

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

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## General Information

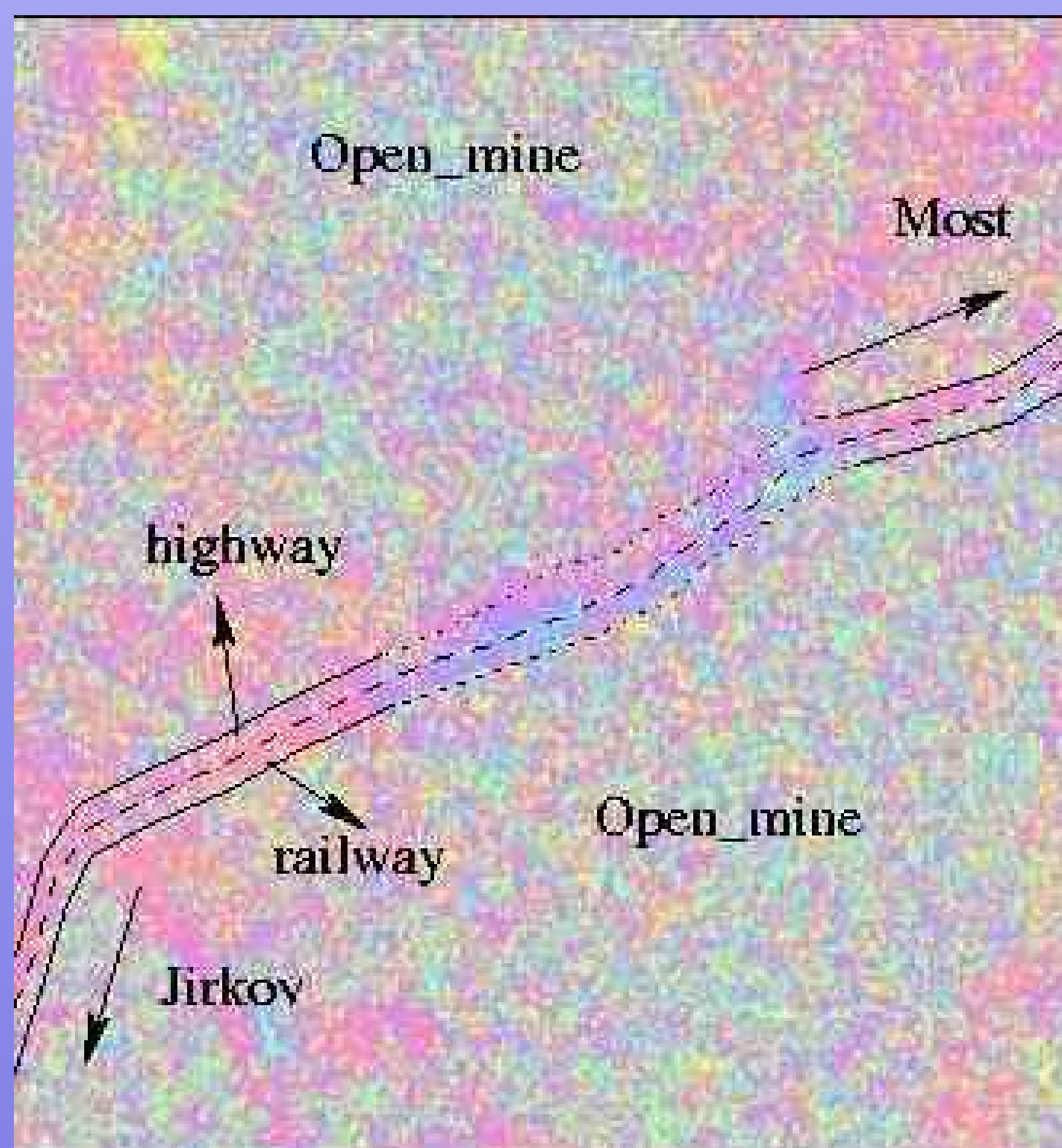
This is the first InSAR project processed by the team and also the first project investigating the northern Bohemia brown coal basin. Five ERS-1/2 scenes were selected, all of them acquired in winter season in order to make the coherence as high as possible. Unfortunately, two of them were acquired during the ERS-2 gyroscope 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

