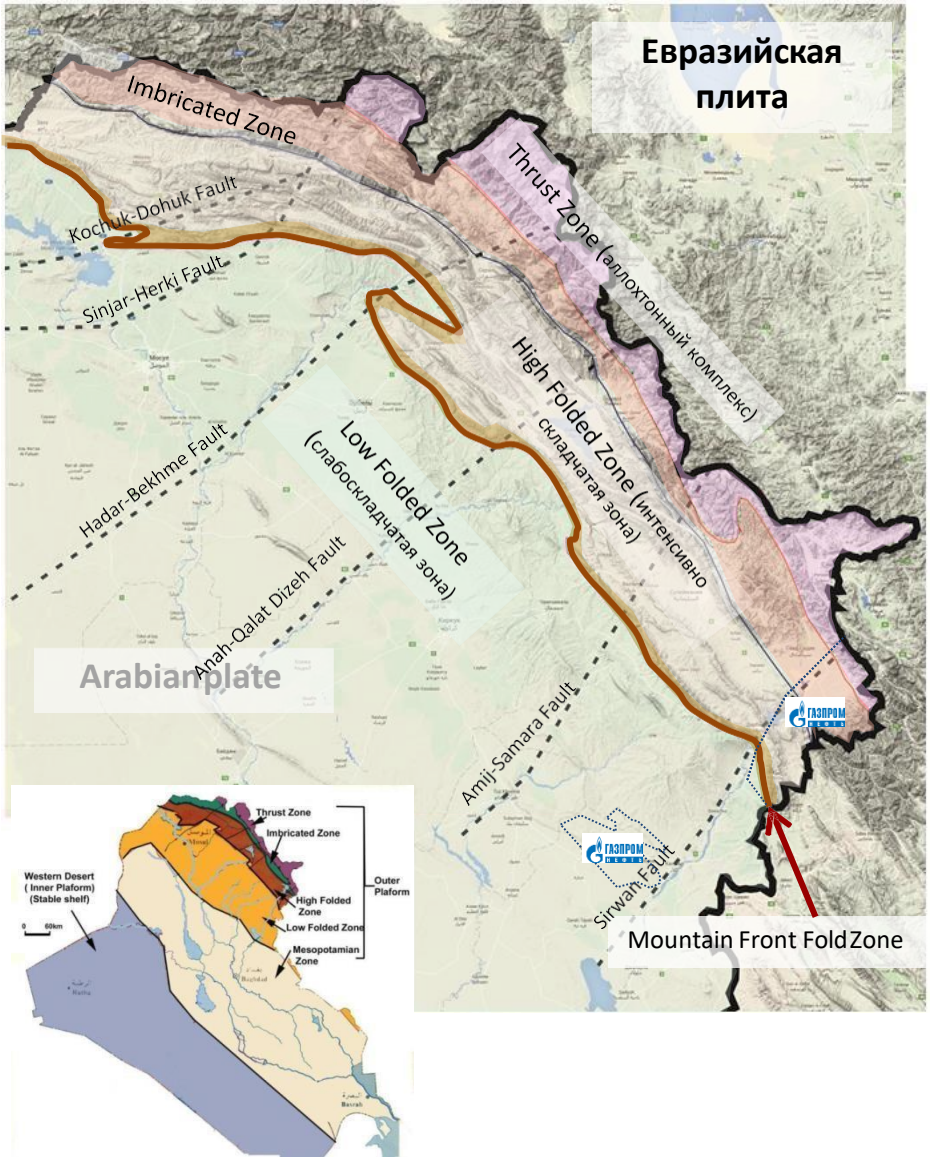
Kurdistan

Regional data and 3D modelling of Garmian block

GEOLOGICAL FRAMEWORK

Tectonicmap



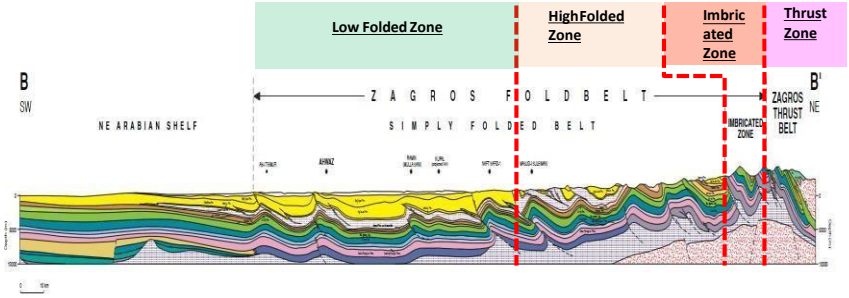
Four tectonic zones areidentified:

Low FoldedZone

High Foldedzone

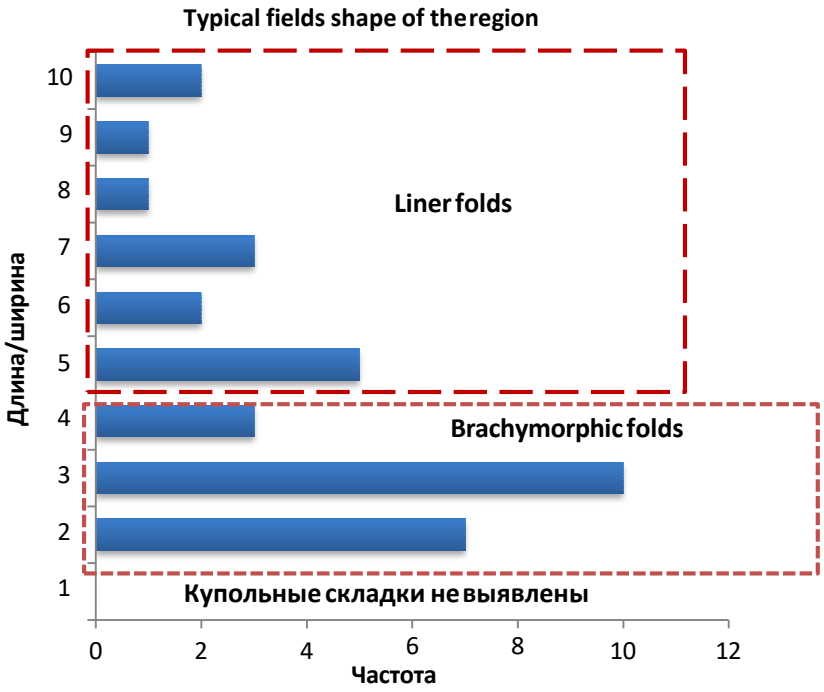
Imbricatedzone

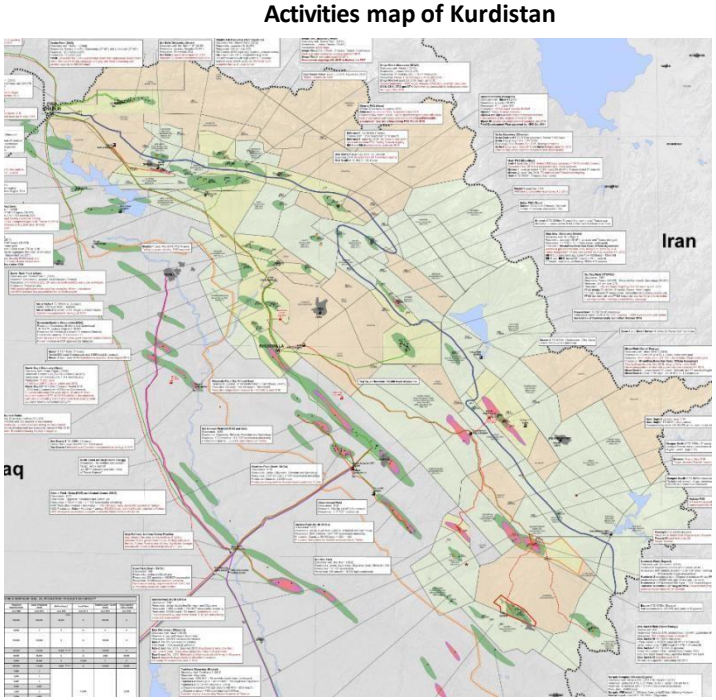
Thrust Zone (Складчато-надвиговаязона)



* *По данным Jassim&Goff «Geology of Iraq», 2006*

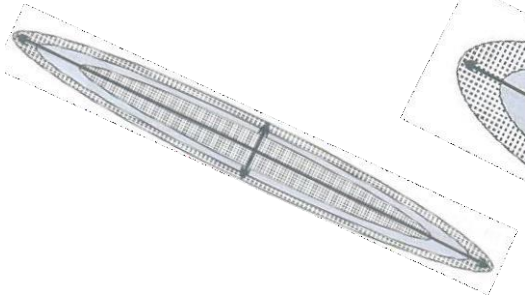
TYPICAL STRUCTURES OF THE REGION



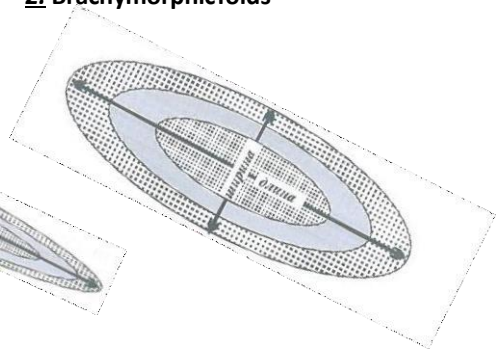


Type of folds

1. Liner folds



2. **Brachymorphic folds**

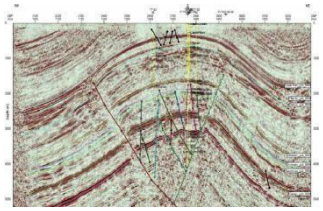


- Fields are represented predominantly by anticlines folds, complicated by faults and thrusts
- All structures are with NW-SE direction

TYPICAL KIND OF TRAPS

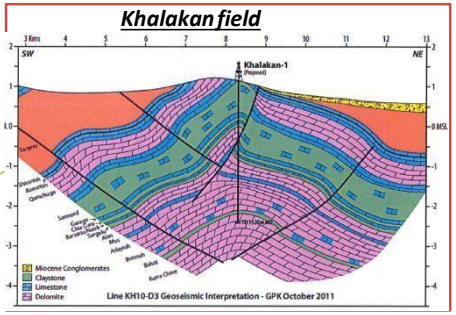
1. 3-way closure (Structural and tectonic)

