Play System from the Last Decade Discoveries in Indonesia Basins*

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Abstract

In the past 10 years of hydrocarbon exploration history in Indonesia, there are several significant hydrocarbon discoveries. Generally, the play concept has moved to the deeper target and older reservoir. Several new play concepts for the Eastern Indonesia area are thin-skinned thrust system in the turbidites in the Kalimantan deepwater, Miocene reef play in the Sulawesi area, and Jurassic sand in Papua and East Timor gap. In East Java basin there are two explorations targets that have been pursued for the last 10 years; they are Oligo-Miocene reef and volcaniclastic Pliocene sediments. Meanwhile in the Sumatra area the target has changed into the deeper target, which is Oligo-Miocene syn-rift sediments.

The successful discoveries have resulted in other companies learning from them and increasing their exploration activities in the past five years by developing new concepts in their blocks or acquiring new blocks in nearby areas. (Mahakam deep water block discovery has been resulted in other discoveries in the surrounding area, including in Tarakan deepwater area.)

The new play exploration strategy, by defining the new play concept from lessons learned from relatively recent discoveries, has become the current model in the exploration activities. Therefore, understanding the play concept in new discoveries will immediately upgrade the opportunity to find hydrocarbons.

PLAY SYSTEM FROM THE LAST DECADE DISCOVERIES IN INDONESIA BASINS

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- Indonesian Unconventional Play Types Criteria
- Unconventional Play Types in Indonesia
- Indonesian Discoveries in Last Decade
- Unexplored Potential Area
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INTRODUCTION

INDONESIAN EXPLORATION HISTORY PERIODS

1. Dutch Government (1865 – 1940)

Exploration by Dutch Government started in 1865 and first exploration well drilled 1872
First oil field discovery (Telaga Said, North Sumatera) 1885
Exploration target defined by outcrop mapping and shallow drilling technology

2. After Indonesian Independence (until early 1970)

Commercial working area operated by several companies
Discovered Duri, Talang Akar, Minas Field using simple exploration methods and increased the production, lifting up to 1,000,000 BPOD

3. Early 1970

Start of applied subsurface 2D seismic technology
Production lifting increased up to 1,600,000 BOPD

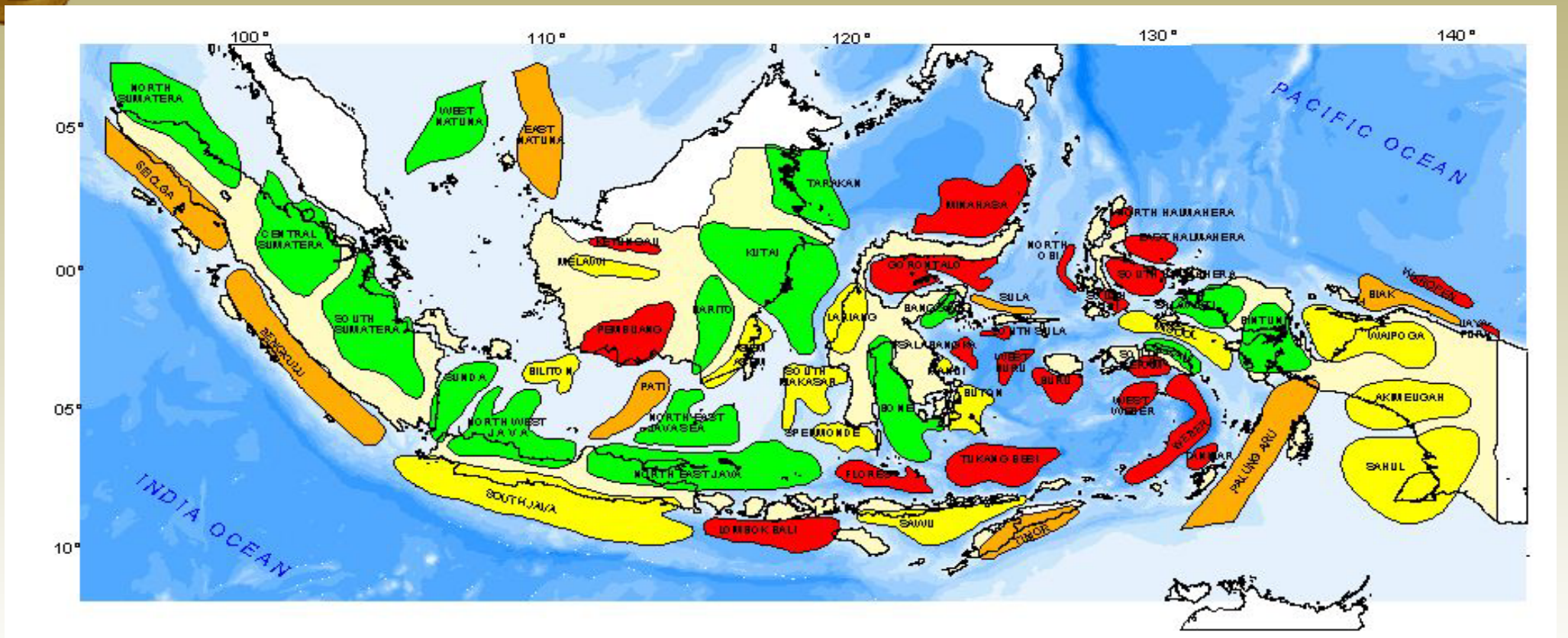
4. 1980 – 1990

Fluctuation of HC Production (lowest in mid1980 and gradually increased until1990)
2D and deep target drilling applied
mostly productive fields located in back-arc & deltaic passive margin settings

5. 1990 – now

Old fields started to depleted
2D / 3D and drilling technology improvement
trigger to find other targets (unconventional)

