

The New Role of Geodetic Networks in Hungary

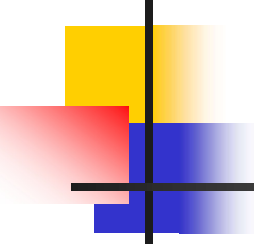


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Content

- Introduction
- Classical geodetic networks
- GPS-GNSS networks
- The plan of integrated network
- The role of National networks in the future



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Data SIO, NOAA, U.S. Navy, NGA, GEBCO
14°04'52.41"N 18°51'31.40"W elev: 2329 m

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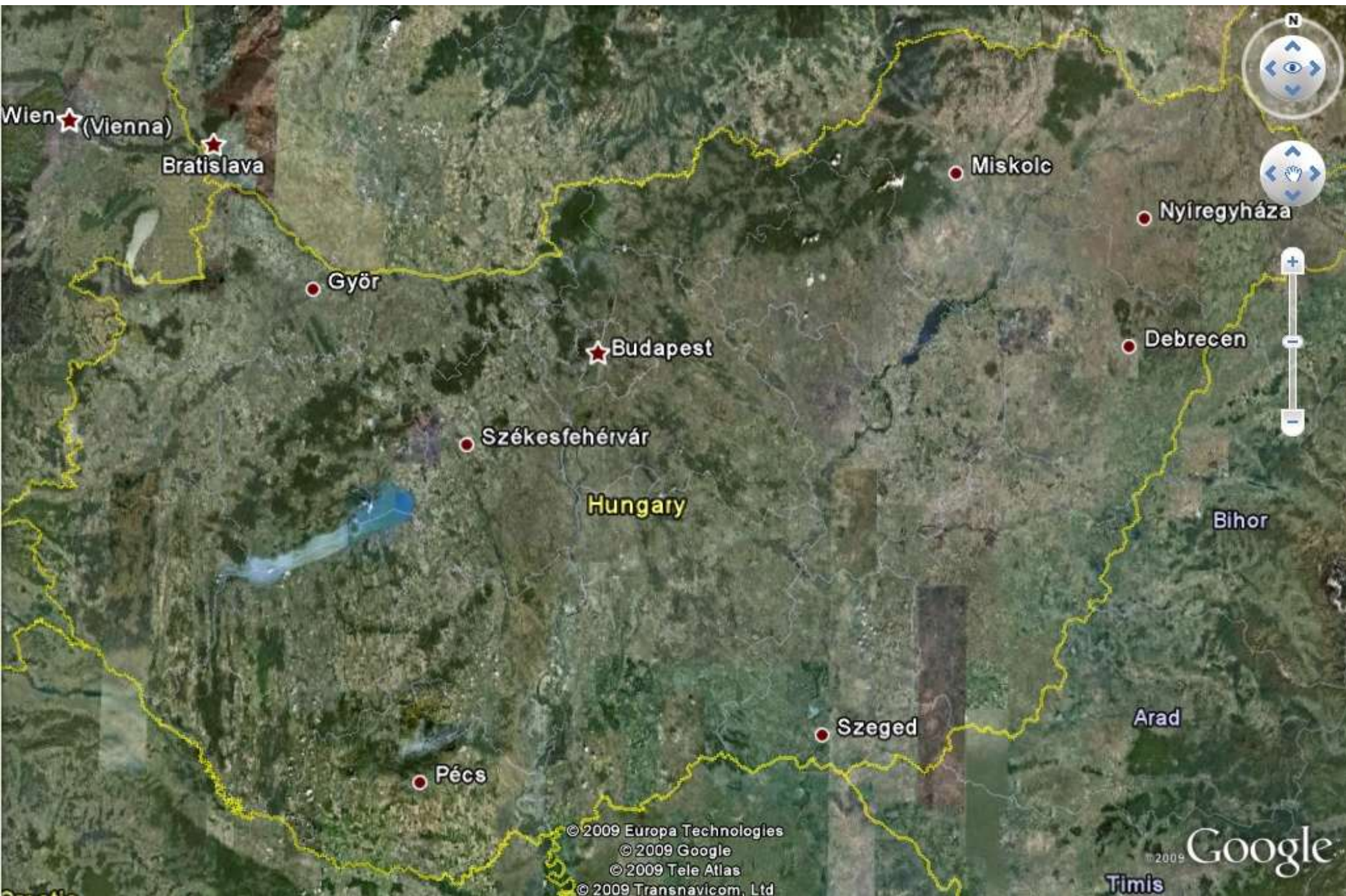
Eye alt: 8221

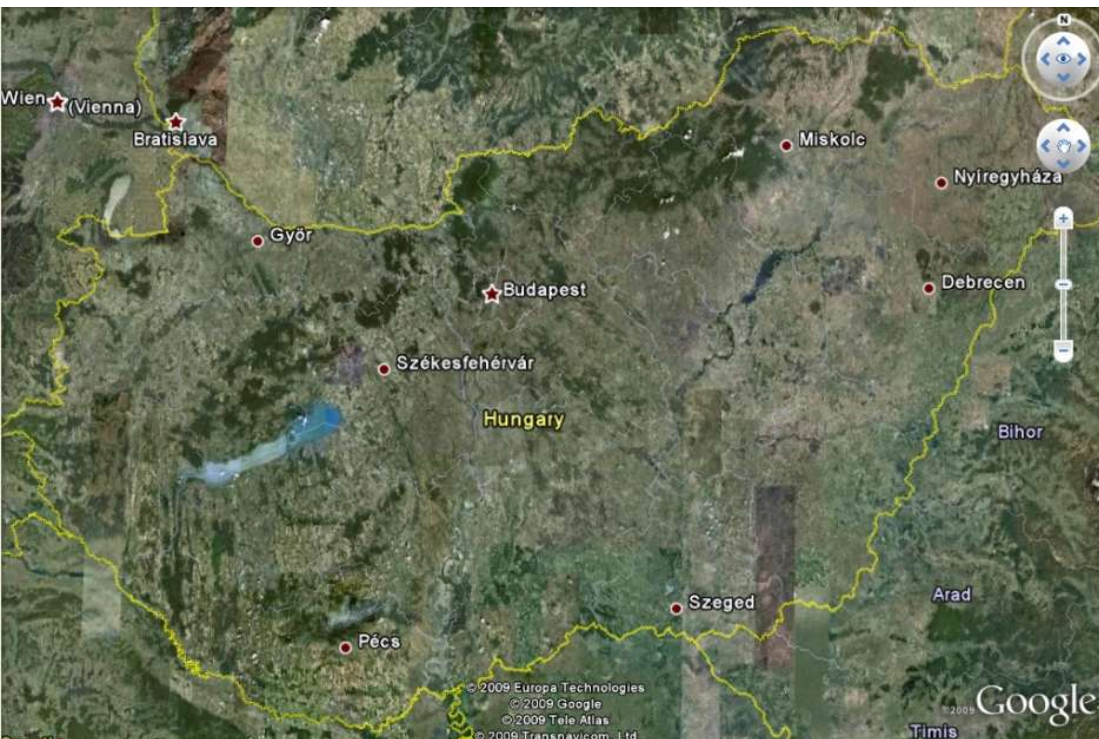


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Hungary: in the heart of the Europe...

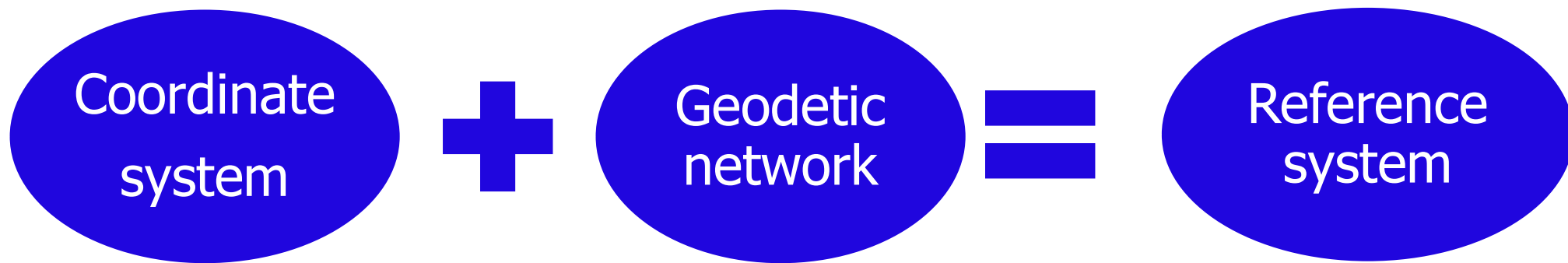




In spite of long geographic distance, many similarities in history, in spirit, ... in geodetic networks...

