



**NORTH SUMATRA – MERGUI BASIN  
CROSS BORDER CASE STUDY  
EPPM-CCOP**

**PIW5**

**INDONESIAN PROGRESS  
REVIEW**

By Indonesian Team :

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**Herru Lastiadi**

**Toba Lake**

# OUTLINES

- INTRODUCTION
- PREVIOUS PROGRESS
- P1W5 PROGRESS
- SUMMARY
- NEXT STEP

# INTRODUCTION



## **P1W4 Outcomes & Way Forward**

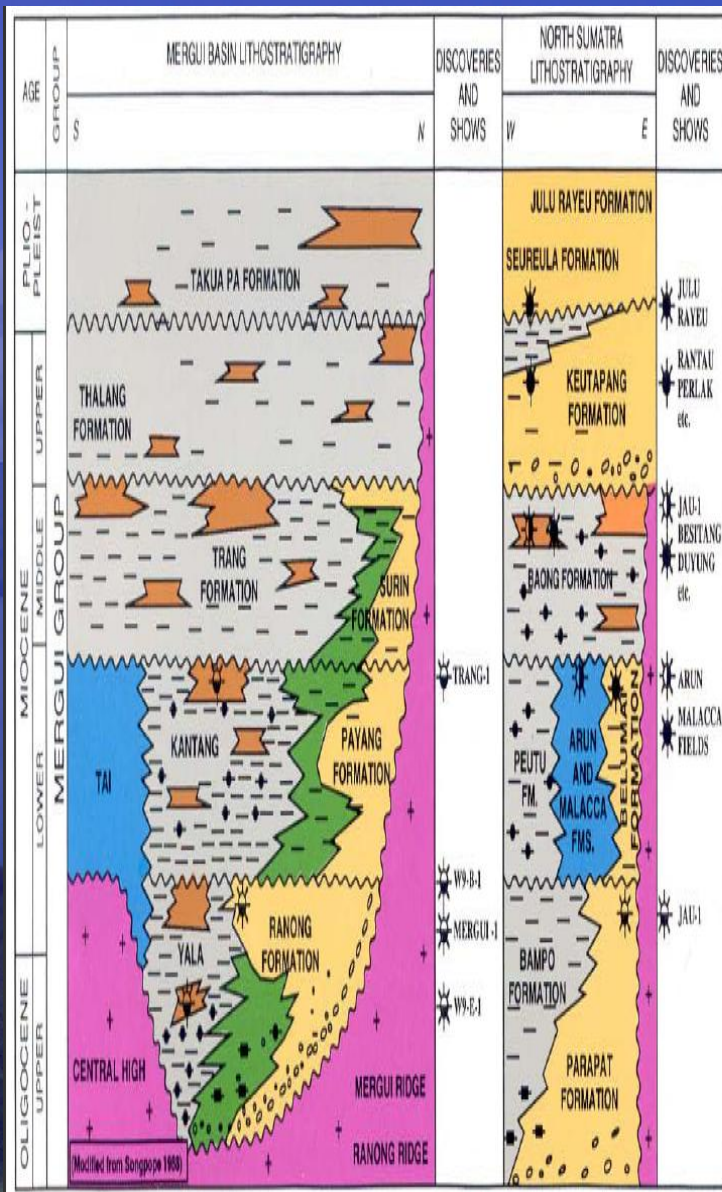
Malaysia had carried out the seismic facies mapping for Keutapang and Baong Formations and also constructed the chronostratigraphic chart and Common Risk Segment (CRS) map for Baong and Keutapang formation.

**Indonesia will update the basin modeling and fine tune with the data sets from Thailand & Malaysia.**

Thailand and Indonesia will help Malaysia to fine tune the well correlation, chronostratigraphic chart and Common Risk Segment (CRS) maps.

Indonesia and Malaysia will help Thailand to fine tune the structural cross-section of the study.”

# THE AGREEMENTS



## Will Map the ff

- ◆ Sea bed
- ◆ Top Upper Miocene
- ◆ Miocene Unconformity
- ◆ Top Syn-rift
- ◆ Basement

- a. Sea bed – blue
- b. Top Upper Miocene – Green
- c. Miocene Unconformity – Yellow
- d. Top Syn-rift – Orange
- e. Basement – red/purple

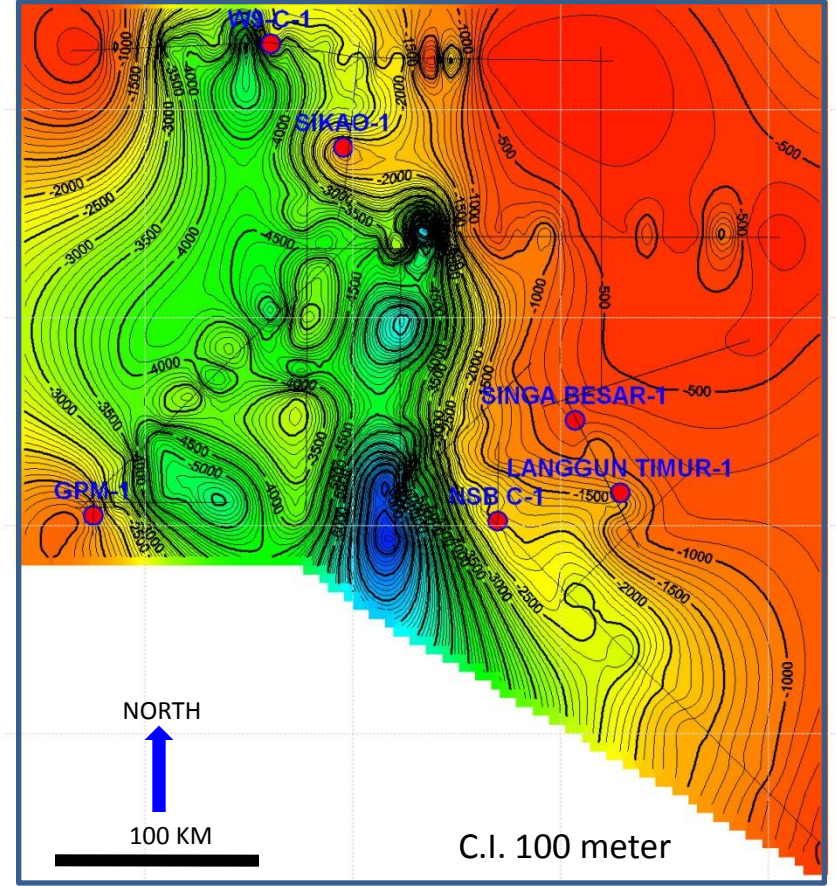
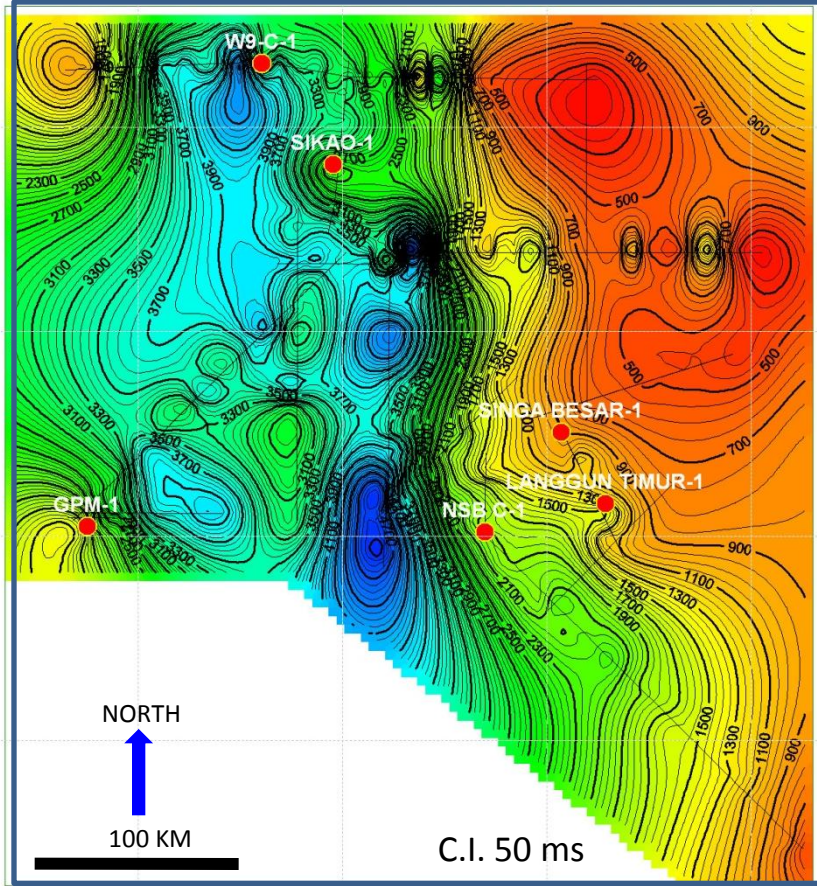
- a. Maps – 1: 500,000
- b. Seismic sections – 5cm/sec, vertical up to 6 sec.



