National report of SLOVAKIA

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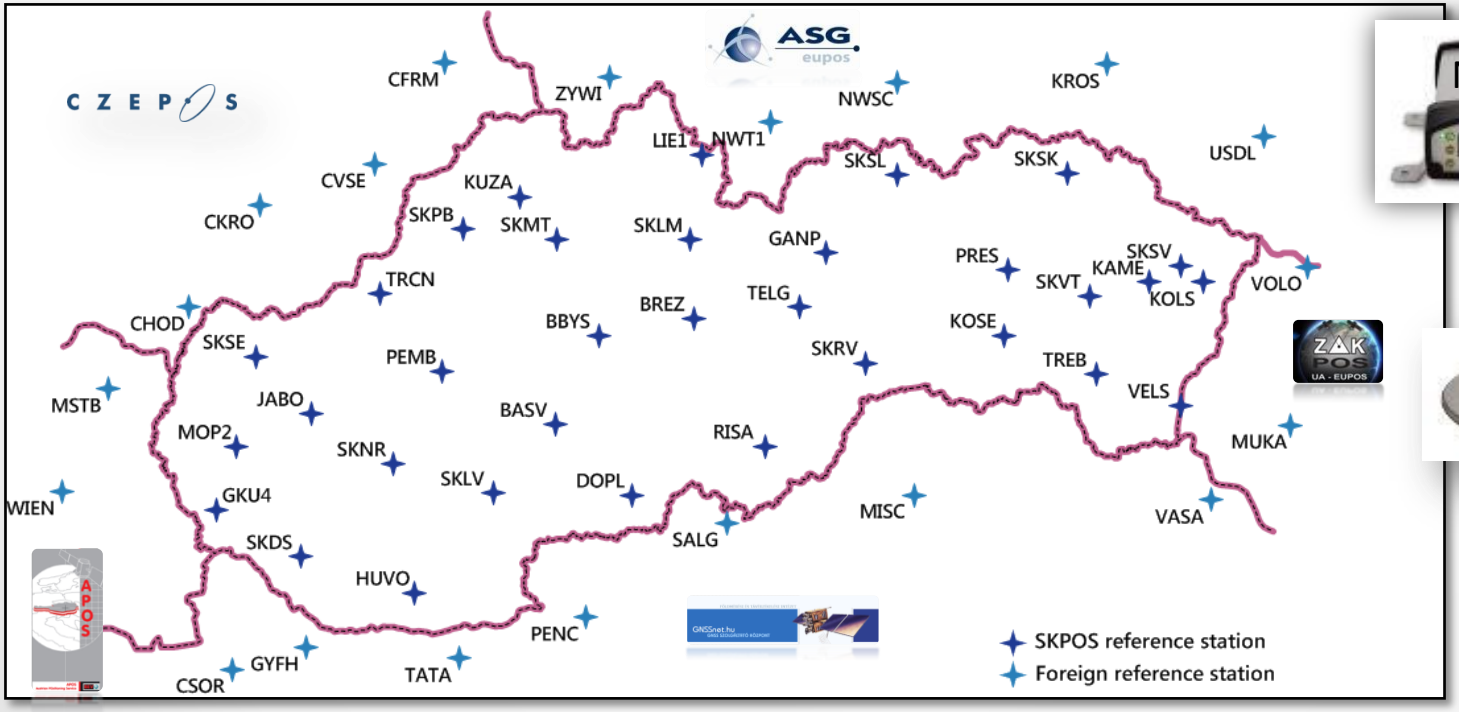
6th EUPOS® Council and Technical Meeting

October 30-31, 2019. Budapest, Hungary

SKPOS stations infrastructure

Status in October 2019

- **33 Slovakian permanent stations**
  - All stations with TRIMBLE receivers and antennas
  - All stations observe GPS + GLONASS + Galileo + BeiDou
- **20 foreign permanent stations (APOS, gnssnet.hu, CZEPOS, ASG-EUPOS, ZAKPOS)**