	Hungary 93 030 km²	Vietnam 329 560 km²
Permanent stations (CORS)	35	(5)
Passive GPS Network	1153	70
Vertical 1st order	6 000	1 200
Vertical 2nd 3rd order	20 000	5 800
Horizontal 1st order	141	326
Horizontal 2nd 3rd order	2 100	14 000
Horizontal 4th order	58 000	- 7

The importance of geodetic networks

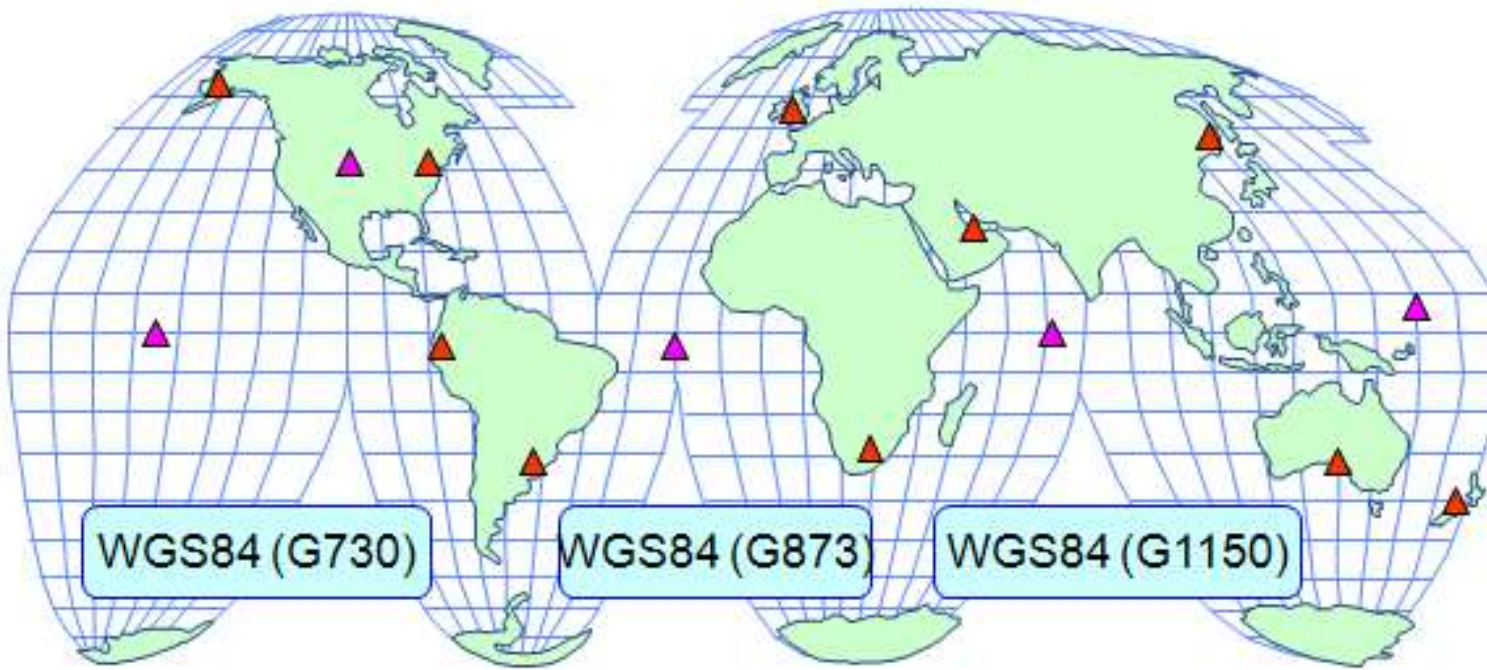


**„frame“
„infrastructure“**

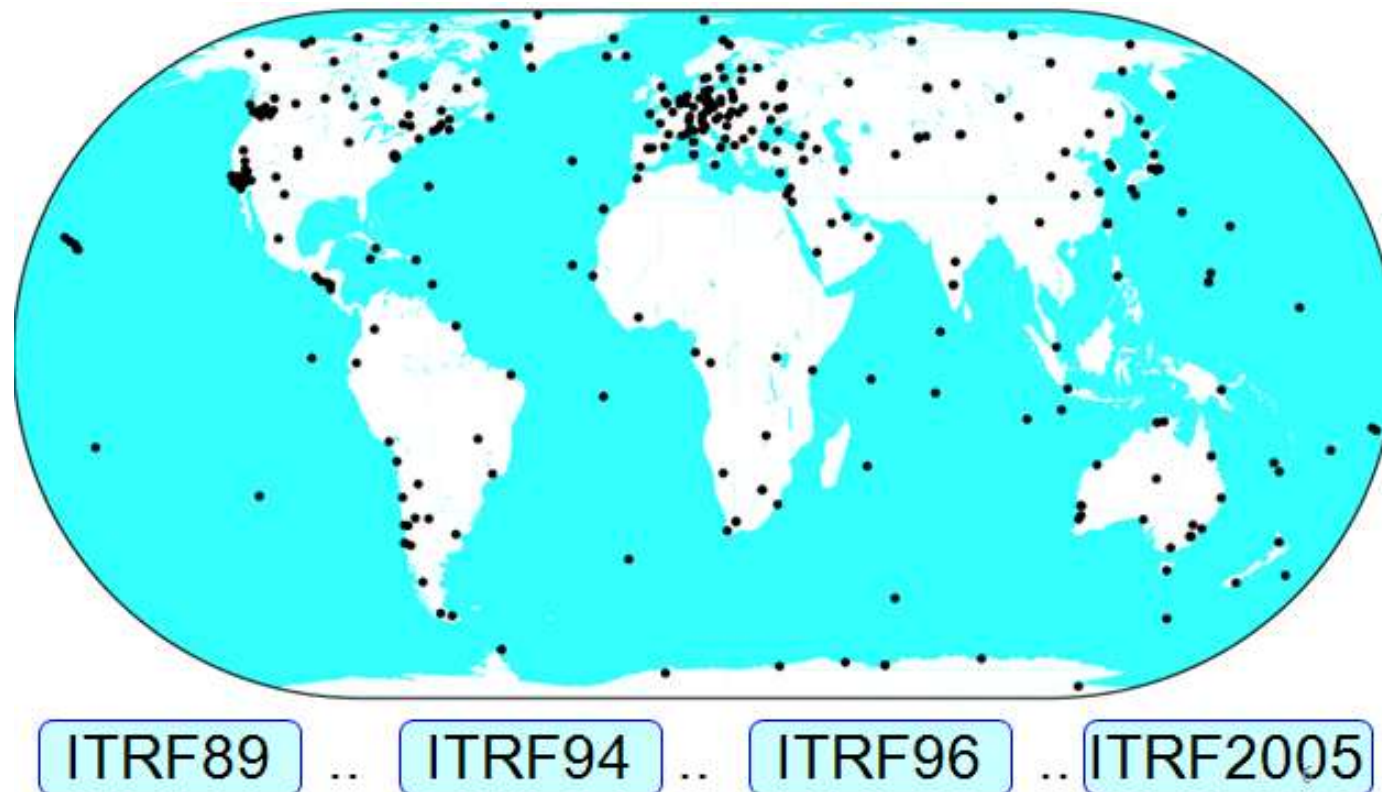
There is no reference system without geodetic network...

Reference system is the base for all maps, all visualization...

*Control stations
of American
GPS systems:
the number of
points and
coordinates are
changes*



