



Preliminary subsidence study for the Upper Silesian Coal Basin, Poland, based on Interferometry SAR and geophysical investigations (EPOS-PL project)

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The area of the Upper Silesian Coal Basin in Southern Poland is one of the largest coal deposits in Europe and it is highly exploited in the last 200 years. The most commonly used technology for mine extraction is longwall system. The intensive exploitation of the deposits affects the Earth's surface stability and leads to significant basin subsidence. The current investigation comprises radar remote sensing technique (InSAR) and geophysical studies in order to detect and quantify the rate of the subsidence and to correlate it with underground mining to better understand deformation processes in the area of interest. A set of ESA's Sentinel-1 data acquired in the year 2017 are used to form consequential monitoring of the area. The results clearly show correlation between the surface deformation detected by InSAR and the ongoing mining activities at a depth of about 1000 m. The deformation pattern revealed by the satellite radar methods is in concordance also with the seismic activity connected to the mine exploitations. The expected terrain subsidence according to the exploitation scenario depends on the thickness of the particular coal layer, geological conditions and old mining exploitation. For Rydułtowy-I mine the subsidence is forecasted as 0.75 to 1.0 m while the results from InSAR study show displacement of about 0.15 m which is reasonable for the time span of three months of monitoring. The detected deformations for the whole inspected area are in the range from 0.06 m up to 0.20 m in Wirek-II, Knurów and Orontowice-I mines for the time span of the third quarter of 2017. The further geodetic investigations in the area will combine the InSAR results with ground measurements such as GNSS and levelling as well as gravimetry, seismometry, laser scanning.