# 3-D Seismic Interpretation and Volumetric Estimation of "Osaja Field" Niger Delta, Nigeria

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**Abstract.** 3-D seismic interpretation and petrophysical analysis of the Osaja Field, Niger Delta, was carried out with aim of carrying out a detailed structural interpretation, reservoir characterization and volumetric estimation of the field. Four wells were correlated across the field to delineate the lithology and establish the continuity of reservoir sand as well as the general stratigraphy of the area. The petrophysical analysis carried out, revealed two sand units that are hydrocarbon bearing reservoirs (Sand_A and Sand_B). The spatial variation of the reservoirs were studied on a field wide scale using seismic interpretation. Time and depth structural maps generated were used to establish the structural architecture/geometry of the prospect area of the field. The depth structure map revealed NE-SW trending anticlinal structures with $F_5$ and $F_6$ as faults assisted closures to the reservoir. Furthermore, reservoir parameters such as net pay, water saturation porosity, net-to-gross etc, were derived from the integration of seismic and well log data. The structural interpretation on the 3-D seismic data of the study area revealed a total of seven faults ranging from synthetic to antithetic faults. The petrophysical analysis gave the porosity values of the reservoir Sand_A ranging from 18.1 - 20.3% and reservoir Sand_B ranging from 13.1-14.9% across the reservoir. The permeability values of reservoir Sand_A ranging from 63-540md and reservoir Sand_B ranging from 18-80 md hence there is decrease in porosity and permeability of the field with depth. The net-to-gross varies from 22.1% to 22.4% in Rerservoir Sand A to between 5.34- 12% for Rerservoir Sand _A while Sw values for the reservoirs ranges from 38-42% in well 2 to about 68.79-96.06% in well 11. The result of original oil in place for all the wells calculated revealed that well 2 has the highest value with 9.3mmbls. These results indicate that the reservoirs under consideration have a poor to fair hydrocarbon (oil) prospect.

## Introduction

The evaluation of the intrinsic properties of a reservoir like thickness, net-to-gross ratio, pore fluid, porosity, permeability, water saturation and volumetric reserve is what is most often regarded as reservoir characterization. Most of these reservoir properties are previously estimated using information from borehole logs. However, in the past few years, most of these properties have been mapped with the help of seismic attributes especially when calibrated with available well data within the study area. This methodology has certain inherent advantages which includes the high spatial coverage as well as the fact that the seismic data can be used for interpolating and extrapolating within and beyond the locations of the few available well data [1]. Seismic attributes

are characteristics of a seismic data often represented by analytical maps that aids the interpreter in better interpretation and visualization of geological features of interest. Seismic attributes have evolved over the past three decades and have been invaluable in making far better accurate predictions and characterization of reservoir properties [2-6]. They are specifically applied in hydrocarbon exploration and development [6]. They are widely used for lithological and petrophysical prediction of reservoir properties. Common seismic attributes such as complex trace [7], coherence [8], curvature [9], or spectral decomposition attributes [10] use mathematical formulations to capture the geometry or physical properties of the subsurface and can be used clarify subtle geologic features of interest. A methodology has now been proposed and described for 3-D structural characterization and based on the combinations of specific attributes of interest and other visualization techniques. Because of their efficiency, Semblance, Structure, and Curvature are three key attributes that must be included in interpretation. The correct combination and sequence of these attributes can enhance the final goal of identifying features that were not visible before.

The areal extent of the Niger delta is about 75000 $km^2$ with a clastic fill of about 12,000 m [11]. It ranks amongst the world's most prolific petroleum producing tertiary deltas that together account for about 5% of the world's oil and gas reserves. Sedimentation in the depobelts is a function of sediment supply and of accommodation space created by basement subsidence and growth faulting. Growth faults, triggered by a pene-contemporaneous deformation of deltaic sediments are the dominant structural features in the Niger delta. For any given depobelt, gravity tectonics were completed before deposition of the Benin Formation and are expressed in complex structures, including shale diapirs, rollover anticlines, collapsed growth fault crests, back-to-back features, and steeply dipping, closely spaced flank faults [12-13]. These faults mostly offset different parts of the Agbada Formation and flatten into detachment planes. Petroleum in the Niger Delta is produced from sandstone and unconsolidated sands predominantly reservoir rocks of Eocene to Pliocene in age and are often stacked, ranging in thickness from less than 15 meters to about 45 meters [12]. Based on reservoir geometry and quality, the lateral variation in reservoir thickness is strongly controlled by growth faults, with the reservoir thickening towards the faults of the downthrown block [14].

There is therefore the need to use a technologically and economically viable method in the exploration and exploitation of oil and gas is inevitable owing to the huge sum of money required for a detail geophysical survey and subsequent exploitation vis-a-vis drilling of wildcat wells. To avert wastage of resources and reduce uncertainty which are major challenges in the oil and gas industry, there is need to properly characterize a reservoir and evaluate a formation in order to accurately ascertain the hydrocarbon potential of the reservoir. It is also very important to determine its petro-physical properties (porosity, permeability, water saturation, etc) and reserve potentials. In this study, 3-D seismic reflection data was integrated with well logs to identify and characterize the various units within the study area using petro-physical analysis and seismic interpretation. Several workers have carried out structural interpretation of seismic data in different sedimentary basins worldwide using 3-D seismic and well log data [16-19].Similarly, structural interpretation, petrology, provenance and depositional environment studies of the reservoir sandstones of part of the Niger Delta have been carried out to determine the hydrocarbon potentials of the area by various authors[12,14,20-27]. Over the years, 3-D seismic and well log data have been integrated for possible generation of geologic models that often incorporate geologic, petrophysical and geophysical constraints leading to more robust interpretation of the seismic data [2-3,15].

This work is therefore aimed at integrating 3-D seismic and well log data for reservoir characterization and volumetric estimation in the study area. The ability of the seismic data to image sub-surface structures and the assessment of the interpreted structures and their closures as potential reservoirs favourable for hydrocarbon entrapment and accumulation is also investigated.

**Geology of the Study area**

The geology, stratigraphy, petroleum geology and structure of the Niger delta basin have been extensively discussed in several key publications [12,14,23,26,28-31].

The Niger Delta is made up of three generalized lithostratigraphic units (from oldest to youngest) namely Akata, Agbada and the topmost Benin Formations [26]. These are the Benin, Agbada, and Akata Formations. These formations were deposited in marine, transitional and continental environments respectively but together they form a thick, over all progradational passive-margin wedge. The Akata Formation is Paleocene to Pliocene in age and it is the basal unit composed mainly of marine shales believed to be the main source rock within the basin. The Akata Formation consist of massive monotonous and generally dark grey marine shales and is generally very rich in fauna and flora remains [26]. Sandstone lenses (rings) occur near the top of the formation, particularly at the contact with the overlying Agbada Formation. Akata Formation is the major source rock for the Hydrocarbons of the Niger delta [12]. Its thickness is uncertain but may reach 7000m in the central part of the delta with age ranging from Paloecene to Holocene [27]. The Agbada Formation that overlies the Akata (basal) Formation is a paralic sequence represented by an alternation of sandstones and shales in various proportions [21]. The Agbada Formation which is made up of an alternation of sand and shale units is Eocene to Quaternary in age while the Benin Formation is Oligocene to Recent in age and it is mainly made up of non-marine fine to coarse grained sands with a few shale intercalations. Deposition of the three formations occurred in each of the five off lapping siliciclastic sedimentation cycles that comprise the Niger Delta. These cycles (depo-belts) are 30-60 kilometers wide, prograde southwestward 250 kilometers over oceanic crust into the Gulf of Guinea, and are defined by syn-sedimentary faulting that occurred in response to variable rates of subsidence and sediment supply [21]. Six major depo-belts are generally recognized, each with its own sedimentation, deformation, and petroleum history. The coastal swamp depo-belt is one of the six depo-belts and is a major hydrocarbon bearing zone in the Niger delta.

