Report of the
WUT EPN Local Analysis Center

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WUT LAC - common project of
Military University of Technology (MUT) and
Warsaw University of Technology (WUT)

- Since 2004 there were many changes regarding common project of WUT EPN LAC

- The main part of the crew works in Applied Geomatics Centre of Miliatary University of Technology, and these are: prof. Mariusz Figurski, dr Krzysztof Kroszczynski, Karolina Szafranek, Pawel Kaminski, Maciej Wrona

- The rest of the team continue their work in Warsaw University of Technology. The team includes: prof. Jerzy Rogowski, dr Tomasz Liwosz, dr Michal Kruczyk.

- Calculations are made in Military University of Warsaw (EPN products: SINEX files and TRO SINEX files)

LAC retrospective

- Established in 1995

- Participation in EPN since
1996
- Standard products:

  – weekly coordinates (SINEX *.CRD file)

  – daily coordinates (SINEX)

  – daily tropospheric solution since 1113: TRO-SINEX

Number of stations processed

- Number of stations processed by WUT LAC systematically grows
  - 20 in 1996
  - 43 in 2003
  - 54 in 2006
  - 71 now

- Starting with 1318 week WUT EPN standard solution was made with Bernese version 5.0

- Stations are vastly disributed all over the Europe, with majority in Central   and East Europe (17 stations in Poland)

WUT EPN LAC

43 stations
calculated in 2003
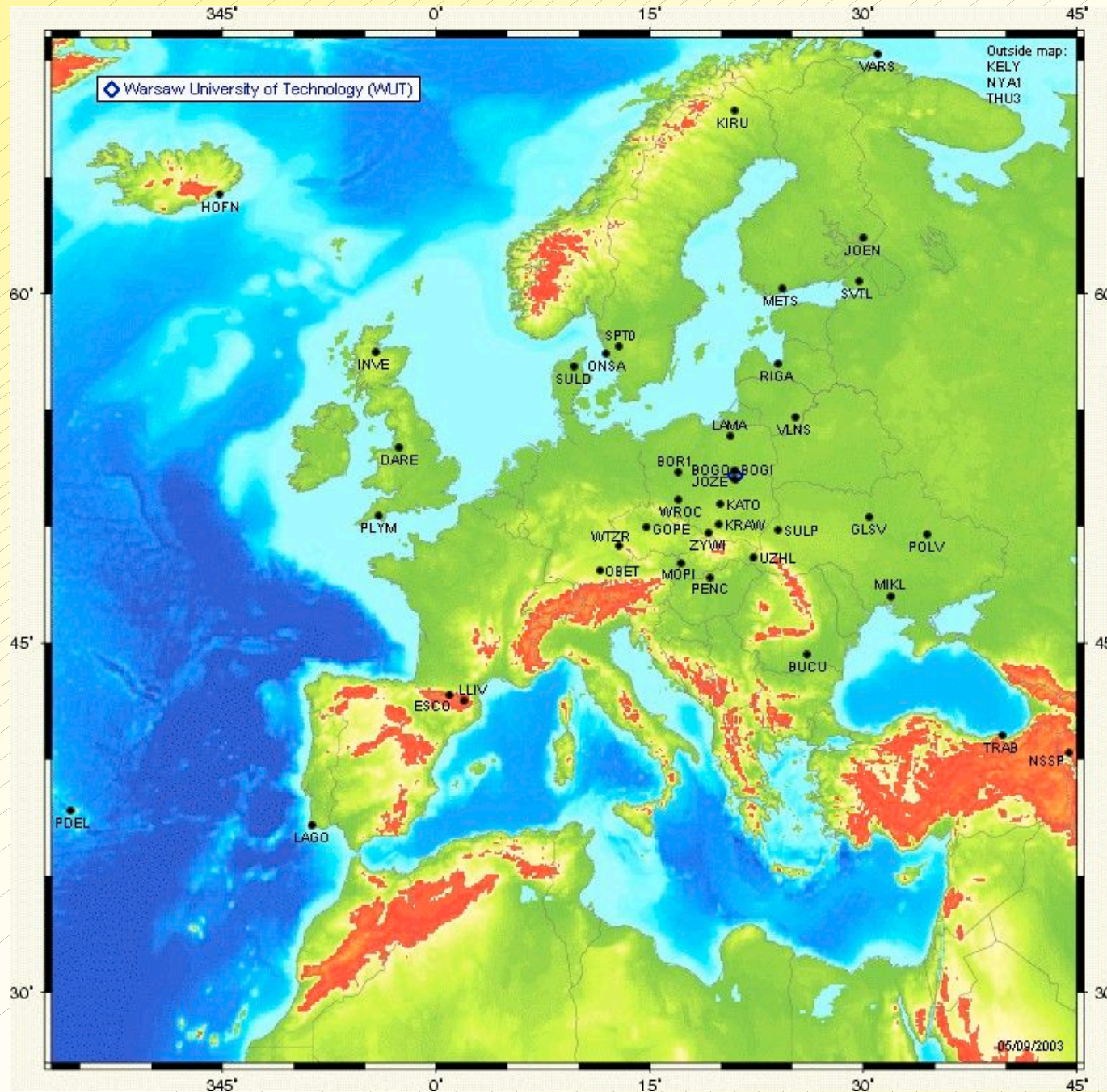
Subnetwork processed by WUT (present status – 71 stations)
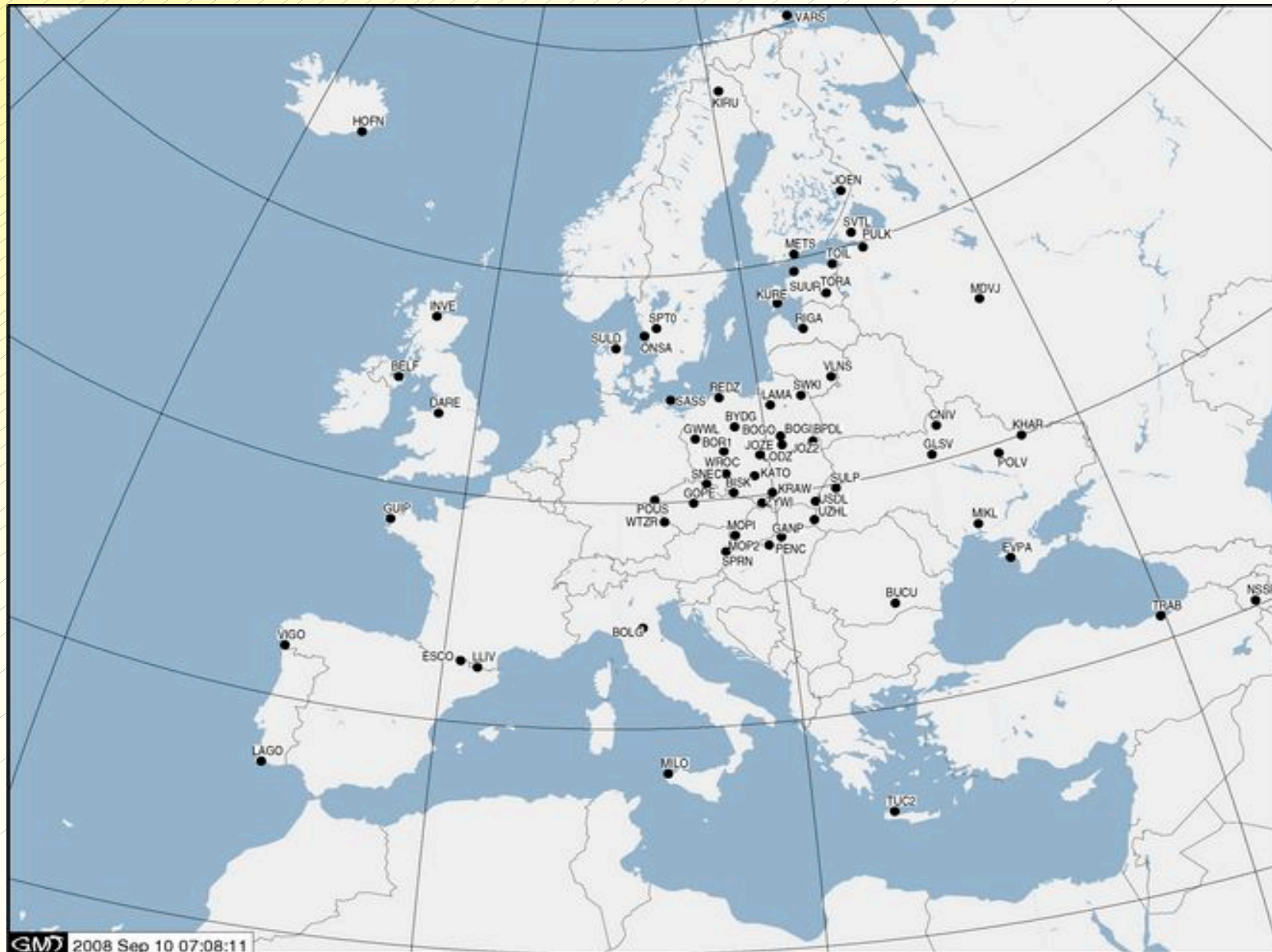
Strategy minutes – Bernese 5.0