# PREVIOUS RESULTS

Toba Lake

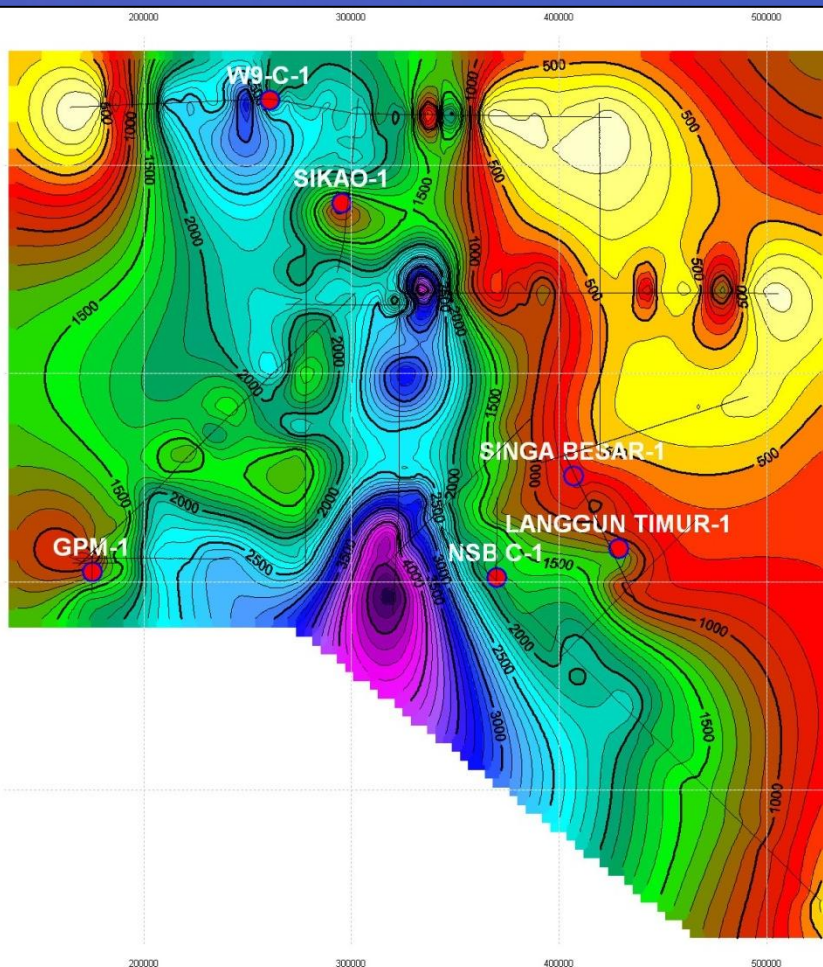
# SUBSURFACE MAP



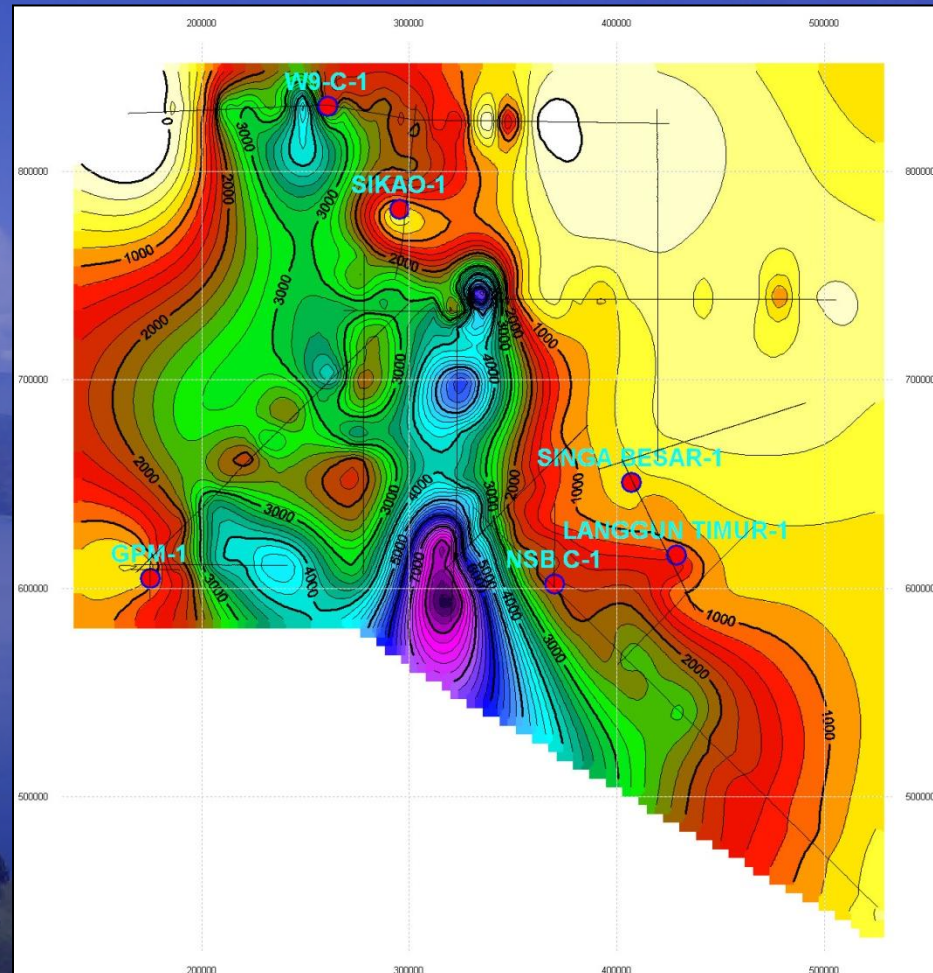
**TIME STRUCTURE MAP  
BASEMENT**

**DEPTH STRUCTURE MAP  
BASEMENT**

# SUBSURFACE MAP



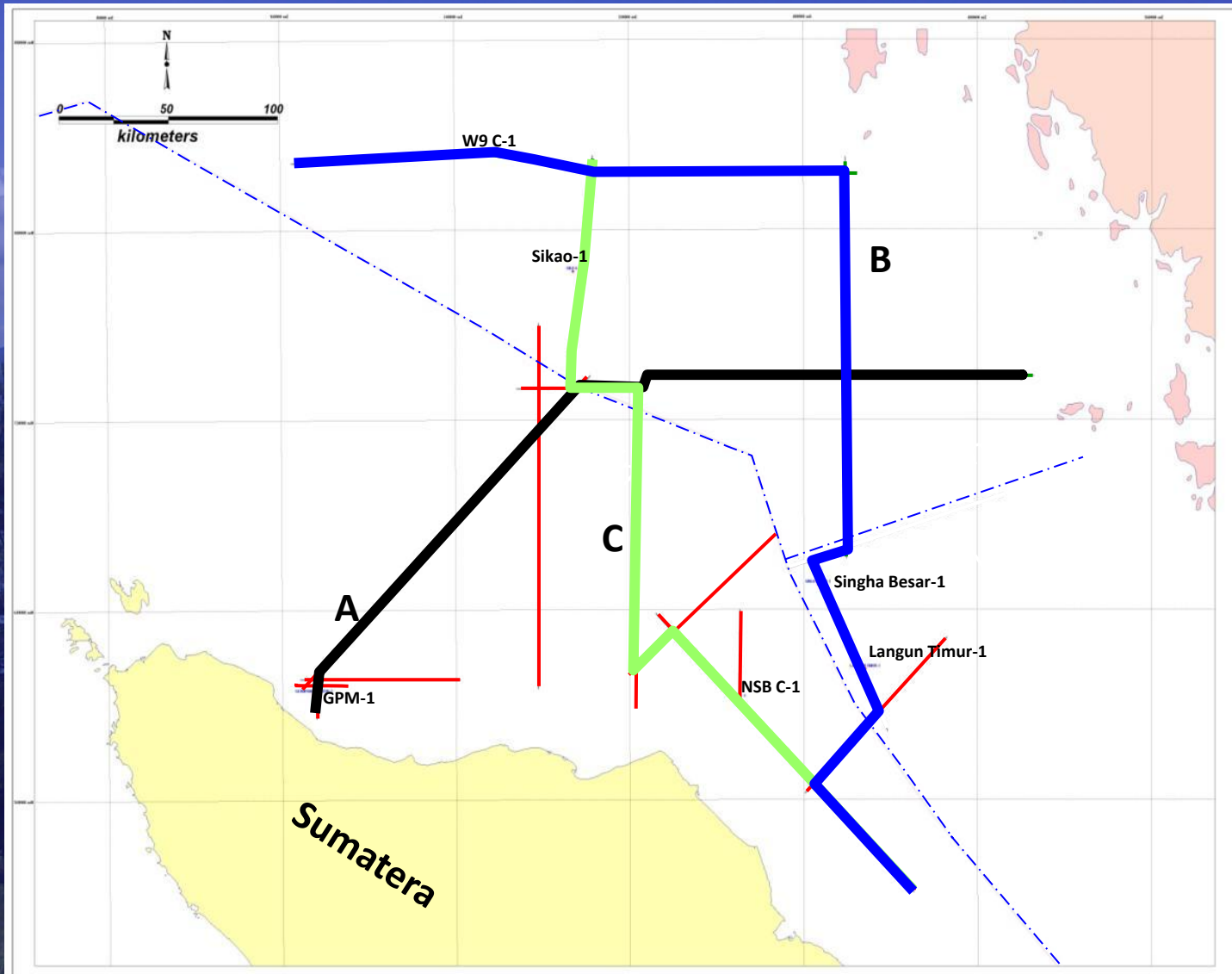
**ISOCHRONE MAP  
BASEMENT-SEA BED**



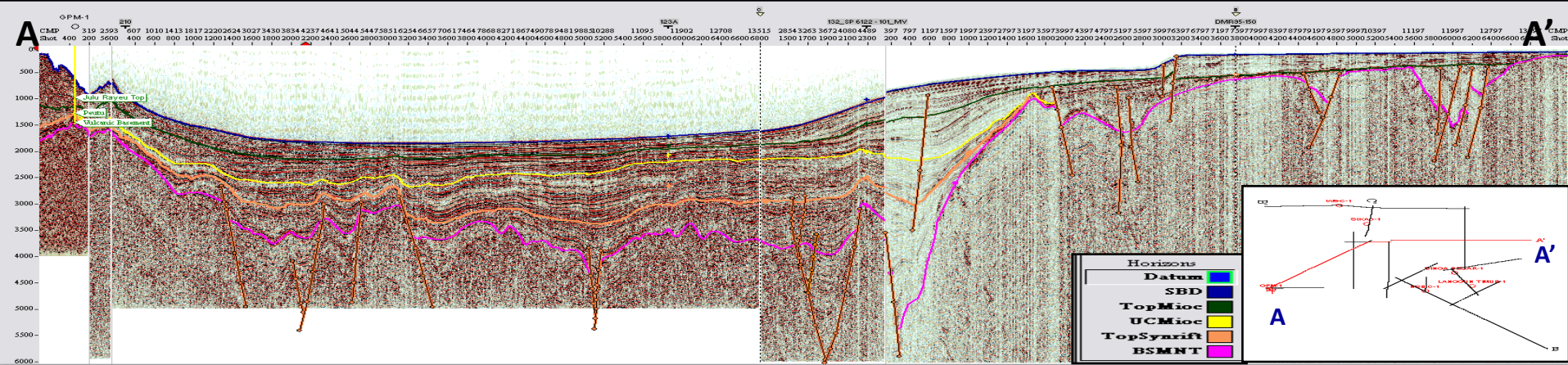
**ISOPACH MAP  
BASEMENT-SEABED  
(SEDIMENT THICKNESS)**



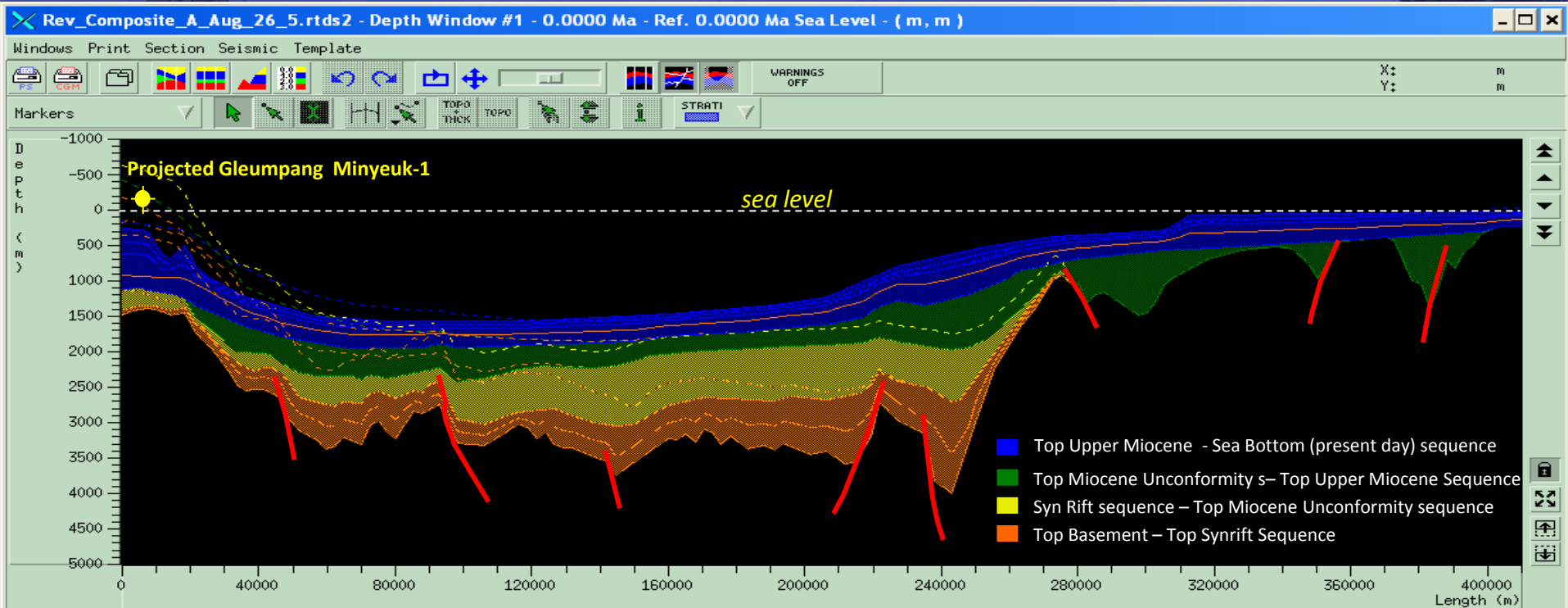
# REGIONAL COMPOSITE SEISMIC LINES FOR 2D BASIN MODELING



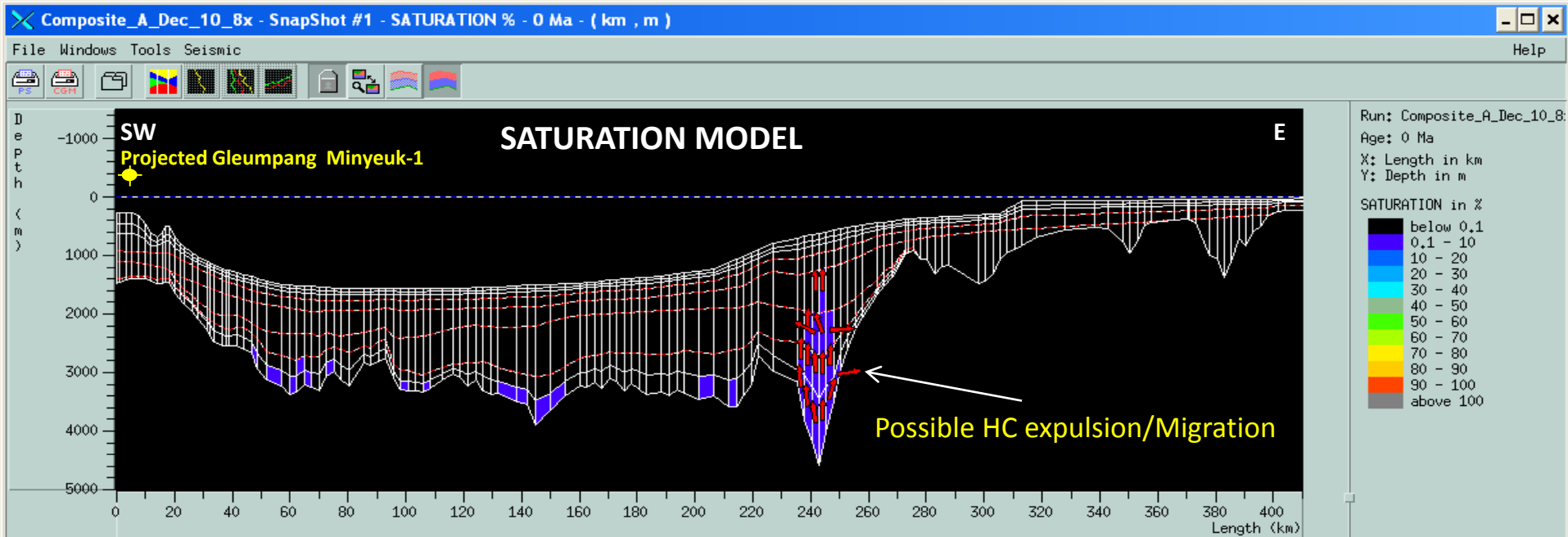
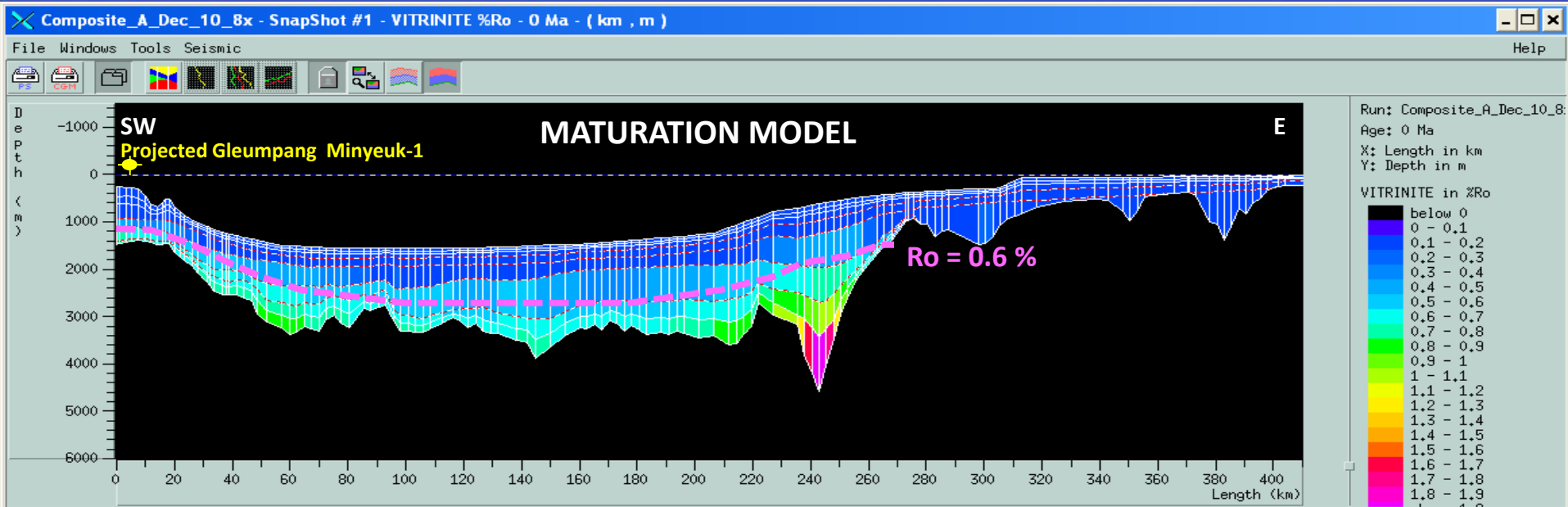
# COMPOSITE SECTION A



CROSSING OR NEAR Gleumpang Minyeuk-1; Section length :  $\pm 420$  km



# 2D BASIN MODELING RESULT of COMPOSITE SECTION A



# P1W5 PROGRESS

## LITHOLOGY COMPOSITION FOR BASIN MODELING

GPM-1				
No.	TOP FORMATION/HORIZON	DEPTH (m)	AGE (Ma)	LITHOLOGY COMPOSITION
1	Sea Bottom (Julu Rayeu & younger formations)	477.5 (466)	0	Sandstone (15%), Shale (85%)
2	Top Upper Miocene	1068.5	5.3	ERODED
3	Miocene Unconformity (Peutu)	1068.5	13.8	Sandstone (1%), Shale (4%), Limestone (95%)
4	Top Syn-rift (Bampo/Parapat?)	1384.9	20.4	Sandstone (10%), Shale (76%), silt (14%)
5	Basement	1400	65	Volcanic breccia & lava (assuming as Quartzite)

W9 C-1				
No.	TOP FORMATION/HORIZON	DEPTH (m)	AGE (Ma)	LITHOLOGY COMPOSITION
1	Sea Bottom (Julu Rayeu & younger formations)	915.9	0	Shale (90%), Limestone (10%) - Estimated (NO LITHOLOGY DATA)
2	Top Upper Miocene	1180	5.3	Shale (90%), Limestone (10%)
3	Miocene Unconformity (Baong?)	1785	13.8	Sandstone (30%), Shale (70%)
4	Top Syn-rift (Bampo/Parapat?)		20.4	?NR
5	Basement		65	NR

NSB C-1				
No.	TOP FORMATION/HORIZON	DEPTH (m)	AGE (Ma)	LITHOLOGY COMPOSITION
1	Sea Bottom (Julu Rayeu & younger formations)	246.9	0	Sandstone (10), Shale (90)
2	Top Upper Miocene	1082.0	5.3	Sandstone (20), Shale (80),
3	Miocene Unconformity (Peutu)	1591.1	13.8	Sandstone (30), Shale (55), Limestone (15)
4	Top Syn-rift (Bampo/Parapat?)	1755.0	20.4	Limestone (100)
5	Basement		65	

SINGHA BESAR -1				
No.	TOP FORMATION/HORIZON	DEPTH (m)	AGE (Ma)	LITHOLOGY COMPOSITION
1	Sea Bottom (Julu Rayeu & younger formations)	125.6	0	Sandstone (15%), Shale (84%), Limestone (1%) - Estimated (NO LITHOLOGY DATA)
2	Top Upper Miocene	675.5	5.3	Sandstone (10%), Shale (65%), Limestone (20%), Dolomite (5%)
3	Miocene Unconformity (Baong?)	804.6	13.8	NOT PRESENT - ?ERODED
4	Top Syn-rift (Bampo/Parapat?)	804.6	20.4	NOT PRESENT - ?ERODED
5	Basement	804.6	65	Shale (2), Limestone (98)

SIKAO - 1				
No.	TOP FORMATION/HORIZON	DEPTH (m)	AGE (Ma)	LITHOLOGY COMPOSITION
1	Sea Bottom (Julu Rayeu & younger formations)	1020.0	0	Sandstone (10), Shale (90) - Estimated (NO LITHOLOGY DATA)
2	Top Upper Miocene	1146.7	5.3	Sandstone (10), Shale (90) - Estimated (NO LITHOLOGY DATA)
3	Miocene Unconformity (Baong?)	1426.5	13.8	Sandstone (15), Shale (85) - Estimated (NO LITHOLOGY DATA)
4	Top Syn-rift (Bampo/Parapat?)	1452.1	20.4	Shale (45), Limestone (55)
5	Basement	1711.8	65	Metamorphic rock/Quartzite or Granite (100%)