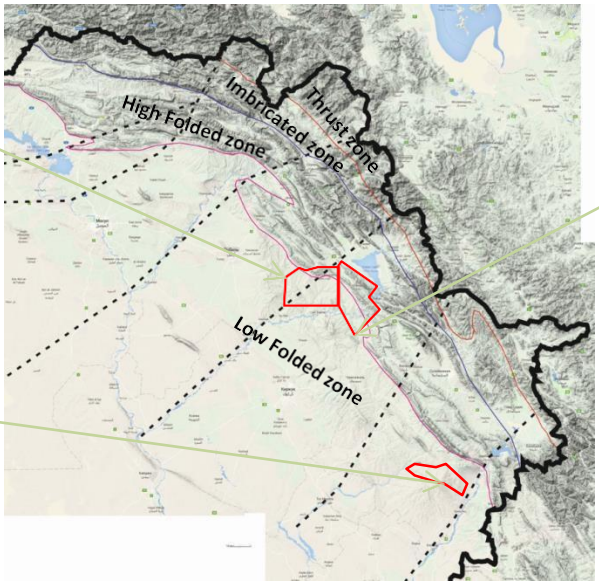
Tak tak field



2. 3-way closure (Structural and tectonic) with faults complexity

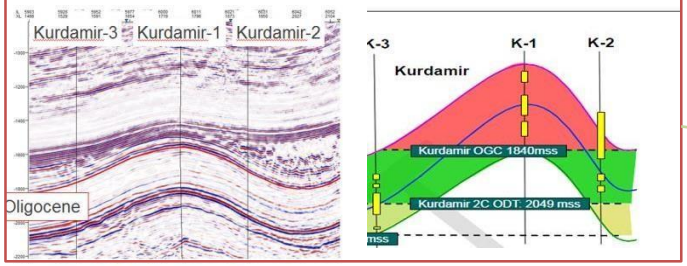
Khalakan field



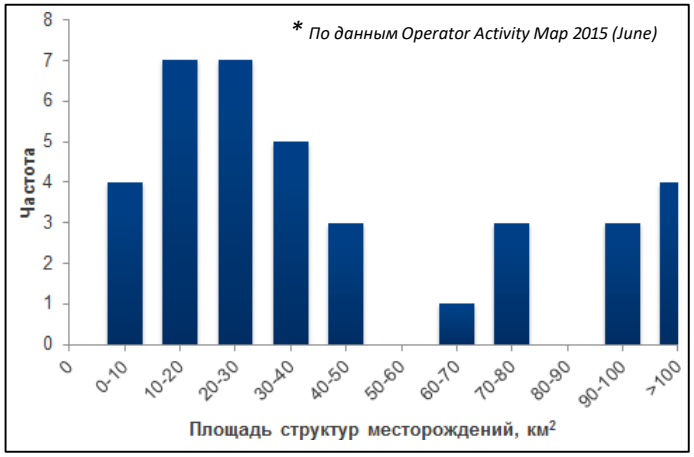


3. 4-way closure(Structural)

Kurdamirfield



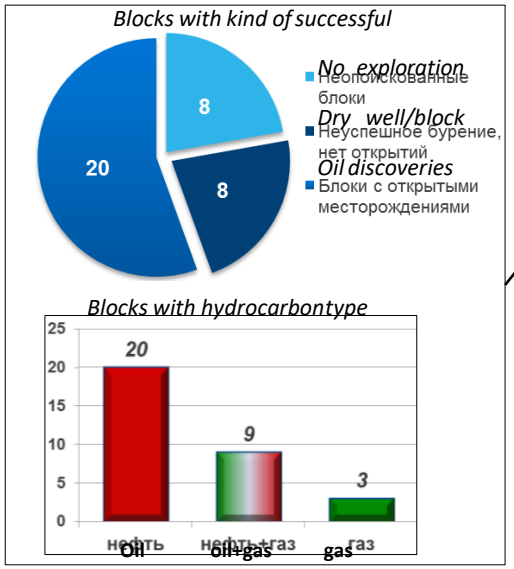
Fields size of the Kurdistan

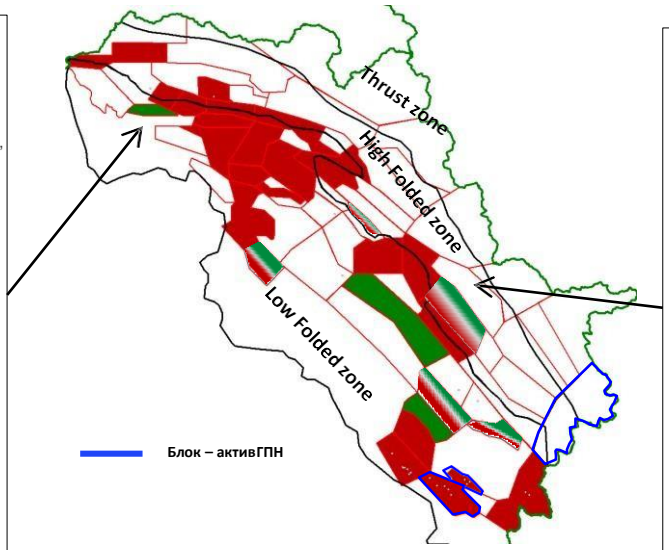


- Complexity of the traps depends of tectoniczones
- Closely to Thrust Zone traps are complicated by faults and thrusts
- Under thrusts zones could be potentiallyforexploration
- Average Area of the field sizes are 10-30 km2
- Time of trapping – Cainozoic

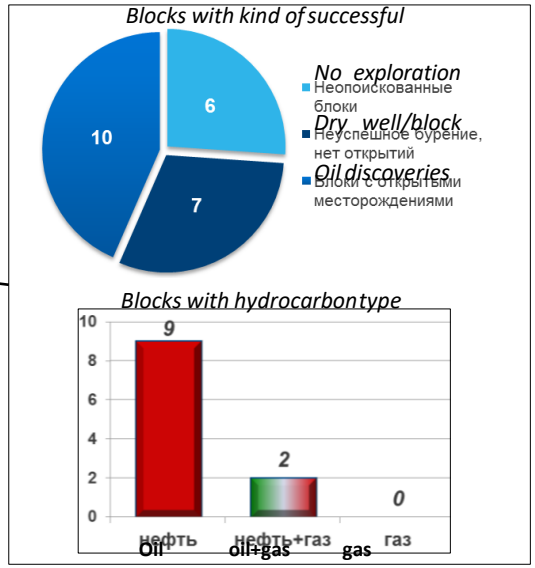
ANALYSIS OF DISCOVERED FIELDS

Low Foldedzone

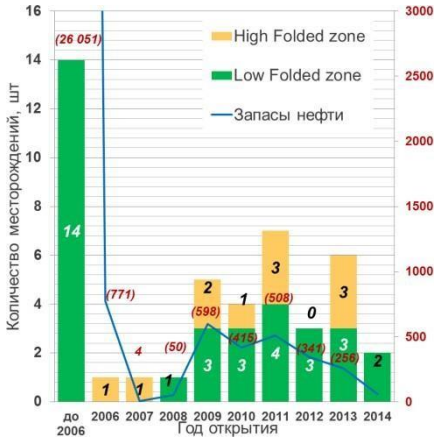




High Foldedzone:



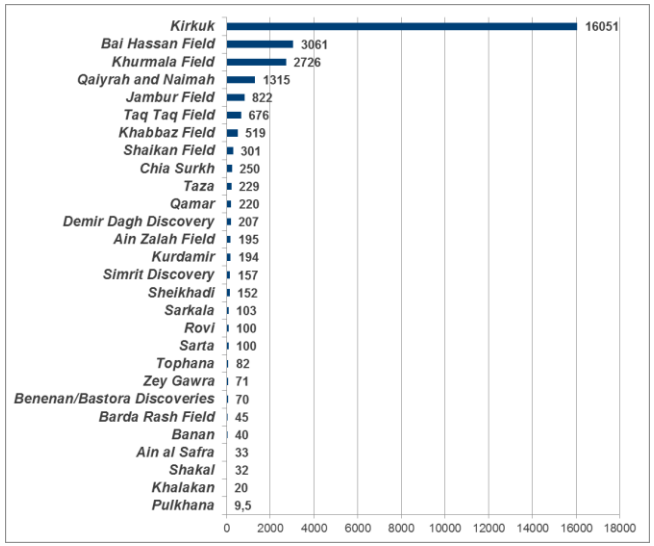
Fields discoveries by years



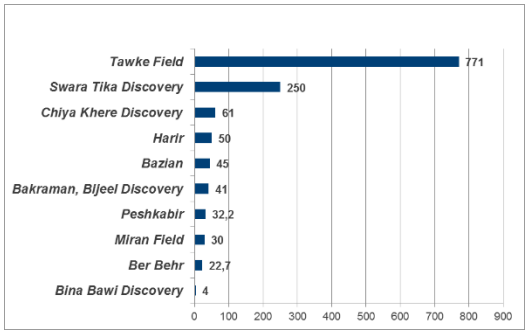
- Major discoveries are made in Low folded zone compare to High folded and Thrust zones
- Major discoveries are made in 2009-2013 in Low Folded zone and High Folded zone. MainSTOIIP are discovered before 2006
- Majority of the fields are content of oil
- Total open blocks in the region 21. Of it 6 are located in Thrust zone, 6 in High folded и 9 in Low folded. Some blocks doesn't have explorationactivities
- Main part of opened blocks for farm in are located in High Folded Zone и Thrust zone with very complex geology and high risks

