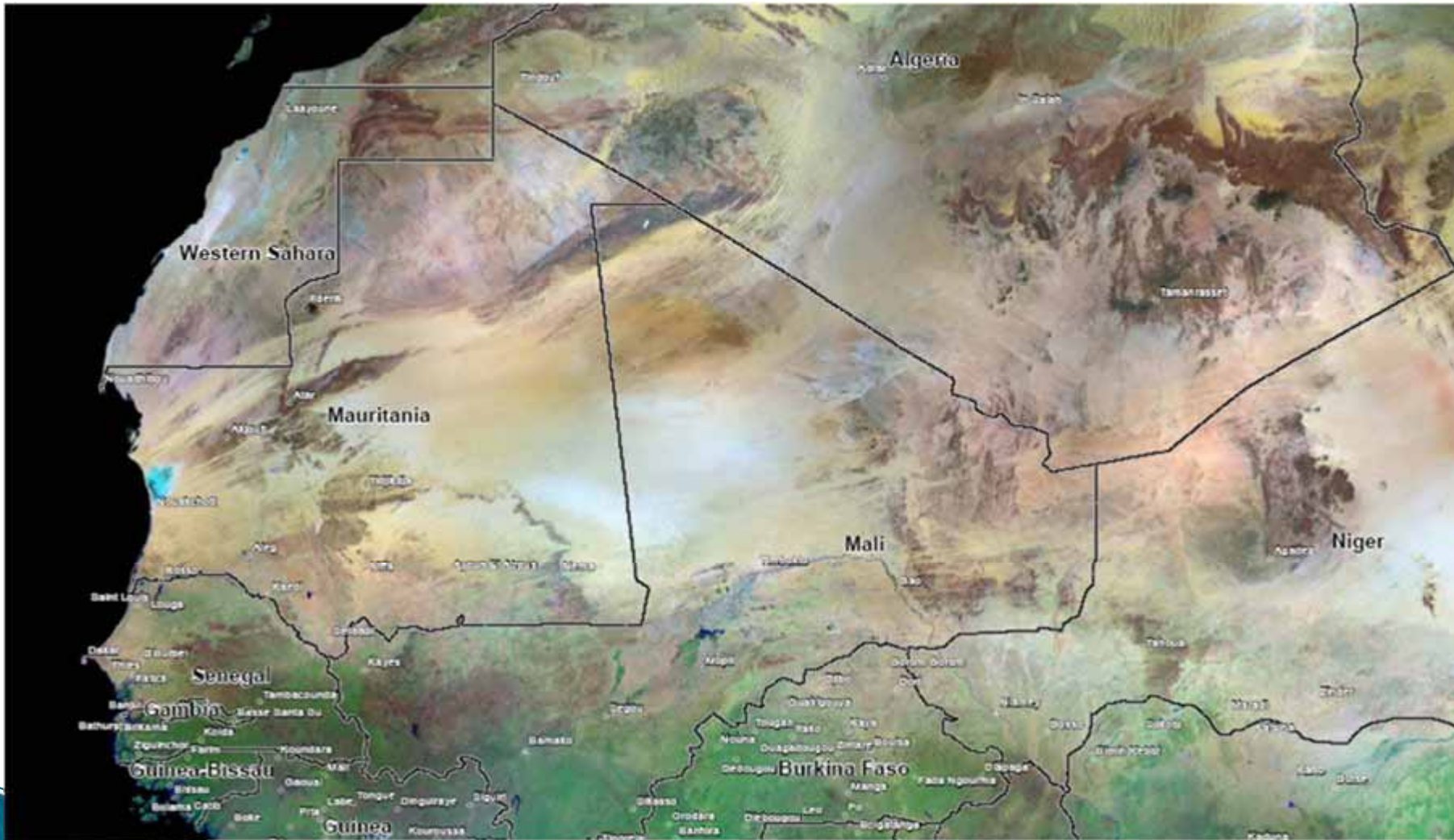


SENEGAL BASIN CURRENT STATE OF EXPLORATION & OPPORTUNITIES



*A.H. Wane
Exploration Advisor
Petrosen*





LOCATION



AREA : 196 192 KM2

POPULATION : ~12 000 000 hbts

DENSITY: 51 h / Km2

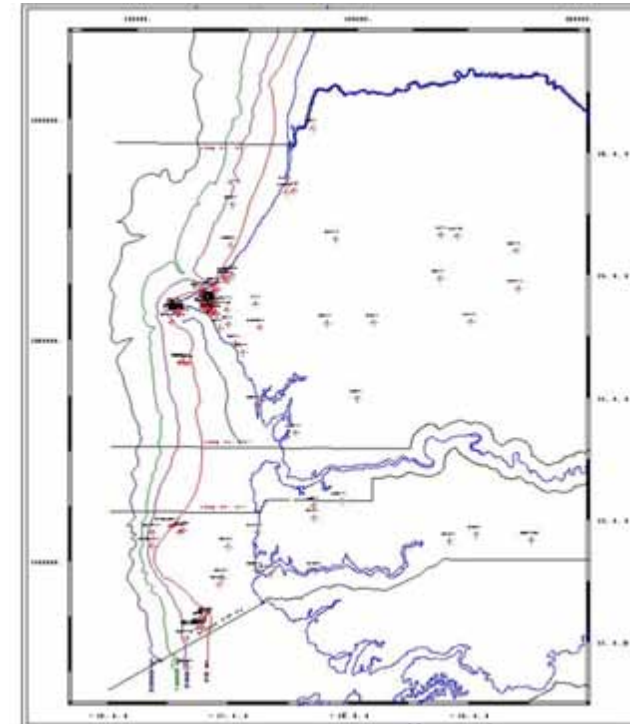
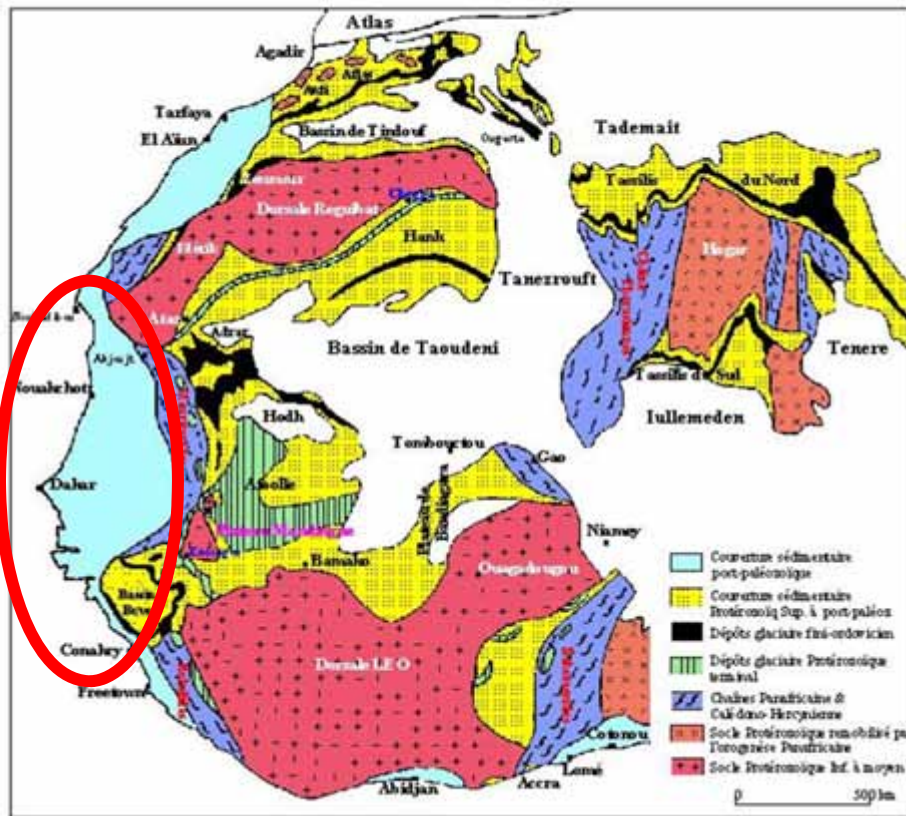
GNP : 1110 \$

Dakar



NW African coastal basin
the MSGBC

Mesozoic-Cenozoic
passive margin basin
overlying a Paleozoic basin



**Mesozoic-Cenozoic
Passive margin Basin
overling a Paleozoic basin**

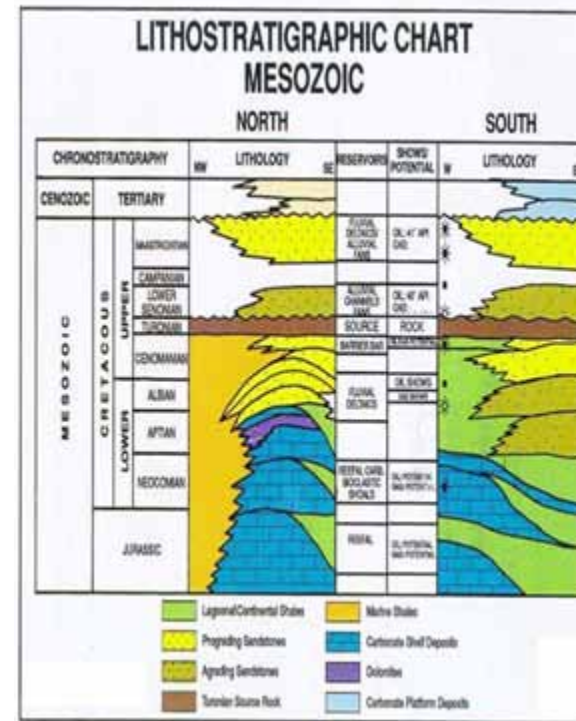
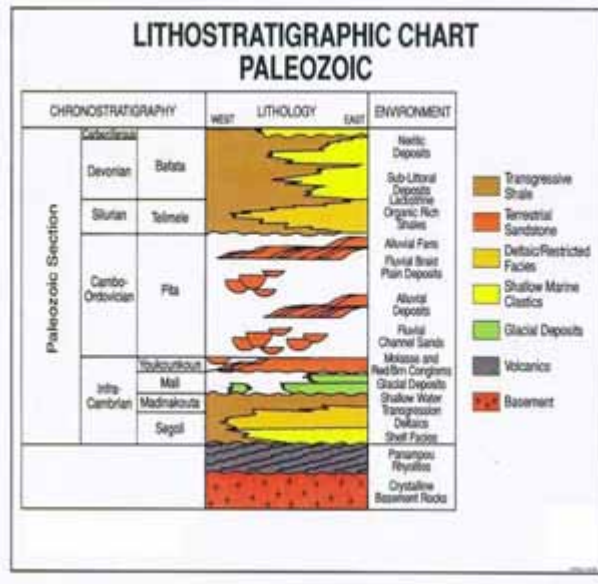
Post-rift stage
Mid Jurassic-Actual

