Federal Agency for
Cartography and Geodesy

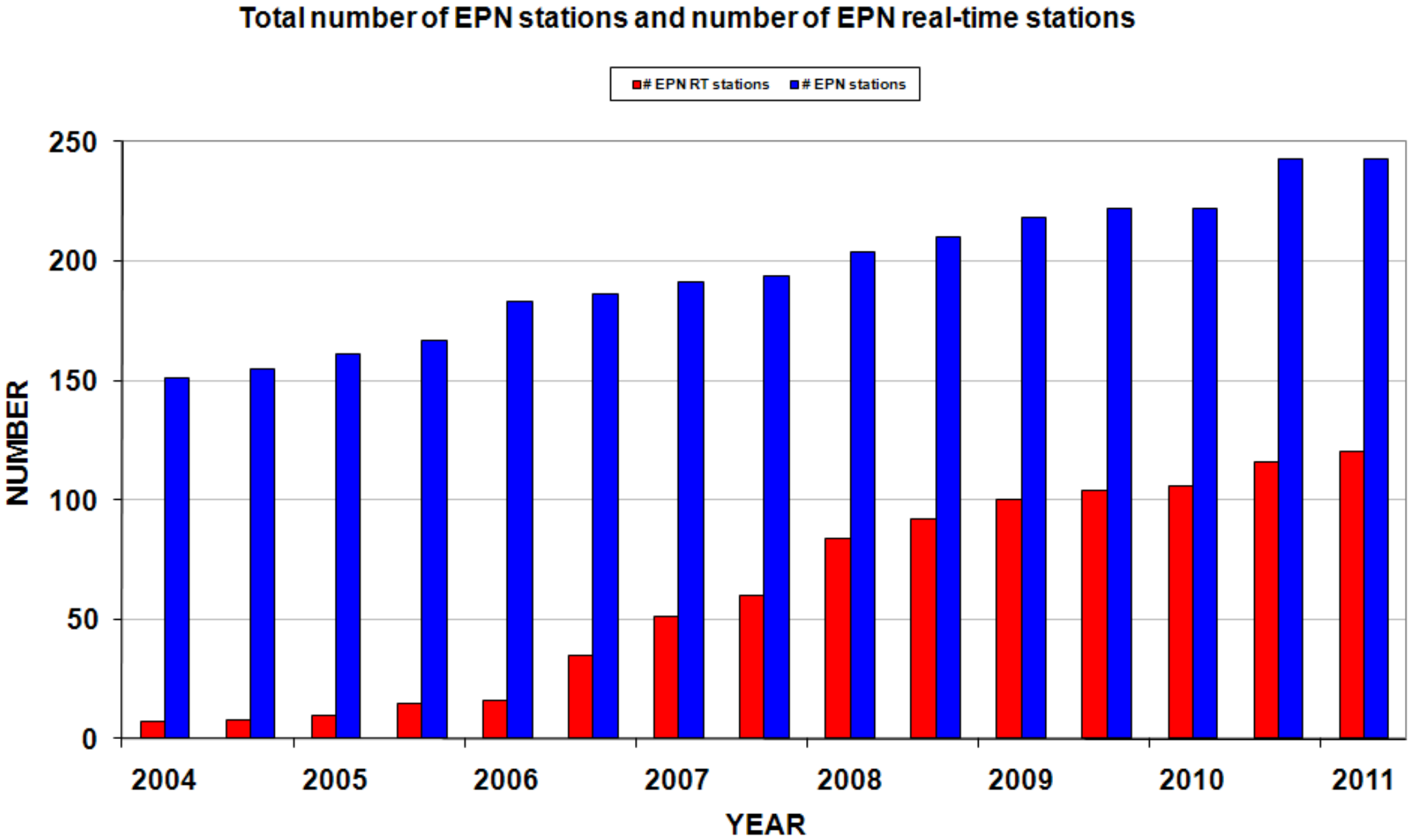
Real-time Positioning using EUREF and IGS Resources

Wolfgang Söhne

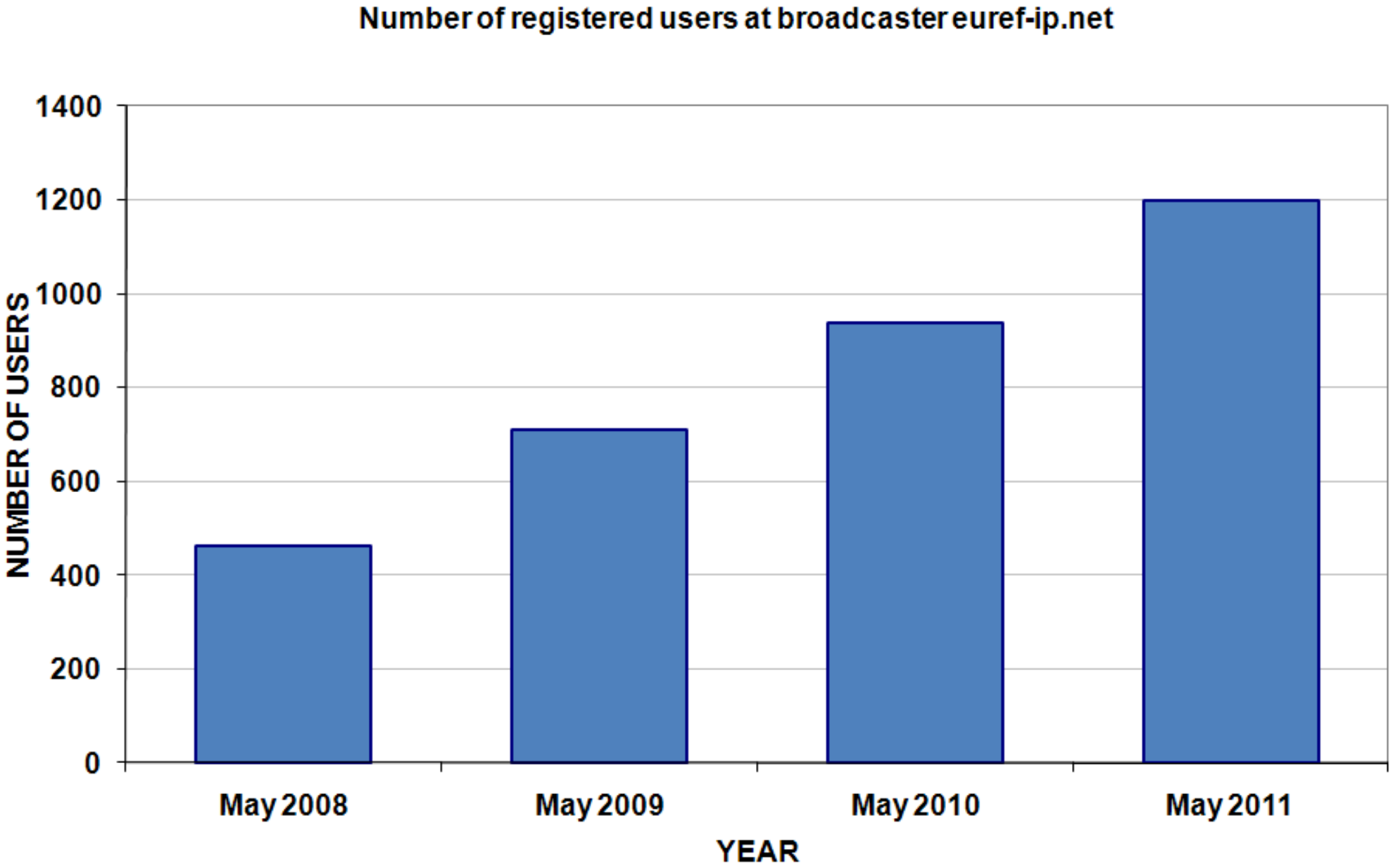
Outline

- EUREF real-time dissemination
- IGS global orbit & clock combination
- Real-time PPP and ZPD processing
- Regional augmentation
- Summary