LANGGUN TIMUR-1				
No.	TOP FORMATION/HORIZON	DEPTH (m)	AGE (Ma)	LITHOLOGY COMPOSITION
1	Sea Bottom (Julu Rayeu & younger formations)	110.0	0	Sandstone (5%), Shale (95%)
2	Top Upper Miocene	717.2	5.3	Sandstone (15%), Shale (85%)
3	Miocene Unconformity (Baong?)	977.3	13.8	Sandstone (40%), Shale (50%), Limestone (10%)
4	Top Syn-rift (Bampo/Parapat?)	1197.6	20.4	Sandstone (30%), Shale (45%), Limestone (15%)
5	Basement	1403.4	65	Siltstone (1%), Shale (5%), Limestone (25%), Dolomite (69%)

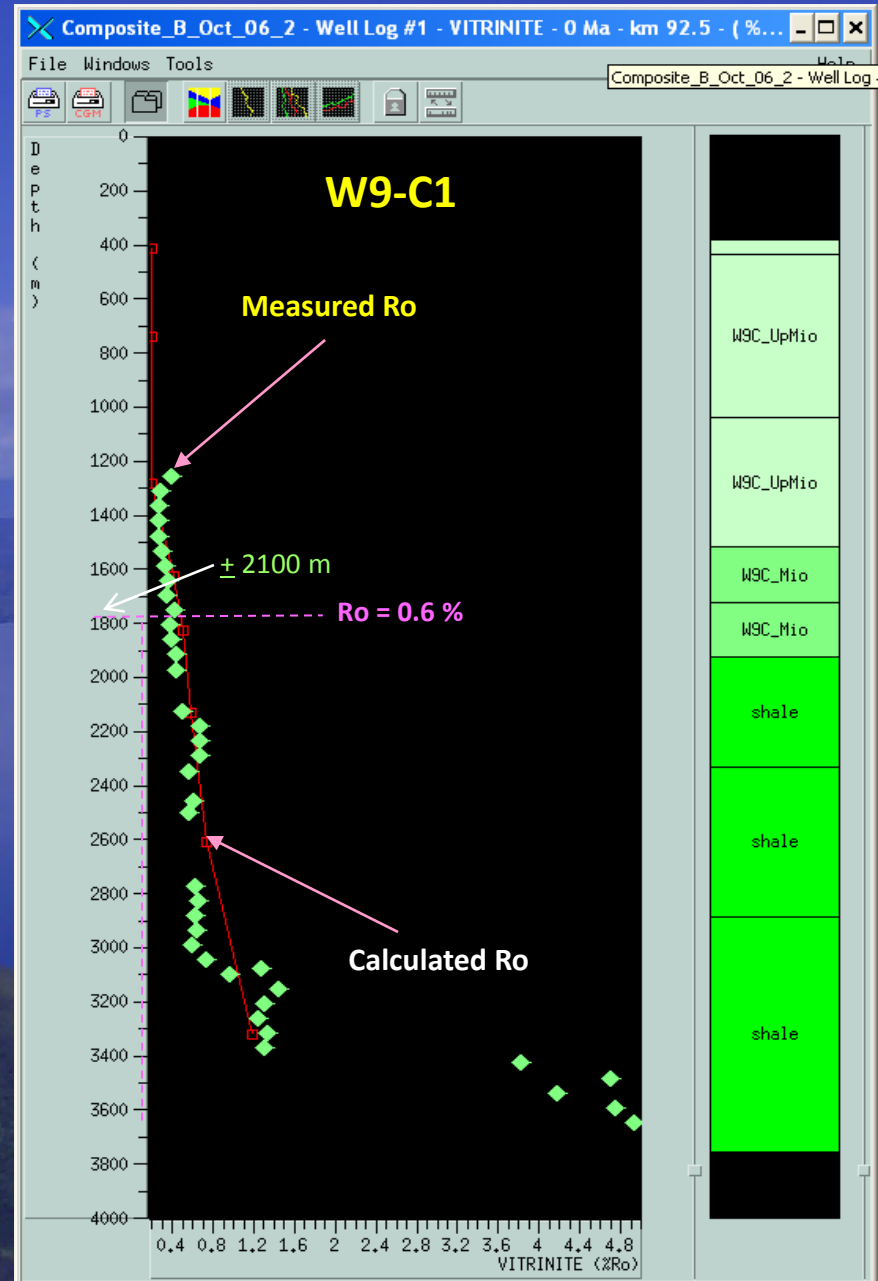
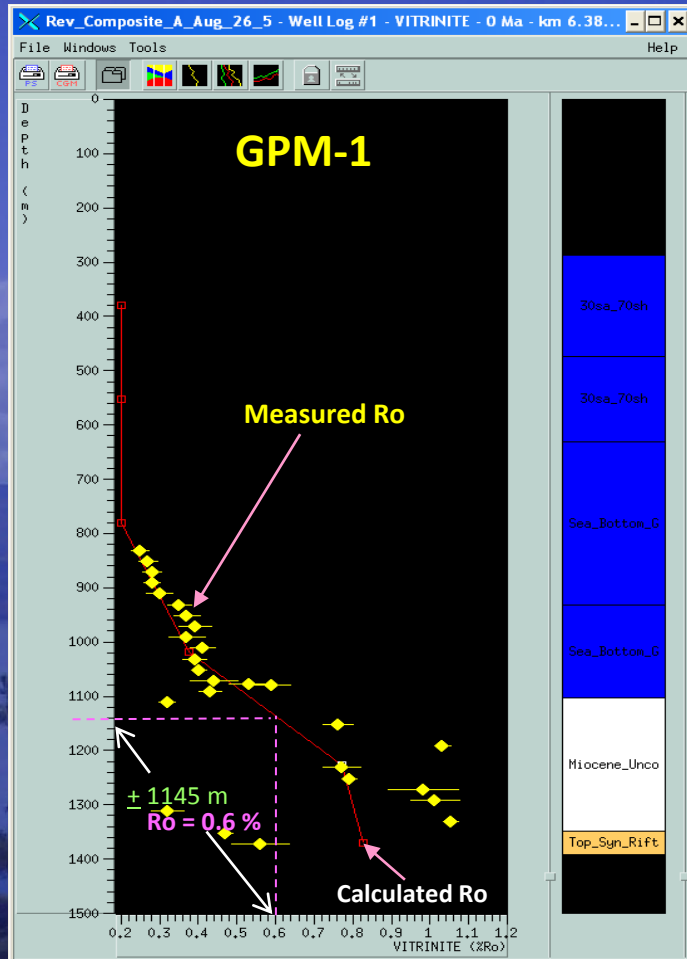
**VR data GPM-1 (Ind)**

**VR data W9-C1 (Tha)**

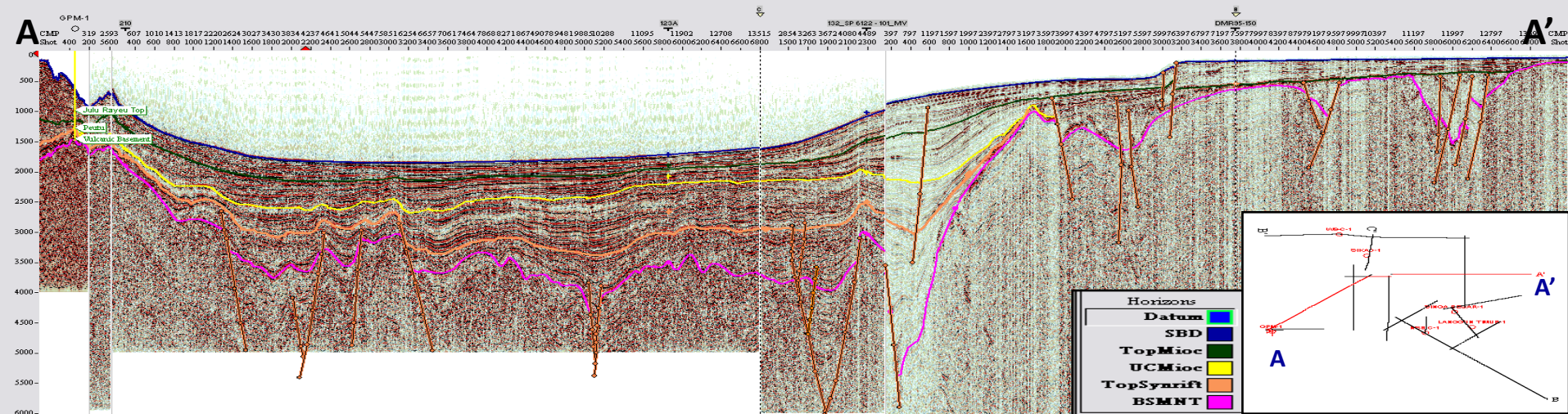
No.	FORMATION	Sample Depth (m)	Mean Ro (%)	No. of readings	Minimum	Maximum	Sd
					Ref. %	Ref. %	
1	JULU RAYEU	830	0.25	18	0.21	0.29	0.023
2		850	0.27	15	0.23	0.3	0.023
3		870	0.28	18	0.23	0.32	0.023
4		890	0.28	5	0.25	0.3	0.022
5		910	0.3	23	0.24	0.35	0.034
6		930	0.35	20	0.30	0.4	0.031
7		950	0.37	5	0.32	0.4	0.034
8		970	0.39	23	0.31	0.44	0.042
9		990	0.37	18	0.31	0.45	0.047
10		1010	0.41	4	0.37	0.44	0.033
11		1030	0.39	13	0.34	0.43	0.032
12		1050	0.4	5	0.38	0.43	0.019
13		1070	0.44	9	0.38	0.55	0.061
14	1076.43	0.53	35	0.46	0.64	0.05	
15	1078.32	0.59	16	0.52	0.67	0.046	
16	1090	0.43	2	0.41	0.45	0.028	
17	1110	0.32	2	0.3	0.33	0.021	
18	1130	BARREN					
19	1150	0.76	7	0.69	0.81	0.04	
20	1170	BARREN					
21	PEUTU	1190	1.03	2	1.02	1.05	0.021
22		1210	1.57	2	1.56	1.56	0.014
23		1230	0.77	3	0.71	0.81	0.049
24		1250	0.79	1	0.79	0.79	
25		1270	0.98	2	0.92	1.05	0.092
26		1290	1.01	8	0.91	1.1	0.063
27		1310	0.32	8	0.25	0.37	0.041
28		1330	1.05	2	0.94	1.16	0.016
29		1350	0.47	6	0.21	0.64	0.18
30		1370	0.55	11	0.48	0.65	0.074
31		1390	2.09	6	1.78	2.46	0.02
32		BASEMENT	1408	4.06	4	3.37	5.17

Depth (ft)		VR (%)	Depth (ft)		VR (%)	Depth (ft)		VR (%)	Depth (ft)		VR (%)
Top	Bottom		Top	Bottom		Top	Bottom		Top	Bottom	
4100	4130	0.4	6950	6980	0.5	9080	9090	0.62	10680	10690	1.25
4220	4250		6980	7010		9140	9150		10740	10750	
4280	4310	0.29	7100	7130		9190	9200		10800	10810	
4340	4370		7130	7160	0.68	9250	9260	0.66	10860	10870	1.33
4460	4490	0.28	7220	7250		9310	9320		10920	10930	
4580	4610		7310	7340	0.86	9370	9380		10980	10990	
4640	4670	0.28	7340	7370		9430	9440	0.62	11040	11050	1.31
4700	4730		7460	7490		9490	9500		11104	11110	
4820	4850	0.27	7490	7520	0.68	9550	9560		11160	11170	
4940	4970		7580	7610		9610	9620	0.65	11220	11230	3.81
5000	5030	0.31	7670	7700	0.57	9670	9680		11280	11290	
5060	5090		7700	7730		9730	9740		11340	11350	
5180	5210	0.34	7820	7850		9790	9800	0.6	11400	11410	4.69
5300	5330		7850	7880	0.7	9850	9860		11470	11480	
5360	5390	0.37	7940	7970		9910	9920		11520	11530	
5420	5450		8030	8060	0.61	9960	9970	0.74	11580	11590	4.17
5540	5570	0.35	8060	8090		10020	10030		11640	11650	
5660	5690		8120	8150		*10043.1			11700	11710	
5720	5750	0.43	8180	8210	0.56	*10047.5		1.42	11760	11770	4.74
5780	5810		8240	8270		*10050.5			11820	11830	
5900	5930	0.38	8300	8330		*10056.2			11880	11890	
6020	6050		8360	8390	0.6	*10072.9		1.28	11940	11950	4.92
6080	6110	0.39	8420	8450		*10080.5			12000	12010	
6140	6170		8480	8510		10094	10100		12060	12070	
6260	6290	0.44	8540	8570	0.64	10140	10150	0.96	12120	12130	5.18
									12170	12180	5.14
									*12201.7	12190	5.45
									*12214.5		
6380	6410		8600	8830		10200	10210				
6440	6470	0.44	8630	8660		10260	10270				
6500	6530		8720	8750	0.62	10320	10330	1.44			
*6538		NDP	8780	8810		10380	10390				
6620	6650	0.51	8840	8870		10440	10450				
6740	6770		8900	8930	0.61	10500	10510	1.31			
6770	6800	0.45	8960	8990		10560	10570				
6860	6890		9020	9030		10620	10630				