"Osaja'' field is located at the coastal swamp depobelt of the Niger delta, which is a sedimentary basin situated in southern Nigeria (Fig. 1) between latitudes $3^{0}$N and $6^{0}$N and longitude $5^{0}$E and $8^{0}$E.The study area covers an area of 55square km and is bounded to the west and northwest by the Benin Hinge Line and to the east by the Calabar Hinge Line. The Niger Delta basin to date is the most prolific and economic sedimentary basin in Nigeria by virtue of the size of petroleum accumulation discovered and produced. Similarly, the spatial distribution of the petroleum resources to the onshore, continental shelf through deep water in the offshore area is widespread. However, the hydrocarbon potentials of the continental slope seaward of the shelf break is only recently becoming clearer with a number of exploration programs having resulted in world class discoveries being made in recent years.
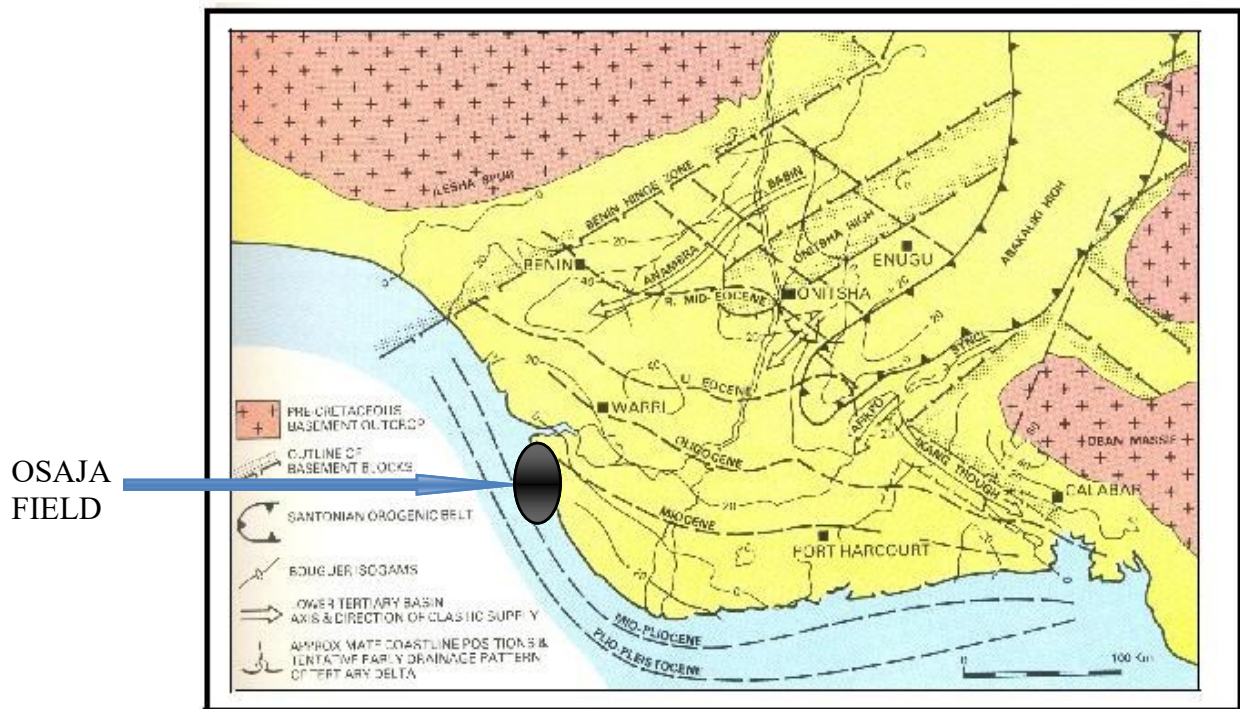
**Fig.1.** Geological map of the Niger Delta showing the ''Osaja field" (modified after [30])

## Methodology

The data set used in this research work includes 3-D seismic data comprising 200 inlines and 190 cross lines, suites of composite logs from four wells, base map of the field and check shot data of the wells. Petrel (seismic to simulation software) and interactive petrophysics (IP) software were used for the project. The study was carried out in two phases – seismic data interpretation and petrophysical data analysis.The adopted approach include seismic interpretation of the field, petrophysical evaluation of the wells (wells 2,7,9& 11) and hydrocarbon reserve estimation using volumetric methods. The wells are shown in the base map in fig.2 below. In addition, regional well-to-well correlation was carried out in the study area with correlation of horizon tops and bases across the ''Osaja Field'' as shown in fig. 3 below. The well correlation panel of Osaja_1, Osaja _2, Osaja_3, and Osaja_4 was done in the NE-SW direction. The suites of logs associated with these wells are the gamma ray logs, resistivity logs, neutron/porosity and density logs. Gamma ray log which is a lithology log was used for lithologic differentiation between sand and shale, resistivity log was used to delineate hydrocarbon bearing zone from water zone while neutron and density log was used to delineate oil and gas contact. Eventually, two reservoirs: Reservoir _A and Reservoir_ B were mapped.