Syn-rift stage
Permo Triassic- lower Jurassic

Pre-rift stage
Upper Proterozoic-Paleozoic

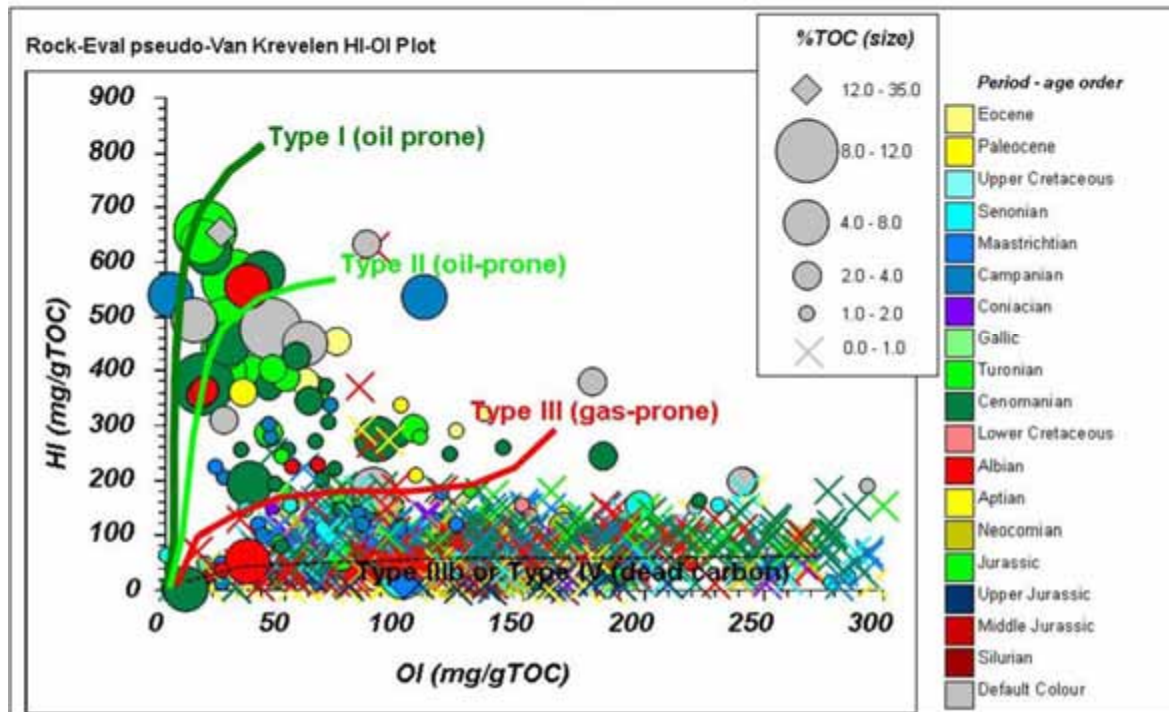
STRATIGRAPHY		LITHOSTRATIGRAPHY	THICKNESS (m)	LITHOLOGY
CENOZOIC				
MESOZOIC	CRETACEOUS	MAASTRICHTIAN	200-1250	SANDSTONE, SHALE & SAND
		CAMPANIAN	100-450	SHALE & SAND
		L. SENONIAN	150-1000	SANDSTONE
		TUROONIAN	50-150	SHALE
		CENOMANIAN	150-950	LIMESTONE, SANDSTONE SHALE & SAND
		ALBIAN	200-1200	LIMESTONE, SANDSTONE SAND & SHALE
		APTIAN	150-1400	ANHYDRITE, LIMESTONE SANDSTONE, SAND & SHALE
	HEDCOMIAN	300-1200	LIMESTONE & SHALE	
	JURASSIC	MALM & DOOGER	1- 2000 †	LIMESTONE & DOLOMITE
		LIAS		
TRIASSIC		200-1500	SALT & ANHYDRITE	
PALEOZOIC	PERMIAN	200-1500 †	SHALE & SANDSTONE	
	DEVONIAN	350	SANDSTONE, GILSTONE & SHALE	
	SILURIAN	350	SHALE & SAND	
	ORDOVICIAN	300-1000	CONGLOMERATE, SANDSTONE & QUARTZITE	
	CAMBRO- ORDOVICIAN	500-3000	SANDY CONGLOMERATE	
	PROTEROZOIC	2000 - 4000	CONGLOMERATE, SHALE SANDSTONE, LIMESTONE & DOLOMITE	
ARCHEAN		BASEMENT		

RESERVOIRS & SEALS



- **Ordovician sandstones** : no primary porosity, but intensely fractured, good secondary reservoirs having excellent deliverability
- **Devonian sandstones** : fine to coarse grained, often oolitic with porosities ~ 15% - 20%.
- **Upper Devonian shales**

- **Upper Tertiary shaly sequences**
- **Lower Tertiary clastics and carbonates**
- **Upper Cretaceous sands and shale sequences**
- **Jurassic - lower Cretaceous carbonate section**



Best source rocks
Cenomanian-Turonian and Albian

- in CM-7
Cenomanian level at 2608m with

TOC = 8.72 %
HI = 660 mg/g

- in CM-10
Turonian level at 2554 m with

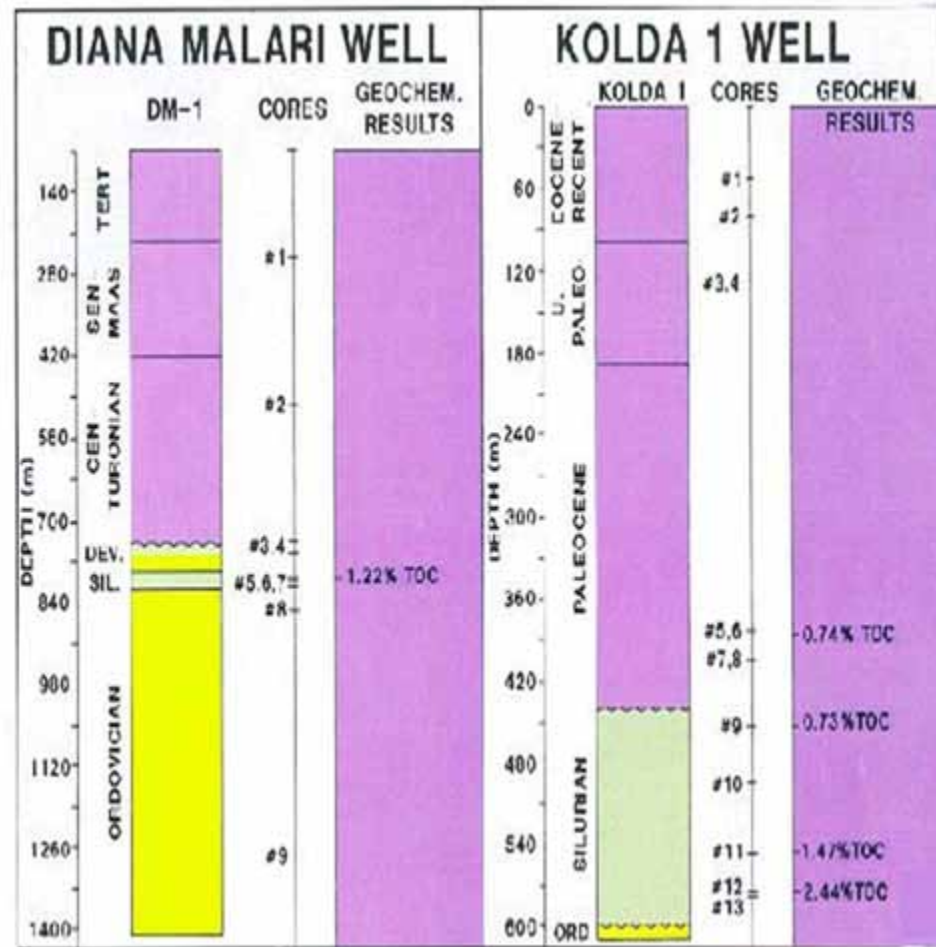
TOC = 5.25 %
HI = 638 mg/g

Silurian shales :

