Spectral Recomposition - An Effective Tool for Sub-Regional Scale GDE Mapping

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The recognition, delineation and characterisation of deepwater turbidites in offshore Niger Delta hydrocarbon province constitute a critical success factor in the exploration and development of the Bonga and other giant fields in the region. This study presents an approach in resolving some of the challenges of interpreting turbidite deposits from seismic in spite of their uniquely varying facies and proceeds to the application of mapped geomorphic elements association in identifying gross depositional environments to predict presence and quality of turbidite reservoirs. The work-flow, though applied to a combination of 2D and 3D data sets at a sub-regional scale, allowed a sufficiently detailed mapping of depositional systems across some of Shell's offshore deep-water acreage in the eastern Niger Delta region.

A framework seismic facies interpretation on selected seismic transects was undertaken to determine the critical distinguishing seismic attributes, resulting in the selection of three broad categories of applicable work-flows namely a) Amplitude based sculpting sub-parallel to stratigraphy; b) Interval wave-form based classifier and c) Spectral Re-composition in RGB domain on screened frequency bands.

Amplitude-based sculpting as well as the interval wave-form attribute maps provide better results within the (predominantly amplitude supported) reservoir sequences of Upper Miocene to Middle Miocene. The result is broadly dependent on signal to noise ratio and visual rendering is also impacted by seismic attributes variations between merged datasets. Although, better results are observed in specific angle stacks for different target layers such quality input stacks were not available for the entire study area.

Spectral Re-composition in RGB domain for screened frequency bands produced the most desired outcome and good geomorphic expressions of subsurface images were obtained in respect of both Shallow, Intermediate and Deep target layers. The quality of depositional elements definition is dependent on factors like choosing the right algorithm for spectral decomposition, determination of the right frequency bands for re-composition and selection of right layer thickness for optimum sedimentary features highlight.