The checkshot data (T-Z) acquired from Osaja_2 is shown in fig.4. A synthetic seismogram was generated using sonic and density logs from Osaja_2 with check shot data from the same well. The seismic calibration is based on a synthetic seismogram using sonic and density logs from Osaja_2 well with check shot from the same well. Similarly, seismic –to –well tie of the study area was also carried out to further correlate tops of horizons already identified in the wells with reflections in the seismic data. This was also carried out to provide a basis for correlating lithology or stratigraphic informations in the wells with characteristic reflection patterns in the seismic data and subsequently extra-polating the identified information for a wider range within the field. In addition, well-to seismic ties is indispensable in time-depth conversion and also key to understanding the spatial and spectral resolution limits of the acquired seismic data. Generally, the seismic-to-well tie for Osaja_2 is good and has been achieved with a – 4 ms time shift as shown in figs.5-6. This tie formed the first step in picking events, which corresponded to the tops of the sands for interpretation. Seismic- to- well ties done for wells 7,9 and 11 A-1, also showed good ties to the seismic data, increasing the confidence in the picked events.
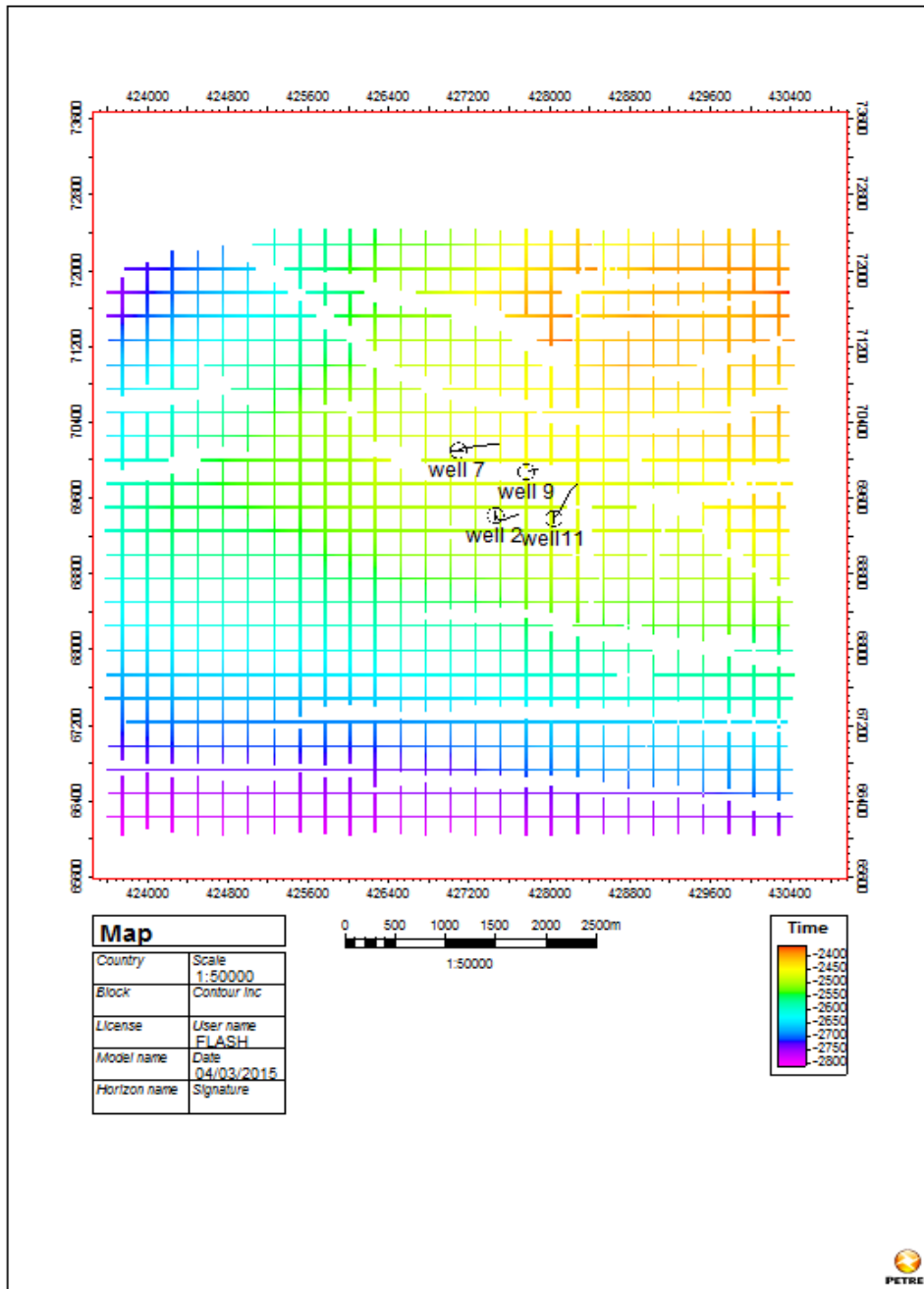
**Fig.2.** Seismic survey base map of the study area showing location of four wells and the seismic incline and cross line sections
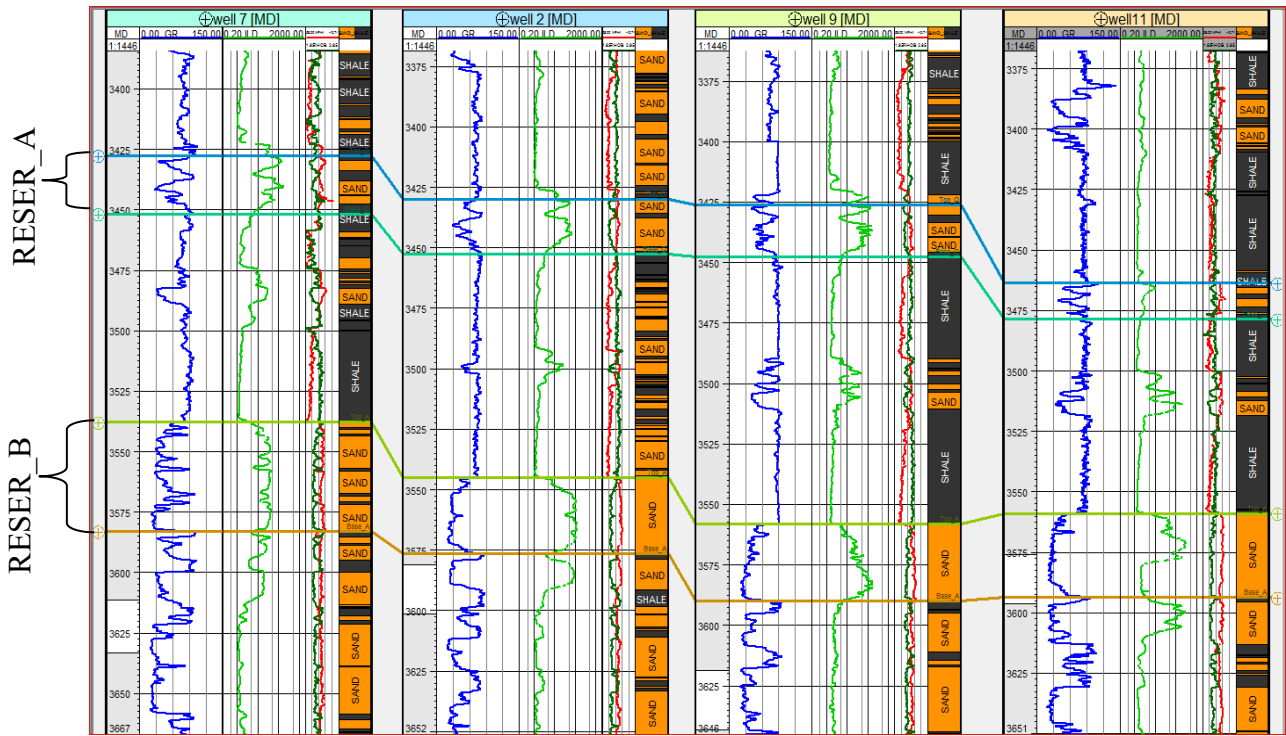
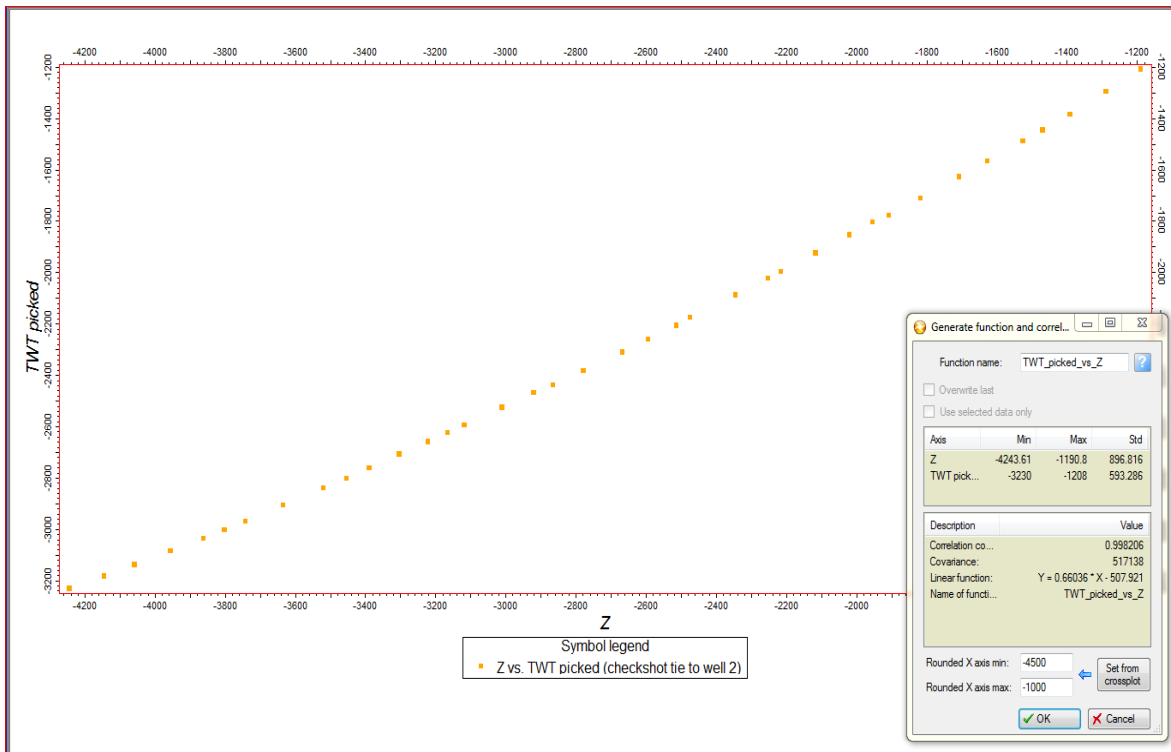**Fig.3.** Showing well-to-well correlation panel of the study area



