

GLOBALIS GNSS ADATGYŰJTÉS ÉS NÉHÁNY ALKALMAZÁSA

Rózsa Szabolcs

BME, Építőmérnöki Kar, Általános és Felsőgeodézia Tanszék



MŰHOLDAS HELYMEGHATÁROZÁS FEJLŐDÉSE



12 nemzetközi Geodéziai
vetség (IGA)
Nemzetközi Geodéziai
figyelő Rendszer
működésének kiépítése

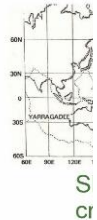
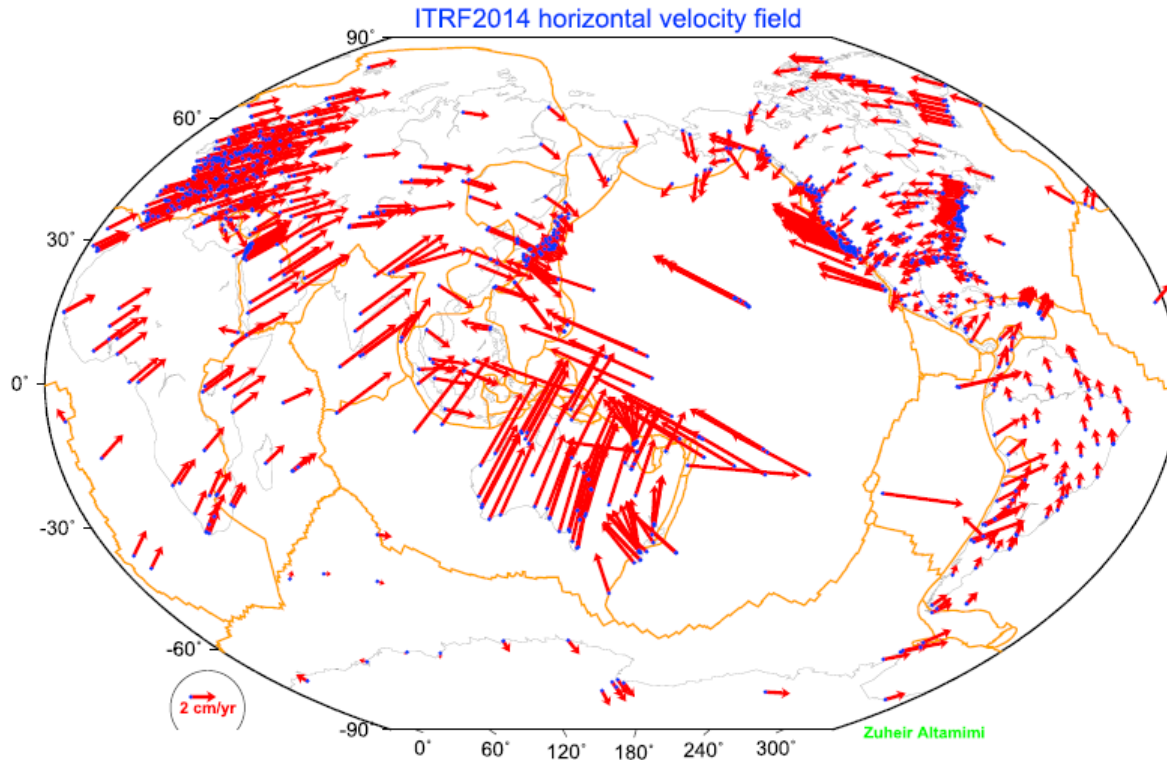


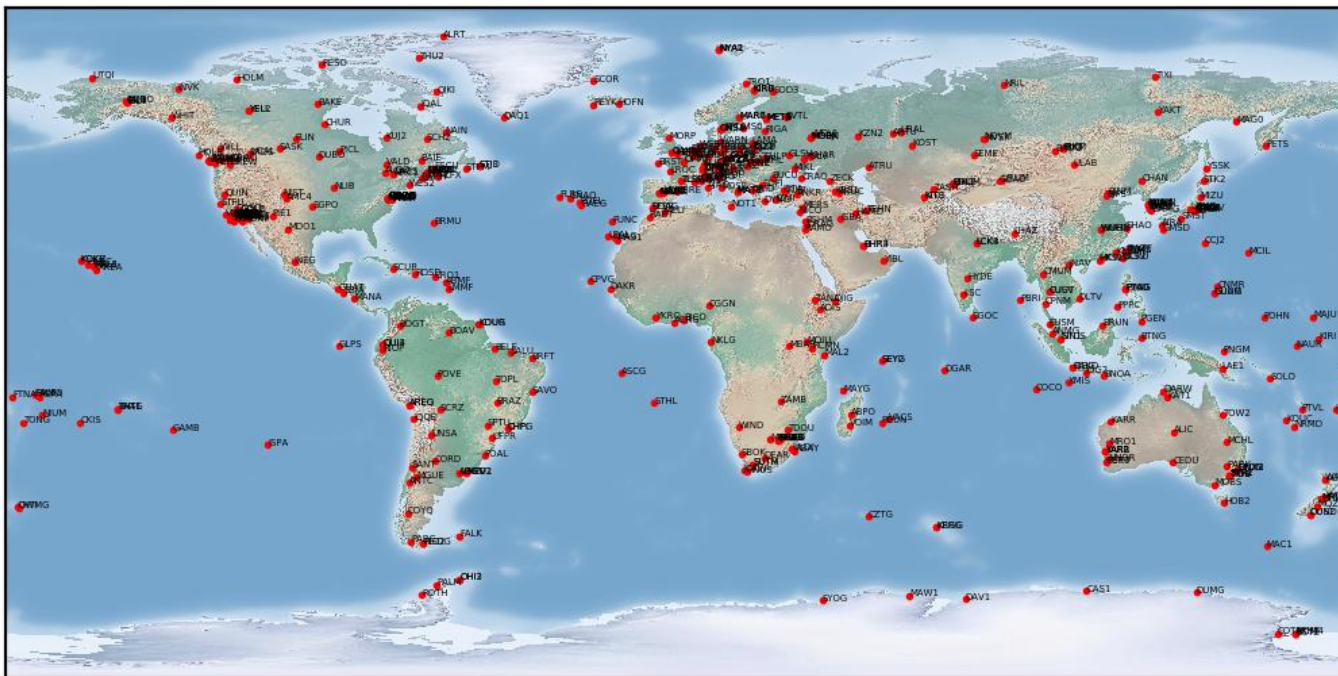
Figure 11. ITRF2014 horizontal site velocities with formal error less than 0.2 mm/yr. Major plate boundaries are shown according to *Bird* [2003].



