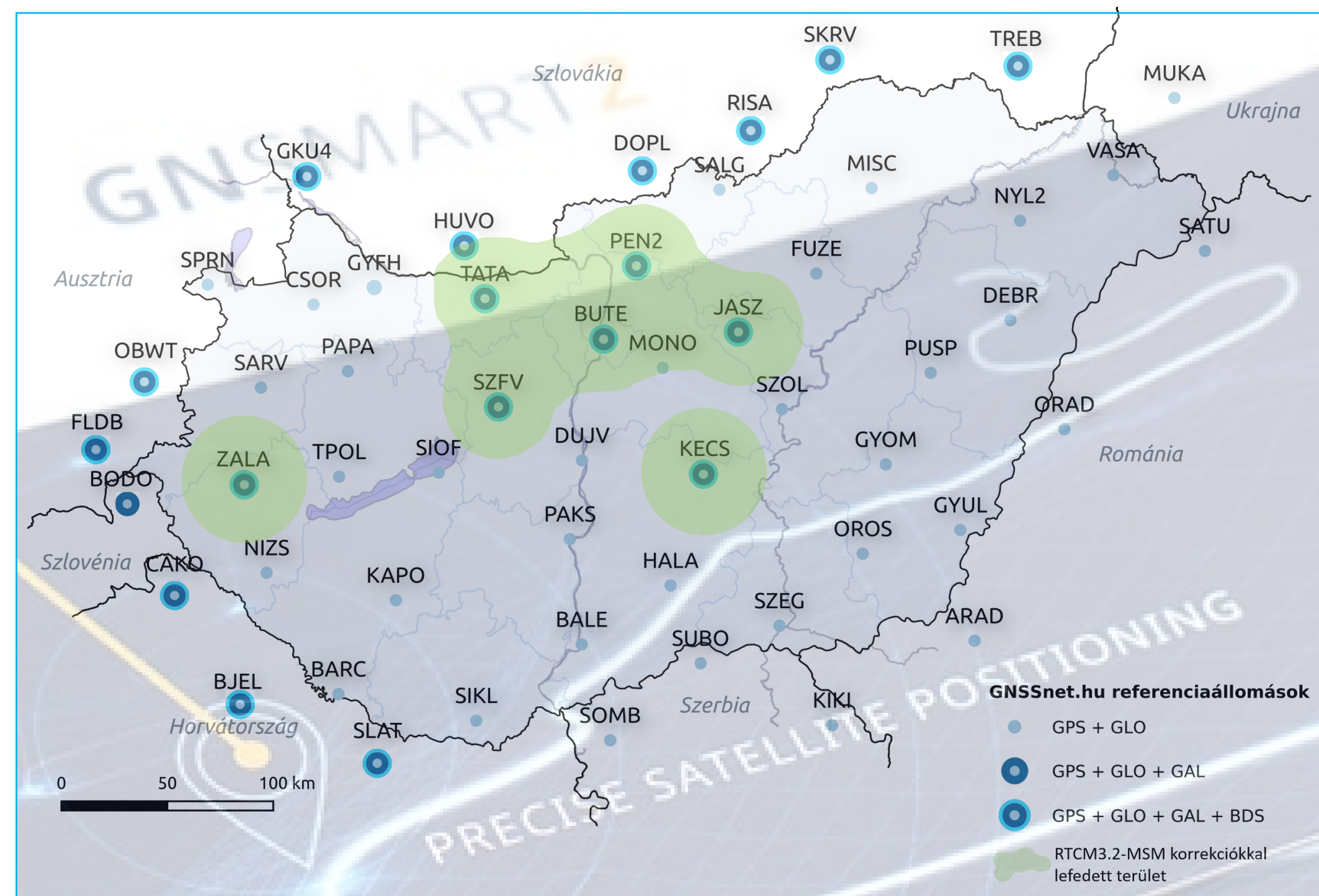


National Report of Hungary

EUPOS Council and Technical Meeting

November 9-10. 2021. - Bucharest, Romania

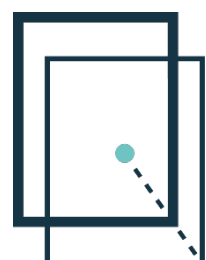


István Galambos
GNSS Service Center (GNSSnet.hu)
Satellite Geodetic Observatory (SGO),
Lechner Nonprofit Ltd., Hungary

Main events of the last two years towards GPS/GLO/GAL/BDS (4-GNSS) capability

Date	08-2019	10-2020	03-2021	08-2021
Real-time Service	4-GNSS single base correction provided by GNSMART2 in <u>test mode</u>	4-GNSS single base RTK corrections from the receivers provided by self developed caster <u>in the service</u>	4-GNSS single base RTK corrections from the receivers provided by self developed caster <u>in the service</u>	4-GNSS network RTK corrections provided by GNSMART2 <u>in the service</u>
4-GNSS stations	5/35 stations	5/35 stations	7/35 stations	7/35 stations

- Just two more 4-GNSS capable stations
- A public procurement in progress now for 6 new receivers+antennas
- Until next spring the number of the 4-GNSS capable stations will be almost doubled
- Another public procurement hoped in 2022



Main events of the last two years towards GPS/GLO/GAL/BDS (4-GNSS) capability:

4-GNSS single base RTK corrections provided by self developed caster

Date	08-2019	10-2020	03-2021	08-2021
Real-time Service	4-GNSS single base correction provided by GNSMART2 in test mode	4-GNSS single base RTK corrections from the receivers provided by self developed caster in the service	4-GNSS single base RTK corrections from the receivers provided by self developed caster in the service	4-GNSS network RTK corrections provided by GNSMART2 in the service
4-GNSS stations	5/35 stations	5/35 stations	7/35 stations	7/35 stations

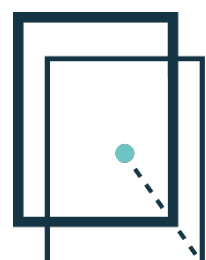
GNSS Caster Admin

Dashboard
Connections
Stream
Station
Map view
Users
Caster

Our self developed caster admin page

Streams

ACTIONS	ENABLED	MOUNTPPOINT	LATITUDE	LONGITUDE	CARRIER	NAV. SYSTEM	NETWORK	COUNTRY
	Enabled	AUTORTK-MSM	0.000 °	0.000 °	2	GPS+GLO+GAL+BDS	GNSSnet.hu	HUN
	Enabled	BUTE-MSM	47.481 °	19.057 °	2	GPS+GLO+GAL+BDS	GNSSnet.hu	HUN
	Enabled	JASZ-MSM	47.506 °	19.920 °	2	GPS+GLO+GAL+BDS	GNSSnet.hu	HUN
	Enabled	KECS-MSM	46.906 °	19.701 °	2	GPS+GLO+GAL+BDS	GNSSnet.hu	HUN
	Enabled	PEN2-MSM	47.790 °	19.282 °	2	GPS+GLO+GAL+BDS	GNSSnet.hu	HUN
	Enabled	SZFV-MSM	47.189 °	18.419 °	2	GPS+GLO+GAL+BDS	GNSSnet.hu	HUN
	Enabled	TATA-MSM	47.649 °	18.329 °	2	GPS+GLO+GAL+BDS	GNSSnet.hu	HUN
	Enabled	ZALA-MSM	46.842 °	16.842 °	2	GPS+GLO+GAL+BDS	GNSSnet.hu	HUN

