CHA
Croatian Hydrocarbon Agency

CROATIAN ONSHORE BIDDING ROUNDS

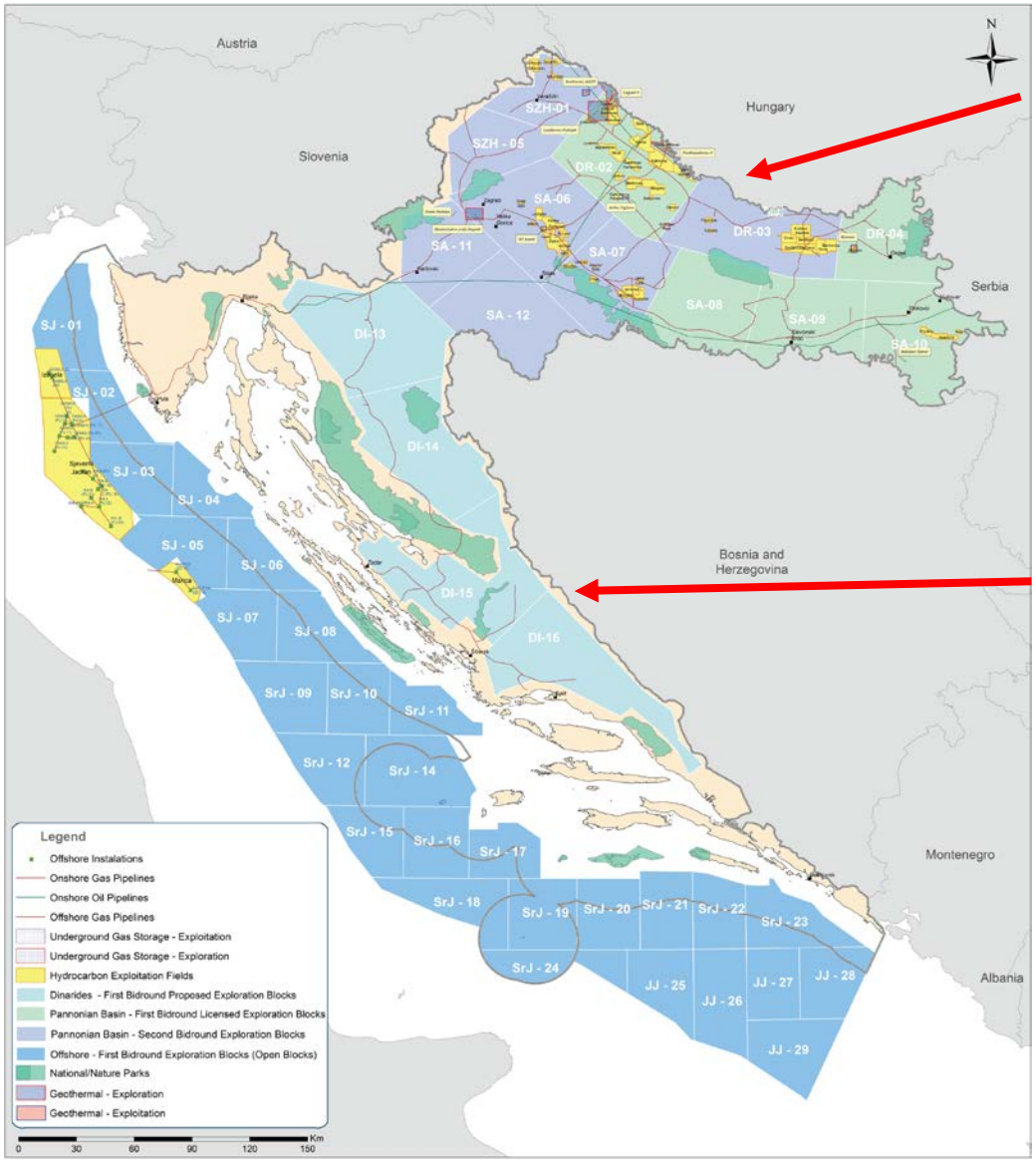
2nd Bidding Round - Pannonian Basin

3rd Bidding Round – Dinarides Area

CROATIA

New Exploration Opportunity

Middle of Europe



PANNONIAN BASIN

2nd Onshore Bidding Round

- Prolific hydrocarbon basin
- 7 exploration blocks (total acreage 14.272 km^2)
- Remaining part of Pannonian Basin
- Block DR-03 is also included

DINARIDES

3rd Onshore Bidding

- Underexplored frontier area
- 4 exploration blocks (total acreage 12.126 km^2)
- Exploration period could last 7 years

(3 + 2 + extended 2x1)

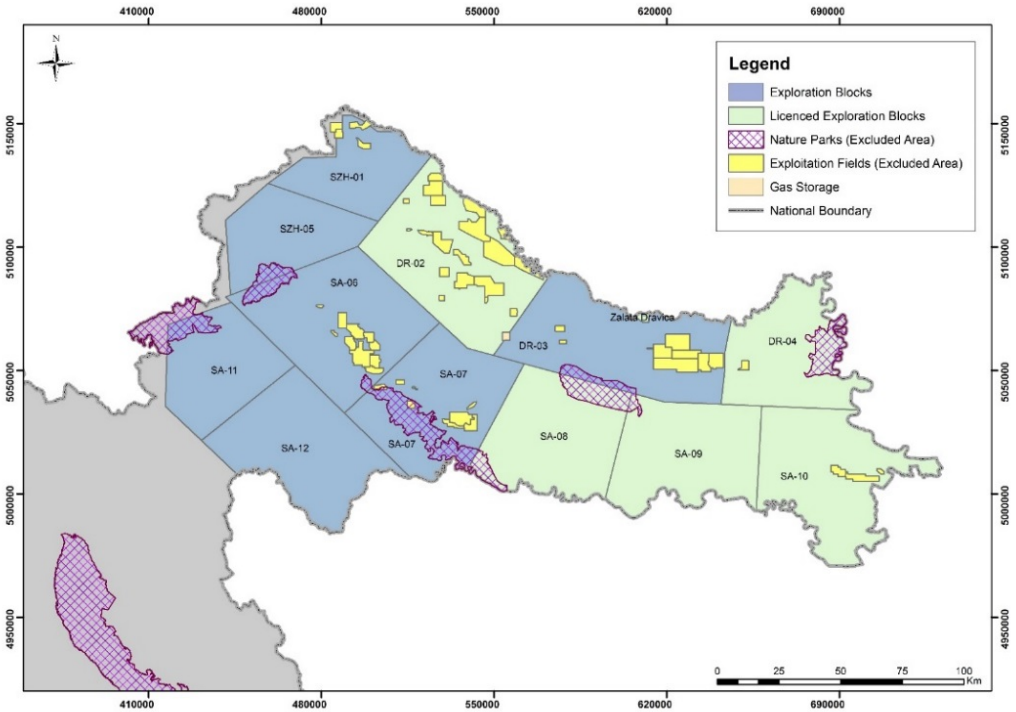
PANONNIAN BASIN

1st Onshore Bidding Round

- 18 July 2014 – 18 February 2015
- 6 exploration blocks within Pannonian Basin
- Awarded 5 licences for exploration and production of hydrocarbons
- 4 PSA signed with Vermilion Zagreb Exploration Ltd. (DR-04, SA-08, SA-09, SA-10)
- 1 PSA signed with INA-Industrija nafte Plc. (DR-02)

2nd Onshore Bidding Round – IN PROGRESS

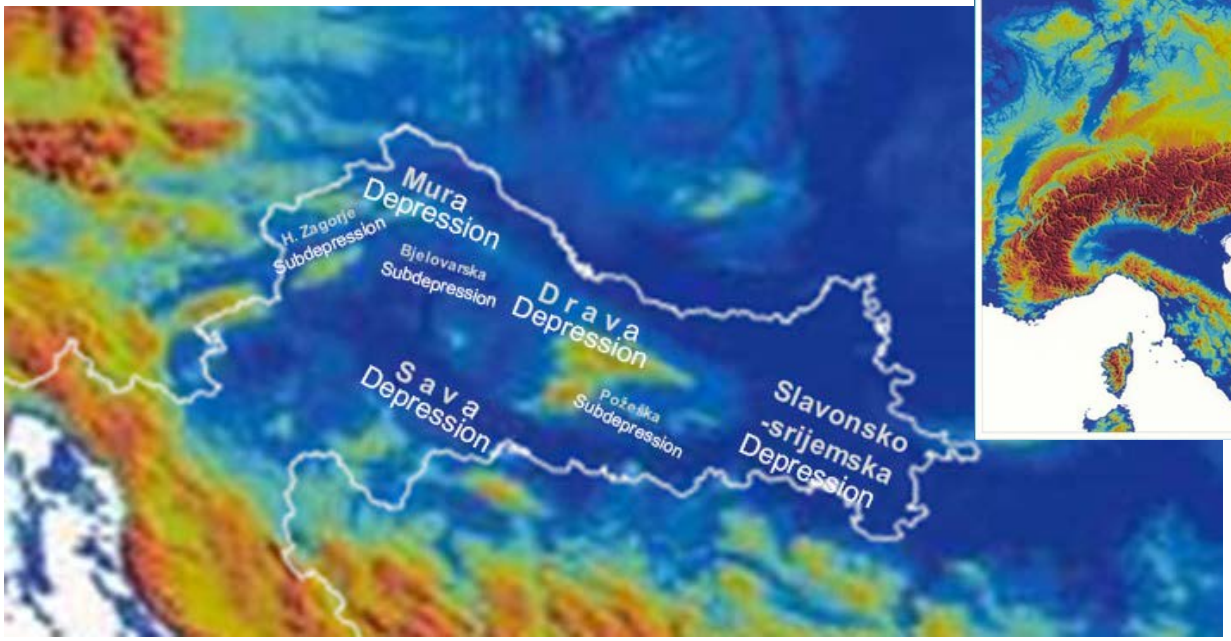
- 7 exploration blocks
- Remaining part of Pannonian Basin
- Block DR-03 is also included, it was offered in 1st Onshore bidding round, but PSA was not signed

