Experience with RTK using Galileo and BeiDou from SKPOS

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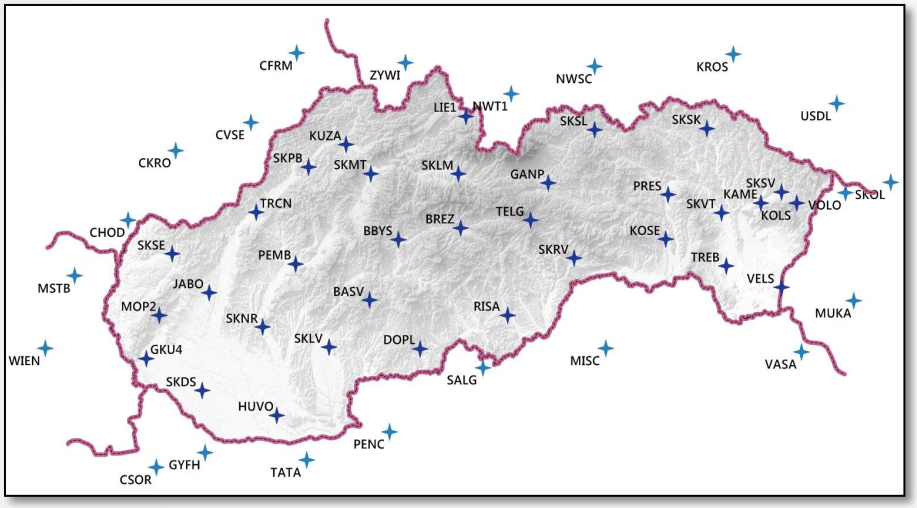
Slovak real-time positioning service

SKPOS®



NetR9

Alloy

Zephyr Geodetic 2
Zephyr Geodetic 3

Choke Ring

Trimble Pivot Platform
Ver. 4.3

RTXNet Processor
Since October 2018

13 years of continuous operation	+50 reference stations
+1 800 active users	GPS, GLONASS, Galileo, BeiDou

Slovak real-time positioning service

SKPOS® +Galileo and +BeiDou

from Dec 2006

- GPS+GLO

from Oct 2018

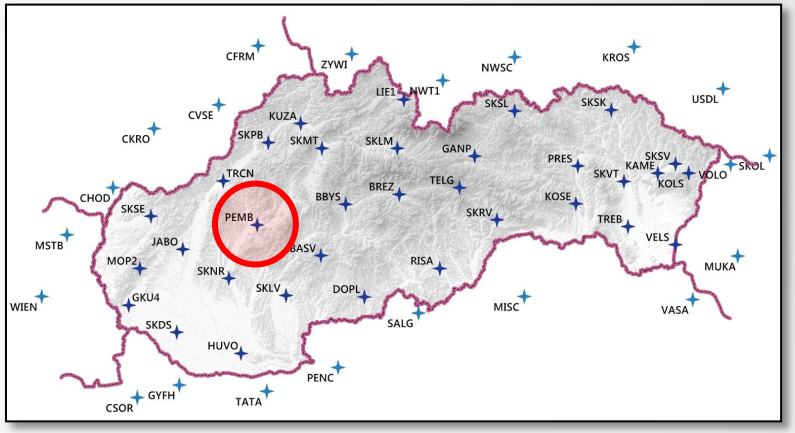
- GPS+GLO+GAL+BDS

Galileo and BeiDou usage need to be checked!

⇒Decision to perform +Galileo +BeiDou test within SKPOS®:

- Long term RTK test (24 hours continuous RTK performance) done by GKU

Long term RTK test



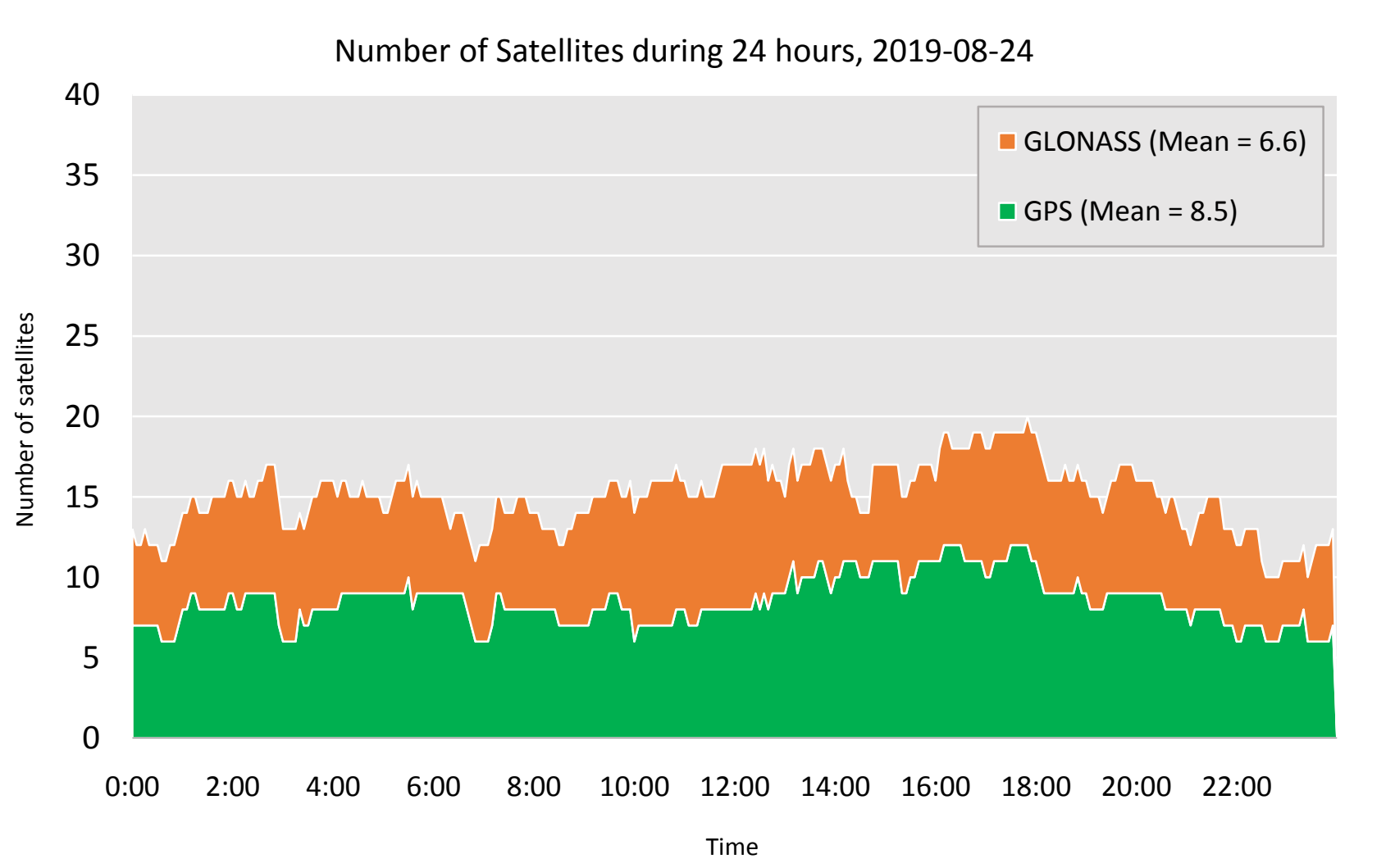
- GNSS antenna on InSar reflector
- Only 10 meters from the nearest reference station
- 24 hours RTK test

	SKPOS_CM_31	SKPOS_CM_32
Rover	Trimble NetR9	Trimble NetR9
Software	RTKNAVI	RTKNAVI
Format	RTCM 3.1	RTCM 3.2 MSM5
GNSS	GPS, GLO	GPS, GLO, GAL, BDS

Number of satellites

SKPOS_CM_31

48° 73’ 49’’
18° 20’ 26’’