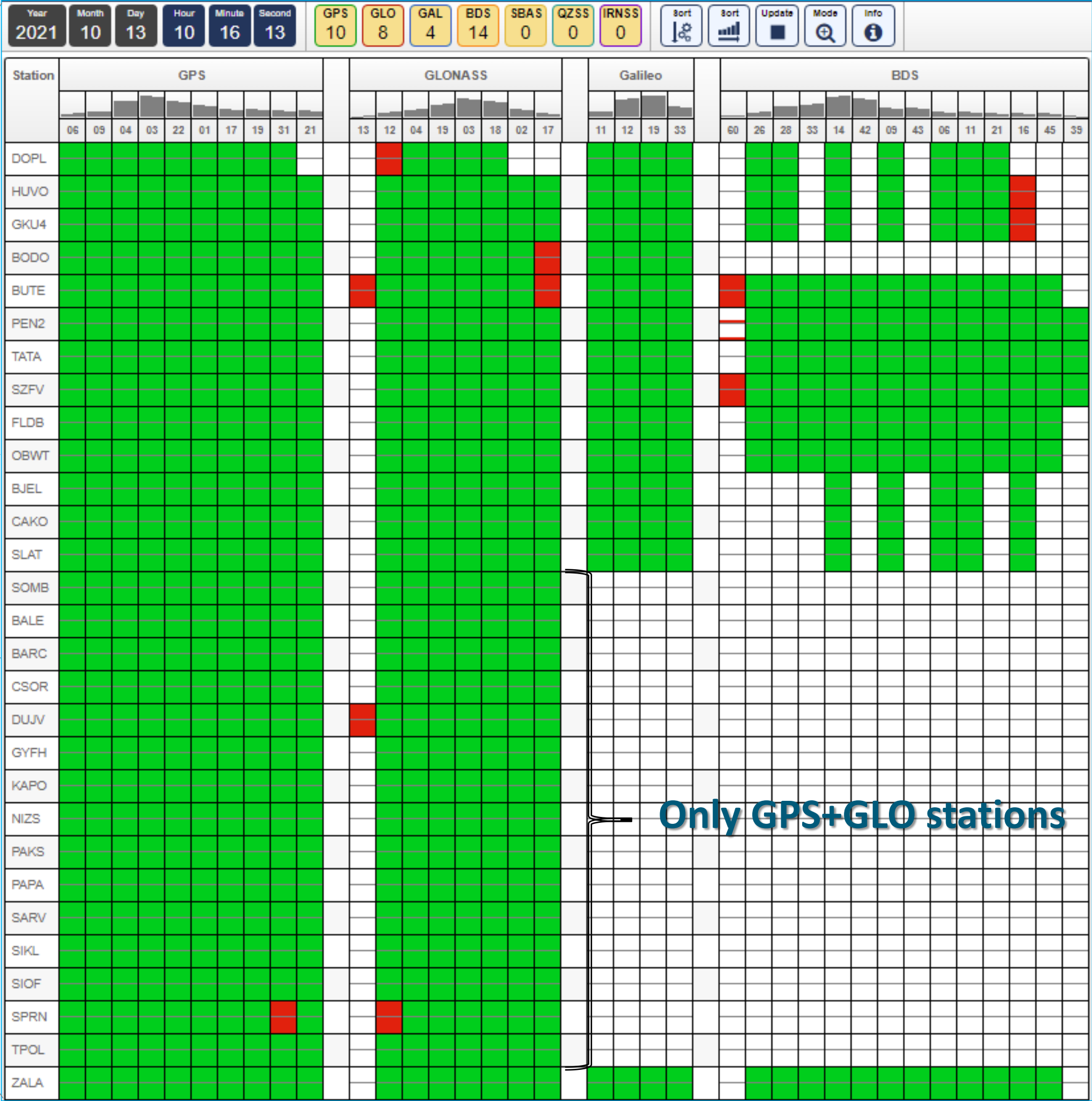


Main events of the last two years towards GPS/GLO/GAL/BDS (4-GNSS) capability:

4-GNSS network RTK corrections by GNSMART2

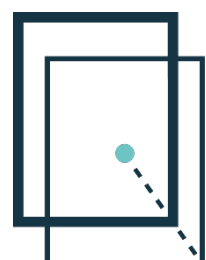
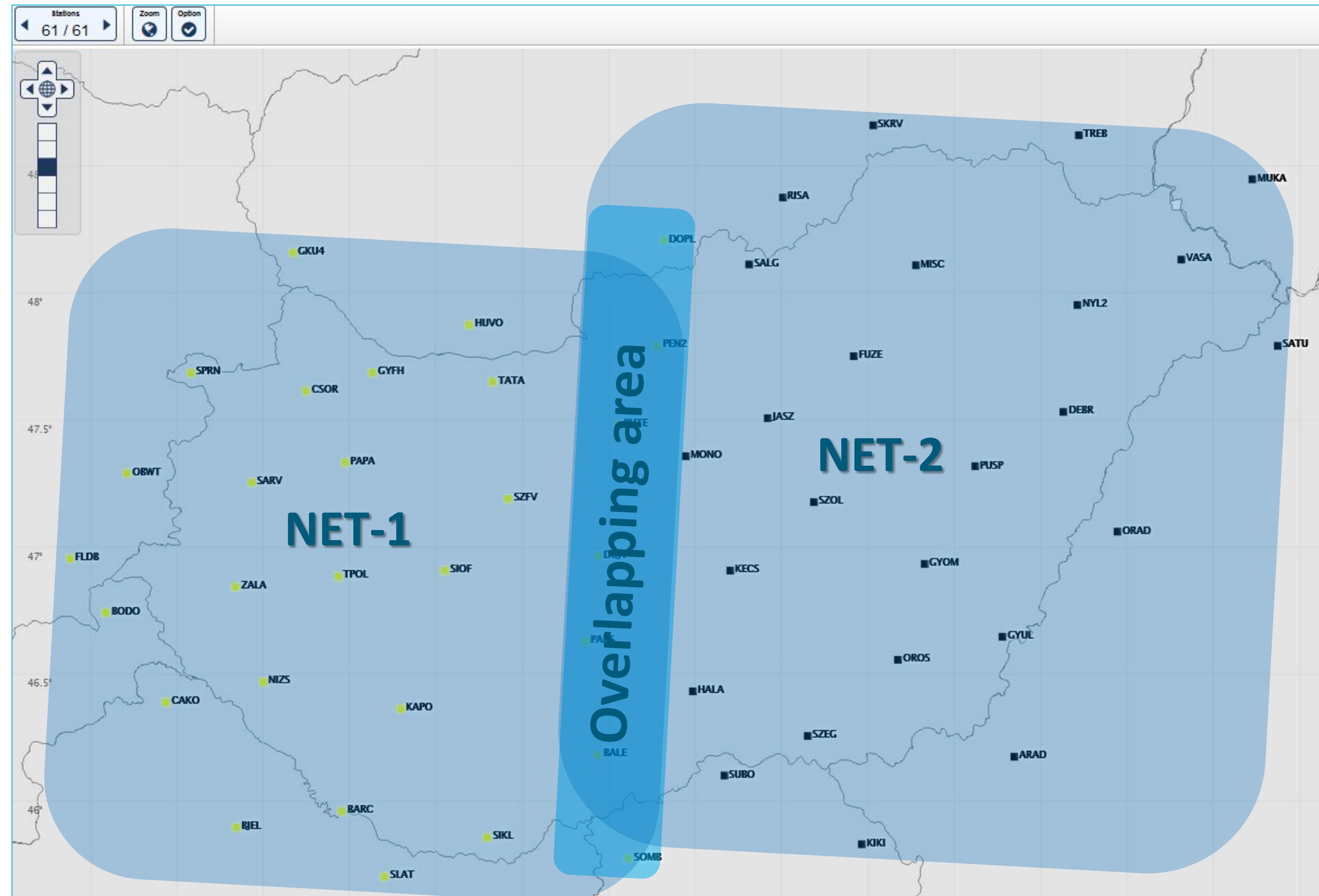
NET-1 network processing

Date	08-2019	10-2020	03-2021	08-2021
Real-time Service	4-GNSS single base correction provided by GNSMART2 in test mode	4-GNSS single base RTK corrections from the receivers provided by self developed caster in the service	4-GNSS single base RTK corrections from the receivers provided by self developed caster in the service	4-GNSS network RTK corrections provided by GNSMART2 in the service
4-GNSS stations	5/35 stations	5/35 stations	7/35 stations	7/35 stations