BC-4
45 pont: 2-8m

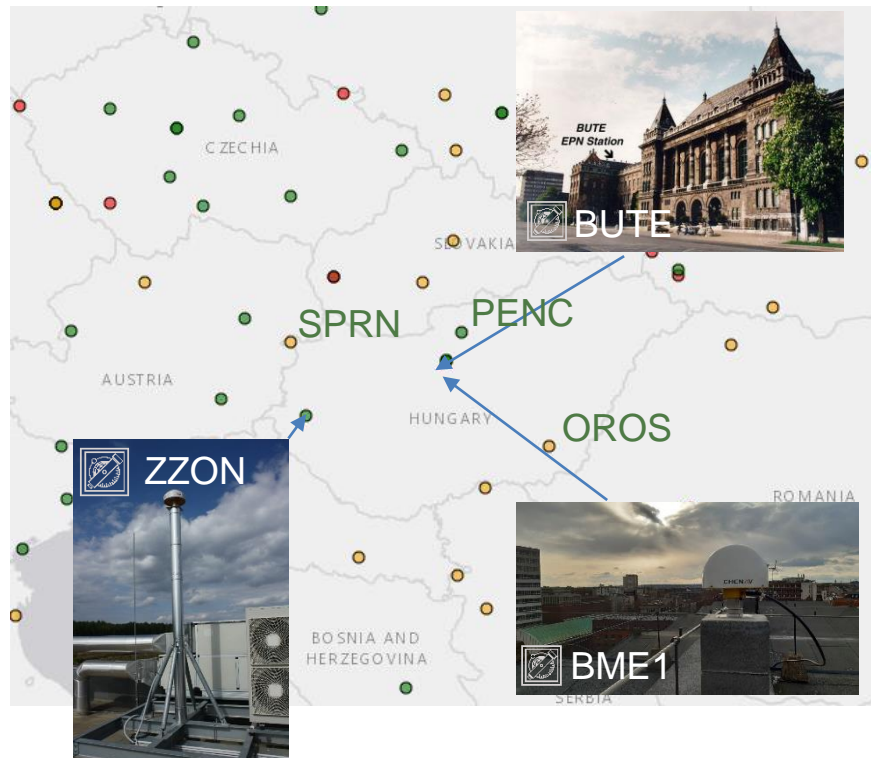
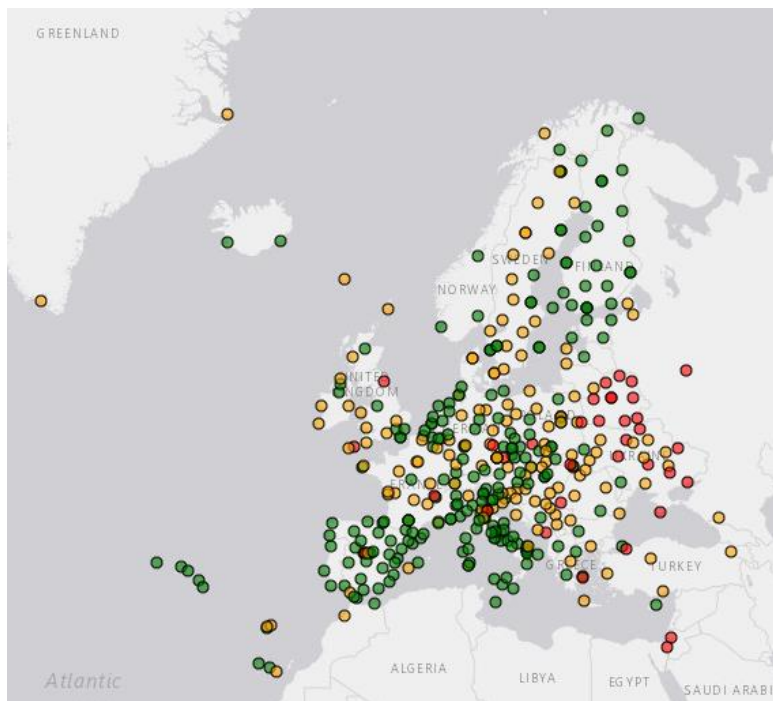
1959: Az első Transit műhold pályáraállítása
1958: Guiffer-Weiffenbach: Doppler-mérések a Szeptnyik-1-re
1957.10.04. Szeptnyik-1

GNSS INFRASTRUKTÚRA



Nemzetközi GNSS Szolgálat globális állomáshálózata (400+ állomás)

EURÓPAI GNSS INFRASTRUKTÚRA



EUREF Permanens állomások hálózata (416 állomás, 2023.10.16)

EURÓPAI GNSS INFRASTRUKTÚRA



PARTNER



EUREF Permanent GNSS
Network



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We invite you to explore the [Issue No 5 of the EUREF Newsletter](#). This edition showcases the key activities, developments, and achievements of the EUREF Community and EUREF GB over the past year, highlighting our collective progress in geodesy and reference systems.

Quick Station Links

[Information](#) [Coordinates](#) [Time Series](#) [Data Quality](#)
[Data Calendar](#)

46

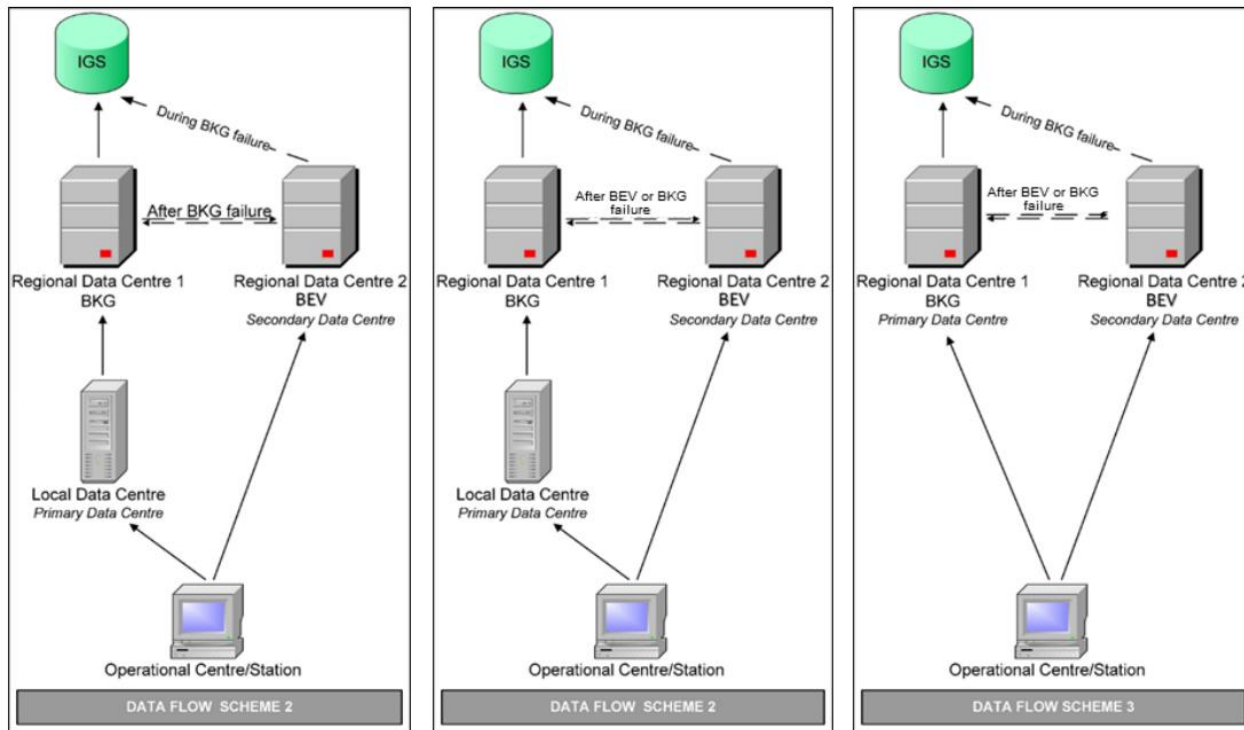
https://www.epncb.oma.be/documentation/guidelines/guidelines_station_operationalcentre.pdf

https://www.epncb.oma.be/documentation/guidelines/procedure_becoming_station.pdf

https://www.epncb.oma.be/documentation/guidelines/guidelines_data_centres.pdf

https://www.epncb.oma.be/documentation/guidelines/guidelines_analysis_centres.pdf

EURÓPAI GNSS INFRASTRUKTÚRA



Standard adatáramlás

EURÓPAI GNSS INFRASTRUKTÚRA



GR50 - 4.50.274 | BUTE | 2025-01-29 11:33:57

[Home](#) | [Status](#) | [GNSS management](#) | [Receiver setup](#) | [Help](#) | [Support](#)

[Logout Admin](#)

GNSS management

FTP and USB locations



FTP push	External USB drive		
Name	FTP server	Queue	
EUREF_BKG	igs.bkg.bund.de	0	
EUREF_OLG	olggps.oeaw.ac.at	0	
EUREF_BEV	gnss.bev.gv.at	0	
EUREF_OLG_HOURLY	olggps.oeaw.ac.at	0	
gpsmet_10Hz	gpsmet.agt.bme.hu	0	
gpsmet_daily	gpsmet.agt.bme.hu	1 !	
gpsmet_hourly	gpsmet.agt.bme.hu	14 !	

