Tourism of Kayangan Api and Bledug Kuwu Phenomenon related to Hydrocarbon Potency at North East Java Basin

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OUTLINE :

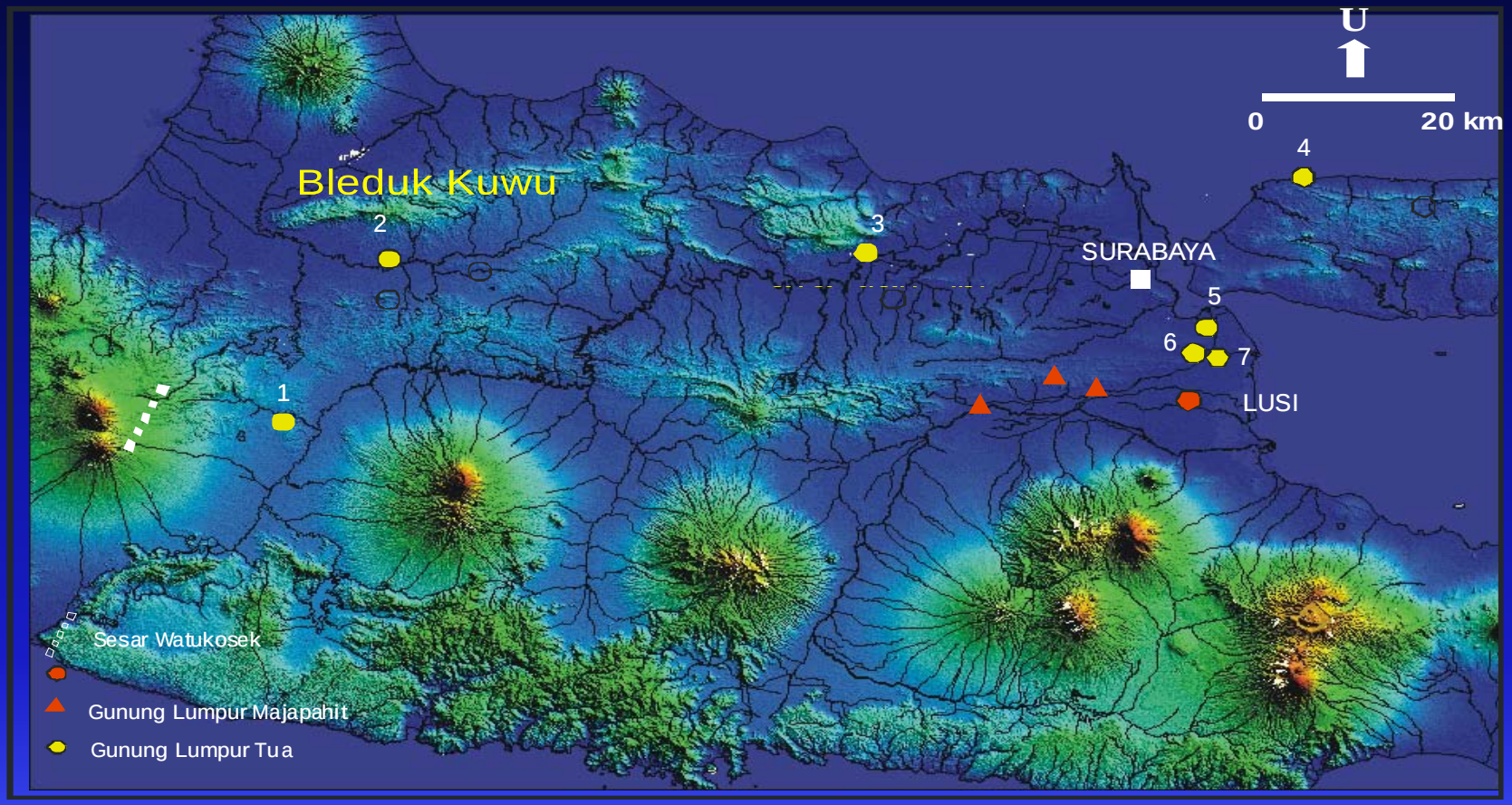
- INTRODUCTION
- OBJECTIVE
- LOCATION OF STUDY AREA
- POTENTIAL HYDROCARBON FROM SAMPLE SURFACE AND WELL DATA
- MATURITY ASSESSMENT FROM WELL ANALYSIS
- GEO-CHRONOLOGICAL RECONSTRUCTION BASED ON MATURITY
- OIL & GAS SEEPAGE AND MUD VULCANO SURFACE DATA
- CONCLUSIONS

INTRODUCTION :

- Phenomenon oil and gas seepage of Bledug Kuwu mud vulcano and Kayangan Api (Grobokan, Purwodadi, Central Java, and Dander, Bojonegoro East Java, Indonesia) are interesting tourism area.

- Based on Geochemistry, potential source rock hydrocarbon and Thermal maturity assessment indicate mature source rocks in North East Java Basin.

The map of tourism location area of Bleduk Kuwu and Kayangan Api in Java



(Badan Geologi, 2011)

OBJECTIVE :

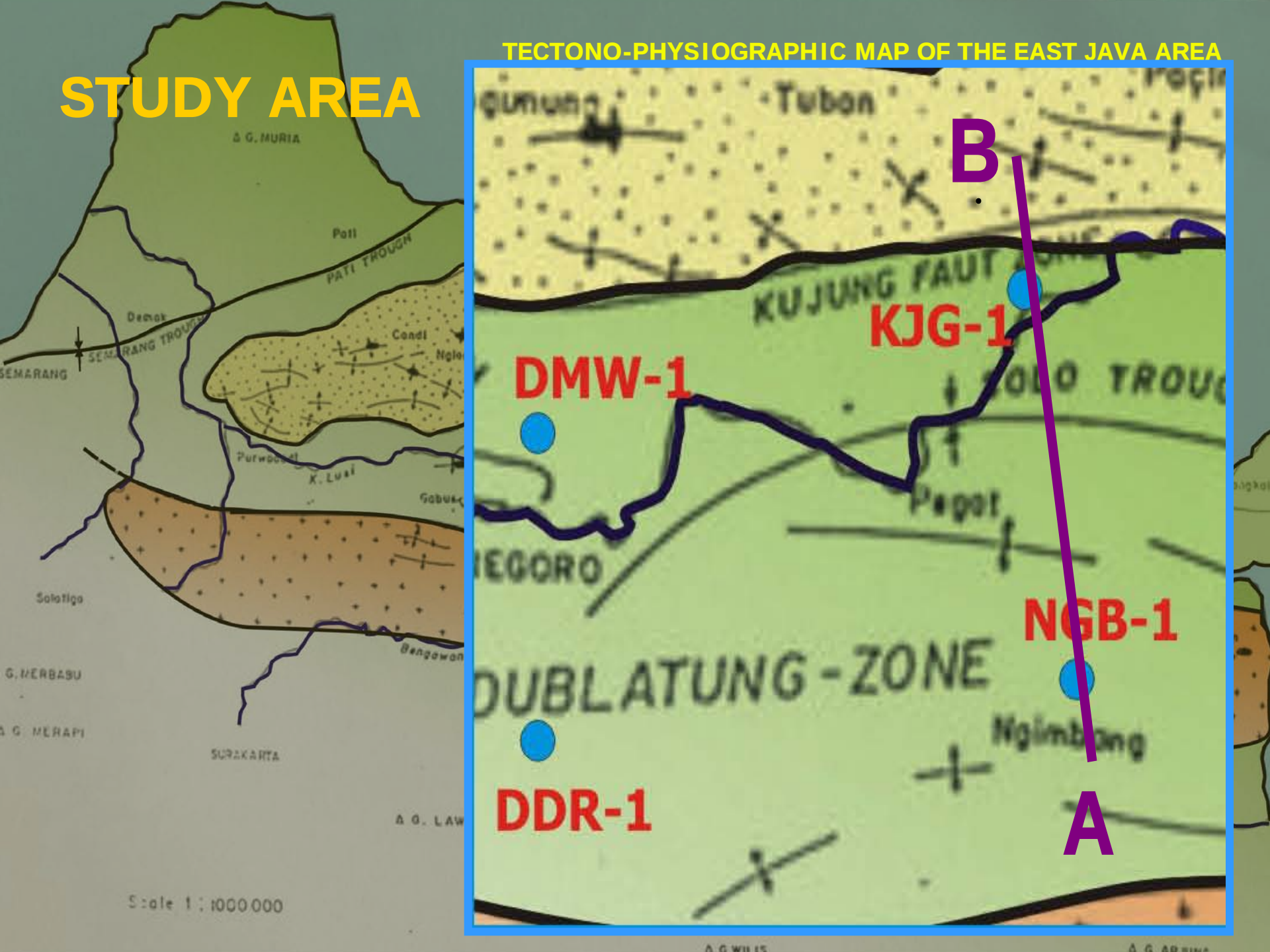
- Phenomenon of oil and gas seepage in Kayangan Api and Bledug Kuwu are interesting in tourism area and analyze Geochemistry.