SKPOS stations infrastructure

April 2018

- 5 new Trimble Zephyr Geodetic 3 antennas

Zephyr Geodetic 2

Full support GAL, BDS

TRCN, SKSV, SKLV, GKU4, KOLS

Zephyr Geodetic 3

SKPOS stations infrastructure

August 2018

- 4 new Trimble Alloy receivers

Trimble NetR8

Plná podpora GAL, BDS

TRCN, GANP, SKNR, VELS

Trimble Alloy

SKPOS stations infrastructure

March 2019

- New UPS battery backup

  Backup of receivers, routers

AEG Protect

Rellio UPS VSD2200

SKPOS stations infrastructure

April 2019

- Station relocation

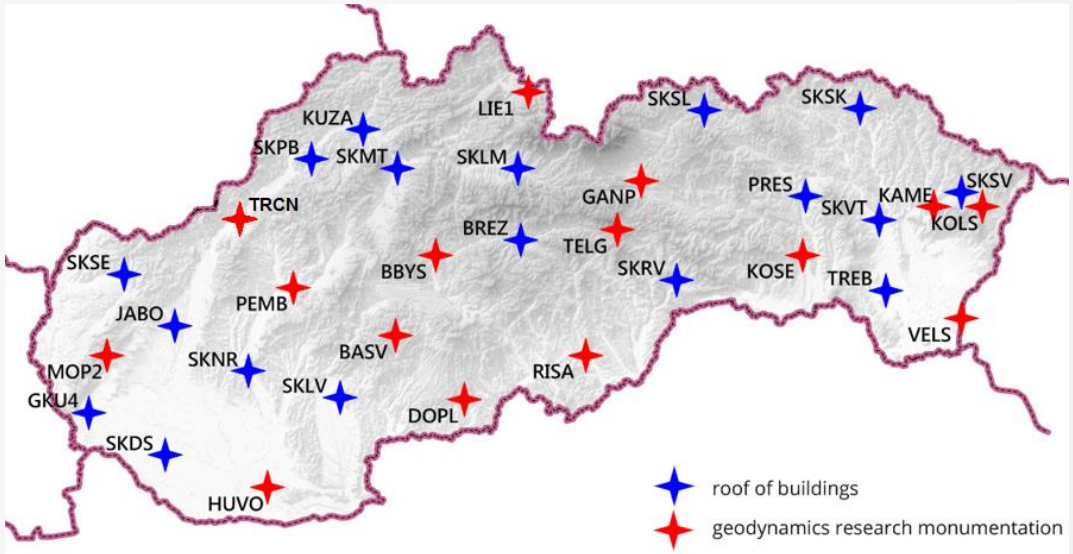
  reinforced-concrete pillar instead of roof monumentation

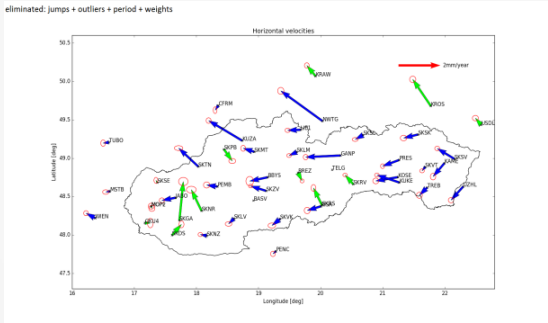
SKTN

TRCN

SKPOS stations infrastructure

- 15 of 33 slovakian permanent stations (45%) have monumentation suitable for geokinematics





SKPOS infrastructure

August 2019

- GNSS/InSAR integrated station PEM2

SKPOS infrastructure

September 2019

- Control software:
  - Trimble Pivot Platform 4.3 **September 2019**
  - RTXNet procesor **Galileo** **BeiDou**

- Receivers firmware
  - Trimble receivers: version 5.42

SKPOS – Galileo and BeiDou

Full capability Galileo and BeiDou

SKPOS	Component	GPS + GLONASS + Galileo + BeiDou
Hardware	Antennas	✓ 33 (33)
	Receivers	✓ 33 (33)
Software Trimble Pivot	RINEX CORS, VRS	✓
	RTK VRS **2018-10-16**	✓

