DEFORMATION RATES IN NORTHERN MORAVIA, 1995-1999

INTRODUCTION

The Northern Moravia region’s 1500 km² large black coal deposit has been extracted since 18th century. According to the mining approach, even that mines were not situated directly in populated areas, the region copes with a plenty of civil structures damages. The real terrain deformation is monitored on places known to subside geodetically - mostly using levelling (mm precision). Testing of C-band satellite synthetic aperture radar interferometry (InSAR) techniques has proven its usability for regional subsidence monitoring. The main difficulties are – a fast subsidence (even more than 2 m/year) often unmeasurable in current InSAR resolution limits and strong regional sources of decorrelation (a dense vegetation cover, high moisture changes in annual periods).

This poster contains a comparison set of different InSAR techniques (differential InSAR, multitemporal InSAR-MTI) using C-band (ERS-2 SAR, Envisat ASAR - wavelength 5.6 cm) or L-band (ALOS PALSAR - wavelength 23.6 cm) radar images and results of levelling in several selected places known to subside in the Northern Moravia region. For the InSAR processing, the Doris 4.2 software, GAMMA (for ALOS PALSAR processing) and StaMPS 3.2 (MTI) has been used. To remove the topography contribution, SRTM DEM (year 2000, 3 arcsec; resolution) was used for interferograms <2002. For later interferograms, Aster GDEM (2000-2009, 1 arcsec; res.) was used. ASTER GDEM is a product of METI and NASA.

KARVINA MINES MONITORING

The area around Karvina mines (9 kveten, Darkov,…) surroundings is covered mostly by forests and agricultural fields. Mostly this is why C-band interferograms decorrelate. L-band waves penetrate through vegetation cover much better. The ALOS interferogram can distinguish a high rate of subsidence in a higher pixel resolution. The center artefact in the image subsides in a LOS deformation rate of around 66 cm per 46 days. On the ALOS interferogram, the subsiding area around the church of St. Peter in Karvina is captured. Note that the nearby Gabriela Mine ended its activities in 2004. An undammed area can impact the surface during a wide time scale.

CONCLUSIONS

The fast subsidence present in the Northern Moravia aggravates its monitoring using InSAR. As one of the solution, L-band SAR data were used. The ALOS PALSAR has a longer acquisition period (46 days) than ERS/Envisat (35 days), but its range resolution is much higher (PALSAR Fine Mode: 7 m, ASAR Image Mode: 30 m). Its longer wavelength allows to measure larger deformations per pixel (PALSAR: 11.8 cm, ASAR: 2.8 cm) and to avoid decorrelation by vegetation/other small scatterers. The StaMPS MTI processing has succeeded in detection of longterm subsiding places. Because of a fast subsidence that easily exceeds mentioned pixel resolution, the MTI results are mostly underestimated.

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