



INDUSTRIJA NAFTE, d.d.

INE's International Workshop on "Hydrocarbon Exploration and Production in the East Mediterranean and the Adriatic Sea"

EXPLORATION IN CROATIA

Athens , April 2012

Presented by:

Goran Bejdic, Project Manager

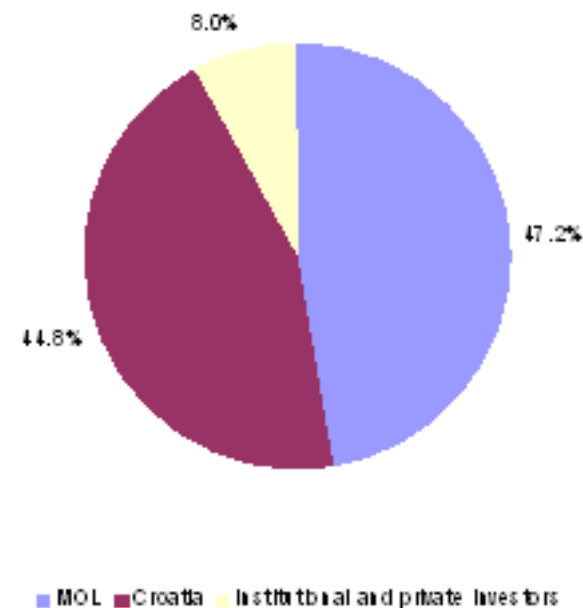
SE Europe Exploration Projects, SE Europe E&P Sector



CROATIA E&P

Oil and gas exploration and production activities in Croatia began in the 1870's, and INA or its legal predecessors have been involved in exploration activities in Croatia since 1952

- A total of 58 oil&gas fields have been discovered in the Pannonian Basin and 17 gas fields
- INA was operating all Croatia

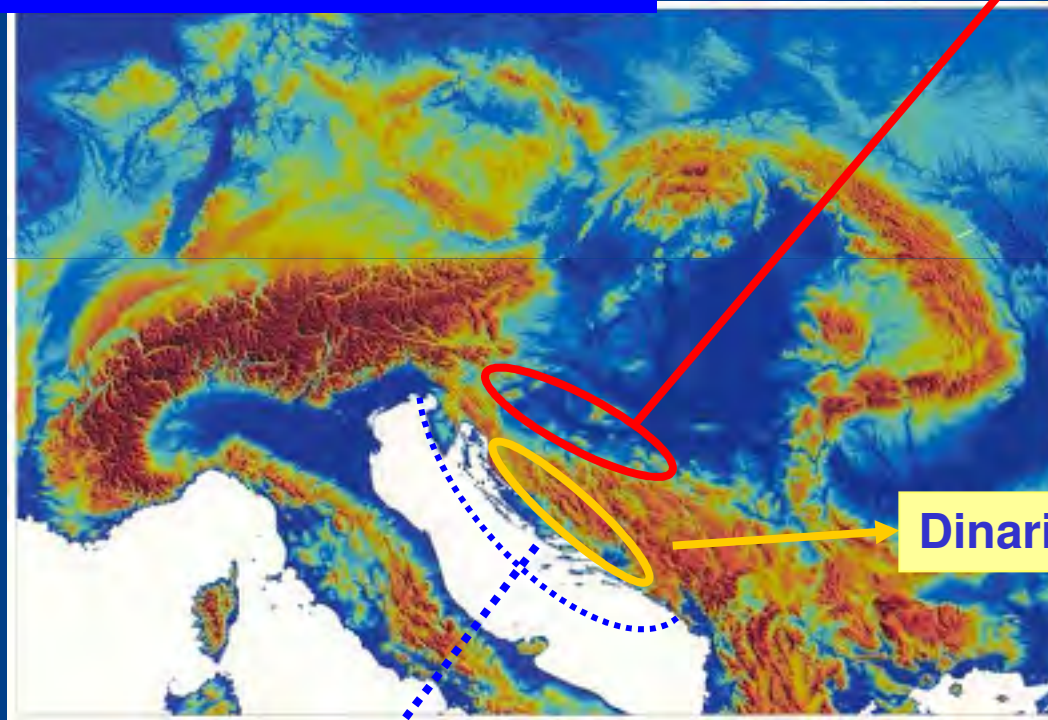




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OPERATING IN 3 DISTINCT GEOGRAPHICAL & GEOLOGICAL UNITS : PANNONIAN BASIN, DINARIDES AND ADRIATIC OFFSHORE