SKPOS portfolio

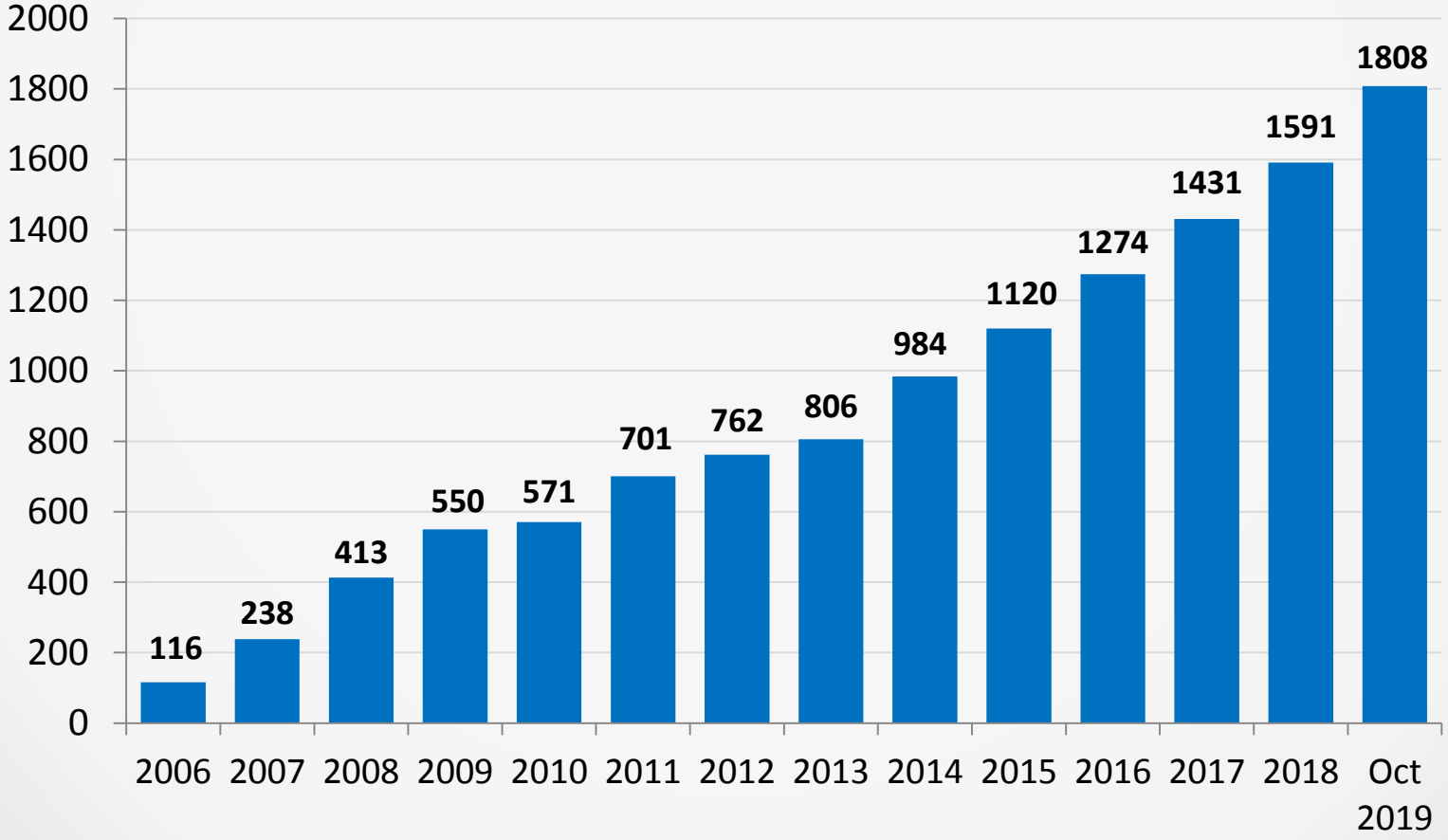
Data formats – content - charges

Only network solution (Network RTK in VRS concept) is provided.
No single RTK!

Package	Content	Duration	Format	Flat rate
SKPOS_mm	RINEX 1000 h	year	RINEX 2.x, 3.x	50 €
SKPOS_cm (year)	RTK unlimited + 50 h RINEX	year	RTCM 2.3, 3.1, RTCM 3.2 MSM, CMRx, CMR+	50 €
SKPOS_cm (month)	RTK unlimited	month	RTCM 2.3, 3.1 RTCM 3.2 MSM, CMRx, CMR+	19 €
SKPOS_dm	DGNSS unlimited	year	RTCM 2.1, 2.3	20 €

