

# **WG1 model sub-group summary**

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Varna, September 11-12, 2014.

# Goal of WG1 model sub-group

see ES1206\_WG1-definitions-2013-12-20.docx document:

## Advanced exploitation of NWM data in precise GNSS analyse

- \* mapping function – assessment, improvements, etc  
(blind, VMF1 concept, real-time, ...)
- \* a priori information from NWM – tropospheric gradients, pressure (ZHD)
- \* developing augmented tropospheric models for precise positioning  
(modeling, impact, assessment, ...)
- \* co-operation with **REPRO, ASYM, PPP, WG2**
- \* **benchmark** – processing with external tropospheric models and compared to standard processing

# Activities

F. Zus sent questionnaire to WG1 members in order to build table of existing (planned) blind and NWM based data sources.

Q1: Achievements since last meeting?

Q2: Blind & NWM based ZHD, ZWD, MF & GRAD?

Q3: Are you interested to compare your products?

Q4: New products must enter GNSS sw. Your GNSS sw?

Q5: What is missing in this questionnaire?

F. Zus received answers from TUV, GOP, AUT & WUELS:

GFZ, GOP, AUT, TUV & WUELS answered Q5 with 'don't know'.

GFZ, GOP, TUV & WUELS answered Q3 with 'yes'(examples are presented), AUT with Yes/No.

# Achievements since last meeting

## GFZ:

- \* Implementation of a site specific ZHD, ZWD, MF & GRAD(IENT) model
- \* Some preliminary comparisons with GOP and TU Vienna.

## TUV:

- \* Validation of GPT2w with ray-traced delays and ZTDs provided by IGS.
- \* Comparison with other blind models RTCA MOPS, ESA model and GPT2.

## GOP:

- \* Development of new augmentation model (publication: Dousa and Elias 2014, GRL)
- \* G-Nut/Shu – implementation of new tropospheric model in several variants
- \* G-Nut/Apep – starting development of new sw for 'blind' modeling and time-series analyses
- \* G-Nut/Geb – modification of GNSS PPP sw for introducing ZTDs from NWM + initial study
- \* Semi-automation of G-Nut/Shu & GFZ/DNS processing, visualization, animation

## AUT

- \* N/A

## WUELS

- \* N/A

# Blind Model Table

Green: available  
 Cyan: in work  
 Grey: N/A

	GFZ	WUELS	AUT	GOP	TUV
Name ZWD ZHD MF GRAD Infos		IGGHZ-G Saastamoinen Saastamoinen Niell (Dry & Wet) Tilting			GPT N/A Saastamoinen GMF N/A
					GPT2 Saastamoinen Saastamoinen GPT2(ah & aw 5° grid) N/A
					GPT2w Askne & Nordius Saastamoinen GPT2(ah & aw 1° grid) N/A
Name ZWD ZHD MF GRAD Infos				GOP-DE-2014 Yes (1° grid) Yes (1° grid) Yes (2nd step) Yes (2nd step) ERA Interim (1990-present)	GPT2w regional Askne & Nordius Saastamoinen GPT2(ah & aw regional) N/A

# NWM grid specific Table

	GFZ	WUELS	AUT	GOP	TUV
Name Status NWM Resolution Frequency Geo ZWD ZHD MF GRAD	GFZ-VMF1 Experimental GFS 6 & 9 h forecast 1° 3h Global Yes Yes Yes N/A			GOP-DE-ERA Experimental ERA Interim 1° 6h Global Yes Yes Yes (2 <sup>nd</sup> step) Yes (2 <sup>nd</sup> step)	VMF1 Operational ECMWF analysis/forecast 2° times 2.5° 6h Global Yes Yes Yes N/A
	GFZ-VMF1 (*) - GFS 6 & 9 h forecast 2° times 2.5° 3h Global Yes Yes Yes N/A	IGGHZ-N - WRF 4km/15km 1h N/A Yes Yes (Saastamoinen) Yes N/A (not decided yet)	SP-EZD - ECMWF 1.5° times 1.5° Static Europe Yes Yes N/A N/A	GOP-REG-ICS - ICS ASCR N/A 1h Europe Yes Yes N/A (optionally Yes) N/A (optionally Yes)	VMF1 (Landskron) - ECMWF To be investigated 6h Global Yes Yes Yes Yes
Name Status NWM Resolution Frequency Geo ZWD ZHD MF GRAD	DNS_GRID - GFS 6 & 9 h forecast 1° 3h Global Yes Yes Yes Yes			GOP-LOC-HAR - HARMONIE (KNMI) 2.5 km 1h Netherlands Yes Yes Yes Yes	