Croatian part of the Pannonian Basin is around **26 000 km²**



Dinarides

Croatian part of the Adriatic area is **38 454 km²**

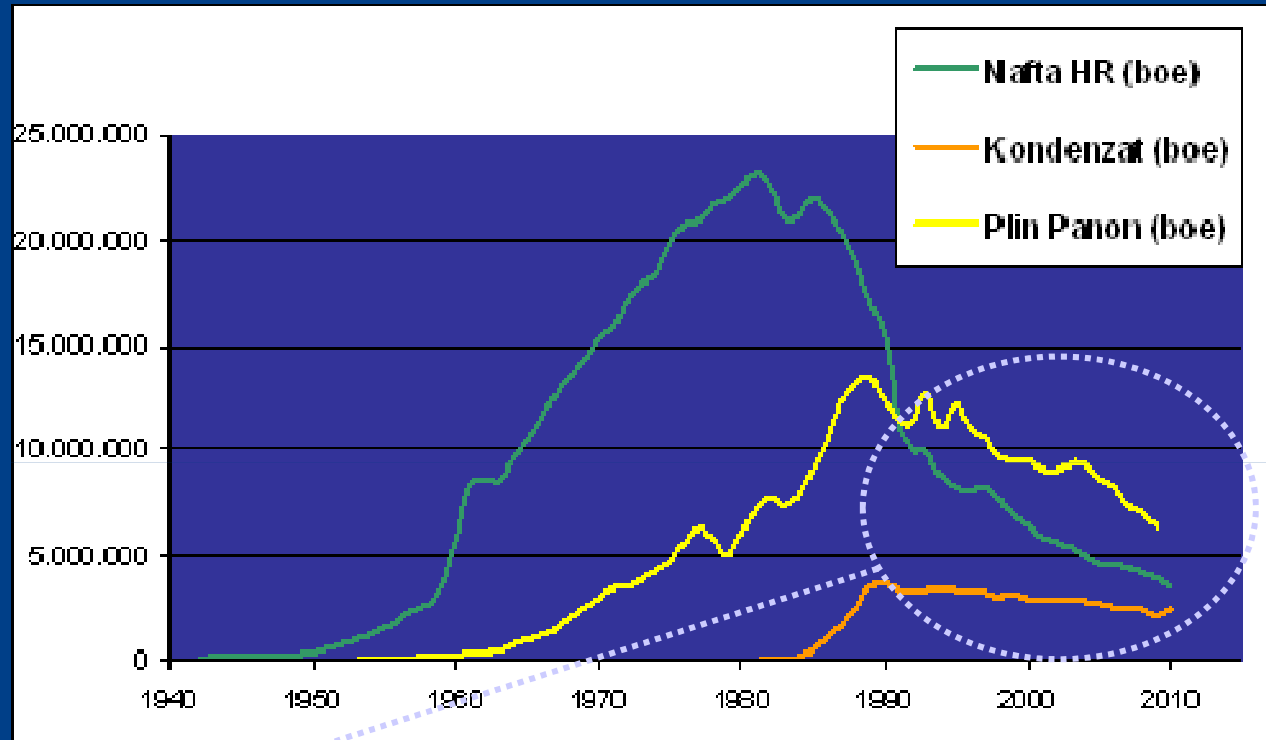


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CROATIA, CUMMULATIVE PRODUCTION Offshore & Onshore

1941-2011	boe (rounded fig.)
Oil + Condensate	742.086.000
Gas	404.482.000

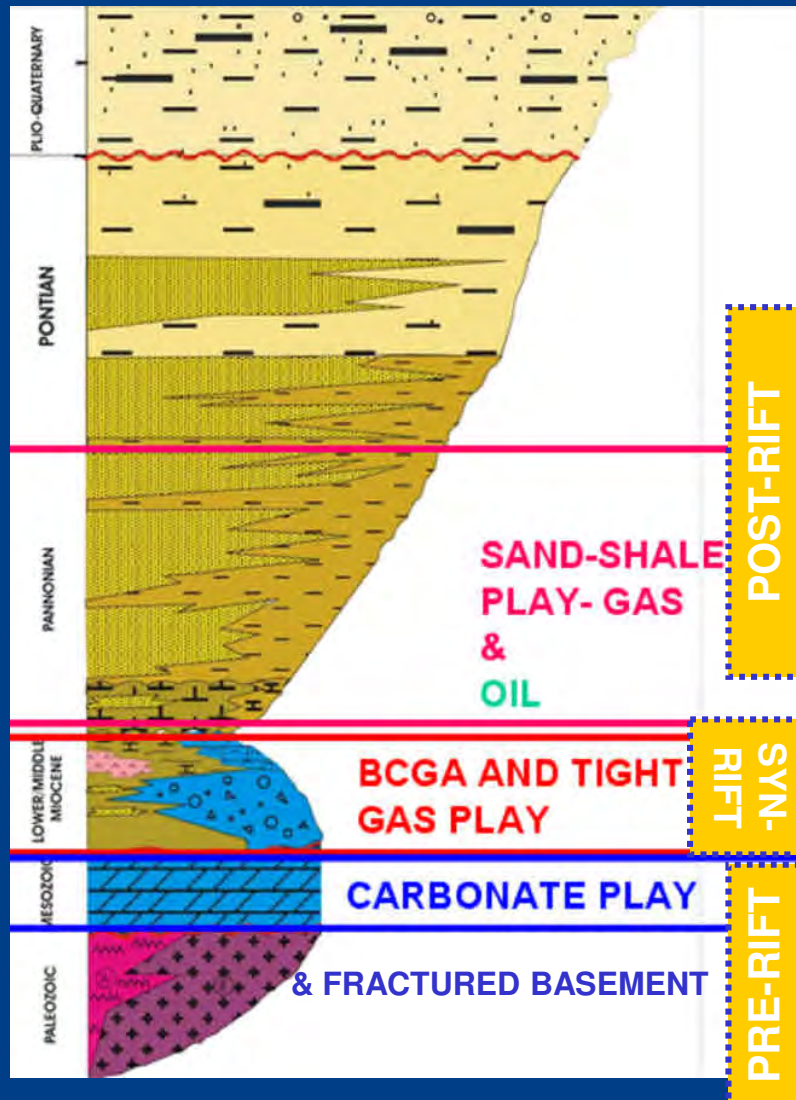
INA - PRODUCTION HISTORY ON SHORE CROATIA



Decline in production is mitigated by drilling more exploration wells, introducing new plays to include unconventional, introducing EOR etc.

