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The Role of Fault Kinematics and Capture in the Western Niger Delta and the Control of Sediment and Reservoir Distribution.

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Large, south-dipping cuspate normal faults separate structural trends within the shelf of the western Niger Delta.

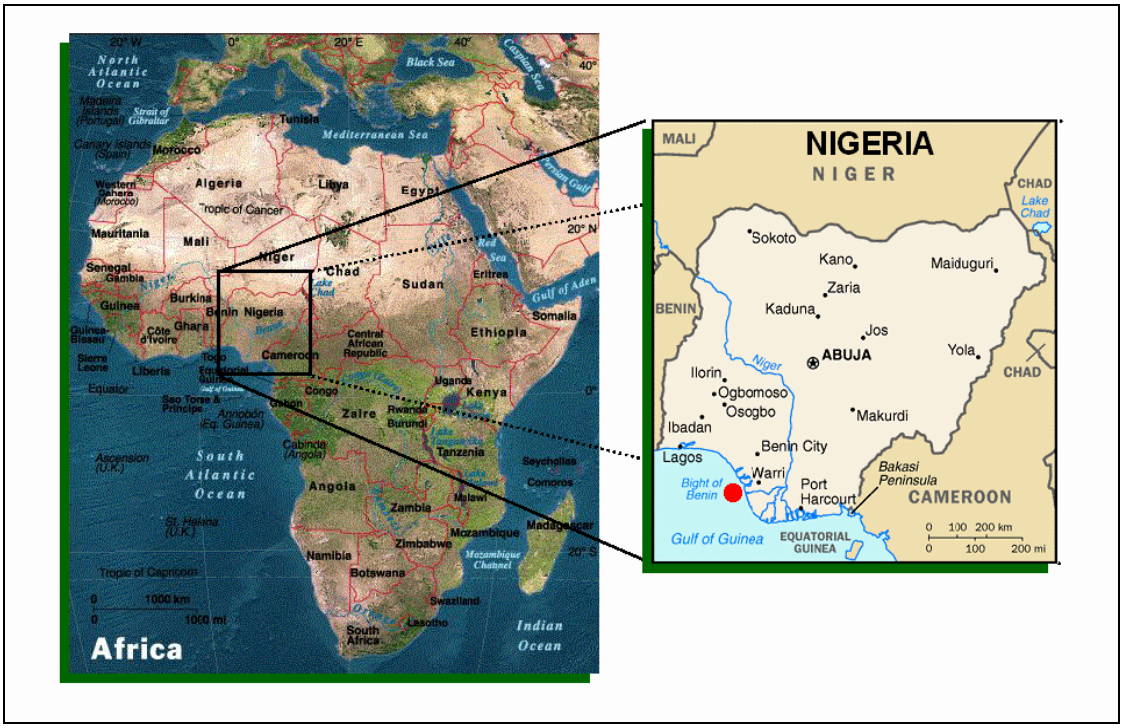


Figure 1. Map of Africa showing Nigeria and the position of the Niger Delta and the Study area

The growth and linkage of these faults exerts control on the distribution, thickness and quality of reservoirs. We have examined 3D seismic, well and biostratigraphic data to examine the structural control over reservoirs in detail in order to understand the relationship between the structure and