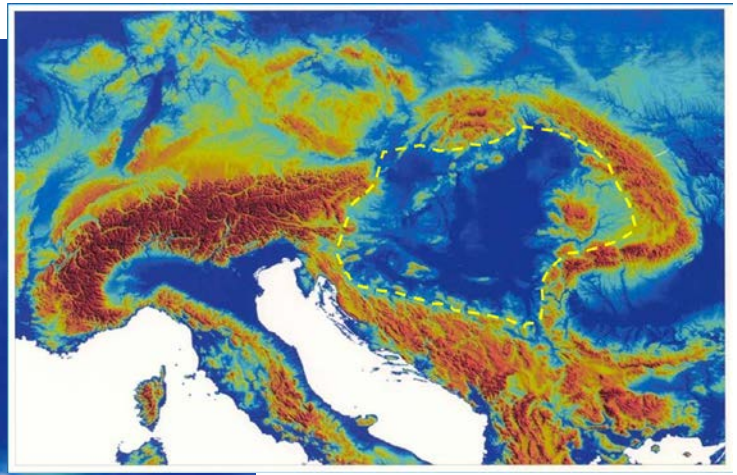


Pannonian Basin (modified from Horvath, 1985 and USGS, Bulletin 2204-B, 2006)

- The geological, hydrodynamic and thermal complexity as well as the variety of hydrocarbon accumulations characterizes the southern, marginal part of the Pannonian Basin in Croatia. The area consists of numerous small depressions/sub-depressions, separated by relatively shallow uplifted basement

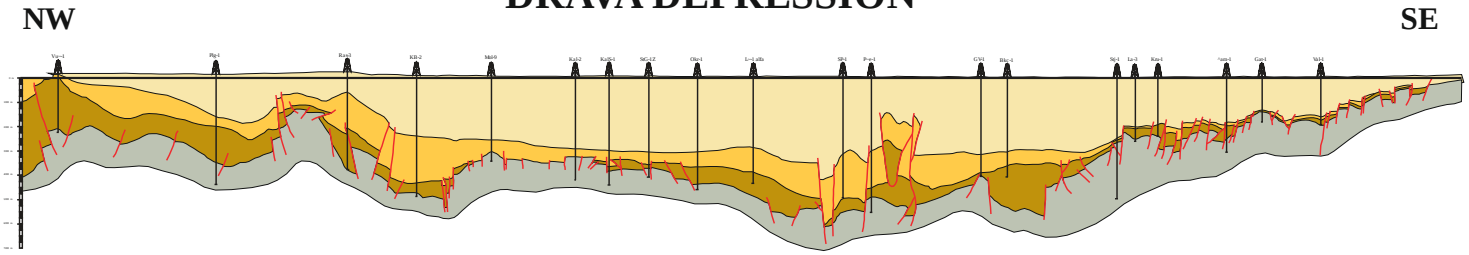
- The biggest **Drava and Sava Depressions** have WNW-ESE direction. The smaller sub-depressions of different orientation are located along the border of the area or in the zones between two major depressions.



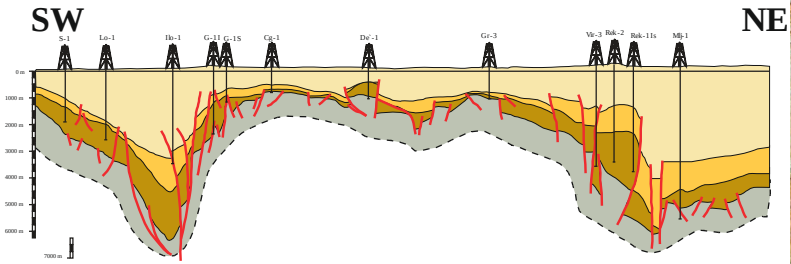


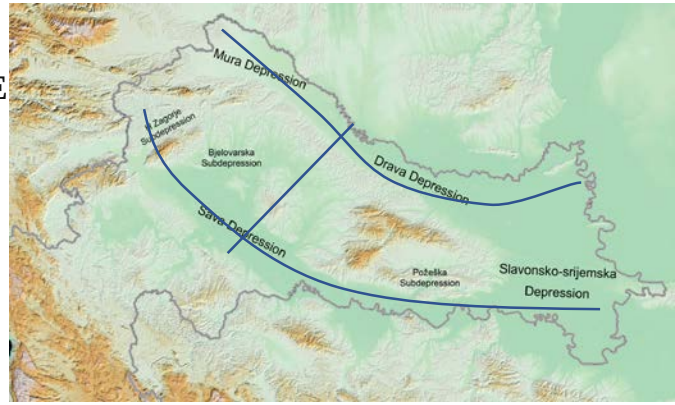
- Drava and Sava Depressions extend in WNW-ESE direction
- Smaller depressions of different orientation are bordering Dinarides and Alps.
- Geometry of depressions suggests their tectonic origin.
- The older, larger and deeper Drava Depression is sub-parallel to the Sava Depression due to the continued post-Tethyan transpression.

DRAVA DEPRESSION

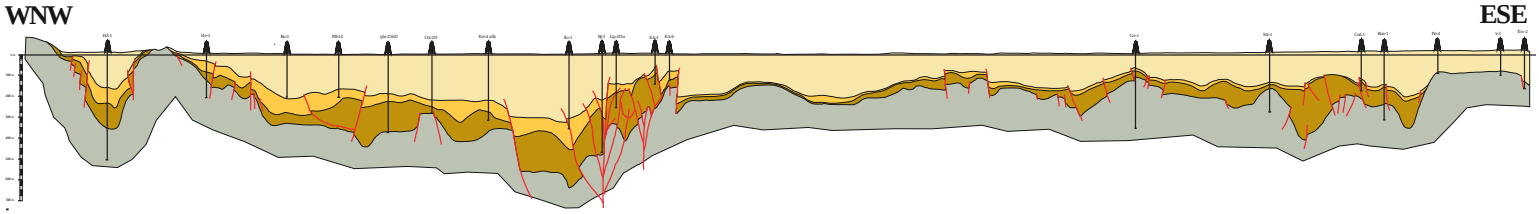


SAVA - DRAVA DEPRESSION





SAVA - EAST SLAVONIA DEPRESSION



Schematic cross sections of Croatian part of Pannonian Basin (from Nafta i Plin, Volume 35, Number 142/2015

Seven tectono-stratigraphic units have been defined:

Unit 1.

The oldest pre-Permian basement (magmatic, metamorphic and rarely sedimentary rocks - granite, gneiss, schists and various low grade metamorphic rocks) affected by Caledonian and Variscan orogeny. Angular unconformity separates basement rocks from the overlying sediments of Late Permian, Triassic and Jurassic carbonates.

Unit 2.

Involves **shallow water dolomites, dolomitic limestones and breccias**. Middle Triassic volcanism is **frequently associated.**

Unit 3.

Comprises **Jurassic carbonate sediments** deposited in gradually deepening platform, basin and seamount conditions. The end of this phase is marked by Late Jurassic obduction of the ophiolites, subsequent local uplift and erosion.

Unit 4.

Late Cretaceous - Paleocene flysch and carbonate platforms sediments suggest continued thrusting, uplift and erosion related to the collision of Apulia with Rhodope/Moessia.

Unit 5.

It is marked by initial Dinarides thrusting and the development of **Eocene flysch and molasse** troughs oriented parallel to the front of the overthrust systems.

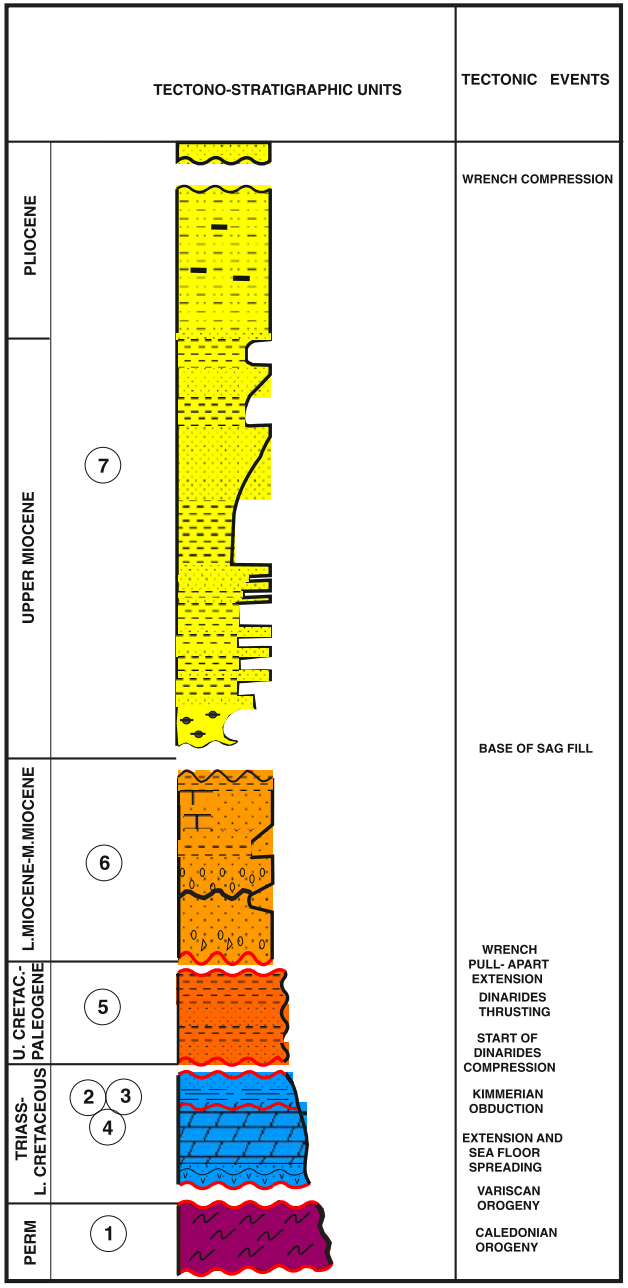
Unit 6.

Lower and Middle Miocene deposits of the deeper parts of Sava and Drava depressions unconformable overlay older basement rocks. In other depressions they are in the anomalous contact with older beds. Its formation is related to the **Miocene wrench pull-apart extension** which induced rapid subsidence and fault controlled marine and nonmarine sedimentation till the end of Sarmatian. Period of gentle subsidence at the beginning of Badenian caused the reefs migration towards marginal parts of the depressions and the formation of thick packages of organic rich marl in the central areas. During Sarmatian slow thermal uplift and intensive weathering of the marginal parts of the depressions led to the formation of a regional unconformity. Subsidence occured immediately after the uplift due to the cooling of the lithosphere and relatively fast filling of the newly formed lake type basins.

