EGU21-10044
https://doi.org/10.5194/egusphere-egu21-10044
EGU General Assembly 2021

Innovative Exploration Drilling and Data Acquisition – Test Center (I-EDDA-TC), Örebro, Central Sweden

Bjarne Almqvist[1], Maria Ask[2], Linus Brander[3], Stefan Buske[4], Christoph Büttner[4], Rüdiger Giese[5], Ulrich Harms[5], Christopher Juhlin[1], Jochem Kück[5], Carl Linden[6], Henning Lorenz[1], and Jan-Erik Rosberg[7]

[1]Department of Earth Sciences, Uppsala University, Uppsala, Sweden
[2]Geosciences and Environmental Engineering, Luleå University of Technology, Luleå, Sweden
[3]Research Institutes of Sweden, Borås, Sweden
[4]Technical University Bergakademie Freiberg, Freiberg, Germany
[5]GeoForschungsZentrum Potsdam, Potsdam, Germany
[6]Epirock Rock Drills AB, Örebro, Sweden
[7]Engineering Geology, Lund University, Lund, Sweden

Increasing the effectiveness of exploration for mineral resources is vital to meet future societal, economic and environmental challenges. Effective exploration drilling for mineral resources is an area where industrial innovation plays an important role. Measurements-while-drilling, data acquisition and next generation logging sondes represent three important areas that need development in the mineral exploration sector. Despite this need, there is a lack of test beds that allow to test novel drilling equipment. This limits the development and implementation of equipment with technology that has been proven, but does not yet fulfil the requirements of a product on the commercial market. Although a variety of test sites exist throughout Europe, they are constrained to existing infrastructure, which limits users to pre-existing conditions that may not fit their purpose or need. The I-EDDA-TC provides a unique environment for the development of drilling, and related, equipment used for exploration of mineral resources.

The regional geology around the test center site is dominated by Svecokarelian age granitoid intrusive and acid volcanic rocks (rhyolites) that strike east-west and dip sub-vertical. During 2019 and 2020, two boreholes were drilled at the test center site, as part of an EIT Raw Materials upscaling project. The first borehole is a fully cored 970 m deep borehole drilled with diamond bit (HQ dimension). The second borehole was drilled in the late summer of 2020, and is a 200 m deep percussion-drilled borehole with ~220 mm diameter. Here we present a preliminary synthesis of results from a geophysical survey, borehole logging and geological logging of drill core.

In summer 2019 a comprehensive geophysical surveying program was performed at the site, including 3D high resolution seismic, 2D deeper seismic with a large vibrator source, a series of high-resolution resistivity profiles and magnetic profiles. The 3D seismic data provided detailed velocity information in the near-surface at the site, allowing interpretation of depths to the groundwater table and bedrock in 3D. Data gained from two downhole logging campaigns

provides a robust base for the detailed differentiation and characterization of the formations. A first look on the data shows well defined correlations amongst the various geophysical downhole parameters. Geological logging focused both on material properties (e.g. mineralogy, grain-size, texture, alteration and mineralization) and rock mass (joints and RQD). Magnetic susceptibility and ultrasonic pulse velocity were measured at regular intervals along the full core length, and 66 specimens were prepared and analysed with respect to porosity, density, abrasivity, major chemical elements, indirect tensile strength and uniaxial compressive strength. The integrated analysis of core data, surface and borehole seismic data, and the continuous logging profiles allows for the 3-dimensional characterization of the underground below the test center platform, as well as provides reference data for assessment of work conducted at the site (e.g. development of geophysical instruments, testing of drillabilaty and wear on drill bits). Our results will be open access published so that data can be compared to drilling and instruments test of commercial and academic parties utilizing this testing facility in future.