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Long-term Changes in the Surface Area in the Surroundings of the Open-cast Brown Coal Mine in Bełchatów (Poland)

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Satellite radar interferometry, in particular time series techniques, allow to monitor the activity of the surface of vast areas, making them a complement and alternative to traditional geodetic methods, the use of which in such areas is often associated with significant restrictions. The above-mentioned areas definitely include open-cast mines, among others the analyzed Bełchatów Brown Coal Mine (Poland).
During the studies, 216 satellite images acquired from the Sentinel-1A and Sentinel-1B satellites (path 175) for the period from October 17, 2014 to June 11, 2019 were used. Due to the fact that the research area was on two adjacent stages, it was necessary to combine data for the correct performance of the calculation process. The use of the SBInSAR imaging processing algorithm allowed to generate 839 interferograms carrying information about the difference in interferometric phases between pairs of images which satisfy the condition of the boundary size of the spatial and temporal base. As a consequence, it allowed to determine the displacements in the direction of the electromagnetic beam LOS (Line of Sight) that occurred in the mining area during this period.
Based on the carried out calculations, significant activity of the area around the open-pit mine was perceived. Dumping ground were analyzed - external Szczerców Fields and internal Bełchatów Fields, as well as excavations where mineral extraction is currently taking place. Continuous deformations (depressions and uplifts) associated with intensively conducted mining exploitation and complicated geological and mining conditions occurring in this area were observed (arrangement of rock layers, faults, the Dębina salt debris separating the Bełchatów Field from the Szczerców Field).