

Speculative Pre-Tertiary Petroleum Systems and Play Types of Myanmar*

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Abstract

Although a large proportion of the world's hydrocarbon reserves is found in Mesozoic age rocks and many oil and gas fields are discovered in the Paleozoic sedimentary basins throughout the world, up to now, Myanmar is still exploring and producing oil and gas from Tertiary petroleum reservoirs only. The Pre-Tertiary basins of the country received minor consideration and remain virtually unexplored. Declining of oil and gas production from Tertiary basins of Myanmar in recent years impels us to start full-scale petroleum exploration in Pre-Tertiary basins. In this presentation, available geo-scientific data have been used to decipher tectono-stratigraphy, paleogeography, sedimentation processes and petroleum geological evaluation to define petroleum systems of the pre-Tertiary basins. Besides, implication of various volcanic activities during different periods were also assessed which may be responsible for induced maturity effects towards hydrocarbon generation, migration and accumulations.

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Speculative Pre-Tertiary Petroleum Systems and Play Types of Myanmar

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OUTLINE

- OBJECTIVE
- PRE-TERTIARY PETROLEUM PROVINCES
- METHOD OF STUDY
- SEQUENCE OF MAJOR PRE-TERTIARY EVENTS IN MYANMAR
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- BRIEF PETROLEUM GEOLOGY OF INDO-BURMAN RANGES AND RAKHINE DEEPWATER AREA.
- SPECULATIVE MESOZOIC PETROLEUM SYSTEMS OF INDO-BURMAN RANGES AND RAKHINE DEEPWATER AREA
- BRIEF ACCOUNTS ON PETROLEUM GEOLOGY OF PRE-TERTIARY PETROLEUM CONCESSIONS OF MYANMAR.
- CONCLUSION AND RECOMMENDATIONS

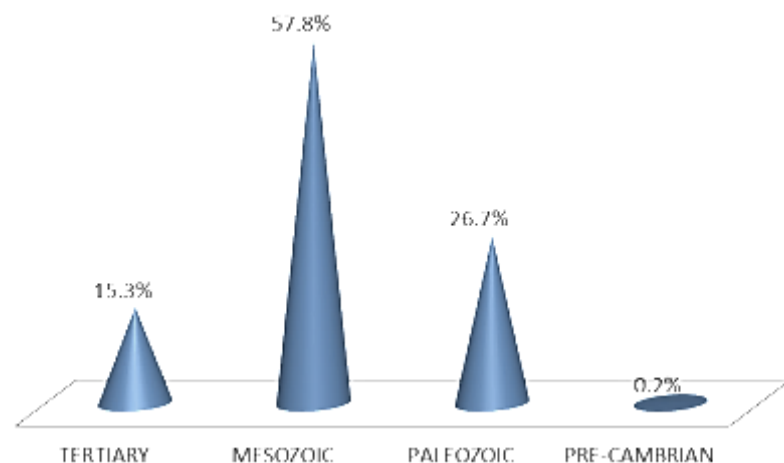
Although a large proportion of the world's hydrocarbon reserves is found in Mesozoic age rocks and many oil and gas fields are discovered in the Paleozoic sedimentary basins throughout the world, up to now, Myanmar is still exploring and producing oil and gas from Tertiary petroleum system only. The Pre-Tertiary basins of the country received minor consideration and remain virtually unexplored.

STRATIGRAPHIC DISTRIBUTION OF DISCOVERED OIL AND GAS RESERVOIRS IN MYANMAR

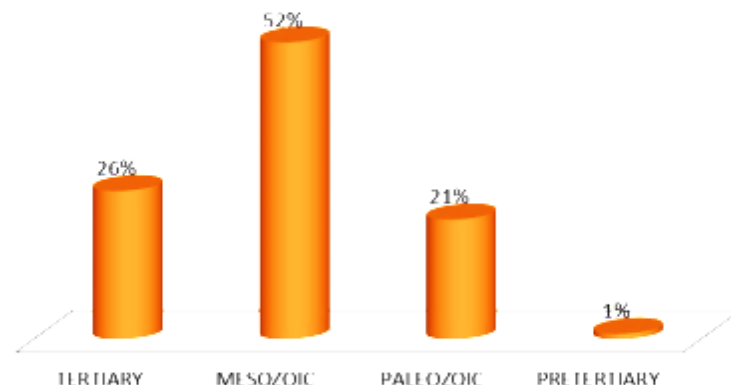
Basin Type	Name of Basin	TERTIARY					MESOZOIC	PALEOZOIC
		Plei-Plio	Mio	Olig	Eoc	Pal		
Fore-arc basins	Hukaung							
	Chindwin		▲	●	▲	●		
	Salin		▲	●	▲	●		
	Pyay Embayment	▲	▲	●				
	Ayeyarwaddy	▲	▲	●				
	West Moattama		▲	▲				
Back-arc basins	Putao							
	Myitkyina-Katha							
	Shwebo-Monywa			▲				
	Bago Yoma		▲					
	Sittaung							
	East Moattama	▲	▲	▲				
	Tanninthary		▲					
	East Andaman Basin							
Foredeep Basins	Rakhine Offshore	▲						
	Rakhine coastal		●	●	●			
Intermontane basins	Mawlamyine							
	Mepale		●					
	Hsipaw-Lashio							
	Kalaw							
	Namyau							