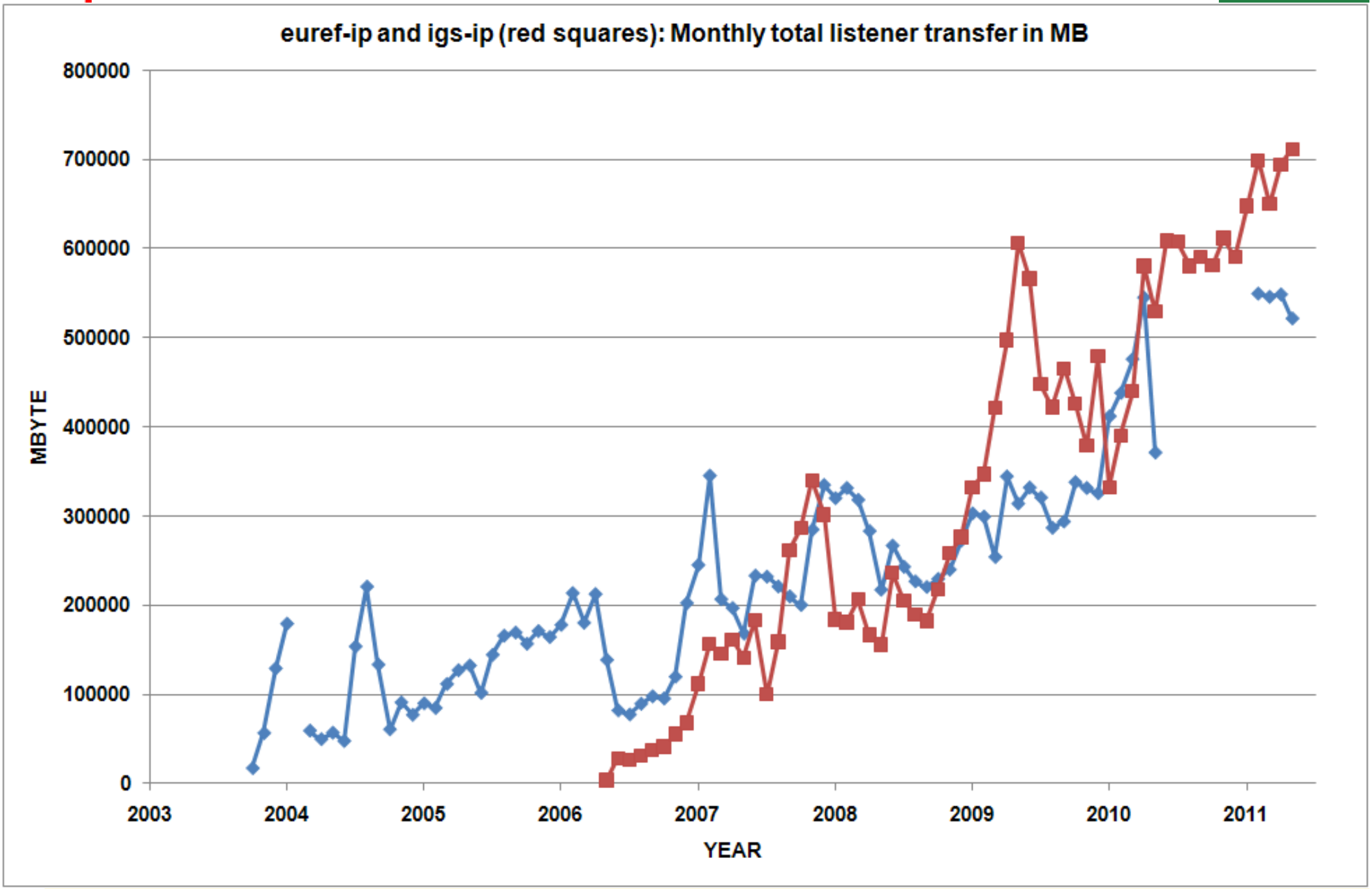
EPN real-time network



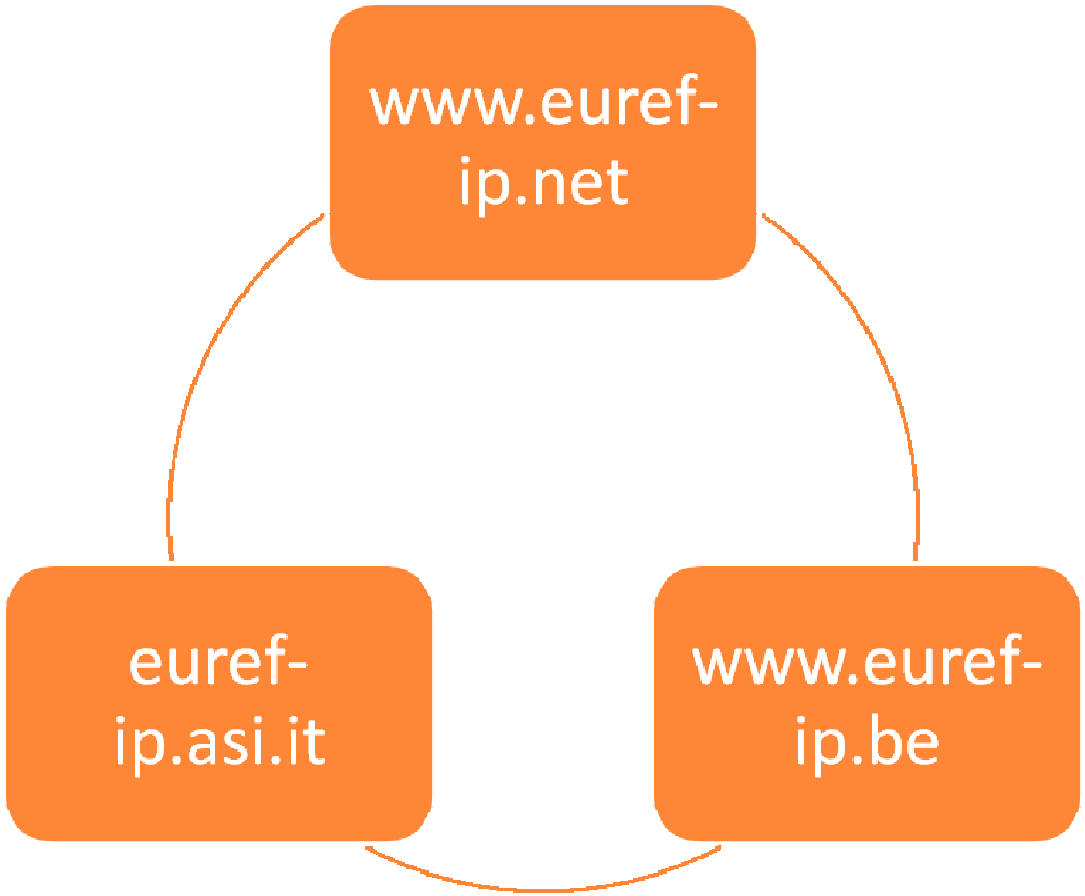
EPN real-time users



EPN real-time transfer



EPN real-time dissemination



IGS-Real-Time Pilot Project

- **Participants to IGS global orbit & clock combination (RT ACs)**
  - **BKG**
  - **CNES**
  - **DLR**
  - **ESOC**
  - **GFZ**
  - **GMV**
  - **NRCan**
  - **TU Vienna**
  - **(U Wuhan)**
  - **(Geo++)**
- **Separate Caster products.igs-ip.net**

Diese Nachricht enthält möglicherweise unnötige Zeilenumbrüche.

