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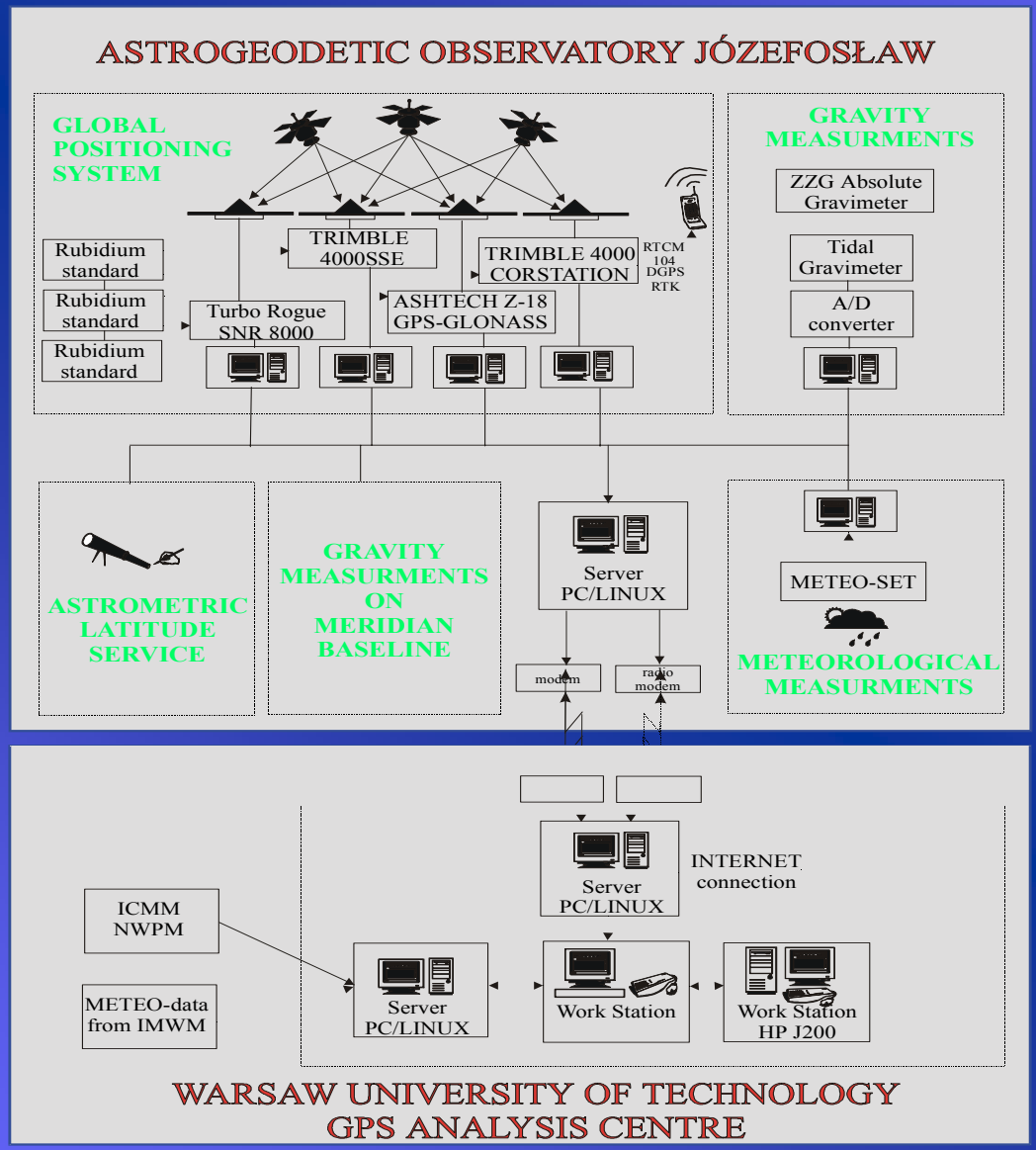
GEODETIC AND NON GEODETIC APPLICATIONS PERFORMED BY WUT LAC

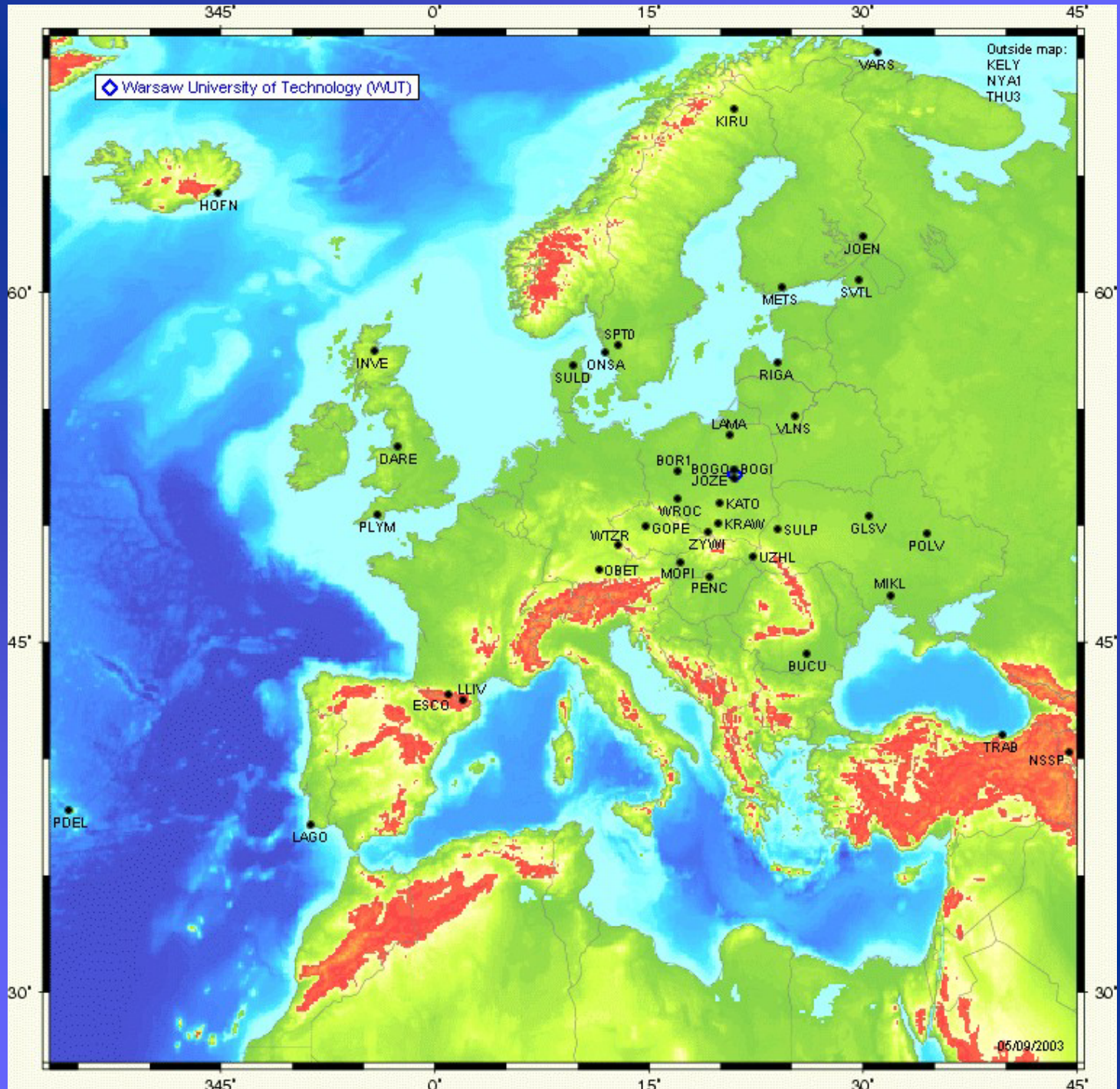
EUREF Permanent GPS Network 4th Local Analysis Centres Workshop
18-19 September, 2003Graz, AUSTRIA

The basic responsibilities of our GPS Analysis Centre include:

- **processing selected part of permanent EUREF network**
- **processing periodic campaign CEGRN and CEGRN2, Extended SAGET, EUVN**
- **processing local and regional campaigns for geophysical and geodetic needs in the area of Poland**
- **processing tropospheric zenith delay and TEC.**

