

**Offshore Mediterranean Conference
Workshop**

Ravenna - April 2, 2004



La Ricerca di Frontiera
Frontier Exploration in Italy

Sergio A. Laura

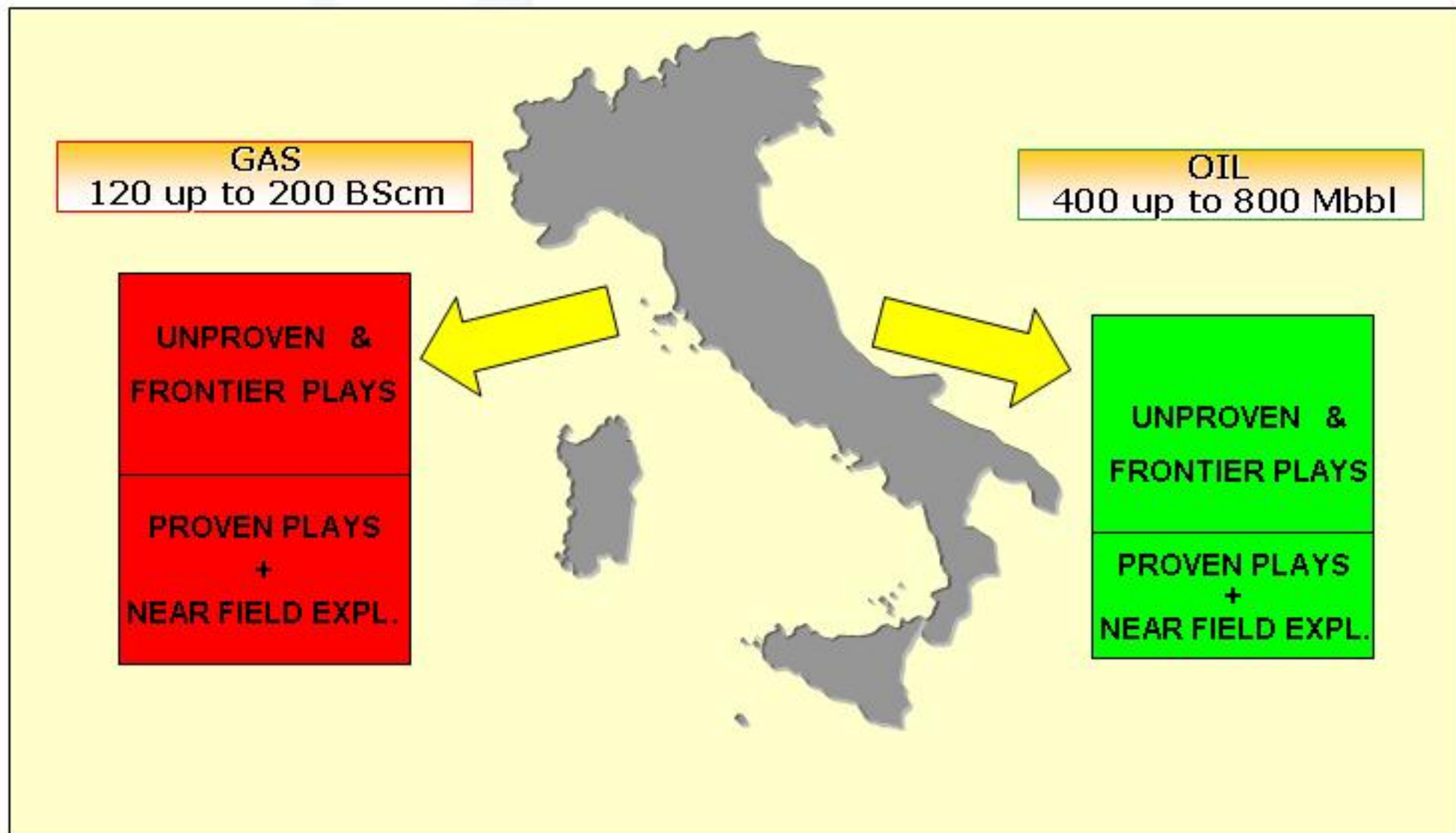
ENI Exploration & Production

FRONTIER EXPLORATION

Objectives and Outline

- Following the previous presentation, that illustrated the general hydrocarbon exploration resources potential in Italy, the objective is to focus on potential that resides in unproven, "frontier" plays
- Some statistic references and comparisons are shown to support the existence of such potential, as well as....
-a brief geological outline of some potential exploration targets (with Assomin' contribution) ...
-and a briefing about the needed technology support

ITALY - EXPLORATION RISKED RECOVERABLE POTENTIAL RESOURCES



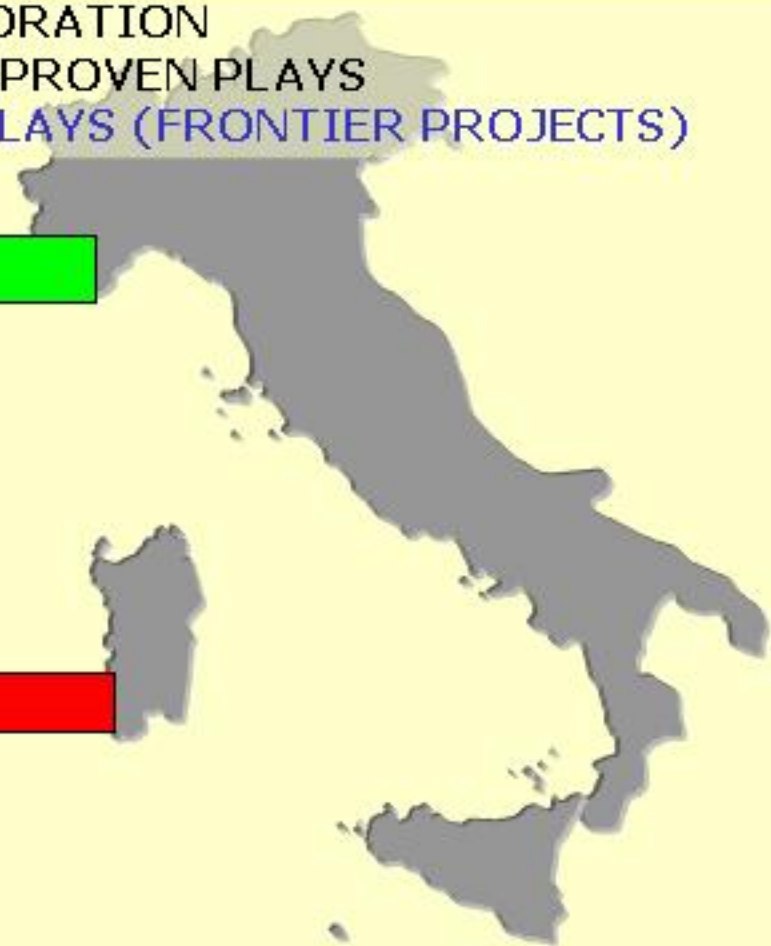
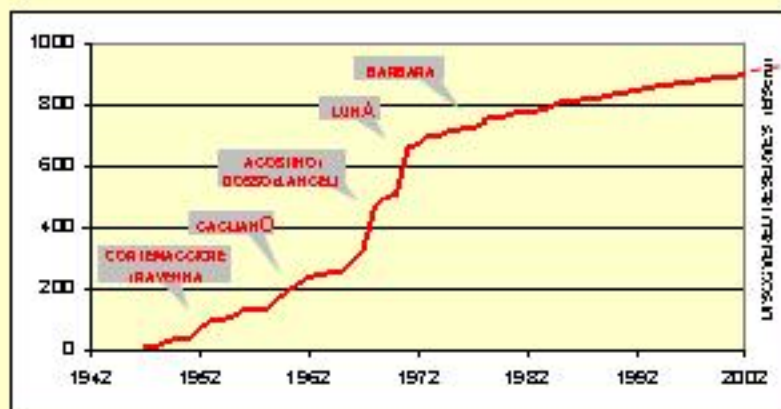
FRONTIER EXPLORATION