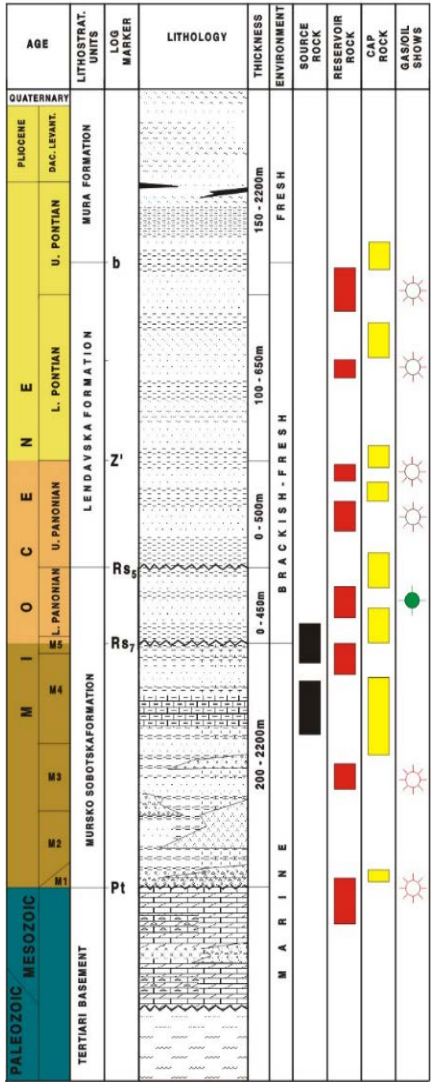
Unit 7.

Regressive tendencies at the end of the Lower Miocene are reflected as progradation of deltaic-turbiditic deposits that infill the depressions.

Final tectonic phase started at the end of the Pliocene, with the formation of the strong transpressive regime. Marginal faults of the basin are transformed into the reverse faults with common occurrences of positive flower structures and associated anticlinal forms. This tectonic phase coincides with the main phase of oil and gas generation and it is assumed that newly formed anticlinal traps were immediately filled with hydrocarbons.



Mura Depression



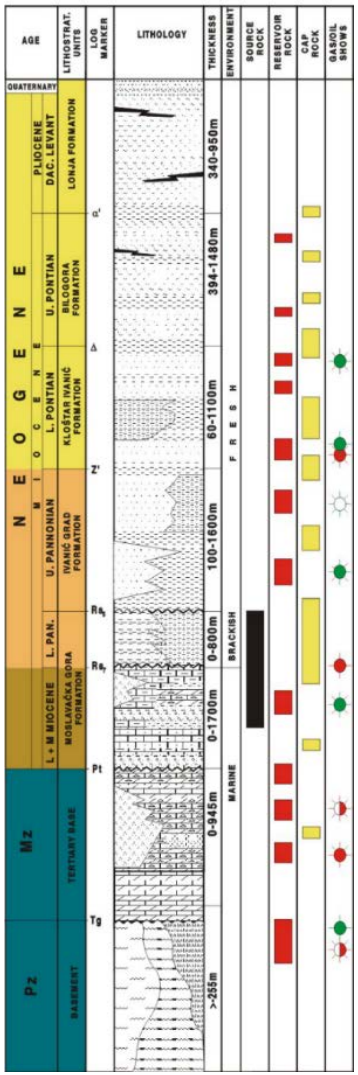
Source rocks: Badenian marls and limy marls ;Lower Pannonian limy marls and clayey limestones
Corg: 0.5-11%
Kerogen type: II and III
Oil window: 1600-2300 m

Reservoirs: Lower and Middle Miocene carbonate breccias, conglomeratic sandstones Upper Pannonian and Pontian sandstones
Porosity: 10-30%
Permeability: 0.01-0.2mm2

Seals: Middle and Upper Miocene marls and clayey limestones

Oil and gas fields
Depth: 1200 – 2100 m
Traps: Structural (burried hill and anticline and structural-stratigraphic
Oil gravity: 32.5 – 37.5° API

Drava Depression



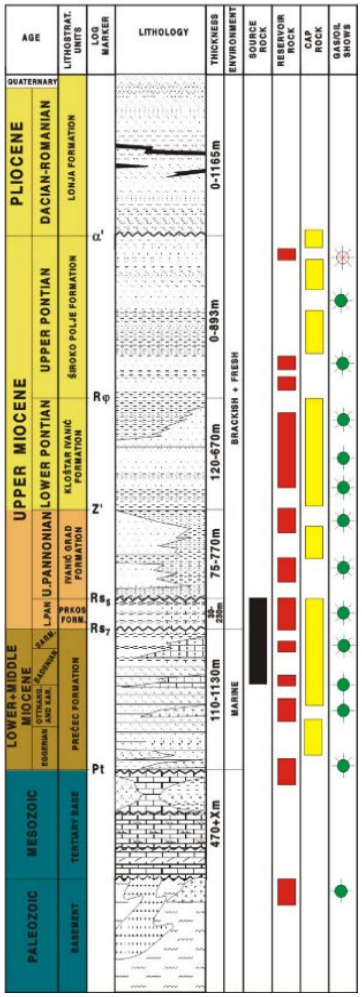
Source rocks: Badenian marls and limy marls, Lower Pannonian limy marls and clayey limestones
Corg: 0.4-5.5%
Kerogen type: II and III
Oil window: 1700-2300m

Reservoirs: Metamorphic and intrusive Paleozoic rocks, Mesozoic carbonates, Early and Middle Miocene carbonate breccias, pyroclastic breccias, conglomeratic sandstones, Lower Pannonian fractured limy marls, Upper Pannonian and Pontian sandstones
Porosity: 10-30%
Permeability: 0.01-0.2mm2

Seals: Middle and Upper Miocene marls and clayey limestones

Oil and gas fields
Depth: 400 – 3500 m
Traps: Structural (burried hill and anticline and structural-stratigraphic
Oil gravity: 24.5 – 44° API

Sava Depression



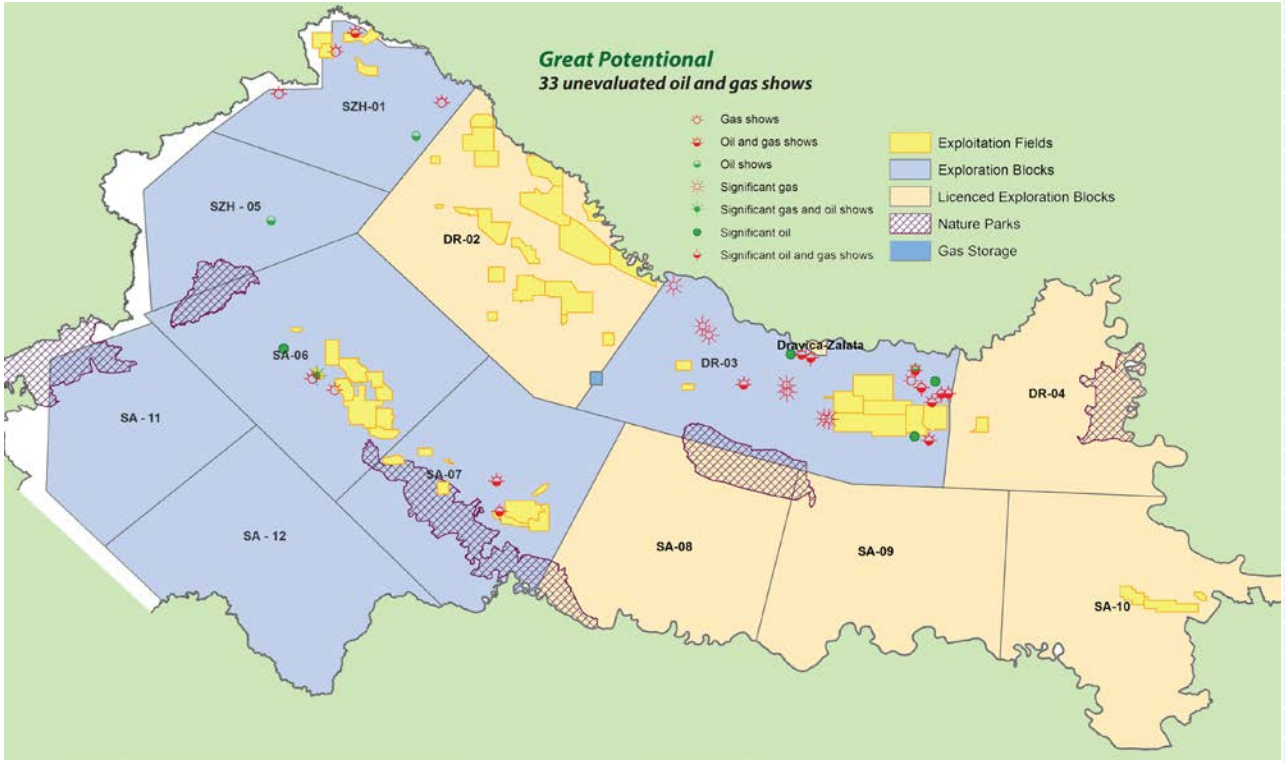
Source rocks: Badenian marls and limy marls, Lower Pannonian limy marls and clayey limestones
Corg: 0.5-2.771%
Kerogen type: I and II
Oil window: 1900-2100m

Reservoirs: Paleozoic metamorphic rocks and intrusives, Early and Middle Miocene carbonate breccias, conglomeratic sandstones, Early Pannonian fractured limy marls, Late Pannonian and Pontian sandstones
Porosity: 10-30%
Permeability: 0.01-0.2mm2

Seals: Middle and Upper Miocene marls and clayey limestones

Oil and gas fields
Depth: 400 – 2300 m
Traps: Structural (burried hill and anticline and structural-stratigraphic
Oil gravity: 15 – 37° API

