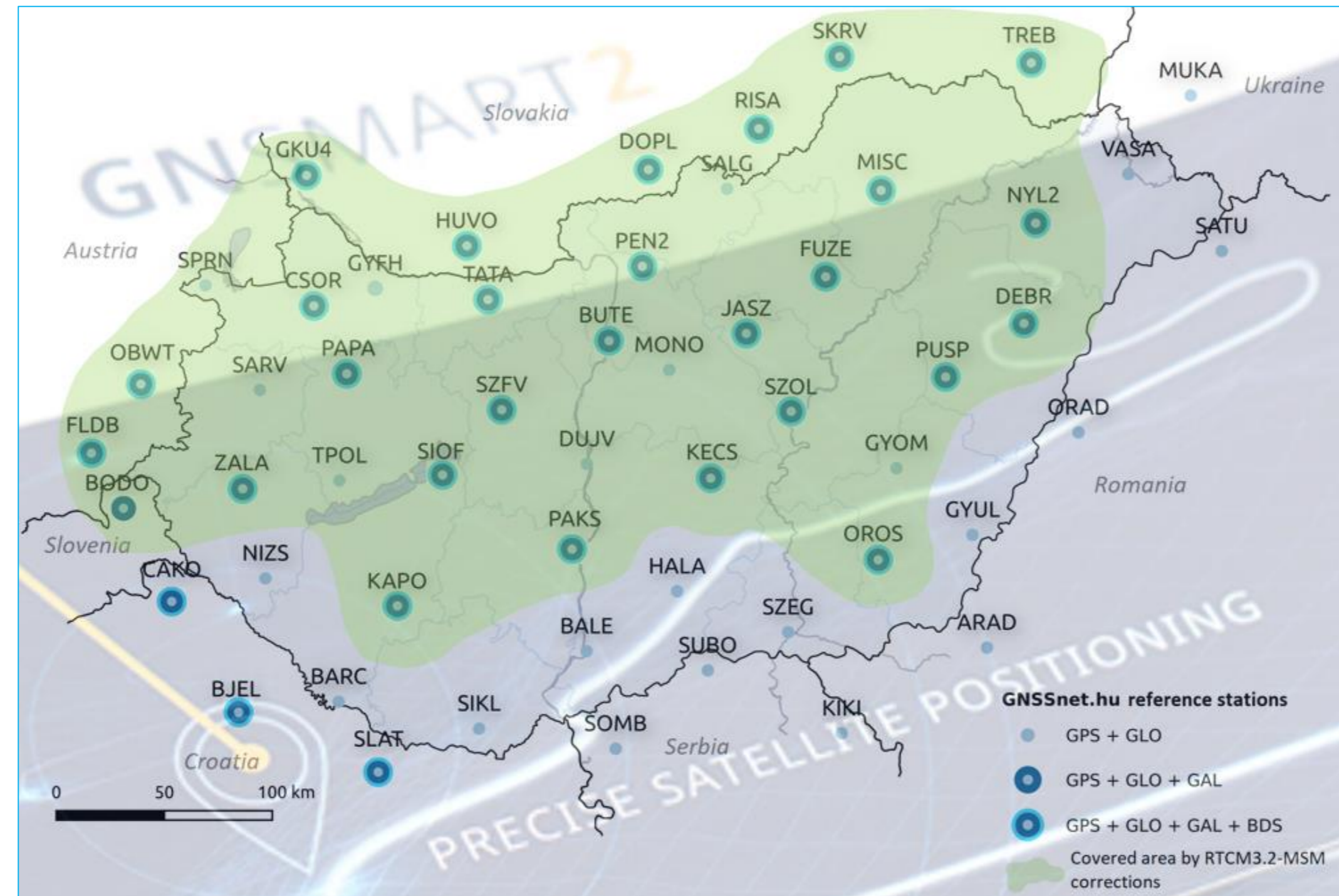


National Report of Hungary

EUPOS Council and Technical Meeting

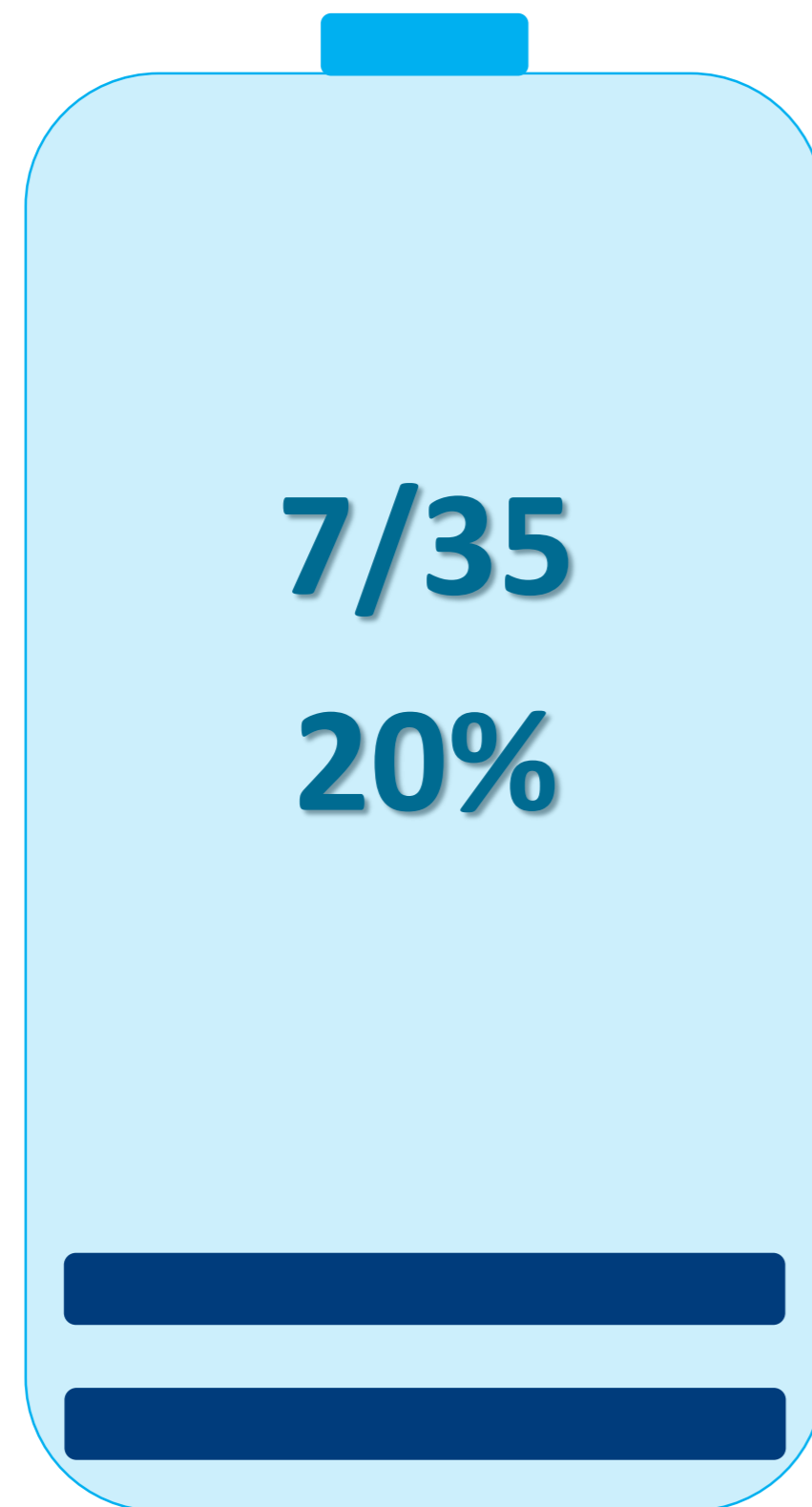
November 15-16. 2022. - Ljubljana, Slovenia



