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Morphology of the Niger Delta: Local Facies Belts Orientation versus Depobelts and Growth Fault Orientations

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Abstract

7KLV ZRUN SUHVHQWV IRU WKH ¿UVW WLPH HYLGHQFH DQG WKH UHODWLRQVKLS
FRDVWDO EHOW LQ WHUPV RI ORFDO IDFLHV EHOWV RULHQWDWLRQ YHUVXV GHSRE
REVHUYDWLRQ VXJJHVWV WKDW WKH DQFLHQW FRDVWDO EHOW RI WKH GHOWD LV P
GHOWD EHFDPH EURDGO\ FRQYH[WR WKH VHD GXULQJ WKH ODWH 0LRFHQH

'HOWDV DUH LQÀXHQFHG E\ D YDULHW\ RI ÀXYLDO DQG PDULQH SURFHVVHV DQG W

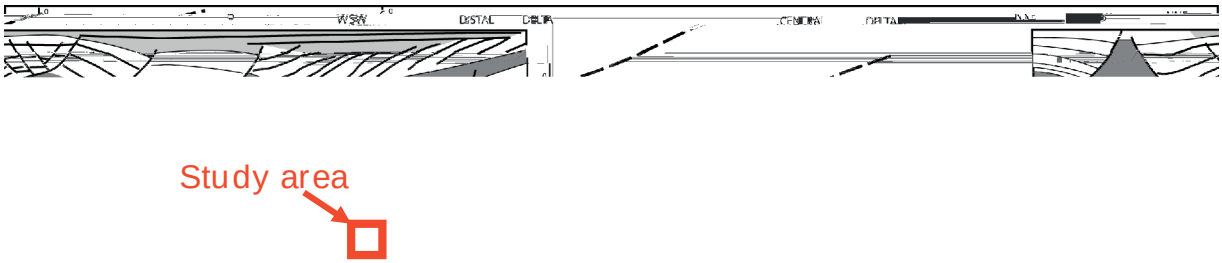
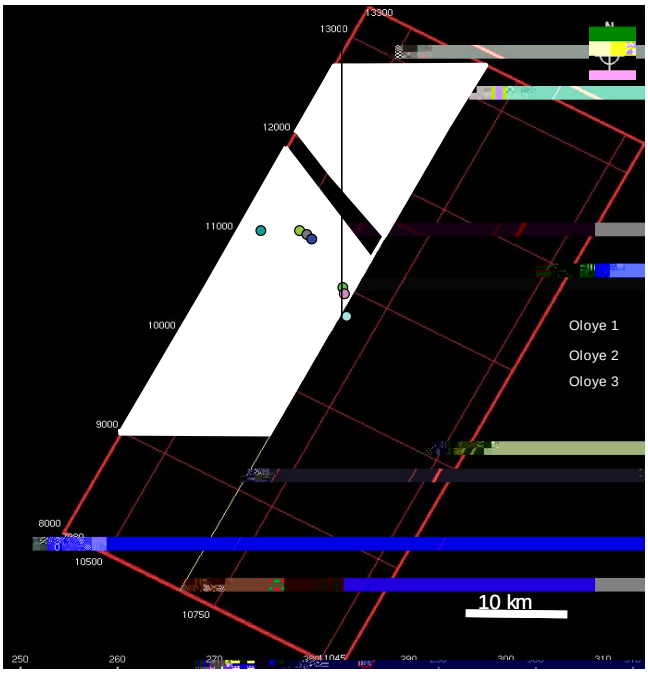


Figure 2: $JH RI GHOWDLF VHTXHQFHV LQ GHSREHOW DQG UHODWLRQVKLS WR WKH EURD

Figure 3: *URZWK IDXOWV DQG NQRZQ K\GURFDUERQ DFFXPXODWLRQ > @

because the key surfaces, strata geometry or stacking patterns are di cult to identify. ese complexes are due to changes in relative sea level which are strongly in uenced by the interplay between shoreline advance and retreat, concomitant isostatic loading and rebound of the continental shelf growth faulting and basin physiography.

Detailed sequence stratigraphic analyses showed that the middle Miocene-early Pliocene strata in the Ewan and Oloye elds of the northwestern Niger delta consist of six depositional sequences [6] (Figures 5-8). In general, sequences are widespread. ey are made up of progradational HST, TST are thin but widespread, and LST are restricted to within valley lls. Outside the LST valleys, transgressive surfaces and sequence boundaries are coincident on inter uves. is



Citation: 'XURJELWDQ $6RUSKRORJ\ RI WKH 1LJHU 'HOWD /RFDO)DFLHV %HOWV 2ULHQWDWLR
0DULQH 6HGL 5HV 'HQYRL

the local facies belts have a di erent orientation in relation to the growth faults, and the depobelts mapped using the high resolutio 3D seismic integrated with available well data, clearly do not mirro the present day orientation. From this detailed study, local facies bel are observed to be oblique to the modern regional depobelts and t interpreted growth faults, compared with the present day coastal be which is parallel to the depobelts.

is work presents for the rst time, evidence and the relationship between the ancient coastal belt and the modern coastal belt in terr of local facies belts orientation versus depobelt and fault orientation within the Niger Delta. is observation suggests that the ancient coastal belt of the delta is more lobate /arcuate than the modern Nig delta. e delta became broadly convex to the sea during the late Miocene.