Definition

- Activity on unexplored basins/plays, poorly known or tested, not productive
- Activity with high geological risk and uncertainty, by definition, however the actual risks often cannot be determined easily
- Long term activity for results, economic return and performance analysis (EMV analysis may not be appropriate)
- Activity that must be sustained by innovative technology

THE REMAINING EXPLORATION POTENTIAL OF ITALY

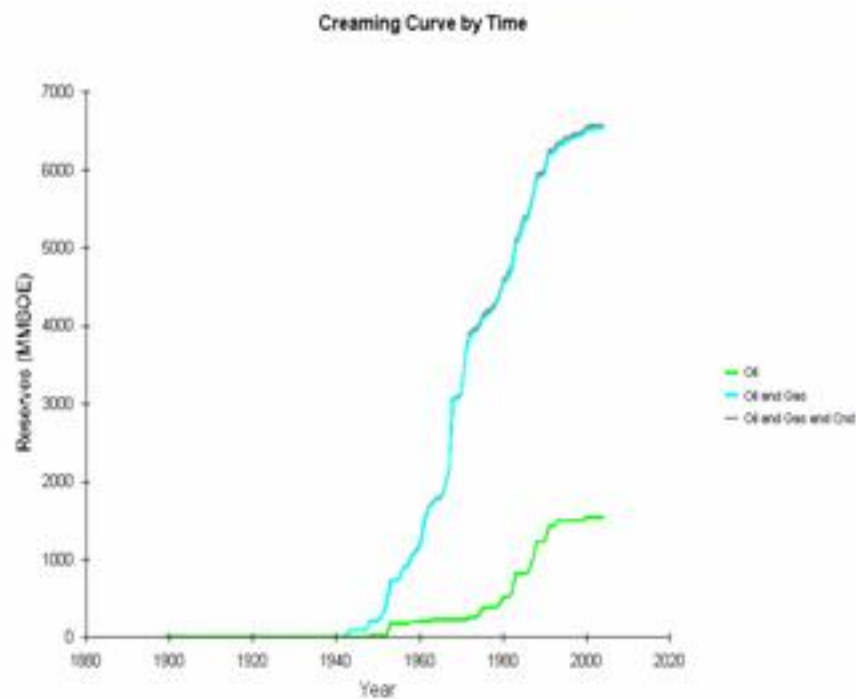
NEAR FIELD EXPLORATION
NEW FIELD WILDCAT IN PROVEN PLAYS
NEW FIELD WILDCAT IN UNPROVEN PLAYS (FRONTIER PROJECTS)



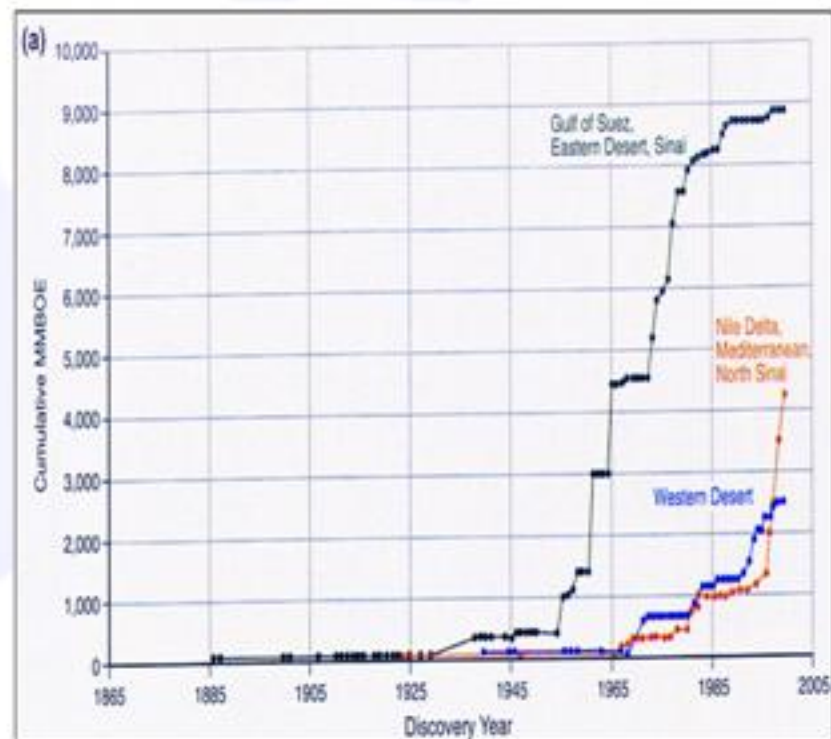
EXPLORATION ACTIVITY IN ITALY

NFW only

Creaming Curves vs. years



Source: IHS Probe

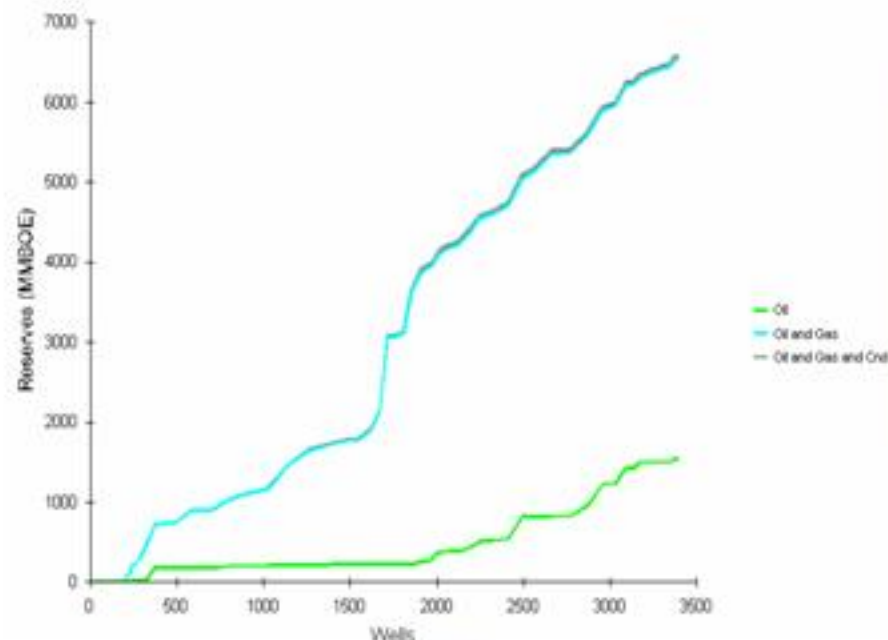


From: Dolson J.C., Shann M.V., Matbouly S.I., Hammouda H. & Rashed M.R., (2001)