● Oil ● Shale oil ▲ Biogenic gas ▲ Thermogenic wet gas ▲ Thermogenic dry gas

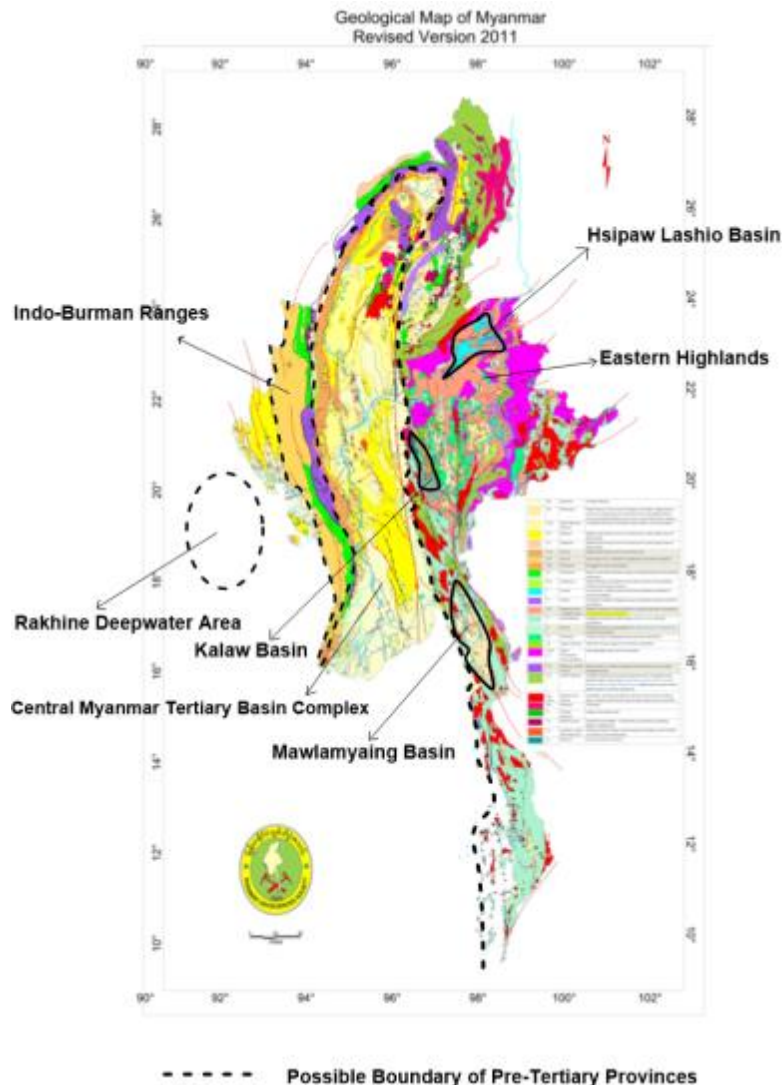
WORLDWIDE STRATIGRAPHIC DISTRIBUTION OF MAJOR SOURCE ROCKS



WORLDWIDE STRATIGRAPHIC DISTRIBUTION OF MAJOR RESERVOIR ROCKS



PRE-TERTIARY PETROLEUM PROVINCES OF MYANMAR



----- Possible boundary of Pre-Tertiary Petroleum Provinces

S.N	Province	Basin	Exploration Status
1	Eastern Highlands	Hsipaw-Lashio	Surface geological survey
		Kalaw	Surface geological survey Gravity- 1174.82 Line Km
		Mawlamyaing	Surface geological survey Gravity- 246.01 Line Km Magnetic-1949 Line Km Aero magnetic/ gravity-4518 Line Km
2	Indoburman Ranges	Not identify yet	Surface geological surveys Ground gravity in limited area
3	Rakhine Offshore	Deepwater	Gravity 2D seismic survey 3D seismic survey in some blocks

In Myanmar the Pre-Tertiary strata are present in the Eastern Highlands (Kachin-Shan-Tanintharyi region), Indo-Burman Ranges (Rakhine-Chin- Naga hills) and Rakhine deepwater area.

- ❖ Three sizable pre-Tertiary basins are identified in Eastern Highlands .
- ❖ No specific basin is identified to date in Indo-Burman Ranges.
- ❖ Existence of pre-Tertiary strata was identified by recent 2D seismic survey in deepwater blocks AD- 3 & AD -9, Rakhine offshorre, Bay of Bengal. Also cannot identify any specific basin yet.

METHOD OF STUDY

In this presentation available geo-scientific data from public domain have been used to decipher tectono-stratigraphy, paleogeography, and sedimentation processes of the pre-Tertiary basins and then investigated petroleum systems based on interpreted data together with the assessment of various volcanic activities during different periods which may be responsible for induced maturity effects towards hydrocarbon generation. Diastrophisms are also analyzed to understand hydrocarbon migration pathways and accumulations.

SEQUENCE OF PRE-TERTIARY MAJOR EVENTS IN MYANMAR

During the Precambrian and Paleozoic eras, Proto-Myanmar region was a part of Sinoburmalaya that probably was a fragment of northern Gondwanaland in Southern Hemisphere.

Late Precambrian

1. Existence of a crystalline basement in northeastern Proto-Myanmar (Eastern Kachin Metamorphics) that extended northwards into Proto-Yunan, and probably southeastwards into the Mogok Gneiss.
2. Deposition of very thick Chaung Magyi sediments under deep sea conditions in Proto-Shan region.
3. Orogeny at the end of Precambrian causing fairly intense deformation, low-grade regional metamorphism, and uplift.

Early Paleozoic

The Paleo-Tethys oceanic plate probably moved from NE to SW and subducted below Sinoburmalaya. Shallow marine sediments were deposited in an apparently passive continental margin of Sinoburmalaya.

4. Deposition of Ngwetaung and Pangyun sandstones and Molohein sandstones in the northern and southern parts of Proto-Shan region, respectively, on a stable shelf during Late Cambrian: eruption of the Bawdwin volcanics.
5. Deposition of thick Ordovician limestones and siltstones under littoral and shelf conditions in Proto-Shan region.
6. Continuous depositional of Silurian phacoidal limestones and clastics, locally with some tuff and ash beds in southern Proto-Shan region; deposition of Mergui sediments probably began during Silurian in Proto-Tanintharyi region.

Devonian

7. Continuous sedimentation from Silurian to Devonian in some parts of Proto-Shan region as black limestone, black shale and reefal limestone were deposited at thin units of limited distribution under lagoonal and restricted marine conditions.
8. Deposition of a limestone unit (later dolomitized into Maymyo Dolomite) began in Proto-Shan region, especially in the northern part. That deposition continued into Carboniferous.
9. Deposition of Mergui sediments continued in Proto-Tanintharyi region.

Early Carboniferous

Separation of Sinoburmalaya from Gondwanaland.

10. Continued deposition of Mergui sediments, locally with tuff and agglomerate beds, under deep-sea conditions in Proto-Tanintharyi-Mon region.
11. Orogeny at the end of Early Carboniferous resulting in the deformation and low-grade regional metamorphism of Mergui Group, and possibly the intrusion of some granite plutons in Proto-Shan region e.g., Taung-baing Granite.

Late Carboniferous-Middle Triassic

12. Deposition of a thick limestone sequence (Plateau Limestone, Moulmein Limestone, and Kamawkala Limestone), later partially dolomitized, in a wide warm shallow sea that covered most of Proto-Shan-Kayah-Kayin region. A thin clastics wedge was also deposited in some parts of Proto-Mon-Kayah region during Late Permian.

SEQUENCE OF PRE-TERTIARY MAJOR EVENTS IN MYANMAR

Contd

13. Earth movements, intrusion of granites in eastern Proto-Shan region, and initial emergence of Proto-Shan-Tanintharyi region at the end of Middle Triassic.

Middle-Late Triassic

Continued northeastward movement of Sinoburmalaya in the Neo-Tethys. Southwest of the emerging land lay a deep sea in which flysch beds were laid down. The northeastward moving ocean floor then began to subduct below the emerging Proto-Shan-Tanintharyi landmass.

14. Deposition of a thick deep-sea flysch unit containing fossils of Halobia and Daonella and locally ophiolites (Thanbaya Formation) along the northeastern margin of Proto-Rakhine-Chin region.

15. Concurrently, depositional of thin units of evaporates (lower) and shales and bone beds (upper) in a few small enclosed basins in northern Proto-Shan region.

Jurassic

16. Flysch deposition most probably continued in Proto-Rakhine-Chin region.

17. Deposition of shallow-sea and deltaic sediments in a few down faulted intermontane basins and shallow seas within and along the western part of the still rising Proto-Shan Plateau—turbidites with coal seams in Proto-Kalaw Basin; sandstones, shales and limestone in Proto-Kinda-Kyaukse area; limestone and red beds in Proto-Lashio Basin.

18. Subduction related large-scale intrusion of granitoid plutons and batholiths (locally with volcanics) during Late Jurassic.

19. Late Jurassic orogeny causing tight folding of the incompetent Jurassic beds; limited metamorphism along the western marginal zone of Proto-Shan Plateau.

Cretaceous

During Early Cretaceous, Indian Plate started to move northeastwards and there was more subduction of the ocean floor beneath Sinoburmalaya.