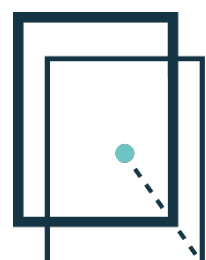
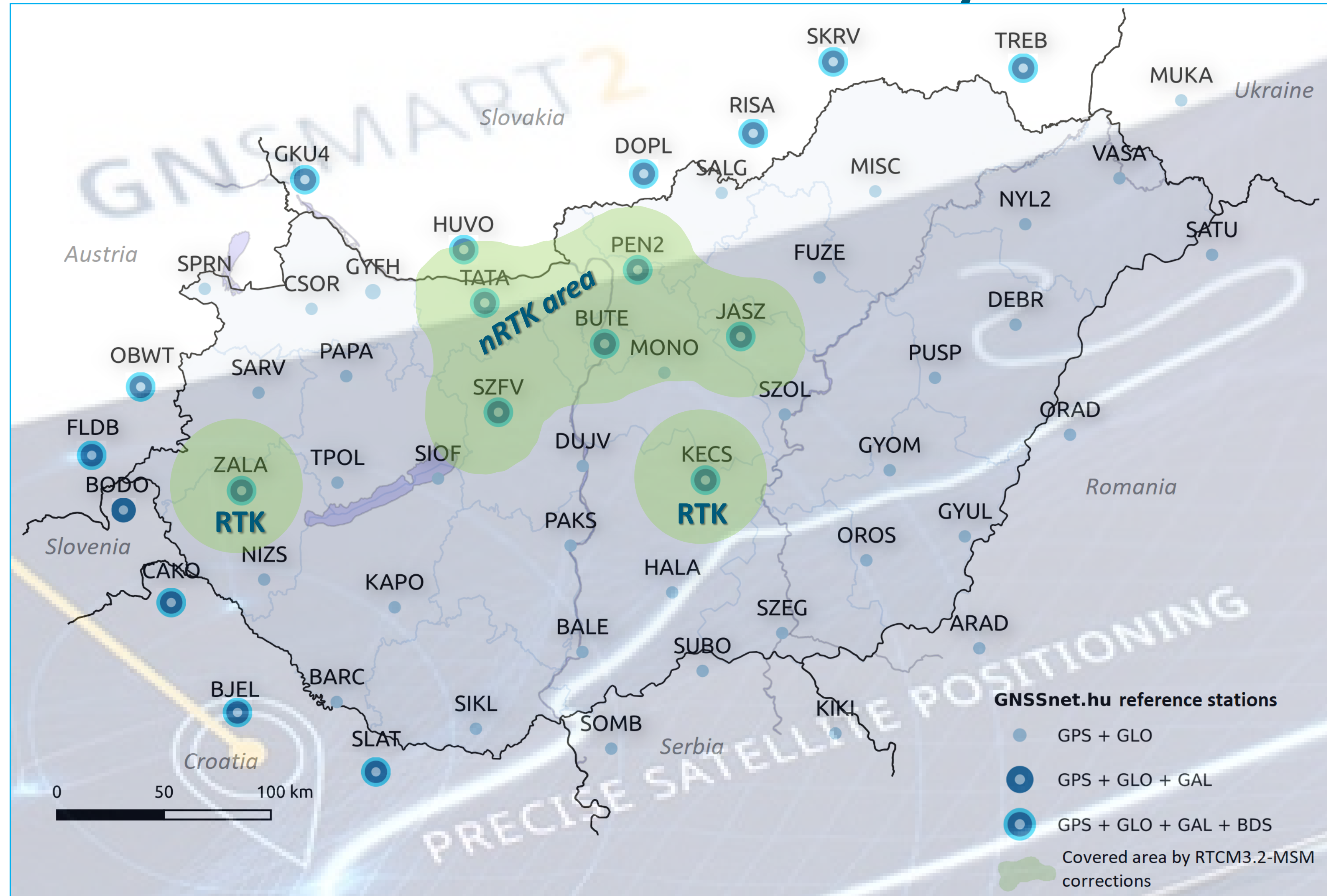
Main events of the last two years towards GPS/GLO/GAL/BDS (4-GNSS) capability:

NET-1, NET-2 network processing



Main events of the last two years towards GPS/GLO/GAL/BDS (4-GNSS) capability:

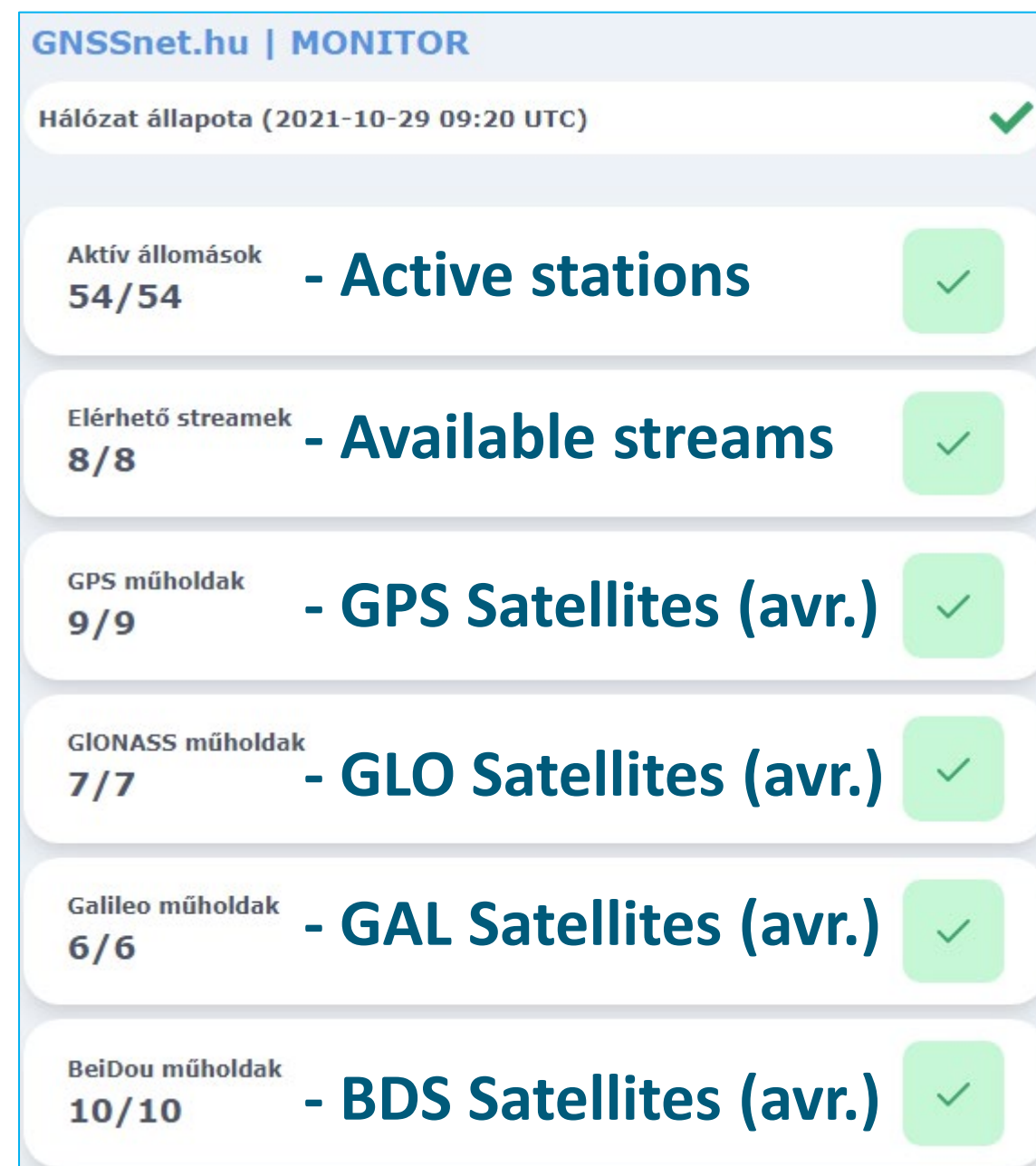
4-GNSS network RTK corrections by GNSMART2