Total No of on shore producing fields:
•34 OIL FIELDS
•16 GAS-CONDENSATE FIELDS

MAJOR HYDROCARBON PLAYS in Pannonian Basin, Croatia:



- FRACTURED BASEMENT
- UPLIFTED MESOZOIC BLOCKS
- LOWER-MIDDLE MIOCENE BRECCIA-CONGLOMERATES & SANDSTONES, IN SOME CASES MIXED WITH VOLCANICS (BASALT-ANDESITE), STRUCTURAL-STRATIGRAPHIC TRAPS
- UPPER MIOCENE STRUCTURAL/STRATIGRAPHIC TRAPS RELATED TO ALLUVIAL SYSTEMS
- LOWER-UPPER MIOCENE UNCONVENTIONAL RESERVOIRS (TGS, GS, OIL IN LIMY MARLS, TIGHT CALCARENITES AND BRECCIA-CONGLOMERATES)



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INA - PRODUCTION HISTORY OFF SHORE CROATIA NORTH ADRIATIC, OPERATED BY INA-ENI JV (INAGIP)



Total No. off shore producing gas fields:
9 GAS FIELDS in 2 CONTRACT AREAS:

1. North Adriatic Contract Area -

Ivana, Ida, Ika, Ana, Annamaria,
Vesna, Irina

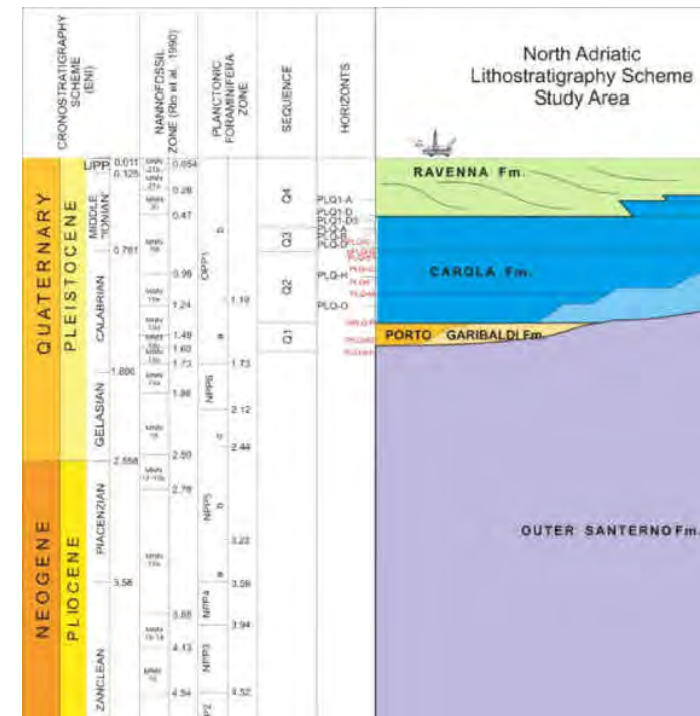
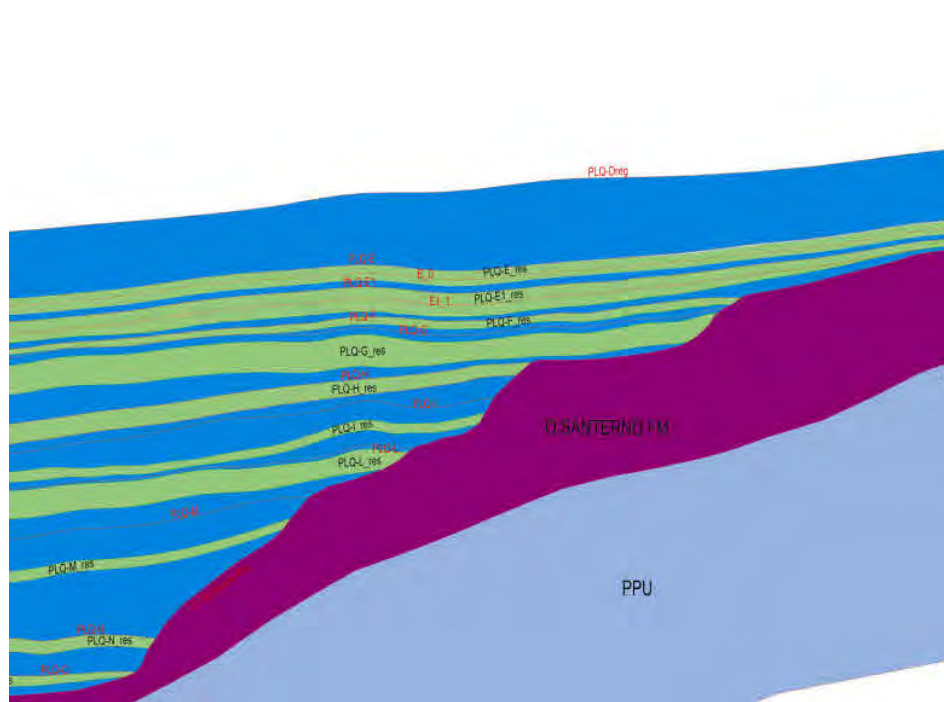
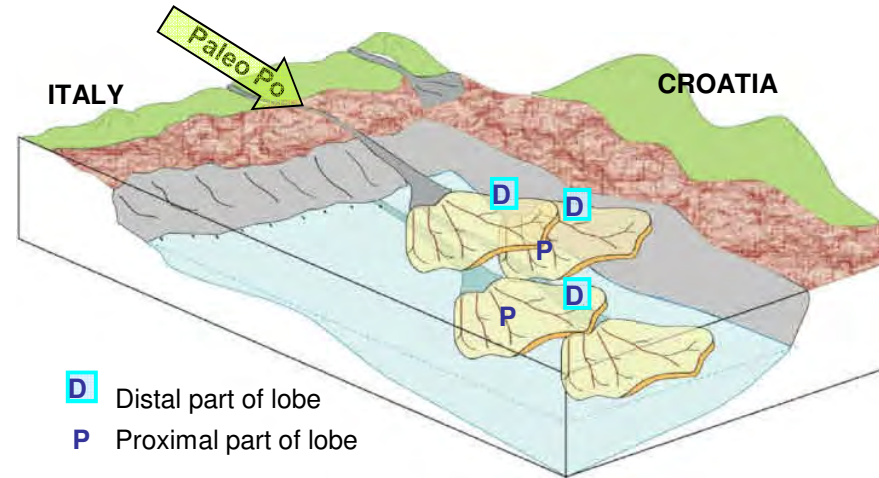
2. Aiza Laura Contract Area –

