New temperature model of the Netherlands from new data and novel modelling methodology

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Deep geothermal energy has grown in interest in Western Europe in the last decades, for direct use but also, as the knowledge of the subsurface improves, for electricity generation. In the Netherlands, where the sector took off with the first system in 2005, geothermal energy is seen has a key player for a sustainable future. The knowledge of the temperature subsurface, together with the available flow from the reservoir, is an important factor that can determine the success of a geothermal energy project. To support the development of deep geothermal energy system in the Netherlands, we have made a first assessment of the subsurface temperature based on thermal data but also on geological elements (Bonté et al, 2012). An outcome of this work was ThermoGIS that uses the temperature model.

This work is a revision of the model that is used in ThermoGIS. The improvement from the first model are multiple, we have been improving not only the dataset used for the calibration and structural model, but also the methodology trough an improved software (called b3t). The temperature dataset has been updated by integrating temperature on the newly accessible wells. The sedimentary description in the basin has been improved by using an updated and refined structural model and an improved lithological definition. A major improvement in from the methodology used to perform the modelling, with b3t the calibration is made not only using the lithospheric parameters but also using the thermal conductivity of the sediments. The result is a much more accurate definition of the parameters for the model and a perfected handling of the calibration process.

The result obtain is a precise and improved temperature model of the Netherlands. The thermal conductivity variation in the sediments associated with geometry of the layers is an important factor of temperature variations and the influence of the Zechtein salt in the north of the country is important. In addition, the radiogenic heat production in the crust shows a significant impact. From the temperature values, also identify in the lower part of the basin, deep convective systems that could be major geothermal energy target in the future.