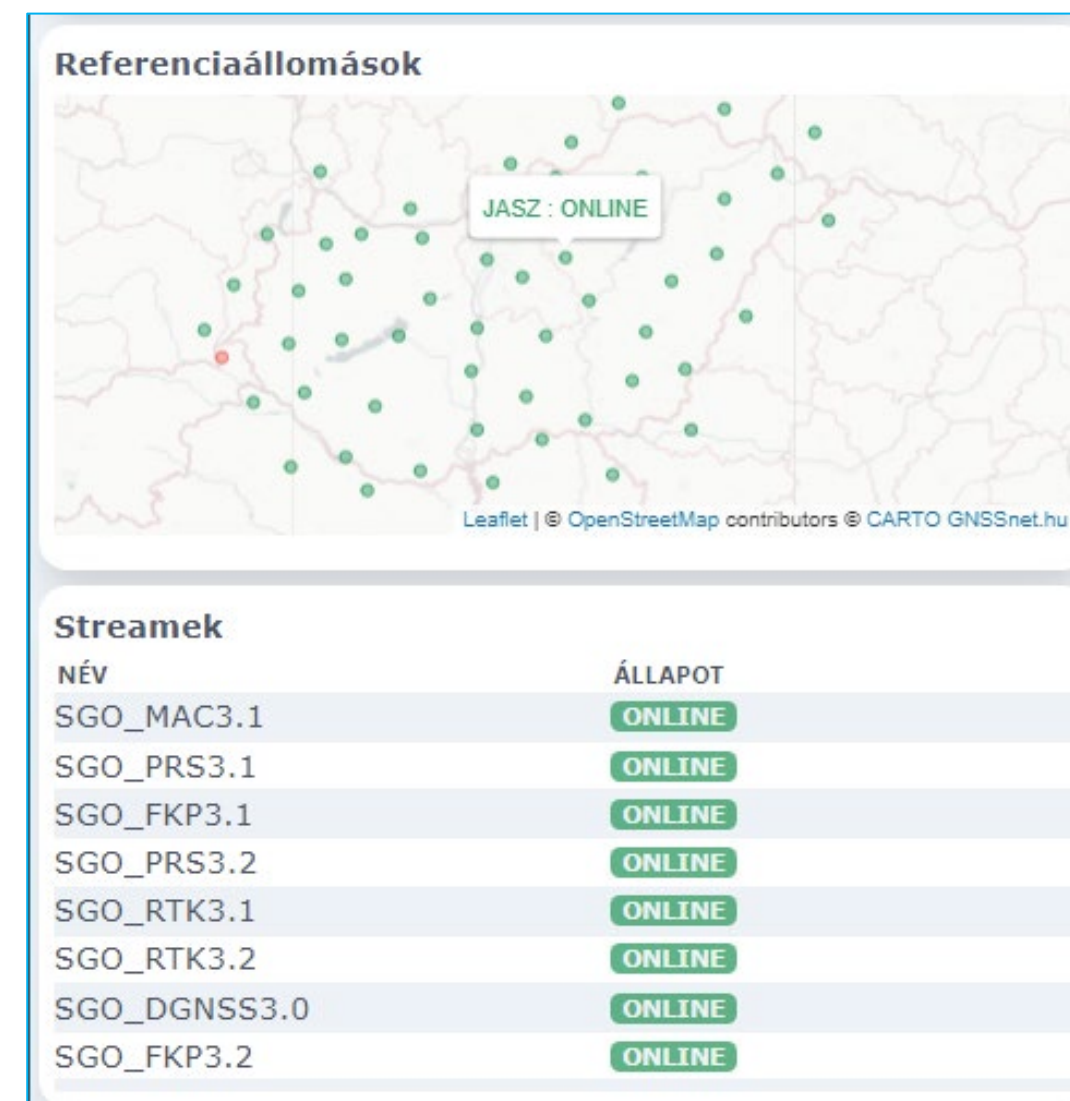
Main events of the last two years towards GPS/GLO/GAL/BDS (4-GNSS) capability:

New monitor site for GNSMART-2 service

Start page with the most important information of the network



Reference stations and available streams

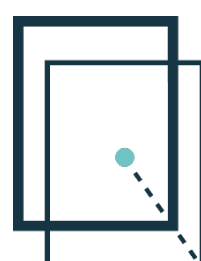
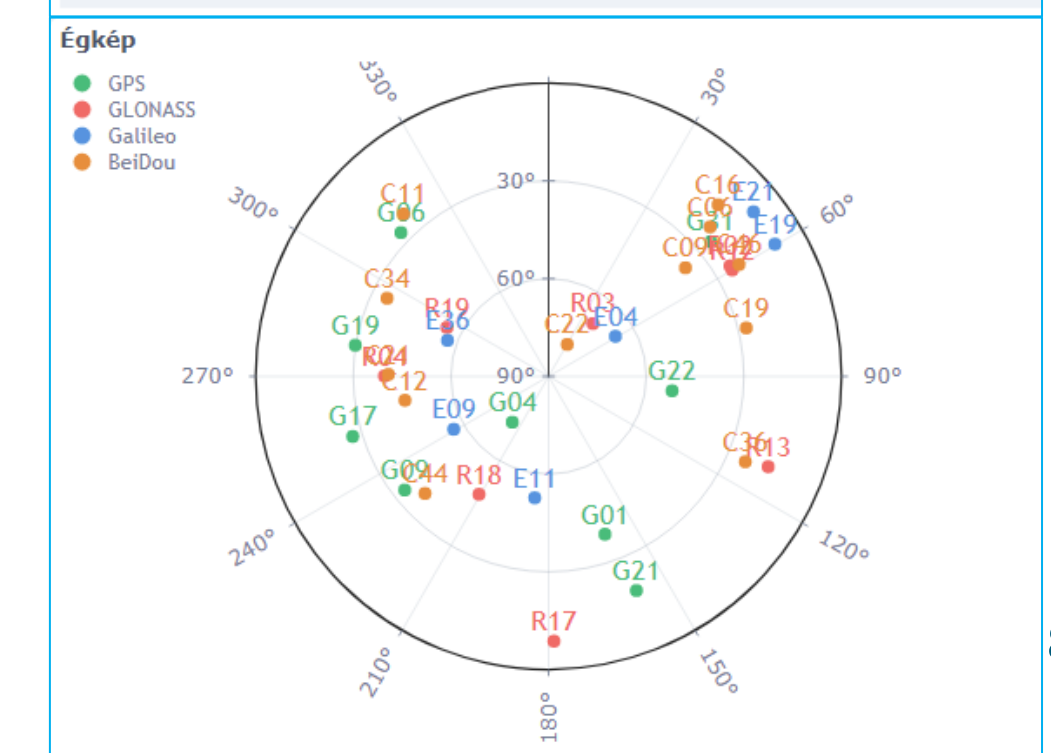


Detailed satellites data of the reference stations

Állomás lista						
NÉV	ÁLLAPOT	KAPCSOLAT VÁLTOZÁS	GPS	GLO	GAL	BDS
ARAD	ONLINE	2021-10-21 11:40	7/7	-/-	-/-	-/-
BALE	ONLINE	2021-09-08 16:44	9/9	7/7	-/-	-/-
BARC	ONLINE	2021-10-25 02:32	9/9	6/7	-/-	-/-
BJEL	ONLINE	2021-09-11 16:36	9/9	7/7	6/6	5/5
BODO	ONLINE	2021-10-04 15:14	8/8	7/7	4/4	-/-
BUTE	ONLINE	2021-08-16 14:16	9/9	8/8	6/6	12/12
CAKO	ONLINE	2021-08-16 14:16	9/9	7/7	5/5	5/5
CSOR	ONLINE	2021-10-25 02:32	9/9	7/7	-/-	-/-
DEBR	ONLINE	2021-10-25 02:32	9/9	7/8	-/-	-/-
DOPL	ONLINE	2021-10-04 23:50	7/7	5/6	4/4	6/7
DUJV	ONLINE	2021-10-25 02:32	9/9	8/8	-/-	-/-
FLDB	ONLINE	2021-10-26 17:36	9/9	7/8	5/5	13/13
FUZE	ONLINE	2021-10-25 02:32	9/9	7/7	-/-	-/-
GKU4	ONLINE	2021-08-16 14:16	9/9	7/7	5/5	8/8
GYFH	ONLINE	2021-10-25 02:32	9/9	7/7	-/-	-/-
GYOM	ONLINE	2021-10-25 02:32	9/9	7/8	-/-	-/-
GYUL	ONLINE	2021-10-25 02:32	9/9	7/7	-/-	-/-
HALA	ONLINE	2021-10-25 02:32	9/9	7/7	-/-	-/-
HUVO	ONLINE	2021-09-03 09:42	8/8	6/7	5/5	8/8
JASZ	ONLINE	2021-10-25 02:32	9/9	7/7	4/6	13/13
KAPO	ONLINE	2021-10-25 02:32	9/9	7/8	-/-	-/-
KECS	ONLINE	2021-10-25 02:32	9/9	7/7	6/6	13/13
KIKI	ONLINE	2021-10-12 18:32	8/9	7/7	-/-	-/-

