

Ground Penetrating Radar, a Tool for Determining Complex Geological Structures from Caverns and Boreholes

Gundelach, V.^{*)}, Eisenburger, D.^{*)}, Wilke, F.^{**)}

^{*)} Federal Institute for Geosciences and Natural Resources (BGR), Hannover Germany
^{**)} DEEP. Underground Engineering GmbH, Bad Zwischenahn, Germany

Abstract

GPR (ground penetrating radar) surveys provide important spatial data on the geological structures within salt deposits for the development of salt mines. GPR measurements can be carried out in shafts, drifts, caverns and gas or oil filled boreholes during exploration.

For detailed underground mapping purposes it is important to record and interpret the detected reflections as a function of their individual direction. Therefore the functionality and the capabilities of the GPR instruments have been further developed and improved. In addition the methods for interpreting and visualising all collected information within the real three-dimensional environment were refined with appropriate software.

The principle of the spatial detection, the data processing and the spatial interpretation will be shown using an example of a recent GPR borehole/cavern measurement in a salt-dome. The survey was carried out in an oil storage cavern. The results of the survey will be visualized and the geological interpretation of the complex faulted internal salt-dome structures will be demonstrated.

It will be pointed out that the three-dimensional interpretation of folded structures allows geologists and miners to better understand the geological framework. The GPR method will enhance the capability to improve the spatial prediction outside the borehole axis, even under reduction of common investigation methods. All planned activities, e.g. cavern abandonment, cavern mining concept or storage project, can be targeted with much more accurate and safe prediction.