Seismic Characterization of Discontinuities Zones from a Deepwater Fold-and-Thrust System, Niger Delta

Iacopini, David [1]; Butler, Robert W.[1] (1) Geology and Petroleum Geology, University of Aberdeen, Aberdeen, United Kingdom.

Deep water settings offer spectacular opportunities to understand the kinematic evolution of thrusts because of the unrivalled quality of seismic data. Nevertheless, there is still a considerable uncertainty concerning the nature of the discontinuities observed in the reflectivity data in absence of clear deflected horizons and drilling dataset within fold and thrust belts. A general interpretation is that such discontinuities mainly represent thrust and fault zones themselves that ramp through these regions. However the natures of such discontinuities bands remain still poorly understood and extreme caution is needed when interpreting such a small structures. Gaining greater insight on the internal architecture of these discontinuity zones is the goal of this research. In this contribution the results of a volume image processing (using SVI Pro) within a 3D seismic dataset from the deep water fold and thrust systems of the western lobe of the Niger Delta are presented. To track the main dipping discontinuities (thrusts) we first performed noise cancellation through the seismic volume and then produced a steering volume using structurally-oriented dip and azimuth filters. The steering volumes were then reprocessed using a detailed structurally-oriented image processing to compute different seismic attributes. The main faults thrust and damage zones imaged clearly shows a branched and dendritic geometry and appear as thick bands defined by a patchwork of small curvilinear discontinuities and non rotated but disrupted reflections. In the backlimb of the main thrust sheet, incoherency zones that are not expressed as discontinuities in the reflectivity data or do not show clear offset or curvatures within the time window specified for autotracking (50-100 meter) are systematically observed. A comparison between several seismic attribute as coherency, dip derivative, spectral decomposition, instantaneous phase and phase based dip maps suggest that these discontinuities and coherency zones mapped can both represent damaged zones and or zone with anisotropic shape fabric (e.g kink fold axial plane). We argue these small features could represent the basis for identifying small scale structures associated with subseismic strain.