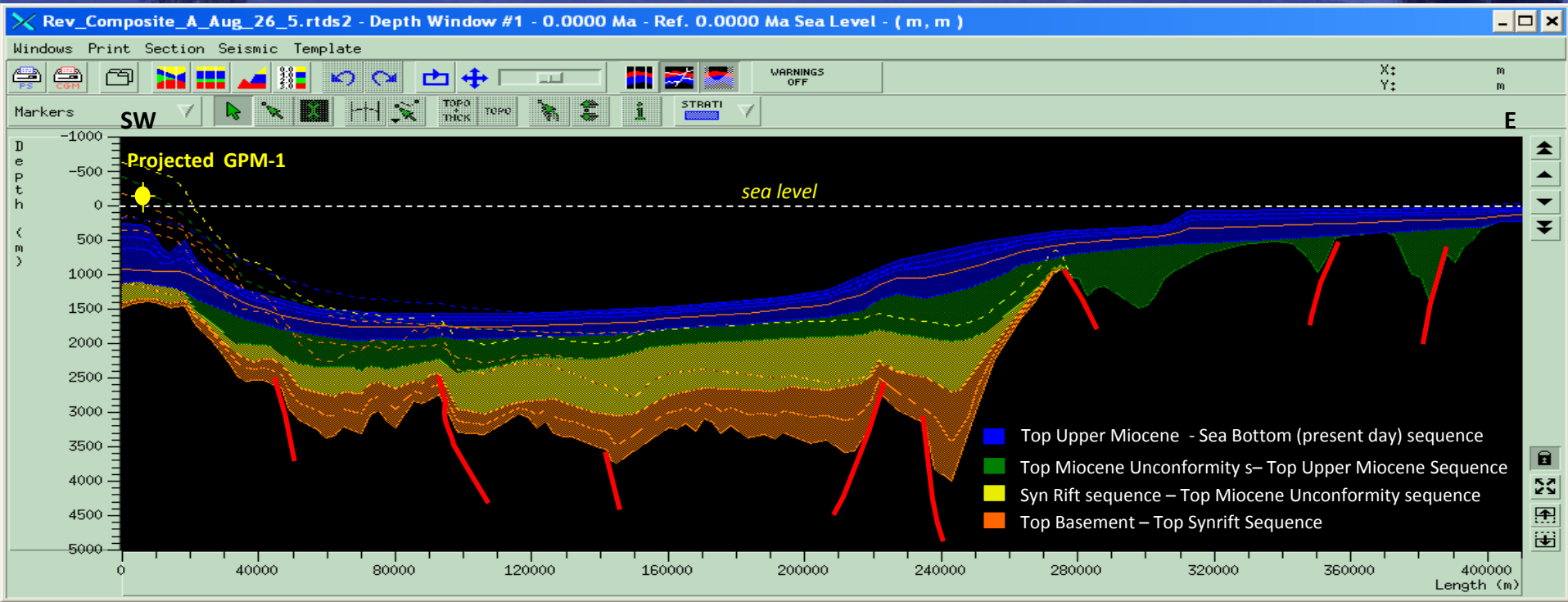
# MODELING VALIDATION



# COMPOSITE SECTION A



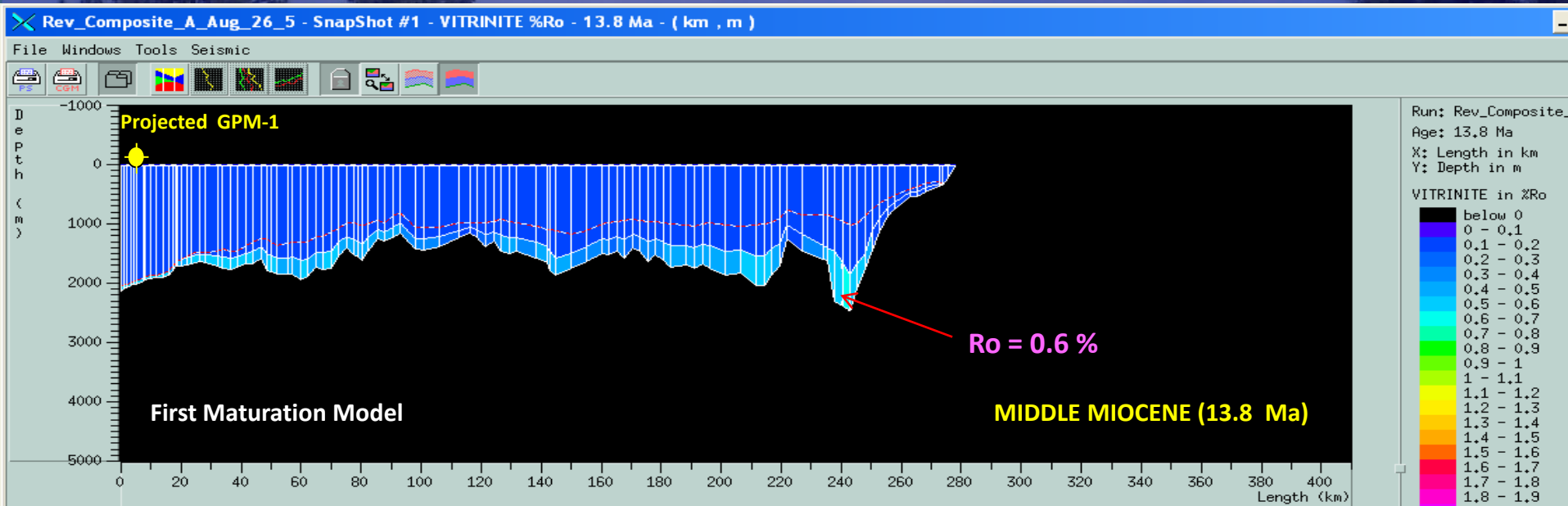
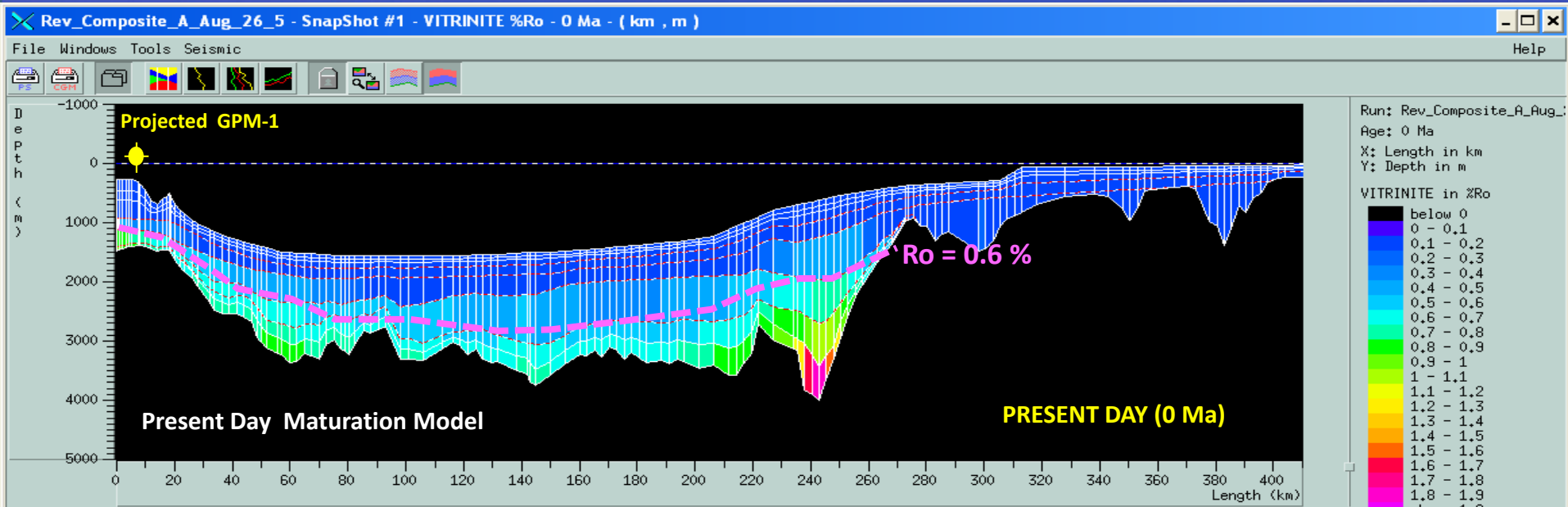
CROSSING OR NEAR Gleumpang Minyeuk-1; Section length : ± 420 km





# SECTION A

## MATURATION MODEL

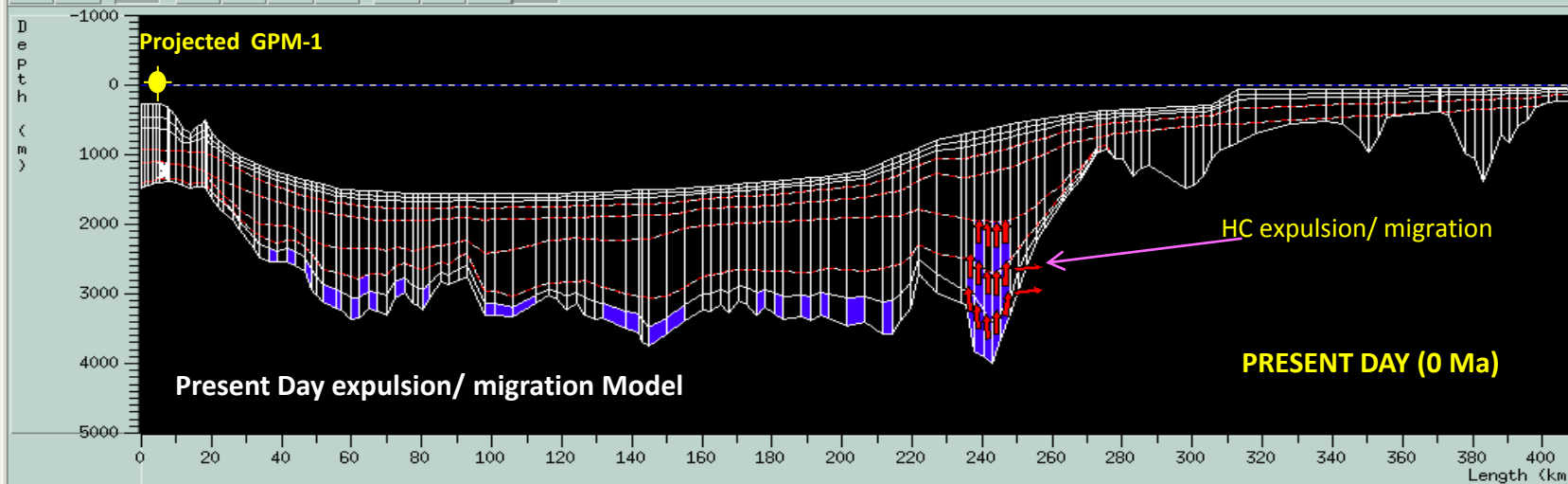
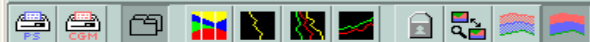


# SECTION A

## HC SATURATION MODEL

Rev\_Composite\_A\_Aug\_26\_5 - SnapShot #1 - SATURATION % - 0 Ma - ( km , m )

File Windows Tools Seismic



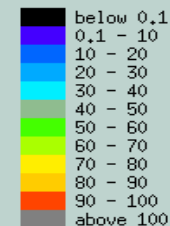
Run: Rev\_Composit

Age: 0 Ma

X: Length in km

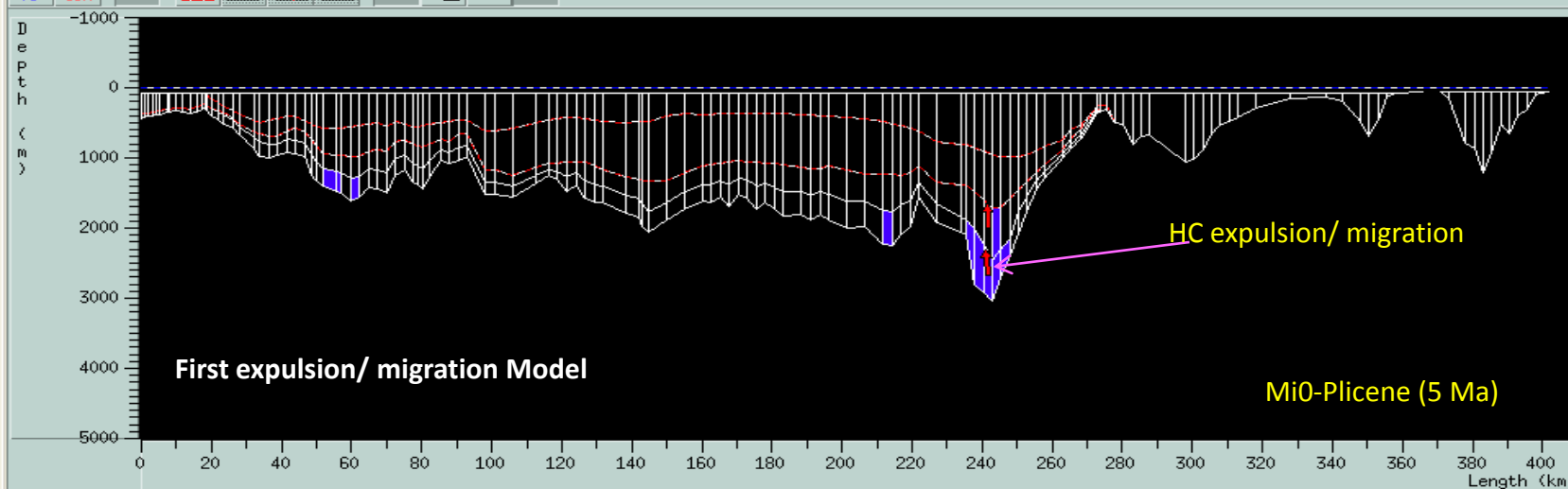
Y: Depth in m

SATURATION in %



Rev\_Composite\_A\_Aug\_26\_5 - SnapShot #1 - SATURATION % - 5 Ma - ( km , m )

