



Figure 1: Automatic Seismic Lineament Detection and Rose Diagrams

## Seismic Lineaments and Rose Diagrams

TMI-11 derived from a seismic interpretation project done for a large international oil company interpreting a 3-D seismic survey as part of an integrated reservoir engineering study of a large fractured natural gas field in South America. The project started with 11 existing wells and building a reservoir model to predict production enhancement based on detailed image log fracture analysis from several of these wells. The seismic interpretation and attribute analysis provided a framework for the reservoir, and Roice Nelson realized some of the seismic attributes, particularly curvature attributes, provide a good way to predict fractures in the interval of interest.

Les Denham, a long-term member of the DRC NetWork (II&T has had exclusive access to one of Roice Nelson's lifetime Landmark seismic interpretation licenses since the mid 1990's) was brought into the project to see if he could automate derivation of fracture prediction within the interval of interest. Les wrote software which takes any 3-D seismic time-slice or horizon-slice or any map and calculates lineaments. He expanded this software to allow the creation of rose diagrams for anyplace on the map area from the calculated lineaments. Figure 1 shows automatically calculated lineaments from a curvature seismic attribute horizon slice from the 3-D seismic survey, the derived rose diagrams overlaid on the semblance seismic attribute time-slice, and a comparison of rose diagrams from seismic amplitude, cepstrum, confidence, dip, edge, negative curvature, phase, positive curvature, and residual attributes with image log interpretations of open fractures, partially open fractures, and composite image log results for two of the wells studied. Like the other DRC TMIs, the approach is to use the best solution possible to pursue specific exploration projects.

DRC proposes an investment of \$100,000 to improve the input user interface to the software, and to run a series of tests for the Investors and their specified oil companies on how this technology can be of benefit in better understanding fractured reservoirs using 3-D seismic.