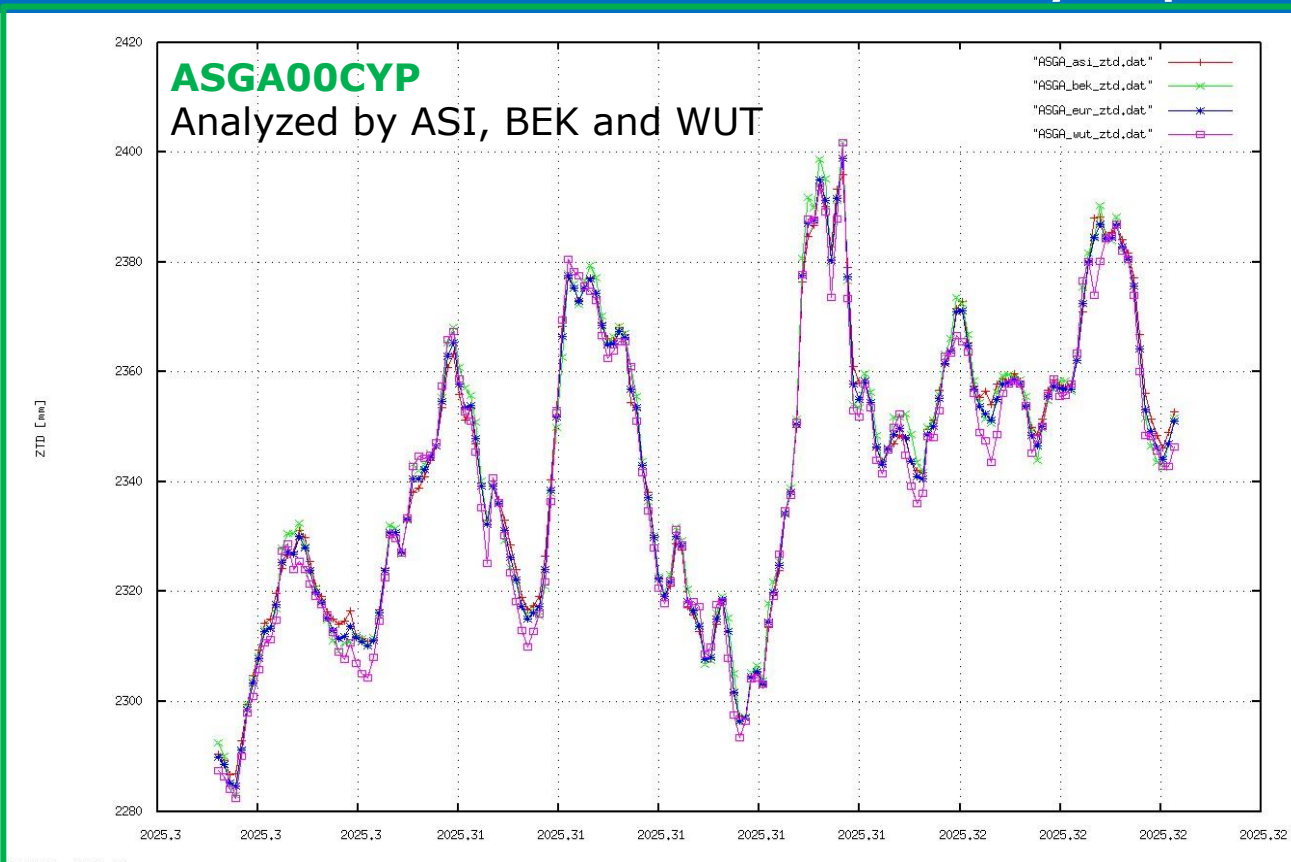
Number of Combined Stations

Last Combined Solution: GPS week 2364 (25Apr27):

- Total Stations available 409
- Combined Stations 389



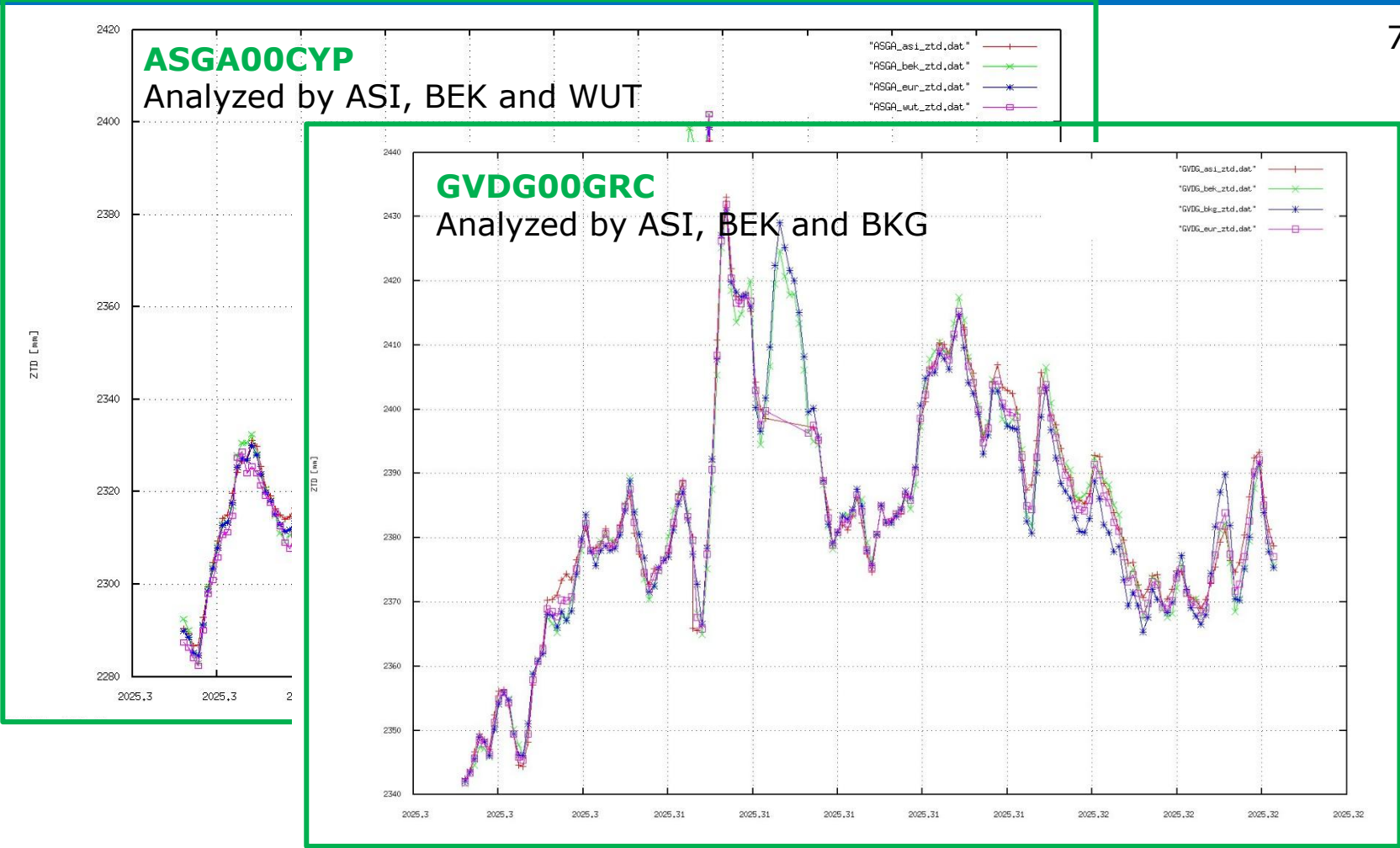
New stations since EUREF Symposium 2024



7 new stations since EUREF Symposium 2024

#	Country	Station
1	Cyprus	ASGA00CYP
1	Greece	GVDG00GRC
1	Grenland	KLSQ00GR
2	France	IGNP00FRA AAER00FRA
2	Luxembourg	ECH200LUX TROS00LUX

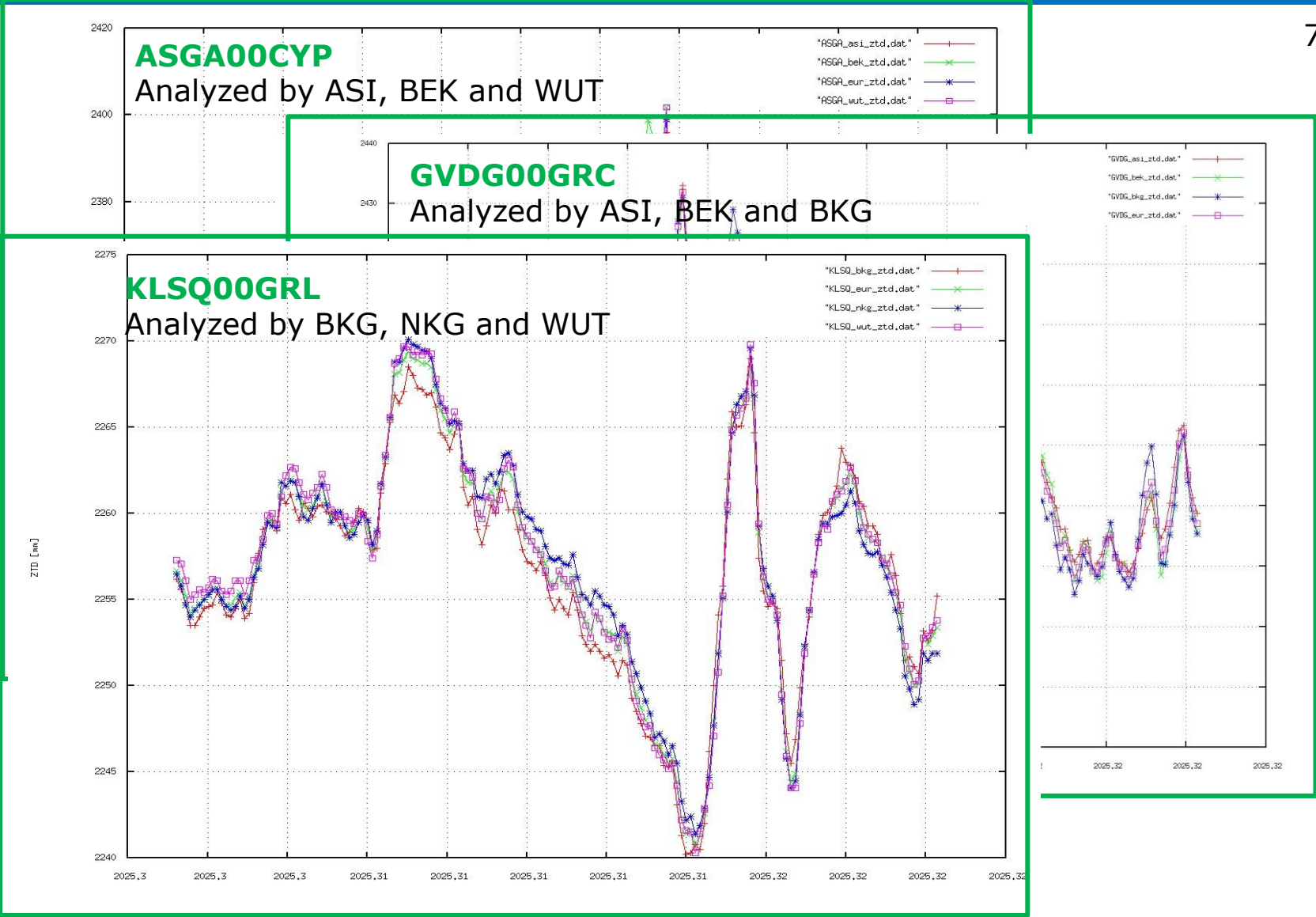
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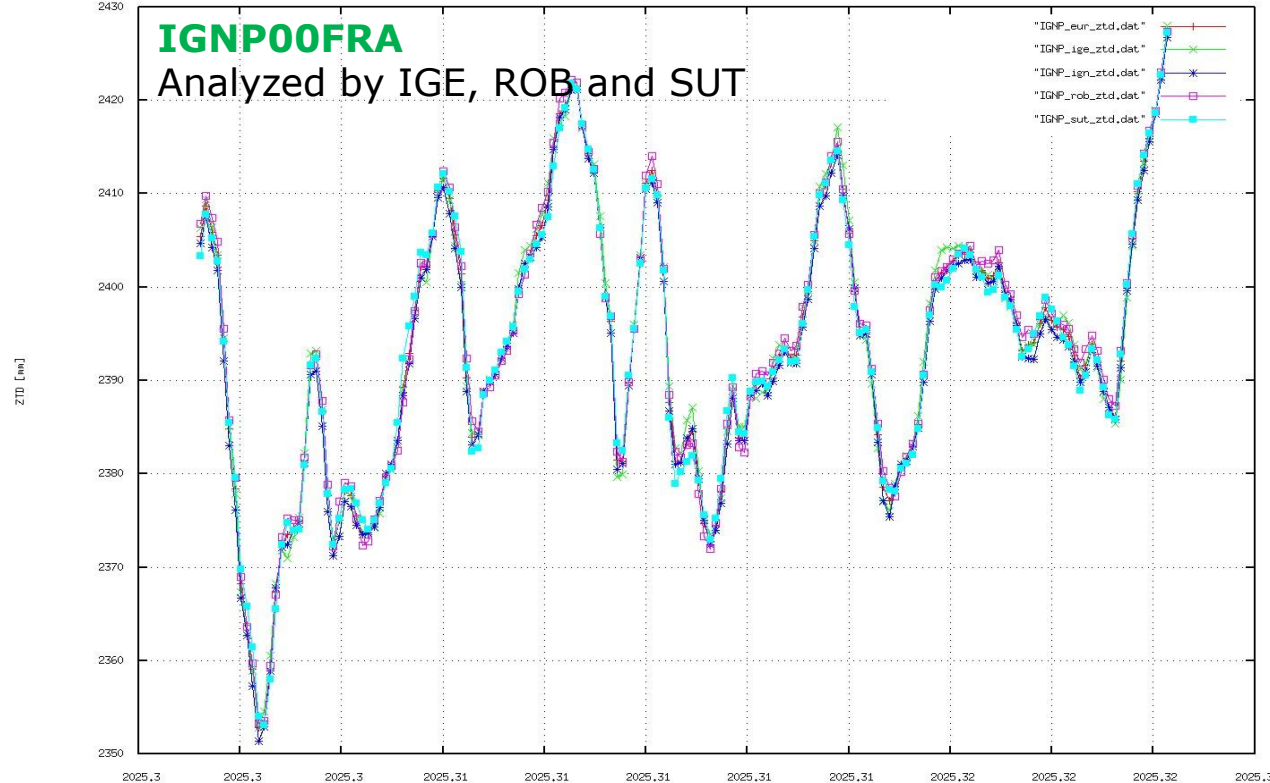
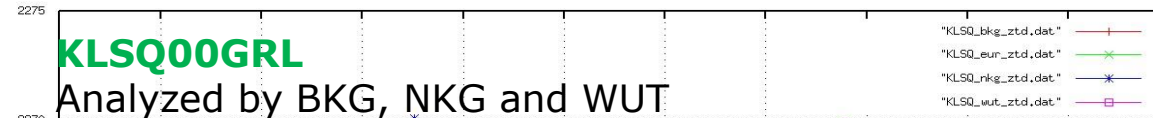
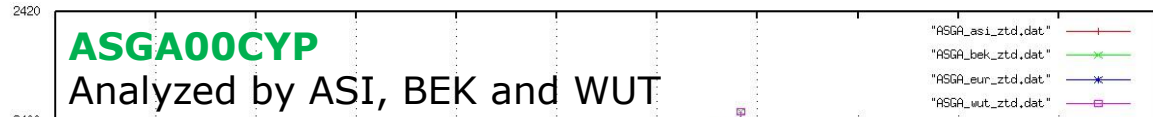