*Permanent
stations of IGS:
define new
reference
frames*



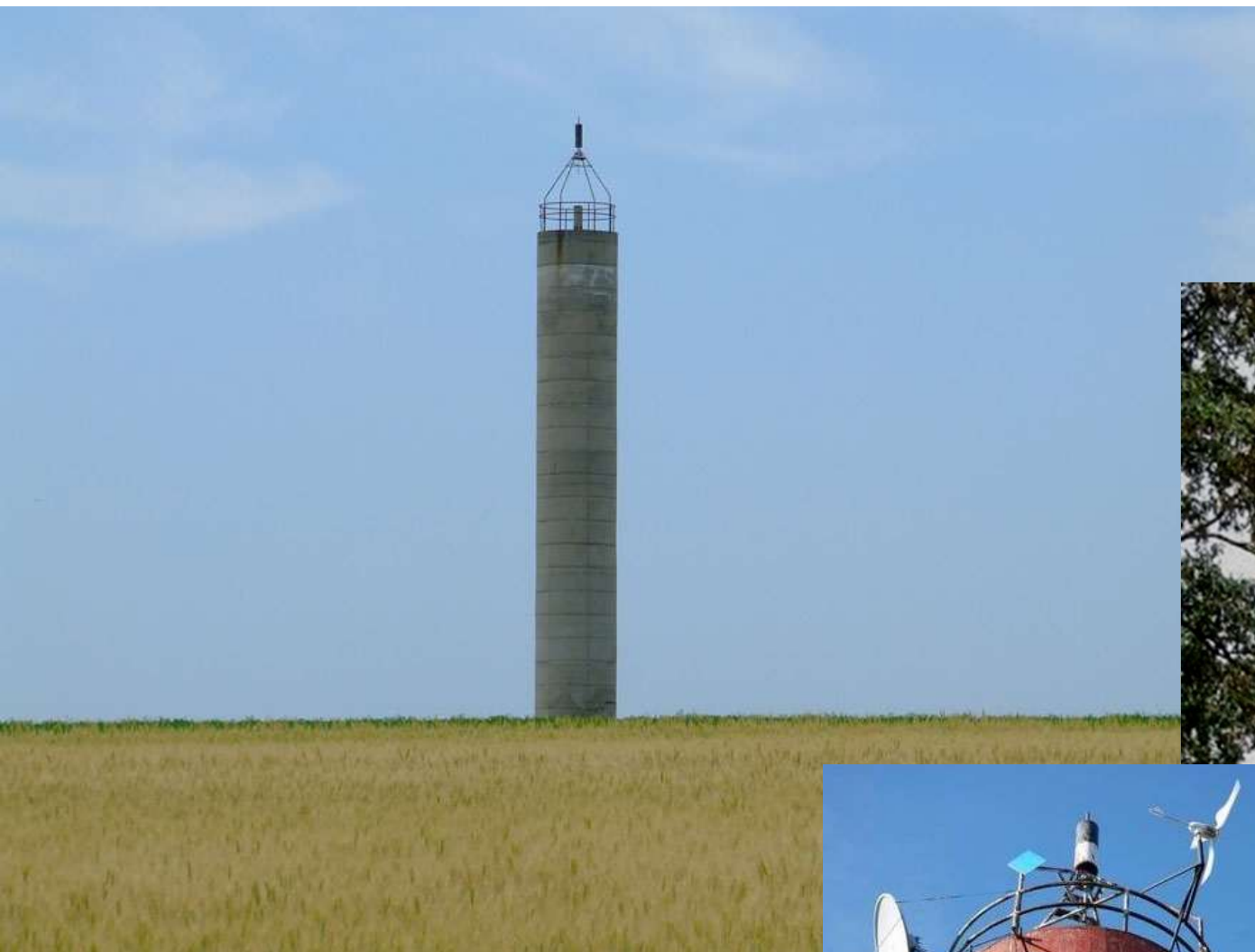
Hungarian Datum 1972

Number of points:
I. o.: 141
III. o.: 2100
IV. o.: 56000

I. o.: 141

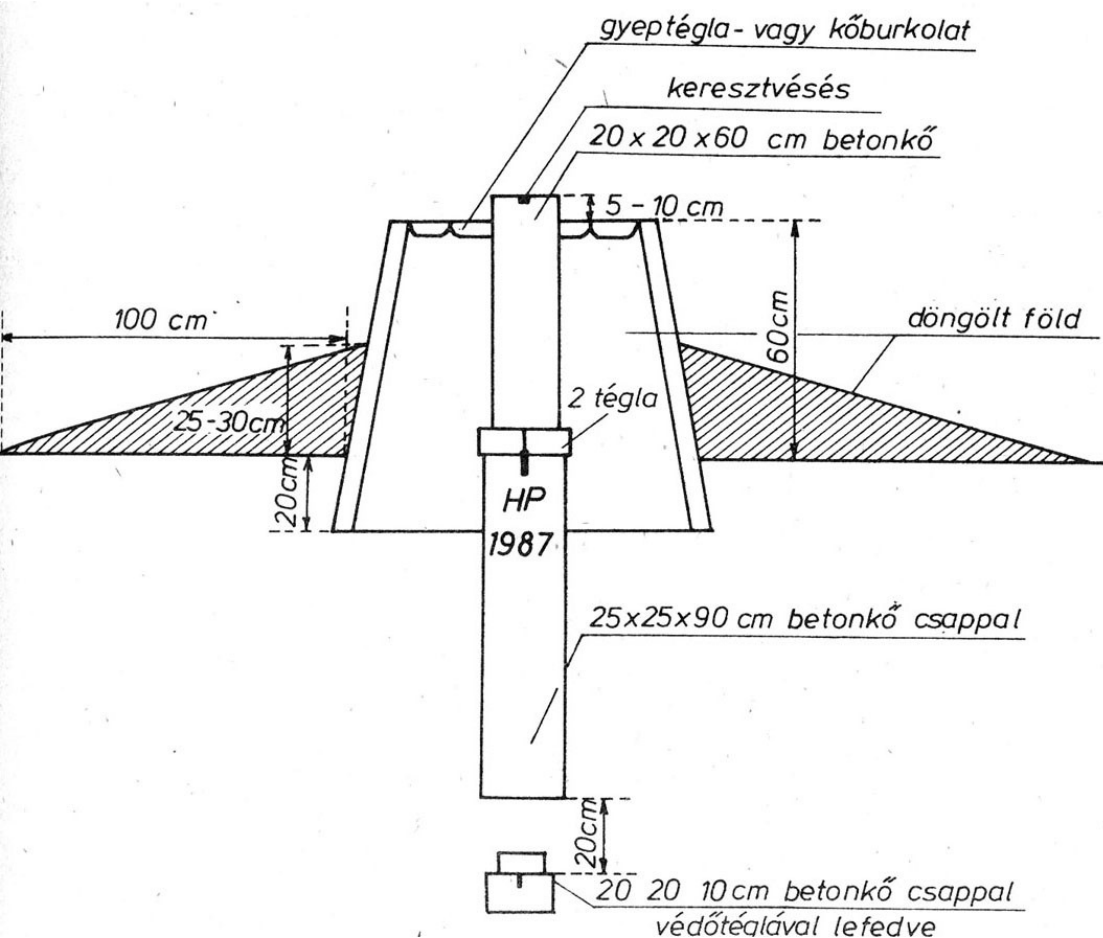
III. o.: 2100

IV. o.: 56000



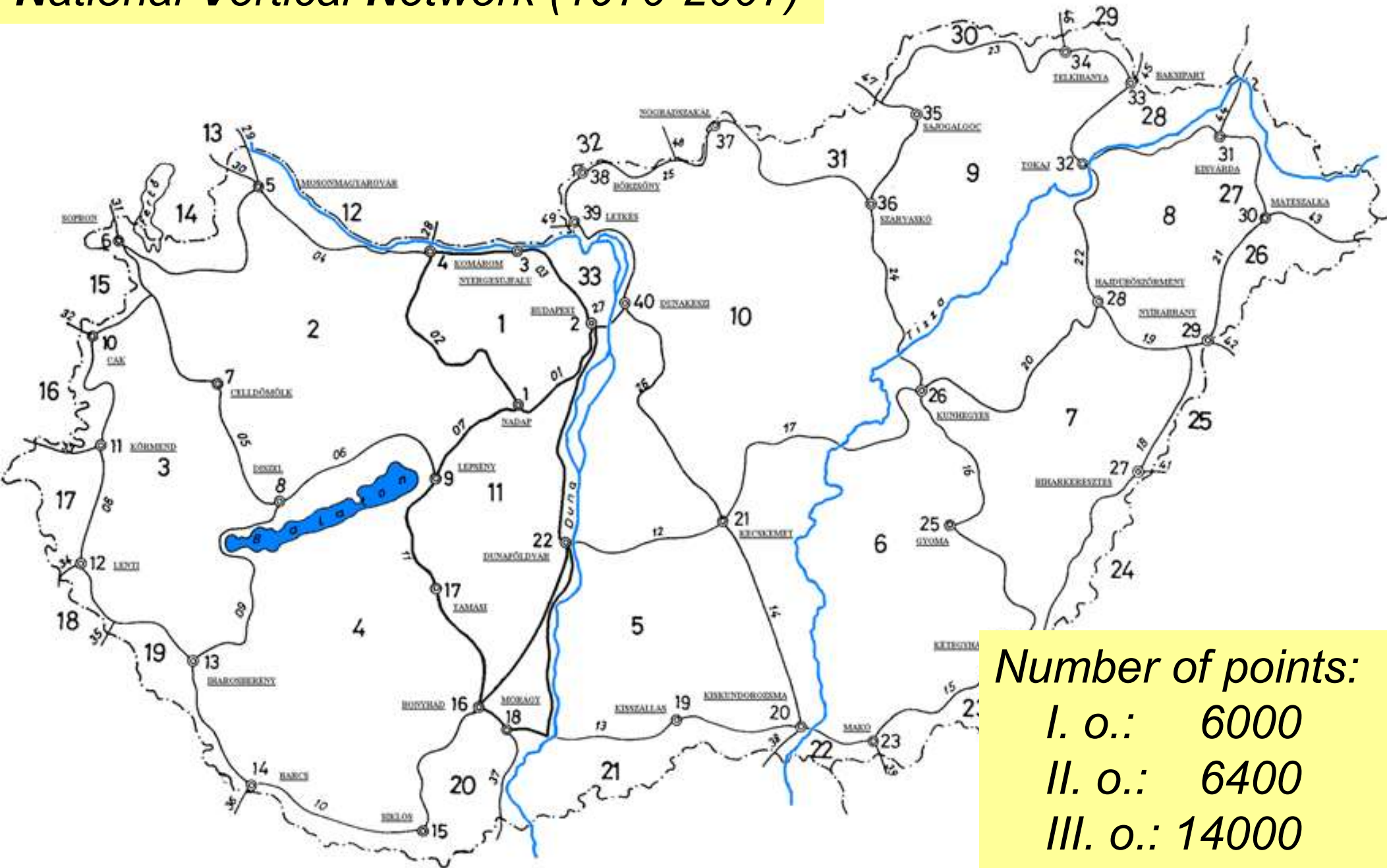
*Speciality:
reinforced concrete
measuring towers
over 1st order
2D points*

