1. Introduction and aims of the study

Switzerland supports the geothermal energy by providing the development of geothermal energy among other renewable energies. In particular, the Canton of Geneva is actively promoting the Gamebas project, generating a large dataset of geophysical and geotechnical measurements. The basin is a sedimentary basin with a maximum depth of about 1600 m. Maximum depth is 3800 m. Geomorphology is dominated by right lateral faults which are in turn in response to tectonic deformations.

We applied this code to build a 3D basin-scale dynamic model of the Gamebas basin used as a natural laboratory. In a second time, ARISTE allowed us to rapidly implement a preliminary study on 3D basin-scale dynamic simulation.

Aims of study

1. Understand the relationship between local geology and fluid flow in the upper crust,
2. Investigate the structure and lithology of heterogeneous domains,
3. Identify where promoting areas for geothermal energy extraction within the Greater Geneva Basin are located.


The Greater Geneva Basin is the first geothermal basin in Switzerland, which was identified based on the alignment of several morphological features. The basin has a north-south orientation along the Alpine orogen and it is characterized by a right lateral fault system.

3. Numerical model building

Model resolution: 40 by 30 km in the x and y directions and 6 layers in the vertical direction. The depth of the basin is about 1600 m. Maximum depth is 3800 m. The basin is dominated by right lateral faults which are in response to tectonic deformations. The model was built with a 3D basin-scale dynamic model of the Gamebas basin used as a natural laboratory. In a second time, ARISTE allowed us to rapidly implement a preliminary study on 3D basin-scale dynamic simulation.

4. Results of the parametric study

4.1. Initialisation - model zero

Temporal evolution of the temperature at the top of the Dogger formation and at 30 m formation (Fig. 2) for the 300,000 simulated years for the model of 3. The thermal field is shown in Fig. 4, displaying is temperatures (ºC) at the three structurally most interesting sections.

4.2. Effect of the thermal and porosity

The thermal field is shown in Fig. 4, displaying is temperatures (ºC) at the three structurally most interesting sections. For the temperature anomaly, the values of the thermal parameters are chosen to be representative of a geothermal basin with a high and uniform thermal gradient.

5. Applications, implications and limitations

Definition of the final model and results

Model 15 is built to be the most geologically representative of the GDB with average thermal gradient from 15 and 30 m, it uses the heterogeneous petrophysical model. Most faults are subdivided into permeable faults after 27°C we keep the geothermal model considering a global cooling down (Fig. 5) is mainly caused by the tectonic heterogeneities. The thermal field is shown in Fig. 4, displaying is temperatures (ºC) at the three structurally most interesting sections. For the temperature anomaly, the values of the thermal parameters are shown to be representative of a geothermal basin with a high and uniform thermal gradient.

Comparison with other studies and implications

The thermal field is shown in Fig. 4, displaying is temperatures (ºC) at the three structurally most interesting sections. For the temperature anomaly, the values of the thermal parameters are shown to be representative of a geothermal basin with a high and uniform thermal gradient.

Limitations and improvements

In the future, we consider adding some conditions for the regression and seasonal ground water. The thermal simulation of the model at basin-scale may cause side effects unexplained that should be investigated further. We neglect the effect of下令时，observed surfaces are lower than the geothermal heterogeneities. Average temperature is lower than the study region. The thermal field is shown in Fig. 4, displaying is temperatures (ºC) at the three structurally most interesting sections. For the temperature anomaly, the values of the thermal parameters are shown to be representative of a geothermal basin with a high and uniform thermal gradient.

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