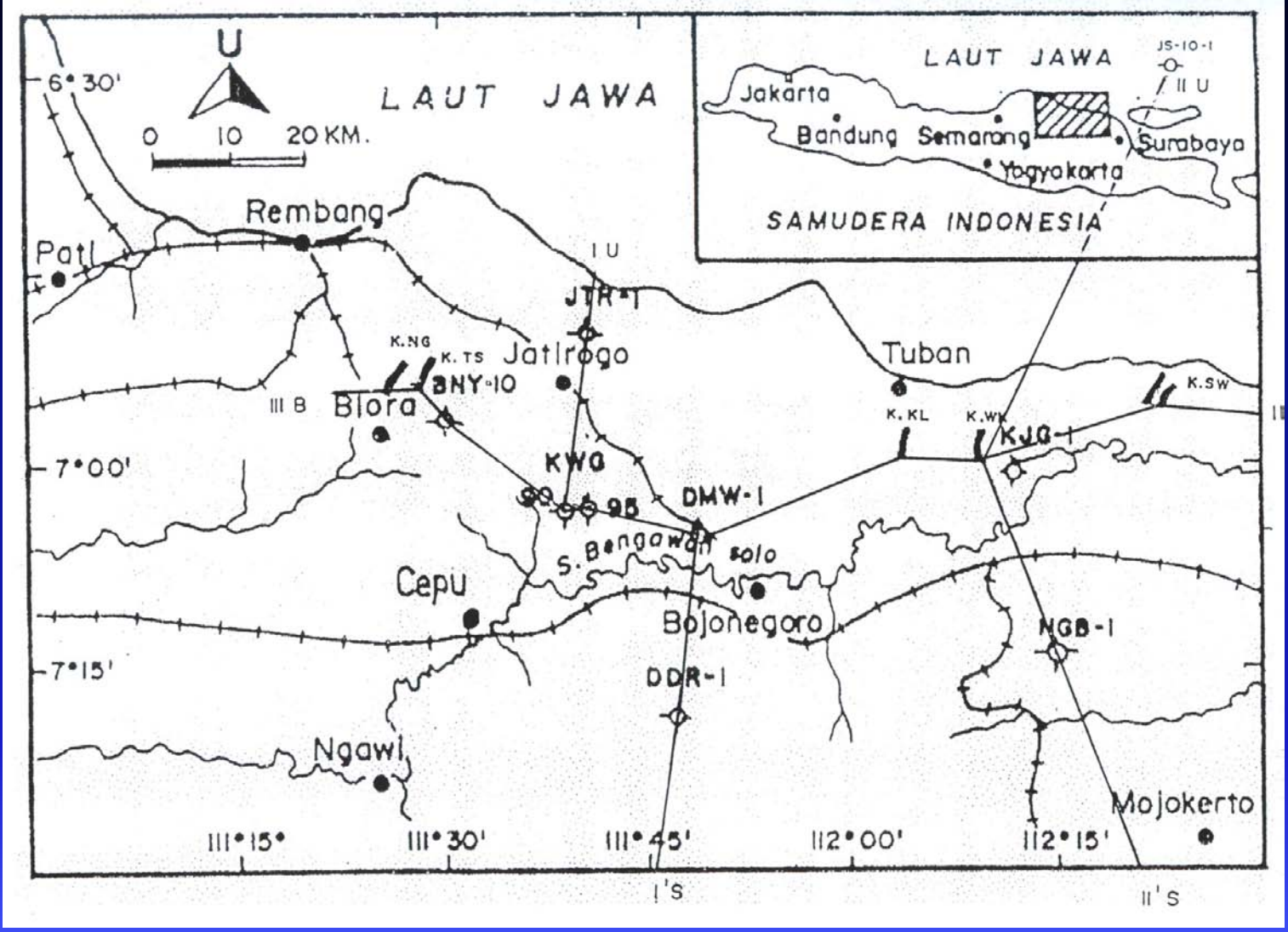
- To illustrate the use of maturity parameters, particularly Vitrinite Reflectance (Ro), Spore Color Index (SCI), and GCMS to explain about thermal maturity, then potential source rock hydrocarbon based on Rock-Eval Pyrolysis.

Bleduk Kuwu

Kayangan Api

STUDY AREA

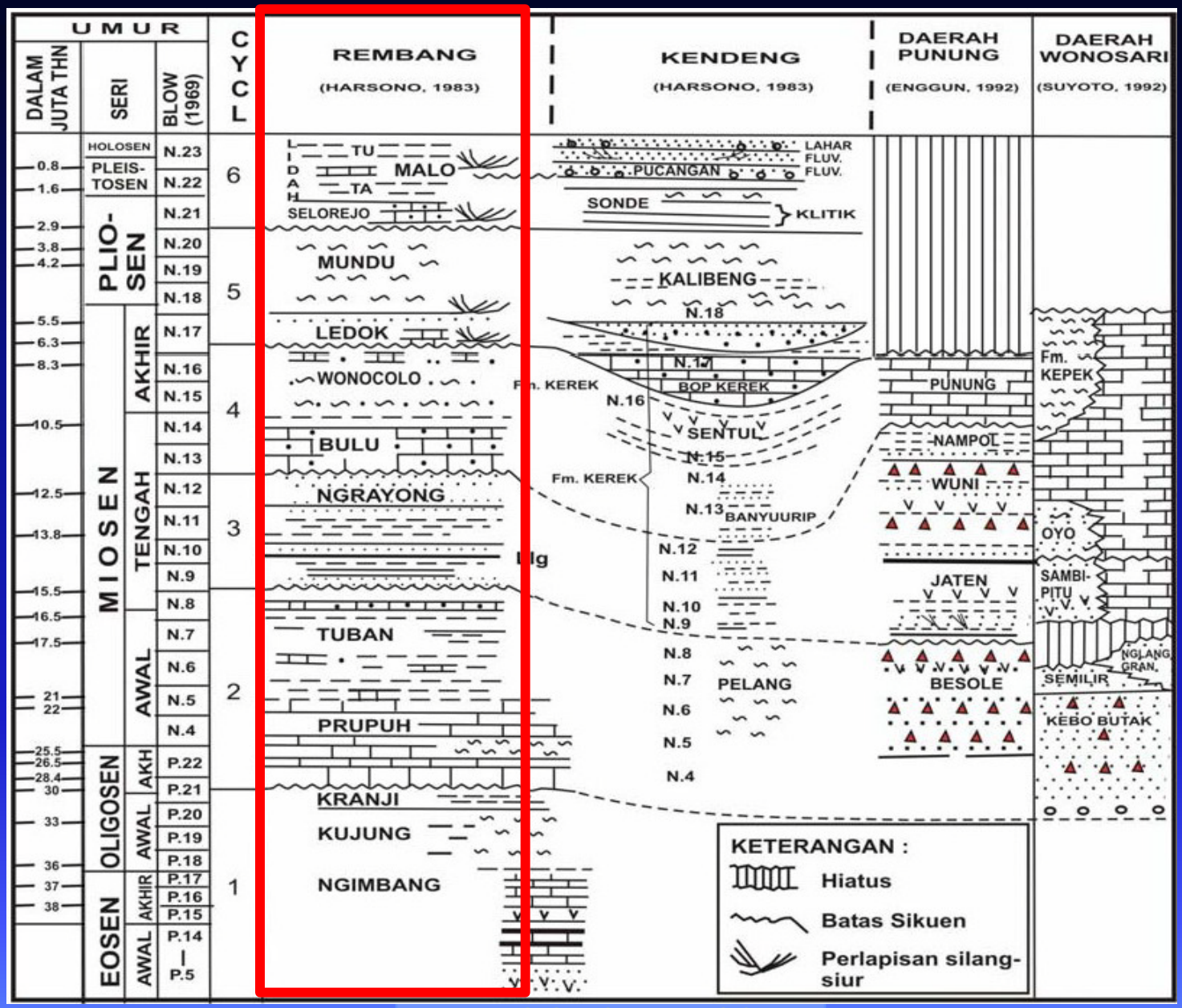

TECTONO-PHYSIOGRAPHIC MAP OF THE EAST JAVA AREA
Tuban
B
KUJUNG FAUT
KJG-1
DMW-1
Pegat
NGB-1
DDR-1
A
Scale 1 : 1000 000



Location Map of Sampling Surface Area

AGE	Blow	Adam		Rock units	
				Formation	Member
Pleistocene	N 23			LIDAH	DANDER
	N 22				
Pliocene	N 21	Tgh		MUNDU	SELOREJO
	N 20				
	N 19				
Miocene	N 18				
	N 17			LEDOK	
	N 16				
	N 15	Tf	Upper	WONOCOLO	
	N 14				
	N 13			BULU	
	N 12			TAWUN	NGRAYONG
	N 11		Lower		
	N 10				
	N 9				
	N 8			TUBAN	
	N 7				
	N 6	Te	Upper		
	N 5				
	N 4			PRUPUH	
Oligocene	P 22 (N 3)		Lower		
	P 21 (N 2)			KUJUNG	
	P 20 (N 1)				
	P19	Tcd			
	P 18				

