Preliminary results of the GNSS Campaign for integration of the ASG-EUPOS permanent stations with first order national geodetic networks

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Campaign 2010/2011

Measured points:

- permanent observations on 142 of EPN/IGS, ASG-EUPOS, SAPOS, LITPOS, SKPOS and CZEPOS stations
- field observations on:
    - 238 POLREF points
    - 4 EUVN points
    - 32 First order classical network points
    - 17 Direction points
    - 113 Eccentric station for ASG-EUPOS stations class A
    - 77 Eccentric stations for ASG-EUPOS stations class B

Campaign 2010/2011

Date of measurements:
The measurements were managed in 3 parts:

• **12.10.2010 – 14.11.2010** (stopped because of requirement that eccentric stations could be measured after 4 months from date of stabilisation)

• **07.12.2010 – 12.12.2010** (stopped because of weather conditions – hard frost, heavy snowfalls)

• **23.03.2011 – 04.04.2011**

Campaign 2010/2011

Observation sessions:

– permanent observations for ASG-EUPOS stations during campaign (24 hours from 0:00 UT till 24:00 UT)

– two sessions by 24 hours-observation (start 12:00 UT stop 12:00 UT) – main field points and eccentric stations class A

– two sessions by 2 hours-observations (minimum 1 hour of break between sessions) – direction points and eccentric stations class B

Campaign 2010/2011

Measurement conditions for field points:

- homogenous measurement equipment – Trimble R8 GNSS receivers
- continuous observation for 24 hour-sessions (the breaks longer than 60 minutes induce must of re-measurement)
- observation interval – 5 sec.
- elevation cut off for satellites – 0 deg.
- accuracy of antenna height measurements 0.005m
- centering accuracy 0.003m

Campaign 2008

Measured points:

- permanent observations on:
    - 97 ASG-EUPOS stations
    - 18 points of SAPOS, LITPOS, SKPOS and CZEPOS
    - 20 EPN/IGS points
- field observations on:
    - 8 EUREF-POL points
    - 102 POLREF points
    - 41 EUVN points

Campaign 2008

Date of measurements:

23.04.2008 – 11.05.2008

Observation sessions:

– permanent observations for ASG-EUPOS stations during campaign (24 hours from 0:00 UT till 24:00 UT)

– 7 days of permanent observations for EUREF-POL points (24 hours from 0:00 UT till 24:00 UT)

– two sessions by 24-hours observation (start 12:00 UT stop 12:00 UT) – main field points

Campaign 2008

Measurement conditions for field points:

- homogenous measurement equipment – Trimble R8 GPS receivers
- continuous observation for 24 hour-sessions (the breaks longer than 60 minutes induce must of re-measurement)
- observation interval – 5 sec.
- elevation cut off for satellites – 0 deg.
- accuracy of antenna height measurements 0.005m
- centering accuracy 0.003m

Processing

Type of processing for campaign 2010/2011:

GPS observations for permanent stations and main field points measured in campaign 2010/2011

- GPS observations for permanent stations and main field points measured in campaigns 2008 and 2010/2011
- GPS and GLONASS observations for permanent stations and main field points measured in campaign 2010/2011
- Observations for direction points and eccentric stations class B processed with reference to main points

Type of processing for campaign 2008:

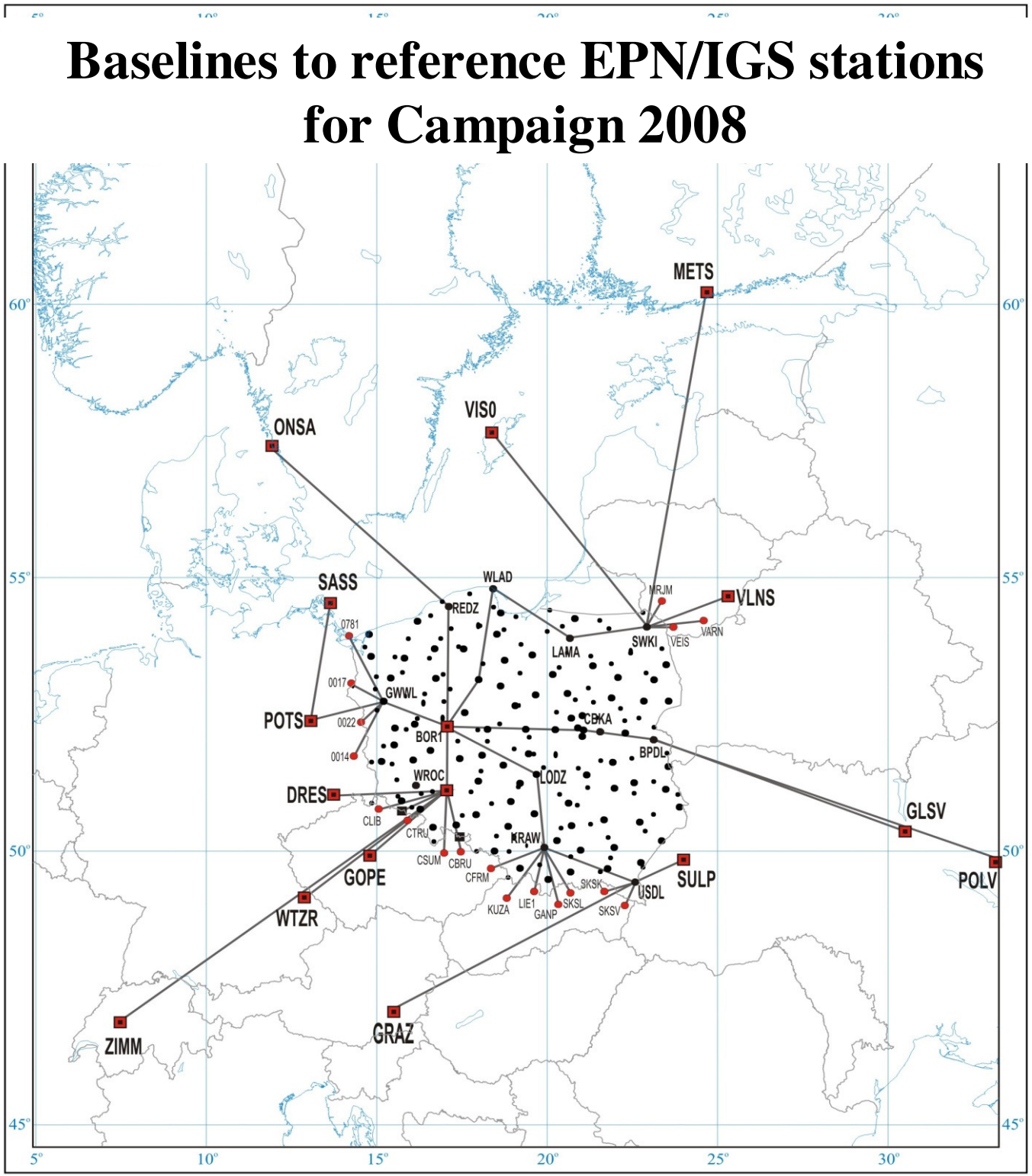
GPS observations for permanent stations and main field points measured in campaign 2010/2011

Processing

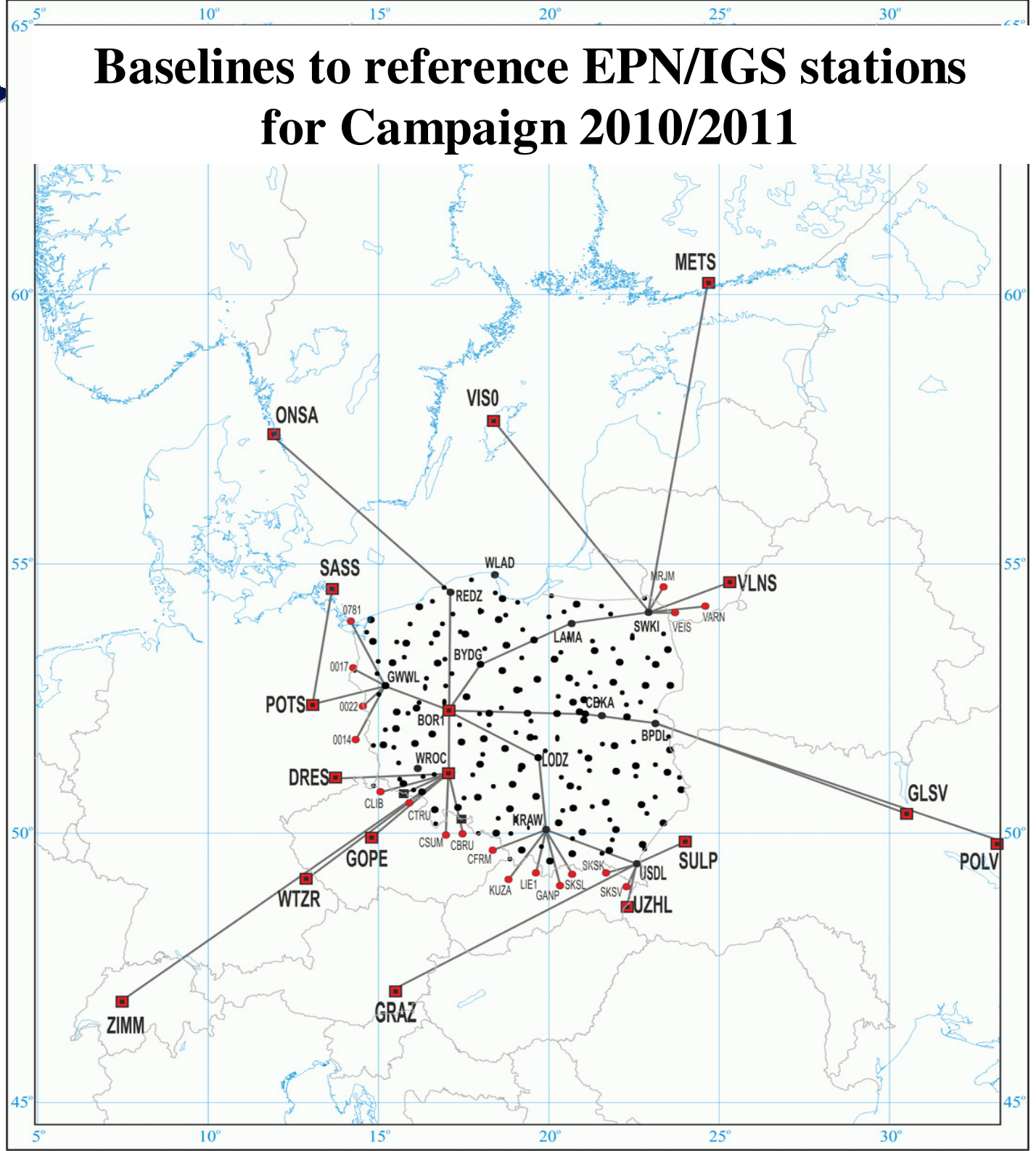
Processing parameters:

- Bernese GPS Software ver. 5.0
- ITRF 2005 for epoch of campaign
- Final IGS orbits
- IGS ERP
- two variants for elevation cut off:
    - 5 deg
    - 10 deg
    - 15 deg (only for campaign 2008)
- observation interval 30 sec.
- tropospheric corrections - NMF
- models:
    - Sun and Moon ephemeris – DE405
    - Precession and Nutation parameters – standard IAU2000
    - Tidal model – IERS2000
    - Ocean loading effect – FE2004
    - Phase center variation absolute model – EPN_05.ATX

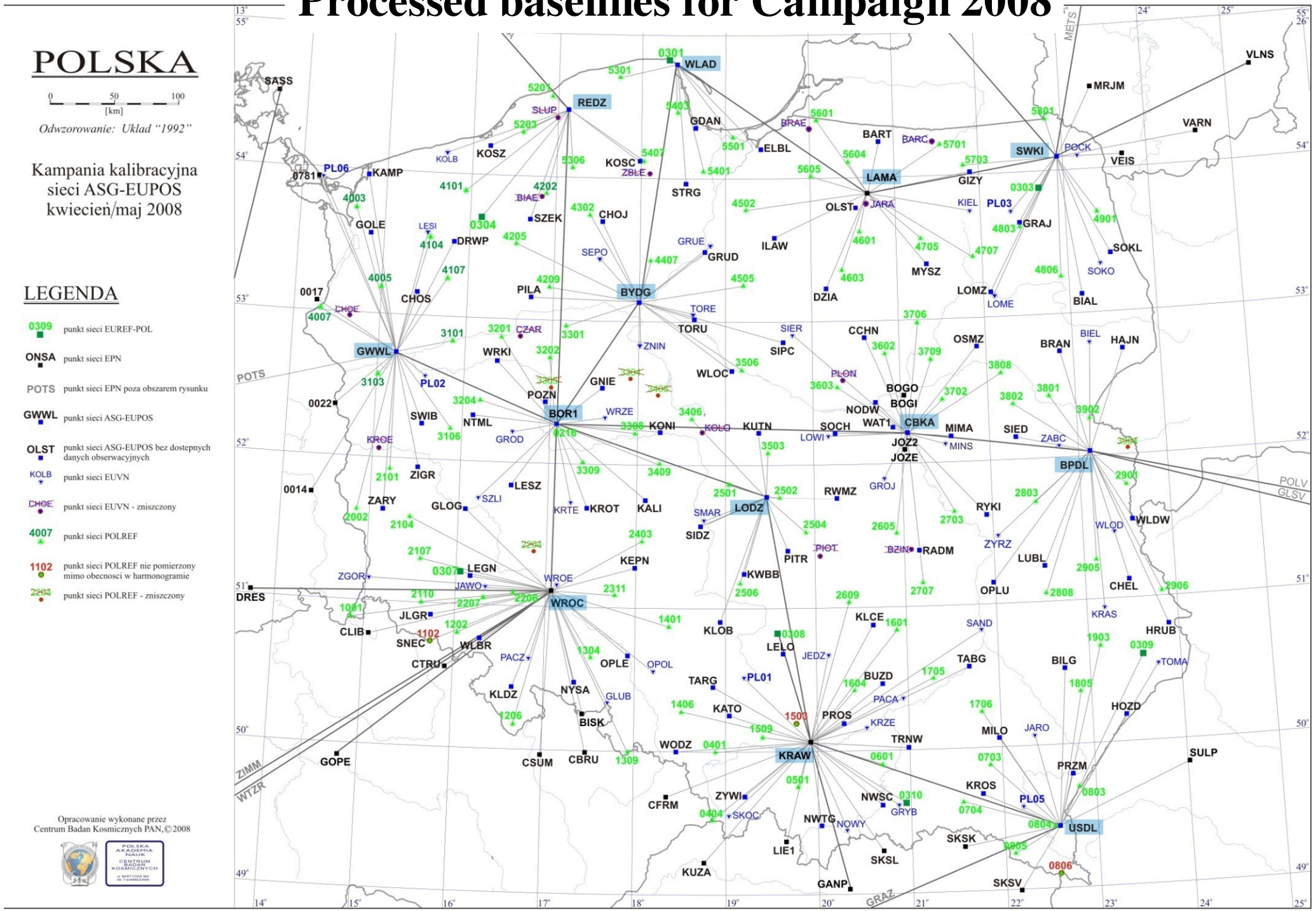
Baselines to reference EPN/IGS stations for Campaign 2008