File Windows Tools Seismic



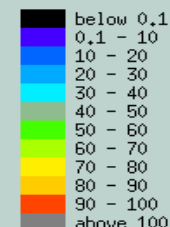
Run: Rev\_Composit

Age: 5 Ma

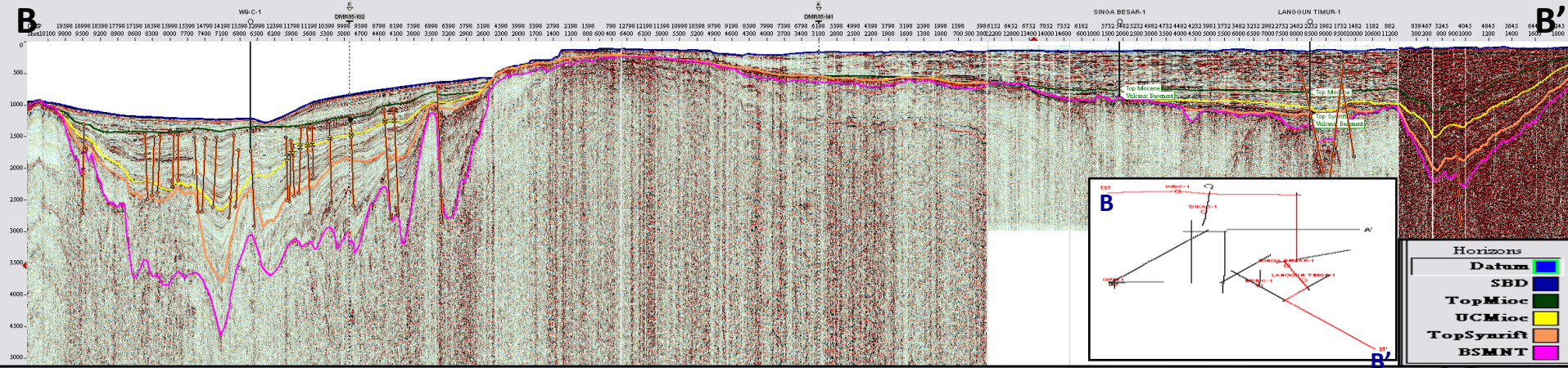
X: Length in km

Y: Depth in m

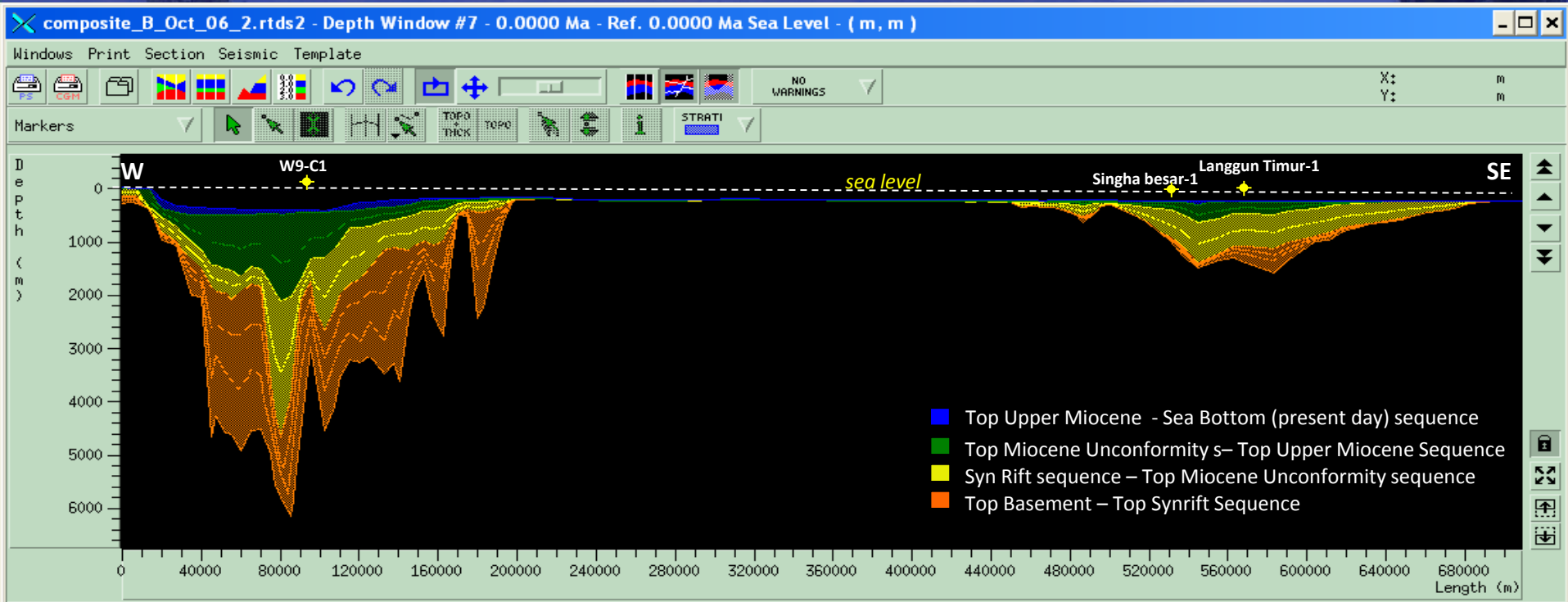
SATURATION in %



# COMPOSITE SECTION B

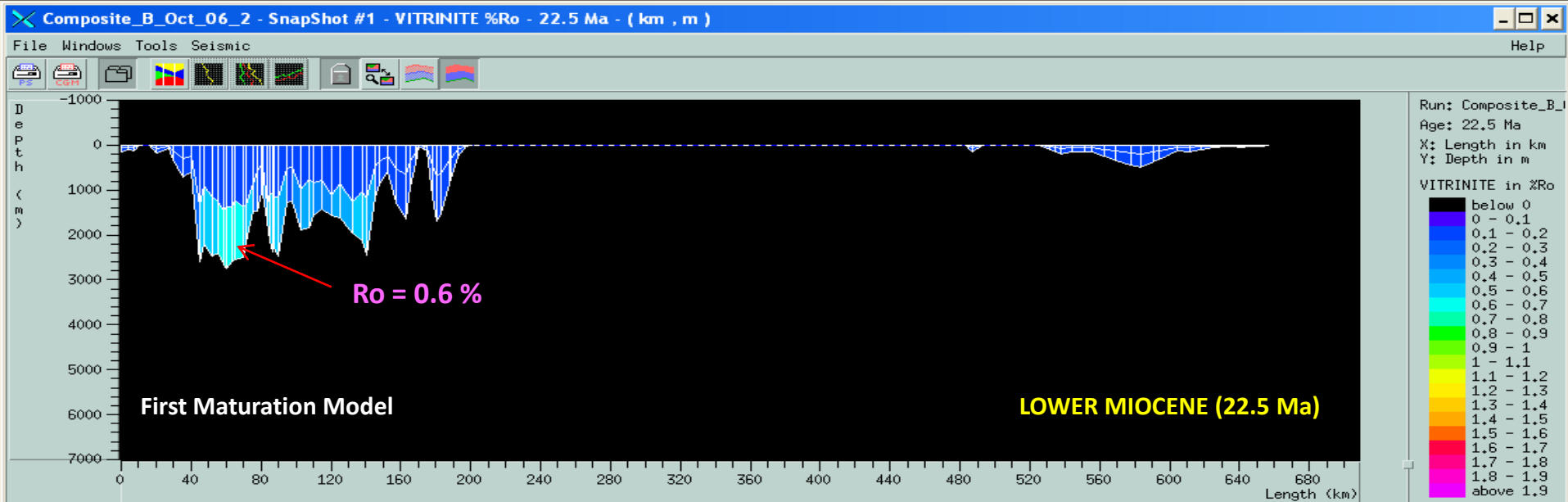
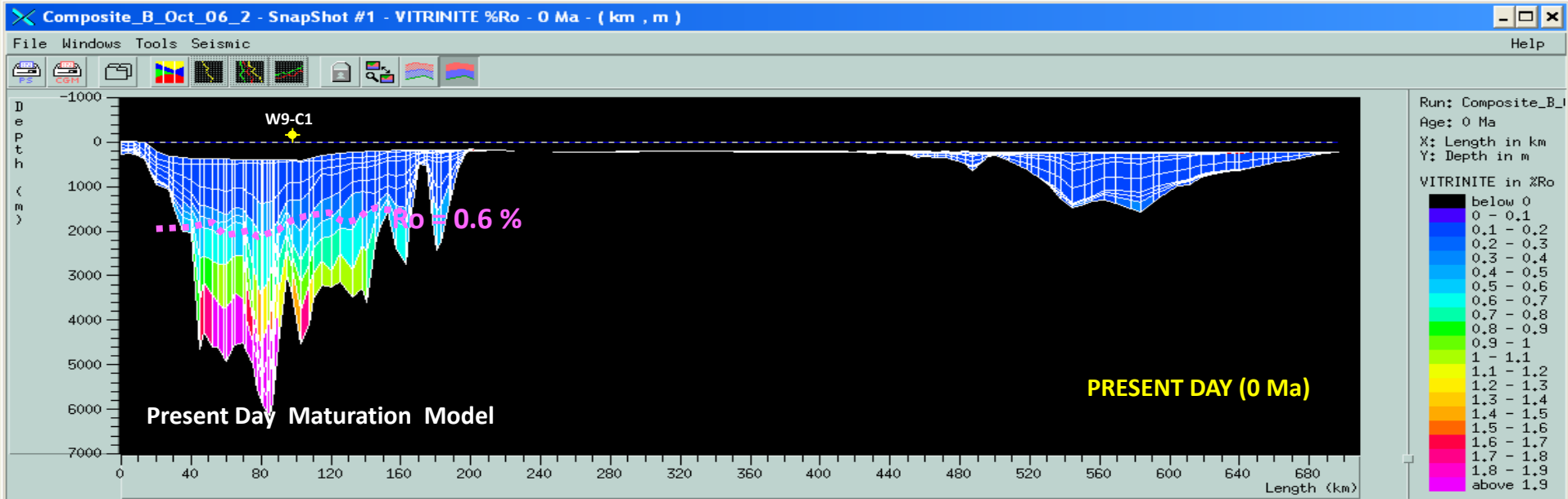


CROSSING OR NEAR : Langgun Timur-1, Singha Besar-1, W9 C-1 Wells; Section length : ± 686 km



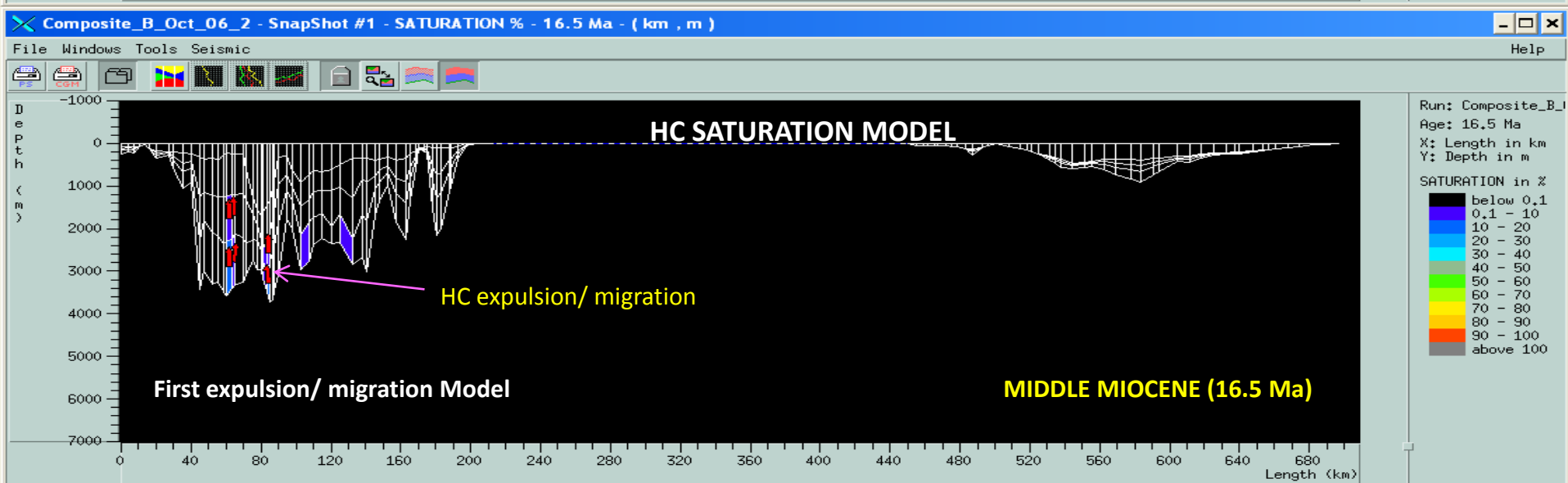
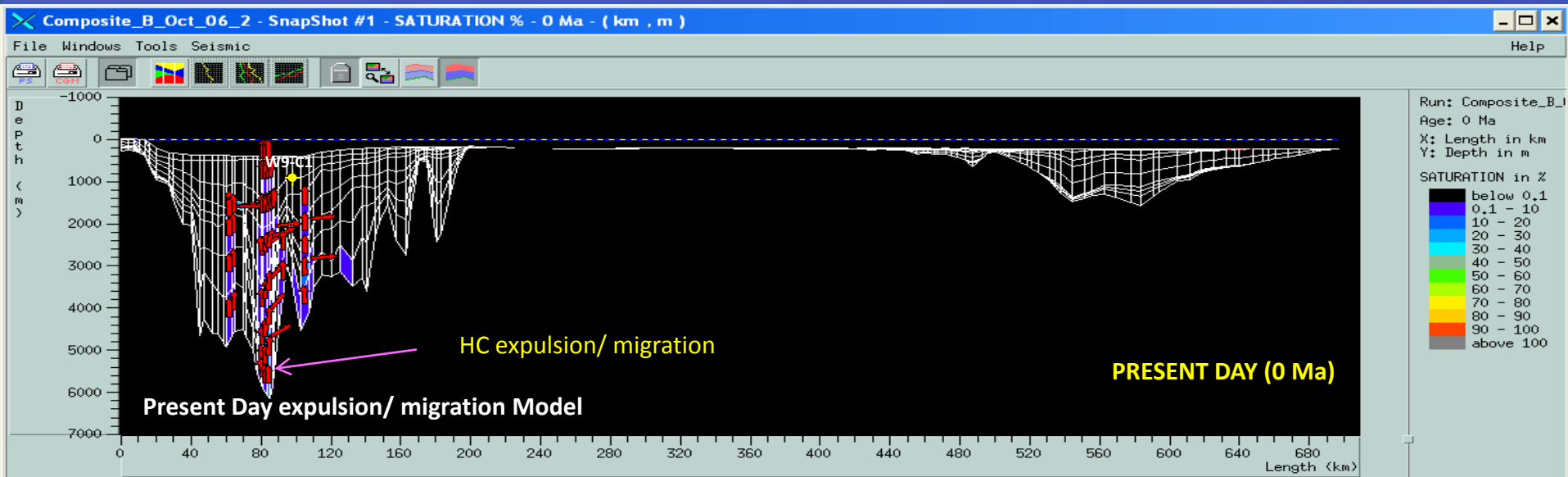
# SECTION B

## MATURATION MODEL

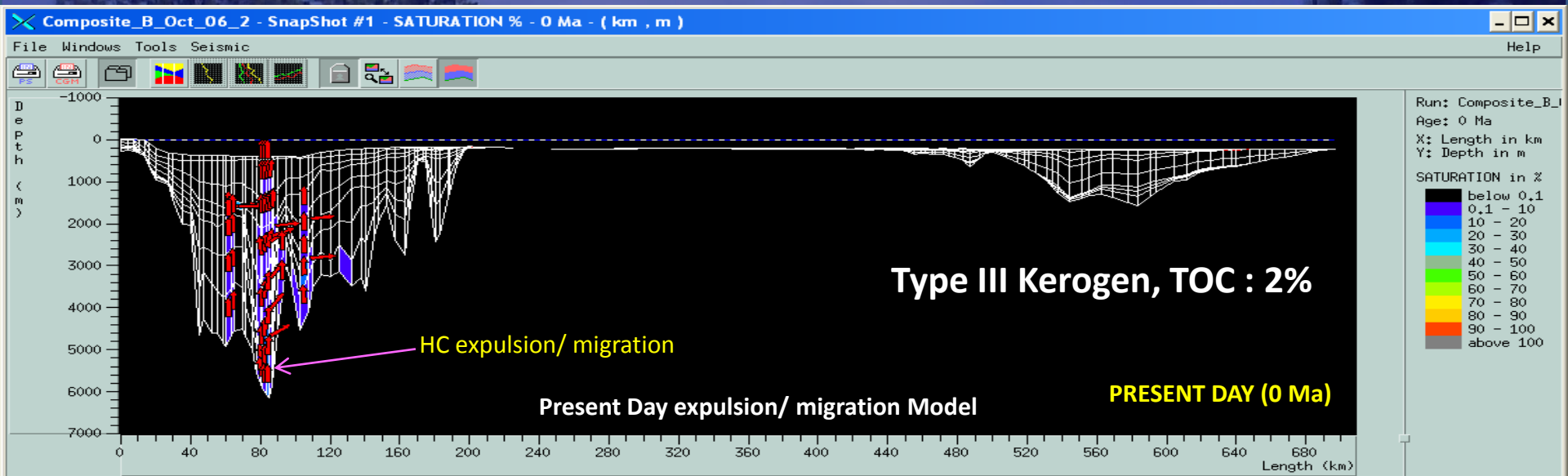
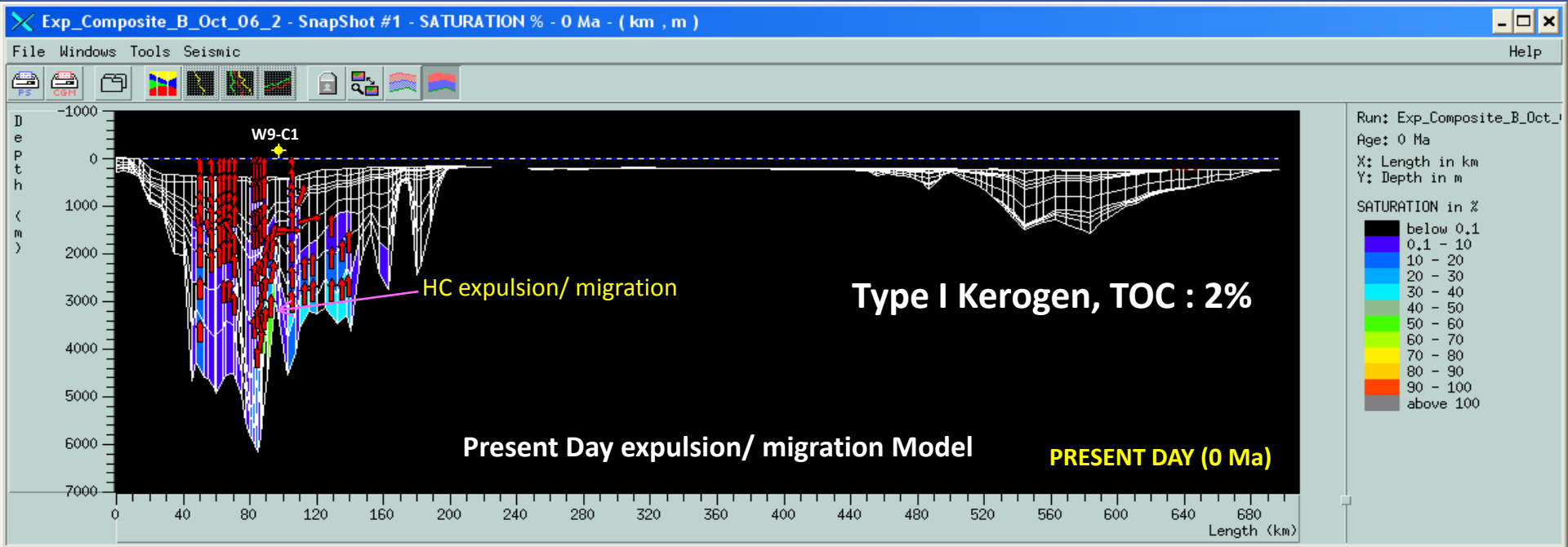