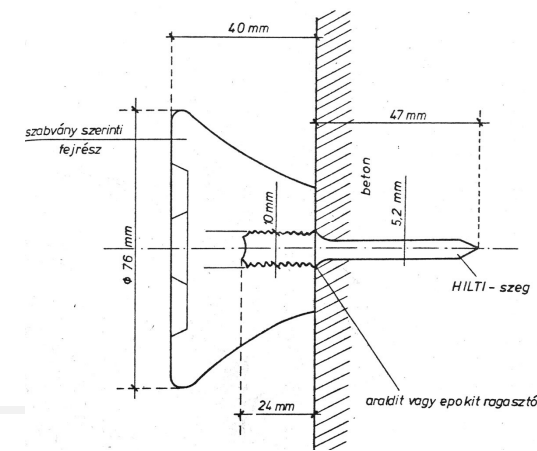
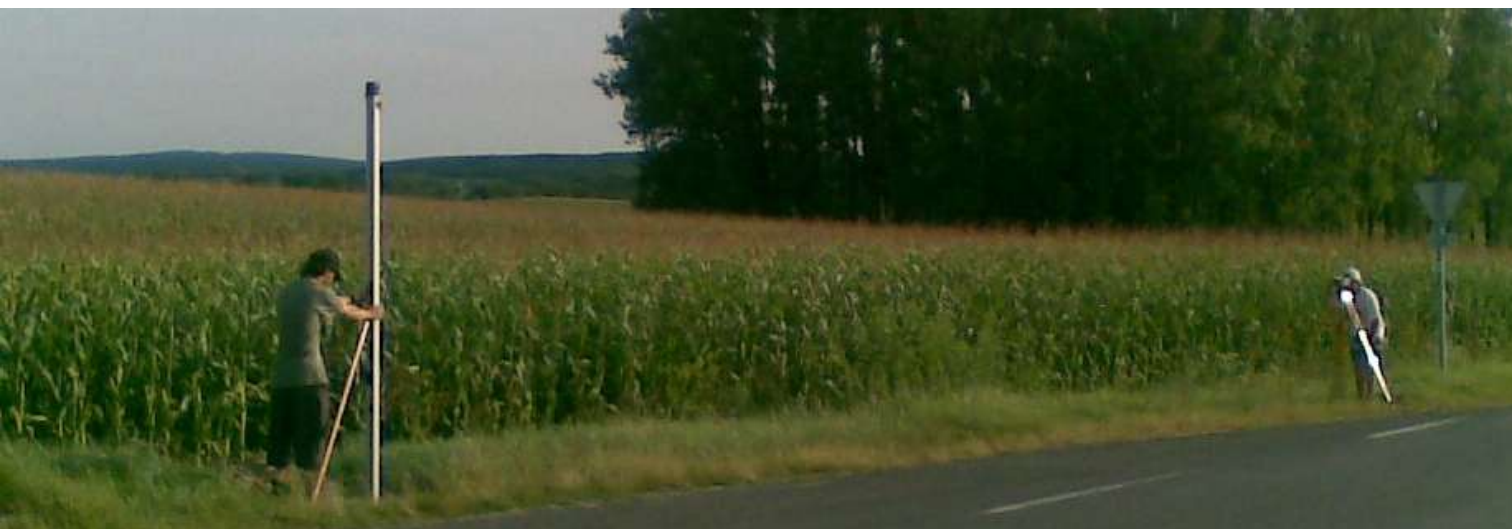
*Stone outside,
equipped with
pyramidal frustum-
shaped protective
concrete cover*



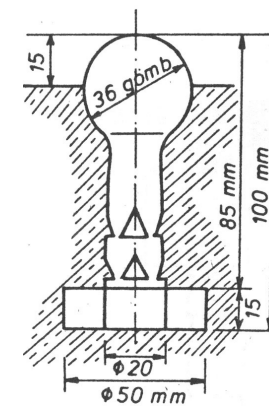
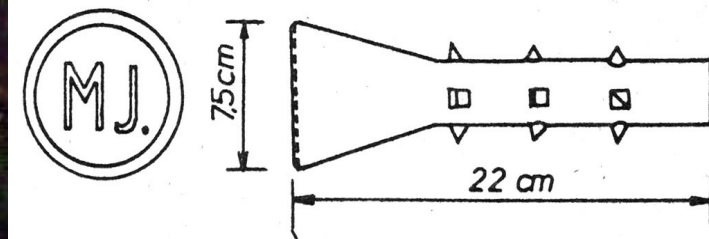
Classical levelling network

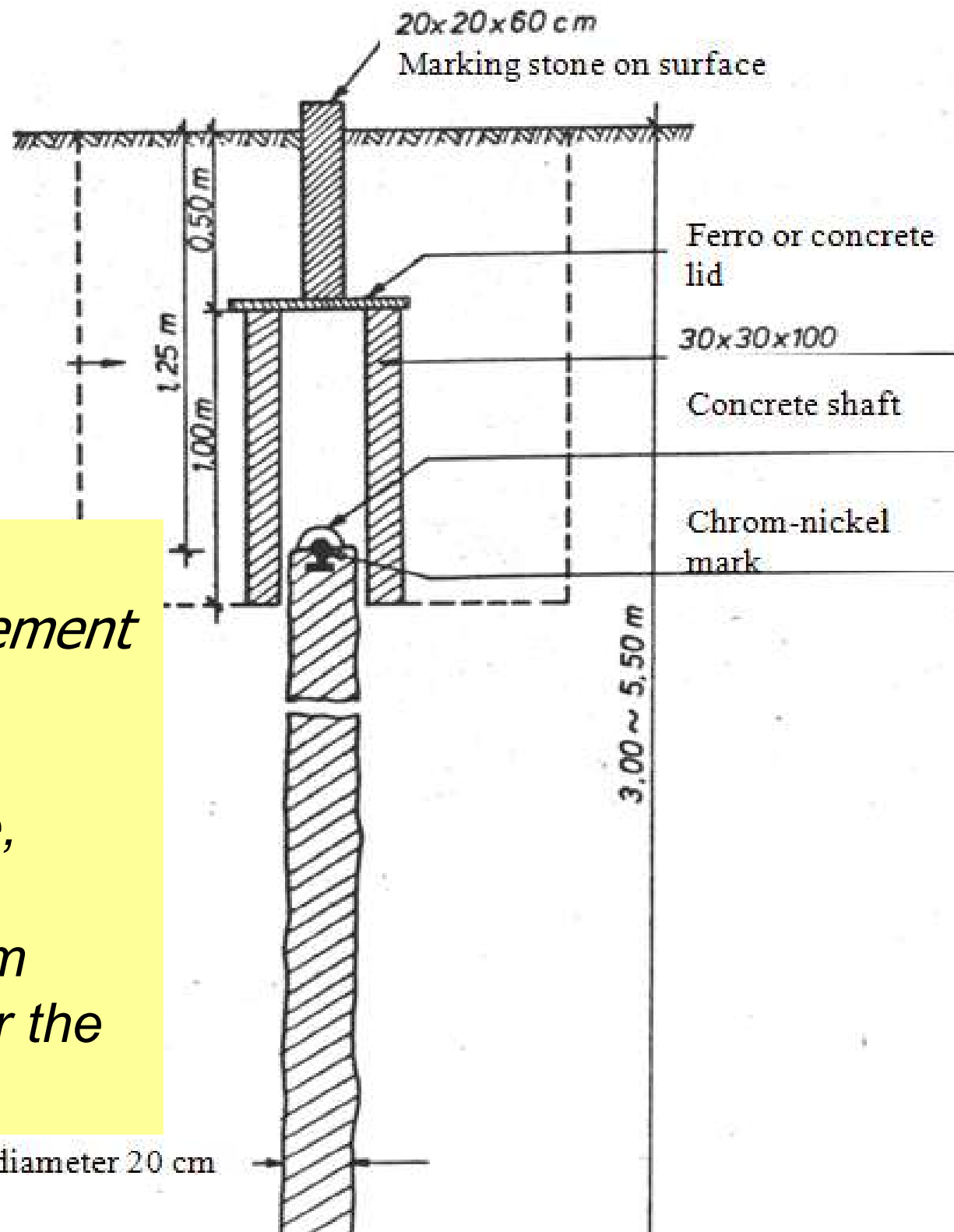
National Vertical Network (1970-2007)