RESERVES OF DISCOVERED FIELDS

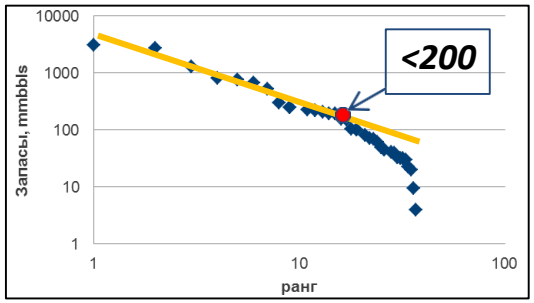
Reserves of Low Folded Zone, mmbbls



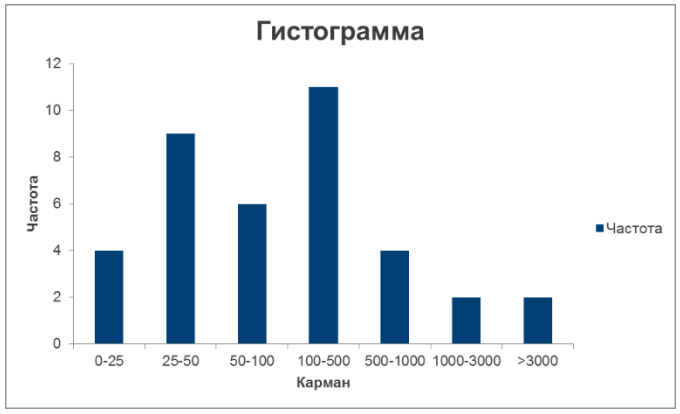
Reserves of High Folded Zone, mmbbls



Zipf's curve for discoveries

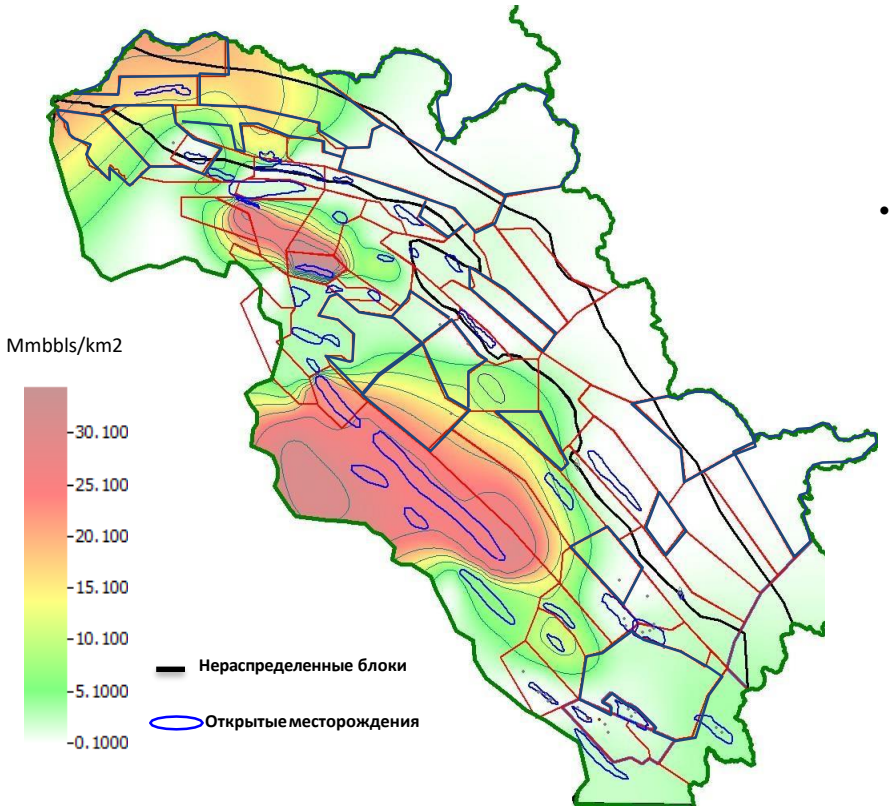


Field size distribution

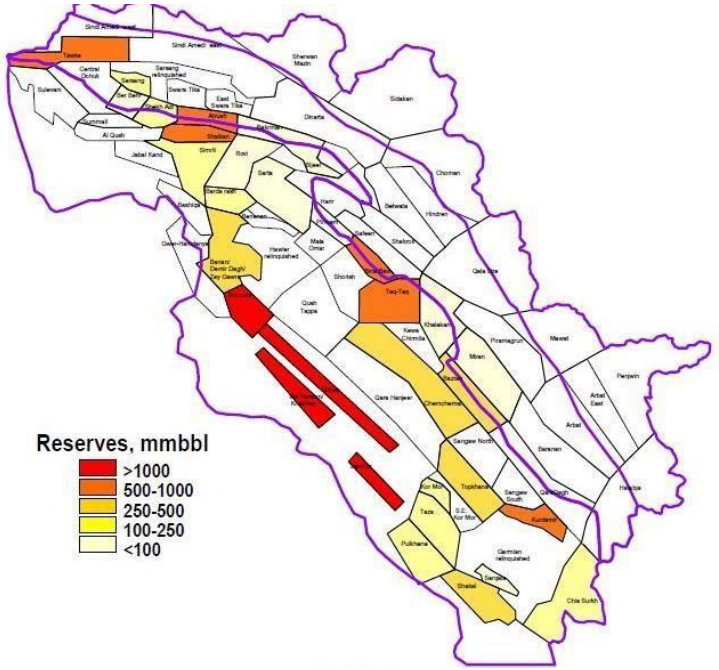


- Major oilfields are Kirkuk, Kurmala, Bai Hassan, which are located in Low Folded zone
- Major field in High folded zone is Tawke Field*
- Possible field size based on Zipf's curve is less then 200 MMbbl of recoverable oil
- Most of the fields are within 25-500 MMbbls of recoverable reserves