Data acquisition system at the Józefosław observatory



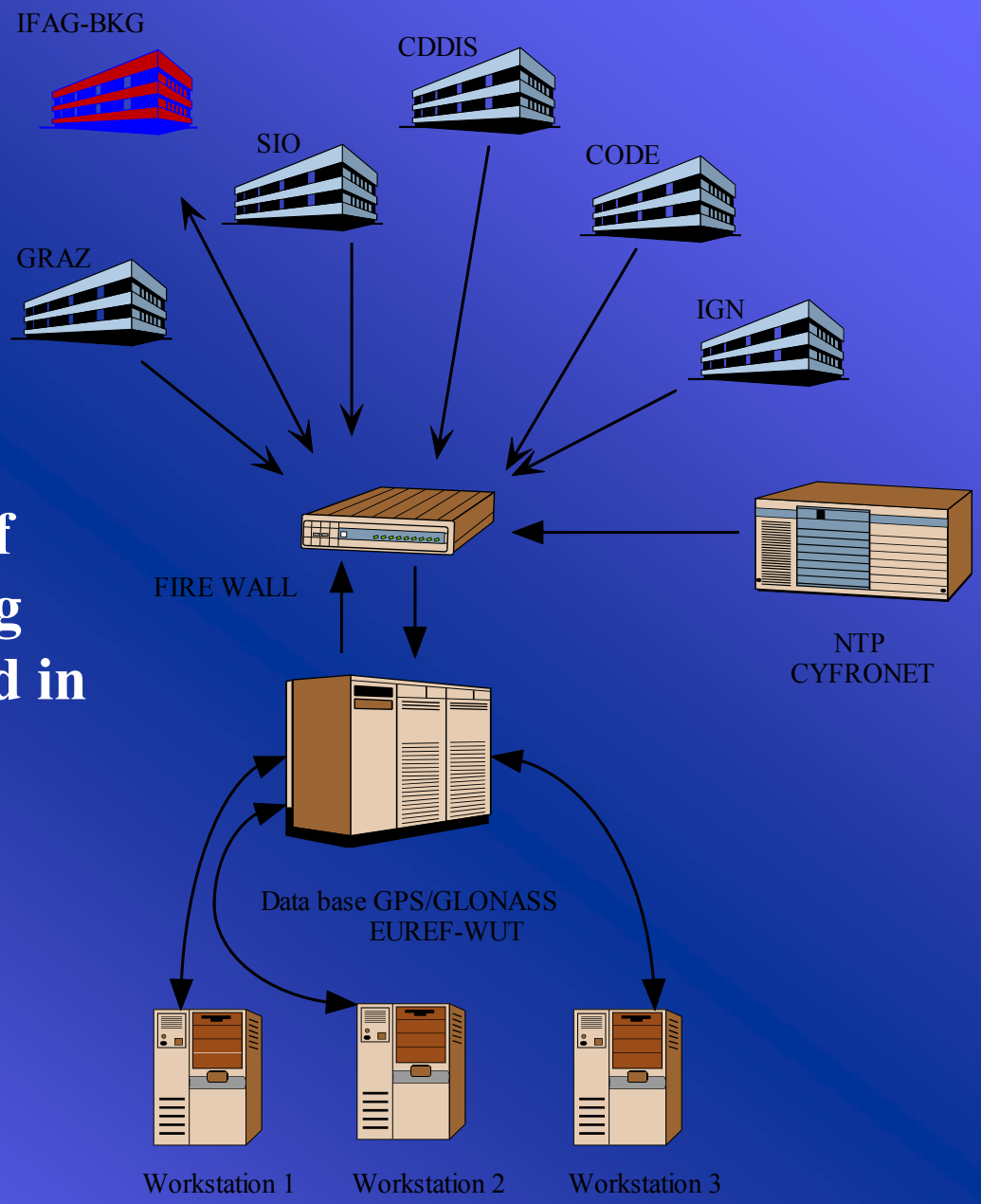

Warsaw University of Technology (WUT)
Outside map:
KELY
NYA1
THU3
345°
0°
15°
30°
45°
60°
45°
30°
VARS
KIRU
HOFN
JOEN
METS
SVTL
SPT0
INVE
ONSA
SULD
RIGA
LAMA
VLNS
DARE
BOR1
BOGO
BOGI
JOZE
KATO
WROC
PLYM
GOPE
KRAW
SULP
GLSV
WTZR
ZYWI
POLV
UZHL
OBET
MOPI
PENC
MIKL
BUCU
LLIV
ESCO
TRAB
NSSP
PDEL
LAGO
05/09/2003

WUT LAC came into being in 1995 year. Since January 1996 year takes part in study active EUREF network (EPN).
Worked out by WUT part network EPN LAC it hugs 45 station disposed in grounds of European continent.
Since 1997 year till September 2003 worked out year network by WUT LAC, from 20 station broaden to 43 station.

GPS WEEK	Station
957	GLSV
987	NSSP
1000	VLNS
1002	BUCU
1015	LLIV
1020	UZHL
1027	ESCO
1047	TRAB
1092	VARS
1101	PDEL,LAGO
1137	SULP

GPS WEEK	Station
1174	SPT0
1185	BOGI
1192	MIKL
1201	THU3
1203	KRAW (Kraków)
1225	OBET
1225	INVE, PLYM, SULD
1229	DARE
1231	KATO, ZYWI
1235	SASS, JOZ2

The functional scheme of system of data processing GPS observation, applied in WUT EUREF LAC



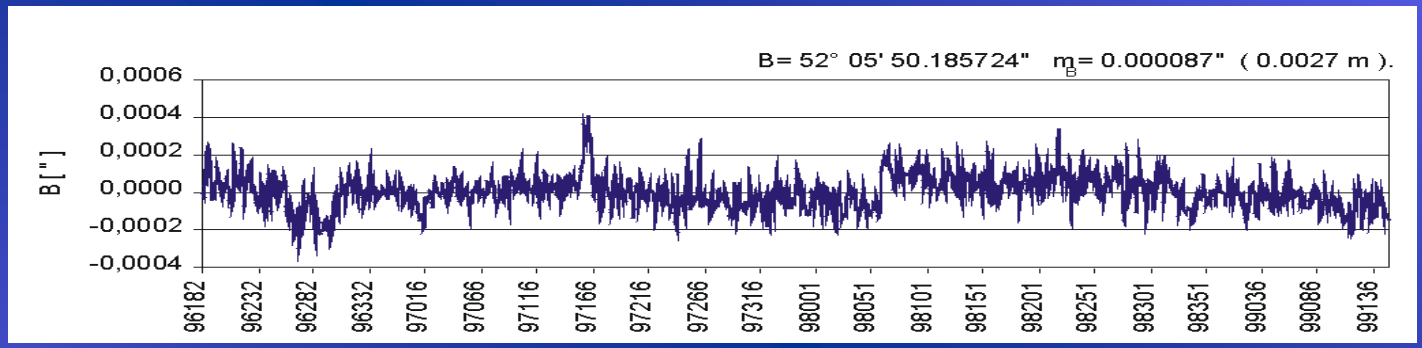
Short description of strategy:

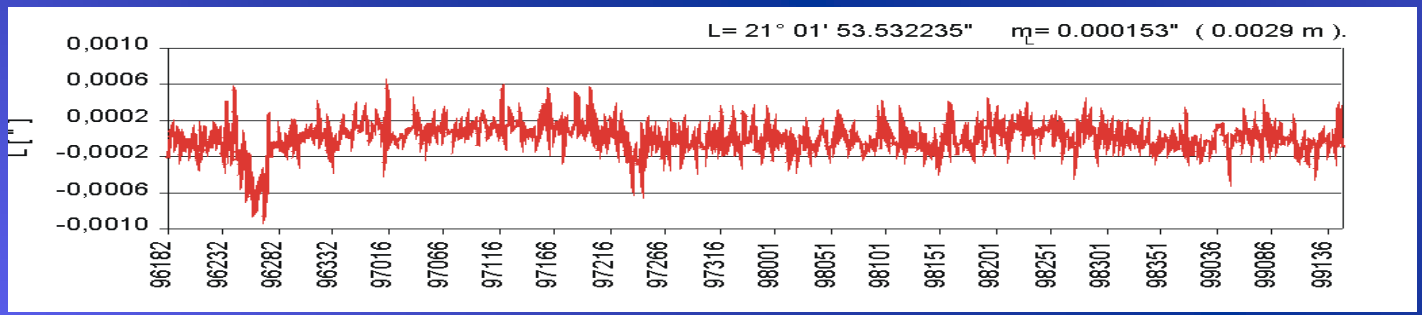
- software: Bernese 4.2
- orbits, ERP - IGS final
- BOR1, WTZR, ONSA constrained (X,Y -0.1 mm, Z-1 mm)
- no a priori tropospheric model, Dry-Niell as mapping function
- troposphere modelled each 1 hours/each station (absolute and relative constraints 5 m)
- ionosphere only modelled for ambiguity resolution step
- tidal displacement: IERS96 convention, ocean loading applied
- geopotential model: JGM
- DE200 planetary ephemeris applied
- adjustment: weighted least squares