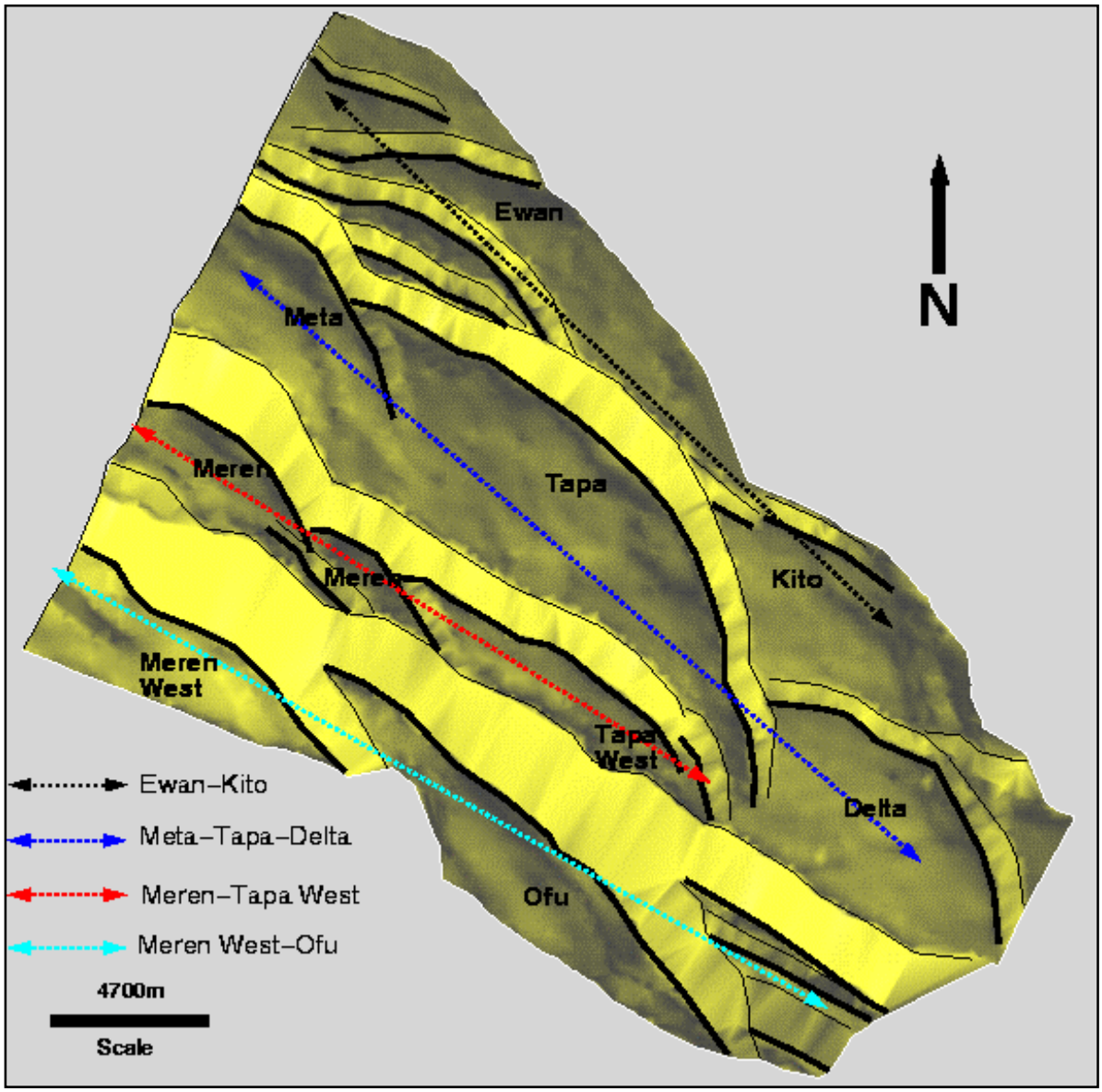
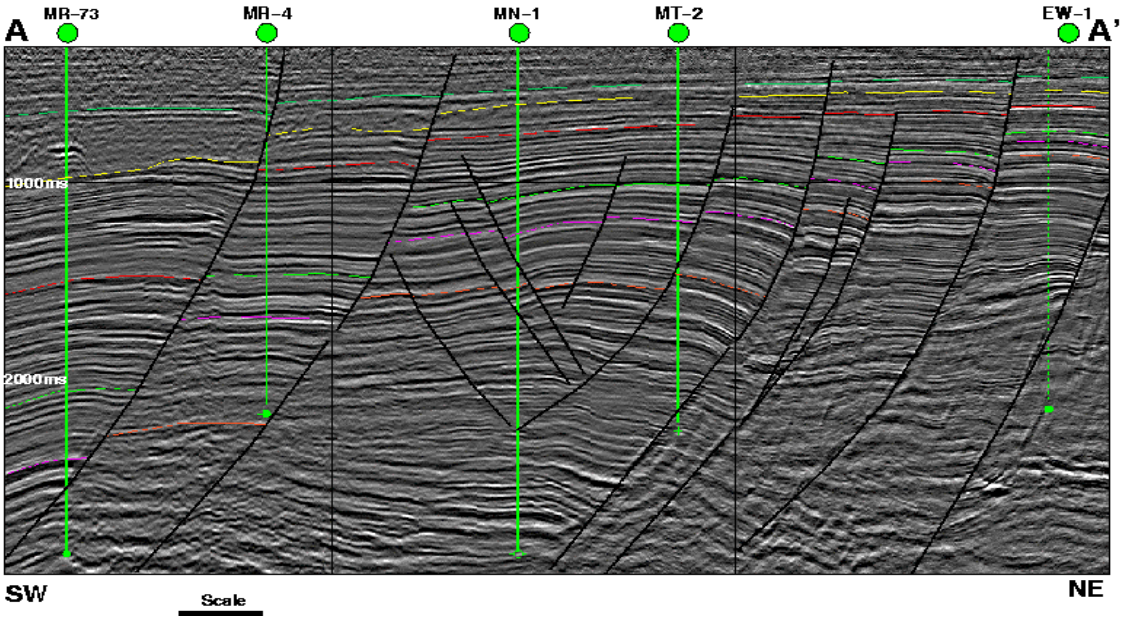
