



Centre of Applied Geomatics (CAG) scientific activities



MUT LAC Report



MUT



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Center of Applied Geomatics



Weekly processing of the EPN subnetwork since 2009 (Military University of Technology Local Analysis Centre – MUT LAC)

- Standard products –weekly and daily coordinates (SINEX)
- Troposphere TZD (tropospheric SINEX format)

Participation to in the EPN Reprocessing project;

Control Processing of the data from national GNSS network ASG-EUPOS to realize ETRS89 (European Terrestrial Reference System) in Poland;

- Alternative to the HOGC solution (control)





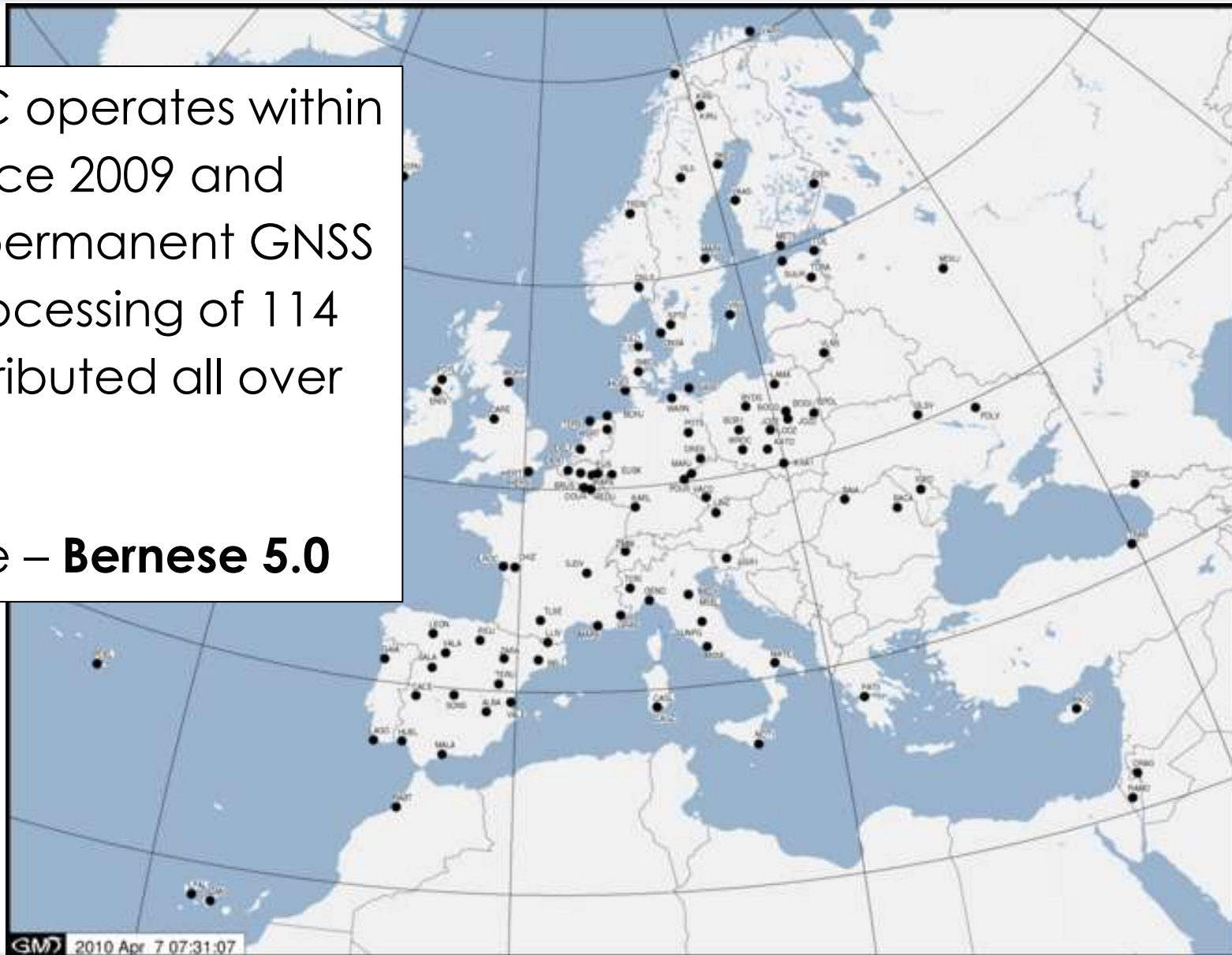
Other activities

- Processing of the data from **commercial** GNSS networks;
- **Numerical weather prediction models** (COAMPS and WRF) application for ionosphere and troposphere investigations;
- Analyzes of the geodetic **time-series**;
- Application of precise GNSS measurements for **engineering purposes**.