# NWM site specific Table

	GFZ	WUELS	AUT	GOP	TUV
Name Status NWM Stations Frequency ZWD ZHD MF GRAD	DNS_EGVAP Experimental GFS 6 & 9 h forecast EGVAP 3h Yes Yes Yes Yes		SP-EMF Experimental Radiosonde EUREF Static Yes Yes Yes N/A	GOP-DE-WEB Experimental ERA interim Any (via web-based) 6h Yes Yes N/A (in 2 <sup>nd</sup> step) N/A (in 2 <sup>nd</sup> step)	VMF1 Operational ECMWF analysis/forecast IGS, IVS & IDS 6h Yes Yes Yes Yes (simple model LHG)
Name Status NWM Stations Frequency ZWD ZHD MF GRAD	DNS_IGS - GFS 6 & 9 h forecast IGS 3h Yes Yes Yes Yes				

# GNSS sw

	GFZ	WUELS	AUT	GOP	TUV
Name	GFZ's EPOS	Bernese 5.0, Bernese GNSS 5.2	Bernese v.5.2 GAMIT v.10.4	G-NUT/Geb. Bernese (optionally)	Bernese, Napeos



# Some comparisons

TUV provided data from the so-called CONT11 campaign:

N & E gradients every 6h for 14 VLBI stations (15-30 September 2011).

TUV, GFZ & GOP compared their data:

VLBI (TUV, VLBI solution)