Traditional levelling, traditional benchmarks: rivet, knob, stone

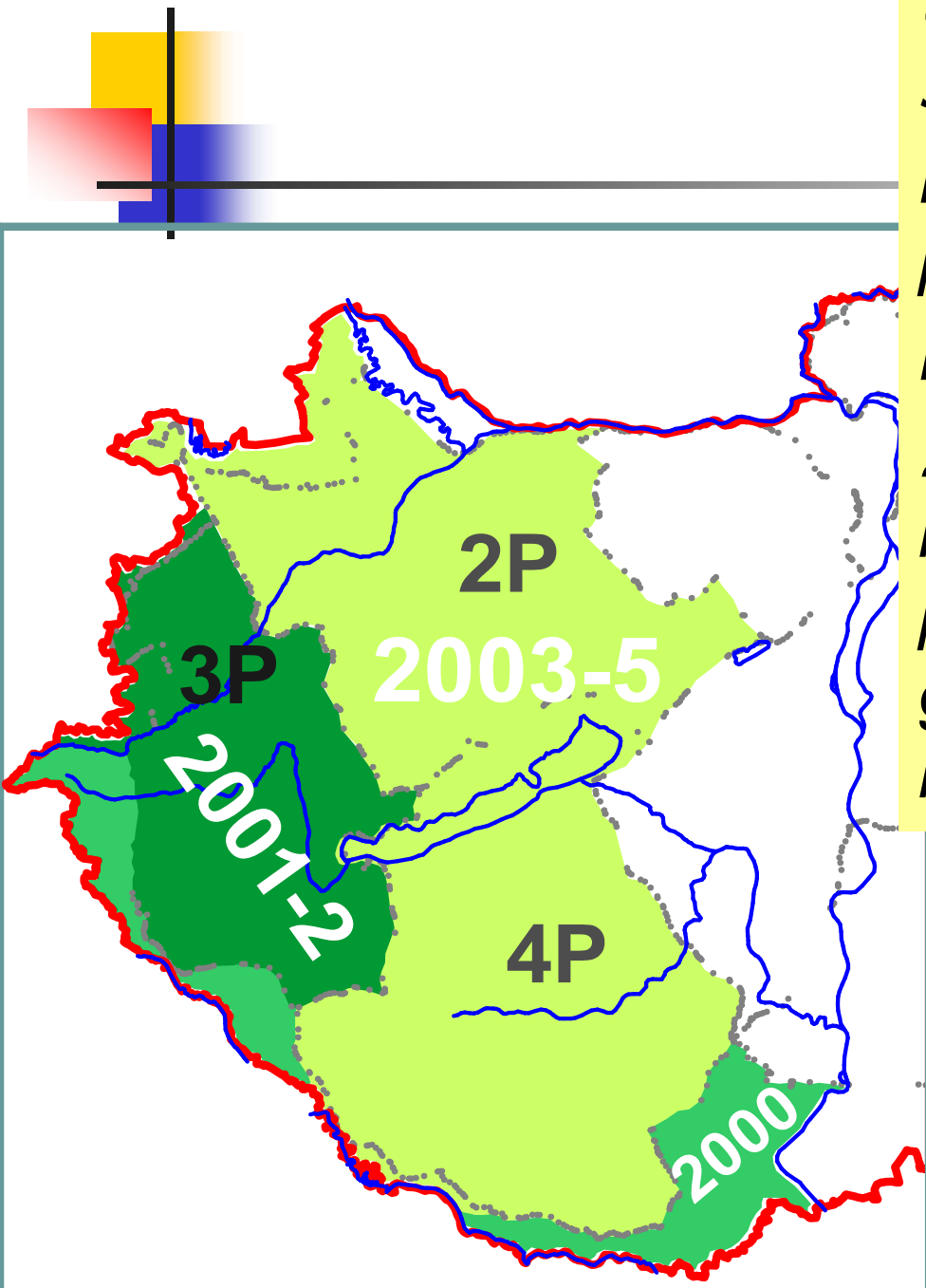




*Speciality:
Crustal Movement
Point
3-5 m long
concrete pile,
with 20 cm
diameter, 1 m
deeply under the
surface*