MUT LAC operates within CAG since 2009 and makes permanent GNSS data processing of 114 sites distributed all over Europe.

Software – **Bernese 5.0**





Project aimed at reprocessing of archival GPS observations gathered by all EPN sites using the newest models and softwares.



<http://www.epncb.oma.be>

Cluster „FENIX”36x64bites core



- 16 nodes HP Server rx1620 (Intel Intanium 2 1.6GHZ ; 4GB RAM; 36GB SCSI) and storage 8TB.
- HP ProLiant DL380 G6 (2xIntel Xeon Nahalem X5570 2.93GHz 4 cores each; 8GB RAM; 584GB SAS)
- HP ProLiant DL380 G7 (2xIntel Xeon Westmere X5680 3.33GHz 6 core each; 12GB RAM; 584GB SAS, 500GB SATA)

The maximum power of cluster processing is about

500 GFLOP

Cluster works under control of 64-bites GNU/Linux operating system with the latest 2.6. nucleus. The Debian GNU/Linux 5.0 Lenny was used as a distribution of GNU/Linux system. The 9TB hdd storage is cooperating with the cluster.

It Software:**Bernese** GPS software v5.0, COAMPS 3.1/3.4, GAMIT/GLOBK 10.35/10.4, Femlab 3.0.are fully exploiting capabilities of the 64-bites architecture.



Time processing – Bernese 5.0



| Platform | Compiler | Processing Time [min] |
|----------------------------|--------------------|-----------------------|
| IA-64 (8 CPU) | g95 | 54:51 |
| IA-64 (8 CPU) | gfortran | 54:38 |
| IA-64 (8 CPU) | Intel fortran 7.0 | 50:30 |
| IA-64 (8 CPU) | Intel Fortran 11.1 | 42:40 |
| Nahalem X5570 (2CPUx4core) | Lahey fortran 8.1 | 27:10 |
| Nahalem X5570 (2CPUx4core) | Intel Fortran 11.1 | 14:49 |
| Nahalem X5680 (2CPUx6core) | Intel Fortran 11.1 | 12:10 |

All processing for the reprocessing is time consuming. We tried to shorten this time using the latest available technologies. Using the latest Intel Nahalem processors allowed to shorten the time needed for calculation.

Table shows the processing time depending on used processor and compiler.





GAMIT/GLOBK

Two centres in Europe:

1. **CAG MUT**
2. **Landmåteriet (Sweden)**

EPN network was divided into 7 sub-networks

CAG processes 3 of them (totally **138 sites**)