Number of satellites

SKPOS_CM_32

48° 73’ 49’’
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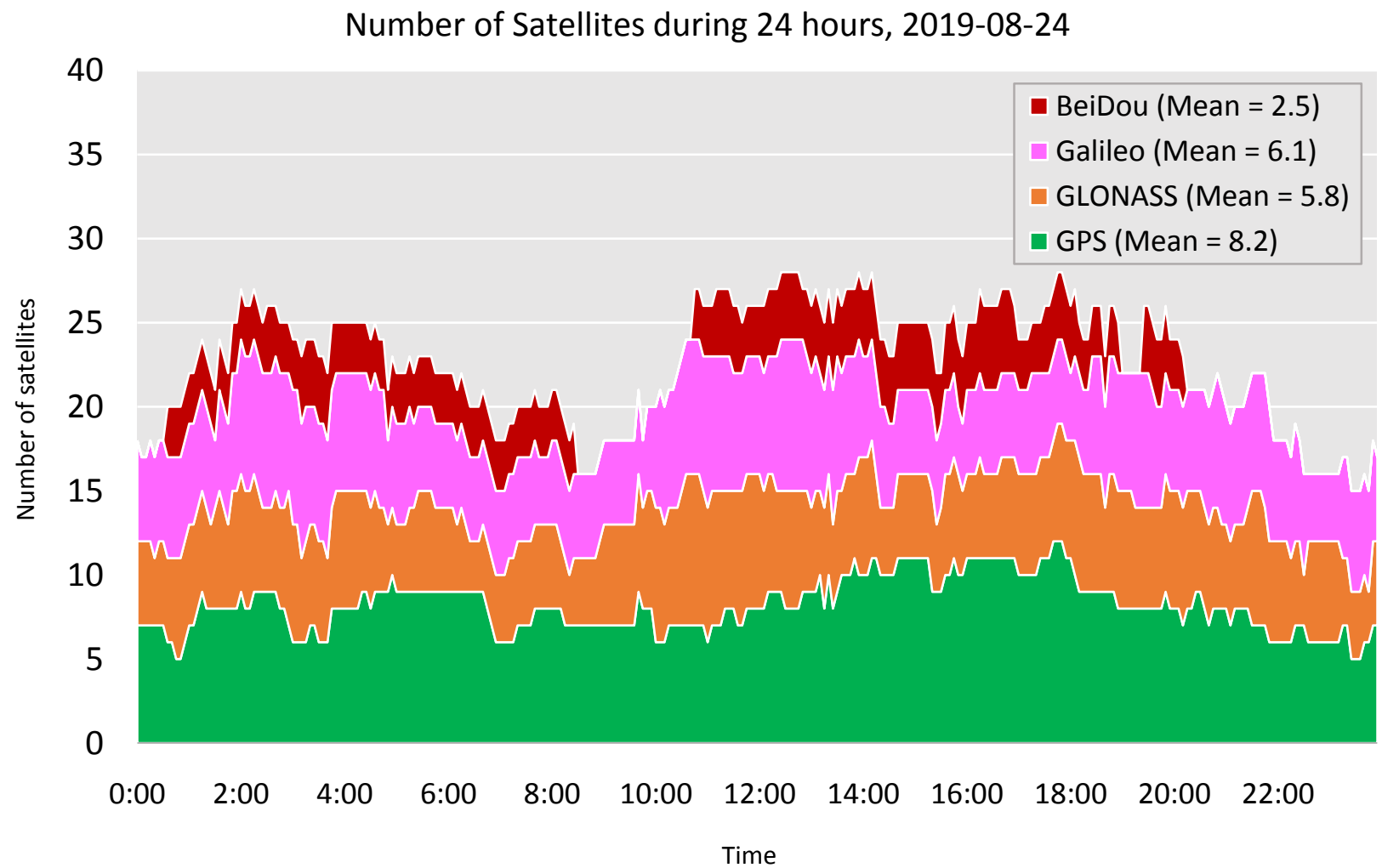
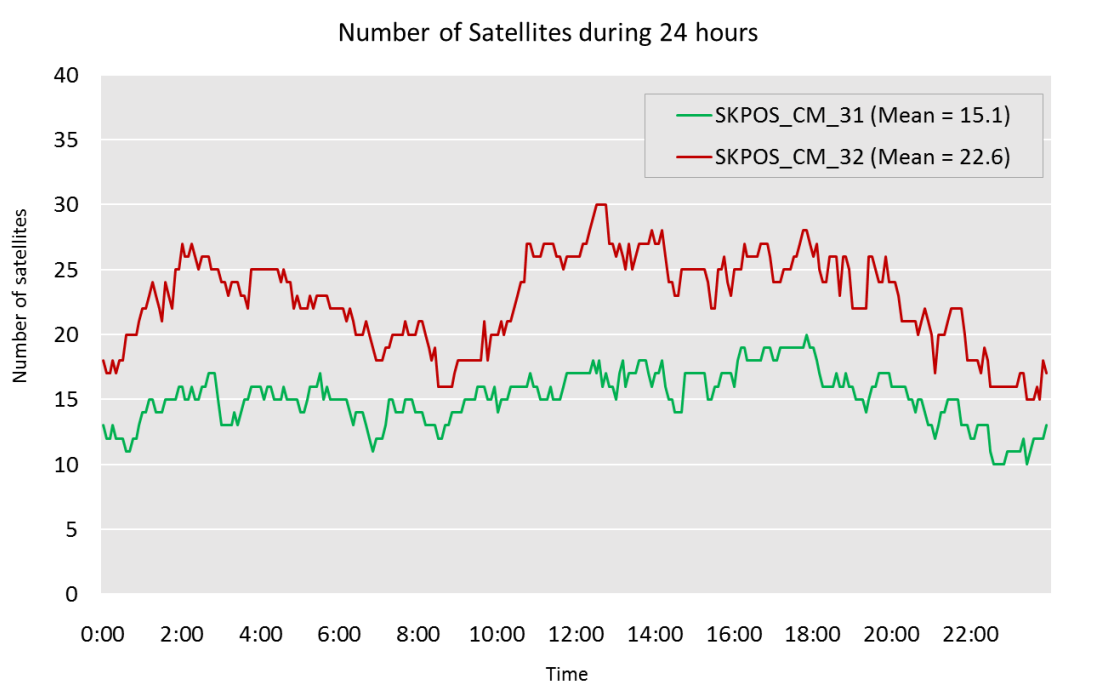


