NSW PESA Presentation

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A Frontier Basin South East Papuan New Guinea

A Seismic Story

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* Note – this presentation deals with a undrilled frontier basin.

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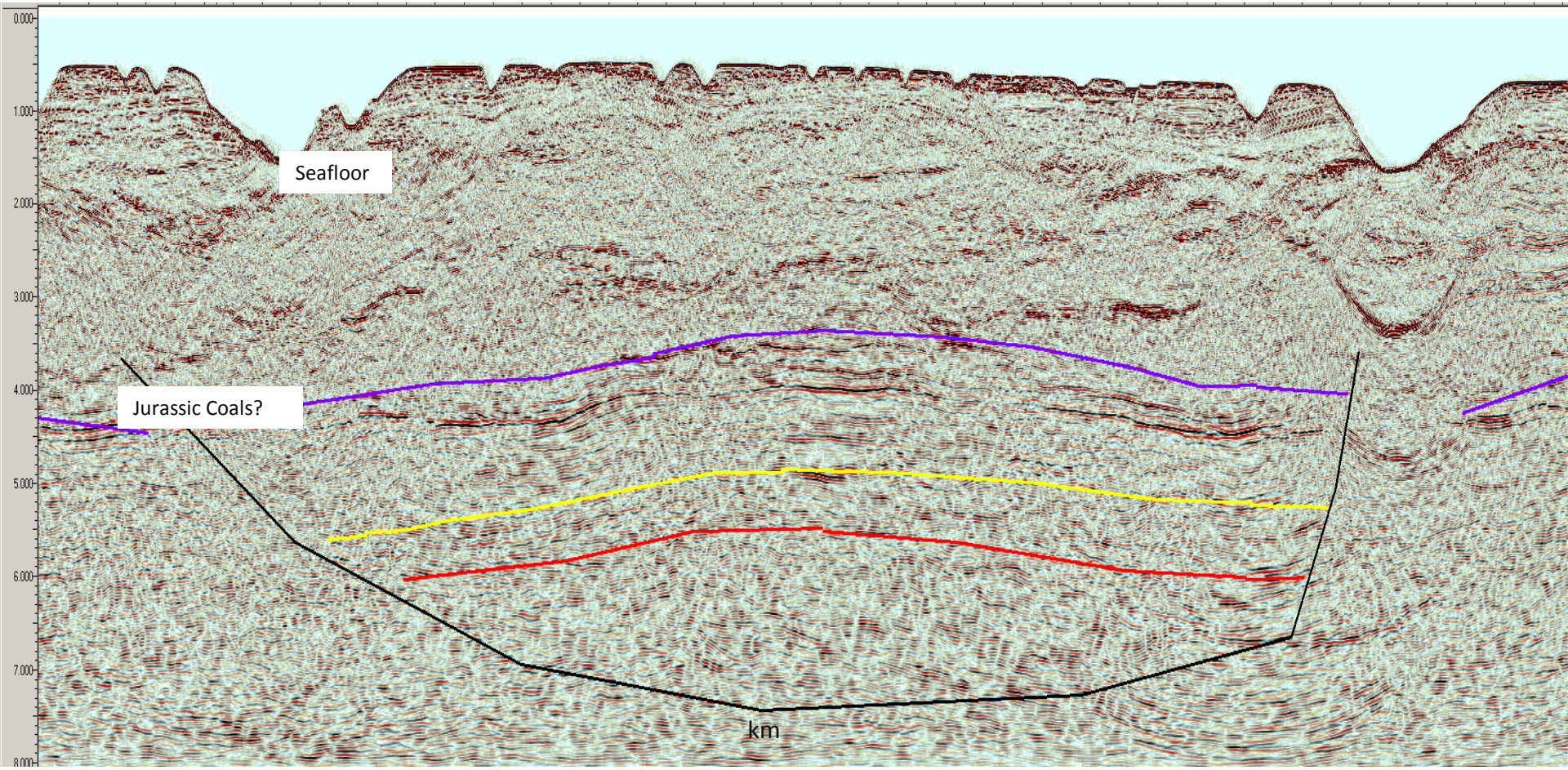
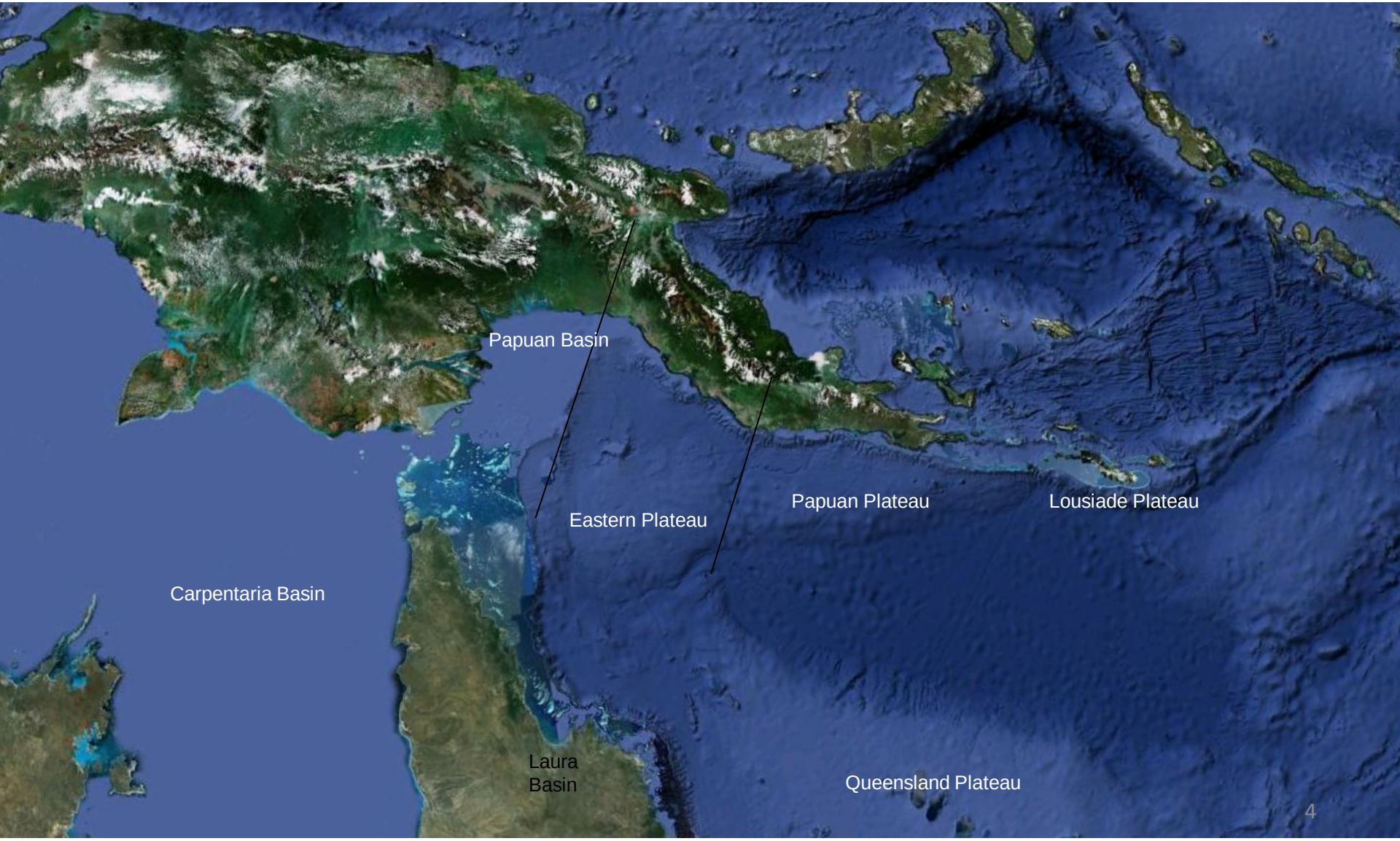
WHAT STARTED THIS EXPLORATION EFFORT?



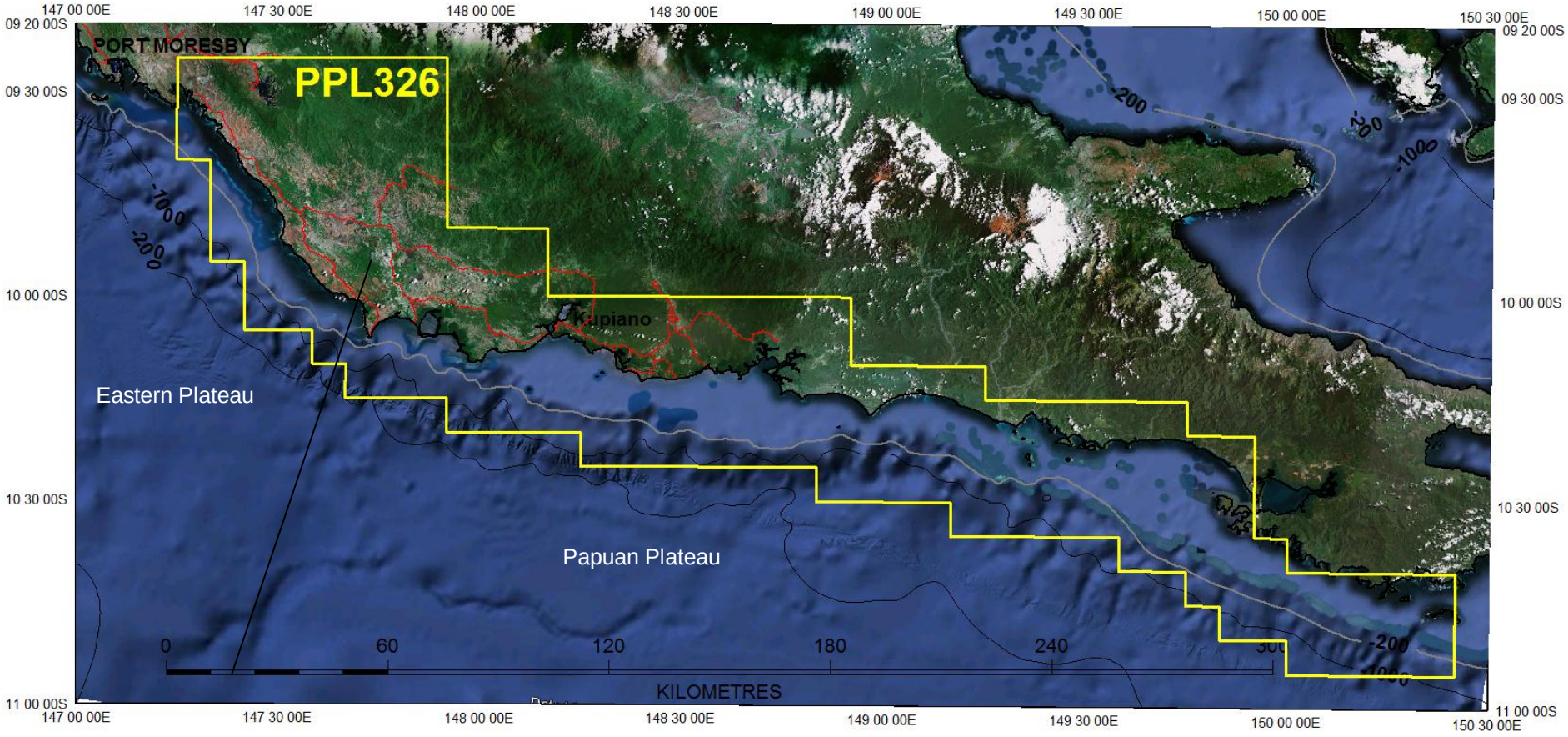
Section Courtesy Fugro Searcher

Offshore seismic SE PNG. This anticline is a world class exploration target!!

Wegener 1924 revisited
Plate reconstruction links SE Papua to Australian Craton



Land and sea extent of PPL326



PPL326 hugs the frontal thrust of the toe of the rise..

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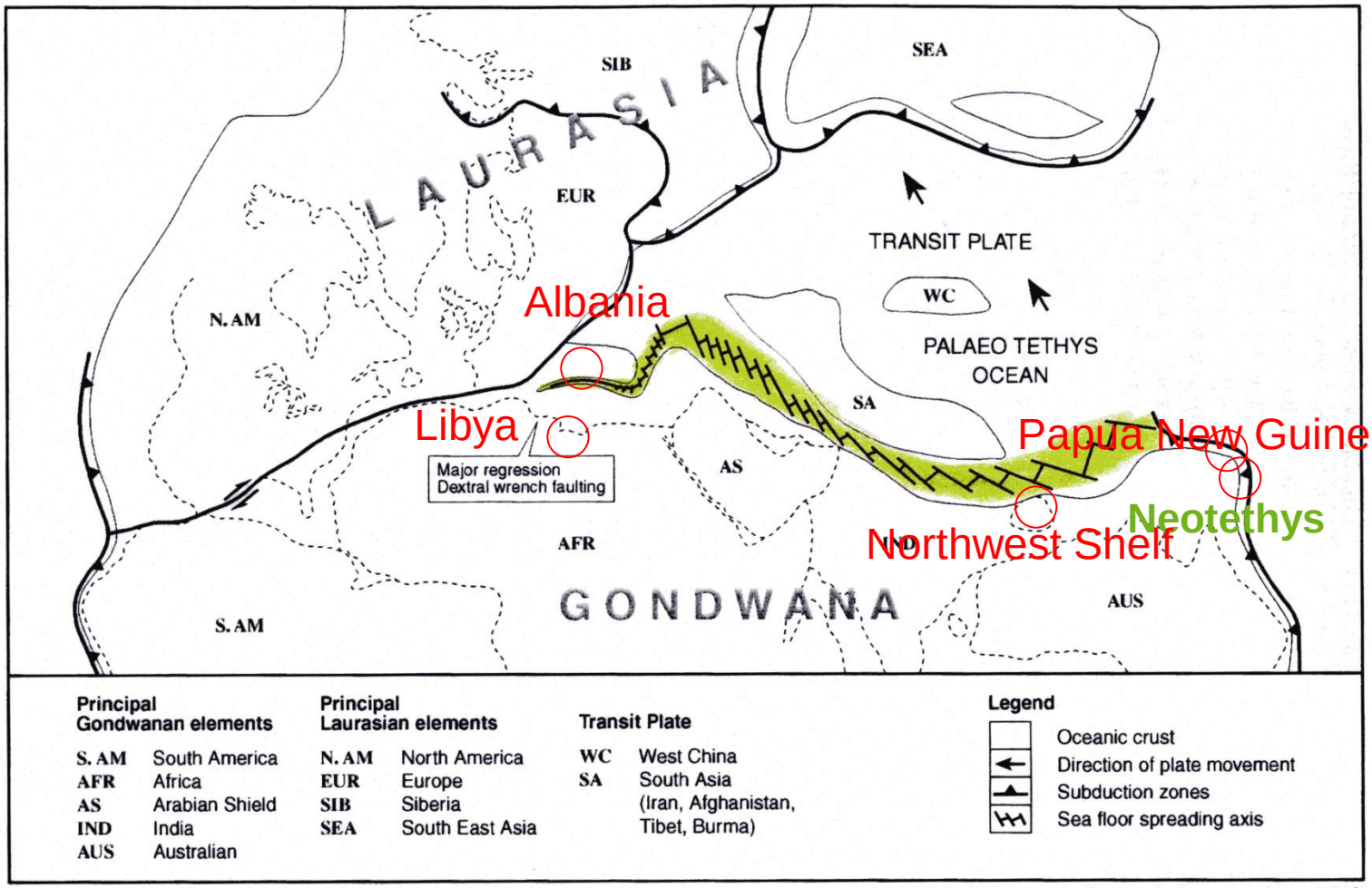
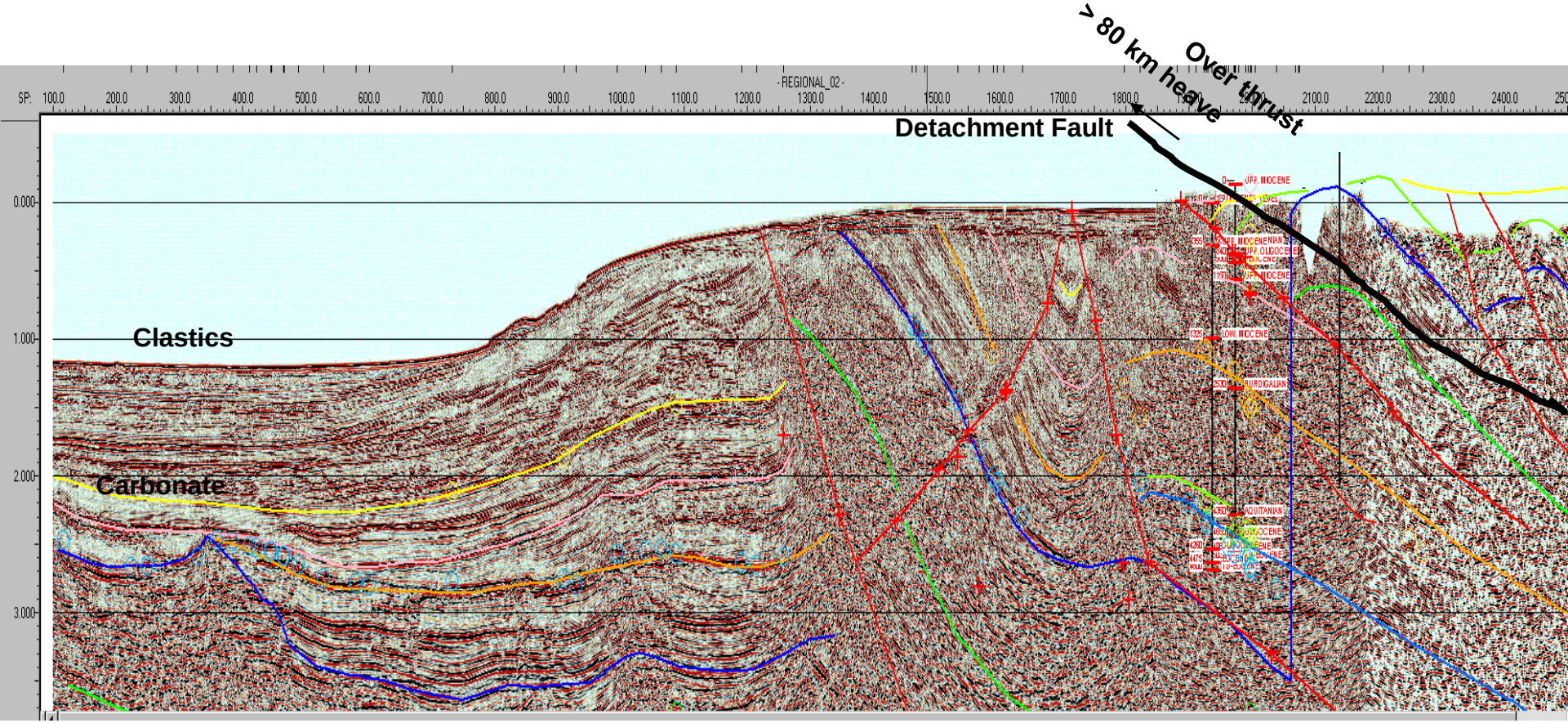
Sunday Lead – Strike Line Revisited



Source: Redrawn from Ricou (1996)

