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The digital Progress of a Geothermal Underground Research Lab in the Odenwald Germany: GeoDT contribution

Due to the currently increasing demand of renewable energy, the exploration of the crystalline basement for geothermal purposes plays in the future an important role. The use of fractured and permeable crystalline rocks for geothermal purposes will be possible once the GeoLaB (Underground Research Lab for geothermal energy) will be built.

Since January 2025 the first research project GeoDT (Digital Twin for GeoLab) has started. The exploration efforts were conducted and implemented so far in the Tromm area Odenwald, as one of the possible sites where GeoLaB could be built.

GeoDT aims to create comprehensive base models with all parameters included, integrate them into a single Digital Twin, and collect, process, analyze and implement the necessary data and results to support the selection of a future GeoLaB location. Datasets used for model construction will include borehole logging, well tests, a broad investigation plan on the drill cores including mineralogical, petrological and geomechanical investigations, GIS, hydrogeological data and geophysical surveys delivering reflection seismic data.

Goals of GeoLaB are to develop more efficient construction strategies and sustainable utilization methods for geothermal powerplants, achievable through CHFE (Controlled High Flow Experiments). It also aims to foster more transparent collaboration between scientists and connect their thermal-hydraulic-mechanical-(bio)chemical (THMC) research findings with a up to date Digital Twin for modern visualization of the area.

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