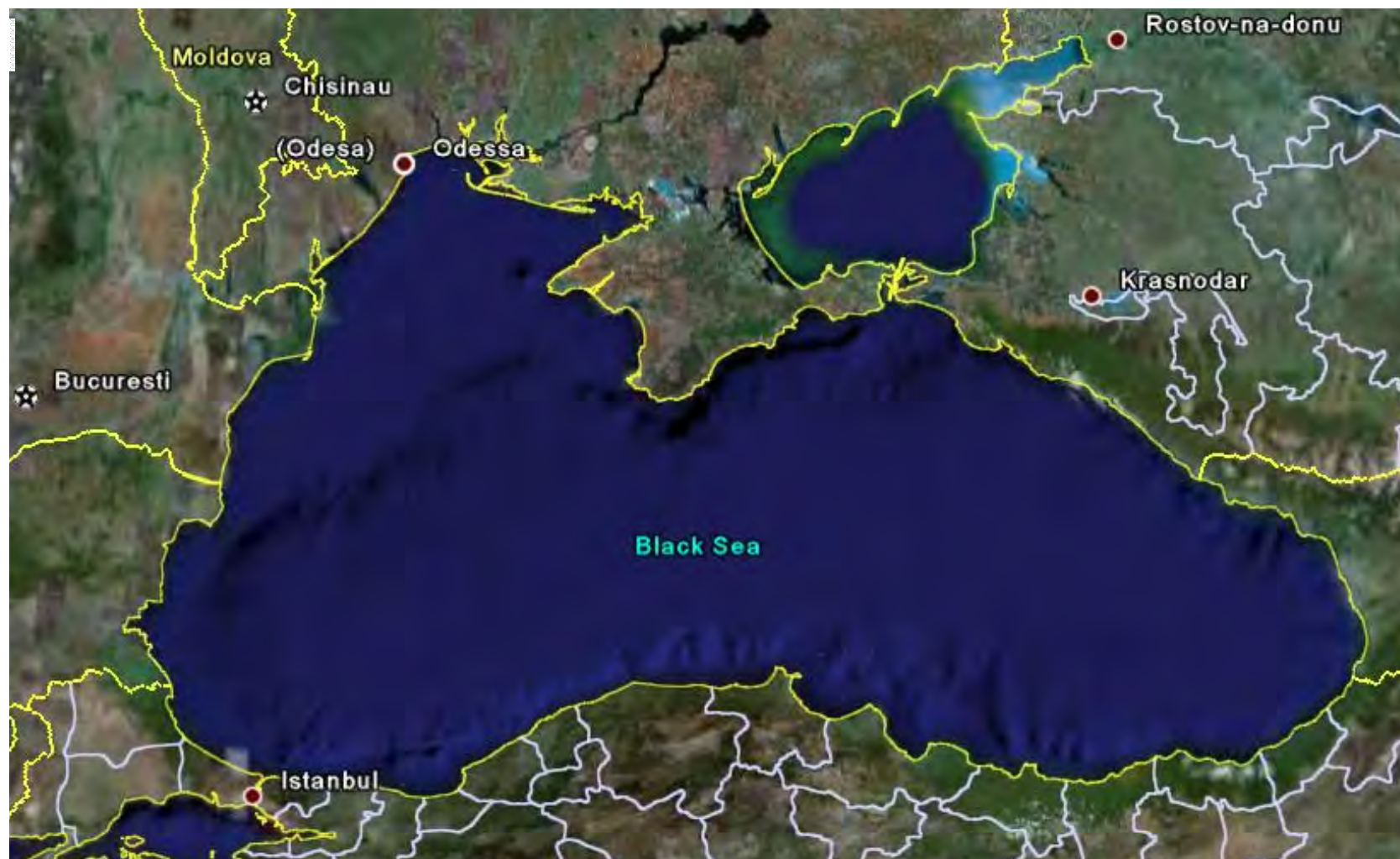


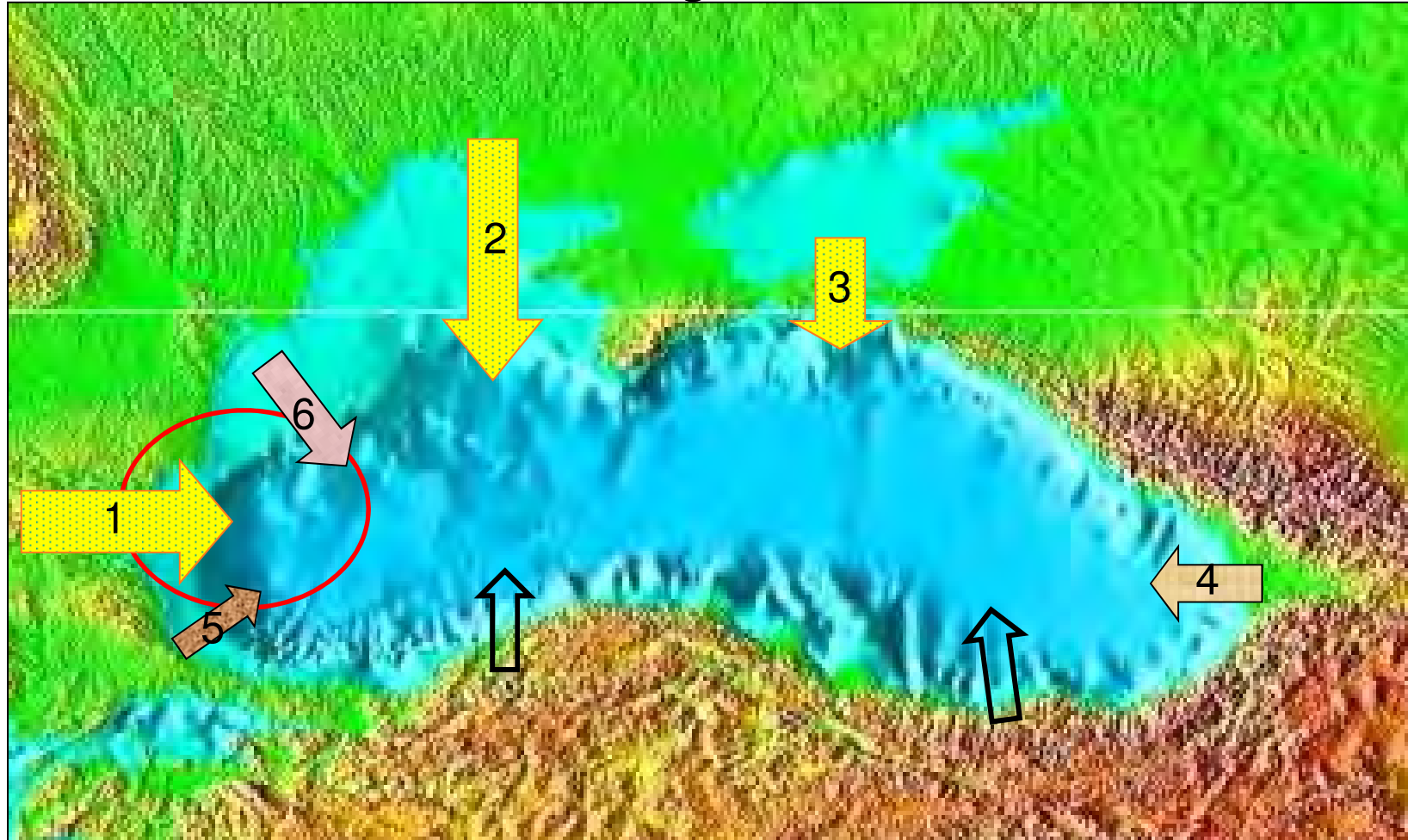
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Is the Black Sea the Next North Sea?