**Fig.4.** A plot of survey check shot travelling time against Depth at Osaja_2
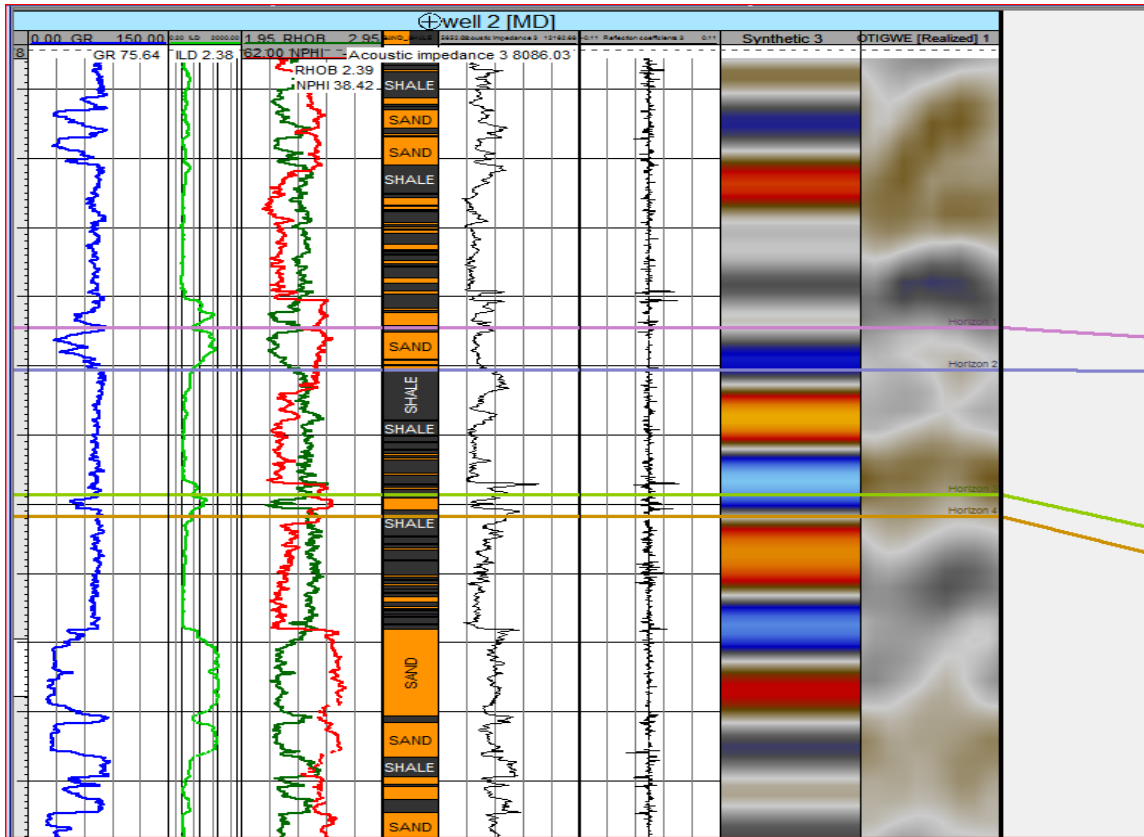
**Fig.5.** Well to seismic tie of well 2, showing acoustic impedance, reflection coefficient, synthetic seismogram and seismic section (inline) and the 4 horizons of the prospect zones
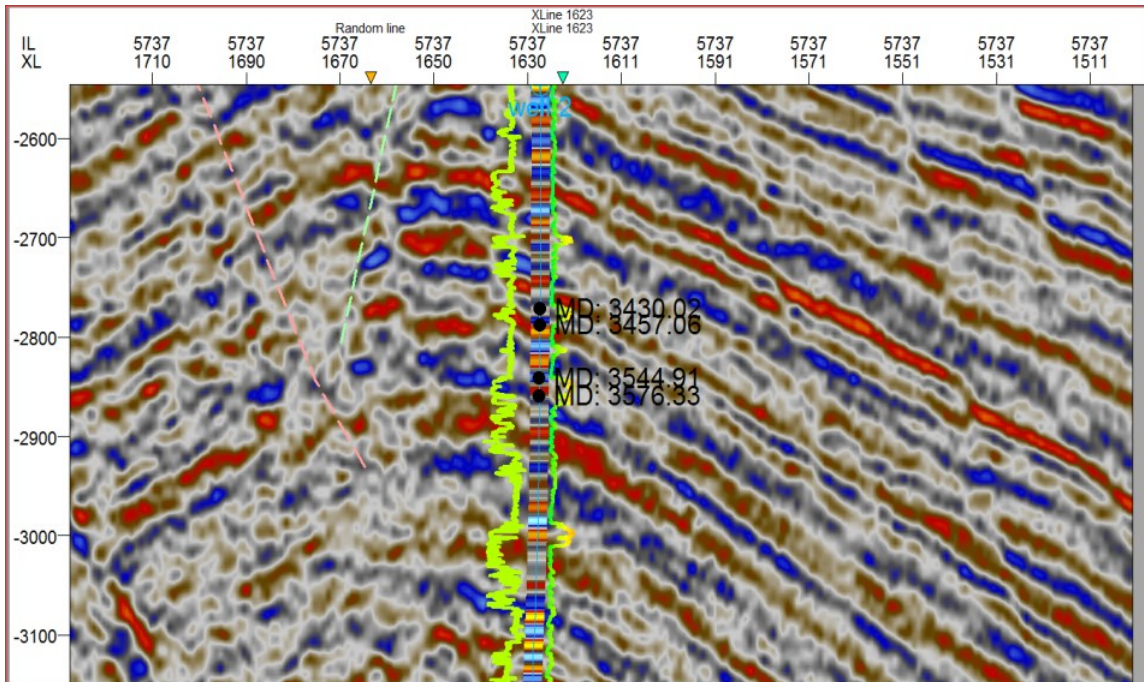