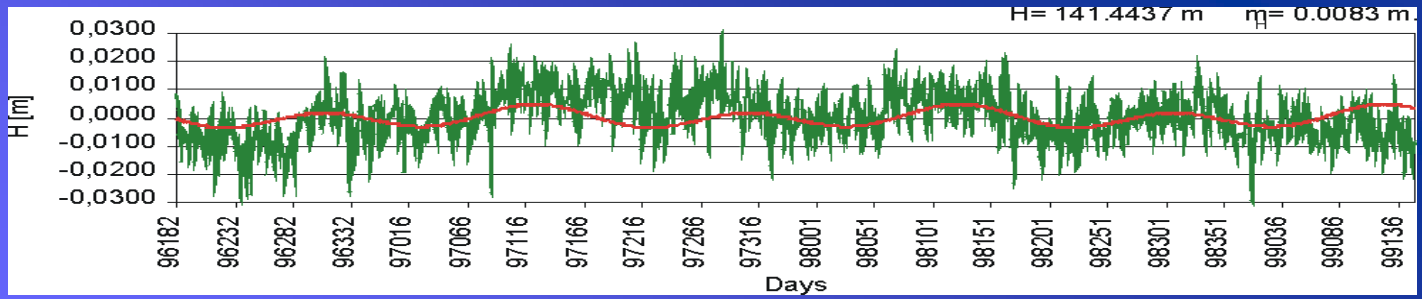
Results of data processing and analyses

GPS Observation Analyses

Changes of the coordinates obtained from day-to-day GPS data processing

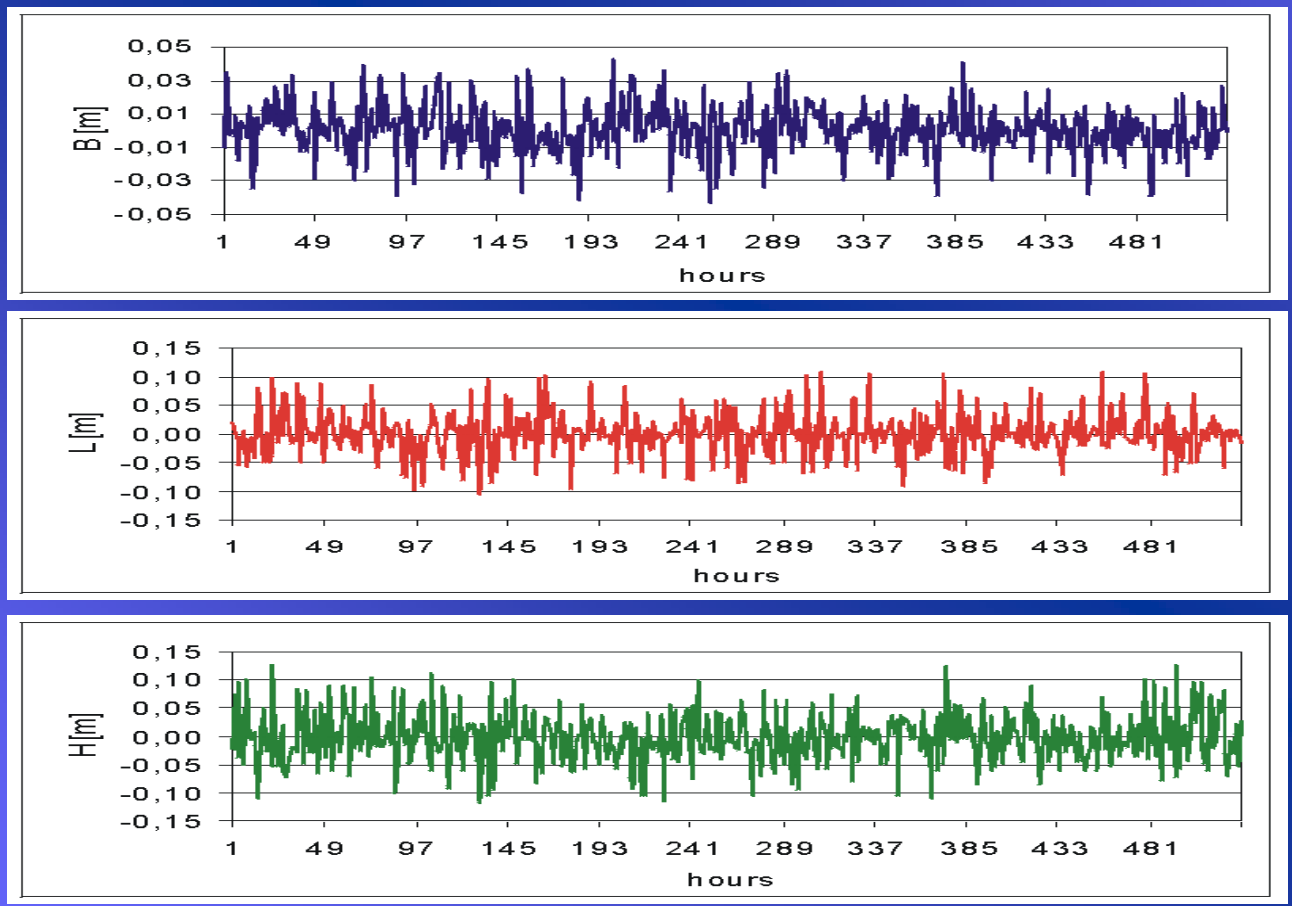




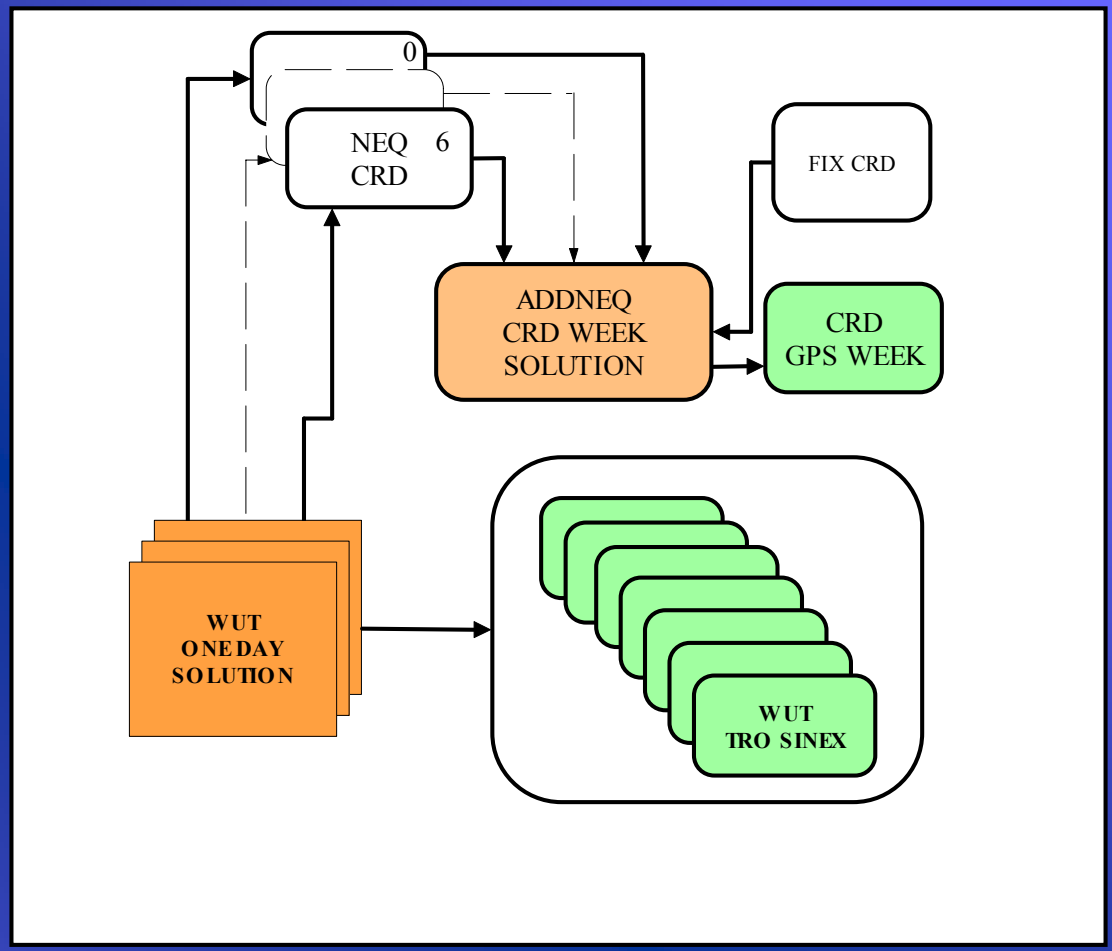


GPS Observation Analyses

Changes of the coordinates obtained from 1-hour GPS observations filtered to 3σ

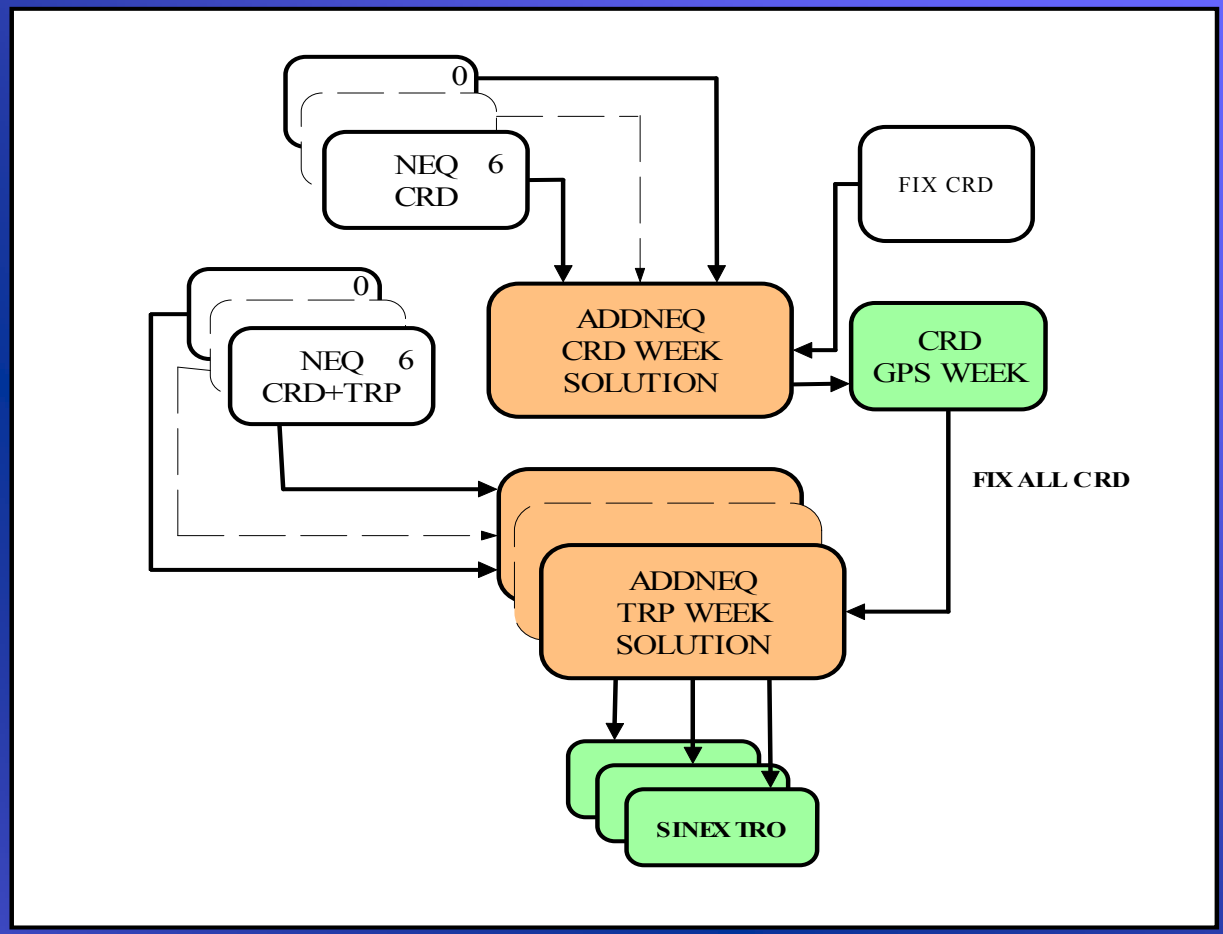


General scheme of computational strategy applied until week 1220 GPS in the Local Analysis Center WUT EUREF- so called „old" computational strategy. In the presented solution the TZD values were determined in a single process with station coordinates estimation. This solution's advantage was relatively short computational time and storing the normal equations with the station coordinates data only.