A Journey around the Tethyan Margin

Albanian Ionia Basin



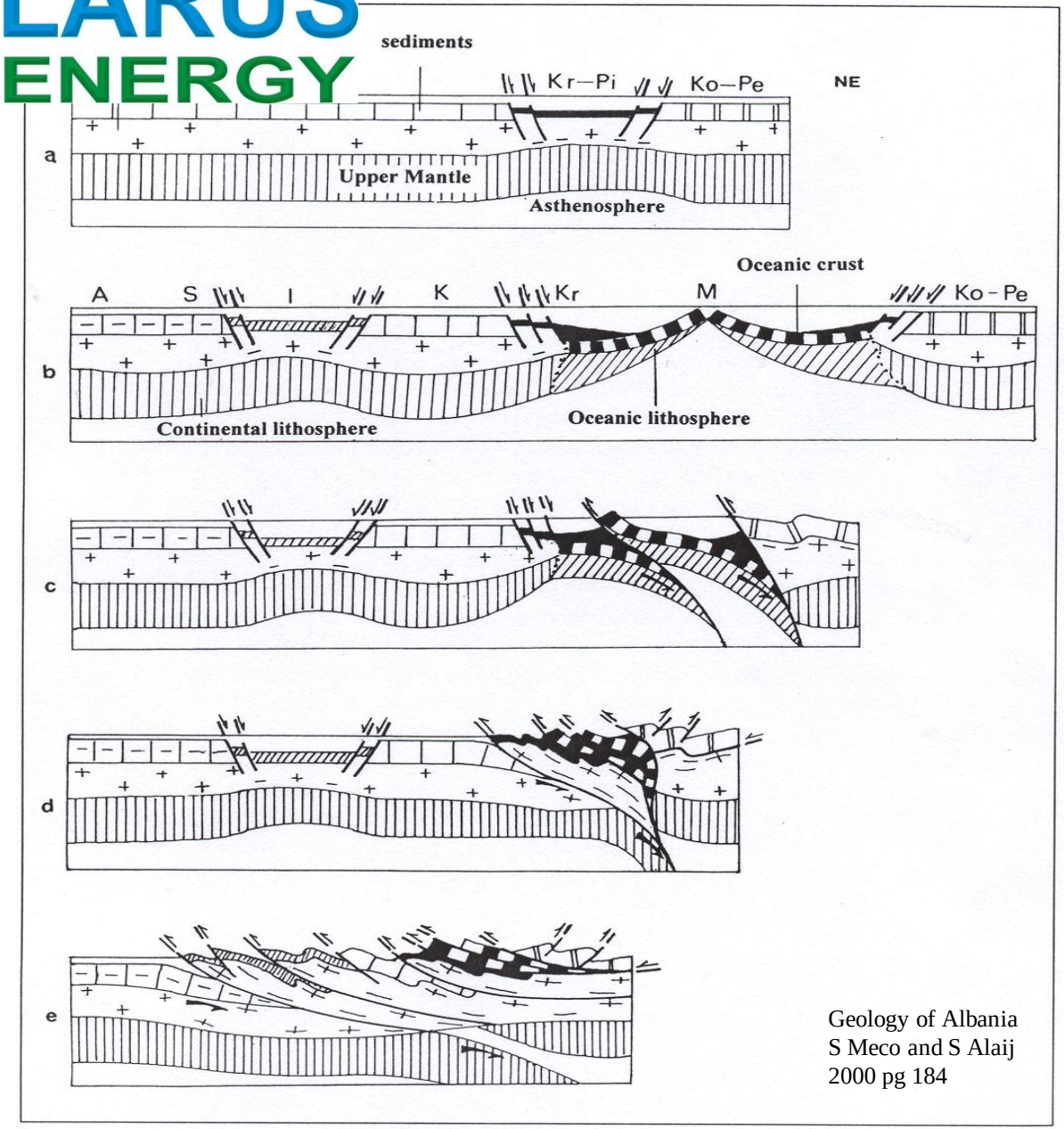
Undeformed

Basin Margin Normal Fault now reversed Frontal Thrust

Well data proved the theory of sub-thrust anticlines

An example of a large over thrust

Ionia Basin Structural History



Geology of Albania
S Meco and S Alaij
2000 pg 184

An association of oceanic crust and an oil field!

L Tr

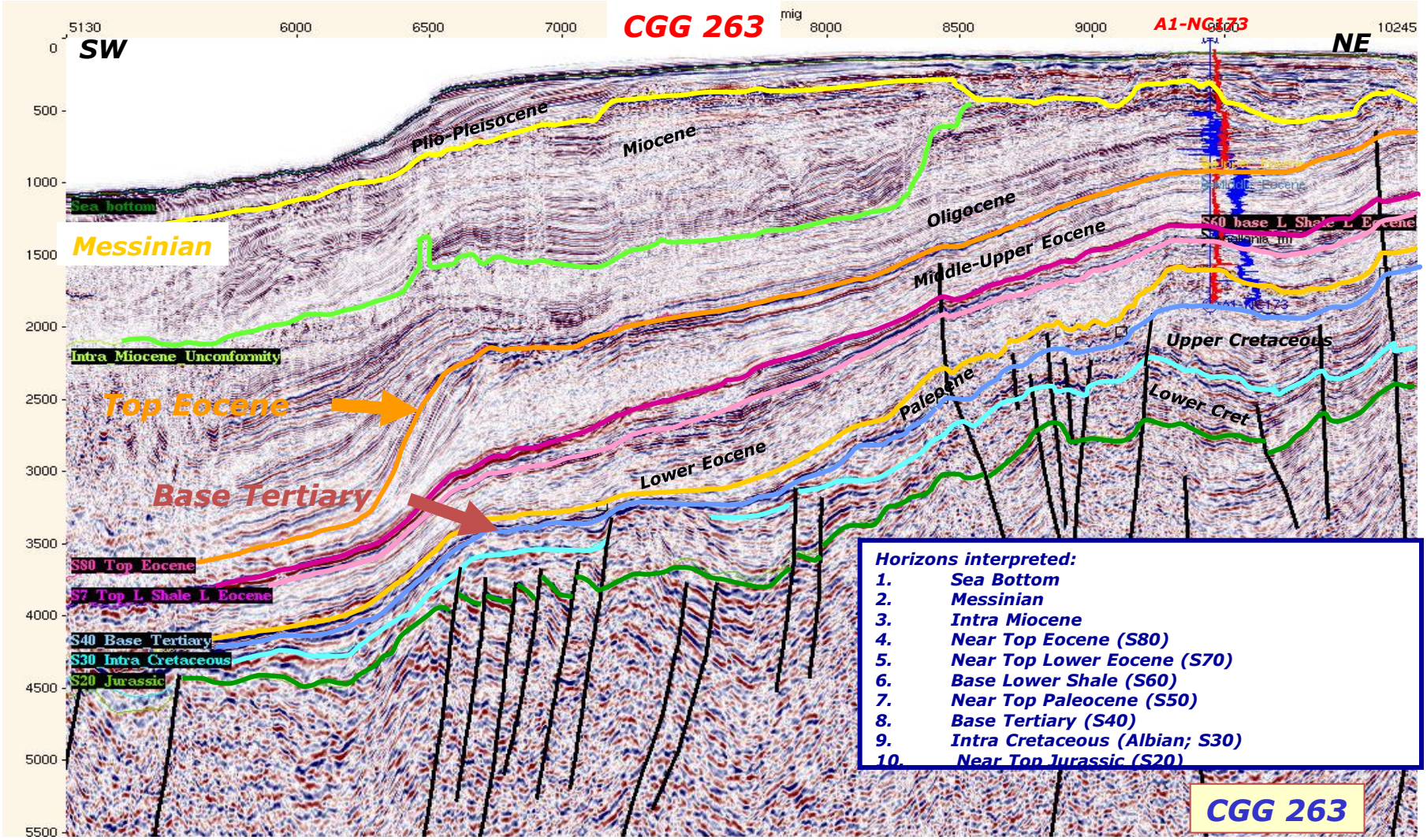
M Jr

L Jr

L Eocene

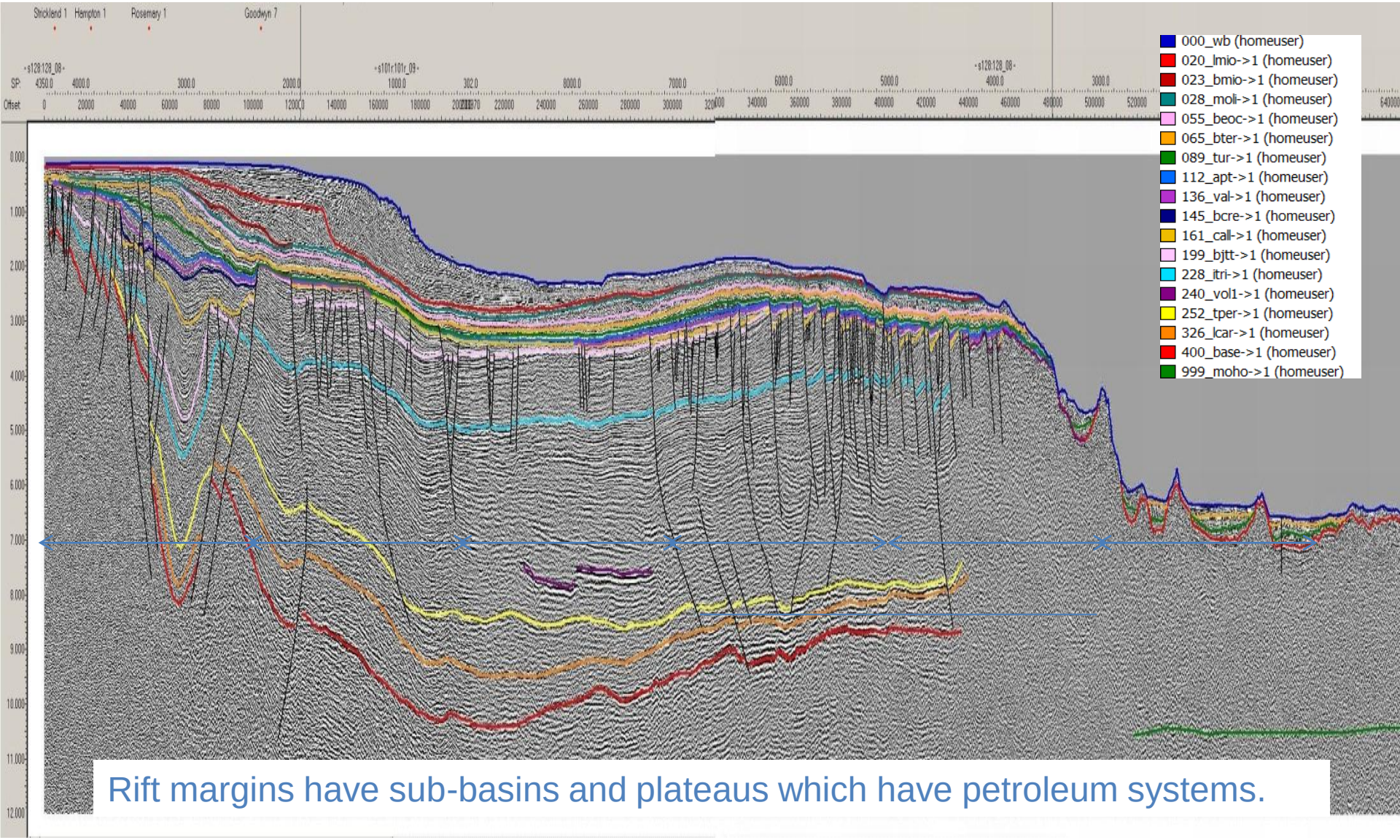
M Miocene (Langhian)

Libyan Northern Margin



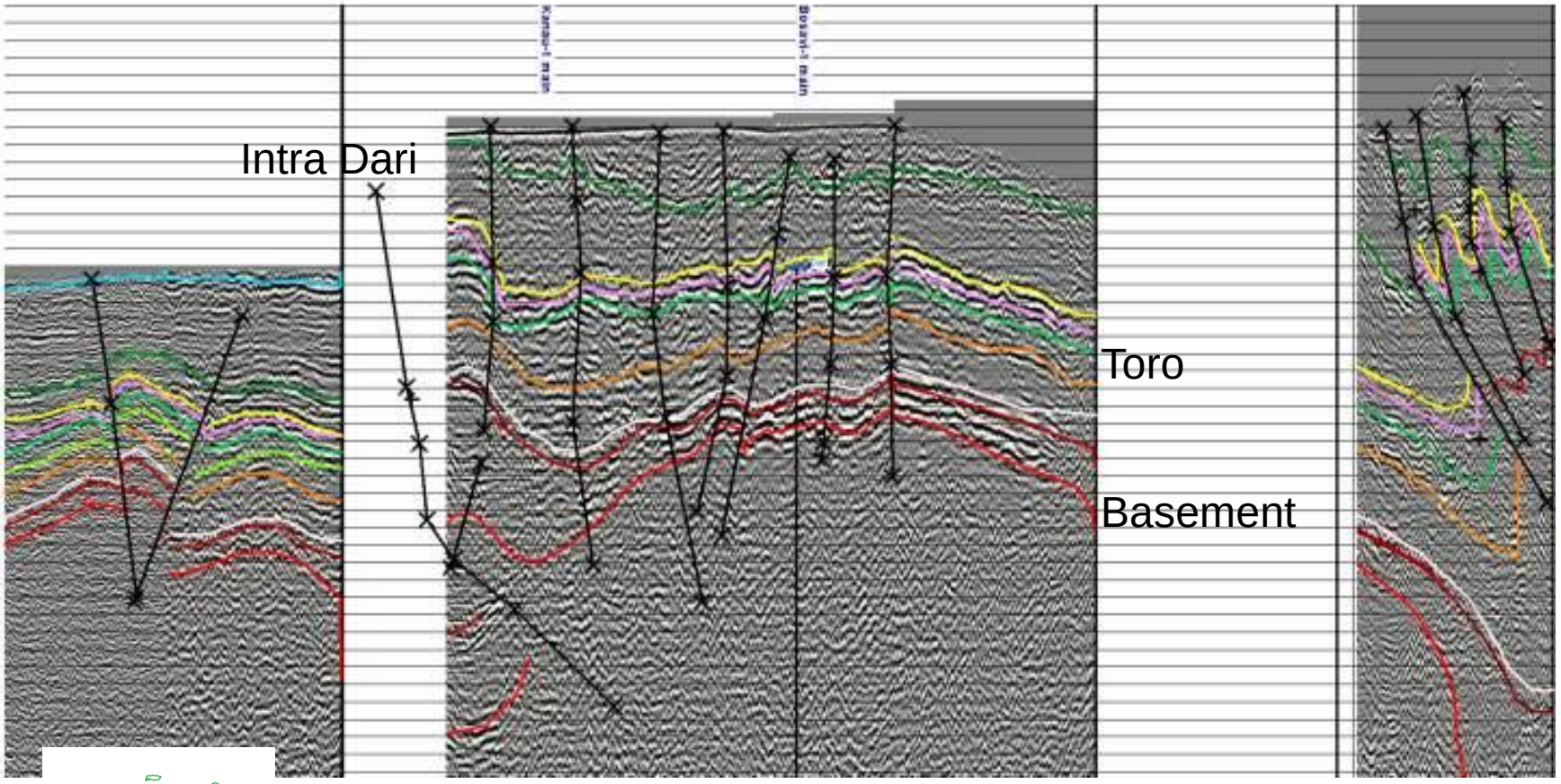
An example of pre-rift sediments surviving the rift uplift and erosion.

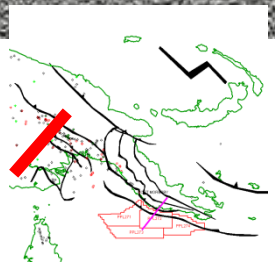
North West Shelf Austalia
Exmouth Plateau



Rift margins have sub-basins and plateaus which have petroleum systems.

Papua Basin
composite regional seismic line

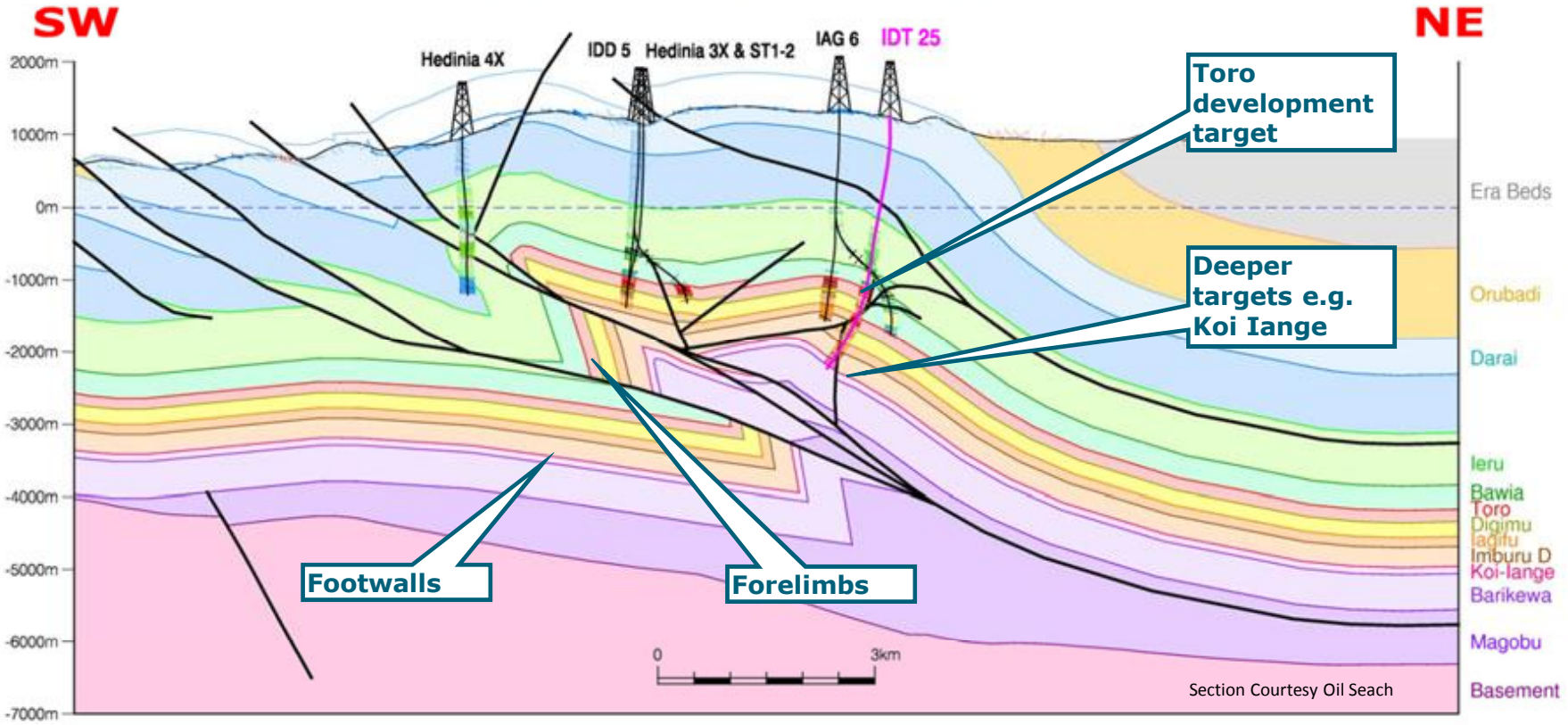


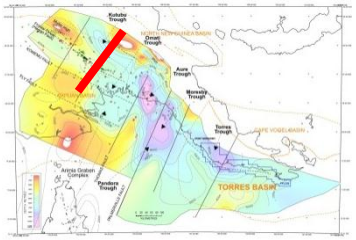


Section Courtesy Papua Petroleum

The frontal thrust is important palaeo-geographically and structurally. What about reservoir risk?

