Recent Seismicity in the years 2023, 2024, 2025 in Aye-yar-wady Delta Basin, Myanmar

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Seismicity of Myanmar region

- 15 Earthquakes of M>6.0 during the 100-year of 1912-2012

give a repeat time of 9 years for such earthquakes.

1912,1927,1930,1930, 1931,1946, 1956,1975,1991, 2003, 2007, 2011, 2012,2017, 2018

Peaks are observed around 2003, 2005 and 2008

- Myanmar – earthquake-prone region
- Yangon Division, based on the seismicity records, low – medium seismicity region
- The most significant earthquake happened – M7.3, 5th May, 1930 Bago earthquake, 500 causalities and great destruction in Bago
- In Yangon, 50 deaths and some considerable damages

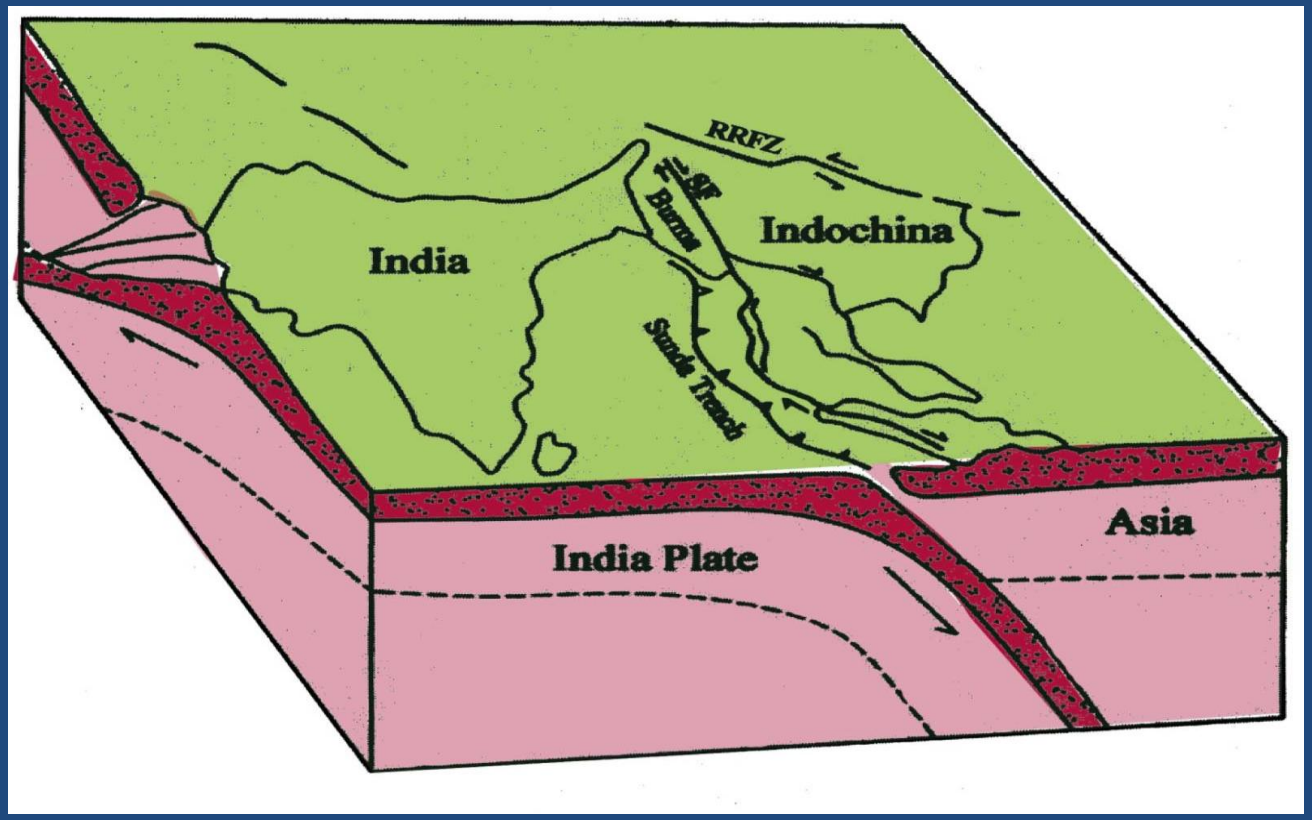
Seismicity in Central Myanmar Basin

- Most of the earthquakes are restricted to shallow shocks between 30-50km at depth
- Mostly associated with normal faulting or strike-slip faulting
- Majority of strain are accommodated along the border faults of the basins
- Slip on these faults lead uplift where they interact with other border fault of adjacent basin
- In this transfer zone, fault accommodate differential horizontal or vertical displacements within the basin-uplift

Seismicity & Tectonics

- Seismicity occur in Central Myanmar Basin as a result of regional tensional stresses and strain set up within the plate on the pre-existing faults which have appropriate orientation with the present day stress field
- The high-angle normal faults cut the long strip into slices of crust and these slices move laterally (horizontal velocity estimate data is 8mm occur between the basin)
- Deformation is distributed over such a broad region of 2000km long and + or -200km wide of basin- uplift province

Plate Tectonic Configuration of Myanmar Region



(1) Earthquake Potential in Myanmar (published), Advances in Geosciences, vol.13 Solid Earth Section ,2009 ,pp.265-280, www.asiaoceania.org

N American Plate / Eurasian Plate

A MEETING THAT HELPED
FOSTER THE ACCEPTANCE OF GLOBAL TECTONICS

By Michael R. Rampino

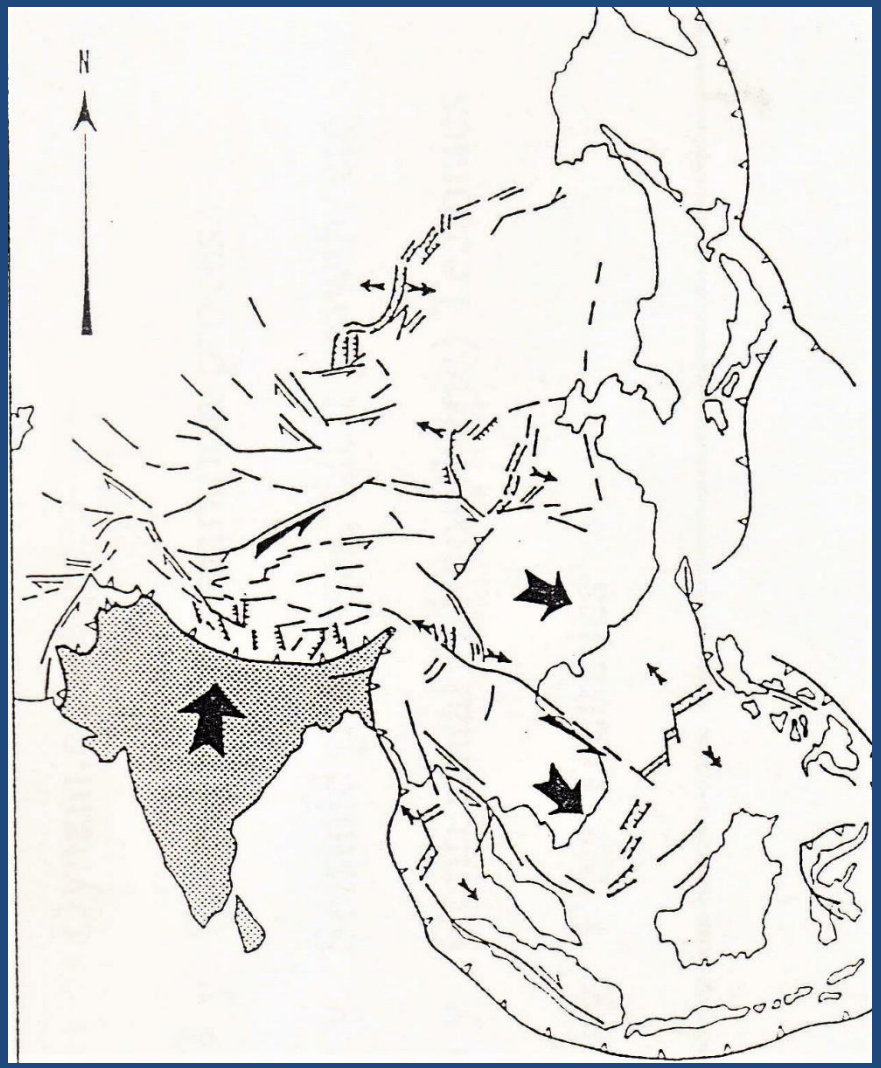
In December, scientists from across the world gathered at the AGU Fall Meeting in San Francisco, Calif. They attended to be a part of history—at such meetings, those who convene present new results, build collaborations, refine ideas, and engage in discussions that could change the very course of our science.