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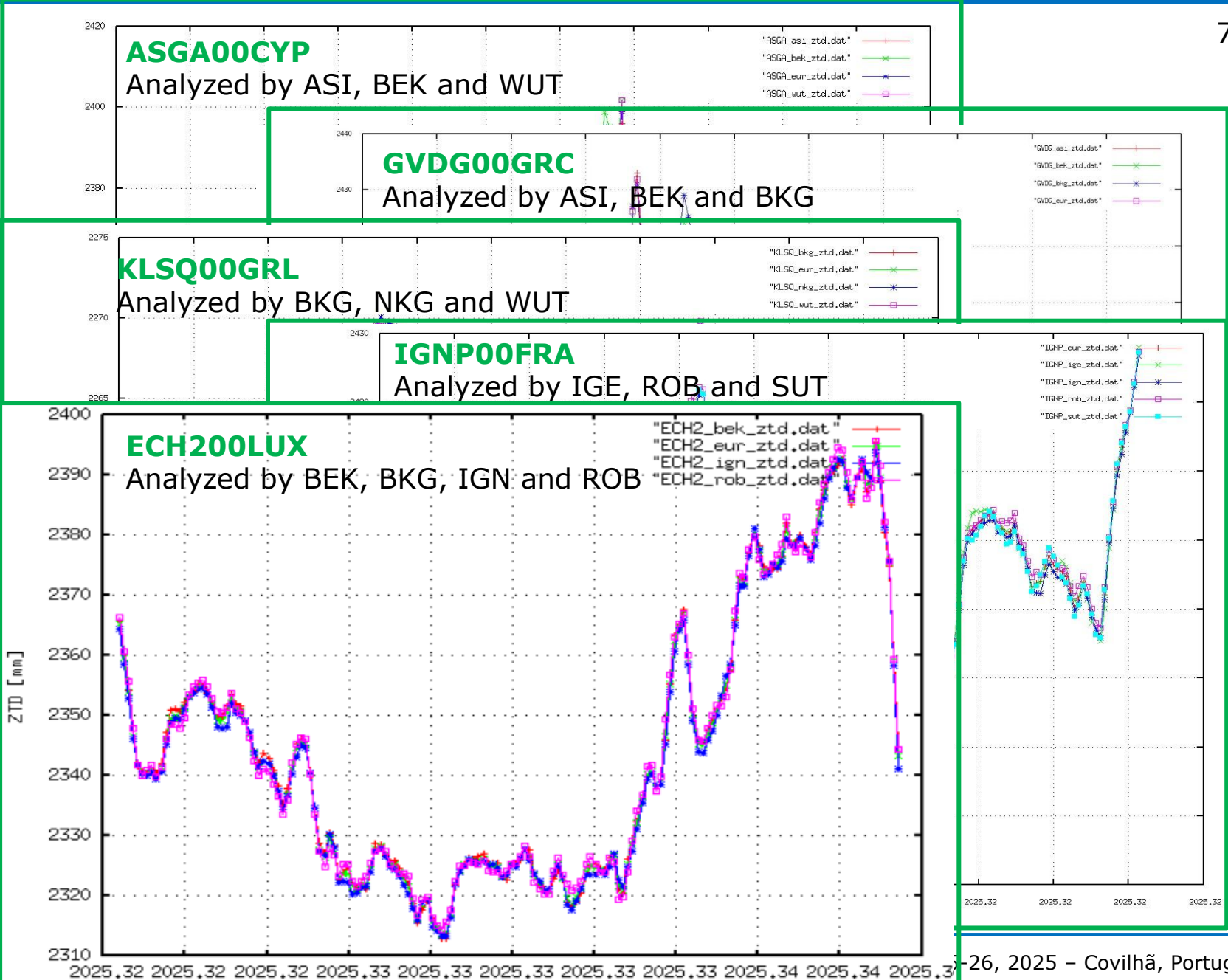
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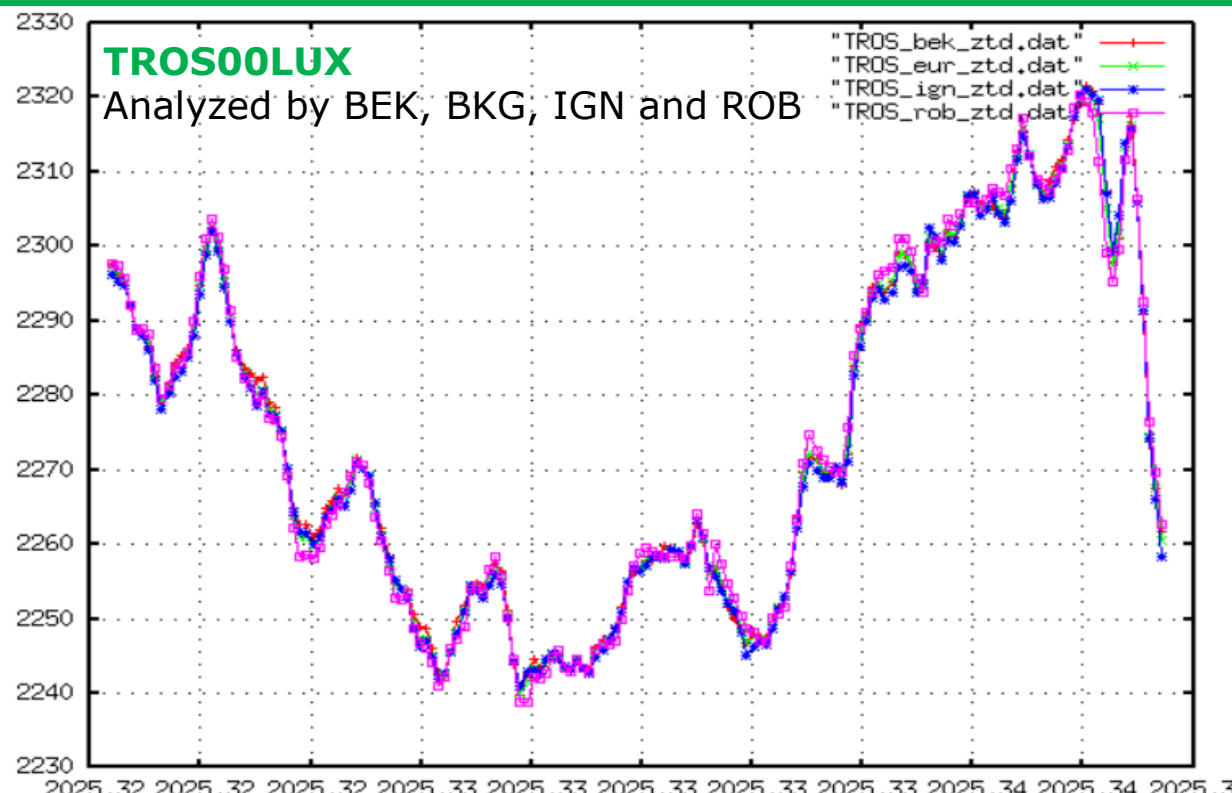
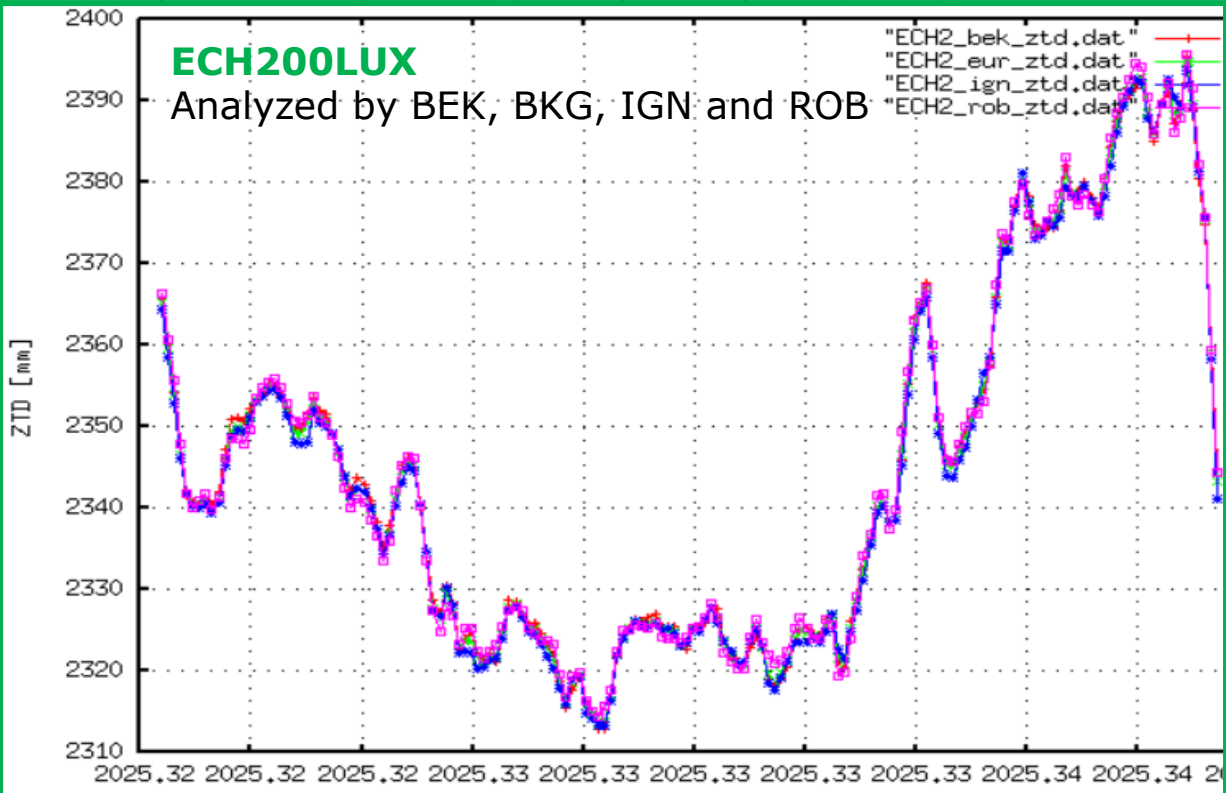
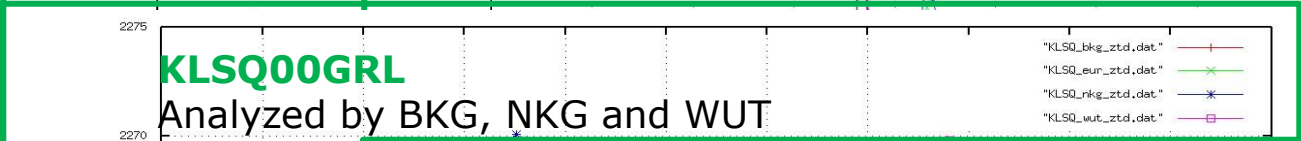
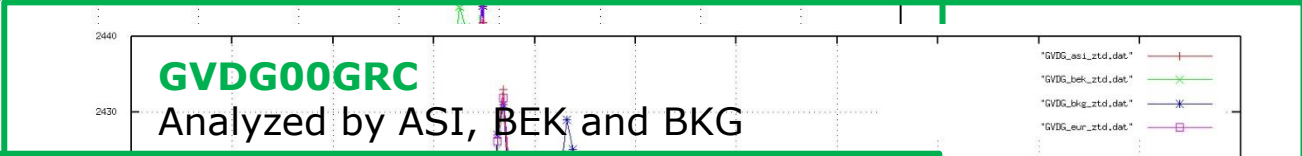
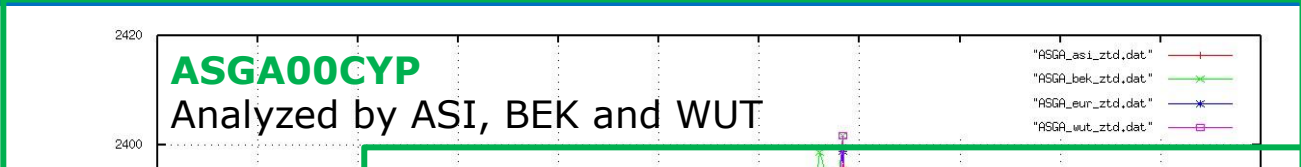