VLBI based

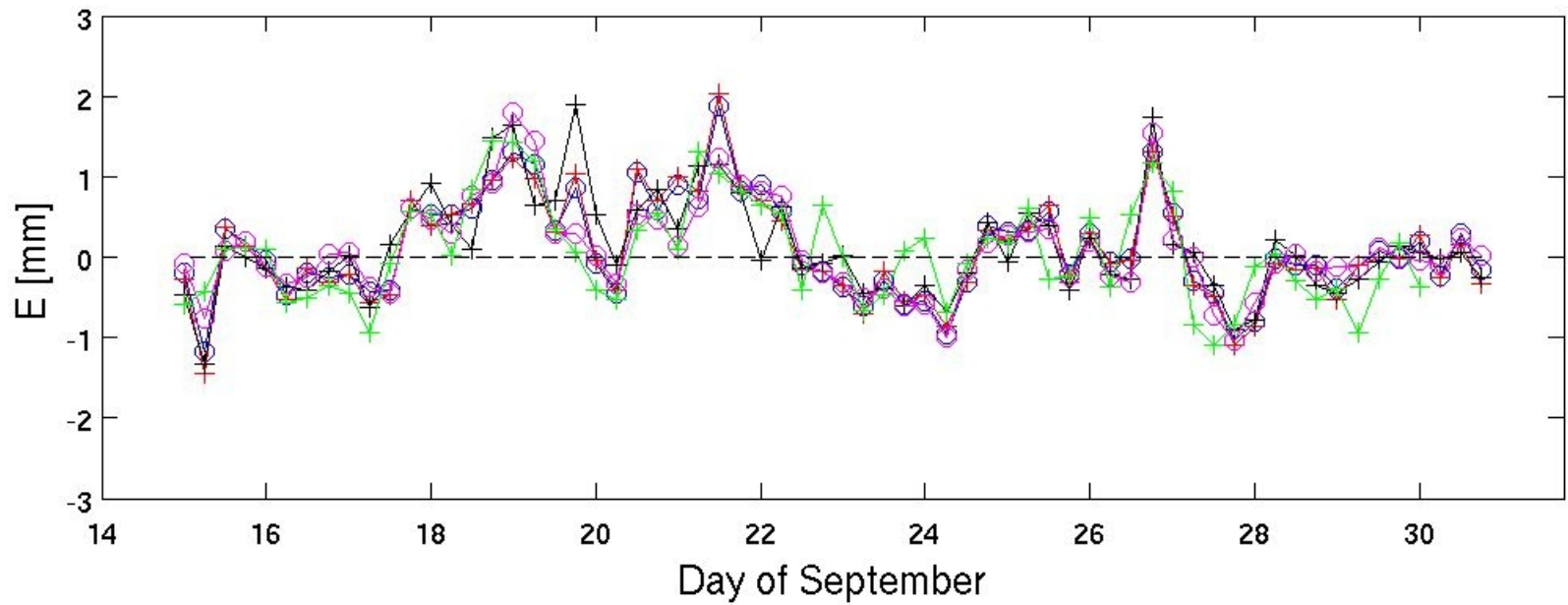
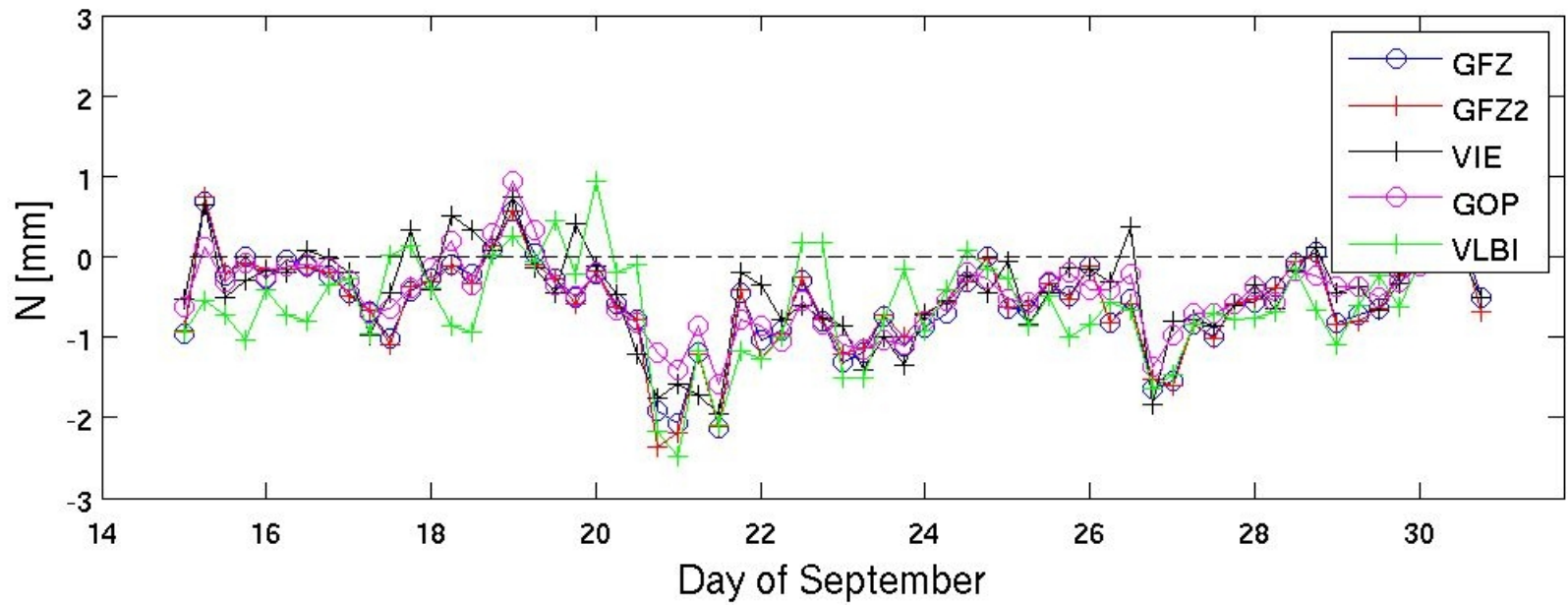
VIE (TUV, ECMWF analysis,  $0.125^\circ$ )

