Geophysical Research Abstracts
Vol. 21, EGU2019-13231, 2019
EGU General Assembly 2019

Investigation for mining-induced deformation in Upper Silesia Coal Basin with GNSS observations in reduced latency near real-time mode

Damian Tondaś, Jan Kapłon, and Witold Rohm
Wrocław University of Environmental and Life Sciences, Institute of Geodesy and Geoinformatics, Wrocław, Poland

The EPOS project is The European Plate Observing System which integrate the existing and newly created research infrastructures to facilitate use the multidisciplinary data and products in the field of Earth sciences in Europe. The assumptions of the project provide for the construction and integration of research infrastructure in the field of earth sciences at the local and national level, which in turn will lead to integration with European and global databases and services. One of the tasks in EPOS project is creation the service for continuous monitoring of GNSS stations position in Near Real- Time (NRT) processing on areas covered by mining exploration. The NRT processing is carried out with a reduced latency 15-minutes GNSS parameters estimation interval.
The most exposed region in Poland on the effects of deformation is the area of Upper Silesia Coal Basin (USCB) in the south of the country. This is one of the largest coal deposits in Europe. The exploitation of deposits has been carried out there for the last 200 years. The present mining works cause subsidence of the most populated area in Poland.
The article will depict the results of long-term subsidence of ground in the mining USCB areas. The determined time series of coordinates was obtained in reduced latency NRT mode, where the parameter estimation time is not longer than 15 minutes with respect to the last observation. The Upper Silesia region, apart from long-term subsidence, is also exposed to earthquakes occurrence with a magnitude below 5.0. In this paper we also have analysed the periods where the largest earthquake magnitudes were occurred.
The main goal of this research is selection the most favourable strategy for determining stations coordinates in individual calculation periods. The most essential criterions are reduction of noise in long-term coordinate series and elimination of random errors. In the research we have applied three strategies and compared the results with standard post-processing results in static and kinematic modes. The purpose of the first approach is estimation of troposphere delays and coordinates based on a 6-hours GNSS observation window. The second strategy is the extension of the previous one, and the determination of coordinates is performed with the introduction of known troposphere parameters. In the third approach, the coordinates are estimated in reduced observation window of one hour, using the known phase ambiguities and troposphere parameters, which allows better detection of sudden changes in the position of the GNSS station.