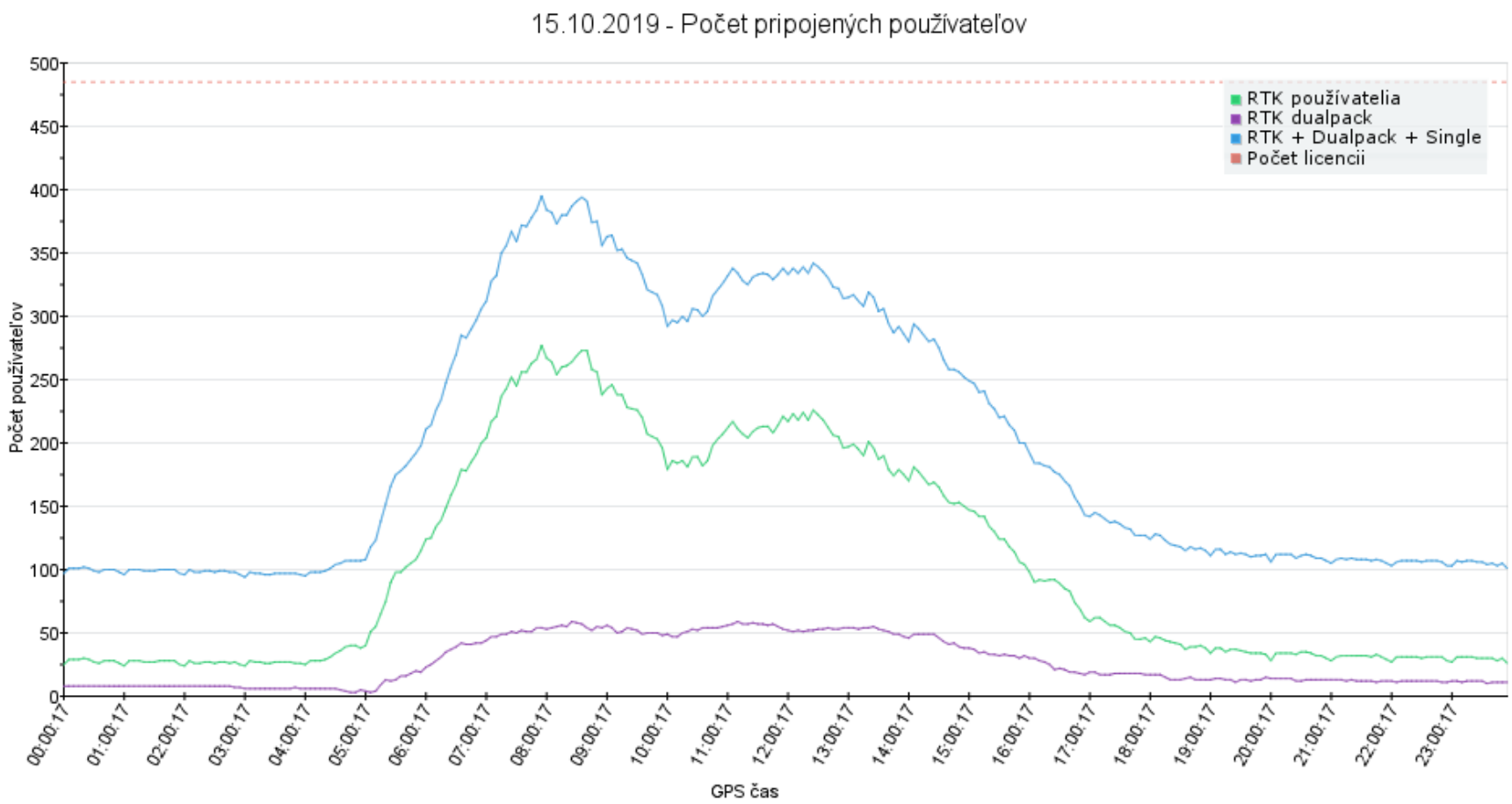
SKPOS
number of users

- over 1,800 registrations (Oct. 2019)