Katarina, Marica



**NORTH ADRIATIC
PRODUCING AREA**

GAS PLAY NORTH ADRIATIC, CROATIA



EXPLORATION HISTORY OFF SHORE CROATIA, ADRIATIC SEA

- First well drilled in 1970, “Jadran-1” in North Adriatic
- Latest one was drilled in 2009, North Adriatic
- TOTAL Adriatic: 128 exploration wells drilled
 - North Adriatic 96 wells
 - Central Adriatic 27 wells and
 - South Adriatic 5 exploration wells
- Irena-1 is the shallowest (840m) and J-10 is the deepest (6010m) well
- 3 exploitation fields in North Adriatic: 2 operated by JV with ENI and 1 by JV with EDISON International

DISCOVERIES:

- First: Ivana (biogenic) gas field was discovered in 1973 , ON-STREAM since 1999
- Last: Ika IKA SW, (biogenic) gas in thin layers, 2008 & 2009

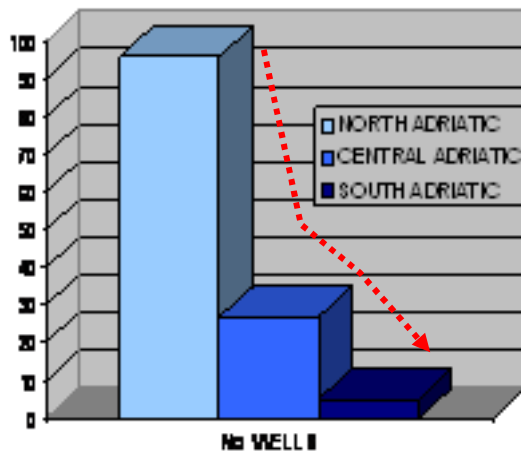




3D Areas

- 3D SEISMIC 5 710 km²
NORTH ADRIATIC (4 710 sq km) & CENTRAL ADRIATIC (1 000 sq km)
- PSEUDO 3D SEISMIC 300 km on NORTH ADRIATIC
- 2D SEISMIC 36 852 km
NORTH ADRIATIC (16 075 km), CENTRAL ADRIATIC (14 287 km), SOUTH ADRIATIC (6490 km)
- NEW (2011-2012) seismic acquisition , Ina 100% at Southern Adriatic

ADRIATIC EXPLORATION WELLS



Croatia, Adriatic offshore, lessons learned from past 40 YEARS exploration period

- 85% success ratio for N. Adriatic offshore for the 10 year period (2000-2009) – shallow, biogenic gas play
- Recently new possibilities opened for thin gas layers exploration
- Central & South Adriatic under-explored, no capital investment in the area since late 80-ies until 2011/2012 2D&3D high resolution seismic in South Adriatic
- New oil plays are proposed for these areas since drilling top of carbonate platform structures was not particularly successful
- Deeper portion of S. Adriatic offshore undrilled (sea depth > 300m)
- Possibilities for gas exploration in Central and South Adriatic not nearly exhausted – most of the wells targeted oil in carbonates, in course of drilling both biogenic and thermogenic gas shows observed in the clastics from Oligocene to Pleistocene age