**Fig.6.** Well to seismic tie of well tops conforming to GR and resitivity log of Osaja_2

## Results and discussion

The results of this study are presented under three distinct headings which include seismic interpretation, petrophysical interpretation and volumetric estimation. Detailed discussion of the above interpretations was later carried out at the end of this section. This was done for the purpose of clarity of expression.

**Seismic interpretation**

Fault mapping was done on the vertical seismic display across the seismic volume as shown in figs 7-9. The seismic calibration is based on a synthetic seismogram using sonic and density logs from Osaja_2 well with checkshot data from same well. Generally, the seismic-to-well-tie was good with – 4 ms time shift. The tie is an integral part in picking of horizons which corresponded to the reservoir top and base (Reser_1 and Reser_2). The horizons ($H_1$, $H_2$, $H_3$ and $H_4$) were converted to surfaces to obtain the time structure maps, which was later converted to depth structure maps using check shot data. Time to depth conversion of the mapped time events was carried out using a velocity model based on the Osaja 3-D migration velocities calibrated using T-Z from wells 2, 7, 9 and 11. Time-migrated 3-D seismic data obtained from the field was used to develop time and depth maps from which the vertex (representation of the prospect/pay zone) was extracted as shown in figs. 10&11 below. The time and depth structure maps were generated from the horizons. With available information from the well logs, the GRV (Gross rock volume or volume of impregnated rock) of the prospect was determined for reserve estimation using volumetric approach. Time structure and depth structure maps were generated from the seismic section while formation parameters such as porosity, permeability, water saturation, net to gross etc, were calculated using the volumetric method. The procedures taken for both phases were carefully done with consideration of the objective of the study, which is to determine appropriate locations for drilling appraisal or development wells and to estimate the reserves in the "Osaja field''.

The seismic tie carried out on the seismic section revealed that the top of the shallow reservoir (Reser_A) which occurred at 3430 m corresponded to 2750ms on the inline while the top of the deeper reservoir (Reser_B) at 3544 m corresponds to 2850ms on the inline. The structural interpretation on the 3-D seismic data of the field revealed a total of seven faults which were identified ($F_1$, $F_2$, $F_3$, $F_4$, $F_5$, $F_6$ and $F_7$) as shown in figs 7-8. While $F_1$, $F_2$, $F_3$, $F_4$ and $F_7$ are synthetic faults, the faults identified as $F_6$ and $F_5$ are antithetic faults. Four horizons were established and indicated the top and base of the two reservoirs (Reser_A and Reser_B) as shown in figs.7 and 10. Fig.10-11 revealed anticlinal structures at the north east of the field stretching to the south west region (trending NE-SW) with $F_5$ and $F_6$ as faults assisted closures to the reservoir.
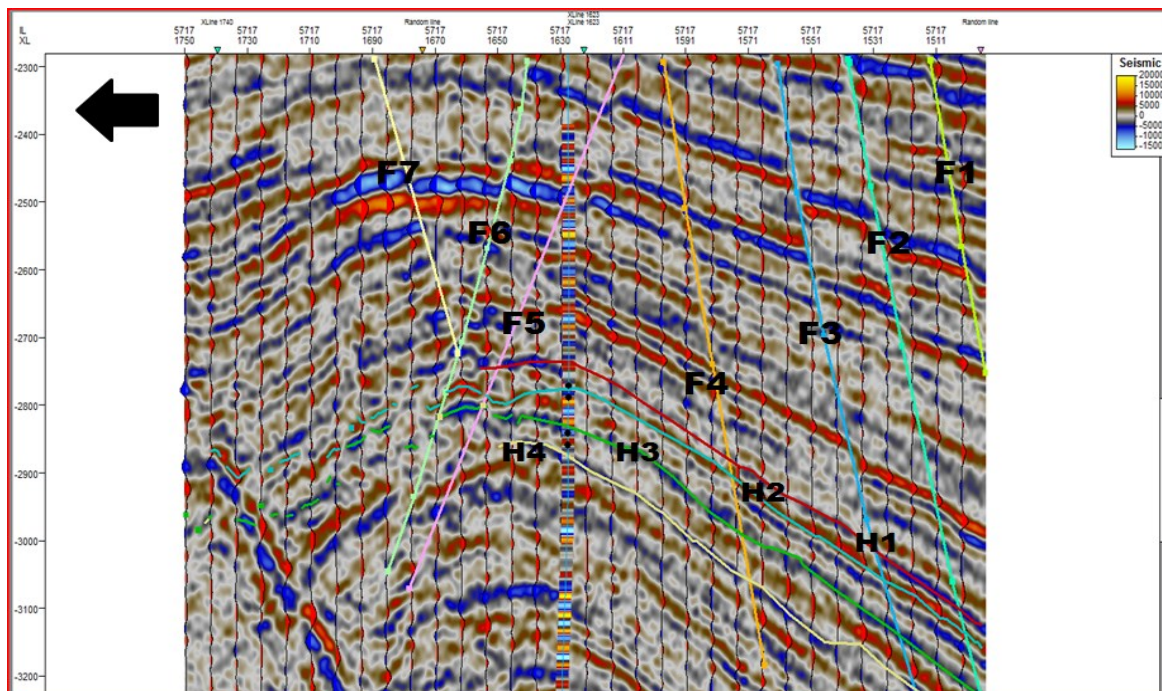


