Summary

Since the eighties aerophotogrammetry is used to determine ground movements due to mining in the German Ruhrarea. The content of this contribution is the development of new analysis methods to ascertain plausible mining subsidence. They combine special modelling techniques, statistical methods as well as spatial information and a standardized workflow.
Though alteration of heights are mostly caused by the mining activities itself the original photogrammetically determined alterations can not be called mining subsidence. Measuring and processing errors and parts which are not caused by mining can overlay the alterations. Gross and systematic errors are to be detected and eliminated.
The random errors have to be considered through the use of weights when the subsidence surface is determined.
This subsidence surface represents the plausible mining subsidence.
For the detection of gross errors it is assumed that mining subsidence generally appear homogeneously. Based on the original photogrammetically determined alteration of heights these homogeneous subsidence can be modelled with a robust adjustment of a plane polynominal. Gross errors are then determined by statistical tests.
Alterations which are not caused by mining also cause deviation from the homogeneous subsidence surface.
They show values above average for their statistical test size. But also mining appearances like subsidence in discontinuity zones at the surface cause de-viations from the homogeneous subsidence surface.
The actual cause of the deviation is determined by a spatial thematic analysis in a geographic information system.
The well-founded detection of subsidence not caused by mining is made by the combined use of spatial information and the mathematically/statistically detected alteration of heights. The thus cleared database contains punctual subsidence. A weighted Multilevel B-Spline Algorithm then enables the derivation of plausible mining subsidence.
The algorithm considers the different accuracies of the punctual subsidence values.
It also filters the noise of measurement.
The statistical and mathematical methods as well as the procedure which is implemented in a software programme are evaluated by practical examples. It could be shown that the amount of working time is considerably reduced and that a qualitative improvement of the results is made.