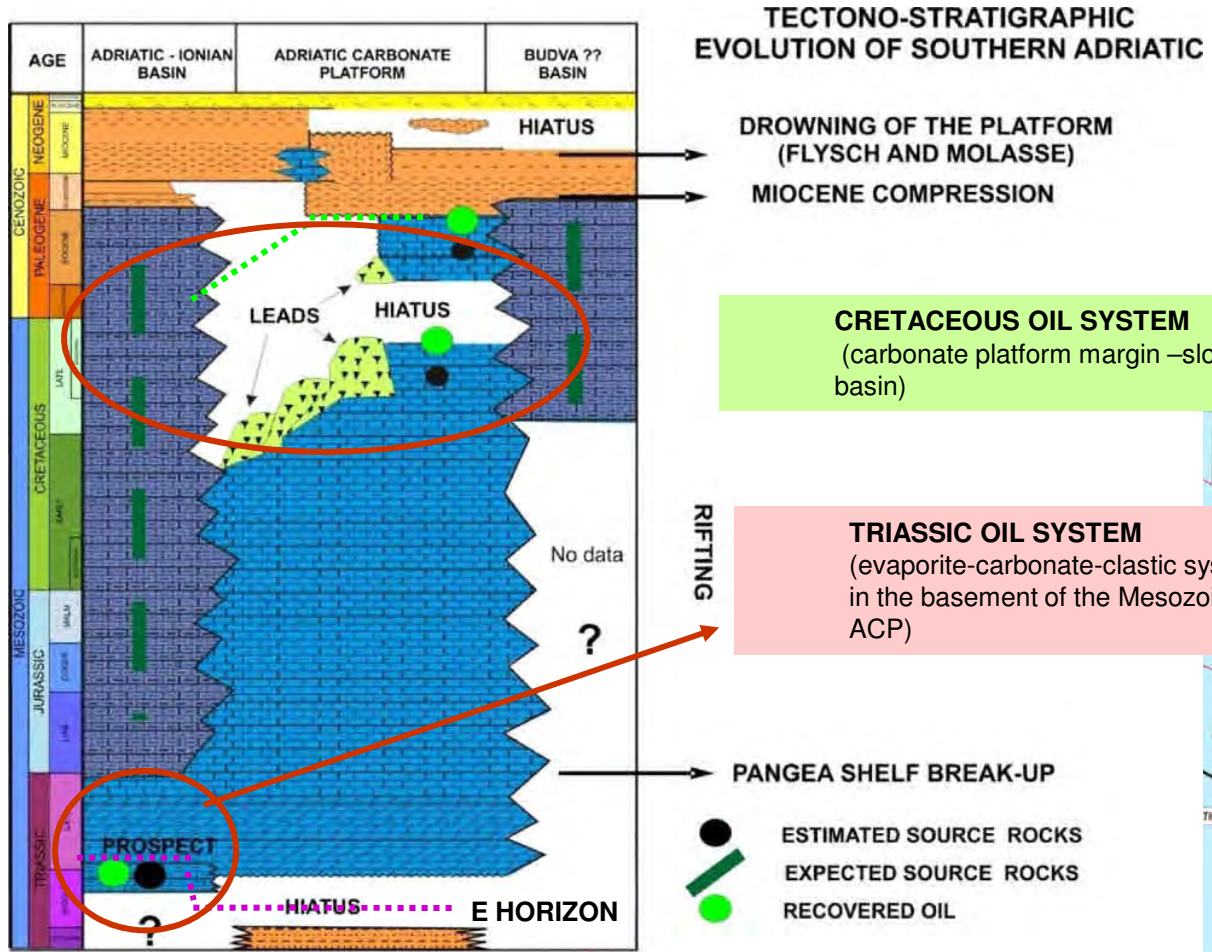


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NEW APPROACH TO INA HYSTORIC AREAS