GFZ (GFZ, GFS analysis,  $1^\circ$ )

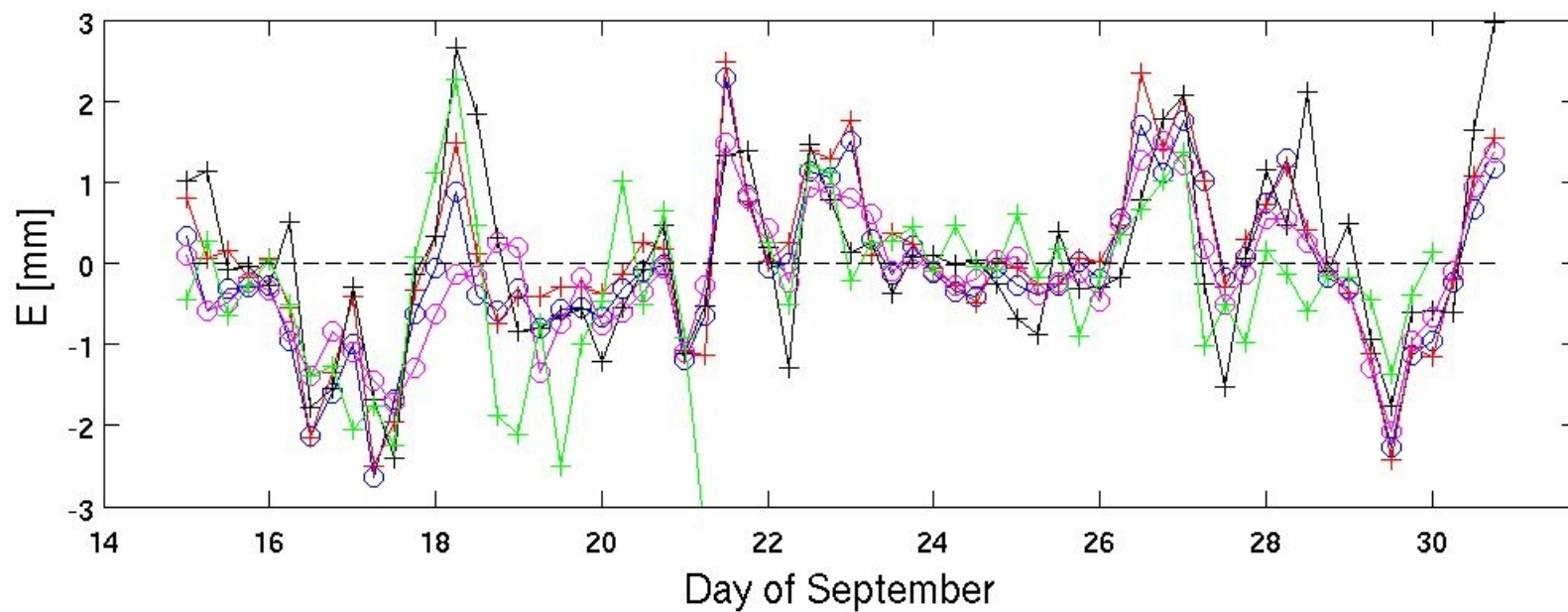