SKPOS
simultaneous logins

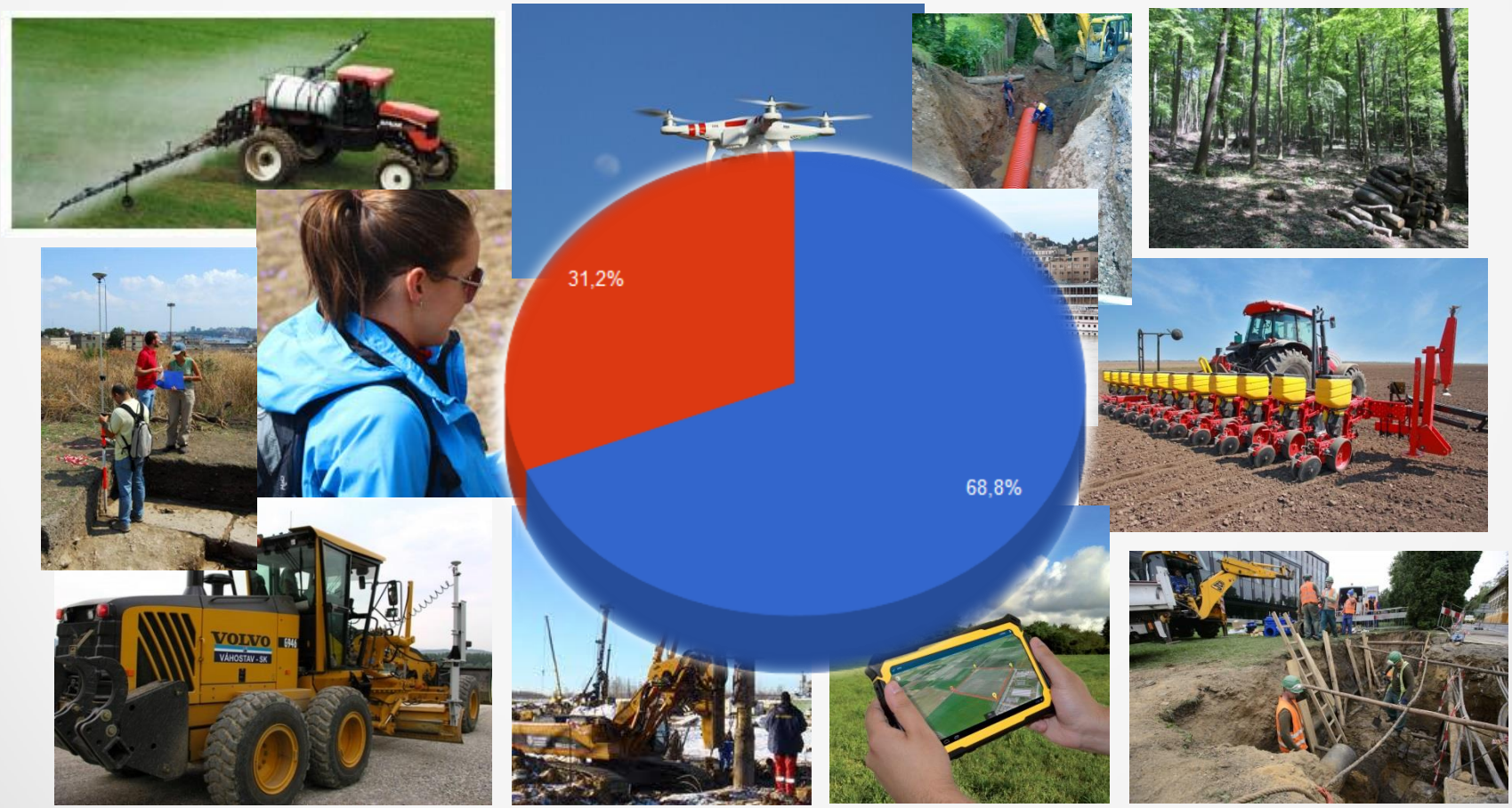
- Maximum: 395 simultaneous logins (2019-10-15)



SKPOS

Type of users (precise values from registration forms)