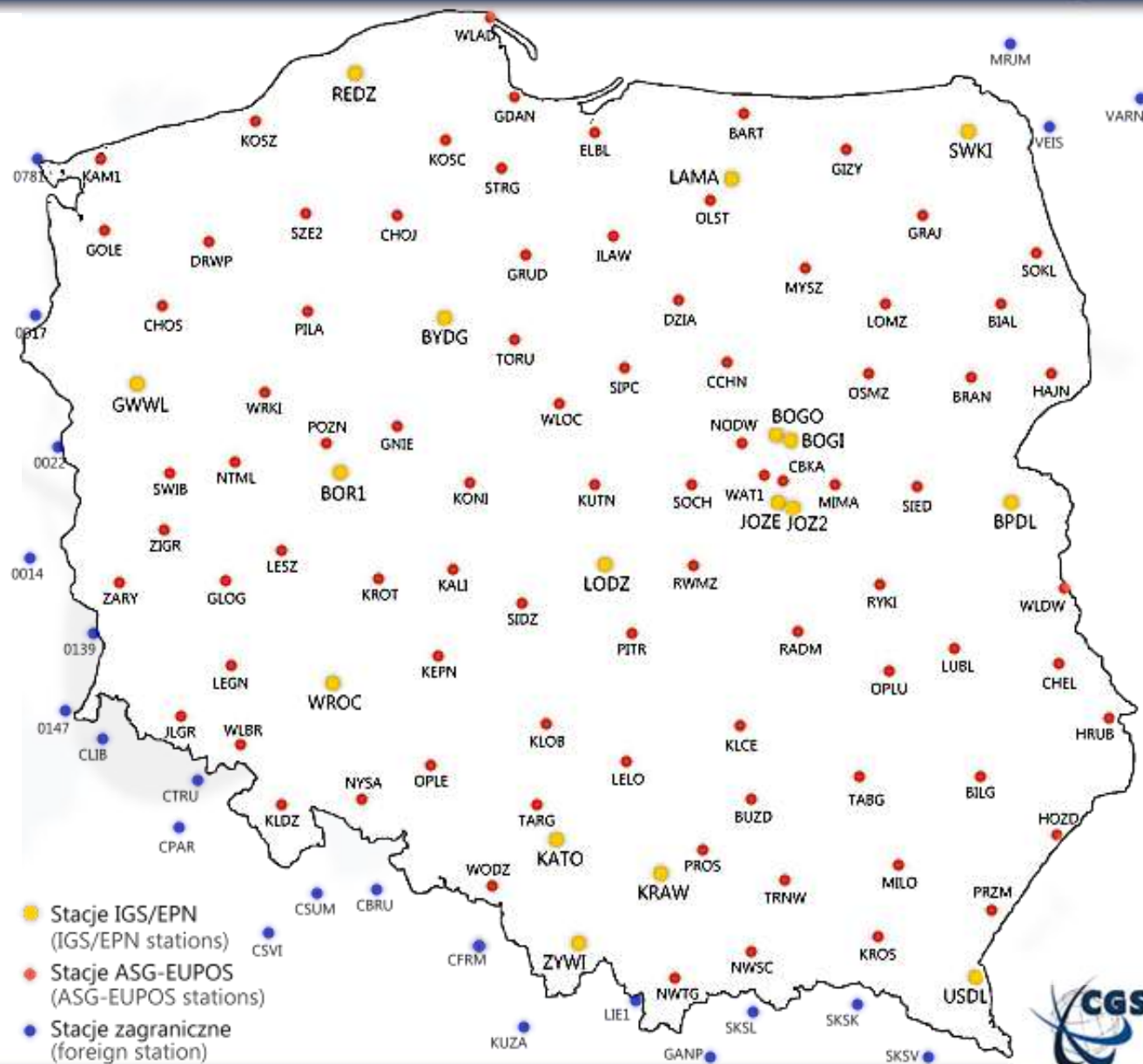




Realisation of ETRS'89 in Poland



ASG-EUPOS (Active Geodetic Network European Positioning System)
- multifunctional precise satellite positioning system established by the Polish Head Office of Geodesy and Cartography in **2008**, consisting of more than 120 GNSS sites.





SOLUTIONS

(North, East, Up for each analyzed site)

weekly
(for each week)

- processing similar to **EPN** (could be joined);
- for **ETRS'89 realization** and determination of velocity field
- **cumulative solutions** – for determination of the most accurate coordinates

daily
(for each day)

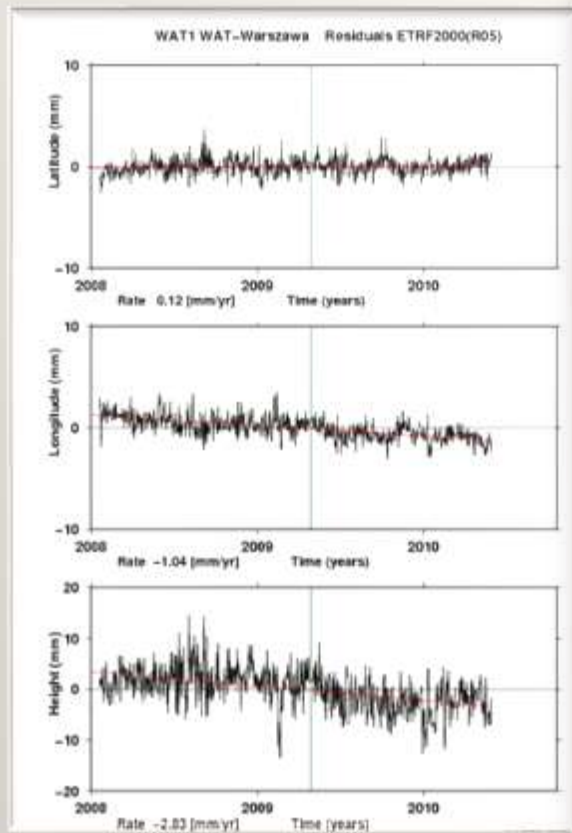
- **monitoring** of the system;
- analyses of the factors which decrease accuracy of the position.

sub-daily
(for each hour)