Create new FTP location

General		Tracking	
	24.4 V	--	
	14.67 GB (98.88%) free		Navigated
	No USB drive		GPS 9 / 10
	9 active data stream(s)		GLO 11 / 11
	2 active log session(s)		GAL 12 / 13
	66d 21h 19min		BDS 16 / 20
	Smart clean-up active		QZSS No option
			NavIC No option
			SBAS Not active
			OSC Internal

Event log	
11:14:00	FTP location gpsmet_hourly: could not archive all files. Execute FTP location test to verify settings.
11:13:59	FTP location gpsmet_daily: could not archive all files. Execute FTP location test to verify settings.
	FTP location gpsmet_hourly: could not archive all files.



Valós idejű adatszolgáltatás: RTCM

RINEX

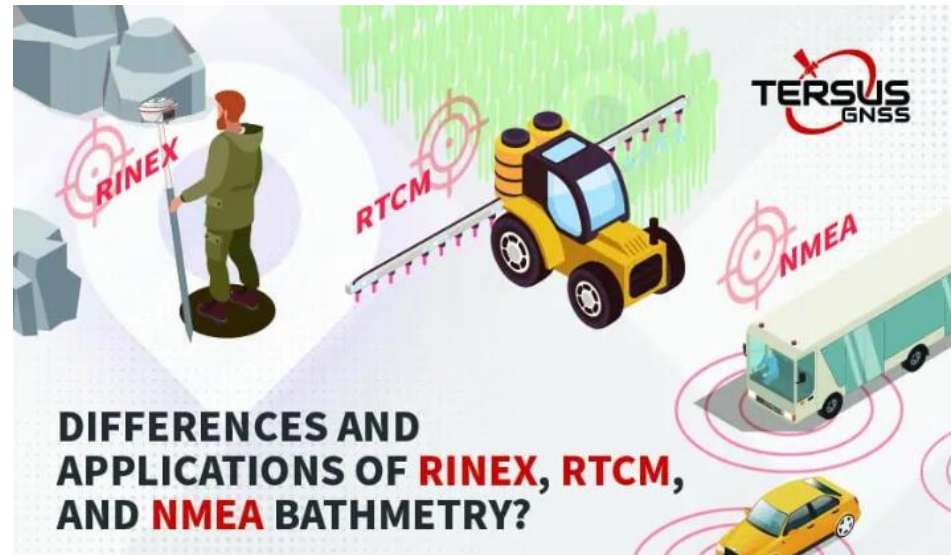
The Receiver Independent Exchange Format

Version 3.04

International GNSS Service (IGS), RINEX Working Group and Radio Technical Commission for Maritime Services Special Committee 104 (RTCM-SC104)

November 23, 2018

Acknowledgement: RINEX Version 3.02, 3.03 and 3.04 are based on RINEX Version 3.01, which was developed by: Werner Gurtner, Astronomical Institute of the University of Bern, Switzerland and Lou Estey, UNAVCO, Boulder, Colorado, USA.



SZABVÁNYOSÍTÁS (CRX – HATANAKA)



```

3.0 COMPACT RINEX FORMAT CRINEX VERS / TYPE
RNX2CRX ver.4.1.0 28-Jan-25 00:12 CRINEX PROG / DATE
3.04 OBSERVATION DATA M: MIXED RINEX VERSION / TYPE
GR50 V4.50 Department of Geodesy20250126 235942 UTC PGM / RUN BY / DATE
SNR is mapped to RINEX snr flag value [1-9] COMMENT
LX: < 12dBHz -> 1; 12-17dBHz -> 2; 18-23dBHz -> 3 COMMENT
24-29dBHz -> 4; 30-35dBHz -> 5; 36-41dBHz -> 6 COMMENT
42-47dBHz -> 7; 48-53dBHz -> 8; >= 54dBHz -> 9 COMMENT
BUTE MARKER NAME
11209M001 MARKER NUMBER
BUTE Department of Geodesy and Surveying OBSERVER / AGENCY
1830377 LEICA GR50 4.50/7.710 REC # / TYPE / VERS
725335 LEIAR25.R4 LEIT ANT # / TYPE
4081882.3774 1410011.1420 4678199.3910 APPROX POSITION XYZ
0.0000 0.0000 0.0000 ANTENNA: DELTA H/E/N
G 16 C1C L1C D1C S1C C2S L2S D2S S2S C2W L2W D2W S2W C5Q SYS / # / OBS TYPES
L5Q D5Q S5Q SYS / # / OBS TYPES
R 12 C1C L1C D1C S1C C2P L2P D2P S2P C2C L2C D2C S2C SYS / # / OBS TYPES
E 16 C1C L1C D1C S1C C5Q L5Q D5Q S5Q C7Q L7Q D7Q S7Q C8Q SYS / # / OBS TYPES
L8Q D8Q S8Q SYS / # / OBS TYPES
C 20 C1P L1P D1P S1P C2I L2I D2I S2I C5P L5P D5P S5P C6I SYS / # / OBS TYPES
L6I D6I S6I C7I L7I D7I S7I SYS / # / OBS TYPES
DBHZ SIGNAL STRENGTH UNIT
30.000 INTERVAL
2025 01 27 00 00 0.0000000 GPS TIME OF FIRST OBS
2025 01 27 23 59 30.0000000 GPS TIME OF LAST OBS
    
```

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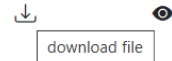
24 R01 1 R02 -4 R03 5 R04 6 R05 1 R06 -6 R07 5 R08
R09 -2 R10 -7 R11 0 R12 -1 R13 -2 R14 -7 R15 0 R16
R17 4 R18 -3 R19 3 R20 2 R21 4 R22 -3 R23 3 R24
C1C -71.940 C1P -71.940 C2C -71.940 C2P -71.940
18 18 1929 7
> 2025 01 27 00 00 0.0000000 0 46 G01G02G03G04G06
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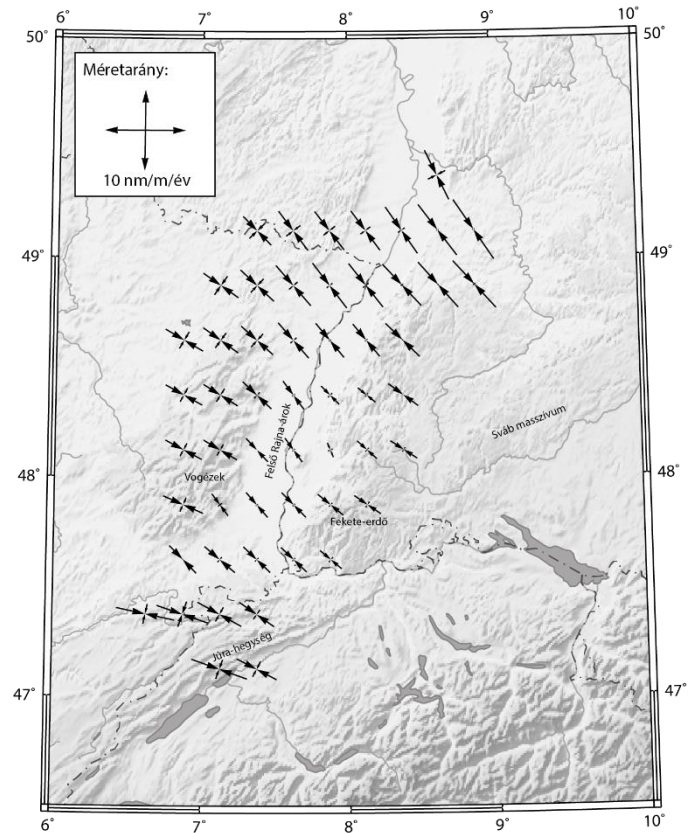
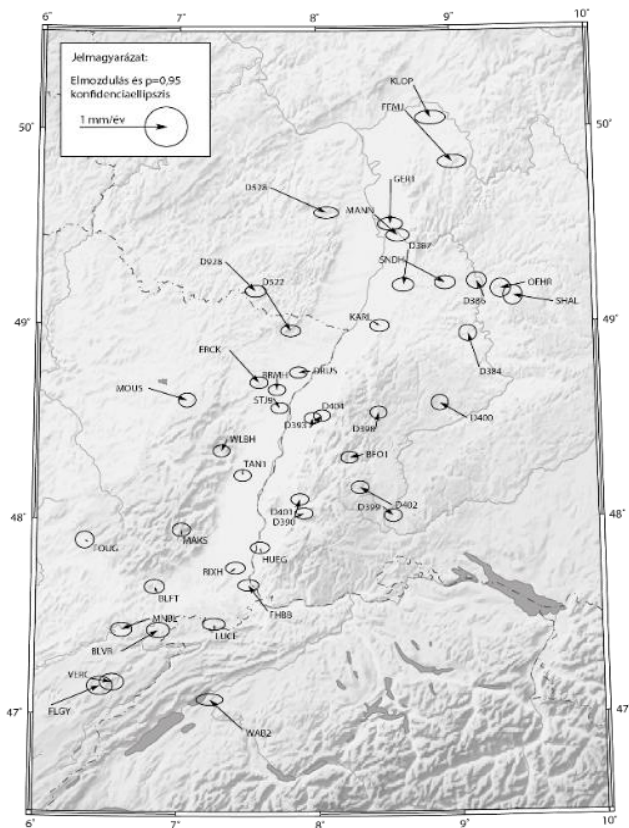
Data & Products Repository