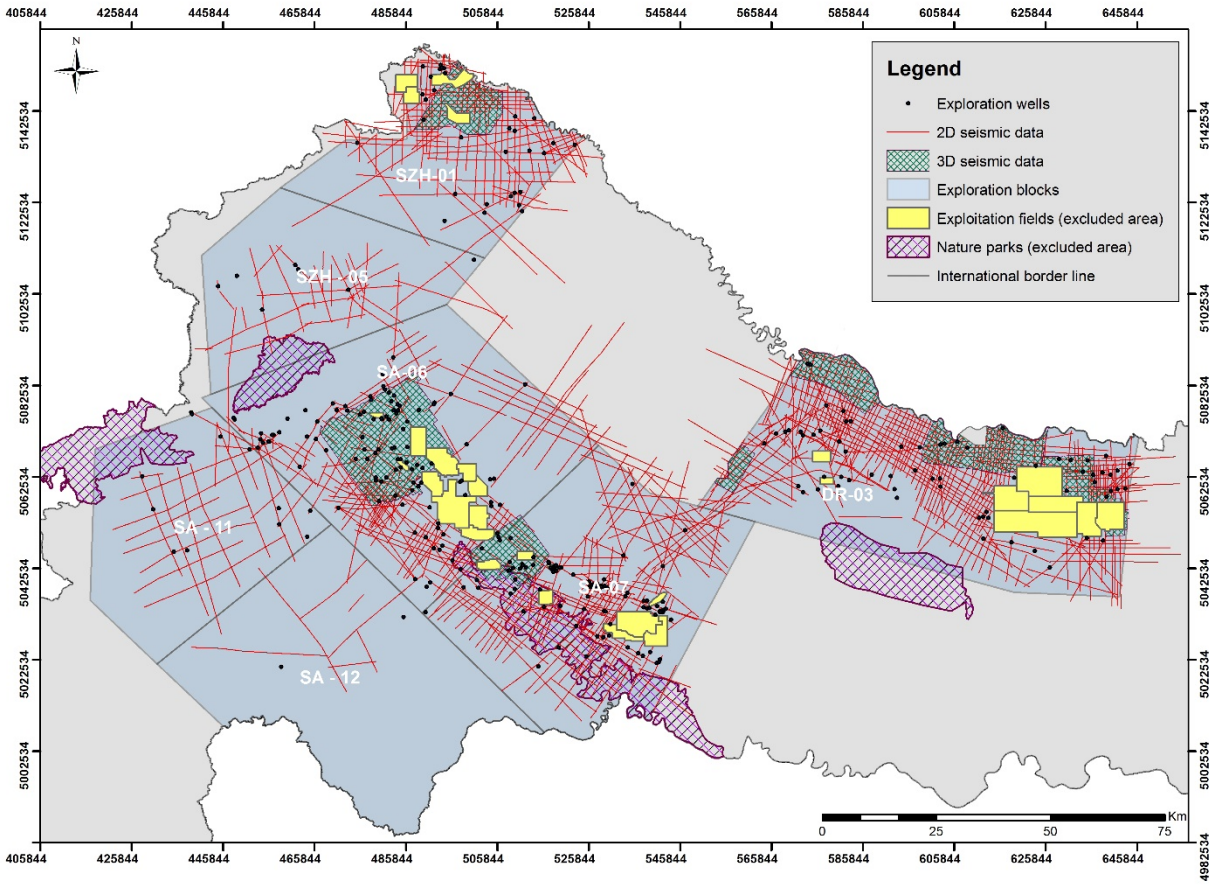
37 Unevaluated Oil and Gas Shows



ID	Well Name	HC Type
1	Čamagajevci-2	Significant oil
2	Donji Miholjac-2	Oil shows
3	Koška-2	Significant oil
4	Podravska Slatina-5	Significant oil
5	Čađavica-1	Significant oil and Gas shows
6	Donji Miholjac-3	Gas shows
7	Donji Miholjac-4	Oil and gas shows
8	Koška-1	Oil and gas shows
9	Marjanci-1	Oil and gas shows
10	Podravska Slatina-3	Oil and gas shows
11	Čamagajevci-1 Alfa	Significant oil and Gas shows
12	Podravska Slatina-2	Oil and gas shows
13	Orešac-2	Significant gas
14	Marjanci-3	Significant oil and gas shows
15	Marjanci-4	Significant oil and gas shows
16	Donja Bukovica-1	Gas significant
17	Donja Bukovica-2	Gas significant
18	Orešac-3	Gas significant
19	Obradovci-1	Gas significant
20	Obradovci-3	Gas significant
21	Lončaruša-1 Alfa	Gas significant
23	Kopčevec-1	Significant oil
24	Duga Greda-1	Gas shows
25	Posavski Bregi-2	Gas shows
26	Duga Greda-2	Significant gas and oil shows
27	Gojlo-2 Istok Alfa	Oil and gas shows
28	Banova Jaruga-3	Significant oil and gas shows
32	Ludbreg-4	Oil shows
33	Međimurje-2	Gas shows
34	Međimurje-5	Gas shows
35	Sitnica-2	Oil and gas shows
36	Strmec Podravski-1	Gas shows
37	Hrvatsko Zagorje-1 Alfa	Oil shows

7 exploration blocks, with total accreage 14.272 km^2, contain the following data:

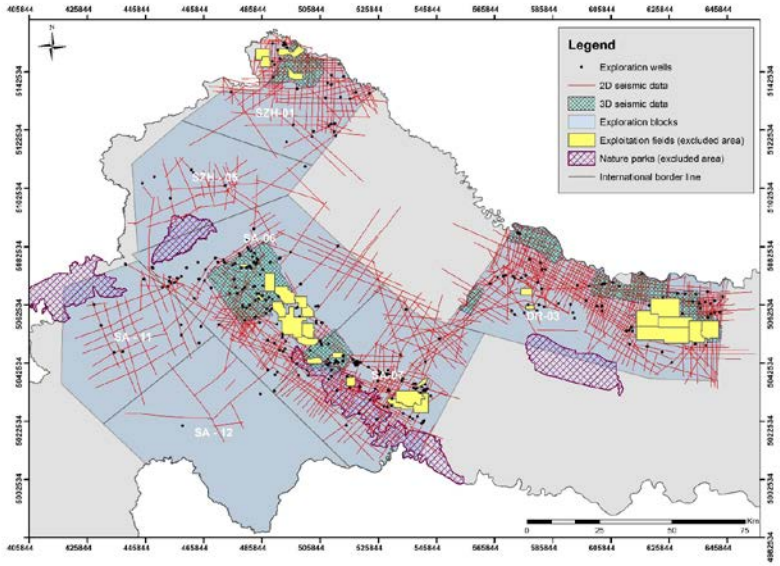
- 10.016 km of 2D legacy seismic data in stk/mig format
- 1.796 km^2 of 3D legacy seismic data in stk/mig format



All the data can be seen in our Data Room in Zagreb.
If you are interested, please contact us at

info@azu.hr

Before visiting you will be provided with tendering documentation, data inventory and spatial data.



Distinguish criteria based on quantity of G&G data and existing oil and gas fields in blocks

Criteria for exploration blocks SZH-01, DR-03, SA-06, SA-07		Mark (up to)	Weight %
1st exploration phase (3 years)	2D seismic survey	5	70
	3D seismic survey	40	
	Other surveys	5	
	Reprocessing of seismic data	2	
	Gravimetry and magnetometry	2	
	Other	1	
	Number and depth of exploration wells	50	
2nd exploration phase (2 years)	2D seismic survey	5	20
	3D seismic survey	35	
	Number and depth od exploration wells	60	
Signature bonus		100	10

Criteria for exploration blocks SZH-05, SA-11, SA-12		Mark (up to)	Weight %
1st exploration phase (3 years)	2D seismic survey	40	70
	3D seismic survey	5	
	Other surveys	15	
	Reprocessing of seismic data	5	
	Gravimetry and magnetometry	5	
	Other	5	
	Number and depth of exploration wells	40	
2nd exploration phase (2 years)	2D seismic survey	30	20
	3D seismic survey	10	
	Number and depth od exploration wells	60	
Signature bonus		100	10

Tentative Bidding Schedule	
November 2nd 2018	Bidding Round opening
June 28th 2019, 12:00 a.m., local time	End date for submitting bids
October 2019	Indicative deadline for granting licences

Bidders must satisfy:

- Administrative requirements
- Formal requirements
- Legal requirements
- Financial requirements
- Technical requirements
- Health, safety and environment requirements

After bidding round closes – open door policy could be activated

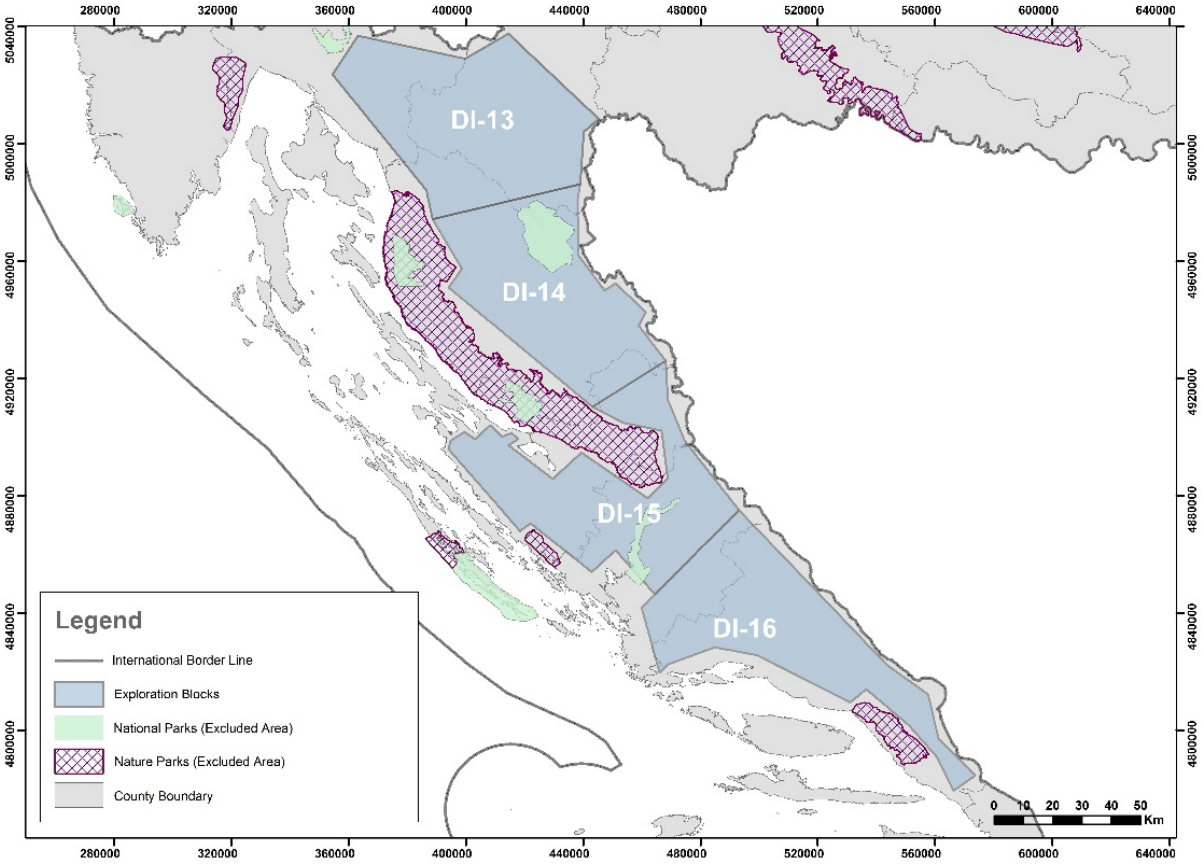
DINARIDES AREA

Dinarides area is divided into 4 exploration blocks (12.126 km^2)

- Dinaridi-13
- Dinaridi-14
- Dinaridi-15
- Dinaridi-16

Exploration period consists of:

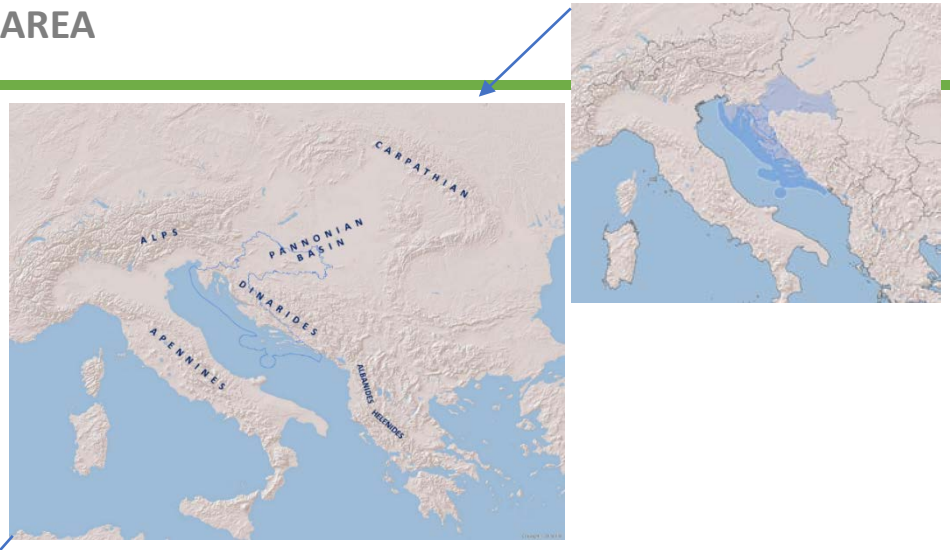
- First exploration phase (3 years),
- Second one (2 years
- Extension could be granted for additional 2 × 1 year

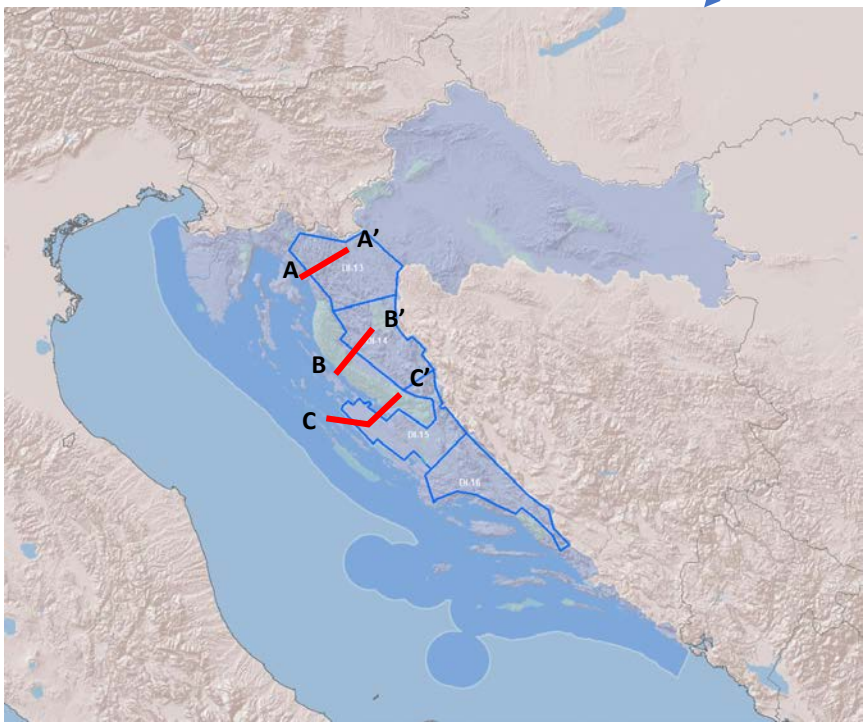


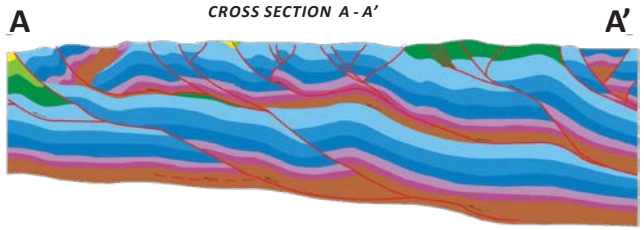
Exploration blocks are moved aside from coast line. National and nature parks are also excluded

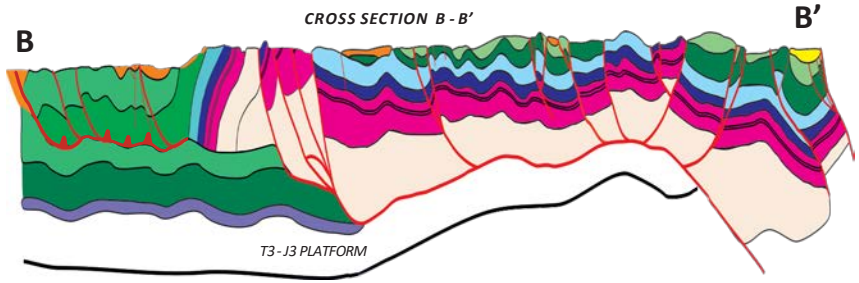
The Dinarides are a wide NW-SE fold-and thrust belt stretching from southwestern Slovenia to Montenegro along the Adriatic coast of Croatia and inland.

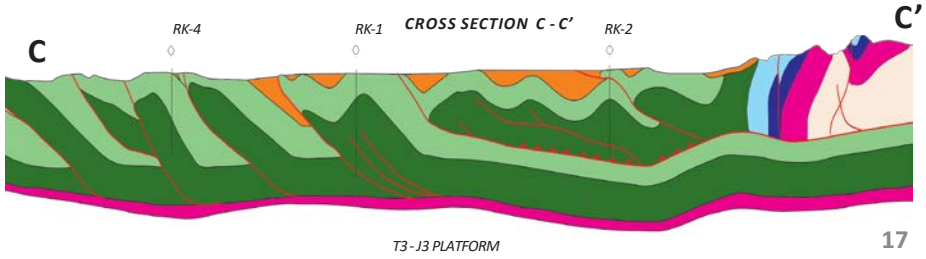
The Dinarides, part of Alpine orogenic system, formed as a consequence of subduction and collision processes in the border zone between Europe and Adria tectonic plates.











Source Rocks

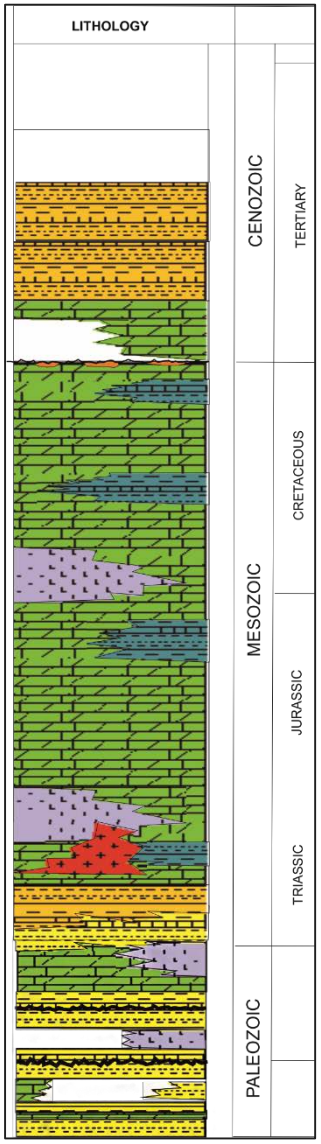
- **Carboniferous and Permian carbonates and clastics** TOC 0,61-15%, type III and IV kerogen, thermal maturity at the end of peak gas or overmature;
- **Middle Triassic deep anoxic lagoons** Lower to mid mature stage of petroleum generation;
- **Ladinian and Carnian carbonates and clastics** TOC up to 8%, type II kerogen in the late to postmature stage for oil generation;
- **Jurassic limestones (Lemes facies)** TOC 0,3-27%, type I and II kerogen, *excellent source potential,* oil window prior to uplift and thrusting

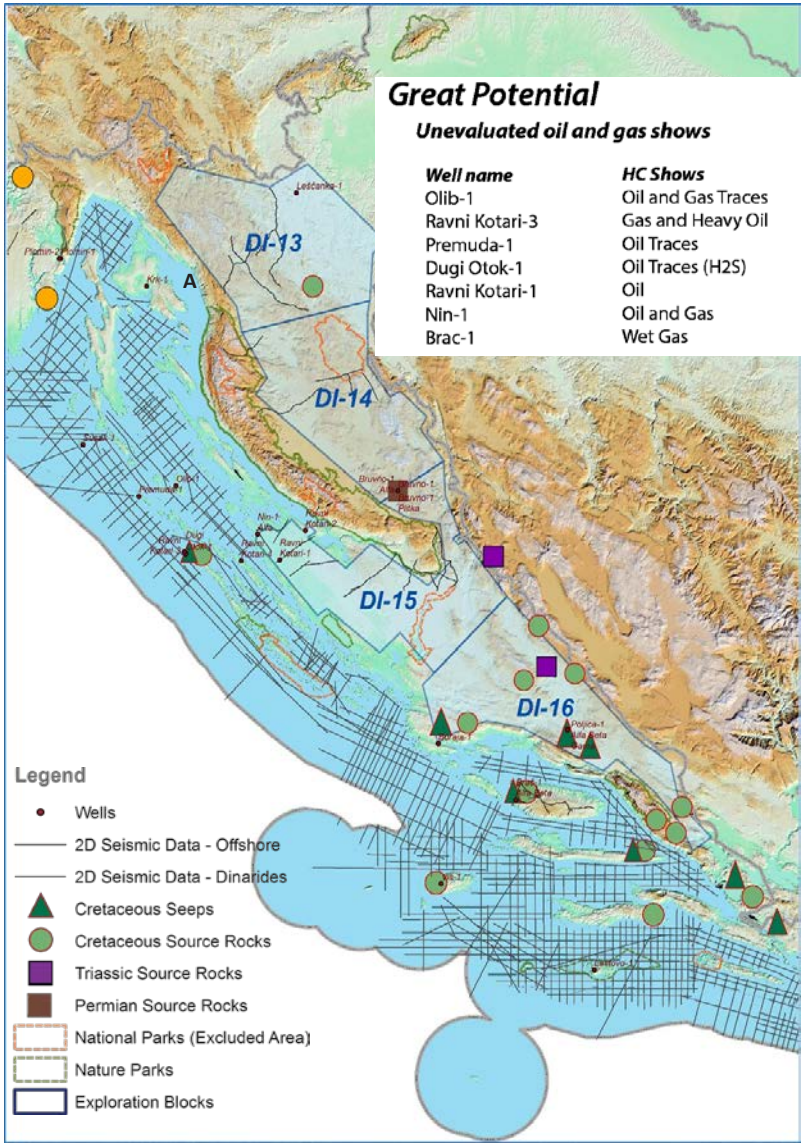
Reservoir Rocks

- **Late Triassic, Middle and Late Jurassic, Early Cretaceous;**
- **Late Cretaceous - Paleogene** Various type of shallow platform carbonates with primary, secondary and fractured porosity
- **Late Paleozoic and Early and Middle Triassic** Siliciclastics

