

Mechanical, hydrogeological and thermal response of the subsurface to climate change in North Central Europe

The subsurface of North-Central Europe has been shaped by repeated glaciations, which have changed underground pressure, temperature, and water flow over thousands of years. Understanding these changes is important for managing groundwater, using geothermal energy, and safely storing materials like CO₂.

In this project, we are building a digital twin of the region's subsurface to study how it reacts to climate changes. This digital twin will combine geological data, climate information, and advanced models to simulate heat, water, and mechanical stresses underground. We will also study key processes, such as how salty and fresh water mix, and explore how these processes are affected by changes in climate. To make the simulations faster and more efficient, we will use special surrogate models that keep the physics realistic while reducing computing time.

The results will help us better understand how past glaciations shaped the subsurface and how future climate changes might affect it. This knowledge will support decisions about water resources, geothermal energy, and safe underground storage, helping to plan for a changing climate.

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