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Reconstruction of the 3D Tectonic Heat Flow History in the Levant Basin (Off-Onshore Lebanon)

Eva Görke[2], Rader Abdul Fattah[1], Samer Bou Daher[2], Hanneke Verweij[1] , Ralf Littke[2]

[1]TNO, Utrecht, NETHERLANDS
[2]RWTH Aachen University, Aachen, GERMANY

ABSTRACT

A 3D heat flow model is constructed in the Levant Basin with focus on the off-onshore Lebanon. A 3D geological model of the Levant 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. Modeling the history of heat flow in the area relies on the reconstruction of the tectonic history of the basin throughout geological times including phases of crustal extension and uplift and erosion. A model of the undelaying crust has been introduced in the heat flow calculation workflow which was based on the interpretation of satellite gravity data. The evolution of the undelaying crust through geological times is taken into account which constrained the heat flow history in the basin.

Previous observations and studies have indicated relatively low surface heat flow values and geothermal gradient in the Levant Basin. The known surface heat flow values (measured and modelled) in the basin generally range between 30 to 40 mw/m2.

The results of the study point out to considerable variations of heat flow in the basin over the geologic times. This is mainly related to the main tectonic events in the region. Moreover, the model shows large variations in heat flow within the basin following different bathymetric and sedimentological settings.

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