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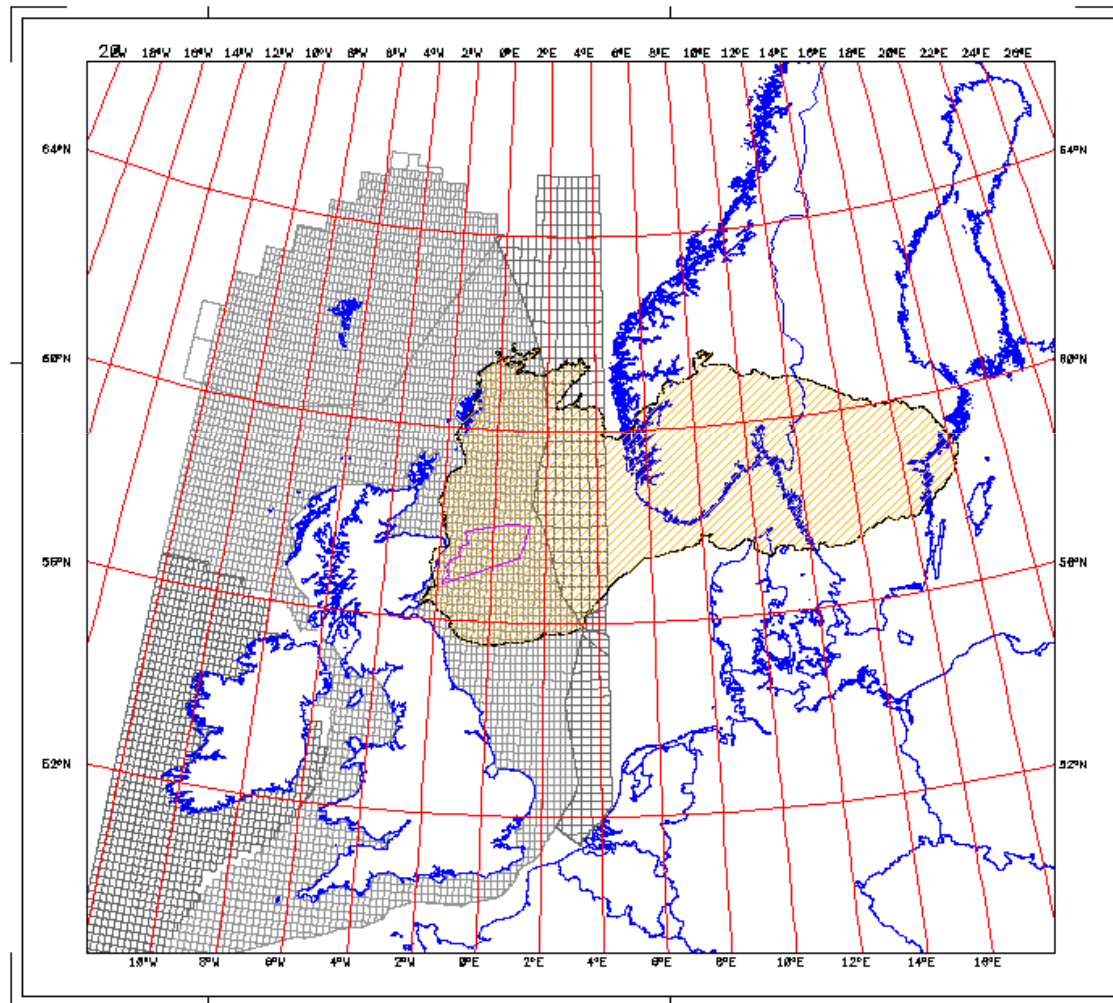


BLACK SEA – Mega Sediment Influx



1 – Paleo Kamchia River; 2 – Paleo Dnepr-Dnestr River; 3 – Paleo Don River; 4 – Paleo Rioni River; 5 – Paleo Maritza River; 6 – Recent Danube River

BLACK SEA AS COMPARED TO NORTH SEA



Comparison Black Sea vs. North Sea

Black Sea-Deep Sea

- Less than 100 Wells drilled
- Widely Unexplored
- Black Sea Deep Water one of World's last Frontier Areas
- Only One Major Discovery in Neptun Block / Romania
- (Gas Hydrates: 3000 Yrs Current Gas Production??)

North Sea

- More than 7000 wells drilled
- First 75 wells dry
- Open political system
- Industrial focus over 30 years
- Declining Production

The North Sea Story

World 4th largest oil – producing area

World 3rd largest gas – producing area

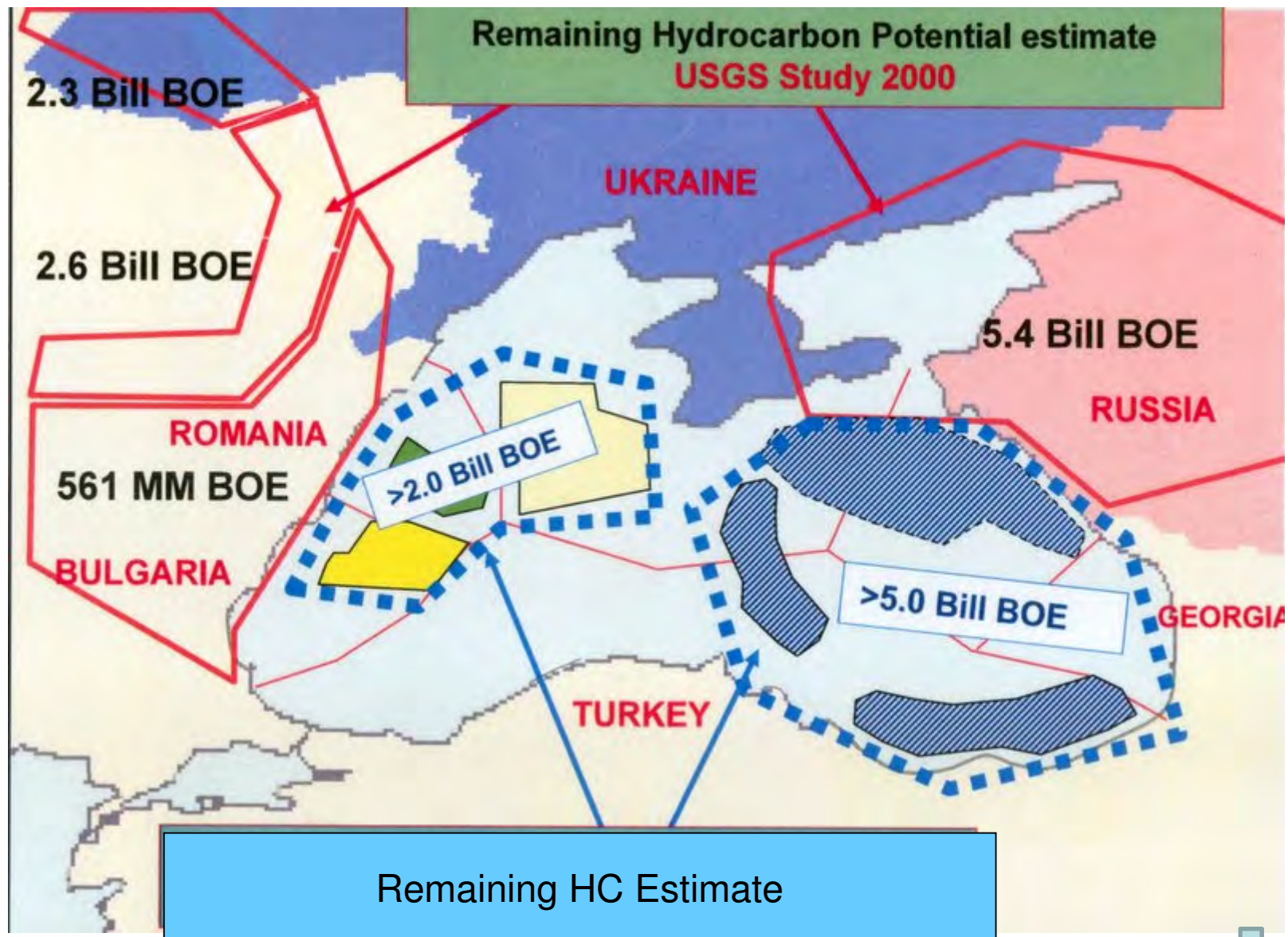
Cumulative gross revenues of approx. 1500 Billion US\$