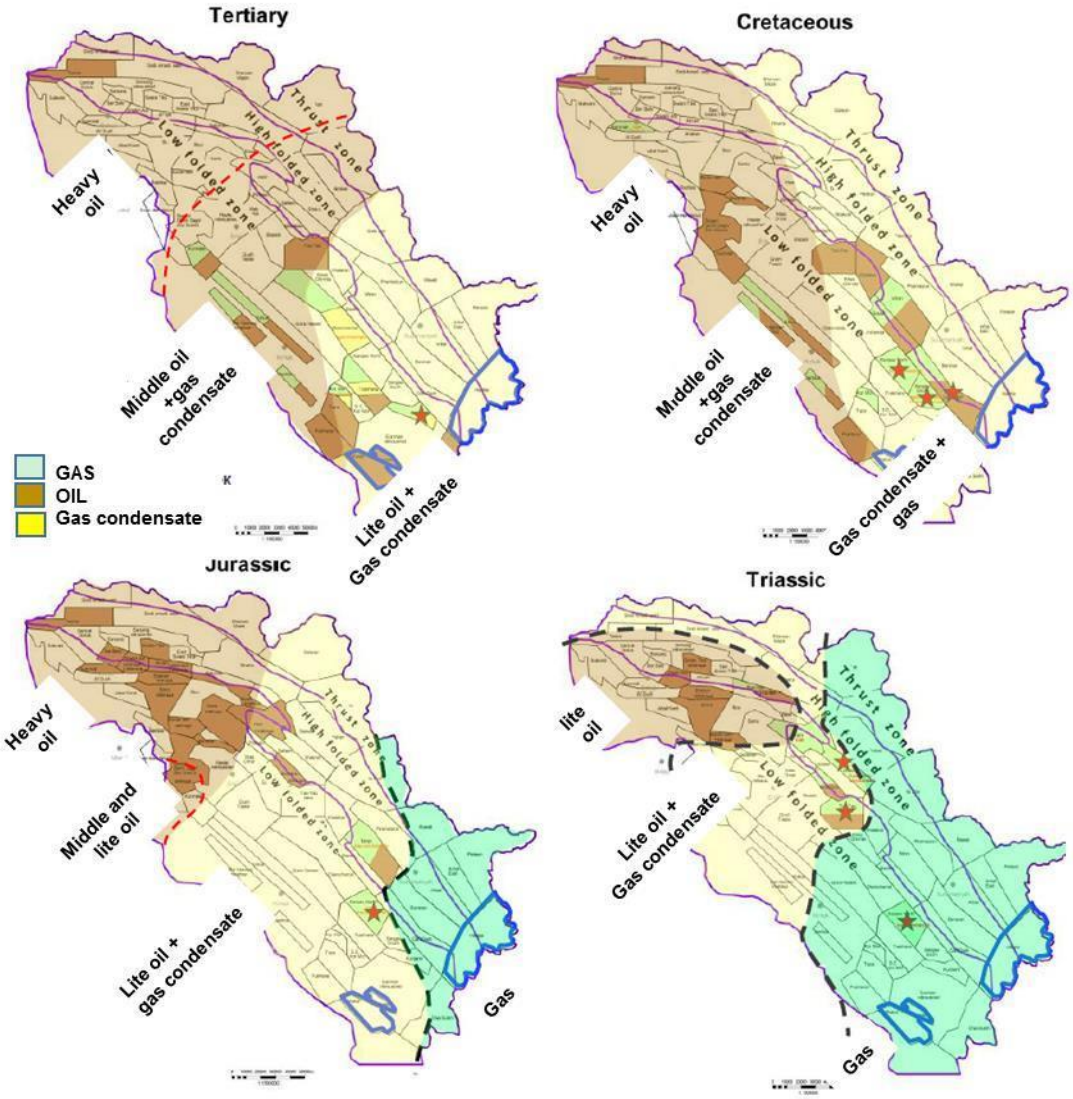
RESERVES DISTRIBUTION

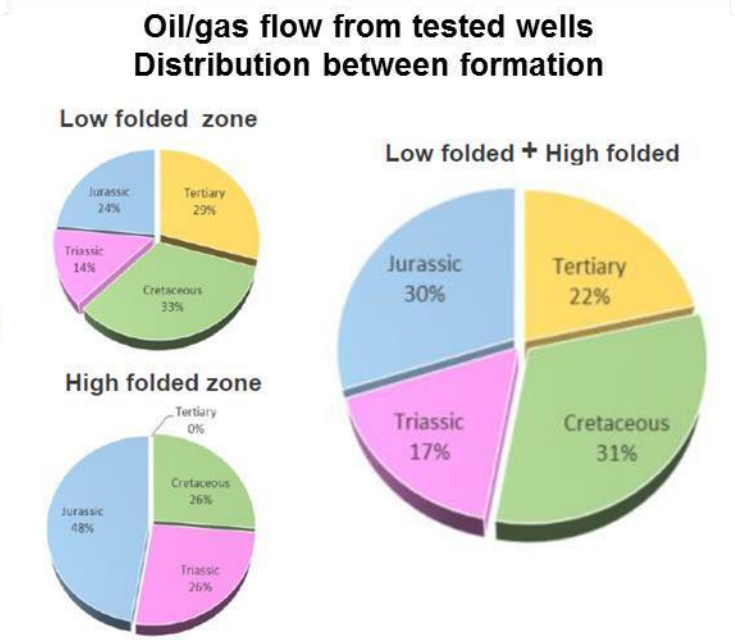


- 5 key zones are identified with more than 500 MMbbl recoverable reserves



FLUID TYPE DISTRIBUTION BASED ON WELL TEST RESULTS

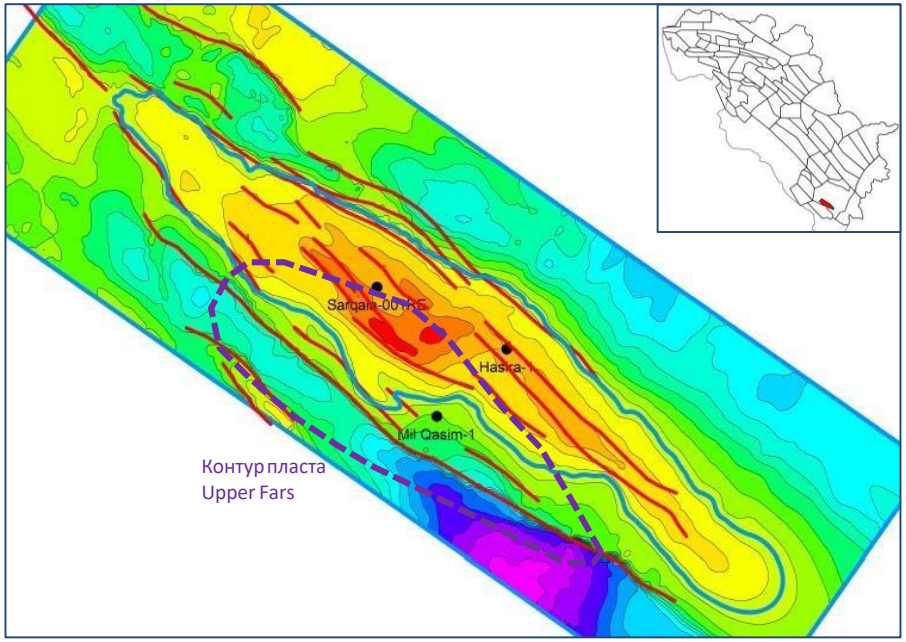




- Main flows were observed from Jurassic and Cretaceous formations.
  Flows from Tertiary were observed only at Low Folded Zone
- There are pattern of fluid type changing from oil to gas condensate and gas in NW-SE direction

GARMIAN BLOCK

Top Jeribe structure map



Geological framework

- Anticline structure complicated with faults
- Main target - Jeribe/U.Dhiban,
- Upsides - Mio-Oligocene, Upper Fars

STOIP/Resevers, mil.ton

GPNME evaluation

Cumulative production of Jeribe/U.Dhiban – 0,320 mil.ton

Reserves (Jeribe/U.Dhiban), mil.ton

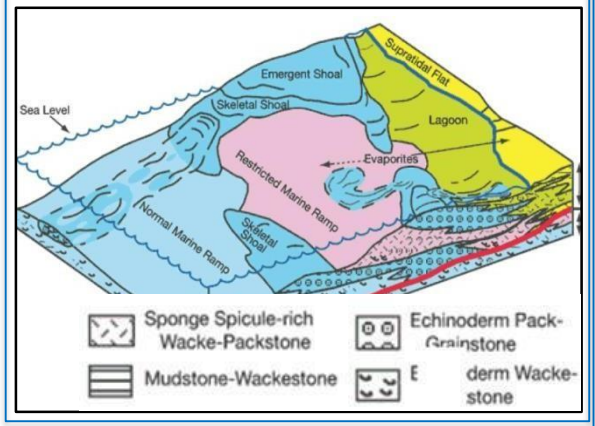
DeGolyer&MacNaughton (2014)