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- BRTS00BLR_R_20250270000_01D_RN.rnx.gz
- BSCN00FRA_R_20250270000_01D_30S_MO.crx.gz
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Last Update: 2025-01-28T00:08:16.554Z
Data Source: Receiver
RINEX Vers.: 3.04



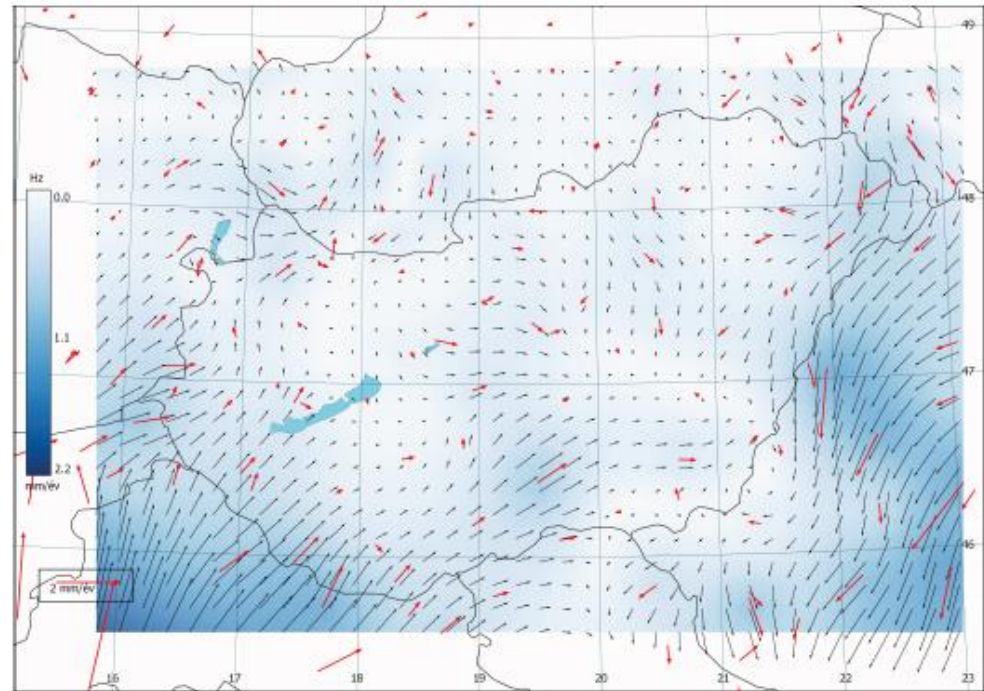
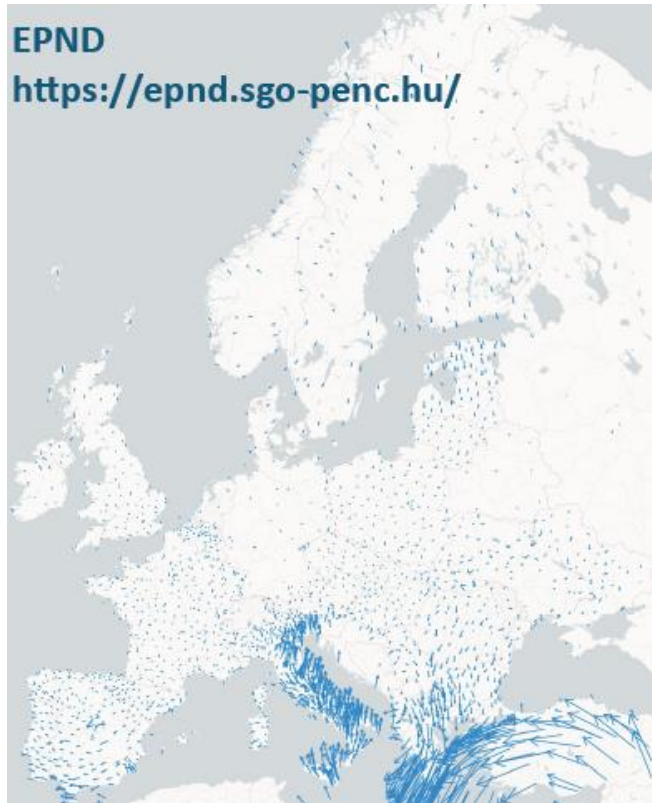
GEOKINEMATIKA – LEMEZEKEN BELÜLI DEFORMÁCIÓK



~ 4-5nm/m/év

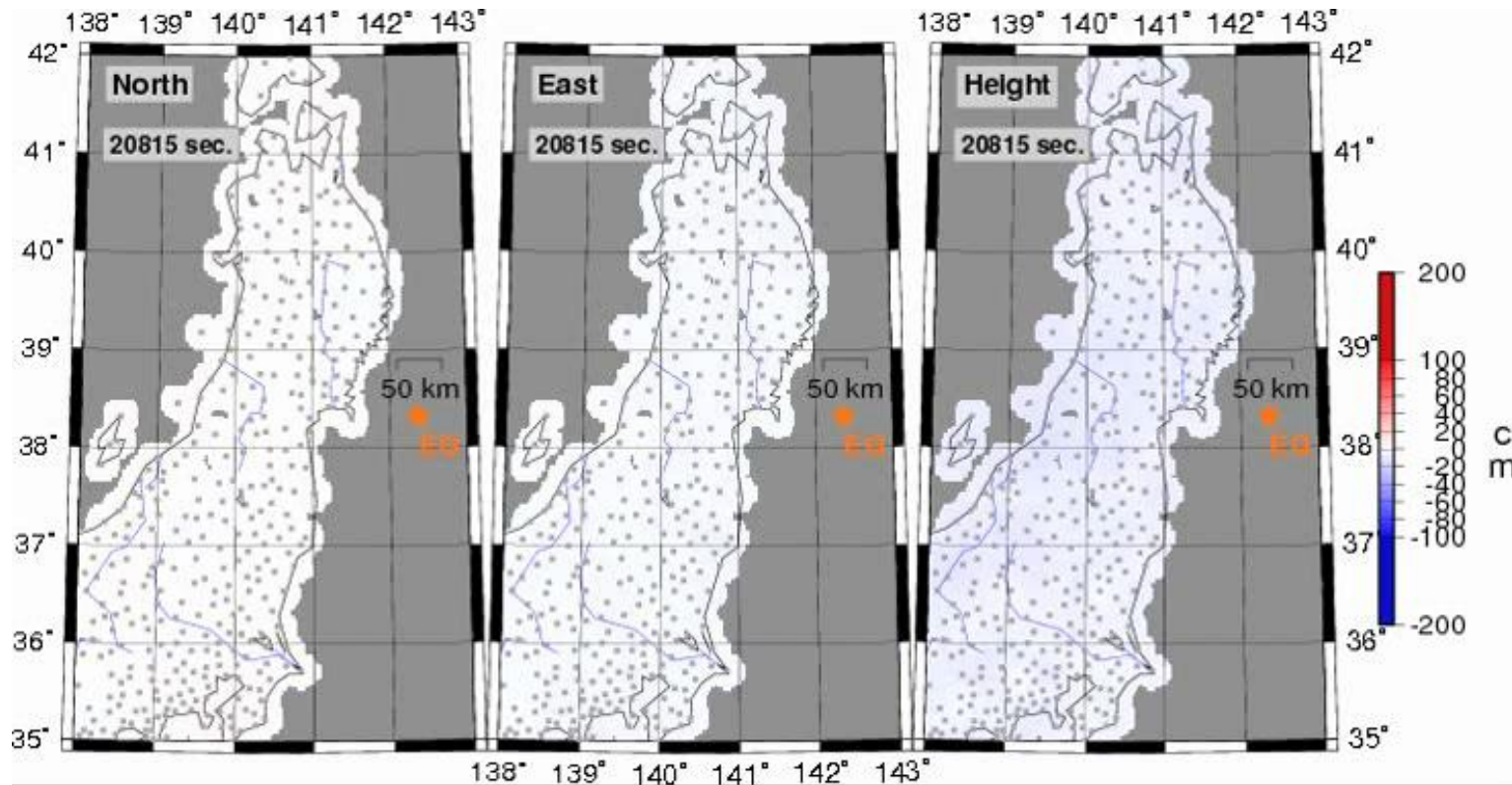
Rózsa, 2023. A geodéziai, geodinamikai és atmoszférai kutatások a műholdas helymeghatározásban)