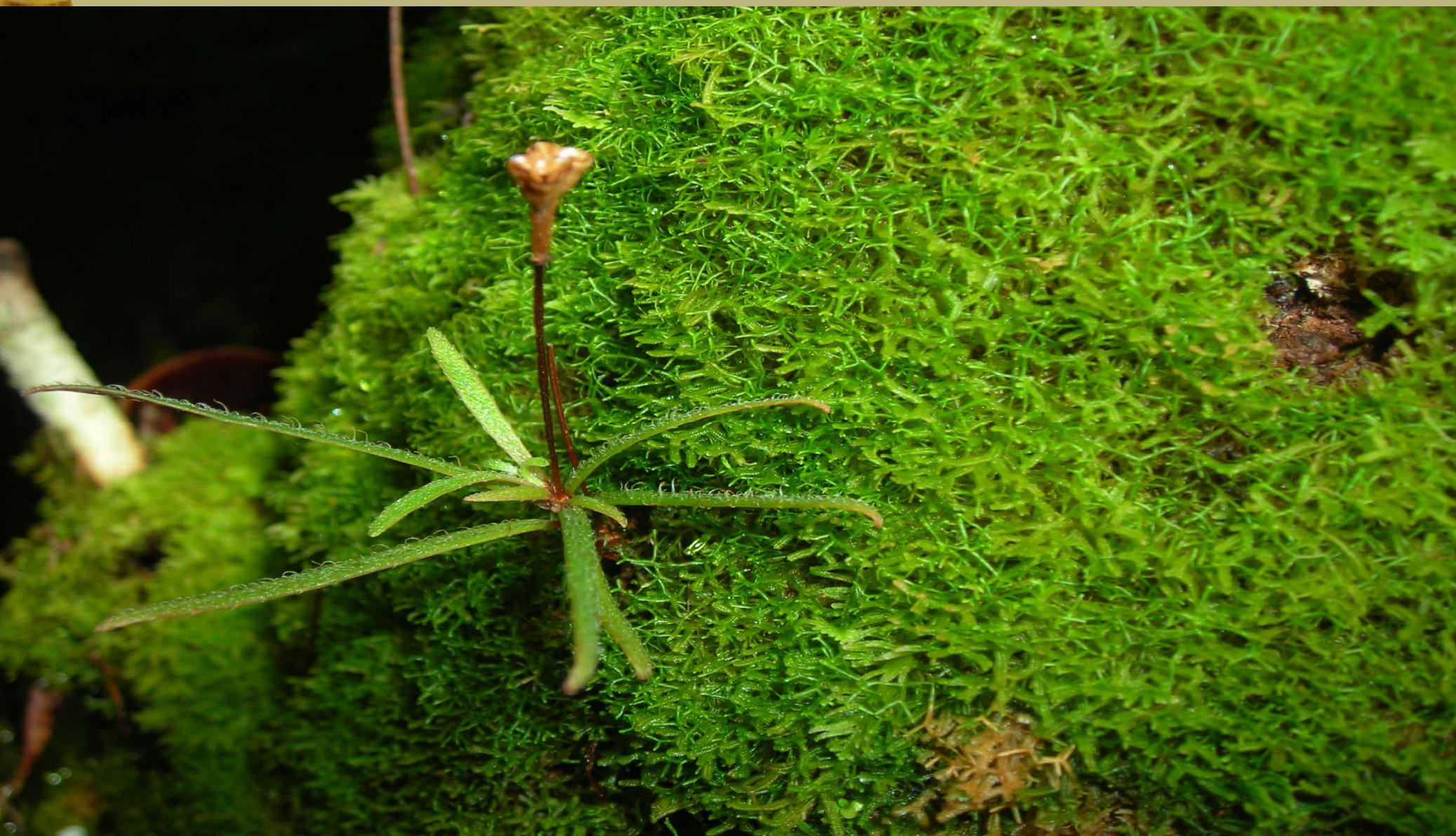
INDONESIAN TERTIARY BASIN



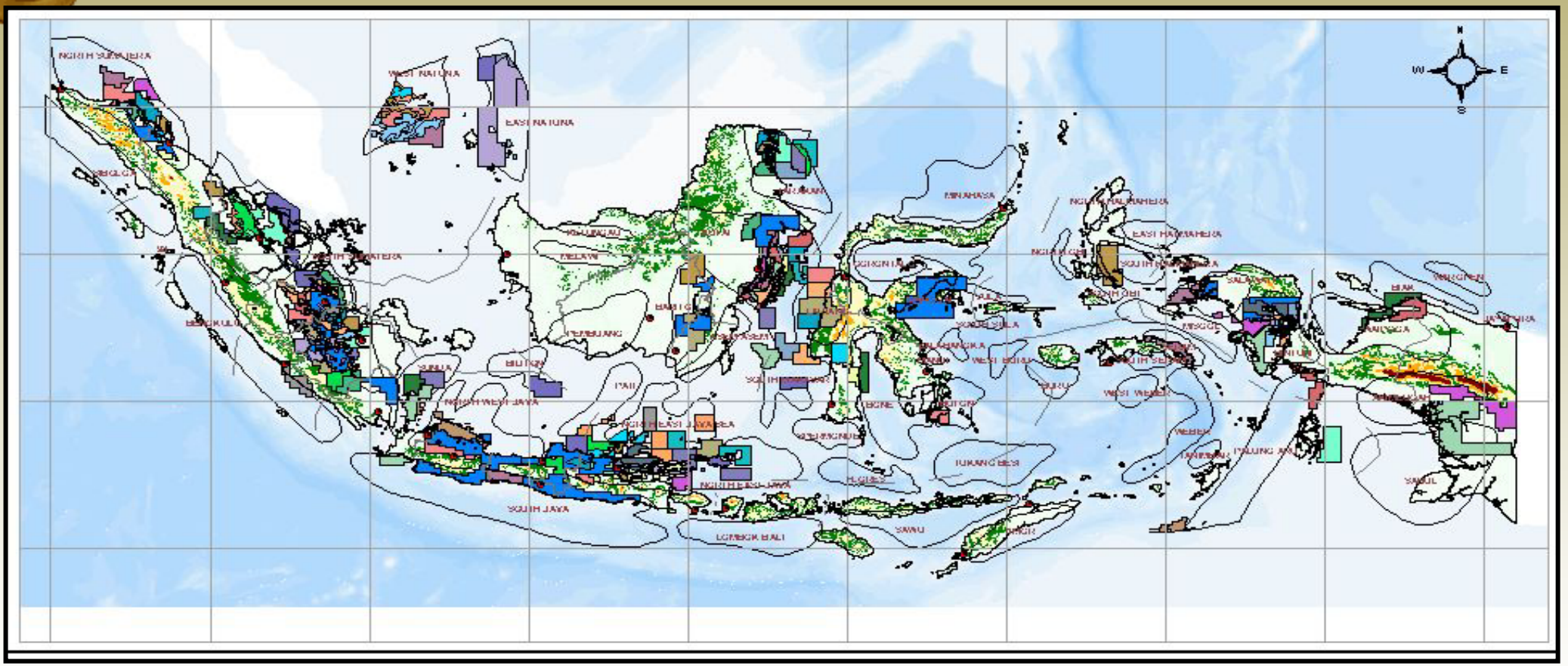
LEGEND :

- PRODUCING BASIN (16)
- BASIN WITH DISCOVERIES, NON PRODUCING (8)
- DRILLED BASIN, NO DISCOVERY (14)
- UNDRILLED BASIN (22)

UNCONVENTIONAL PLAY TYPES



INDONESIA WORKING AREA



Tertiary Basin	60
Working Area	167
Production Block	58
Exploration Block	109

PLAY TYPES

In general, the exploration targets in Indonesia before 1990 are situated in Western Area and mostly discoveries were in **Neogene Back-Arc Basin** and **Passive Margin Deltaic Settings**, called **Indonesian Conventional (classic) Play Types**, Including :