- phase preprocessing in a baseline by baseline mode using triple-differences; if a cycle slip cannot be fixed reliably (by linear combinations) bad data points are removed/ new ambiguities are set up

- elevation cut-off angle - 3 deg

- phase center corrections IGS_05 model

- observable: double-differences, ionosphere-free linear combination

- troposhere a priori model: with the dry-Niell MF; wet-Niell MF for estimation of wet component; Corrections to a priori model constrained to 5 m (abs) and 5 m (rel)

- regional ionospheric model calculated, but only used for QIF ambiguity resolution (not modelled in final solution)

Strategy minutes (cont.)

- observations rejection: daily RINEX observation files containing less than 50 percent of possible observation epochs; threshold value concerning data screening is 2.5 mm (L1 zero-difference zenith residual); baseline data exceeding the overall sigma level of 5 millimeters

- datum definition by 3-translation condition with respect to IGS05;

- stations defining the datum: BOR1, ONSA, WTZR

- troposphere solution based on the weekly coordinate files

- satellite clock corrections are eliminated by forming double differences

- IGS final orbit and ERP information

- DE200 planetary ephemeris; Earth geopotential model - JGM3;

- solid earth tidal displacements - IERS conventions 1996;

- ocean loading-Scherneck's amplitudes and phases; no atmospheric loading

Local Analysis Center – WUT's part

- WUT runs the following analysis:

  – analysis of TZD solution correctness,

  – processing periodic campaign CERGOP and CERGOP2,

  – user automatic GPS service,

  – GNSS-RTK service

Other activities – WUT's part: CERGOP 1994-2007 Reprocessing

In 2006 and 2007 WUT Analysis Center took part in reprocessing of all 9 CERGOP and CERGOP-2 campaigns. Campaigns were performed in years 1994 - 2007.