**Fig.7.** The vertical section (inline 57I7) through well 2, showing the faults and the picked horizons (H1, H2, H3 and H4)
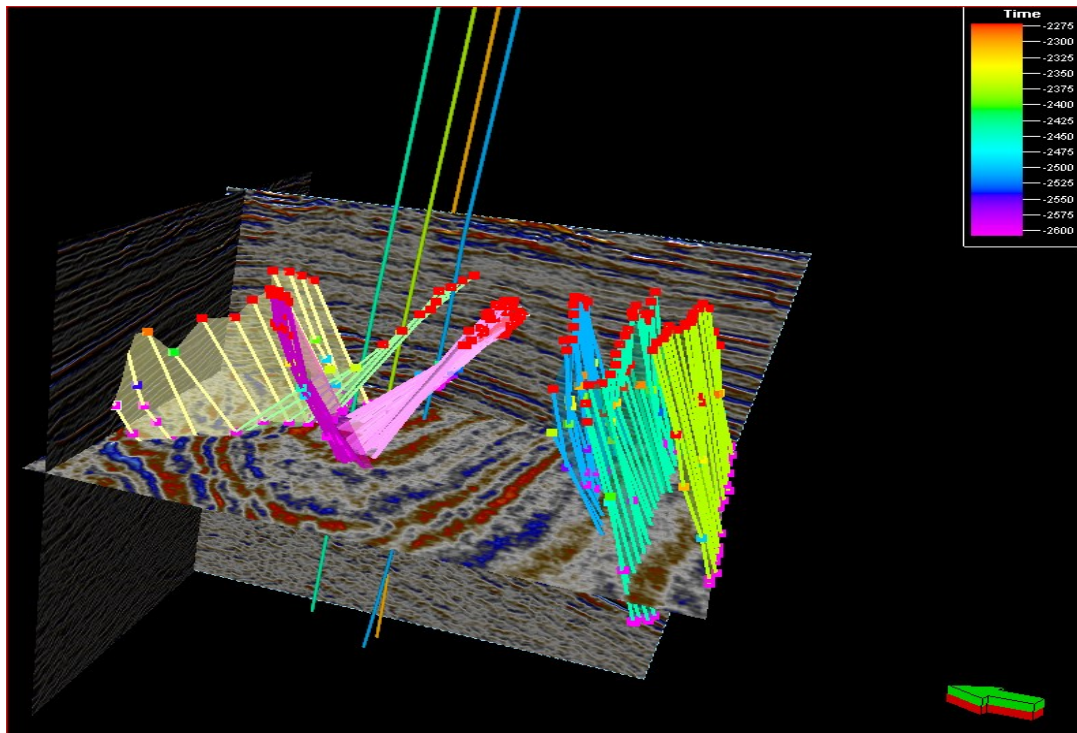
**Fig.8.** 3-D seismic section of inlie 5713 with time slice showing the fault architecture of the field
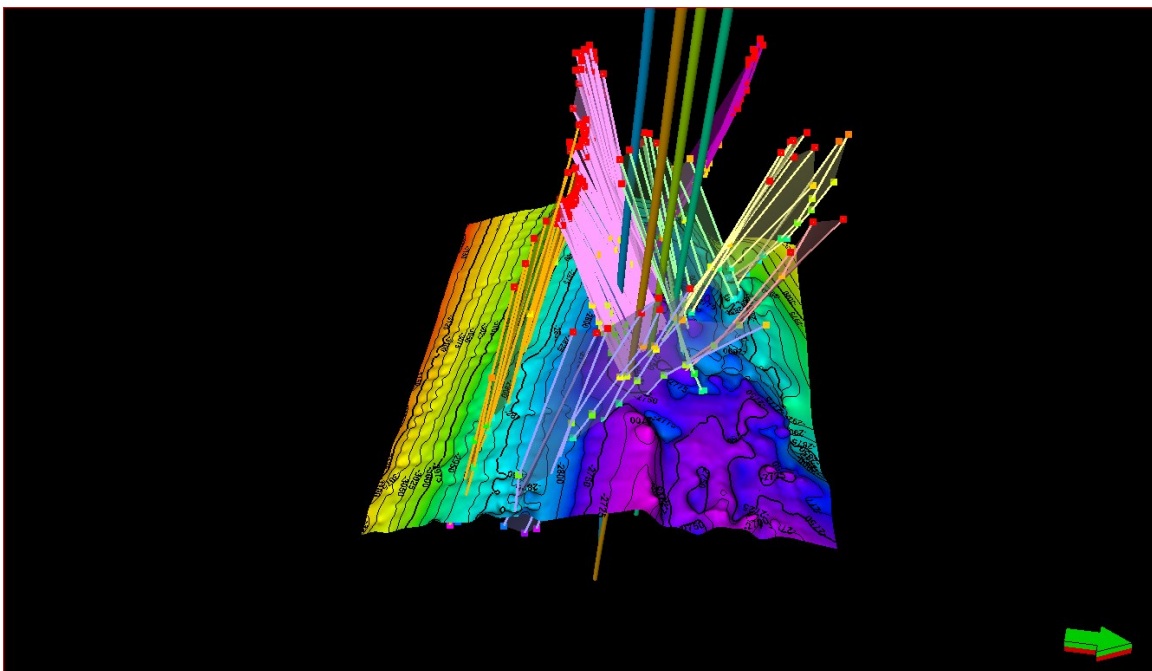


**Fig.9.** Time structural map showing the fault geometry of the prospect zone with penetrated wells

**Fig. 10.** The event time structure maps of horizon H1 and H3 (tops of Reser_A and Reser_B reservoir) at 2700ms and 27800ms respectively