1. Classic Shallow Target
2. Classic Clastics
3. Classic Carbonates
4. Classic Stratigraphic & Combination

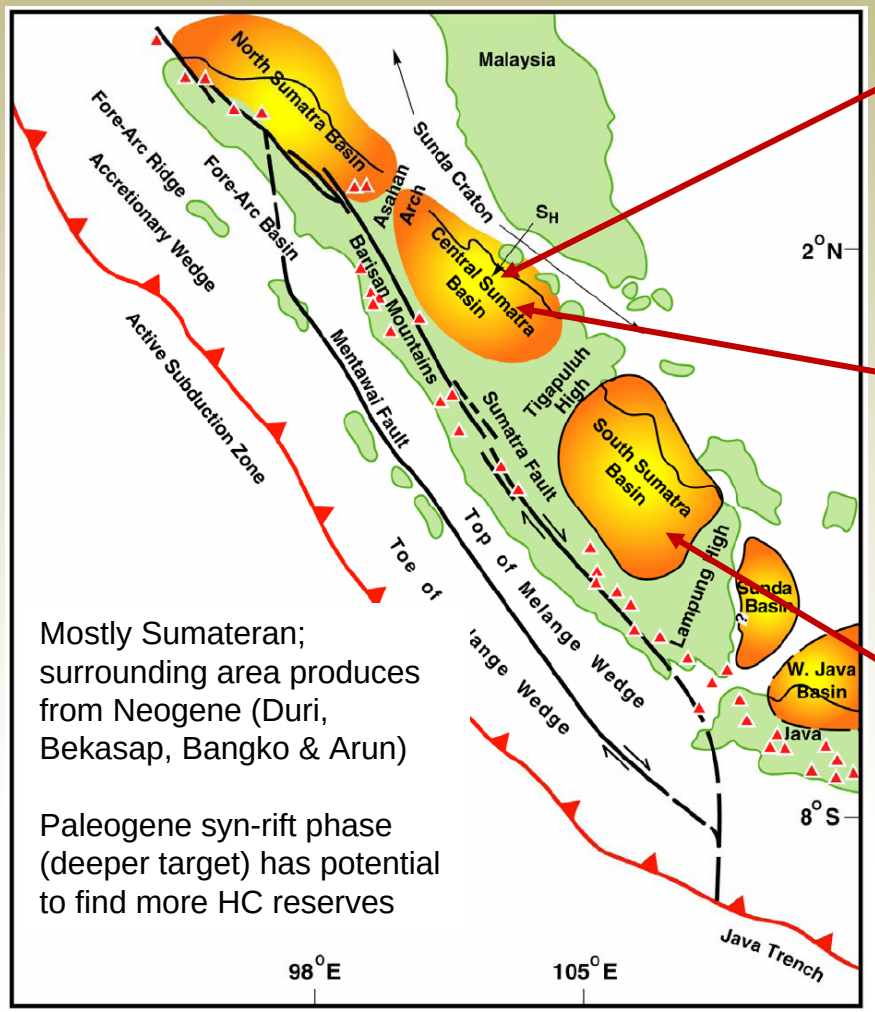
Thus **Indonesian Unconventional Play Types** are play types besides the conventional types as mentioned above.

The successful unconventional plays have been explored from 1990; they are in :

1. Deep Oligo-Miocene ~ Rift Phase Clastics (5)
2. Deep Oligo-Miocene ~ Carbonate (6)
3. Deep water clastics (Pro-Delta) (7)
4. Volcaniclastics (8)
5. Pre-Tertiary & Basement (9)
6. Collision Tectonic Setting Complex (10)

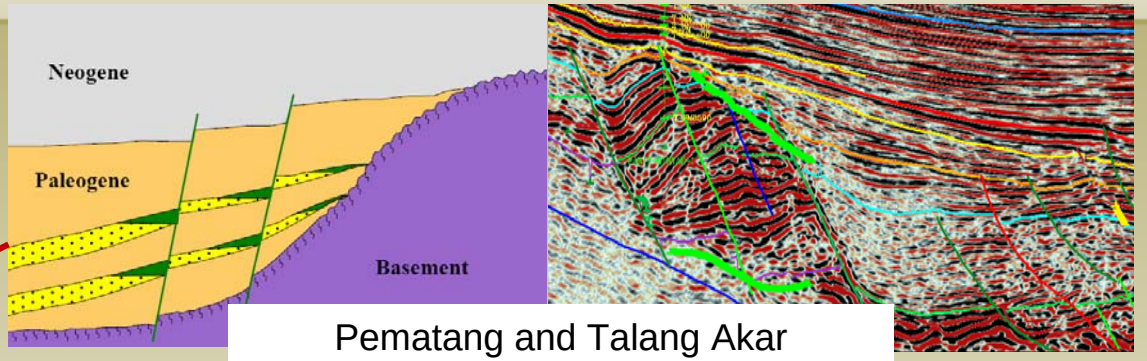
SUMATERA BACK-ARC

DEEP CLASTIC PLAY

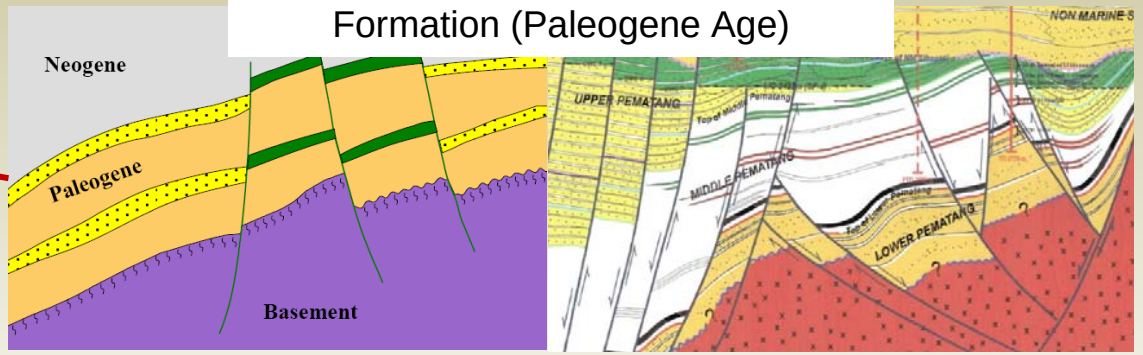


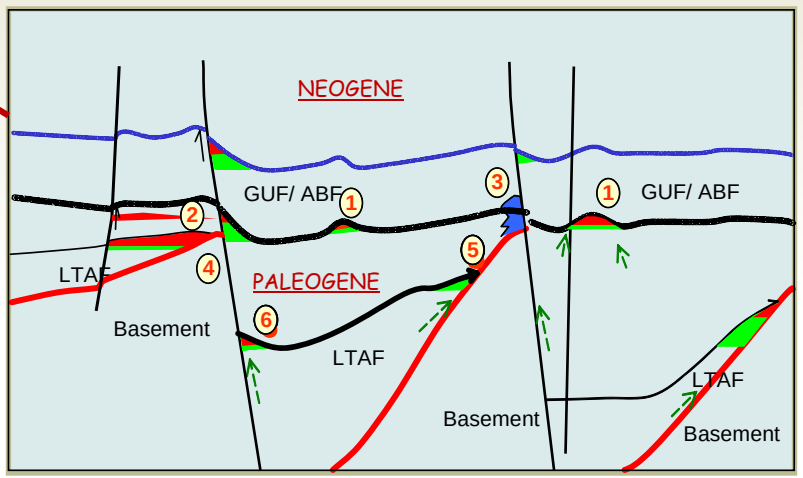
Mostly Sumateran; surrounding area produces from Neogene (Duri, Bekasap, Bangko & Arun)

Paleogene syn-rift phase (deeper target) has potential to find more HC reserves



Pematang and Talang Akar Formation (Paleogene Age)