After Pringgoprawiro, 1983

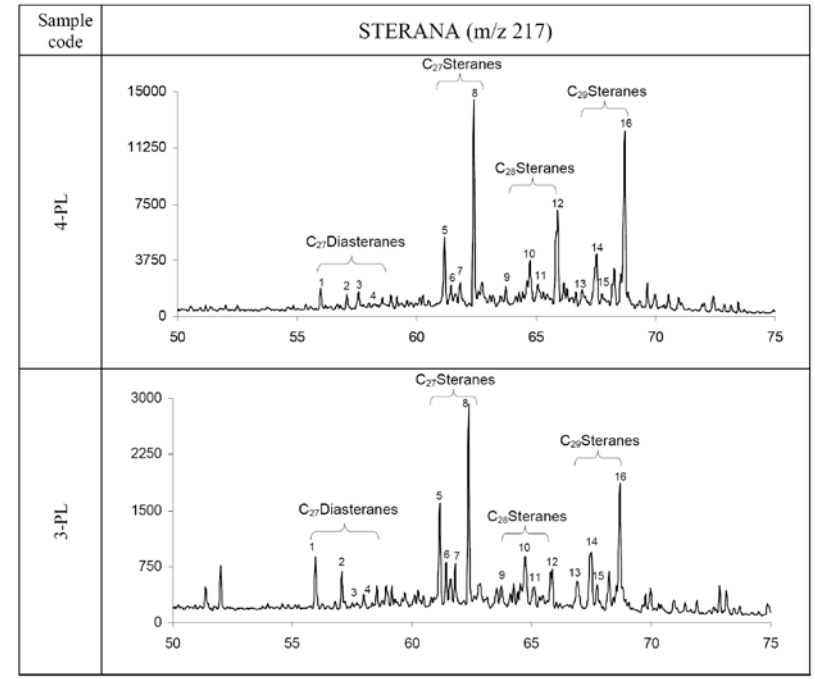


1 – 4 OCTOBER 2011

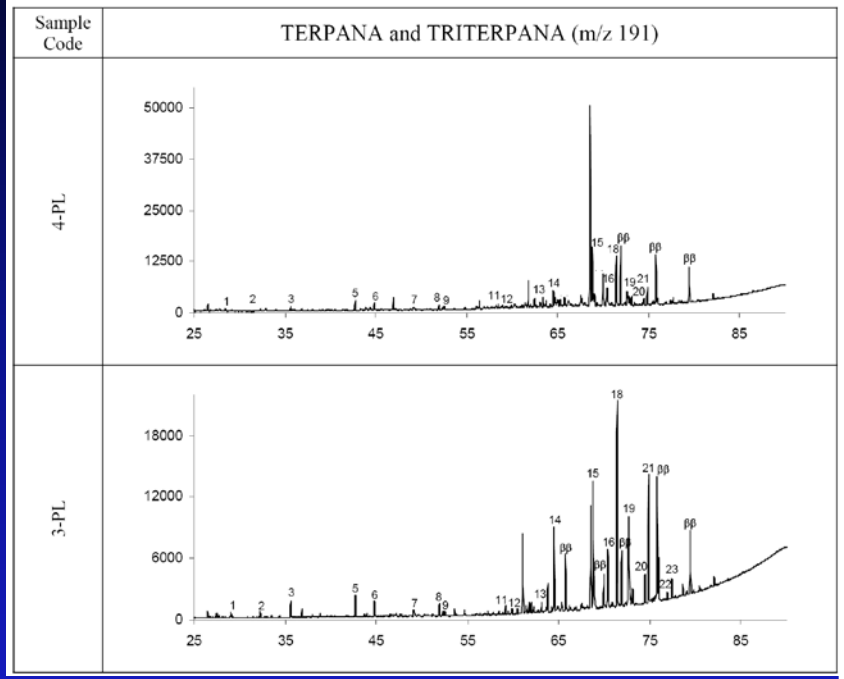
POTENTIAL HYDROCARBONFROM SAMPLE SURFACE DATA

Kode conto	Formasi	S1 (mgHC/g batuan)	S2 (mg HC/g batuan)	S3 (mg CO_2/g batuan)	S2/S3	TOC (% berat)	HI (mg HC/g batuan)	OI (mg CO_2/g C organik)
SB-13	Ngrayong	0.00	0.17	0.44	0.39	0.64	27	69
SB13B	Ngrayong	0.00	0.58	0.56	1.04	0.79	73	71
SB-3	Tawun	0.02	1.50	0.31	4.84	1.57	96	20
SB-6	Tawun	0.01	0.60	0.24	2.5	0.73	82	33
SB-8	Tawun	0.00	0.57	0.35	1.63	1.05	54	33
SB-11	Tawun	0.03	1.85	0.82	2.26	1.70	109	48
SK-26	Tawun	0.04	0.79	2.81	0.28	0.98	81	288
SW22	Kujung	0.00	0.28	1.09	0.26	0.63	44	173
SW23	Kujung	0.06	0.82	0.18	4.56	0.69	119	26
SS19	Kujung	0.00	0.29	0.64	0.45	0.51	57	125