best regional source rocks

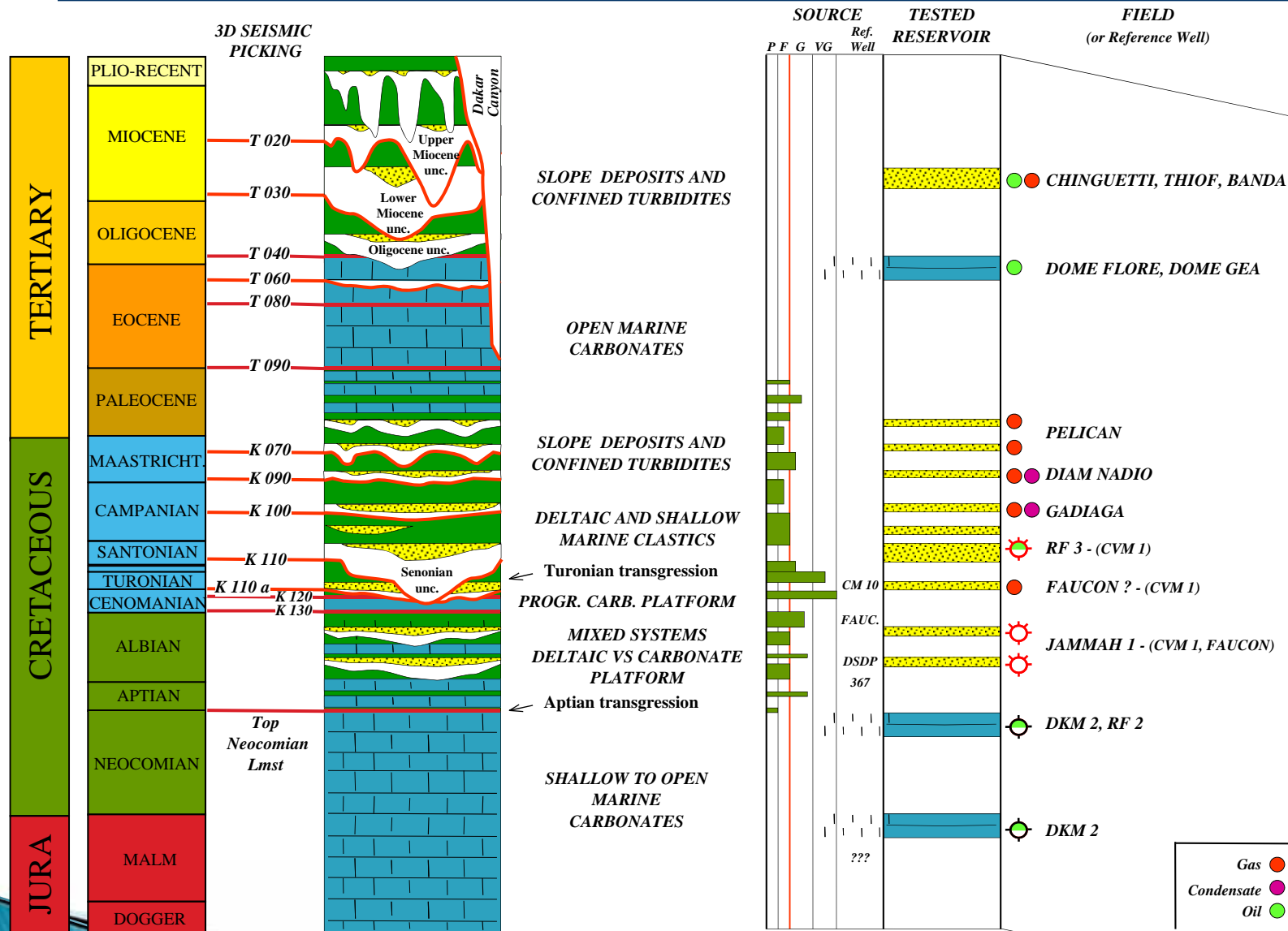
TOC ~ 1% - 3%

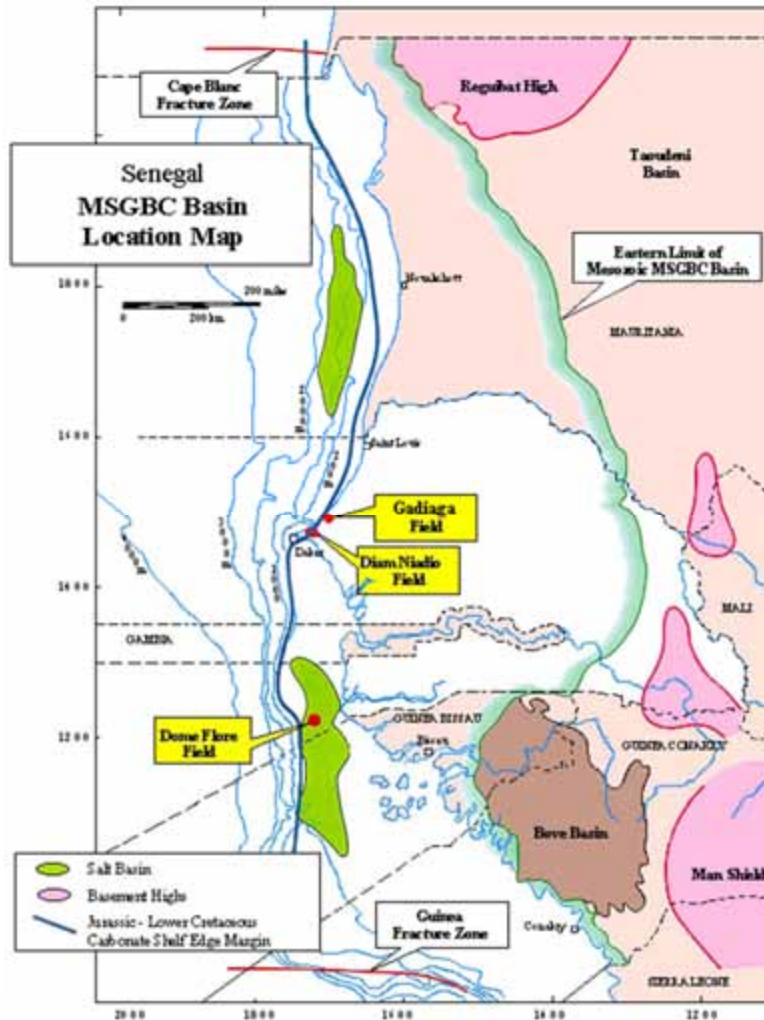
Ro ~ 0.95 - 1.3





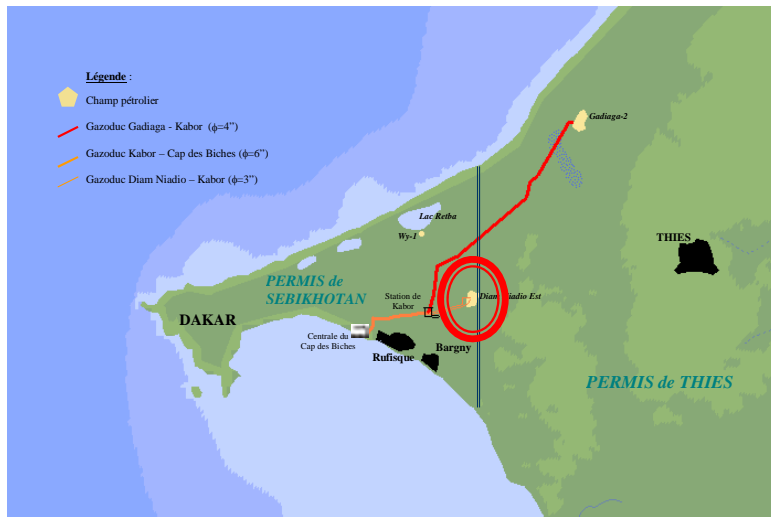
HYDROCARBON SHOWS MSGBC





- Diam Niadio field
- Gadiaga field
- Dome Flore & Gea fields

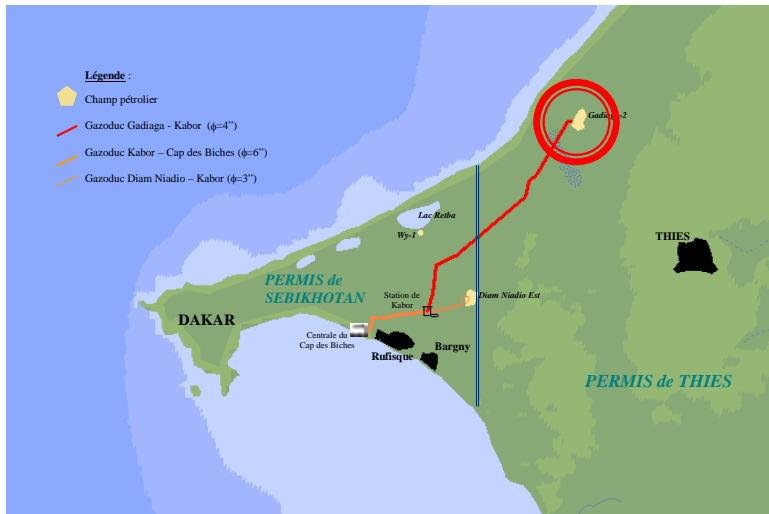
Diamniadio field



- 217 393 033 Nm³ (7.6 Bcf)
1987 - 2000

- 62 642 bbs light oil 34 API
- 35 692 bbls condensate

Gadiaga field



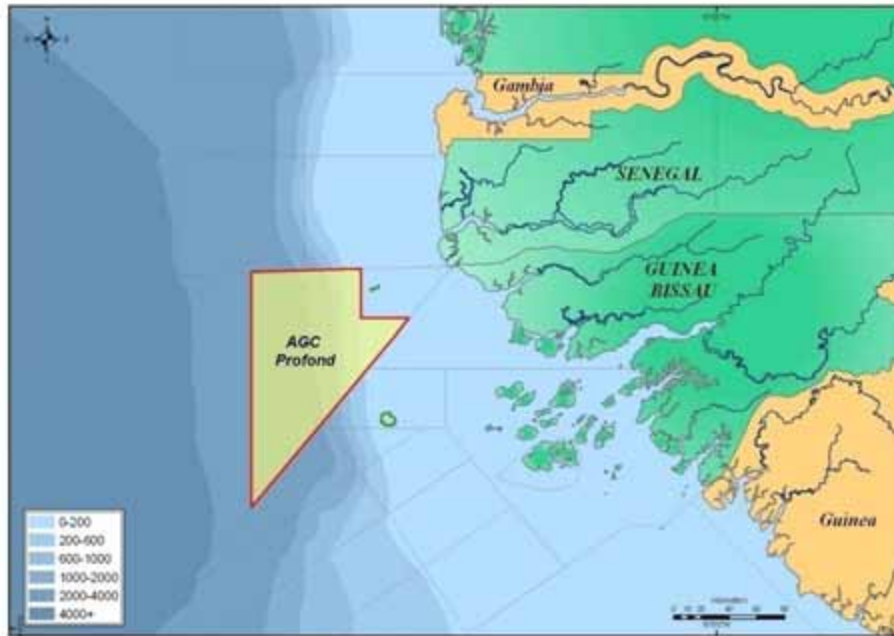
producing since Oct 2002

3.29 Bcf at end 2009

ANNEE	PRODUCTION DE GAZ (Nm ³)	CUMUL (Nm ³)
Octobre 2002	3 379 431	3 379 431
2003	12 637 561	16 016 992
2004	15 101 900	31 118 892
2005	15 936 769	47 055 661
2006	12 225 816	59 281 477
2007	10 865 236	70 146 713
2008	6 796 073	76 942 786
2009	17 069 894	94 012 680

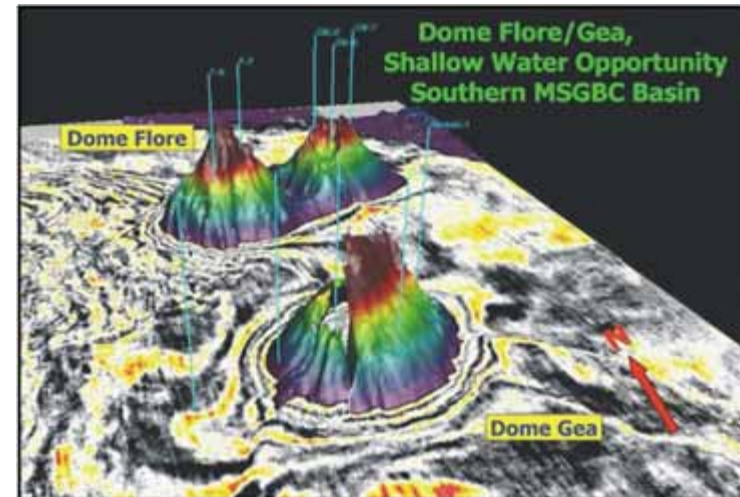


DOME FLORE & GEA

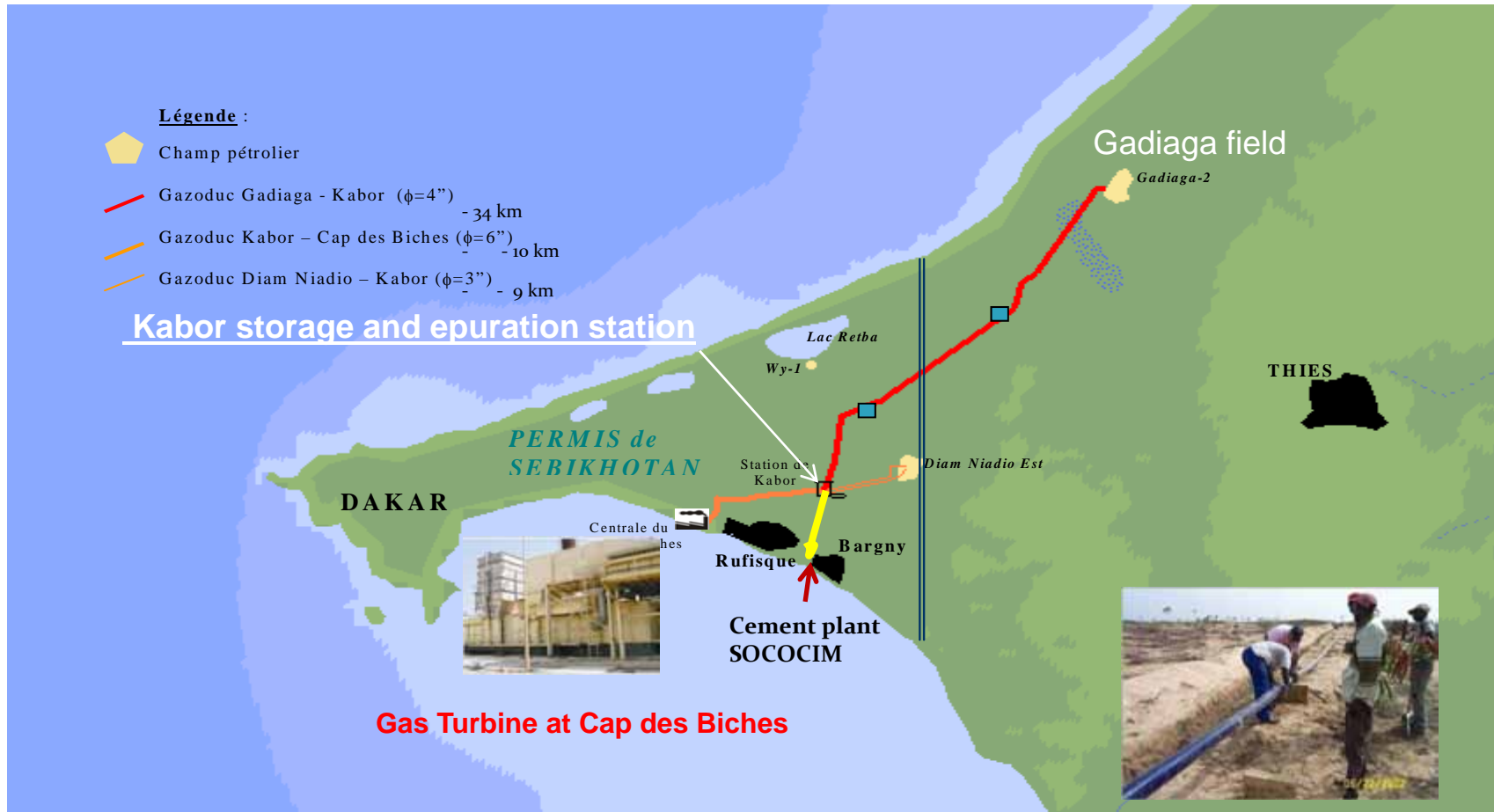


Heavy Oil in Oligocene limestones
(10 – 13 API ~ 1Bbls)
Light Oil Maestrichtian
(33 API)
Oil shows in Miocene & Albian sands

