Tectonic Heat Flow Modeling of the Levant Basin (Off-onshore Lebanon)

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ABSTRACT

The evolution of heat flow is reconstructed in the Levant Basin with focus on the off-onshore Lebanon. A 3D geological model of the basin is used as input for the tectonic and heat flow analysis. The model consists of 30 layers extending from the Permian to the Pliocene and includes 8 erosion phases.

The modeled heat flow is inferred from the tectonic evolution of the basin through geologic times including phases of crustal extension and uplift. A model of the undelaying crust was introduced to the workflow assuming an initial crustal thickness that is calculated from the present-day crustal thickness. The evolution of the undelaying crust is taken into account which constrained the heat flow history in the basin.

The results of the study point out to a varying heat flow in the basin over the geologic times. The model shows a decreasing heat flow in the basin starting from the Late Cretaceous onward which is mainly related to the tectonic settings of the basin and predominated by converging regimes. In addition to that, the model shows some variations in heat flow within the basin following different bathymetric and sedimentological settings. The modeling results are generally consistent with the heat flow observations that indicate relatively low surface heat flow values and geothermal gradient in the Levant Basin. These values (measured and modeled) generally range between 30 to 40 mw/m2.

Although the cause of the low heat flows in the Levant Basin is not fully understood, implications of the heat flow values on generation of hydrocarbons from potential Mesozoic and Cenozoic source rocks can be significant.

We present the result of the 3D heat flow modeling and discuss possible implications for evolution of the petroleum systems in the Levant basin.