PELANG ROCK SAMPLES ANALYSIS

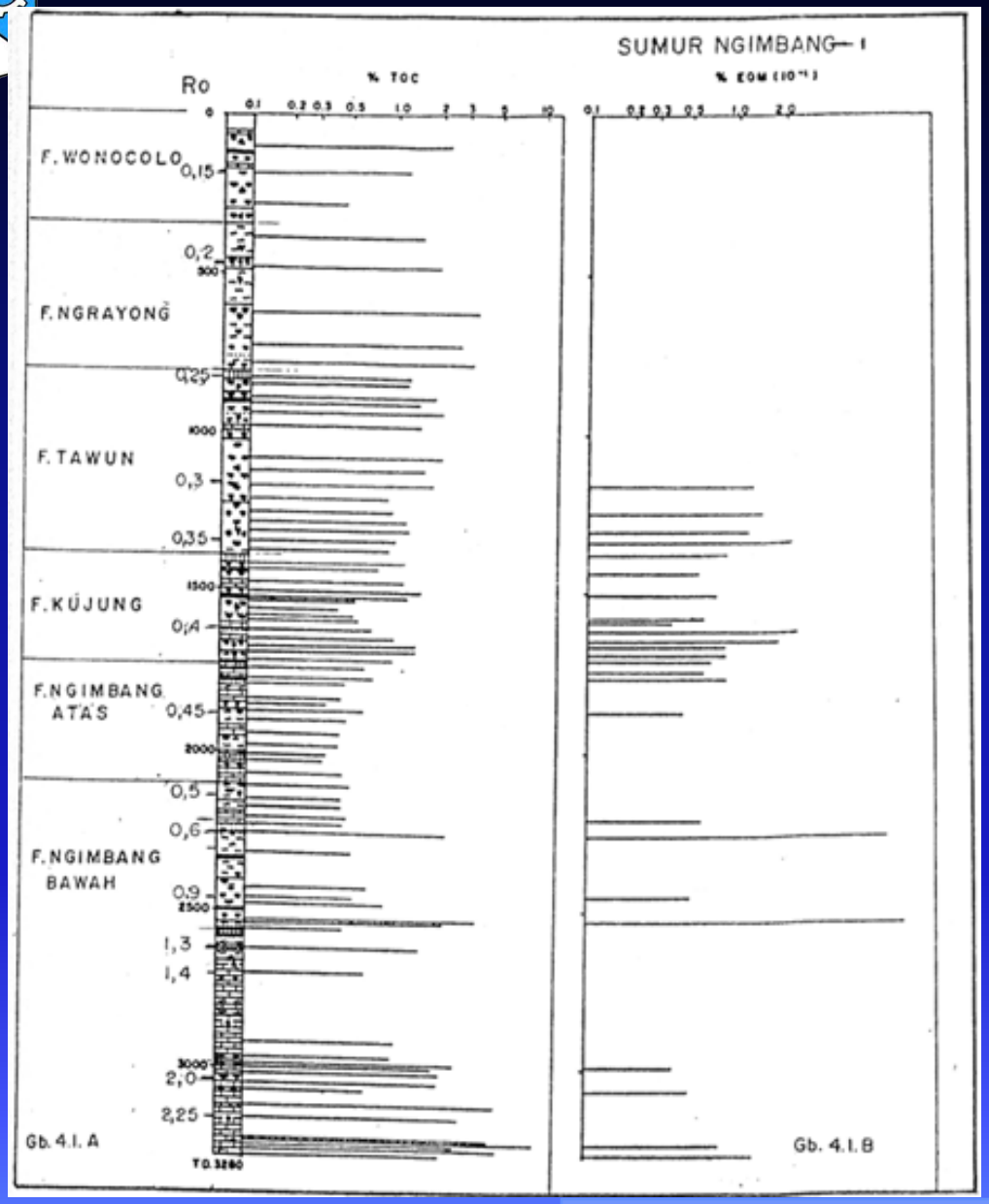


Bitument extract of sample 4-PL and 3-PL



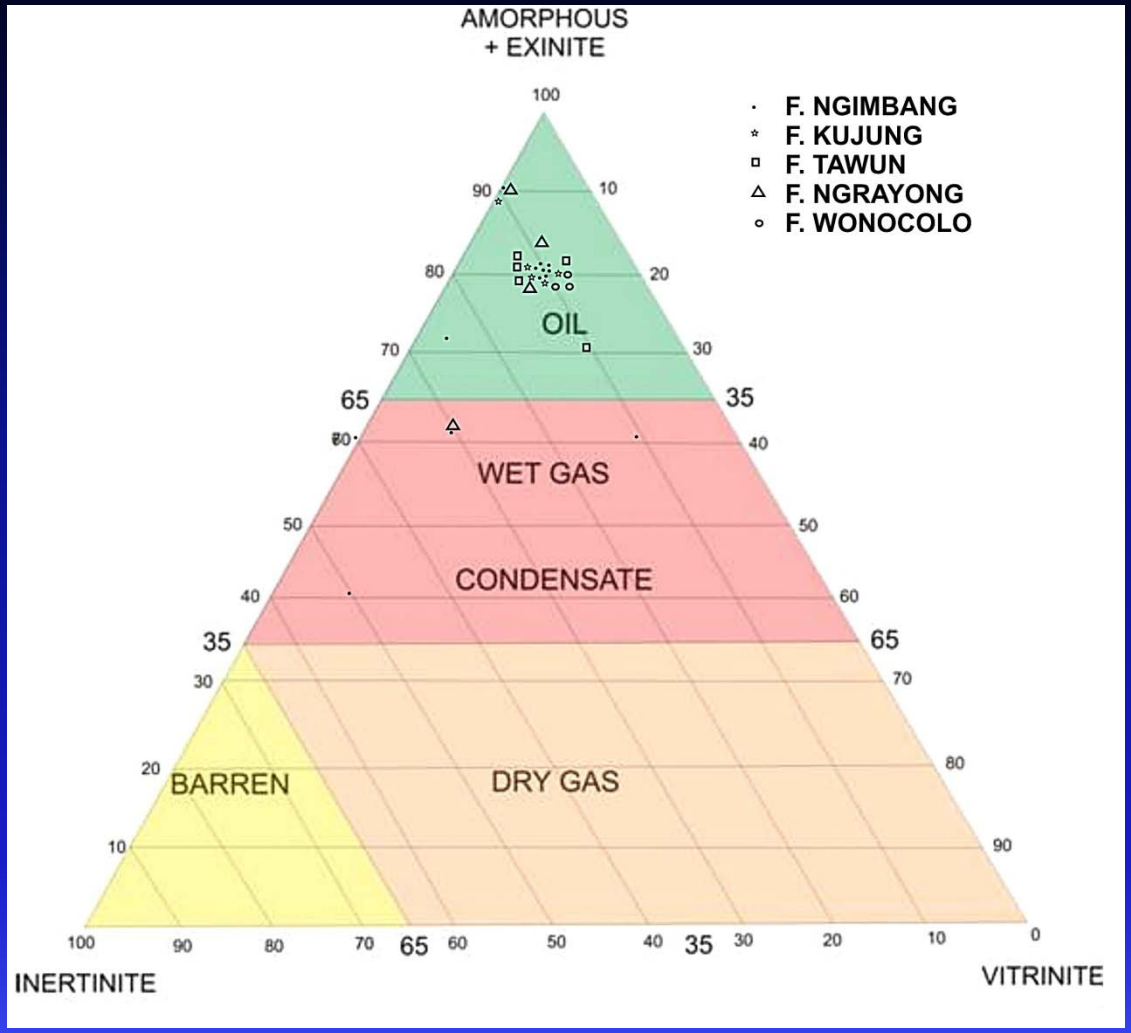
Bitumen extract of sample 3-PL and 4-PL

- *Maturity : Biomarker peaks and ratios indicates low thermal maturity.*
- *Environment : Sterane composition (C27>C29>C28) shows organic material derived from deltaic system with marine influence.*

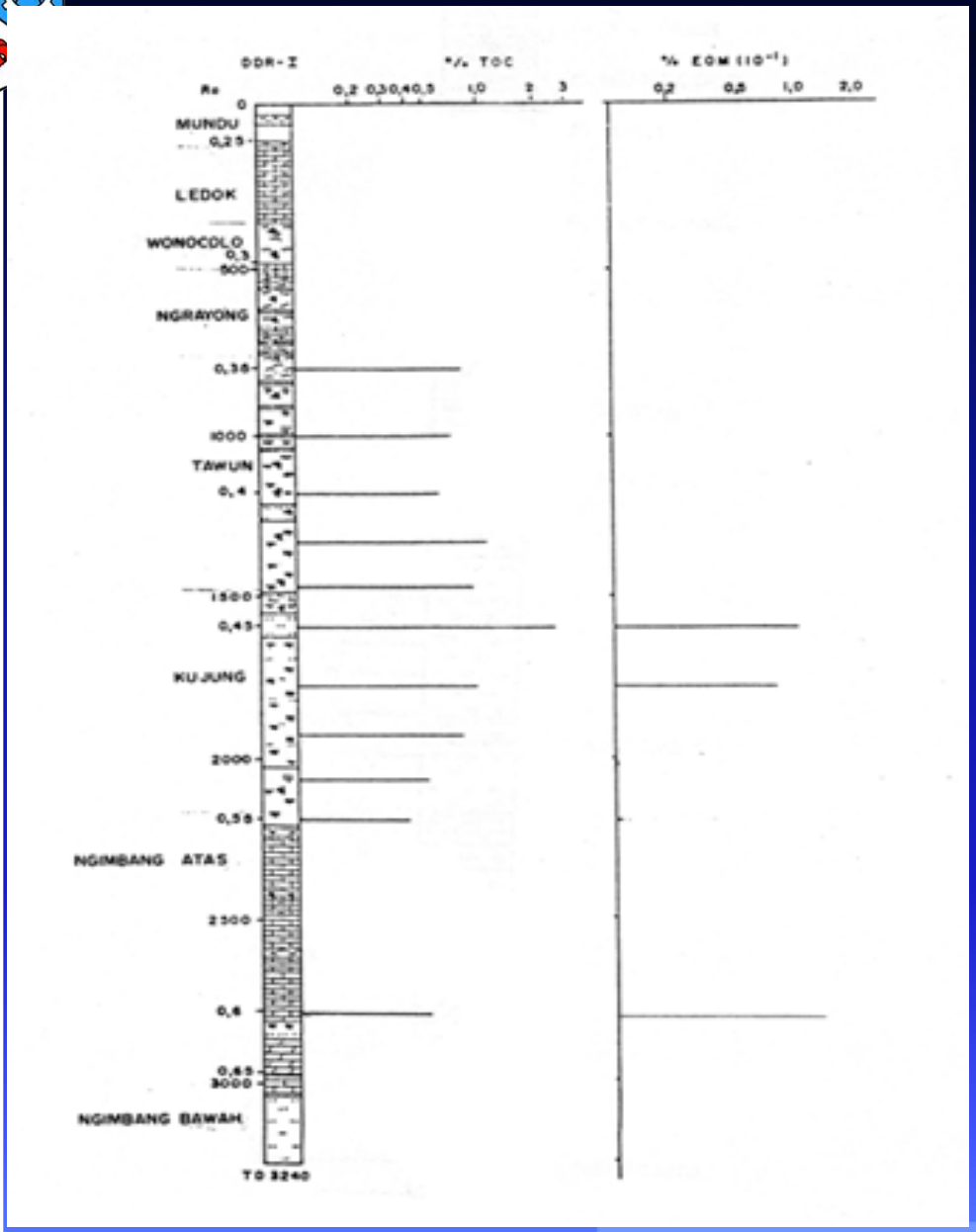


POTENTIAL HYDROCARBON FROM WELL DATA

Total Organic Carbon (TOC) and Potential Hydrocarbon vs Depth and Extracable of material organic vs Depth on NGB-1 well. (Final report of UEP-III, 1980)

