

A method for the prediction of ground movements on open pit mine dumps including spatio-temporally dense monitoring data

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In the course of the coal phase-out in Germany, numerous opencast lignite mines will have to be closed prematurely. The remaining dump areas pose a significant problem for post-mining use, since settlement processes can hardly be estimated so far and last for several decades. In the course of the European project Trim4Post-Mining, a model was developed that can predict ground movements based on various input data, both in terms of magnitude and time span. The work is initially based on a large amount of geological data, which could be overlaid and evaluated with an existing dump model. This makes it possible to estimate settlement-relevant parameters at almost every point of the dump and, based on this, to calculate the maximum settlement to be expected.

A time series of satellite-based vertical terrain measurements serves as a comparative parameter, providing millimetre-accurate elevation changes on the dump every three to four days over a period of four years. By knowing the original height of the dump immediately after dumping and the terrain height during the measurements, the time series can be extrapolated to the maximum expected settlement. A comparison with the previously calculated values shows that both systems provide similar prediction values. Via inverse modelling, the parameters used for the calculation can be adjusted so that calculated and extrapolated settlement match. On the basis of this, a reduction factor can be determined, which gives an indication of the extent to which the soil-specific parameters change during transport from extraction site to the dump.