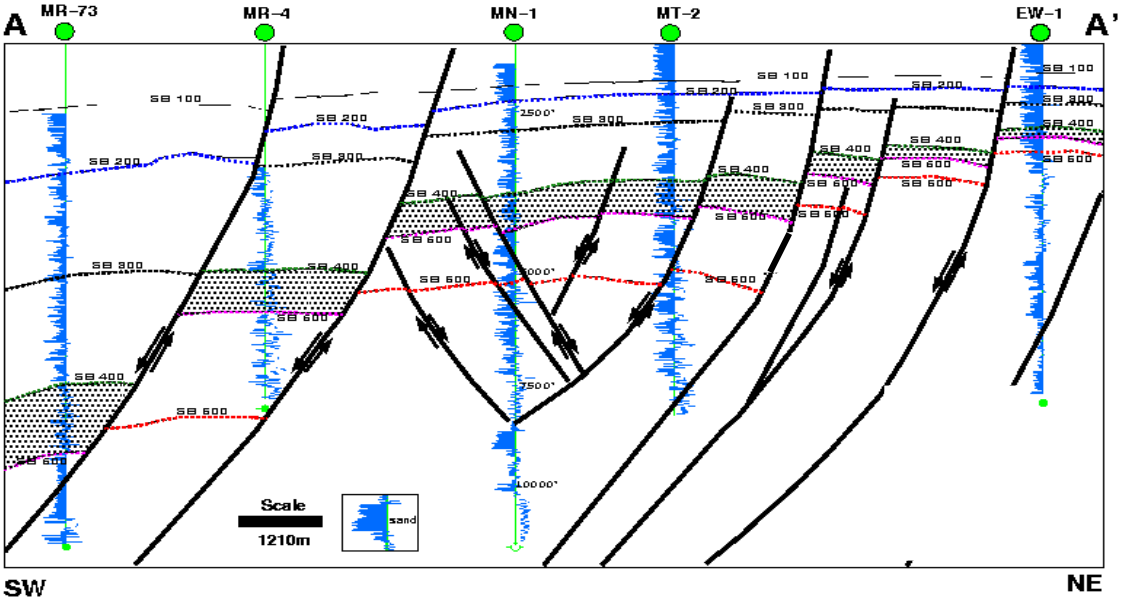