20. Continued deposition of thick flysch, with Globotruncana-bearing limestone locally in the upper part, in the subduction trench; and there was deposition of a thin unit of Orbitolina-bearing limestone in some places of the shallow sea that lay between the said subduction trench and Proto-Shan Plateau.

21. A unit of red fanglomerates and siltstones (Kalaw Red Beds) was laid down in an oxidizing continental environment in the Kalaw Basin.

22. Intrusion of more granitoid plutons during Late Cretaceous.

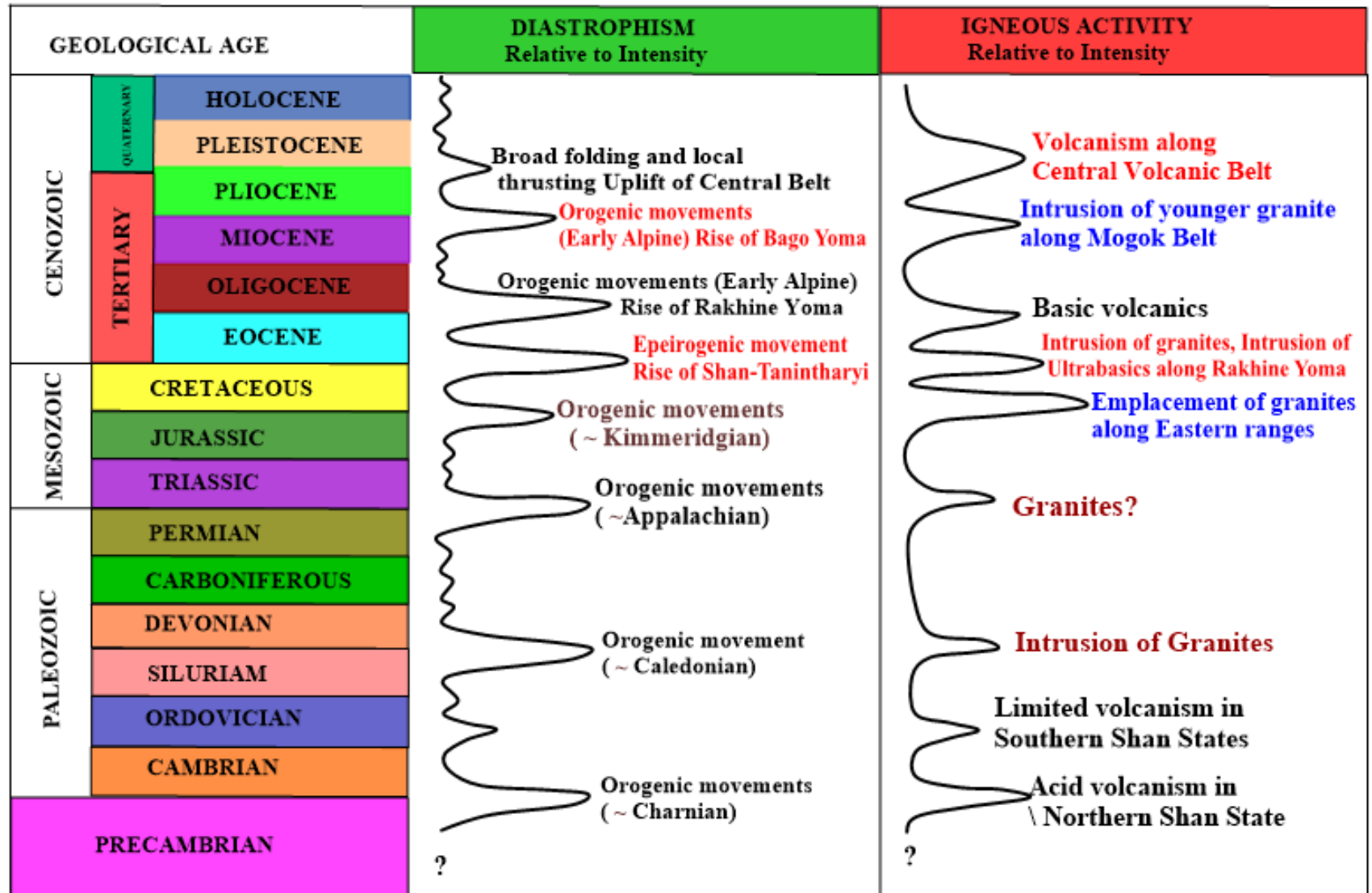
23. During Late Cretaceous-Early Paleocene, intrusion of small and medium sized ultramafic bodies along the eastern flank of Proto-Rakhine-Naga region (Serpentinite Line) and in Proto-Kachin region,

24. Beginning of igneous activity in Proto- Wuntho area at the close of Cretaceous.

25. Epirogenic movements and final uplift of Proto-Shan-Tanintharyi region at the end of Cretaceous.

Relative Intensities of Diastrophism and Igneous Activity through time in Myanmar Region.

(Source: Maung Thein: 1973)



PRECAMBRIAN AND PALEOZOIC STRATIGRAPHY

- The only confirmed occurrences of Precambrian and Paleozoic rocks are those of the Kachin-Shan-Tanintharyi region (Eastern Highlands).
- Due to the age span and pronounced north-south variation in depositional history of the Shan-Tanintharyi region, the Precambrian and Paleozoic stratigraphy will be discussed in terms of three separate parts such as northern part (Kachin-Northern Shan State), central part (Southern Shan State) and southern part (Kayah-Tanintharyi area).
- Precambrian and lower Paleozoic sequences are thicker and more complete in northern part whereas the upper Paleozoic is better represented in the central region.
- Metasediments comprising the Precambrian Chaung Magyi Series are unconformably overlain by 800 meter thick upper Cambrian micaceous sandstones, shallow water marine quartzites and dolomites comprising the Molohein group in the central part and by the lower to middle Cambrian 400 meter thick Bawdwin intermediate volcanics in the northern part. Strongly metamorphosed Mogok gneiss which is assumed to be Archean (Thein, 1978) the Chaung Magyi Series in northernmost part.
- Bawdwin volcanics are overlain by 600 meter thick upper Cambrian Ngwetaung sandstone and Pangyun Beds which consist of sandstone, quartzites and dolomites (bear sauikiid trilobite fauna, identical to Molohein group of central part).
- Molohein group is overlain by the shallow marine Naung kangyi limestones, marls, siltstones and sandstones (La Touche, 1913) and Pangyun sandstones (Thein, 1978) which in turn are overlain by the 1500m thick shales, limestones and dolomites of the Pindaya Group.
- The lower and middle Silurian are represented by 300 meter thick shales and phacoidal limestones of the Linwe Formation of the central part and by the Nyaungbaw limestones of the northern part which are composed of Michelinoceras-bearing pinkish grey limestone interbedded with graptolitic shales and slates. The 150 meter thick upper Silurian Wabya Formation in central part and 100 meter thick Pang-has-pye Series of northern part are essentially graptolitic shales.
- The lower Devonian is present only in northern part and consists of 70 meters thick shallow marine Tentaculites bearing limestones and Zebingyi siltstones and shales.
- The regionally extensive 4000 to 5000 (?) meter thick Plateau Limestone Group of the northern part encompasses the upper Devonian to the Permian whereas in central part it ranges from the upper Carboniferous to the middle Triassic where it overlies the thick, lower to upper Carboniferous greywakes and clastics of Lebyin Group (Thein, 1978).
- The upper Carboniferous to Permian Moulmein limestone and the Triassic Kamawkala limestone of southern part have been correlated with the Plateau limestone of the central part by Thein (1978) and overlie the greywakes and associated clastics of the Mergui Series.
- The Lebyin Group of central part, Mawchi series of Kayah State, Martaban Beds and Taungnyo Series of northern Tanintharyi are apparently quite similar and consist of shales, slates, quartzites, greywakes and mudstones. Martaban Beds have been assigned to Permian (Thein 1978).