Adriatic & Dinarides

Central and South Adriatic oil system



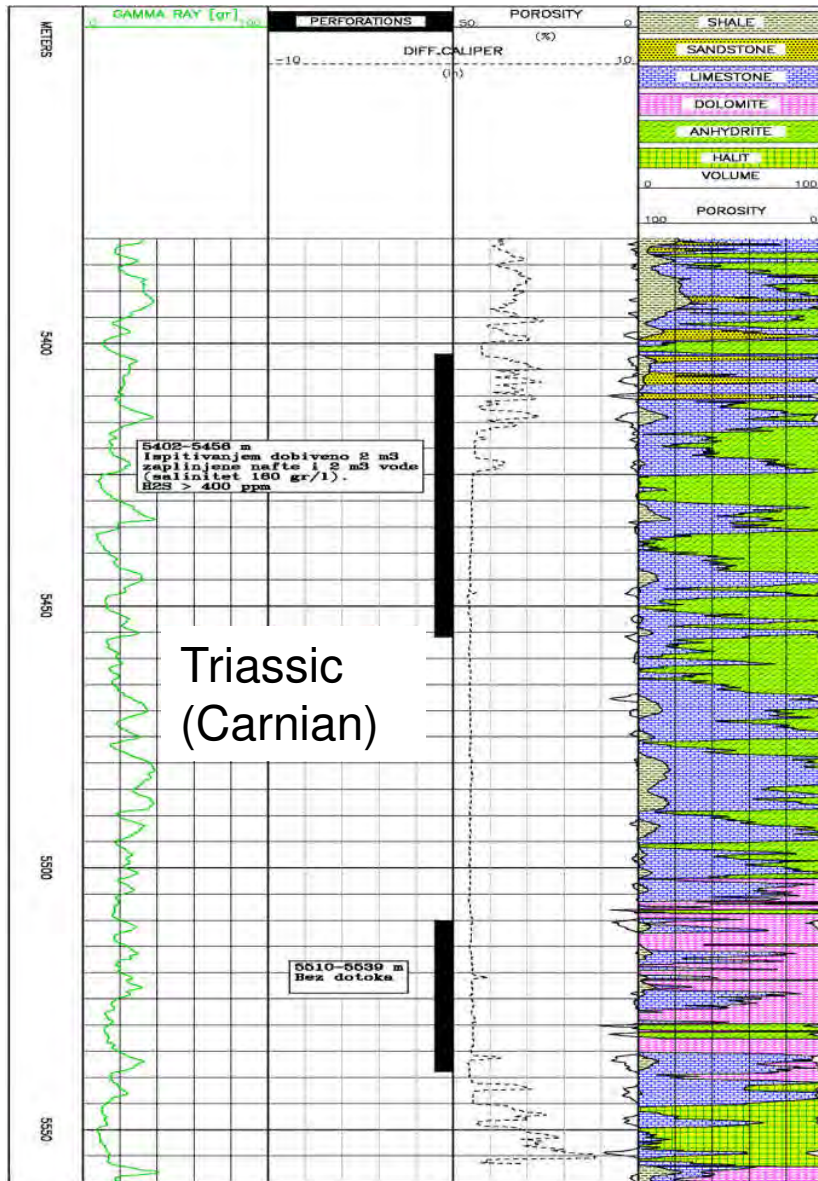
CRETACEOUS OIL SYSTEM
 (carbonate platform margin – slope – basin)

TRIASSIC OIL SYSTEM
 (evaporite-carbonate-clastic system in the basement of the Mesozoic ACP)