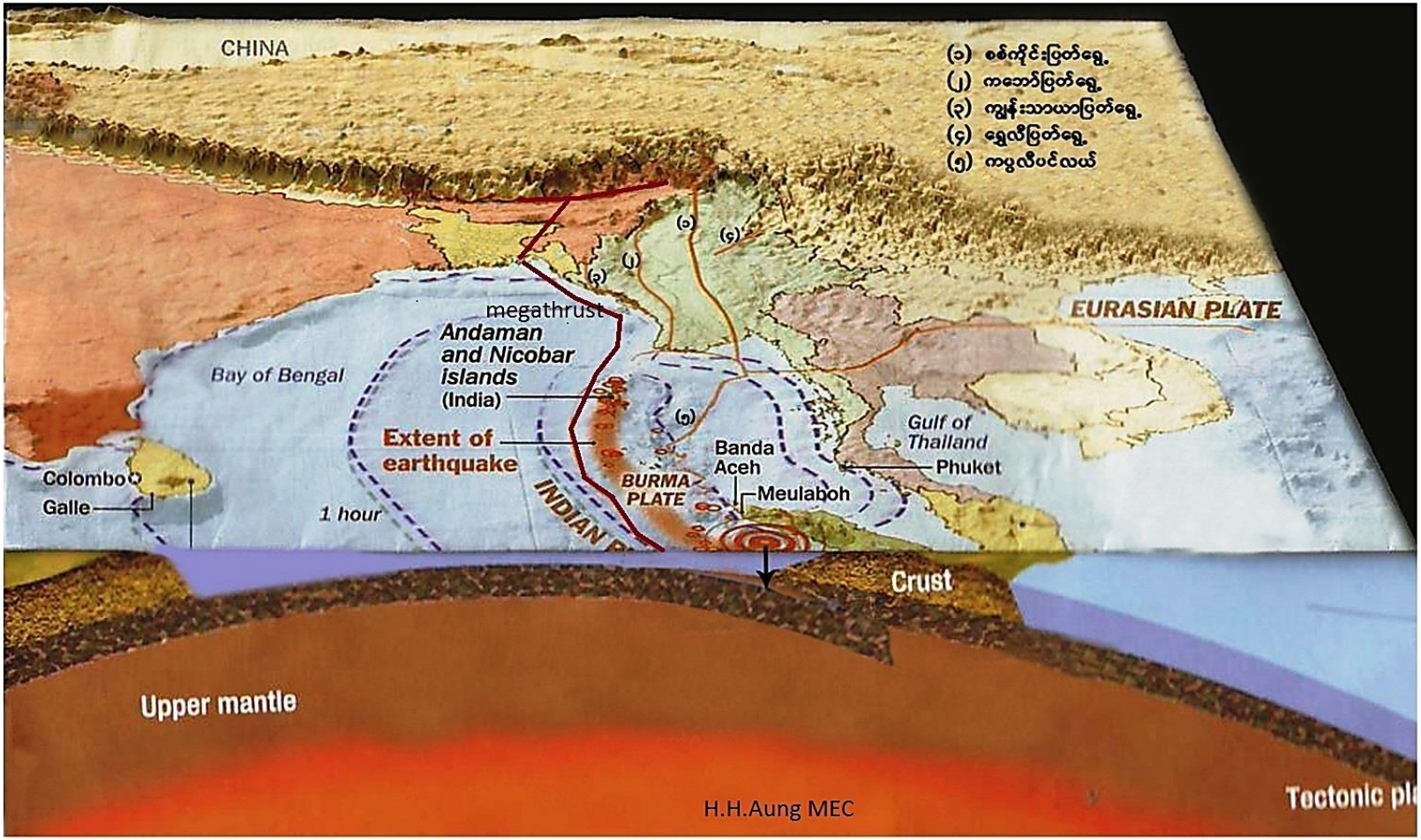
For those involved with seismology, paleomagnetism, and global tectonics, last year's event marked an important anniversary of another meeting 50 years ago. On 11–12 November 1966, a crucial private meeting took place in New York at the NASA Goddard Institute for Space Studies. Called the History of the Earth's Crust Symposium, the gathering brought together geologists and geophysicists interested in the evolution of continents and oceans, especially in new ideas pertain-

A diver explores a deep fault filled with freshwater in the rift valley between the (left) North American Plate and (right) Eurasian Plate in Iceland's Thingvellir National Park.

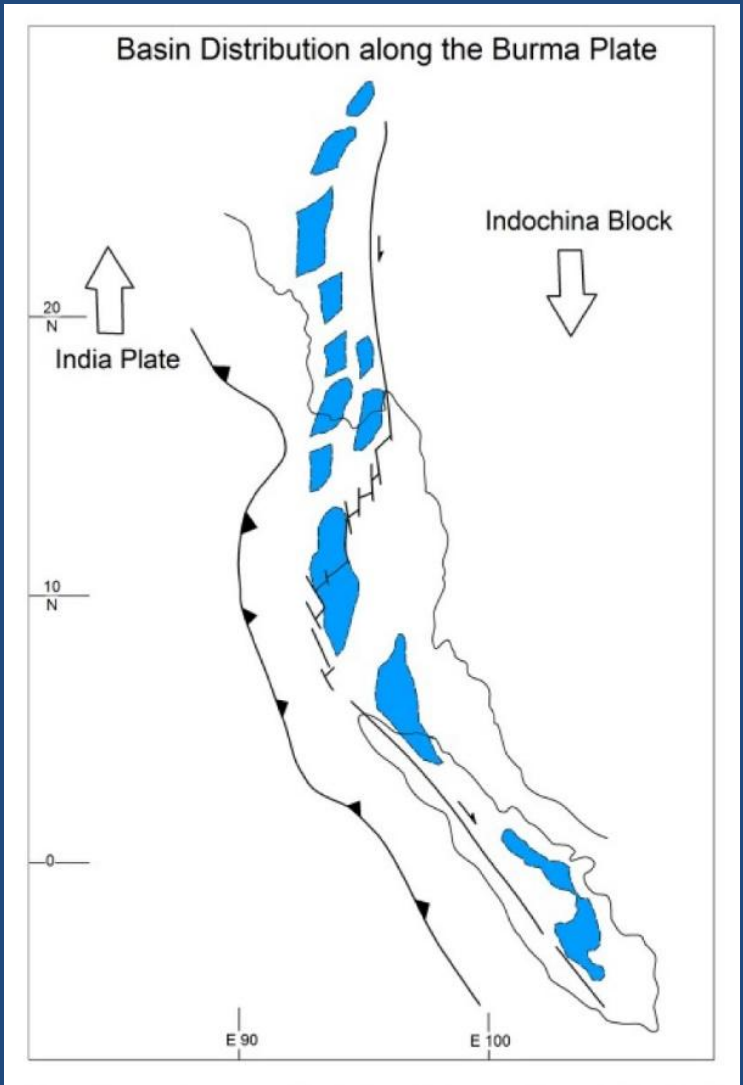
Myanmar Earthquake Committee 1999

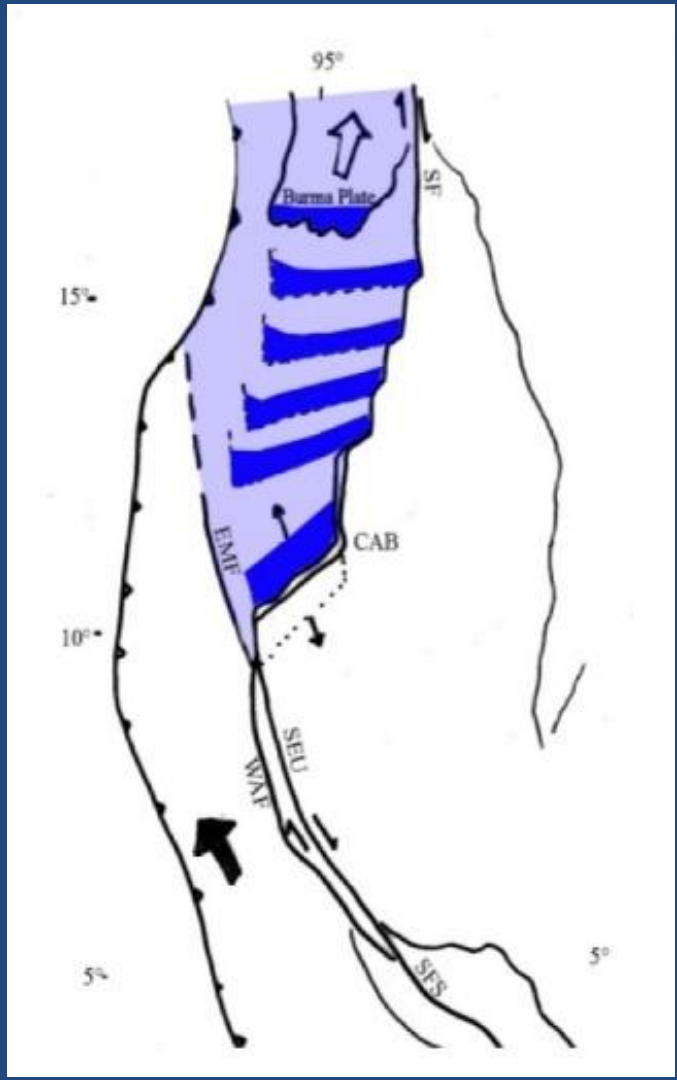
Differential Rotation of the India, Indochina and Tibetan Plateau



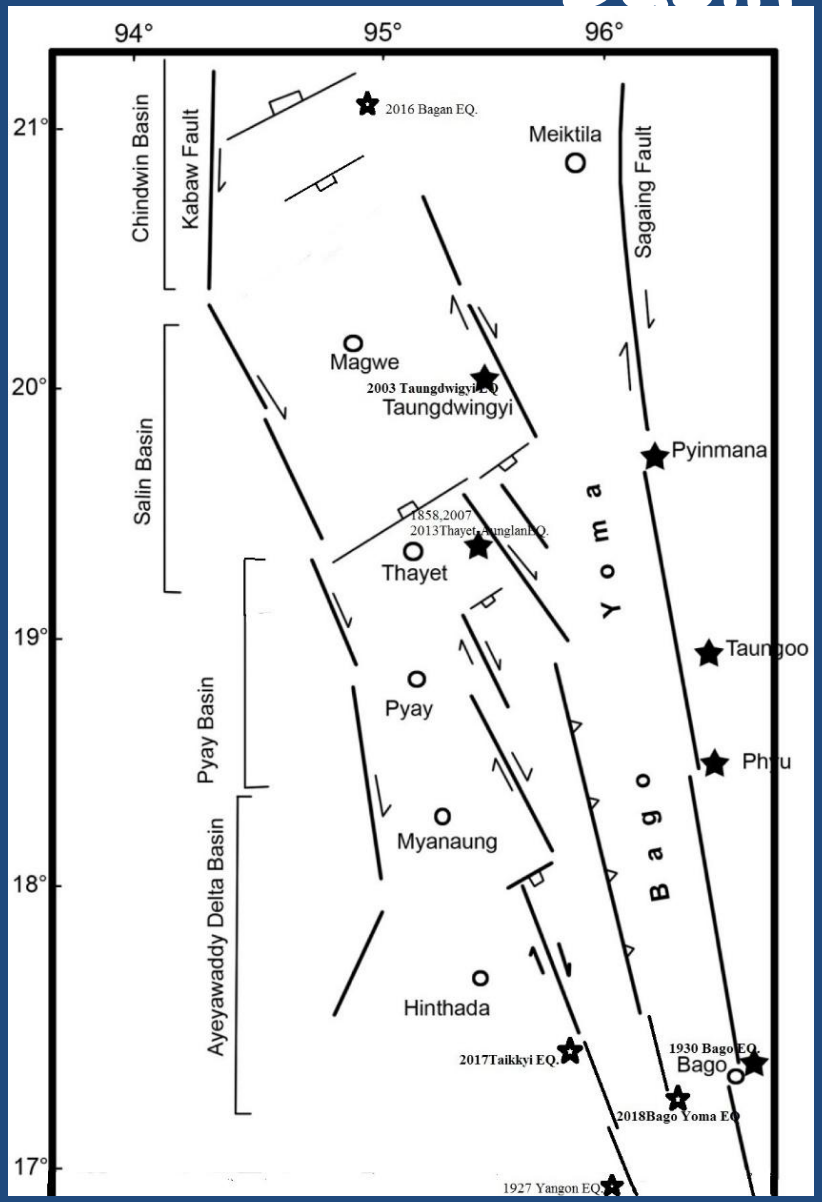

CHINA
(၁) စစ်ကိုင်းတြိတ်ရွေ့.
(၂) ကဘော်တြိတ်ရွေ့.
(၃) ကျွန်းသာယာတြိတ်ရွေ့.
(၄) ရွေ့လီတြိတ်ရွေ့.
(၅) ကပွလီဝင်လယ်
megathrust
Andaman and Nicobar islands (India)
Bay of Bengal
EURASIAN PLATE
Extent of earthquake
Gulf of Thailand
Banda Aceh
Phuket
Colombo
Galle
1 hour
BURMA PLATE
Meulaboh
Crust
Upper mantle
Tectonic pl