GEOKINEMATIKA – LEMEZEKEN BELÜLI DEFORMÁCIÓK



Kenyeres és társai (2023). Merre tovább EOMA infrastruktúra? IMMA!

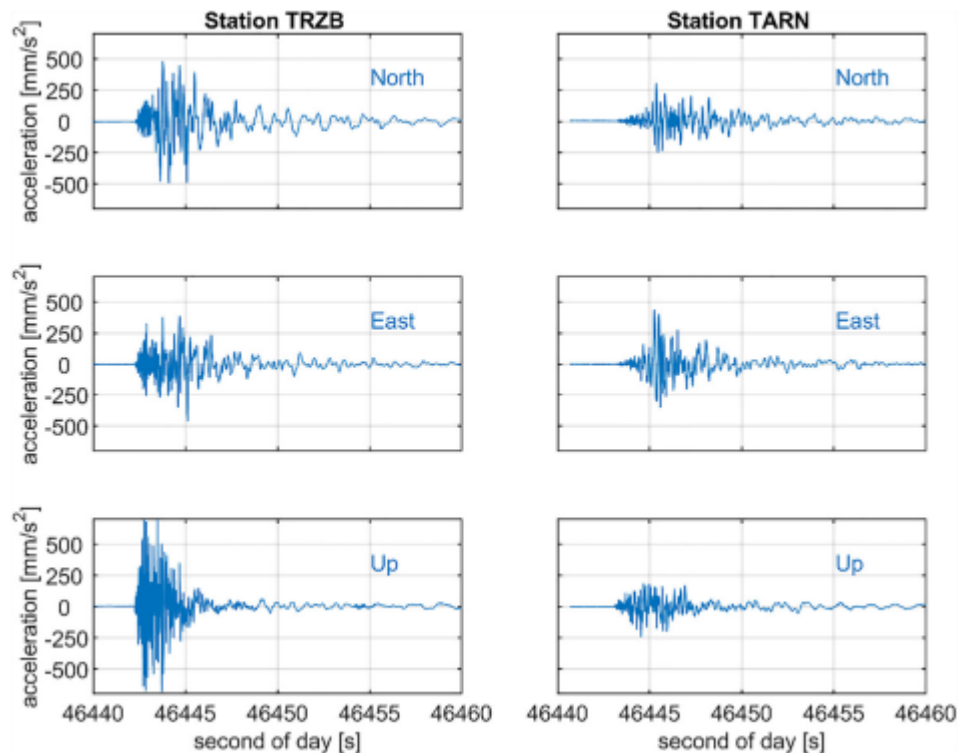
SZEIZMOLÓGIAI ALKALMAZÁSOK



Geospatial Information Authority of Japan



SZEIZMOLÓGIAI ALKALMAZÁSOK



$$M_W=3,8$$

epicentrális távolság 1,2
(TRZB) ill. 4 km (TARN)

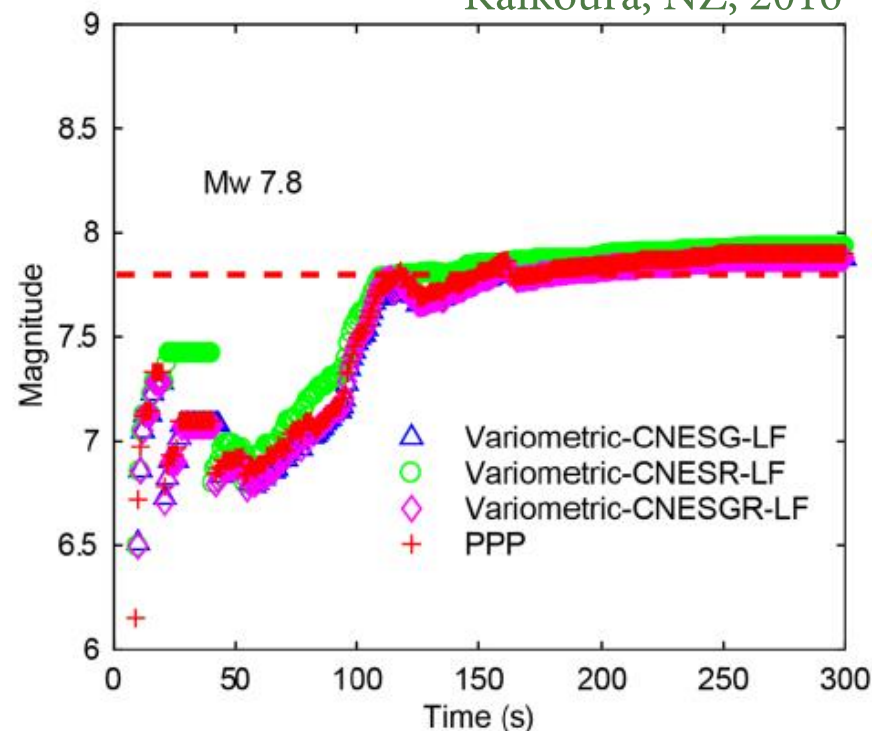
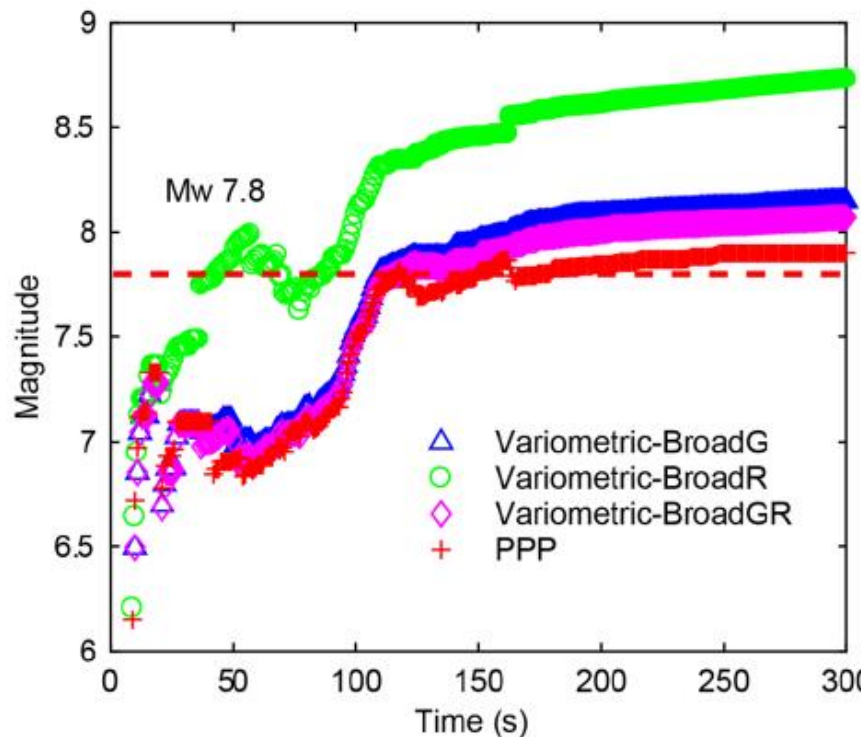
relatív GNSS
helymeghatározás
(koordinátaváltozásokból
gyorsulás)