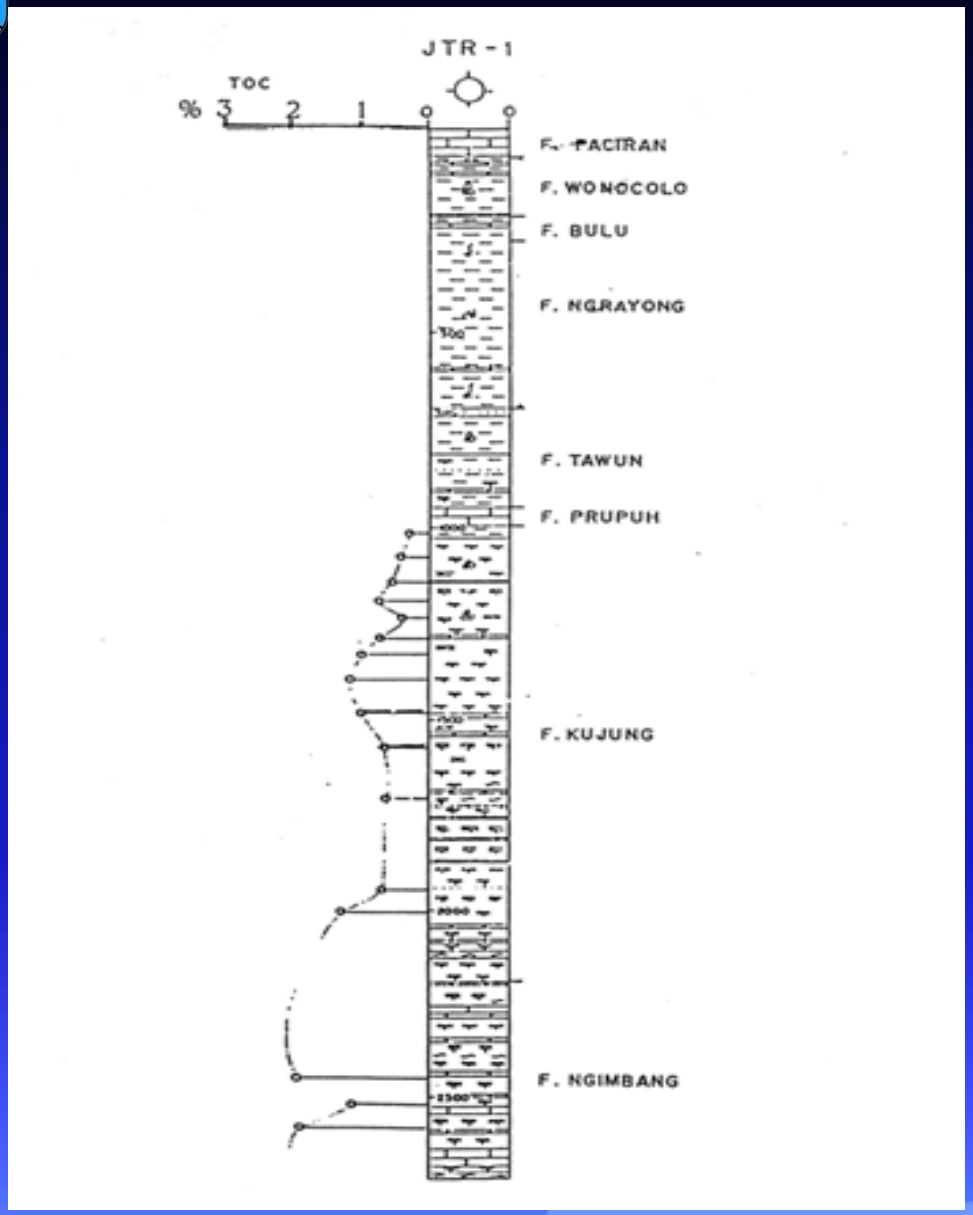


Generation of hydrocarbons and Kerogen type on a cross-section well Ngimbang-1, base on visual analysis with light reflection microscopy (after Dow and O. Connor, 1082; reprint with permission of the Association of Paleontology, economics, and Mineralogy, in Selley and Morrill, 1984).



Potential Hydrocarbon Assessments

Total Organic Carbon (TOC) and Potential Hydrocarbon on DDR-1 well. (Final report of UEP-III, 1980)

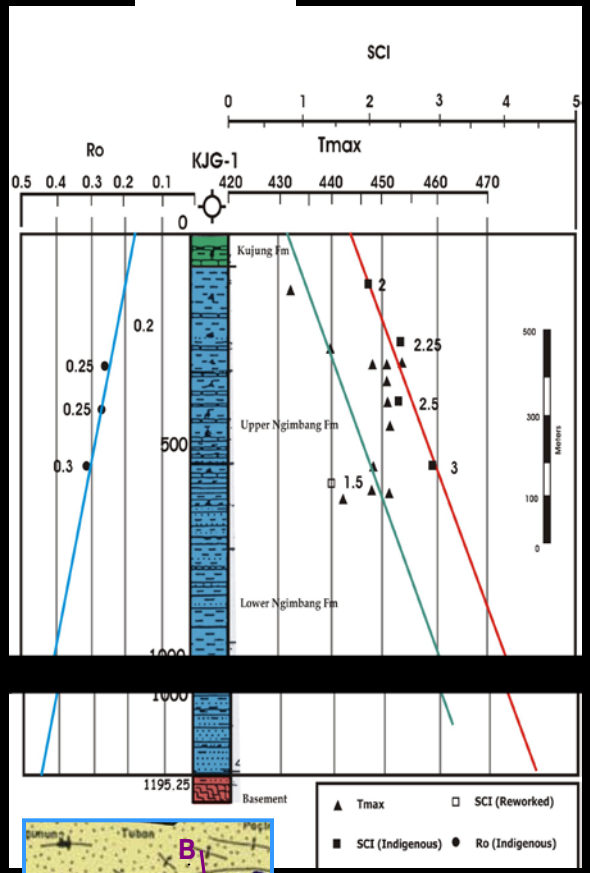


Potential hydrocarbon Assessments

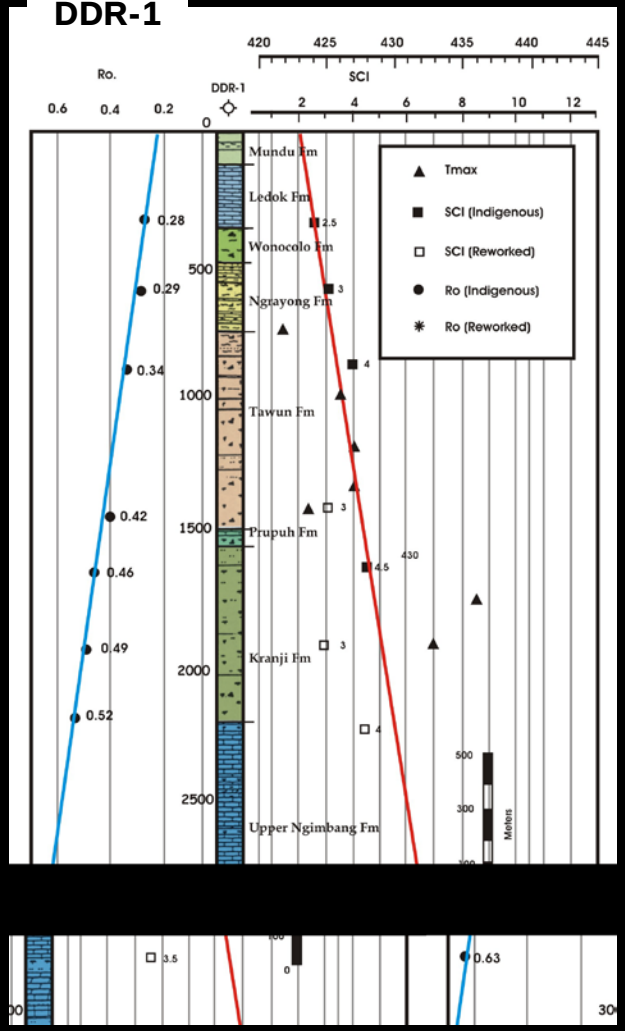
Total Organic Carbon (TOC) vs Depth on JTR-1 well. (Final report of UEP-III, 1980)