Highlands Look-a-like





This is a cross section from the Highlands. In PPL326 we expect similar structuring and places to drill. Very large footwall anticlines, large thrust anticlines and more. The seismic below looks very much like this section!

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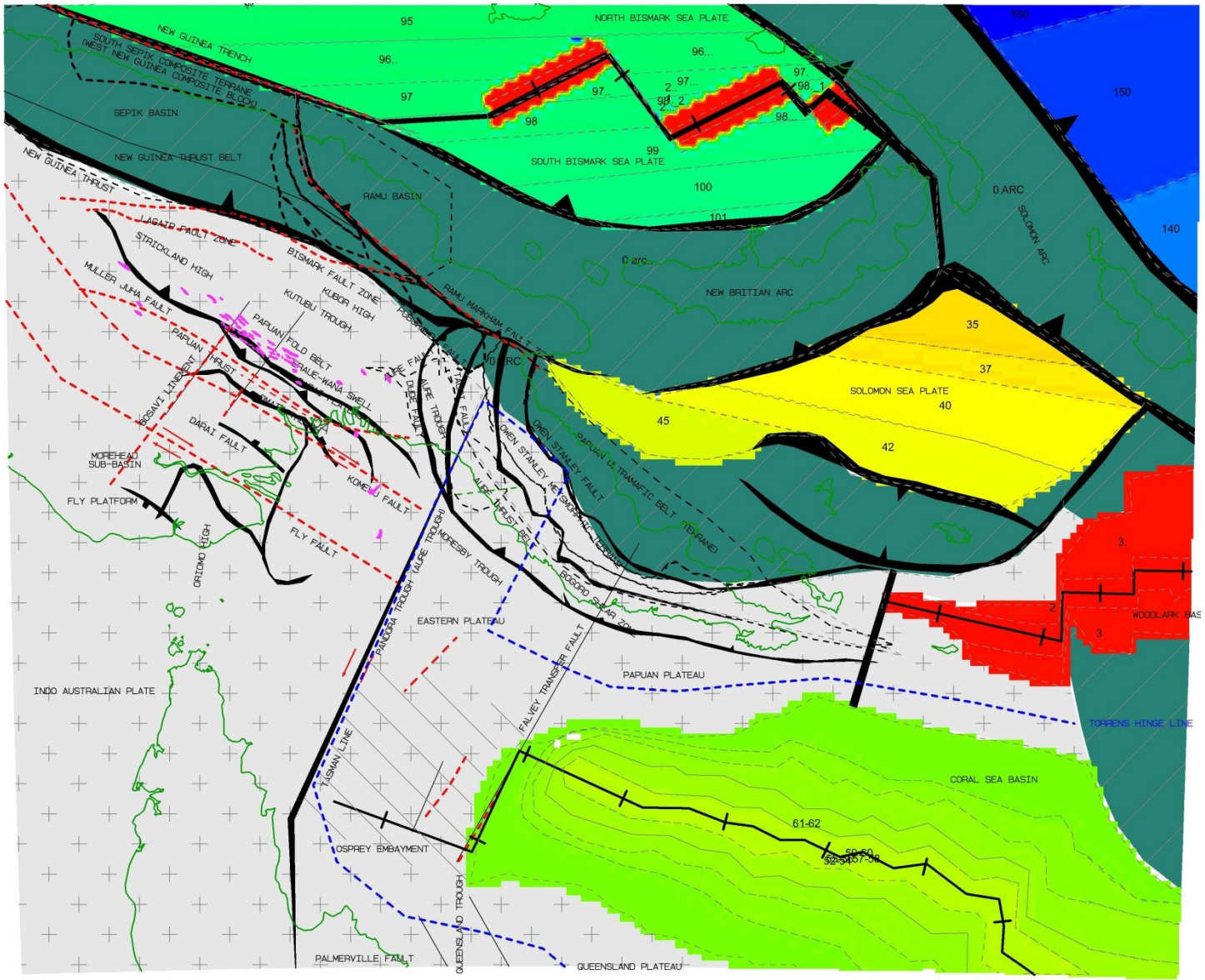
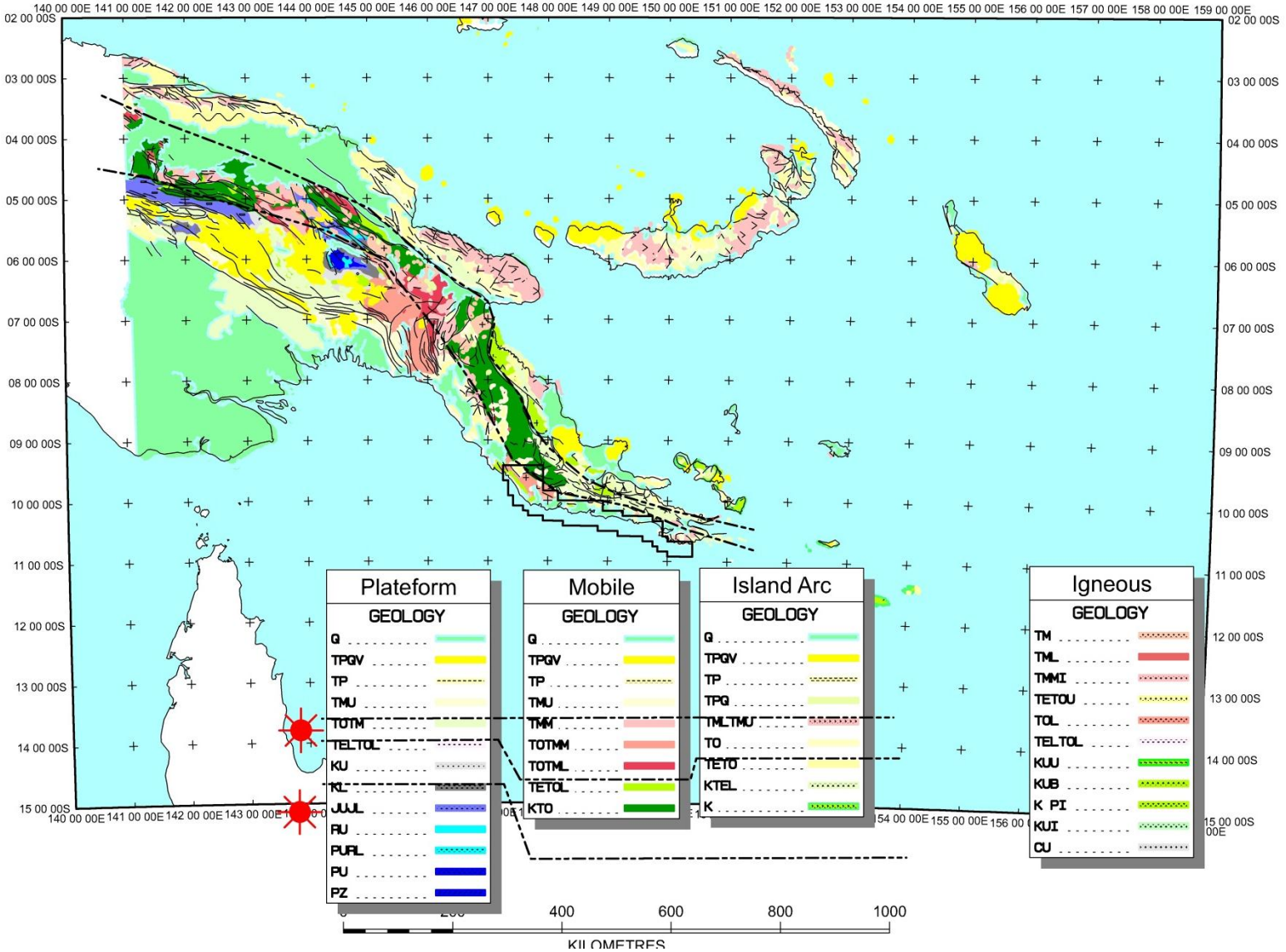
Ring of Volcanics
Concentrated Oil and Gas Fields
Volcanics and Oil don't mix?



PPL326 and Surface Geology & Trendology



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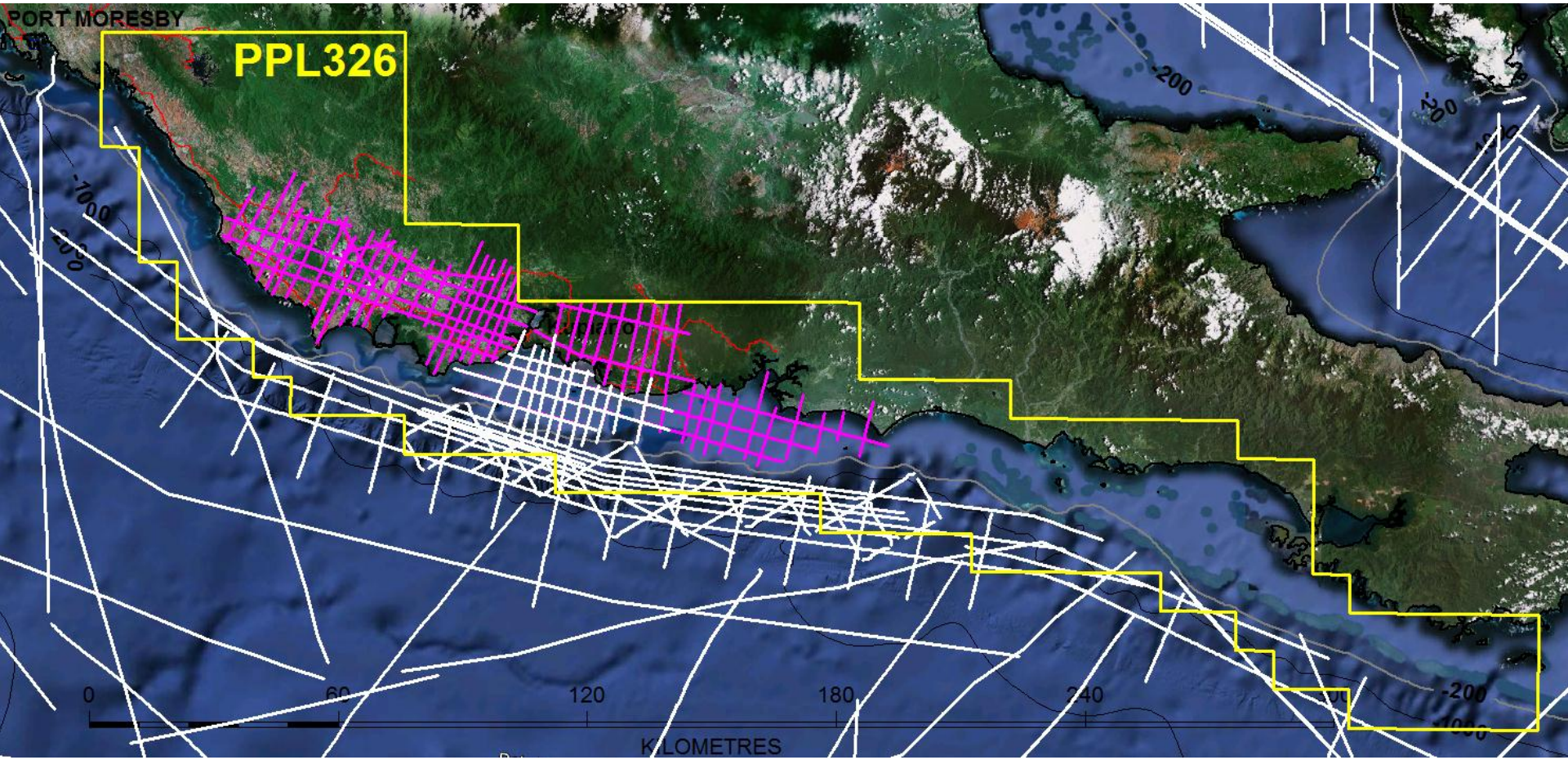
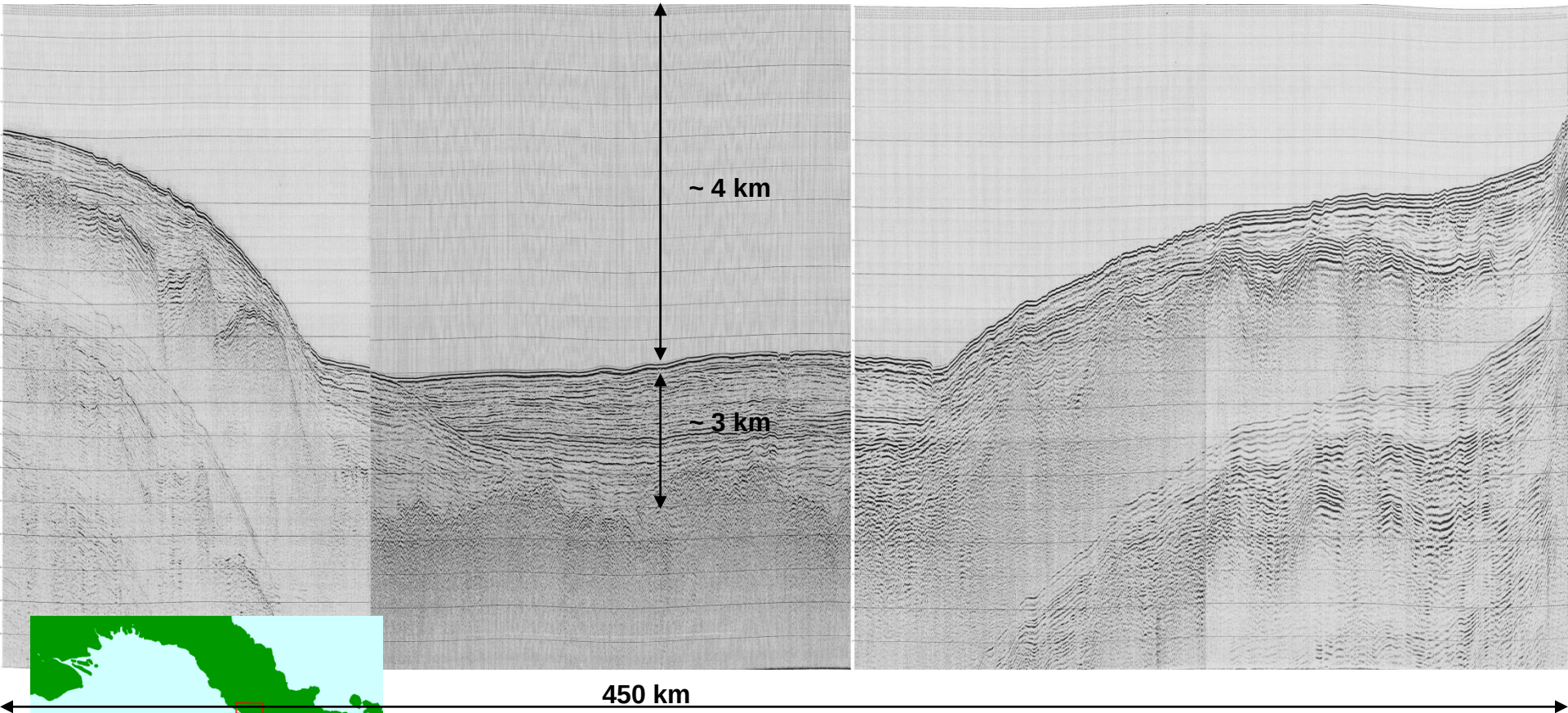
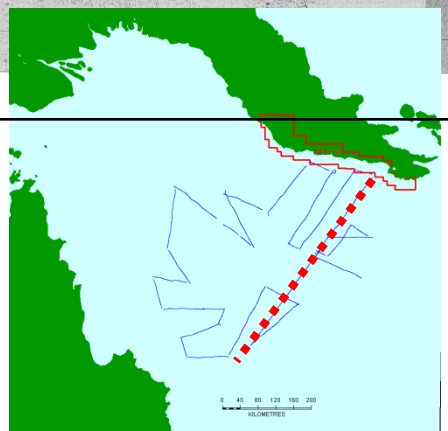
PPL326 Seismic Database
Actual (White)
Planned (Q4 2012) Purple



There is sufficient 2D seismic to confirm multiple deep and shallow fairways with PPL326. Similar play types on and offshore, NWW-SEE strike.

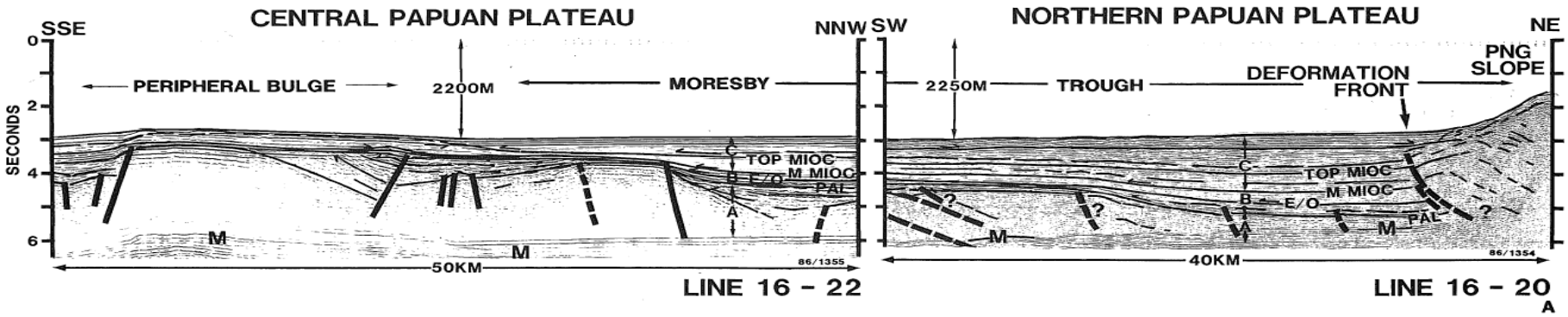
Big Seismic - offshore

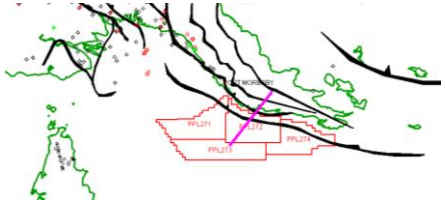




The Sonne 1981 data provides 3200 line kilometres of regional seismic reflection data whose interpretation clearly supports the proposition of a Mesozoic petroleum system in the region of PPL326.

Papua New Guinea – Regional Offshore Seismic





Map Courtesy Blue Energy

Conventional Wisdom

•Palaeocene on basement = no petroleum system

Re-interpretation

•Seismic stratigraphic analysis would place greater emphasis of truncations (unconformities) and onlap edges
•The NNW end of Line 16-22 shows a marked thickening and convergence of unconformities – the hinge point for the Coral Sea uplift.
•We lift the Top Mioc, M Mioc, E/O and Pal and place Mesozoic on Permian Basement
•The NE end of Line 16-20 shows the deformation front and anticlinal development!