500,000 person-years of effort to understand Geology

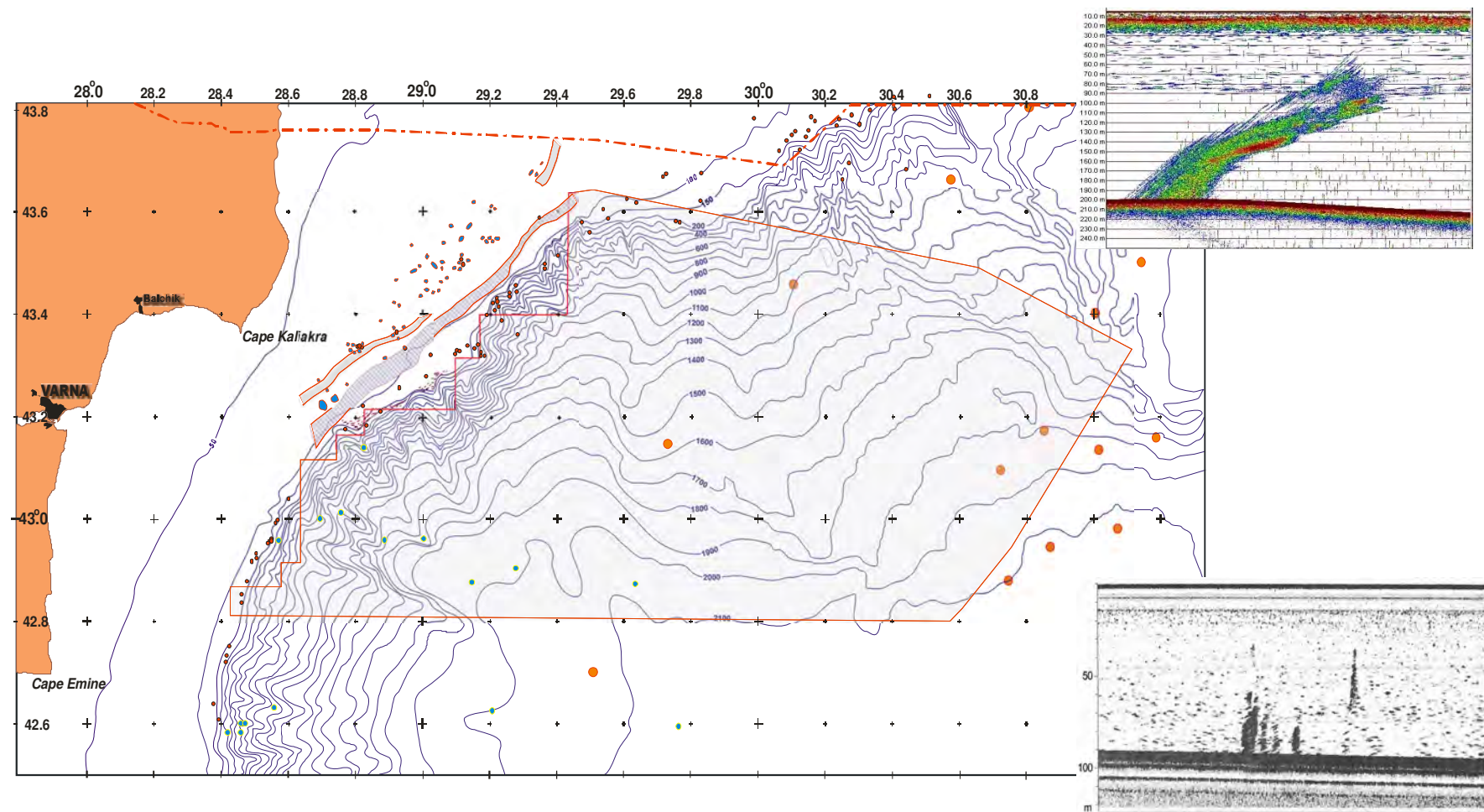
300,000 jobs onshore – 50,000 jobs offshore