CERGOP Sites (1994 – 2007)
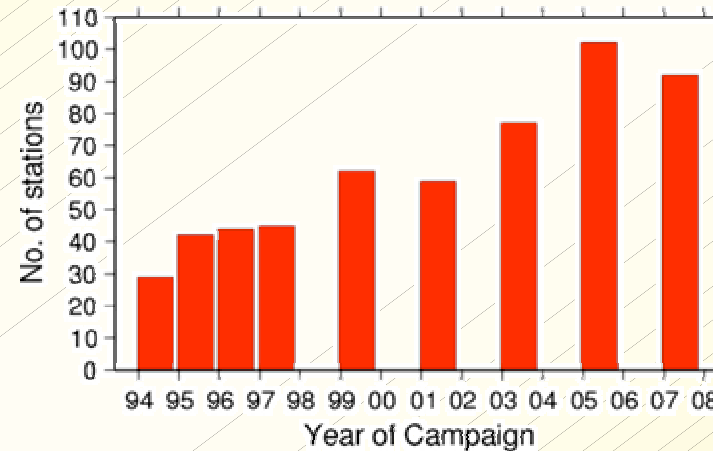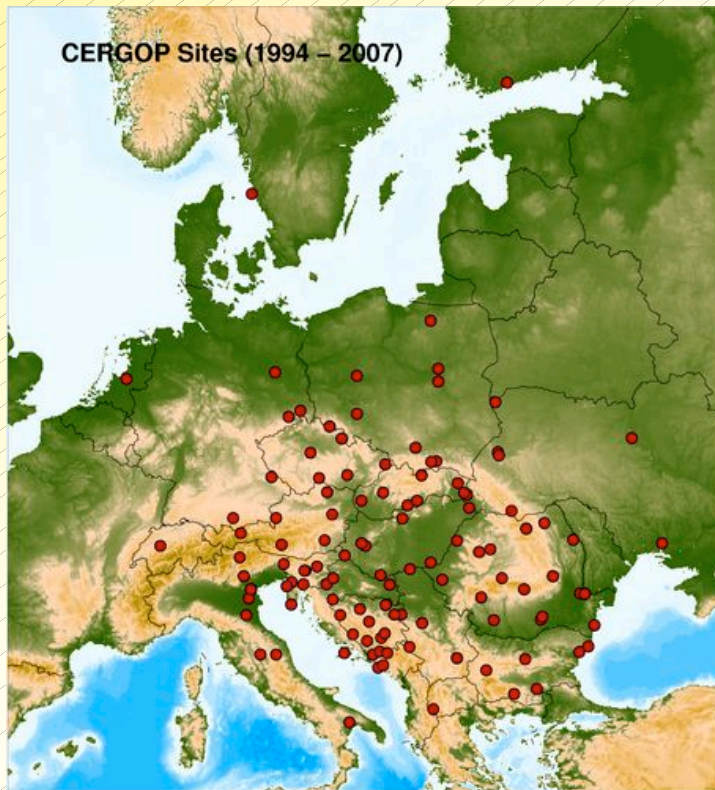
The number of stations processed in each campaign

The total number of 145 stations was analyzed at WUT during CERGOP campaign history.