Sub-thrust anticlines with Mesozoic petroleum system

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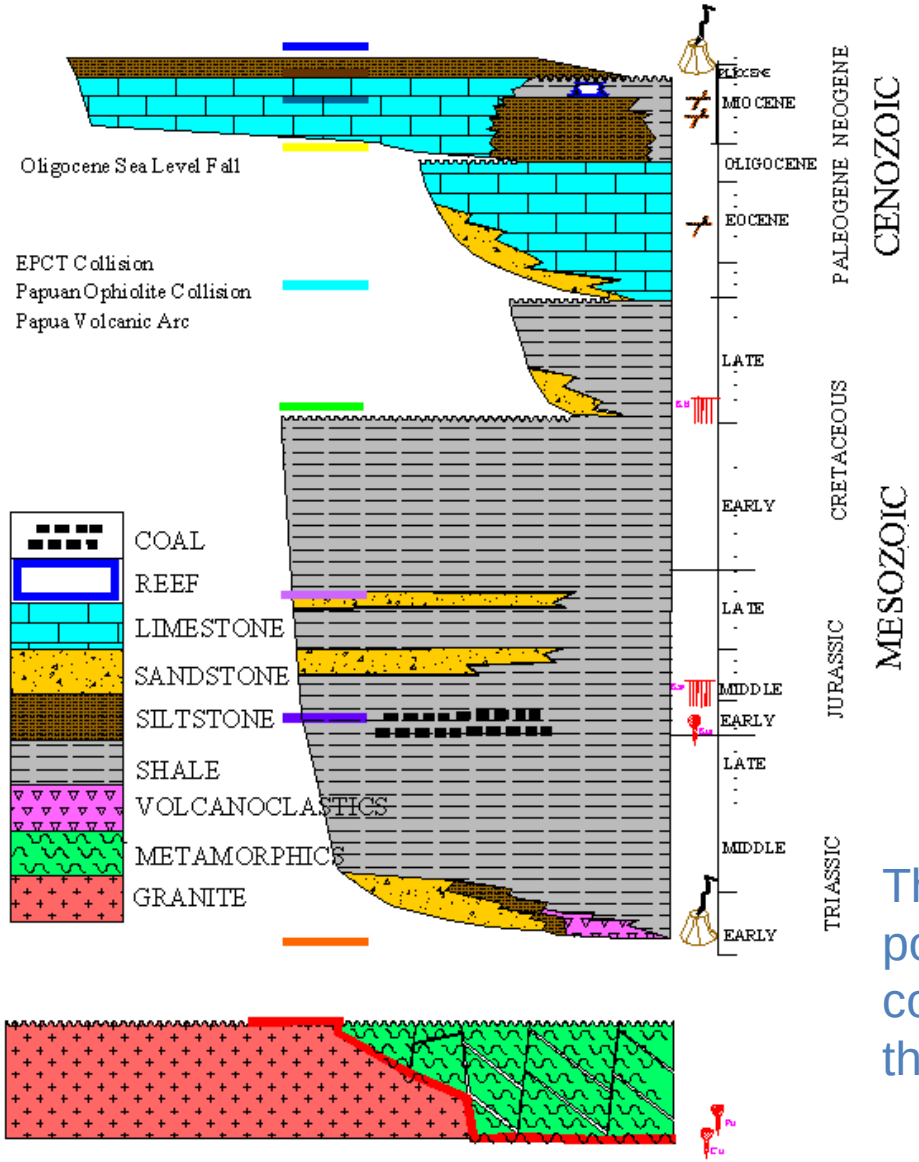
Plays



FAMILY	Oligocene-Miocene Turonian Aptian-Albian Upper Jurassic Pennsylvanian-Lower Permian Upper Devonian Silurian	* Tethyan System
BASIN	Depositional Style - Rift Margin	Torres (=Papuan?) Basin
AREA (Model, Type, Trend)	Source kitchen Migration fairways Reservoirs (Deltaic, Carbonate) Traps Structure, Stratigraphic, Hydrodynamic	* Fold Belt
PLAY (Petroleum System)		* Miocene reefs * Early Cretaceous sst in thrust anticlines - late gas * Early Cretaceous sst in thrust anticlines - early gas/oil Late Cretaceous sst in thrust anticlines - late gas * Tertiary Lmst anticlines (fractured) Foreland clastics Karst Lmst
LEAD		Hedging uncertainty with technology G&G Seismic
PROSPECT		Consistent Objective Technically Sound (Procedures,Concepts,Principles)

The new geological model shows numerous possible sandstone reservoirs. The late compression and thrusting hopefully puts these is anticlinal traps.

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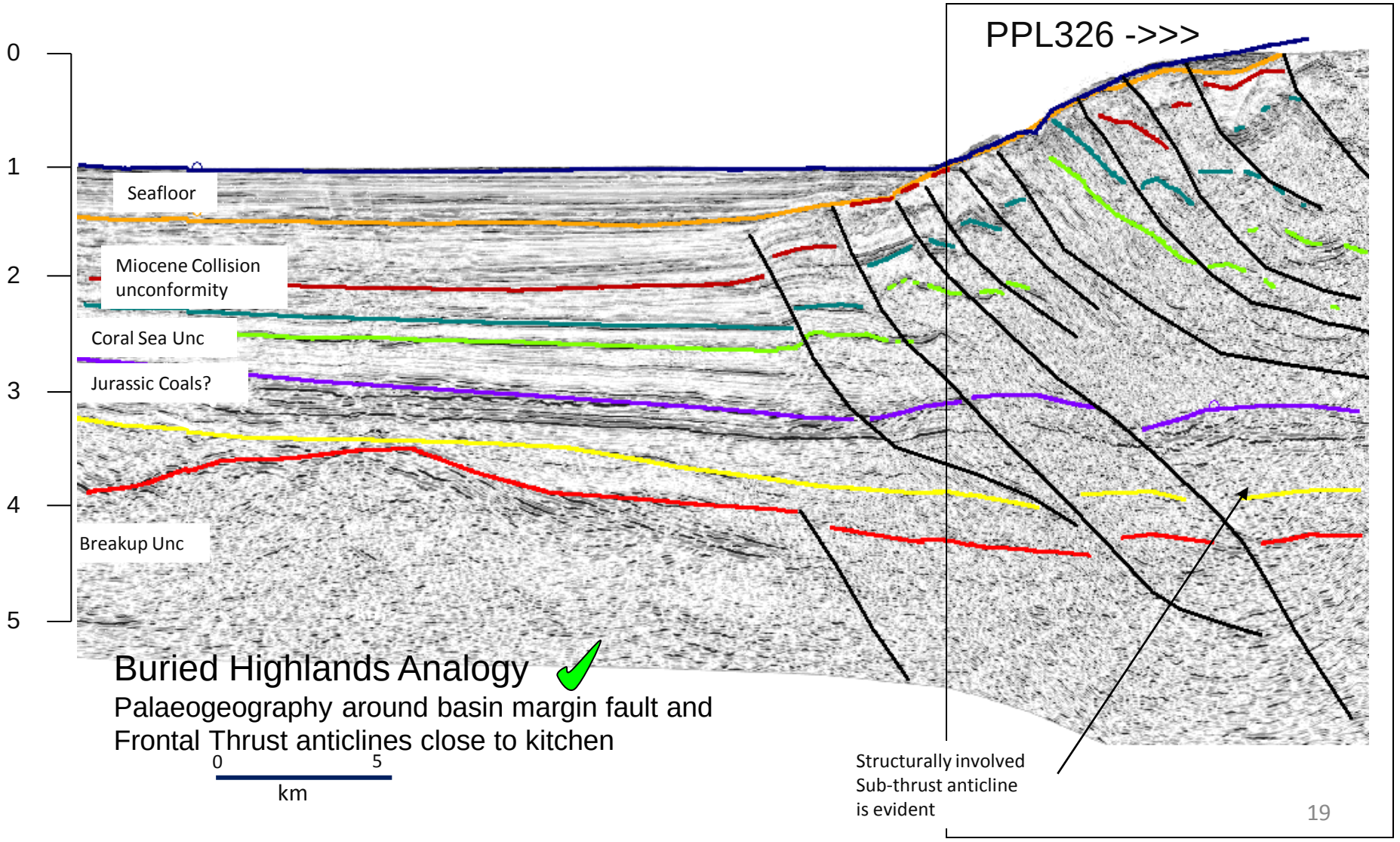
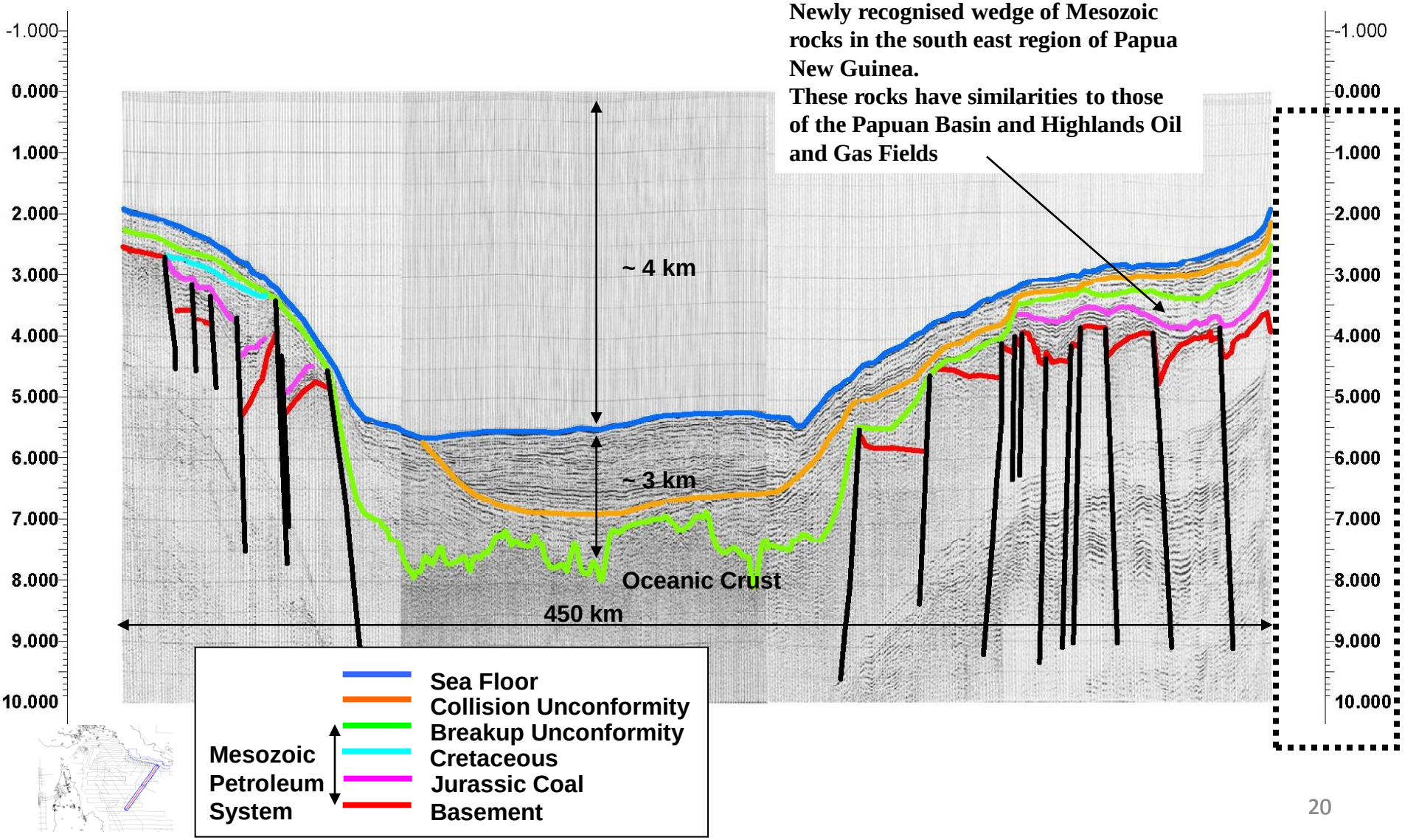
High Resolution Seismic

SW

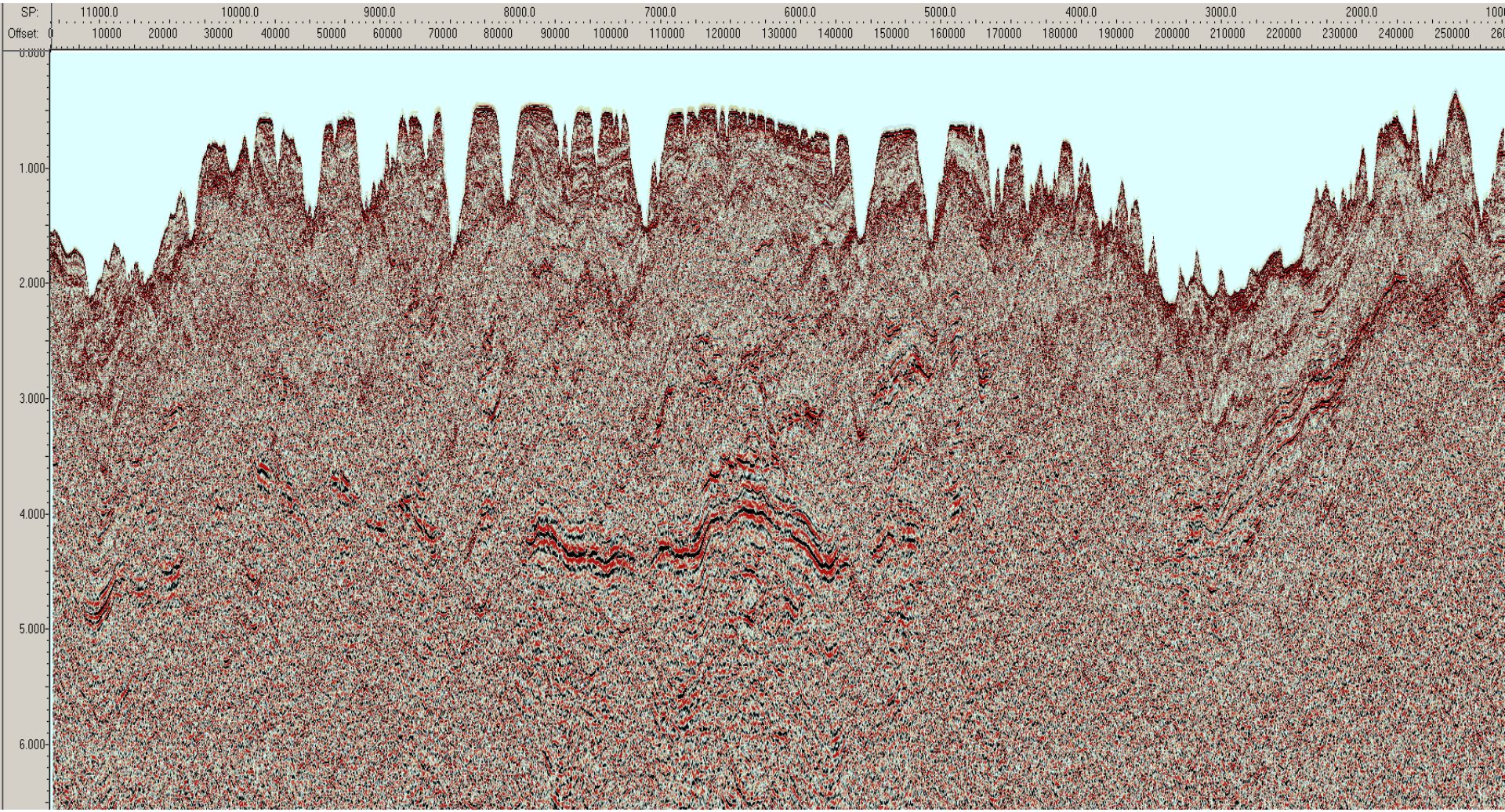
NE



Big Picture – Coral Sea/Papuan Plateau



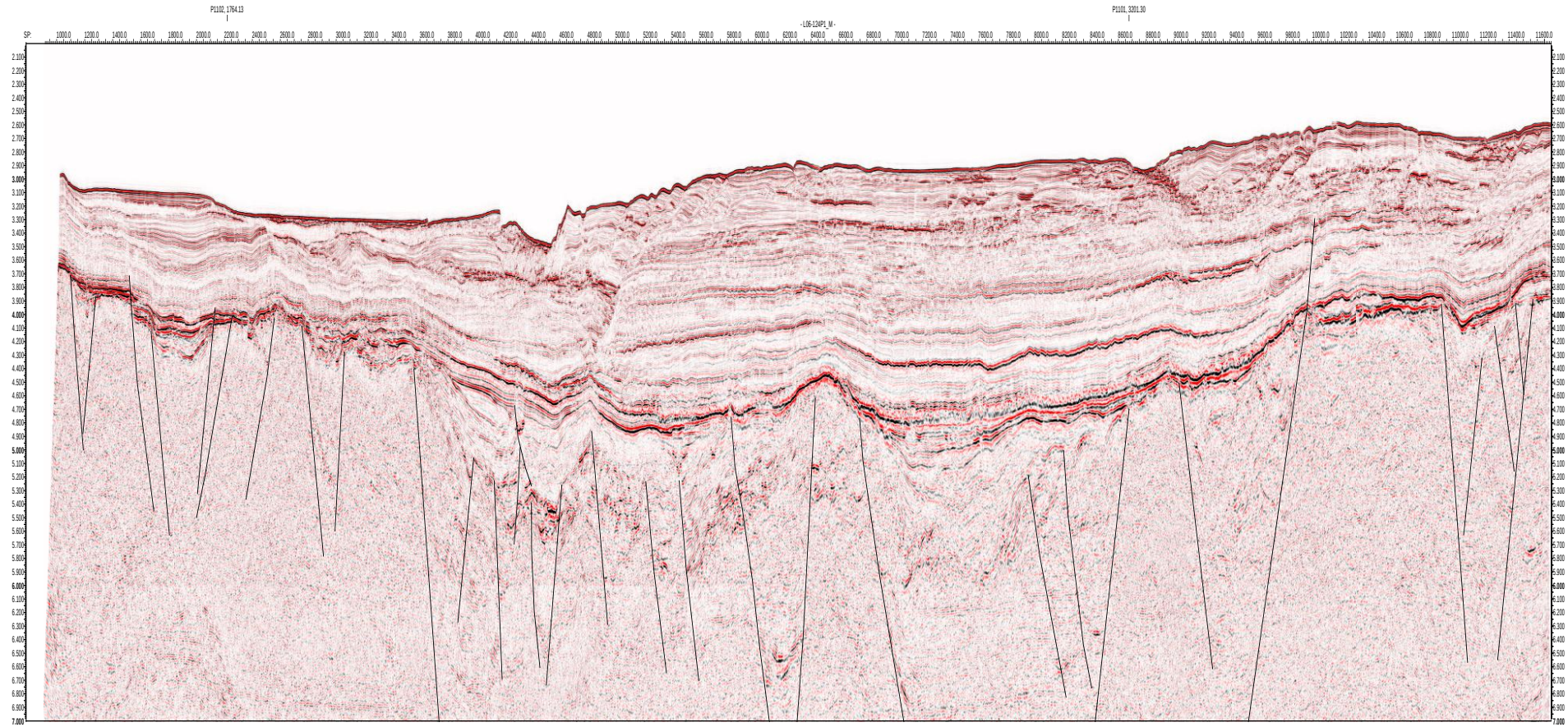
Sunday Lead – Strike Line Revisited



This anticline is a world class exploration target!!