Cum. production about 48 Billion bbl oil and 127 TCF gas

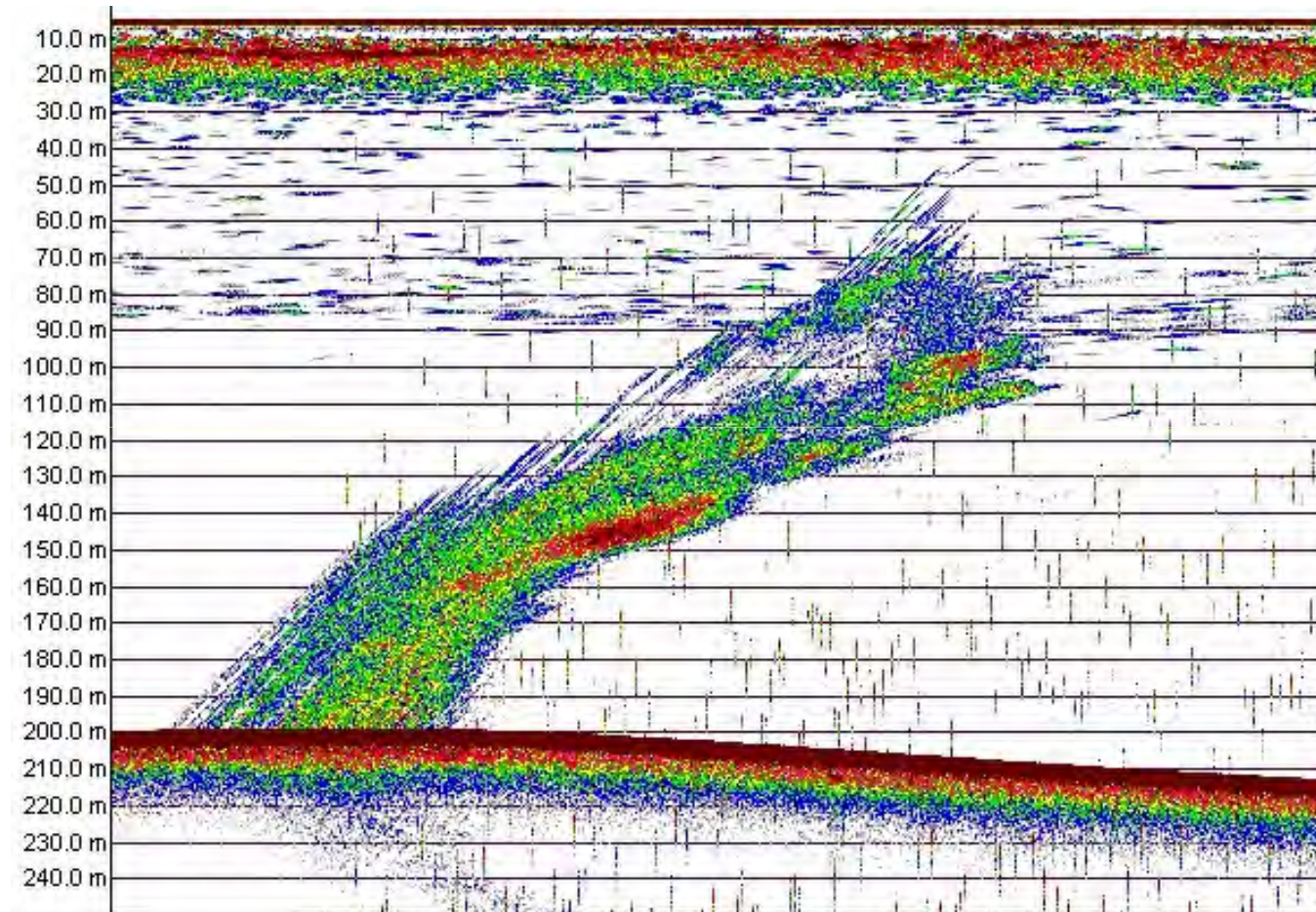
The Black Sea Story



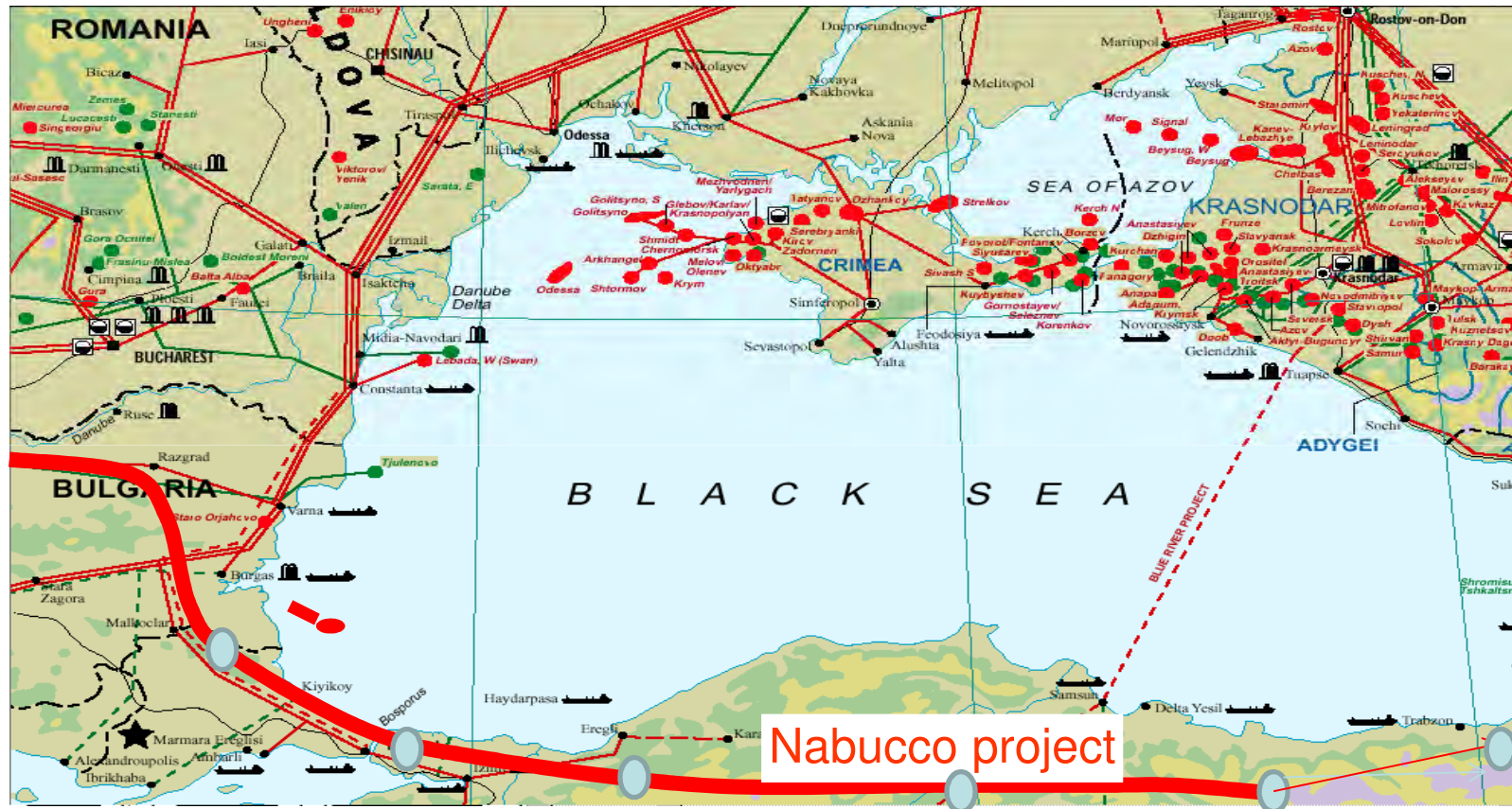
WESTERN BLACK SEA – Gas Seeps



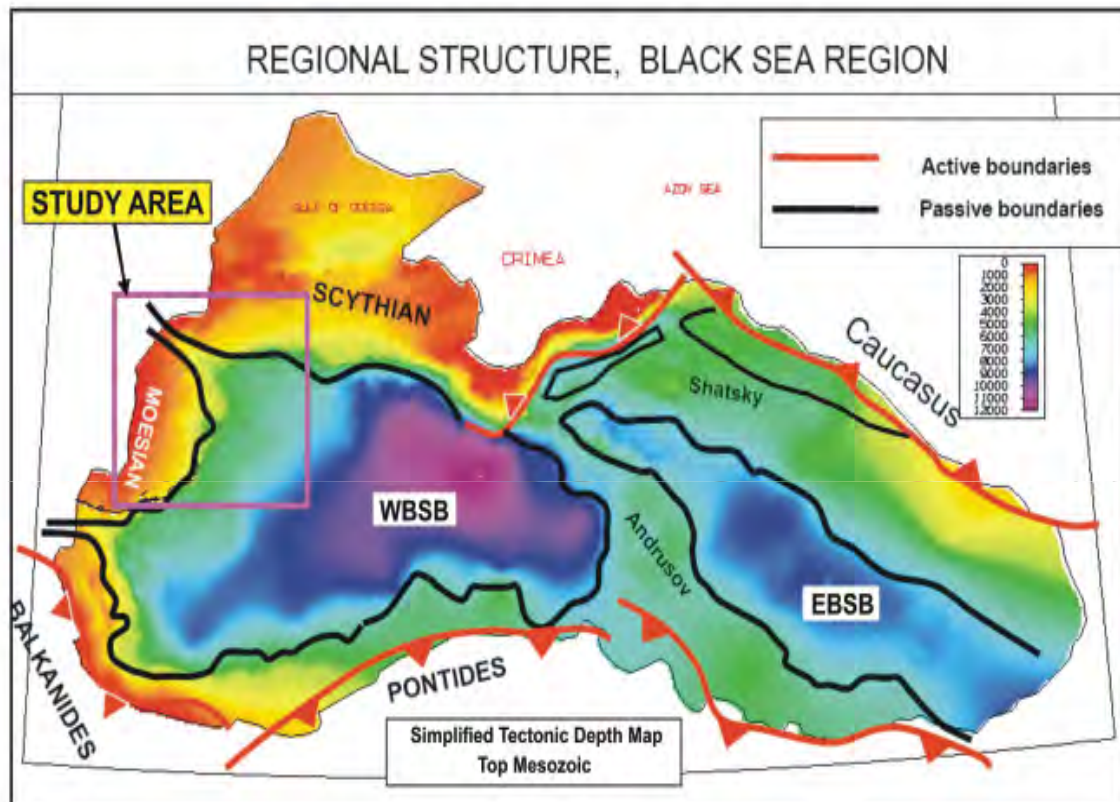
Black Sea-Deep Sea – Gas Seeps



Black Sea Area Pipelines – Gas



Is Nabucco dead? According to "Die Presse", Saturday 26 May 2012: No, i.e. from Turkish border to Baugarten-Nabucco West, from Turkish border to Azerbaijan Tanap (with Socar)? Reason: EU Legislation (requires supply competition), TR and AZ may not agree. Three possible competitors: TAP (TR to IT), Nabucco West and Seep (parallel to Nabucco West), Russia and Iran wild card (is Caspian Sea a Lake or Sea-question; if Sea: Ru and IR could claim rights to pipelines).