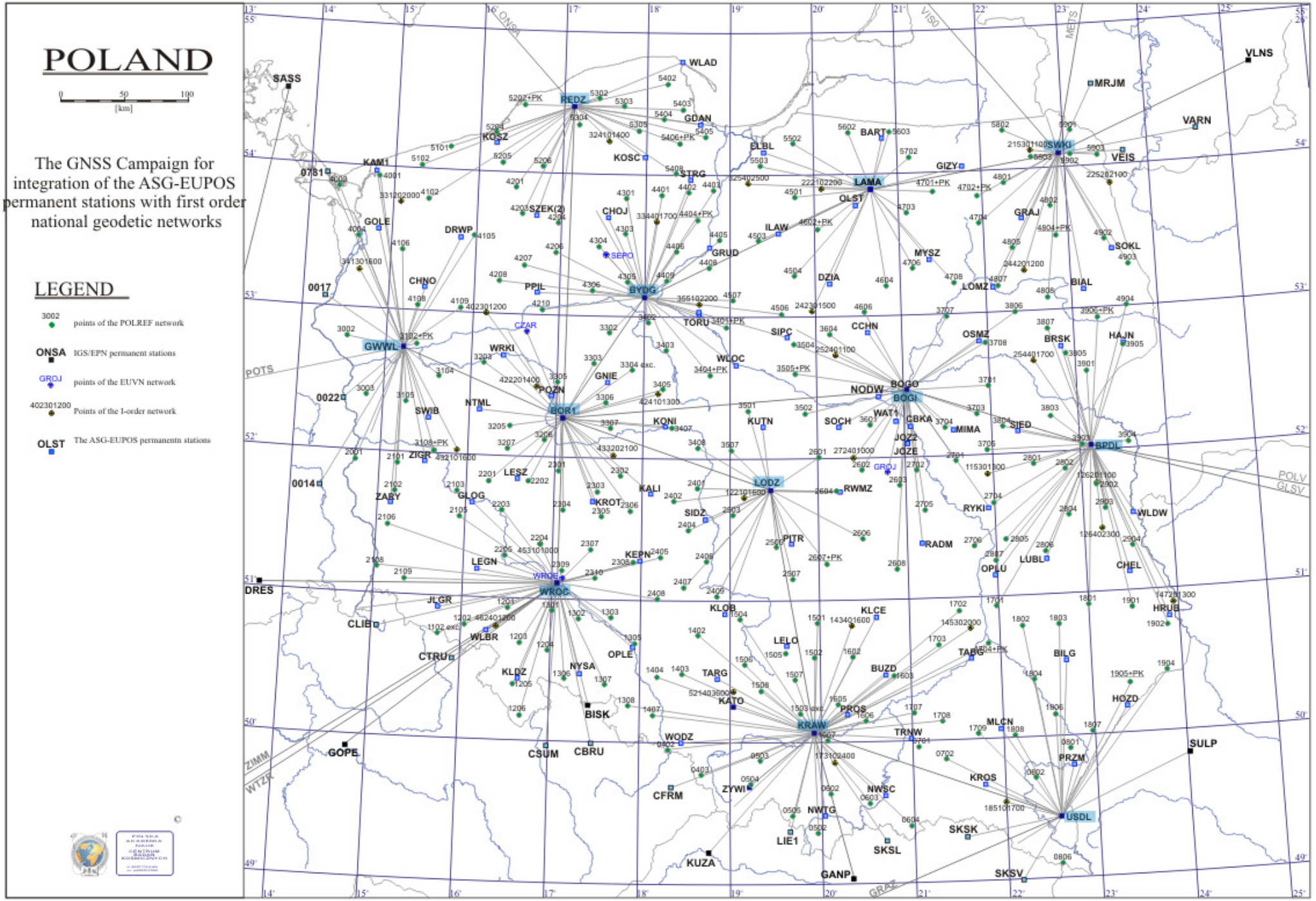
Baselines to reference EPN/IGS stations for Campaign 2010/2011