Speciality: GPS-levelling, instead of 3rd order traditional levelling

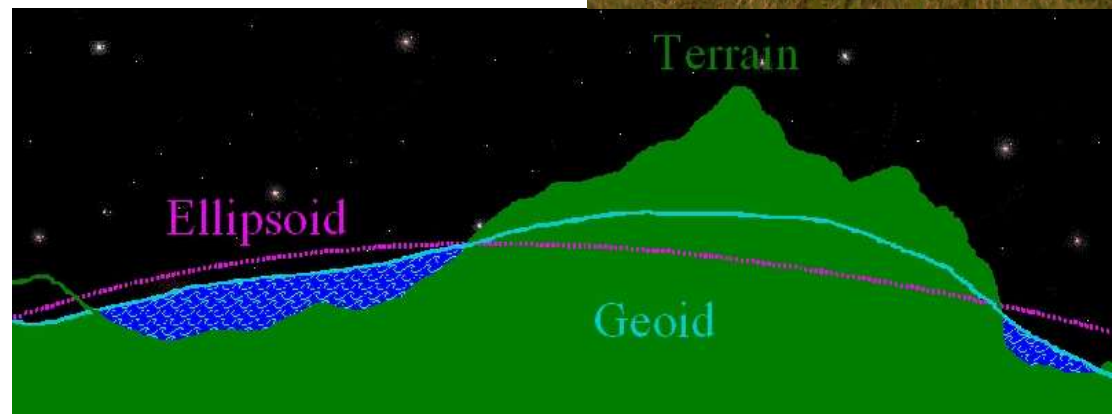


6 hours long GPS session

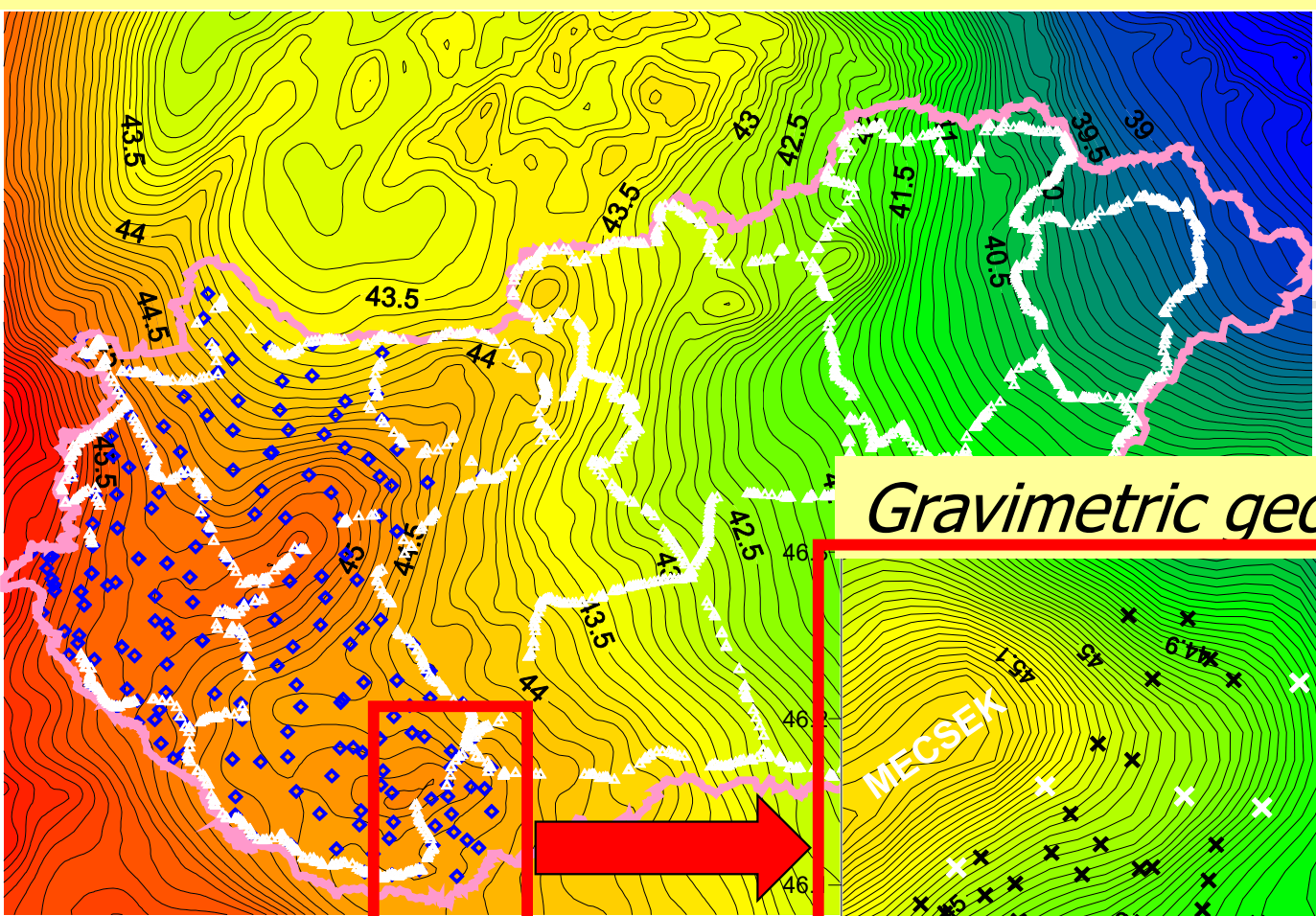
Multifunctional points

Deep marks

2nd order levelling-GPS points for fitting gravimetric geoid locally



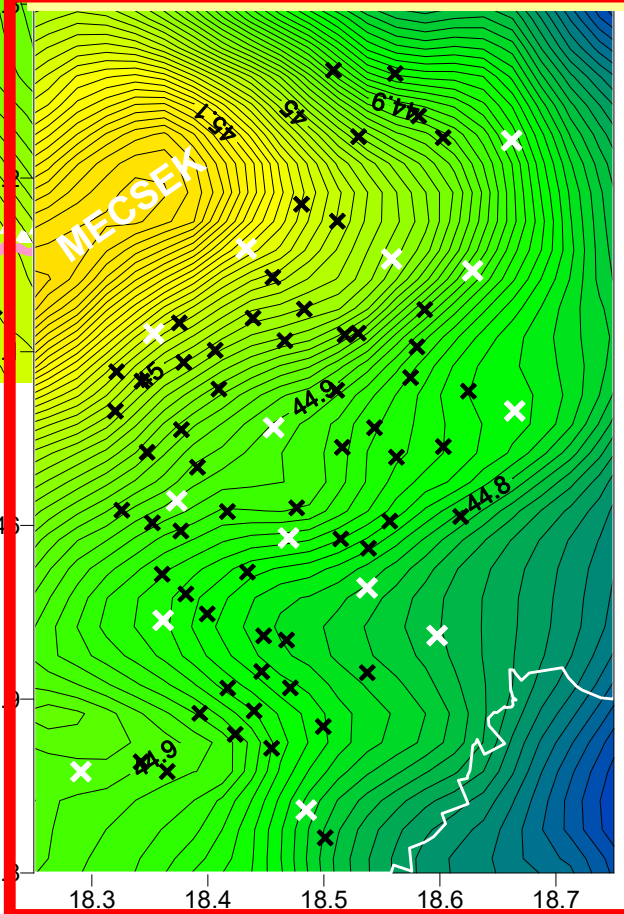
Our example: GPS-levelling instead of slow and expensive work



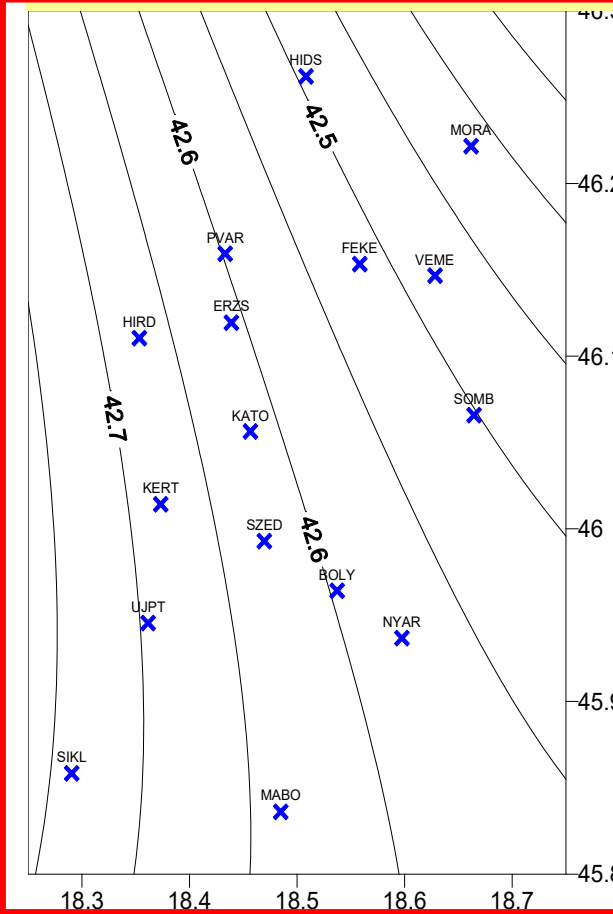
Gravimetric geoid model is fitted to GPS-levelled points

Residuals < 5 mm

Gravimetric geoid



GPS geoid

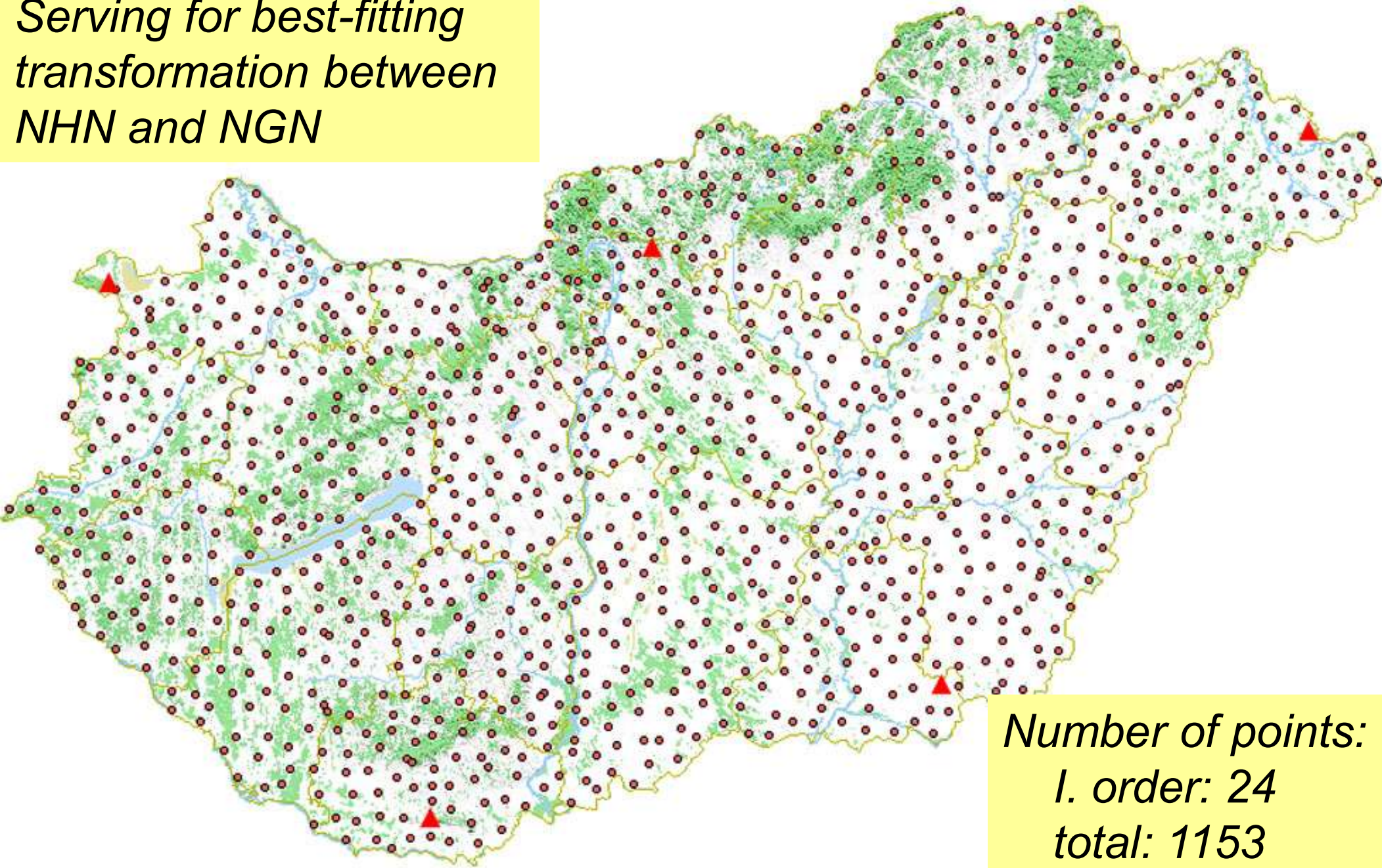


2nd order NVN points serve as common points for geoid fitting

Passive GPS network

National GPS Network (1991-1998)