Number of satellites

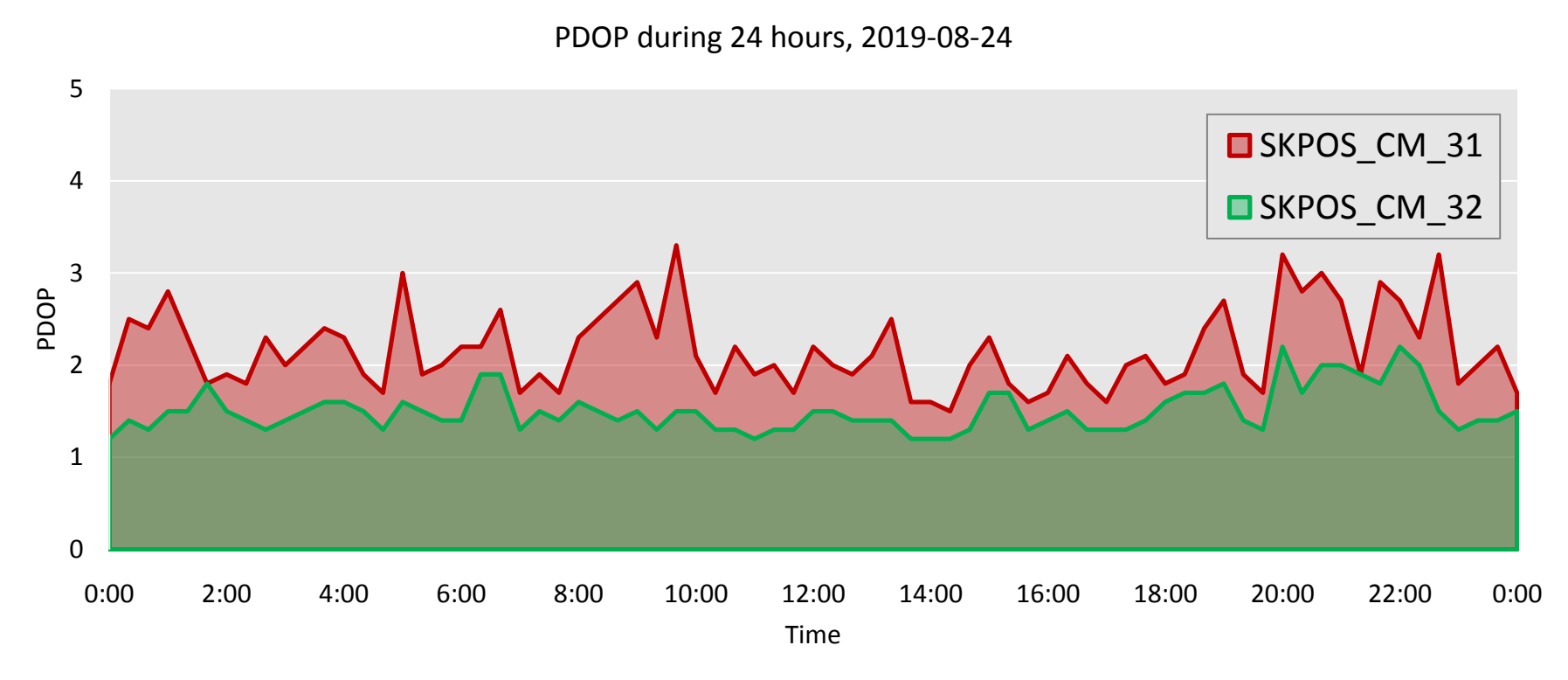
SKPOS_CM_31 vs SKPOS_CM_32



Mean values during 24 hours

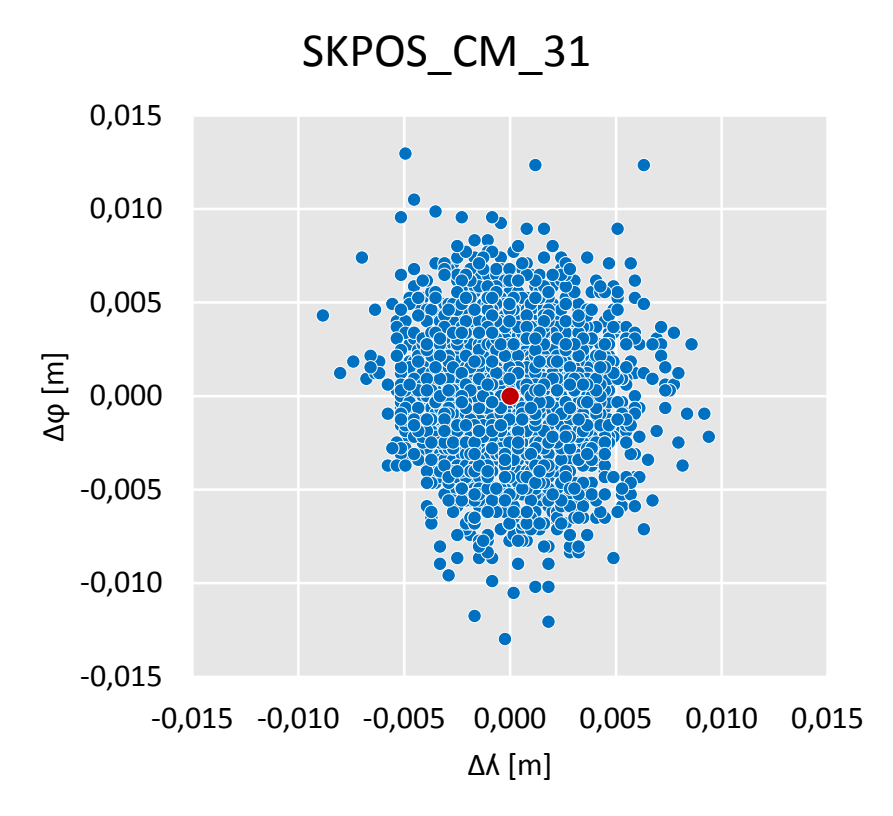
GNSS	CM_31	CM_32
GPS	8.5	8.2
GLONASS	6.6	5.8
Galileo	-	6.1
BeiDou	-	2.5
SUM	**15.1**	**22.6**