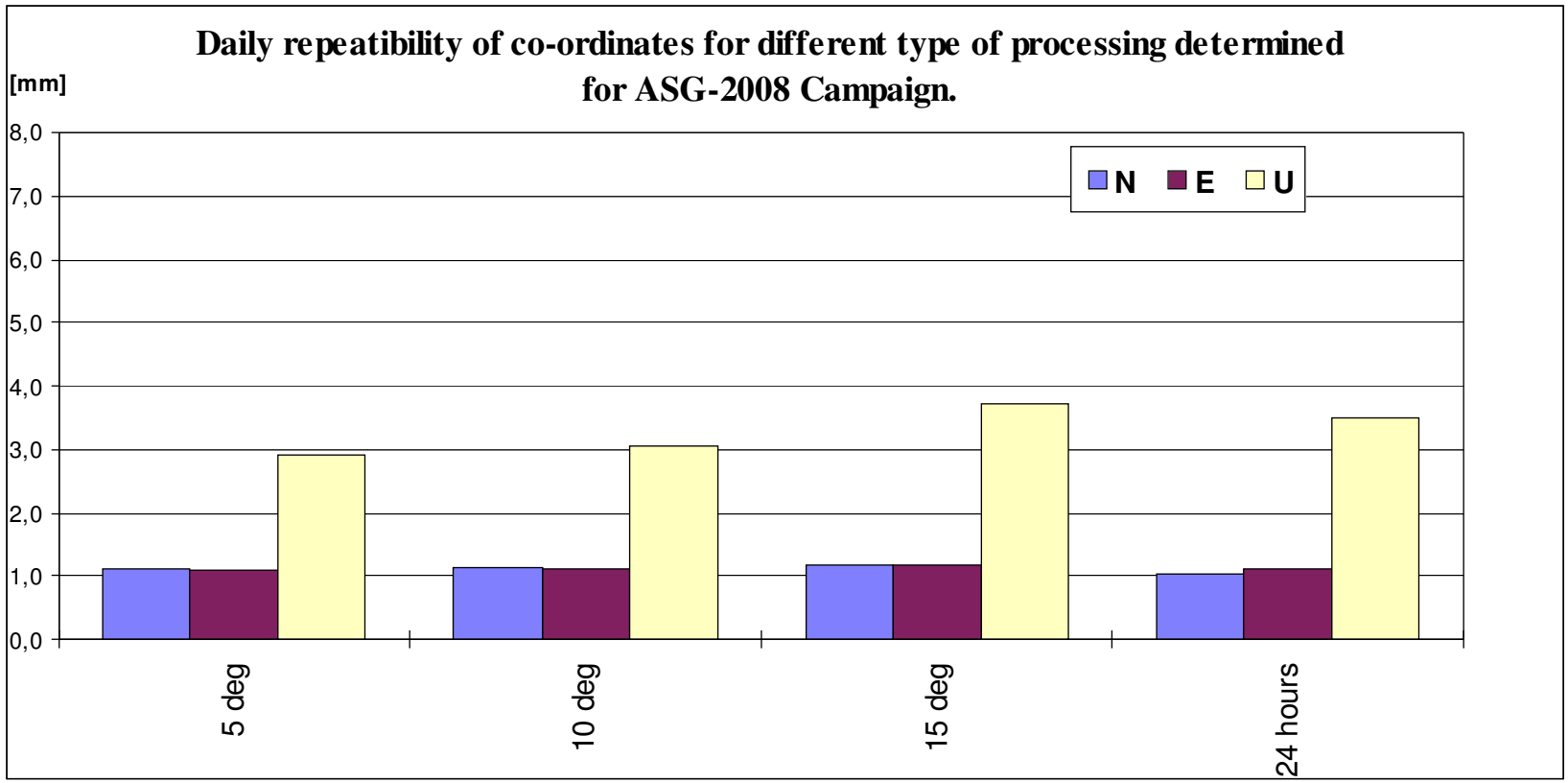
Processed baselines for Campaign 2008



Processed baselines for Campaign 2010/2011



Daily repeatability of station co-ordinates