Reservoir characteristics

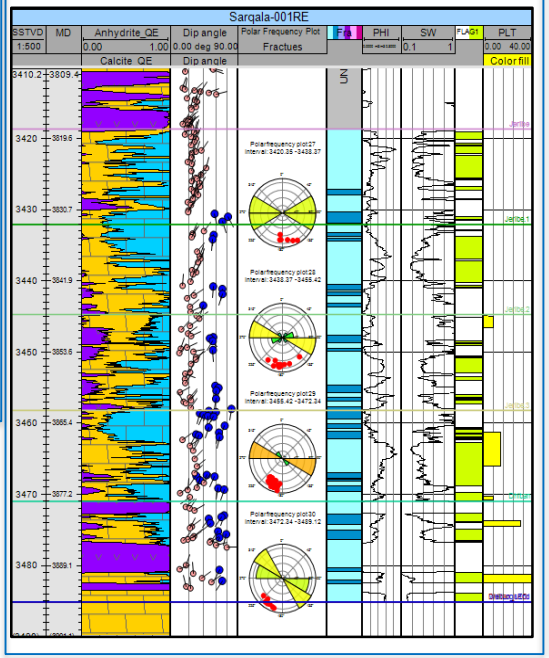
Formation	Area	Net pay	Por	So	Density	Bo
U.Fars	15	9	0.1	0.31	0.818	1.5
Jeribe/U.Dhiban	29	35	0.13	0.85	0.818	1.73
Mio-Oligocene	30	11	0.15	0.44	0.825	2

JEREBE-U.DHIBAN RESERVOIR

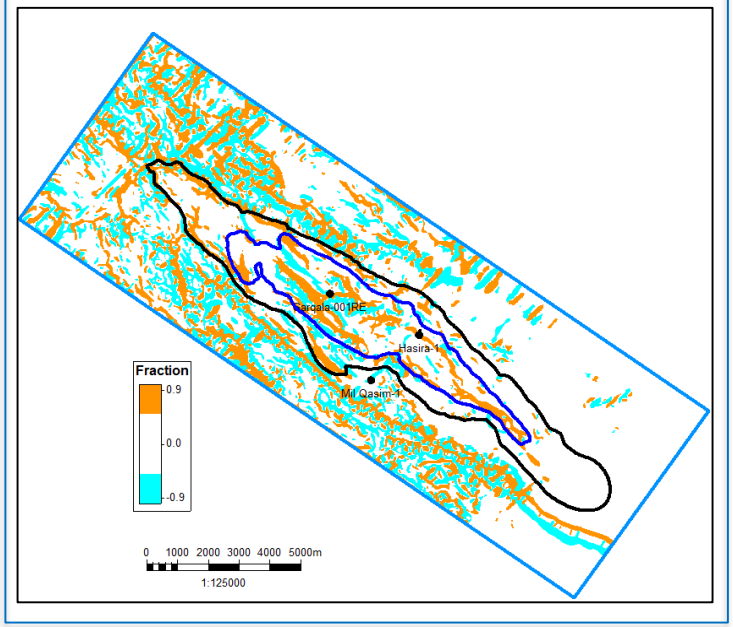
Sedimentary environment



Logs of the well S-1re



2D fracture trend



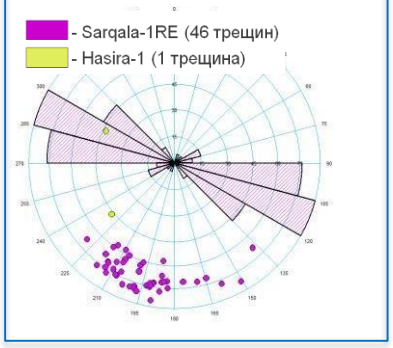
Reservoir description:

- Interbeddedof limestone, dolomites and anhydrites
- Matrix and fracture porosity;
- Fractures direction is NW-SE
- Dip of fractures are 70-90 grad

Sediments description:

- Shallow-marine sedimentary environment with short time of see level downchanging
- Clay content is less than 1%, Quartz content is less than 1%, Some pyrites <0,5%
- Post diagenetic process are observed (dolomitization, fracturedistribution)
- Wackestones are observed on core and cuttings