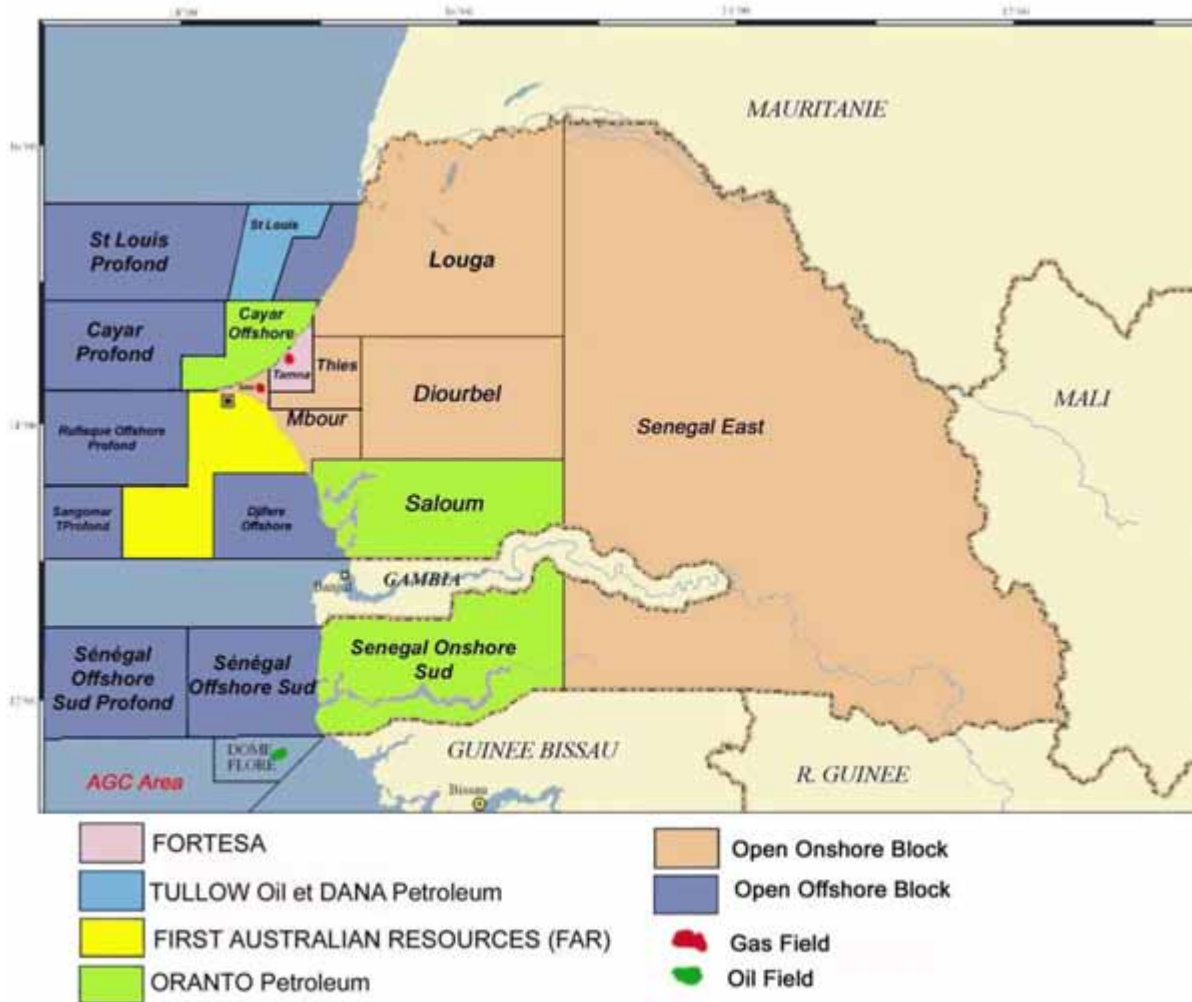
Flore & Gea fields



GAS TRANSPORT NETWORK



CONTRACT AREAS

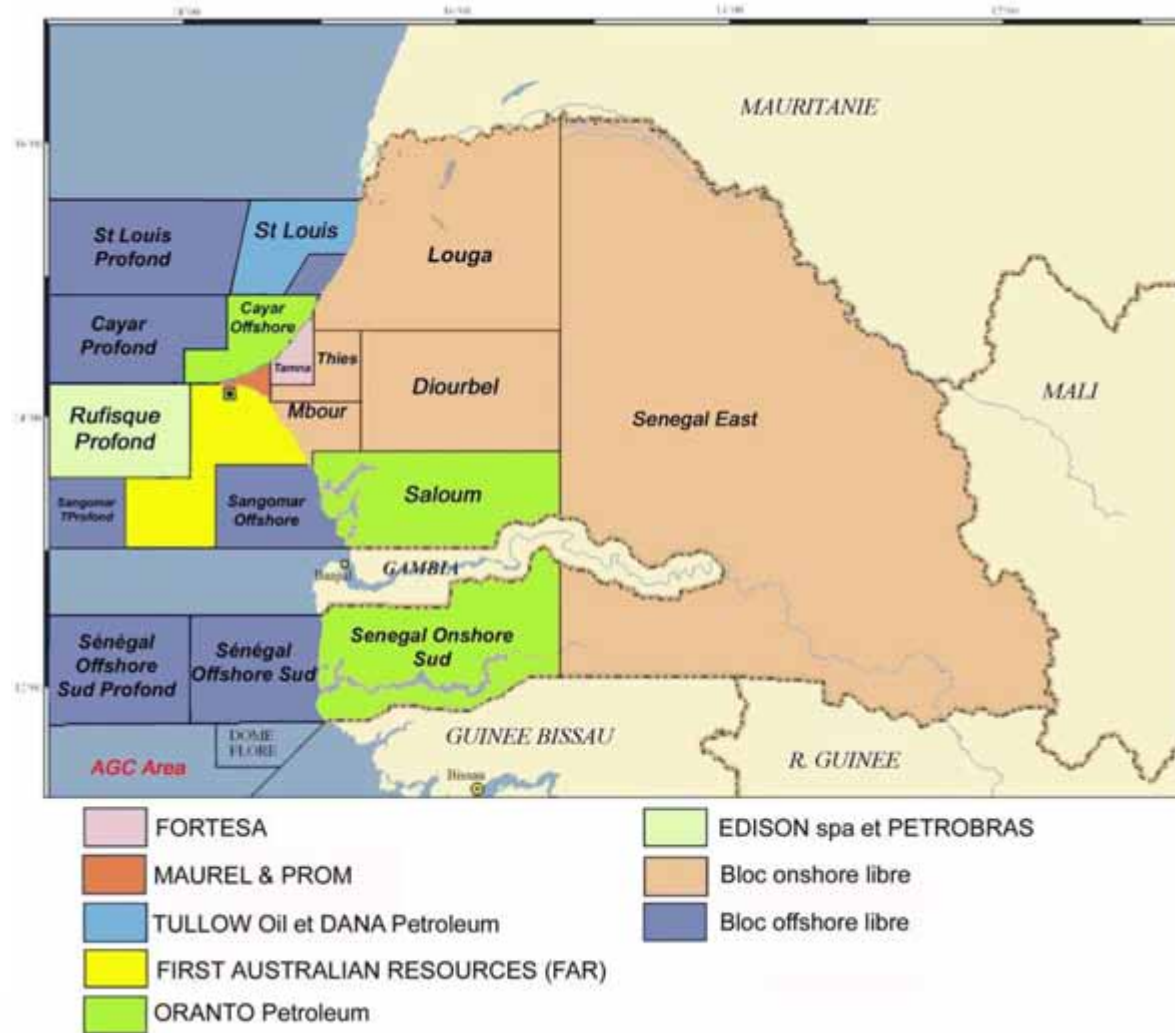


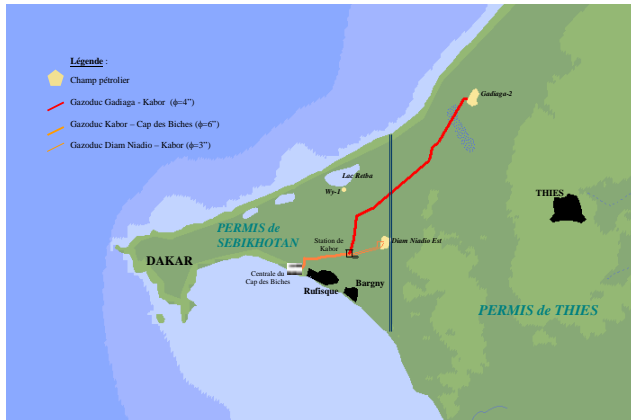
- 3 PSCs offshore

- 3 PSCs onshore



REVIEW OF RECENT EXPLORATION ACTIVITIES





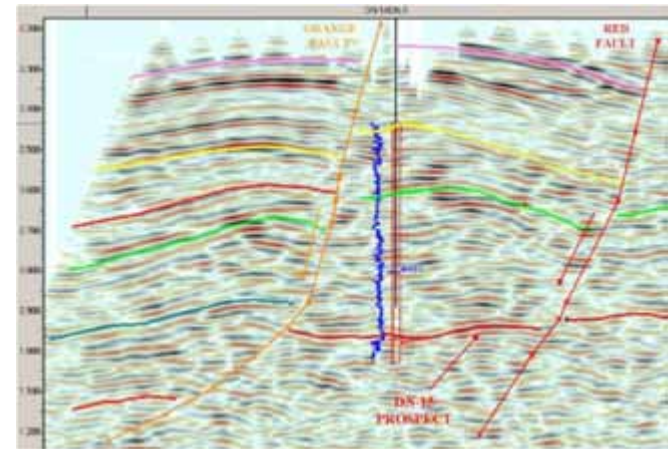
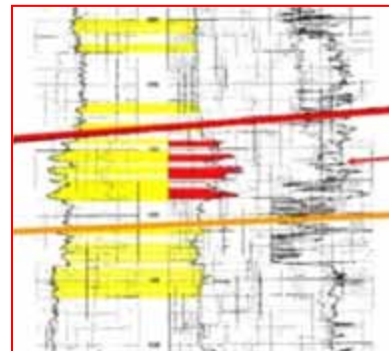
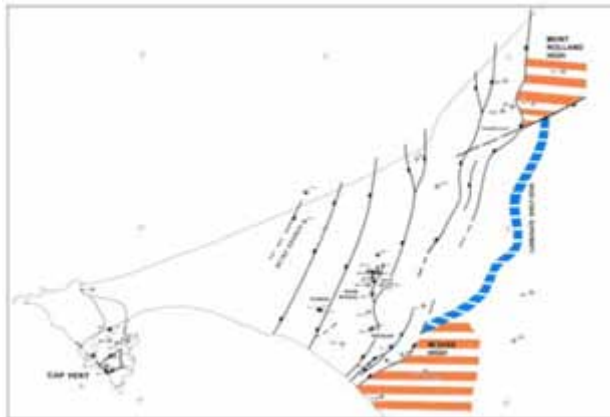
Avril 2003