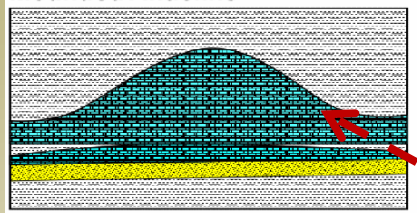




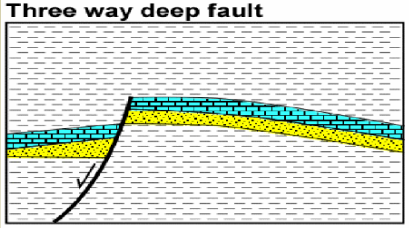
EAST JAVA AREA

DEEP CARBONATE & CLASTIC PLAY

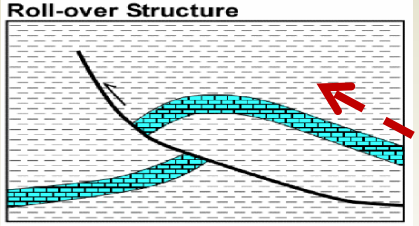
Trap Type 1
Mounded Anticline



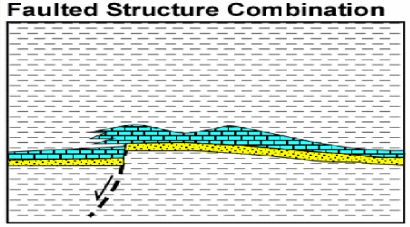
Trap Type 2
Three way deep fault

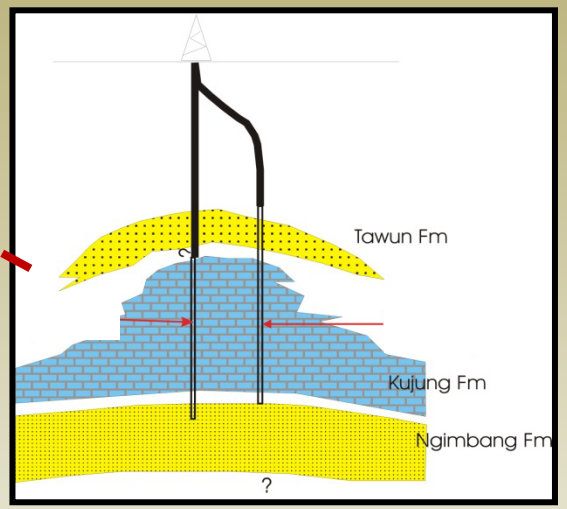


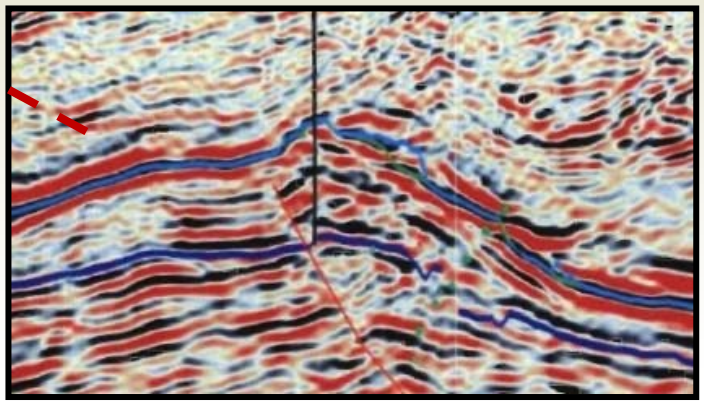
Trap Type 3
Roll-over Structure

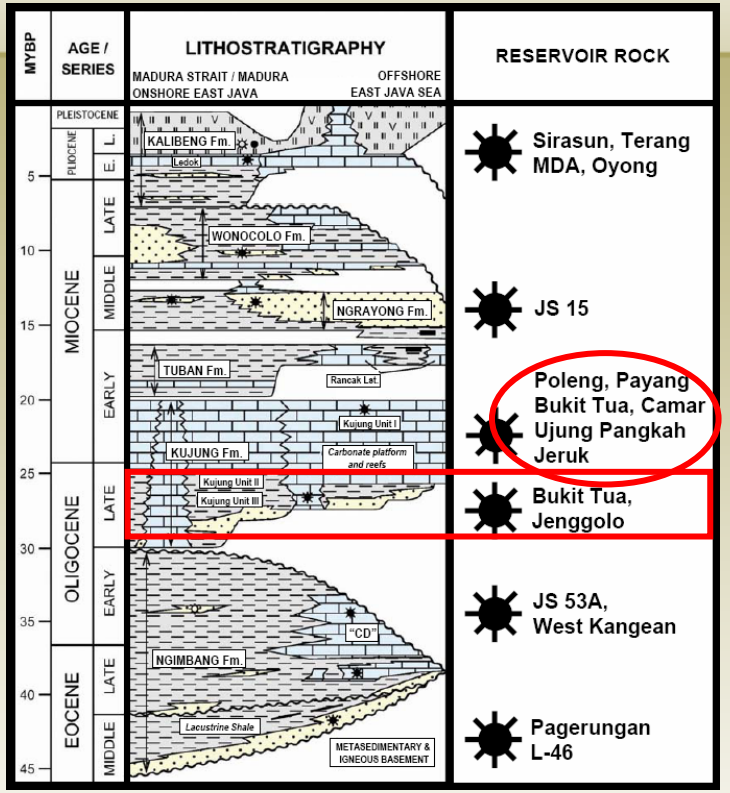


Trap Type 4
Stratigraphic Carbontae Build-up
Faulted Structure Combination



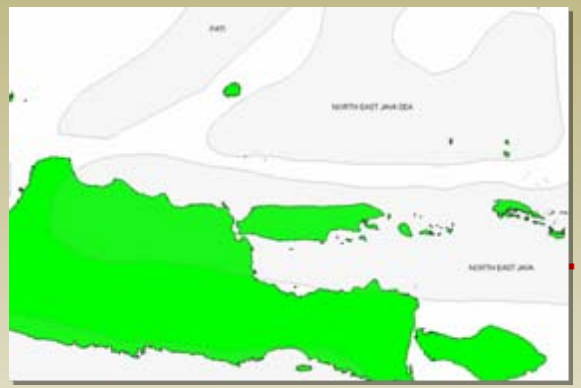