Skyplot; Satellites data

MŰHOLD	MAGASSÁGI SZÖG	AZIMUTH SZÖG	IRÁNY
G01	40°	160°	↓
G19	30°	281°	↓
G04	70°	218°	↑
G09	32°	231°	↑
G31	26°	52°	↓
G22	53°	95°	↓
G21	21°	157°	↓
G06	25°	315°	↑
G17	28°	255°	↓
R19	55°	299°	↑
R18	50°	212°	↓
R17	10°	179°	↓
R13	15°	114°	↑
R12	24°	62°	↑
R04	38°	268°	↑
R03	70°	253°	↓
R02	26°	57°	↓
E36	56°	292°	↑
E21	9°	53°	↑
E19	10°	59°	↓
E12	9°	157°	↓
E11	54°	187°	↓
E09	55°	239°	↑
E04	67°	59°	↓
C46	22°	61°	↑
C44	39°	228°	↓
C36	23°	115°	↑
C34	35°	298°	↑
C22	80°	23°	↓
C21	39°	269°	↑
C19	29°	75°	↓
C16	16°	44°	↓
C12	46°	263°	↓



Main events of the last two years towards GPS/GLO/GAL/BDS (4-GNSS) capability:

Temporarily three independent real-time service

GNSMART-1, GPS/GLO data: Caster address - ntrip1.gnssnet.hu:2101
Nationwide coverage

GPS GLO

GNSMART-2, 4-GNSS data: Caster address - ntrip².gnssnet.hu:2101
Partial coverage (7 stations)
GPS/GLO/adatokkal: Nationwide coverage

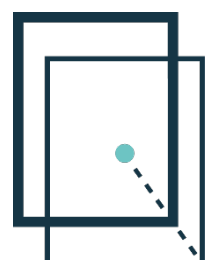
GPS GLO GAL BDS

GPS GLO

Single base, 4-GNSS data by self developed caster: ntrip².gnssnet.hu:210²
Partial coverage (7 stations)

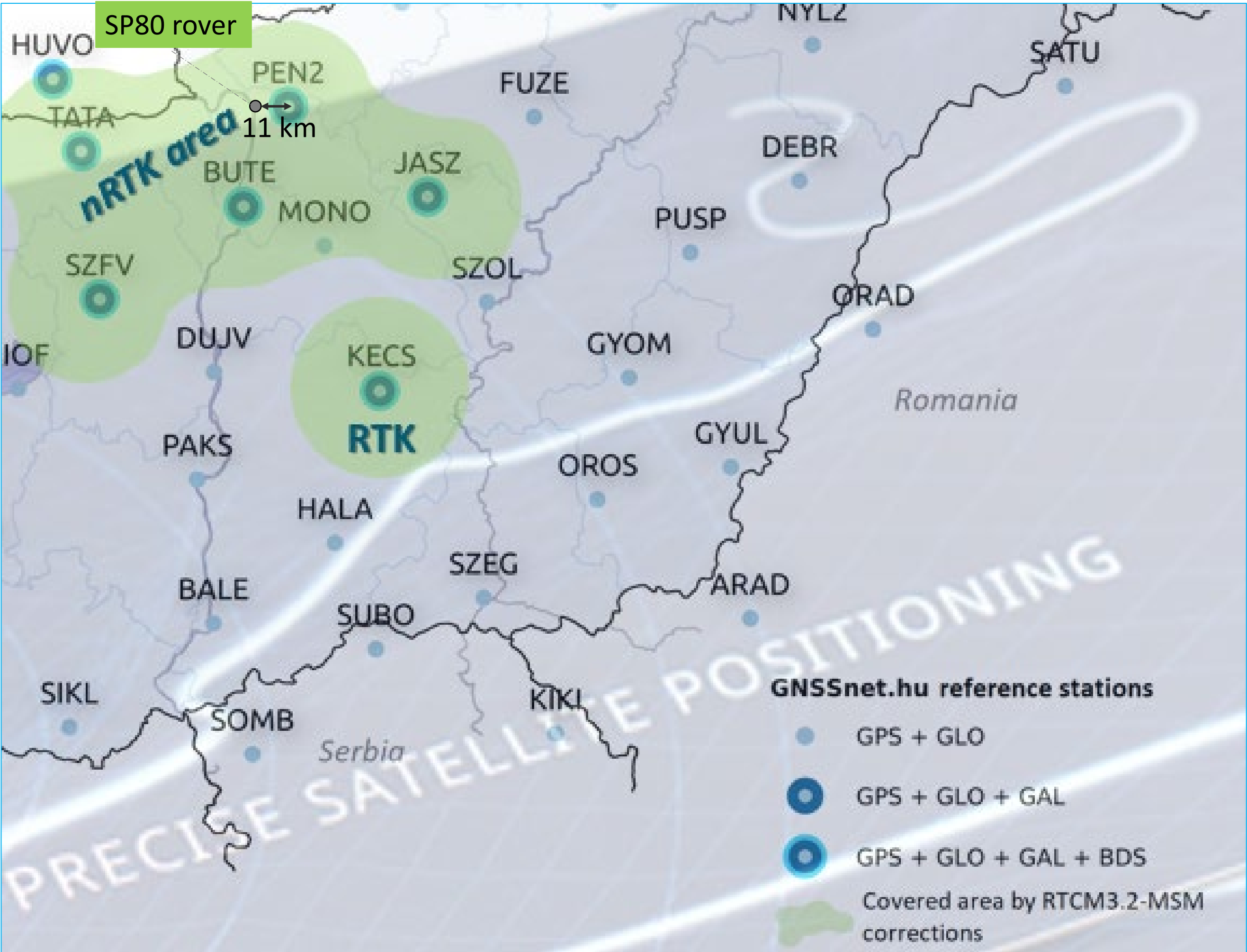
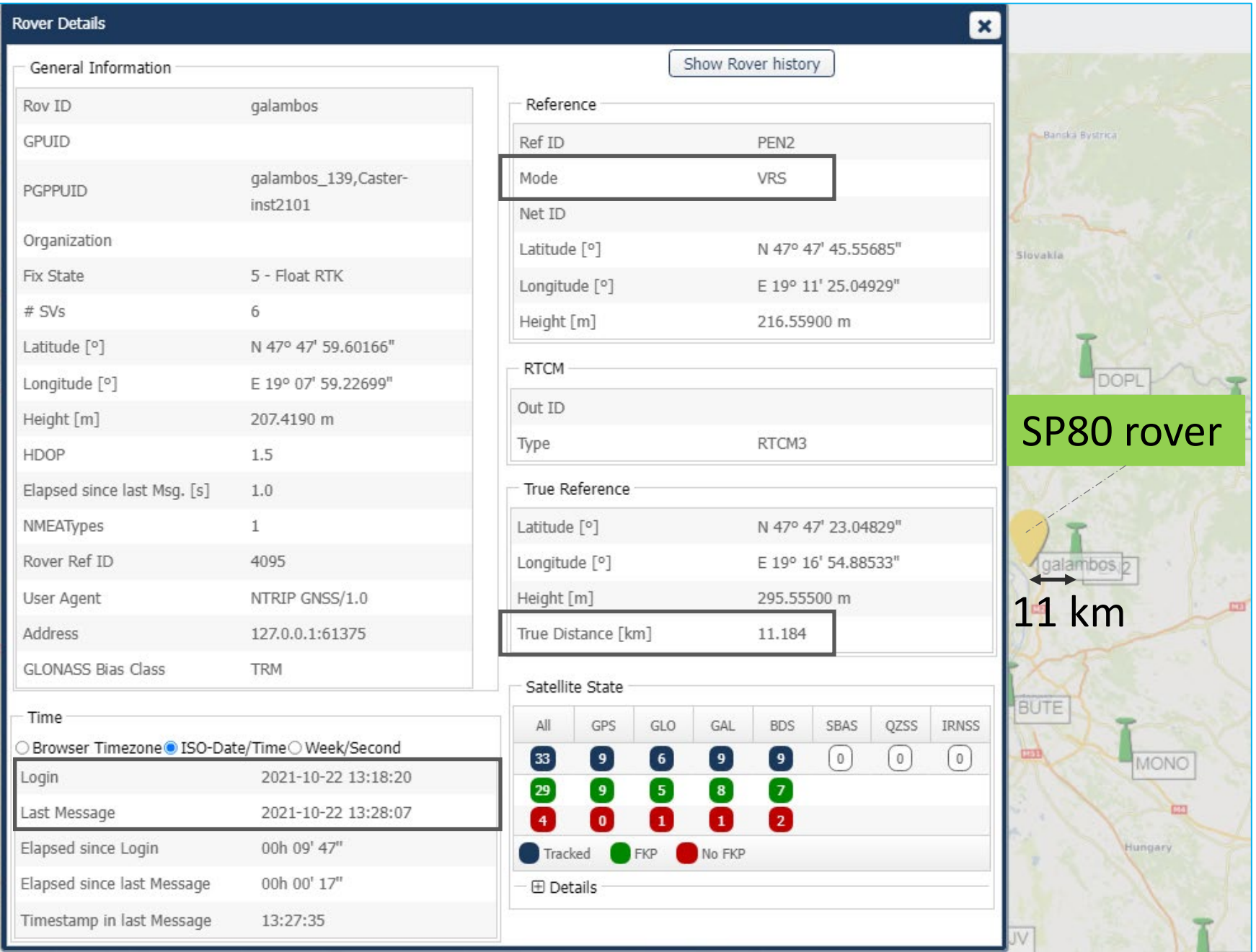
GPS GLO GAL BDS