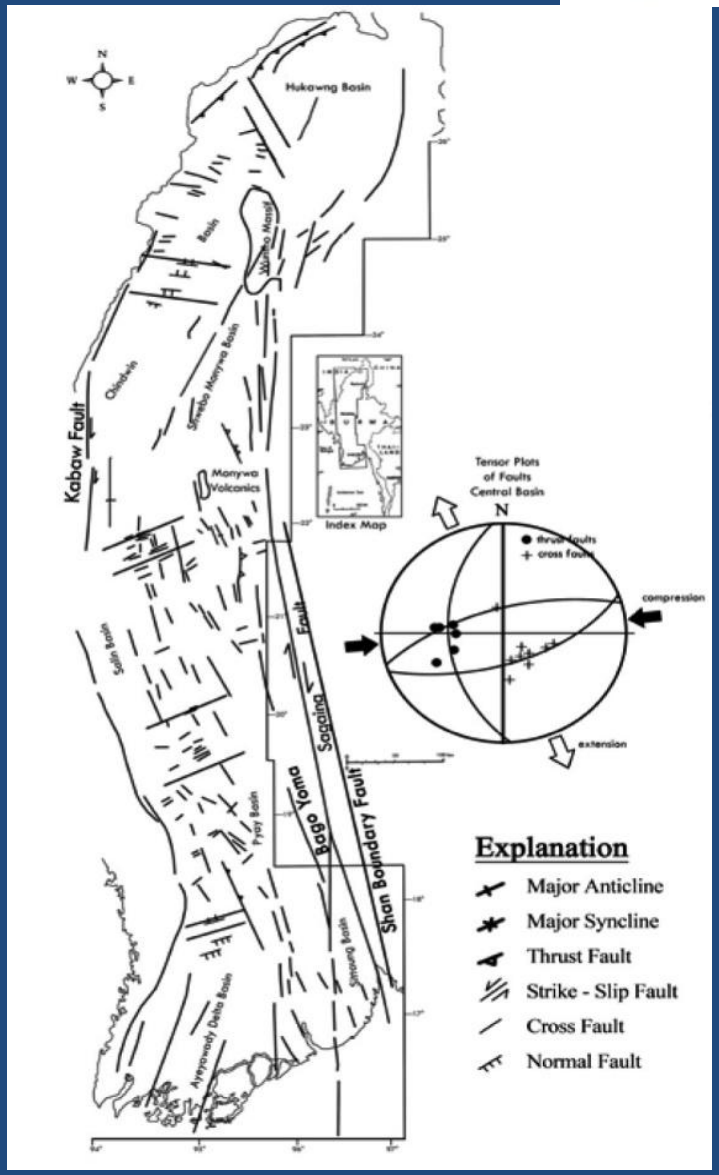
Series of basins along the Burma an Sumatra plate

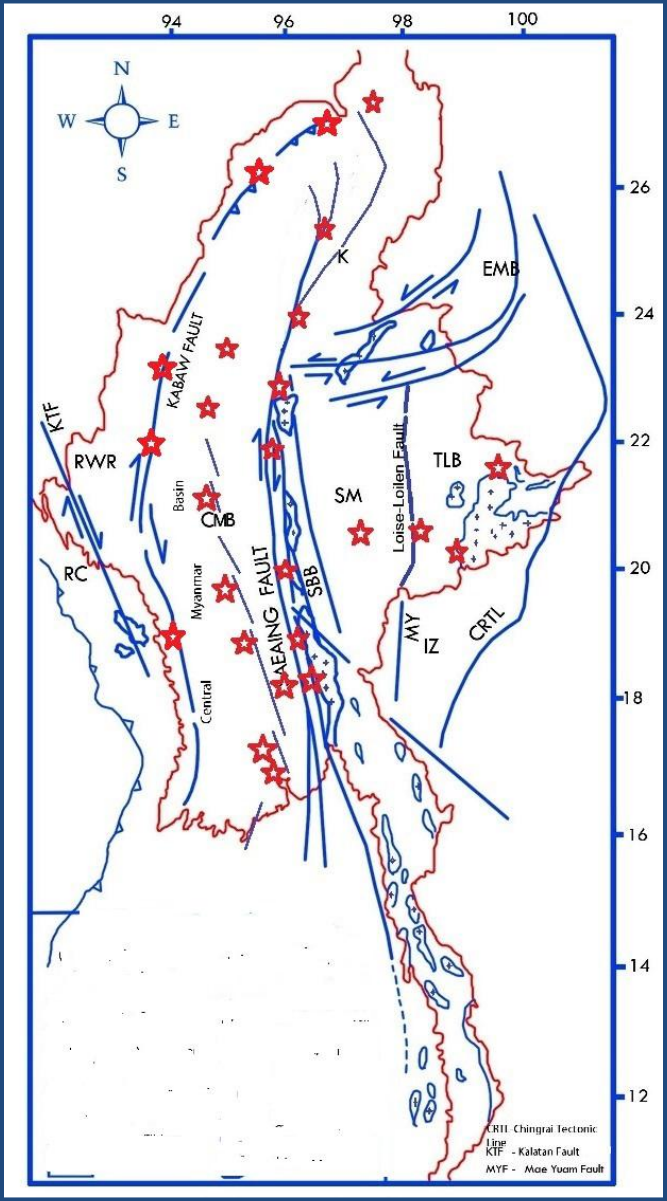


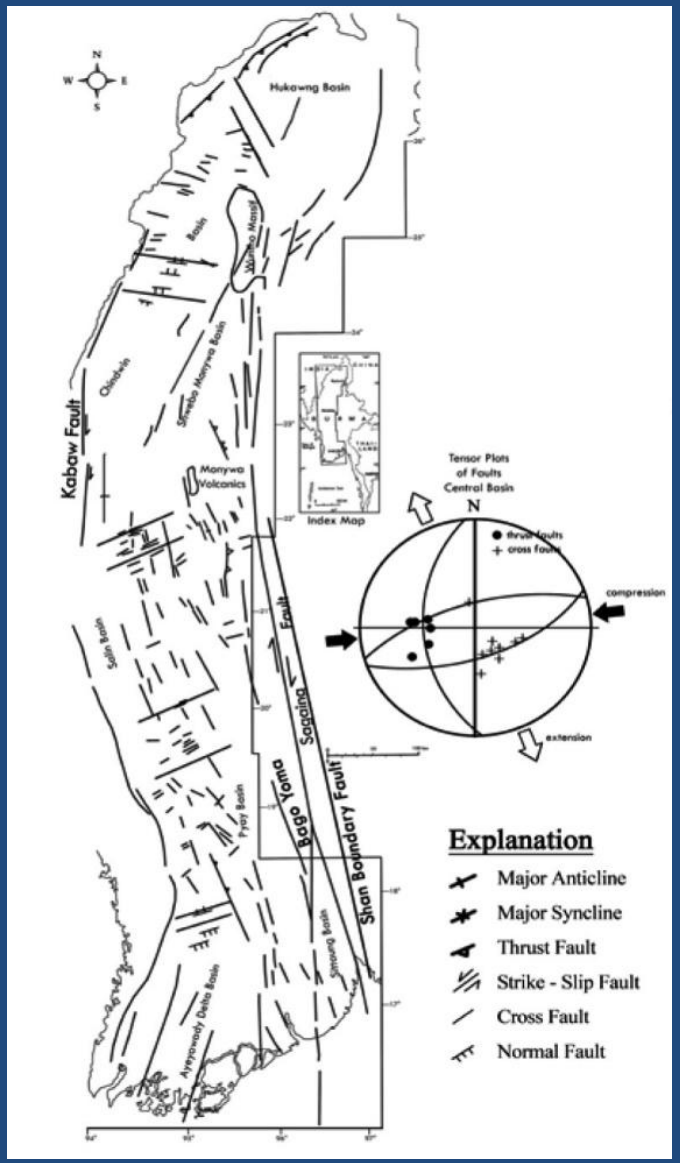


Tectonic basins in Central Myanma Basin






94
96
98
100
N
W
E
S
26
24
22
20
18
16
14
12
K
EMB
KABAW FAULT
KTF
RWVR
Basin
CMB
SM
Loise-Loilen Fault
TLB
RC
Myanmar
Central
SAGAING FAULT
SBB
MY
IZ
CRTL
CRTL Chingrai Tectonic Line
KTF - Kalatan Fault
MYF - Mae Yuam Fault


Hukawng Basin
Kabaw Fault
Monywa Volcanics
Index Map
Tensor Plots of Faults Central Basin
N
compression
extension
Sagaing Fault
Bago Yoma
Shan Boundary Fault
Explanation
Major Anticline
Major Syncline
Thrust Fault
Strike - Slip Fault
Cross Fault
Normal Fault

Earthquake occurrences after the year 2011, new era of seismic activity.