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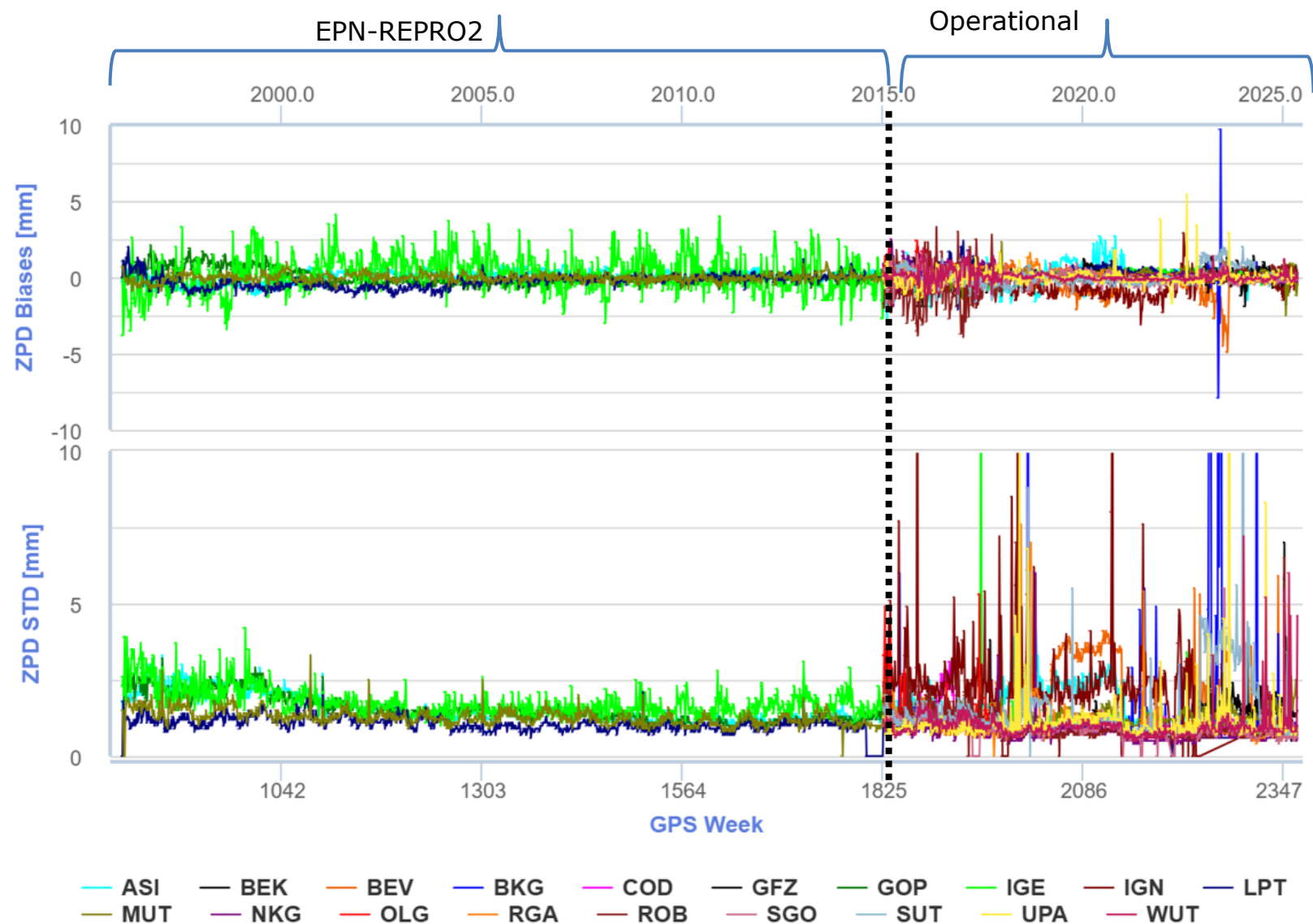


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- Filename for weekly troposphere solution and summary:
 - EUR0OPSFIN_YYYYDDD0000_07D_01H_TRO.TRO.gz
 - EUR0OPSFIN_YYYYDDD0000_07D_01H_TRO.SUM.gz
- Latency: 5 weeks after the end of observations of the analyzed week
- Combined EPN products available at BKG and BEV data centers:
 - https://igs.bkg.bund.de/root_ftp/EUREF/products/
 - <https://gnss.bev.gv.at/at.gv.bev.dc/data/products>
- EPNCB web page with AC bias/sdt w.r.t. the combined product
 - https://epncb.oma.be/_productservices/troposphere/mean_zpd_biases.php

