



## **Monitoring of terrain subsidence caused by coal mining using combined differential and SBAS Sentinel-1 SAR interferometry - Rydultowy case study, Poland**

Andrzej Borkowski and Kamila Pawłuszek

Institute of Geodesy and Geoinformatics, Wrocław University of Environmental and Life Sciences, Wrocław, Poland  
(andrzej.borkowski@upwr.edu.pl; kamila.pawluszek@upwr.edu.pl)

Ground surface displacement around the mining area is a quite natural phenomenon. Availability of space borne SAR data, especially Sentinel-1 data, allows to study this phenomenon and to measure terrain displacement rate over large areas.

Through, traditional differential SAR interferometry (DInSAR) exploits single interferometric SAR pairs. The accuracy of this technique is limited by factors related to spatial and temporal decorrelation, signal delay as a result of atmospheric artefacts as well as orbital or topographic errors. In order to overcome above mentioned limitations, Small Baseline Subset (SBAS) method have been developed. On the one side, SBAS offers great advantage to eliminate some of DInSAR limitations, but on the other side, one of the main disadvantages of SBAS is incapacity to detect “fast” deformations and deformations differing from chosen model.

Therefore, the main objective of the presented research is subsidence monitoring using a combination of both techniques namely: consecutive DInSAR and SBAS. Due to the spatial gaps occurring in SBAS results, which were caused by fast deformation rate as well as temporal decorrelation, the aim of the study was to combine results from DInSAR and SBAS in order to assemble advantages and overcome disadvantages of both methods and try to retrieve complete deformation pattern over the study area. Thus, DInSAR allowed measurement of fast displacements and SBAS allowed reduction of the error budget.

The study was carried out on the surrounding area of Rydultowy mine, Poland. Using six-day Sentinel-1 data in ascending mode and proposed approach, subsidence up to 87 cm in LOS direction for the time span between 4th January 2017 and 8th October 2018 have been detected in the study area.