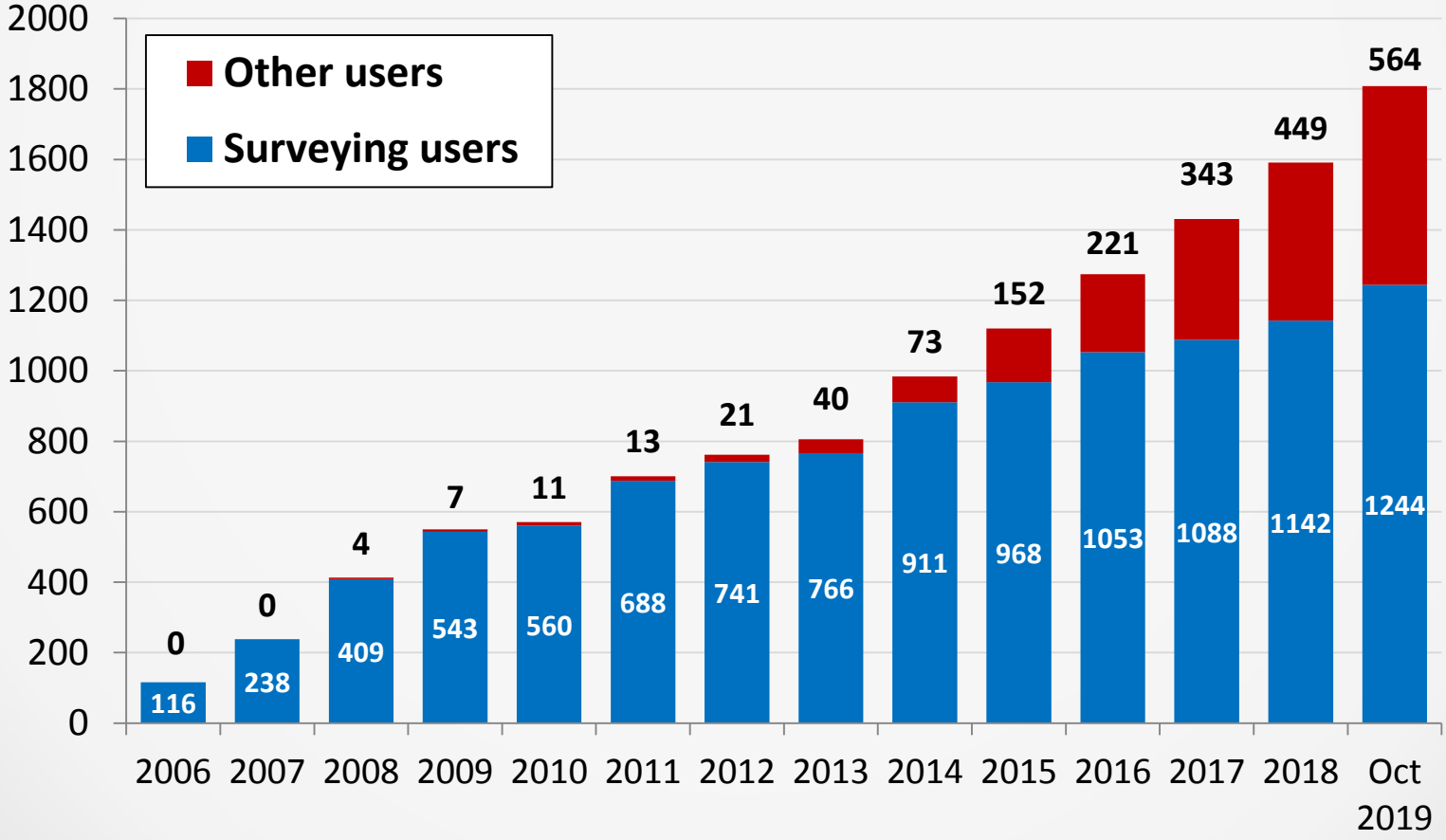
- Surveying fields (cadastre, surveying, mapping, GIS) – **69 %**
- Other fields (precise agriculture, machine guarding) – **31 %**



SKPOS

Type of users (precise values from registration forms)

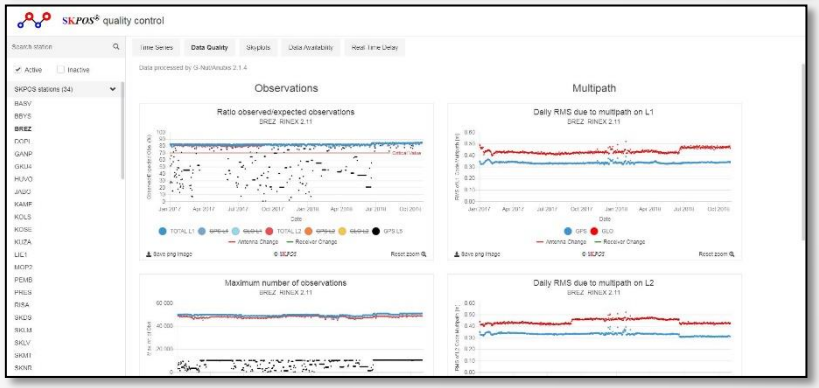
- Since 2017 more new SKPOS users were from non geodetic field