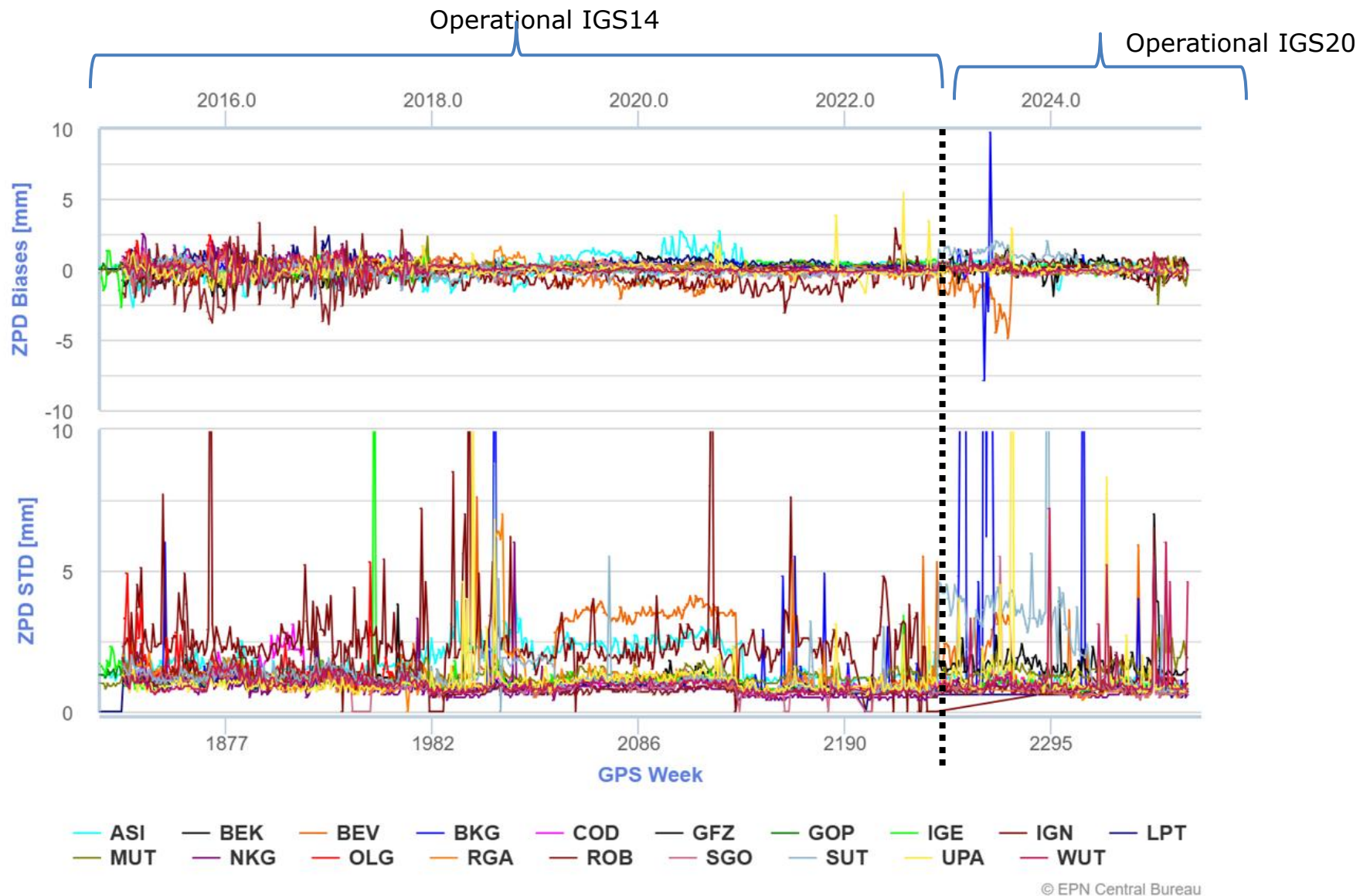
Operational Monitoring at AC level



© EPN Central Bureau

http://www.epncb.oma.be/_productsservices/sitezenithpathdelays/

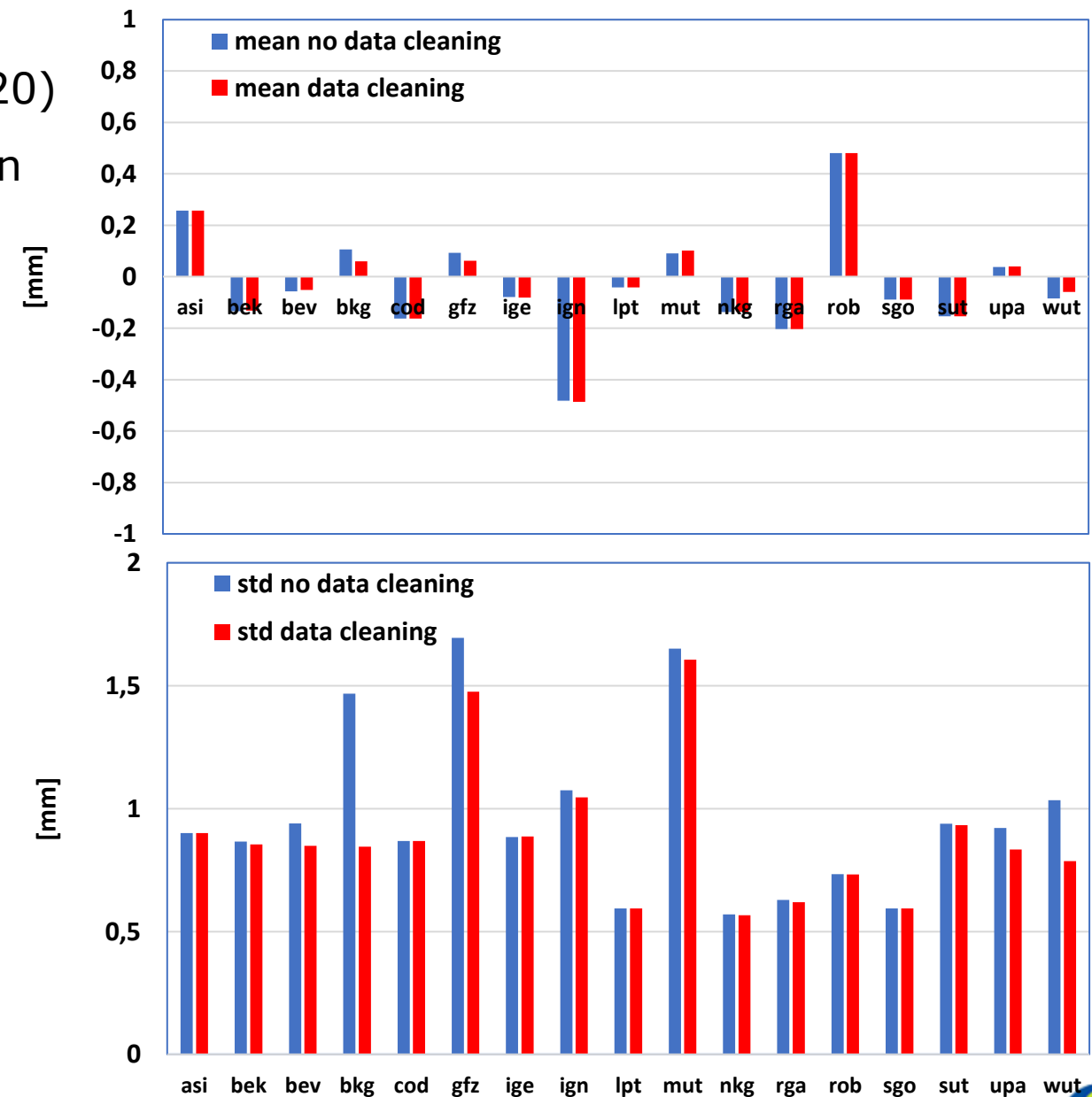
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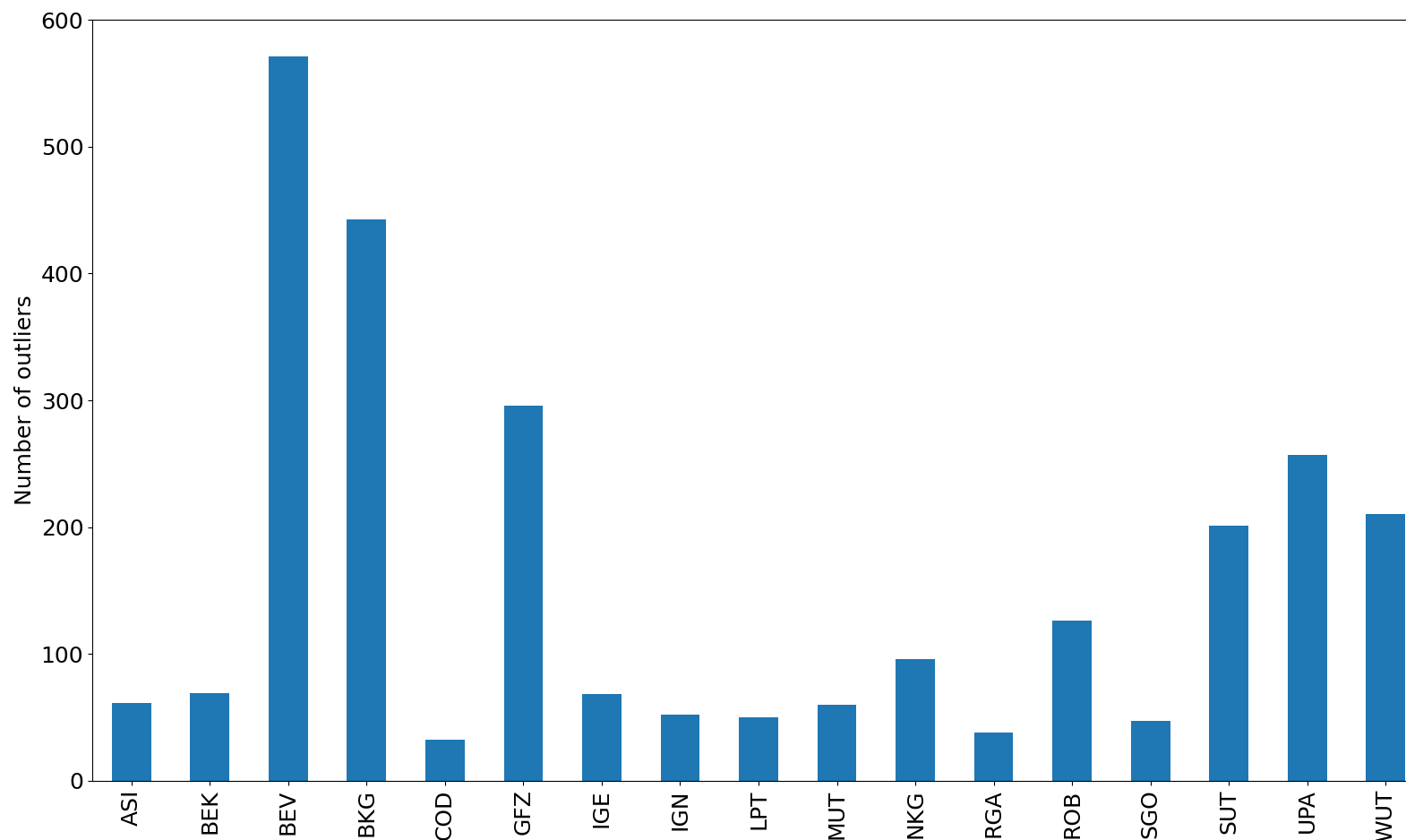
AC performance w.r.t. the combination

- Period: GPS week 2311-2363 (24APR21-25APR20)
- Overall AC mean/std w.r.t. the combined solution
- Data cleaning done at combination level



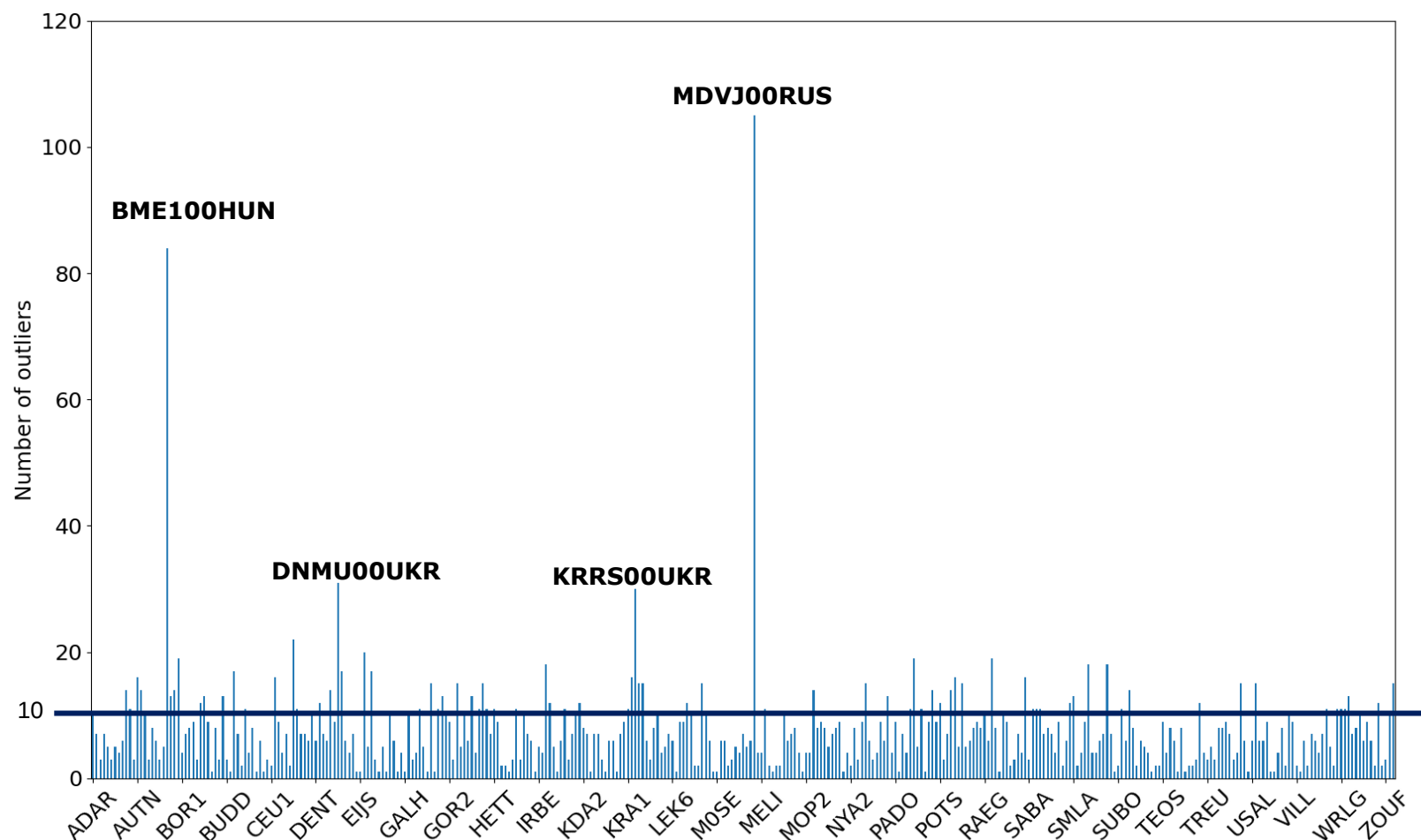
Statistics of outliers vs AC

- Period: GPS week 2311-2363 (24APR21-25APR20)
- Outliers if AC/site specific bias > 10 mm



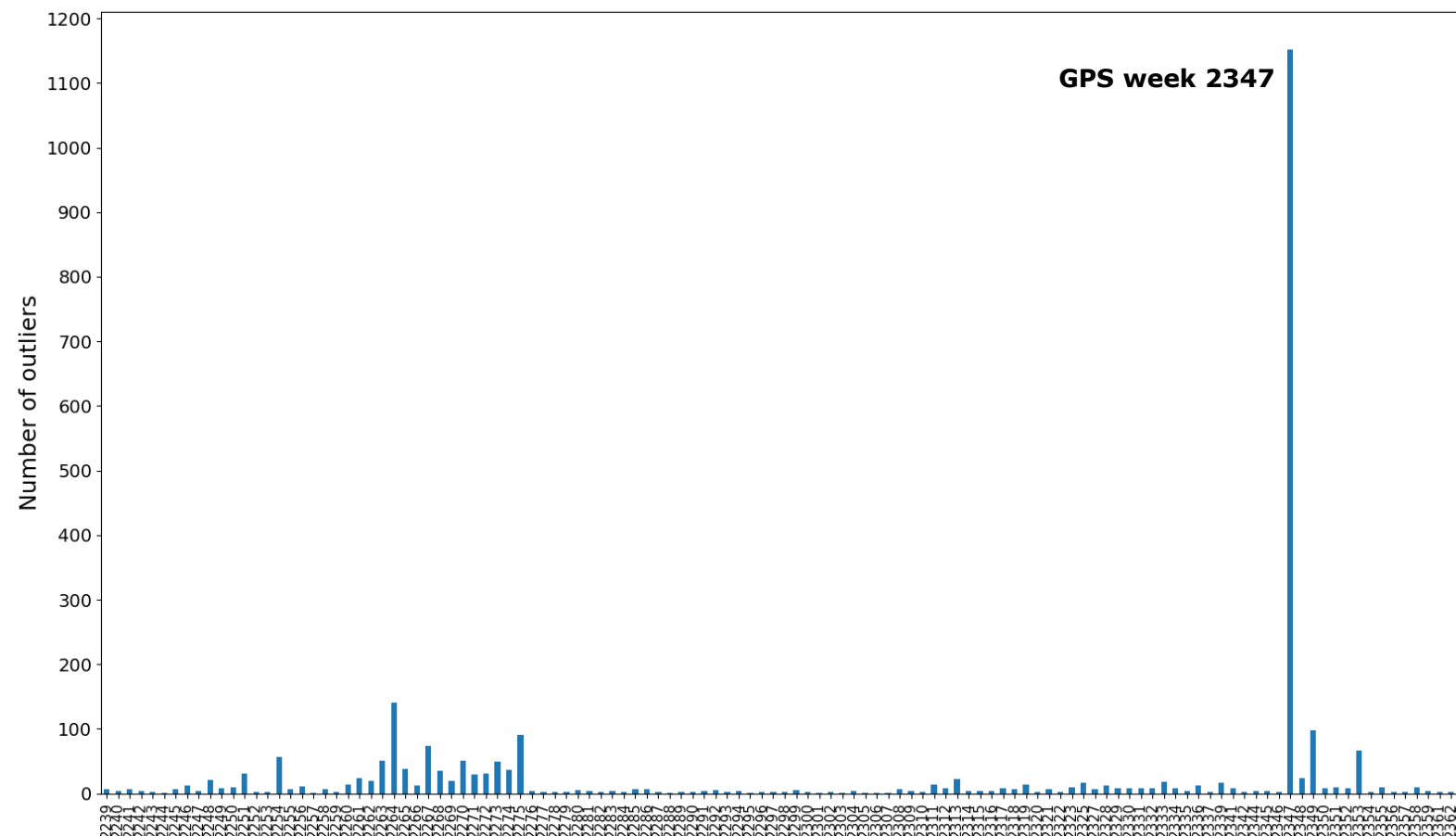
Statistics of outliers vs Stations

- Period: GPS week 2311-2363 (24APR21-25APR20)
- Outliers if AC/site specific bias > 10 mm



