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Detecting faults with using the seismic attributes and neural networks in an oil reservoir

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The main objective of this study is to detect faults in a reservoir with using the seismic attributes and neural networks. Faults and fractures play an important role in creating areas of high porosity and permeability in reservoir rocks. Therefore accurate identification of faults and fracture zones are important in maximizing production from petroleum traps. Seismic single- and multitrace attributes analysis are used separately to determine faults and fractures on the seismic section, but the different kinds of the geological features are not detectable with using individual attributes only. Thus a new method has been created to enhance the detection of the faults, which is proposed the more exact results and the information. This method is based on compilation and combination of relevant input attributes to create new attributes by an artificial neural network system that gives optimal the view of the targeted object. Firstly, in this study different attributes like energy (with different time gates), frequency, polar dip, polar dip angle, dip variance ,similarity (different of orientations and distances) were calculated on the seismic section, then the set of attributes and the representative points of the fault and non fault locations, were introduced as input to system artificial neural network to train. Finally, the results of the fault and non fault probability cube were obtained which were based on combined attributes. The faults are more continuous in the fault cube than the individual attributes, and the less disturbance are shown comparable to the individual attributes. The computed results based on this study state that using a combination of attributes in ANN system is more dependable than applying a separated individual attributes to create the faults and fractures in the oil reservoir. One of the other benefits of this method is interpretation possibility of more information with higher accuracy in the less time where the contrast of the faults and fractures has increased comparable with their surroundings which could be of great help to better identify the fault and fracture systems.

Key words: fault, seismic attribute, neural network, energy, frequency, dip variance, similarity.