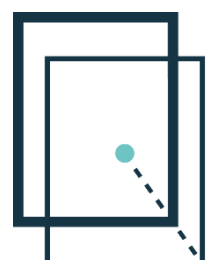
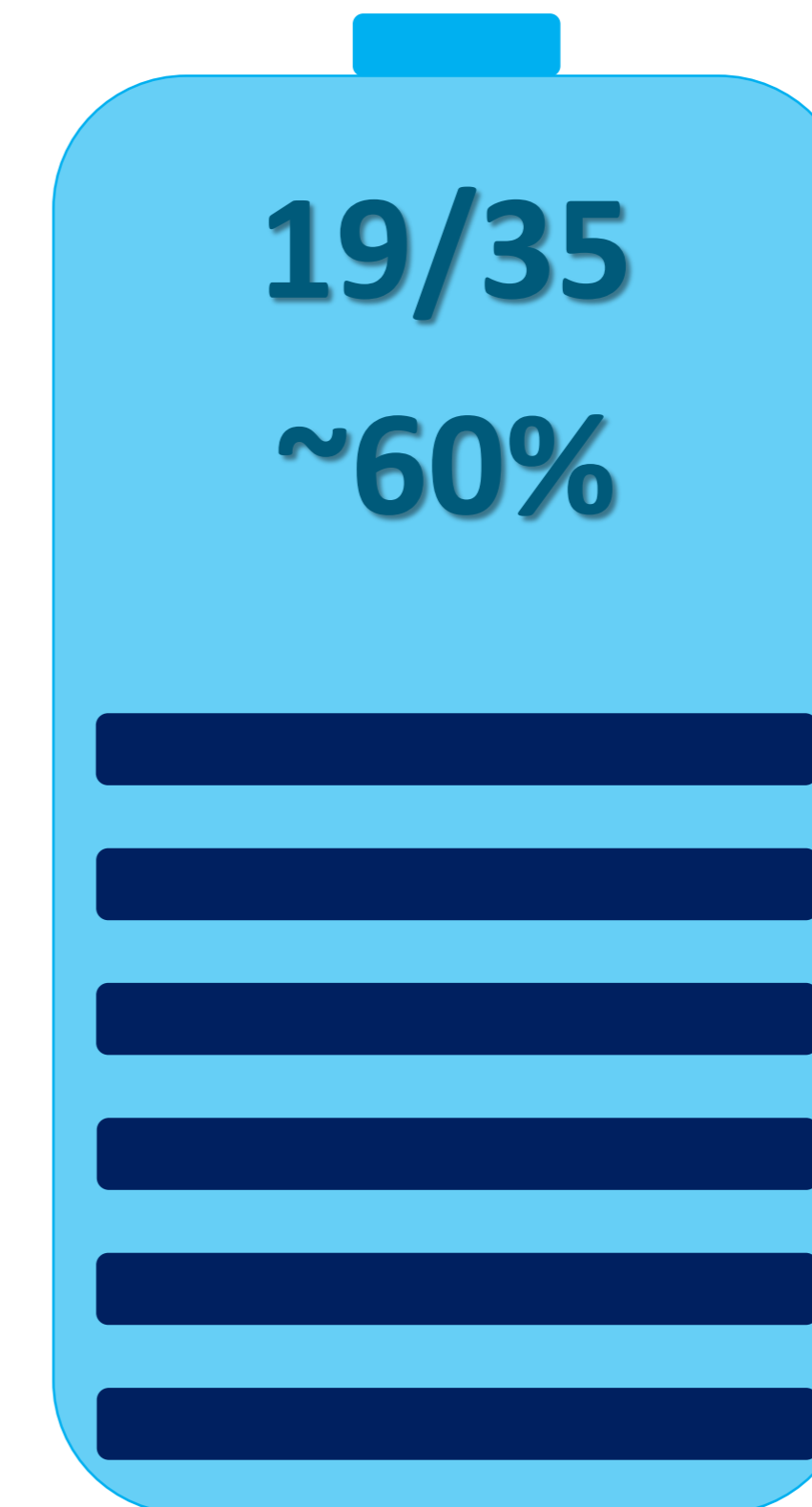
István Galambos
GNSS Service Center (GNSSnet.hu)
Satellite Geodetic Observatory (SGO),
Lechner Nonprofit Ltd., Hungary

Multi GNSS (GPS/GLO/GAL/BDS) Hungarian stations in the GNSSnet.hu service

Multi GNSS „charge level”
in **2021**



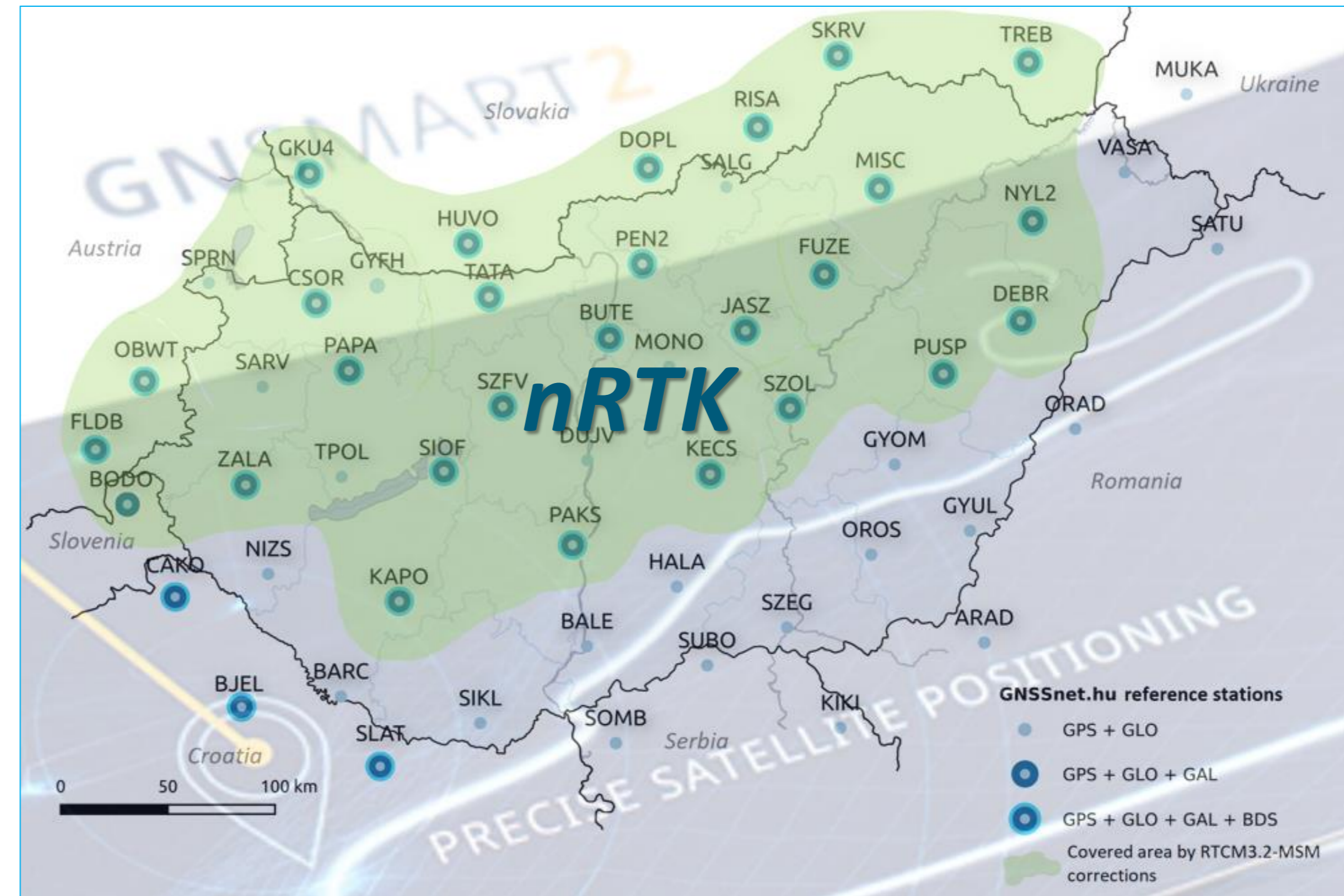
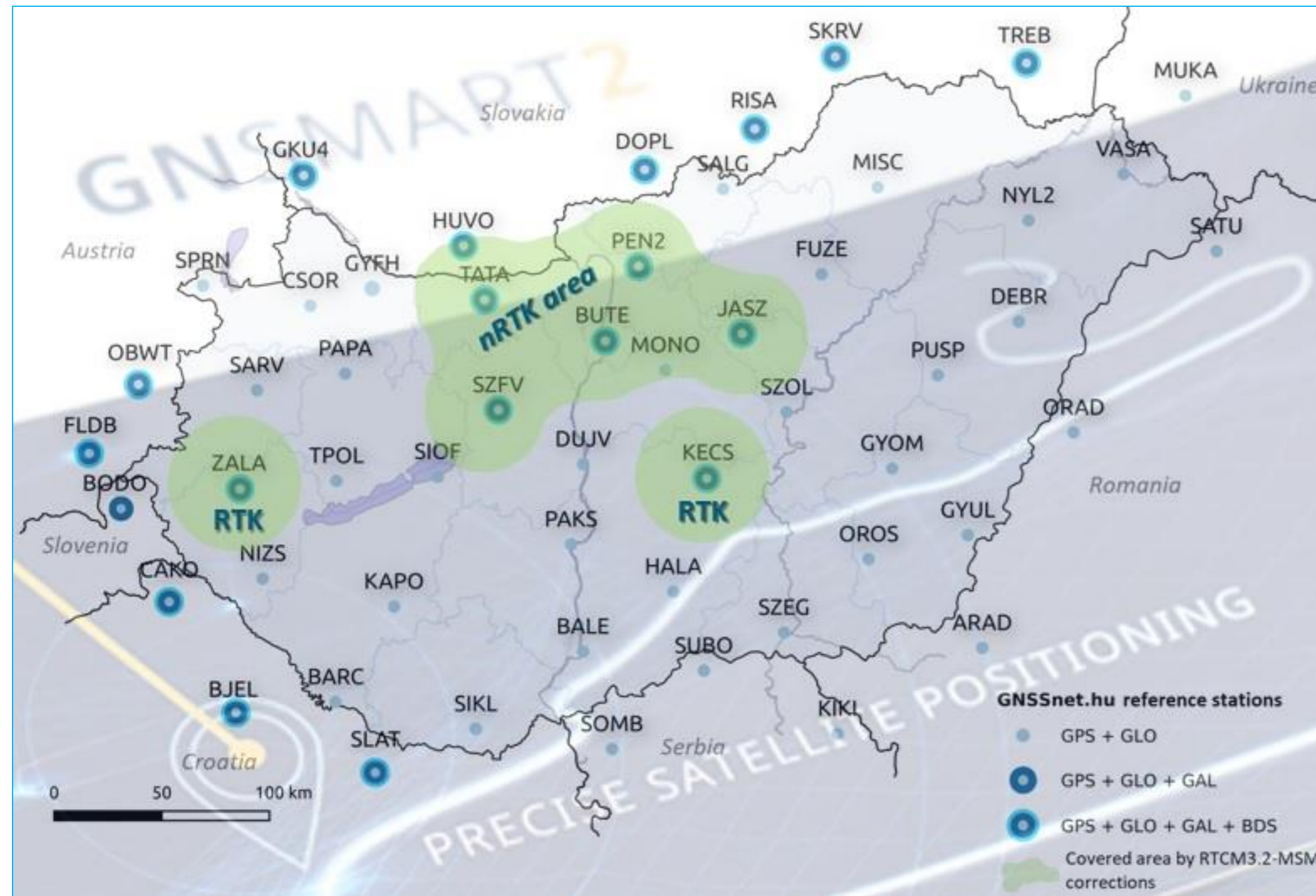
Multi GNSS „charge level”
in **2022**