- the 2011 M 6.8 Tarlay earthquake,
- the 2012 M 6.8 Thabeikkyin earthquake,
- the 2013 M 3.4 Yangon earthquake,
- the 2013 M 5.4 Thayet-Aunglan earthquake,
- the 2015 M 5.0 Monywa-Kani earthquake,
- the 2016 M 6.9 Mawlaik earthquake,
- the 2016 M 6.8 Chauk earthquake,
- the 2017 M 5.1 Taikkyi earthquake,
- the 2018 M 6.0 Bago Yoma earthquake,
- the 2019 M 3.4 Yangon earthquake
- the 2020 M 5.9 Falam earthquake

Name/Date/Time	Duration	M/D	Epicenter lat./long.	Damage	Loss of Life	Focal Mechanism	earthquake Source
Ava EQ 23 March 1893 at 4:00 am	30 Sec.		22° N 96′ E	Pagodas Monasteries Mingun Pagoda	300-400	Strike-Slip Faulting	Yega Inn Pull-apart basin
Swa EQ 8 Aug 1929 At 7:20 pm	5 Sec.	M.S 7.0	19° 25′N 96° 25′E	Bridge & Culnets Collapsed			Fault scarp
Bago EQ 5 May 1930 at 8:18 pm	30 Sec.	MS 7.3 (Abe)	17 °N 96.50°E	Hti of Shwemawdaw, Shwe Dagon, Sule	500(Bago) 50 (YGN)	Strike-Slip Faulting	Kabauk inn Pull-apart basin
Phyu EQ 4 Dec, 1930 At 1:20 am	20 Sec.	MS 7.5	18° 24′N 96° 24′E		30		Restraining bend
Kamaing EQ 27 Jan 1931 At 2:25 am	30 Sec.	MS 7.6	25.60°N 96.80° E	Fissure and cracks block fissures		Strike-Slip Faulting	Indawgyi Lake,pull-apart basin
Pyinmanar EQ 10 Aug 1931 At 4 :50 pm	10 Sec.			Two pagodas destroyed, bamboo house collapse			Releasing bend
Tagaung EQ 12 Sept. 1946 At/ 5 Jan 1991		MW 7.5		Pagodas collapsed landslides		Strike-Slip Faulting	Sag pond
Sagaing EQ 16 July 1956 At 9:40 pm		7	21° 58′N 95° 50′E	Pagodas, Monasteries, Mingun Pagoda		Strike-Slip Faulting	Yega Inn Pull-apart basin
Thabeikyin EQ 11 Nov 2012 At 7:42 am		6.8 10km	23.009°N 95.884°E	More than 150 pagodas destroyed school bridges	34	Strike-slip faulting	Fault scarp
Maymyo EQ 23 May, 1912 At 9:00 am		MW 8.0	21°N 97′E	60 pagodas landslides		Strike-slip faulting	Inlay lake Pull-part basin
Yangon EQ 17 Dec 1972 30 Sep 1978 30 Jan 2013	5/6 Sec.	MW 7.0 10km	16.950°N 96.127°E				
Bagan EQ 8 July 1975 At 12:00 night		6.8		Pagodas in Bagan	1 person		Subduction
Taungdwingyi EQ 22 Sept. 2003		MW 6.6 10km	19.90°N 95.73°E	Landslides, Damagepagodas ,bridge & school	7	Strike-slip faulting	Flower structure
Tarlay EQ 24 March 2011		6.8 10km	20.705°N 99.949°E		74	Strike-slip faulting	Tarlay basin pull-

Major Earthquakes Occurrences in t basins

Ye-U EQ (2020)- Shwebo-Monywa basin

Taungdwingyi EQ.(2003)- Salin basin

Thayet-Aunglan EQ (2013)-Pyay basin

Taikkyi EQ.(2017)- Aye-yar-wady Delta basin

Yangon EQ.(2019)- Aye-yar wady Delta basin

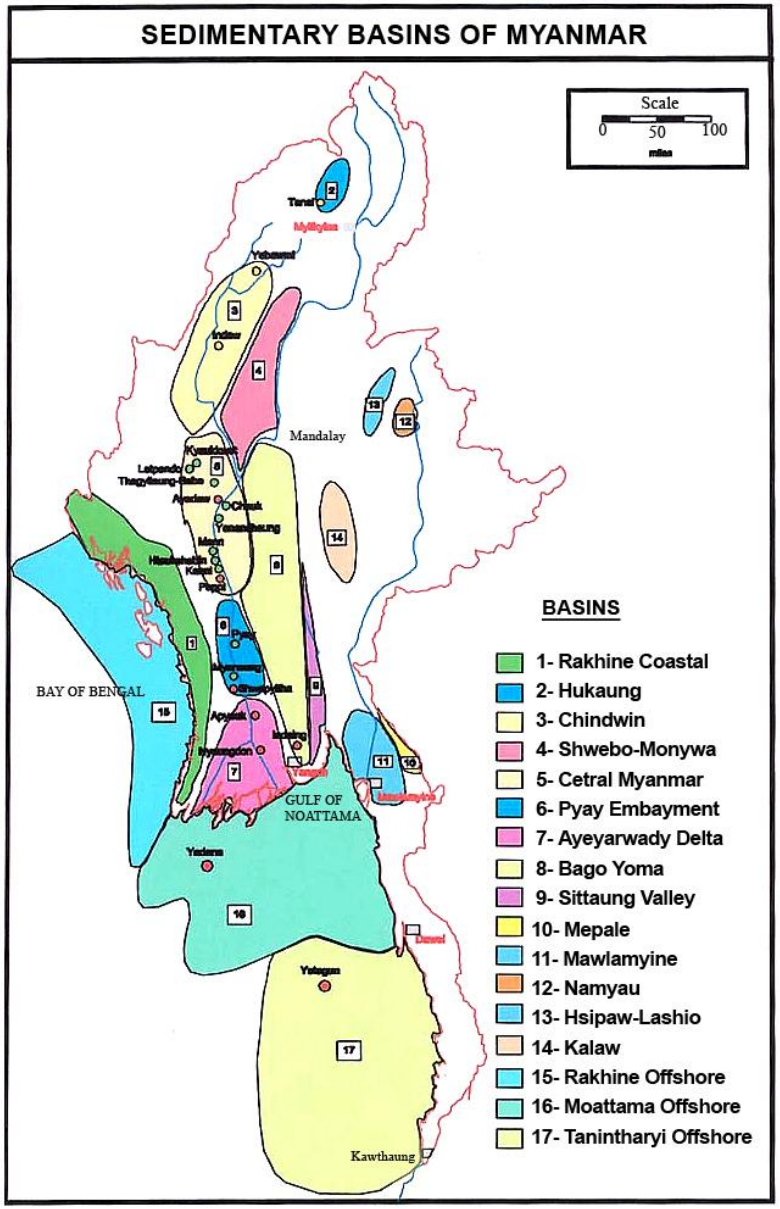
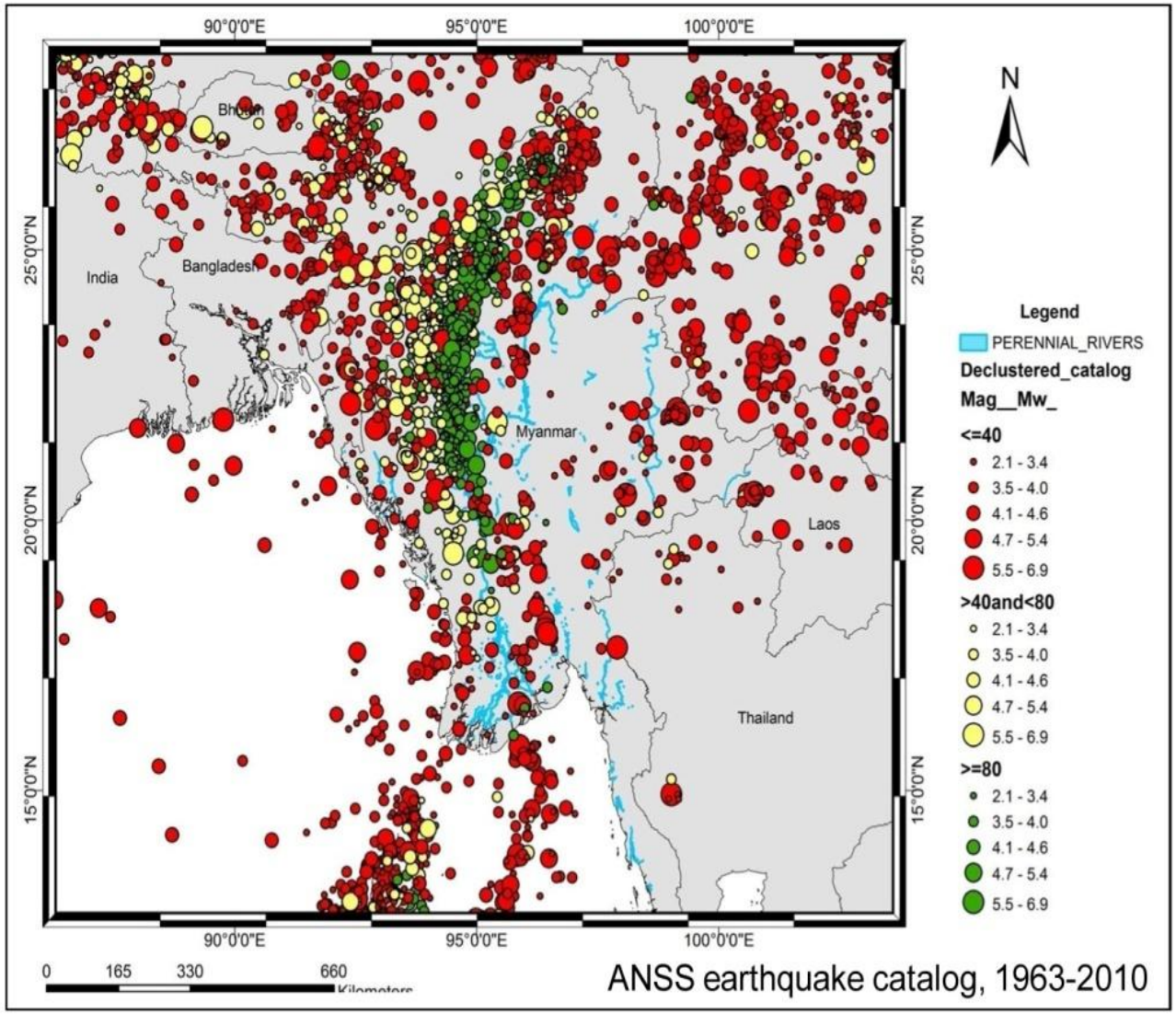
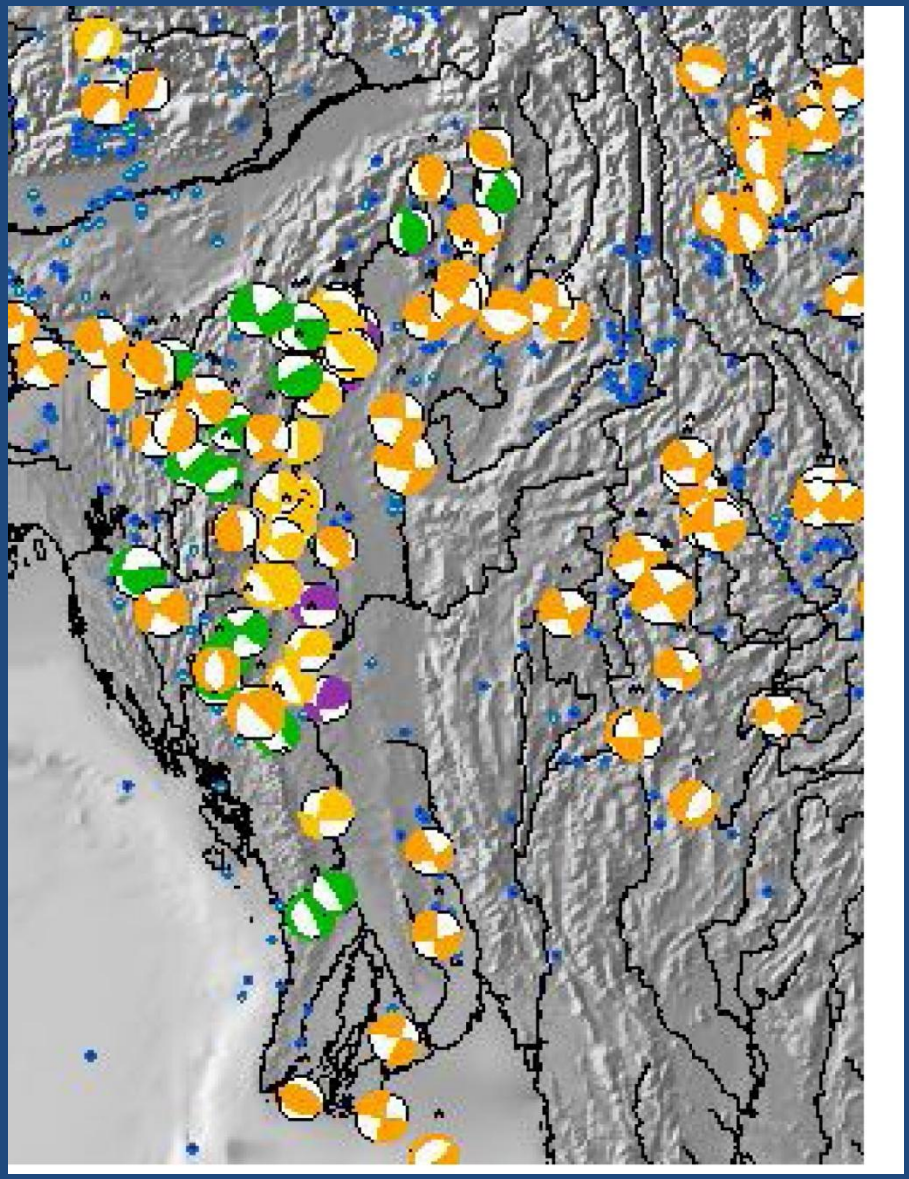