After a slow transition from GNSMART-1 to GNSMART-2, GNSMART-1 service will be stopped!

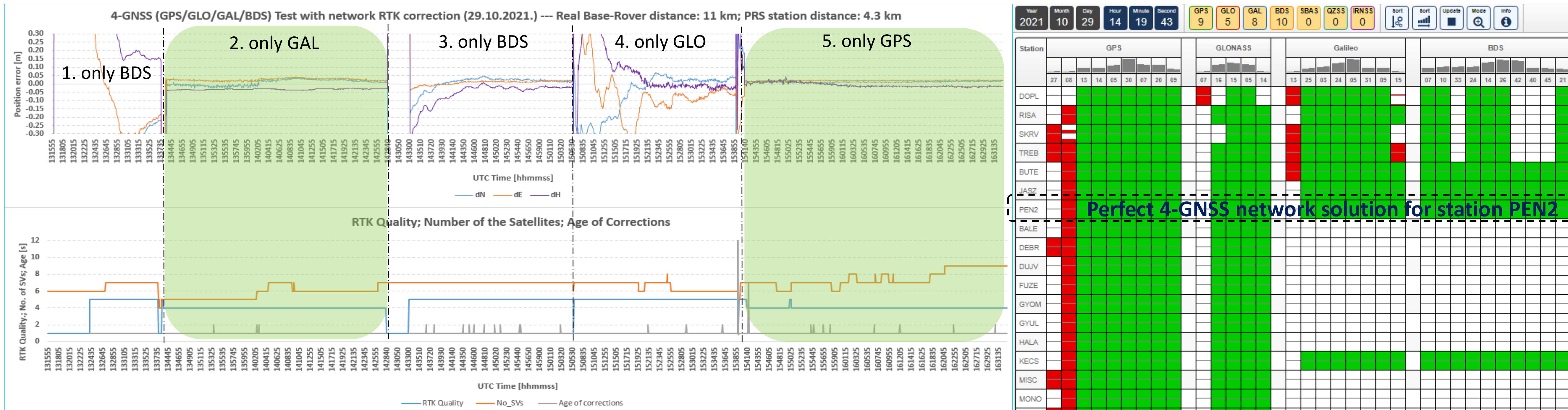


Experiences with Galileo and Beidou: About the test measurements

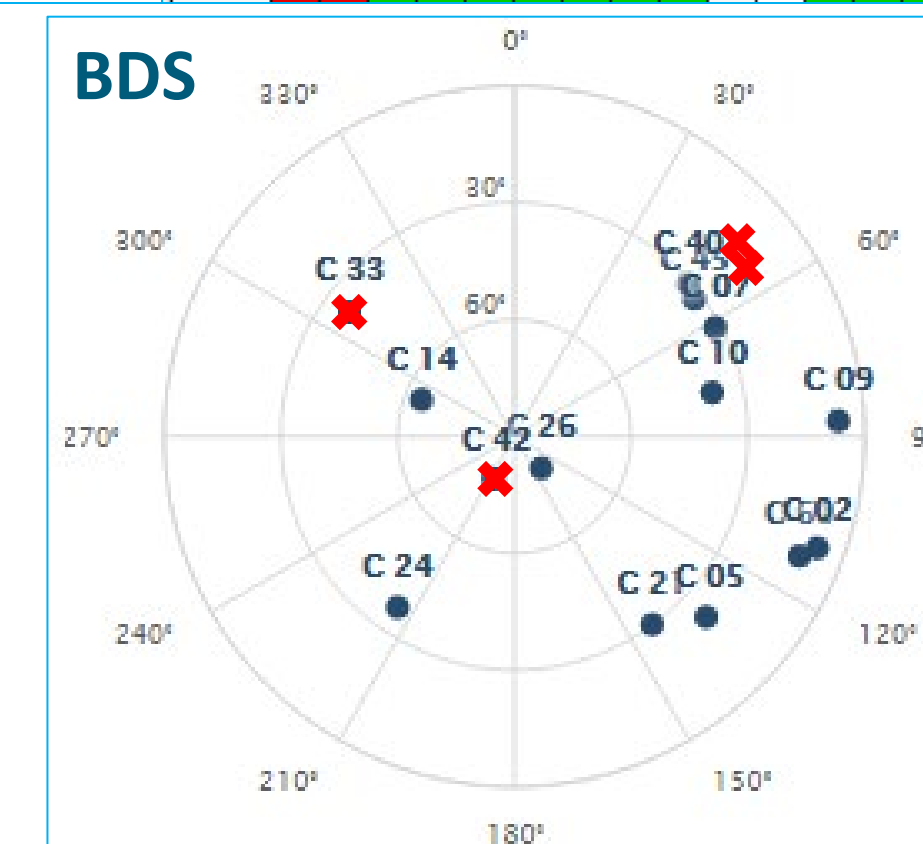
Rover type	<i>Spectra Precision 80</i>
Date	<i>October 2021</i>
Location	<i>11 km far away from station PEN2 (SGO)</i>
Measurement	<i>Continuous for hours</i>
Correction type	<i>Network RTK PRS correction by GNSMART2</i>
Data logging rate	<i>Every 5 seconds</i>
Elevation mask	<i>5° but partially obscured location (at the 1th test) and significantly obscured location (at the 2nd test)</i>



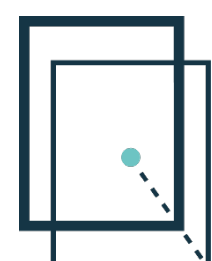
Experiencies with Galileo and Beidou: Test measurement with GNSS systems separately