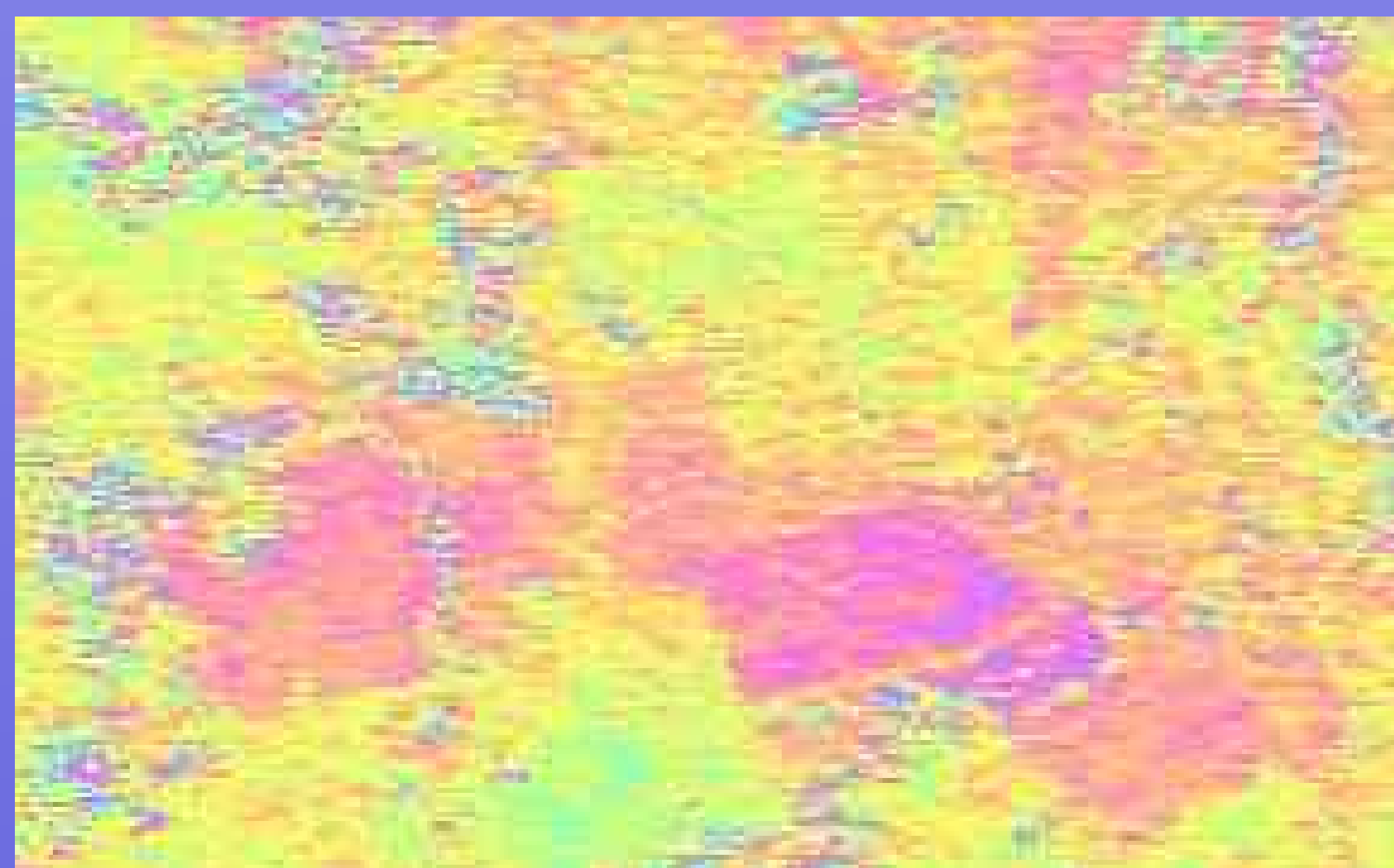
SAR Interferometry is used in this project in order to investigate the Earth-crust deformations caused by mining of coal and other mineral. The area has been exploited since the 15th century using different techniques, of which the oldest ones were the most dangerous, causing squeezes and fires. A large 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 subsidence 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.



## The Ervenice corridor

The 3-pass deformation interferogram of the highway between Most and Chomutov cities and the photo of the area. The highway is built on the reclaimed dump and surrounded by open mines at both sides. The subsidence of the traffic corridor is clearly visible and is confirmed by other methods. Different subsidence depth can be also recognized in the interferogram. The railway is approximately 20 m higher than the road and the subsidence is more significant. In comparison to the average of the phase of the surrounding area, the highway subsided by approximately 0.35 cm in the 70 days, the railway subsided by approximately 1.13 cm during this period.