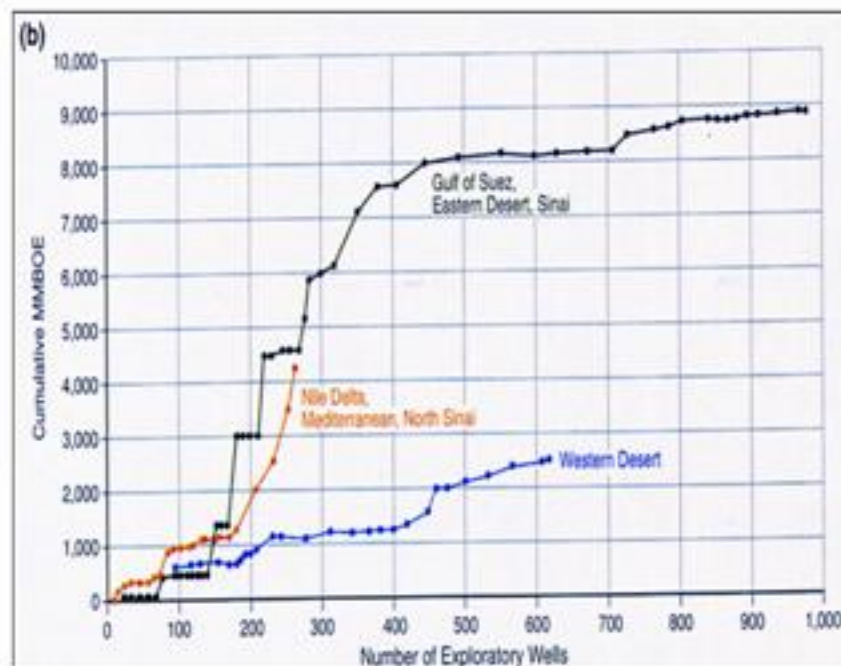
EXPLORATION ACTIVITY IN ITALY

Creaming Curves vs. number of drilled NFW wells

Creaming Curve by Wells



Source: IHS Probe



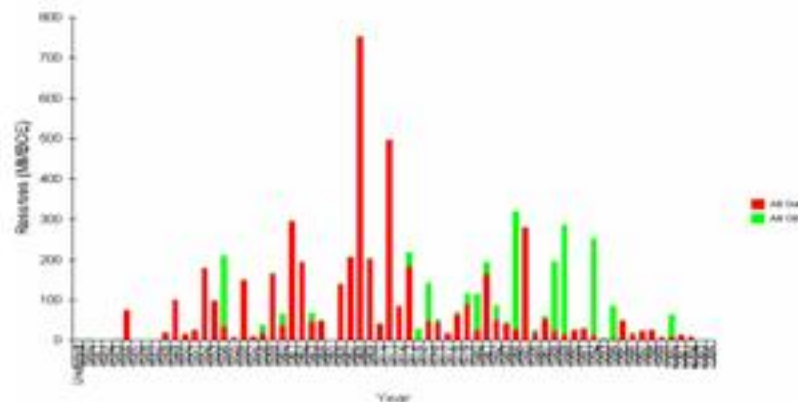
From: Dolson J.C., Shann M.V., Matbouly S.I., Hammouda H. & Rashed M.R., (2001)

EXPLORATION ACTIVITY in ITALY

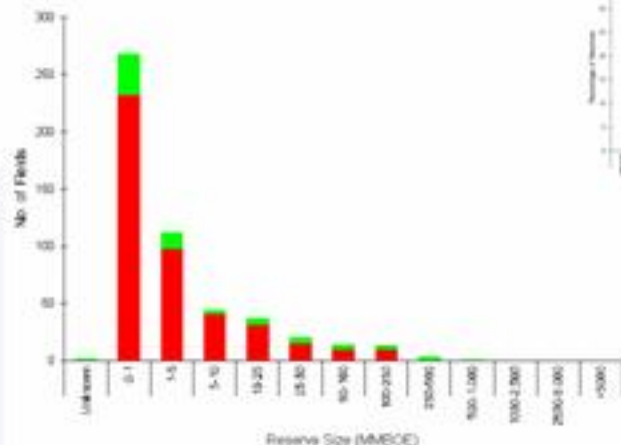
O&G Fields Frequency Diagrams

All O&G Fields (...)

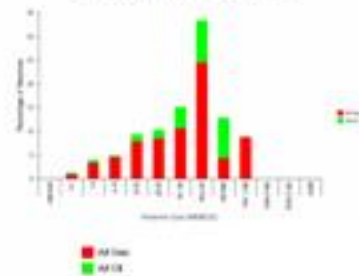
Oil, Gas & Cond. Discovery History by Reserves



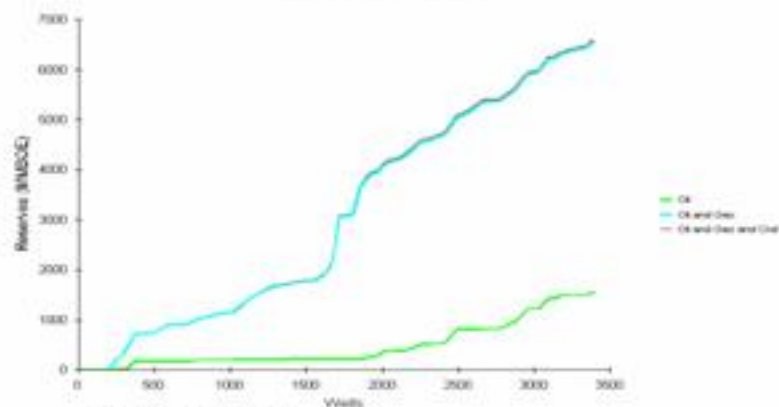
Original Oil, Gas & Cond. Field Size Distribution