# SECTION B

## HC SATURATION MODEL

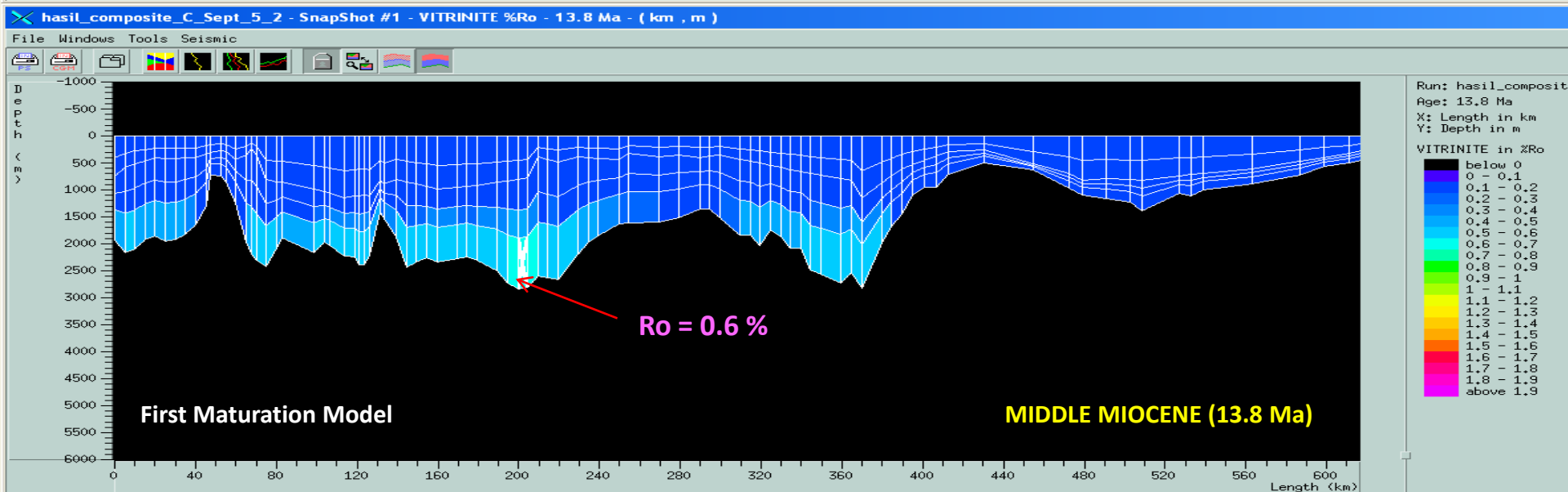
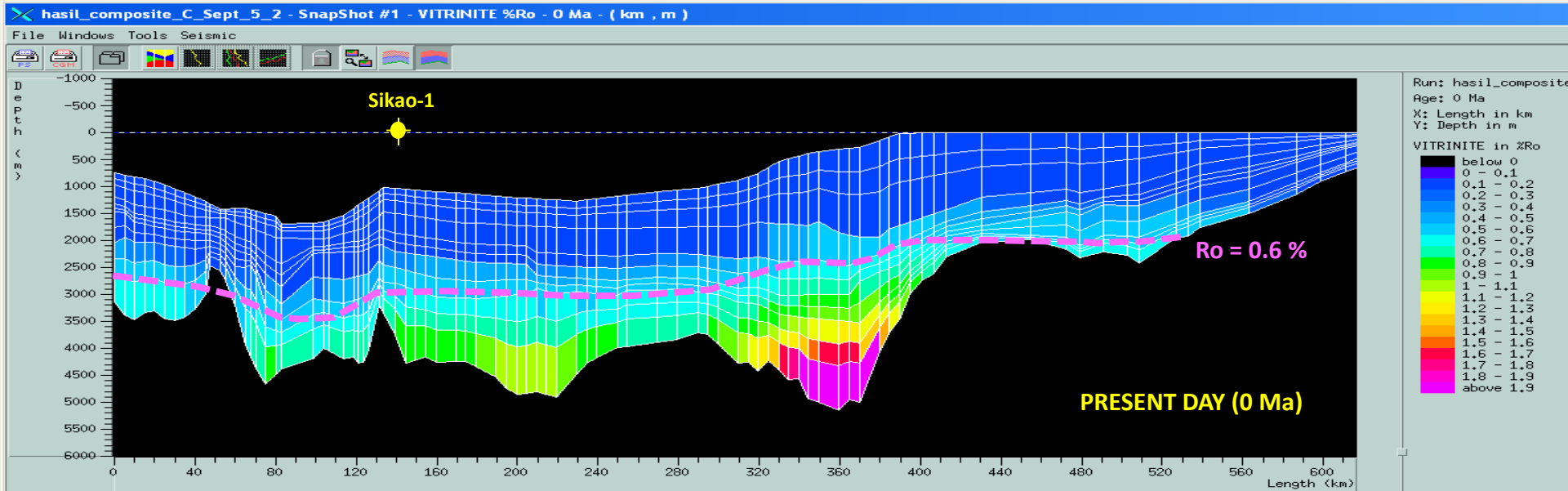


# EXPERIMENT ON SECTION B USING TYPE I KEROGEN



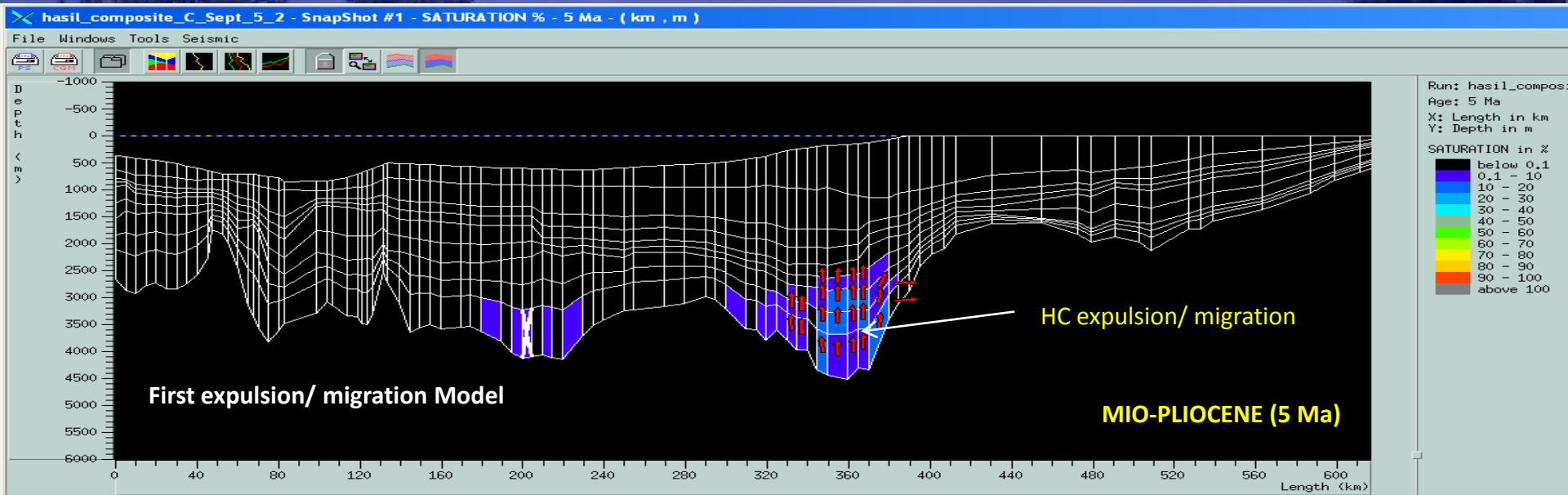
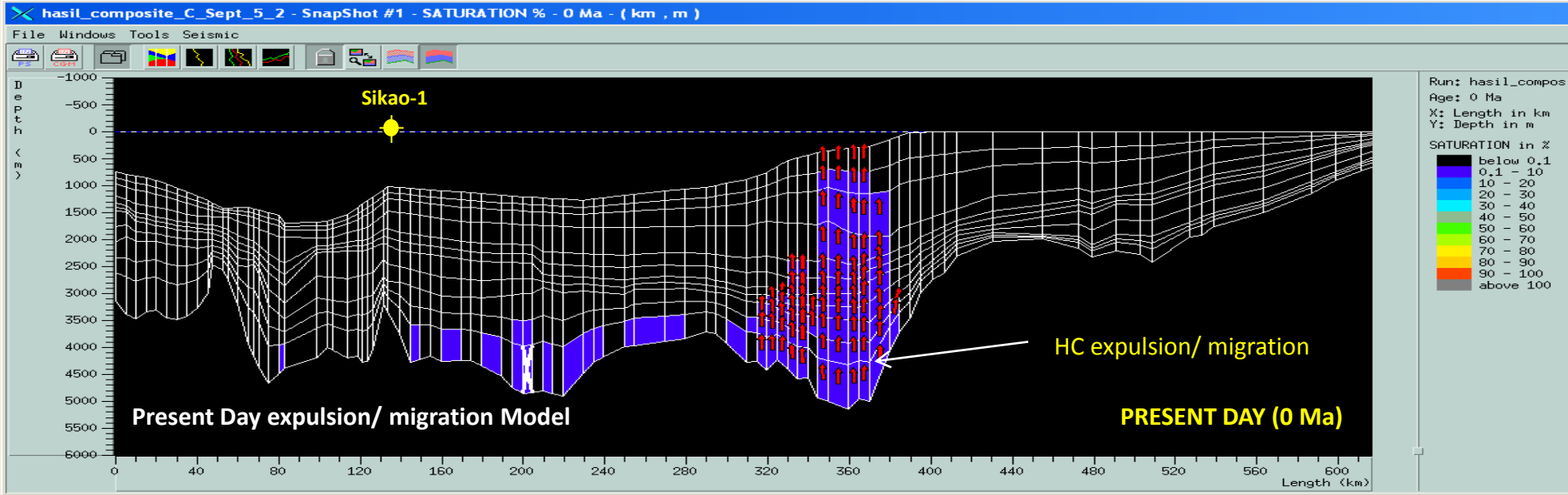


# SECTION C

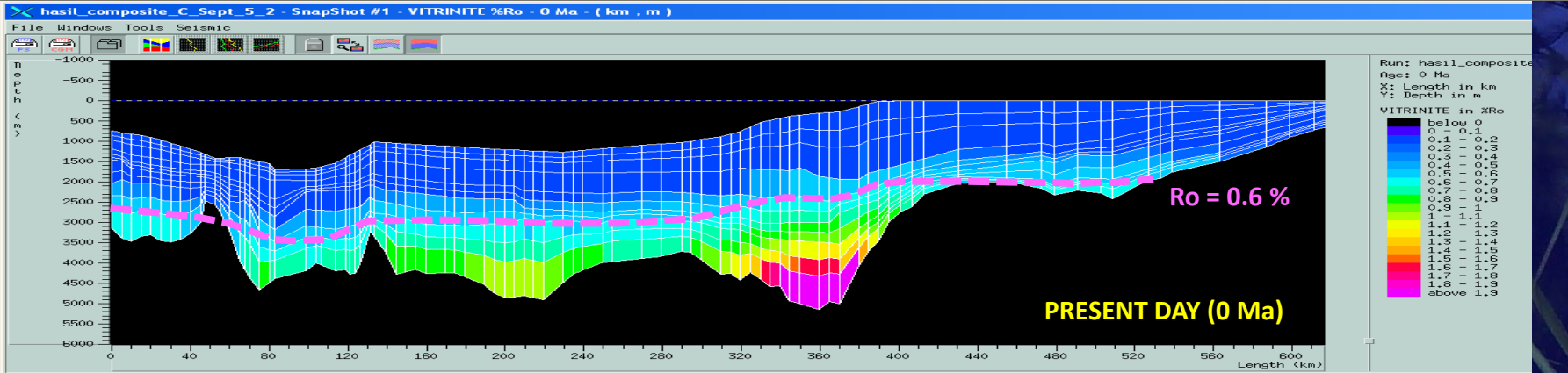
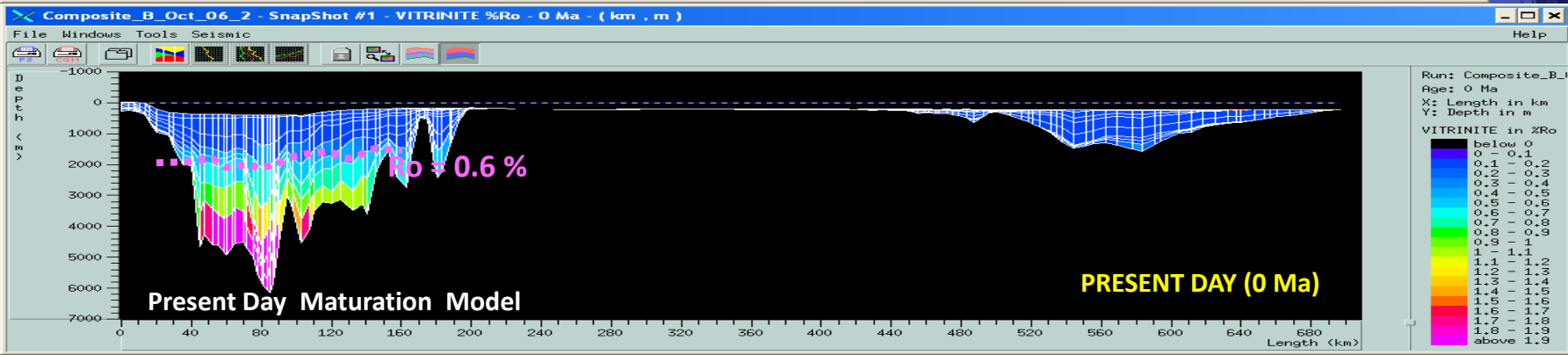
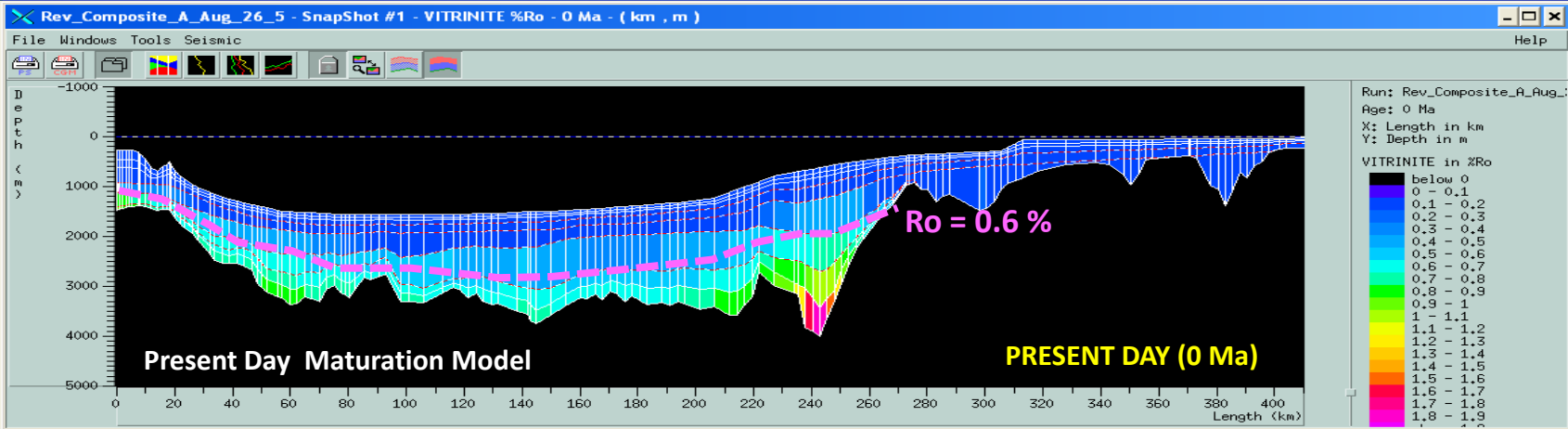