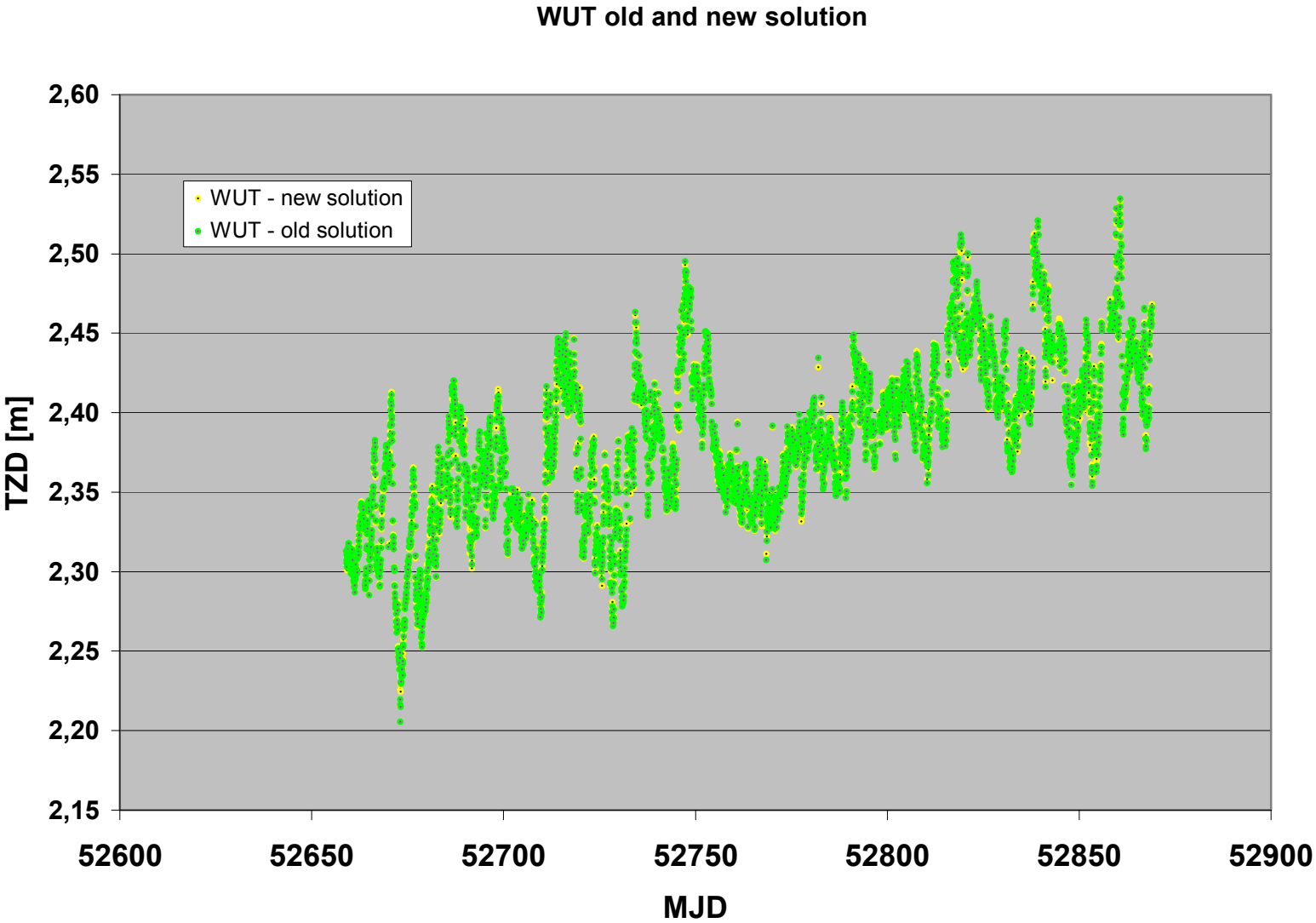


The main disadvantage are the station coordinates for which the TZD values were determined. Recorded in the SINEX TRO format, they were characterized by different values for each observation day, although they belonged to the same GPS week.

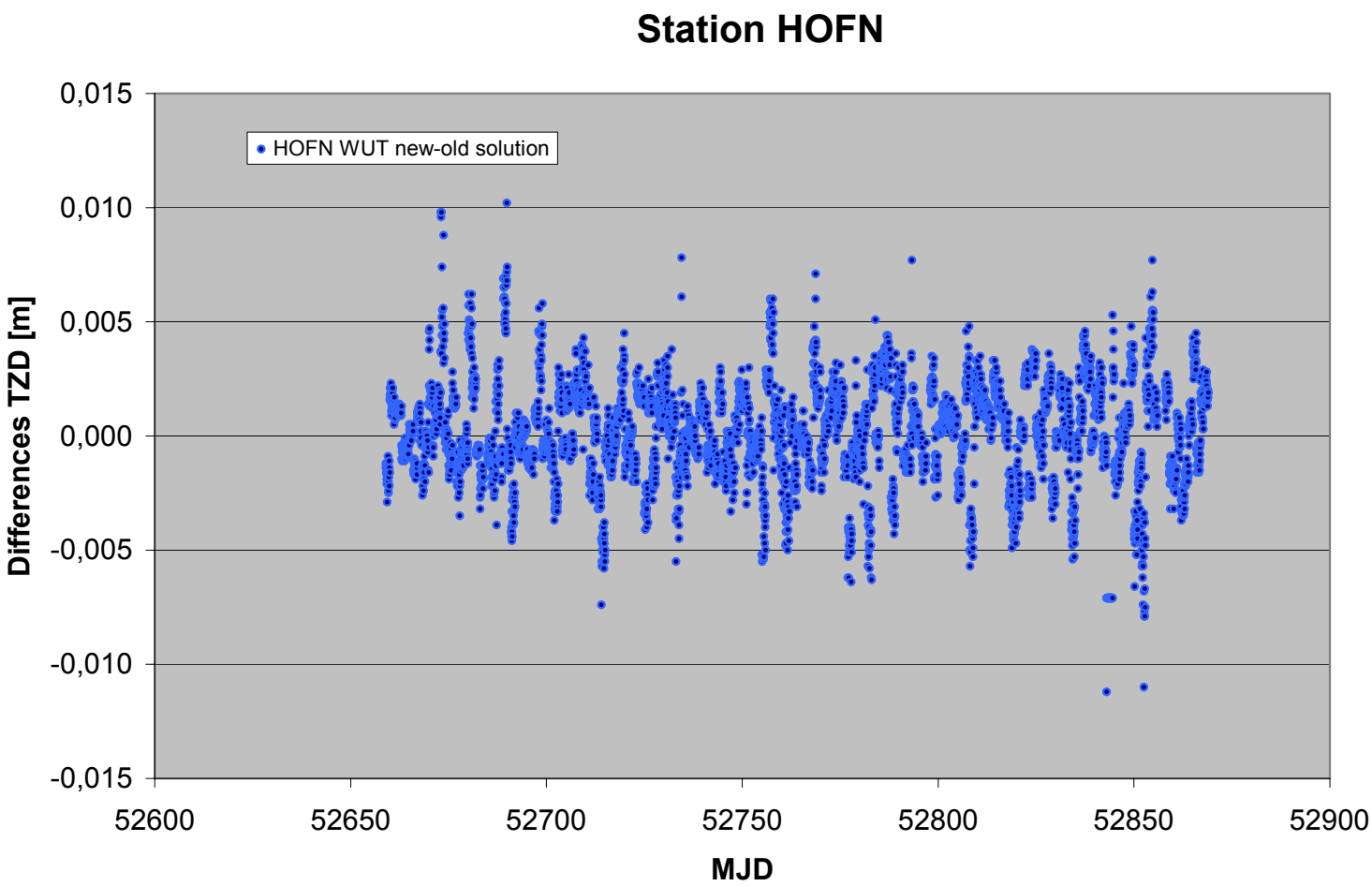
Scheme of the new strategy of GPS observations study applied in WUT LAC. The main change introduced in the study is stations' coordinates and the determined tropospheric parameters storing in the normal equations file. The tropospheric parameters are estimated only after completion of the computational process on the last day of the week.