Original Oil, Gas & Cond. Field Size Distribution by Percentage

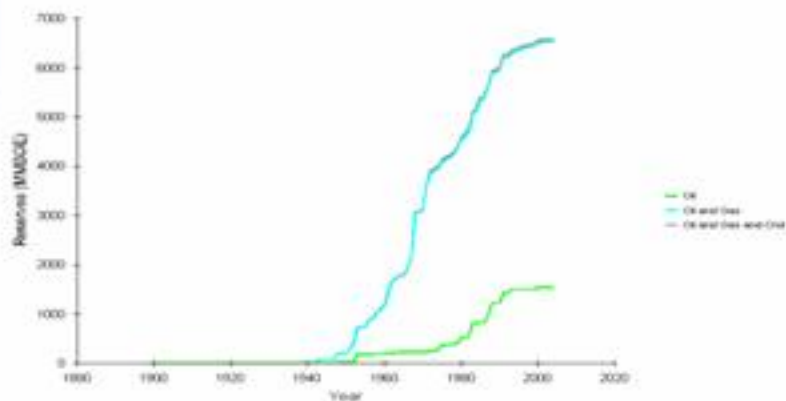


Creeping Curve by Wells



Source: HIS Probe

Creeping Curve by Time

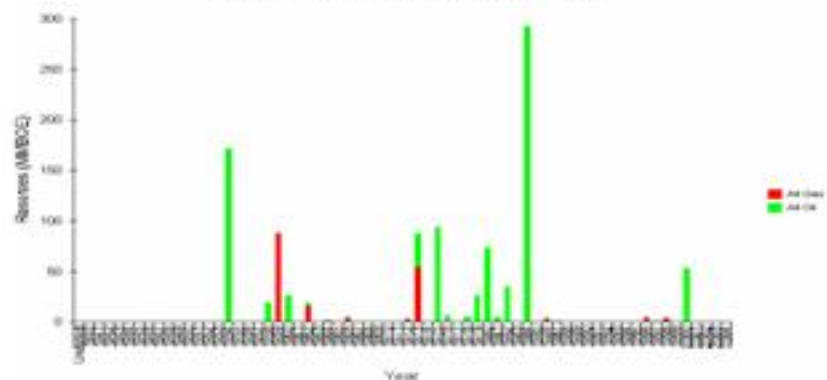


EXPLORATION ACTIVITY in ITALY

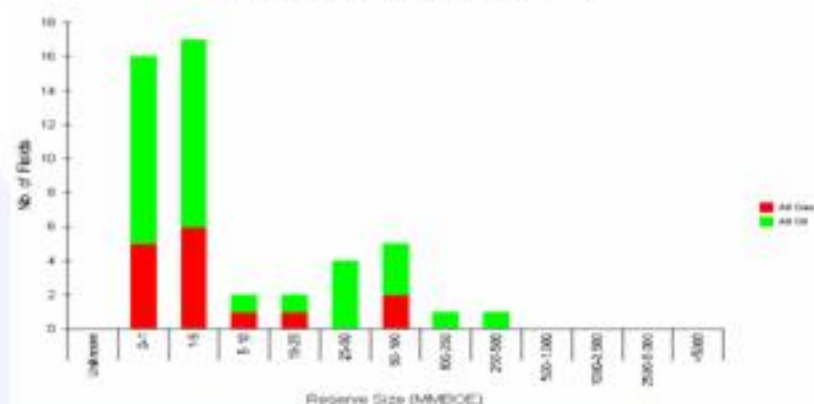
O&G Fields Frequency Diagrams

Mesozoic Carbonate Fields (*Deep targets*)

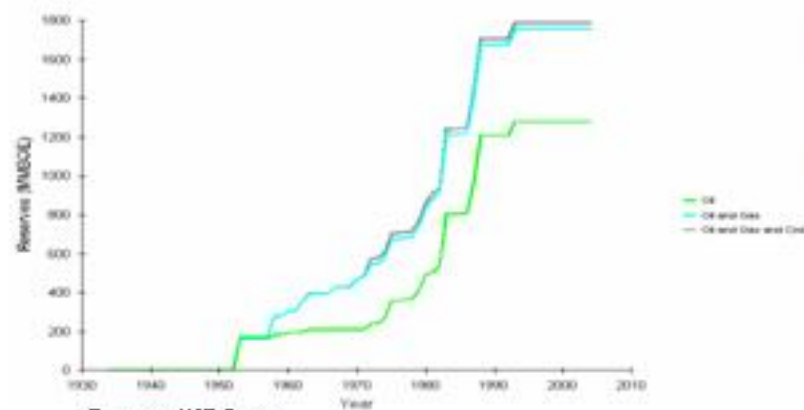
OIL, Gas & Cond. Discovery History by Reserves



Original Oil, Gas & Cond. Field Size Distribution

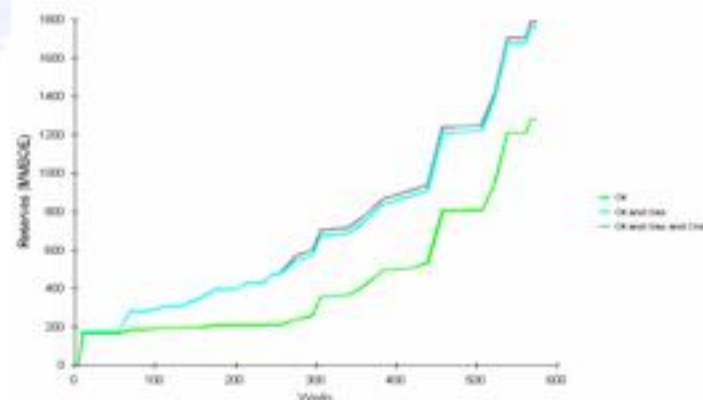


Creeping Curve by Time



Source: HIS Probe

Creeping Curve by Wells



FRONTIER EXPLORATION

Exploration Potential in Untested Basins/Play

"NFWU - New Field Wildcat Unproven Play" category

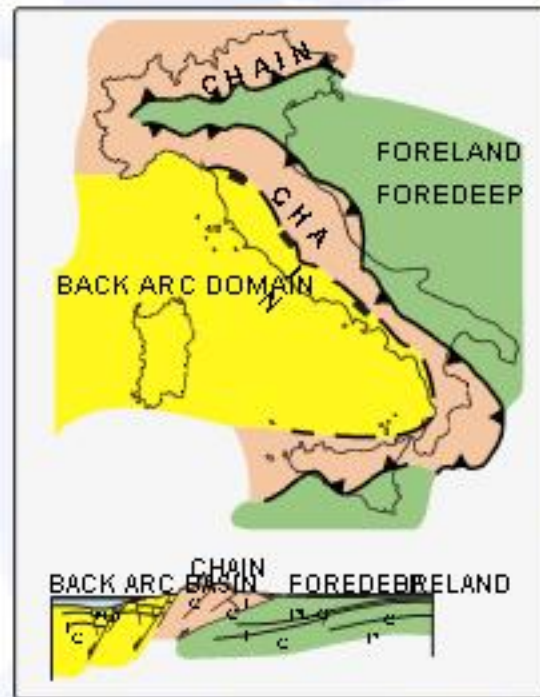
Three possible occurrences:

- **New Play in Explored basin**
- **Known play in unexplored basin** → **Frontier domain**
- **New play in unexplored basin** → **Frontier domain**

HYDROCARBON OCCURRENCE IN ITALY

STRUCTURAL DOMAINS

GAS PROVEN DISTRICTS & PLAYS



Hydrocarbon System zonation

OIL PROVEN DISTRICTS & PLAYS

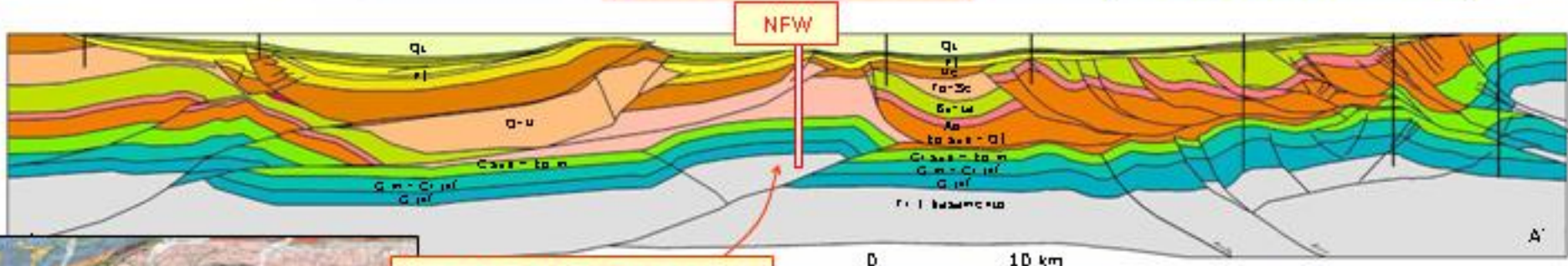




NEW FIELD WILDCAT in UNPROVEN PLAYS
New play in explored basin
 Oil (and termogenic gas) in the Mid - Po Plain structures

Hydrocarbon: Oil
Target: mesozoic carbonates of Mid Po Plain structures
Depth range: 5500-7000
Size range : > 250 Mbbl of Unrisk. Rec. Reserves
Risk: very high

Unexplored belt: Mid Po Plain structures Explored belt: South-alpine structures



0 10 km

New play in deep Mid Po Plain structures



Qc	Quaternario
Pl	Pliocene
Me	Messiniense
To-Se	Tortoniano-Serravalliano
Bu-La	Burdigalliano-Langhiano
Aq	Aquitaniano
Bo sup - OI	Eocene superiore - Oligocene
Cr sup - Bo m	Cretacico superiore - Eocene medio
G inf	Gliassico inferiore
Tr + basamento	Triassico + basamento cristallino

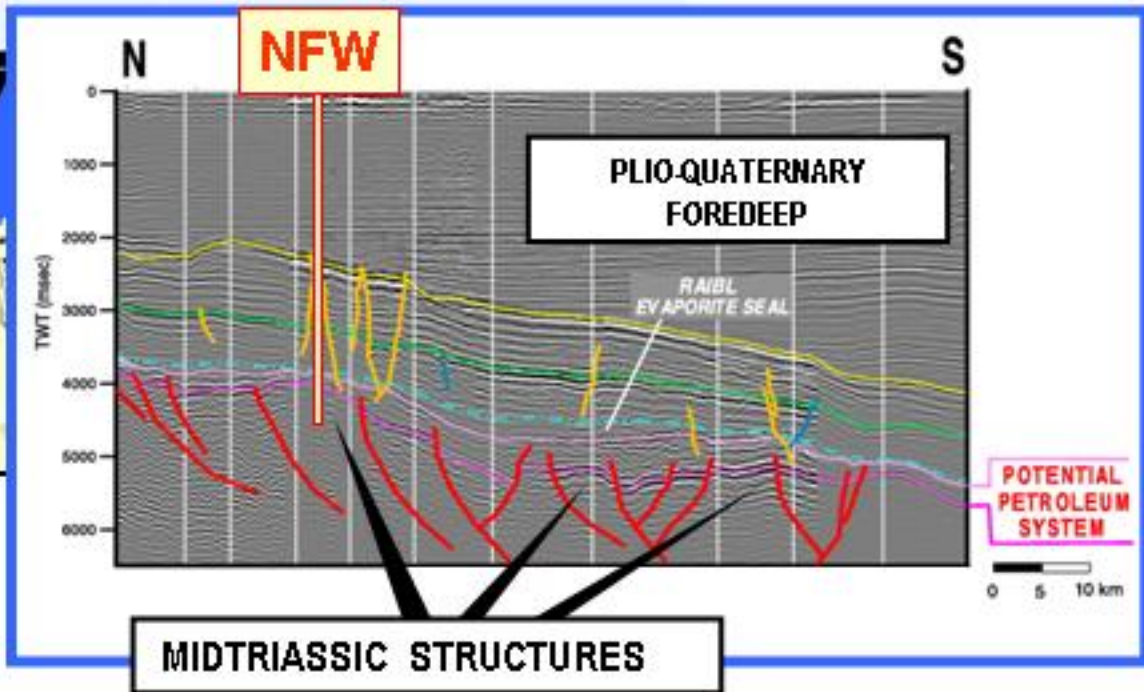


NEW FIELD WILDCATS in UNPROVEN PLAYS

Assessed play in a unexplored basin

The Villafortuna Midtriassic play below the Northadriatic foredeep

Hydrocarbon:	oil (and/or thermogenic gas)
Target:	Deep Mesozoic carbonate substratum of the North Adriatic foredeep
Depth range:	5200 – 7500 m
Size range:	70 – 250 MBOE of Unrisk. Rec. Reserves
Risk:	high



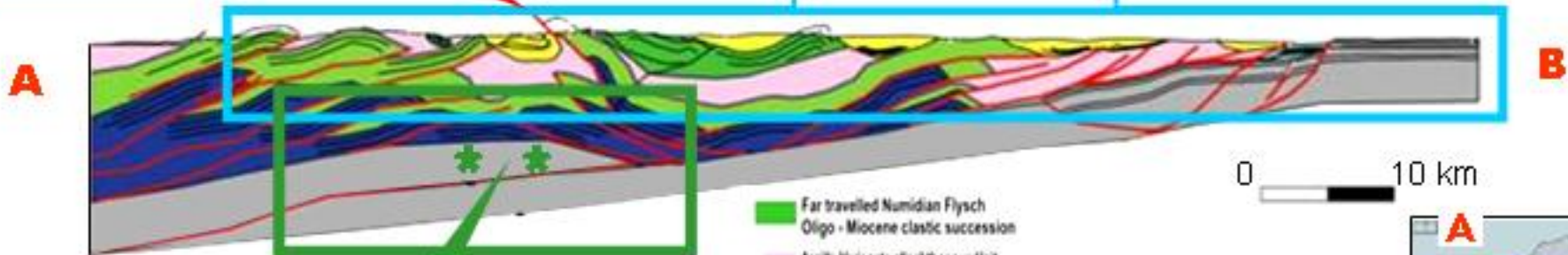


NEW FIELD WILDCATS in UNPROVEN PLAYS
New play in a unexplored basin
 The deep frontal antiform of the Sicily chain