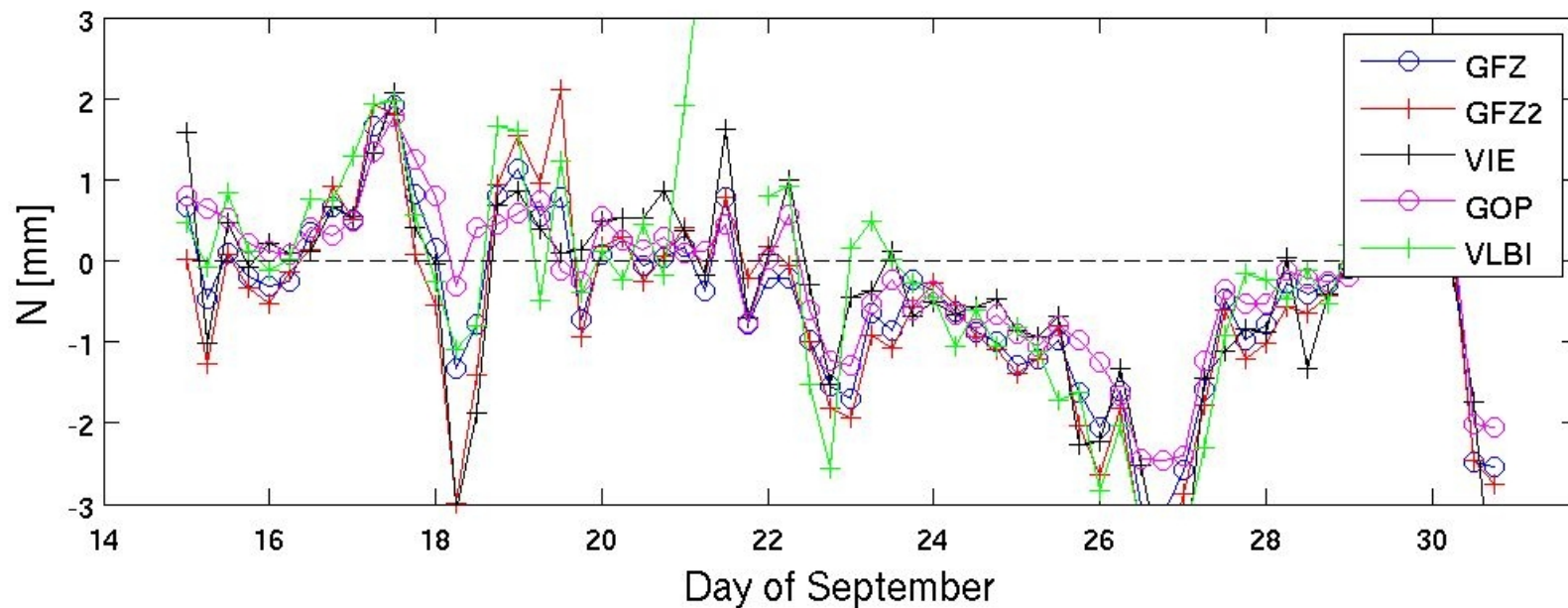
GFZ2 (GFZ, GFS analysis,  $0.5^\circ$ )