Multi GNSS (GPS/GLO/GAL/BDS) coverage area in the GNSSnet.hu service - Today

Multi GNSS „charge level”
in 2021

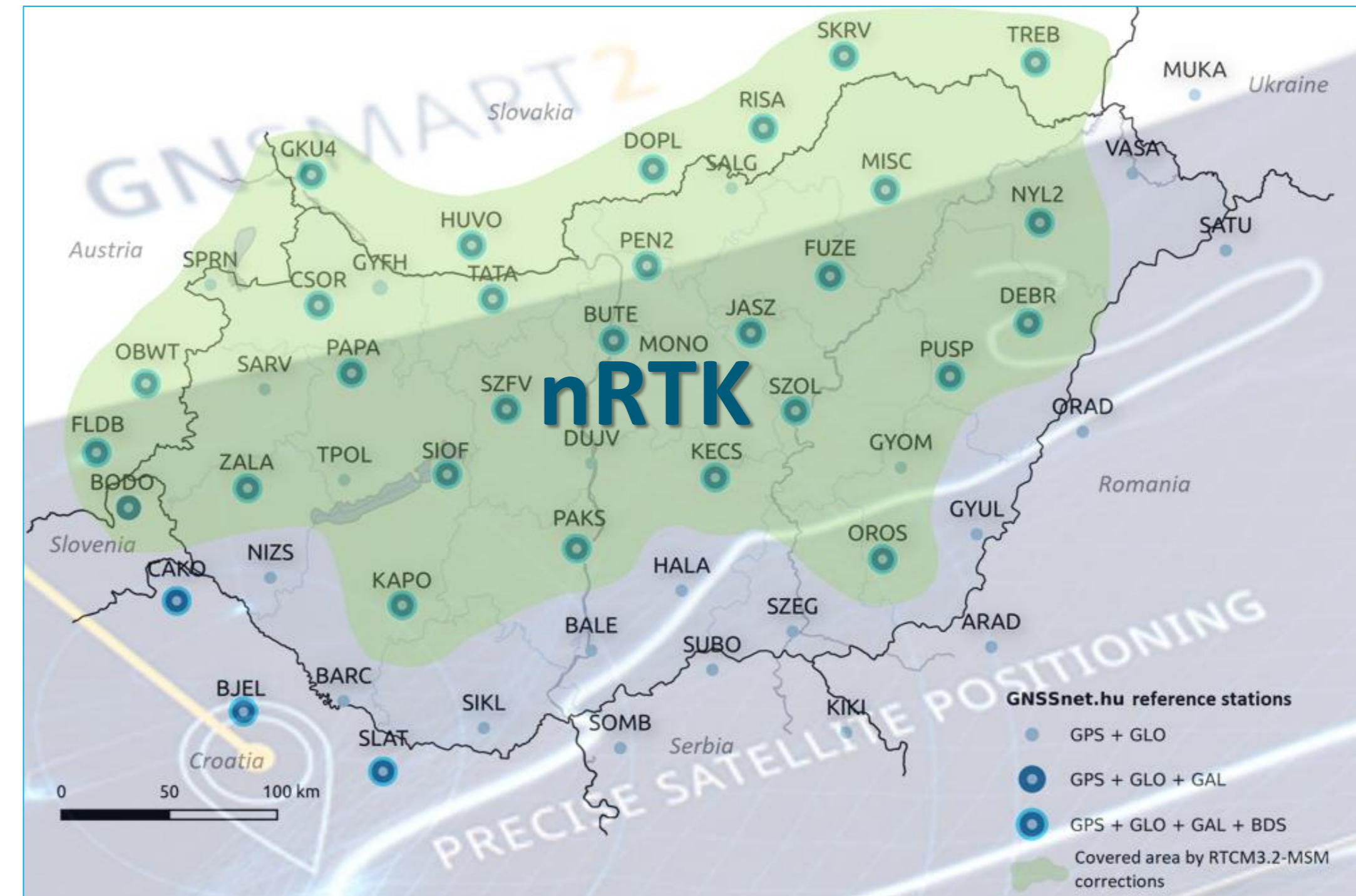
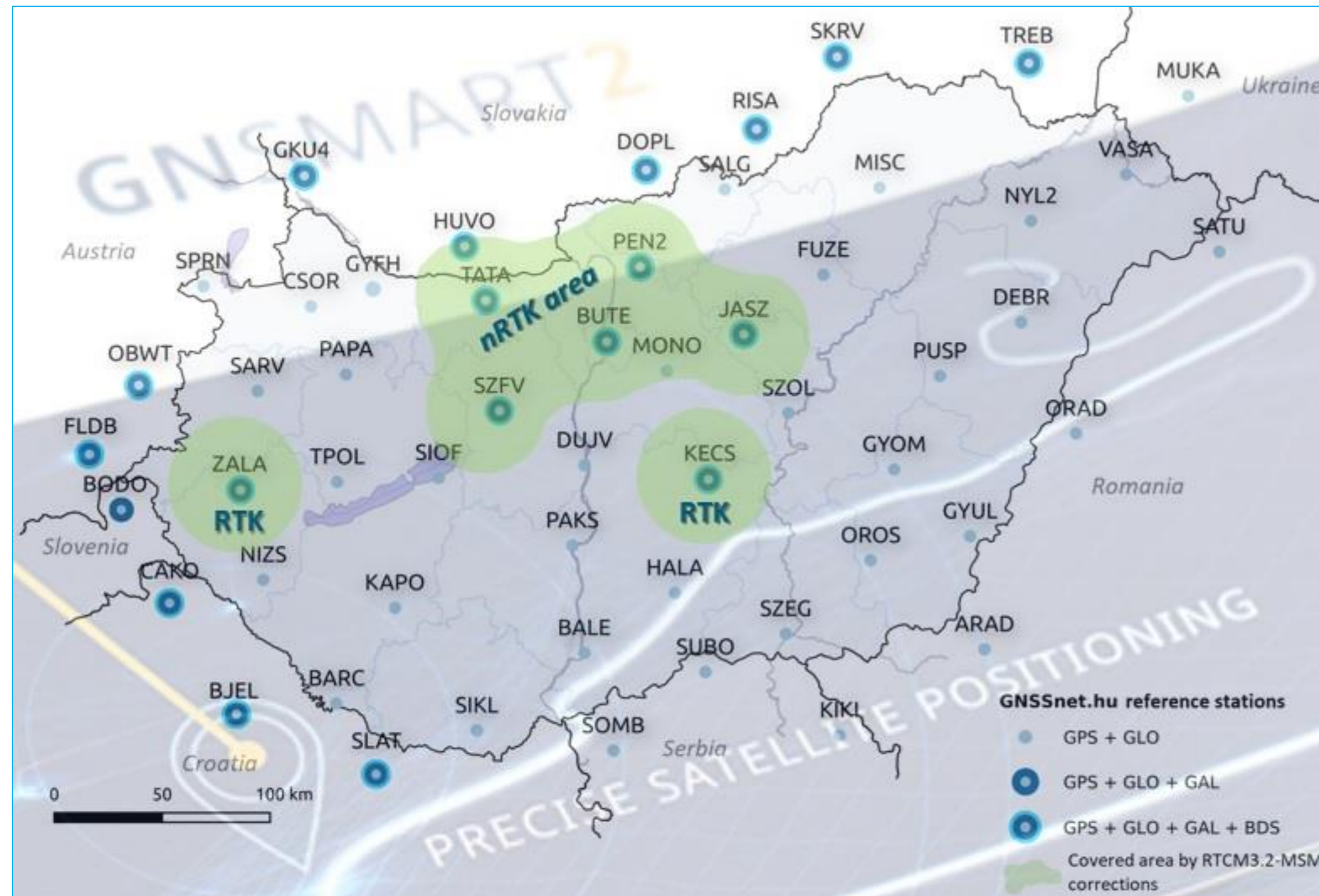
Multi GNSS „charge level”
in 2022



