



Seismic tomography for characterization of an ore vein in the research and education mine Reiche Zeche

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A test site for the design, implementation and operation of an underground in-situ bioleaching unit has been installed by the „Biohydrometallurgical Center for Strategic Elements“ at the research and education mine "Reiche Zeche" of Technical University Bergakademie Freiberg. For this purpose an ore vein block will be developed and mined with the bio-hydrometallurgical in-situ leaching technology. As a site survey an underground seismic tomography experiment has been performed to investigate the spatial distribution of the ore vein within this block consisting mainly of gneiss and with dimensions of about 30 x 10 meters. The experiment was performed with a sledgehammer as source and 76 three-component receivers with source and receiver point intervals of about 1 m surrounding the approximately rectangular block. High precision laser scanning was performed to obtain accurate source and receiver positions which was particularly necessary to obtain reliable results due to the generally high wave velocities of the gneiss.

The resulting seismic data set showed a high signal-to-noise ratio with clear first arrivals which were picked for all source and receiver combinations and subsequently used as input to a first-arrival tomographic inversion scheme. The resulting velocity model has very good ray coverage and shows well resolved high- and low-velocity regions within the block. These regions can be clearly assigned to mapped outcrops of the ore vein along the galleries surrounding the block, including a correlation of low velocities to fractured rock parts as well as high velocities to the undisturbed ore vein core, respectively. In summary the obtained velocity model and the inferred spatial distribution of the ore vein provides a good basis for planning and implementing the actual ore mining step using the envisaged bioleaching technology.