

COUNTRY REPORT BERLIN

GERMAN FEDERAL STATE

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BERLIN



Outline

- Ground-based reference station in Berlin
- PPP-RTK – a new SAPOS[®] service
- Implementation of 4G
- RSN-Monitoring
- GNSS campaign 2021 in Germany
- Summary



Overview to the installation of the ground based SAPOS[®] reference station

- Reference station is located in the area of a University.
- Geological survey of the local area was assigned.
- Construction works were needed for
 - the basements of the reference station and corner reflector (1.5 m deep)
 - the necessary infrastructure (internet and power supply) from the station to the buildings of the University.
- The GNSS antenna is installed on a 2.5 m mast.



Future prospects for ground based SAPOS[®] reference stations in Berlin

- Further ground based SAPOS[®] reference stations are planned in the future.
 - Locations for further reference stations have to be found in the area of Berlin.
 - Challenge: Berlin has less locations with reduced shadowing and necessary infrastructure (power supply, internet).
- The goal of changing to ground based reference stations is in reducing the effect of motion of the buildings.

Implementation of 4G

- The federal state Berlin is using the software of Geo++ for the computation of the correction data service and the postprocessing services.
- The federal state Berlin has been providing the correction data service in 4G since September 2021. The recent version of the Geo++ software is in use.

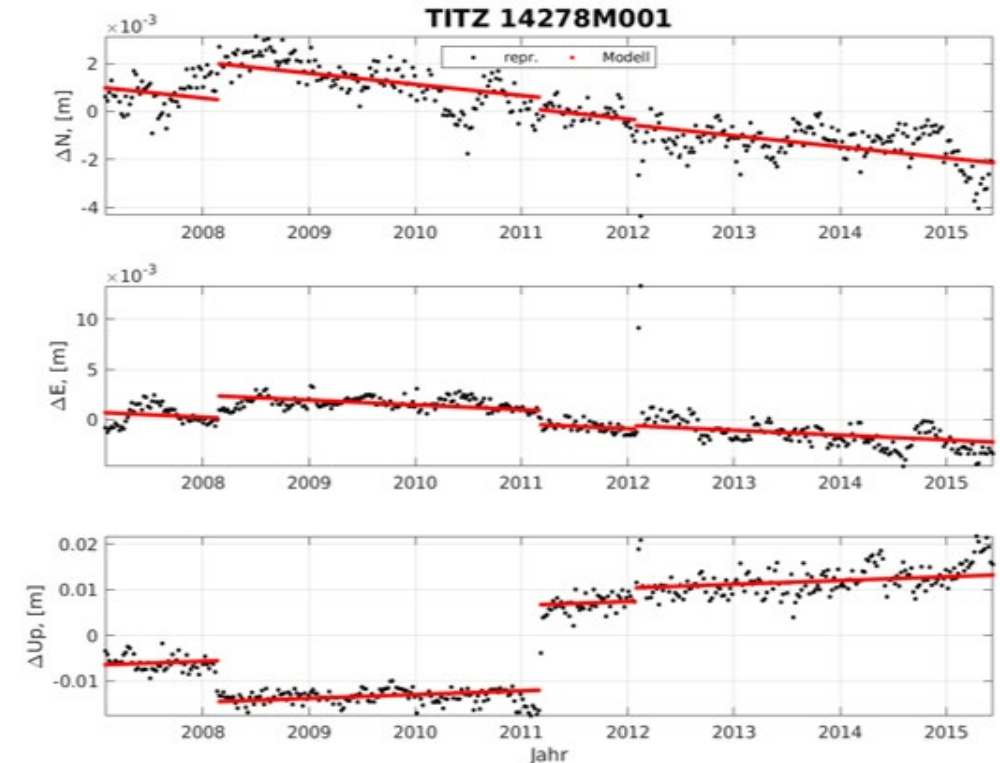
PPP-RTK – a new **SAPOS**[®] service

- A PPP-RTK service is planned as broadcast service in Germany .
- Several feasibility studies are running in the next years for investigating, i.e., the data transmission and performance in test beds. Up to now it is planned that the correction data shall be also transmitted by DAB+.
- The details are investigated and tested in working groups and feasibility studies.



RSN-Monitoring

- Replacement of the coordinate monitoring in Germany to RSN-monitoring (coordinate monitoring of the reference station network).
- Previous coordinate monitoring
 - Long-time coordinate monitoring for GREF/SAP^{OS}® stations
 - Systematic errors included
 - for the reference stations (change of antennas or seasonal building motion)
 - for changes in the ITRF (new transformation parameter)
- Steps in the monitoring of the height accuracy



RSN-Monitoring

- The goal for implementing a new coordinate monitoring are in robust statements regarding ground motion
 - Reference points are geosensors
 - Elimination of systematic errors
 - Time series for relative ground motion
- Change of the official coordinate for the reference stations only if the critical values are achieved.
- Weekly coordinate monitoring of the German reference station network
 - Observation data of GPS, GLONASS, GALILEO, BEIDOU
 - Daily computation for the coordinate and eliminating of systematic errors
 - Computation of a solution once per week with equal standards in Germany
 - Combination of the weekly solutions of each reference station in two combination centers

RSN-Monitoring

- Significant coordinate time series
 - After eliminating systematic errors
 - Unconstrained weekly solutions for the coordinates
- Future task for developing a method to compute and supply of technical transformation parameter



GNSS campaign 2021 in Germany

- Observations
 - June 7th – July 15th 2021
 - 3 cycles per 10 days with 24 hours observations at 6 or 5 sessions.
- 35 surveying teams; one by the federal state of Berlin.
- Observations of the 250 GGP (Geodetic groundnetwork points) two times
 - 2 GGP in Berlin (Kurt-Schumacher-Damm, Britzer Garten).
- Goal of the GNSS campaign: Survey and verification of the GGP an their stability.
- Lot of positive feedback in press (newspaper, internet, TV, radio).



Summary

- The federal state of Berlin has its first ground-based reference station in operation.
- A new PPP-RTK service is in preparation.
- A new coordinate monitoring has been set up and is in operation.
- The GNSS campaign was performed in 2021 for monitoring the 250 GGP in Germany.



Thank you.

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