PDOP

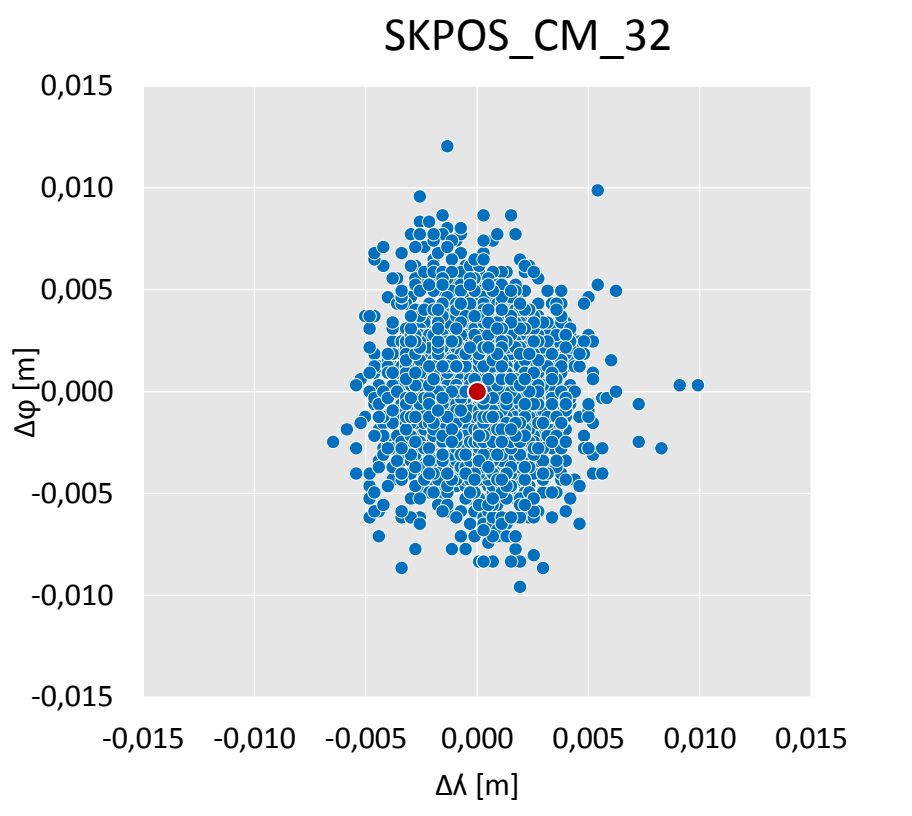

PDOP during 24 hours, 2019-08-24
PDOP
5
4
3
2
1
0
0:00
2:00
4:00
6:00
8:00
10:00
12:00
14:00
16:00
18:00
20:00
22:00
0:00
Time
SKPOS_CM_31
SKPOS_CM_32