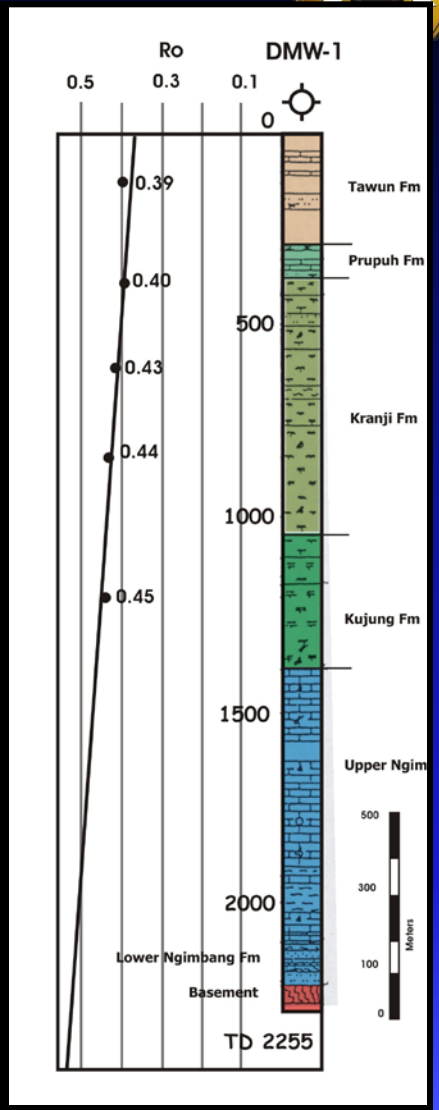
MATURITY ASSESSMENTS FROM WELL DATA

KJG-1

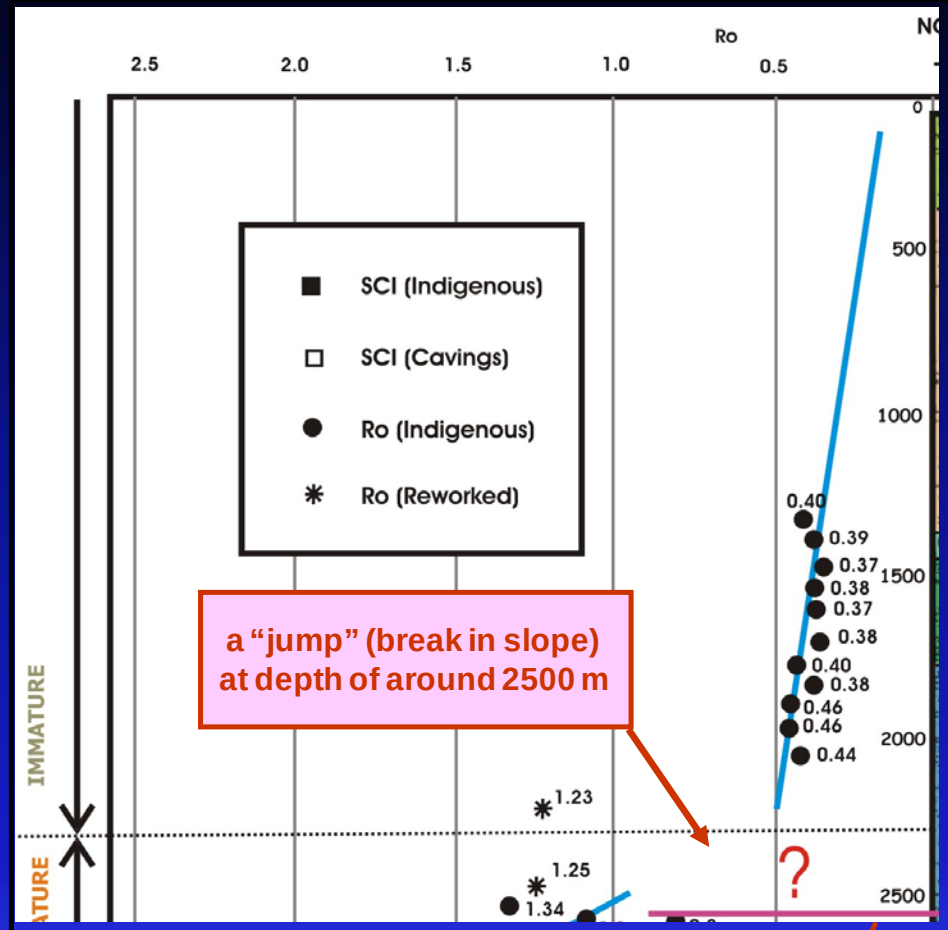


DDR-1

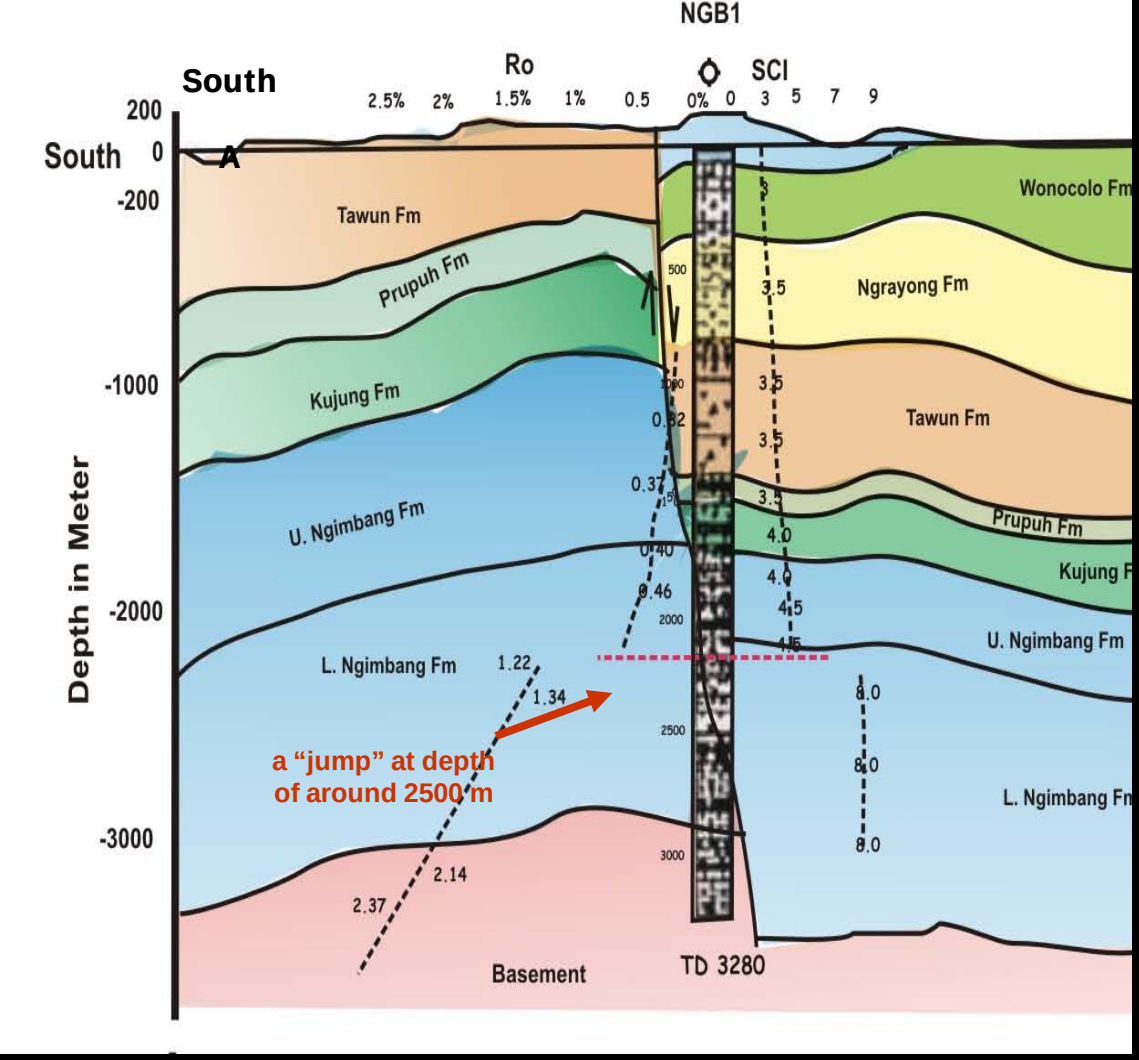




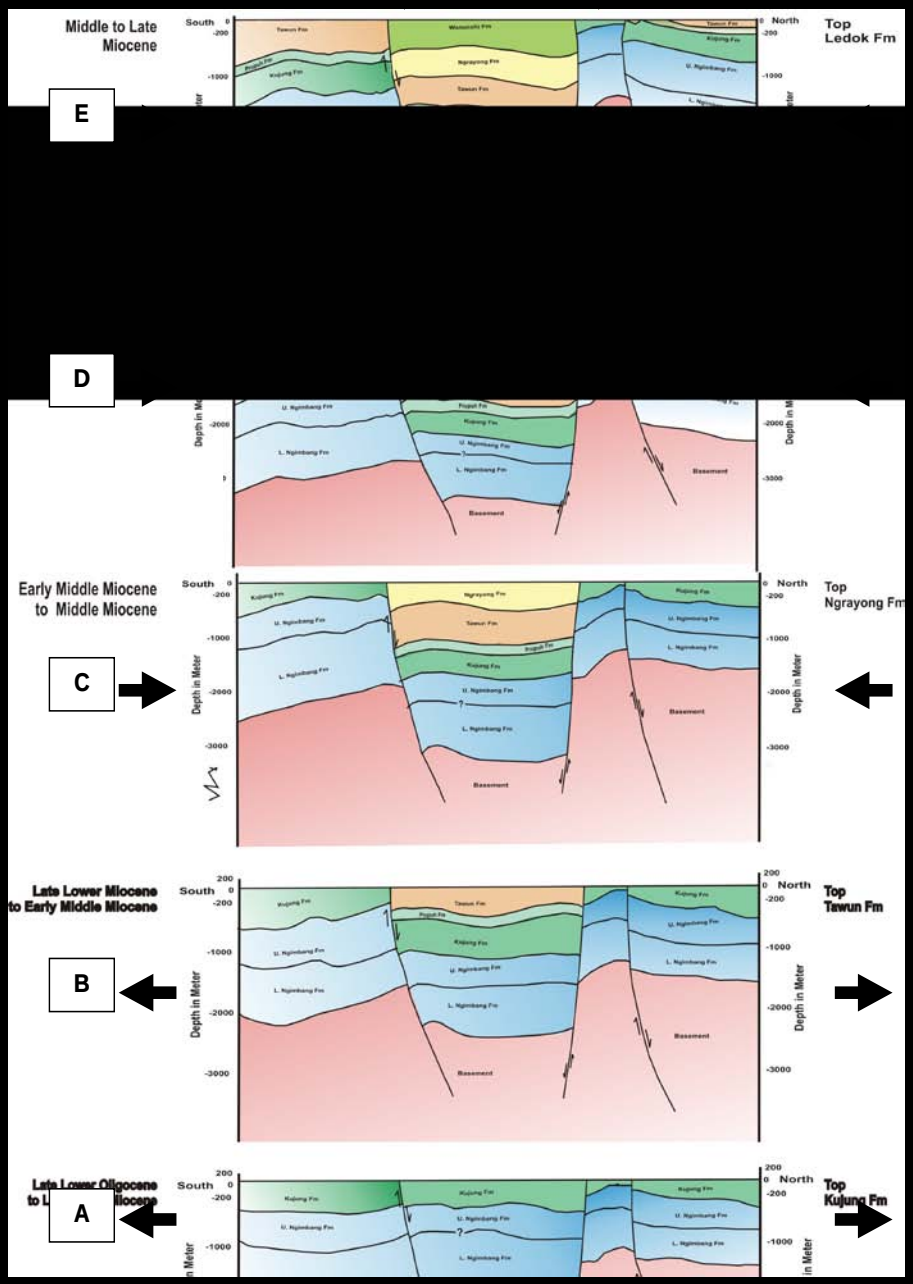
All of the assessments indicate a normal maturity increase.



a "jump" (break in slope) at depth of around 2500 m



Geological reconstruction crossing NGB-1 and KJG-1 wells



Geo-chronological reconstruction from Eocene to Late Miocene.

E. The transgression sedimentation :
Depositional of Bulu Fm carbonate, Wonocolo Fm and Ledok Fm

D. The compressional tectonic :
inversion started causing uplifting of the East Java Basin. In the deeper position sandstone and claystone of Ngrayong Formation were deposited

C. Transgression :
In the highs, reef carbonate of Prupuh Fm was formed and in the lows, the deeper facies of sedimentary rocks were deposited. The growth of the Prupuh reef carbonate ceased until N5 due to the huge transgression which then followed by sedimentation of the Tawun Fm.

B. Sedimentation of the Kujung Fm :
Sedimentary deposition was controlled by fault structures, whereas in the highs, erosion occurred

A. The extensional tectonic activity (rifting) :
resulting formation of horst & graben, invitation of Ngimbang Fm.

OIL & GAS SEEPAGE AND MUD VULCANO SURFACE DATA

Location : NGLANTUNG (Gembol)

HYDROCARBON ANALYSIS OF GAS SAMPLE

Component		Mol Percent	GPM	Description
Hydrogen Sulfide	H2S	0		
Carbon Dioxide	CO2	1,8415		
Oxygen	O2	***13,1073***		
Nitrogen	N2	***43,1318***		