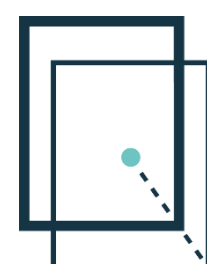
Multi GNSS (GPS/GLO/GAL/BDS) coverage in the GNSSnet.hu service – This Thursday

Multi GNSS „charge level”
in 2021

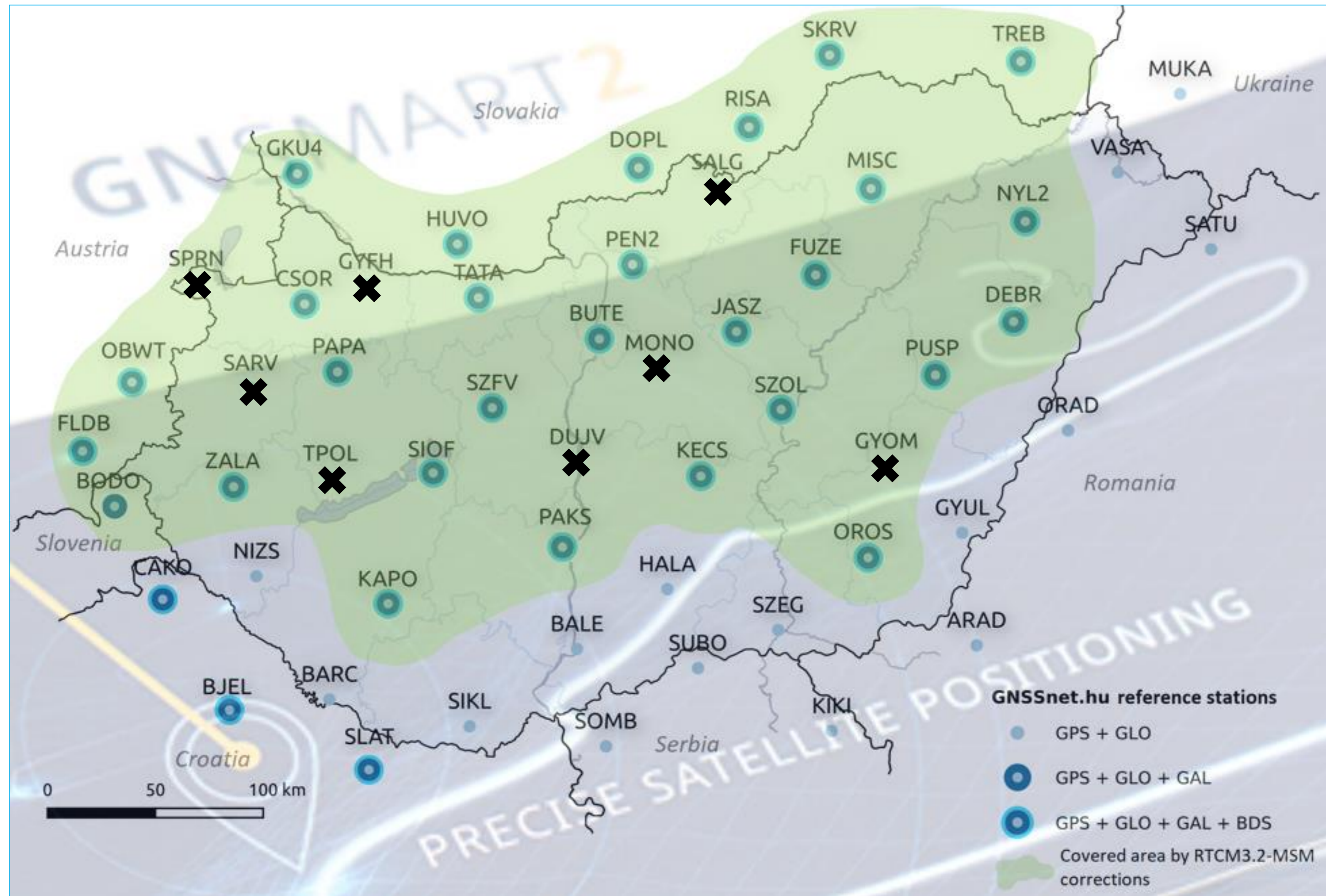
Multi GNSS „charge level”
in 2022



**New equipments on 12 stations:
Leica GR50 receivers + Leica AR20 antennas**



Multi GNSS coverage area: Ignored stations from the RTCM3.2 streams





GNSMART1 – GNSMART2 Parallel operating

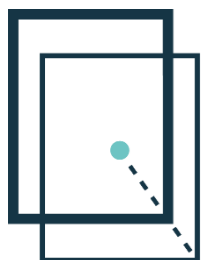


GNSMART1
Only GPS/GLO



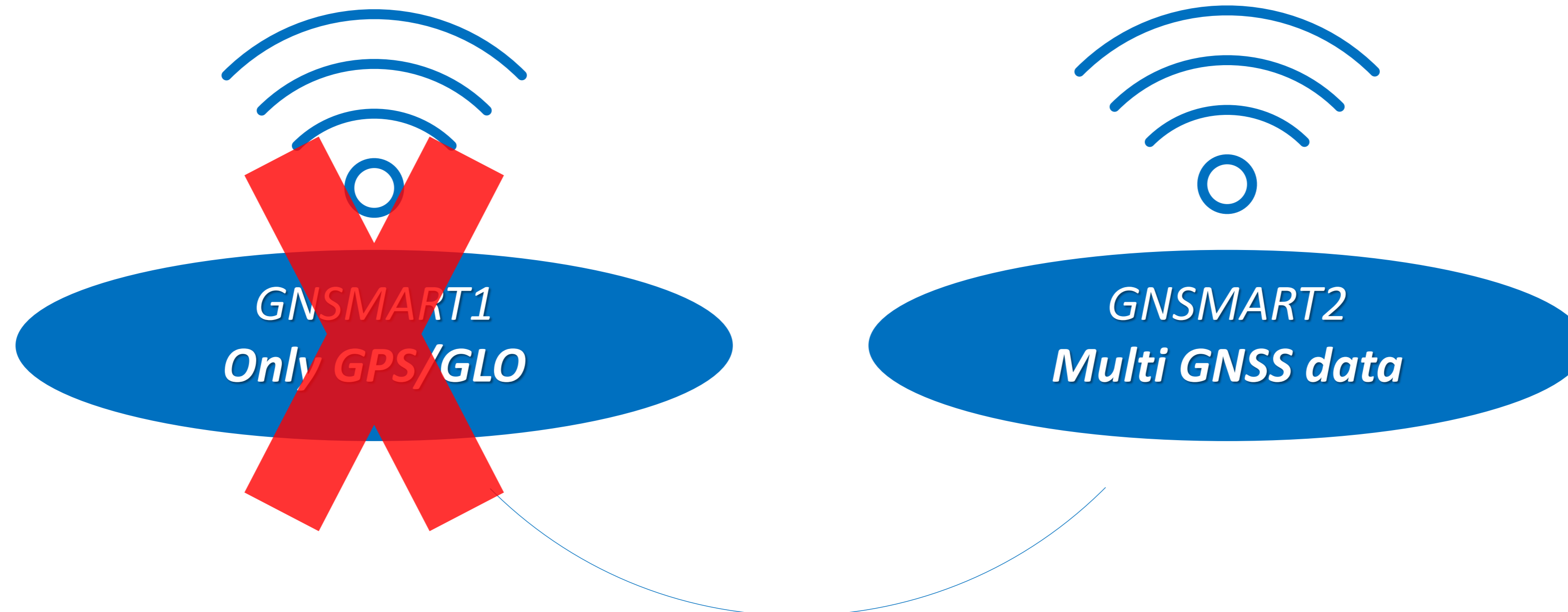
GNSMART2
Multi GNSS data