Figure.1. Sedimentary Basins of Myanmar showing location of Ayeyarwady Delta Basin.

ANSS earthquake catalog, 1963-2010

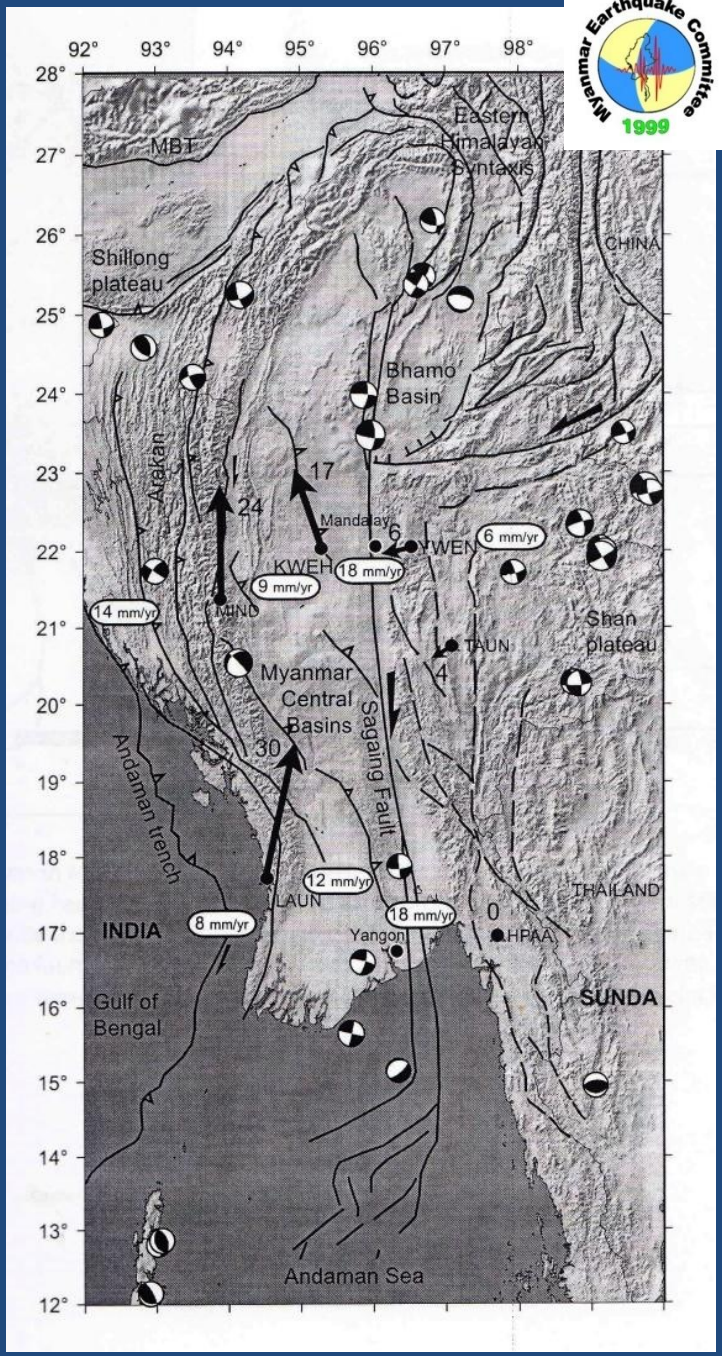


Focal Mechanism

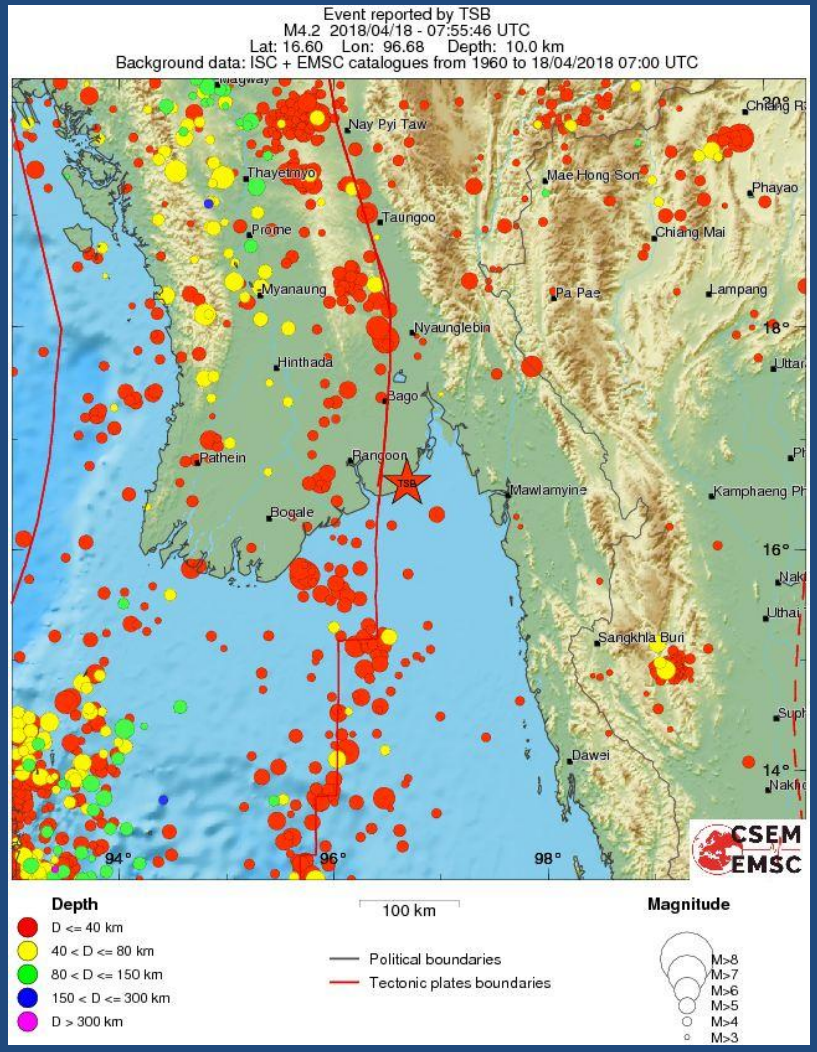


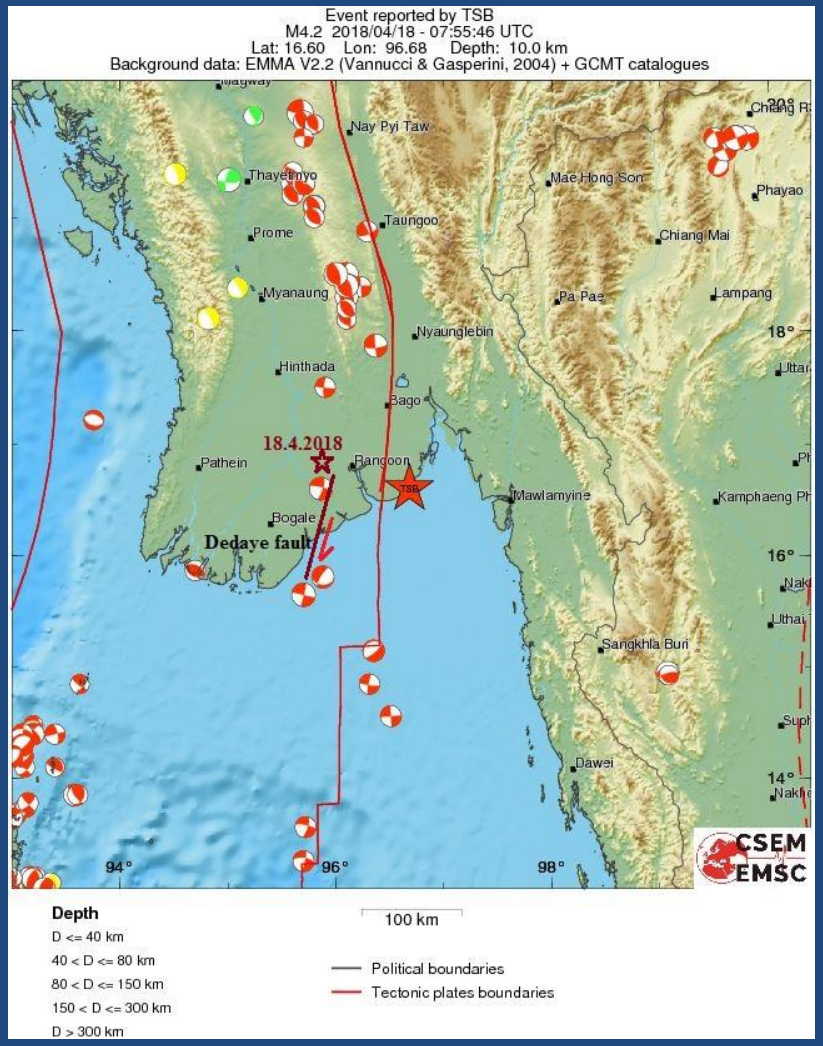
Tectonic stress field in Ayeya-wady Delta Basin

- NNW-SSE extensional regime (black quadrant)
- and
- ENE-WSW compressional regime (white quadrant)