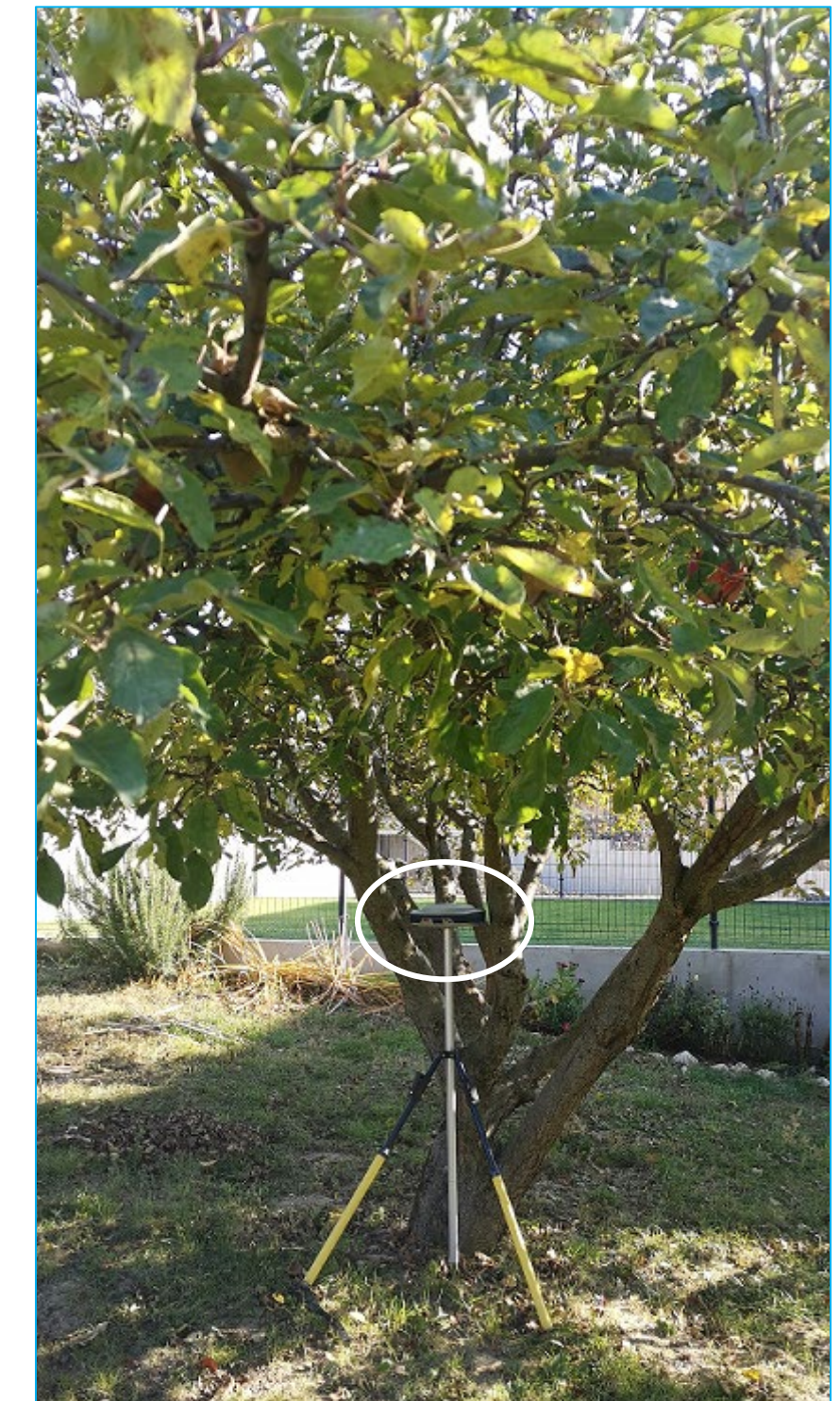
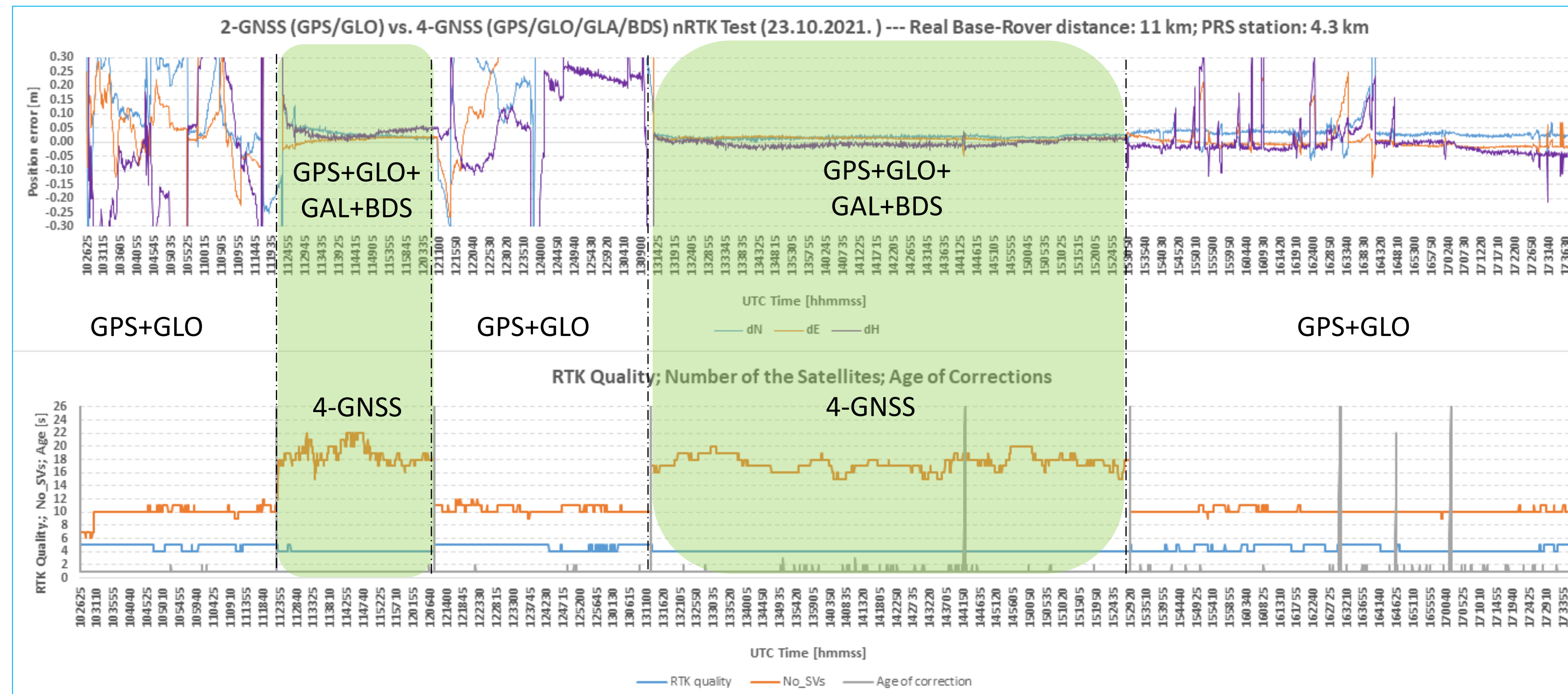
- Only GPS gave perfect positioning, GAL almost perfect
- Our rover can not use all BDS SVs (only between C1-29)
- 4-GNSS together working very well



Partially obscured location

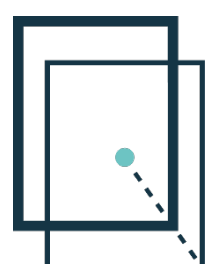


Experiences with Galileo and Beidou: Test measurement in difficult conditions



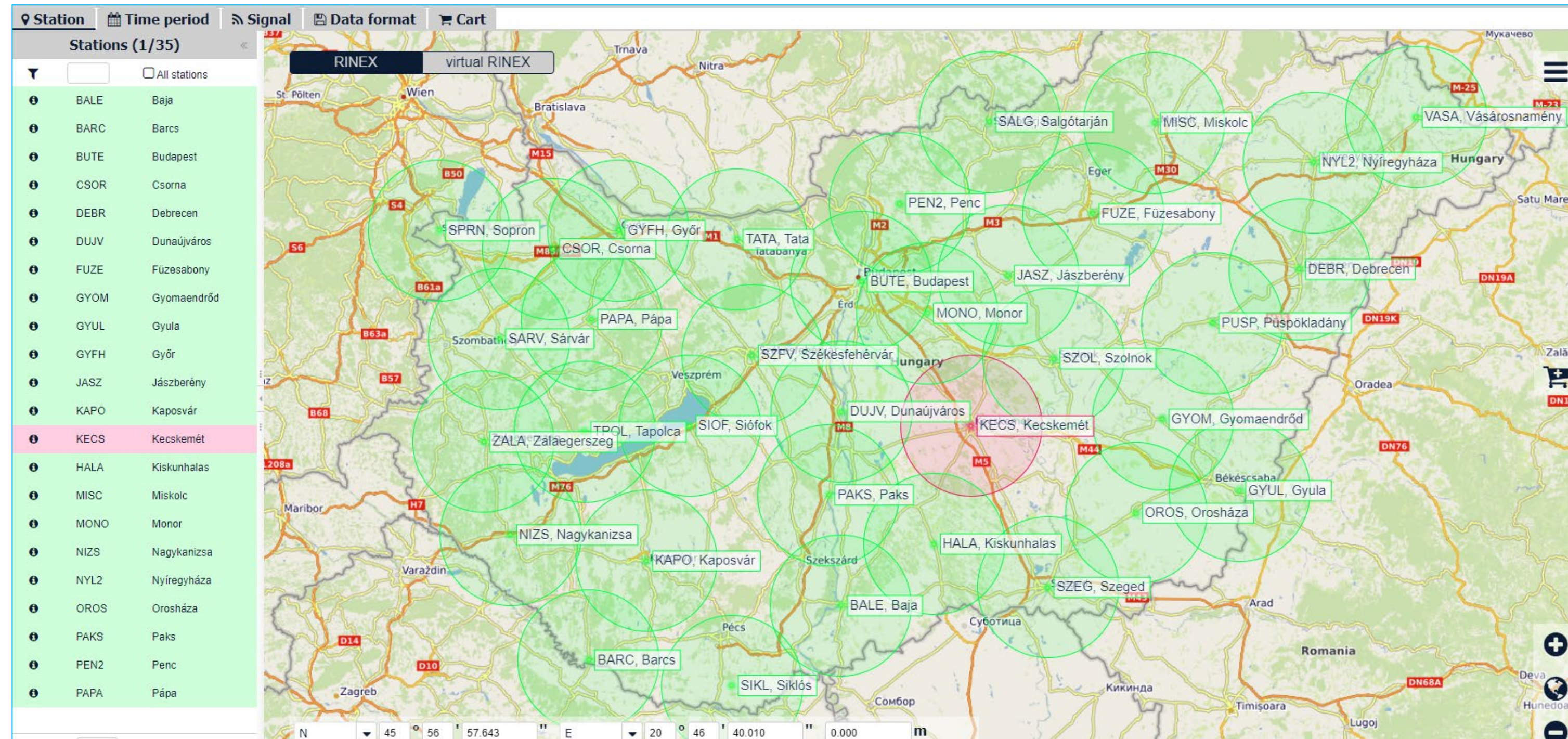
Spectacular benefit using 4-GNSS system vs. 2-GNSS
on obscured location