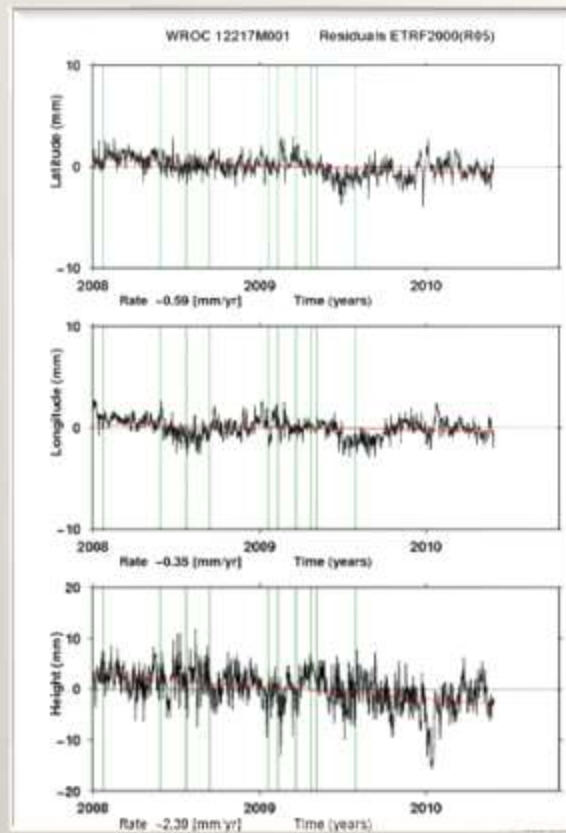
- for **verification** of the models used in the data processing.



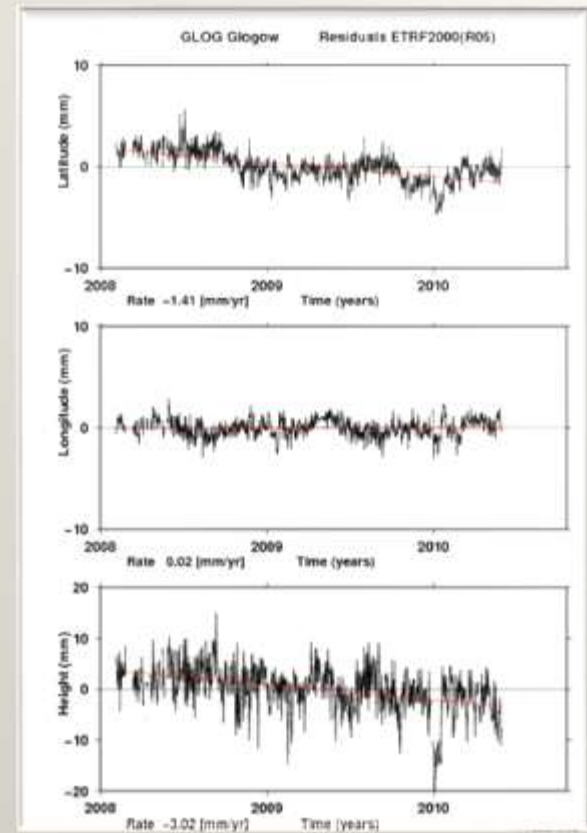
Determination of the station's stability