Figure 2. A 3-D view of the major structural trends in the study area.

reservoirs so that we could explore and develop fields more efficiently. The major faults link together to form trends through the process of fault capture. These faults form a linked system whose temporal pattern of movement is documented in the sedimentary record. Four-way structural traps occur in the hanging walls of the major faults.

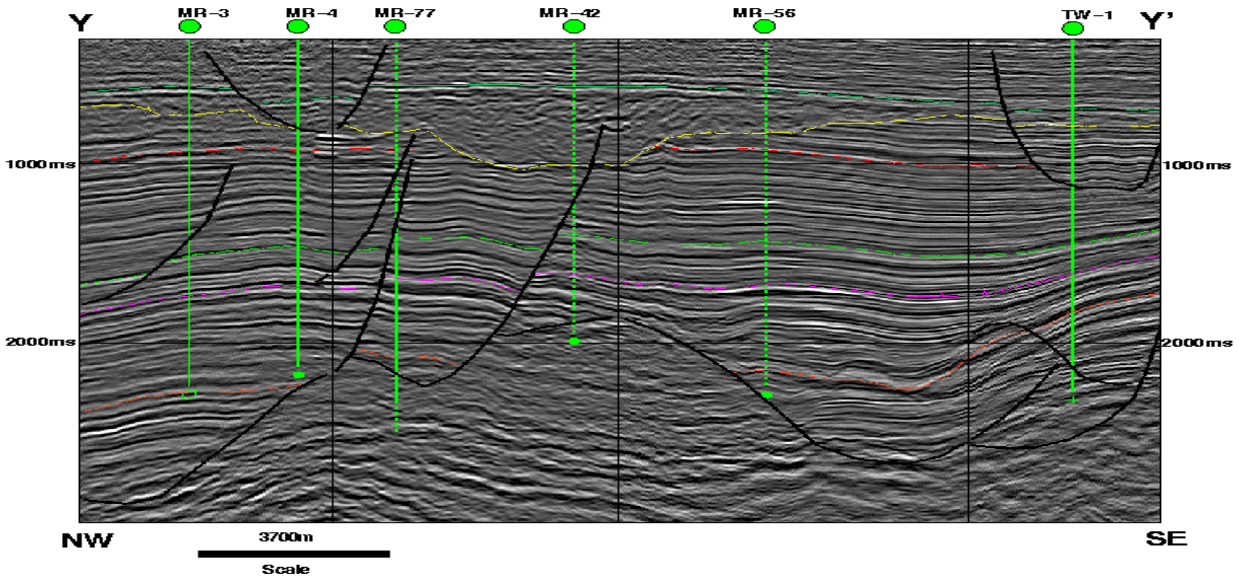


(a)

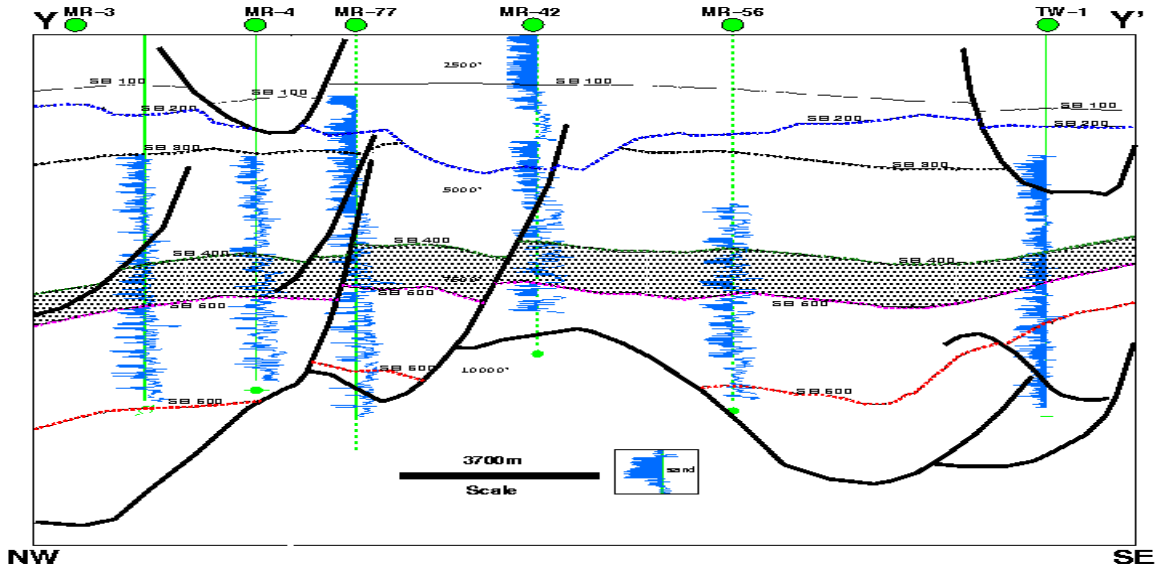


(b)