Horizontal position during 24 hours

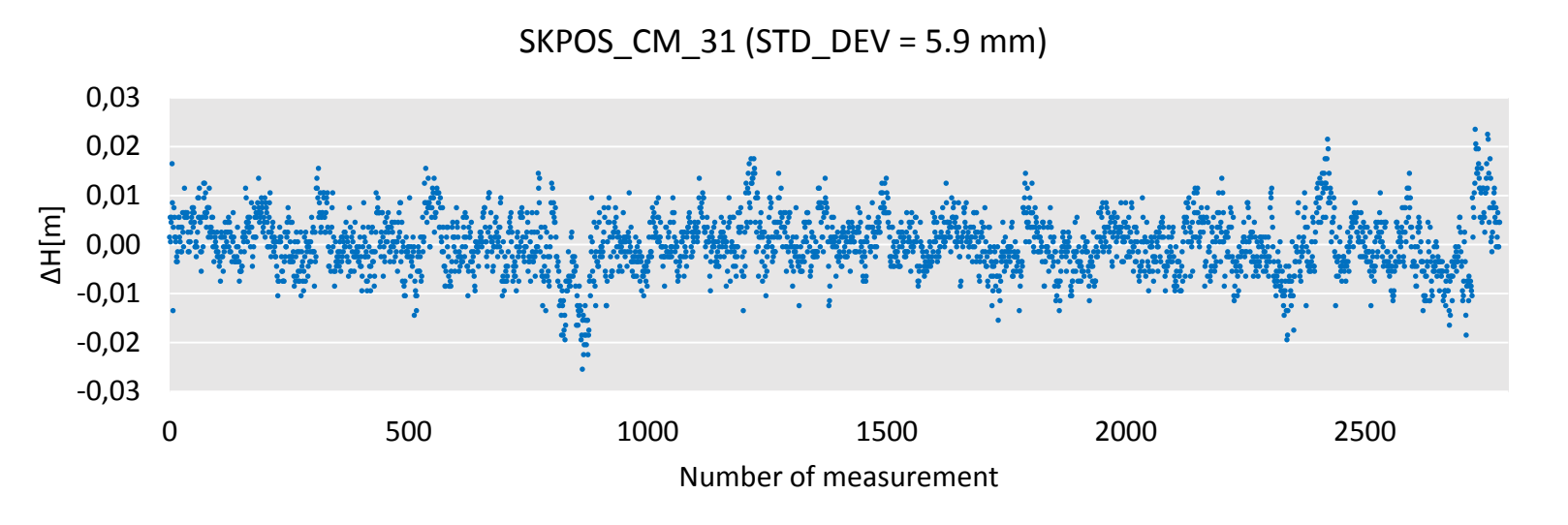
STD_DEV = 2.0 mm

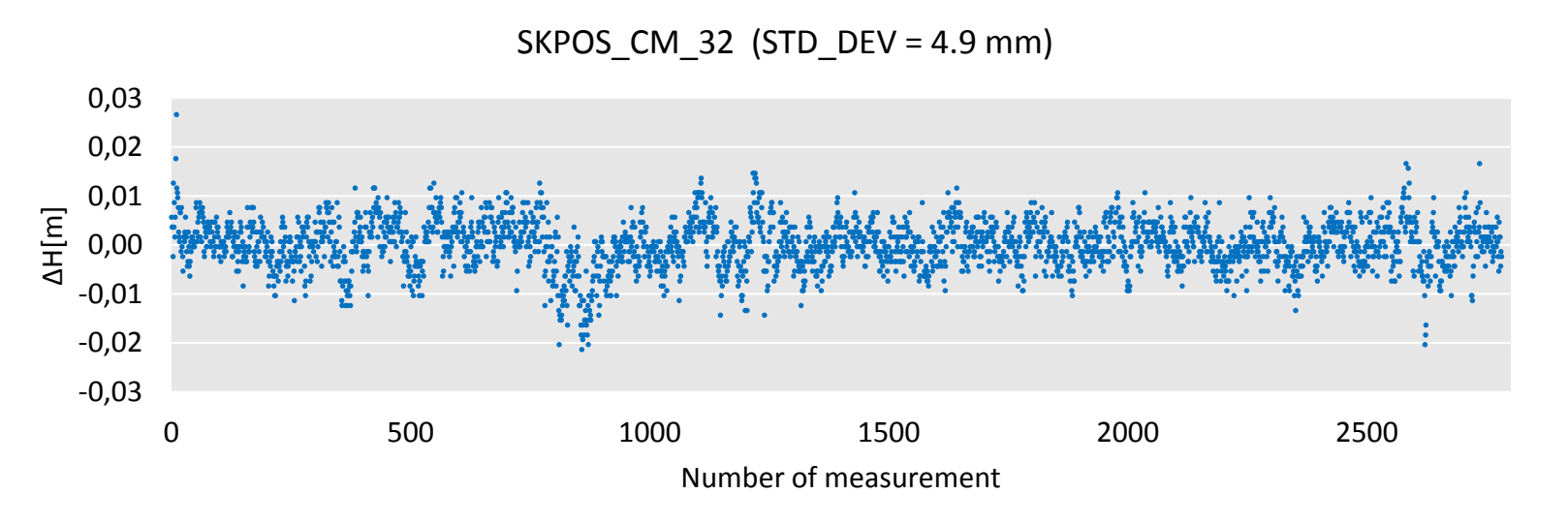


STD_DEV = 1.7 mm



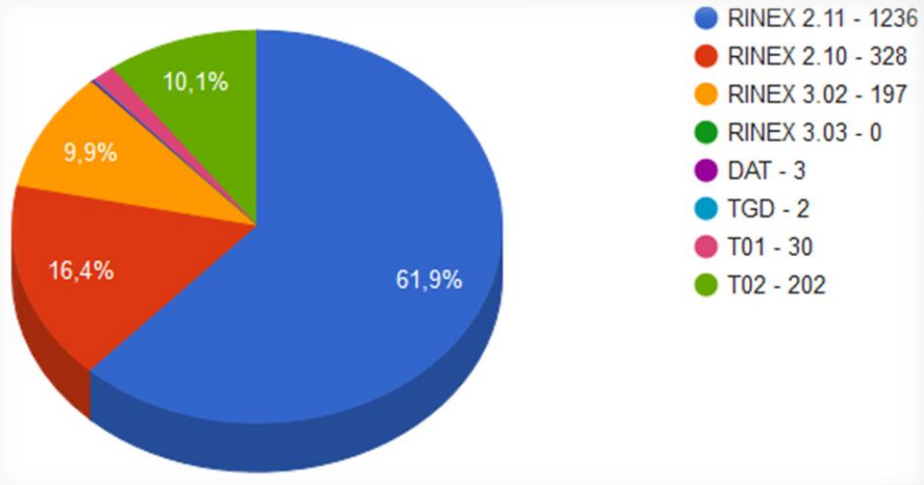
Height component during 24 hours



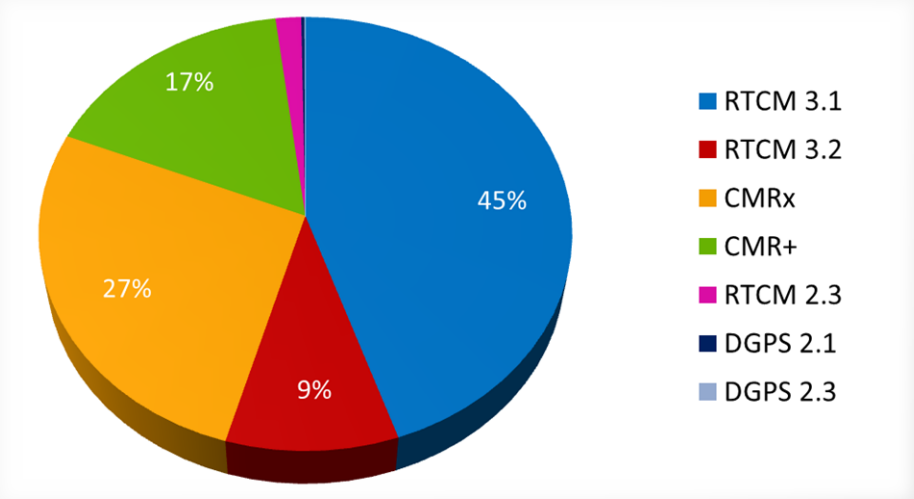


SKPOS® Data Shop and Mountpoint usage statistics

- Reference Data Shop post-processing files download statistics
  - GAL+BDS fully available only in RINEX v3 format (too in T02-4)
  - 78% of useres still use RINEX v2 files (no correct BDS)



- Mountpoint usage statistics
  - GAL+BDS provided only by SKPOS_CM_32 mountpoint (RTCM 3.2 MSM5)
  - only 9% of all SKPOS users use SKPOS_CM_32 mountpoint



Conclusions

- Performed test showed a possitive impact of the uses Galileo and BeiDou satellites
  - an average of 7 more satellites
  - decrease PDOP
  - reduction of standard deviation
  - more fixed solutions

- The main benefits of using Galileo and BeiDou
  - better measurement availability in bad conditions (forest, urban area, ...)
  - more fixed solutions
  - greater measurement reliability - less outliers

Thank you for your attention