Hydrocarbon: oil (and/or thermogenic gas)
Target: Deep Mesozoic carbonate section of Sicily Hyblean foreland
Depth range: 5000 – 7000 m
Size range: 50 – 300 MBOE of Unrisk. Rec. Reserves
Risk: very high

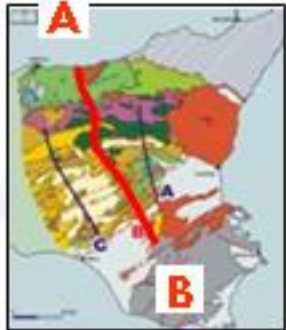
Surface Regional backthrusting

EXPLORED BELT



Deep frontal antiform
 (New play)

- Far travelled Numidian Flysch
Oligo - Miocene clastic succession
- Argile Variegata allochthonous Unit
Cretaceous - Eocene pelagic successions
- Late Tortonian - Pliocene
Syntectonic successions
- Numidian Flysch
Oligo-Miocene clastic succession
- Imerese-Sicano allochthonous Unit
deep water Mesozoic carbonates
- Hyblean Foreland Unit
(Triassic- Pleistocene)



Assomineraria

**“ Italy Frontier Exploration “
Study Group
(GdL)**

Participants:

Eni

Edison Gas

Gas della Concordia

Shell Italia E&P

TotalFinaElf Italia

May 2003

ASSOMINERARIA



Italy – Frontier Exploration

Why develop Frontier Exploration Projects in Italy

Technical reasons:

identify new exploration areas, plays and potential

test, validate and develop new exploration technologies

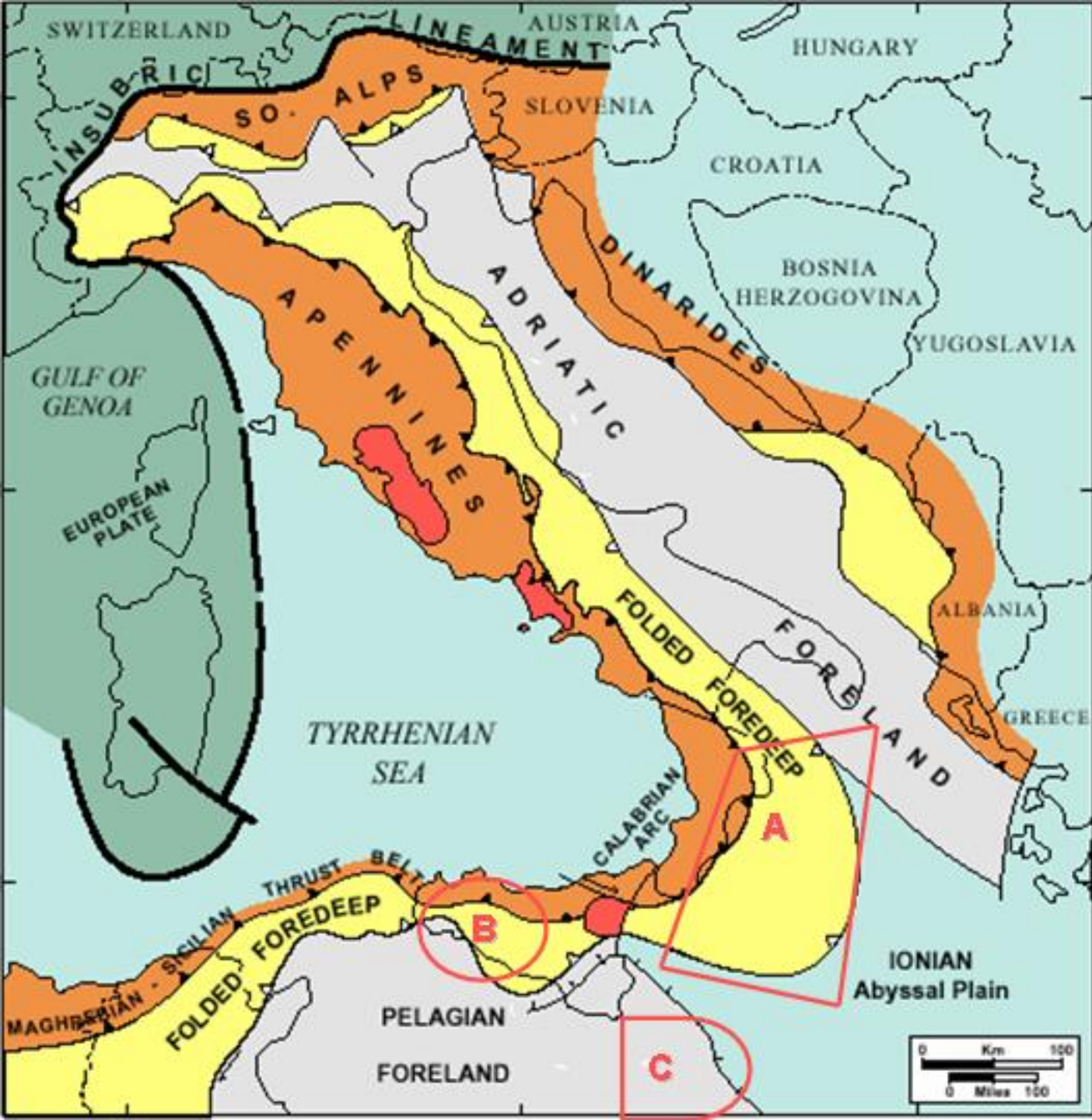
Strategic reasons:

Technical assessment (preliminary) of the region

attract new Players and E&P investments to Italy

political and financial incentivations & benefits





The three selected

“Frontier Exploration Projects”

- A:** Ionian Sea – “Ultra Deep” off shore
- B:** Sicily – deep Thrust Belt
- C:** Eastern Streppenosa Basin



ITALY – Frontier Exploration Project

A) Ionian Sea - Ultra Deep Off Shore



- water depth 1000 to 3000 m
- no exploration and no well
- currently not open for exploration

- **Accretionary Wedge of the Apennine Calabrian Arc System**
- **No specific evidence today in terms of:**
 - **Depositional units**
 - **Structural style**
 - **Sedimentary Thickness**
 - **Subduction or collisional margin feature**

Project's activities:

- **acquire** G&G data to understand this geological setting better
- **evaluate** the existence of a Petroleum System and Plays

Project's target:

push the **Government** to open the area for exploration ?