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Gesendet: Do 19.05.2011 21:11

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Cc:

Betreff: IGS RT clock comparison 16363

-------IGS RTPP daily clock report-------
Real Time Clock Report - Week 1636 - Day 3 - (May 18, 2011)

Prepared by ESOC RTPP group - Contacts:

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Results of the Real Time Analysis Centre comparisons against the IGS rapid solution:

This report (igt16363.sum.Z) and combination clock product (igt16363.clk.Z) are available in directory:
ftp://cddis.nasa.gov/gps/products/rtpp/1636

Summary Table

AC	PFX	nSats	OrbRMS(mm)	nSatClk	nUsed	SatRMS(ns)	SatSig(ns)	nStaClk	nUsed	StaRMS(ns)	StaSig(ns)
comb	igt	31	0.0	8703	8613	0.22	0.11	0	0	0.00	0.00
rtcomb	igc	30	32.9	8530	8451	0.25	0.12	0	0	0.00	0.00
bkgcomb	bnc	30	106.2	8640	8550	0.33	0.13	0	0	0.00	0.00
bkg	rtn	30	47.3	8640	8550	0.55	0.16	0	0	0.00	0.00
bkg2	rt2	54	72.7	8839	8749	0.61	0.19	0	0	0.00	0.00
cnes	cnt	30	42.6	8552	8471	0.38	0.12	0	0	0.00	0.00
cnes2	c2t	28	42.6	8023	8023	0.69	0.06	0	0	0.00	0.00
dlr	dlt	30	45.7	8640	8550	0.32	0.17	0	0	0.00	0.00
dlr2	d2t	30	49.0	8640	8550	0.38	0.25	0	0	0.00	0.00
esoc	est	31	67.0	8636	8546	0.22	0.12	8101	8021	2.14	0.36
esoc2	e2t	31	47.3	8640	8550	1.08	0.19	9350	9279	2.13	0.16
nrc	emt	31	39.8	8712	8622	0.28	0.13	9413	9252	1.71	0.21
gmv	gmt	31	67.1	8856	8774	0.39	0.12	0	0	0.00	0.00
gfz	gft	30	45.6	8640	8550	0.57	0.16	0	0	0.00	0.00
tuw	TUW	31	44.3	8620	8530	0.68	0.49	7346	7202	1.65	1.26

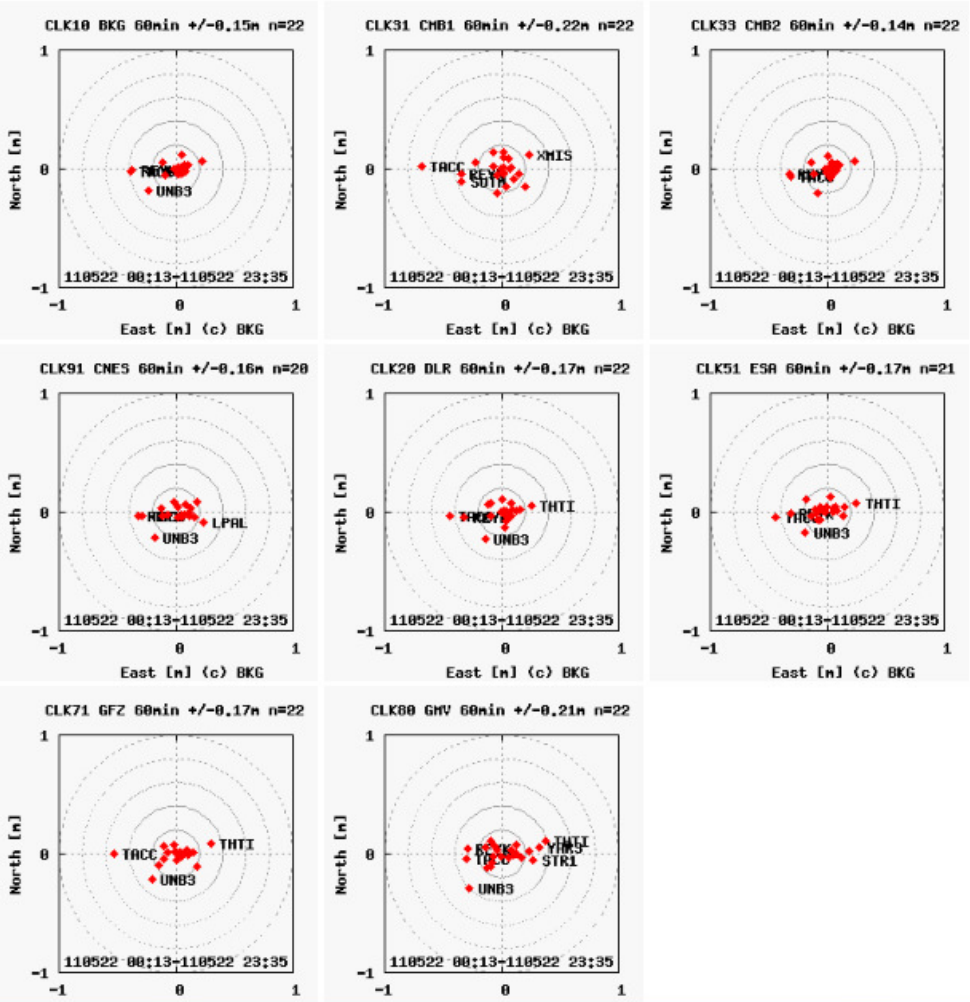
AC Solutions in Combination:

AC	Weight

PPP Monitor Scenario 15:

The following plots show horizontal displacements of real-time PPP tests using a selection of orbit/clock correctors streams provided by IGS Analysis Centers (AC). Tests are run every day simultaneously for all ACs in kinematic mode for a set of globally distributed sites. Each individual test is time limited and carried out with the BKG Ntrip Client (BNC). The ratio of sigma-code to sigma-pase is set to 500. Only GPS observations are used. Plots are updated once per day. Each dot represents the moving average over the last 5 minutes of a test. Site names are added when displacements exceed 25 cm. Tests interrupted by stream outages remain unconsidered. Plot titles provide the following information:

