From geological structure to geothermal potentiel assessment of the Dinantian limestones in northern France.

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DGE Rollout is a European INTERREG project with mission to reduce the energy related CO2 emission in the North-West Europe using deep geothermal energy. The area scoped by the project covers Germany, Netherland, Belgium and France and the targeted potential deep geothermal reservoir is the deformed carbonates of the Dinantian. In the northern France, the variscan front affects the Dinantian limestones and caused big thrusting like the Midi fault as well as complex deformations. Geothermal wells drilled in the 80's and distant by roughly 20km hit very different reservoir characteristics though they were in the same formation. The highly complex geology caused such unpredictable outcome in reservoir properties and therefore limited the geothermal exploitation development of the area. To perform geothermal exploration in Northern France, understanding of the deep geological structures and better knowledge of the Dinantian, will be required

To that end, we conduct a comprehensive geological and geophysical study of the deep-seated structure of the Dinantian reservoir in the northern France with a focus between Lens and Maubeuge, where geothermal energy could answer the significant need for energy. First, a detailed stratigraphic chart is produced from the literature, shared and homogenized with the other country partner. With such a chart, representing the different logs at their respective location in space, a first concept of the structures at depth can be obtained.

Secondly vintage seismic lines acquired in the 70's to obtain geometrical information for the carboniferous terrains were reprocessed in pre stack depth migration and in true amplitude fashion. This reprocessing has allowed performing an accurate geological and structural interpretation of the seismic lines aided by the stratigraphic chart.

This reprocessing in true amplitude and the interpretation were followed by a quantitative analysis allowing for the derivation of reservoir properties away from well control. Unfortunately, well data are very few and the vintage/quality of the data meant that the characterization of the reservoir carries many uncertainties. Nonetheless, the Dinantian structure and composition has been specified and a first estimation of the areas with favorable resources could be obtained. The best targeted areas where the geothermal exploitation could be developed in the future are then determined by combining the result of stakeholder analyses and by overlapping the location of these potential deep geothermal resource with the surface energy requirements. This defines the hot spot, where the future exploration will have to focus.