- Most of the year was transition phase to GNSMART2
- But our users were able to use both GNSMART1 and GNSMART2 servers



GNSMART1 – GNSMART2

On the 1th of September 2022

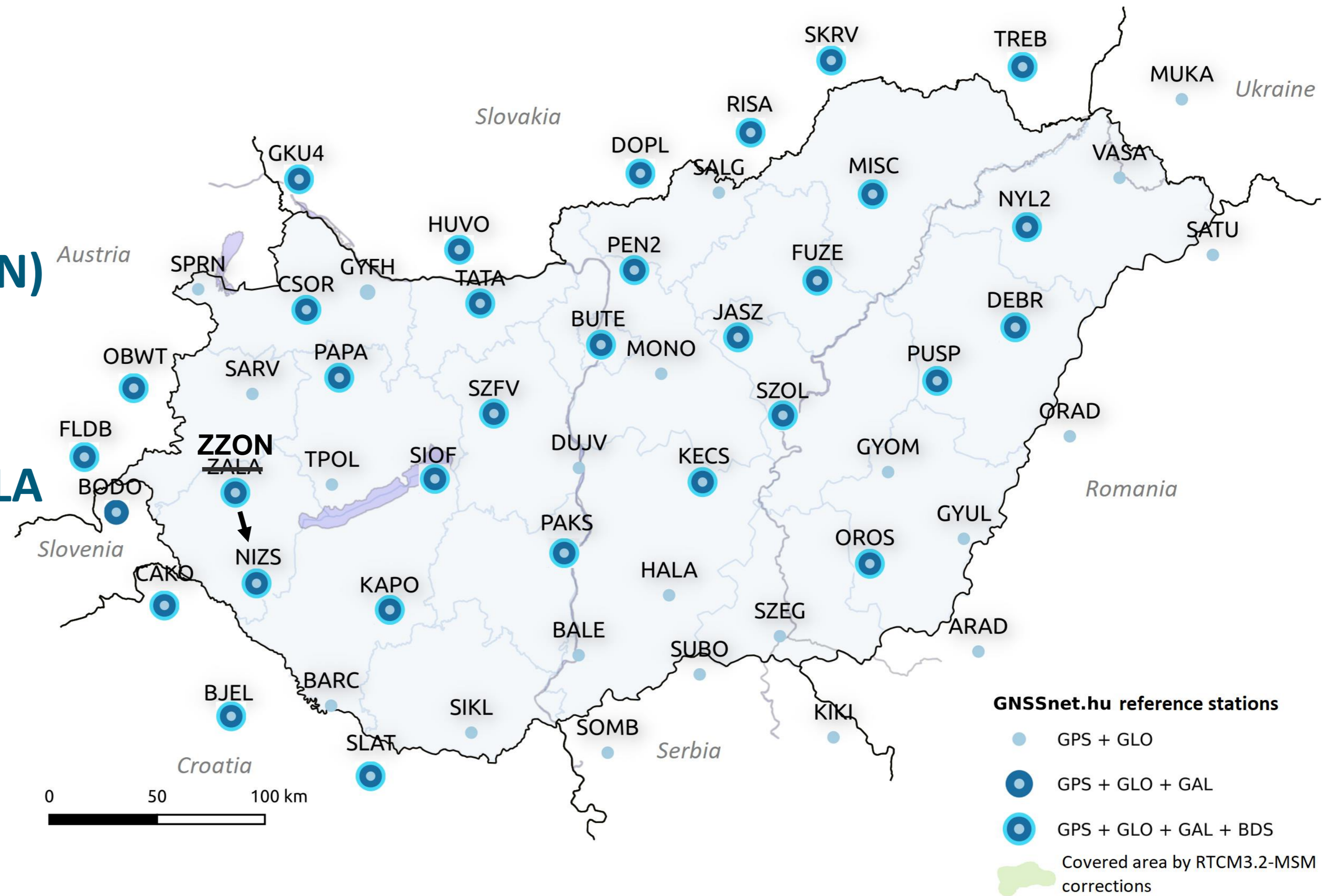


- The central processing software was changed to GNSMART2
- GNSMART1 was completely stopped
- Only GNSMART2 operates now (version 2.9.4)
- But both data format (RTCM3.2 and RTCM3.1) are available



Plan for the near future

- Integration of a new station (ZZON) near ZALA into the service
- Stop the station ZALA
- Relocation the equipments of ZALA to station NIZS



