Geophysical Research Abstracts
Vol. 15, EGU2013-9315, 2013
EGU General Assembly 2013

Application of neural networks for identification of faults in a 3D seismic survey offshore Tunisia

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The Kerkennah High area (offshore Tunisia) is dominated by series of horst and grabens resulting from multiple tectonic events and multiphase stress (extension, compression, translation). In order to decipher this complex structural history from a 3D seismic survey, a neural network is applied to extract a fault-cube from the amplitude data (which does not image faults directly).

The neural network transforms seismic attributes into a new 3D data cube in which faults are highlighted. This technique comprises the following steps. First, we compute several seismic attributes (dip-steering similarity, curvature, frequency, ridge and fault enhancement filters…) that enhance different aspects of the seismic data related to faulting. In a second step, a number of points in the seismic data are selected as representative of either faults or areas devoid of faults. These points are tested by the artificial neural network to determine the range in which the different attributes are representative of faults or not. Based on this learning phase, the neural network is then applied to the entire 3D seismic cube to produce a fault-cube that contains only faults which contrast and continuity have been enhance.