MESOZOIC STRATIGRAPHY

The Mesozoic strata are exposed in two provinces;

Eastern Highlands

- The 75 meter thick upper Triassic Pannyo evaporites and 250 meter thick marine Napeng shale and mudstone beds of northern part have no equivalents in central part.
- The Jurassic is represented by the 2000(?) meter thick lower to middle Jurassic marine clastics of the Loi-An Group and the 800(?) meter thick lamellibranch-bearing (Reed, 1936) middle to upper Jurassic paralic facies clastics of the Namyau Group in central part (Thein, 1978).
- The Cretaceous is represented by the alternating marine and terrestrial facies, cephalopod bearing (Fox, 1936) siltstones and conglomerates of the Kalaw Red Beds of central part and their equivalents in southern part. Lower Cretaceous shallow water marine Orbitolina bearing limestones are known from the Jade Mines area. These are overlain by upper Cretaceous Kalaw Formation consists of shallow to deep water marine sandstones, shales and limestones .

Arakan-Chin-Naga Foldbelts

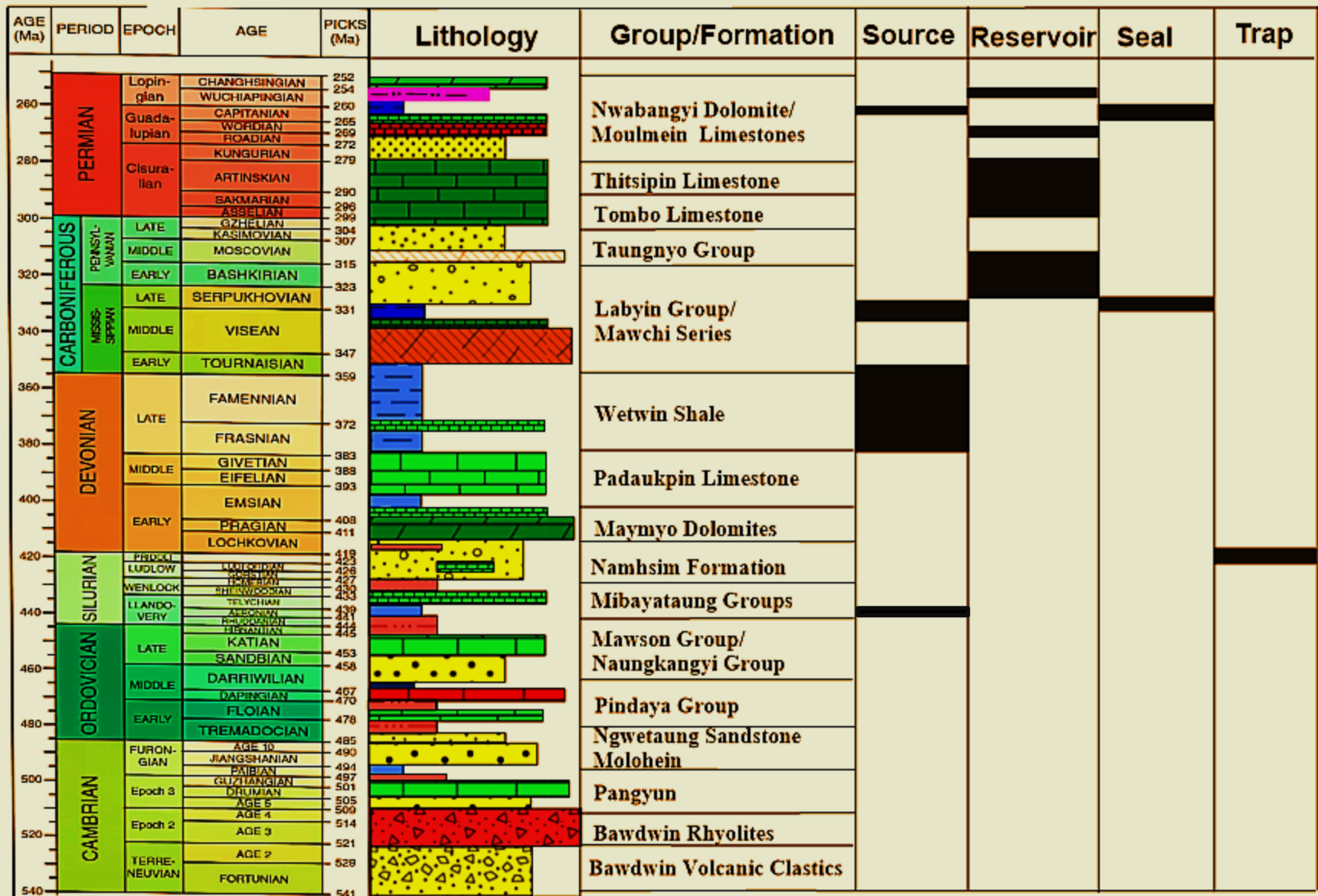
- The Arakan (Rakhine) -Chin-Naga foldbelts comprise thick sequences of strongly deformed flyschoid, mainly indurated dark grey slaty shale with thin interbeds of grey sandstones. A deep water limestone beds are present but their exact stratigraphic position is problematical.
- Upper Cretaceous complexes also occur as exotics of limestone in black, shaly Eocene melanges.
- Paleontologic evidence indicates that sedimentation in the Arakan- Chin-Naga region commenced in the middle Triassic, judging from coeval exposures comprising the Daonella and Halobia- bearing shales and slates of the Thanbaya Formation of the Chin Hills. Deposition was not continuous however, as is indicated by a widespread Jurassic- Cretaceous hiatus (Nyunt and Saing, 1978)
- The stratigraphic sequence in the northern part of the foldbelt consists of four major units; The Kanpetlet schists, Thanbaya Formation(Triassic), Rangfi Formation (Cretaceous) and Eocene flysch. The thick sandstones, shales and limestones of the Thanbaya unconformably overlie the Kanpetlet schists.
- Deposition of deepwater radiolarian cherts, pelagic limestones, sandstones and shales of the Rangfi Formation were subsequently replaced by the deposition of flysch during the Eocene.