Diamniadio & Kabor fields : 7.6 Bcf

DN-15B in 2006

Konkorong-1 en 2009

Just relinquished



TAMNA PERMIT AREA

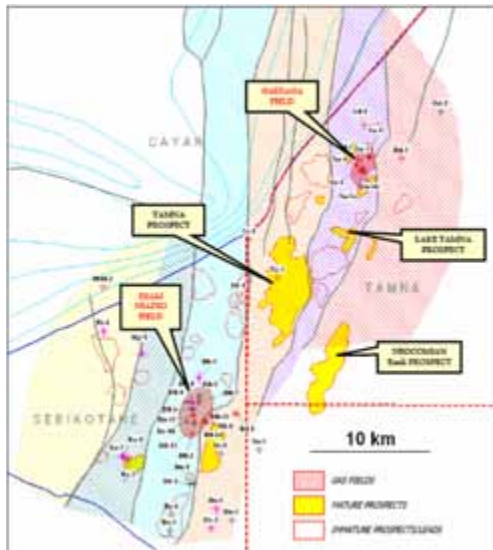


October 2006

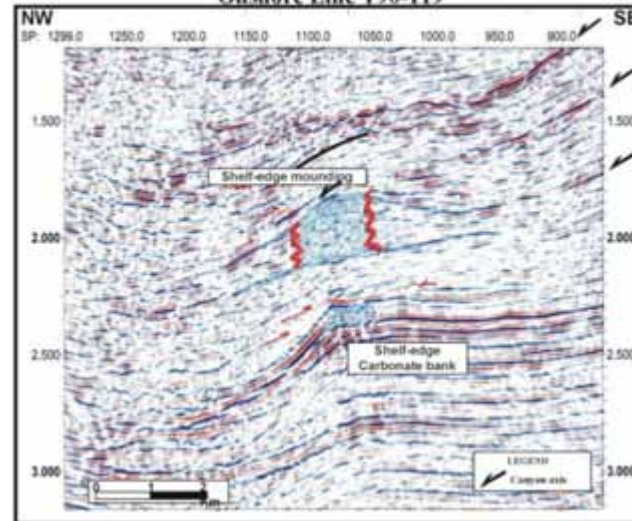
7 wells drilled the last two years

Production from Campanian & Lower Senonian sands

- ~64 000 Nm³ to Sococim cement plant
- ~ 300 000 Nm³ / day possible delivery
- ~ estimated reserves 18 Bcf



Carbonate Bank Build-up With Reefal Mounding
Onshore Line T90-119



SAINT LOUIS offshore

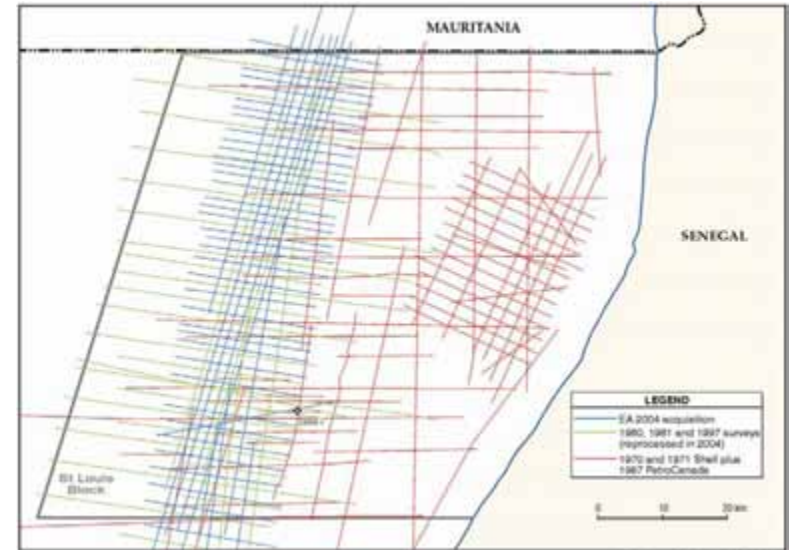
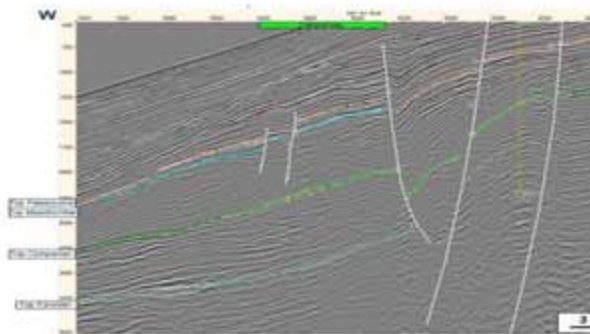
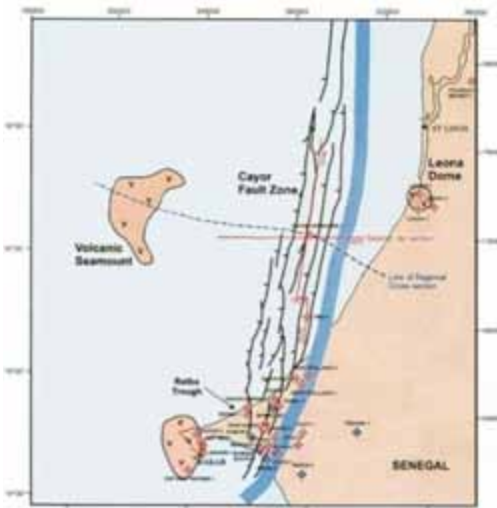


granted 2003

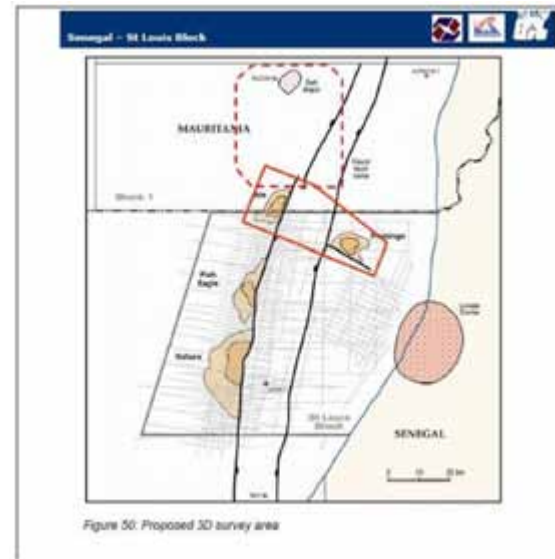
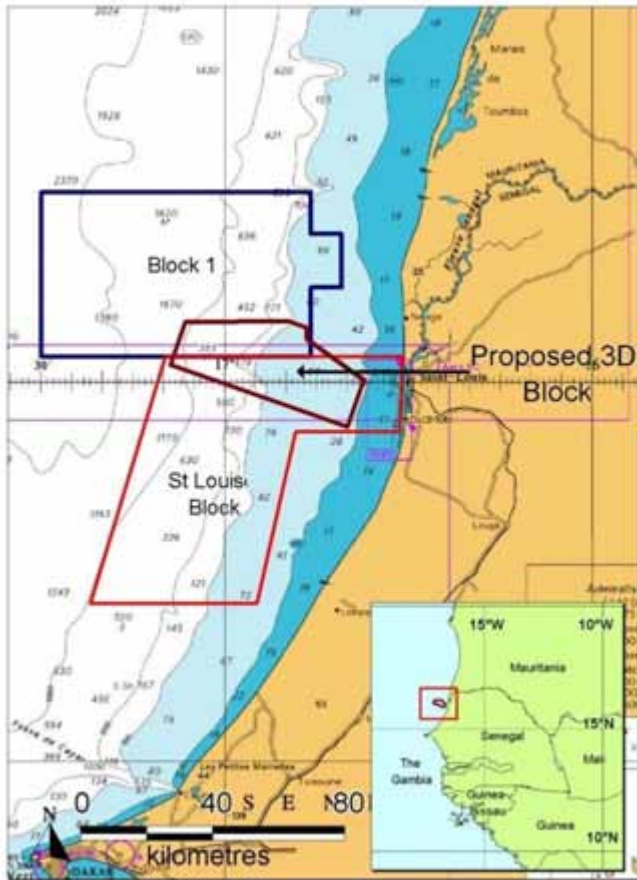


- Structural/Stratigraphic traps west of the Cayar fault zone;
- Structural traps within the Cayar fault zone;
- Turbidites/mas flow deposits west the Cayar fault zone

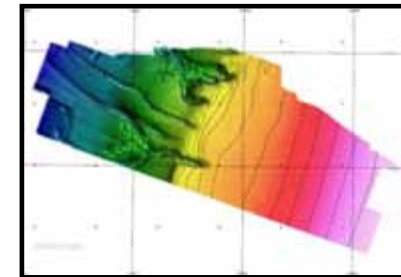
1200 km 2D *Juillet 2004*



SAINT LOUIS offshore



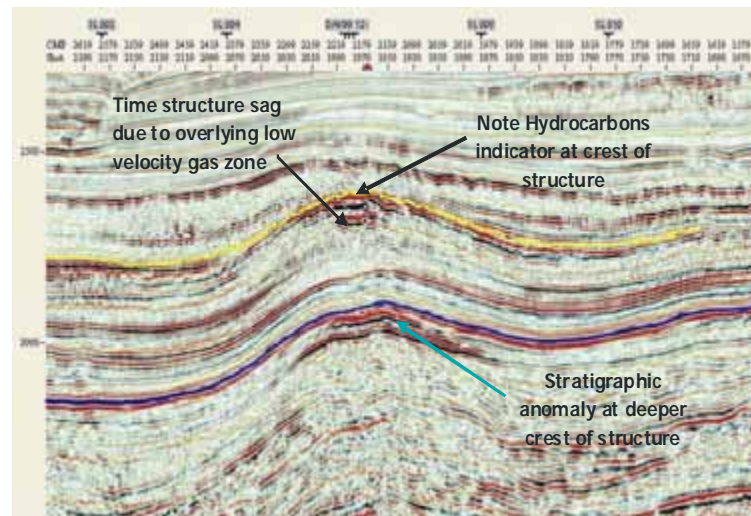
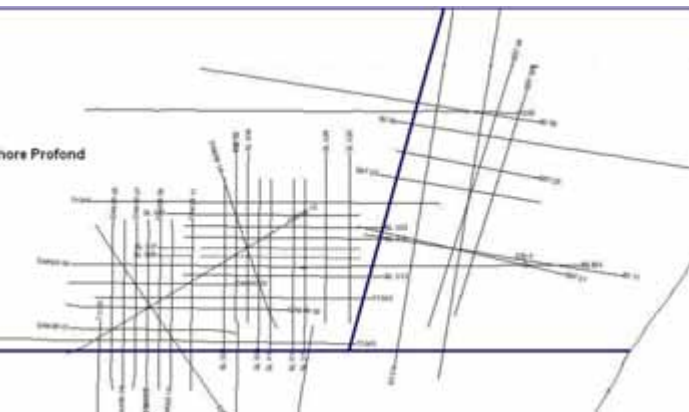
Acquisition 620 km² of 3D in March-April 2008
Ibis & Flamengo leads



