CAN TOTAL ORGANIC CARBON TOC VALUES BE PREDICTED FROM SEISMIC DATA? A CASE STUDY OF THE KAZHDUMI FORMATION, SOROOSH OILFIELD, PERSIAN GULF, IRAN

In the petroleum investigations scientists permanently are trying to find innovative techniques to reduce exploration costs as much as possible. Measuring Total Organic Contents is one of the first and essential steps in the early evaluations of source rocks and some unconventional gas reservoirs. This valuable parameter is traditionally measured by laboratory analyses such as Rock-Eval pyrolysis which despite its preciseness is expensive and time-consuming. On the other hand in the last decades numerous authors introduced successful statistical and intelligence techniques to predict TOC values from more available and cheaper petrophysical data, while despite all benefits the results are local. So it raises this question that is it possible to accurately predict TOC values between well intervals, in addition to well sites? In this research regard to vast coverage and continuity of seismic data a novel application of multiattribute analyses is proposed to convert seismic data into TOC values. For this reason at first a continuous TOC log for the kazhdumii formation was predicted from available petrophysical data using a BP-NN model, where a 2D seismic line intersects two wells of an Iranian offshore oil field. Then available seismic data was processed through a model based seismic inversion algorithm to calculate acoustic impedance values. Next using multiple linear regression, seismic attributes with the highest meaningful relationships with the TOC contents was determined and using a PNN model 2D seismic line converted into TOC values with the least possible prediction error (≤ 10 wt.%). Finally in order to present a quick overview of the organic matter distribution Hierarchical Cluster Analysis technique was used to cluster the generated TOC section into 4 organic facies according to their organic enrichments. The results indicated that utilizing this methodology could enormously reduce exploration costs in evaluations of potential source rocks and some unconventional gas reservoirs.
neural network, Hierarchical cluster analyses; Kazhdumi formation; Persian Gulf; Iran

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