BRIEF PETROLEUM GEOLOGY OF EASTERN HIGHLANDS

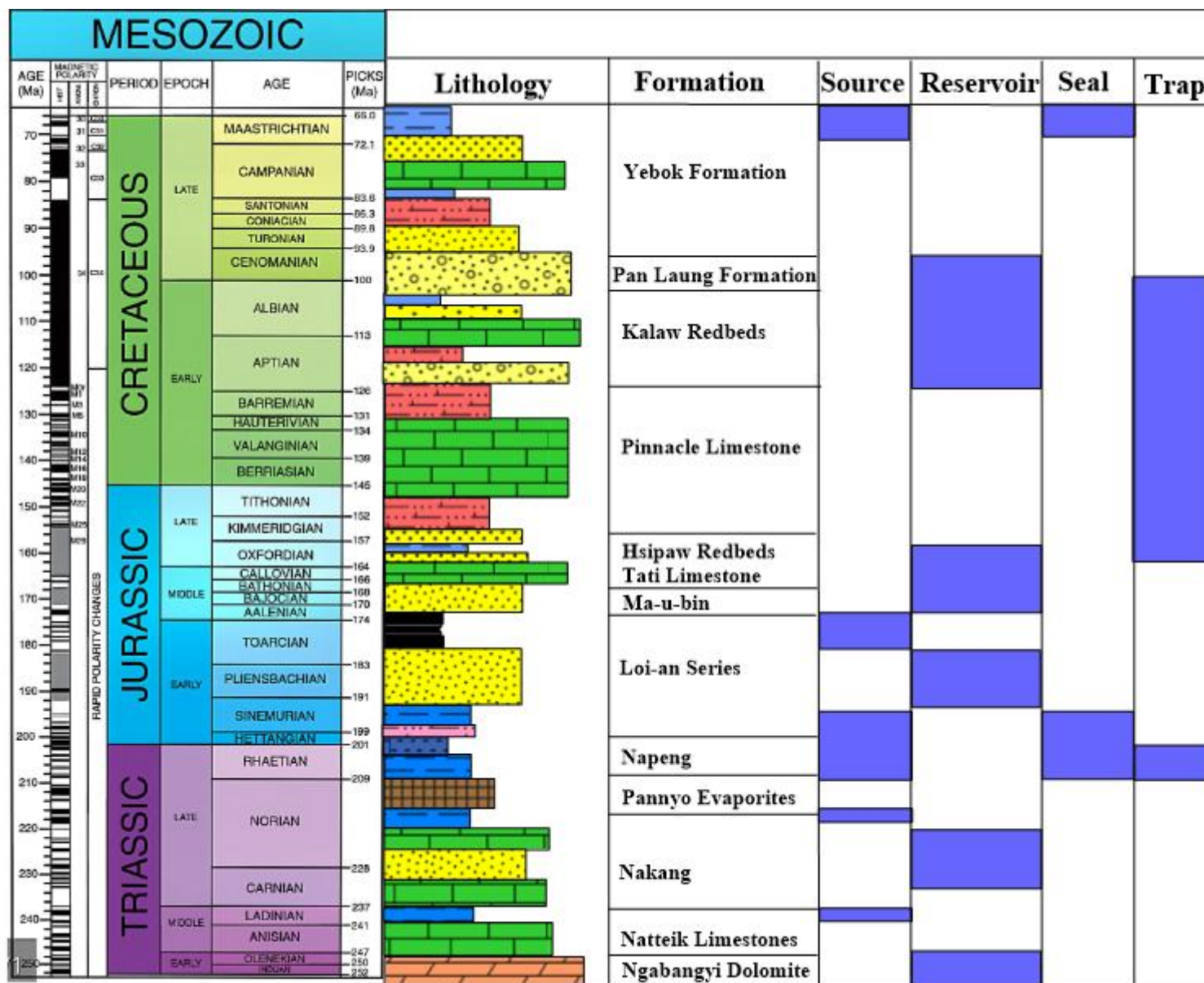
- The Eastern Highlands region is constituted of Precambrian, Paleozoic and Mesozoic rocks, formed partly in mobile belts and partly on shelves, which were later highly deformed and metamorphosed. Stratigraphic records have documented a succession of marine transgressions and regressions in the area throughout the Pre-Tertiary time. The repetition of sedimentological features indicates persistent geologic controls in the region and suggests that these paleo-environments might provide good targets for hydrocarbon exploration.
- Shelf type sedimentation system primarily of siliciclastics with abundant carbonates contains source rocks, reservoir rocks and seal rocks. As manifested by distinct stratigraphic breaks, up till the end of the Mesozoic, probably there were at least five periods of major structural disturbances and upheavals which provide structural and stratigraphic traps.
- The speculative Paleozoic and Mesozoic petroleum systems of Eastern Highlands are introduced in slide no.13&14 .
- The sizable Pre-Tertiary basins which are identified in eastern highlands to date include; Hsipaw-Lashio Basin covering about 4807 square miles in the Northern Shan State, the Kalaw Basin covering approximately 5704 square miles in the Southern Shan State and Kayah State, and the Maylamyaing Basin covering 4438 square miles in the Mon-Tanintharyi region respectively.

The discovery of oil and gas in Pre-Cambrian age weathered granites reservoirs in Cauvery basin (India), granites, granulites, diabases and hornblendic metamorphics reservoirs in Dong Sheng Pu Field (China), gneiss reservoirs in Wangzhuang Field (China), volcanics reservoirs in Dujiatai, Qija, Shijutuo and Shuguang fields (China), metamorphics reservoirs in Jinganpa Field (China) suggests that the Pre Cambrian igneous rocks and metamorphic rocks in the Eastern Highlands of Myanmar can also be considered as potential exploration target.

SPECULATIVE PALEOZOIC PETROLEUM SYSTEM OF EASTERN HIGHLANDS , MYANMAR.



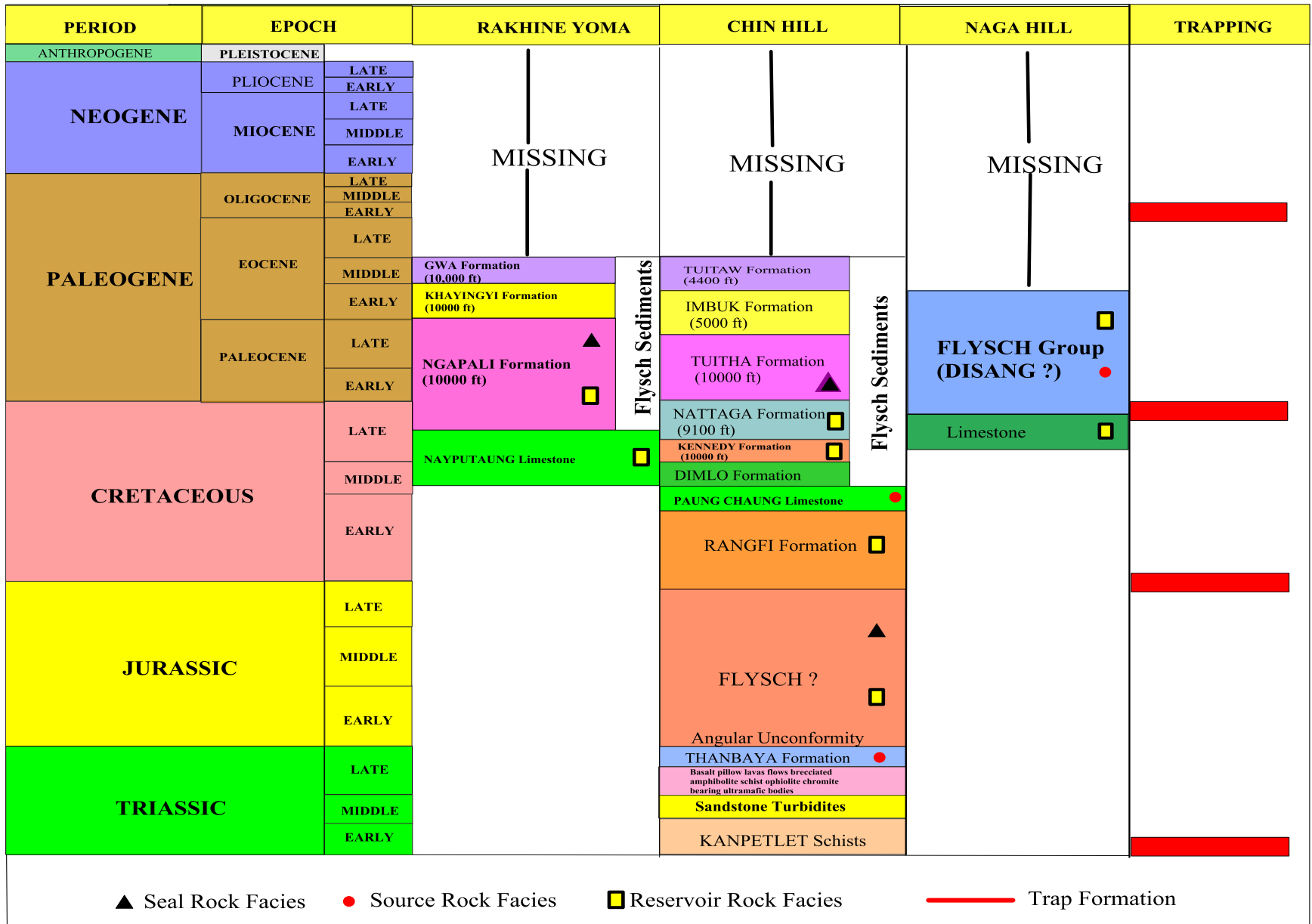
SPECULATIVE MESOZOIC PETROLEUM SYSTEM OF EASTERN HIGHLANDS, MYANMAR.



