Geological structures identification using wavelets

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In this work the authors present a method of identifying the certain geological structures in a subcrop based on analysis of wavelet transform coefficients of the well thermogram.

The well temperature distribution depends on a number of factors including the deep heat flow, thermal conductivity of rocks, the value and direction of the mass transfer in them, and provides critical information on the thermal regime of the Earth. The thermogram of each well contains information on geological structure of its subcrop. Each structural element produces a characteristic feature or pattern in the temperature distribution graph. Such patterns will be referred to as temperature anomalies. The geophysical surveys combined with thermogram investigations revealed that zones with reservoir properties yield distinctive temperature anomalies of several types.

The goal of this work was to discover different types of anomalies that correspond to the certain geological structures and to identify them on the unknown thermograms. The authors proposed a set of criteria to mark out anomalies of the certain type. The method was tested on about 300 thermograms to reveal potential oil reservoirs. The known oil reservoirs were effectively marked out using the formulated criteria.