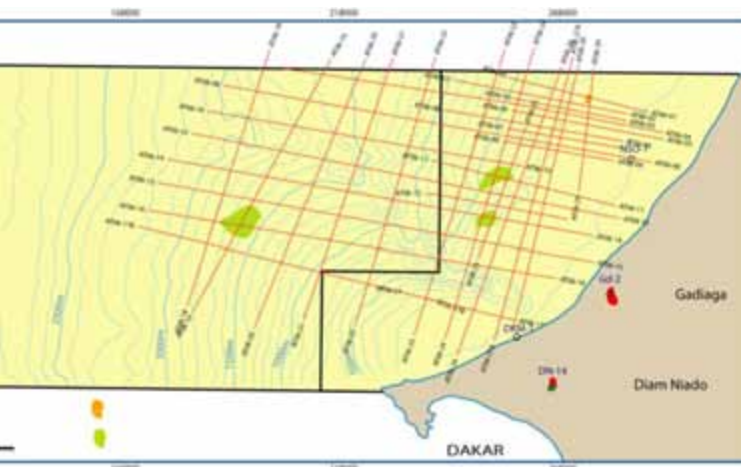
SAINT LOUIS offshore profond



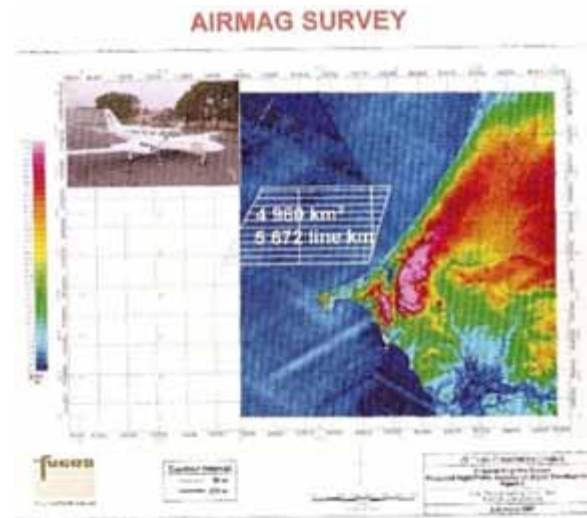
- 1500 Km 2D
- high frequency airmag survey
4225 Km²
5695 line Kms
- Satellite seep study
- economic evaluation
(1.5 TCF)



CAYARS offshore blocks

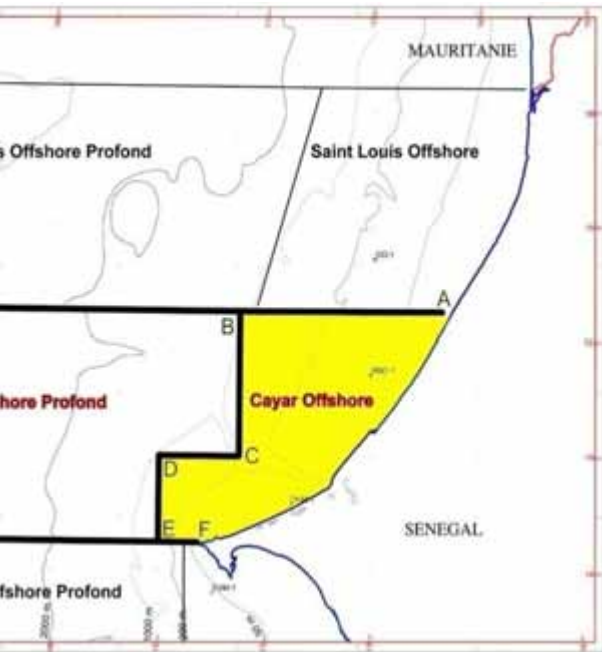


590 km 2D on March 2006



Airmag survey March 2007

CAYAR offshore



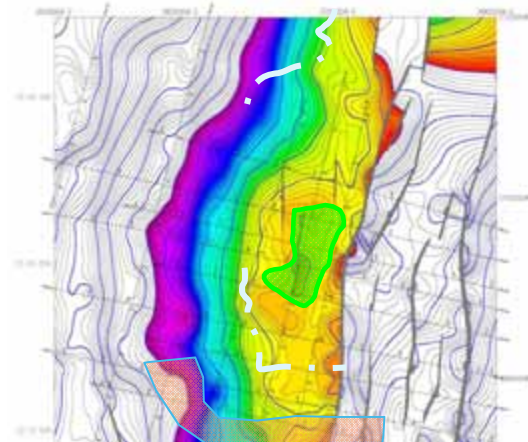
- Work Program first period (3 years) : 500 sq km 3D

ember 2008

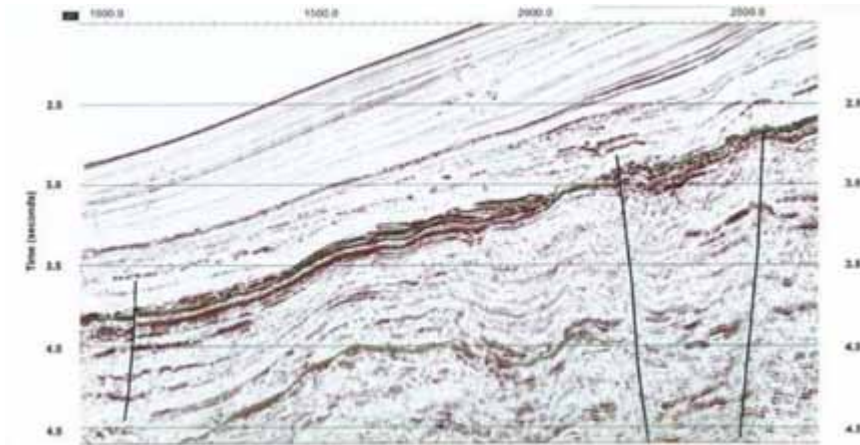
GAINDE PROSPECT

TOP MAASTRICHTIAN DEPTH MAP

Average WD : 200m
Width : 2.5 - 6.5 km



CAYAR offshore profond



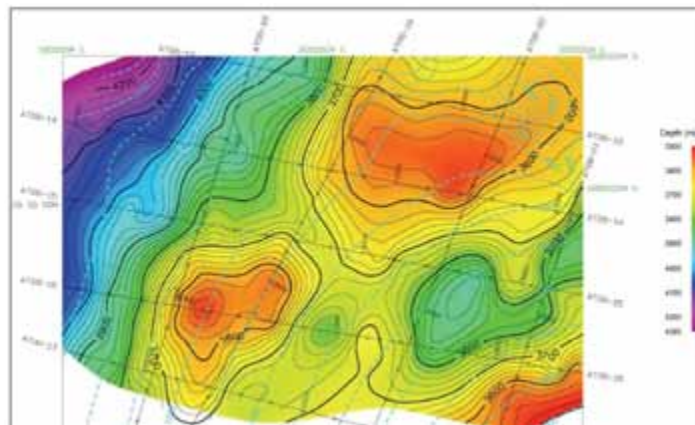
Cretaceous plays

spects

lem (116 km²)

Guelem (114 km²)

Average WD : 1700m
Main target : Cretaceous
Width : 9.5 km

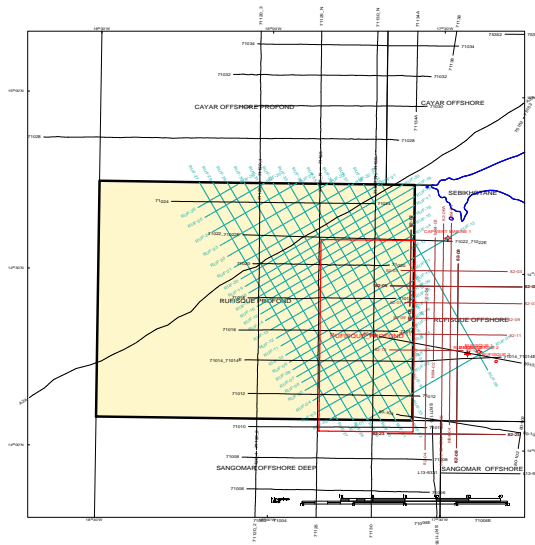


RUFISQUE offshore profond

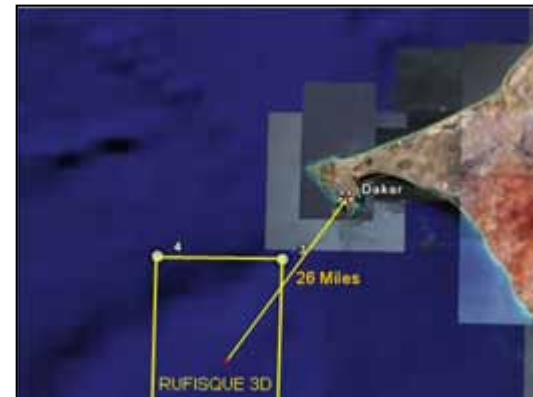


st 2004

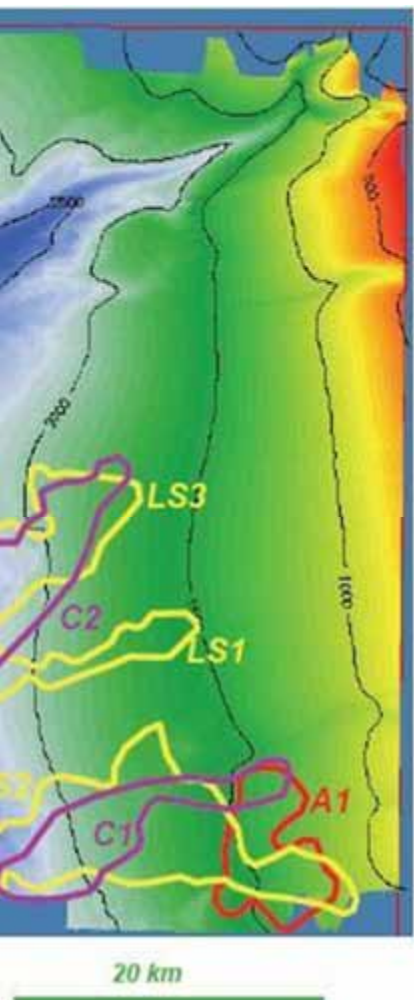
2088 Km 2D Dec 2004



1500 km2 3D Feb 2007

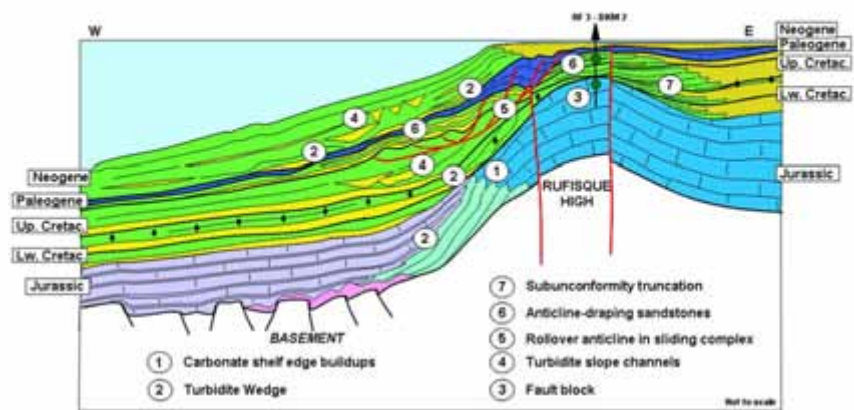


RUFISQUE offshore profond



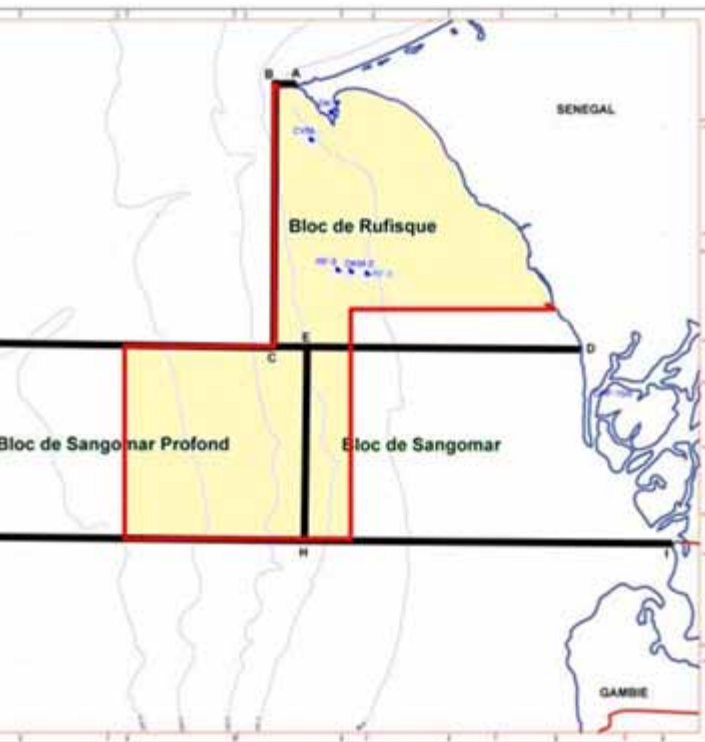
- Leads du Campanien
- Leads du Sénonien Inf.
- Leads de l'Albien