Observations from campaigns were processed according to a uniform processing strategy (absolute PCV+PCO, ITRF2005, PDR orbits), similar to EPN standards. Reprocessing was performed using Bernese GPS Software ver. 5.0.
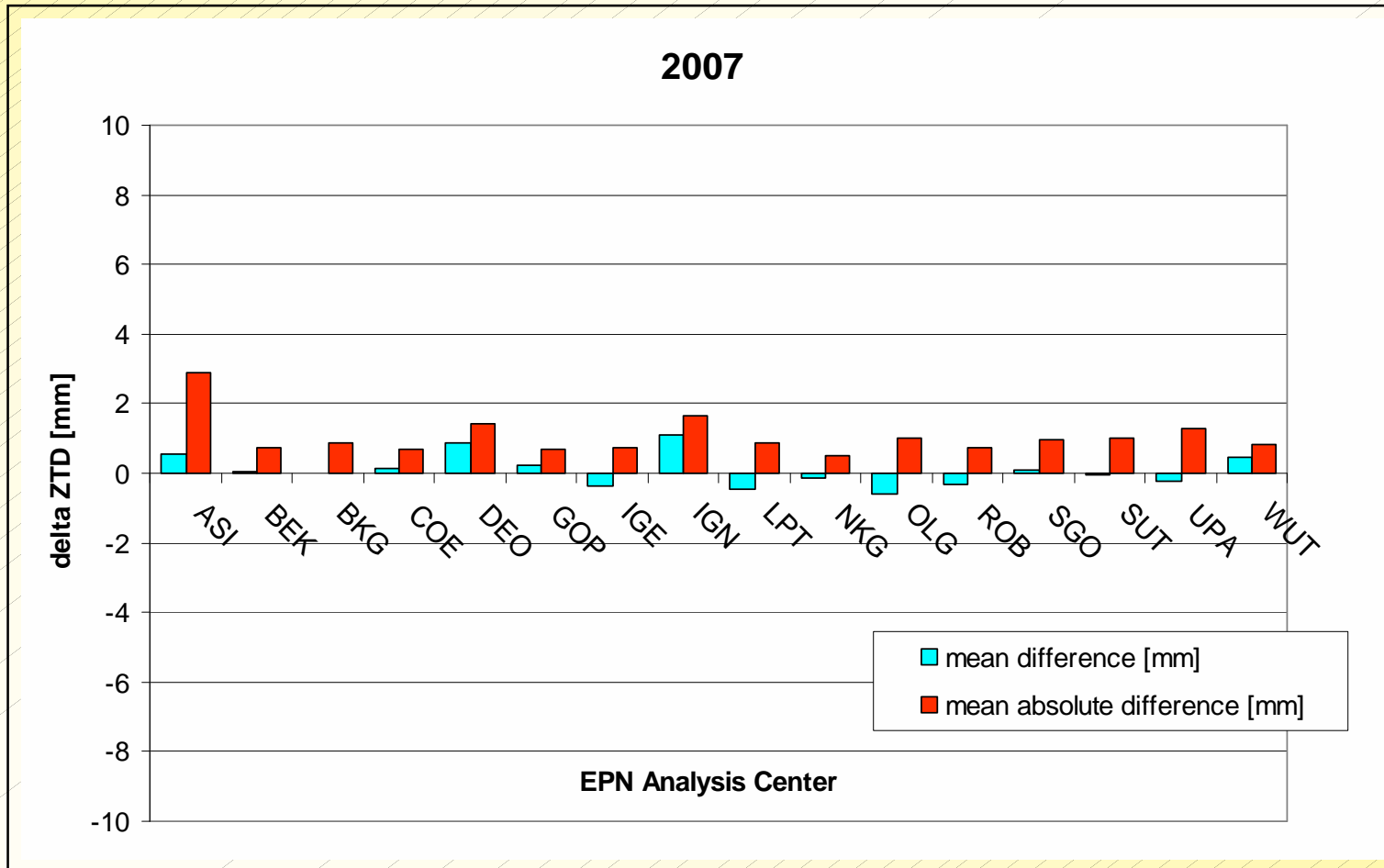
JOZE (Jozefoslaw near Warsaw) ZTD weekly mean differences (taken from combination file made by W. Söehne):
EUR combined product - individual LAC (M. Kruczyk)
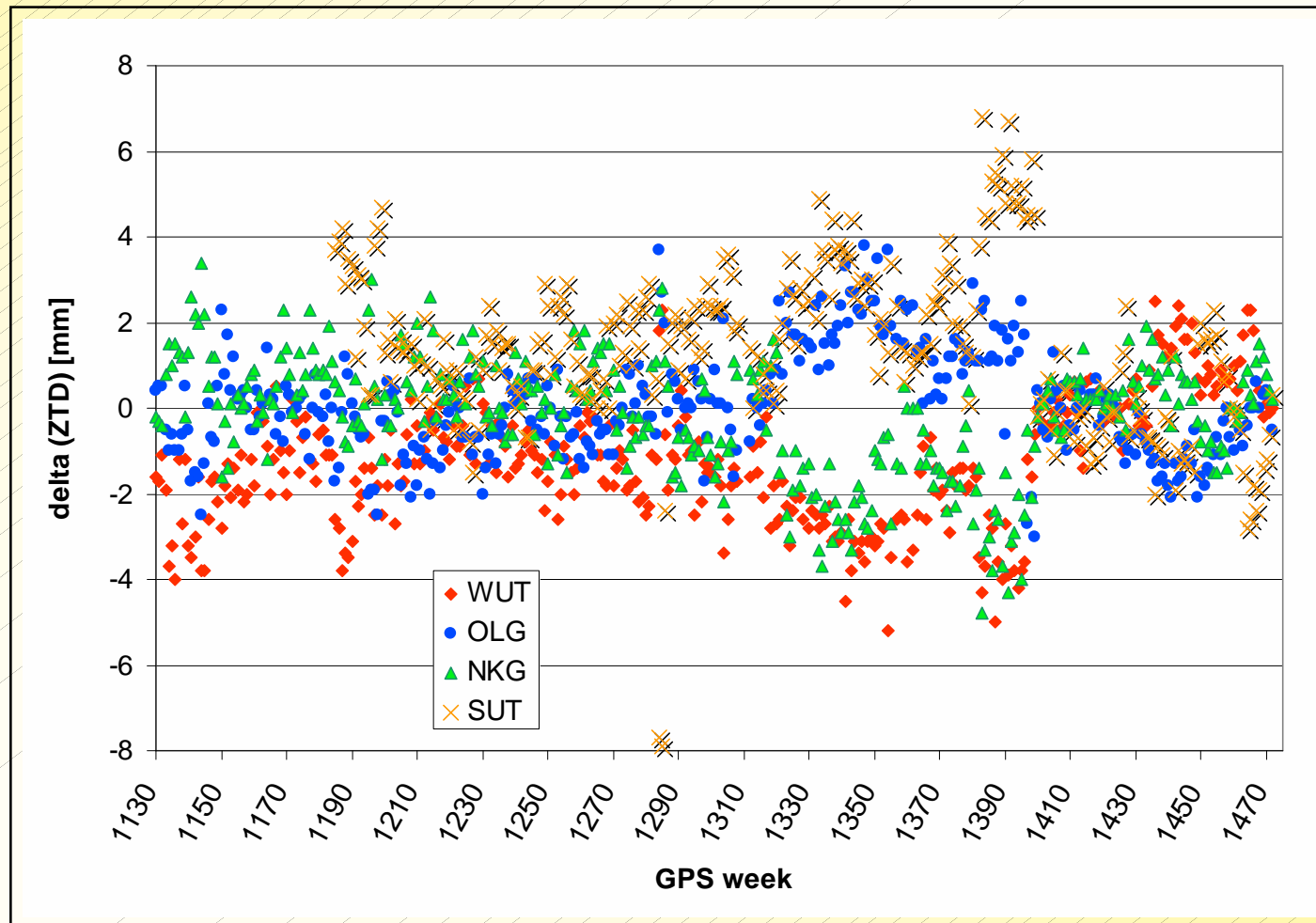
LAC EPN tropospheric solution statistics in 2006 : all LACs vs EUR combination
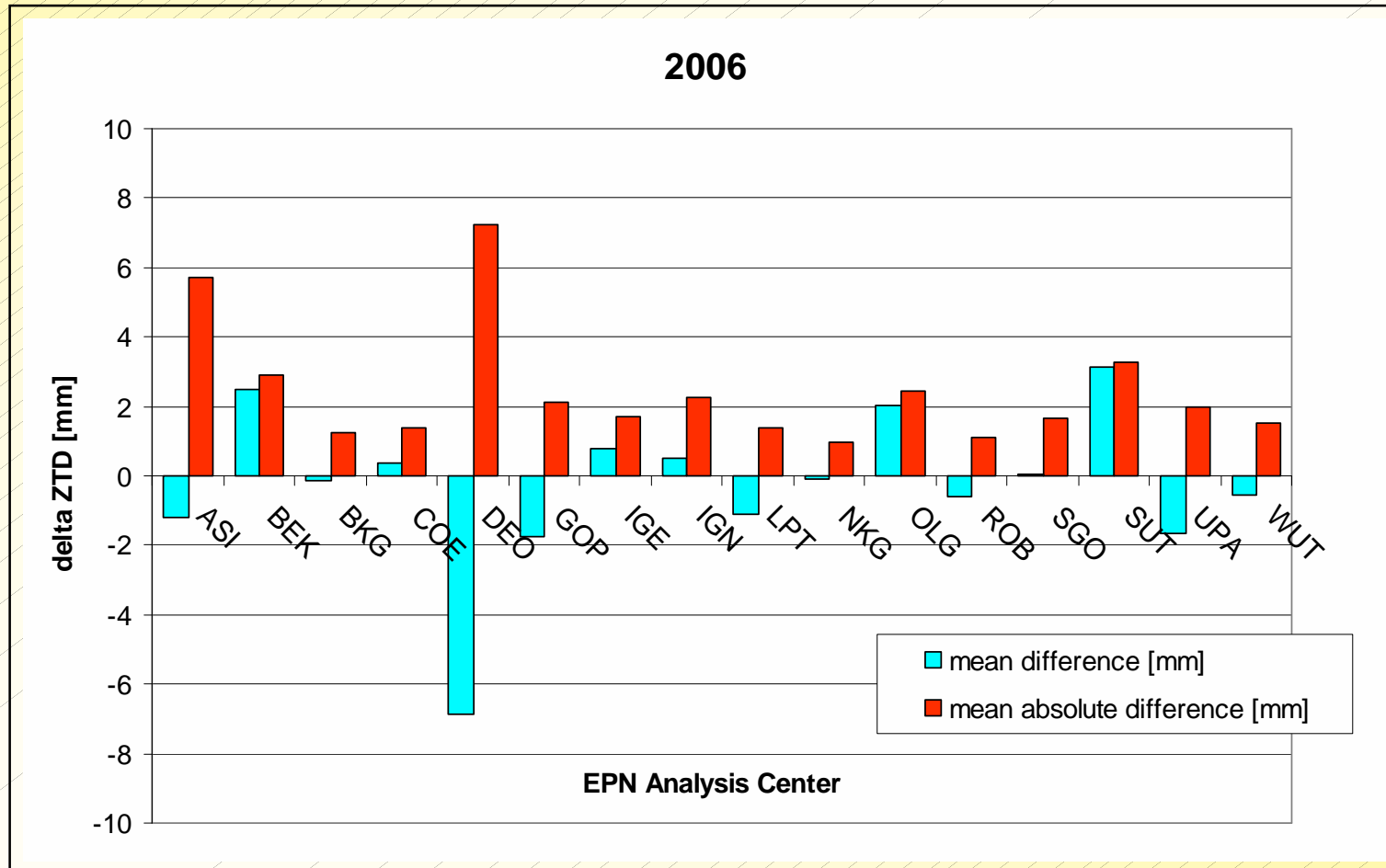
LAC EPN tropospheric solution statistics in 2006 : all LACs vs EUR combination