Paziewski és társai (2020). Towards Galileo + GPS seismology: Validation of high-rate GNSS-based system for seismic events characterisation

SZEIZMOLÓGIAI ALKALMAZÁSOK

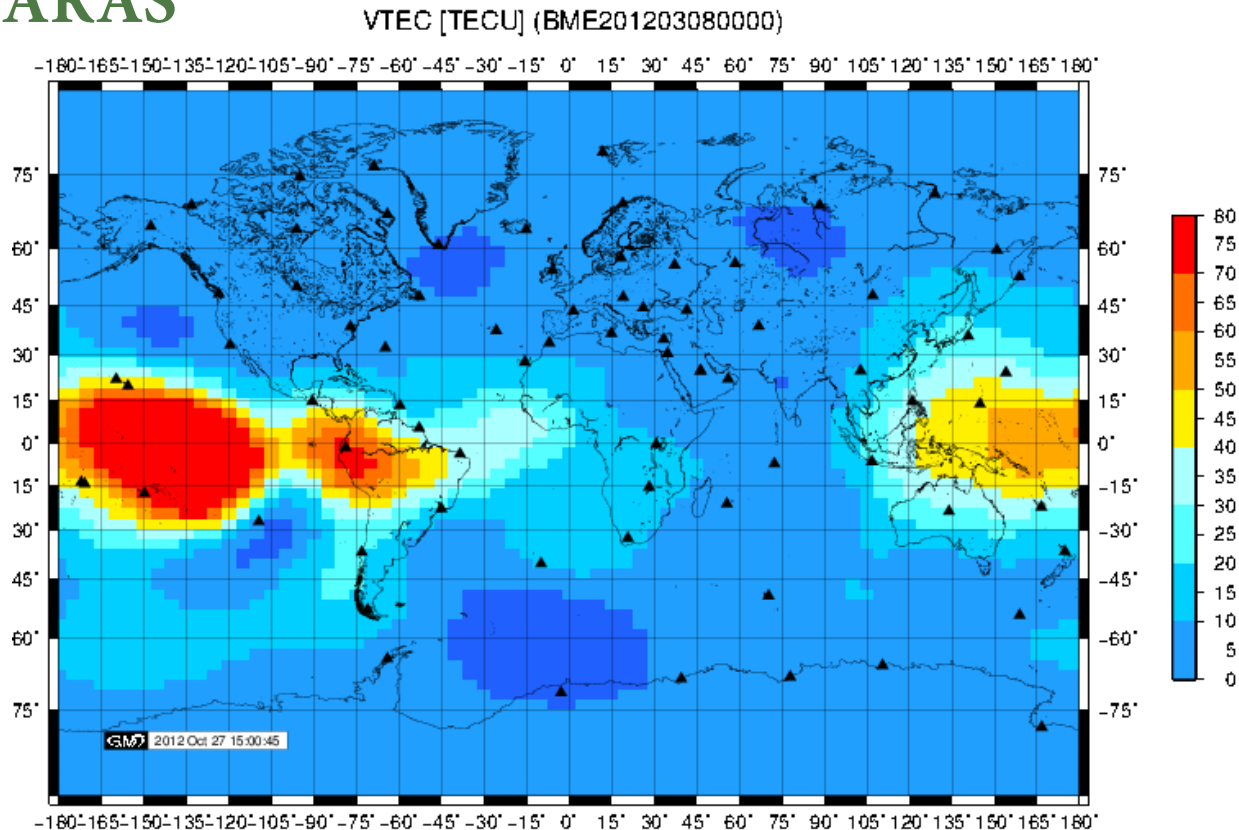


Kaikoura, NZ, 2016



Jianfei és társai (2020). Scaling earthquake magnitude in real time with high-rate GNSS peak ground displacement from variometric approach

ŰRIDŐJÁRÁS

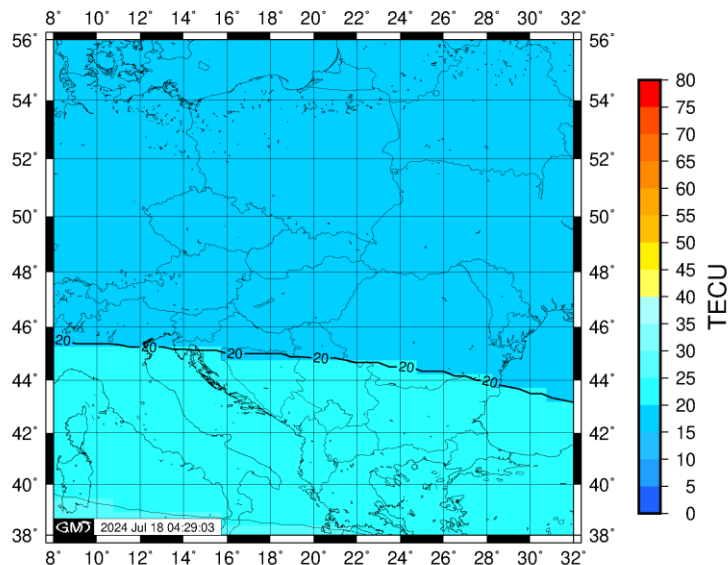


Globális ionoszféra modell a 2012. március 5-i napkitörést követően (I. Juni, BME)

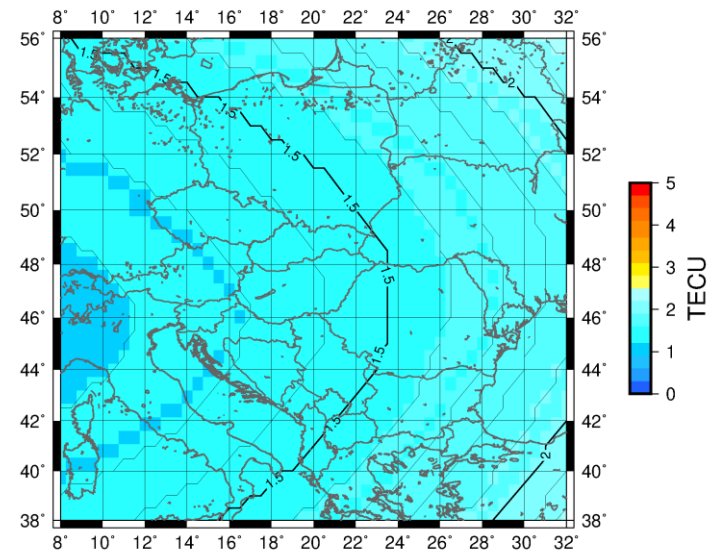
VTEC BECSLÉSEK KÜLÖNFÉLE FELDOLGOZÁSI STRATÉGIÁKKAL

GPS+GLO+GAL

VTEC (2024-200 01UTC)



VTEC RMS (2024-200 01UTC)