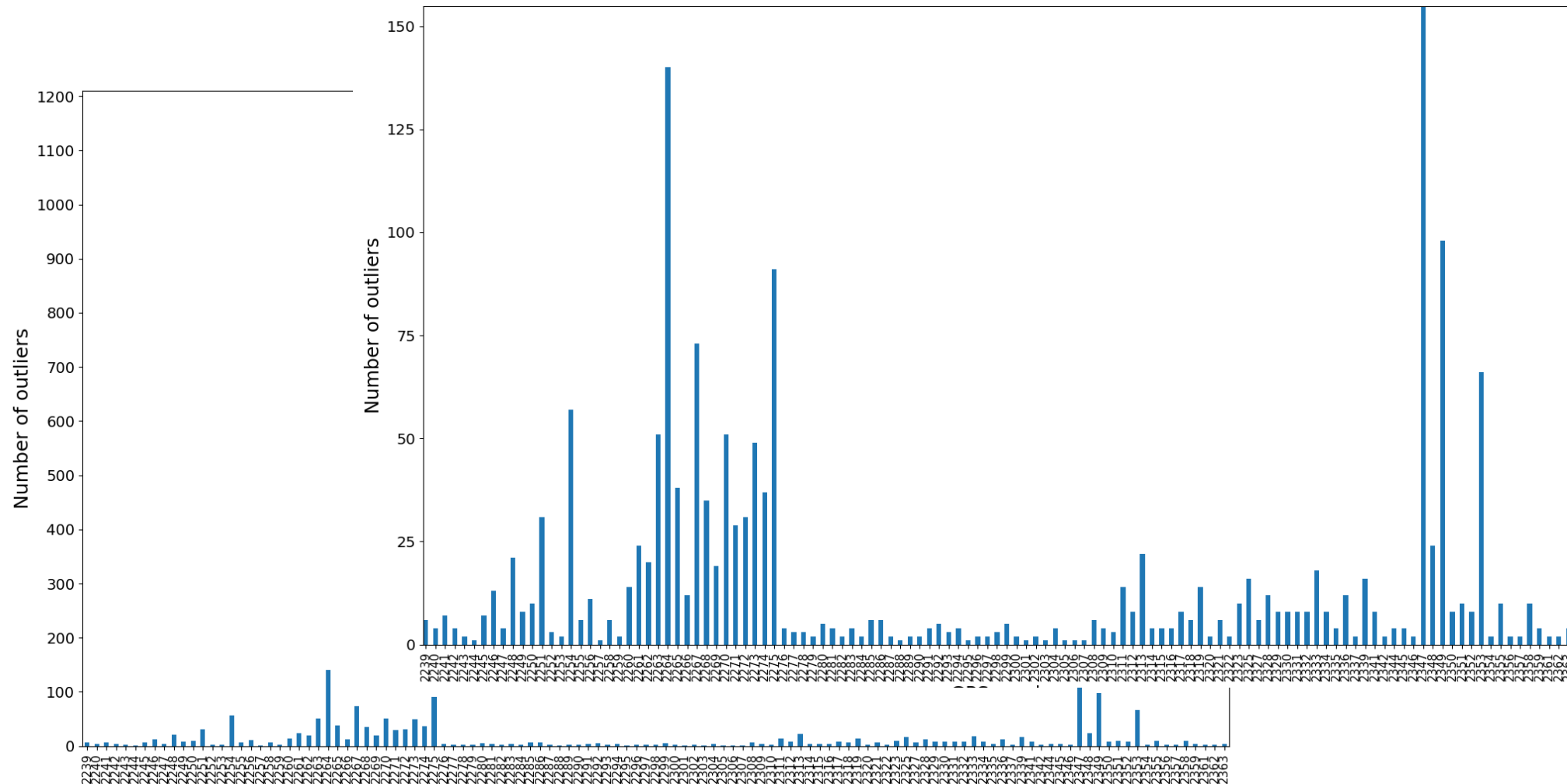
Statistics of outliers vs GPS week

- Period: GPS week 2311-2363 (24APR21-25APR20)
- Outliers if AC/site specific bias > 10 mm



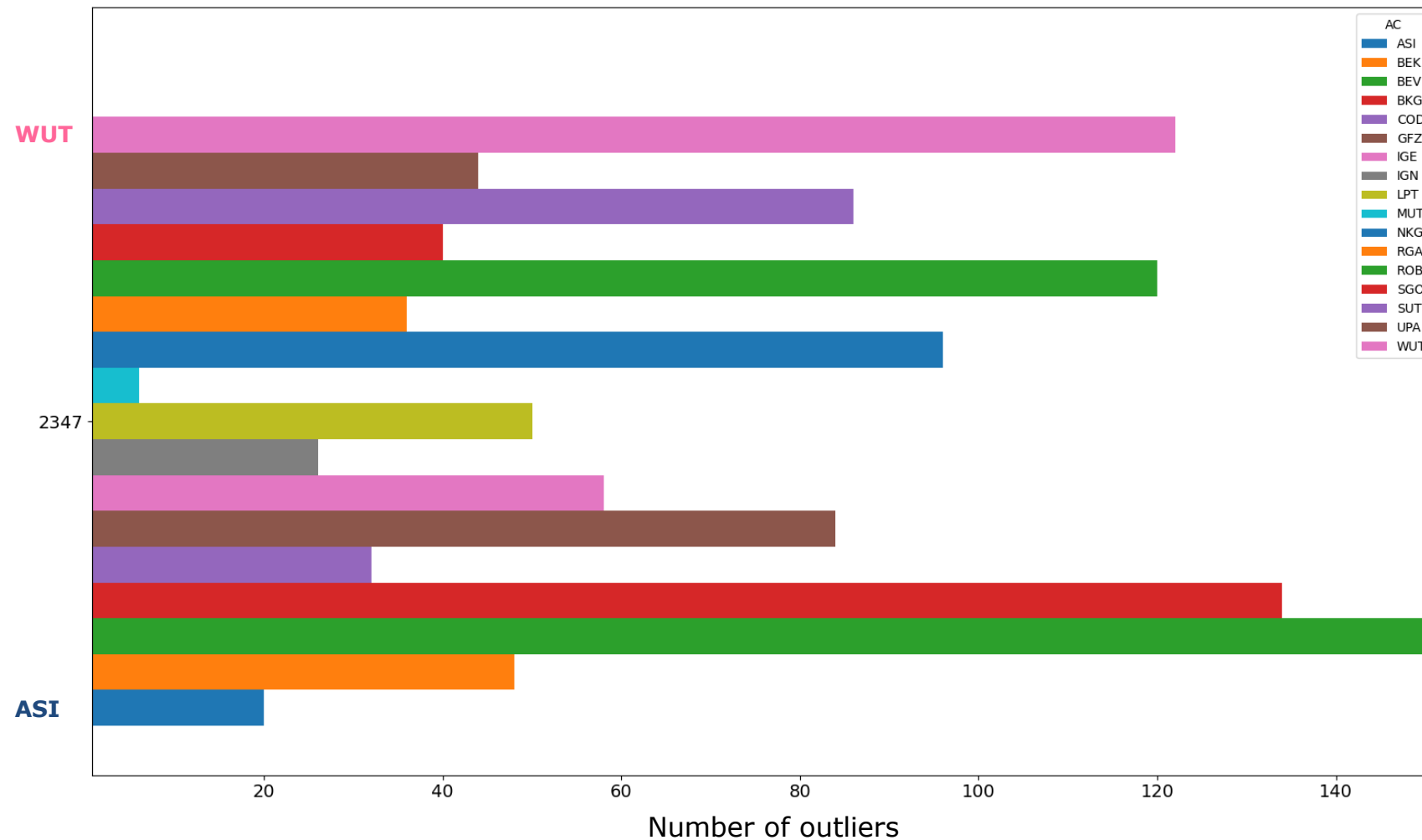
Statistics of outliers

- Period: GPS week 2311-2363 (24APR21-25APR20)
- Outliers if AC/site specific bias > 10 mm



Statistics of outliers GPS week 2347

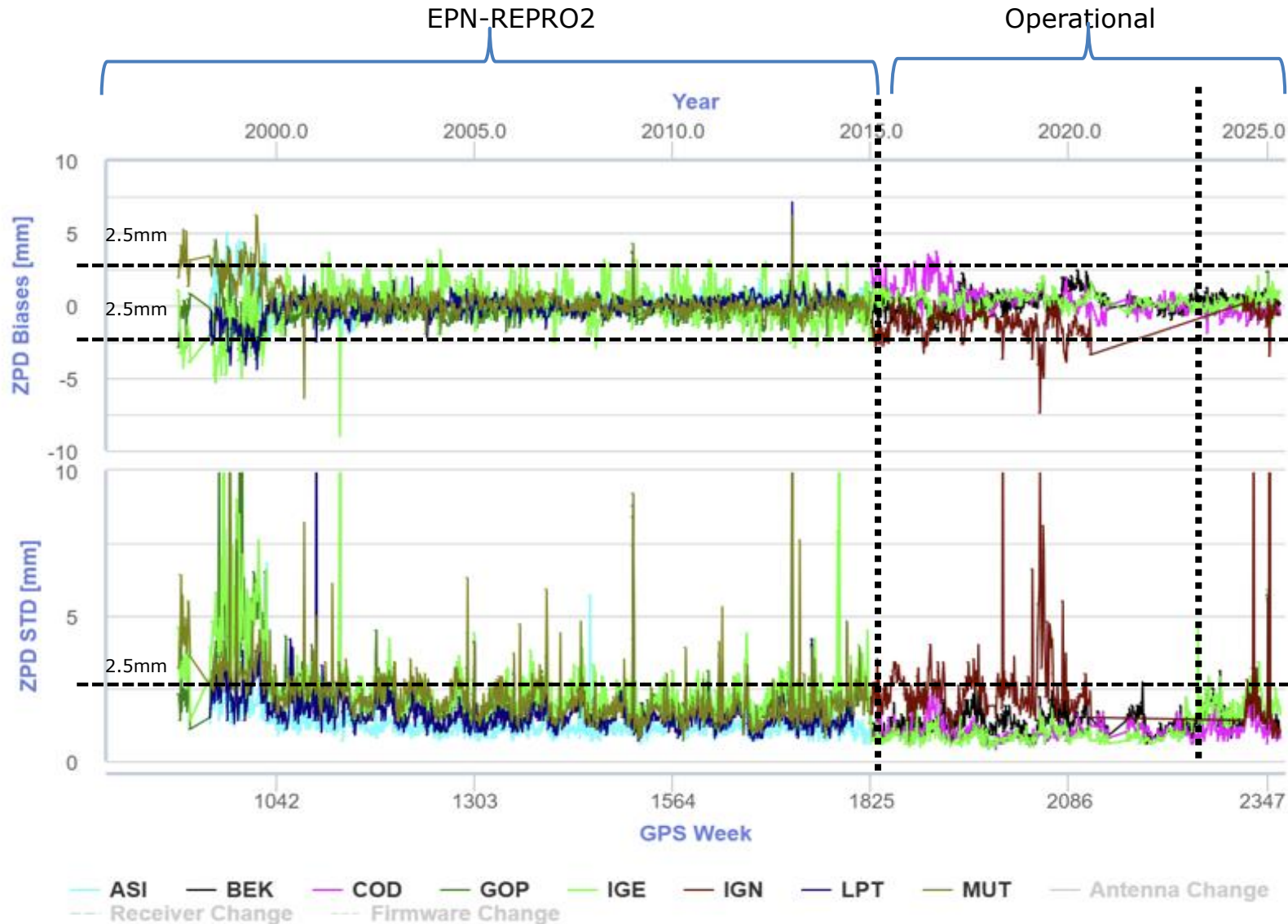
- Period: GPS week 2311-2363 (24APR21-25APR20)
- Outliers if AC/site specific bias > 10 mm