Methane	CH4	41,9194		Biogenic or Thermogenic Gas
Ethane	C2H6	0	0	
Propane	C3H8	0	0	
Iso-Butane	i-C4H10	0	0	
n-Butane	n-C4H10	0	0	
Iso-Pentane	i-C5H12	0	0	
n-Pentane	n-C5H12	0	0	
Hexanes	C5H14	0	0	
Heptanes plus	C7H16 +	0	0	

Thermogenic/biogenic gas with low CO2 and some atmospheric contamination

Desa Gembol (Nglantung)

Coordinate : X : 0529481
Y : 9186806

Status : Active, bubble gas, no smell

Phenomenon of Tourism Area

Location : PLABENGAN SANGIRAN				
HYDROCARBON ANALYSIS OF GAS SAMPLE				
Component		Mol Percent	GPM	Description
Hydrogen Sulfide	H2S	0		
Carbon Dioxide	CO2	0,207		
Oxygen	O2	12,2431		
Nitrogen	N2	36,8273		
Methane	**CH4**	**50,647**		**Biogenic or Thermogenic Gas**
Ethane	**C2H6**	**0,0756**	**202**	**Thermogenic Gas**
Propane	C3H8	0	0	
Iso-Butane	i-C4H10	0	0	
n-Butane	n-C4H10	0	0	
Iso-Pentane	i-C5H12	0	0	
n-Pentane	n-C5H12	0	0	
Hexanes	C5H14	0	0	
Heptanes plus	C7H16 +	0	0	

Desa Plabengan

Coordinate : X : 481998
Y : 9175668

Status :Active, bubble gas, no smell

Thermogenic gas with low CO_2 and some atmospheric contamination

Location : SETREN				
HYDROCARBON ANALYSIS OF GAS SAMPLE				
Component		Mol Percent	GPM	Description
Hydrogen Sulfide	H2S	0		
Carbon Dioxide	CO2	0,1594		
Oxygen	O2	8,1994		
Nitrogen	N2	26,6117		
Methane	CH4	64,9623		**Biogenic or Thermogenic Gas**
Ethane	C2H6	0,0672	179	**Thermogenic Gas**
Propane	C3H8	0	0	
Iso-Butane	i-C4H10	0	0	
n-Butane	n-C4H10	0	0	
Iso-Pentane	i-C5H12	0	0	
n-Pentane	n-C5H12	0	0	
Hexanes	C5H14	0	0	
Heptanes plus	C7H16+	0	0	

