Paradigm®

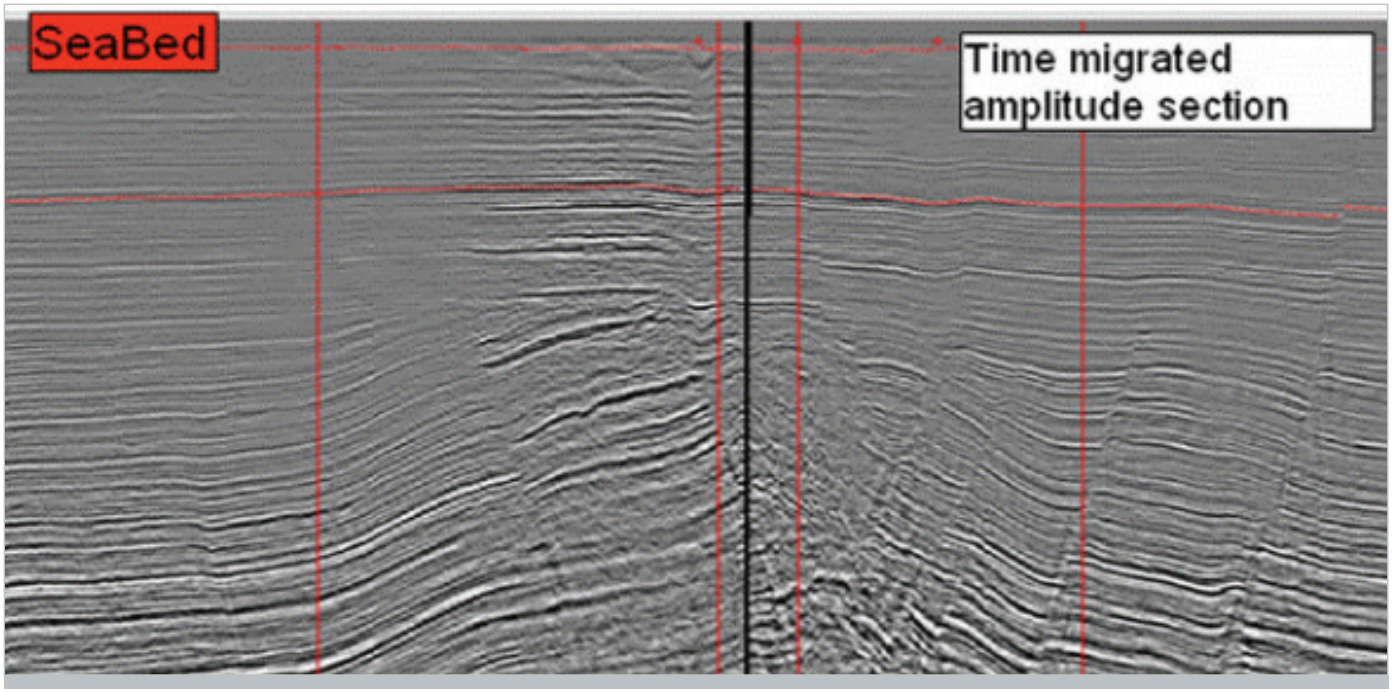
Improve Structural Seismic Interpretation with 3D Curvature

The Challenge

An independent oil company needed to reduce uncertainty in their structural trapping prospects description for a deepwater play in Indonesia. They also wanted to better understand the flow characteristics within the reservoir.

The Assessment

The structural framework of the basin was complex, consisting of extensional grabens, half-grabens, normal faults, horsts and en-echelon faults. An accurate description of the lateral continuity and vertical throw of the seismic scale faulting would enhance the analysis of each structural trap. Detailing the extent and orientation of sub-seismic fracture zones around the main faults and geobodies would aid the understanding of the reservoir flow characteristics.