WAT



WROCŁAW



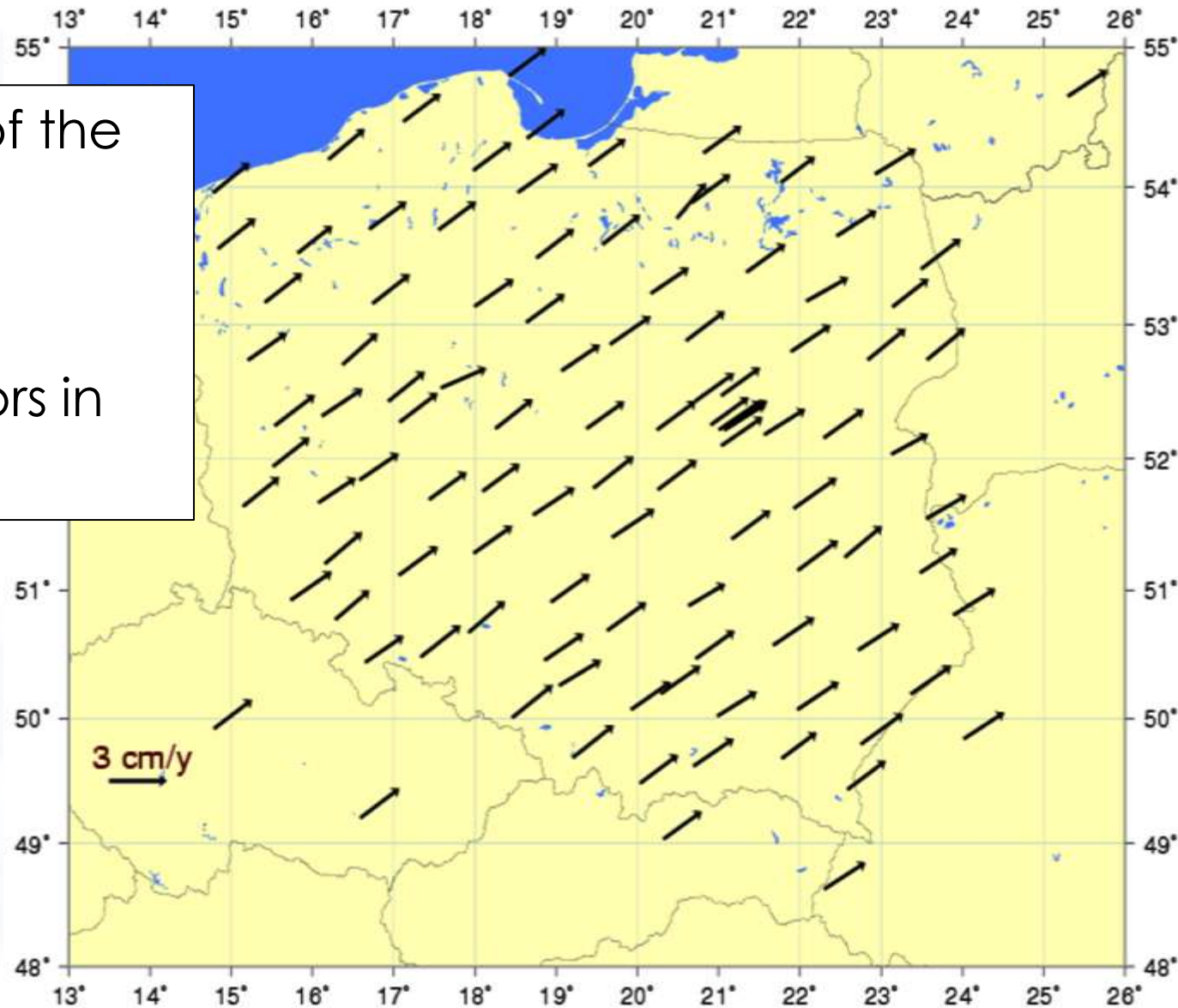
GŁOGÓW