Operational Monitoring at Station level

CASC00PRT

Analyzed by 4 EPN Acs:
BEK, COD, IGE, IGN

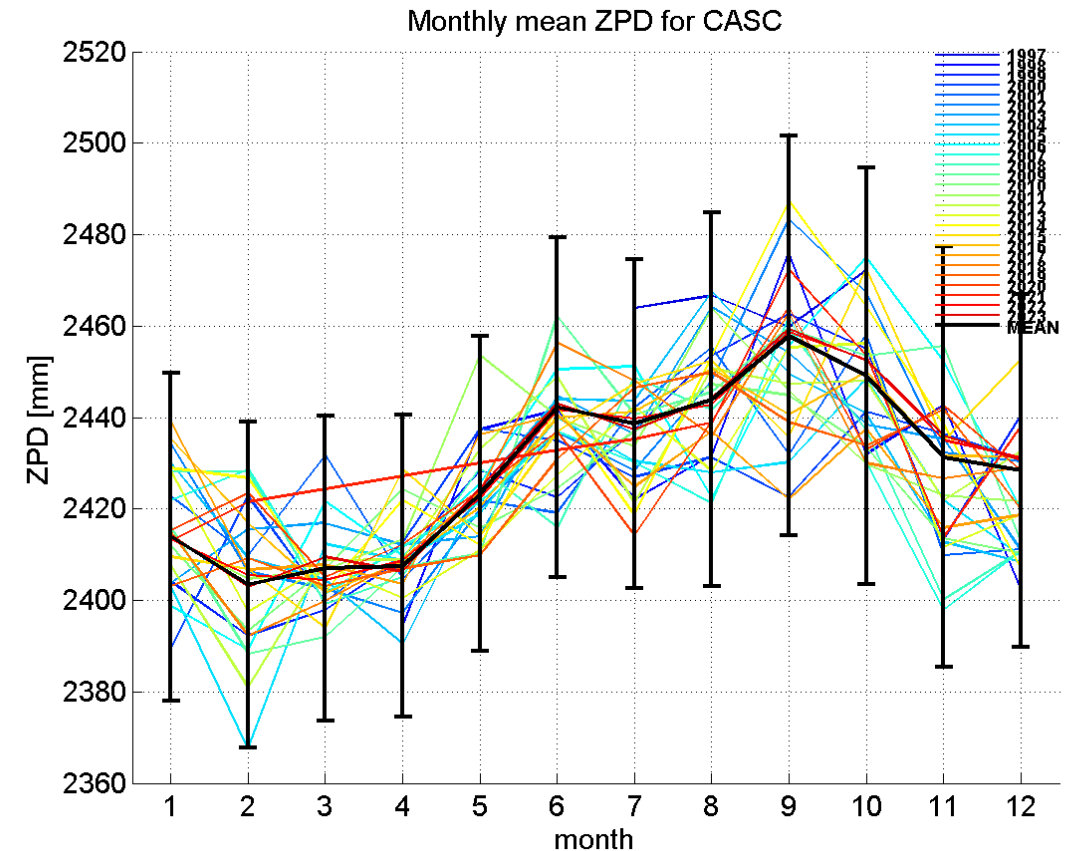
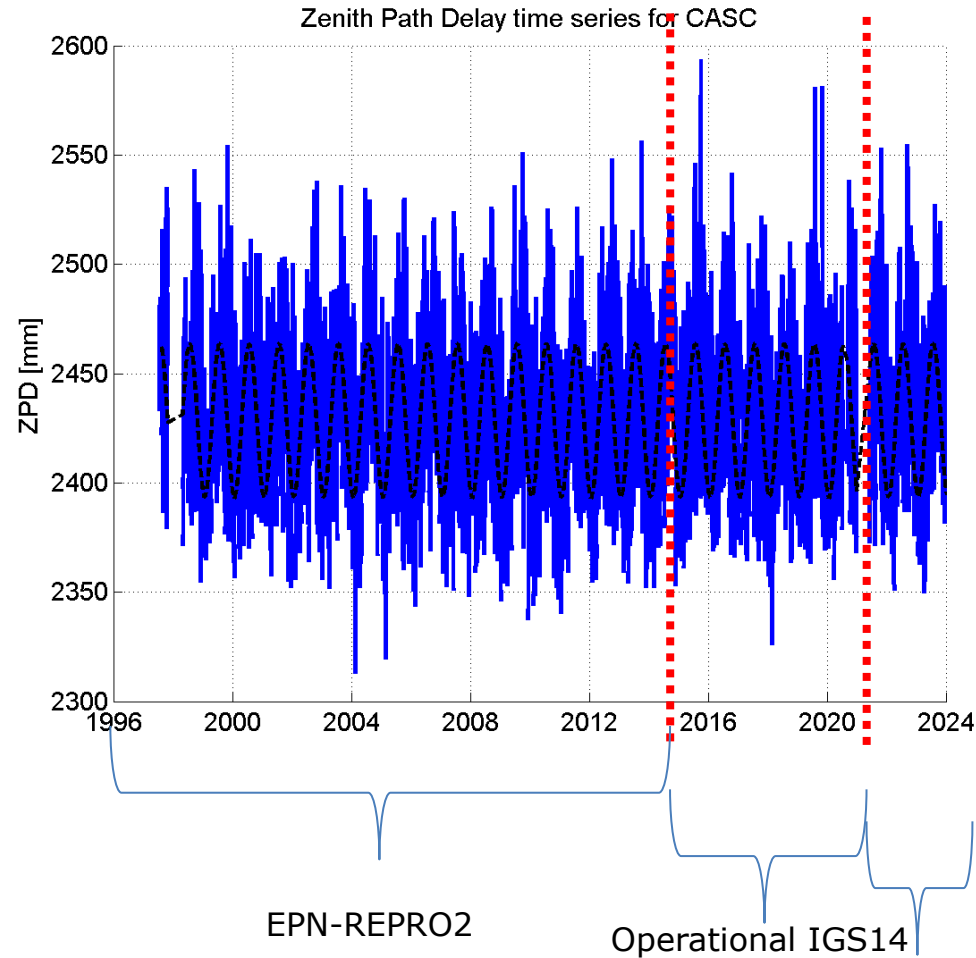


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https://epncb.eu/_productsservices/troposphere/zpd_biases_station.php?station=CASC00PRT

EPN multi-year tropo solution T2295 (1996-2023)

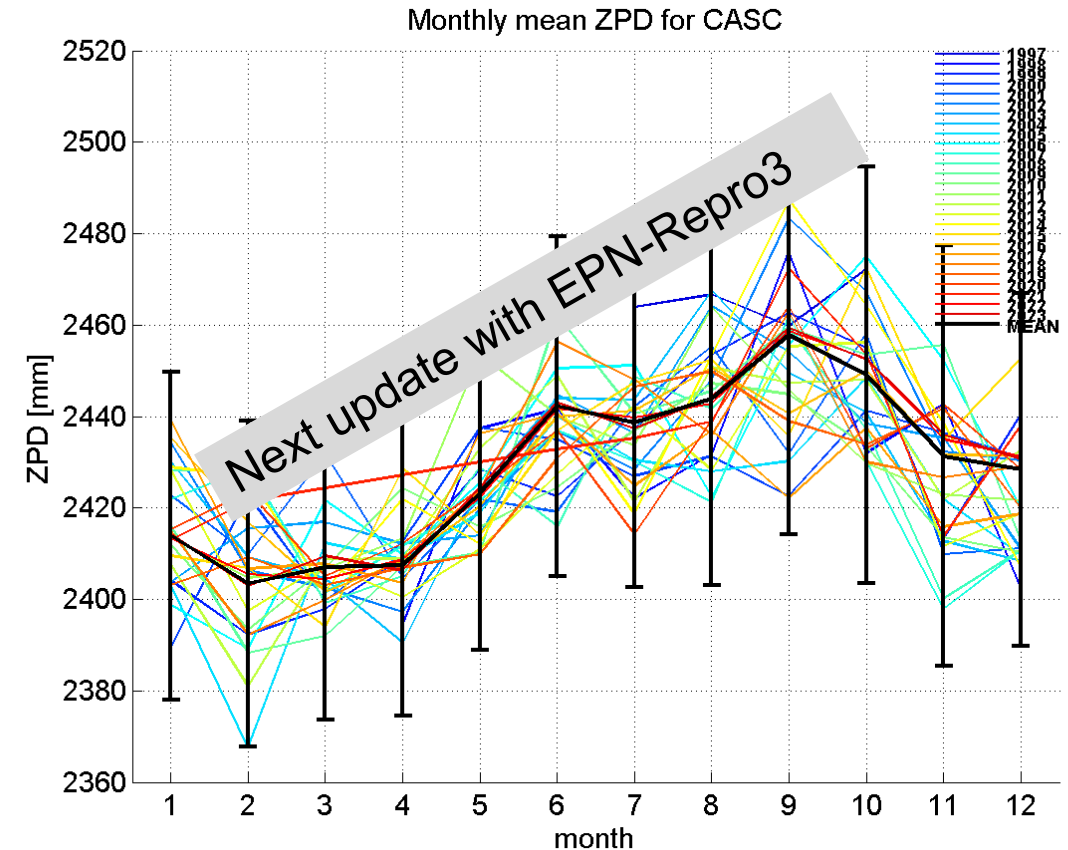
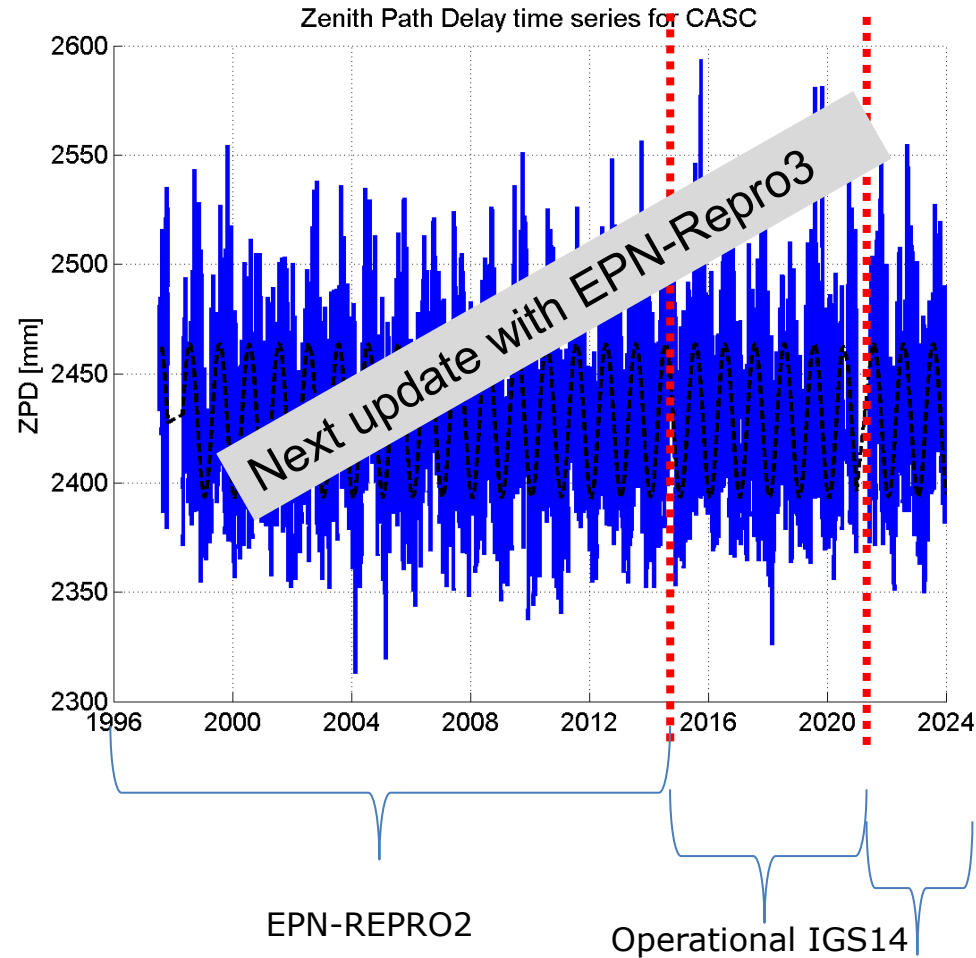
Released on May 2024 (Ref. EUREF Message Number 11801)



https://epncb.eu/_productsservices/troposphere/zpd_timeseries_station.php?station=CASC00PRT

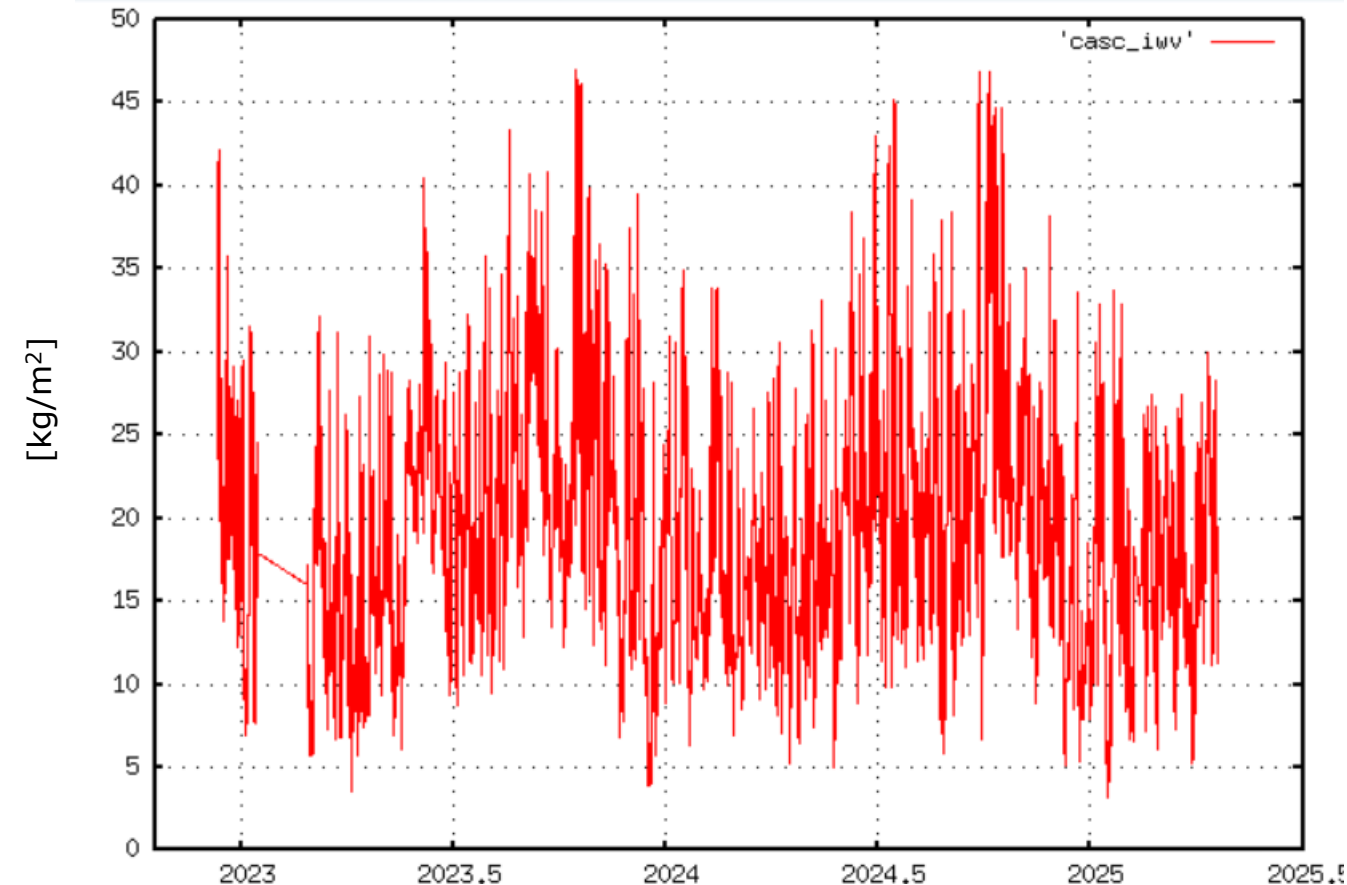
EPN multi-year tropo solution T2295 (1996-2023)

