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A New Technique to Improve 3-D Fault Geometry Interpretation from a Seismic Dataset: An Example from a Welded Growth Fault Family, Offshore Angola

A new methodology for building interconnected fault surface models in 3-D is presented. The technique eliminates the need to use traditional 'fault stick' interpretation schemes that are both time-consuming and difficult to apply in highly connected fault networks. A novel skeletonisation algorithm is used to extract fault traces directly from horizon maps to provide a set of polyline data that are subsequently used in 3-D surface creation. The technique recognises that horizon maps represent the most robust interpretation that can be made from seismic datasets for complex faulted regions.

Displacement information is automatically mapped to each skeleton from vertical offsets within the horizons. The information is used to help guide fault surface construction and also make estimates about the temporal evolution of the fault network. This new technique allows for the first time, a rapid and accurate appraisal of fault geometry and displacement from interpretations of 3-D seismic data across a large area with no prior fault interpretation.

This study is illustrated by application of the approach to a salt-related growth fault array from offshore Angola. The accuracy associated with the delineation of the 'charging window' created by the genesis, evolution and partial destruction of a primary welded fault surface at the presalt/postsalt interface was significantly improved using the new modelling method. Specifically, 3-D displacement modelling of the fault surfaces showed that kinematic partitioning associated with the development of a welded fault surface produces distinctive displacement patterns.