BRIEF PETROLEUM GEOLOGY OF INDO-BURMAN RANGES

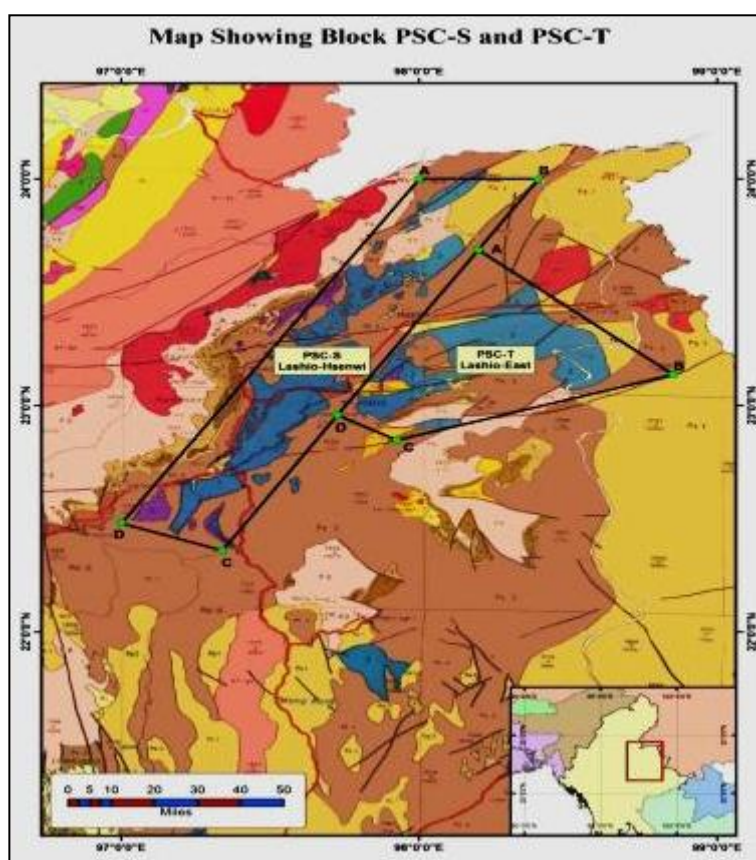
- **The Indo-Burman Ranges underlain by Mesozoic rocks is a mobile belt which has undergone rather intense orogenic movements manifested by large scale overthrusting and tight folding in the deep sea flysch sequences. Transpressive structural trap geometries are common in this region and hydrocarbons may likely be trapped in the sub-thrust segments. The subsurface configuration of the region is not known yet due to lack of seismic images. Deepwater shales act as potential source and cap rocks. Pelagic limestones and sandstones may have good reservoir properties. Based on the study in conjunction with Chittagong-Tripura Fold Belt, this region will have working Mesozoic petroleum systems.**
- **Recently acquired geophysical data show existence of pre-Tertiary strata in Rakhine deepwater area. It is expected that the hydrocarbon reservoirs in the Mesozoic section of Rakhine deepwater area will be primarily composed of limestone, chalk and chert. The deep marine shales and clays are potential source rocks. Its promising hydrocarbon potential is highlighted by oil and gas discoveries in pre-Tertiary rocks of East India deepwater area. Slide no.16 shows the speculative Mesozoic petroleum systems of Indo-Burman Ranges and Rakhine Deepwater area.**

SPECULATIVE MESOZOIC PETROLEUM SYSTEMS OF INDO-BURMAN RANGES AND RAKHINE DEEPWATER AREA



S.N	BASIN	CONCESSION
1	Hsipaw-Lashio	PSC_S (Lashio-Hsenwi) PSC-T (Lashio East)
2	Kalaw	PSC-U (Kalaw) PSC-V (Loikaw)
3	Mawlamyaing	PSC-J (Mawlamyaing)
4	Rakhine Deepwater	AD-2 to AD-18

S.N	BASIN	CONCESSION
1	Hsipaw-Lashio	PSC_S (Lashio-Hsenwi) PSC-T (Lashio East)
2	Kalaw	PSC-U (Kalaw) PSC-V (Loikaw)
3	Mawlamyaing	PSC-J (Mawlamyaing)
4	Rakhine Deepwater	AD-2 to AD-18



HSIPAW-LASHIO BASIN (Mesozoic & Paleozoic)

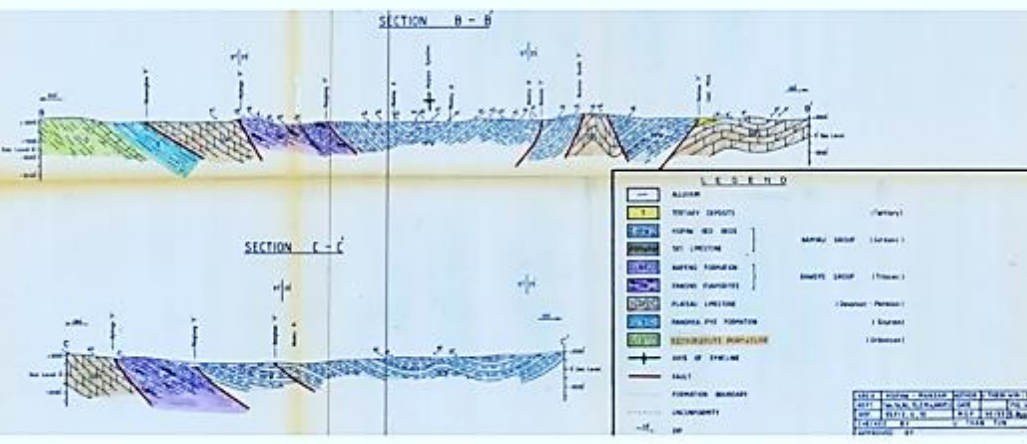
Source: MOGE

STRATIGRAPHY:

