



Thermal structure of the Paris Basin from tectonic-Heat Flow modelling

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Located on the inner part of the Variscan Orogen, the Paris Basin has evolved from the Permo-Carboniferous as an intracratonic basin. The usual description of the sediments in the Paris Basin involves imbricated bowl shaped layers, starting from the Triassic. Due to their discontinuity, depth and complexity the Permian and Carboniferous layers have been commonly left aside. Fortunately, recent studies have been completed to look specifically at these deeper sedimentary layers. With the development of geothermal energy and the widely used shallow medium enthalpy geothermal resources in the Paris Basin (Dogger) these pre-Mesozoic sediments are of a lot of interest. In this work, we use a tectonic-heat flow modelling methodology to model the present day thermal structure of the Paris Basin. The modelling takes into account the geometry of the layering and the petrophysical parameters (i.e. thermal conductivity, the radiogenic heat production of the sedimentary layers in relation with their facies). In addition, the upper part of the basement is closely considered to allow the description of magmatic intrusions that could have a major impact on the present day temperature (i.e. the variation of the radiogenic heat production). To assess the result of our thermal modelling, the obtained temperature is compared to BHT's (Bottom Hole Temperature) and DST's (Drill Stem Test) values when available.

As a result of this modelling, we are able to present present-day temperature within the basin as well as in the shallower part of the basement. The aim of this work is to identify the sources of the temperature perturbation. The impact of the sediment's thermal conductivity has already been assessed on a previous work, in this work the deeper source of perturbation are of great interest (thermal conductivity and heat production of the pre-Mesozoic sedimentary layers, heat production of magmatic intrusion in the basement, and regional faults in the sediments and basement).