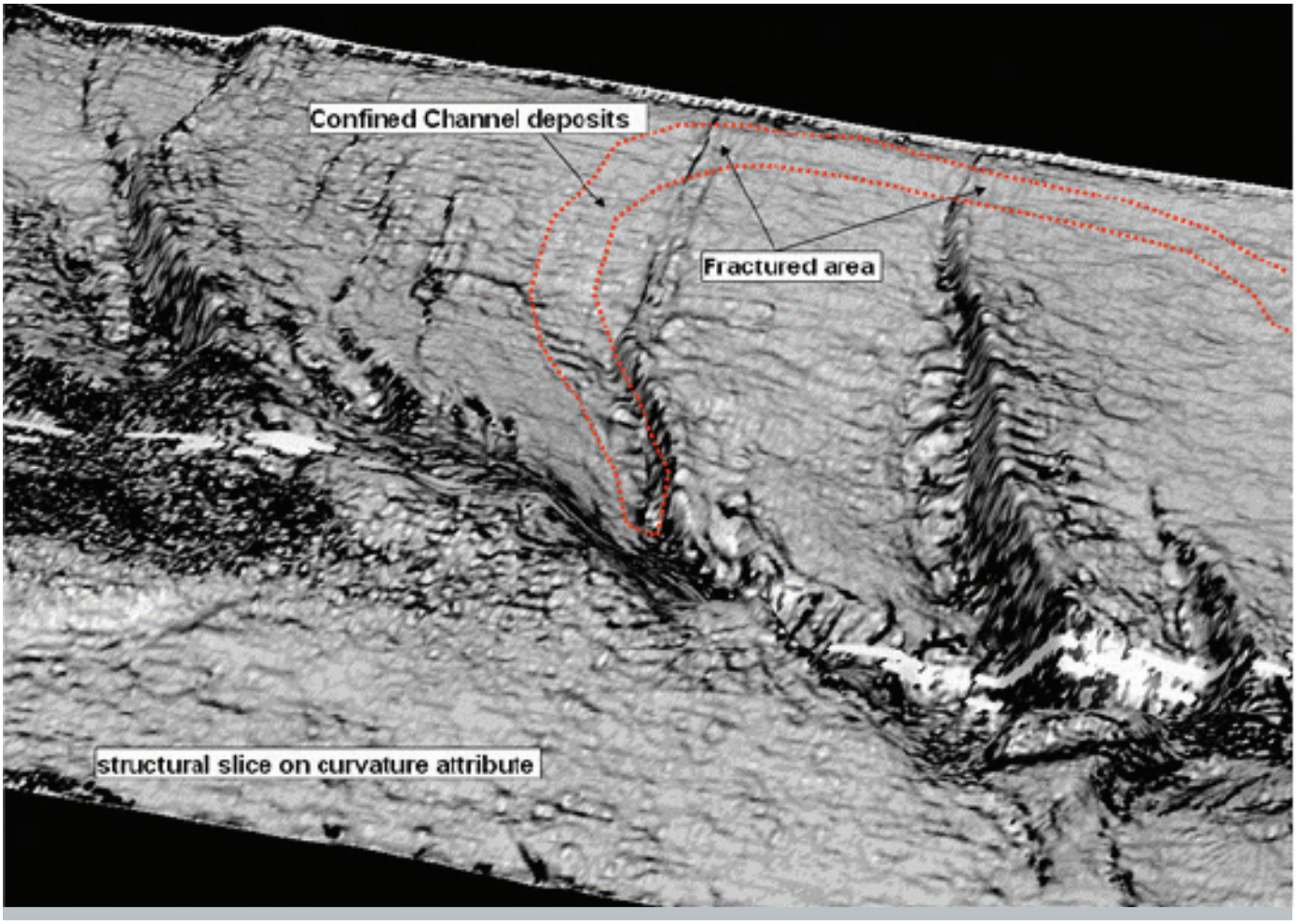
▲ The above demonstrates a time-migrated amplitude section.

The Solution

Volume curvature was used as an input to the Paradigm™ Fracture and Reservoir Modeling workflow. Volume curvature focuses on trace shape rather than amplitude. It is therefore less affected by changes in the seismic amplitude field caused by variations in fluid and lithology, and it better highlights variations caused by faults and folding. Minimum and maximum curvature attribute cubes were generated and interpreted in three dimensions. A discrete fracture network was then produced by running Paradigm™ Automated Fault Extraction on those attribute cubes and was correlated to dipmeter data at well locations.

The Results

Vertical fault displacement was quantified between 35 to 110ms, confirming the prior assessment, with increased certainty, that structural trapping was occurring against faults. High values of curvature around the main faults in the study area indicated brittle fracturing with fracture densities of between 50 and 100m, visible from the seismic data. Fracture alignment was found to be parallel to the fault direction. These findings lead to a better understanding of flow characteristics.



▲ Fracture area illuminated by the minimum principal curvature; structural slice on minimum curvature.