Section Courtesy Fugro Searcher

2006's Semi-Regional Seismic Data



Deep water offshore line before the frontal thrust helps unlock the basin.
Understanding the transfer faults is critical! The best anticlines are between them.

Section Courtesy Fugro Searcher

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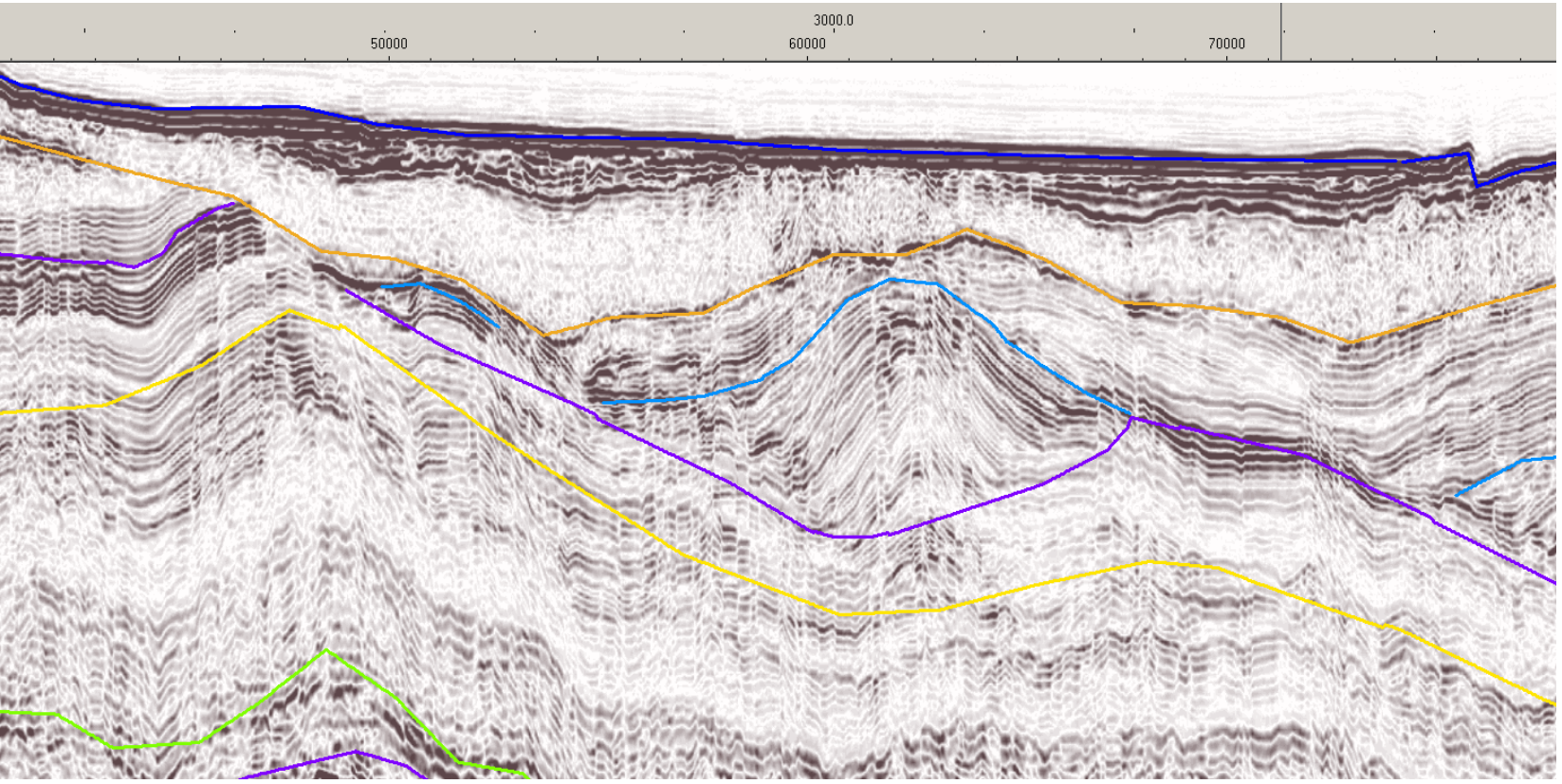
2006's Semi-Regional Seismic Data
A close look



Reefs date the Miocene

Mesozoic Petroleum System

- Sea Floor
- Collision Unconformity
- Breakup Unconformity
- Cretaceous
- Jurassic Coal
- Basement

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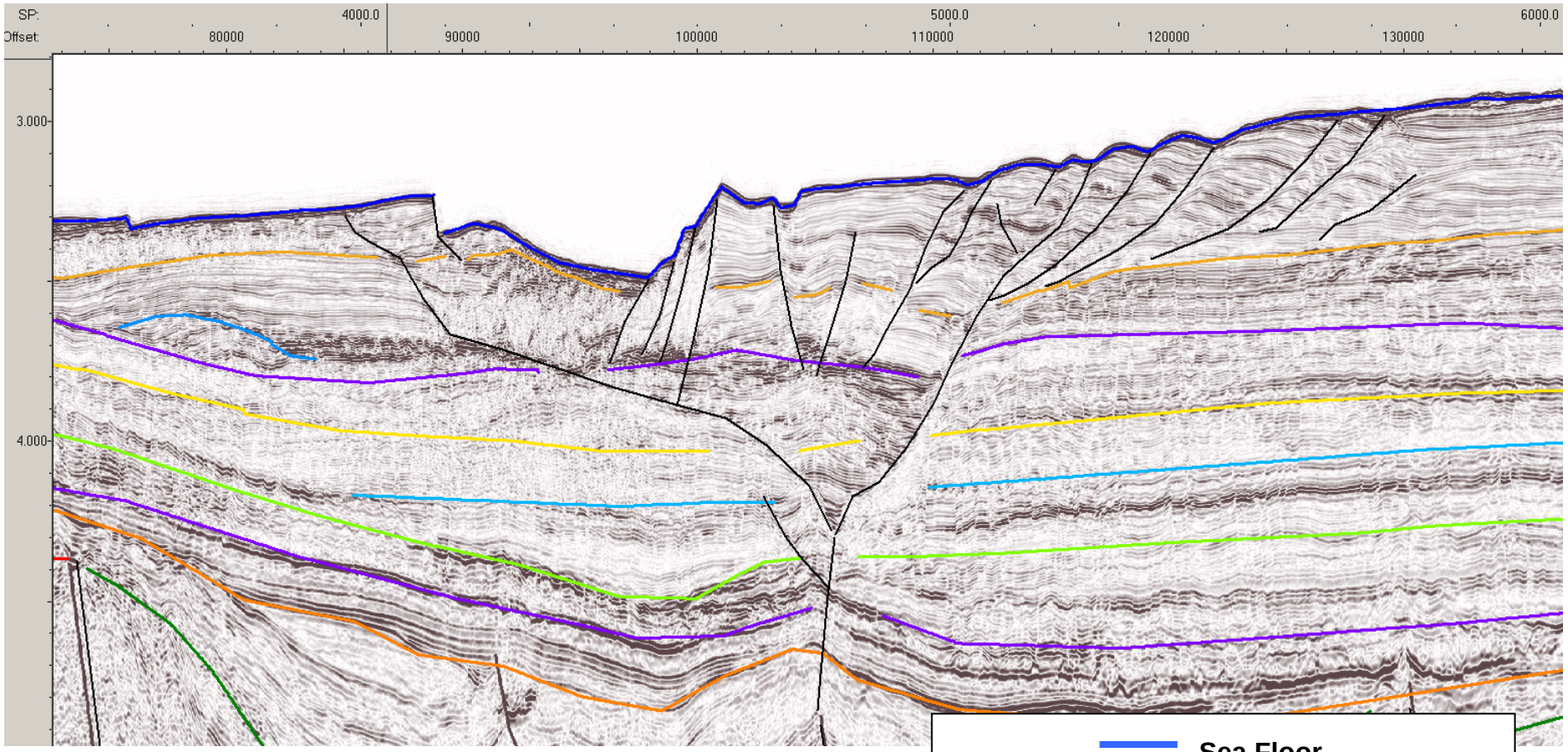
2006's Semi-Regional Seismic Data
A close look



Negative flower structure dates the collision event

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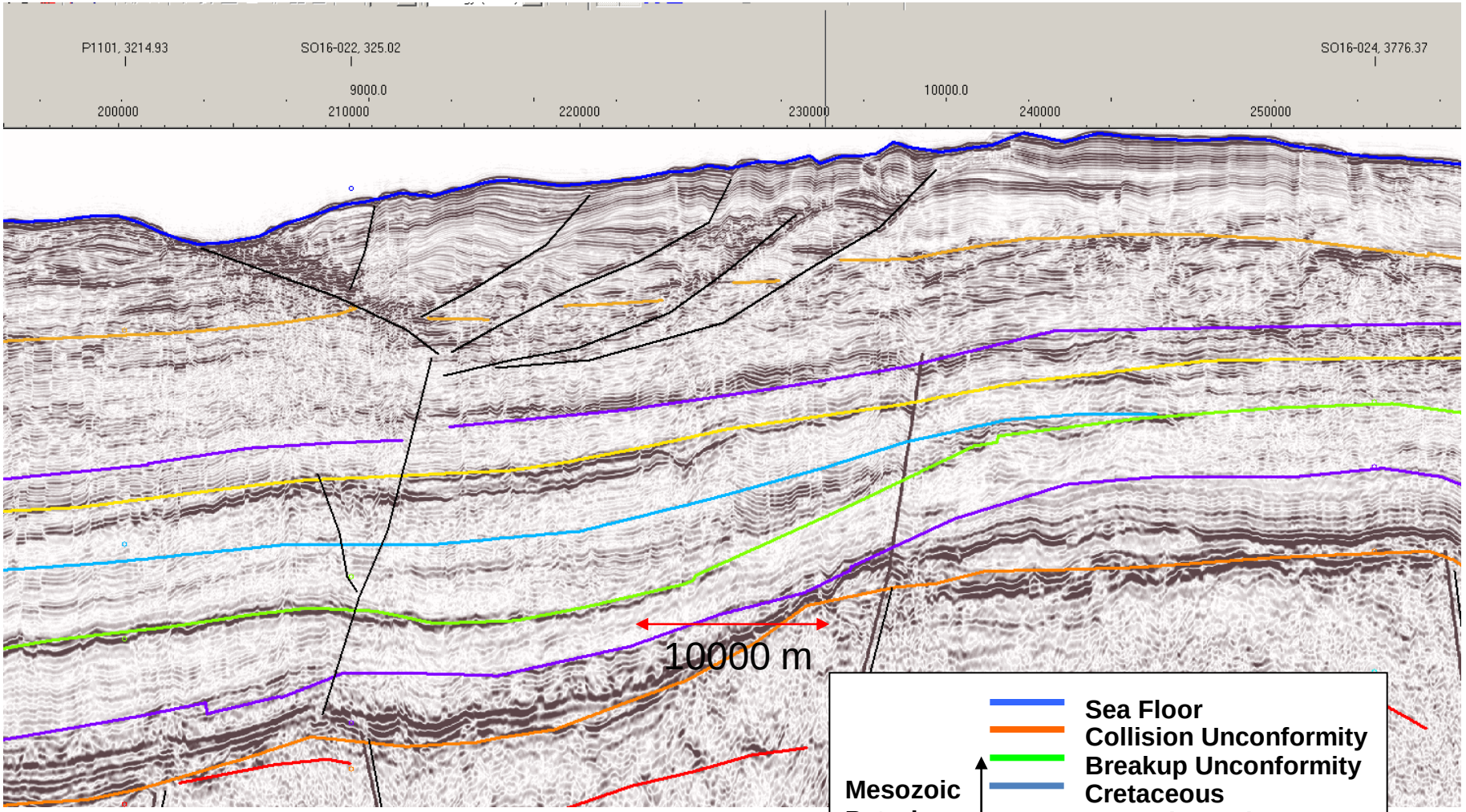
2006's Semi-Regional Seismic Data
A close look



On lap defines post Coral Sea Basin

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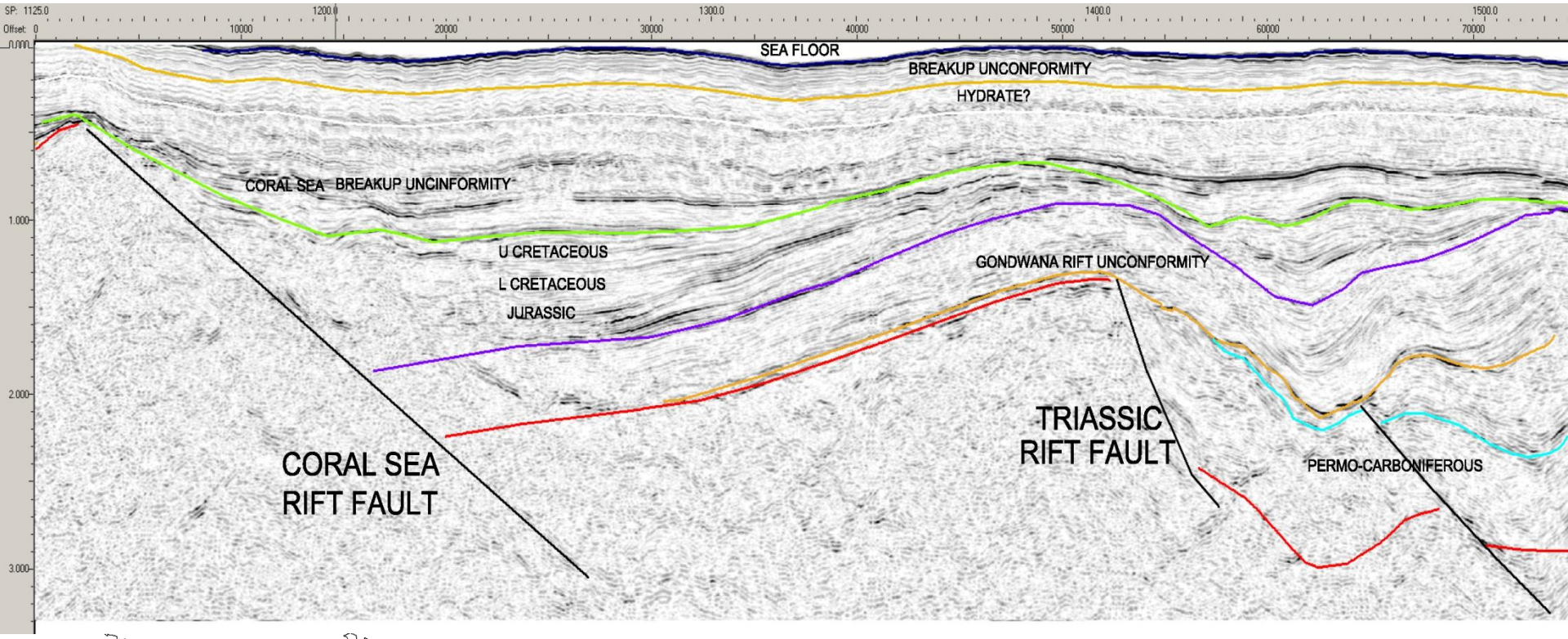
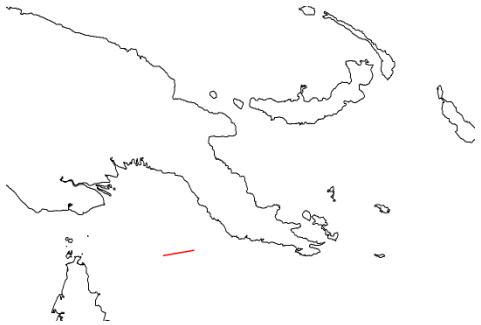
Nearby BIG seismic





10000 m

Mesozoic Petroleum System

- Sea Floor
- Collision Unconformity
- Breakup Unconformity
- Cretaceous
- Jurassic Coal
- Basement