Aktuális animált ionoszféra térképek GPS, GLONASS és Galileo észlelések felhasználásával:

http://gpsmet.agt.bme.hu/img/figion/last_TEC_O_anim.gif

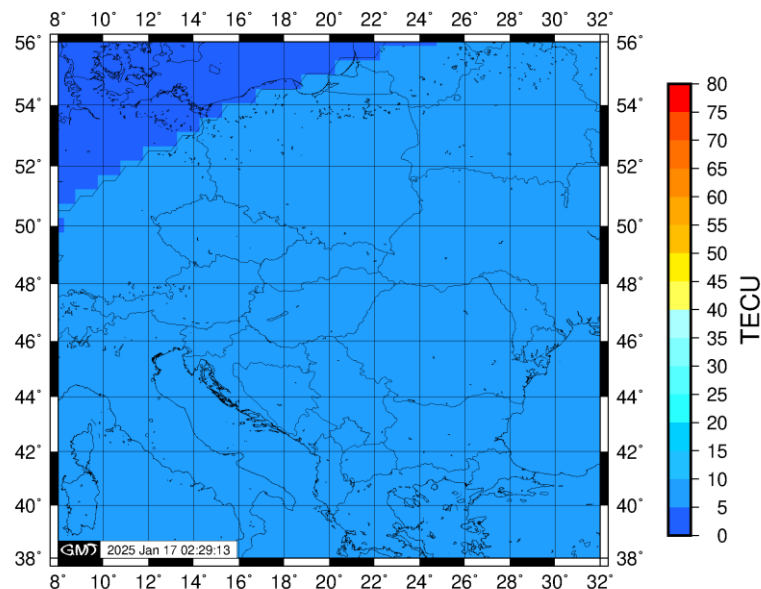
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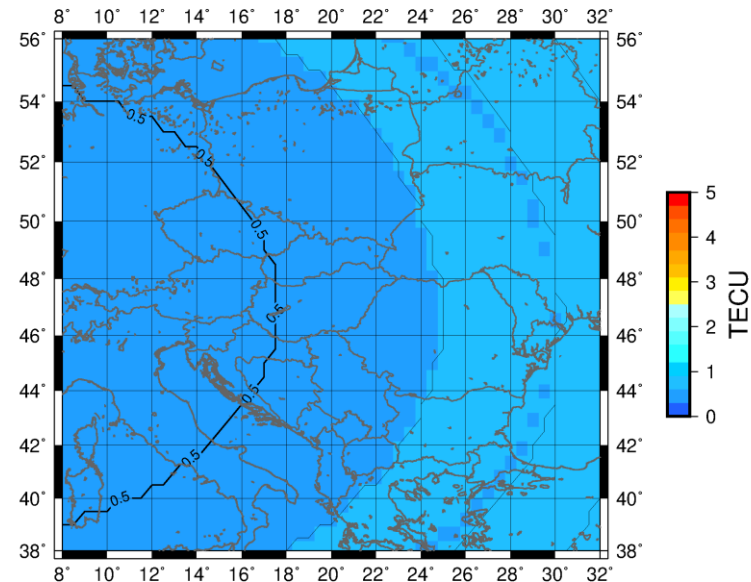
VTEC BECSLÉSEK KÜLÖNFÉLE FELDOLGOZÁSI STRATÉGIÁKKAL

GPS+GLO+GAL

VTEC (2025-017 00UTC)



VTEC RMS (2025-017 00UTC)



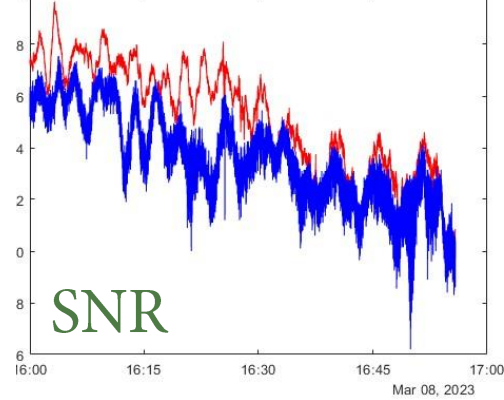
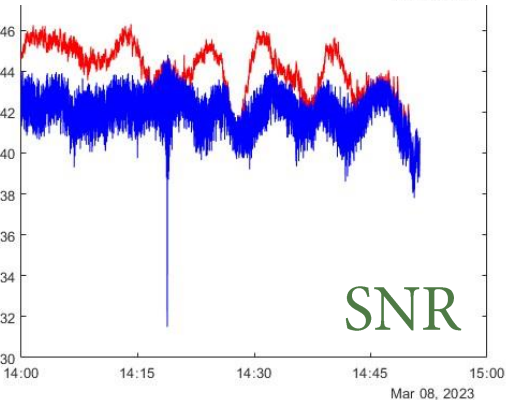
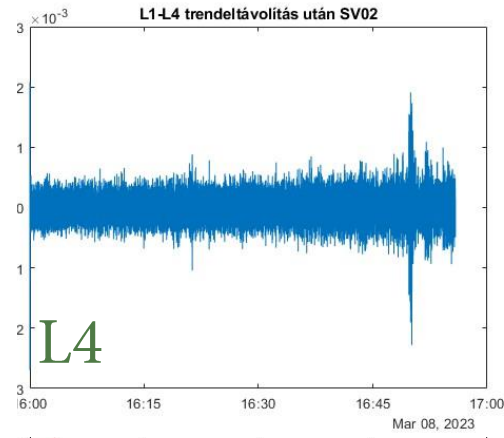
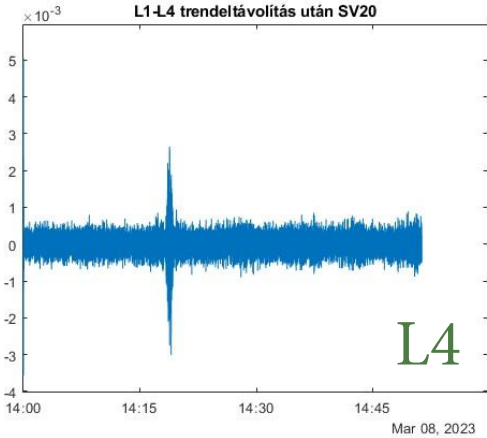
Aktuális animált ionoszféra térképek GPS, GLONASS és Galileo és

http://gpsmet.agt.bme.hu/img/figion/last_TEC_O_anim.gif

http://gpsmet.agt.bme.hu/img/figion/last_RMS_O_anim.gif



IONOSZFÉRIKUS SZCINTILLÁCIÓ

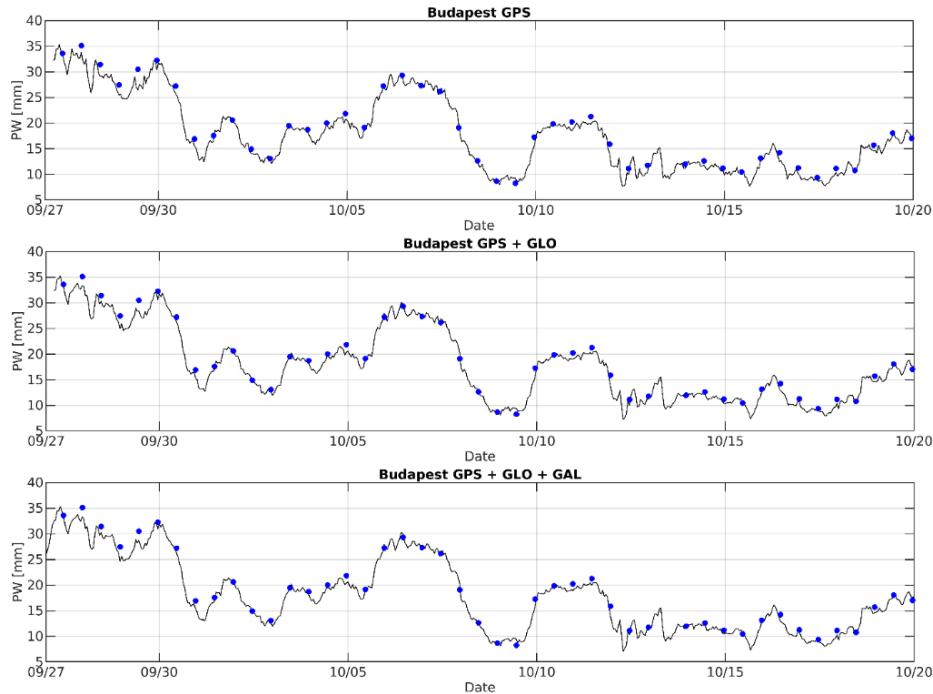


Az ionoszféra finomszerkezete miatt az elektromágneses hullámok elhajolnak, szóródnak, így az antenna a különböző úton érkező hullámok interferenciáját érzékeli:

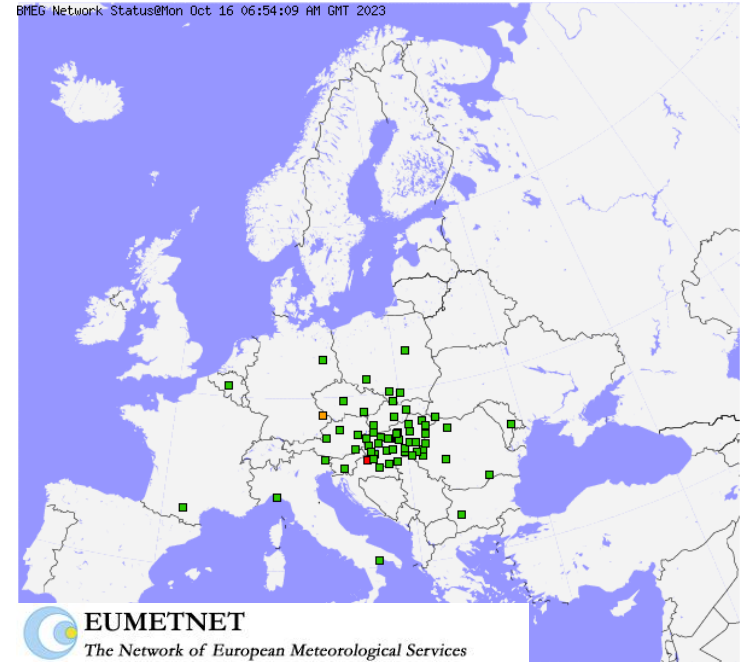
- fáziseltérést (távolságmérési hibát) és
- teljesítményeltérést okoz (jel/zaj viszony esik)

Budapest, 2023.03.08

METEOROLÓGIAI ALKALMAZÁSOK

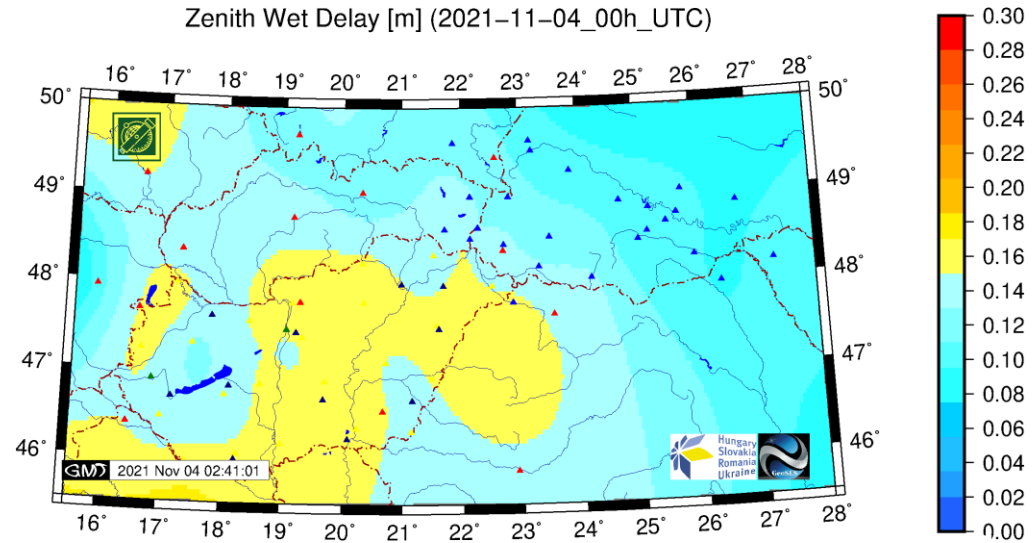
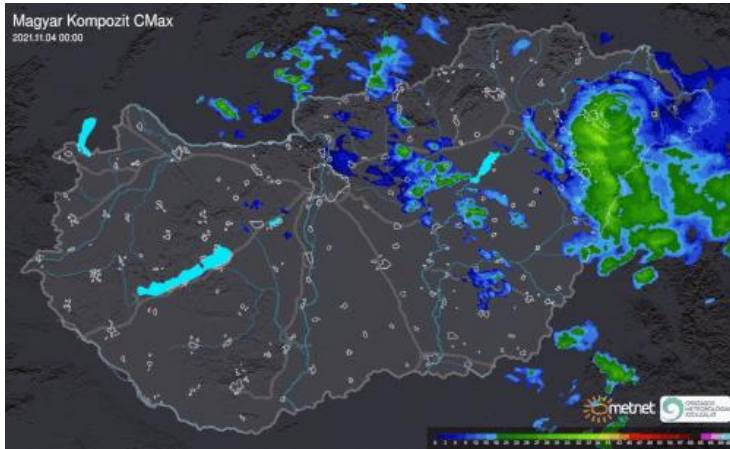


Rózsa és társai (2022). Multi-GNSS near real-time precipitable water vapour estimation for severe weather prediction



BMEG feldolgozóközpont (69 állomás, 2023. szeptember)

METEOROLÓGIAI ALKALMAZÁSOK



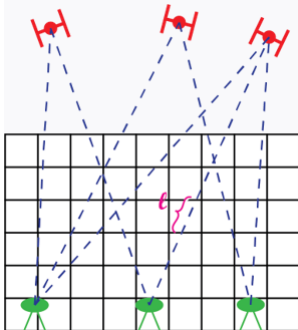
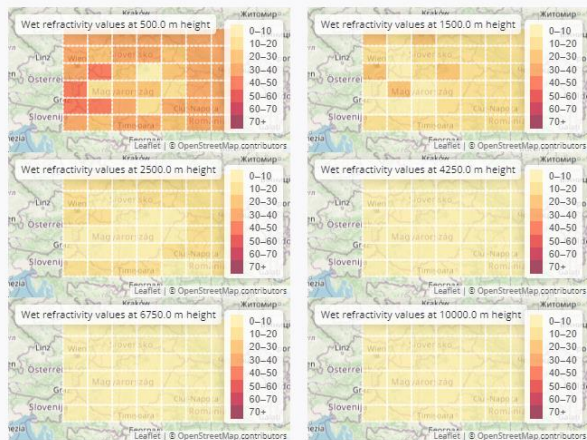
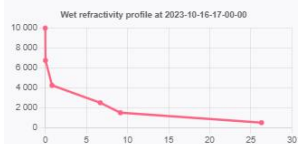
Rózsa és társai (2022). Multi-GNSS near real-time precipitable water vapour estimation for severe weather prediction



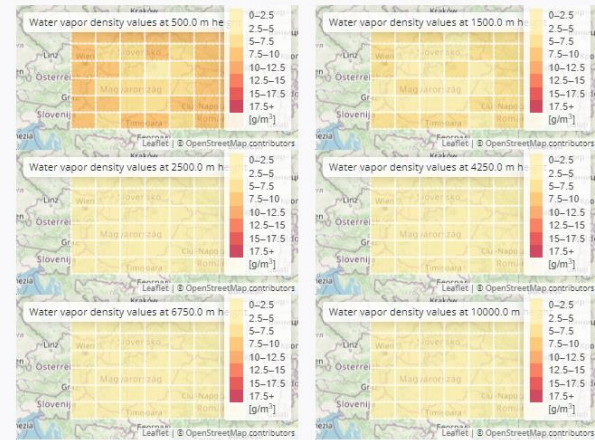
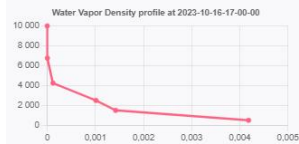
METEOROLÓGIAI ALKALMAZÁSOK



WET REFRACTIVITY



WATER VAPOR DENSITY



Turák és társai (2023). Tomographic Reconstruction of Atmospheric Water Vapor Profiles Using Multi-GNSS Observations



gpsmet.agt.bme.hu