Local Analysis Center – MUT's part

The basic responsibilities of MUT's part GPS Analysis Centre include:

- Processing of selected parts of permanent EUREF network (WUT subnetwork)

- Processing of local and regional campaigns for geophysical and geodetic needs in the area of Poland

- Processing of tropospheric zenith delay and TEC.

- Reprocessing of the whole EPN network

- Non EPN Polish stations monitoring

- Numerical weather models COAMPS and WRF - assimilation of data to mezoscale models in order to analyse GNSS observations

- Time series analysis.

- Hight-rate GNSS measurements – level 20Hz

Hardware and software in MUT

The cluster consists of 16 servers - HP Server rx1620, each is equipped with two processors Intel Itanium 2 with the frequency 1.6GHz (FSB 533 MHz). Every server has the 4 GB operating store and also the 36 GB SCSI disc. The maximum power of cluster processing is about 210 GFLOP. It works under control of 64-bites GNU/Linux operating system with the latest 2.6. nucleus. The Debian GNU/Linux 3.1 Sarge was used as a distribution of GNU/Linux system. The 9TB hdd storage is cooperating with the cluster.

Software:Bernese GPS software v5.0, COAMPS 3.1, GAMIT/GLOBK 10.33, Femlab 3.0.are fully exploiting capabilities of the 64-bites architecture.

