National report of Slovakia

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8th EUPOS Council and Technical Meeting
November 15-16 2022, Ljubljana, Slovenia
SKPOS stations infrastructure
Status in November 2022

16 years of continuous operation

2 500+ active users

35+21 reference stations

GPS, GLONASS, Galileo, BeiDou

Trimble NetR9
Trimble Alloy
Zephyr Geodetic 2
Zephyr Geodetic 3
Choke Ring
SKPOS stations infrastructure

- **DVCN** - new EPN station from 2022-02-20
  - pillar monumentation + InSAR reflector
  - GPS+GLO+GAL+BDS+QZSS+SBAS

- **EPOS contribution**
  - stations GANP, BBYS
SKPOS stations infrastructure

October 2022

- Station relocation
  - reinforced-concrete pillar instead of roof monumentation

JABO

JASL
SKPOS stations infrastructure

November 2022

- New station
  - reinforced-concrete pillar
SKPOS stations infrastructure

- Station relocation
  - Reinforced-concrete pillar instead of roof monumentation
SKPOS stations infrastructure

- 21 of 35 slovak permanent stations (60%) have monumentation suitable for geokinematics
Multi-year solution 2007 – 2020
Horizontal velocities
Multi-year solution 2007 – 2020
Vertical velocities
SKPOS GNSS/InSAR collocation
SKPOS GNSS/InSAR collocation

- Collocations helps us to monitor station surroundings stability

- InSAR = new geodetic technique
  - we plan to provide precise coordinates of InSAR reflector phase centers (like coordinates or heights of benchmarks)
  - InSAR reflector coordinates will enable to do correct absolute referencing of InSAR images to ETRS89
  - results from referenced InSAR image processing will be used e.g. for vertical monitoring of Slovakia etc.

- usage of InSAR technology is done in cooperation with Slovak University of Technology
Physical monitoring station

- **2013**
  Quality monitoring based on virtual stations

- **2020**
  New physical monitoring station SUT2

- **2022**
  Relocation of monitoring station SUT2 → AGOA
SKPOS Infrastructure

- Control software:
  - Trimble Pivot Platform
    - Version 4.72

- Receivers firmware
  - Alloy: 6.15
  - NetR9: 5.55
SKPOS Infrastructure

- Control software
  - Problem with missing epochs in npr files
Only network solution (Network RTK in VRS concept) is provided. No single RTK!

<table>
<thead>
<tr>
<th>Package</th>
<th>Content</th>
<th>Duration</th>
<th>Format</th>
<th>Flat rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>SKPOS_mm</td>
<td>RINEX 1000 h</td>
<td>year</td>
<td>RINEX 2.x, 3.x</td>
<td>50 €</td>
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<tr>
<td>SKPOS_cm (year)</td>
<td>RTK unlimited + 50 h RINEX</td>
<td>year</td>
<td>RTCM 2.3, 3.1, RTCM 3.2, CMRx, CMR+</td>
<td>50 €</td>
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<tr>
<td>SKPOS_cm (month)</td>
<td>RTK unlimited</td>
<td>month</td>
<td>RTCM 2.3, 3.1 RTCM 3.2, CMRx, CMR+</td>
<td>19 €</td>
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<tr>
<td>SKPOS_dm</td>
<td>DGNSS unlimited</td>
<td>year</td>
<td>RTCM 2.1, 2.3</td>
<td>20 €</td>
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</tbody>
</table>
Number of users

- Number of users: 2565 (Nov. 2022)
Maximum simultaneous logins

- Maximum 622 simultaneous logins (2022-10-12)
Type of users

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

- ETRS89 (ETRF2000) epoch 2008.5
- 7 Helmert transformation parameters to national system S-JTSK (JTSK03)
- Shift-grid transformation from S-JTSK (JTSK03) to S-JTSK (JTSK) – Nadcon, NTv2
- All valid geodetic reference system are standardized = have EPSG codes from February 2018

<table>
<thead>
<tr>
<th>Reference system</th>
<th>EPSG Code</th>
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</thead>
<tbody>
<tr>
<td>S-JTSK (JTSK) East-North</td>
<td>EPSG:5514</td>
</tr>
<tr>
<td>S-JTSK (JTSK) South-West</td>
<td>EPSG:5513</td>
</tr>
<tr>
<td>S-JTSK (JTSK03) East-North</td>
<td>EPSG:8353</td>
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<tr>
<td>S-JTSK (JTSK03) South-West</td>
<td>EPSG:8352</td>
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<tr>
<td>...</td>
<td></td>
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</tbody>
</table>
CORS coordinates keeping up to date

  - accepted by EUREF GB at EUREF 2022 Symposium in Zagreb as a new Class A – EUREF Densification for Slovakia
  - reference frame and epoch remain the same to keep transformation parameters to S-JTSK consistent

**ETRS89 (ETRF2000) at epoch 2008.5**
Tenders

- New 4 Trimble Alloy receivers
  - Plan to replace 4 Trimble NetR9 for Trimble Alloy each year

- Tender for provider of network connection for reference stations
  - next year we probably change the provider
  - tender must be done every 4 years
Thank you for your attention

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