*Serving for best-fitting
transformation between
NHN and NGN*

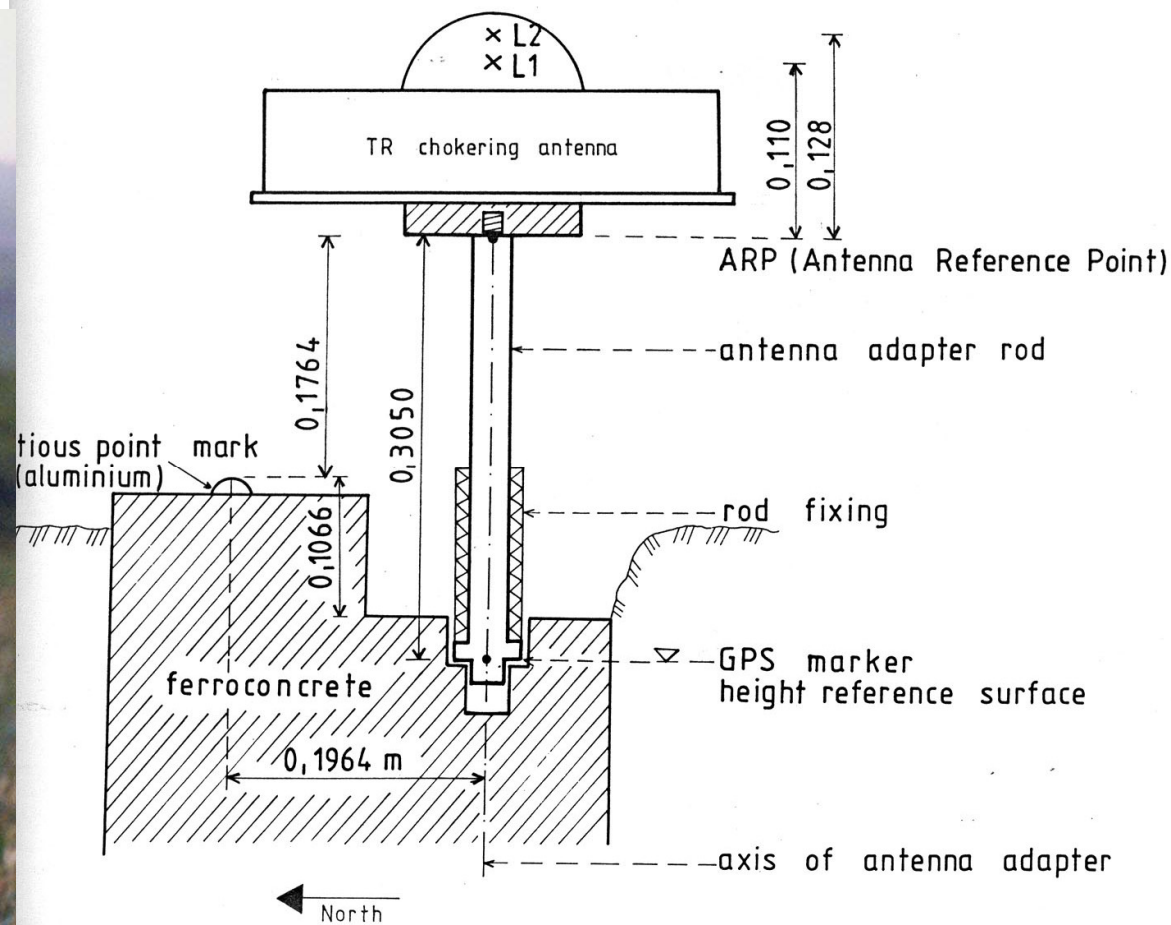


*Number of points:
I. order: 24
total: 1153*

Special monumentation for Hungarian Geodynamic Reference Points



Choke-ring antenna setup on bedrock stepwise movement point



Two point marks:

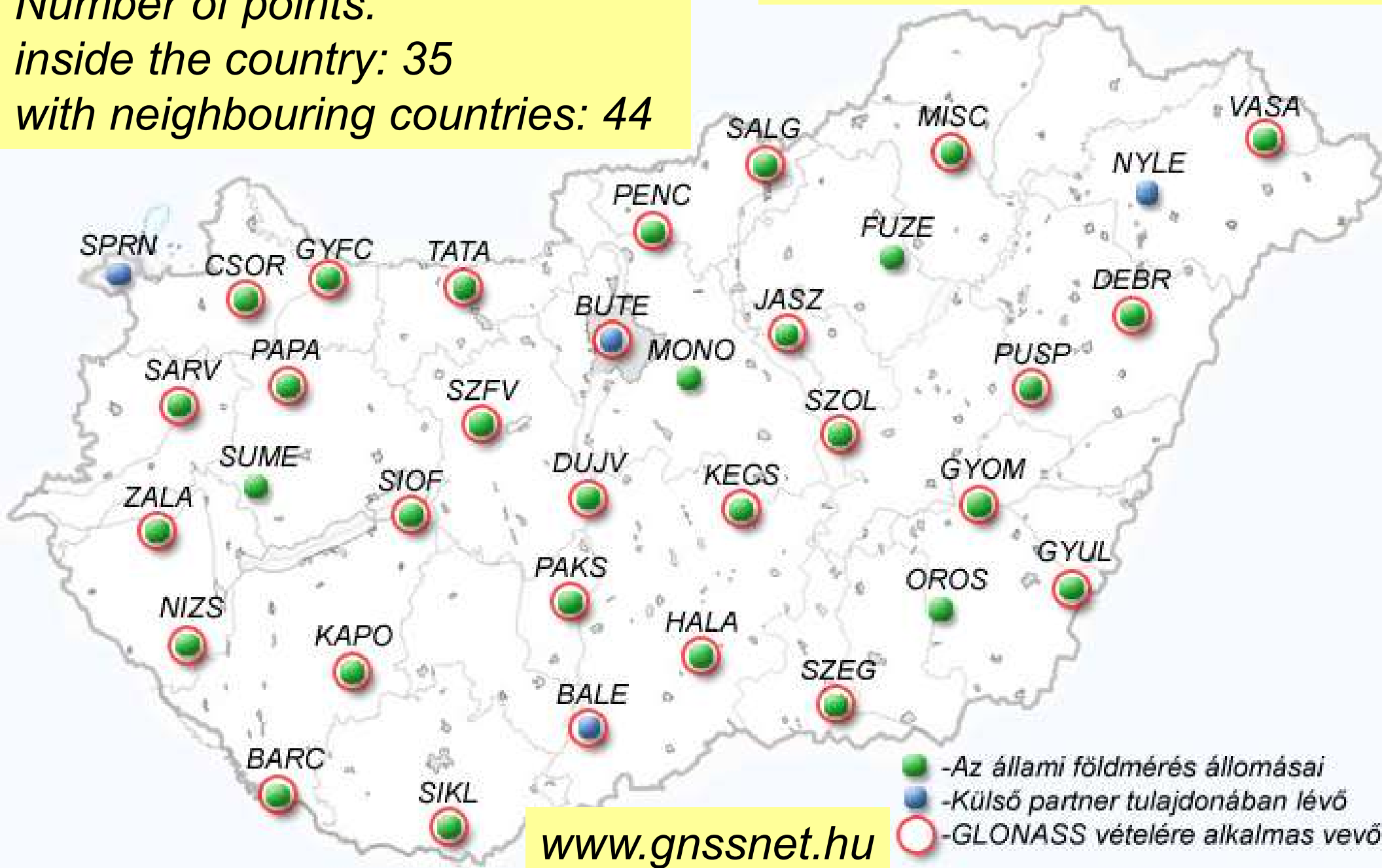
Upper: fictitious, for everyday use

Lower: real, for movement monitoring

Active GNSS network (CORS): GNSSnet.hu

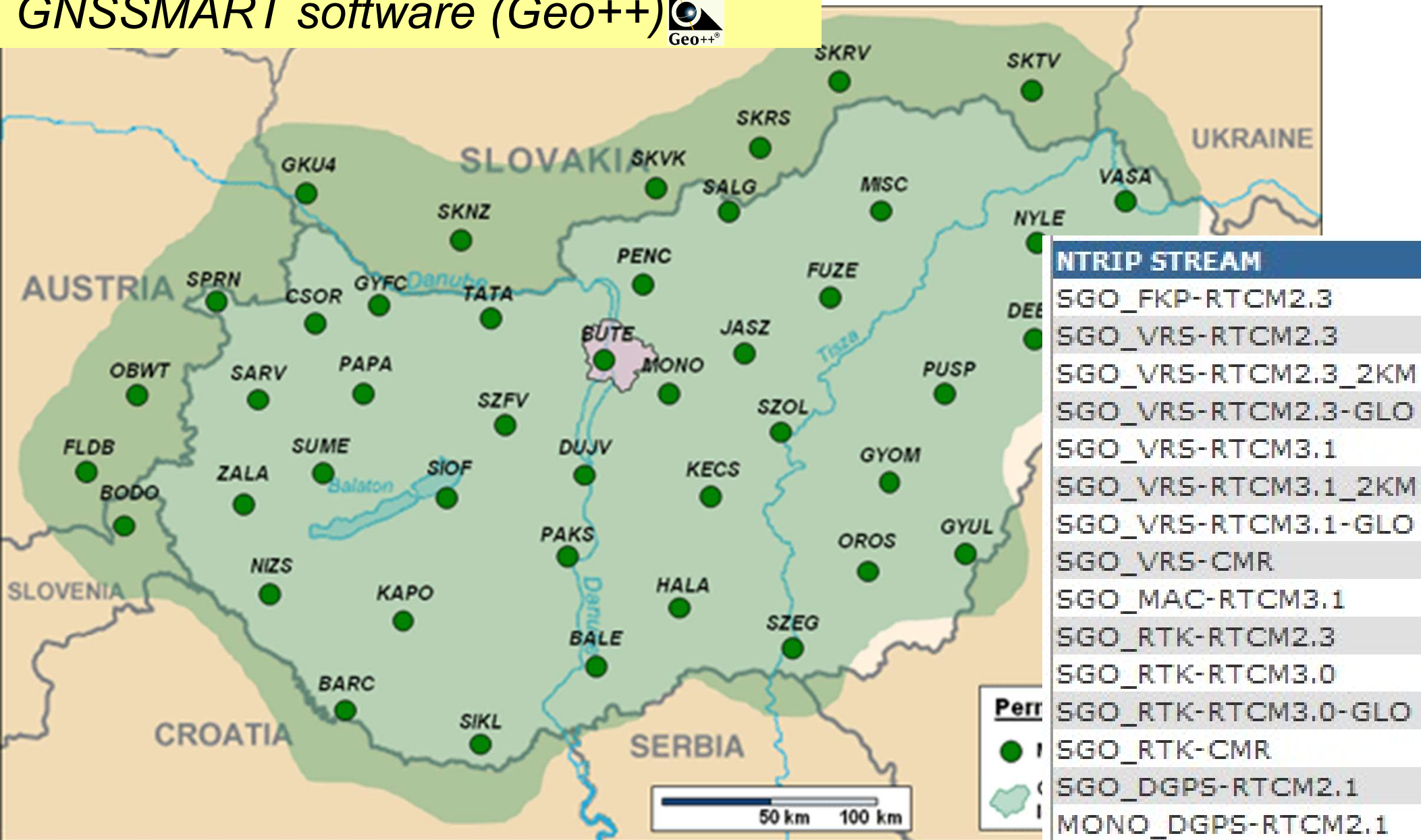
National CORS (2001-2008)

Number of points:
inside the country: 35
with neighbouring countries: 44



Network RTK services today

VRS, FKP, MAC conceptions +DGPS
GPS+GLONASS systems
GNSSSMART software (Geo++)



Kérjük adja meg a megtekinteni kívánt hónapot és adattípust:

2009

05

RTK (percalapú)

Térképre

2009.05. RTK



Where have you been?...