Seismicity and Focal Mechanism Solutio
in Ayeyawady Delta Bain

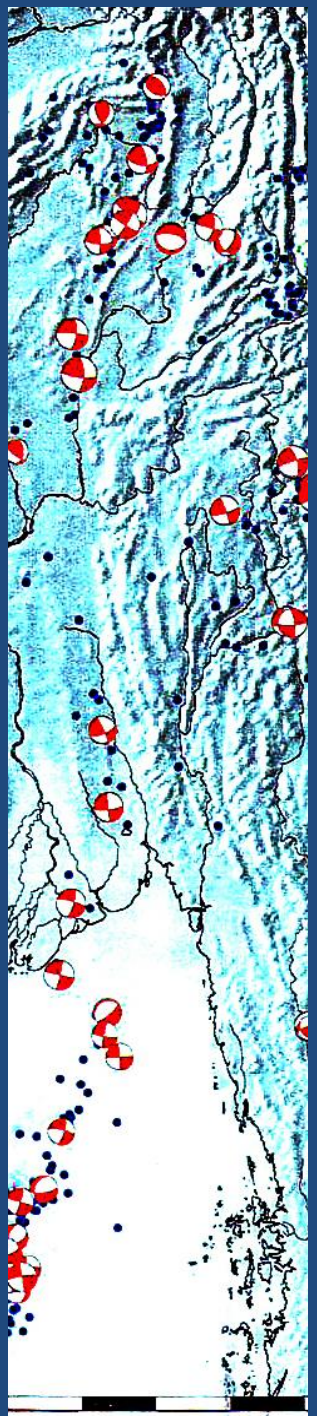




Focal Mechanism Solution along the Sagaing fault

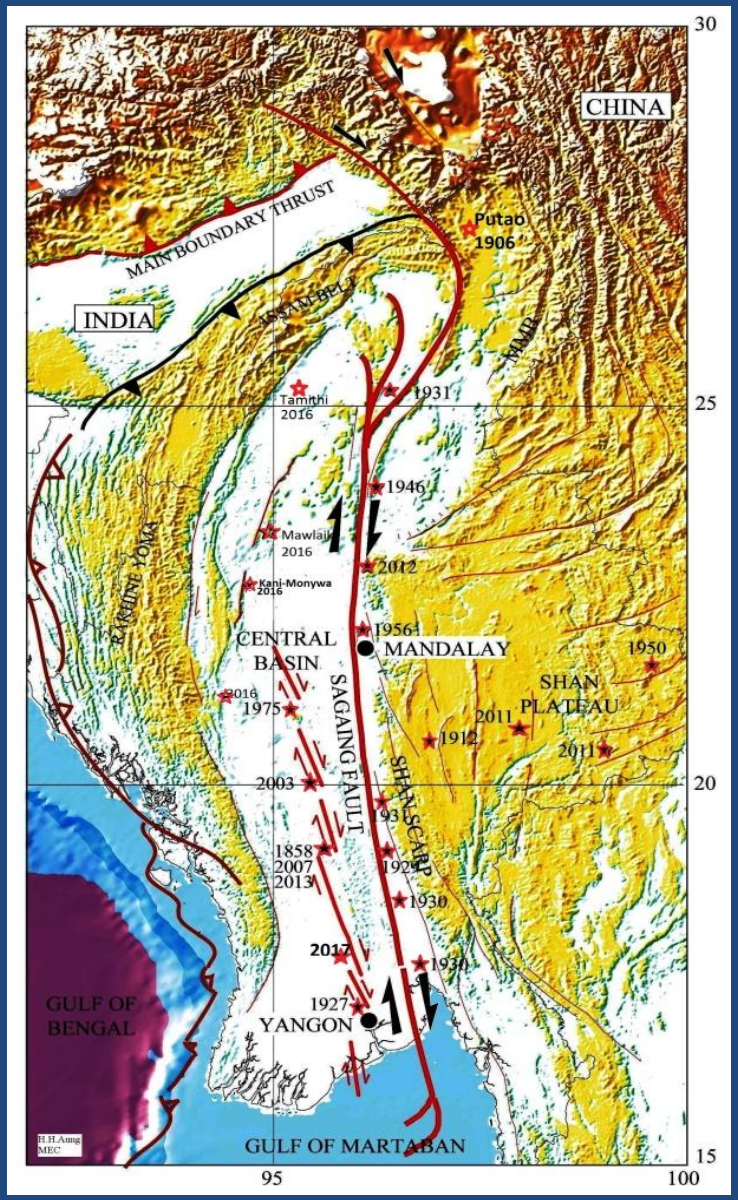
- Focal mechanism solution (CMT from Harvard) and epicenter from ENGDHAL) gives strike-slip faulting

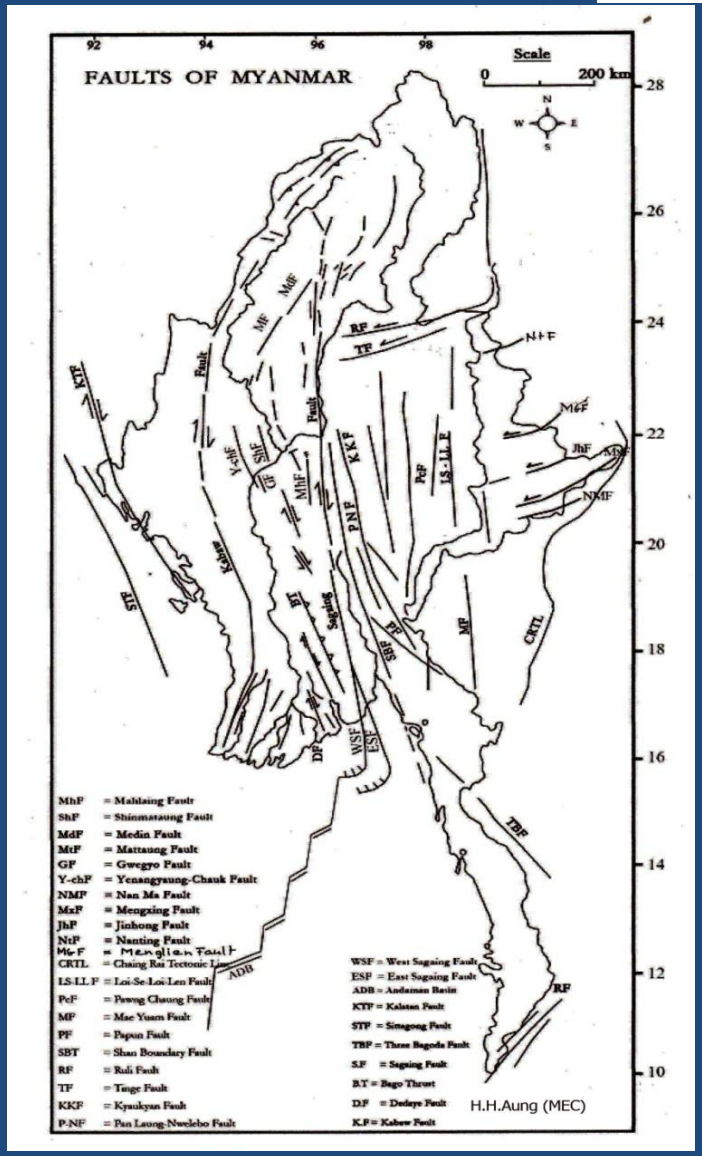
- Red quadrants show NW-SE trending extension regime
- White quadrants show NE-SW compression regime