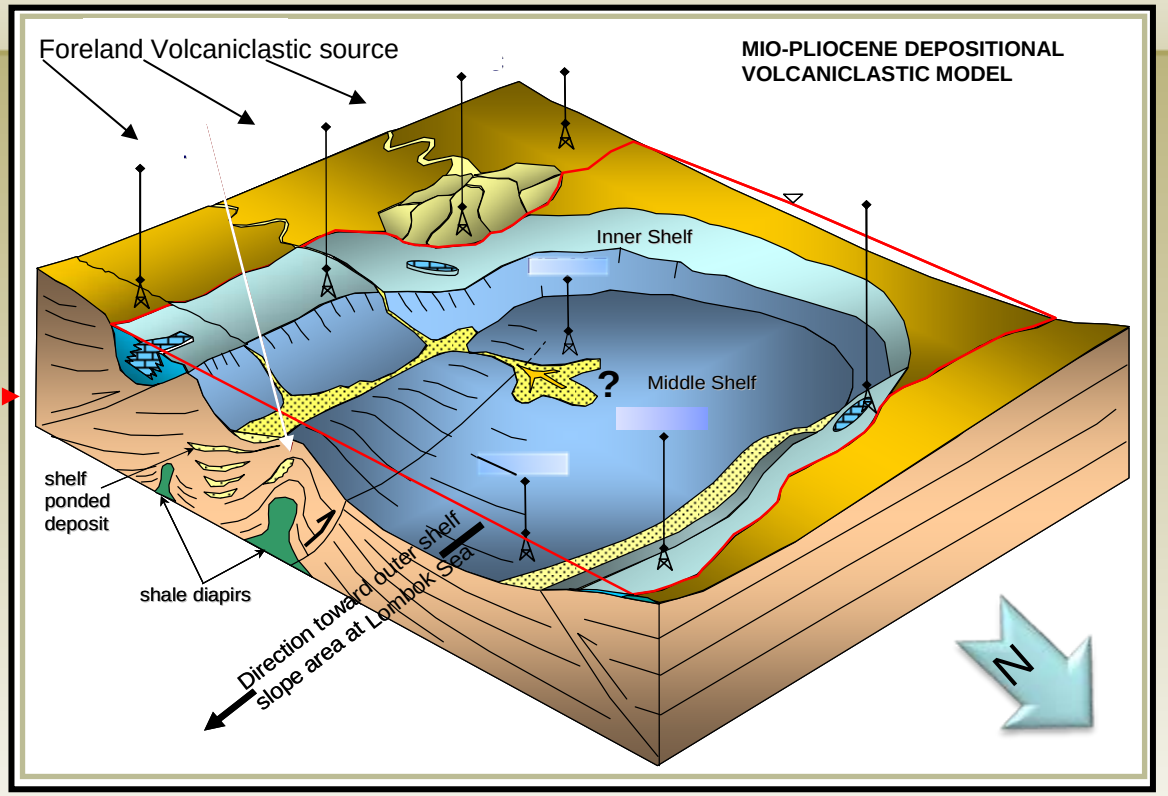


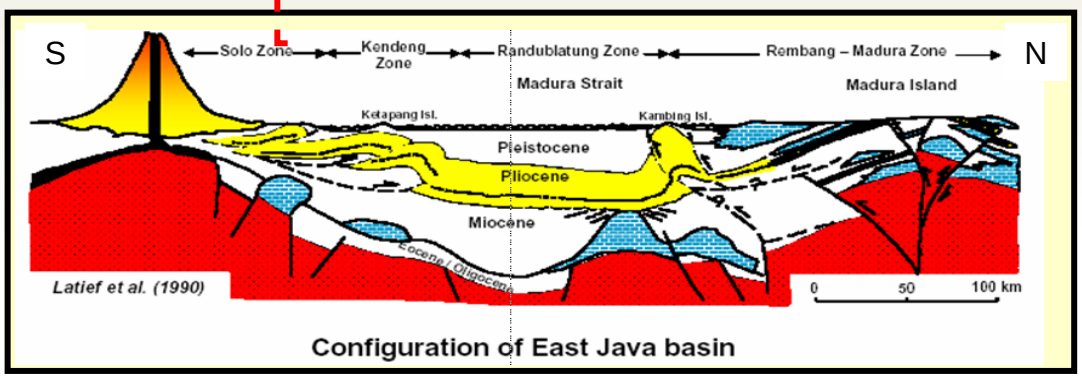


EAST JAVA AREA

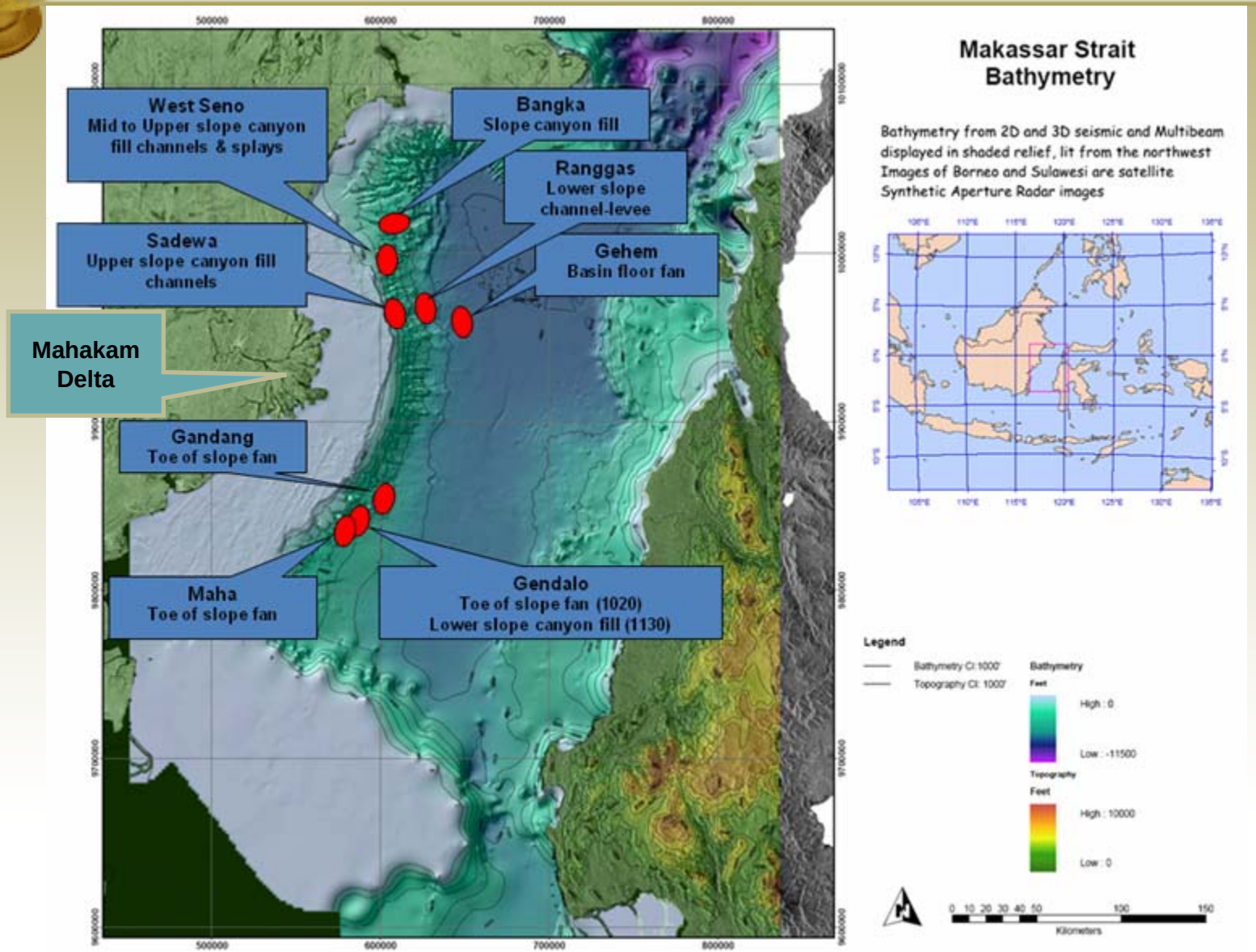
MIO-PLIOCENE VOLCANiCLASTIC PLAY







KALIMANTAN DEEP WATER
PRO-DELTA SAND PLAY



Success of deepwater play in Indonesia was firstly shown by exploration efforts of Unocal and its partners in the Lower Kutei – North Makassar Basin.

A number of fields have been discovered in Lower Kutei – North Makassar Basin since the late 1990s, including : Merah Besar, West Seno, Gendalo, Gandang, Gula, Gada, Ranggas, and Gehem.