Significantly obscured location
under a tree

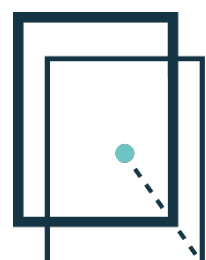


Main events of the last two years towards GPS/GLO/GAL/BDS (4-GNSS) capability:

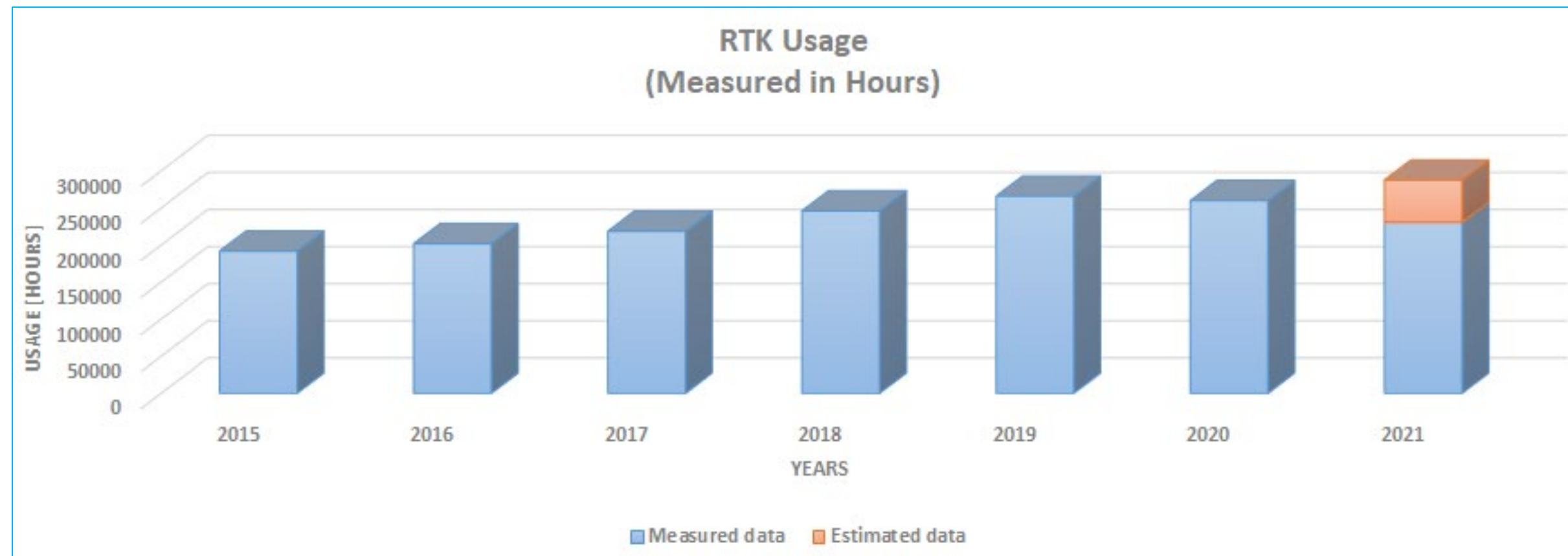
New website for post-processing data (GPPWEB)



- RINEX and virtual RINEX data with 2.11 and 3.x versions
- GPS/GLO/GAL/BDS data from 7 stations



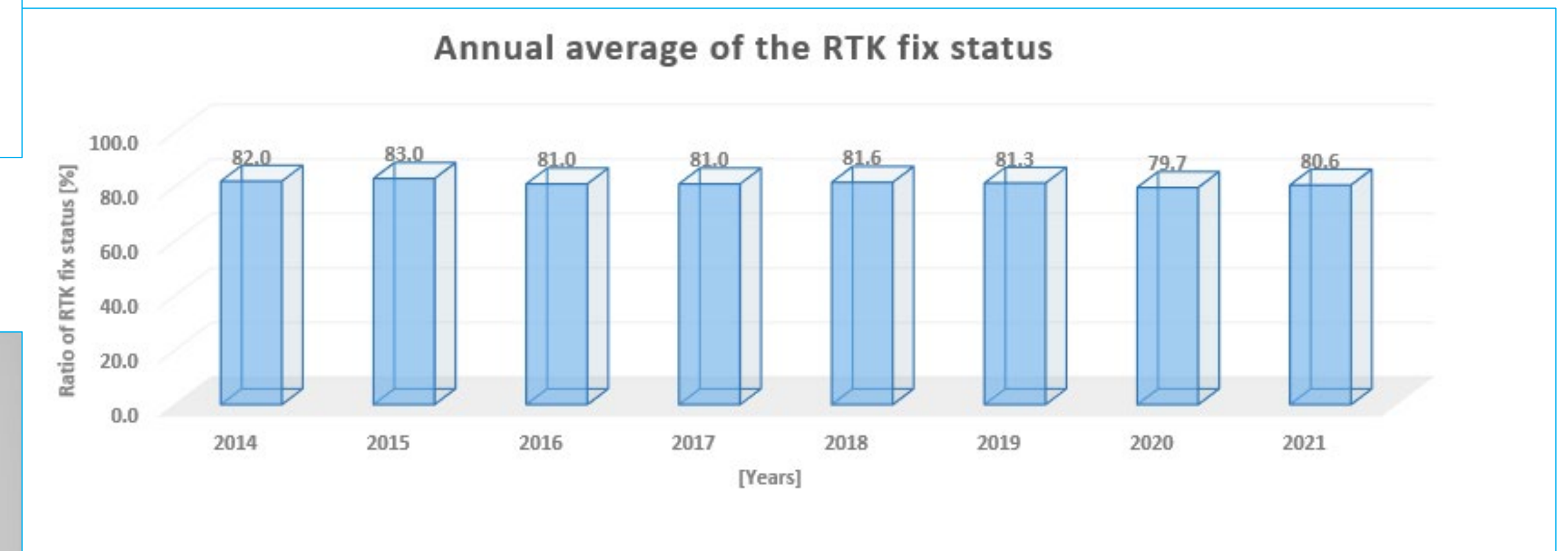
Statistics



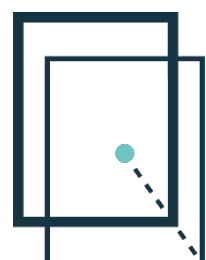
**Decreasing usage in 2020 (COVID19?)
but increasing trend again in 2021**



Near 100%



Approximately 80%



Thank you for your attention!



Lechner Nonprofit Ltd.
Satellite Geodetic Observatory, Penc (SGO)
1111 Budapest, Budafoki út 59.
1149 Budapest, Bosnyák tér 5.



www.lechnerkozpont.hu
www.gnssnet.hu