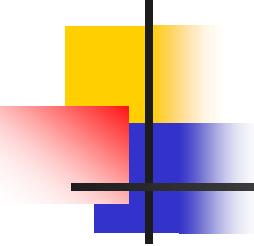
Where are you now?...

Koordináta: 47.21569°, 18.54538°

Idő: 2009-05-13 10:06:26 - 2009-05-13 10:10:36 (5 perc)

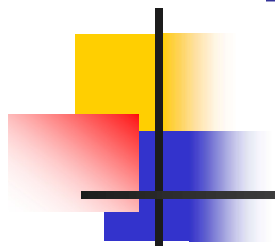
NTRIP Mountpoint: SGO_MAC-RTCM3.1





The demand for Integrated Network

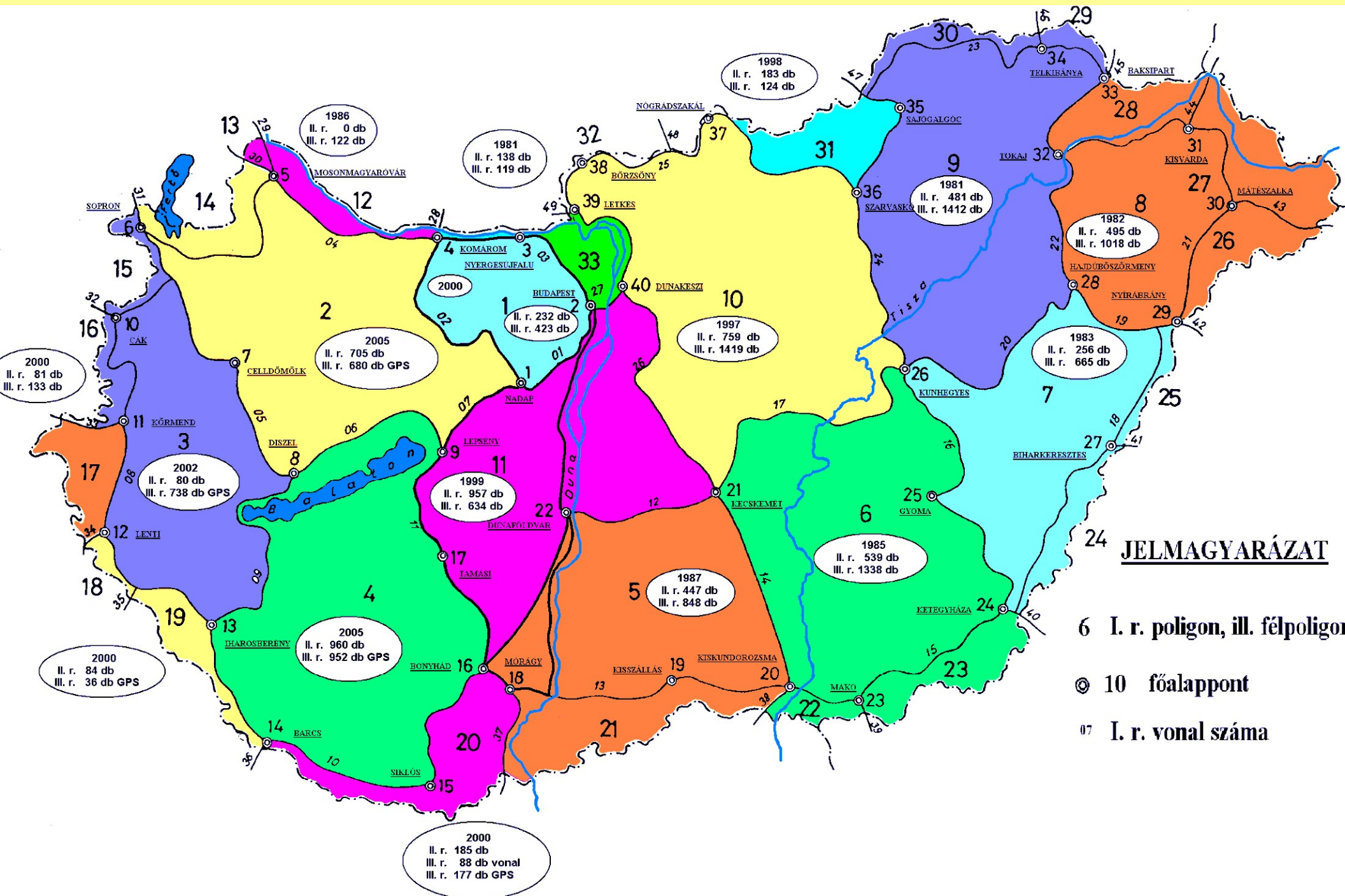
- Real need for precise sea-level height **using Network RTK**, but absence of good GPS-NVN common points and geoid
- Real need for precise, homogenous height data **on large working area**, but the surface (and marks) are moving



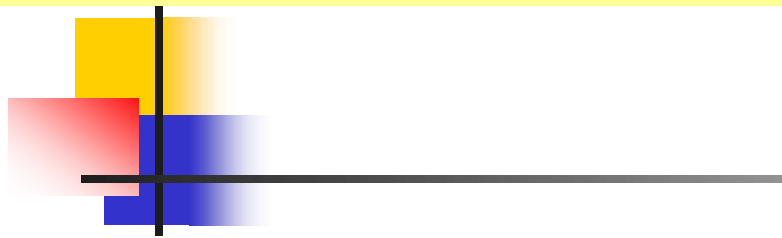
The plan of Integrated Geodetic Network

- Re-measure 1st order National Vertical Network
- Long static (12 hour) GPS measurement on suitable points at the same time, aprx. 20 km
- Using geoid model
- Results: new levelling network, new GNSS network, transformed horizontal coordinates, correct fitting

Integrated point: 1st order levelling point + 12 hours static GPS point + transformed horizontal point, found every 20 km on the levelling line



New type of documentation



Geodéziai alappont pontleírása (2008)

pontazonosító		település	EOIR szelvényszám	dimenzio
VÁL-5		Vál	54-222-142	1D (magassági)
pontjelölés		pontvédelem		GPS mérhetőség
gomb földalatti betonodlóban		vaslemez földdel takarva		nincs
Vonatkoztatási rendszer		Helymeghatározó adatok		
ETRS89/ ETRF1995		X	Y	Z
		4102131	1384952	4668073
		φ	λ	h
		47 20 45.8	18 39 20.1	211
EOV	EOMA	y	x	H
		620392	222522	167.1038
A pont megközelítésének szöveges leírása				

A pont a Vajda János emlékház kertjében, annak ÉNy-i sarkában, a saroktól 1-1 méterre található. A pontot fedő kazánlemez 0,3 m-re a föld alatt van. Gépkocsival jól megközelíthető.

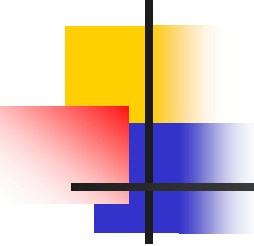
Coordinates in 3 reference systems:

ETRS89 (ETRF2005)
X, Y, Z φ, λ, h

NVN: **H**

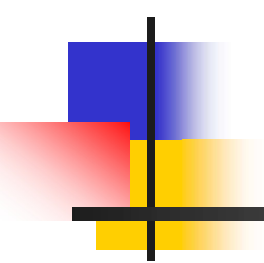
NHN: **y, x**

Utolsó helyszínelési bejegyzés	Helyszínelés dátuma
A pont ép. Mérés után visszatérve.	2008. 07. 20.
Fénykép, áttekintő térkép, helyszínrajz	



The future tasks

- Face to integrated network (precise levelling+gravimetry+precise GPS)
- Reduce control points, to be preserved: only points of the **NGN**, first and second-order points of the **NVN**, and high-order points of the **NHN**
- New digital registry of control points



Thanks for your attention

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