SCHMATIC PLAY CONCEPT
IN DEEP-WATER SENEGAL MARGIN



Just relinquished

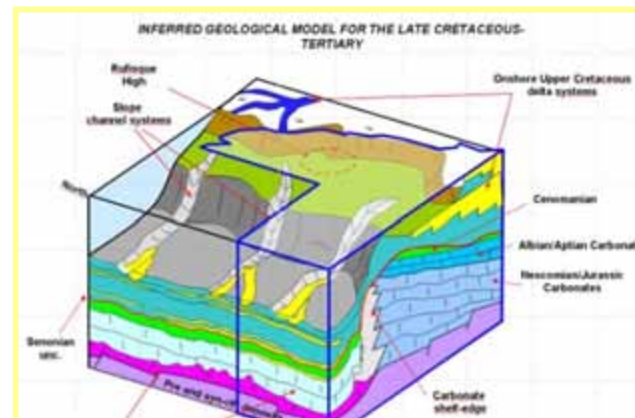
SANGOMAR - RUFISQUE



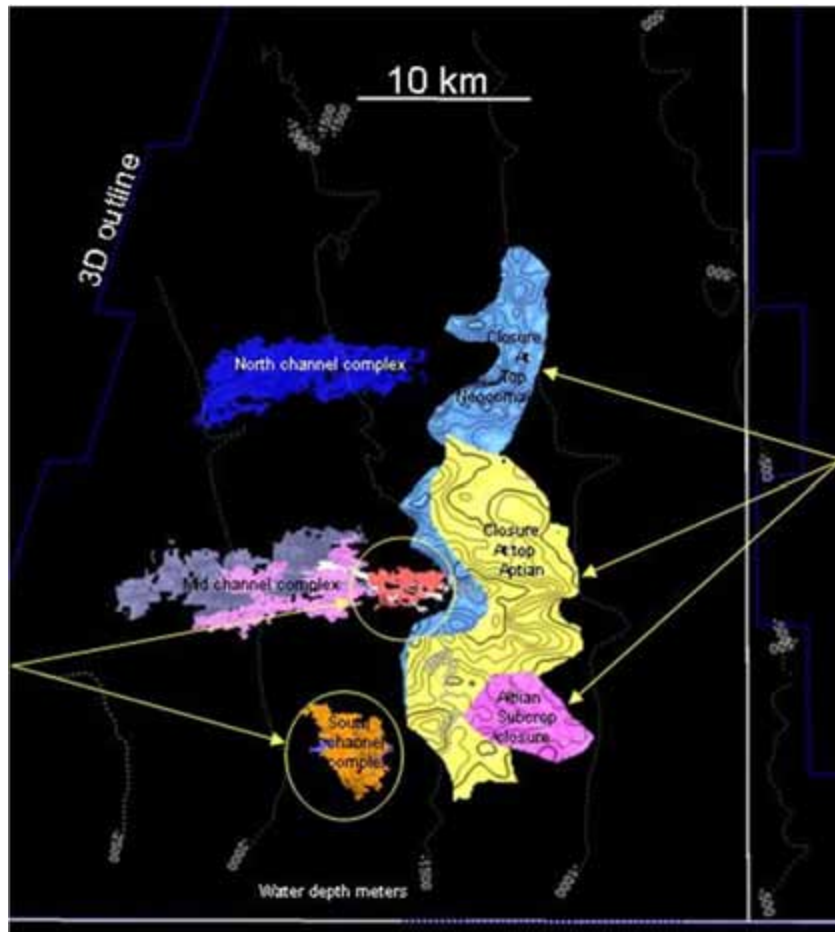
November 2004



2050 km² 3D



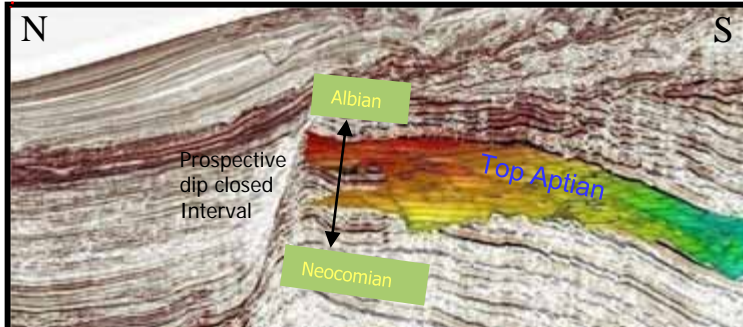
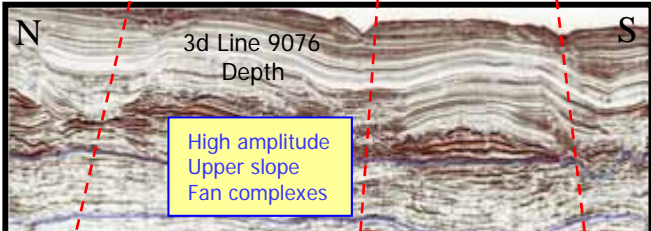
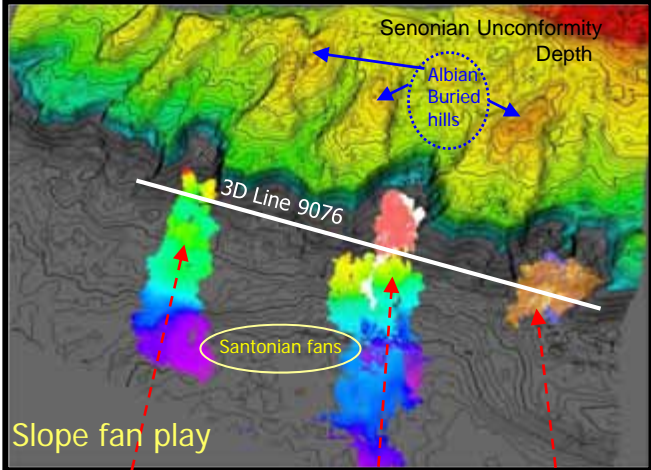
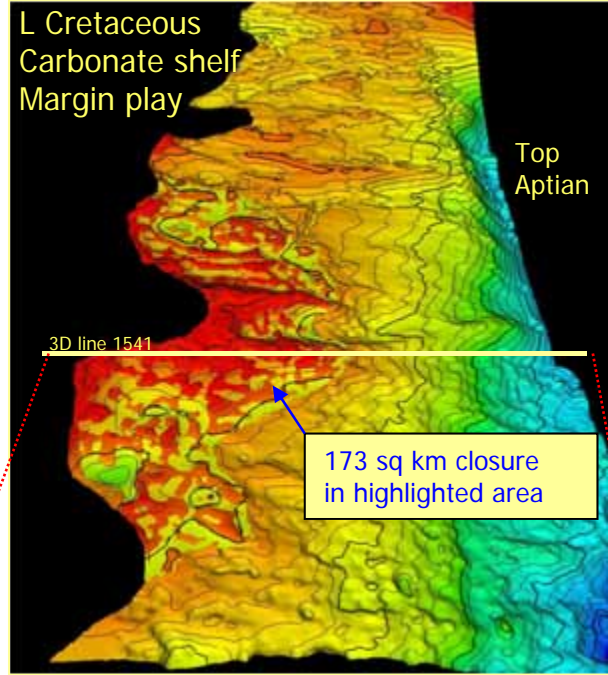
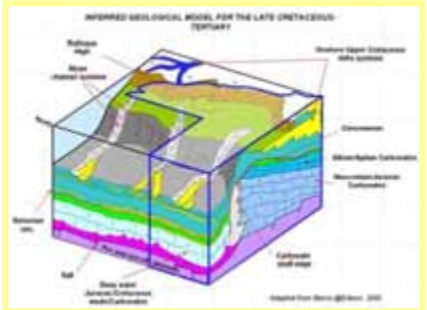
PLAYS & LEADS



Lower Cretaceous
Carbonate shelf margin
Structural closures

n upper slope
ans
amplitudes

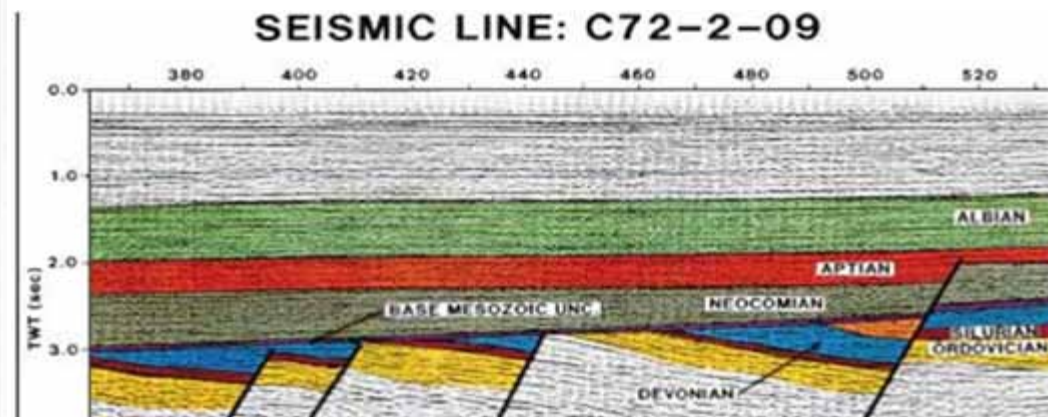
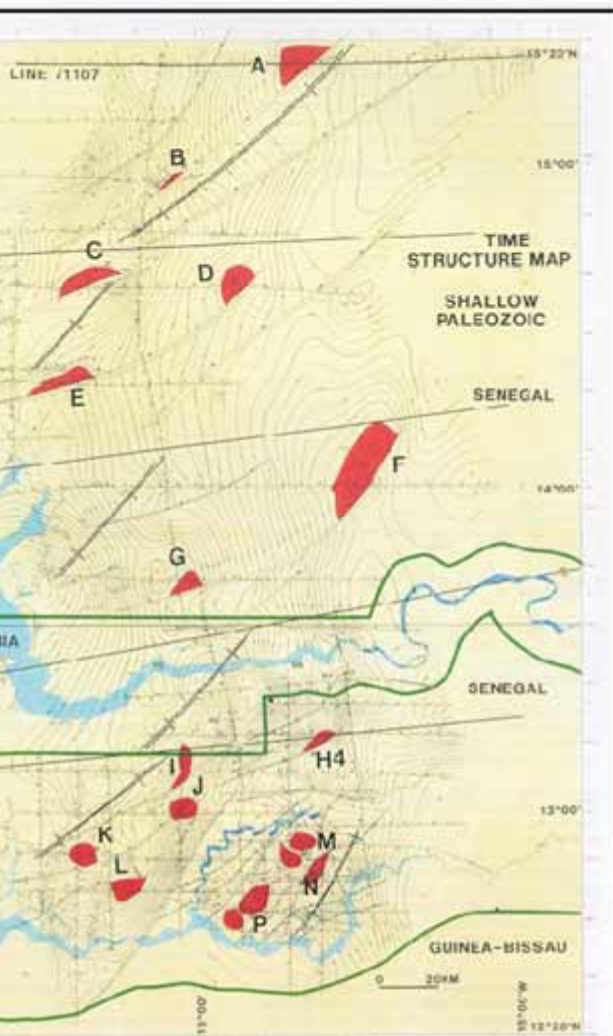
need partners