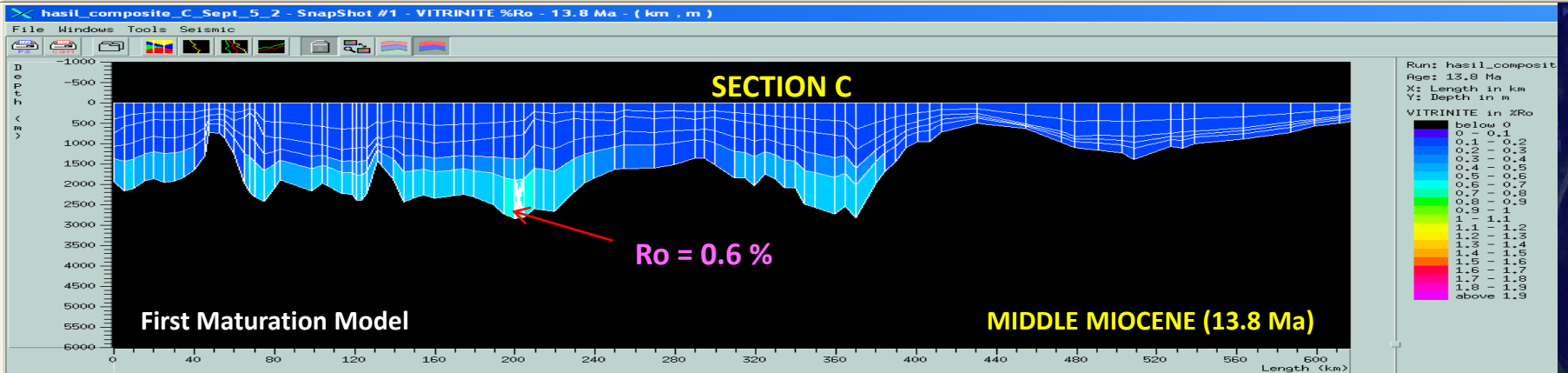
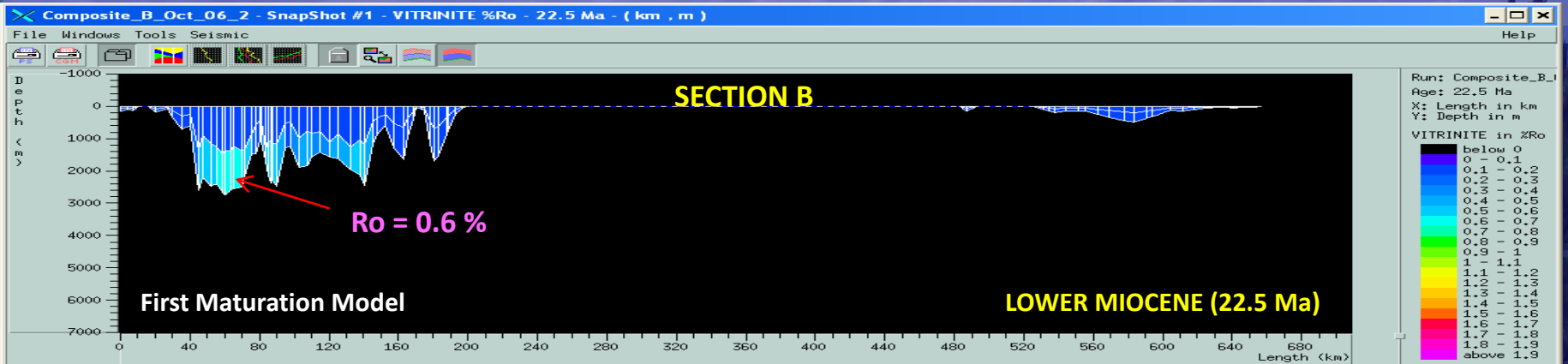
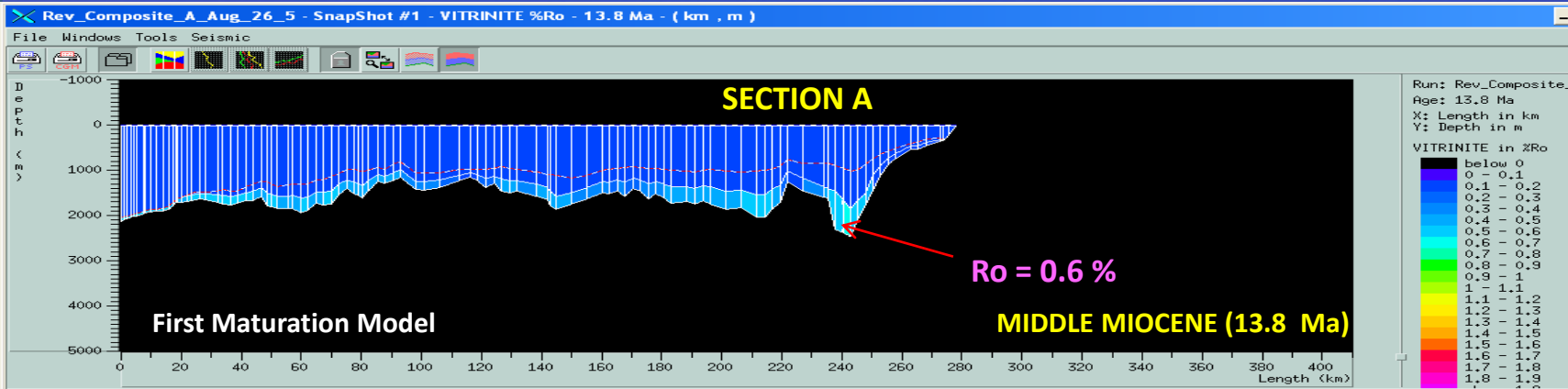
# SECTION C



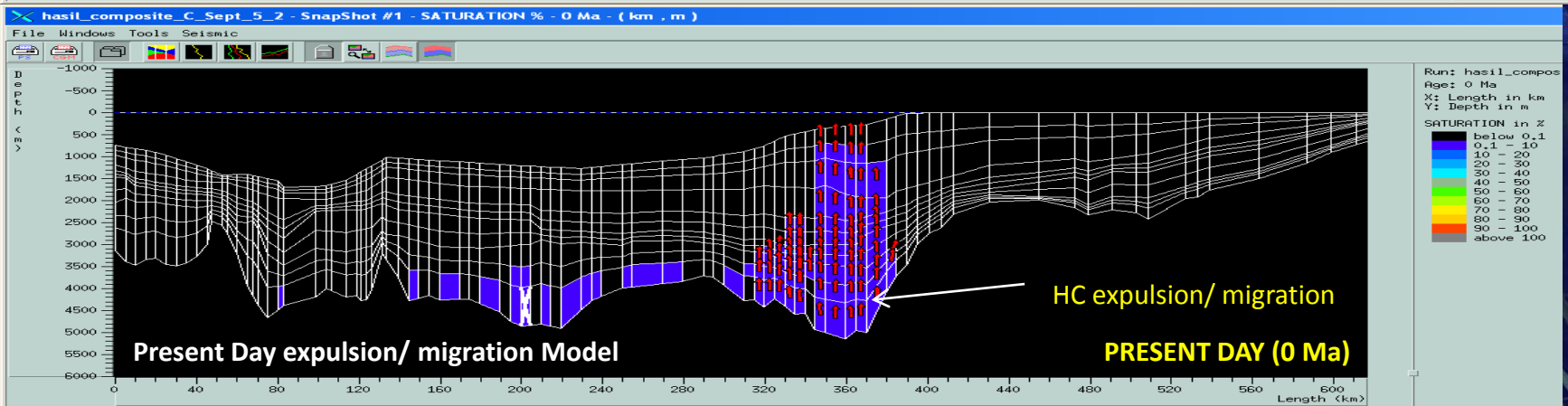
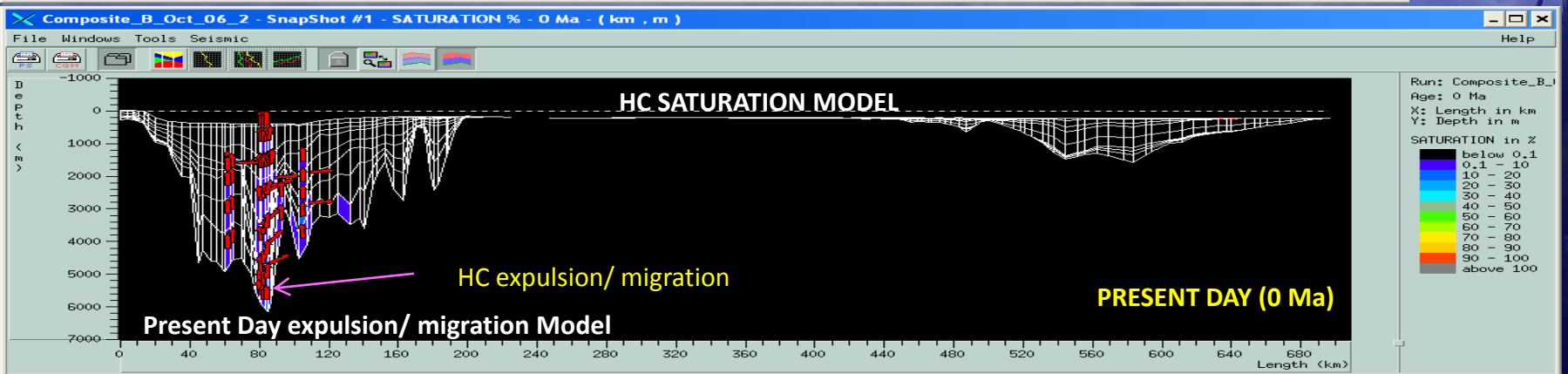
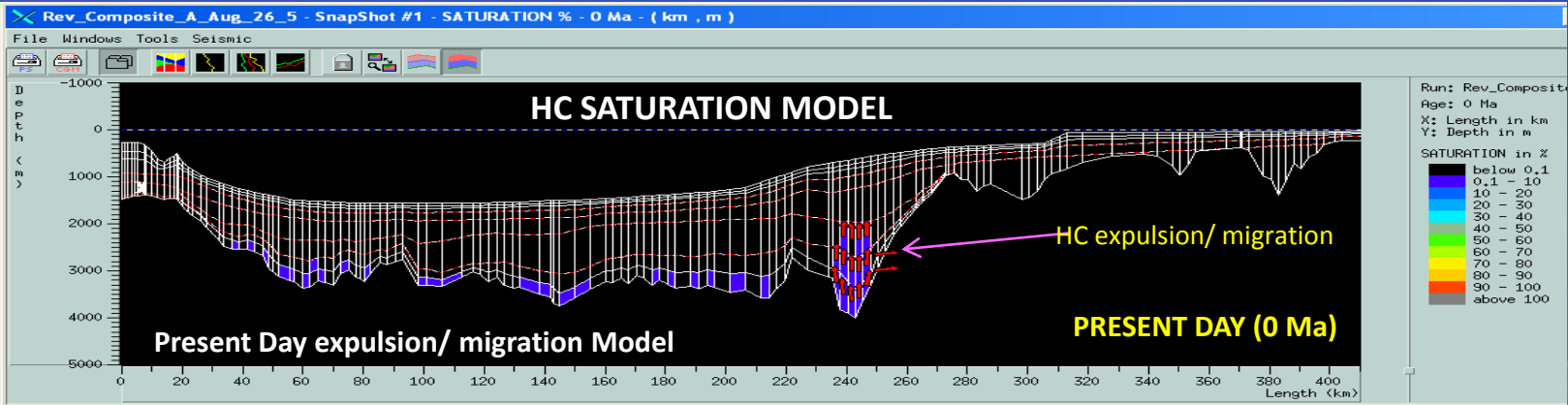
# COMPARISON of PRESENT DAY MATURATION MODEL



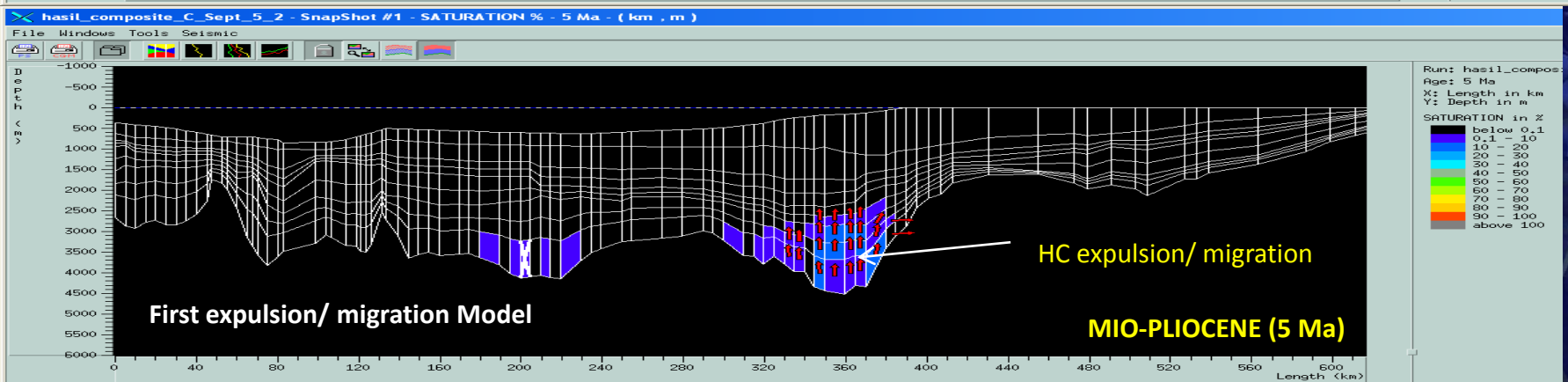
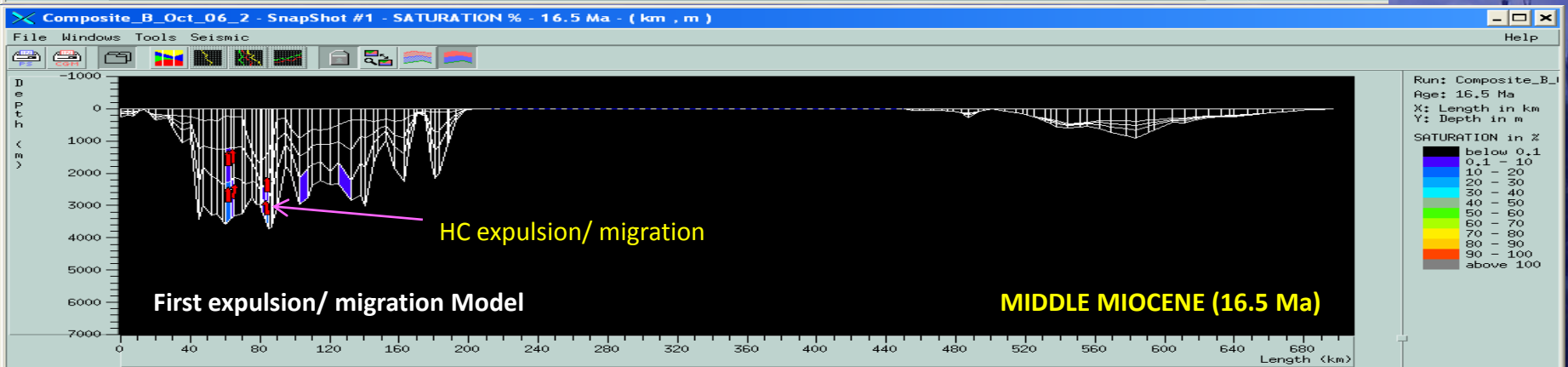
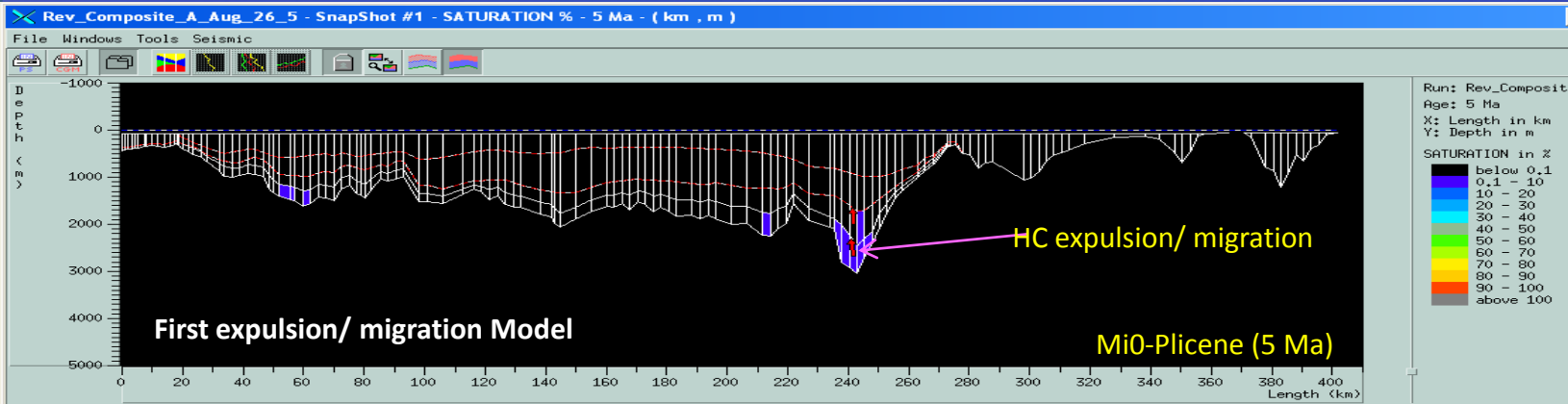
# COMPARISON of FIRST MATURATION MODEL



# COMPARISON of PRESENT DAY HC SATURATION MODEL



# HC SATURATION MODEL



# SUMMARY

2D BASIN MODELING OF THE THREE COMPOSITE SECTION OF THE CASE STUDY AREA  
SUMMARIES THAT :

- **Thermally mature ( $R_o = 0.6\%$ ) rocks lies below 1100 – 2100 m (subsea) depth across the Study Area.**
- **Hydrocarbon Expulsion/Migration mainly occurs in the syn-rift area. The favorable area for Hydrocarbon accumulation is the high area in the edge of the syn-rift.**