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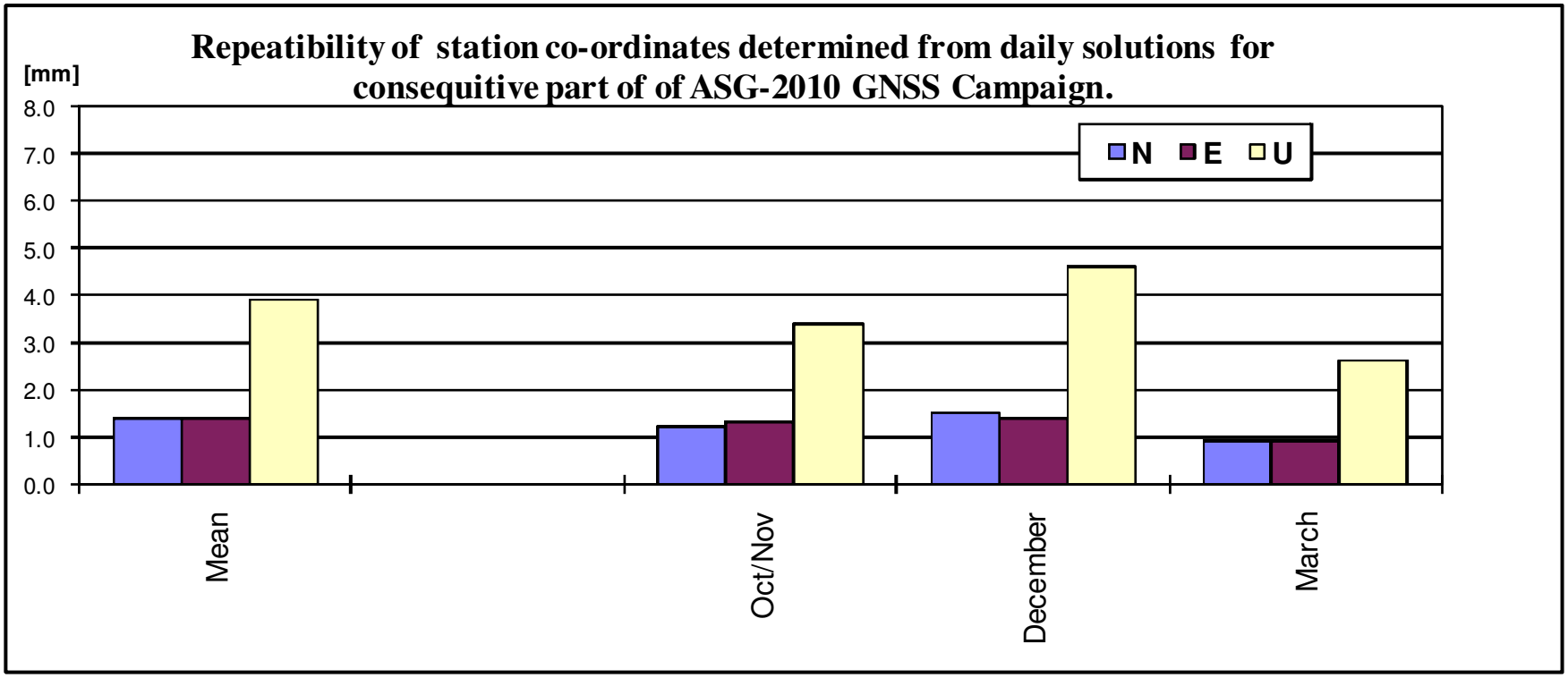
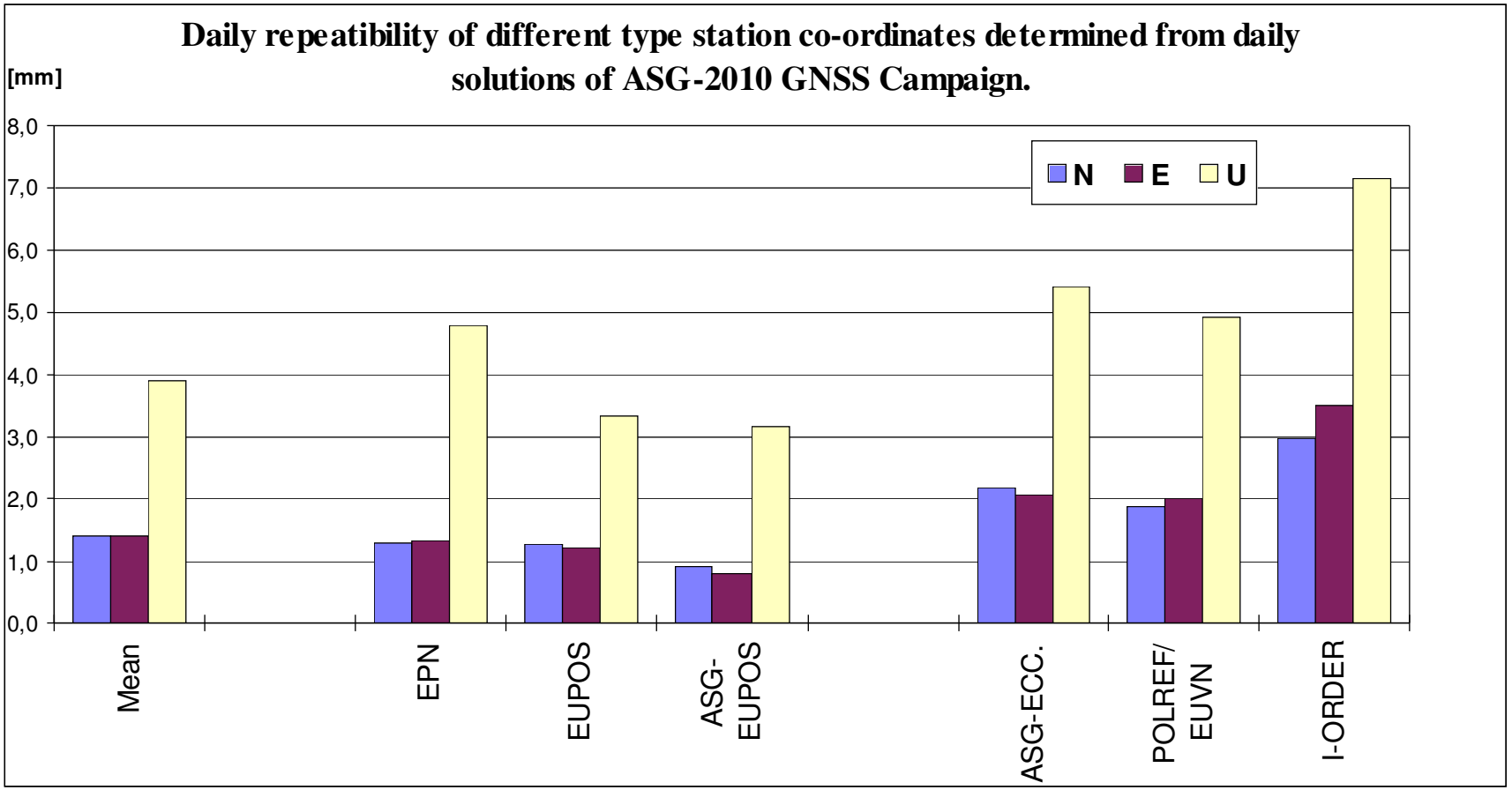