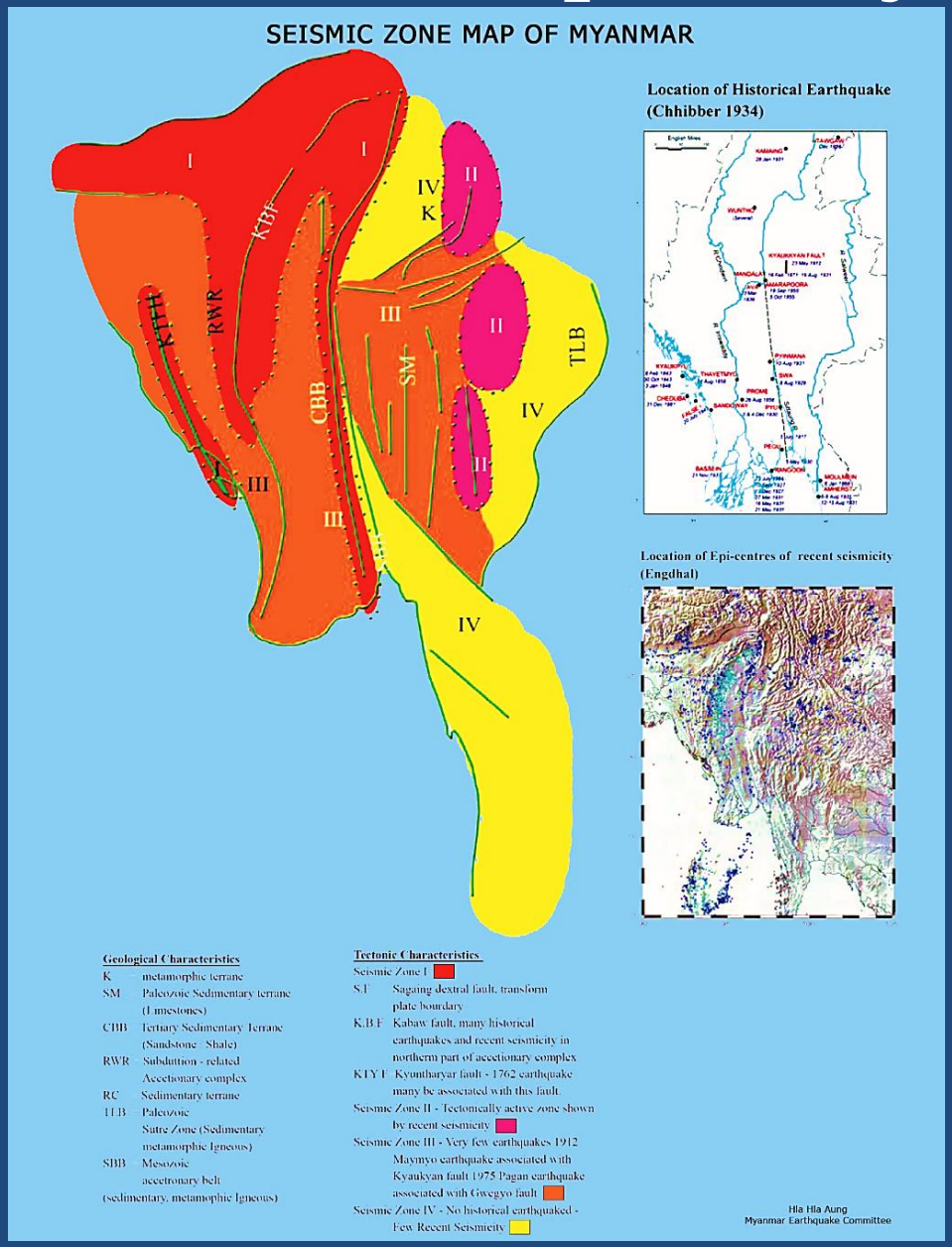
Myanmar Earthquake Committee 1999

Relation between seismicity and their type of fault



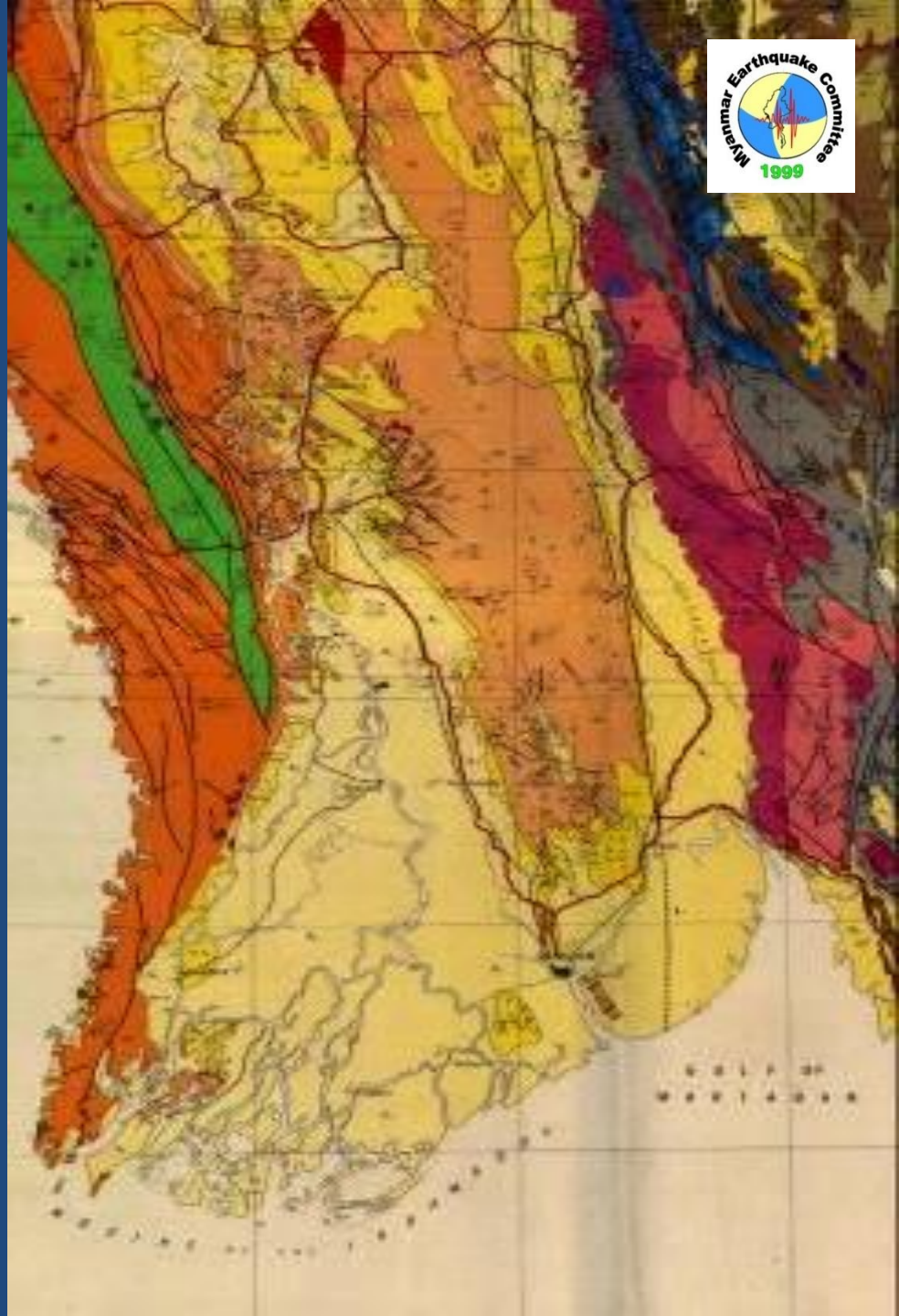


Seismic Zone Map of Myanmar

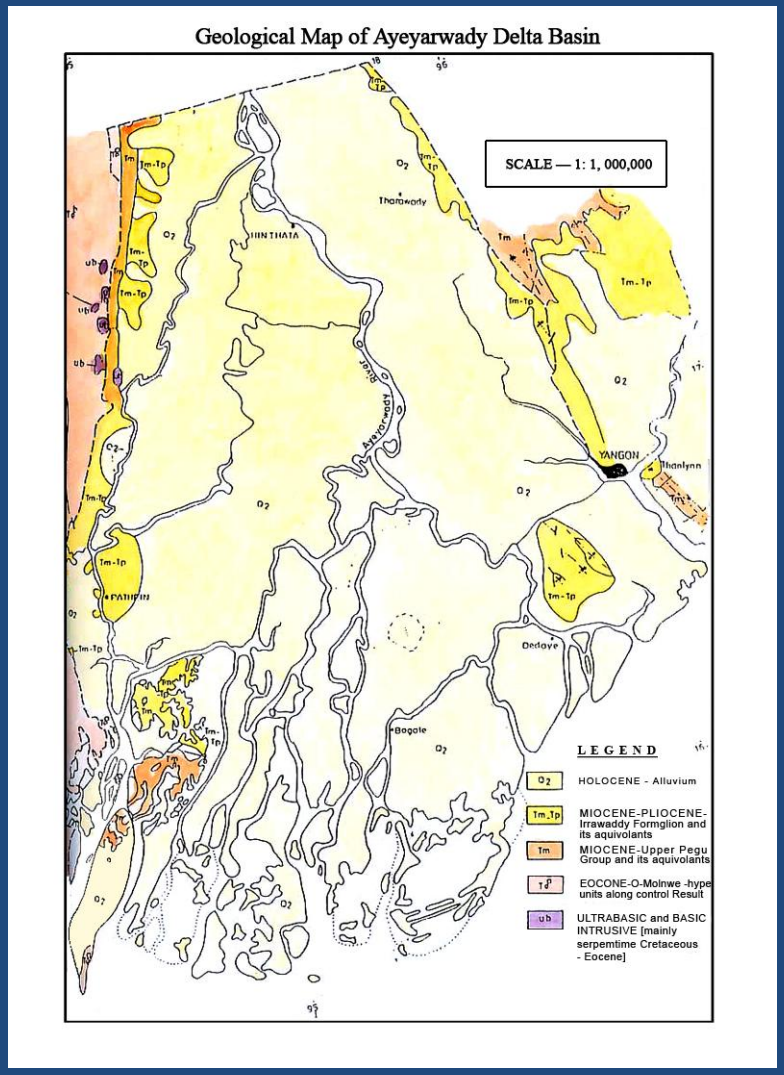


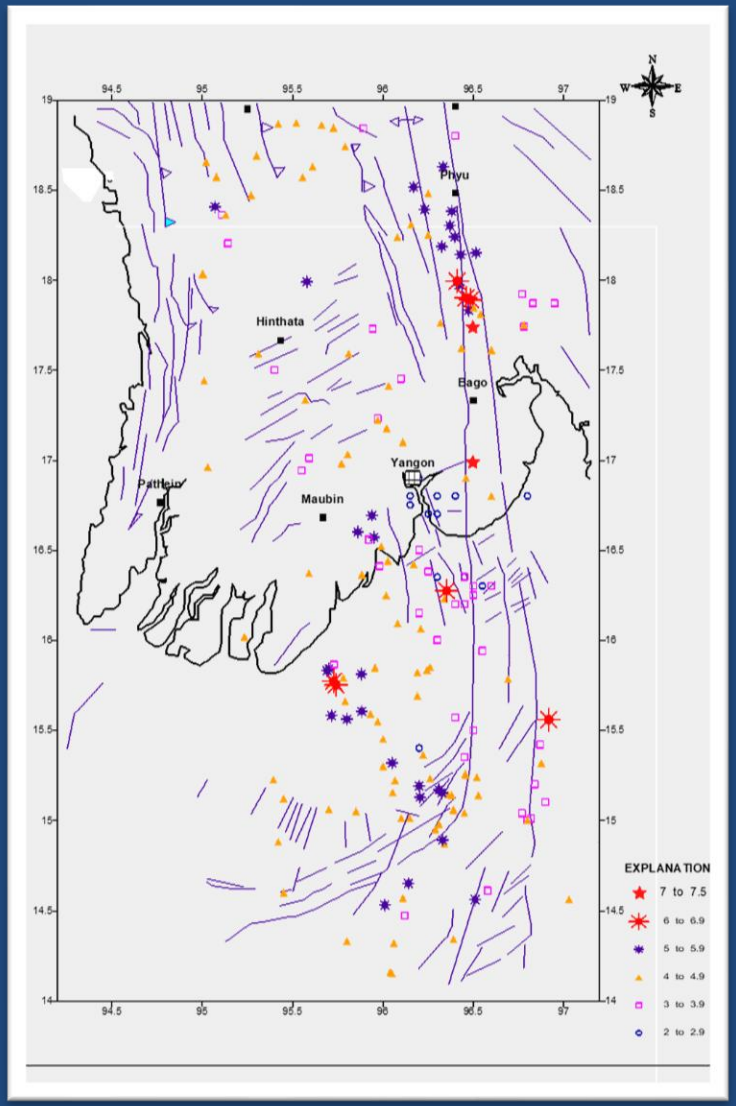
ADB

- **Ayeyarwaddy Delta Basin is located between latitude 15-17N and 18-20N;longitude 94-15E and 96-20E.**
- **Geographic position is between Rakkkhine Western Ranges in the west , Pyay Basin in the north , Bago Yoma in the east.**



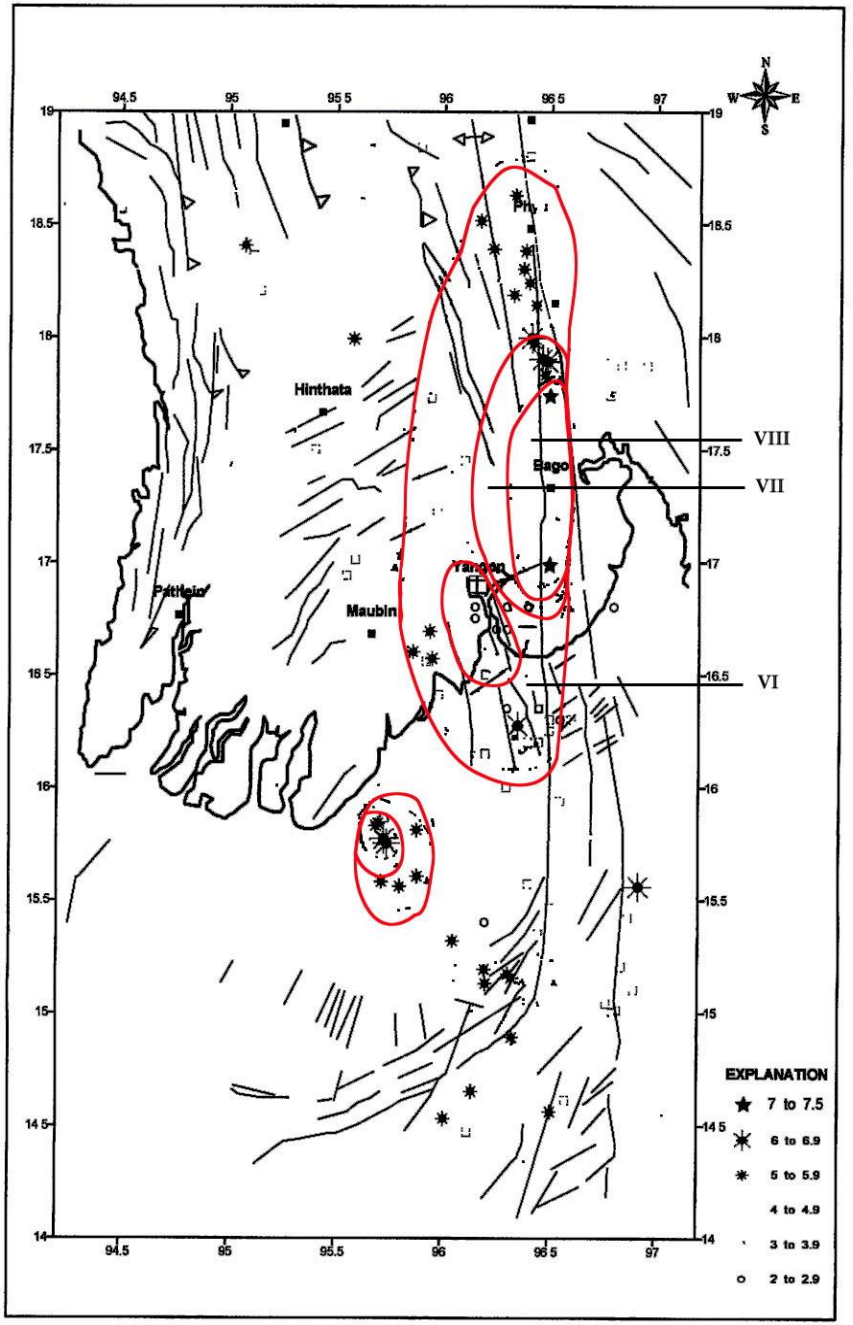
Geological map of Ayeyawaddy Delta Basin





Earthquake Zonation map of Bago-Yangon region

- Isoseismal lines are drawn according to the epicenters recorded
- There are V-VI, VI-VII and VII-VIII and IX
- Yangon lies in zone VI-VII of Modified Mercalli Intensity Scale



Seismic Intensity Map of Yangon - Bago Area

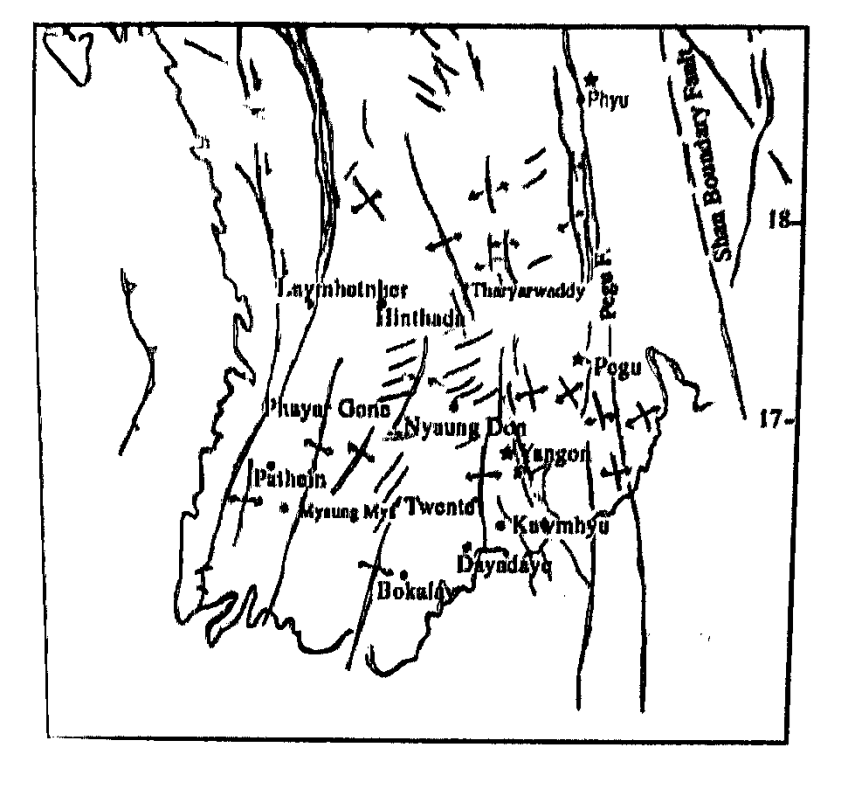
List of previous earthquakes that occurred in ADB

- **M 3.8 - near the south coast of Myanmar**

- **M 4.2 - 12km WNW of Twante, Burma**
- 2018-04-18 07:55:36 UTC 16.750°N 95.821°E
  10.0 km depth
-
-
- **M 3.4 - 14km S of Pyapon, Burma**
- 2018-04-16 13:32:33 UTC 16.149°N 95.676°E
  10.0 km depth
-
- **M 4.6 - 20km SW of Mawlamyinegyunn, Burma**
- 2019-09-10 20:18:45 (UTC)
- 16.265°N 95.115°E