# NEXT STEP

DEPTH STRUCTURE MAP



Closure identification



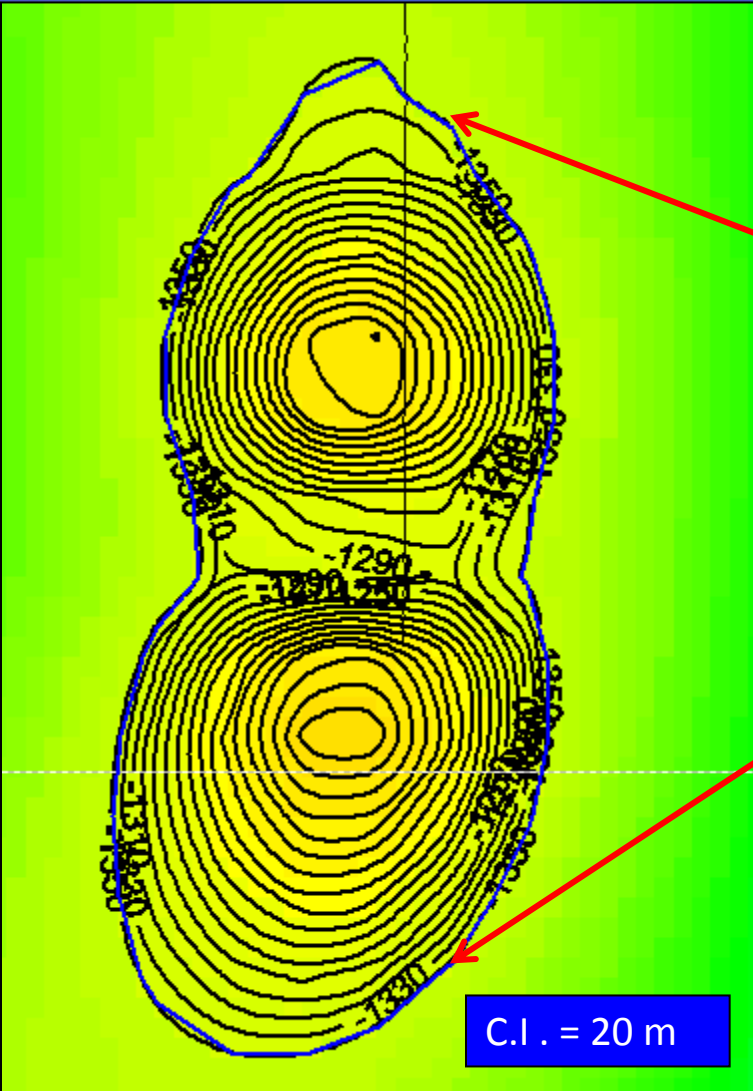
PROSPECT / LEAD



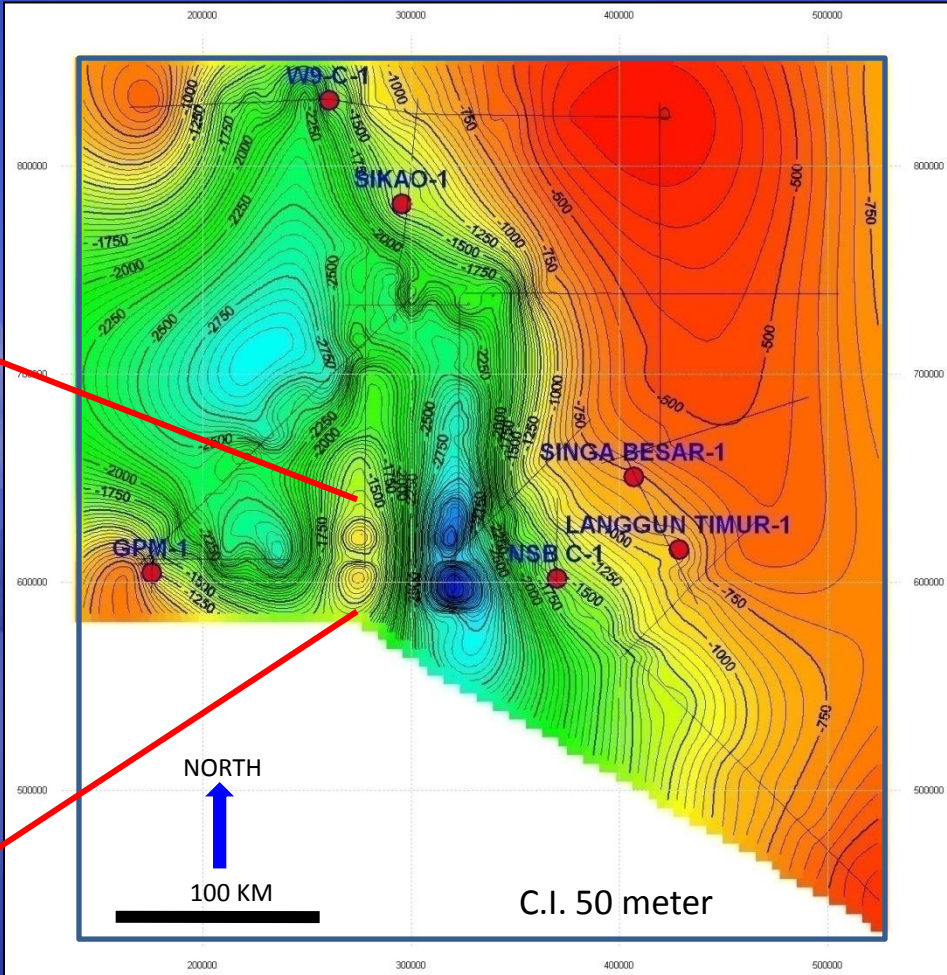
RESOURCES ESTIMATION

RISK ANALYSIS

# CLOSURE IDENTIFICATION



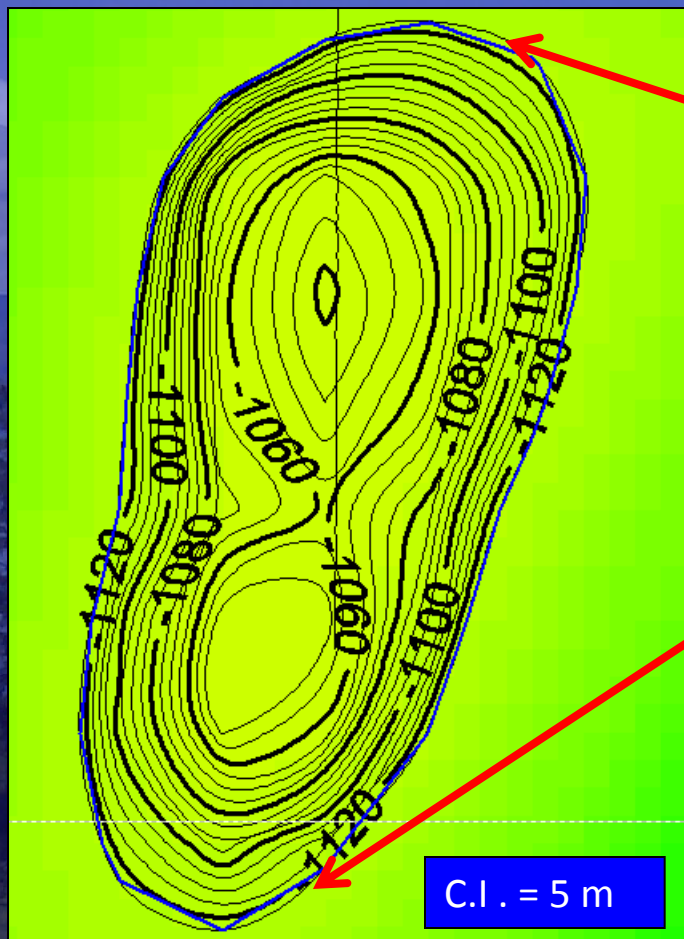
Contour area -1350 = 227692.52 Acres



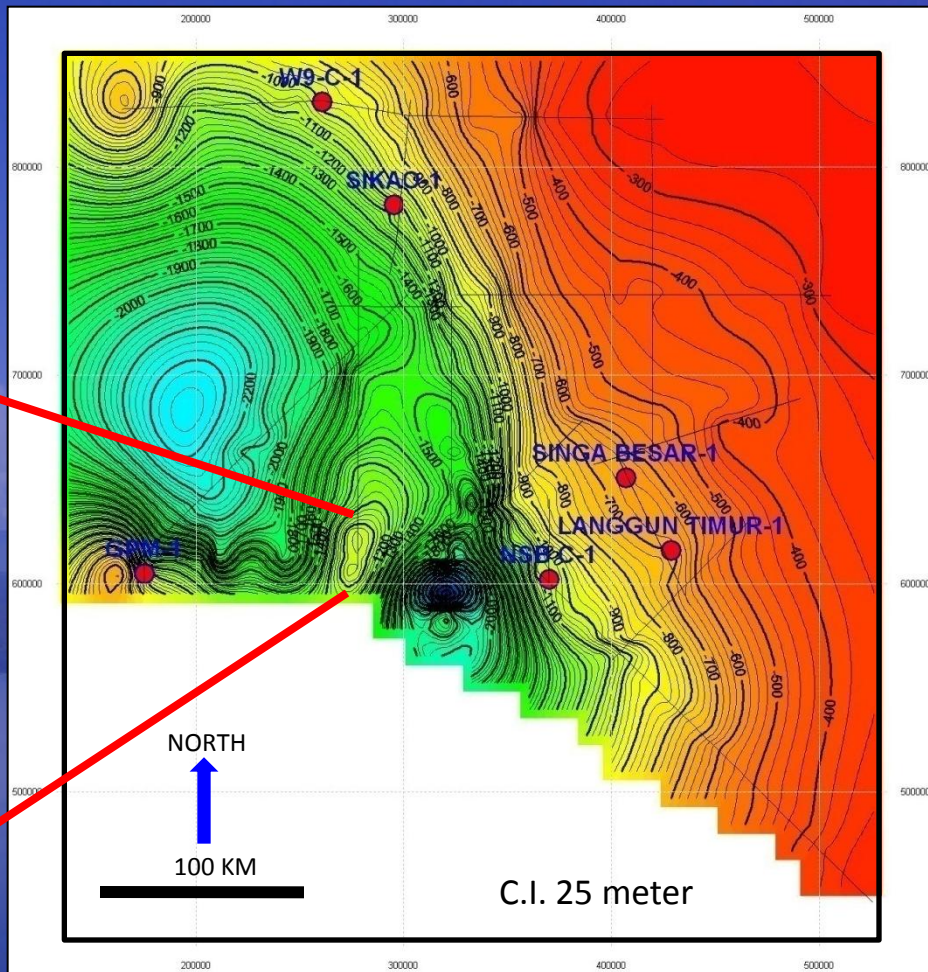
## DEPTH STRUCTURE MAP BAONG Fm.



# CLOSURE IDENTIFICATION

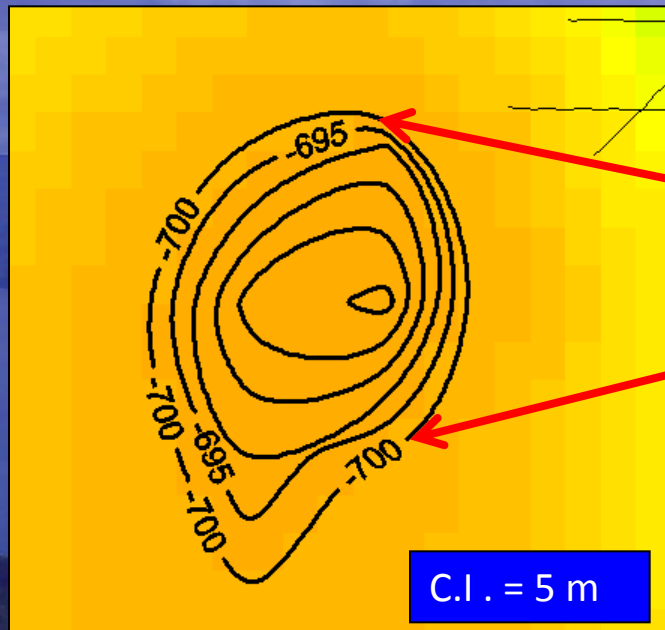


Contour area -1125 = 114290.40 Acres

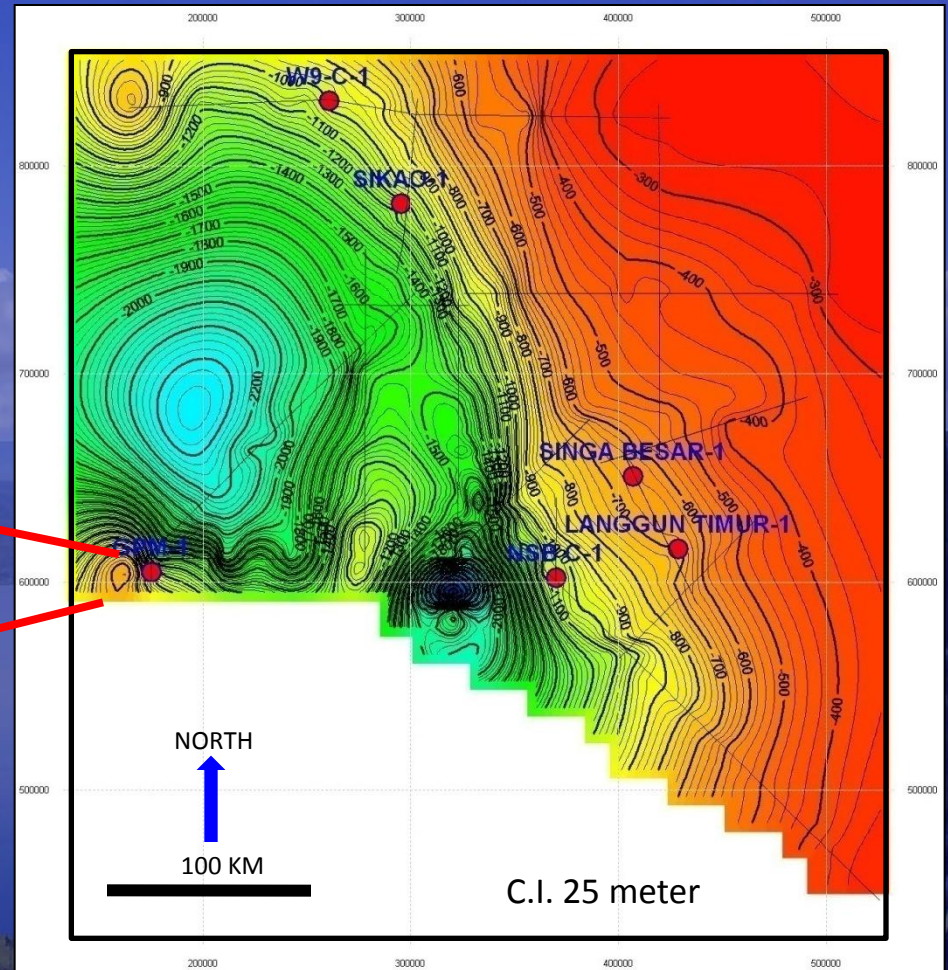


**DEPTH STRUCTURE MAP  
KEUTAPANG Fm.**

# CLOSURE IDENTIFICATION



Contour area -700 = 17941.27 Acres



DEPTH STRUCTURE MAP  
KEUTAPANG Fm.

## BAONG PLAY

Well/Field NAME	BESITANG	PALUH TABUHAN BARAT	PALUH TABUHAN TIMUR	SECURAI
STATUS	Oil & Gas	Oil & Gas	Oil & Gas	Oil & Gas
OBJECTIVE	Middle Baong Sandstone	Middle Baong Sandstone	Middle Baong Sandstone	Baong Sandstone
TRAPPING TYPE	Faulted anticline / Pinchout	Faulted anticline	Faulted anticline	Anticline
<b>RESERVOIR PARAMETERS :</b>				
N/G (%)	5.6	3.9	3.5	51.4
Gas-Oil Ratio (Vol./Vol.)	100	280	65 - 600	150
Porosity (%)	18.5	20	20	21
Water Saturation (%) :				
Oil	65		70	
Gas	40		40	
<b>FORMATION VOLUME FACTOR :</b>				
OIL (BBL/STB)	1.26			
GAS (CF/SCF)	0.01224			

## KEUTAPANG PLAY

Well/Field NAME	IEE TABUE	PEUDAWA	PERLAK	RANTAU	TUALANG
STATUS	Shut-In	Shut-In	Shut-In	Oil & Gas	Oil
OBJECTIVE	Lower Keutapang Sandstone	Keutapang Sandstone	Keutapang Sandstone	Keutapang Sandstone	Lower Keutapang (Tualang)
TRAPPING TYPE	Faulted anticline	Fault, permeability pinchout	Faulted anticline	Faulted anticline	Faulted anticline
<b>RESERVOIR PARAMETERS :</b>					
N/G (%)	24.9	18.7	5.4	2.9	17.3
Gas-Oil Ratio (Vol./Vol.)	150	44.5	N.A	35 - 350	120
Porosity (%)	23	28	28	25	24.5
Water Saturation (%) :					
Oil	70			70	45
Gas	50			50	
<b>FORMATION VOLUME FACTOR :</b>					
OIL (BBL/STB)	1.26				1.56
GAS (CF/SCF)				0.01224	

# RESERVOIR PARAMETER



**MATUR NUWUN  
THANK YOU**