Deltas are in uenced by a variety of uvial and marine processes and these processes controlled their morphology [8-10]. e most widely used classi cation scheme today is that of Galloway [8], wh subdivided delta according to their dominant processes i.e. river waves and tide (Figure 9). Fluvially dominated deltas tend to display lobate-elongate morphology, e.g. the Balize delta- Mississippi. In contrast wave-dominated deltas tend to be more lobate and have smooth, arcuate to cuspate margins, e.g. the Nile delta. Tide dominated deltas tended to be estuarine to irregular in geometry [8] (Figure 10). Although the Niger delta has been characterized to be mixed in uenced delta showing the combination of the e ects of river, wave and tidal processes [3,11,12]. e modern Niger delta has been described to be more wave dominated and more lobate [1], and the classi cation falls within the wave dominated section on Galloway classi cations. is implies that during Miocene, the delta was more uvially dominated in relation to sediment supply and basinal processes (wave and tide) (Figure 11). is also implies that the modern Niger delta cannot be used as a direct analogue for the ancient delta [13,14] (Figure 12).

Conclusion

In summary, seismic, sequence stratigraphic and depositional models developed for the Ewan and Oloye elds, enable detailed facies correlation on the eld scale, and o er predictive models that can be used on a regional scale

e implication of this interpretation is that the modern Niger delta cannot be used as a direct analogue for the ancient delta (from the point view of sedimentary process). e data from the study area suggests that the ancient delta was more lobate with more complex facies distribution, and the delta was more uvially in uenced, wave dominated in relation to sediment supply and basinal processes uvial input. It can be inferred and interpreted from the study that the ancient delta is characterized by lowstand shelf edge while the present day modern delta are of high stand shelf edge, because there was a believe that relative sea level over 20,000 yrs ago was at high stand. is de ned major di erence between the present day delta and the ancient delta in term of shelf edge location.

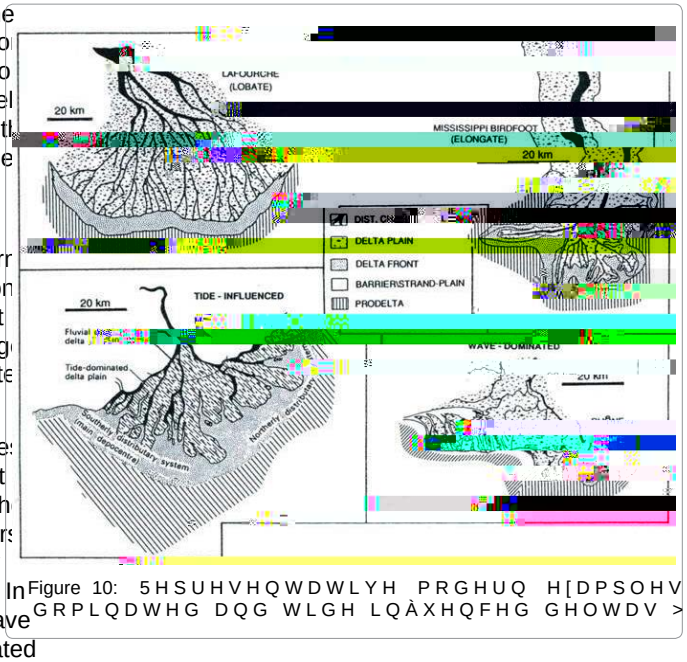


Figure 10: 5HSUHVHQWDWLYH PRGHUQ H[DPSOHV RI U GRPLQDWHG DQG WLGH LQÀXHQFHG GHOWDV >

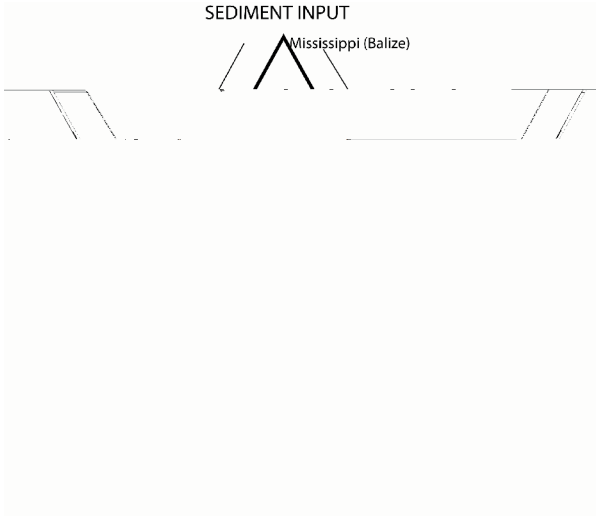


Figure 11: 6FKHPDWLF WULSDUWLWH GLDJUDP VKRZLQJ GHOWD 0LRFHQH WR SUHVHQW GD\ 1LJHU GHOWD > @

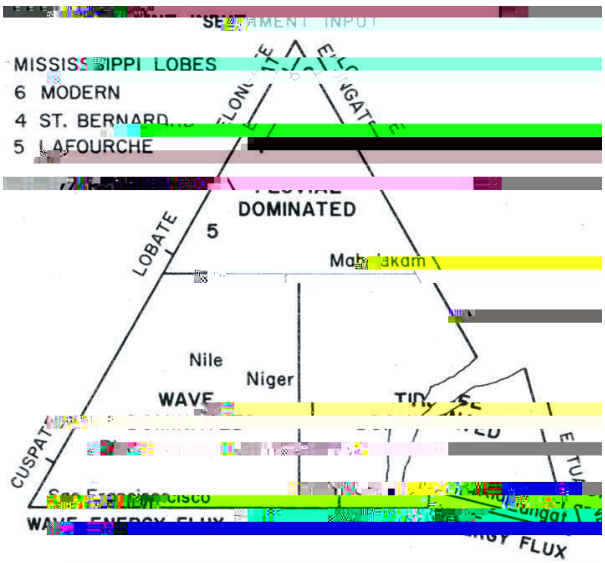


Figure 9: &ODVVL¿FDWLRQ RI GHOWDV LQ WHUPV RI WLGH ZDYH DQG WLGH LQÀXHQFH > @