Detection of Subsidences and Landslides in the North-Bohemian Coal Basin by the InSAR Method

Capkova, I., Kianicka, J., Halounova, L.
Remote Sensing Laboratory, Department of Mapping and Cartography
Faculty of Civil Engineering, Czech Technical University Prague, Czech Republic

General Information
This is the first InSAR project processed by the team and also the first project investigating the northern Bohemia brown coal basin. Five ERS-1/2 scenes were selected, all of them acquired in winter season in order to make the coherence as high as possible. Unfortunately, two of them were acquired during the ERS-2 gyroscopic problem, causing that they do not generate a coherent interferogram.

Therefore, only two scene pairs were processed with common master: tandem pair acquired on March 7, 1999 (ERS-1) and March 8, 1999 (ERS-2; master); the deformation contains the March 8, 1999 scene (master) and scene acquired on December 28, 1998 (ERS-2). The temporal baseline is 70 days, the perpendicular baseline is 98 m. The third pair (with perp. bas. of 16 m), was processed as well, showing no additional information.

Area characteristics
SAR Interferometry is used in this project in order to investigate the Earth-crust deformations caused by mining of coal and other minerals. The area has been exploited since the 15th century using different techniques, of which the oldest ones were the most dangerous, causing squeezes and fires. A large part of the coal basin has been exploited by open mining, but in the central part, where the coal is deposited deeper, there are many deep mines as well.

While we can expect landslides in the reclaimed open-mined areas, which are often covered by vegetation (causing the coherence to be low), the deep mines are often situated in built-up areas, causing smaller subsidences in areas where higher coherence values are expected. In addition, it is much more important to investigate Earth-crust deformations in the built-up areas.

Conclusions
There are many more areas suspicious of Earth-crust deformation in the northern Bohemia brown coal basin. The deformation can be expected almost everywhere. In addition, it is not possible to judge whether a deformation really occurred in a suspicious area from only three SAR scenes. However, some of the suspicious areas correspond to reclaimed areas. Due to a short temporal baseline, we are not able to find out slow subsidences which we can expect in built-up areas, except for the Ervenice corridor, which is extremely unstable.

The coherence of the interferograms is considered to be high enough.

Future work
The new project is focused on repeat-pass interferometry, 53 scenes are to be processed from two orbits. The data selection was now performed with the goal to obtain as many scenes as possible, without respect to season or weather. The pairs with longer temporal baseline are hoped to provide some information about subsidences in built-up areas.

Acknowledgement
This project is donated by the CTU0503411 project Mapovani sesuvu v severinich Cechach metodou radarove interferometrie, GA CR 205/03/0218 project Evaluation of reclaimed areas in the Northern Brown Coal Basin using remote sensing, the data were provided by ESA within project 2404 Interferometry used for landslide and land subsidence detection in the undermined area and in the area with abandoned open brown coal mines.