EASTERN INDONESIA / AUSTRALIAN CONTINENTAL RELATED

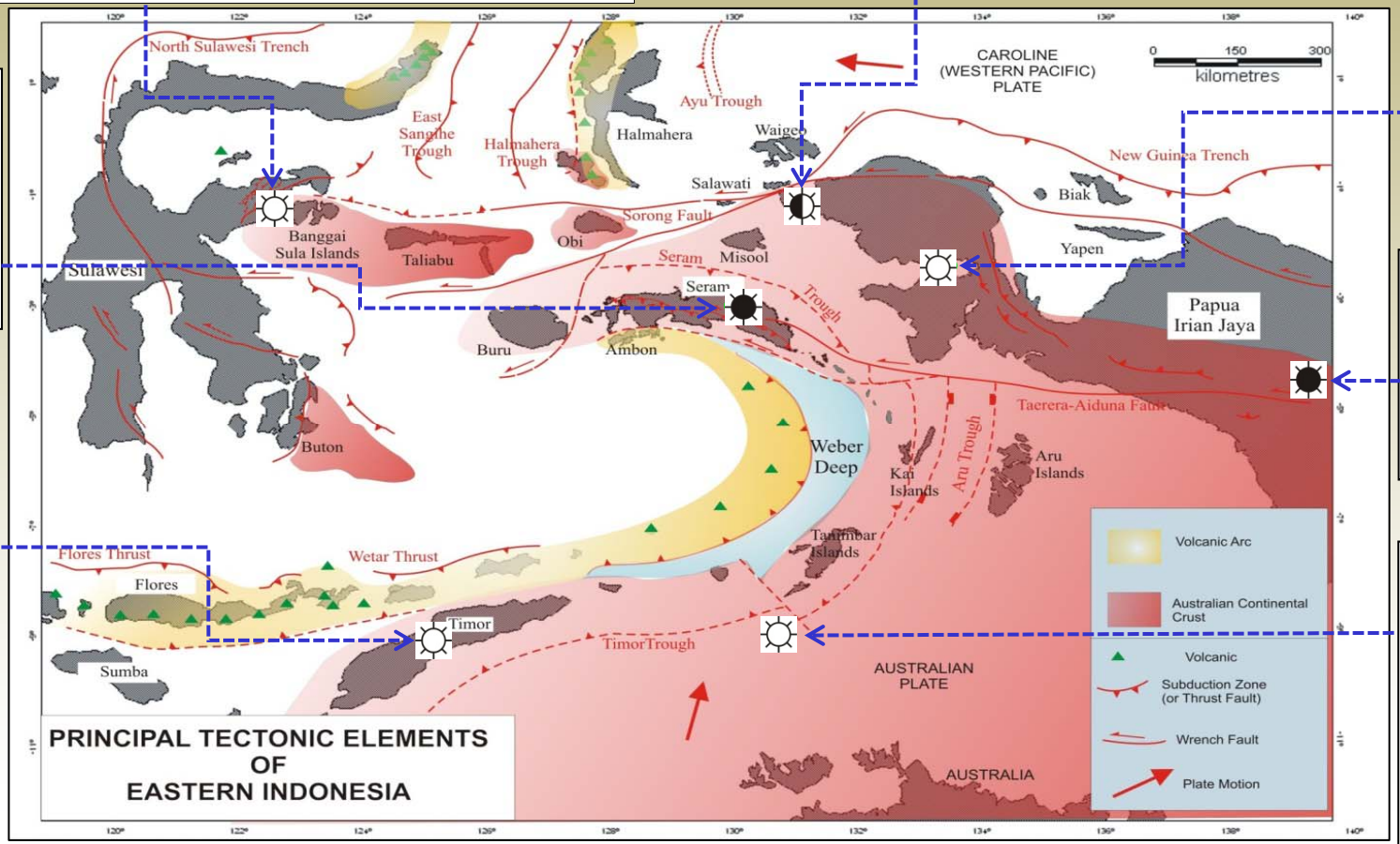
(PASSIVE CONTINENTAL MARGIN & COLLISION PLAY)

Tomori Area ; Collision-Related Play in Miocene Carbonate Reservoir ; First Discovery in 1999 ; Total Estimated Reserve 3.0 TCFG and 65 MMBC (D. Hasanusi et.al., 2004)

Salawati Basin ; Old Oil & Gas Discoveries in Miocene Carbonate Reservoir

Bintuni Basin ; The Pre-Tertiary First Discovery in 1991 ; Middle Jurassic Sandstone Reservoir ; Total Reserves Potential 24 TCFG (Larry J. Casarta et. al., 1998)

Seram Area ; Old Oil Discoveries at Collision-Related Play in Cenozoic and Jurassic Carbonate Reservoir



Central Range of Papua ; Collision-Related play in Upper Jurassic Sandstone Reservoir ; Non-Commercial oil discoveries (1998)

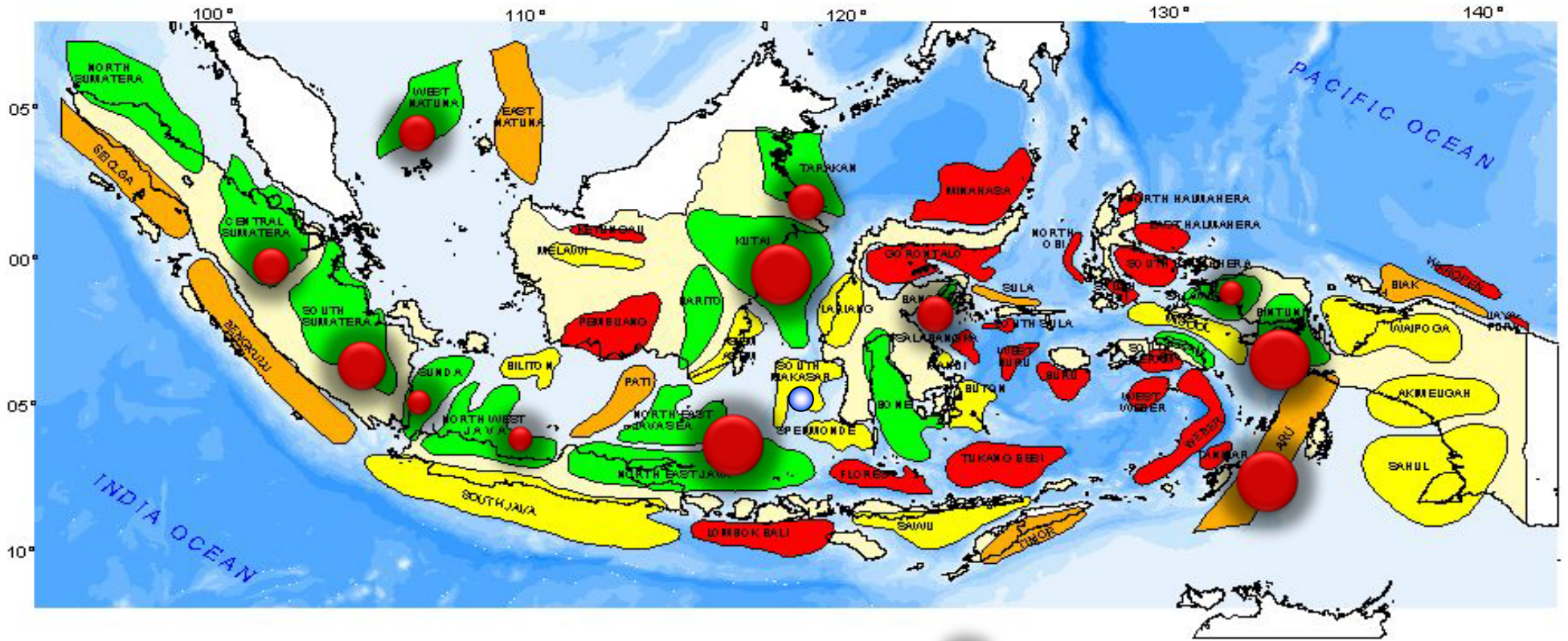
Timor Area ; Old Gas Discoveries in Collision-Related Play in Jurassic Sandstone Reservoir

Abadi Field (Bonaparte Basin) ; First Discovery in 2000 ; Middle Jurassic Sandstone Reservoir ; Preliminary Estimated Reserves 5 TCFG (H. Nagura et. Al., 2003)