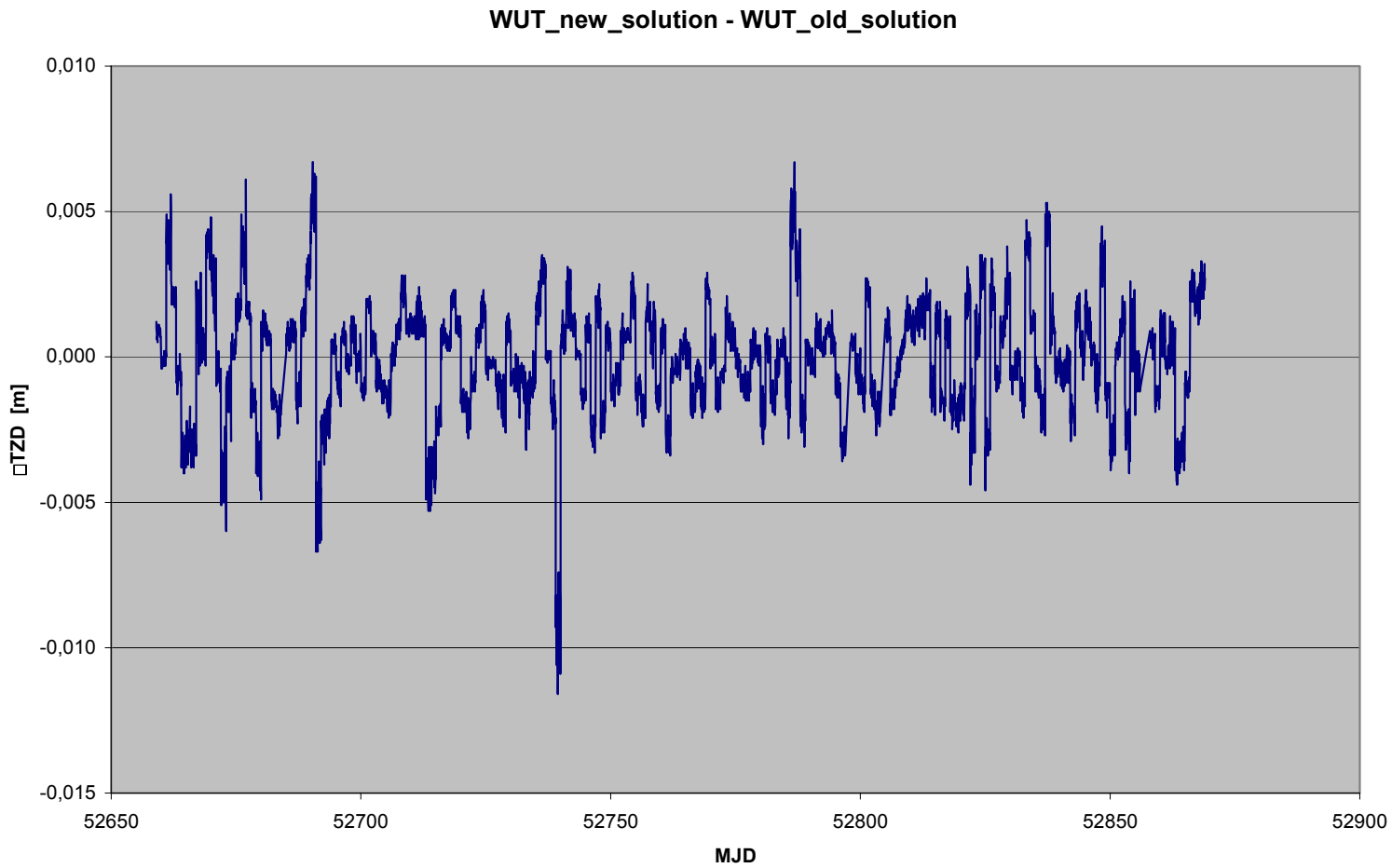
At first, the weekly solution is generated (stations' coordinates – the official product of WUT LAC). The tropospheric parameters are determined using the obtained values, considered as error-free, and applying ADDNEQ software and the prepared in advance normal equations files. The computational process is longer but the determined tropospheric parameters (TZD) are burdened with smaller errors. It my numeric analyses' were conducted was on appro folding from about 40 station EUREF / IGS



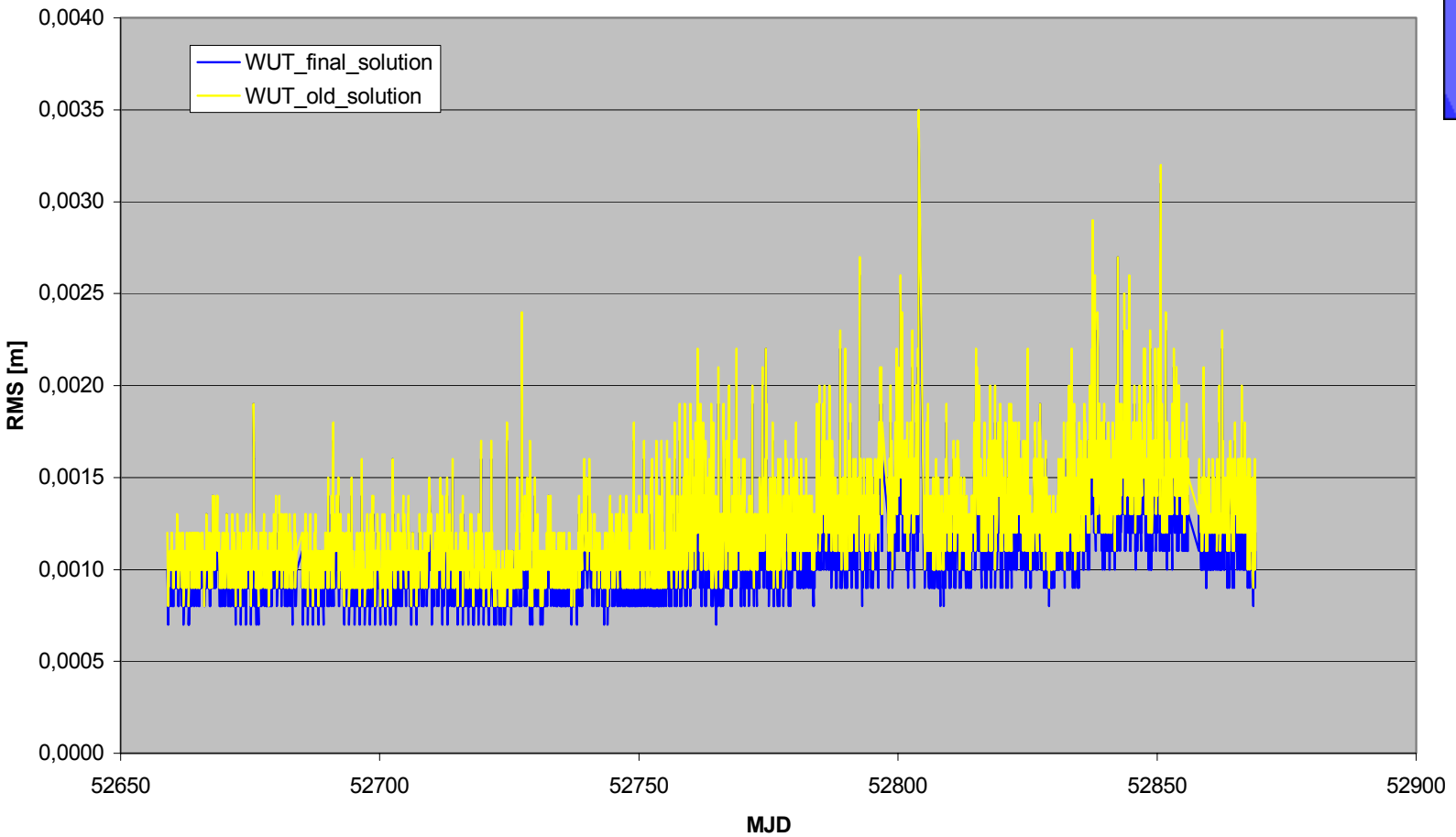
The figure presents TZD obtained according to the new and old computational strategies for Józefosław station.