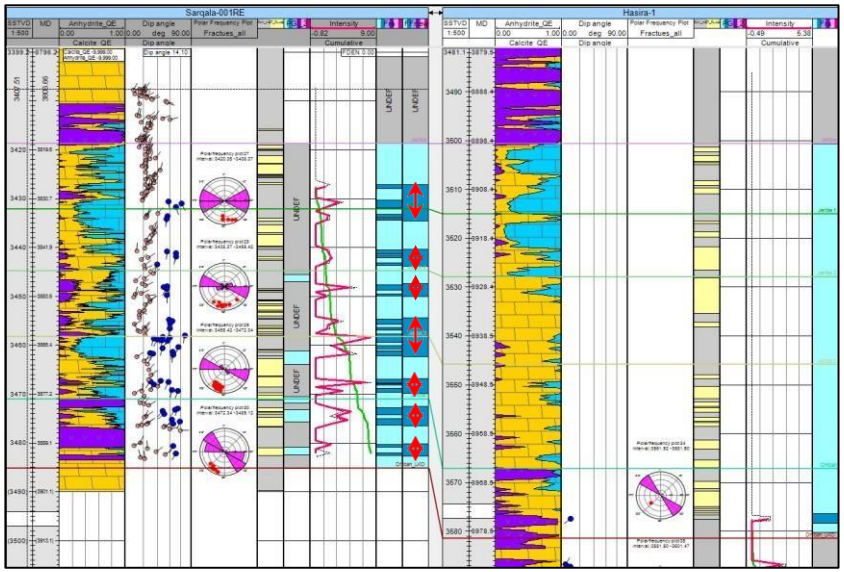
CMI/FMI results



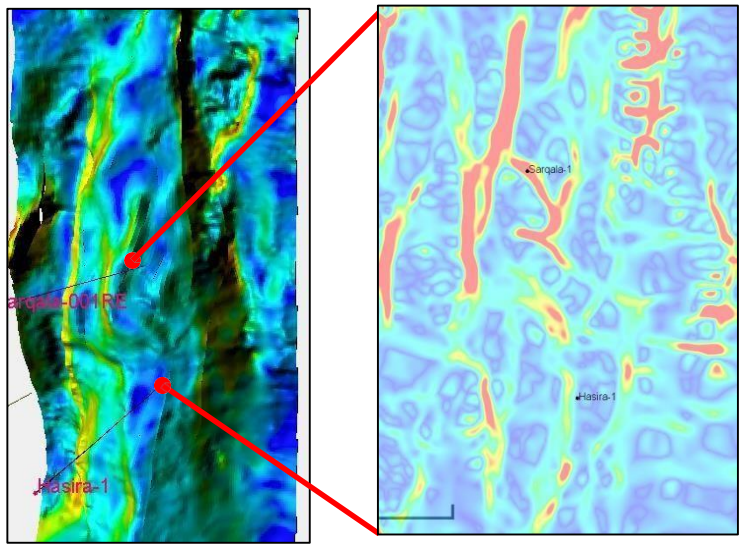
3D STATIC MODEL OF DUAL POROSITY AND PERMEABILITY

Data preparation

FMI/CMI results

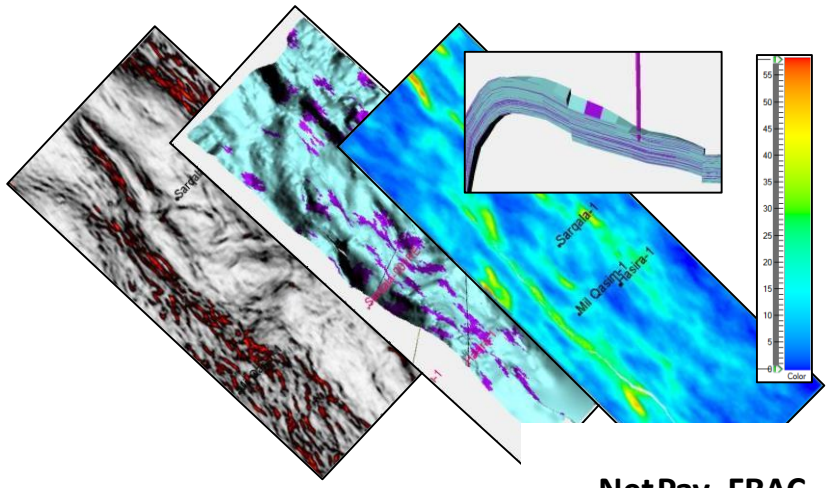


Seismic trend



Fracturemodeling:

- Discrete logs of fractured zones
- Volume seismic trend, which is correlated with FMI and Local Structural Dip
- Fracture distribution with azimuth -50 to -55 grad with Facies Modeling and SIS seismic trends



STOIIP EVALUATION

➢ UNCERTAINTIES

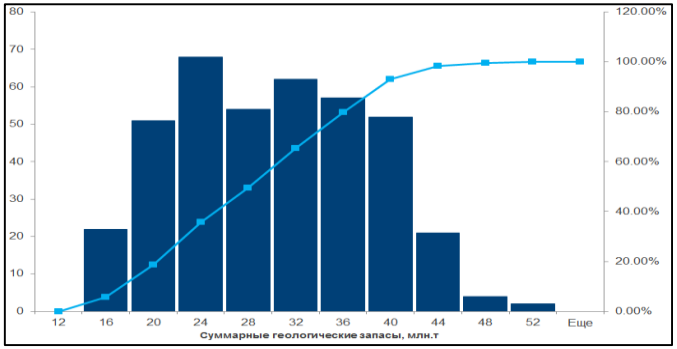
	Параметр	Min	Aver	Max
	Structure			
Mutual	OWC, m	-3754		Spill point
	Bo	1.730	1.893	2.057
	Oil density	0.818	0.8245	0.831
Matrix	Net-to-Gross	0.41	0.48	0.54
	Porosity	0.126	0.133	0.138
	Water Saturation	0.39	0.42	0.46
Fractures	Net-to-Gross	0.05	0.125	0.2
	Porosity	0.0027	0.01	0.02
	Water Saturation	0.01		0.1

➢ STOIIP

Matrix

Matrix	Mil.ton
P90	17
P50	27
P10	37

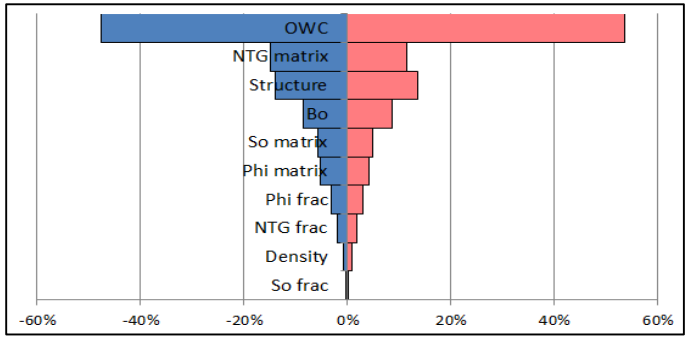
STOIIP distribution



Fractures

Frac	Mil.ton
P90	0.4
P50	1.0
P10	2.3

Tornado plot



RESULTS OF NEW WELL DRILLING

Gazprom Neft Commissions Second Well at Sarqala Field

May 16, 2018

Gazprom Neft subsidiary Gazprom Neft Middle East B.V. has commissioned a second well — the Sarqala-2 — at its Sarqala field (within the Garmian block), located in the Kurdistan Region of Iraq (KRI). The new well is currently producing 11,000 barrels per day (bpd), with potential to increase this to 15,000. Total daily production at the field has now increased more than two-fold, exceeding 21,000 bpd.