**Fig. 11.** Depth structure maps of the tops of Sand_A and Sand_B Reservoir at 3450m and 3500 m respectively

**Petrophysical interpretation of the reservoirs**

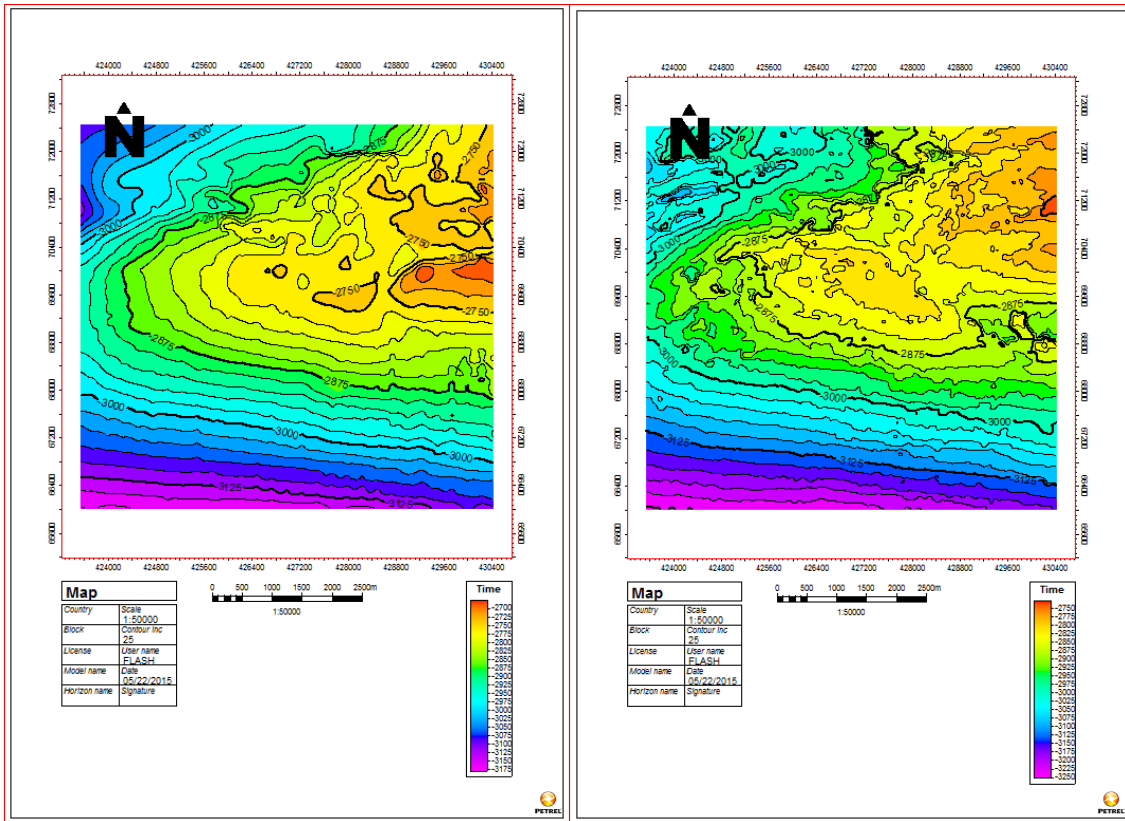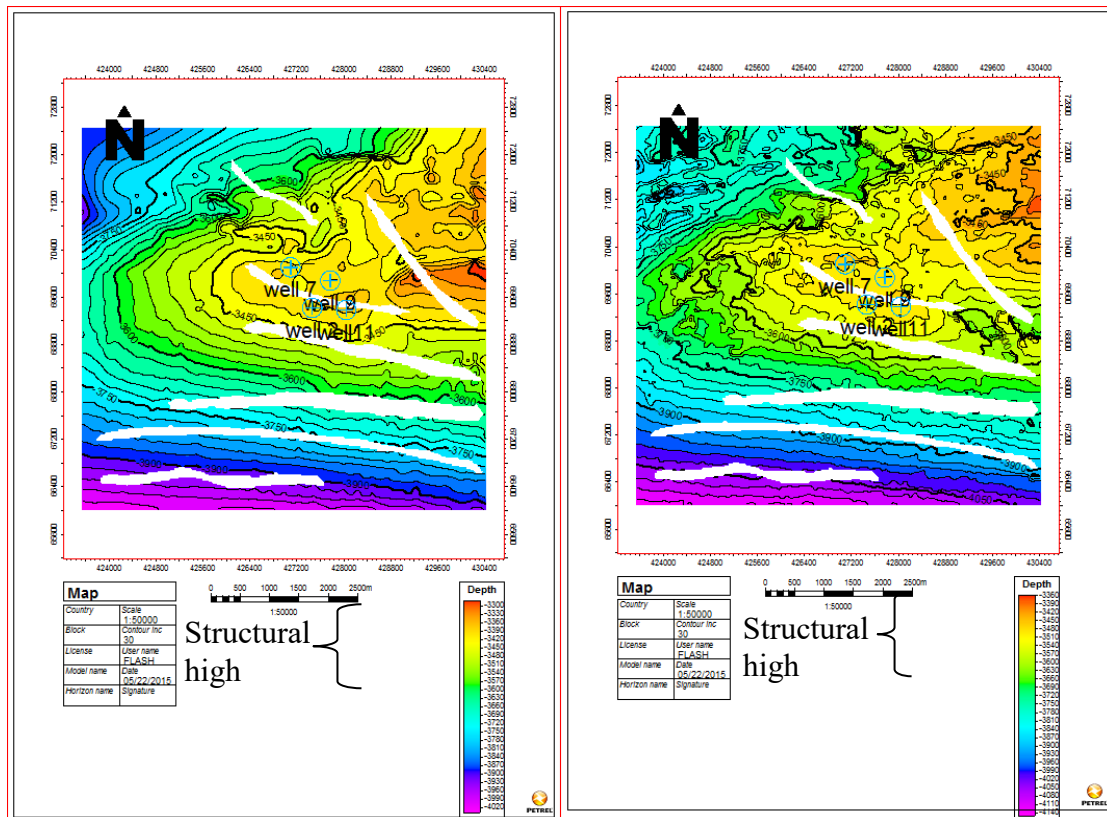This involved the use of empirical formulae to estimate the petrophysical properties of the mapped reservoir units delineated from the well logs. The reservoir units which was identified through the use of gamma ray and resistivity signatures were further characterized quantitatively to arrive at the following parameters: volume of shale, formation factor, porosity, water saturation, permeability etc. The GRV (Gross Rock Volume) of the prospect area was determined for reserve estimation using volumetric approach. Deterministic estimation of the volume of hydrocarbon in place involves the application of one or more simple equations that describes the volume of hydrocarbon filled pore space in the reservoir and the way that volume will change from the reservoir to the surface. The parameters deduced from the analysis include gamma ray index, porosity, net to gross, volume of shale, formation factor, irreducible water saturation, hydrocarbon saturation, water saturation and hydrocarbon pore volume. These parameters are very vital for the evaluation processes at all stages of the reservoirs in terms of hydrocarbon pore volume and amount of hydrocarbon in place. The estimated petrophysical parameters of the study area are presented in tables 1 and 2 above. The analysis began with the identification of reservoirs (sand bodies) within the Agbada Formation, by observing intervals where gamma ray has relatively low values (i.e. defection to the left). The fluid contacts were determined using the resistive log, neutron and density log for hydrocarbon and water contacts respectively.

**Table 1.** Showing the calculated petrophysical parameters for sand_A

| Wells | Gross(m) | Vsh | Vsh (%) | Porosity (%) | F | Swirr (%) | K (Oil) | Sw | Sw (%) | N/G | N/G (%) | Shc (%) | HCPV |
|-------|----------|-----|---------|--------------|-----|-----------|---------|------|--------|------|---------|---------|------|
| Well 7 | 33.86 | 0.49 | 49.0 | 19.1 | 25.7 | 11.1 | 309 | 0.35 | 35.0 | 0.22 | 22.4 | 64.6 | 12.0 |
| Well 2 | 26.77 | 0.49 | 49.0 | 18.7 | 23.9 | 41.7 | 65 | 0.42 | 42.0 | 0.22 | 22.1 | 58.0 | 11.0 |
| Well 9 | 26.32 | 0.49 | 49.0 | 18.7 | 24.4 | 10.97 | 63 | 0.32 | 32.0 | 0.22 | 22.2 | 67.7 | 12.0 |
| Well 11 | 18.20 | 0.49 | 49.0 | 20.3 | 28.1 | 11.13 | 540 | 0.96 | 96.0 | 0.22 | 22.2 | 0.04 | 2.0 |

**Table 2.** Showing the calculated petrophysical parameters for the sand_B

| Wells | Gross (m) | Vsh | Vsh (%) | Porosity (%) | F | Swirr (%) | K (oil) | Sw | Sw (%) | N/G | N/G (%) | Shc | Hcpv |
|-------|-----------|-----|---------|--------------|-----|-----------|---------|------|--------|------|---------|------|------|
| Well 7 | 77.47 | 0.17 | 17 | 13.1 | 50.6 | 15.8 | 18 | 0.68 | 68 | 0.05 | 5.34 | 32 | 4.0 |
| Well 2 | 49.13 | 0.82 | 82 | 14.9 | 40.7 | 37.7 | 80 | 0.38 | 38 | 0.12 | 12 | 62 | 9.0 |
| Well 9 | 31.48 | 0.29 | 29 | 13.1 | 51.9 | 15.8 | 15 | 0.46 | 46 | 0.01 | 10 | 54 | 7.0 |
| Well 11 | 53.59 | 0.17 | 17 | 13.1 | 15.6 | 15.8 | 18 | 0.69 | 69 | 0.05 | 5.34 | 31 | 4.0 |

**Volumetric Estimation**

Deterministic estimation of the volume of hydrocarbon in place (OOIP) involves the application of one or more simple equations that describes the volume of hydrocarbon filled pore space in the reservoir and the way the volume will change from the reservoir to the surface. These simple volumetric equations were used to derive petrophysical parameters, which includes: volume of shale, formation factor, porosity, water saturation, permeability, gross rock volume, net to gross, irreducible water saturation, hydrocarbon pore volume etc. These estimated parameters were then integrated with the results from seismic interpretation to estimate the hydrocarbon reserve of the identified reservoirs. Generally, OOIP is estimated as the product of volume of oil resources and the area covered by oil.