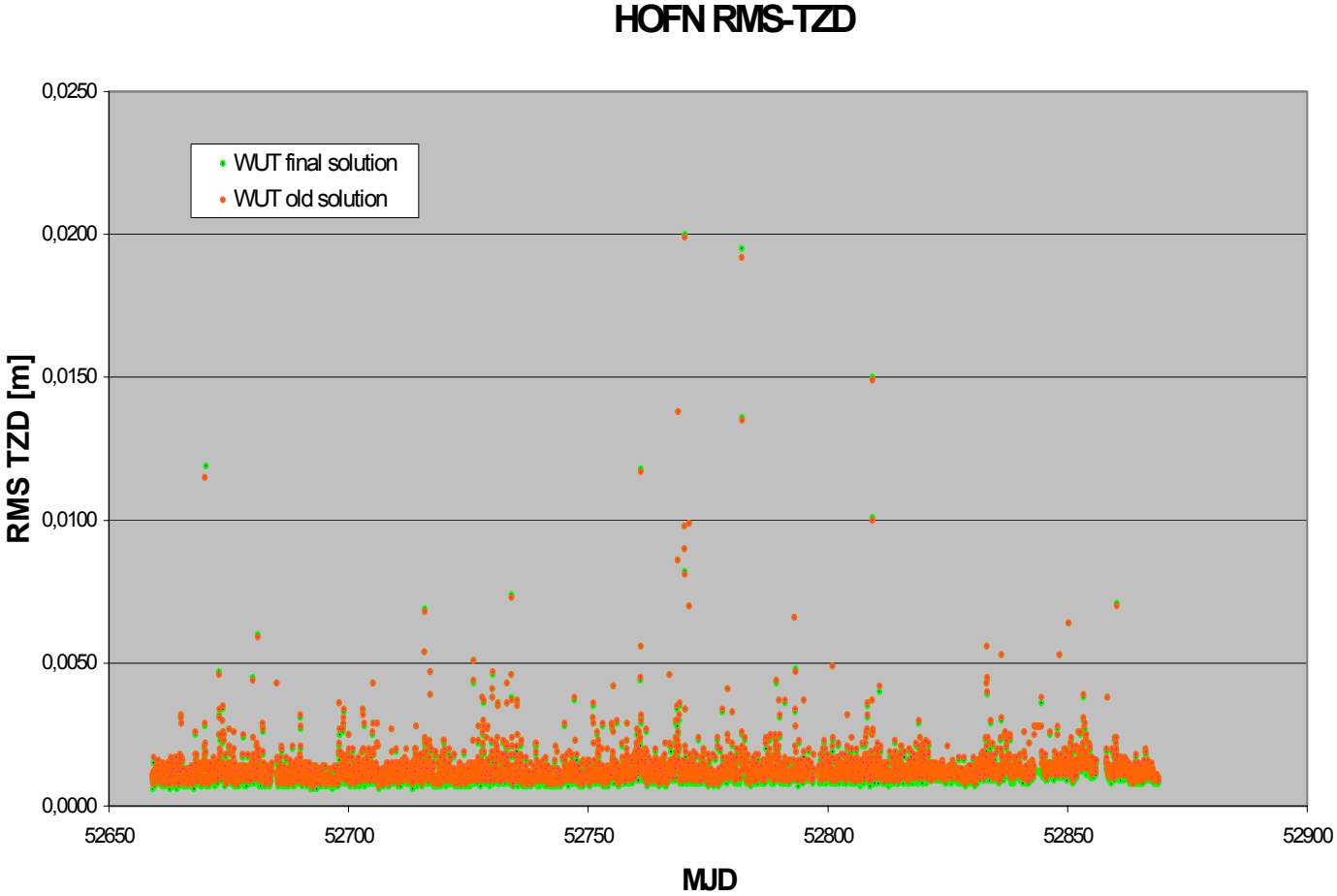
The figure presents TZD differences obtained according to the new and old computational strategies for HOFN station (Iceland).



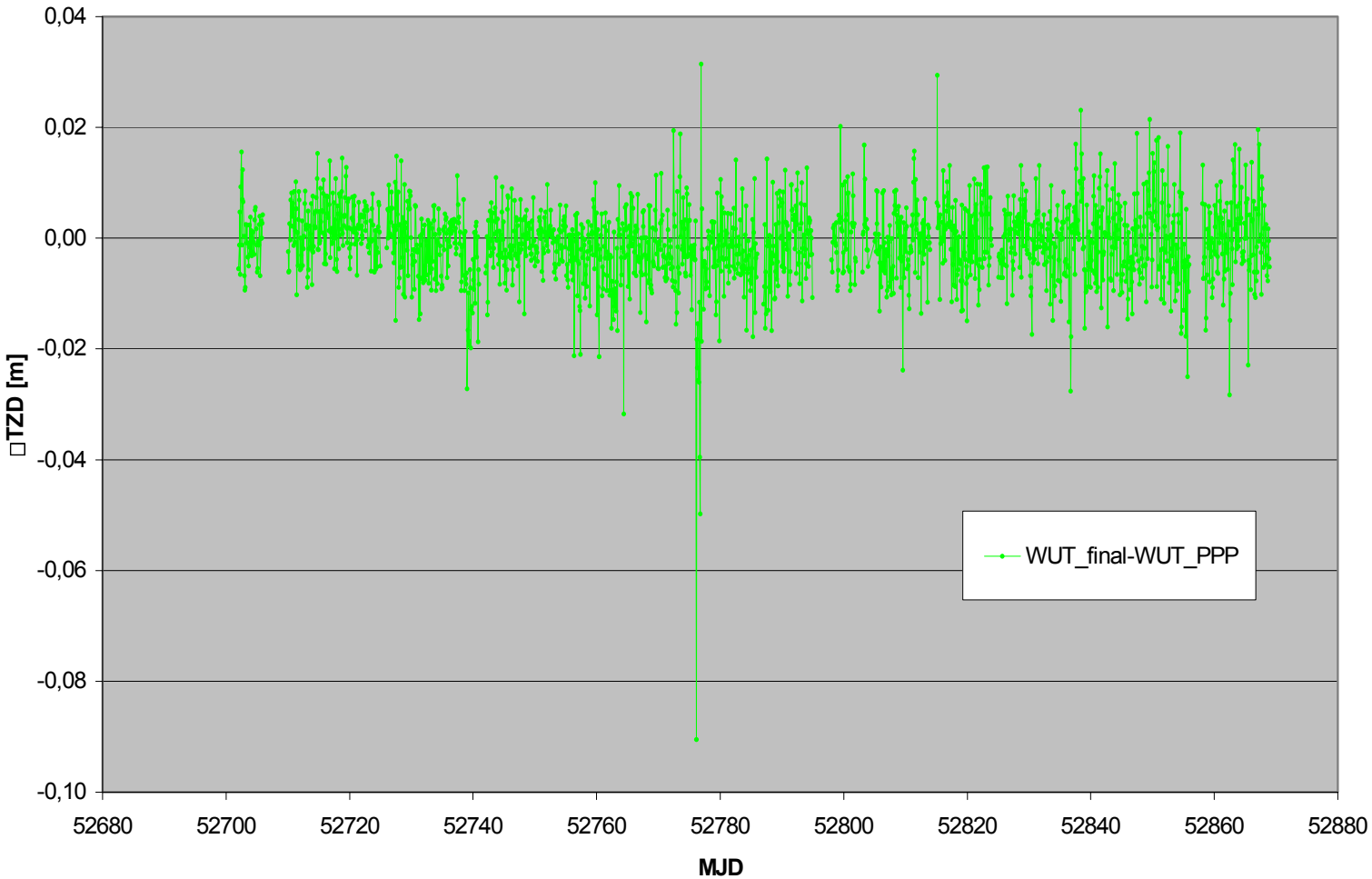
The figure presents TZD differences obtained according to the new and old computational strategies for Józefosław station.