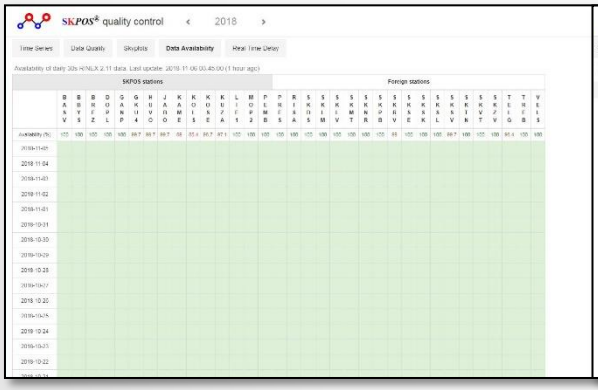


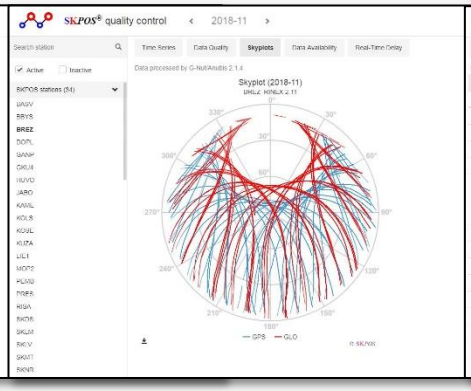
SKPOS Quality Control

Quality Control RINEX v3 (under development)

- Time Series
- Data Quality:
  - Number and percentage of observations
  - Ambiguity resolution
  - SNR
  - Cycle slips
  - Multipath errors
  - Skyplots
- RINEX availability
- Real-time data delay (station -> control sw)
- 86 stations (SKPOS / foreign SKPOS / EPN)







EPSG Registry
Standardization for Slovakian reference systems

- The **EPSG** Geodetic Parameter Dataset is a structured dataset of Coordinate Reference Systems and Coordinate Transformations

International Association of Oil & Gas Producers

- from February 2018 all valid slovakian geodetic reference systems are standardized = they have EPSG codes

EPSG Registry
Standardized Slovakian reference systems

Geodetic reference system	Reference frame	Alphanumeric/ alphabetic code	EPSG code
European terestrial reference system 1989	Slovak terestrial reference frame 2009	SKTRF09 = ETRF2000	EPSG::4937 (3D - φλh) EPSG::4258 (2D - φλ) EPSG::4936 (3D - XYZ)
Súradnicový systém Jednotnej trigonometrickej siete katastrálnej	Jednotná trigonometrická sieť katastrálna	JTSK	EPSG::2065 (meridian Ferro) EPSG::5513 (meridian Greenwich))
	Jednotná trigonometrická sieť katastrálna 2003	JTSK03	EPSG::8352 (meridian Greenwich)
Baltic vertical system after adjustment	Baltic vertical frame after adjustment	Bpv = Bpv (1957)	EPSG::8357
European vertical reference system	Slovak vertical reference frame 2005	SKVRF05 = EVRF2000	EPSG::5730

EPSG Registry
Standardized transformations

Source geodetic reference system	Target geodetic reference system	EPSG code of transformation
S-JTSK (JTSK03)	S-JTSK (JTSK)	EPSG::8364
S-JTSK (JTSK)	S-JTSK (JTSK03)	EPSG::8364
ETRS89 (ETRF2000)	S-JTSK (JTSK03)	EPSG::8365
S-JTSK (JTSK03)	ETRS89 (ETRF2000)	EPSG::8367
ETRS89 (ETRF2000)	S-JTSK (JTSK)	EPSG::8442
S-JTSK (JTSK)	ETRS89 (ETRF2000)	EPSG::8443
ETRS89 (ETRF2000) 3D	ETRS89 (ETRF2000) 2D + Bpv	EPSG::8361
ETRS89 (ETRF2000) 2D + Bpv	ETRS89 (ETRF2000) 3D	EPSG::8361
ETRS89 (ETRF2000) 3D	ETRS89 (ETRF2000) 2D + EVRF2007	EPSG::8362
ETRS89 (ETRF2000) 2D + EVRF2007	ETRS89 (ETRF2000) 3D	EPSG::8362
ETRS89 (ETRF2000) 2D + Bpv	ETRS89 (ETRF2000) 2D + EVRF2007	EPSG::8363
ETRS89 (ETRF2000) 2D + EVRF2007	ETRS89 (ETRF2000) 2D + Bpv	EPSG::8363

Thank you for your attention

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