TECTONIC HISTORY

Stages		Quaternary-Pliocene		
		3 Late Miocene Middle Miocene Early Miocene Late Eocene	 Compression	Gravity Driven Tectonics Tilted Blocks Inversion Stage (3 phases)
	2	Middle Eocene Paleocene	Thermal Subsidence ↓	Post-rift Subsidence Stage
	1	Late Cretaceous Early Cretaceous	Extension ↔	Rift Stage
		Jurassic-Triassic	Pre-extension	

Major Mesozoic Ridges, Thicker Tertiary sediments on the western part of the BS, than on the Eastern Part, Bega et. Al. 2010

Western / Mid Black Sea – Deep Sea

Significant Exploration Opportunities

Polshkov Ridge – Bulgarian Offshore

- Various different **Play Types** have been identified
- Defined by several **Fault Blocks**

Tetyaev High – Offshore Ukraine

- Same play like Andrusov, but Western black sea has thicker **tertiary sediments** as compared to the eastern BS

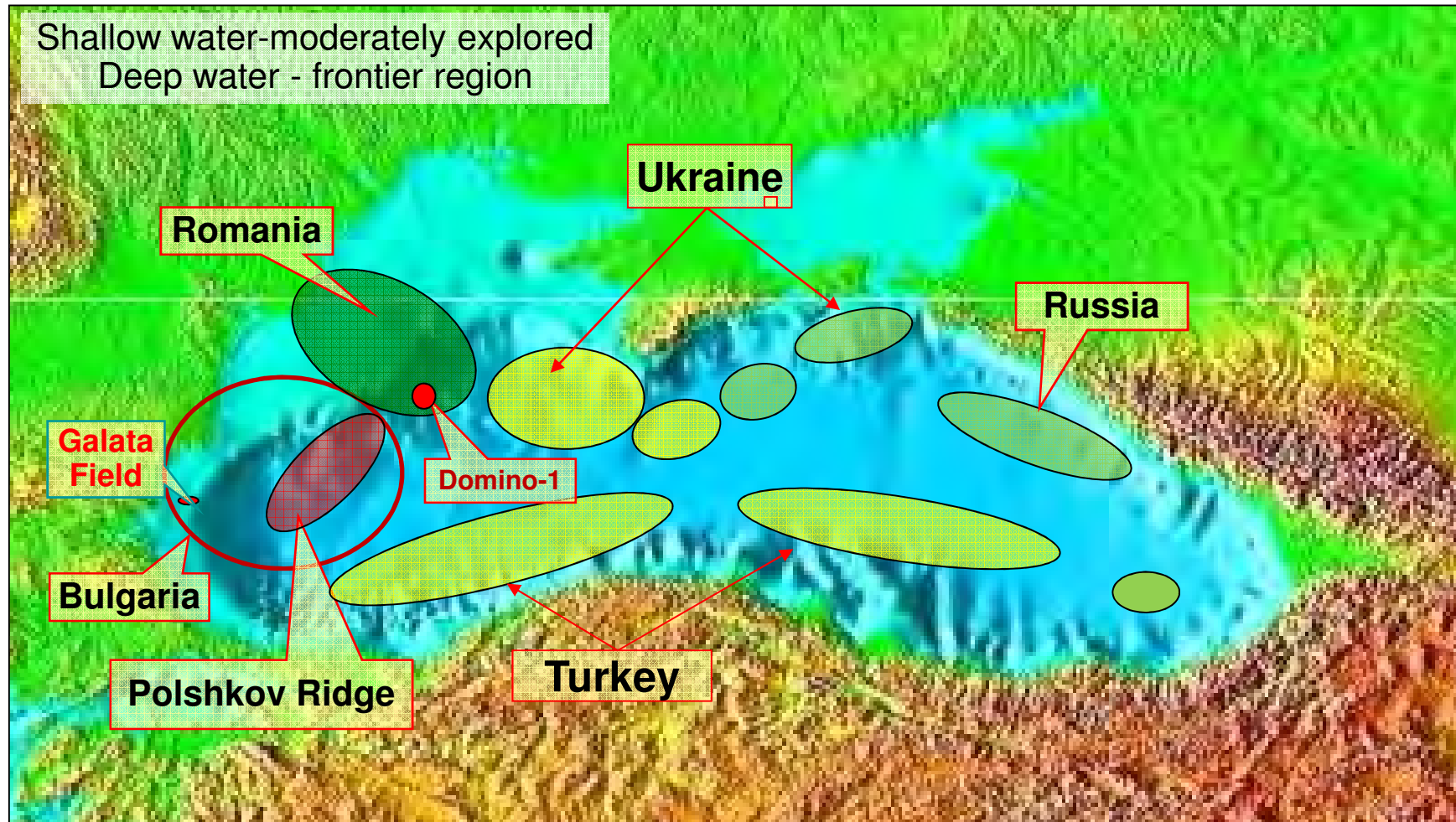
Andrusov Ridge

- Mid Black Sea – Offshore Turkey **was drilled** - 2 wells dry

Shatzky Ridge

- Offshore Russia/Caucasus, needs **more exploration**

Western Black Sea Basin – Deep Sea



Bulgaria and Polshkov Ridge

- **Shallow Waters**

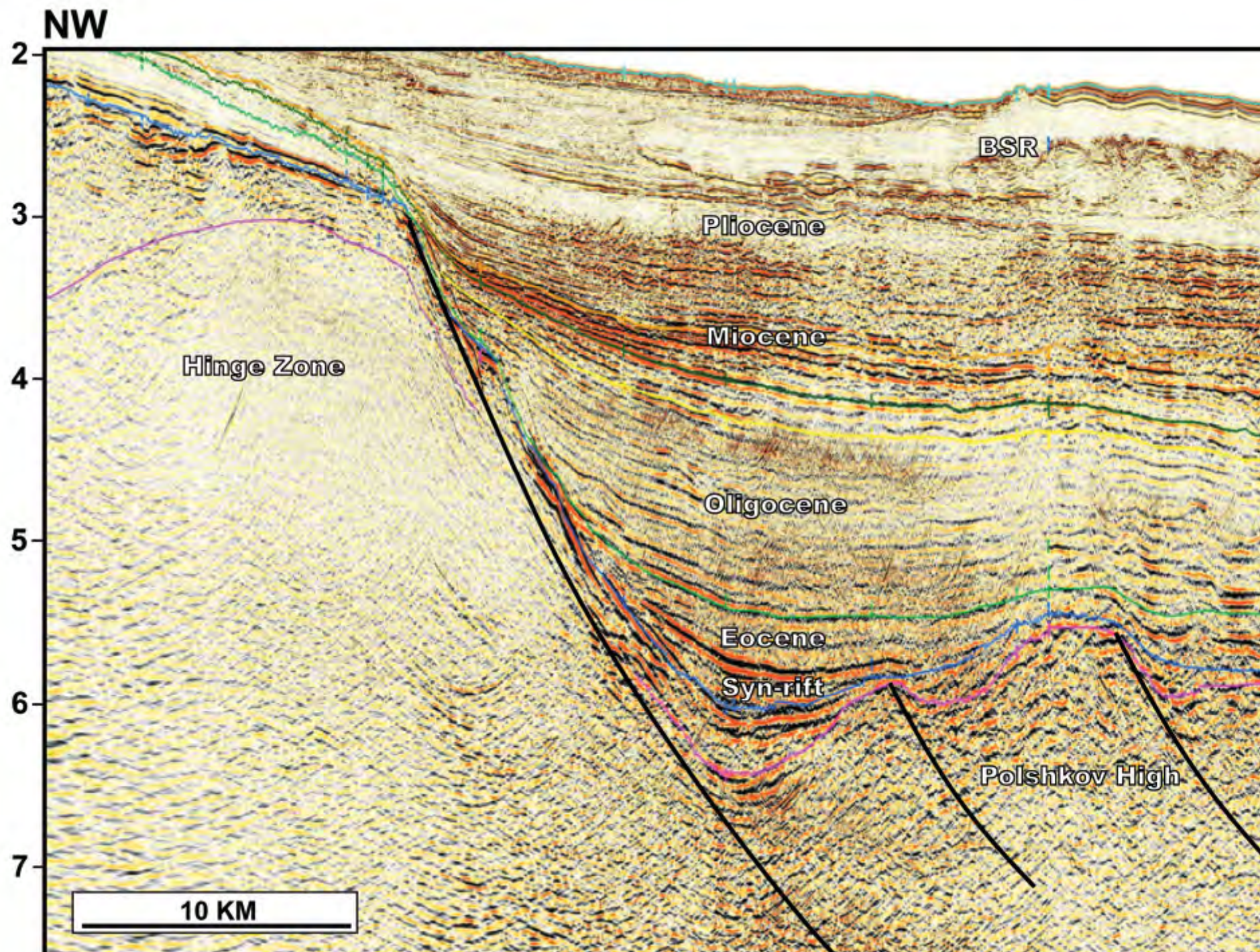
1995-Galata Discovery (Texaco, Exxon, OMV), Tested then 34 MMcf Gas