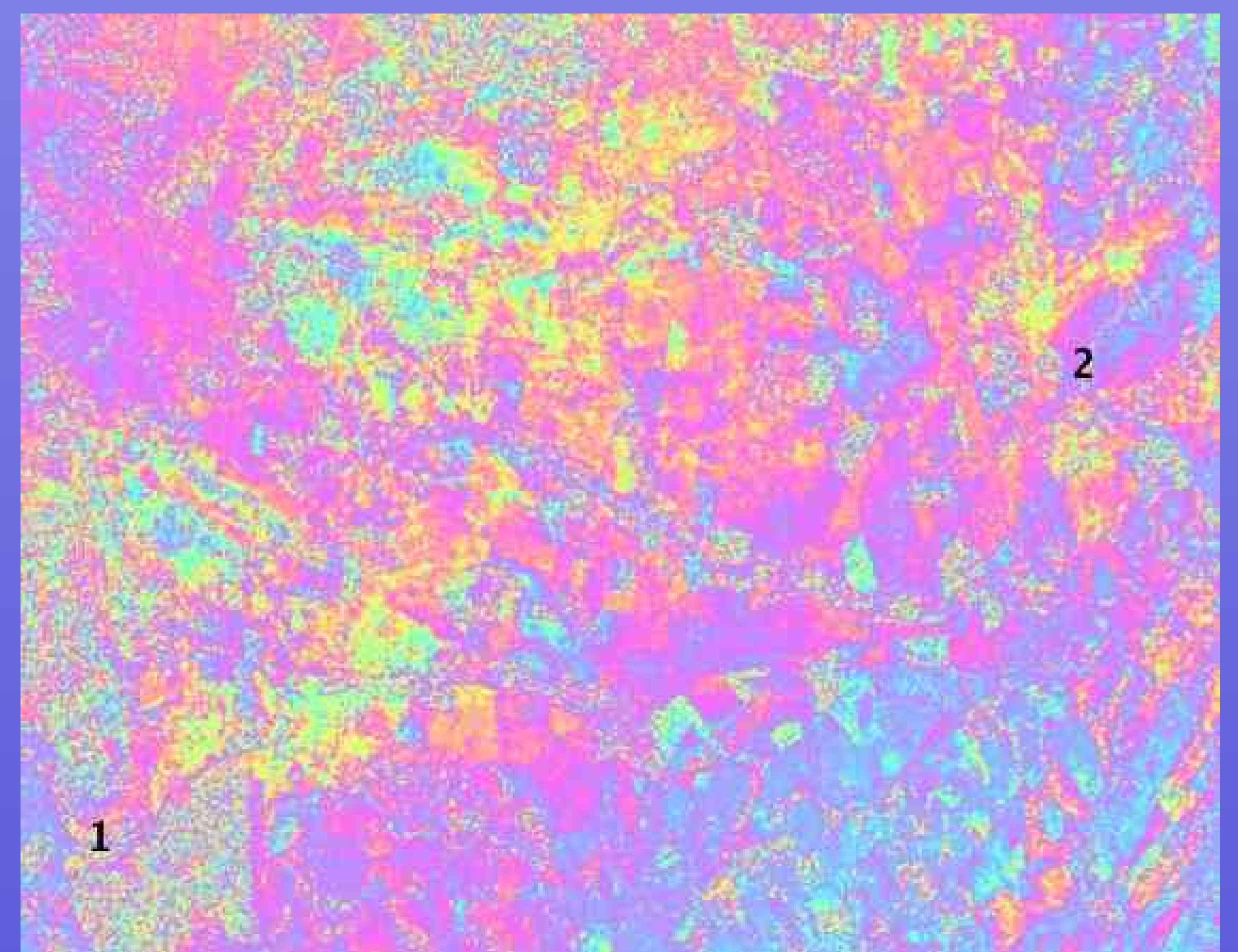
## A suspicious area near Teplice

The area is situated to the south-west of the Teplice city close to the Zabrusany village. There are some small open mines in this area; unfortunately, there is no information available about the state of the dump. These areas may also be already reclaimed.

## The southern part of the basin

The northern shore of the Nechanice dam (area 1) is stricken by land movements caused by high level of the underground water. This is probably the reason of the relative movements of the road placed there. In addition, the surrounding of the power station Tusimice shows some interesting events connected with mining activity in the area.

The suspicious place 2 is considered to be interesting by its shape, smooth borders and first of all by its magnitude of subsidence. The centre of the area is decorrelated. In addition, the terrain is flat here, therefore it cannot be considered a DEM error or atmospheric delay. In situ investigation showed that there is a sedimentation tank and the ash dump of the power station Pocerady. It is a wide area between vilages Blazim, Vyskov, Brvany and Pocerady. That suggests that subsidence can occur here.



## 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 subsidence 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 subsidence in built-up areas.

## Acknowledgement

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