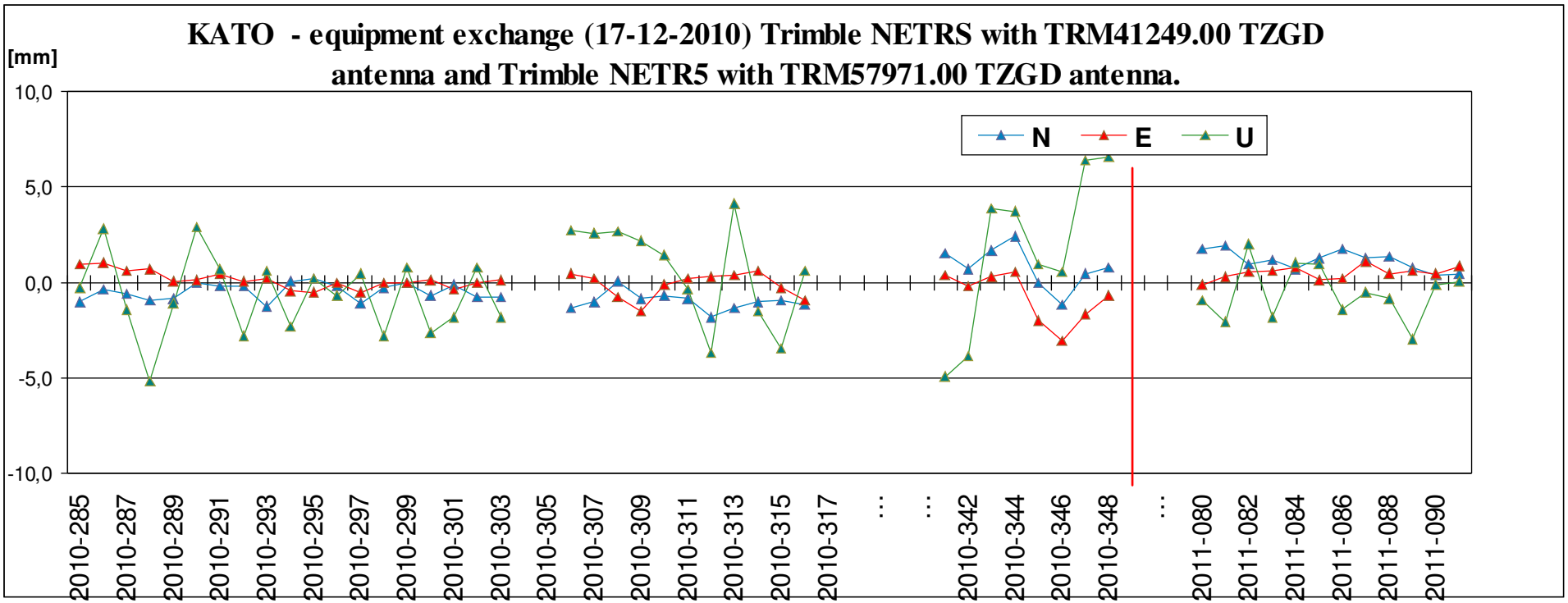
Daily repeatability of station co-ordinates