<u>AGE</u>	<u>GROUP</u>	<u>FORMATION</u>	<u>THICKNESS(FT)</u>
Tertiary		Lignite Bed	?
		~~~~~Unconformity~~~~~	
Jurassic	Namyau	Hsipaw Red Beds	9060+
		Tati Limestone	3950
Up.Triassic	Bawgyo	Napeng	?
		Pangno Evaporites	2100
		-----x-----x-----Faulted-----x-----x-----x-----	
Permian			
Devonian		Plateau Limestone	5840
		-----x-----x-----Faulted-----x-----x-----x-----	
Silurian		Panghsapye	2950
Ordovician		Naungkangyi	420+

## GEOLOGICAL CROSS SECTION THROUGH HSIPAW-MANSAM AREA

SCALE 1 INCH TO MILE



## PETROLEUM SYSTEM: Mesozoic & Paleozoic

**Source:** Coal from Napeng Formation  
Devonian/Silurian shales

**Reservoir:** Hsipaw Red Beds (porosity 12%-21%)  
Conglomerative limestones(11% porosity)  
Karstified Plateau limestone

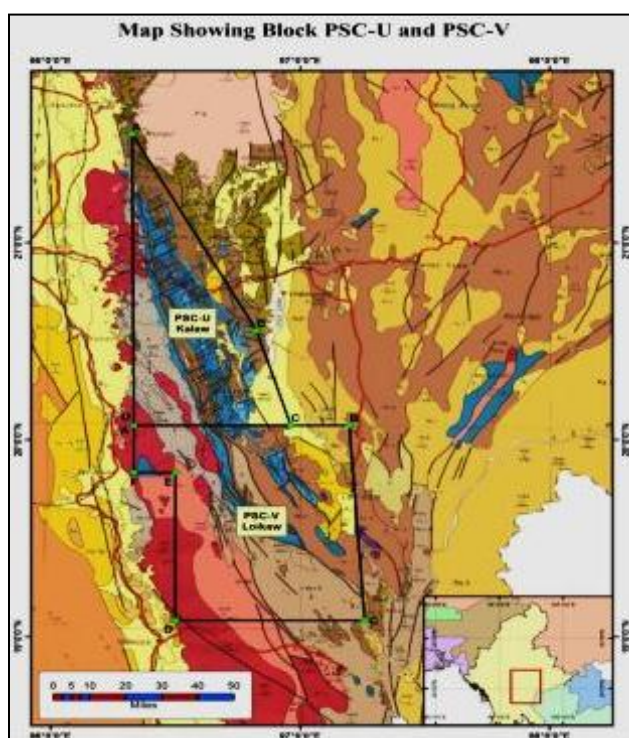
**Cap rock:** Clay and shales of Up.Triassic to Jurassic

**Trap Timing:** Paleozoic and Mesozoic

**Trap type:** Compressive Anticlines, Fault dependent closures

## PLAY TYPES:

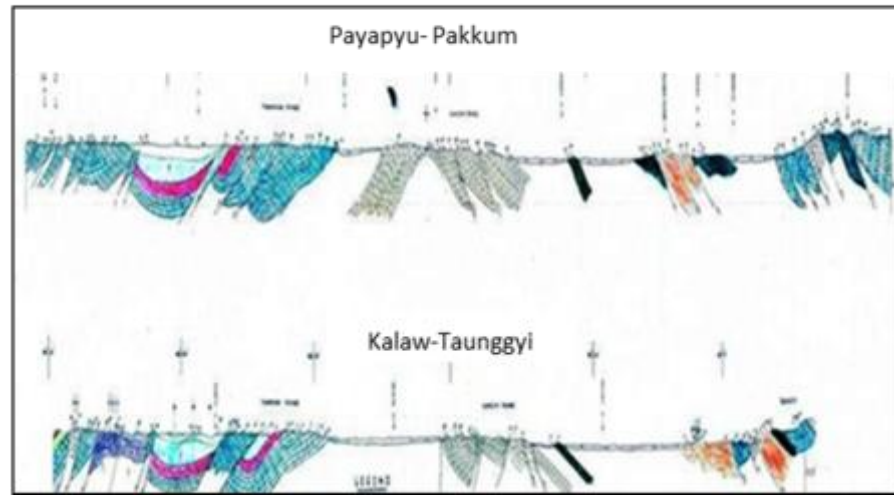
1. Paleozoic carbonates associated with medium to high amplitude anticlines
2. Mesozoic clastics associated with anticlines
3. Mesozoic carbonates and clastics associated with fault dependent two way closures



# KALAW BASIN (Paleozoic- Mesozoic)

Source: MOGE

## Geological Cross Section of Kalaw Basin



### PETROLEUM SYSTEMS: Paleozoic & Mesozoic

**source:** Nyaungbin and Thitpalwe ( Mesozoic)  
Permian and Silurian Shales (Paleozoic)

**Reservoir:** Sandstones of Thitpalwe and Nyaungbin  
Karstified fractured Plateau Limestones

**Cap rock:** Tertiary shales & clays

**Trap timing:** Mesozoic and Paleozoic

**Trap Type:** Anticlines, Fault dependent closures

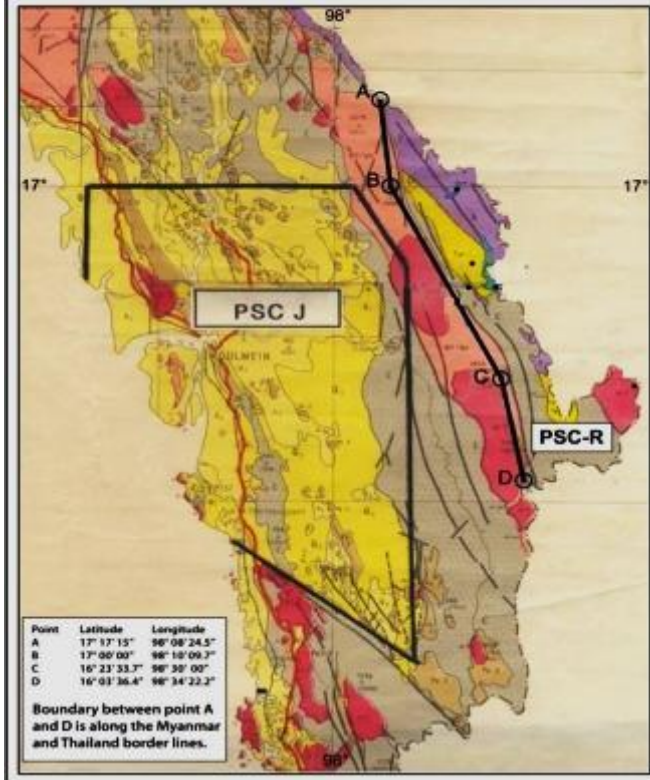
### PLAY TYPES:

1. Carbonates associated with low to medium amplitude anticlines
2. Clastics associated with domal structures
3. Carbonates and clastics associated with Fault dependent two ways closures

### STRATIGRAPHY

<u>AGE</u>	<u>GROUP</u>	<u>FORMATION</u>
Recent		Alluvium Residual deposits Boulder conglomerate
Tertiary		Lacustrine deposit
Cretaceous		Kalaw Tatamaw
Jurassic	Loi-an	Thitpalwe Nyaungbin Gegauk
	Shweminbon	Nampadet Myittha
Middle Triassic		Kondeik Limestone
Permian		Yinyaw
Permo-Carboniferous		Plateau Limestone
Silurian/ Ordovician		
Cambrian		Hsimango
~~~~~Unconformity~~~~~		
Pre-Cambrian	Paung Chaung	