This volume was calculated directly from the volume of oil resources contour map. The area of the map occupied by oil is calculated in sections with respect to the contour intervals. The individual area is then multiplied by the individual contour value to get the individual volumes. Finally, all the individual volumes were added to get the total volume of oil resources in the entire field which is equivalent to the volume of oil in place (OOIP). The unit here is stock tank barrels. The Oil originally in place (OOIP) could also be computed directly using the average value for the net pay thicknesses, average hydrocarbon saturations and average porosity values and substituted in the following equations as shown below:

$$OOIP = (7758 * Aoil * hoil * Sh(oil) * \phi N - D)/B0 \qquad (1)$$

where $Aoil$ is the area occupied by oil, $hoil$ is the average height of the oil column, $Sh(oil)$, the hydrocarbon saturation(oil column) and $B_0$ the Formation oil volume factor = 1.2 bbls/STB. The volumetric reserve estimates of the ''Osaja field'' is summarized in table 3 below.

**Table 3.** Showing oil originally in place (OOIP) in the various wells

| WELLS | Well 2 | Well 7 | Well 9 | Well 11 |
|---|---|---|---|---|
| OOIP(MMbls) | 9.3 | 5.7 | 3.5 | 2.3 |

## Discussion of results

The formation evaluation and reservoir characterisation of ''Osaja Field'' revealed the two major lithological units in the area to be sand and shale. In various parts of the Niger Delta opportunities have been captured at the shallow, intermediate and deep levels represented by sand units [32]. An anticlinal structure was observed on the depth map in the northeast and stretching to the southwest of the study area, dipping towards the southwest. Seven faults labelled F1, F2, F3, F3, F4, F5, F6 and F7 were continuous across the field.

The structural disposition of the four horizons mapped greatly favours the accumulation of hydrocarbon but the poor to fair reservoir parameters obtained from the wells indicate that the economic viability of the field is low. The interval, average, RMS and instantaneous extraction maps from the horizons revealed high amplitude and bright spot areas around the structural highs which coincided with locations where producing wells well 2, well 7, well 9 and well 11 had already been drilled thereby validating earlier interpretations that led to their drilling. Two reservoirs named Sand_A and Sand_B was mapped. The petrophysical analysis of the reservoirs gave the porosity values of reservoir Sand_A as varying between 18.1-20.3% while reservoir Sand_B varies between 13.1-14.9% across the reservoir. The permeability values of the study area ranges from 63-540md at reservoir Sand_A to 18-80md at reservoir Sand_B. Results of this spatial variation of porosity and permeability values across the area revealed that there is a consistent decrease in porosity and permeability of the field with depth. The Sw values for the reservoir ranges from 38-42% in well 2, 35.39-68.79% in well 7, 32.28-45.57% in well 9 and 68.79-96.06% in well 11. The volume of shale ranges from 17-82% across Sand_B to 49% in reservoir Sand_A. The result of original oil in place for all the wells calculated shows that well 2 has the highest value with 9.3mmbls. In conclusion, the result of the seismic interpretation and petrophysical analysis shows that the reservoirs under consideration have a poor to fair hydrocarbon (oil) prospect.

Information extracted from the integration of the 3-D seismic data volume and the well logs shows a better understanding of the structural style, architecture and accurate delineation of reservoir units in the study area. The lithologic units are consistent across the wells, while the increasing trend of the thickness of the shale units and high sand to shale ratio across the reservoir is indicative of the Agbada Formation [33]. The time and depth maps generated shows that the most dominant traps in the field are the crestal synthetic faults (F1, F2, F3, F4, F7) which forms rollover anticlines trending north-east – southwest while $F_5$ and $F_6$ are antithetic faults. The presence of these faults around the structural highs of the field is an indication that the geometry of the reservoir is good for a possible hydrocarbon accumulation as seen from the well logs acquired from the four wells drilled [33]. The results of this study is in line with several key studies which applied 3-D

interpretation and advanced visualization in geologicaly interpretation of structural and stratigraphic features [34-40]. Generally, the structural style of the study area is dominated by simple rollover anticlines and collapsed crest faults which is in line with previous studies in the Niger delta [12, 21-22, 32]. The subsurface of the Niger Delta basin is extensively deformed by growth fault structures and roll over anticlines [21]. For any given depobelt, gravity tectonics were completed before deposition of the Benin Formation and are expressed in complex structures, including shale diapirs, roll- over anticlines, collapsed growth fault crests, back-to-back features, and steeply dipping, closely spaced flank faults [12, 21, 34]. These faults mostly offset different parts of the Agbada Formation and flatten into detachment planes near the top of the Akata Formation. Certainly the reservoirs are not uniform, they have variable porosity, permeability, and may be compartmentalized with fractures and faults breaking them up and complicating fluid flow, therefore more wells should be drilled around the anticline with core sample analysis to improve estimation of the reserve and reduce uncertainty.

Analysis of the well logs revealed that the reservoirs have a roughly cylindrical log motif suggesting distributary channel depositional environment. The petrophysical results of the wells (table 2) show fair porosity despite high $V_{sh}$ (shaliness) cut offs. Similarly, it was observed that porosity and permeability decreases with depth, which is believed to be due to compaction resulting from over burden. The interaction of the resistivity, porosity and density logs revealed that the reservoirs are more of gas bearing zones which is further proven by the increase in gas to oil ratio as we move basin ward. The bulk volume water of the reservoir units are not constant across the wells indicating a variation in water saturation and irreducible water ($s_w > s_{wr}$) across the study area. Geologically this shows that the reservoirs may not produce water free hydrocarbons. The reserve estimates revealed that the reservoirs are not economical; they have fair to poor porosities and permeabilities and with an average hydrocarbon saturation across the study area less than 50%.

**Conclusion**

The formation evaluation and reservoir characterisation of ''Osaja Field'' revealed a shale/sand sequence. The 3-D seismic interpretation of the study area revealed that the structural style is dominated by simple rollover anticlines and collapsed crest faults which is in line with previous studies in the Niger delta. Certainly the reservoirs are not uniform; they have variable porosity, permeability, and may be compartmentalized with fractures and faults breaking them up and complicating fluid flow, therefore more wells should be drilled around the anticline with core sample analysis to improve estimation of the reserve and reduce uncertainty. The structural disposition of the four horizons mapped greatly favours the accumulation of hydrocarbon but the poor to fair reservoir parameters obtained from the wells indicate that the economic viability is low. In conclusion, the result of the seismic interpretation and petrophysical analysis shows that the reservoirs under consideration have a poor to fair hydrocarbon (oil) prospect.

**Acknowledgement**

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