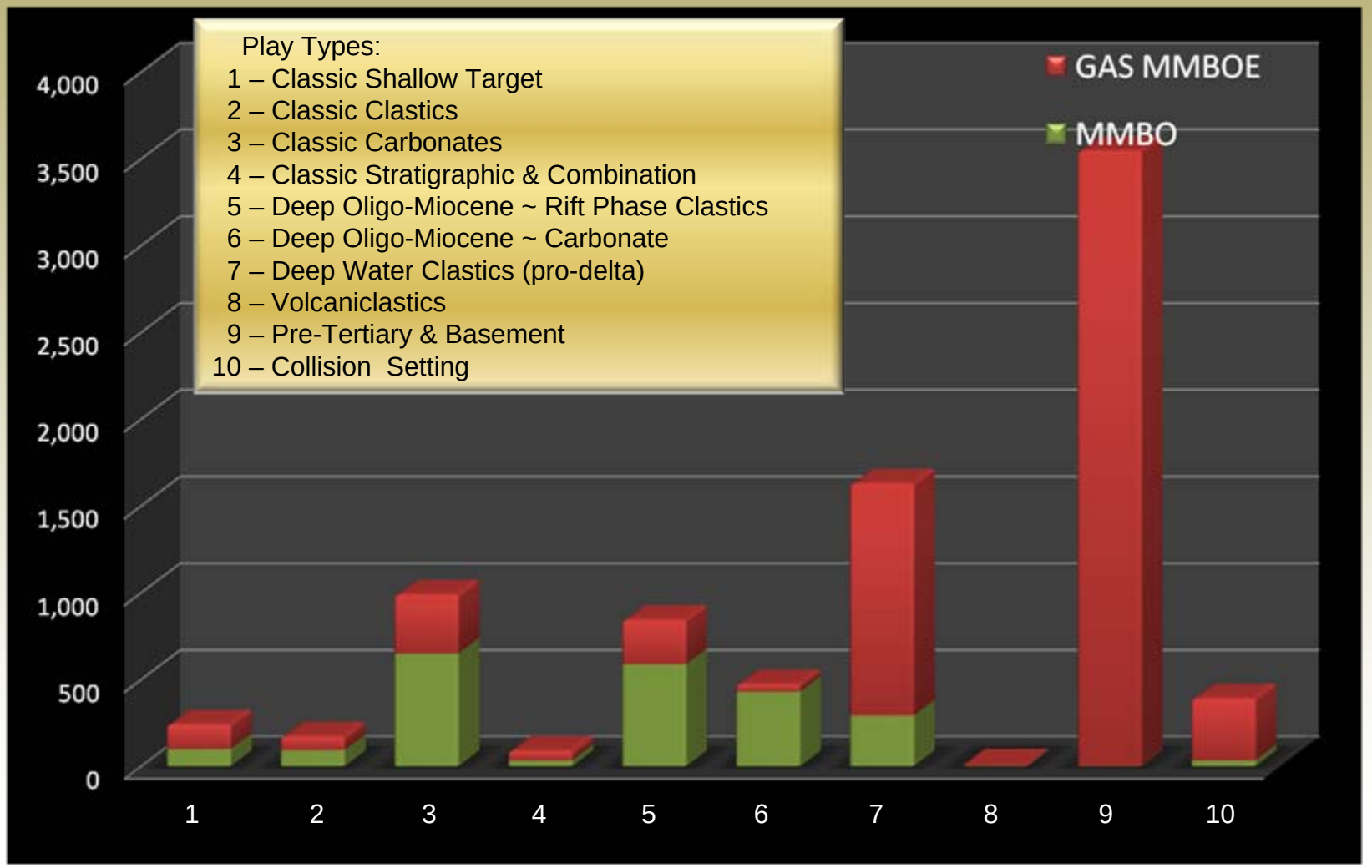
Principal Tectonic Elements Map of Eastern Indonesia shows the related Australian Continent in transparent red colour (Modified from Nilandroe & Baraclough,2003)