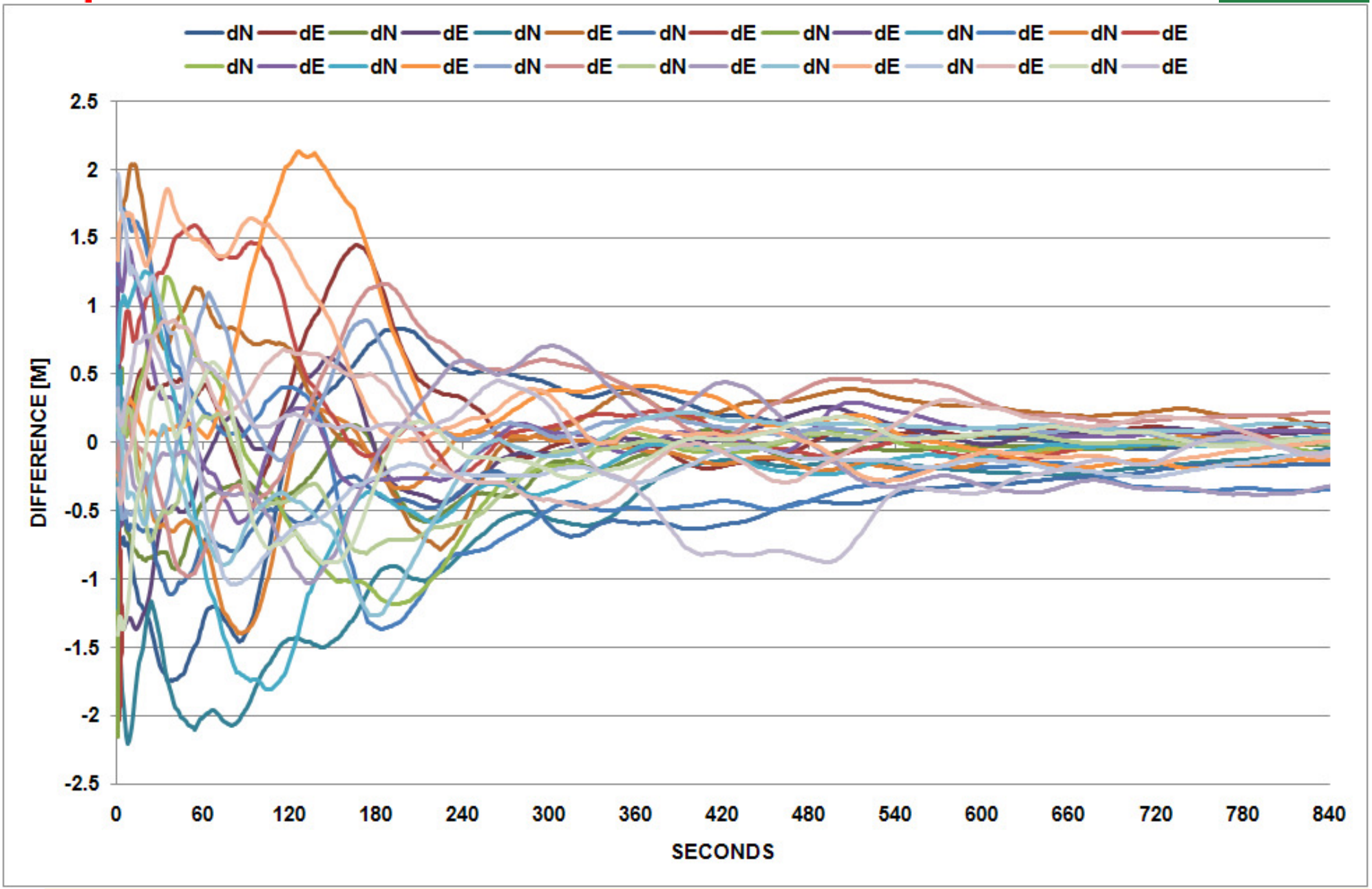
- Orbit/clock correctors stream on caster products.igs-ip.net
- Real-time IGS Analysis Center generating the correctors
- Duration of each individual test
- Number of tests performed
- RMS of horizontal displacements



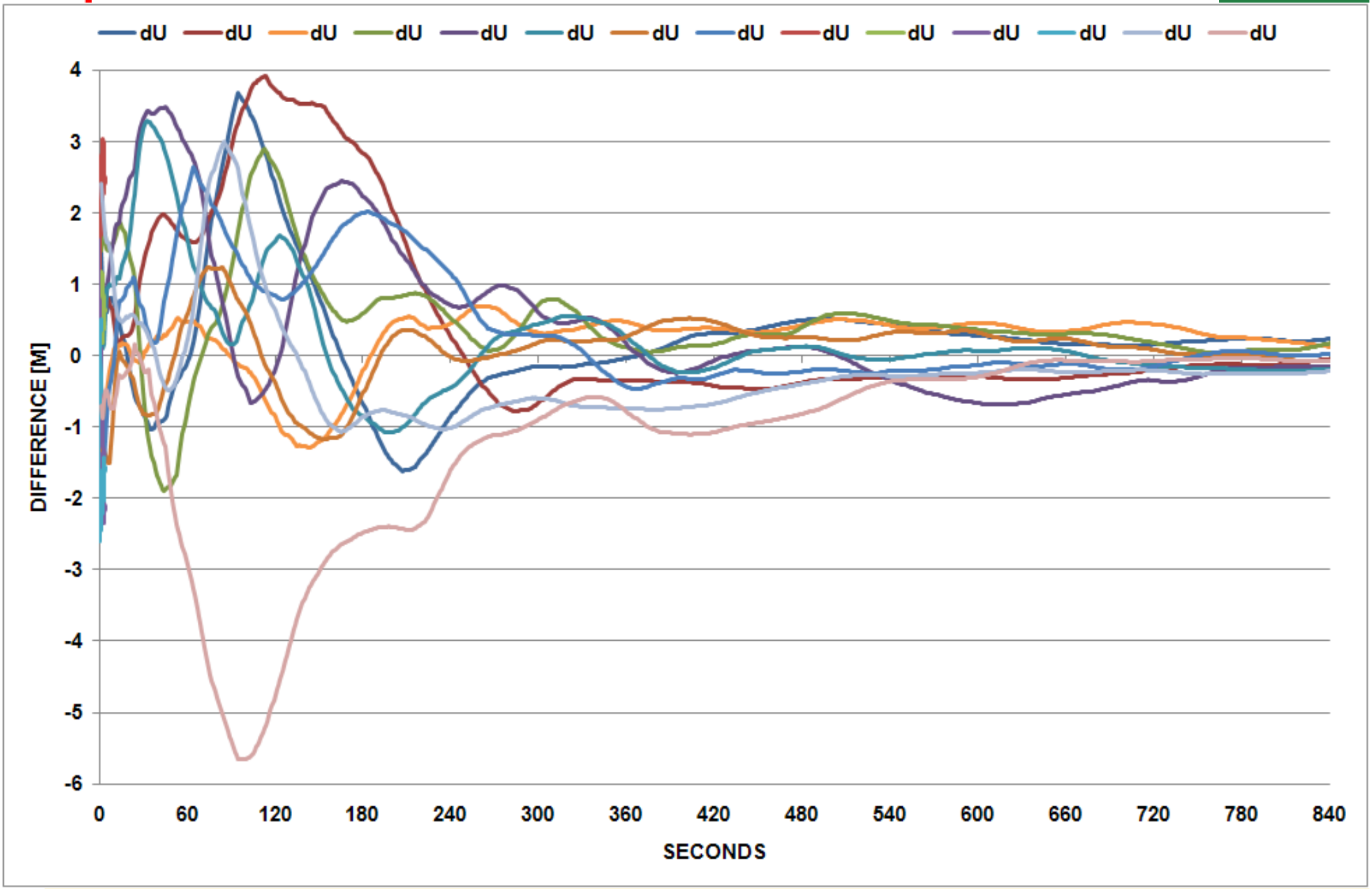
BNC2.6

- BKG Ntrip Client (BNC)
- Starting with version 2.0: Precise Point Positioning (PPP) module implemented
- New options within version 2.6
  - Various filter parameters for positioning and for troposphere to be changed by the user
  - Features of the BKG Ntrip Server (BNS), i.e., the upload of the corrections, included into BNC

