



Using ALOS PALSAR and ERS data for monitoring of subsidence and related ground failures in Upper Silesian Coal Basin, Southern Poland

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In the frame of GMES TerraFirma project, established to detect ground motion hazards, the Polish Geological Institute received satellite radar interferometry data for Silesian Coal Basin, where mining activity has had a strong and negative impact on the environment.

Persistent Scatterer Interferometry (PSI) processing was applied to C-band ERS 1/2 and Differential Interferometry (DInSAR) to L-band PALSAR data from ALOS satellite. The analyzed PSI dataset consisted of 48 ERS 1/2 scenes acquired between 1995-2000. The entire Persistent Scatterers (PS) displacement database includes points with velocities ranging from $-16,10$ mm/yr to $+2,55$ mm/yr. ALOS interferograms relative to the periods 10.07.2007-25.08.2007 and 22.02.2007-22.07.2007 show maximum displacements reaching 20 cm.

In this work we examine the radar results for the Southern Part of Upper Silesian Coal Basin where four coal mines are under operation:

KWK "Zofiówka", KWK Jas-Mos, KWK Moszczenica, KWK Borynia. Several areas characterized by relatively large, short-term ground motions (up to 20 cm in 46 days) are indicated from the L-band interferometric data; these can be clearly related to mining exploitation. The C-band, mm precision PSI results indicated ground displacements not exceeding -1 cm/y. Therefore, with PSI data alone there would remain a huge information gap on the faster ground motions. Field reconnaissance showed that PS with these velocities correspond to infrastructure elements such as buildings located on gentle slopes at the peripheries of the subsidence bowls. Thus there seems to be a link between the mining-induced subsidence and slope creep. The presented case study indicate that a joint application of L-band DinSAR and C-band PSI techniques can represent a very useful tool for monitoring, respectively faster and slower movements related to mining subsidence and associated ground deformations.