- **Polshkov Ridge**

High Potential Identified in Block **Offshore Varna** (Former OMV Block 'Varna') on Polshkov High - Primary Target Post Mesozoic Sequence

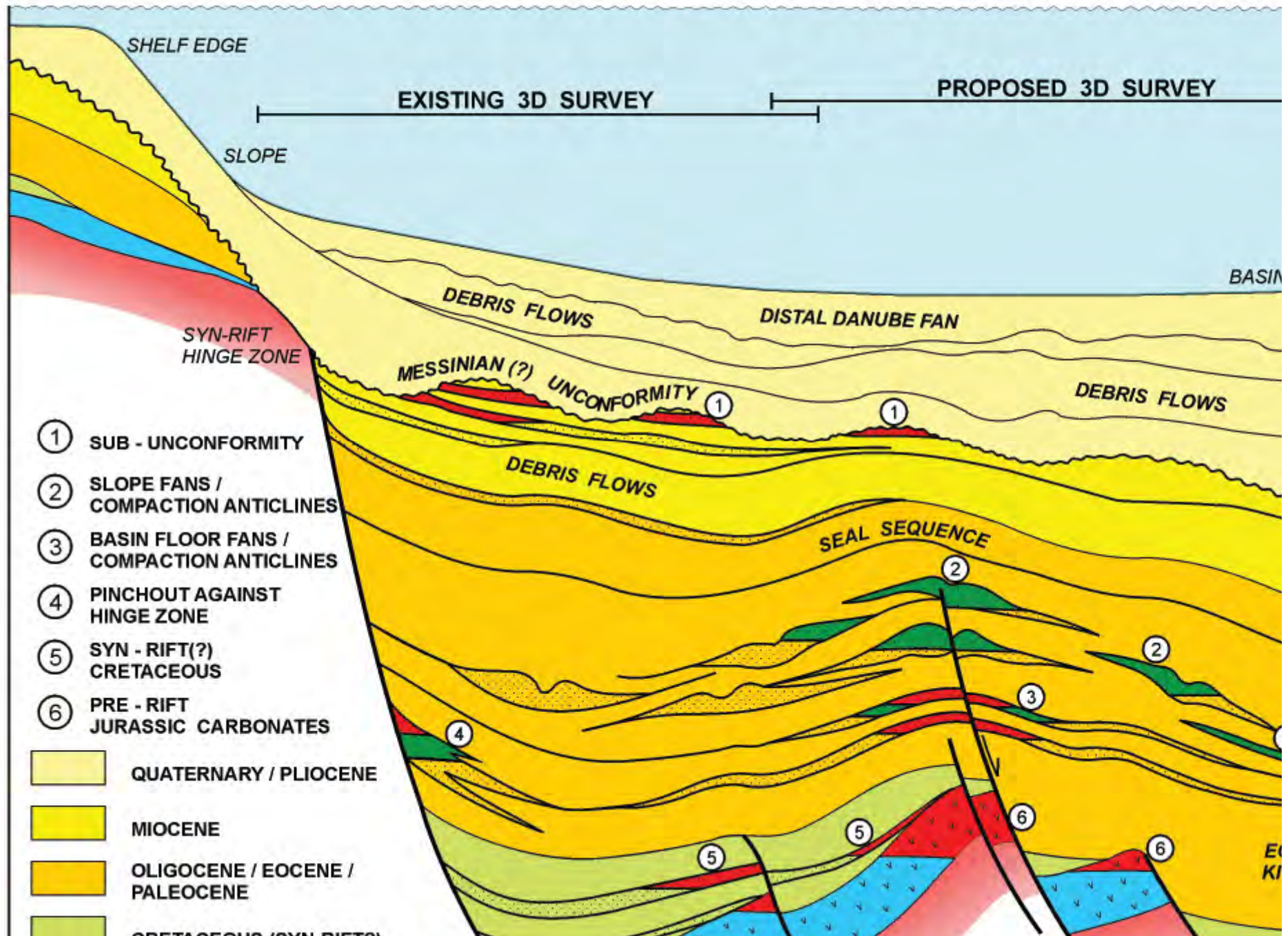
- Gabor Tari et. al. Identified at Least **three to four Post Mesozoic Deepwater Plays** - Segment Severely Underexplored