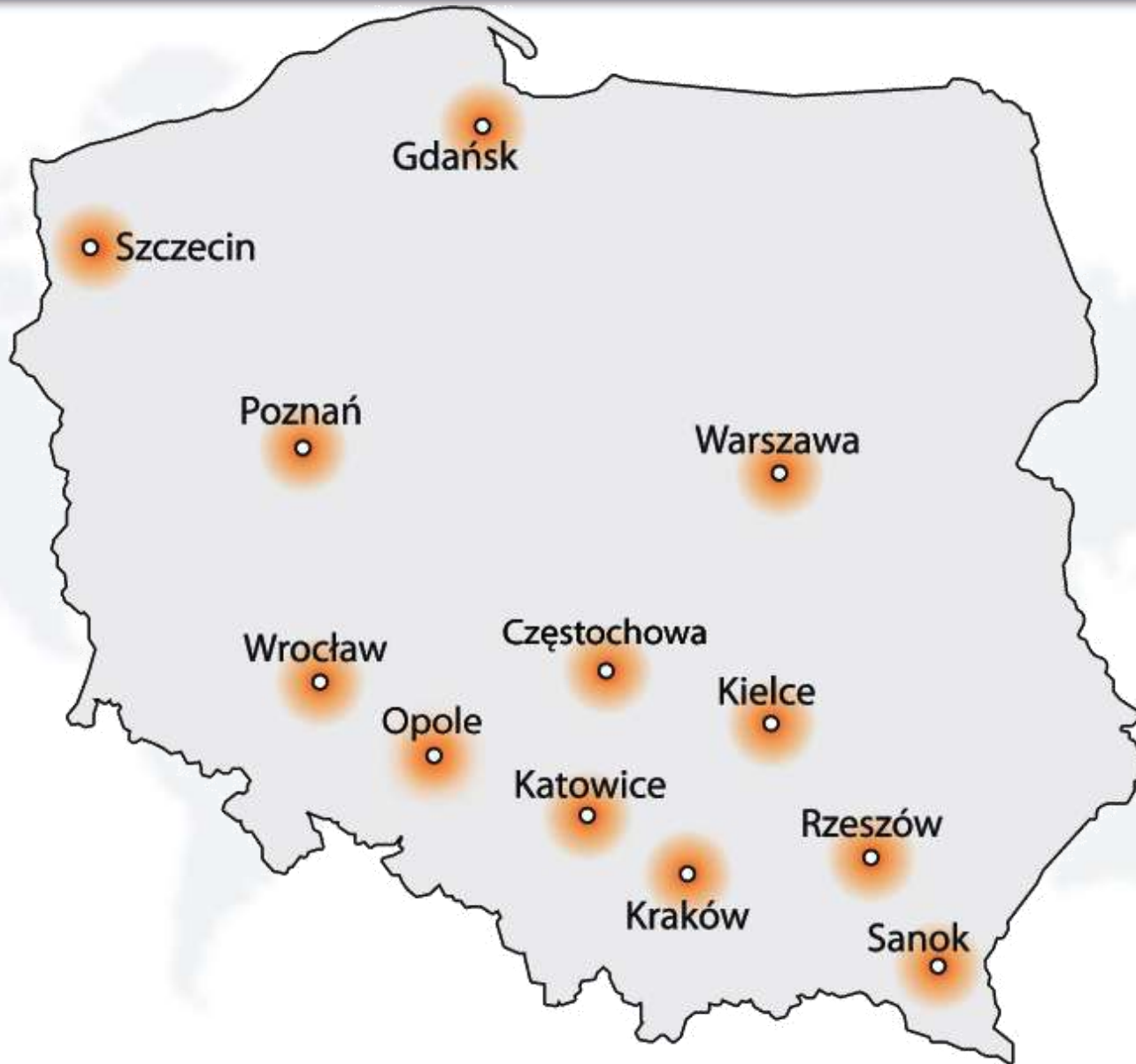
Determination of the geodynamical parameters:

- velocity vectors in ITRF2005;





Monitoring of the TPI commercial GNSS network

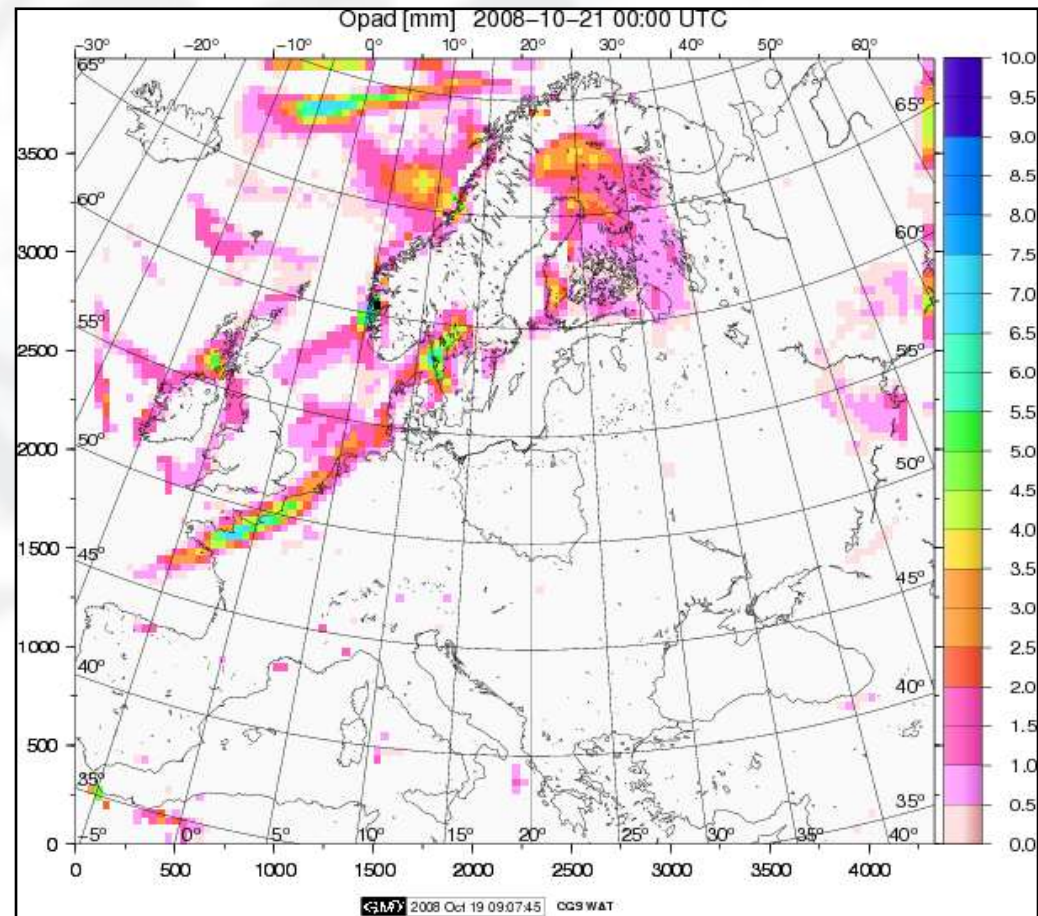
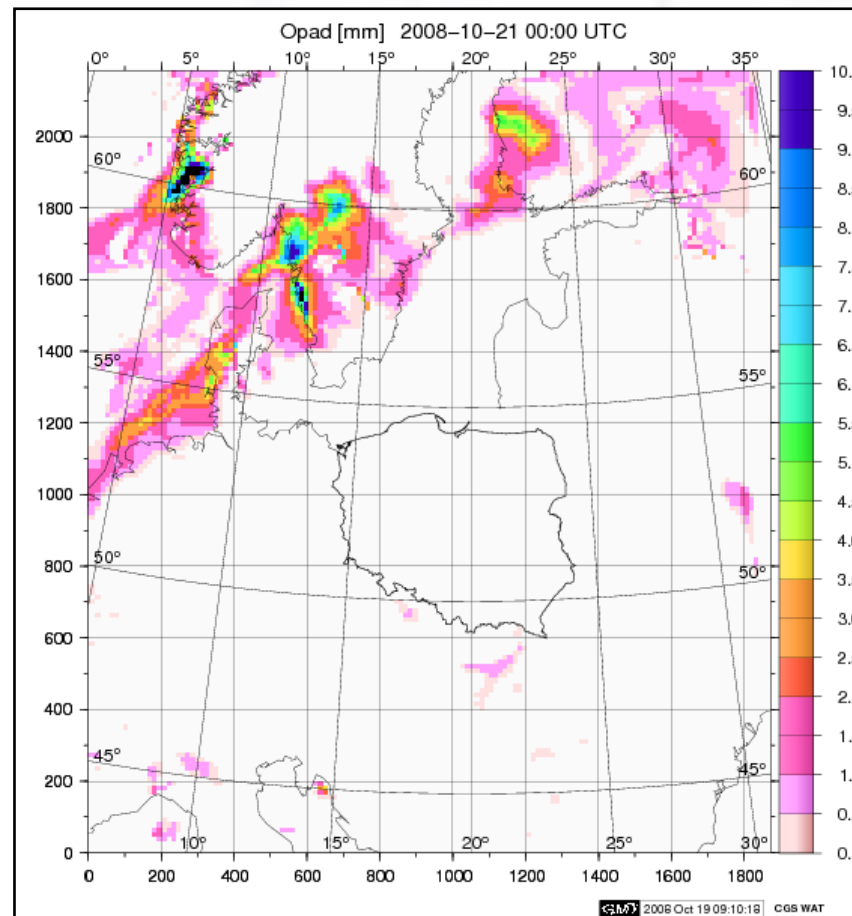