Figure 3. Transverse profile A-A' through the study area. (a) Interpreted time seismic section (b) Depth section showing faults, gamma-ray well logs and sequence boundaries.



(a)



(b)

Figure 4. Longitudinal profile X-X' through the study area. (a) Interpreted time seismic section (b) Depth section showing faults, gamma-ray well logs and sequence boundaries.

A chronostratigraphic framework was established by interpreting and mapping time correlative sequences and their associated sediments. A strong structural control is observed on sediment and reservoir deposition and distribution. There is an overall thickening of each sequence basin-wards from one structural trend to the next. There is also a decrease in reservoir rock thickness and net-to-gross ratio from one structure-building fault towards the next younger one.

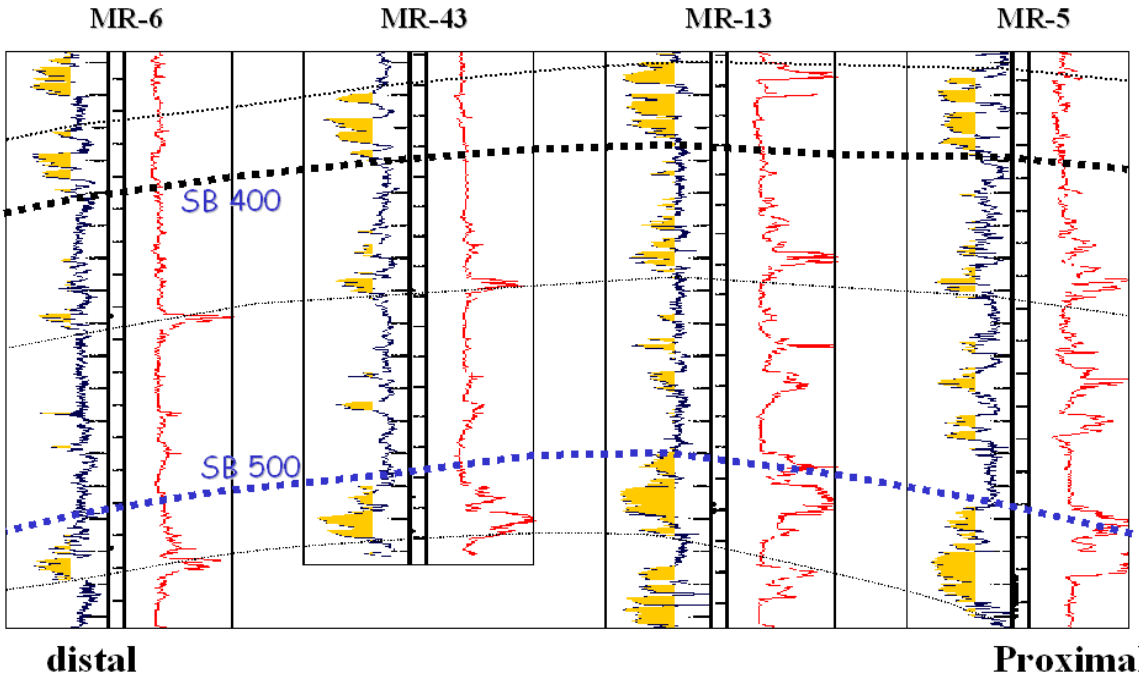


Figure 5. Dip profile through the Meren Trend showing reservoir distribution away from the major structure-building fault.

Structural control on sedimentation is also observed within each trend in an along-strike direction, with net-to-gross decreasing towards fault tips. The timing of displacement and linkage through fault capture is clearly shown in the thickness and reservoir facies patterns.