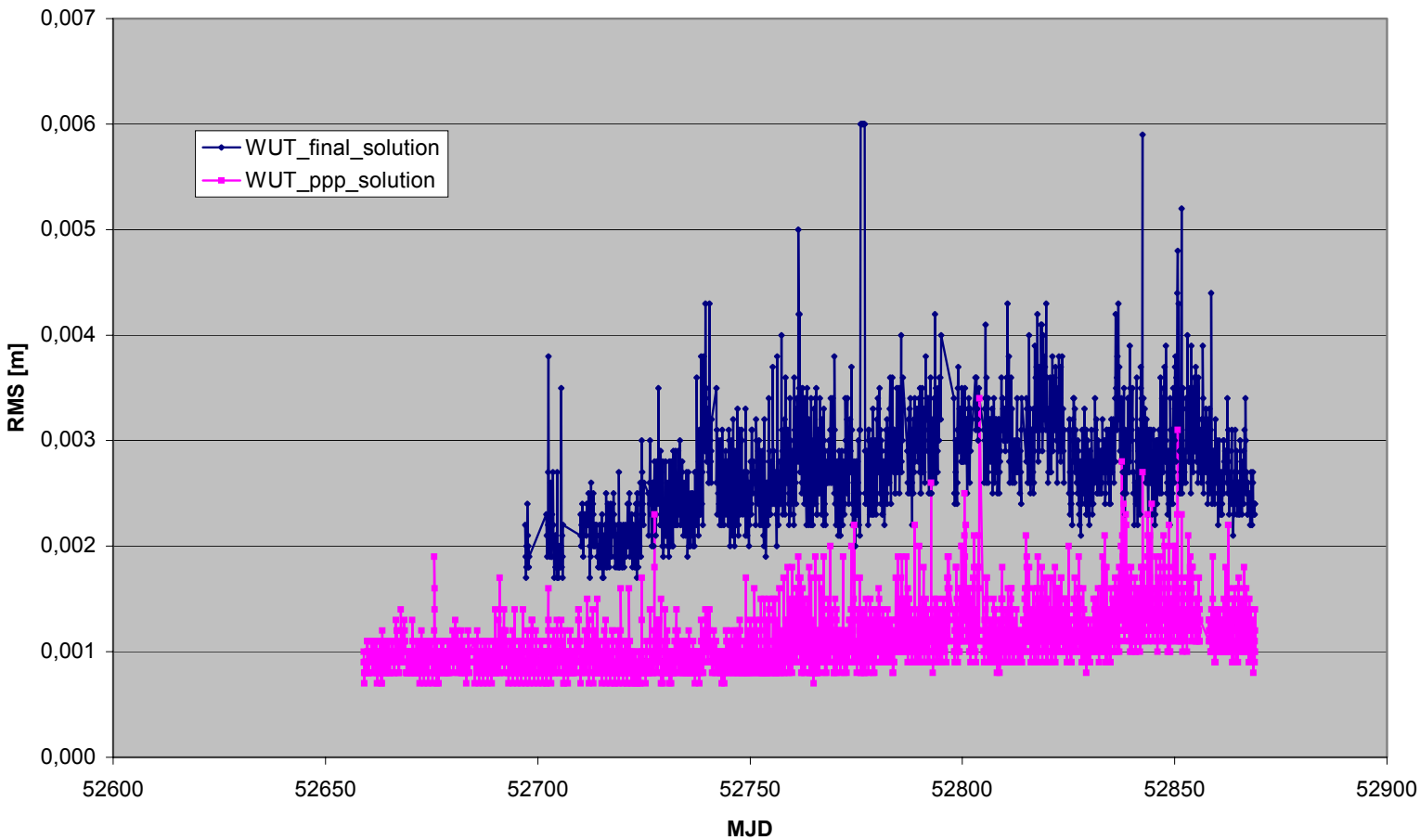
Temporal plot of RMS error change of TZD calculation for Józefosław station. The figure presents results obtained from WUT EUREF final solution – blue and yellow - WUT EUREF old strategy. Application of the new strategy of TZD computation resulted in increase of the solution precision from 0.9 mm to 0.7-0.8 mm.



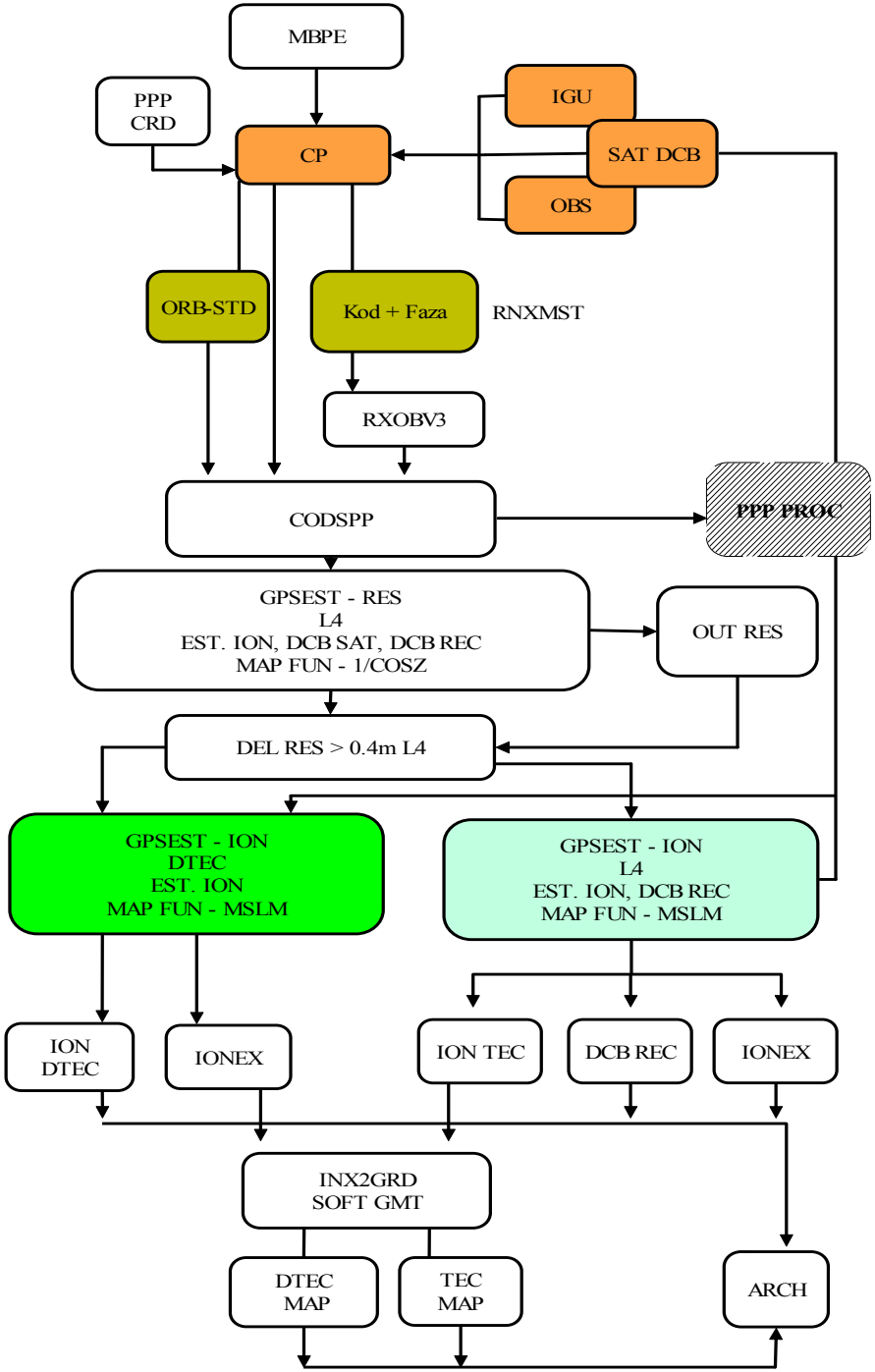
Temporal plot of RMS error change of TZD calculation for HOFN station. The figure presents results obtained from WUT EUREF final solution – green and red - WUT EUREF old strategy.



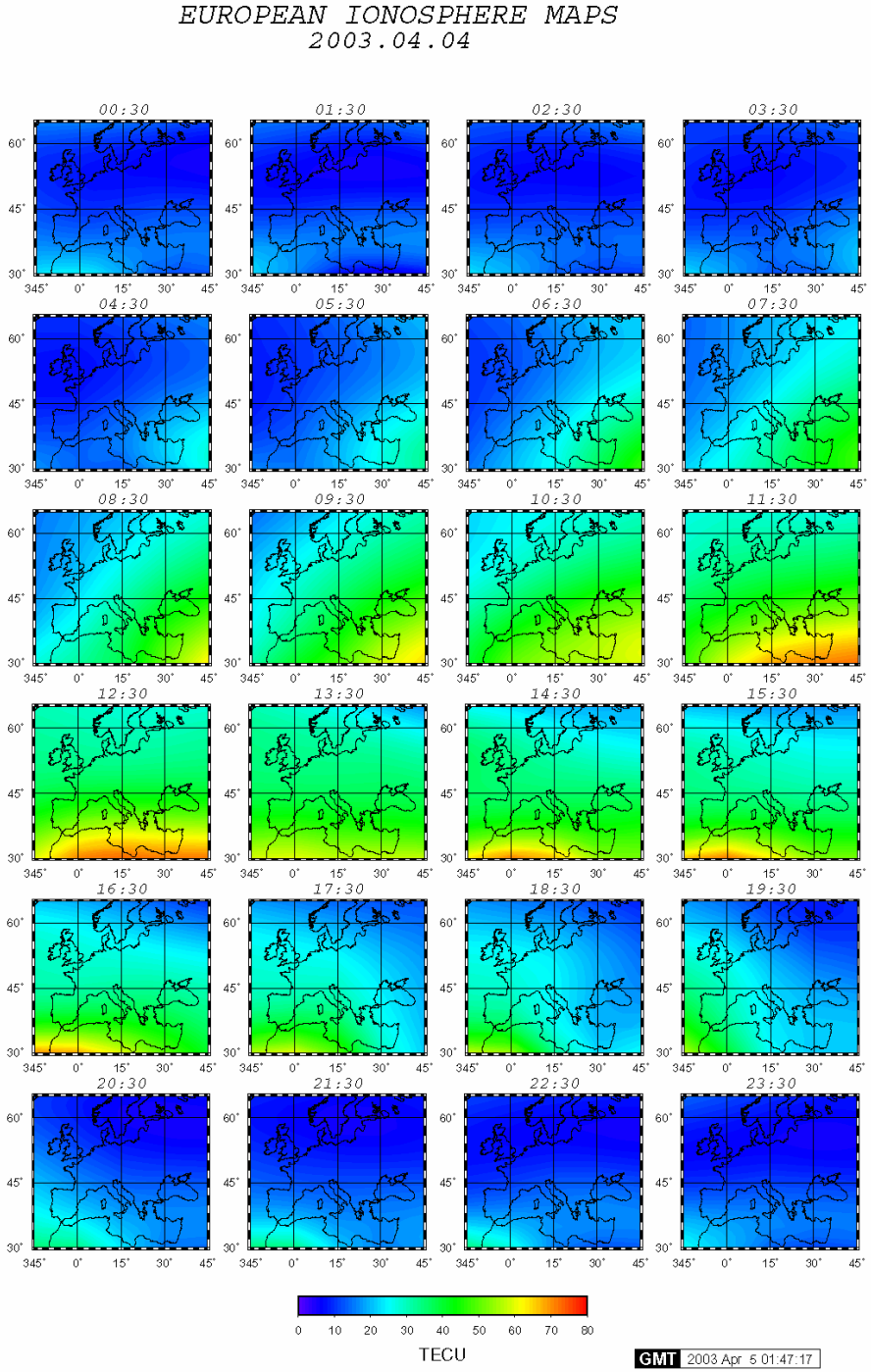
Plot of TZD differences obtained according to WUT EUREF final and WUT-PPP solutions. The series of TZD differences includes the first half of the 2003. The series of differences ranges from -0.15 to 0.15. The difference of about -0.9 m that occurred on modified julian day 52776 is an uncorrected computational error.