ITALY – Frontier Exploration Project

B) Western Sicily – deep Thrust Belt

- sub-thrust depth: > 6000 m
- no deep exploration well
- currently no exploration activity



- deep Apennine- Maghrebian thrust belt
- thin – skinned style with uninvolved basement ?
- Deep Triassic foreland platform unit never explored in this area
- Sub – thrust unknown issues:
 - Presence of Carbonate
 - Carbonate depositional facies
 - Sedimentary Thickness
 - Detailed structural setting

Project's activities:

- **acquire** an innovative "Sequential global Offset Global Seismic line" - 90 km length
- **set up** :
 - deep Structural model
 - Petroleum System and Plays

Project's target:

- improve deep seismic imaging
- involve "New Comers" by the identification of a carbonate structural play in the Western Sicily deep belt



Italy – Frontier Exploration

C) Eastern Streppenosa Basin



- SE offshore of Sicily and is bounded to the East by the Malta Escarpment.
- thick Mesozoic carbonate sequence
- poor seismic compromise the evaluation of the exploration potential

Project's activities:

- acquire:
 - no. 1 "innovative OBC Global seismic Imaging" line to increase deep seismic visibility
- verify:
 - imaging enhancement
 - Deep Petroleum System and Plays consistency

Project's target:

- **evaluate** the results of first "OBC Global Offset" experiment in the Mediterranean off shore
- **reactivate** the exploration activity in this area

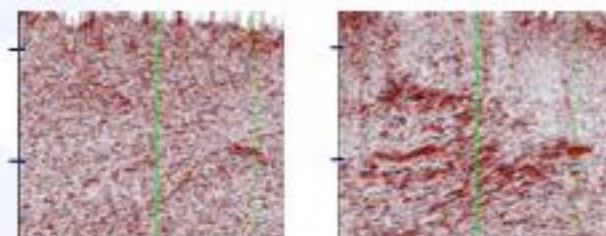


Technology Support to Frontier Exploration

GEOPHYSICS:

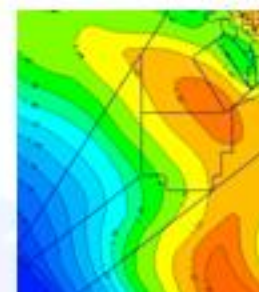
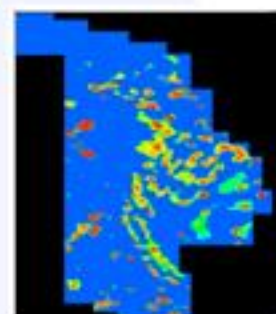
Improve target imaging and definition

- Global Offset Approach, CRS Common Reflection Surface Stack, ideally compatible technologies to improve the Imaging of complex areas where conventional approach fail



GEOLOGY:

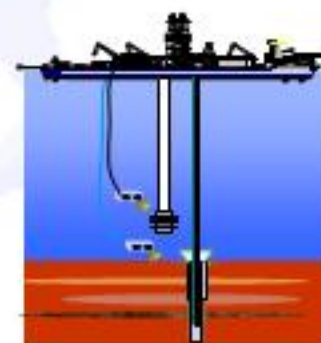
- *Petroleum System Definition*: potential to generate and expell hydrocarbons – processes simulation
- *Structural modelling, restoration*: correct model Comprehension and reconstruction through time



DRILLING:

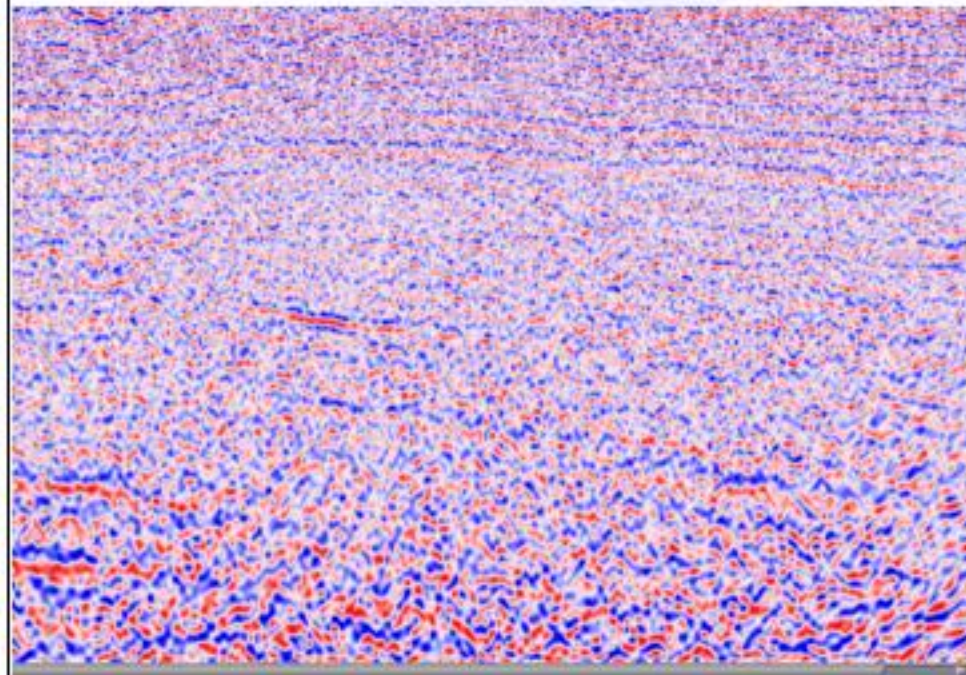
Drilling costs reduction, less drilling days

- Dual Casing Running Technology
- Riserless operations
- Combination Running System (Eni)