NEW SEISMIC 11/12
INA 100%
 - 1200 SKM OF 3D
 - 850 KM OF 2D



CENTRAL AND SOUTHERN ADRIATIC

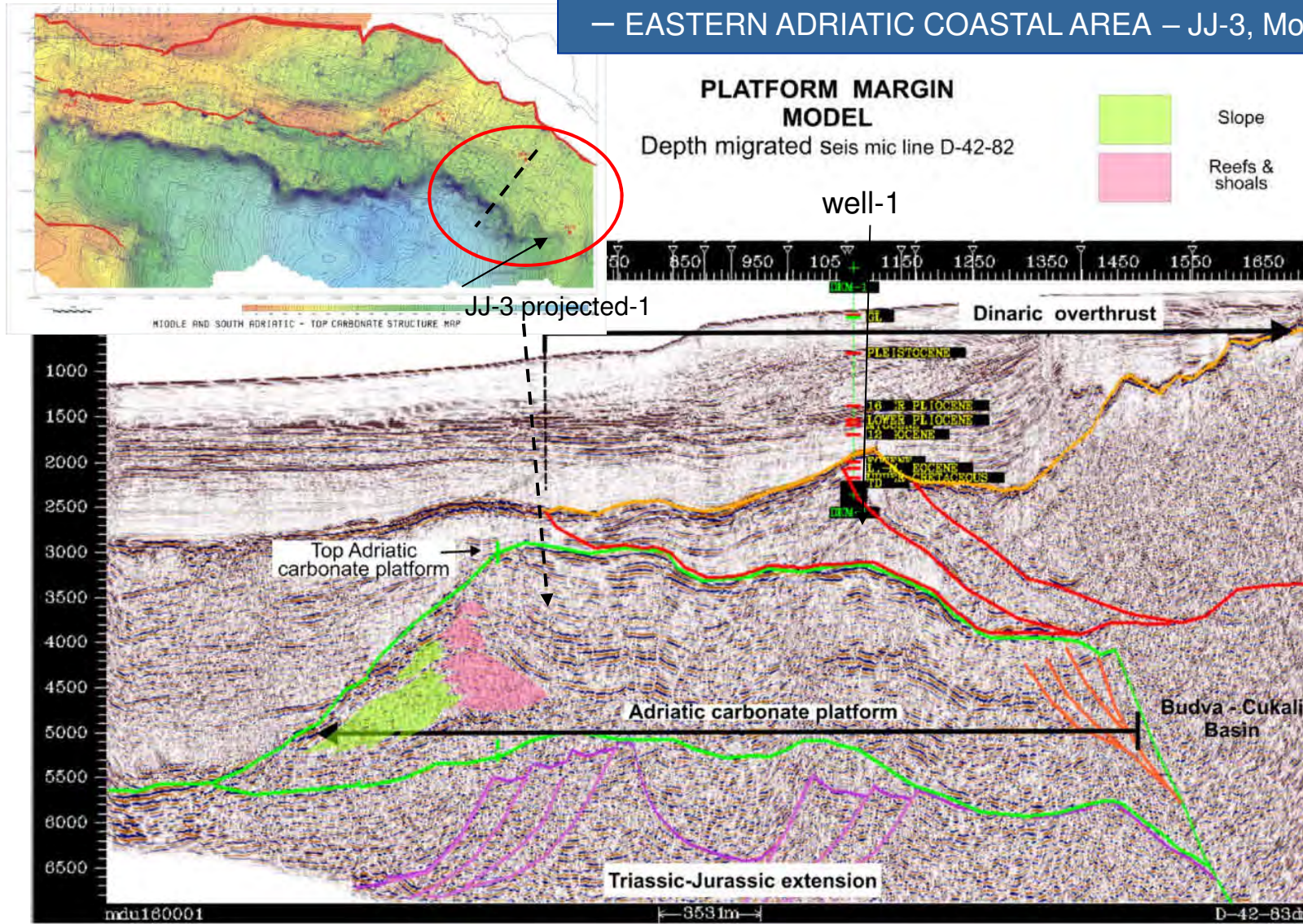


PROVEN TRIASSIC PETROLEUM SYSTEM VLASTA-1 WELL

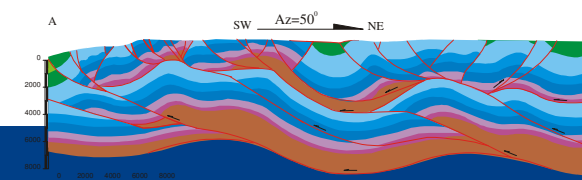
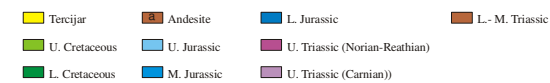
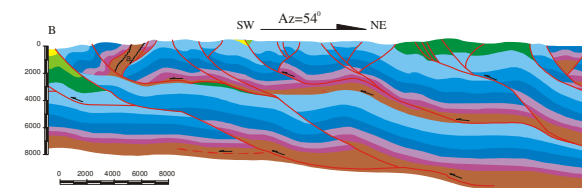
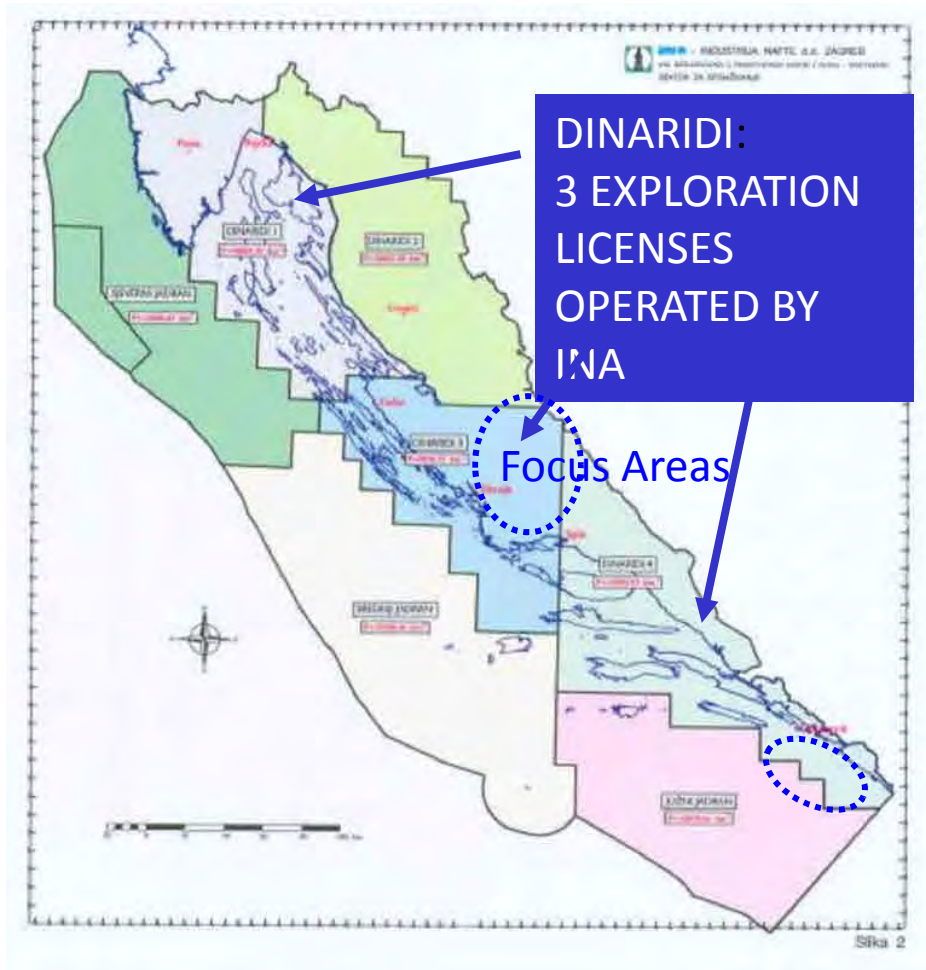
- 2 m³ of oil (26,5 API) TESTED