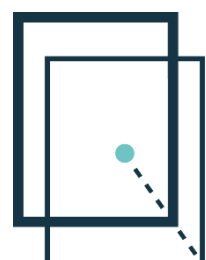
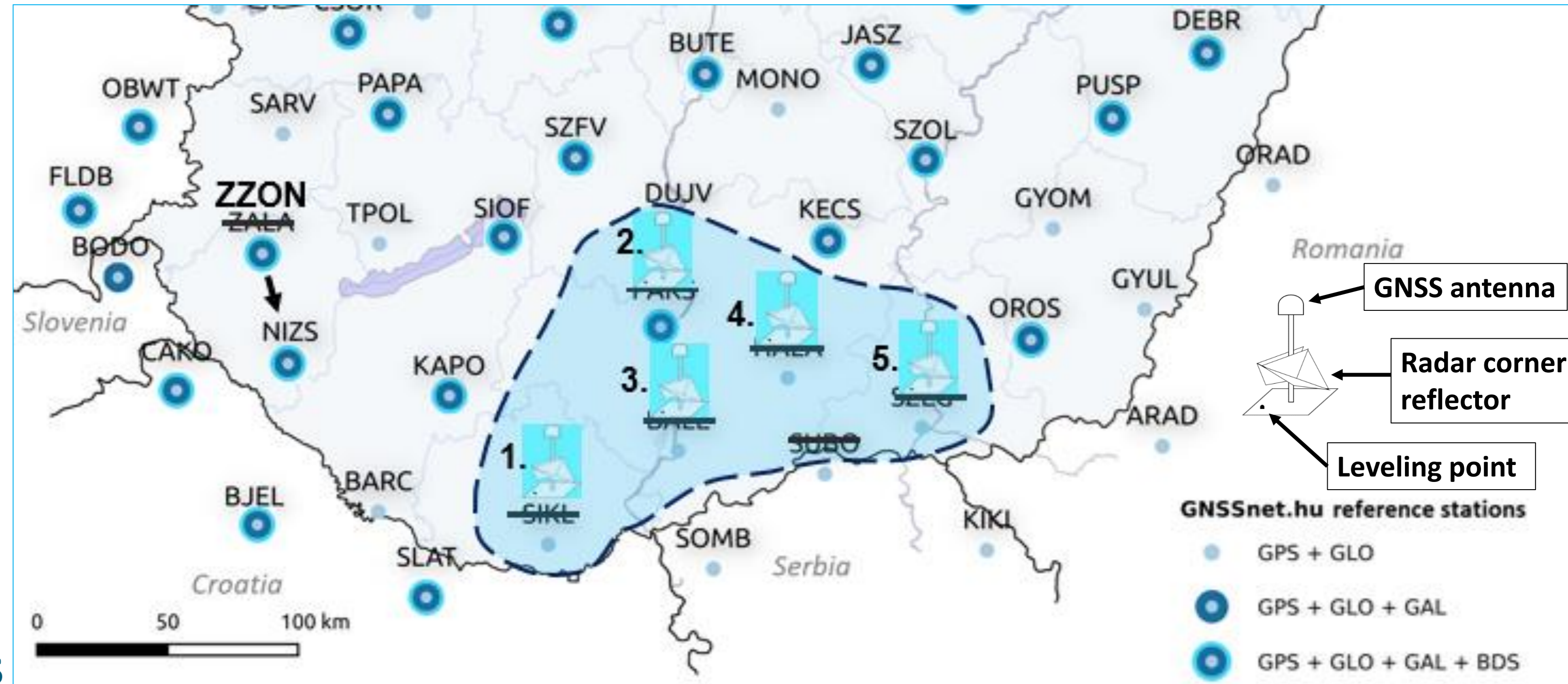
Plans for next summer and autumn: Collocation with InSAR

- Installation of 5 new GNSS and InSAR collocation station in the Southern part of Hungary



Planned GNSS-InSAR stations

- Another public procurement is hoped for new GNSS equipments
- All together at least 10 upgraded GNSS stations are expected



Coordinate reference frame and transformation method in the GNSSnet.hu

Referenciaállomás pontleírása: SZOL			
Pontleírás érvényes	2022. november 05-től		
Település	Szolnok		
Cím	Jász-Nagykun-Szolnok Megyei Kormányhivatal 5000 Szolnok, Ostor u. 1/a.		
Tulajdonos	Lechner Nonprofit Kft.		
Létesítve	2007. december		
ETRS89/ETRF2000 Epocha: 2007.4	X=4076699.2338	Y=1498871.0204	Z=4655140.1214
WGS 84 (ETRS89)	$\phi=47^{\circ}10'31.10977''$	$\lambda=20^{\circ}11'12.65877''$	h=143.672
EOV	$\gamma=736365.415$	x=204095.057	H _{GPS} =101.443
Referenciapont	A referenciapont koordinátái nem a fáziscentrumra vonatkoznak, hanem az antenna aljára!		
GNSS vevő	LEICA GR50		
GNSS antenna	LEICA LEIAR20 _____ LEIM (Choke Ring Antenna + Dome)		
Kormányhivatal épülete		Referenciapont	
			

- ETRS89/ETRF2000
- Epocha 2007.4
- Uniform National Projection System of Hungary (EOV)



Coordinate reference frame and transformation method in the GNSSnet.hu

EHT: ETRS89/EOV – Official/Local – Spatial/Transformation



The screenshot shows the EHT website interface. At the top left is the 'EHT' logo. To its right are links for 'Kézi bevitel', 'Gyakran ismételt kérdések', and 'Bejelentkezés'. The main heading is 'ETRS89/ETRF2000 – EOV' followed by 'HIVATALOS HELYI TÉRBELI TRANSZFORMÁCIÓ'. Below this, it states 'Adatbázis verziószáma: VITEL2014' and 'Program verzió: 2.0.5'. A paragraph of text explains that the EHT2014 web-based transformation process is used for GNSS measurements in the ETRS89/ETRF2000 system and the Hungarian National Geodetic Reference System (EOV). It mentions that the process is updated and that the VITEL database is used for corrections. At the bottom, there are two columns of text with icons: 'ETRS89/ETRF2000 >>> EOVS transzformáció' and 'EOV >>> ETRS89/ETRF2000 transzformáció'. The footer contains 'EHT version 2.0.5 © 2022 GNSSnet.hu' and 'LECHNER NONPROFIT KFT.'.

- Post data transformation by our official transformation server (web address: eht.gnssnet.hu)
- Typically for post-processing GNSS applications



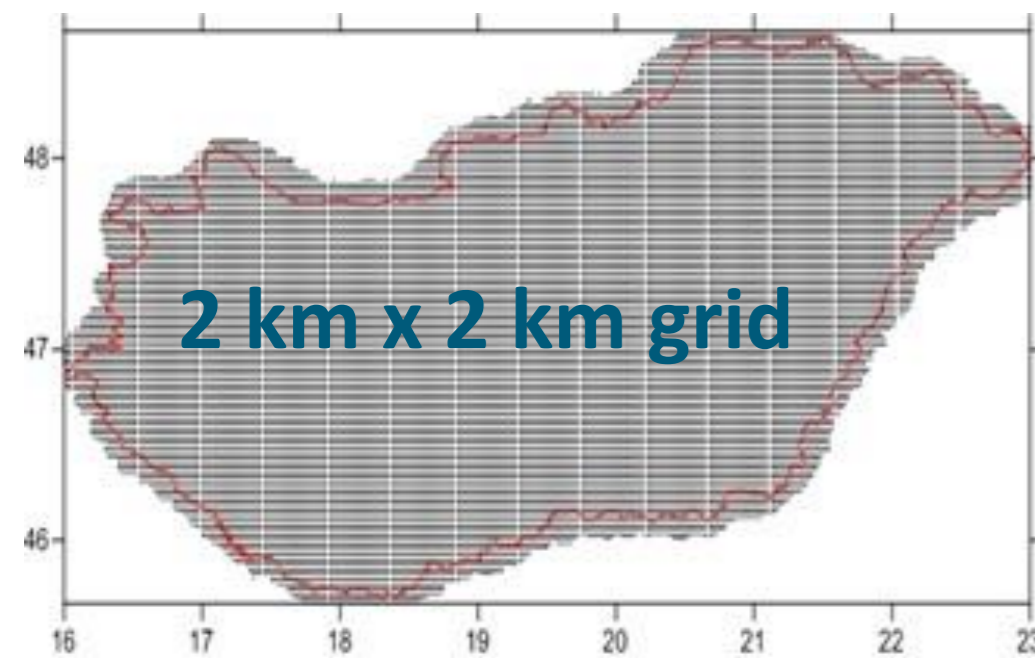
Coordinate reference frame and transformation method in the real time service