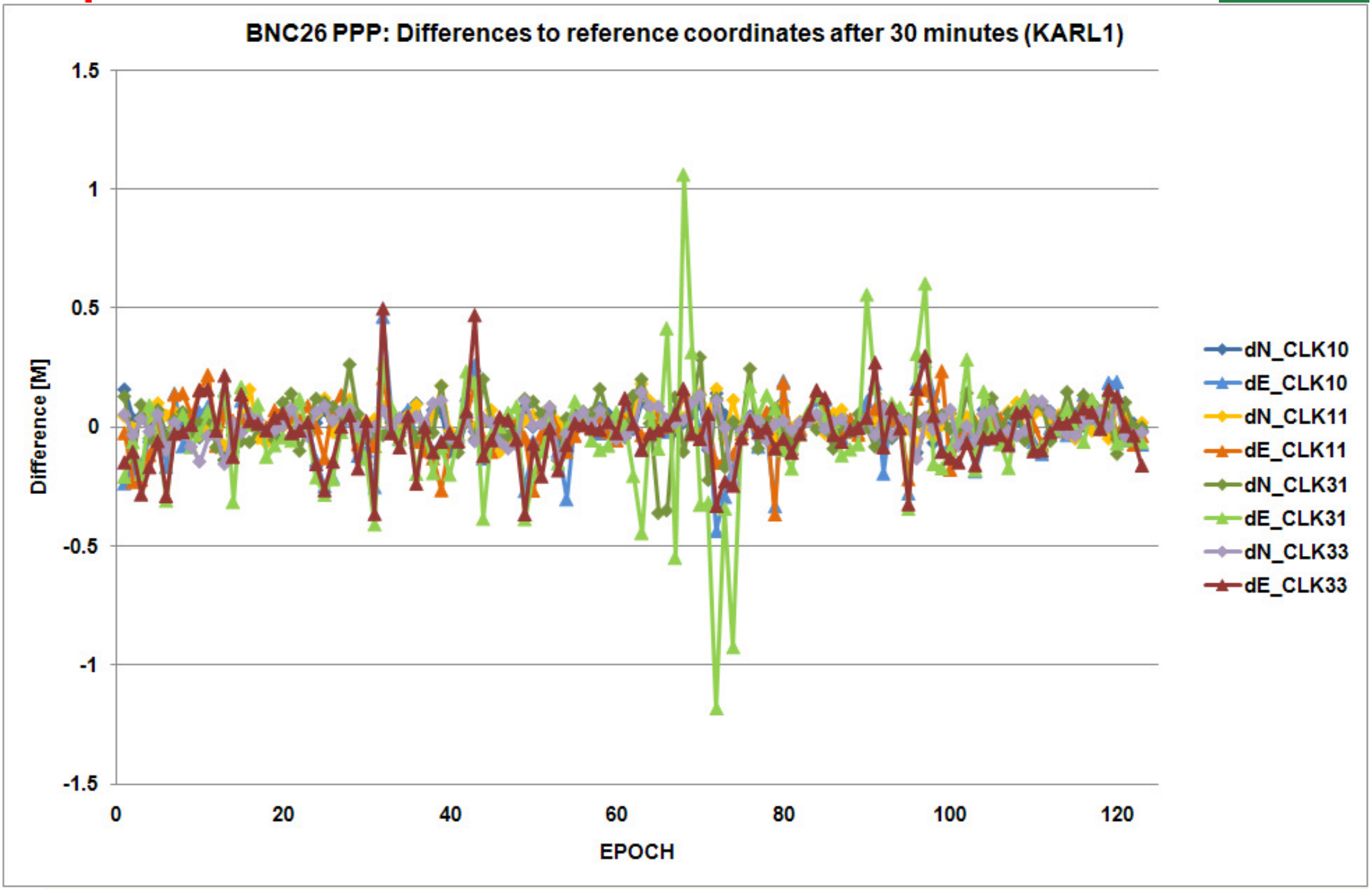
BNC26 – PPP results



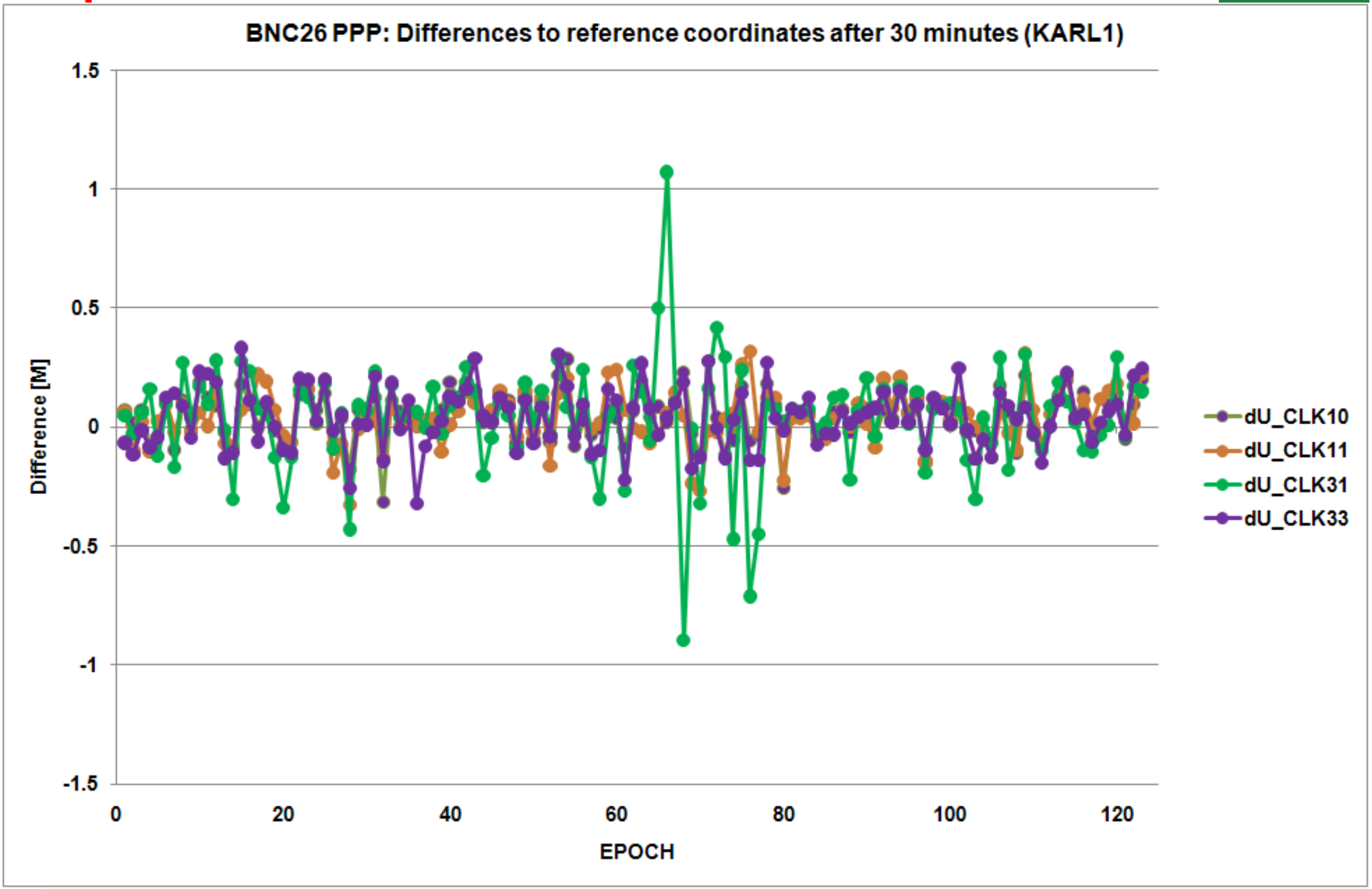
BNC26 – PPP results



BNC26 – PPP results



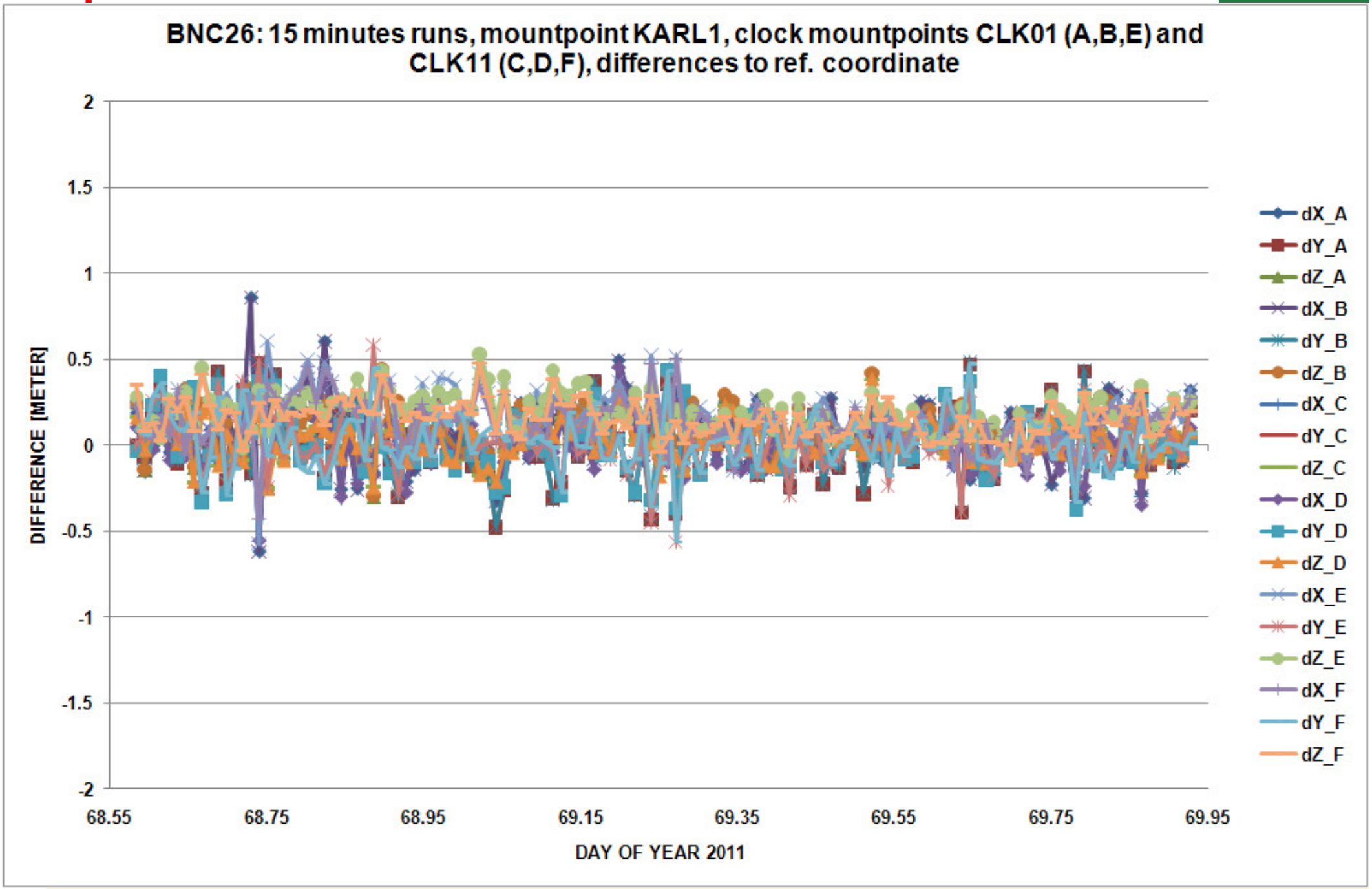
BNC26 – PPP results



BNC26 – PPP results after 30 min

	North		East		Up	
Clock correction	Mean [m]	Stdev [m]	Mean [m]	Stdev [m]	Mean [m]	Stdev [m]
CLK10 (GPS only	+0.01	0.05	-0.01	0.13	+0.04	0.10
CLK11 (GPS+GLO)	+0.02	0.05	+0.00	0.10	+0.04	0.11
CLK31 (IGS comb)	+0.02	0.10	-0.04	0.24	+0.04	0.22
CLK33 (BNC comb)	+0.01	0.06	-0.02	0.14	+0.04	0.13