Released on May, 2024 (Ref. EUREF Message Number 11801)



https://epncb.eu/_productsservices/troposphere/zpd_timeseries_station.php?station=CASC00PRT

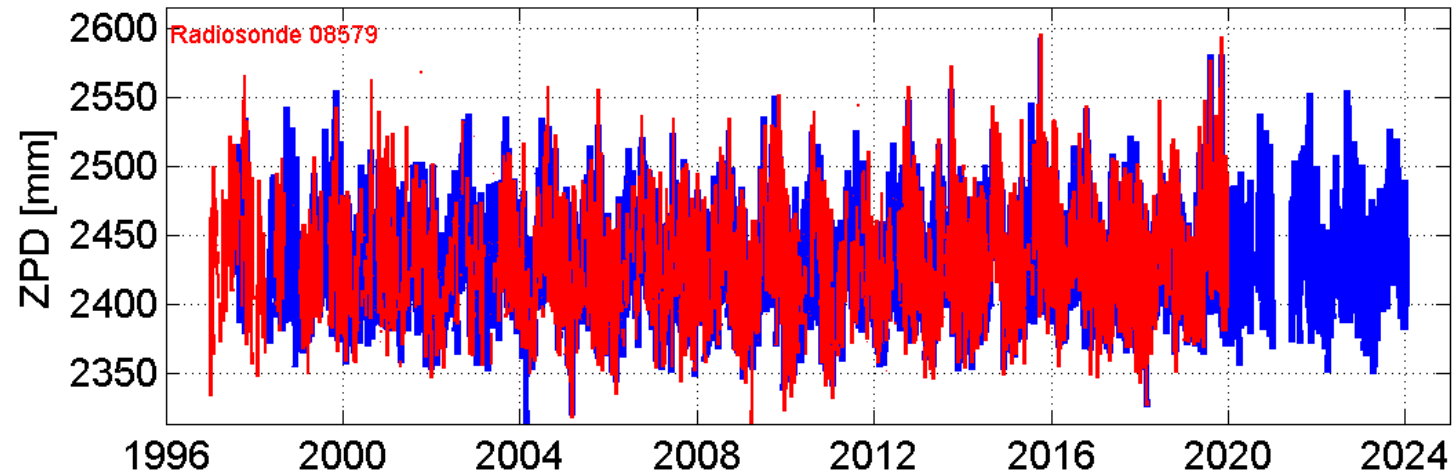
IWV time series at CASC00PRT



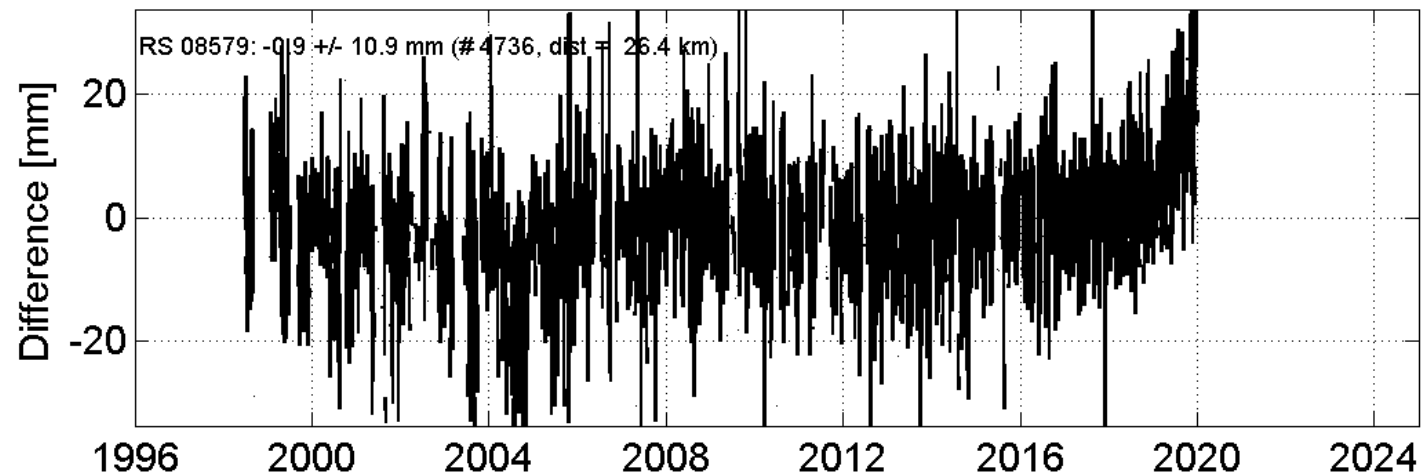
- **Input:** EPN ZTD combined values
- **Auxiliary Data:** ECMWF operational products available at TU WIEN:
 - Linear interpolation in time
 - Bilinear interpolation in space
- **Output:** EPN ZTD and IWV in SINEX_TRO_v2.0 from GPS week 2139 (21JAN03)

GNSS and RS EPN multi-year tropo solution T2295 (1996-2023)

Radiosonde and EUR ZPD time series for CASC

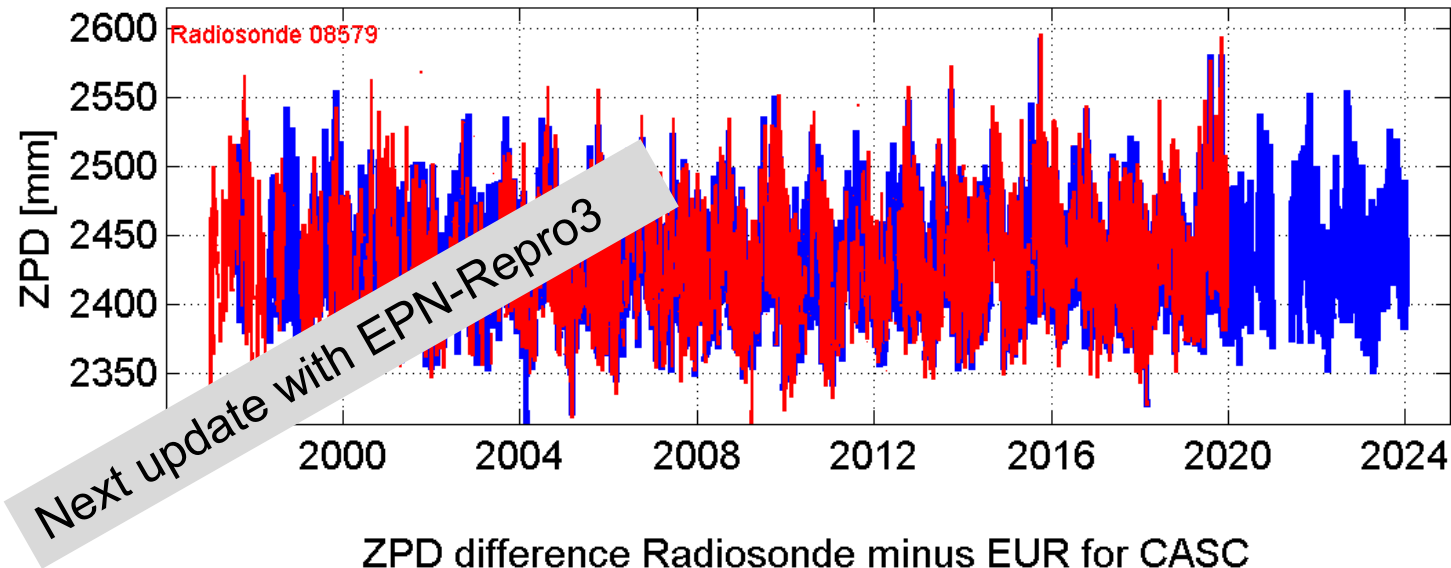


ZPD difference Radiosonde minus EUR for CASC

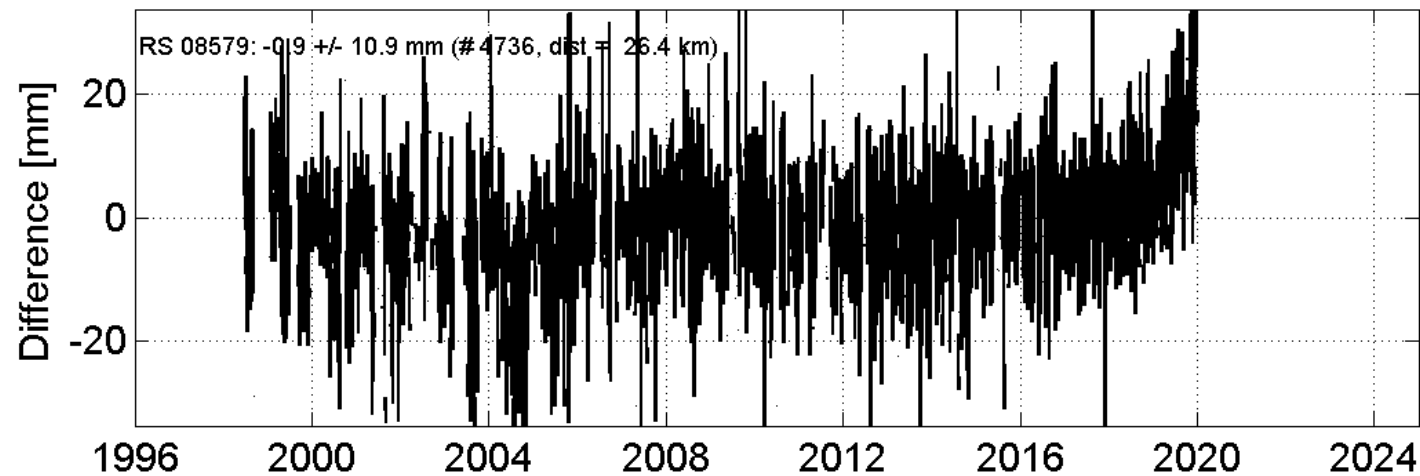


GNSS and RS EPN multi-year tropo solution T2295 (1996-2023)

Radiosonde and EUR ZPD time series for CASC



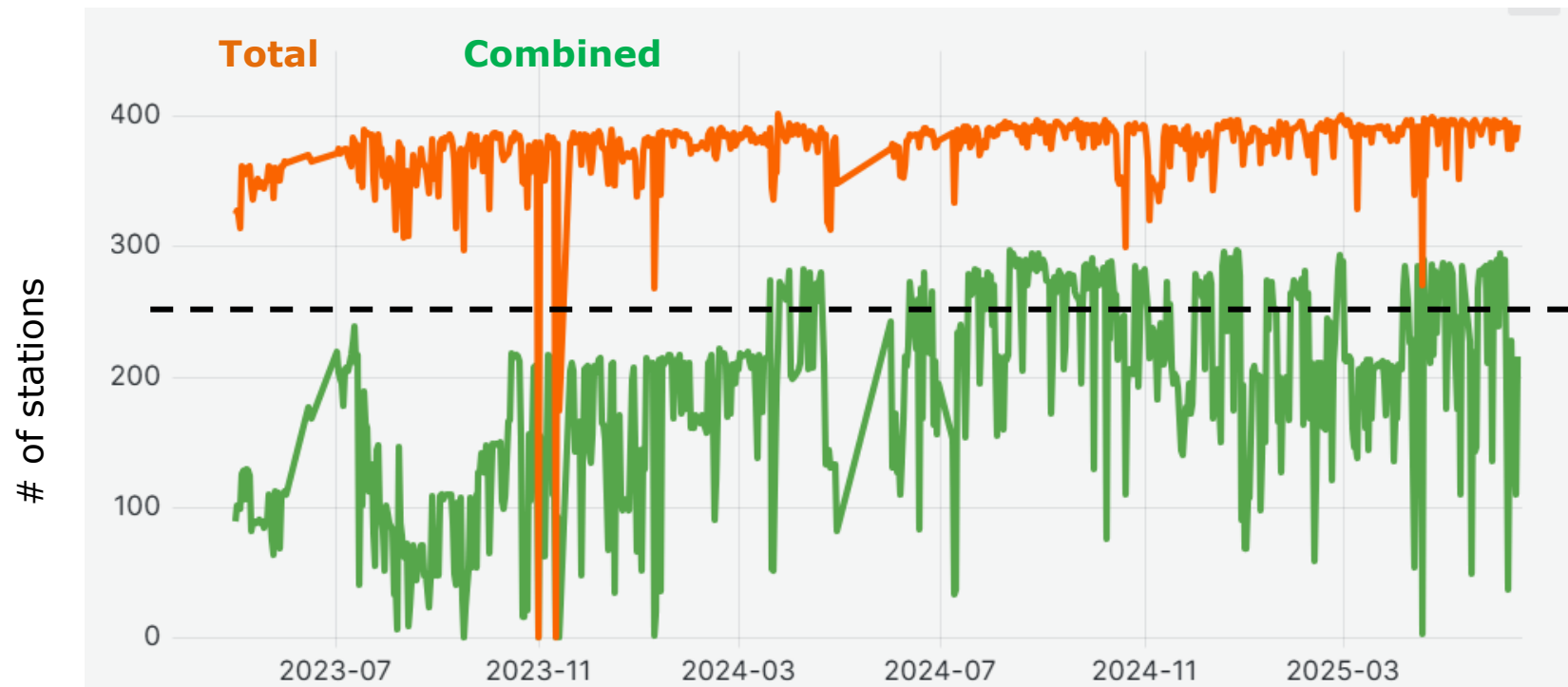
ZPD difference Radiosonde minus EUR for CASC