GOP (GOP, ERA interim,  $1^\circ$ )

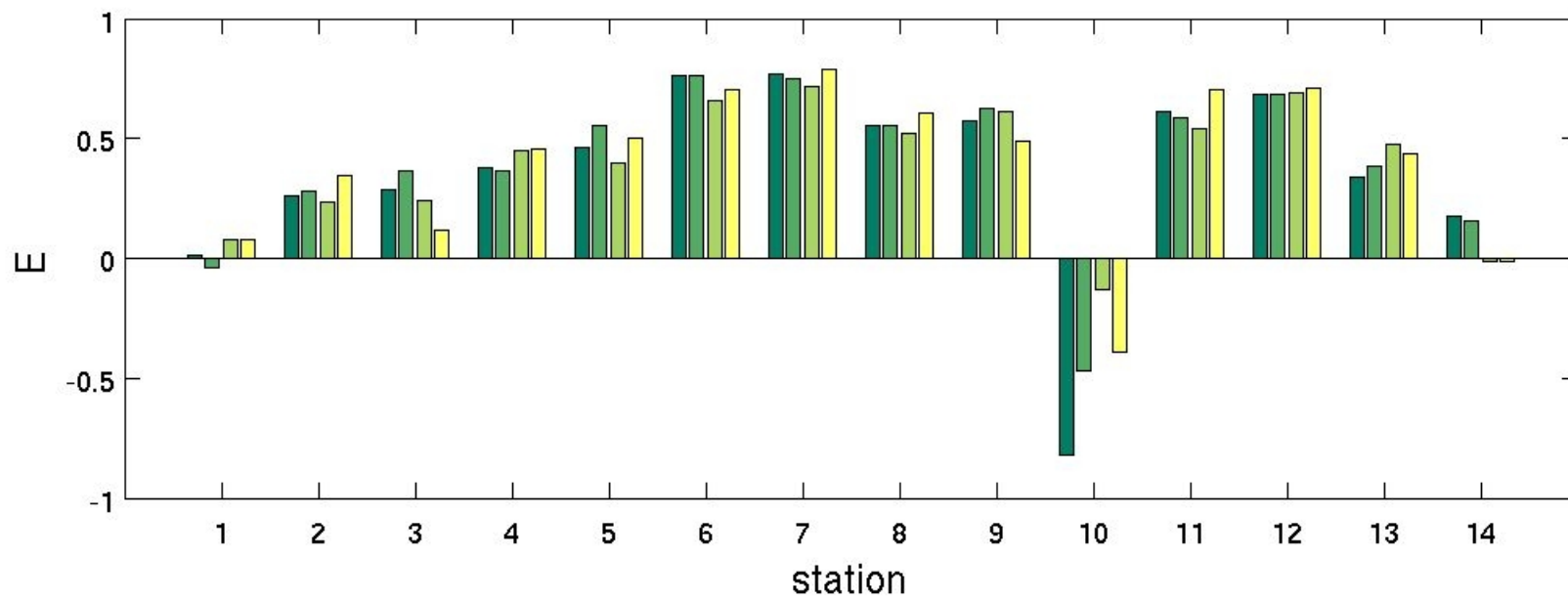
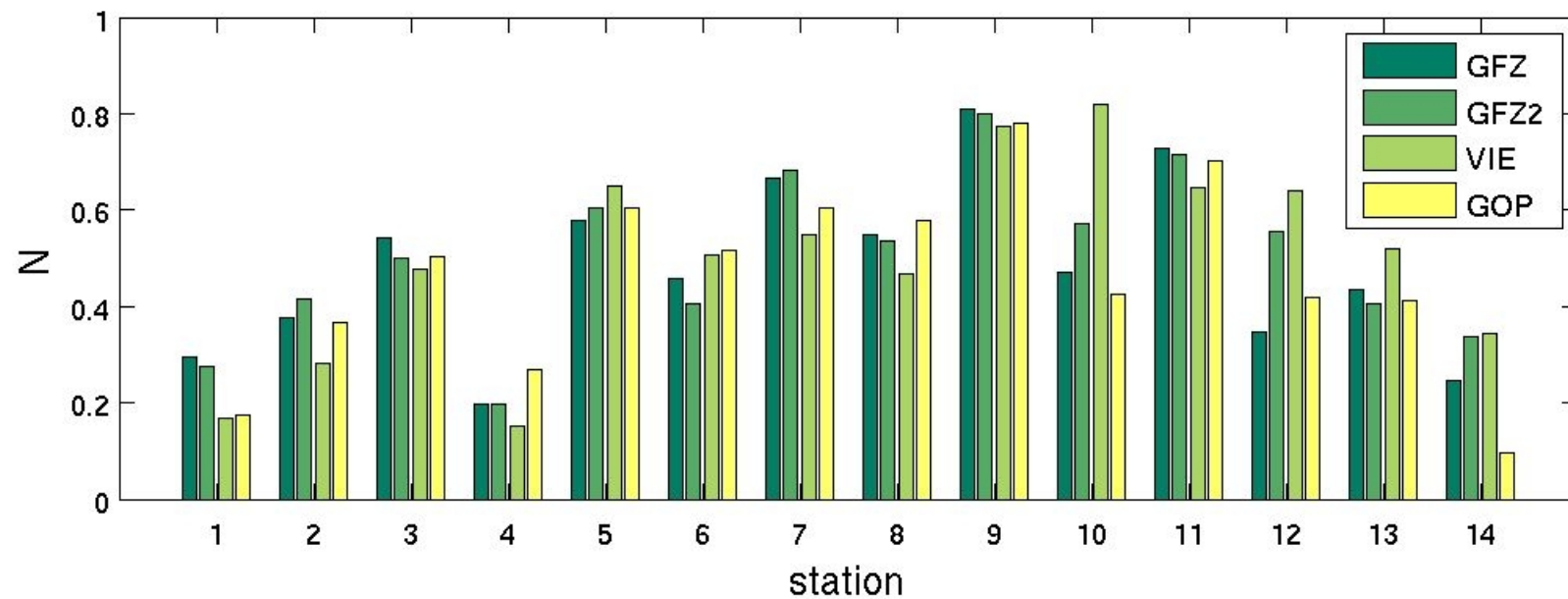
# ONSALA60