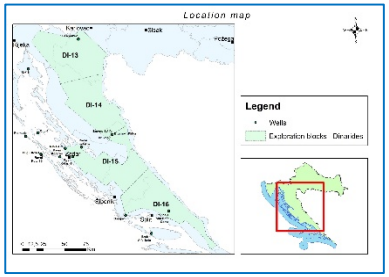
Seals

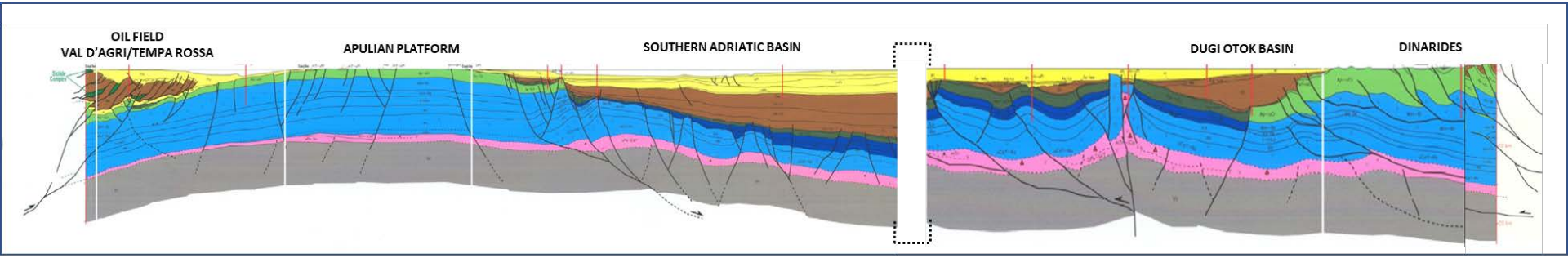
- **Evaporites** attributed to Late Permian, Late Jurassic and Early Creataceous
- Basinal and anoxic **Shales/Platy Limestones** attributed to Upper Jurassic (Lemes facies) and Lower and Upper Cretaceous
- **Tertiary clastic** (**Flysh** and Promina beds), Eocene - Miocene





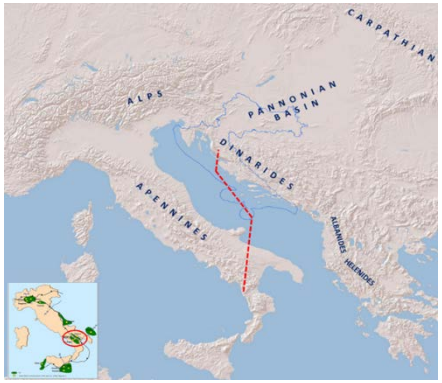
Well name	Interval Depth	Lithology	HC Type	Comment
Boraja-1	3660- TD	Lower Cretaceous (Dolomite)	Oil shows	Bitumen traces in whole interval
Brač-1	5785-5827	Lower Cretaceous (Dolomite and Anhydrite)	Gas shows	
	5995-6045	Lower Cretaceous (Dolomite and Anhydrite)	Gas shows	Gas detected during drilling
Dugi Otok-1	2901-3105	Lower-Upper Cretaceous	Oil Shows	
Nin-1 Alfa	2901- 4580	Lower Cretaceous (Limestone and Anhydrite)	Gas and oil shows	In those intervals under UV lamp there is positive shows on gas and oil. Most DST testing was unsuccessful caused by technical problems.
Nin-1	4036-5220	Lower Cretaceous - Upper Jurrasic (Dolomite and Anhydrite)	Gas and oil shows	
Olib-1	458-460	Lower Cretaceous (Limestone)	Oil shows	
	1748, 2599, 2971	Lower Cretaceous - Upper Jurassic (Dolomite and Anhydrite)	Oil Shows	from core
Premuda-1	2282- 4121	Upper Jurasic - Lower Cretaceous (Limestone-Dolomite-Anhydrite)	Oil Shows	In this big interval there are many places with positivity on UV lamp. There were na DST testing and EK measurement did not reach TD
Ravni Kotari -1	2369- 4442	Lower Cretaceous (Dolomite and Anhydrite)	Oil Traces	In this big interval there are many oil traces noted from core during drilling
Ravni Kotari-3	2671-2713	Lower Cretaceous (Limestone)	Gas shows, Oil significant	Gas is with H2S. Low formation pressure
	2707-2767	Lower Cretaceous (Anhydrite)	Gas and oil shows	Gas with H2S. Low formation pressure. Oil is mixed with brine
	2814-2867	Lower Cretaceous (Anhydrite)	Gas shows, Oil significant	Increased amount of H2S mixed with gas.

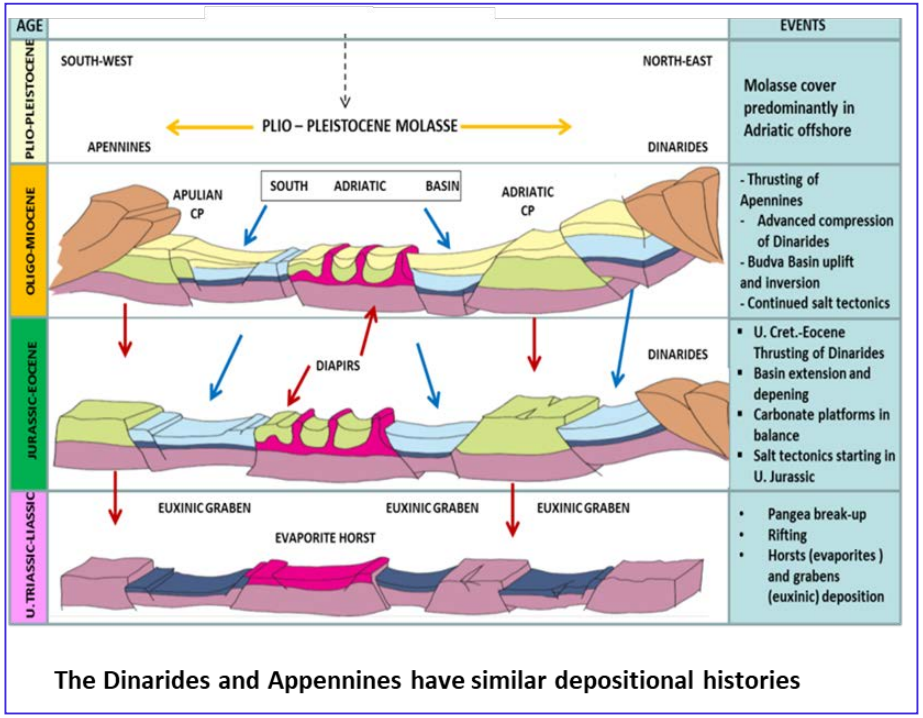




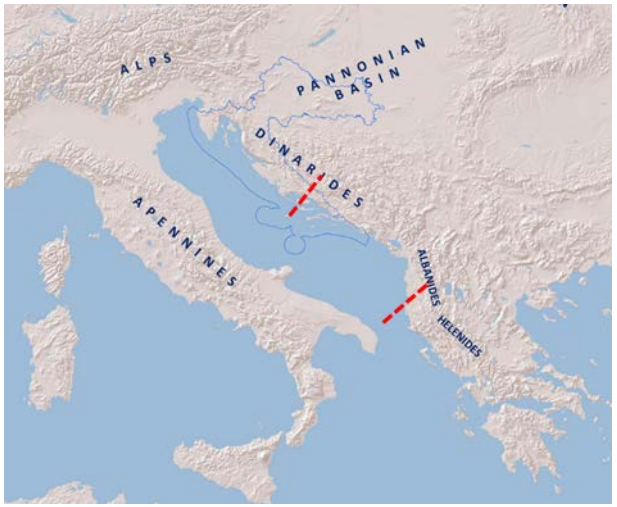
Source: modified from JPG, 38/3,2015

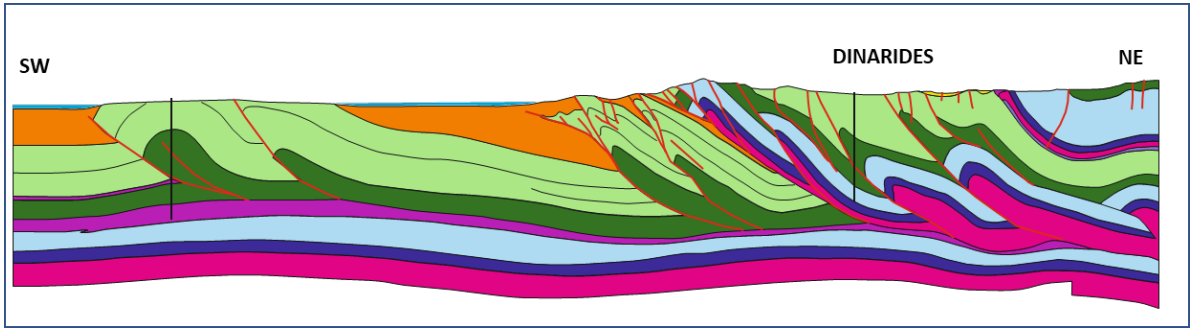
- Val 'Agri is one of the three largest Italian oil accumulation
- Val d'Agri was deposited during Mesozoic crustal extension and are mainly oil-prone. Hydrocarbon occurrences associated with this source are usually found in complex carbonate structures along the Apennines thrust-and-fold belt and in the foreland. Oil is Cretaceous origin
- The same complex carbonate structures can be found in Dinaridic area. Isotopic analyses of several oil seeps in Dinaric area apperear similar to Val d'Agri oils



