Regional Groundwater modelling - Integration of geological structures into numerical models

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Introduction

The INTERREG VB project GRETA (near-surface geothermal resources in the territory of the Alpine Space), aims at unlocking the potential of Near-Surface Geothermal Energy (NSGE) in the Alpine Space through the exchange of best technical and regulatory practices, the identification of most suitable territories for these installations and the development of guidelines for the integration of NSGE into energy planning. Together with the project partners, the Office of Nature and Environment Chur, the Federal Office for Spatial Development ARE, the Gemeinde Davos and Geotest AG Davos, the AUG is working on a pilot study located in Davos (Canton Grisons, Switzerland) and its surroundings.

Method

The basis for this was the integration of a 3D geological model (GOCAD®) into a numerical ground-water flow model (COMSOL®).

In spite of low data availability regarding the hydraulic conditions of the subsurface the main challenge was to create a regional groundwater model which maps the large-scale circulation systems.

Results

Regional groundwater flow is characterized by the topography driven groundwater circulation in the large-scale context.

Figure 1. Case study area

Figure 2. Geological model

Figure 3. Cross section

Conclusions

- The model is an expandable tool for groundwater management (shallow geothermal and regional circulation systems)
- Changes in the origin of water components of wells at large water withdrawals
- With (high) groundwater extraction, the direction of flow changes. Groundwater flows from the Quaternary to the Arosa Dolomites - but also from deeper areas
- Tool which allows under certain conditions the calculation of management scenarios

References:

Excerpt from the Proceedings of the 2018 COMSOL Conference in Lausanne