ASG-EUPOS - polish part of the EUPOS network
Coordinates of EPN Polish stations on the basis of MUT analysis
are used to calibrate ASG-EUPOS
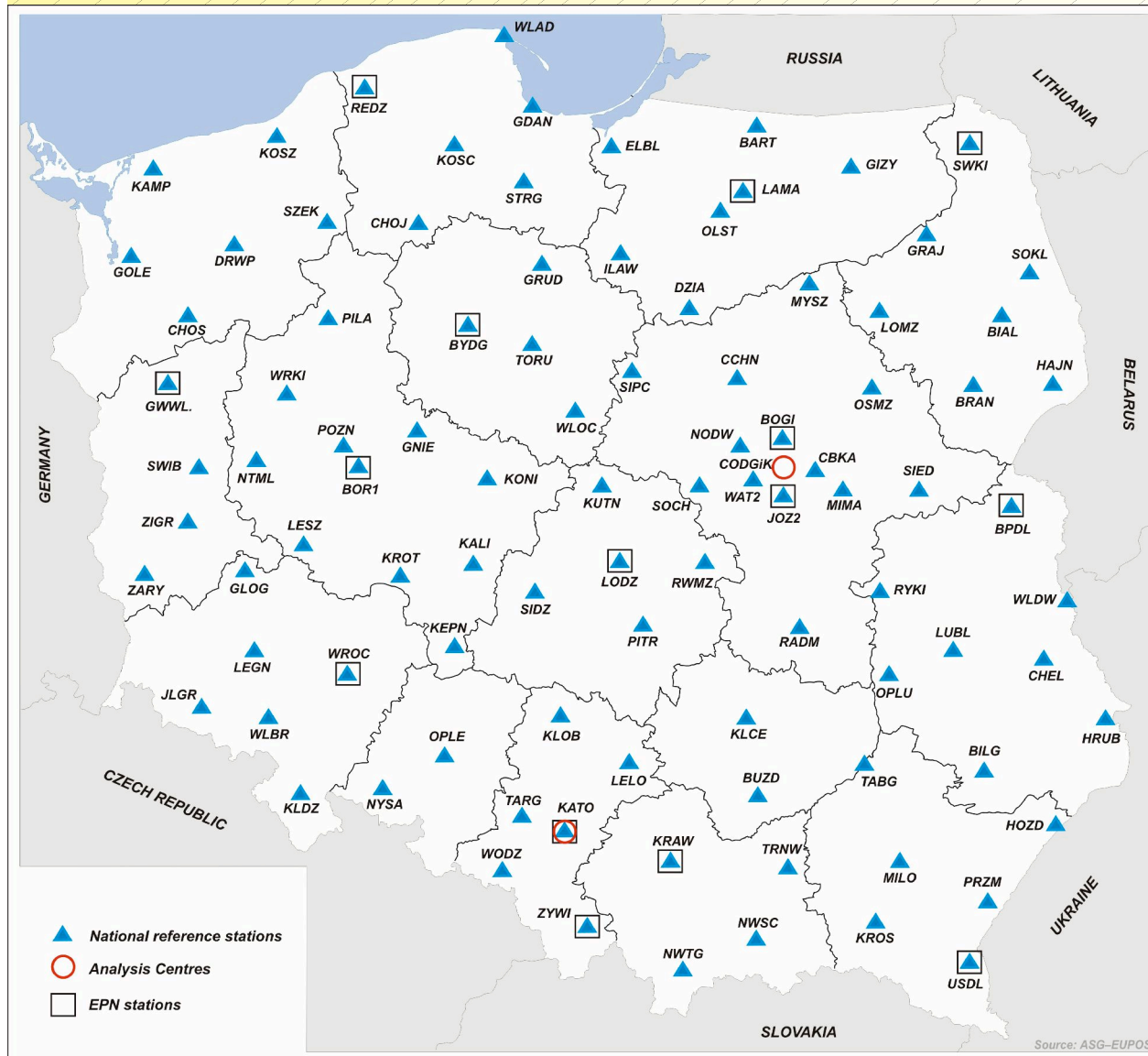
68 reference stations include GPS modules constructed on the basis of the project

8 stations include GPS/GLONASS modules

16 active reference stations with GPS modules in Poland

6 active reference stations with GPS/GLONASS in Poland

30 outside country reference stations (near borders – EUPOS).