Indonesian Discoveries in Last Decade

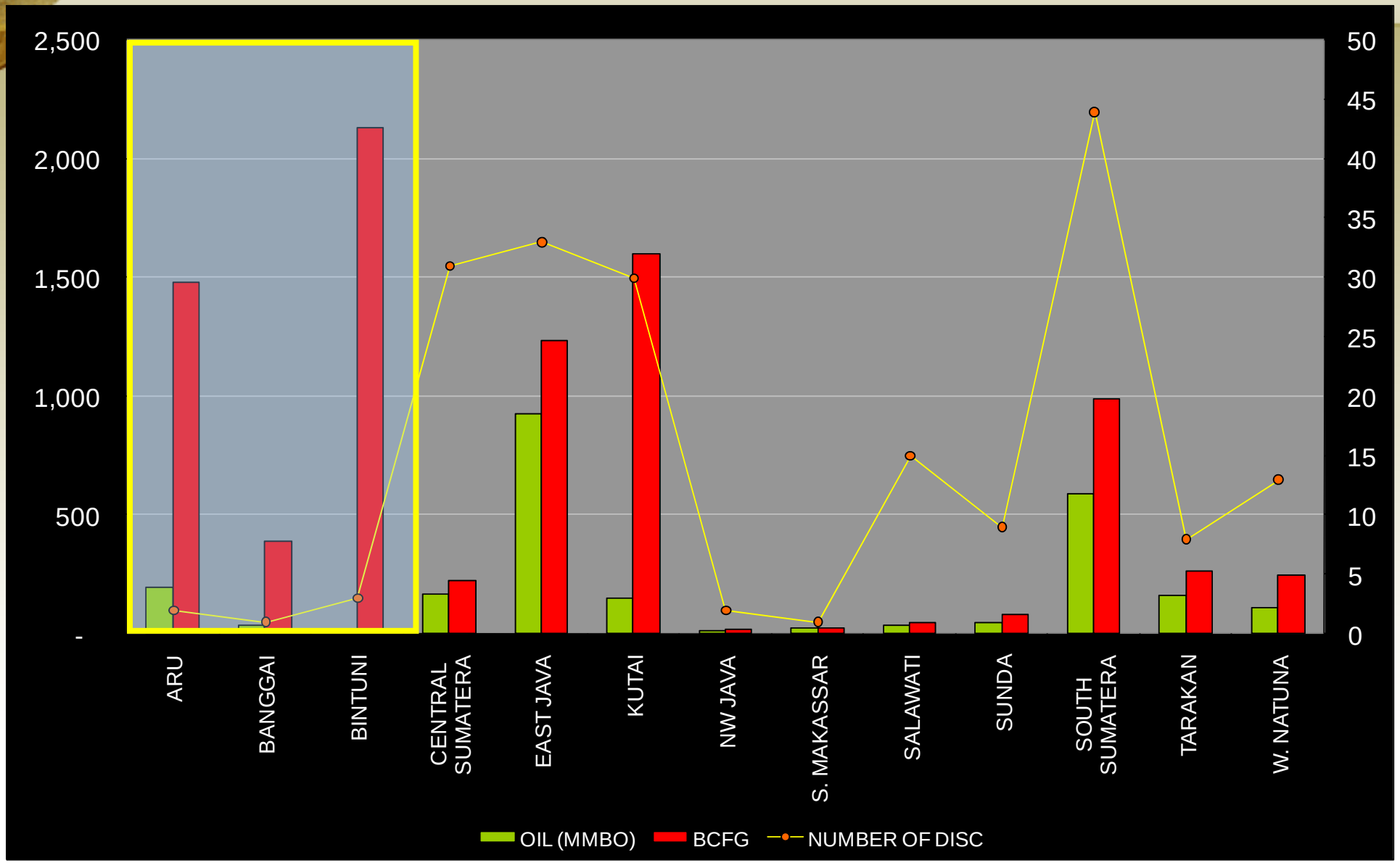
1998 – 2007 DISCOVERIES



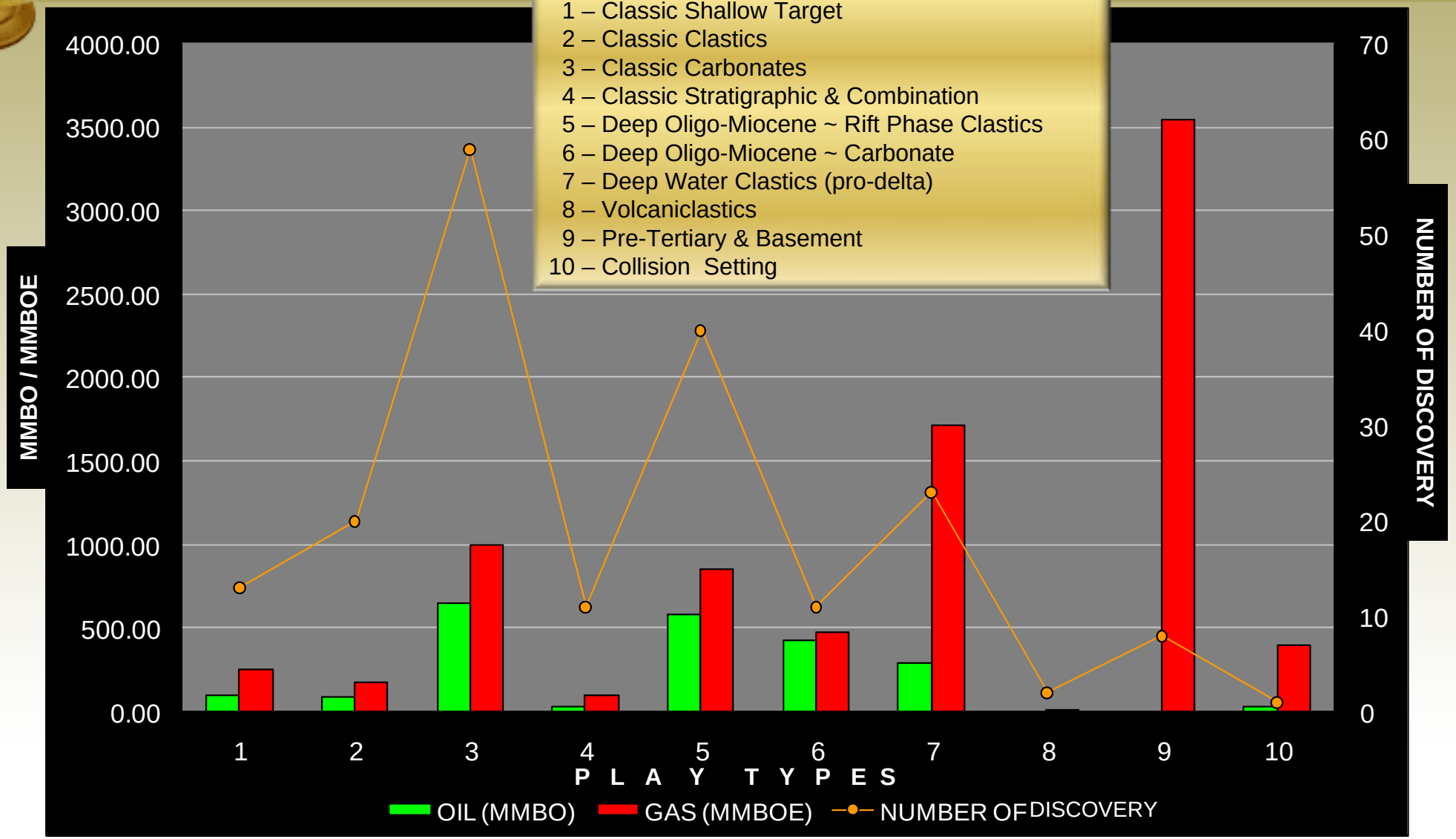
DISCOVERY RESERVES BY PLAY TYPE



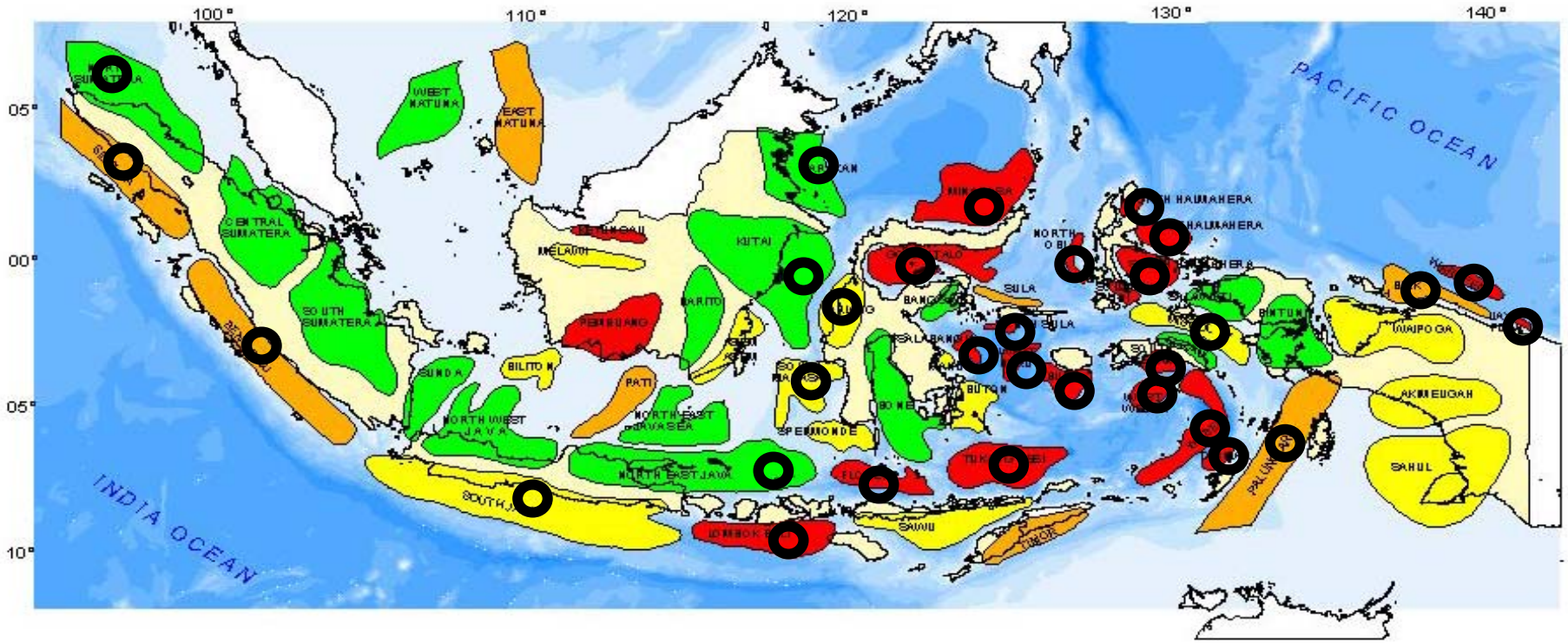
DISCOVERY BY BASIN



RESERVES vs NUMBER OF DISCOVERY



Many Frontier "Deep Water" Basins of Indonesia Remain Unexplored



- *producing (16)*
- *discovery, non producing (8)*
- *no discovery (14)*
- *no drilling (22)*
- *deep water basins (31 basins)*

New Opportunities !

Awang H. Satyana – frontier exploration (Dec. 2007)

CONCLUSION

Why Unconventional Type ?

- Oil production from mature field is declining.
- New reserve addition from conventional (classic) play type is minor. No significant replacement of reserves that are being reduced by HC production.
- Unconventional play type discoveries, which are ready to develop, give larger HC new reserves.
- Pre-Tertiary, related to collision with Australian plate, contributed the most of HC reserves in last decade and needmore exploration efforts.
- Some frontier basins that have unconventional play types may trap “big fish” (high risk, high reward as opposed to low risk, low reward).

THANK YOU

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Total E&P Indonesie

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