- **Recoverable Gas Resources Estimated at > 10 Tcf**

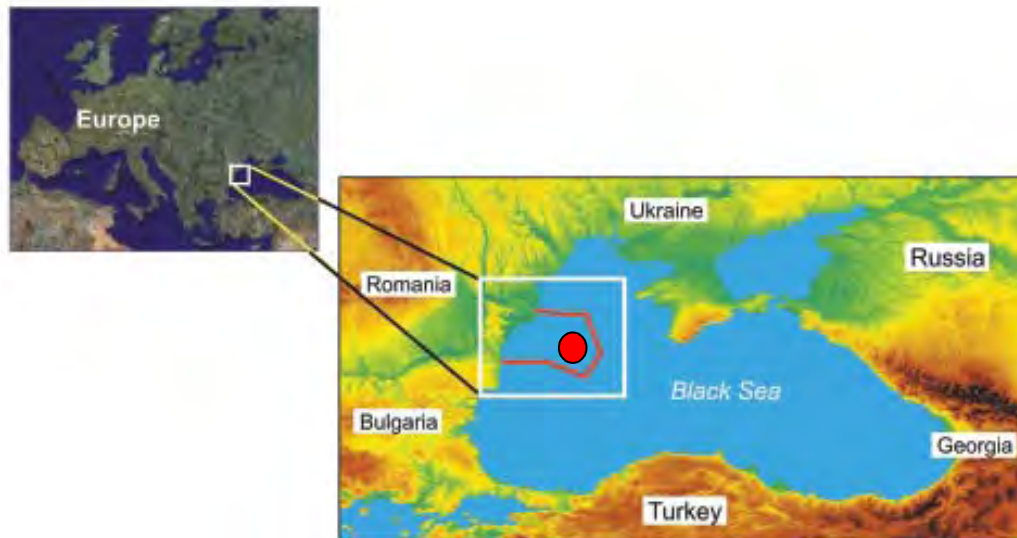


NW

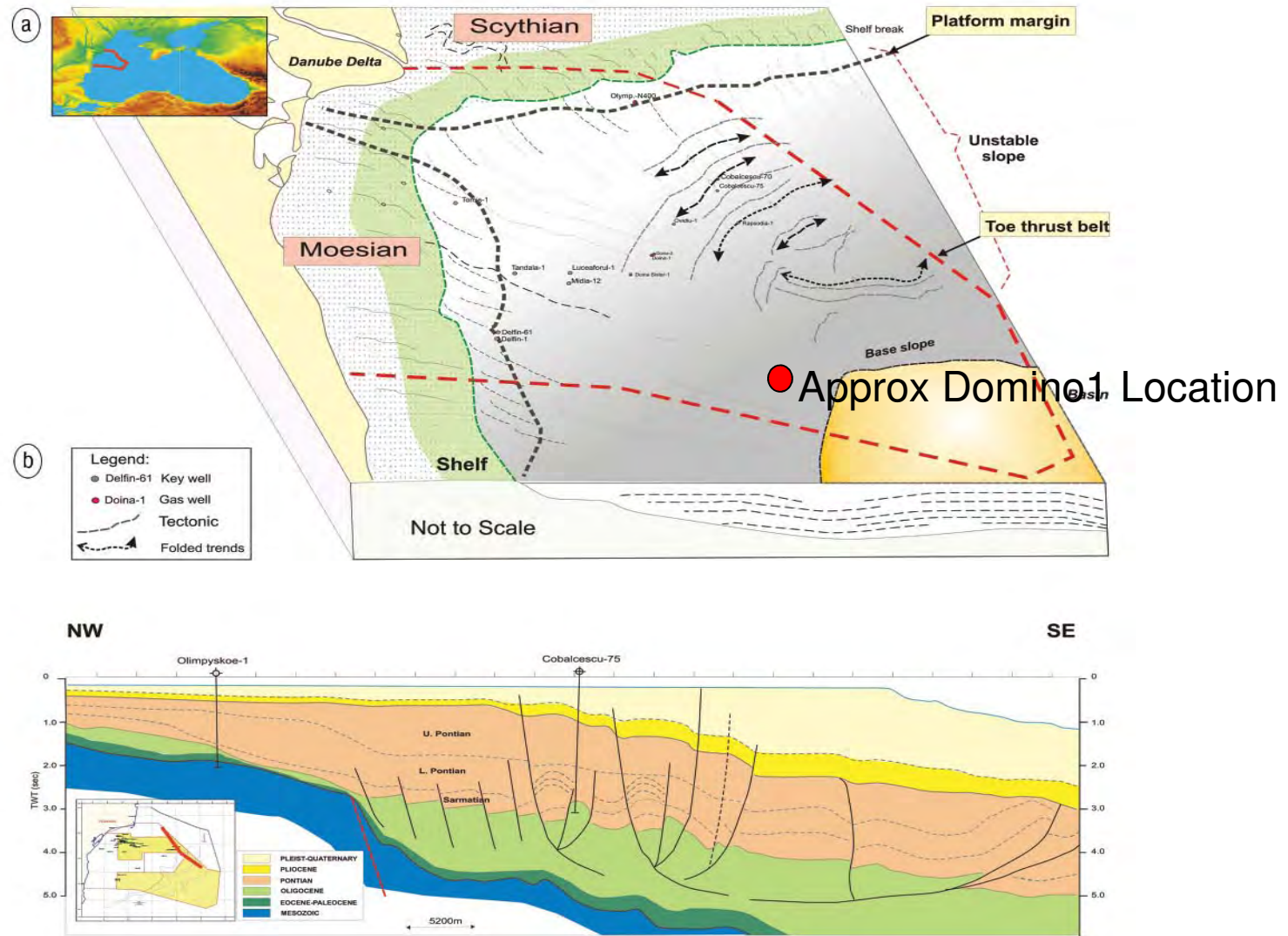
PLAY TYPES, OFFSHORE VARNA, BULGARIA



Romania - Deep Sea Discovery: Domino-1

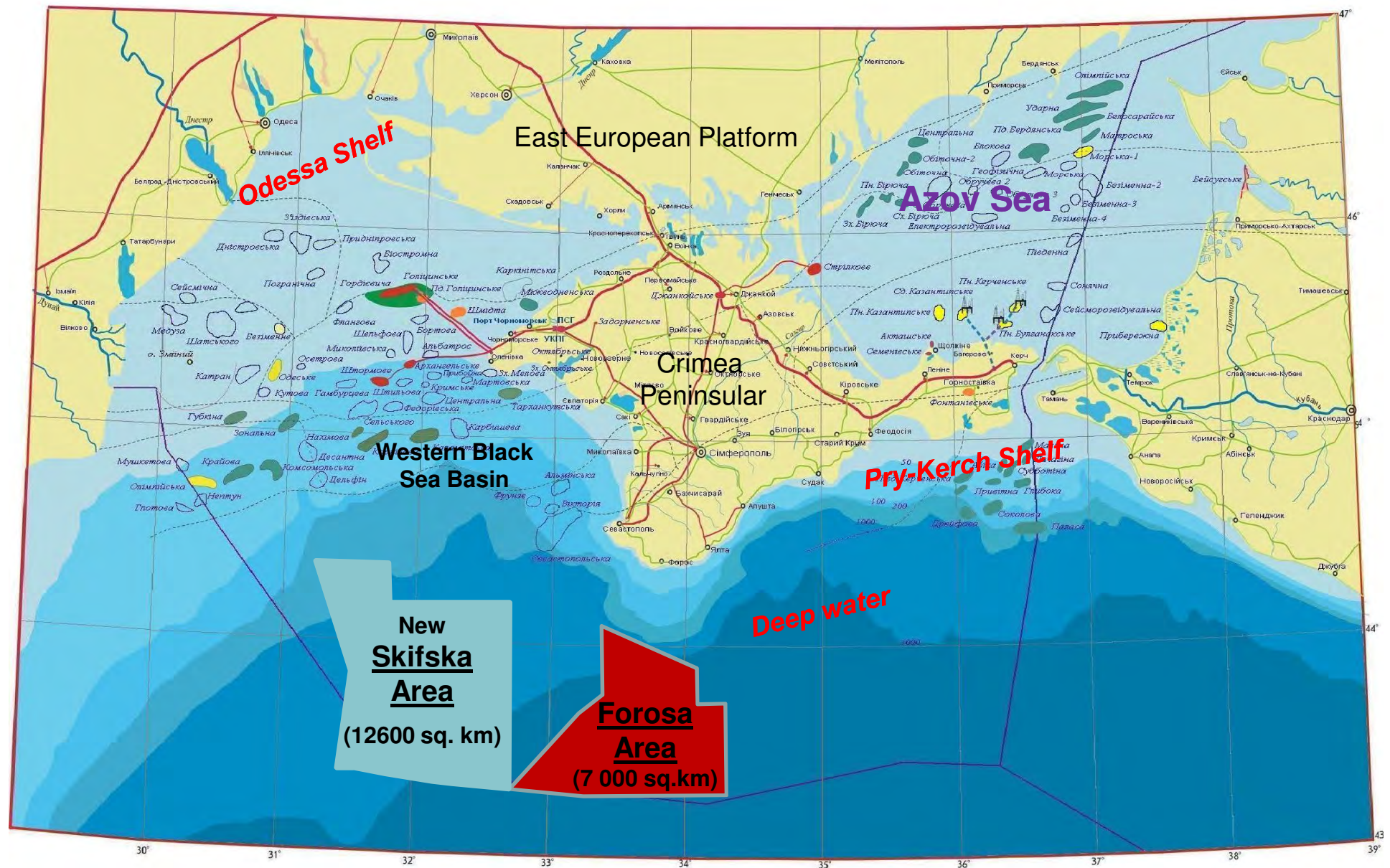


- First Deep Sea Drilling at 3000 m Depth, 970 m Water Depth
- Gas Horizon 70.7 m (Operator Exxon, Petrom)
- Estimated Reserves: 1.5 to 3 Tcf
- Investment of Several Billion USD required
- Possibility to Combine with Bulgarian Polshkov Ridge?



According to Bega et.al. 2010: Structural trends at Lower Pontian deposits are not scattered but aligned in trends in the Northern Margin. They mimic the Scythian Platform margin, suggesting that they are genetically related with tectono-genesis of northern areas. (b) Simplified geo-seismic section through the Northern Margin. Most structuration appears in the lower Pontian sequence, mainly due to gravity-driven tectonics. The toe thrust was active until the end of the Pontian.