National Management Centre in Warsaw and Katowice

Regional ionosphere model

System for near real time
determination of ionosphere
parameters (TEC – hourly IONEX
files and .gif maps) for Europe was
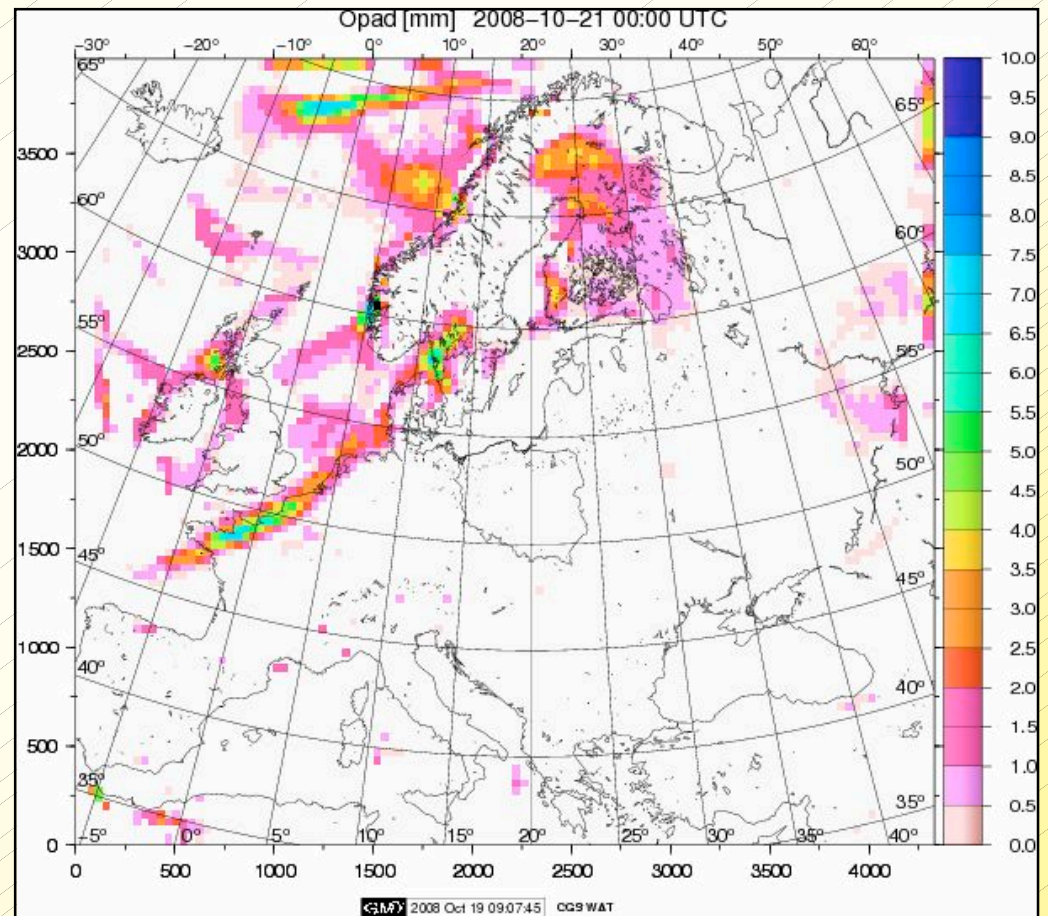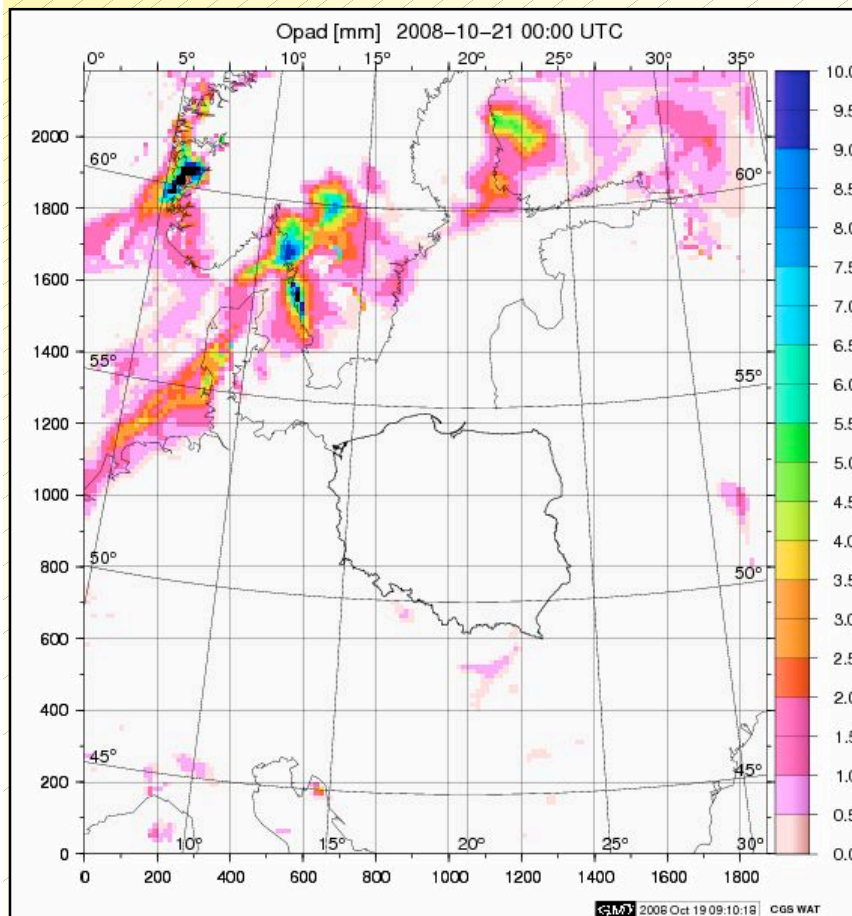developed by MUT in 2003

Now it is not operationing, new
system will be started in 2009.