PALEOZOIC BASIN

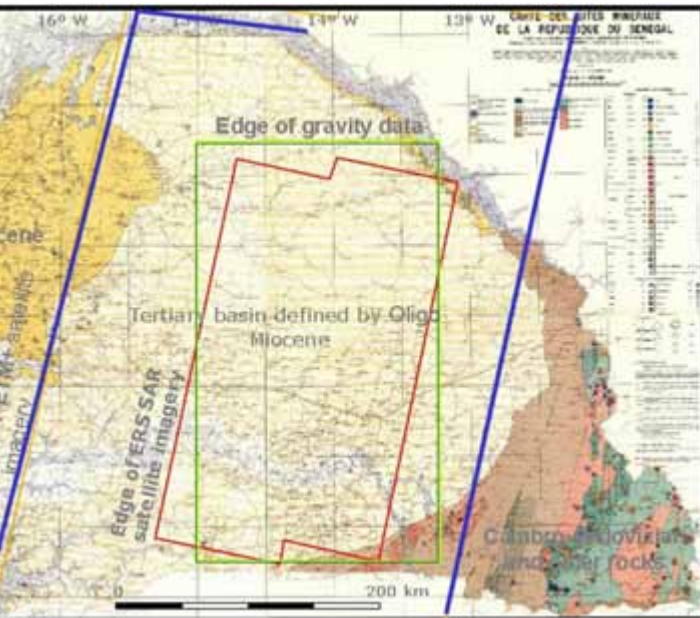


PALEOZOIC BASIN



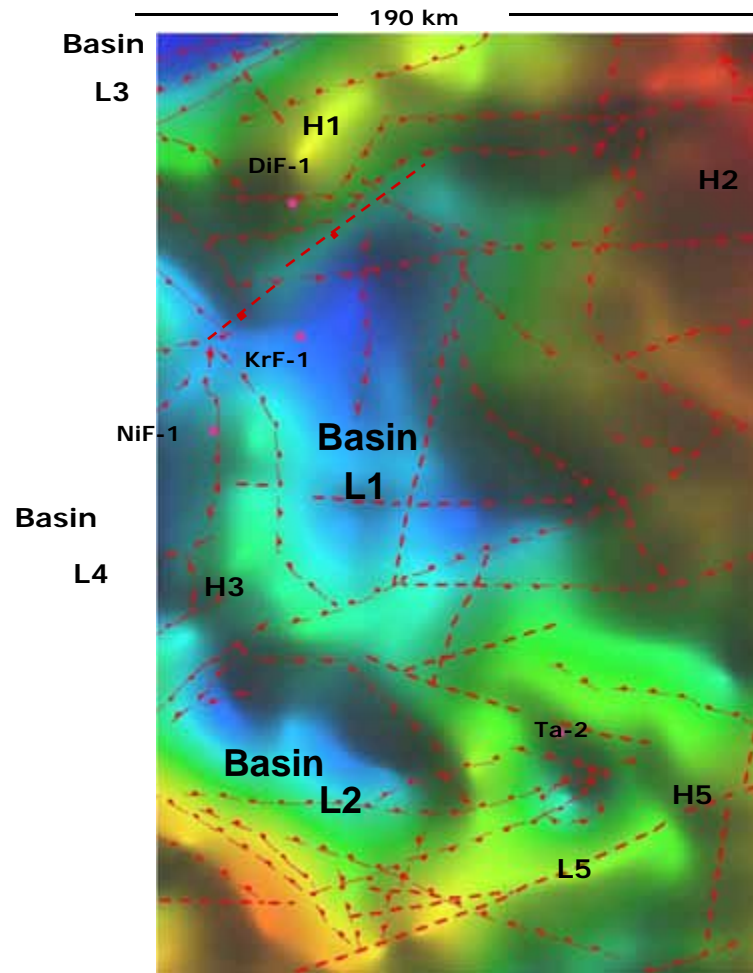
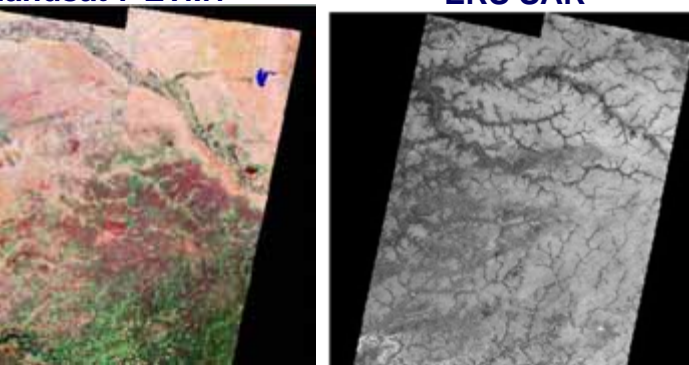
SENEGAL EAST AREA

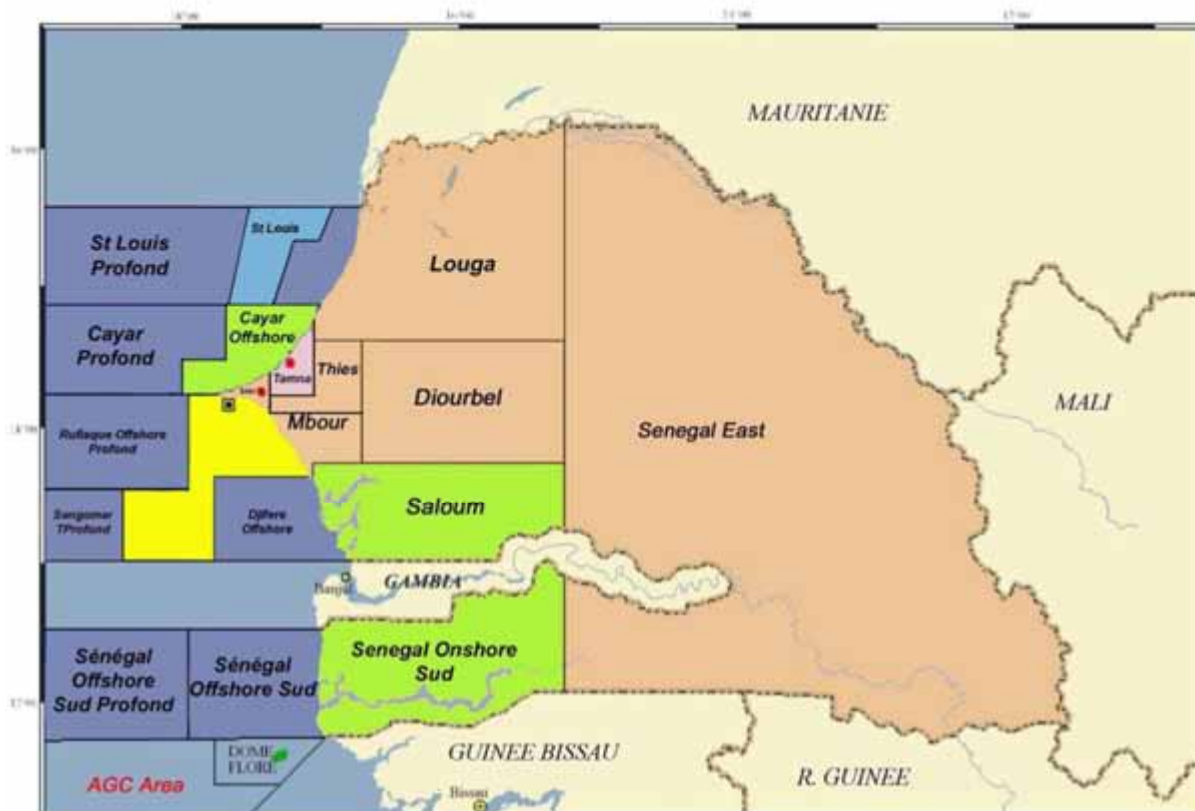
2 bassins L1 et L2 identified











landsat 7 ETM+

ERS SAR





- | | | | |
|-------------------------------------------------------------------------------------|----------------------------------|-------------------------------------------------------------------------------------|---------------------|
|  | FORTESA |  | Open Onshore Block |
|  | TULLOW Oil et DANA Petroleum |  | Open Offshore Block |
|  | FIRST AUSTRALIAN RESOURCES (FAR) |  | Gas Field |
|  | ORANTO Petroleum |  | Oil Field |

PETROLEUM LEGISLATION



LEGAL AND FISCAL TERMS

LAW N° 98-05 of January 08, 1998 (PETROLEUM CODE)

- PRODUCTION SHARING CONTRACT (PSC)

EXPLORATION

- Initial Period: 3-4 years
- Renewal Periods: 2-3 years

EXPLOITATION PERIOD

- Initial Period: 25 years
- Extension Periods: 10+10 years

EXPLORATION WORK PROGRAM & EXPENDITURE OBLIGATIONS

to be negotiated

RETENTION PERIOD

If a discovery is certified non commercial, Contractor may be granted a Retention Period of maximum:

- **3 years** for crude oil
- **8 years** for natural gas



PETROSEN PARTICIPATION

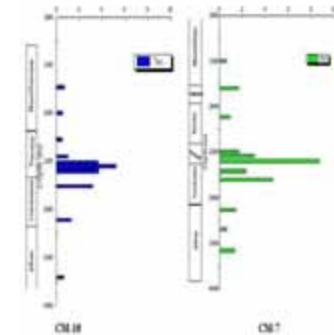
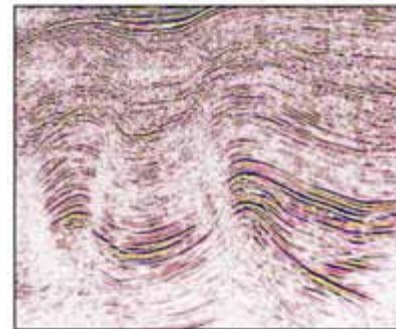
- Exploration phases: Carried Interest of 10 %
- After Commercial discovery: Working Interest up to 20 %

FISCAL REGIME

Twenty five per cent 25% Income Tax
(applied on net profit)

MERCI POUR VOTRE AIMABLE ATTENTION

- Senegal Basin has generated oil and gas
Diamniadio, Gadiaga and Casamance Dôme Flore
- Presence of world class source rocks in Turonian-Cenomanian
secondary good sources in Albo-Aptian and Jurassic
- Petroleum system in Deep water
with various structural trends and traps
- 60 000 km² underexplored Paleozoic basin
with good reservoirs in Ordovician and Devonian
and good source in Silurian, and traps and plays
identified



Law with flexible terms