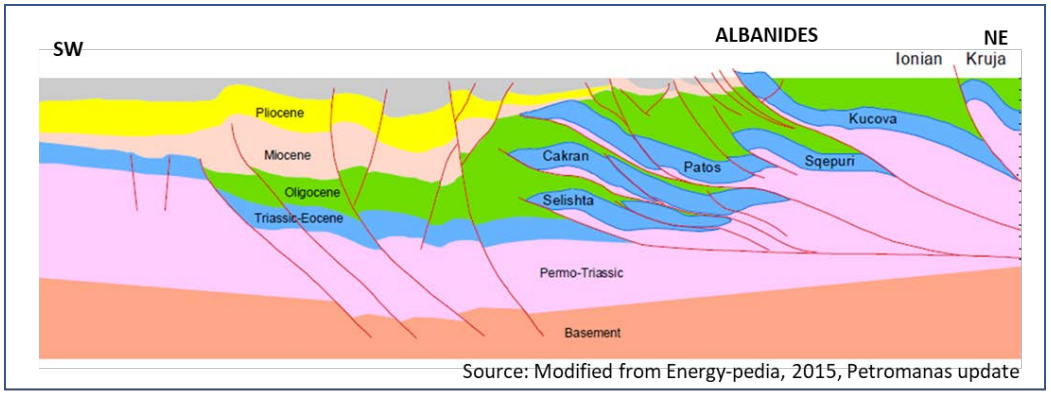


The Dinarides and Appennines have similar depositional histories



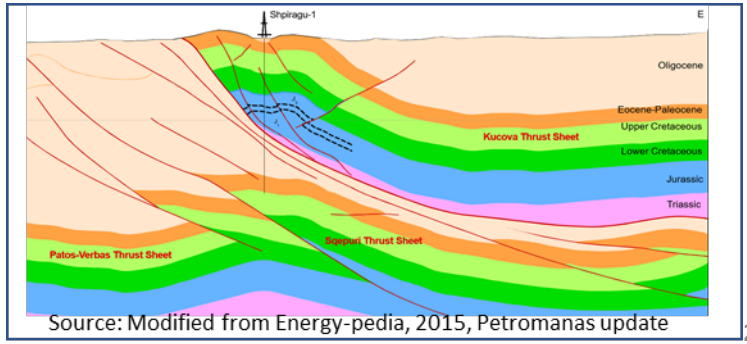


Schematic geological cross sections over Dinarides Area (modied from Final report on the Technical Evaluation of the Dinarides of Croatia, AMOCO, 1990)



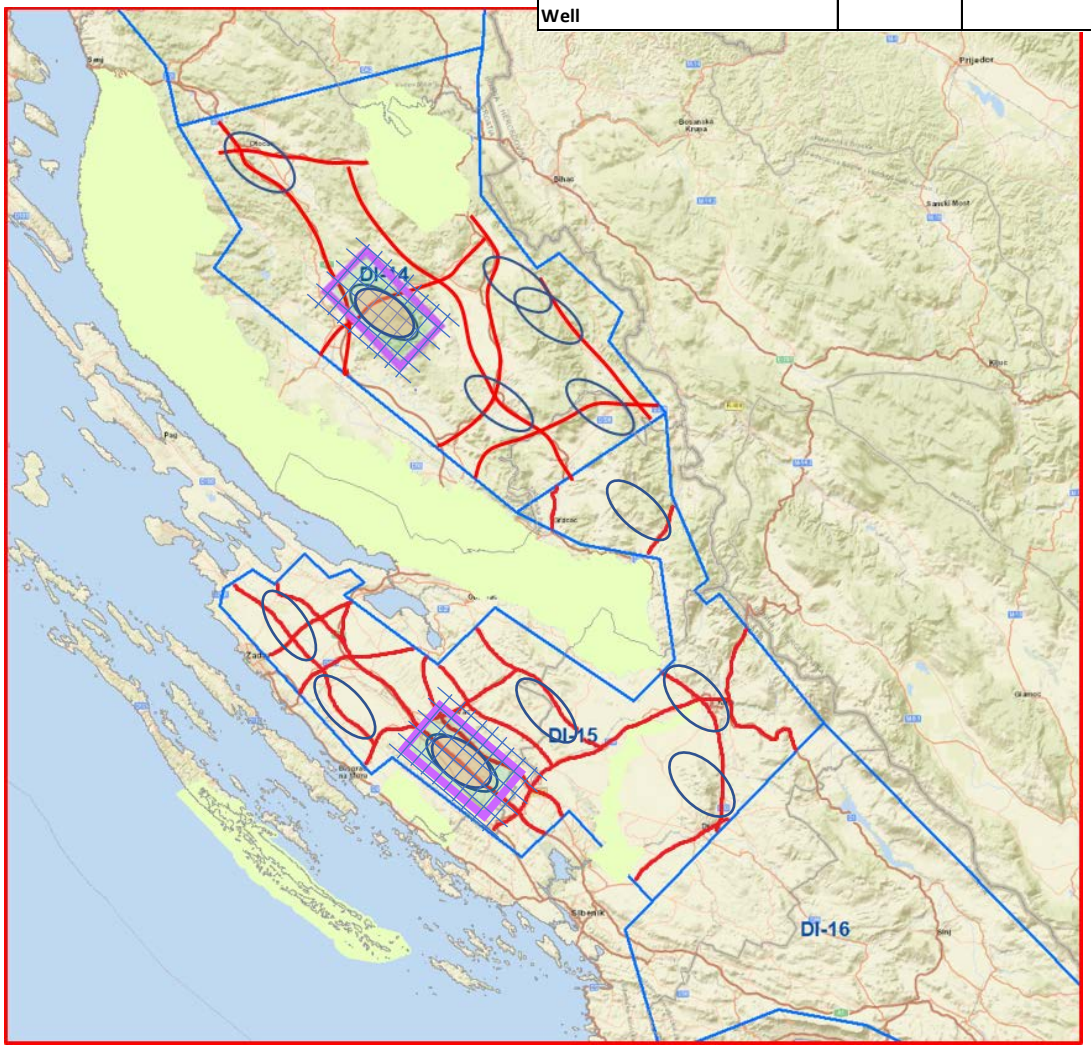
Source: Modified from Energy-pedia, 2015, Petromanas update

- Numerous gas oil fields in Albania in thrust belts
- Similar geological evolution between Dinarides and Albanides since beginning of Mesozoic
- Cretaceous-Eocene age fractured carbonate reservoirs charged from the Mesozoic section (Visoka, Gorishti-Koculi, Ballshi-Hekal, Finiq-Krane, Cakran-Mollaj, Amonica and Delvina oil fields)
- The same complex carbonate structures can be found in Dinaridic area
- Recent discovery Shpiragu – confirms underthrust play



Source: Modified from Energy-pedia, 2015, Petromanas update

Year	2020				2021				2022				2023				2024				2025				2026				2027			
Exploration Phase	First Phase												1st extension				Second Phase												2nd extension			
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Milestones													★				★												★			
Fieldwork																																
Airborne FTG/Mag/LIDAR																																
2d Seismic acquisitIon - regional					Acq				Proc				Interp																			
2dSeismic acquisition - lead																	Acq				Proc				Interp							
Well																									Plan/Mob				Well			

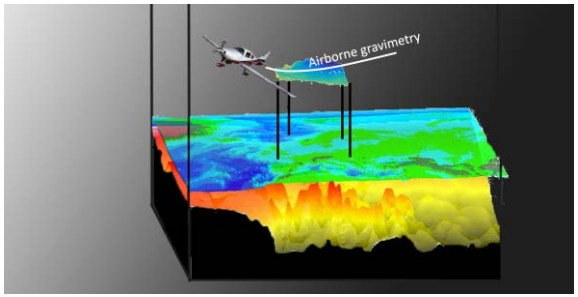


Blocks DI – 14 and DI – 15

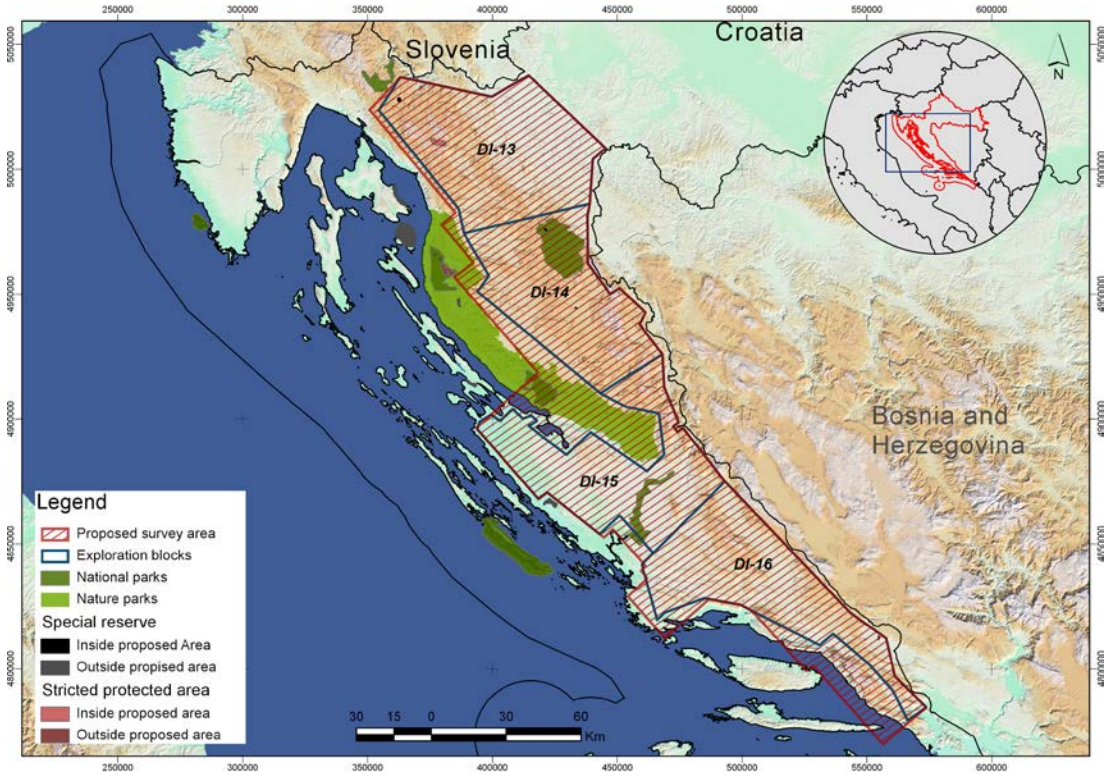
1. Airborne gravity, magnetic Lidar to identify perspective area
2. Regional seismic grid to identify **leads** (initial lines shot along road network for more rapid viborseis acquisition
3. Infill grids required over leads to delineate **prospect** size and drilling location

- Block Outline
- Regional 2D seismic (along road network)
- Lead definition
- 2D seismic infill grid
- Prospect definition
- Appraisal Area
- Excluded Parks