SOUTHERN ADRIATIC

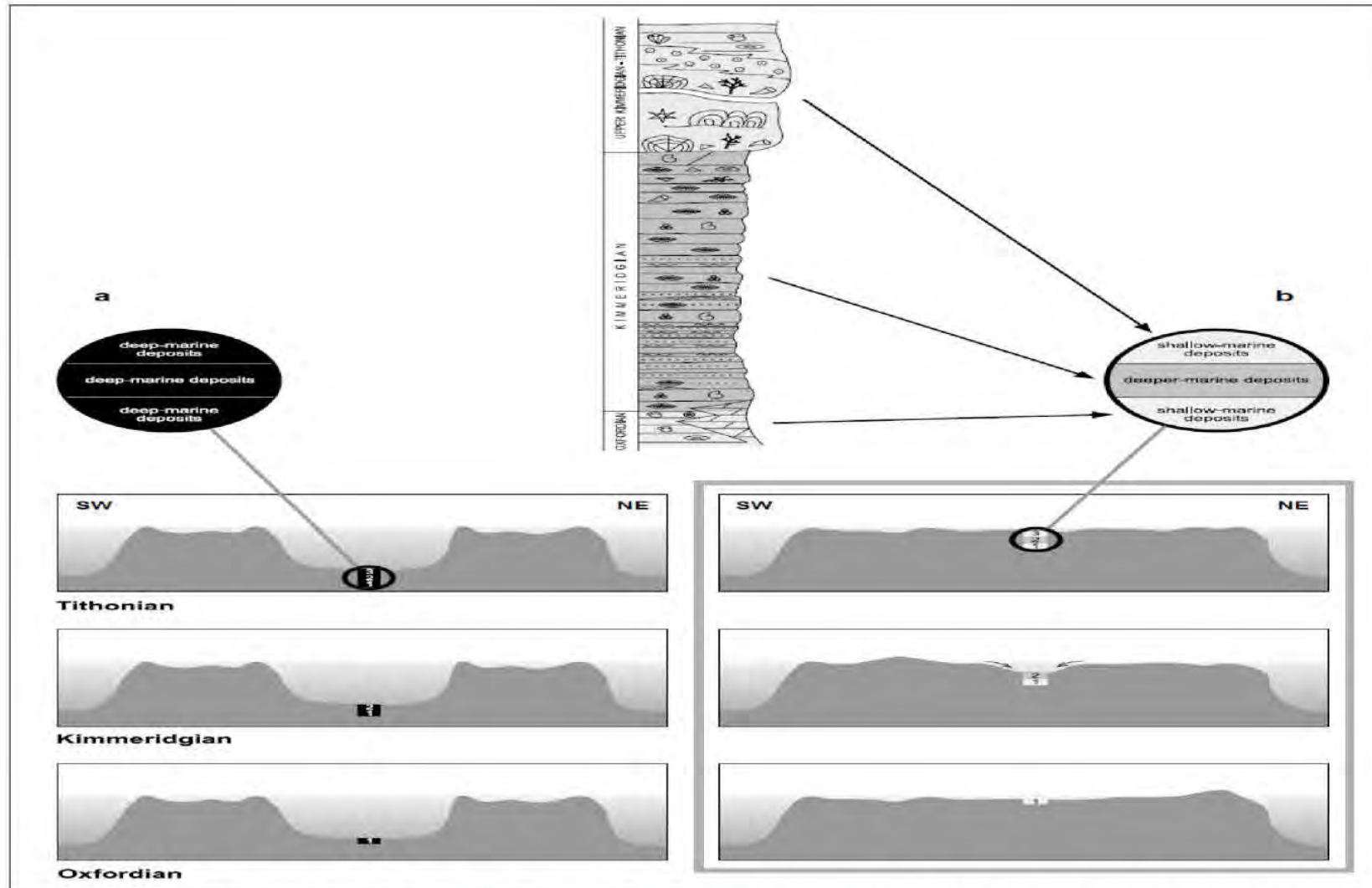
CRETACEOUS PETROLEUM SYSTEM – EASTERN ADRIATIC COASTAL AREA – JJ-3, Montenegro



FRONTIER EXPLORATION: DINARIDI THRUST BELT



NEW EXPLORATION CONCEPT FOR ONE PART OF DINARIDI:



- FOCUS IS ON KIMERIDGE DEPOSITS DEPOSITED IN A DEEP MARINE INTRAPLATFORM TROUGH, EITHER AS PER MODEL a) OR b) (after Vlahovic et al.)
- **EXCELLENT KIMERIDGE SOURCE ROCKS** HAVE BEEN PROVEN FROM THE OUTCROPS IN LIKA&DALMATIA AREA

INA-Zagreb University TEAM



Dinaridi, new exploration cycle



Upper Jurassic source rock system

SUMMARY – Adriatic and Dinaridi

60ies-80ies Intensive exploration period; North Adriatic Gas Discoveries, Joint Ventures in Central and South Adriatic

1980-2010

Passive strategy (war period...) without investments for the Dinarides and S&C Adriatic - trying to find partners....

2010-2012

Ranking-Best Prospects in S.Adriatic and Dinaridi with small GPOS mostly due to old-poor quality seismic. New studies with new geological models- 2011/2012 new 2D/3D seismic acquisition in Adriatic (INA 100%)

Present & Future

South Adriatic - ongoing processing of seismic 2D/3D data
- next- G&G evaluation.....

Dinarides - present- Seismic planning
- next- tender and 2D seismic acquisition