VITEL: Real-Time Transformation Process

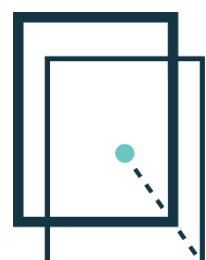
Helmert
7 parameter set

+

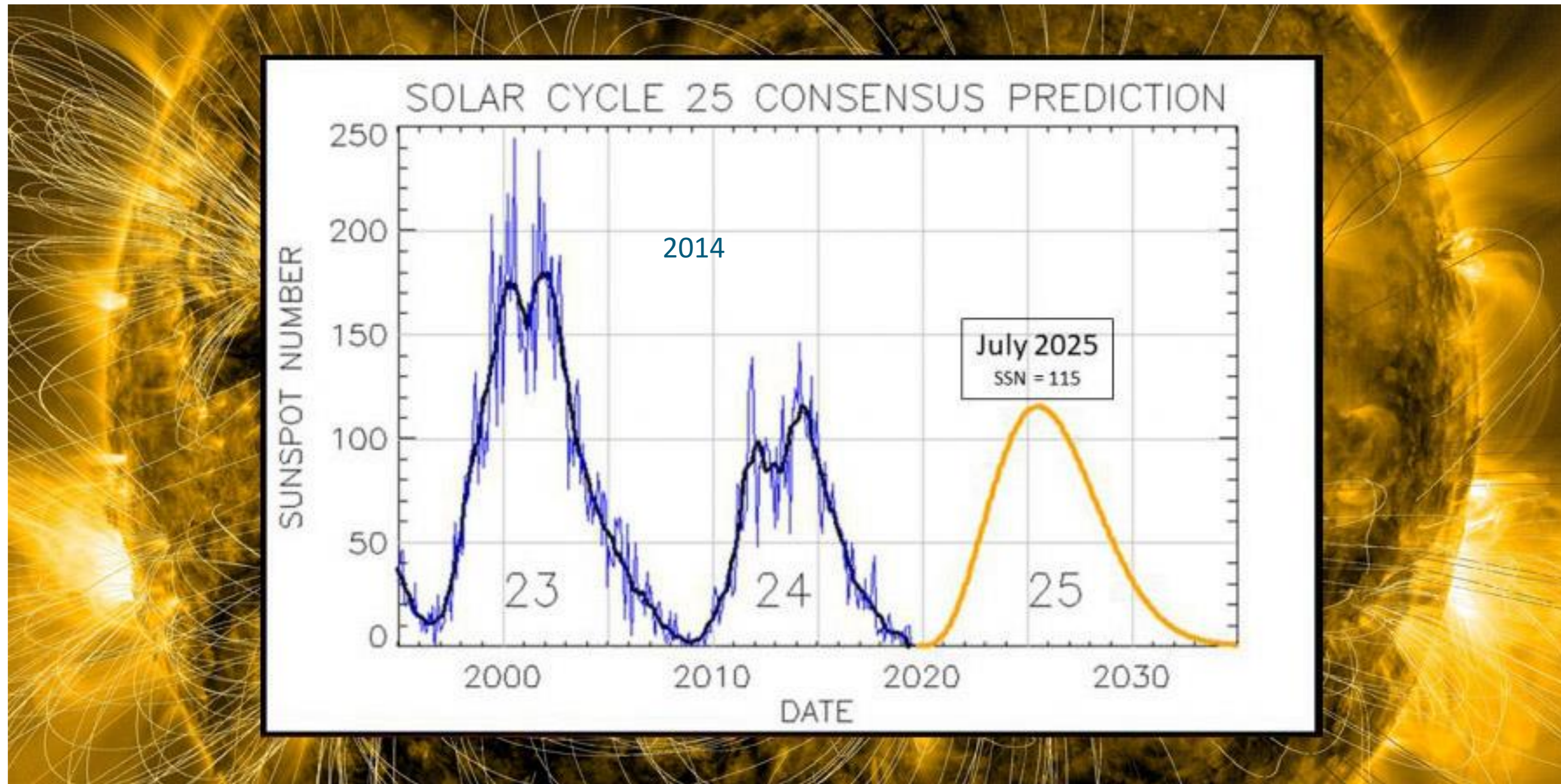
correction database



- The national set of 7 parameter (Helmert) is well-known for the submeter accuracy results
- Our company is owner of the database which is used in the rover equipments for the centimeter accuracy results
- The database consist of corrections in 3D with a regular grid (2 km x 2 km)
- Hungarian GNSS rover distributors (e.g.:Trimble, Topcon, Leica) must be contracted with our company for the sale of VITEL
- Then they get the permission to upload the transformation database into the given rover device
- The accuracy of real-time and post-processing transformation is equal

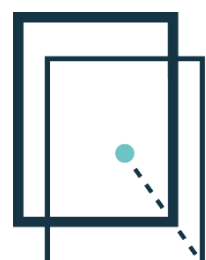


Upcoming 25th Sunspot Cycle

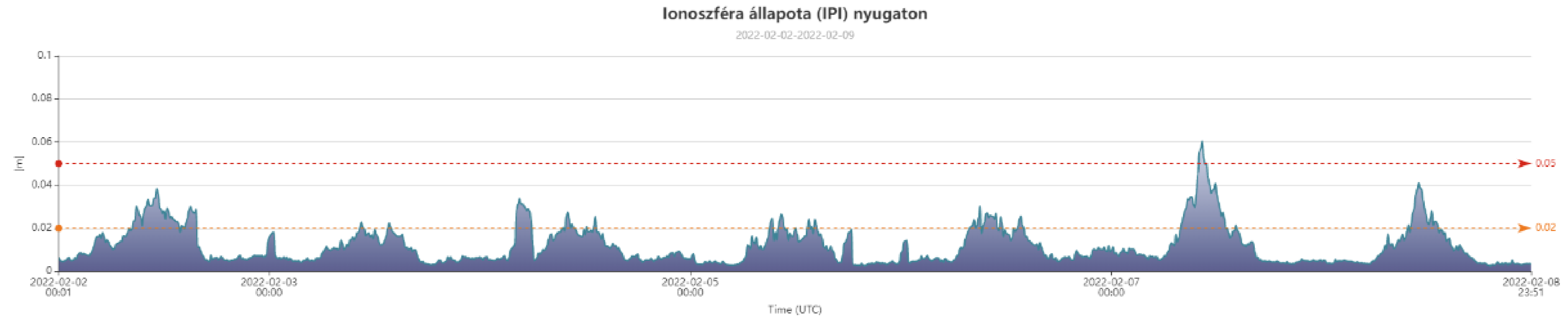


© SpaceWeatherLive.com

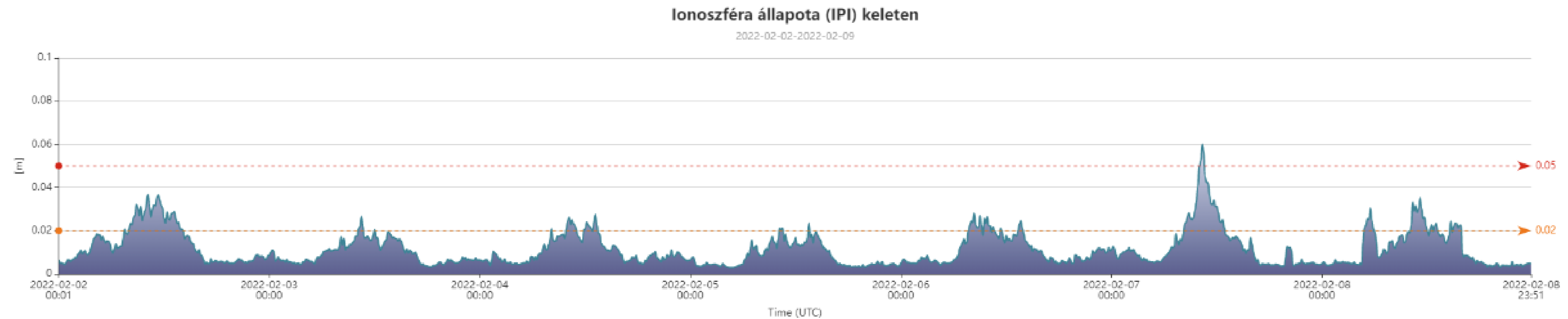
It is likely that RTK measurement becomes more difficult during the next winter periods



Ionosphere residual errors (IP-I values) In the GNSMART1 (only GPS/GLO data)