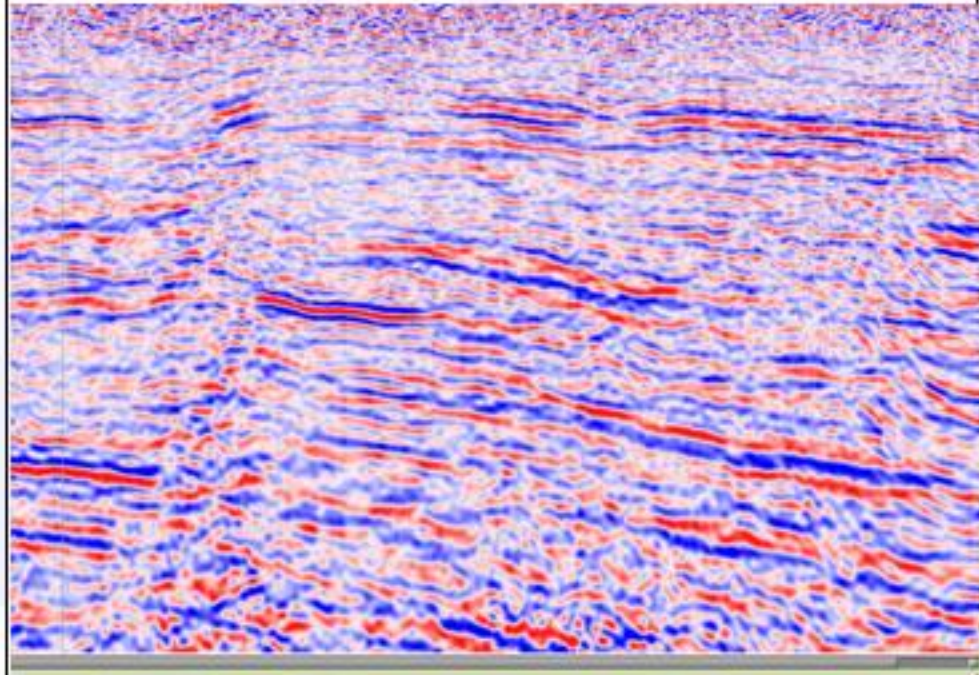
Technology Support to Frontier Exploration Global seismic imaging: the CRS concept

IN THE 50' TO GET A PHOTO KNOWLEDGE OF THE DISTANCE BETWEEN THE CAMERA AND THE TARGET AND THE BRIGHTNESS WERE NEEDED



WITH THE CONVENTIONAL PROCESSING TO FOCUS THE SEISMIC IMAGE WE NEED TO INPUT VELOCITY AND STATIC CORRECTION

TODAY THE NEW DIGITAL CAMERAS HAVE AUTOFOCUS CAPABILITY



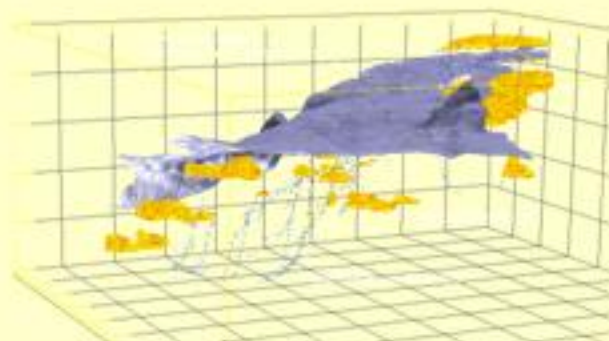
WITH CO CRS EIGHT PARAMETERS ARE AUTOMATICALLY COMPUTED TO FOCUS THE SEISMIC IMAGE

Technology Support to Frontier Exploration

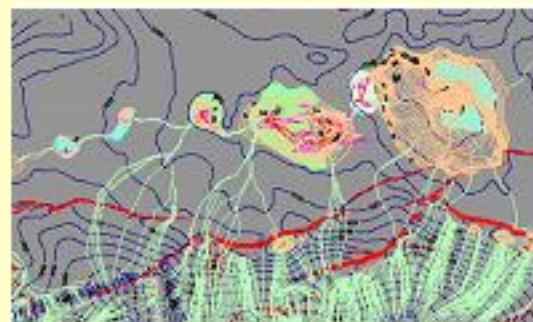
New exploration targets: Understand and Predict

3D PETROLEUM SYSTEM MODELING

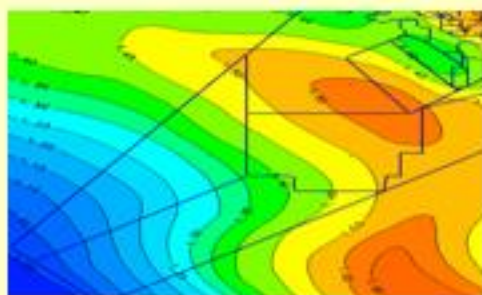
- FAST TRACK MODELING:
REGIONALLY ORIENTED



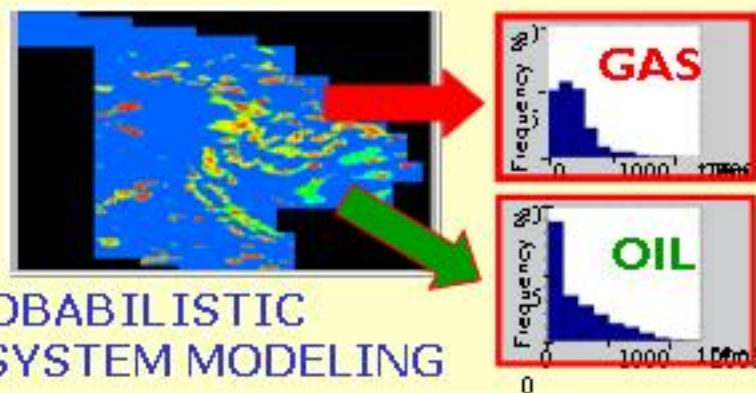
- BEST TRACK MODELING:
PROSPECT SCALE ORIENTED



- 2D/3D TECTONIC MODELLING



- 3D PROBABILISTIC
PETROLEUM SYSTEM MODELING



FRONTIER EXPLORATION IN ITALY

Summary and Conclusions

- Significant Frontier Potential exists, has a high materiality and can be estimated in 60-100 MSCMG and 300-500 MBO (risky exploration reserves), with a possible significant upside, mainly related to undiscovered oil.
- Such Potential is located in new plays within known basins (i.e. Mesozoic in the Po Plain), in known plays (i.e. Mesozoic in the N. Adriatic Deep) or in new plays located in unexplored basins (i.e. Western Sicily onshore and offshore, Ionian Sea deep offshore) *N.B.! Frontier Exploration in Italy has to compete with other Countries' exploration opportunities*
- Risks and uncertainties can be very high, the technology has yet to be developed for some potential projects, therefore such potential is only theoretical and needs support and incentives

FRONTIER EXPLORATION IN ITALY

Challenges and Conclusions

- **PRIOR TO BE OPERATED, FRONTIER EXPL. PROJECTS REQUIRE:**
 - Significant investments in exploration studies and data acquisition, and in R&D studies to provide adequate and cost effective technology support
 - Technical excellence in data acquisition, processing, G&G studies
 - Careful assessment of environmental issues and all H,SEQ aspects
 - Stakeholders' effective cooperation for project/business sustainability (i.e. investment decision, timely authorisations and support)
- **TECHNICAL STUDIES AIMED AT FRONTIER EXPLORATION SHOULD BE REINFORCED AS IT REPRESENTS THE FUTURE OF THE O.&G. INDUSTRY IN ITALY.....**
- **.....BUT IT MUST BE MADE A *SUSTAINABLE* FUTURE BY A STRONG, CLOSE COOPERATION OF ALL STAKEHOLDERS**