Deep Sea Ukraine: Forosa and New Skifsk Area



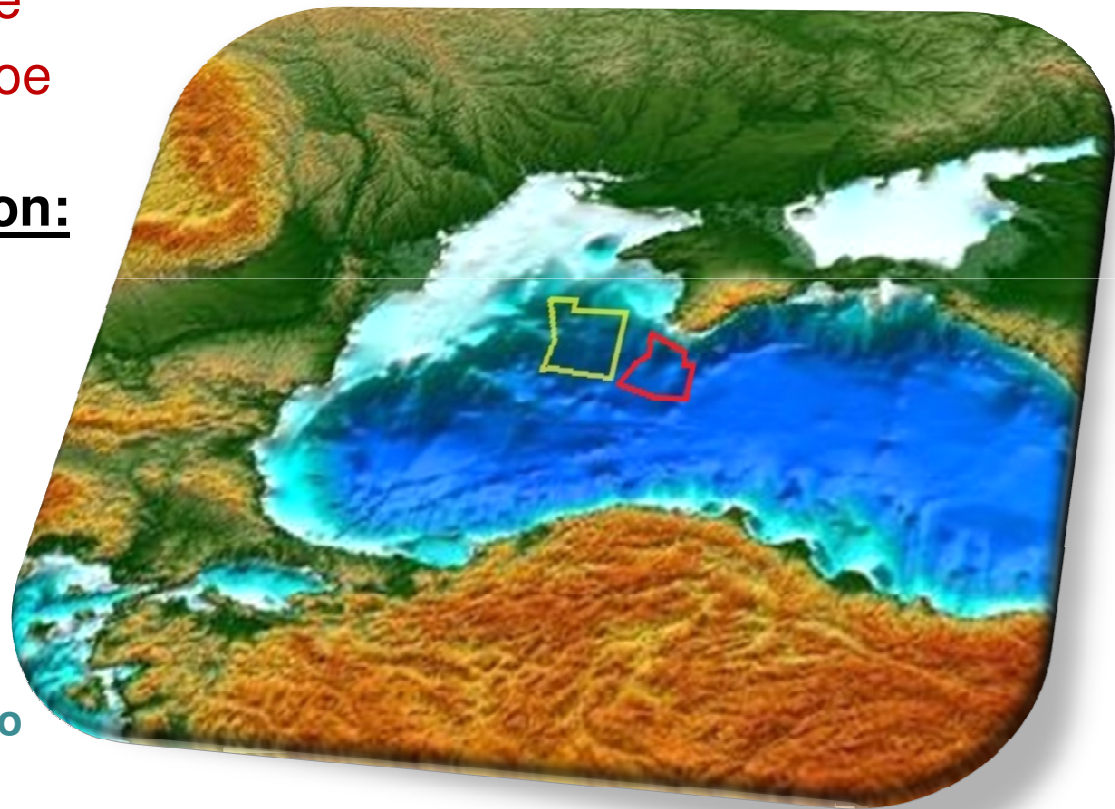
Forosa and New Skifska Area

Recoverable Resources:

Skifska	80-100 M toe
Forosa	130-150 M toe

Expected Annual Production:

Skifska	up to 3 M toe
Forosa	up to 4 M toe

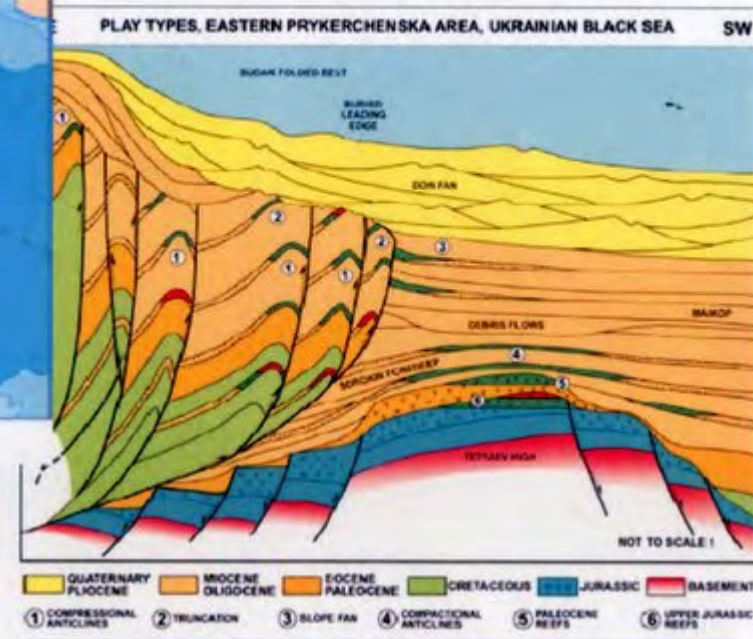


Source: Dr. Volodymyr Ignashchenko
Secretary of PSA Inter-Agency
Commission, Ukraine

Vanco Energy



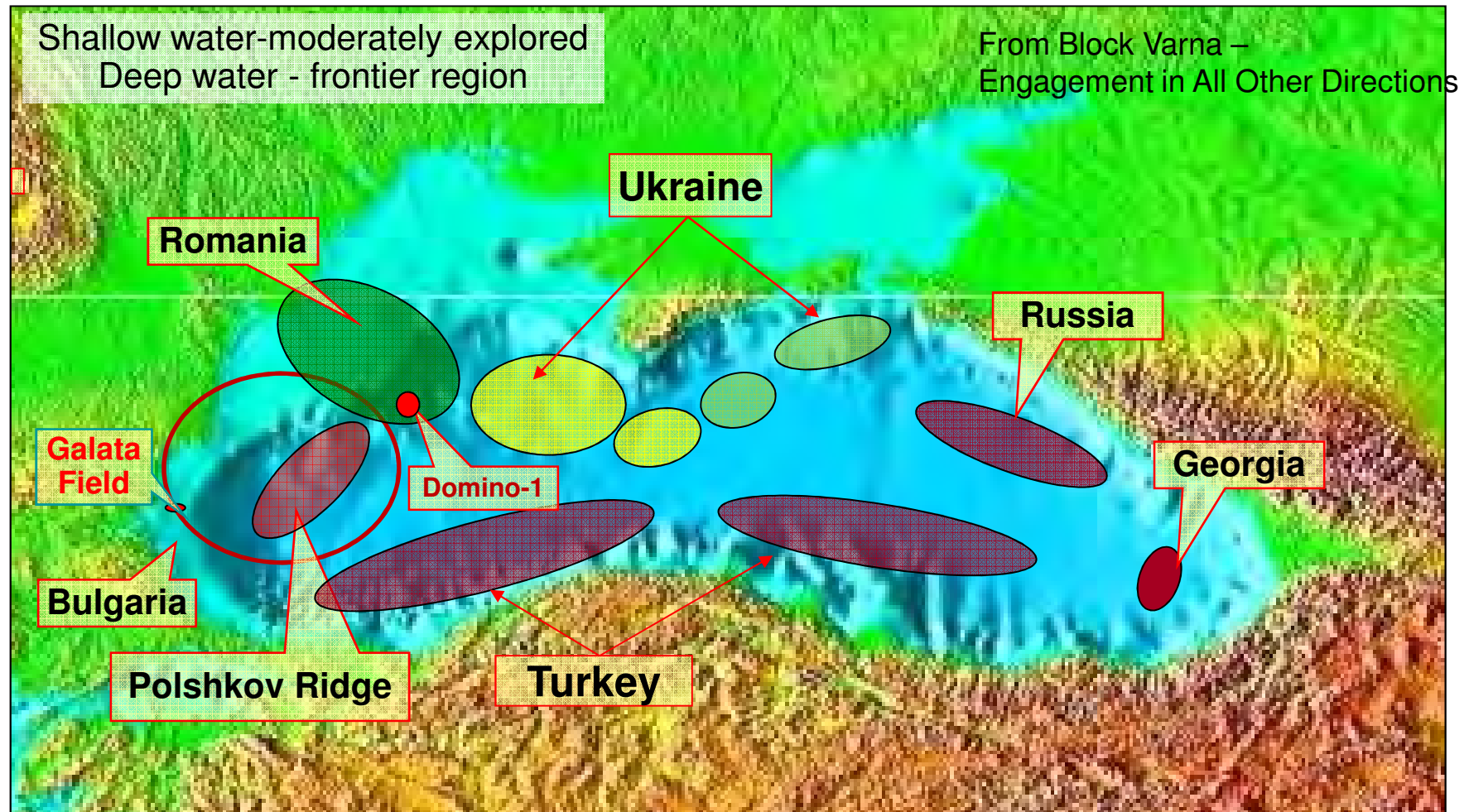
Click to Enlarge



Click to Enlarge

Pre-Kerchenskaya Block

Eastern and Southern Black Sea



Black Sea - Studies

Ukrainian Sector: **Kriachevskaya et al.** Sees Tremendous Exploration Potential, Many Undrilled Structures – **Stovba et.al.** Describe Deep Water Plays with Huge Potential for HC - **Naudts et al.**, Prospectivity of the Dnepr Paleodelta

Shatzky Ridge, Offshore Russia: Large Structure, Seen by **Meisner et.al** and **Edwards et al.**

• **Turkish Black Sea:** Numerous Exploration Targets Described by **Menlik et al.**

Western Black Sea: **Tari et al.** describes Polshkov Ridge High Potential (see above), **Bega and Ionescu** Outline Romanian play types leading to Domino-1 Discovery, **Duley and Fogg** Promote Technical Success to Romanian Black Sea

BLACK SEA

One of the Last Deep Water Frontier
Area in the World

The Coming HC *(north)* - Sea??

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