EUROPEAN IONOSPHERE MAPS
2003.04.04
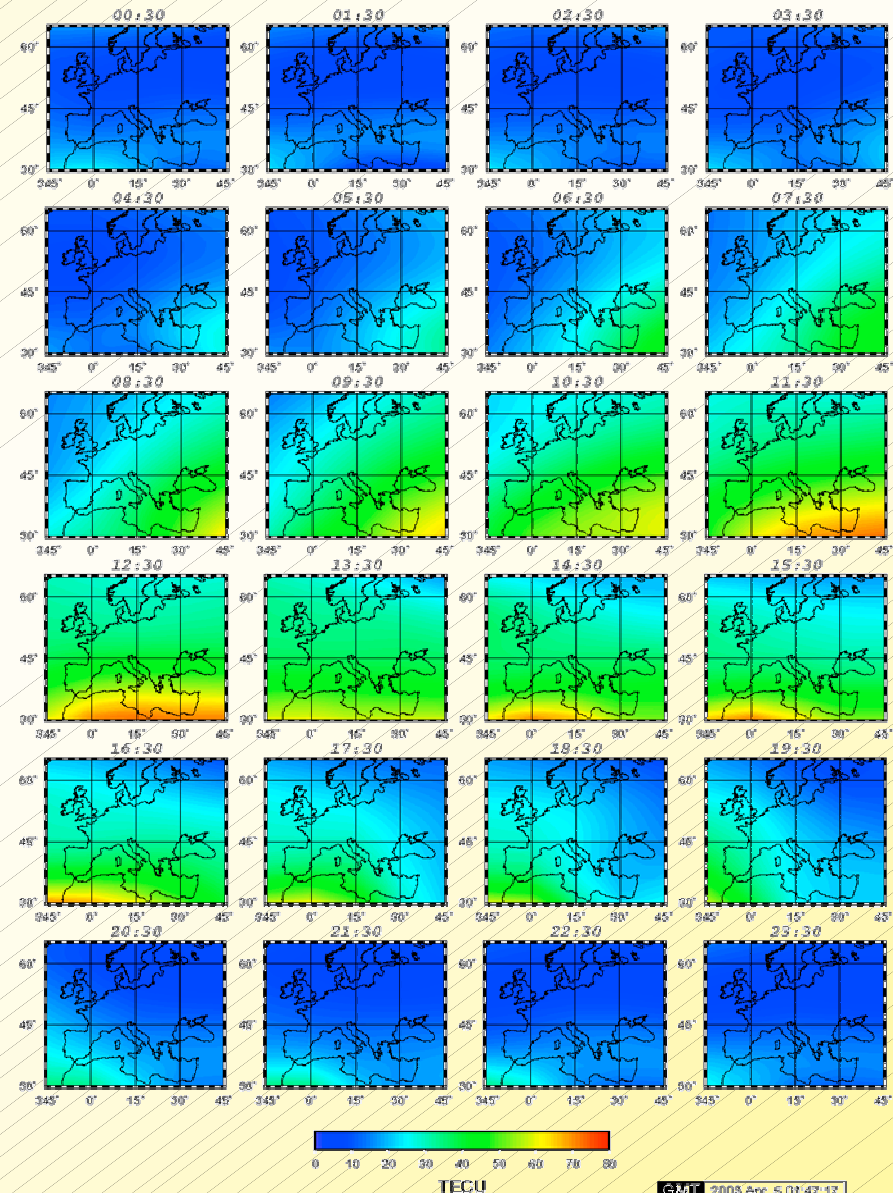
COAMPS - forecast model

COAMPS is non-hydrostatic model of the atmosphere which is run on IA64 Feniks computer cluster in the Department of Civil Engineering and Geodesy.

Mesoscale anisotropy of GPS slant delay

GPS slant delay determination using data from COAMPS

(Hodur, R.M., The Naval Research Laboratory's Coupled Ocean/Atmosphere Mesoscale Prediction System, Monthly Weather Review, 135, 1414-1430, 1997)
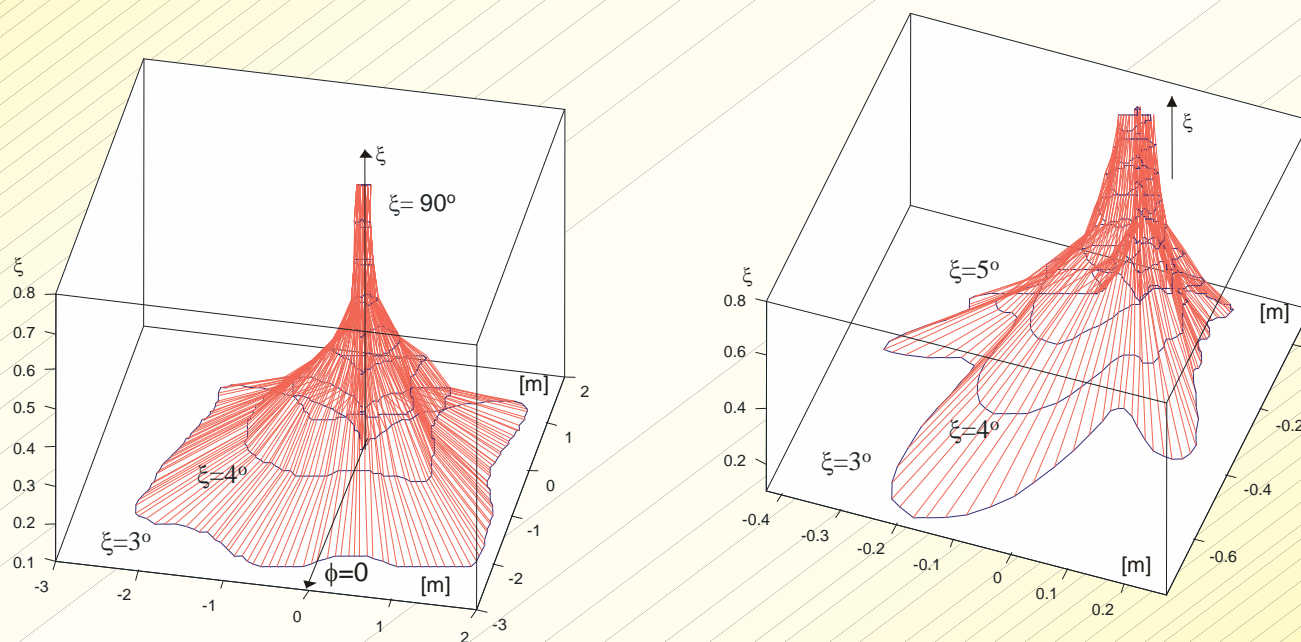
The investigation results show that the azimuthal difference which is the measure of the delay anisotropy in adverse weather conditions may be for elevation angles greater then 3 degrees of the order of one meter. However for elevation angles equal or less then 3 degrees this difference can be order of meters.

Future tasks and problems to solve:

- Filling up data for EPN reprocessing (lack of data for some stations);

- Preparation of strategy for new EPN reprocessing;

- Execution of new EPN reprocessing (final?);

- ASG-EUPOS control and monitoring system in accordance with EPN standards;

- Rapid Service for the whole EPN processing (under consideration);

- Analysing of TZD assimilation for COAMPS or WRF.