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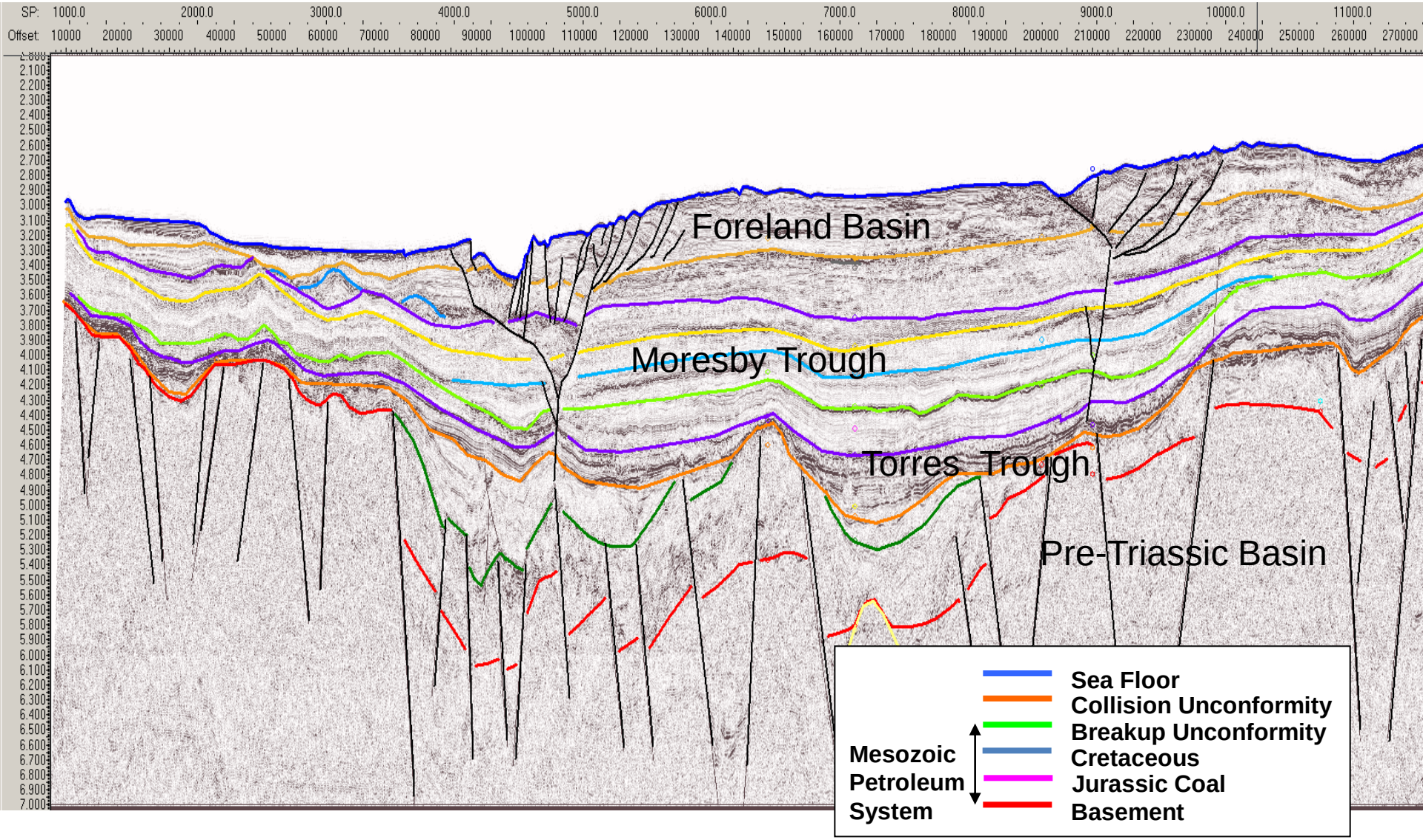
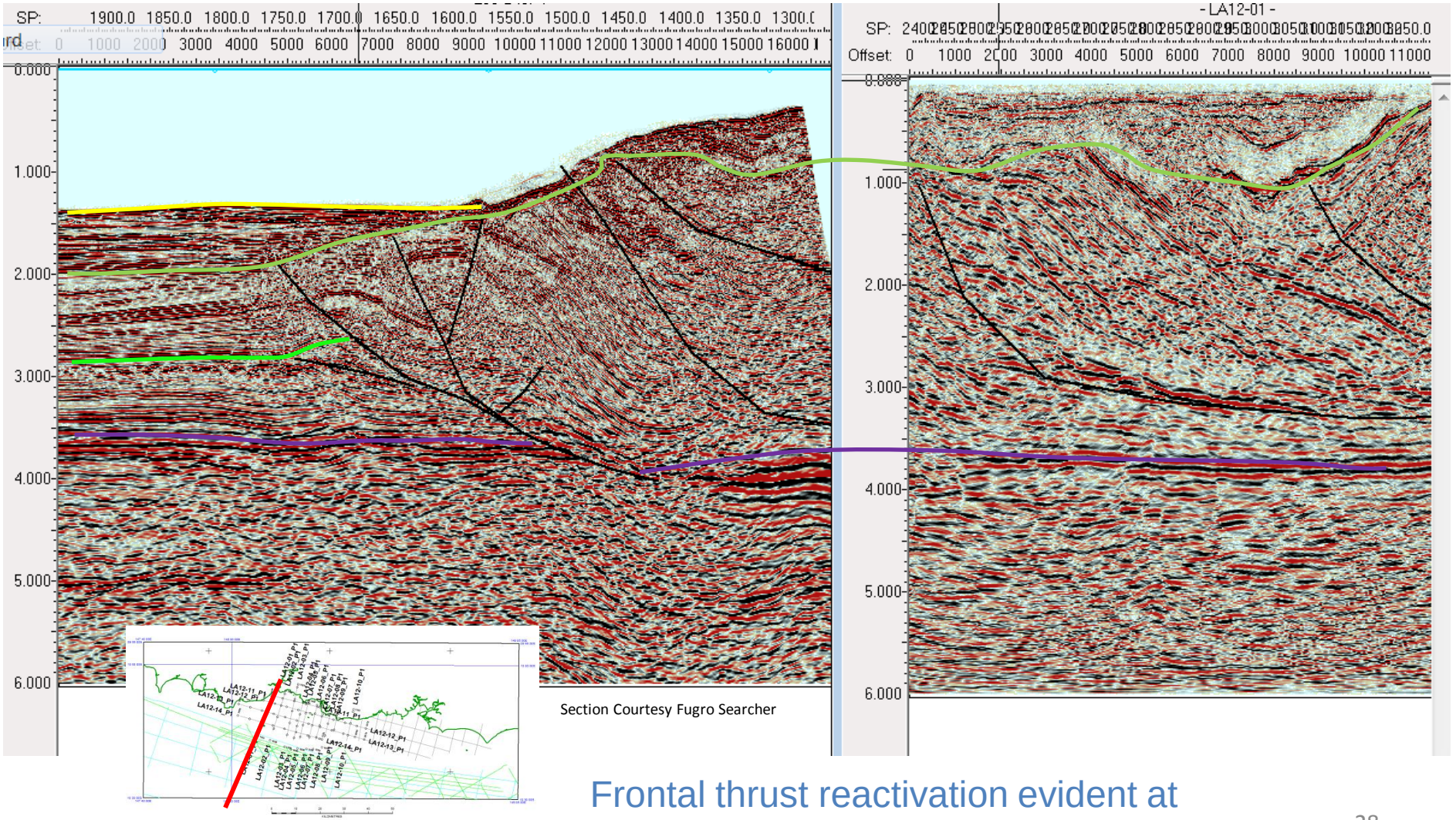
2006's Semi-Regional Seismic Data
Bring it all together



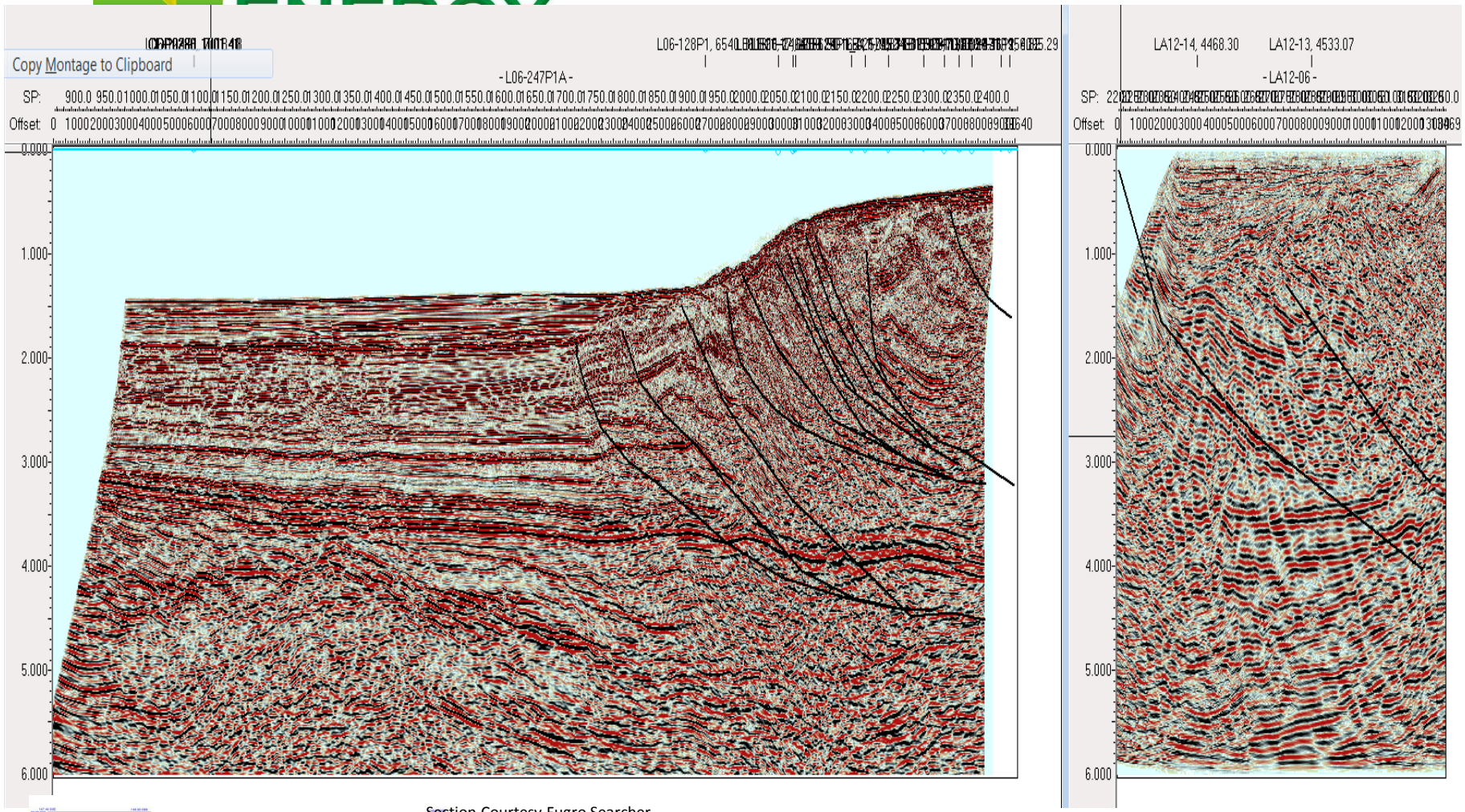
PPL326 Regional Composite

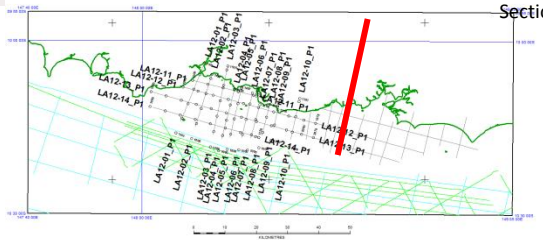


Section Courtesy Fugro Searcher

Frontal thrust reactivation evident at Jurassic level.

PPL326 Regional Composite

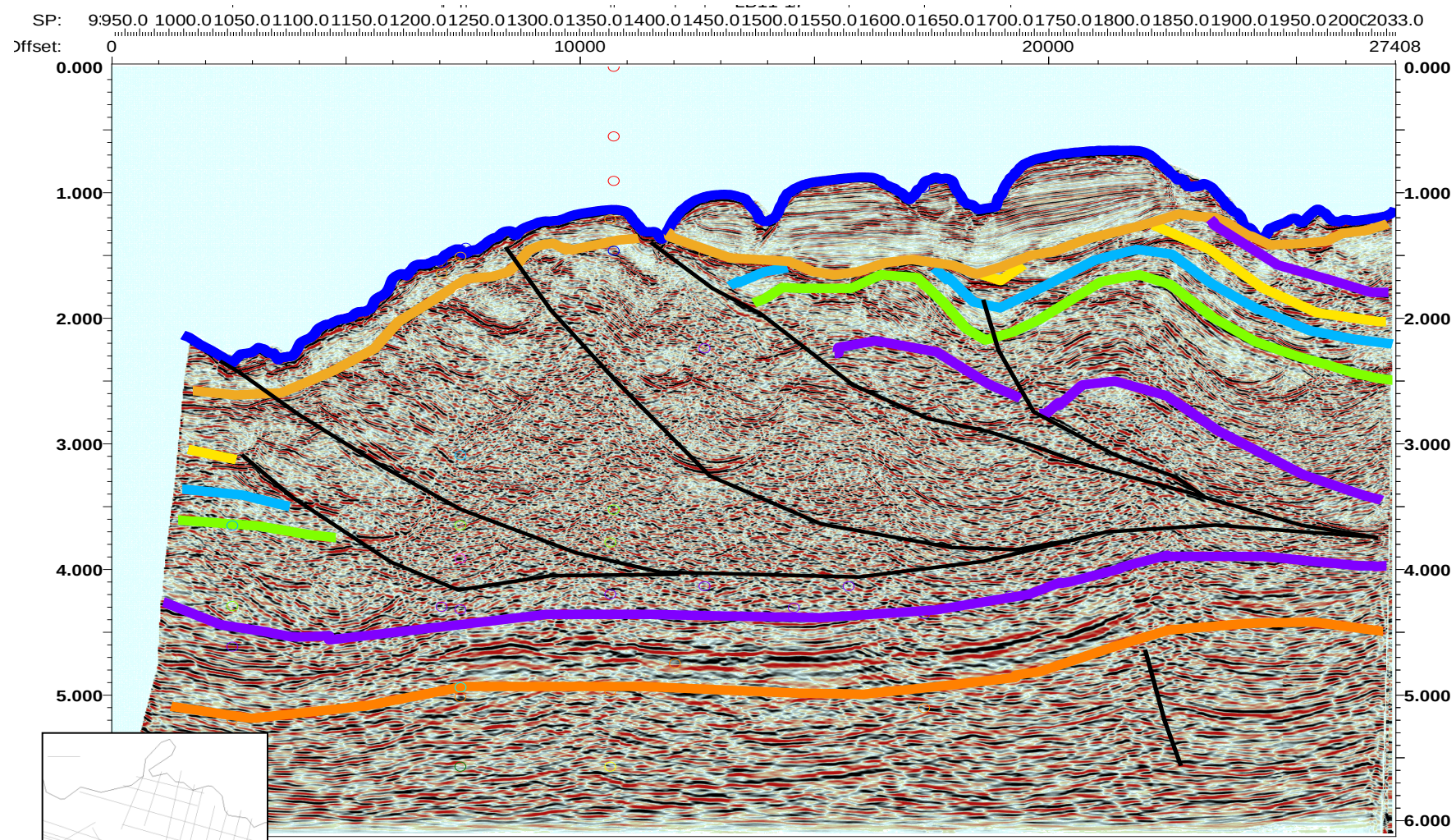


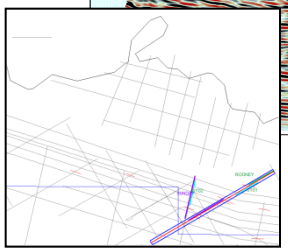


Section Courtesy Fugro Searcher

Deep and shallow anticlinal development.

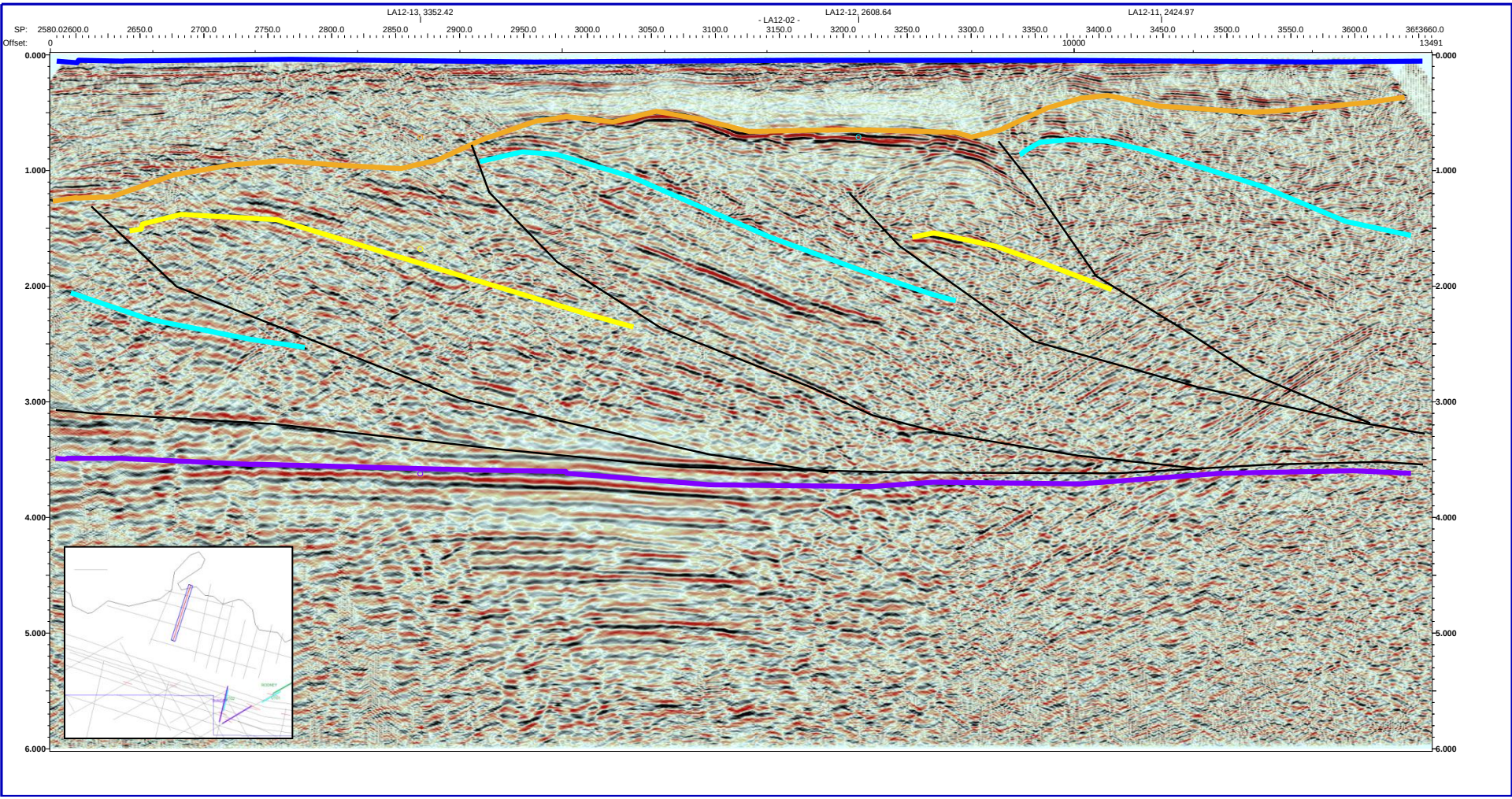
Baramata Deep Water Seismic Survey
LB11-12
(Final Stack PSTM)





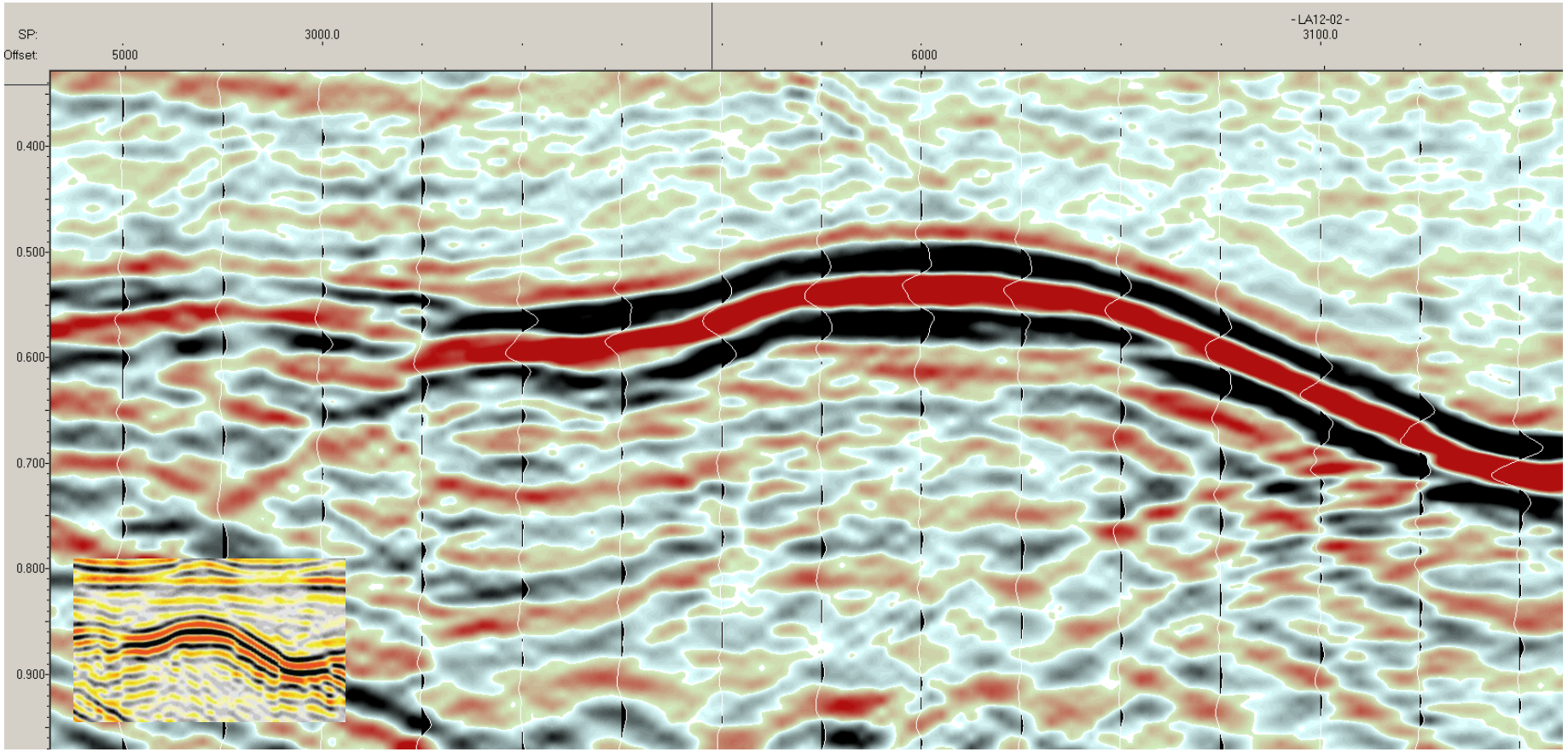
This section confirms Sunday and Rodney Leads and turns up a lead in the shallow section!!

