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Fracture detection using multi seismic attributes ant-tracking in the Rag-e-Sefid oilfield, SW Iran

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Abstract

The detailed characterization of faults and fractures can give valuable information about the fluid flow through petroleum reservoir and directly affect the hydrocarbon exploration and production programs. In this study, large- and small-scale fractures in the Asmari horizon of the Rag-e-Sefid oilfield were characterized using seismic attribute and well data analyses. Different spatial filters including finite median hybrid (SO-FMH), dip-steered median, dip-steered diffusion, and fault enhancement filters were used on 3D seismic data to reduce noise, enhance the seismic data quality, and create a 3D seismic steering cube. In the next step, seismic attributes such as coherency, similarity, variance, spectral decomposition, dip, and curvature were applied to identify structural features. In order to check the validity of these structural features, results from seismic attributes calibrated by the interpreted fractures from image logs in the Rag-e-Safid oilfield. Then, the ant-tracking algorithm applied on the selected seismic attributes to highlight faults and fractures. These attributes combined using neural network method to create multi-seismic attributes, view different fault- or fold-sensitive seismic attributes in a single image, and facilitate the large-scale fractures extraction process. Finally, automatic fault and fracture extraction technique used to reduce human intervention, improve accuracy and efficiency for the large-scale fracture interpretation and extraction from edge volumes in the Asmari horizon of the Rag-e-Sefid oilfield. In addition to, small- scale fractures were characterized by the obtained information from the image logs interpretation for sixteen wells. All the detected fractures from seismic and well data have been divided into eight fracture sets based on their orientation and using the statistical analysis. The obtained results show that fractures characteristics and their origin are different in the northwestern and southeastern parts of the Rag-e-Sefid oilfield. The NW Rag-e-Sefid and Nourooz Hendijan Izeh Faults reactivation during Zagros orogeny led to create the dextral shear zone and P, R, R', T, Y- fracture sets in the northwestern part of the Rag-e-Safid oilfield. Also, activity of the SE-Rag-e-Sefid thrust fault during Zagros orogeny caused to form fault-related

fractures sets in the southeastern part of the Rag-e-Sefid field. In addition to, axial, cross axial, oblique fracture sets in the Asmari horizon of the Rag-e-Sefid oilfield were created by folding phase during Zagros orogeny. The obtained results were used to fracture modeling in the Asmari horizon of the Rag-e-Sefid oilfield.