Rapid daily combination

Rapid tropo combination - Status

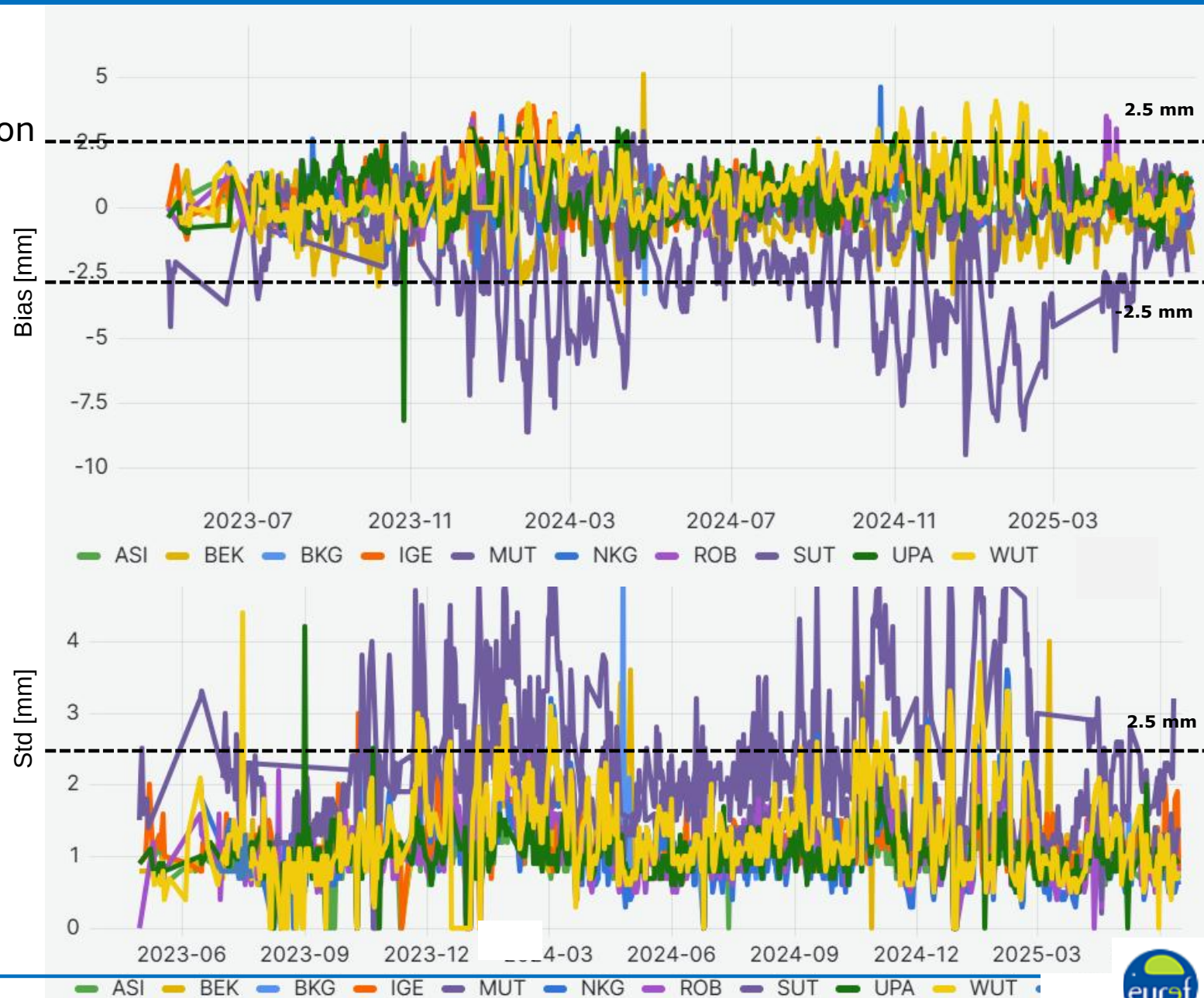
- **10 EPN ACs** are delivering rapid tropo estimates as a by-product of the rapid site coordinate processing
- **Filename** for daily troposphere solution and summary:
EUR0OPSRAP_YYYYDOY0000_01D_01H_TRO.TRO.gz/SUM.gz
- **Latency**: 22 hours after the end of observations of the analyzed day



Operational Monitoring at AC level

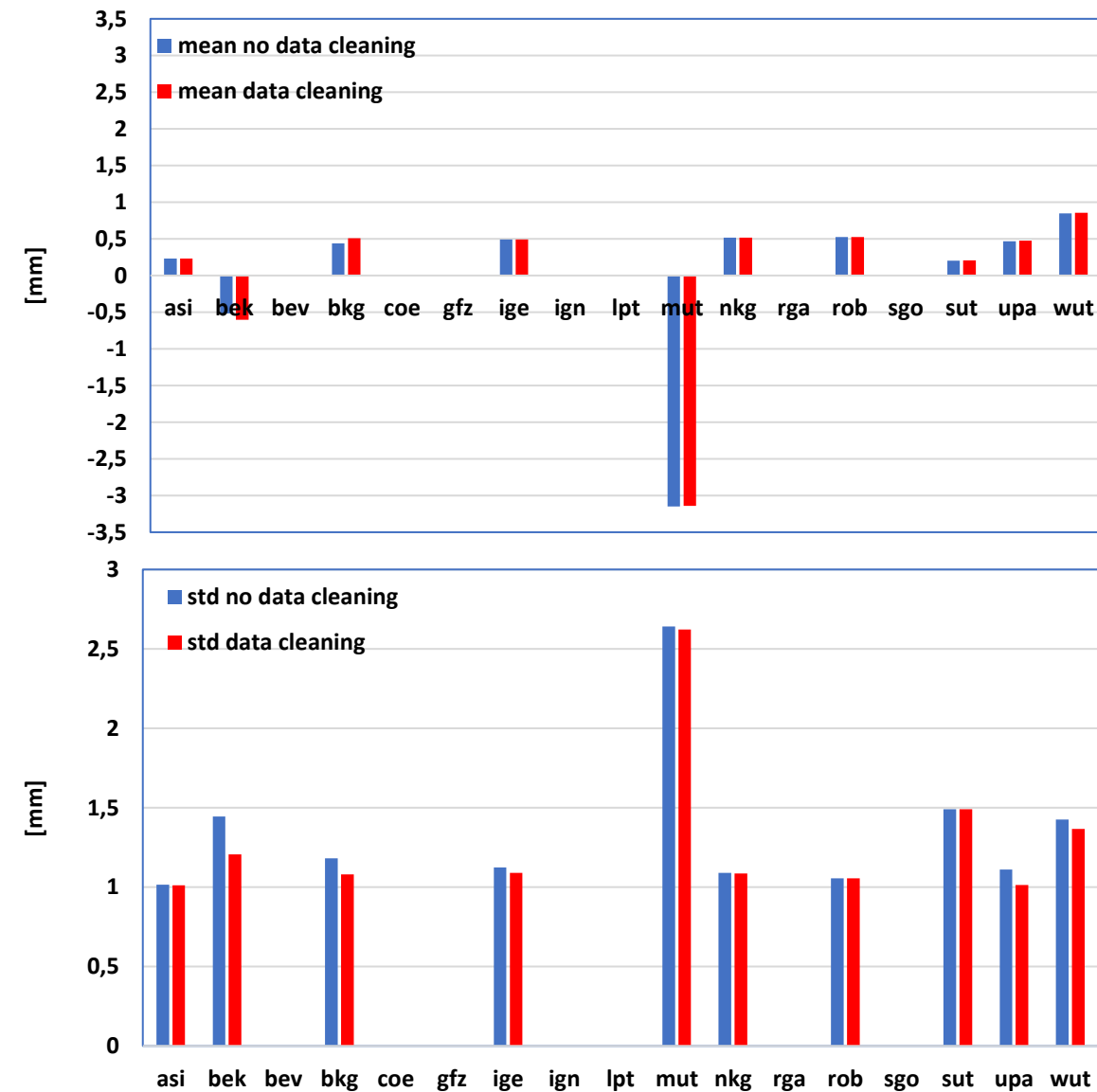
W.r.t. the final combination:

- Less stations are included in the combination
- Monitoring done on daily basis
- Some data cleaning done at combi level



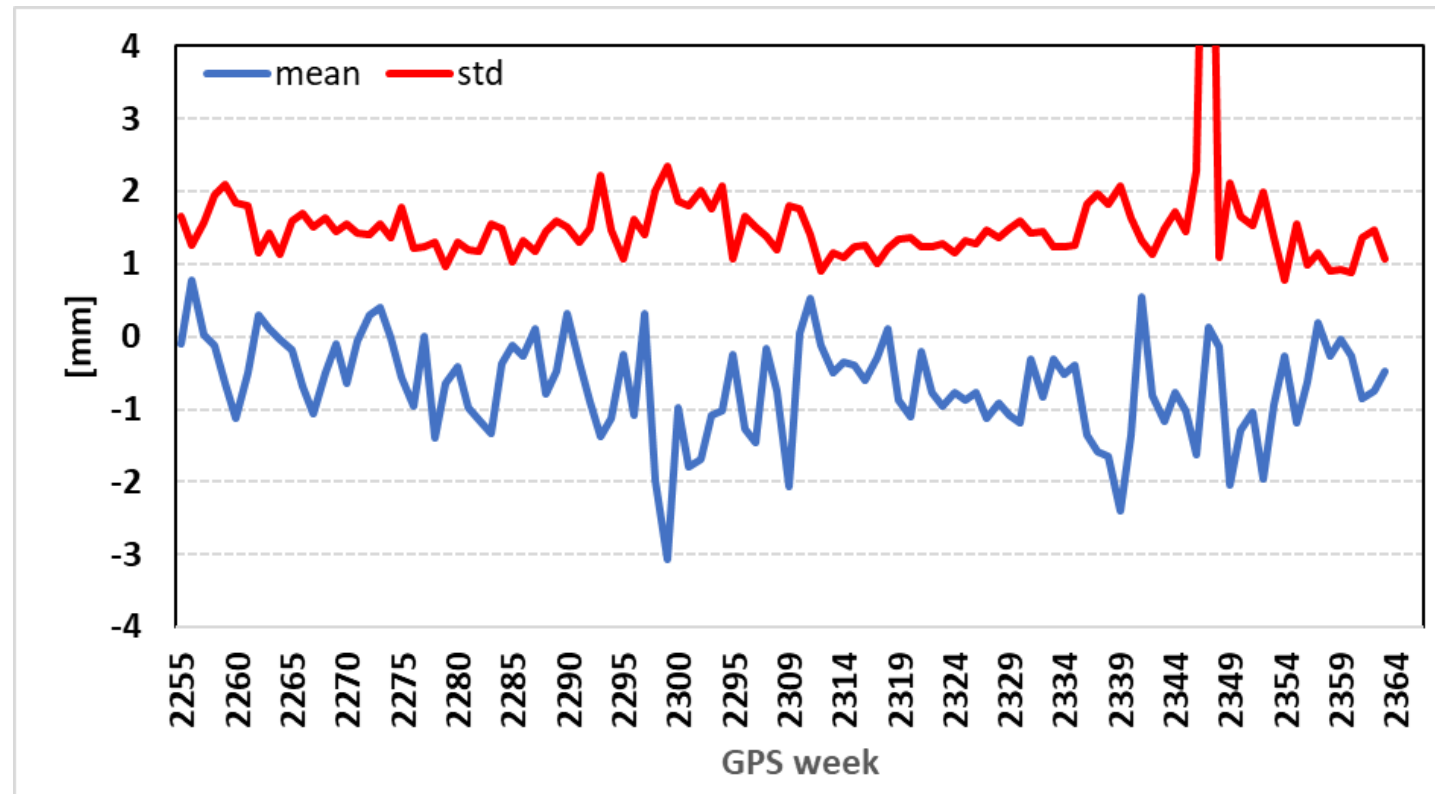
AC performance w.r.t. the combination

- Period: GPS week 2311-2363 (24APR21-25APR20)
- Overall AC mean/std w.r.t. the combined solution
- Data cleaning done at combination level



Final vs Rapid tropo combination

- Period: GPS weeks 2255-2363 (23MAR26-25APR20)
- Weekly basis
- ALL common stations



Summary:

- Overview of the status of the EPN operational tropo products along with the monitoring activities
- Final weekly tropo combination is provided regularly
- Rapid daily tropo combination is provided regularly → overall std w.r.t. final 1-2 mm

Next step:

- EPN-Repro3 is in the pipeline

Thank you for your attention

Cite this presentation as:

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the EPN ACs for providing the solutions used for the combination, the EPNCB for making available some of the plots used in this presentation, the TU Vienna for the auxiliary data used in the ZTD2IVW conversion and the GNSS site owners for the collection and distribution of GNSS rinex data.

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