

Geothermal Resource Atlas of the Swiss Plateau

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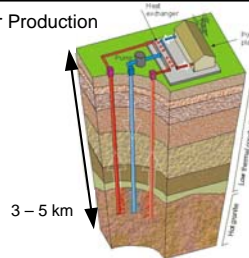
GOAL

The increased interest in geothermal energy leads to a desire for more sophisticated analyses of available geothermal resources for heat and power production.

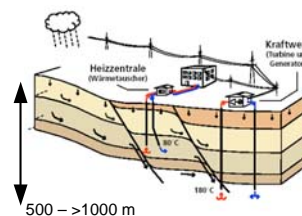
PROCEDURE

Our methodology integrated existing geological, hydrogeological and petrophysical data in a 3D numerical evaluation. Areas of significant convective flow can be located. In combination with surface utilisation data zones, suited for geothermal doublet systems (power production) and even preferential sites for borehole heat exchanger systems (heat production), can then be identified. This approach allows us to better define the financial risk of geothermal utilization systems on reducing the hazard in exploration of reservoirs.

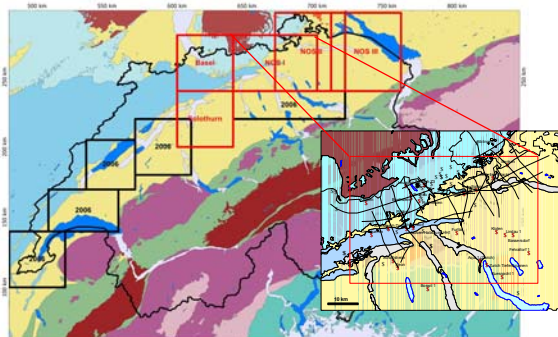
Power Production



Heat Production



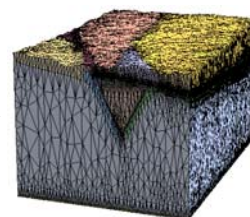
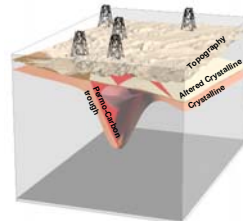
AREA OF INVESTIGATION AND AVAILABLE DATA



3D GEOLOGICAL MODEL

Construction of 3D geological model on the basis of numerous data sets such as seismic profiles, geological interpretations and borehole data using the software GOCAD

Discretization in a 3D representation model with tetrahedral meshes

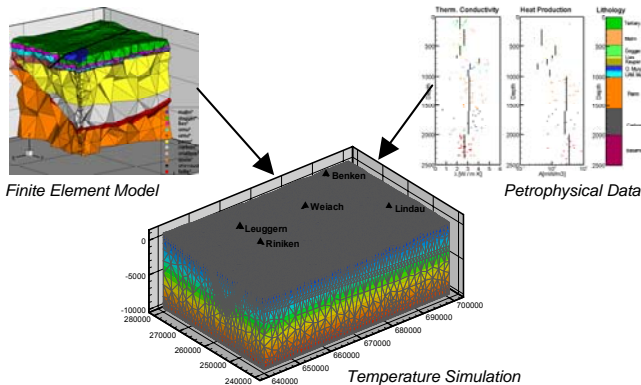


Interpretation of geological data

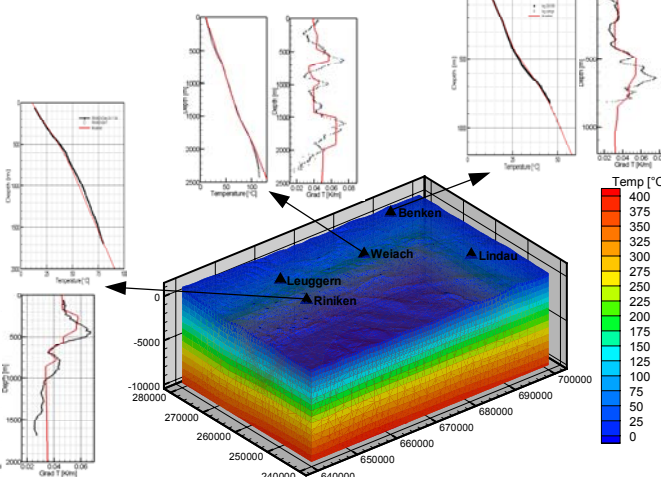
Discretization with tetrahedral meshes

3D NUMERICAL TEMPERATURE SIMULATION

- Conversion of the geological model into finite elements
- Attribution of petrophysical data to geological units
- Simulation of the temperature using the software FRACTure



ANALYSIS OF EXISTING TEMPERATURE DATA



EVALUATION OF GEOTHERMAL RESOURCE ON A REGIONAL SCALE: Preliminary geothermal potential for Top Crystalline

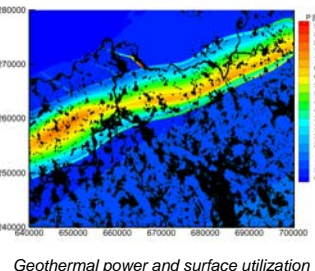
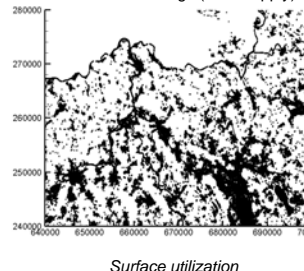
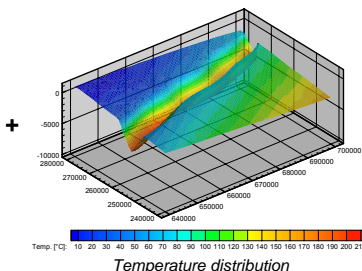
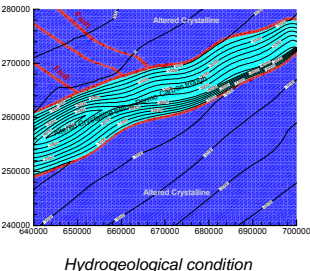
1. Quantification of hydrogeological conditions based on analysis of available measurements to identify **zones of convective flow**

2. Simulation of the **temperature field**

3. Identification of areas suitable for geothermal use based on **surface GIS data**:

- <500 m from water (Cooling)
- <200 m from buildings (Heat supply)

4. Identification of **areas of high geothermal interest** by combination of hydrogeological conditions and temperature field with surface data



SUMMARY

The project contains different successful developments:

- Qualitative model assessment by merging geological and geophysical data interpretation into a 3D geological model.
- Quantitative evaluation by discretization and parameterization on a regional scale

- Calibration and uncertainty analysis
- Definition of regional geothermal resources
- Identification of areas of high geothermal interest by combination with surface GIS data

The geothermal resource atlas indicates a possible annually extractable energy of 10 PJ per km³