Abau OBC TZ Seismic Survey
LA12-02
(Preliminary Stack)



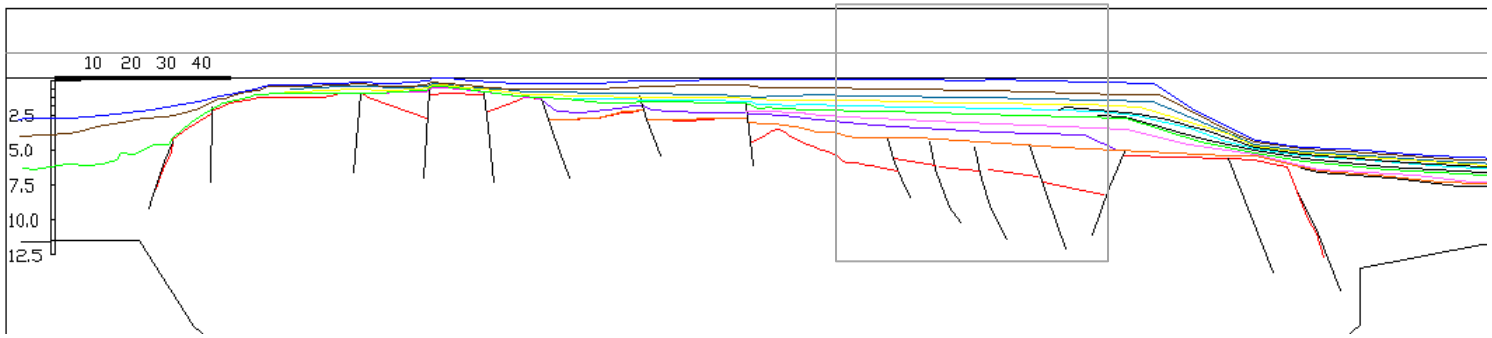
This field stack proves deep anticlines and numerous shallow anticlines. The bright shallow event and the region under the arrow shows a very exotic play!

Abau OBC TZ Seismic Survey
LA12-01
(DHI – Amplitude and Flat Spot)

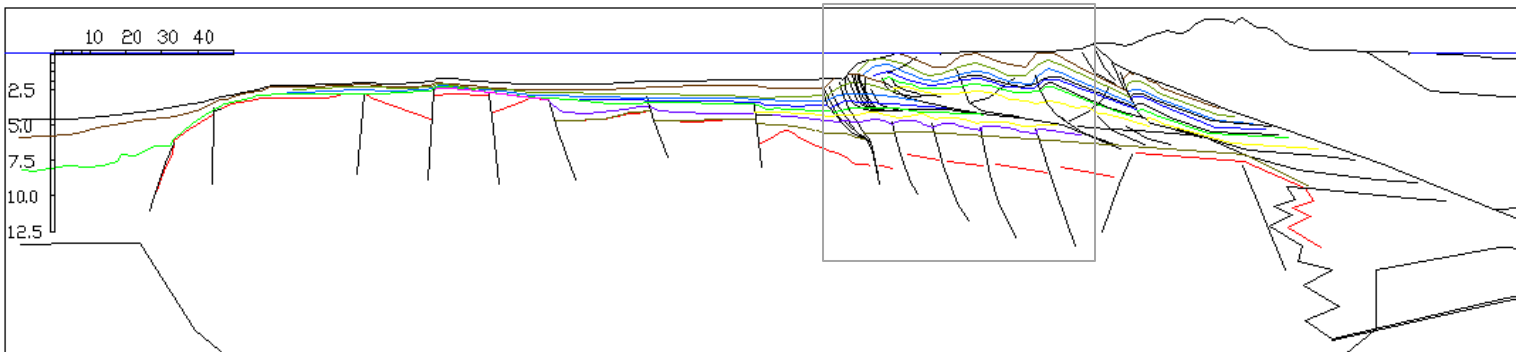


The ‘Holy Grail’ of seismic exploration and usually a direct indication of gas in the system. The lack of oil and gas seeps at the surface is now understood, 800 metres of Pliocene clay rich sediments from the Owen Stanely’s has provide an excellent seal.

Structural History of the North PNG Coast



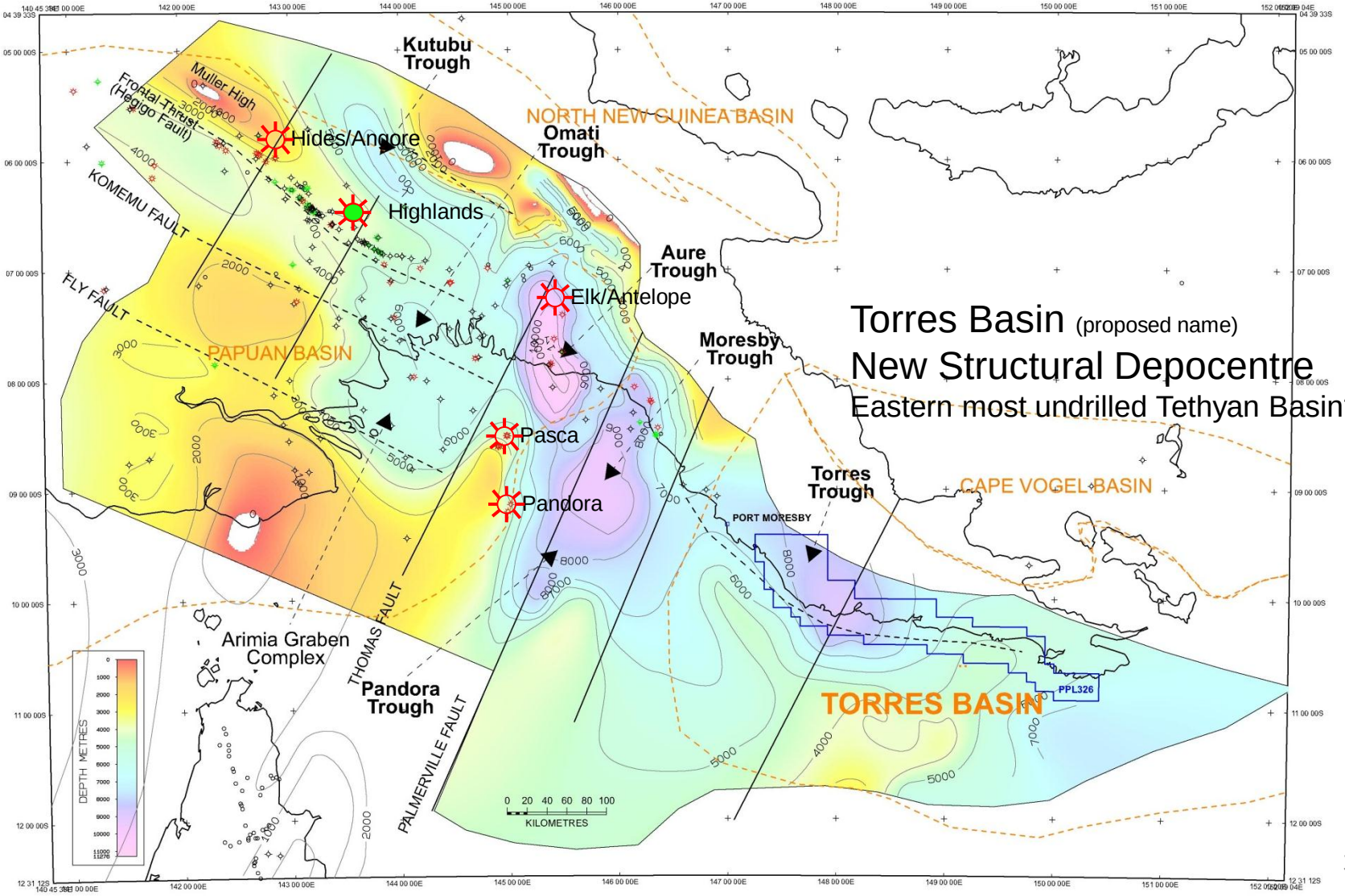
SW **Starting configuration (15 Myr)** NE



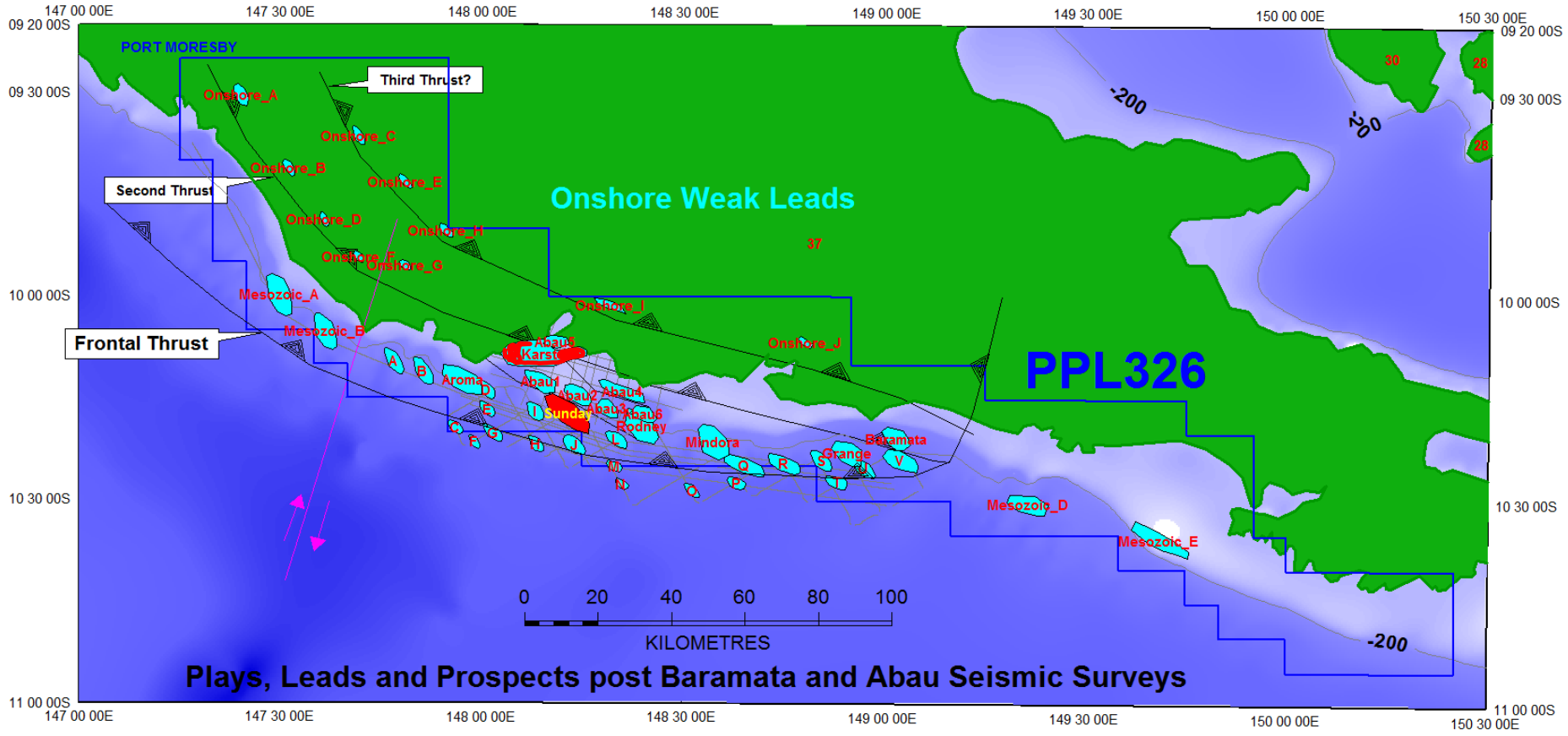
SW **End configuration (Today)** NE

Cross section View

New Basement Map

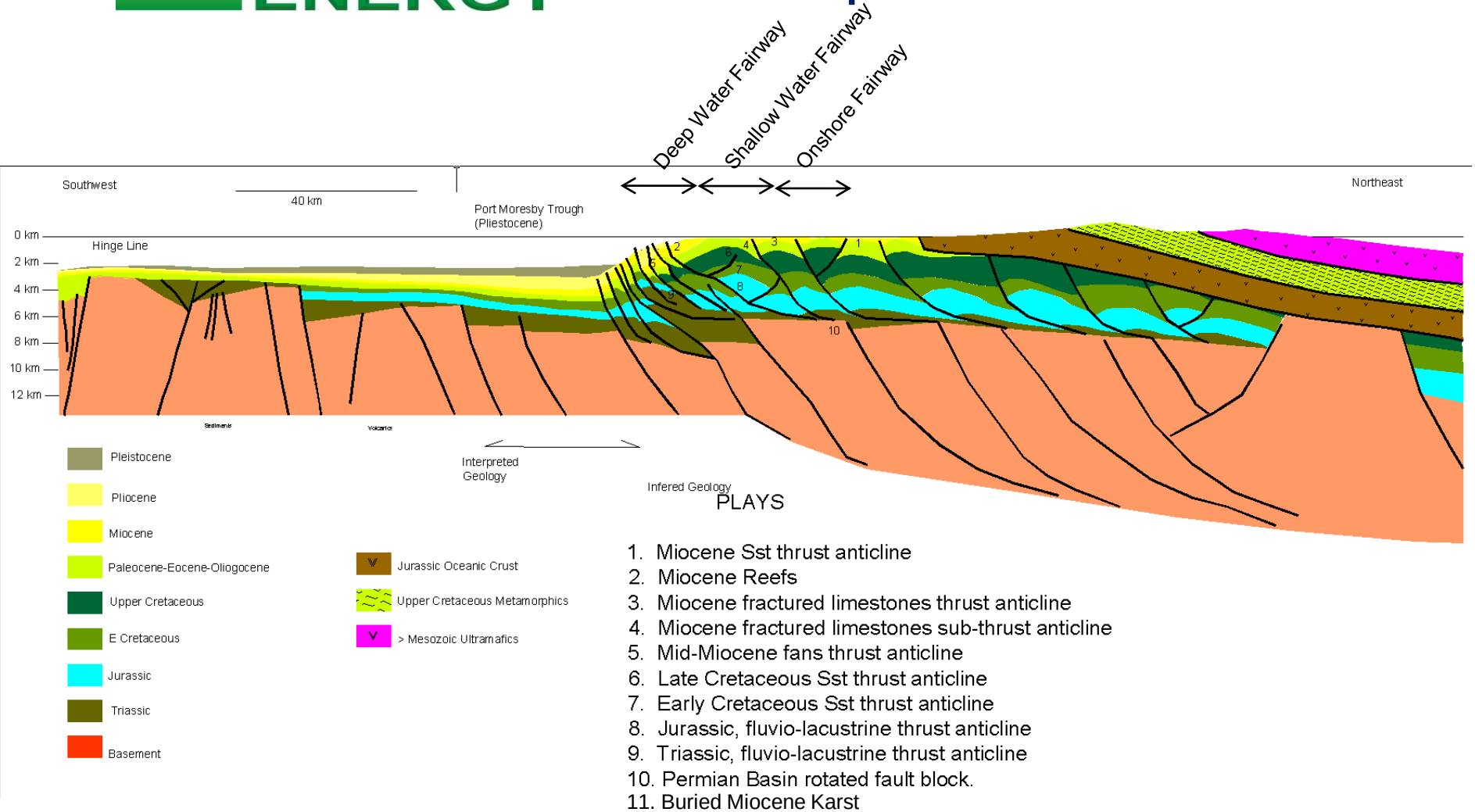


PPL326 Map of Prospects &Leads May 2012



As with last years comment “Based on studies to date – further seismic will give further exploration fairways” Currently 2 prospects 33 leads and Abau Seismic to do (which looks at 6 leads).

PLAYS
Conceptual 'Over Thrust' Model

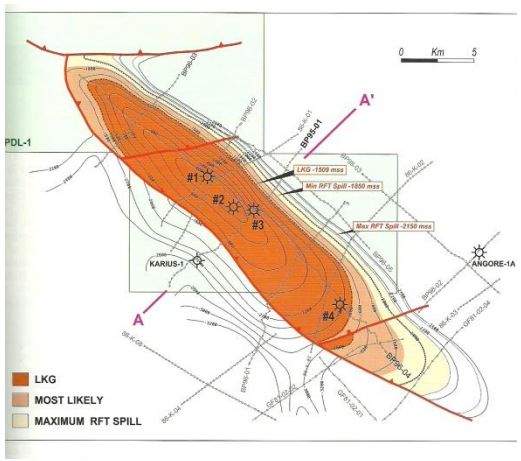


1. Miocene Sst thrust anticline
2. Miocene Reefs
3. Miocene fractured limestones thrust anticline
4. Miocene fractured limestones sub-thrust anticline
5. Mid-Miocene fans thrust anticline
6. Late Cretaceous Sst thrust anticline
7. Early Cretaceous Sst thrust anticline
8. Jurassic, fluvio-lacustrine thrust anticline
9. Triassic, fluvio-lacustrine thrust anticline
10. Permian Basin rotated fault block.
11. Buried Miocene Karst

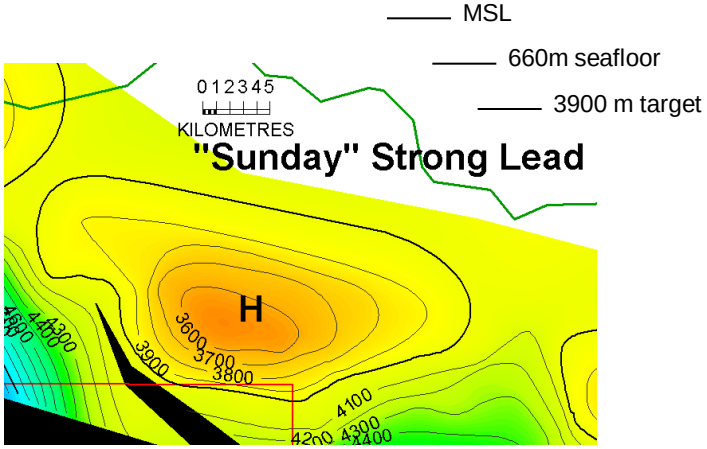
Larus now has the largest data set for the region. The seismic proves we have a 'Highlands' like structuring and the proven plays.