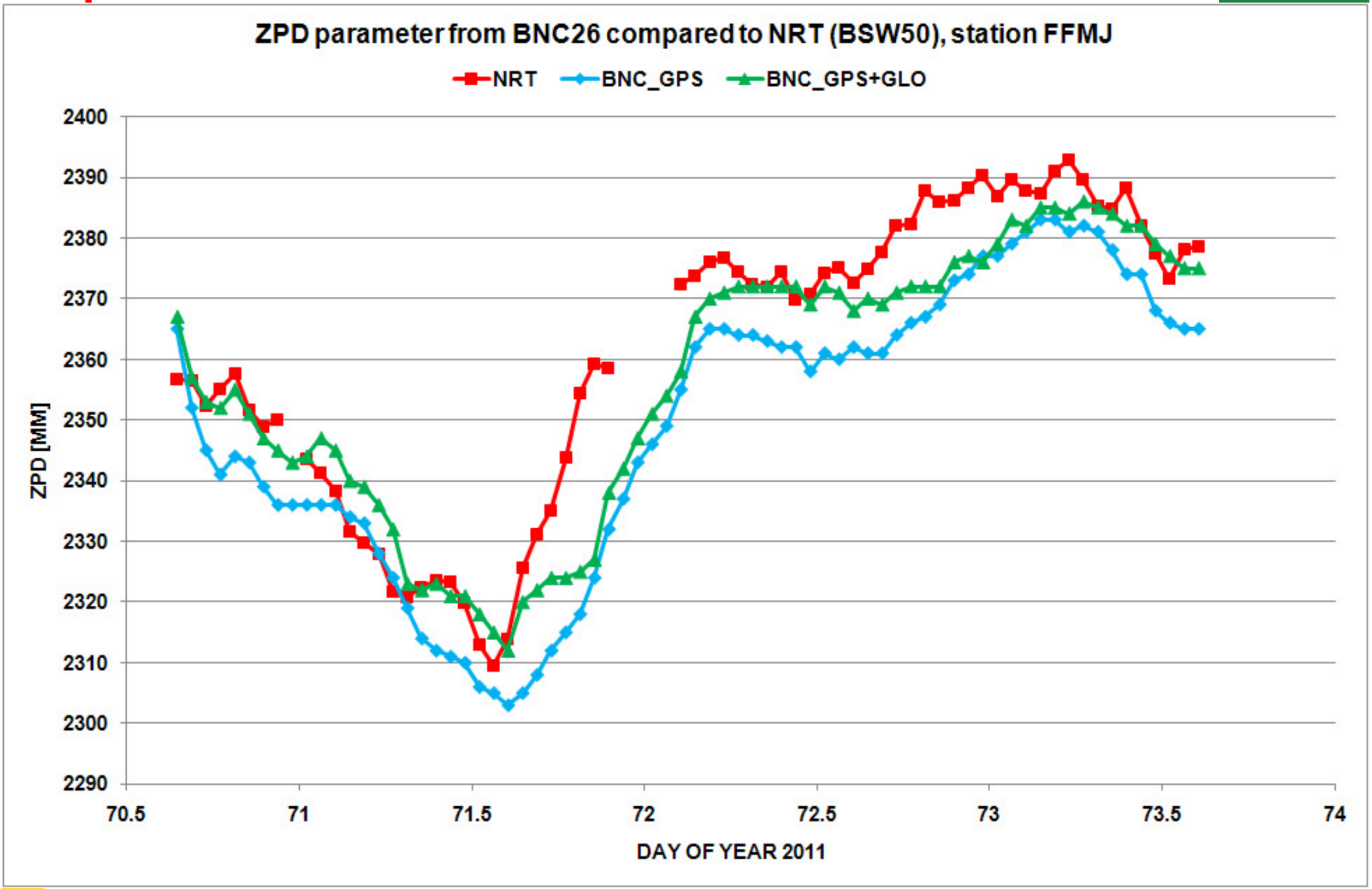
BNC26 – PPP results



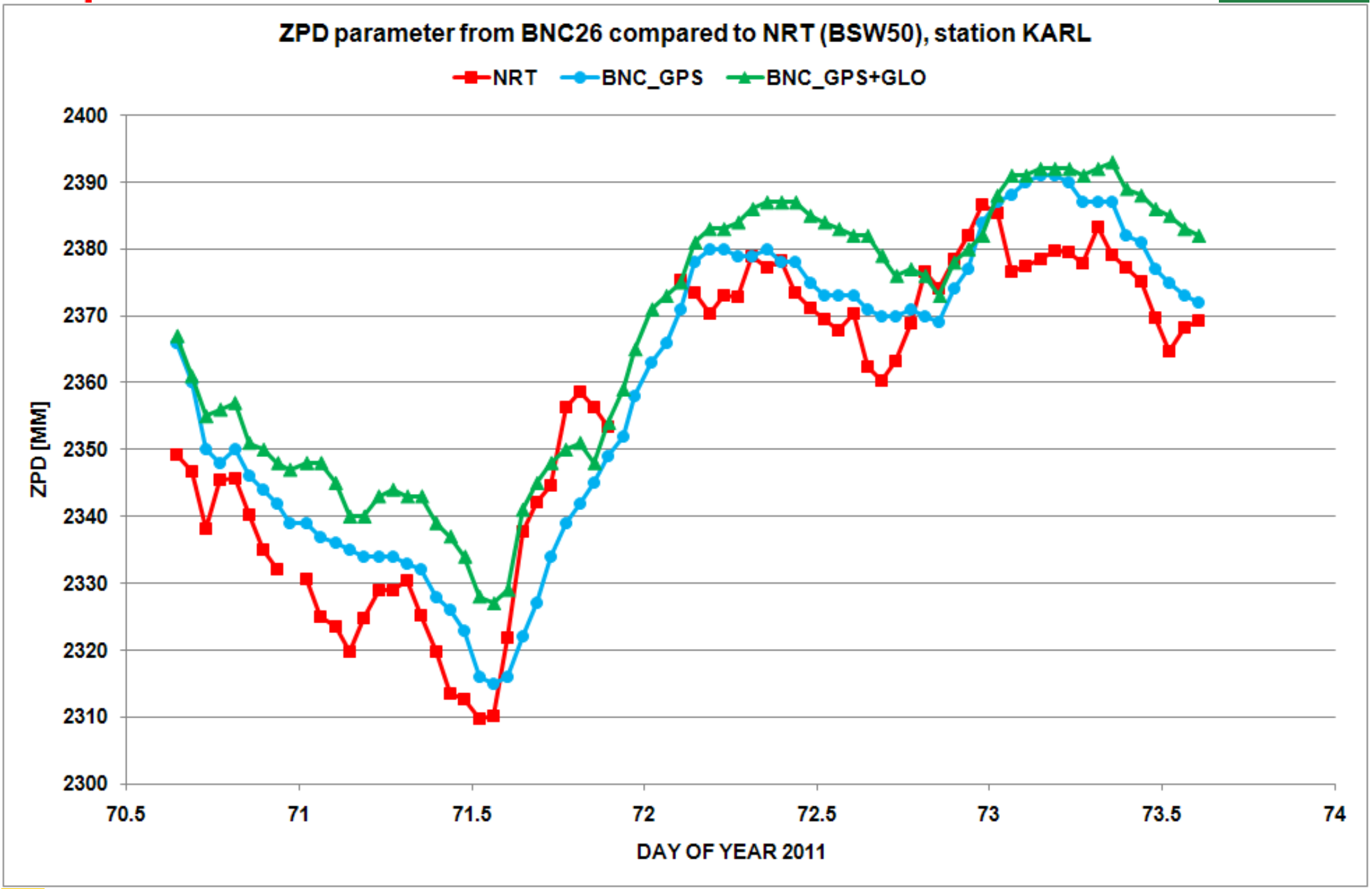
BNC26 – PPP results after 15 min

	X		Y		Z	
Parameter settings	**Mean [m]**	**Stdev [m]**	**Mean [m]**	**Stdev [m]**	**Mean [m]**	**Stdev [m]**
A: EstimateTropo=yes, pppSigTrpP=1e-5, pppSigTrpP=0.00, GPS	**+0.06**	**0.19**	**+0.01**	**0.19**	**+0.08**	**0.13**
B: EstimateTropo=yes, pppSigTrpP=1e-6, pppSigTrpP=0.00, GPS	**+0.06**	**0.19**	**+0.01**	**0.19**	**+0.08**	**0.13**
C: EstimateTropo=yes, pppSigTrpP=1e-5, pppSigTrpP=0.00, GPS+GLO	**+0.01**	**0.15**	**+0.02**	**0.17**	**+0.03**	**0.12**
D: EstimateTropo=yes, pppSigTrpP=1e-6, pppSigTrpP=0.00, GPS+GLO	**+0.01**	**0.15**	**+0.02**	**0.17**	**+0.03**	**0.12**
E: EstimateTropo=no, pppSigTrpP=0.00, GPS	**+0.16**	**0.16**	**+0.02**	**0.17**	**+0.19**	**0.11**
F: EstimateTropo=no, pppSigTrpP=0.00, GPS+GLO	**+0.13**	**0.14**	**+0.02**	**0.16**	**+0.15**	**0.10**