Location of Mawlamyaing Basin(PSC-J)



MAWLAMYAING BASIN (Paleozoic)

Source : MOGE

STRATIGRAPHY

<u>AGE</u>	<u>FORMATION</u>	<u>LITHOLOGY</u>	<u>THICKNESS (FT)</u>
Pleistocene		Gravel, sand & laterites	
Tertiary		Clay/ Sand	
Late Mesozoic	Kamawkala	Limestone	3000
Triassic	Mataban	Sandstone/ Shale	600
Permian	Moulmein	Limestone	3000
~~~~~ Unconformity ~~~~			
Devonian	Taungnyo	Mudstones with sandstones	
Carboniferous	Mergui	Phyllite and schist	

## PETROLEUM SYSTEMS: Paleozoic and Mesozoic

Source: Taungnyo, Moulmein(Paleozoic)  
Martaban (Mesozoic)

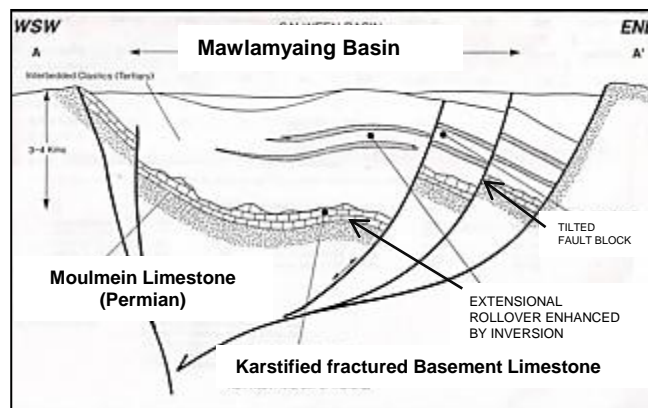
Reservoirs: Moulmein Limestones (Paleozoic)  
Kamawkala Limestones (Mesozoic)

Cap rock: Tertiary shales and clays  
Trap Timing: Mesozoic, Paleozoic

## PLAY TYPES:

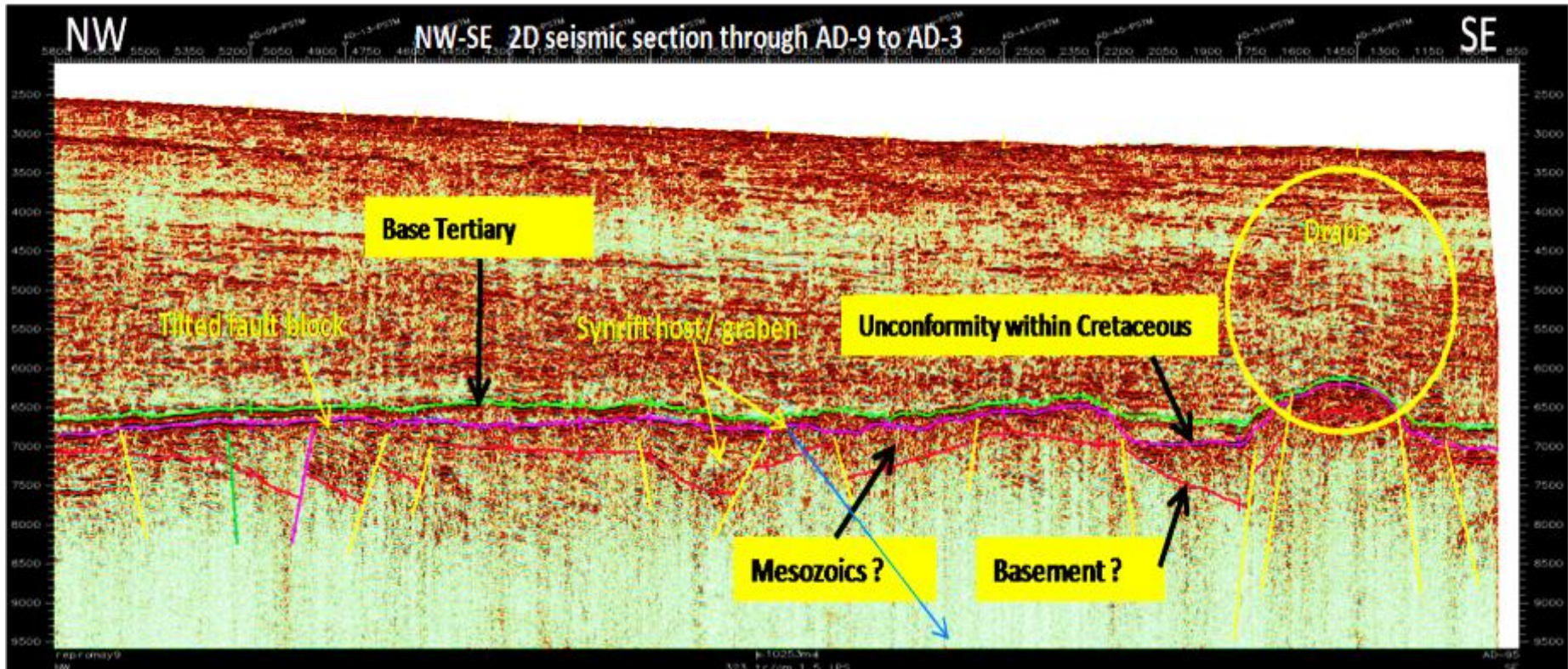
1. Carbonates associated with extensional rollovers enhanced by inversion
2. Carbonates and clastics associated with tilted fault blocks

General cross section and main play types in Mawlamyaing Basin



# PRE- TERTIARY PLAY TYPES RAKHINE DEEPWATER

Source: MOGE



Both structural and stratigraphic trapping geometries are identified in 2D seismic data which include; Basement related Highs (Drapes), Tilted Fault Blocks, Unconformities and Pinchouts.

# CONCLUSION AND RECOMMENDATIONS



- Oil and gas exploration and production activities in Myanmar are confined only in Tertiary petroleum systems to date and Pre-Tertiary systems of the country remain virtually unexplored.
- More than half of the Myanmar territory is occupied by pre-Tertiary strata, and huge amount of hydrocarbon resources in which are untapped.
- Realistic hydrocarbon resources potential of Myanmar is still not known due to lack of assessment of hydrocarbon resources potential of Pre-Tertiary petroleum systems.
- Declining of oil and gas production from Tertiary basins of Myanmar in recent years impels to start full scale petroleum exploration in pre-Tertiary basins.
- On account of technical and financial constraints, non-exclusive geochemical and geophysical surveys with competent service providers should be conducted in Pre-Tertiary petroleum provinces as early as possible.

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