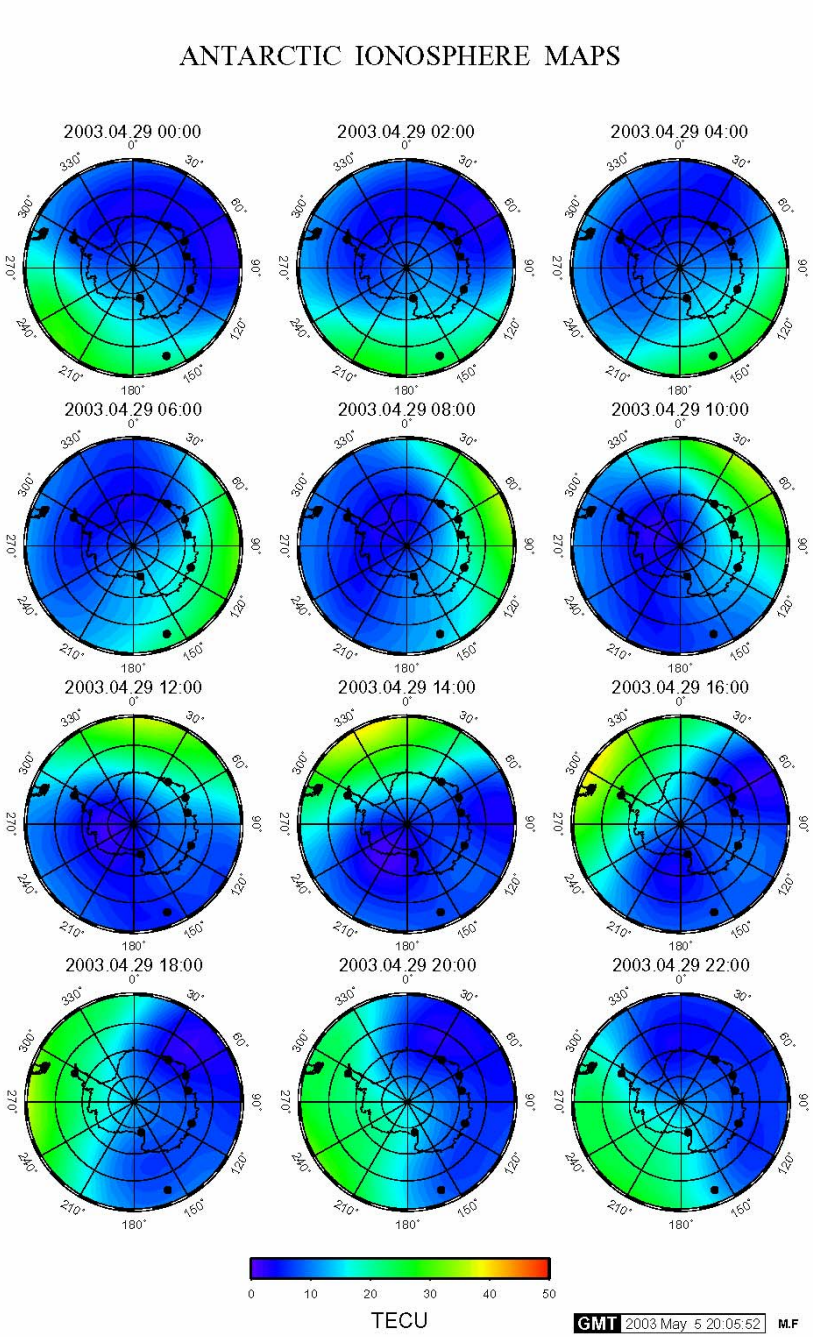
Plot of RMS error change of TZD calculation for Józefosław station. The figure presents results obtained from PPP solution – dark blue and WUT EUREF final. Application of PPP solution causes increase of the error of TZD calculation only up to the level of 3 mm as compared with 1 mm obtained from WUT EUREF solution



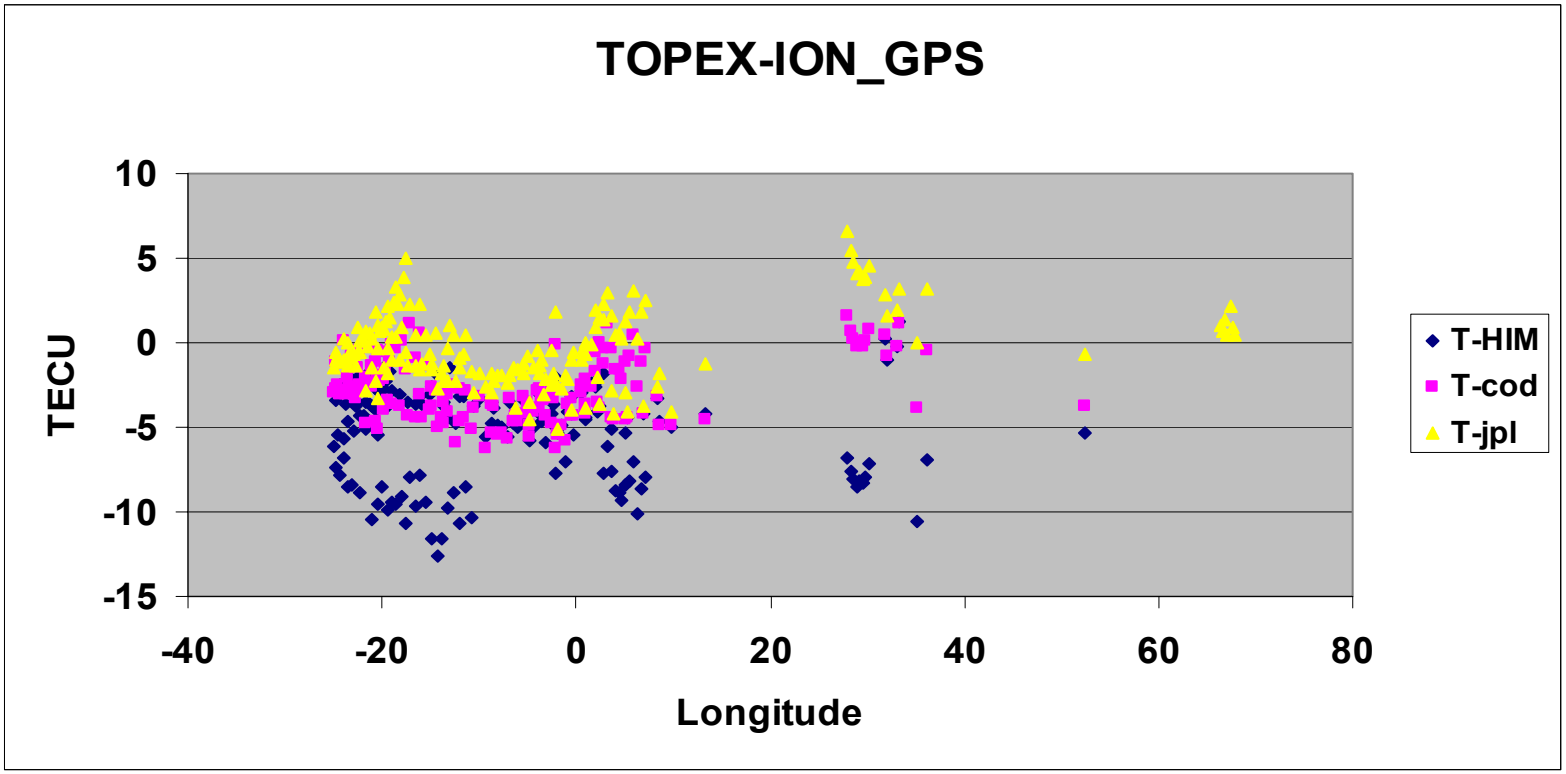
Scheme of one hour GPS processing strategy.



Ionospheric maps got with study one hour GPS observation. 2003.04.04



Antarctic ionosphereric maps obtained from the GPS observations , 2003.04.29.



The figure presents diffrences TEC obtained from TOPEX, CODE, JPL and WUT one hour ionosphere model (HIM).

Conclusions and future

- To improve the study of one hour GPS observations.
- The conduct the exact analyses' of calculacion the TZD with GPS and GLONASS observation.
- The conduct in process the analysis of the PPP strategy to the calculation TZD.