MULTI CLIENT – NON-EXCLUSIVE SURVEY

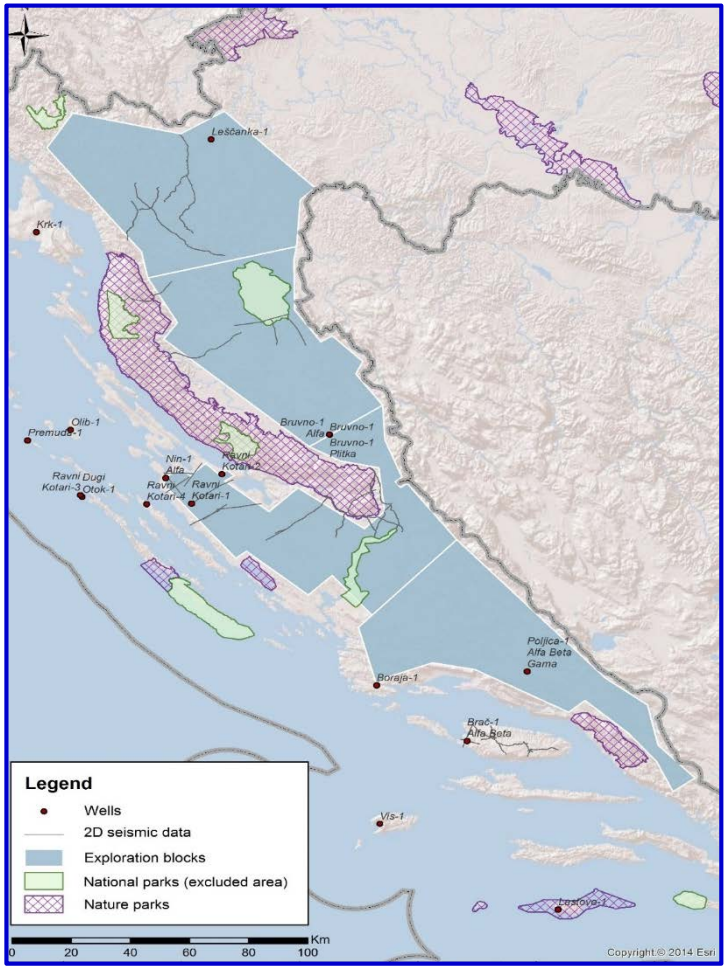


Proposed Survey Area approximatelly 16000 sq km



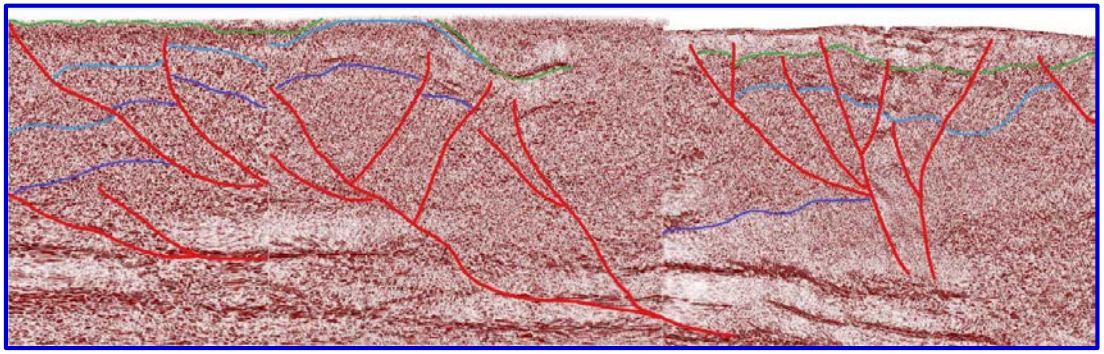
The main objectives for Airborne Gravity Gradiometer (AGG) and magnetic datasets:

- The main focus of the proposed survey is to improve geological understanding of the Dinarides region and provide coherent geophysical dataset in a relatively data-poor area for potential hydrocarbon exploration in the area
- Acquisition of seismic data is complicated both by terrain and by the karst landscape in this area – new airborne geophysical data set is alternative data set which could delineate the perspective area for new seismic acquisition
- Identification and delineation of structures in the intra-sedimentary section
- Identify major fault trends (strike-slip faulting)
- Definition of Basement – particularly with respect to depth and architecture
- Definition of igneous features that may be present in the area, including volcaniclastics in sedimentary section and intrusive in the basement



- Petroleum exploration in the Dinarides has been carried out from 60' through 80' of the last century

- 4 exploration blocks, with total acreage 12.126 km2, contain the following data:
  - 9 wells
  - 441,86 km of 2D legacy seismic data (in stck/mig format and raw data)



All the data can be seen in our Data Room in Zagreb.
If you are interested, please contact us at

info@azu.hr

Before visiting you will be provided with tendering documentation, data inventory and spatial data.

Bidding Round Schedule - DINARIDES	
February 8th 2019	Bidding Round opening
September 10th 2019, 12:00 a.m. local time	End date for submitting bids
December 2019	Indicative deadline for granting licenses

Criteria for exploration blocks DI-13, DI-14, DI-15, DI-16		Mark (up to)	Weight %
First exploration phase (3 years)	2D seismic survey	15	70
	Other activities	85	
	Reprocessing of existing seismic data	5	
	Airborne Gravity and Magnetic	50	
	Other surveys*	30	
Second exploration phase (2 years)	2D seismic survey	70	20
	Other surveys*	10	
	Number and depth of exploration wells	20	
Signature bonus		100	10

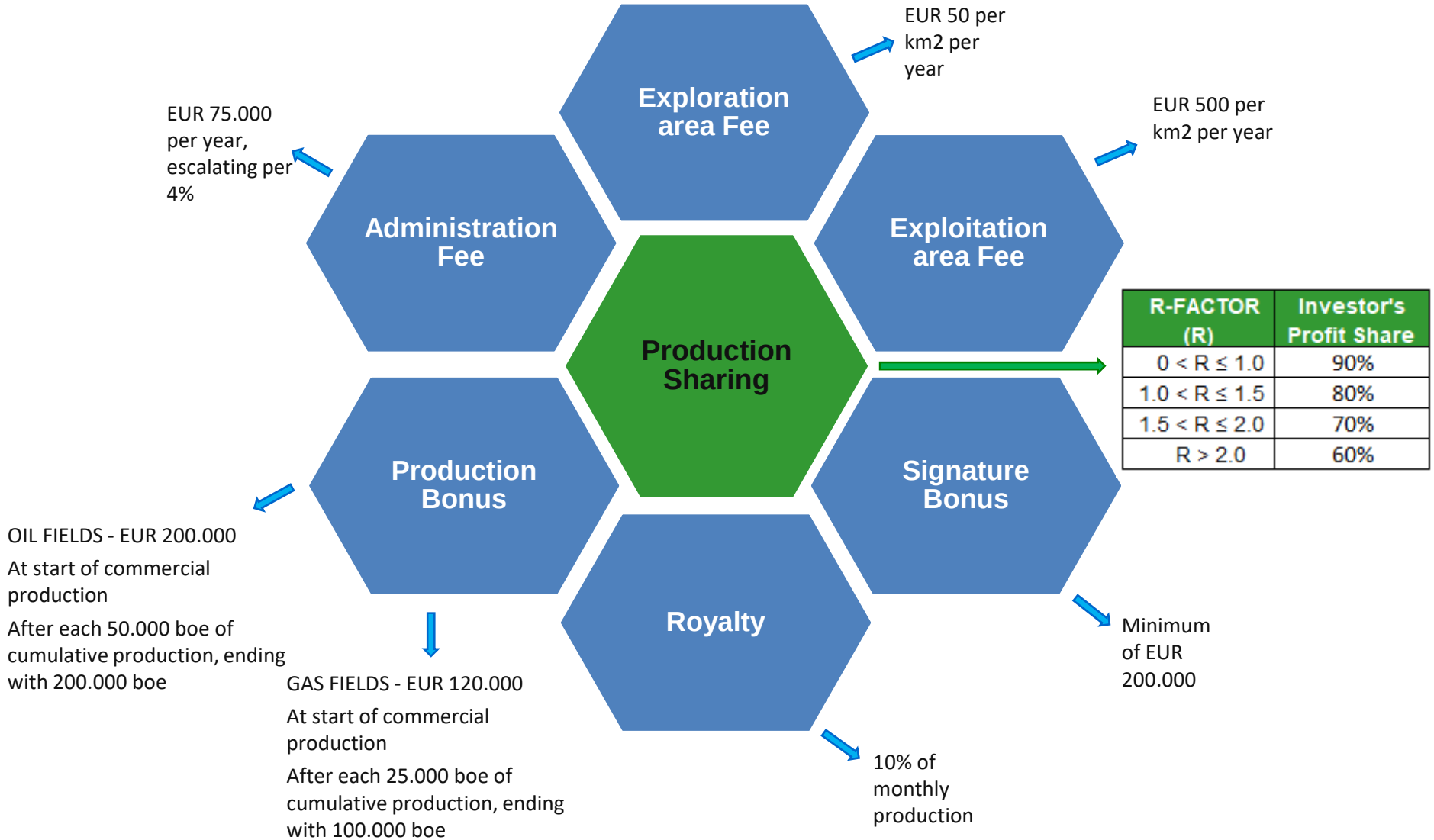
Bidders must satisfy:

- Administrative requirements
- Formal requirements
- Legal requirements
- Financial requirements
- Technical requirements
- Health, safety and environment requirements

After bidding round closes – open door policy could be activated

FISCAL TERMS

CROATIA – SUMMARY OF FISCAL TERMS



R-FACTOR (R)	Investor's Profit Share
0 < R ≤ 1.0	90%
1.0 < R ≤ 1.5	80%
1.5 < R ≤ 2.0	70%
R > 2.0	60%

CROATIA – SUMMARY OF FISCAL TERMS

Royalty	10% of the production
Cost recovery	Contractor is entitled to recover 100% of its approved petroleum costs. Unrecovered costs can be carried forward within the duration of the contract.
Cost recovery ceiling	70% of annually production net of royalty (onshore)
Profit production	The production remaining after royalty and cost recovery. Subject to further split between the State and the contractor.
Production sharing	Linked to R-factor
Income tax	12% or 18% For revenues up to EUR 0.4 million, a tax rate of 12% applies, and for revenues equal to or exceeding HRK 0.4 million, a tax rate of 18% applies
Biddable fee	Signature bonus, min. EUR 0,19 million
Other fees	Production bonus, administrative fee, surface rental fees

R-FACTOR (R)	Investor's Profit Share
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1.0 < R ≤ 1.5	80%
1.5 < R ≤ 2.0	70%
R > 2.0	60%