

Volume Interpretation of Shelf Collapse Processes and Biafra "Disturbed" Reservoirs, Eastern Niger Delta Joint Venture

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Base Qua Iboe (BQI, 4 my) is a regional unconformity in the eastern Niger Delta associated with a geologically instantaneous shelf collapse that interrupted a normally prograding, growth faulted shelf margin. We applied volume interpretation (VI) techniques to regional amplitude and derivative 3-D seismic volumes that permitted imaging and extraction of key elements of the collapse and related reservoir.

The BQI separates shallow marine Upper Biafra strata, locally severely deformed and known as the "disturbed" or "rubble beds", from younger, mildly deformed deep-water facies. Disturbed beds resulted from collapse-related uplift, shelf edge retreat, and gravitational instability that led to mass wasting, erosion, and redeposition. Deformation includes shear zones, translated coherent blocks, slumping, soft-sediment features, and the generation of debris flows. Proximal to the post-collapse shelf edge, the BQI is highly erosional with incised valleys, and marks the onset of large-scale canyon cutting. This erosion may have been responsible for mass transport complexes that exist outboard of the fold-thrust belt on the basin floor.

The BQI collapse triggered a regional flooding event and top seal that provides a key control on hydrocarbon distribution in the JV and is associated with several billions of barrels of discovered reserves. At Ubit Field, seismically imaged field wide fluid contacts in the disturbed beds suggest that the field would behave like a large tank on a geologic time scale. However, 30 years of production history shows the complex structure and stratigraphy of the disturbed beds results in local variations in reservoir quality and production behavior.