Táblázat ↓



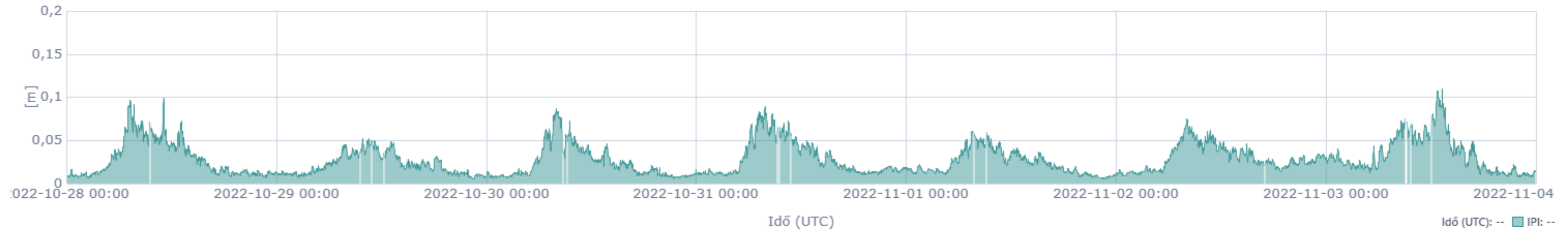
One week period this February (02.02.2022 – 09.02.2022)

Error values were higher than normal cases but mainly less than 5 cm



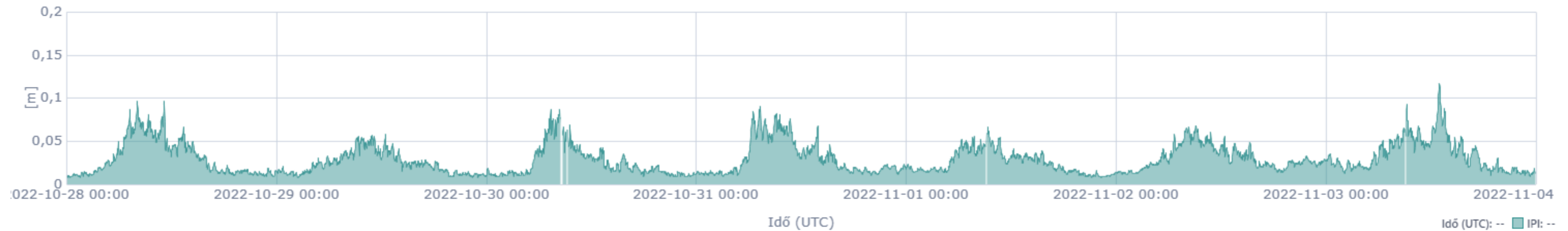
Ionosphere residual errors (IP-I values) In the GNSMART2

NET1 - Ionoszféra - 2022-10-28 - 2022-11-04



Letöltés

NET2 - Ionoszféra - 2022-10-28 - 2022-11-04

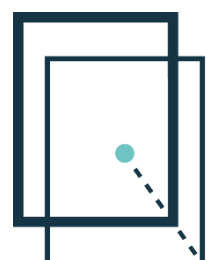


Letöltés

One week period nowadays (28.10.2022 – 04.11.2022)

IP-I values are processed 21 GPS/GLO and 27 GPS/GLO/GAL/BDS stations

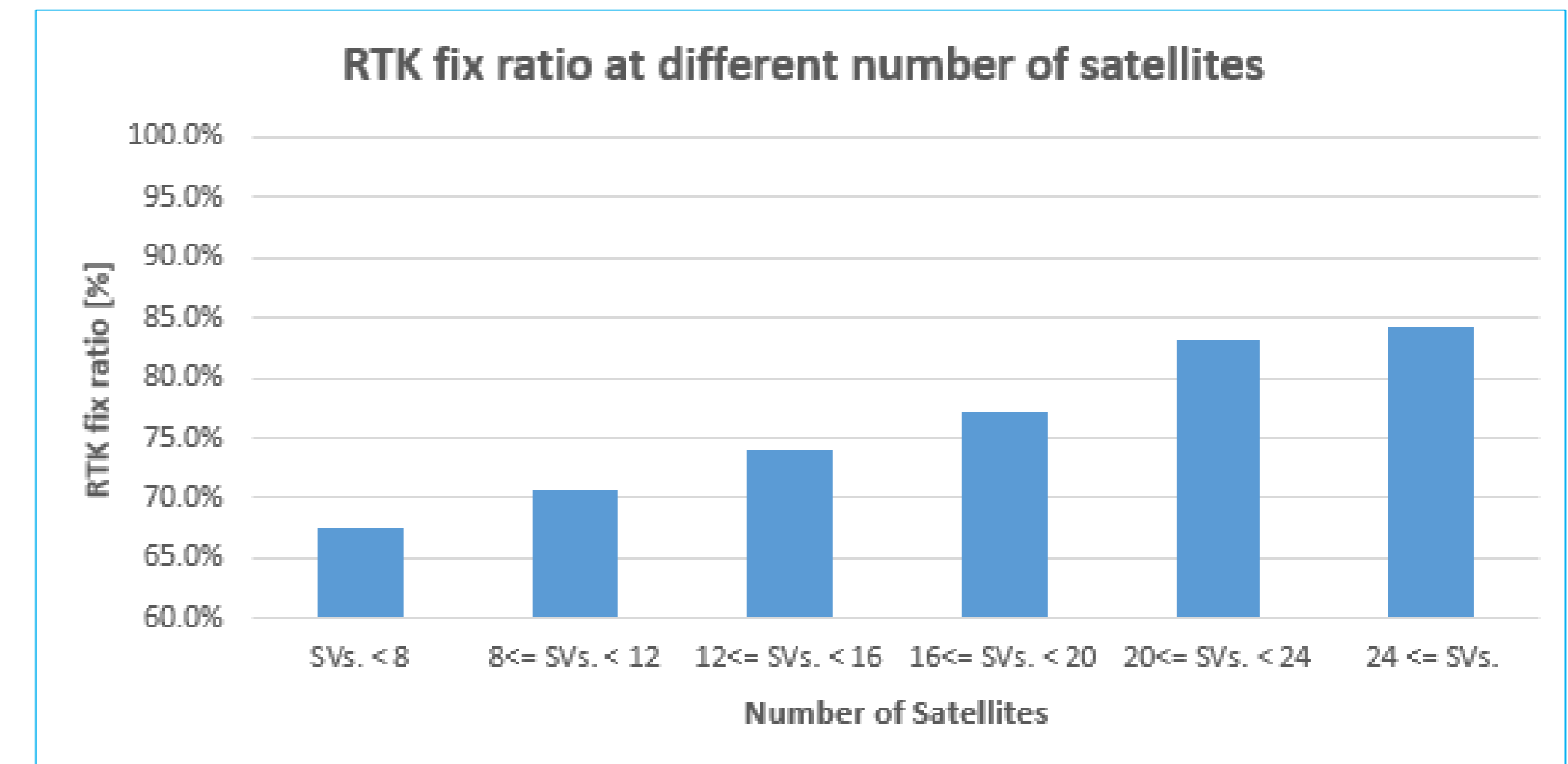
Residual errors were over 5 cm in many cases



RTK fix status ratio at different number of satellites

Period: 28.10.2022 – 04.11.2022

Number of Satellites	RTK fix ratio	RTK fix in the NMEA sentences	All NMEA sentences
	[%]	[Rows]	[Rows]
SVs. < 8	67.6%	140846	208279
8<= SVs. < 12	70.7%	371417	525090
12<= SVs. < 16	73.9%	452553	612417
16<= SVs. < 20	77.1%	167441	217074
20<= SVs. < 24	83.2%	172023	206847
24 <= SVs.	84.4%	379288	449599
All	0.759	1683568	2219306



- It seems more satellites number helps the rovers performance
- RTK fix ratio is better with using more satellites (in our service)



Thank you for your attention!



Lechner Nonprofit Ltd.
Satellite Geodetic Observatory, Penc (SGO)
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1149 Budapest, Bosnyák tér 5.



www.lechnerkozpont.hu
www.gnssnet.hu

