



Toward an exploration method for sedimentary basins and basement

Chrystel Dezayes and the IMAGE-SP3 team
BRGM, DGR/REG, Orléans, France (c.dezayes@brgm.fr)

In order to expand the geothermal energy exploitation, we need to explore various geological contexts, particularly the sedimentary basins, which concentrate customers. Nowadays, with the improvement of the binary power plant productivities and the need of industrial heat, the deep layers of sedimentary basins and the upper part of the basement are attractive to tap fluid with temperature between 120°C and 150°C. In a normal geothermal gradient (around 30°C/km) context, this temperature range is reached between 3 and 5 km depth and corresponds to the deep layers of sedimentary basins (aquifers more or less permeable, namely HSA) and the upper part of the basement, more or less fractured and altered, having potentially used EGS technologies.

In this context, we propose to set up and validate an integrated exploration workflow that consists in building, step by step, models based on larger scale models and key situations identifiable by innovative and validated exploration methods. Therefore, three questions arise:

- What are we looking for? What are the key parameters and the key situations that allow withdrawing the geothermal fluid?
- Which methods are able to identify these key situations at the different scales?
- How used these methods to find the best drilling place and reduce the financial risk of drilling?

At the base, a geological and structural model has been done from public data and improves from geophysical and geological analysis. Thermal, Hydraulic and Mechanical models, independent or partially coupled, are built based on this geological model and from other data like temperature, fluid geochemical and stress data. Three scales have been considered in this pre-drill exploration workflow: continental scale (around 1000kmx1000km) considers temperature, heat flow and stress field that constrain regional scale; the regional scale (50 to 100km) covers a geological region considered as relevant; the local scale (10 to 25km) corresponds to the focus which is made at the last step. The way between the different scales is done by the analysis of the key situations defining the geothermal location. Finally, at the smaller scale, the best geothermal location is refined in terms of risk and cost for the first exploration well.