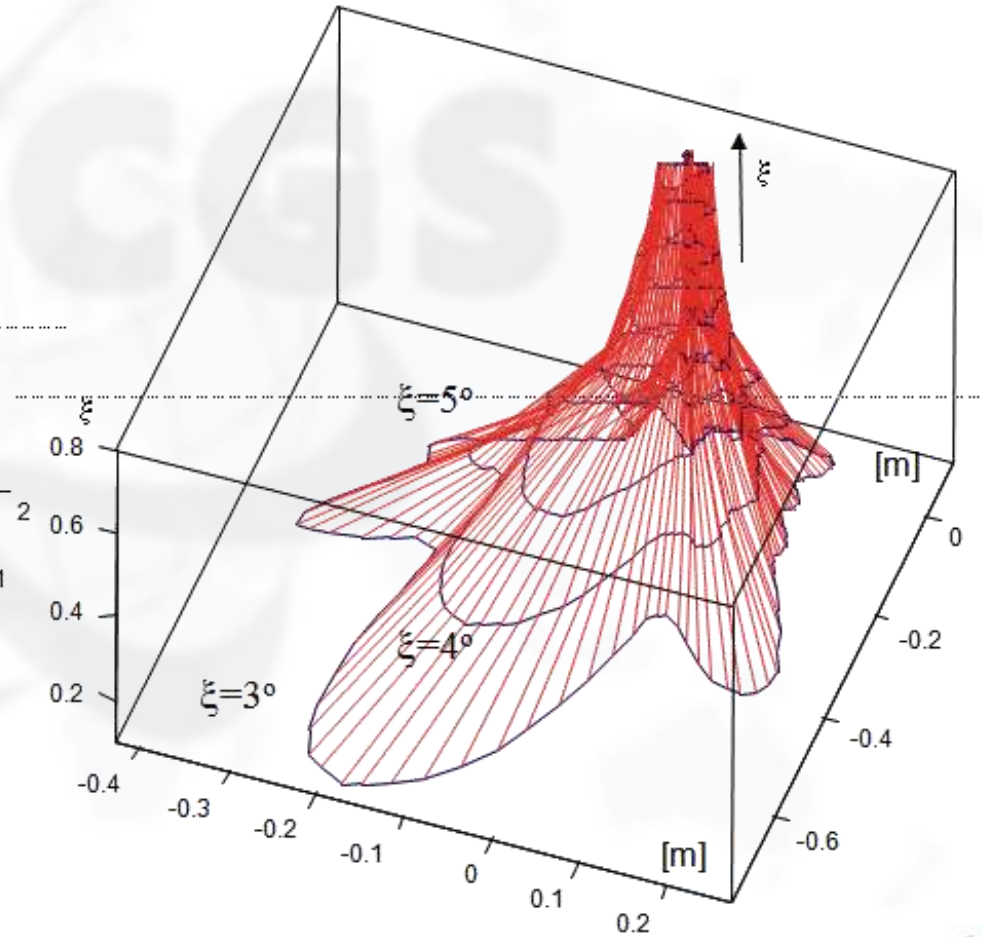
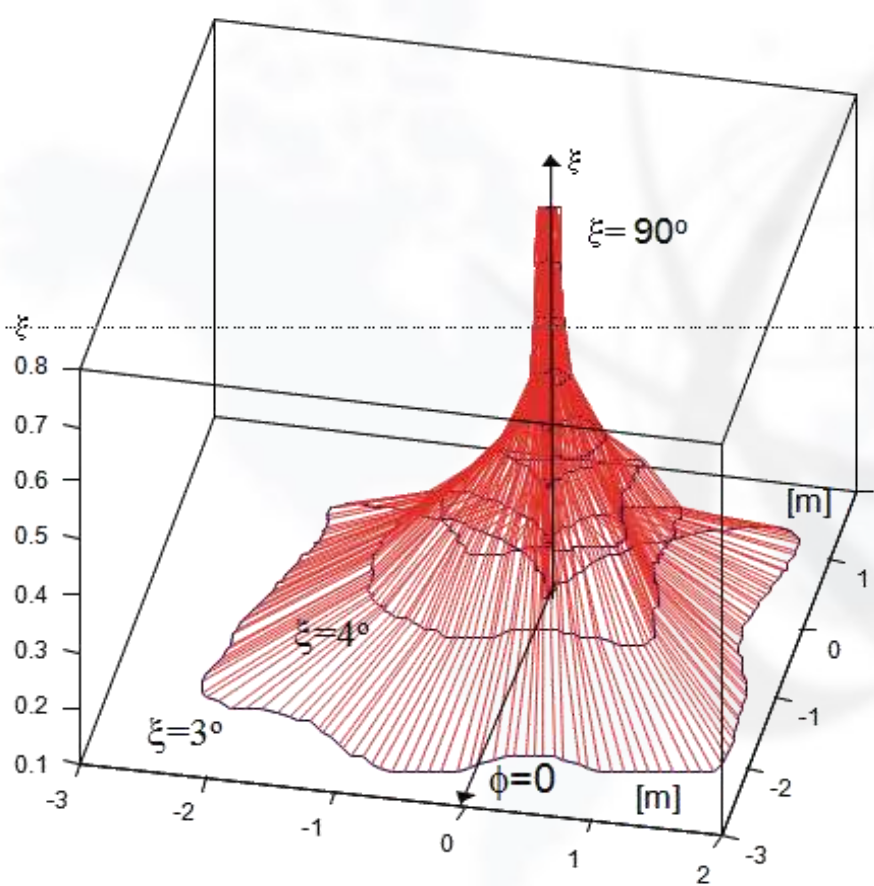
Numerical Weather Prediction Models



COAMPS (Coupled Ocean/Atmosphere Mesoscale Prediction System) and
WRF (Weather Research and Forecasting)



COAMPS and WRF in GNSS slant delay determination



GNSS in structural monitoring applications





Future tasks and problems to solve:



- Expression of the REPRO1 solution (for the whole EPN network) in ITRF2005 and ITRF2008 (before the end of 2010);
- **ASG-EUPOS** monitoring system using EPN standards and combination with other EUPOS solutions;
- Analyzes of TSD assimilation for COAMPS or WRF.





www.cgs.wat.edu.pl