Desa Setren, Ngawi

Coordinate : X : 0682094

Y : 9192648

Status : Active

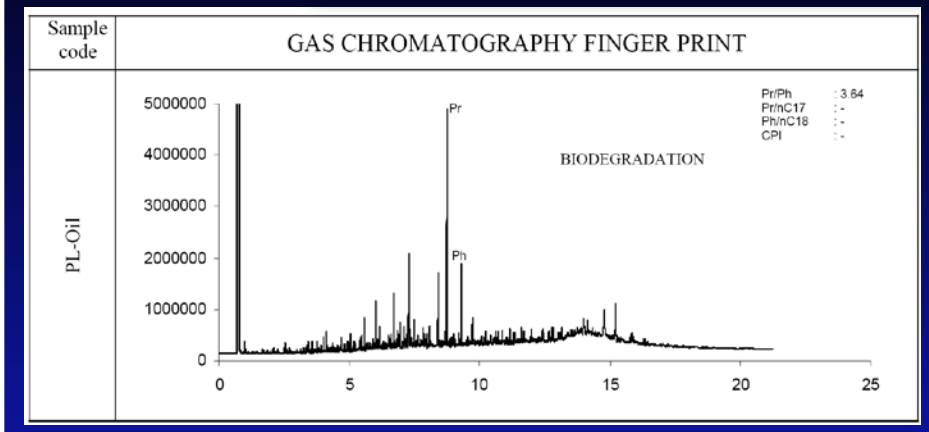
Thermogenic gas with low CO2 and some atmospheric contamination

Location : KAYANGAN API (WATER)				
HYDROCARBON ANALYSIS OF GAS SAMPLE				
Component		**Mol Percent**	**GPM**	**Description**
Hydrogen Sulfide	H2S	0		
Carbon Dioxide	CO2	28,1572		
Oxygen	O2	2,4589		
Nitrogen	N2	4,9374		
Methane	**CH4**	**64,1875**		**Biogenic or Thermogenic Gas**
Ethane	**C2H6**	**0,1896**	**506**	**Thermogenic Gas**
Propane	**C3H8**	**0,0609**	**167**	**Thermogenic Gas**
Iso-Butane	**i-C4H10**	**0,0085**	**0,0028**	**Thermogenic Gas**
n-Butane	n-C4H10	0	0	
Iso-Pentane	i-C5H12	0	0	
n-Pentane	n-C5H12	0	0	
Hexanes	C5H14	0	0	
Heptanes plus	C7H16+	0	0	

Phenomenon of Tourism Area

Thermogenic gas with high CO2

WONOKERTO OIL SEEP ANALYSIS



Chromatography finger print of oil sample PL-Oil

Oil identification based on saturated hydrocarbon fraction:

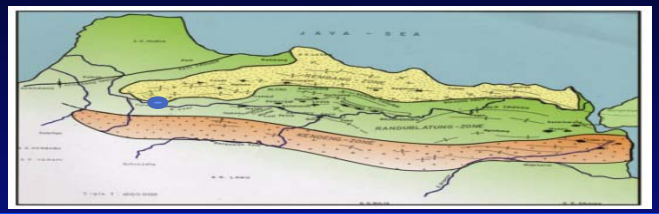
- ***Indication of biodegradation***

- ***High Pr/Ph ratio 3.64 (>3%) signifies either suboxic to oxic conditions or high input of allochtonous higher plant material.***

CHEMICAL COMPOSITION OF THE GAS BLEDUG KUWU

Purwodadi, Bledug Kuwu

Coordinate : X : 110°57'34.3"
Y : 7 °6 '13.1"

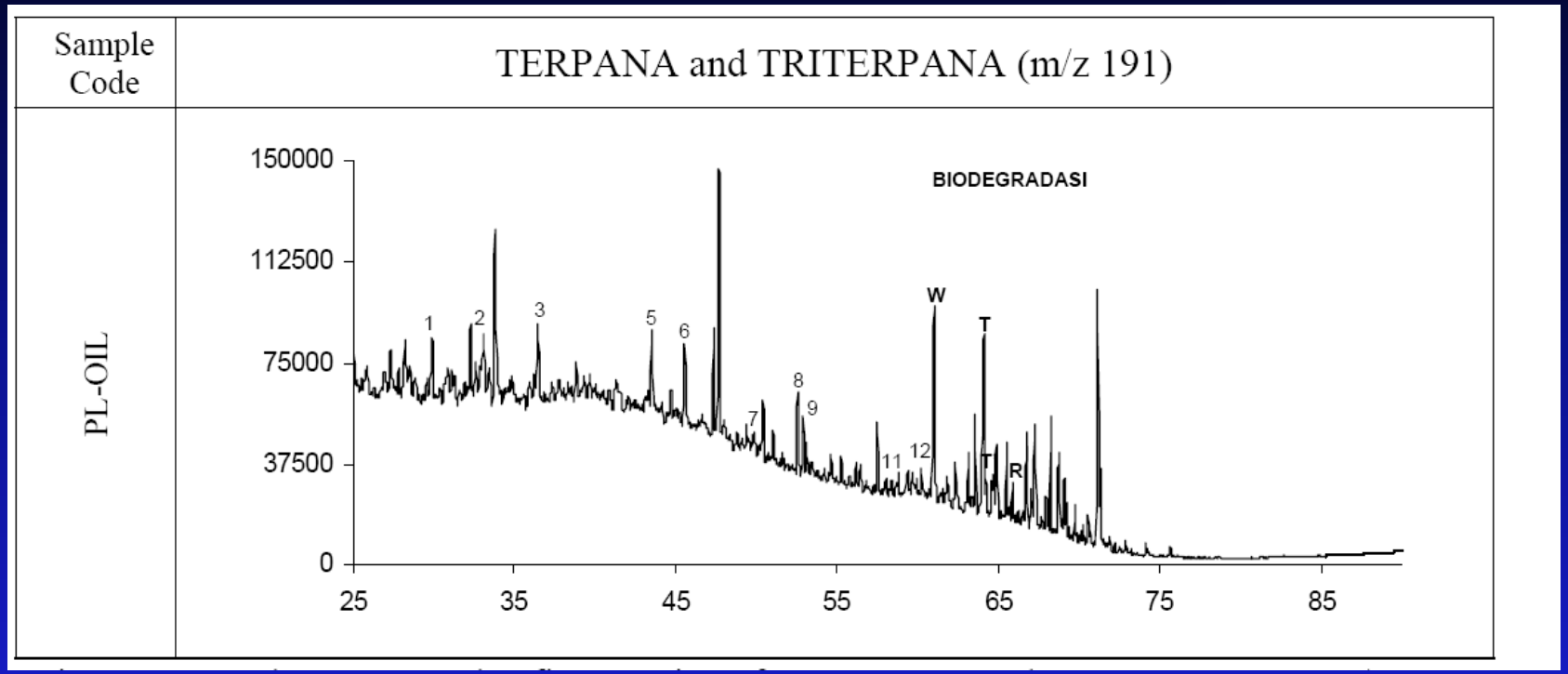


ELEMENTs	BLEDUG KUWU (% mol)	DESCRIPTION
H_2 (Hydrogen)	0.05	
O_2 + Ar (Oxygen + Argon)	6.03	
N_2 (Nitrogen)	19.65	
CH_4 (Methane)	4.89	Biogenic or Thermogenic Gas
CO_2 (Carbon Dioxide)	66.31	
H_2S (Hydrogen sulfide)	0.29	

Biogenic/Thermogenic gas with high CO2

Phenomenon of Tourism Area

WONOKERTO OIL SEEP ANALYSIS



Chromatography finger print of TERPANE and TRITERPANE (m/z 191) for sample oil (PL-Oil).

Maturity

- *Hopane distribution normally used to determine maturity and source environment is masked by the presence of bikadinane.*
- *The bikadinane index / [BMI (T/T'+R) = 2.83] indicates source thermally mature.*

CONCLUSIONS :

- Potential source rock North East Java Basin, Ngimbang Formation shale, TOC 4 % – 10 %, Thermal mature Ro 0.6 % - 1.4 %.
- Quality of hydrocarbon generation is oil and gas.
- Oil & Gas seepage in Kayangan Api, Nglantung, Setren, Wonokerto, Plabengan, and Bledug Kuwu mud volcano of indication Ngimbang Source Rock.
- Bledug Kuwu and Kayangan Api are interesting tourism area.
- Bleduk Kuwu gas dominated by 66.31% CO_2 66.31% mol whereas CH_4 only 4.8% mol.
- Kayangan Api gas containing a higher CH_4 than Bleduk Kuwu gas, also contain higher hydrocarbon gases (C_2-C_4) which indicate thermogenic gas.

ACKNOWLEDGEMENTS :

Pertamina
for providing the data

BPMIGAS
for permission to publish data

Prof. R..P. Koesoemadinata
as one of our supervisors

Pusat Kajian Minyak & Gas Bumi (PKMIGAS)
UPN "Veteran" Yogyakarta
for sponsorship


Thank you