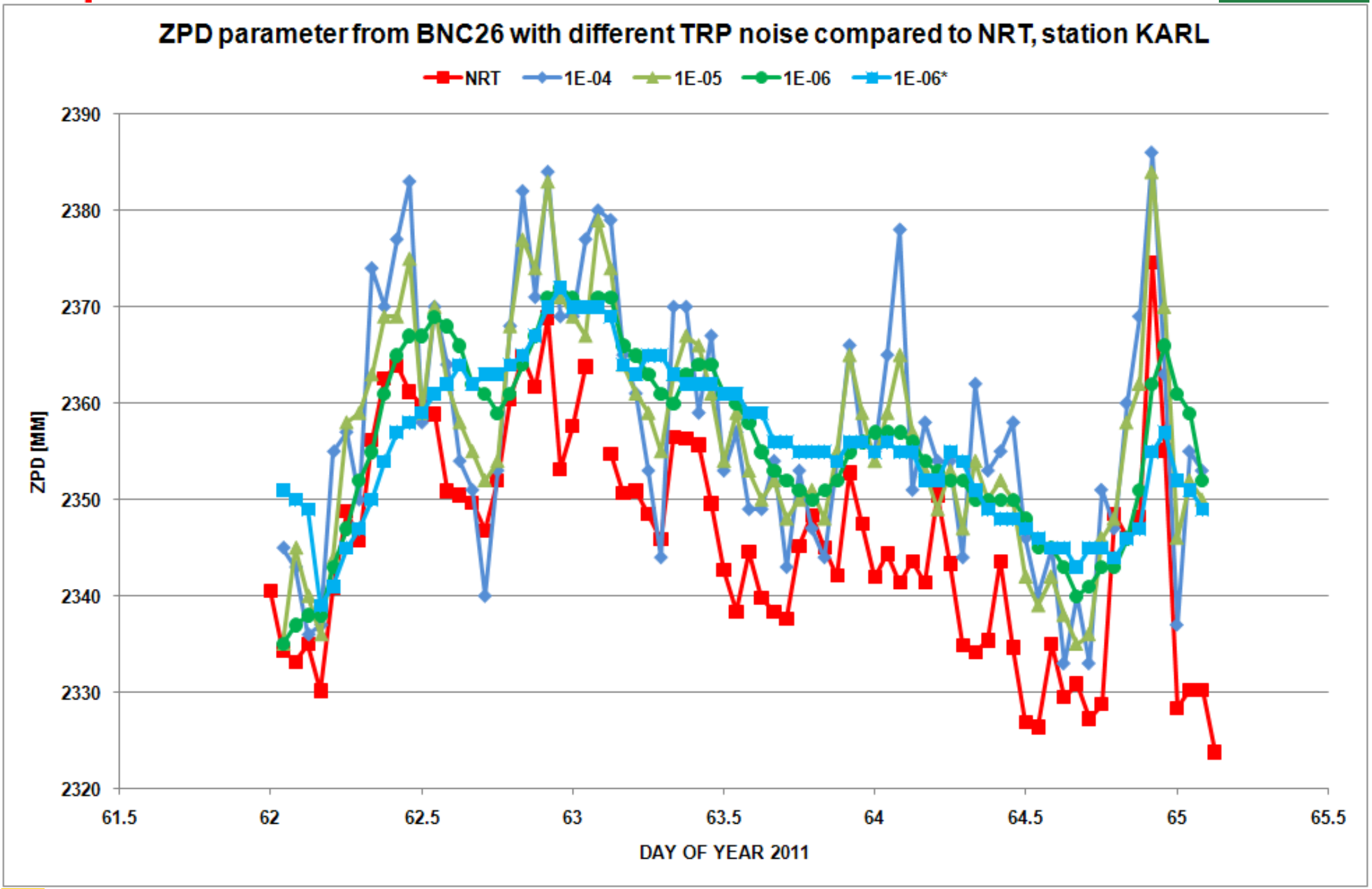
BNC26 – TRP results



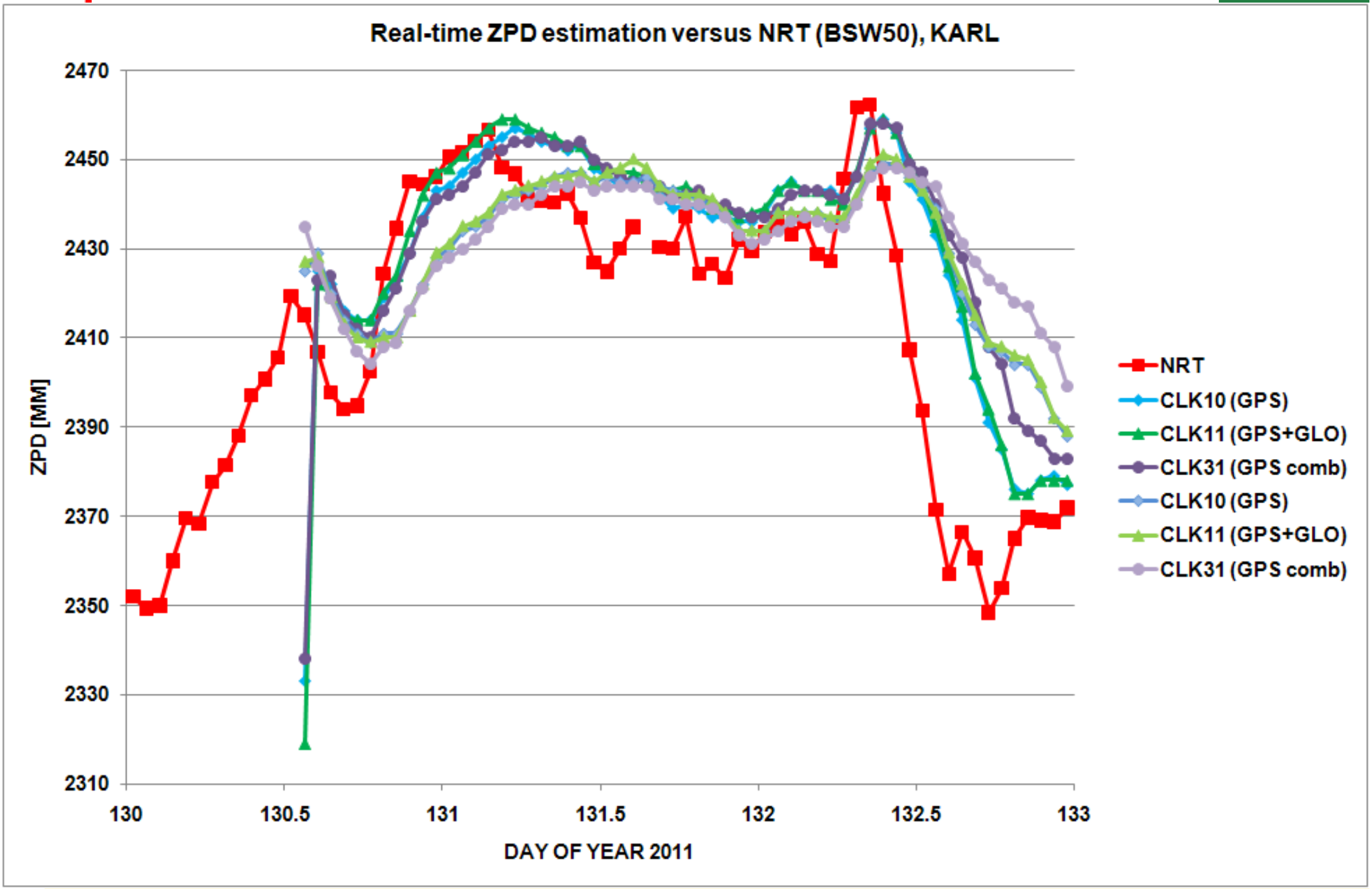
BNC26 – TRP results



BNC26 – TRP results



BNC26 – TRP results



Regional augmentation

- **IGS-RT:**
  - **orbit and clock corrections processed/derived from a global reference station network**
  - **PPP possible with an accuracy of few dm after > 15-30 min**
- **Better accuracy, shorter convergence time need:**
  - **More corrections (ionosphere, troposphere; bias parameters)**
  - **Shorter distances between reference stations**
  - **Regional (or even national) network of reference stations needed**

Summary

- EPN RT stations participating to IGS global orbit & clock correction product
- RT PPP with few dm accuracy, RT TRP with some mm
- EUREF dissemination concept as a basis for future RT processing
- May lead to RT PPP with less than 1 dm accuracy after << 15 minutes