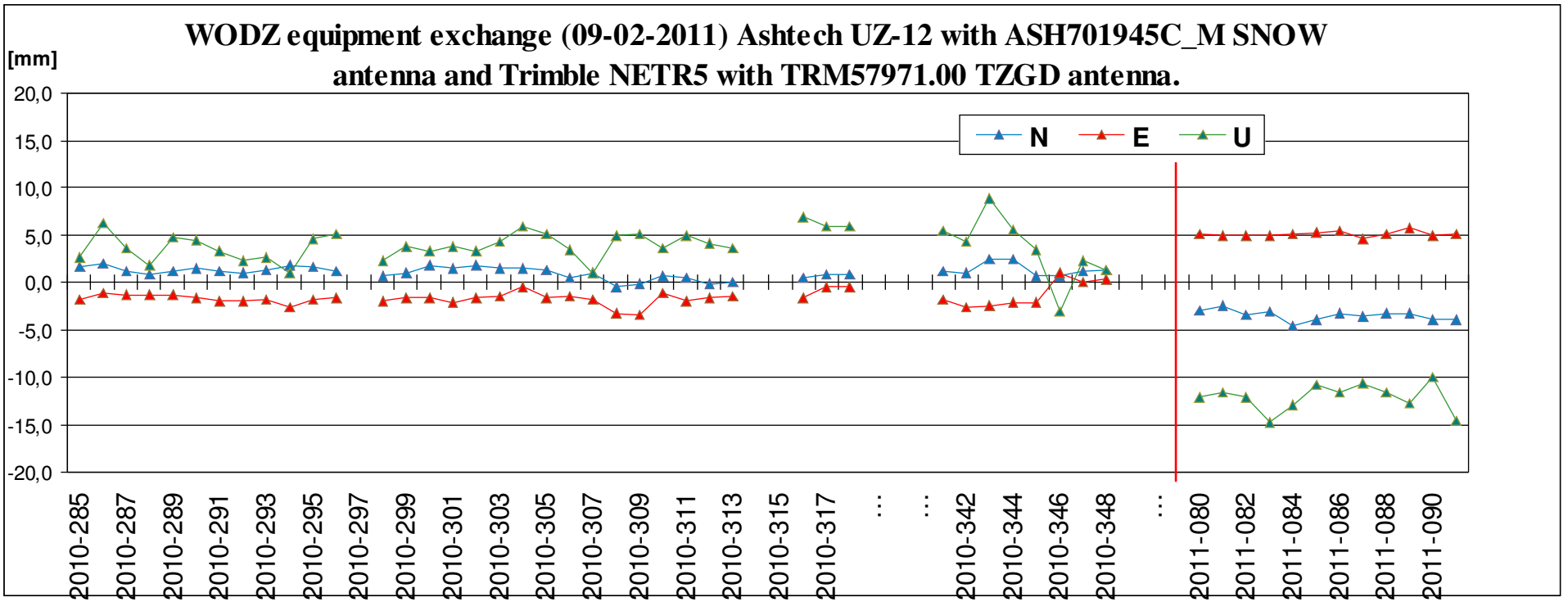
View of horizon for point I324

View of horizon for point I344

Equipment exchange during Campaign 2010/2011



Equipment exchange during Campaign 2010/2011



Conclusions

Presented results are preliminary, but obtained accuracy seems to be very good.

Unfortunately, the First order classical network points – were selected without full information about local horizon for satellite measurements. They increase the noise of repeatability of co-ordinates and means errors of solution.

We hope that final solution and integration of solutions from both campaigns (2008 and 2010/2011) will give the satisfying results.