Sunday Strong Lead Metrics

Field Analogy – Hides (Papuan Basin)



	Low	High	
Net/Gross %	44	62	
Porosity %	7	11	
Sw %	15.8	19.6	
Perm md	0.01	800	
Recovery	75		
Toro Sst m	100		
Column m	1240	1800	Gas on rock
Anticine m	2000		35km long 5 km wide
Target Depth m	3000		
Initial Flow MMscfd	15.9		
bopd	39.6		
Pressure PSI	5600	5950	
CGR stb/MMcf	36		
Condensate API	50	56	



Hide data from Johnstone and Emmett 2000
Petroleum Geology of the Hides Gas Field…
Proc 4th PNG Petroleum Conf

	AREA acre	AREA KM*KM		HEIGHT FEET		GEOMETRI FACTOR	GRV MM m cub	net	POROSITY PHI	So	1/Bo	OIL/GAS TOTAL	OIP [MMbbls]	Recovery factor		
Hides	43209		174.99645	300	16001.675	0.8	12,801	0.55	0.1	0.82	1	0.03	100.87	1	100.8715	OIL MMBBLS
Hides	43209		174.99645	300	16001.675	0.8	12,801	0.55	0.1	0.82	0.0025	1.00	8155.44	0.7	5708.809	GAS BCF

OIP =6.28983 * GRV * Phi * So *1/Bo [MMbbls]
GIP=0.00353*GRV*Phi*So*1/Bo [BCF]

Sunday Lead	69135		279.99675	300	25602.903	0.8	20,482	0.55	0.1	0.82	1	0.03	161.40	1	161.3958	OIL MMBBLS
Sunday Lead	69135		279.99675	300	25602.903	0.8	20,482	0.55	0.1	0.82	0.0025	1.00	13048.82	0.7	9134.174	GAS BCF

Unrisked reserves of 9TCF and 160 MMBbls oil – a must drill!

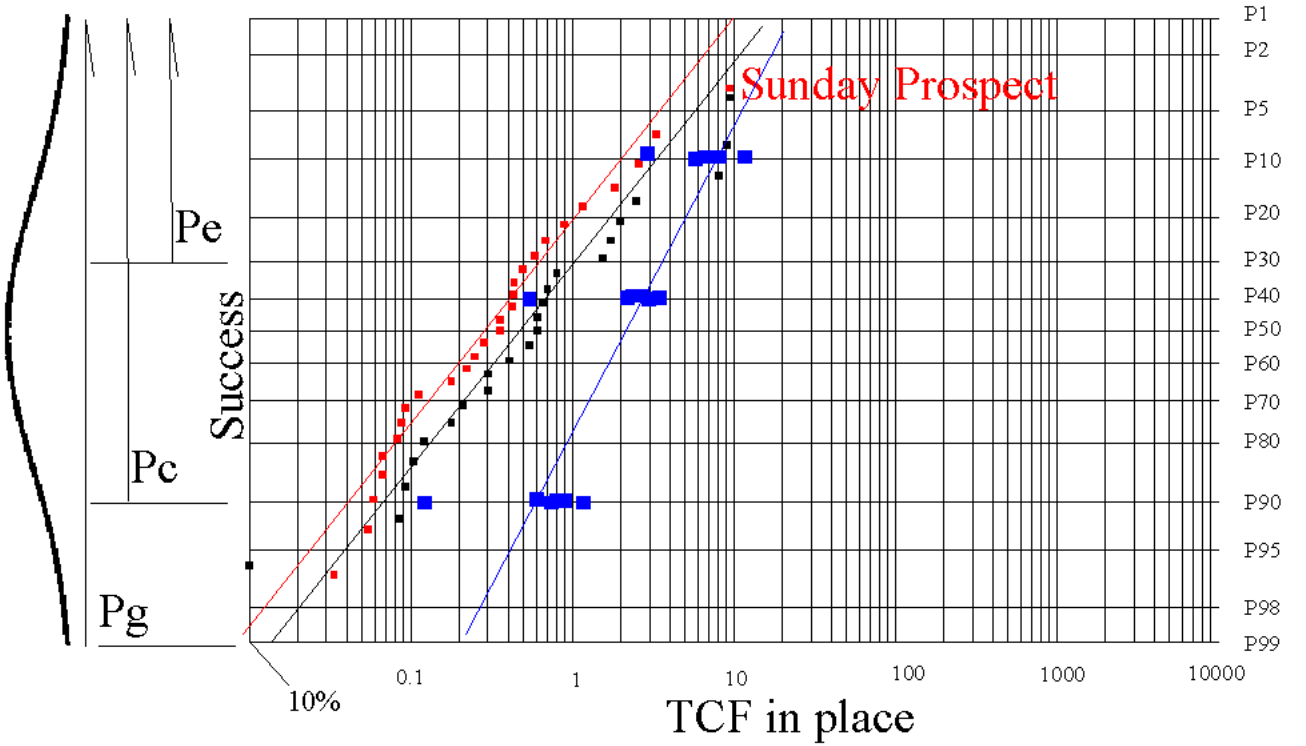
PPL326
Prospects and Leads Inventory
993 MMBbls Oil
62 TCF Gas

Resource	Estimates based on seimsic data GRV and avergae Papuan Basin reservoir properties														OIIP	GIIP		
		l	w	h	AREA	HEIGH	GRV	GEOM	GRV	net	%	1-Sw	1/Bo	Bo	(3% Vol)		Status	Play Type
		km	km	msec	KM*KM	FEET	RAW	FACT	MM m cub		PHI		Oil	Gas	[MMbbls]	BCF		
TERTIARY	A																Weak Lead	Tertiary Clastics
TERTIARY	B																Weak Lead	Tertiary Clastics
TERTIARY	C	3	1.5	130	4.50	746	1024	0.78	799	0.55	0.1	0.82	1	0.007	7	200	Weak Lead	Tertiary Clastics
TERTIARY	D	1.5	1.5	211	2.25	1211	831	0.78	648	0.55	0.1	0.82	1	0.007	6	162	Weak Lead	Tertiary Clastics
TERTIARY	E																Weak Lead	Tertiary Clastics
TERTIARY	I	4	3	100	12.00	574	2100	0.78	1,638	0.55	0.1	0.82	1	0.007	15	410	Weak Lead	Tertiary Clastics
TERTIARY	K	7	4	95	28.00	545	4655	0.78	3,631	0.55	0.1	0.82	1	0.007	34	909	Weak Lead	Tertiary Clastics
TERTIARY	L	4	2	40	8.00	230	560	0.78	437	0.55	0.1	0.82	1	0.007	4	109	Weak Lead	Tertiary Clastics
TERTIARY	M																Weak Lead	Tertiary Clastics
TERTIARY	Q	8	3	80	24.00	459	3360	0.78	2,621	0.55	0.1	0.82	1	0.007	25	656	Strong Lead	Tertiary Clastics
TERTIARY	R	4	3	30	12.00	172	630	0.78	491	0.55	0.1	0.82	1	0.007	5	123	Strong Lead	Tertiary Clastics
TERTIARY	S	5	2	60	10.00	344	1050	0.78	819	0.55	0.1	0.82	1	0.007	8	205	Weak Lead	Tertiary Clastics
TERTIARY	T	5	6	10	30.00	57	525	0.78	410	0.55	0.1	0.82	1	0.007	4	102	Strong Lead	Tertiary Clastics
TERTIARY	U	5	5	20	25.00	115	875	0.78	683	0.55	0.1	0.82	1	0.007	6	171	Weak Lead	Tertiary Clastics
TERTIARY	V	6	4	40	24.00	230	1680	0.78	1,310	0.55	0.1	0.82	1	0.007	12	328	Weak Lead	Tertiary Clastics
TERTIARY	Abau1																Weak Lead	Tertiary Clastics
TERTIARY	Abau2																Weak Lead	Tertiary Clastics
TERTIARY	Abau3																Weak Lead	Tertiary Clastics
TERTIARY	Abau4																Weak Lead	Tertiary Clastics
TERTIARY	Abau5																Weak Lead	Tertiary Clastics
TERTIARY	Karst	17	7	20	119.00	82	2975	1	2,975	0.95	0.3	0.82	1	0.01	131	2455	Strong Lead	Karst Eocene Lmst
Miocene	REEF_A																Weak Lead	Miocene Reef
Miocene	REEF_B																Weak Lead	Miocene Reef
MESOZOIC	A	14	4	86	56.00	494	8428	0.78	6,574	0.55	0.1	0.82	1	0.0025	56	4188	Weak Lead	Mesozoic Clastics
MESOZOIC	B	7	2	223	14.00	1280	5464	0.78	4,262	0.55	0.1	0.82	1	0.0025	36	2715	Weak Lead	Mesozoic Clastics
MESOZOIC	AROMA(deep)	16	3	100	48.00	574	8400	0.78	6,552	0.55	0.1	0.82	1	0.0025	56	4174	Strong Lead	Mesozoic Clastics
MESOZOIC	AROMA(shallow)	9	3	400	27.00	2297	18900	0.78	14,742	0.55	0.1	0.82	1	0.0025	125	9392	Strong Lead	Mesozoic Clastics
MESOZOIC	Sunday	20	8	200	160.00	1148	18797	1	18,797	0.55	0.1	0.82	1	0.0022	160	13472	Prospect	Mesozoic Clastics
MESOZOIC	Rodney (deep)	12	7	100	84.00	574	14700	0.78	11,466	0.55	0.1	0.82	1	0.0025	98	7305	Strong Lead	Mesozoic Clastics
Tertiary	Rodney (shallow)	12	3	190	36.00	1091	11970	0.78	9,337	0.55	0.1	0.82	1	0.0025	79	5948	Strong Lead	Mesozoic Clastics
MESOZOIC	Mindora(deep)	8	5	100	40.00	574	7000	0.78	5,460	0.55	0.1	0.82	1	0.0025	46	3478	Strong Lead	Mesozoic Clastics
MESOZOIC	Mindora(Shallow)	8	4	80	32.00	459	4480	0.78	3,494	0.55	0.1	0.82	1	0.0025	30	2226	Strong Lead	Mesozoic Clastics
MESOZOIC	Grange	8	5	63	40.00	362	4410	0.78	3,440	0.55	0.1	0.82	1	0.0025	29	2191	Weak Lead	Mesozoic Clastics
MESOZOIC	Baramata	8	7	30	56.00	172	2940	0.78	2,293	0.55	0.1	0.82	1	0.0025	20	1461	Weak Lead	Mesozoic Clastics
MESOZOIC	D																Weak Lead	Mesozoic Clastics
	Totals	**Resource in Place - Deterministic Values - Unrisked**													**993**	**62381**		
															OIIP	GIIP		
															[MMbbls]	BCF		

PPL326 the inventory that will get over the 10.5 TCF project threshold
'Oily' gas fields resource numbers – a pure oil field would be fantastic!!

Probability of Success in a Regional Context (Papuan Basin, Larus Assessment, RPS Report)

PAPUAN BASIN GAS FIELD SIZE DISTRIBUTION
(Based on published data)
PPL326 LEADS GAS FIELD SIZE DISTRIBUTION
Gross Prospective Resource (Larus)
PPL326 LEADS GAS FIELD SIZE DISTRIBUTION
Gross Prospective Resource (RPS Independent Geologist)



To get onto the graph.
As plays….
Tertiary 40% (1:2.5)
Reefs 29% (1:3.5)
Sub-thrust 39% (1:2.5)

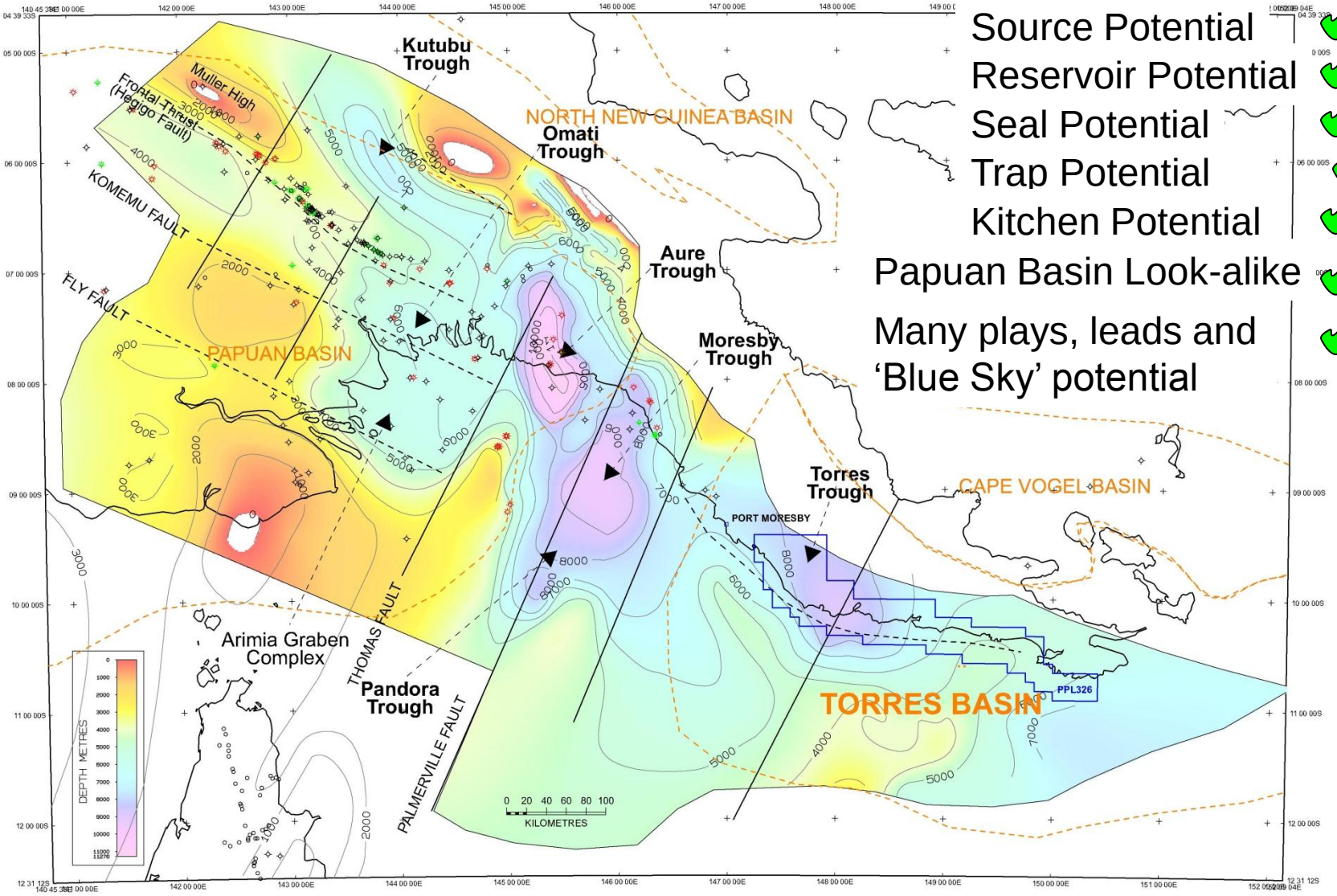
As prospects….
Sunday 9% (1:11)

As leads…..
Aroma 8% (1:12.5)
Grange 5% (1:20)
W. Baramata 4% (1:25)
E. Baramata 3% (1:33)
Rodney (shallow) 7% (1:14)

Red dots based on previous table and shows trend found in Papuan Basin

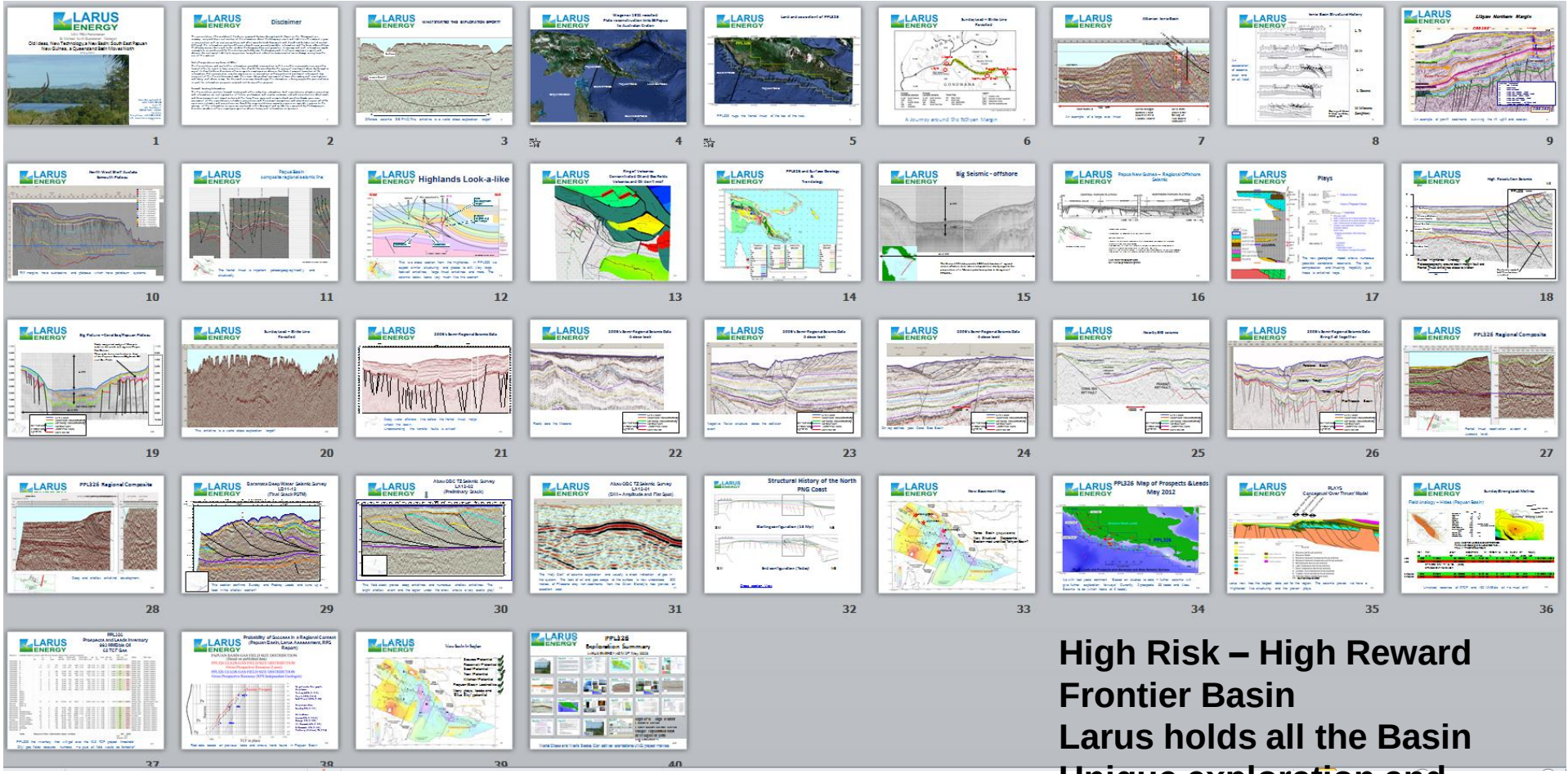
LARUS ENERGY

New Basin in Region



- Source Potential ✓
- Reservoir Potential ✓
- Seal Potential ✓
- Trap Potential ✓
- Kitchen Potential ✓
- Papuan Basin Look-alike ✓
- Many plays, leads and ‘Blue Sky’ potential ✓

PPL326
Exploration Summary



High Risk – High Reward Frontier Basin
Larus holds all the Basin
Unique exploration and development path.
Big Structures

World Class and World Scale. Can deliver standalone LNG project metrics.