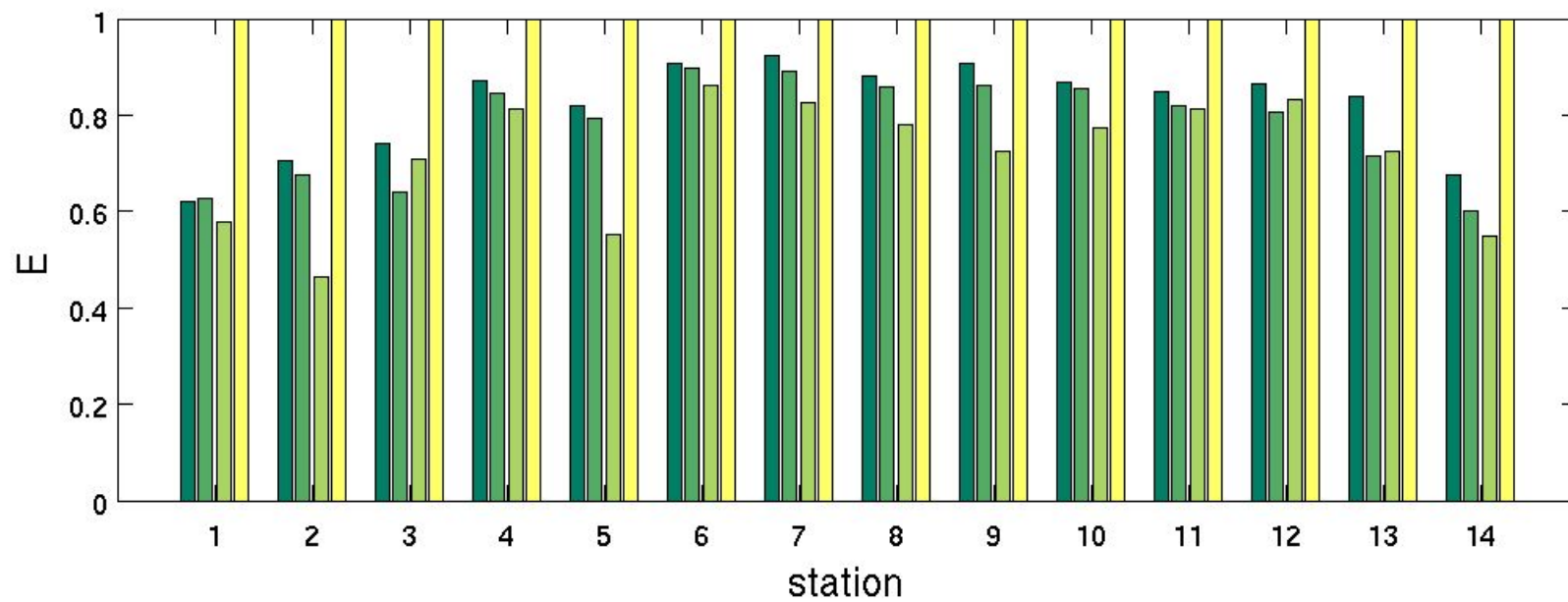
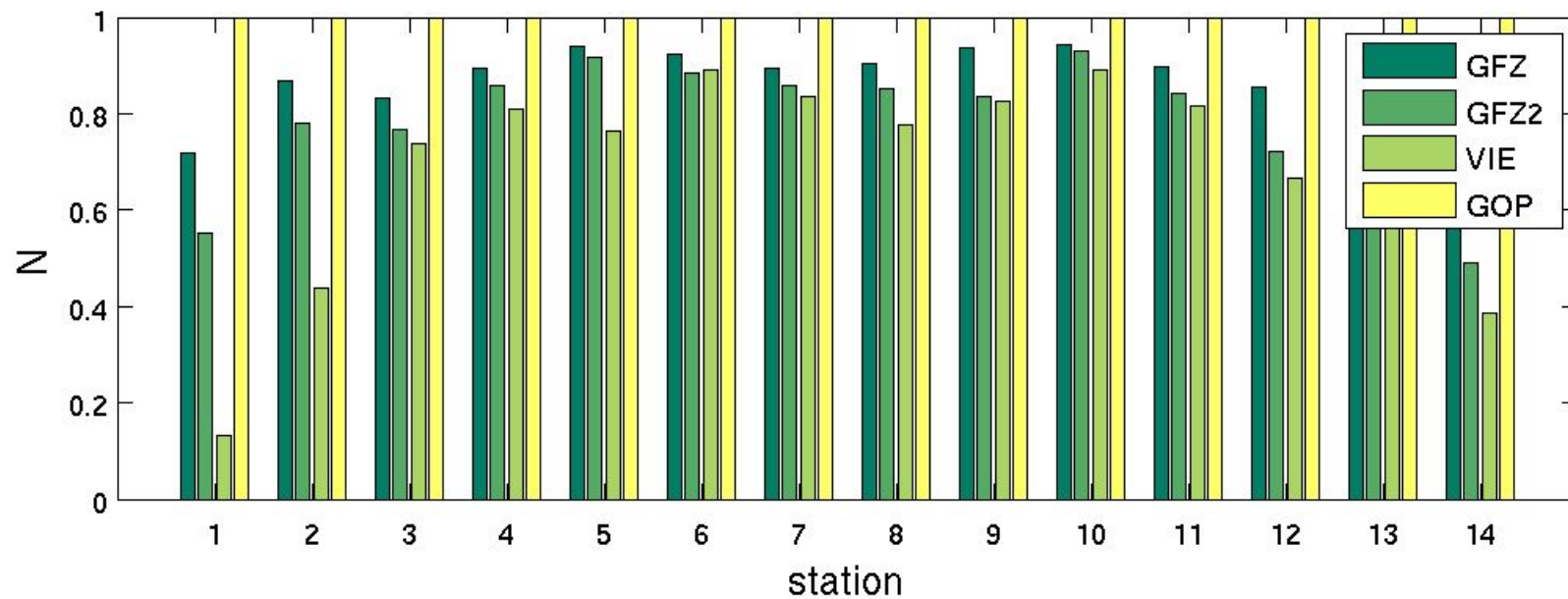
# TSUKUBA32



# PMCC NWM-VLBI



# PMCC NWM-GOP



# Summary & Outlook

- \* NWM and VLBI based gradients fit quite well. The resolution of the NWM matters.  
Everyone is invited to participate with his/her solution.
- \* More comparison studies needed. GOP can provide IGS REPRO1 ZTD & gradients.
- \* N. Zinas (Tekmon Geomatics) informed F. Zus that they will host J. Dousa on a STSM for the installation of the GOP RT ZTD system at the University of Thessaloniki, Greece. They work towards establishing an AC in Greece.
- \* For the benchmark campaign we need datum (and station list?).