- 10.0 km depth

- **M 4.3 - 73km S of Thongwa, Burma**
- 2018-08-16 06:50:11 UTC 16.098°N 96.494°E
  10.0 km depth
-
- **M 4.1 - 10km SE of Pyapon, Burma**
- 2018-04-14 22:27:32 UTC 16.205°N 95.746°E
  10.0 km depth

-
- 4.5 7m from Phyar-pon West of Yangon
- 2025-3-3 03:333:02 UTC 16.322 N 95.622 E
- Depth 10km



Recent Seismicity in the year: 2023, 2024,2025 in Ayeyyawady Delta Basin

- On 23rd September 2023, there was an earthquake with M 4.8 (USGS), 9 km south of Taikkyi and 20 km north of Yangon, latitude 17.6° N, longitude 96.088° E, 14:24:4(UTC), 8:55 pm (MST) at 10km depth. Due to this earthquake, many ancient buildings have been damaged near Pan Ta Pwint Taung, Taikkky.

- On 20th November 2024, an earthquake with magnitude 4.9 at 05:34, Lat.16.44° N 95.683° E, 20 km from Kawt-hmoo, at 10 km depth. Diamond bud of Kyauk-taw pagoda fell down in Kawt-Mhoo.

- On 5th March 2025 at 04:36:43+06:30 (UTC), 14 km north of Maubin, an earthquake with magnitude 5.1 (USGS), Yangon Region at 04:36:37 on 5th March,2025. Its epicenter was situated at latitude 16.864°N, longitude 95.613°E and at 10 km depth (USGS). There are damages and cracks formed at ancient buildings such as Mahaboti cave, 108-taung pagoda and walls of warehouse due to this earthquake.

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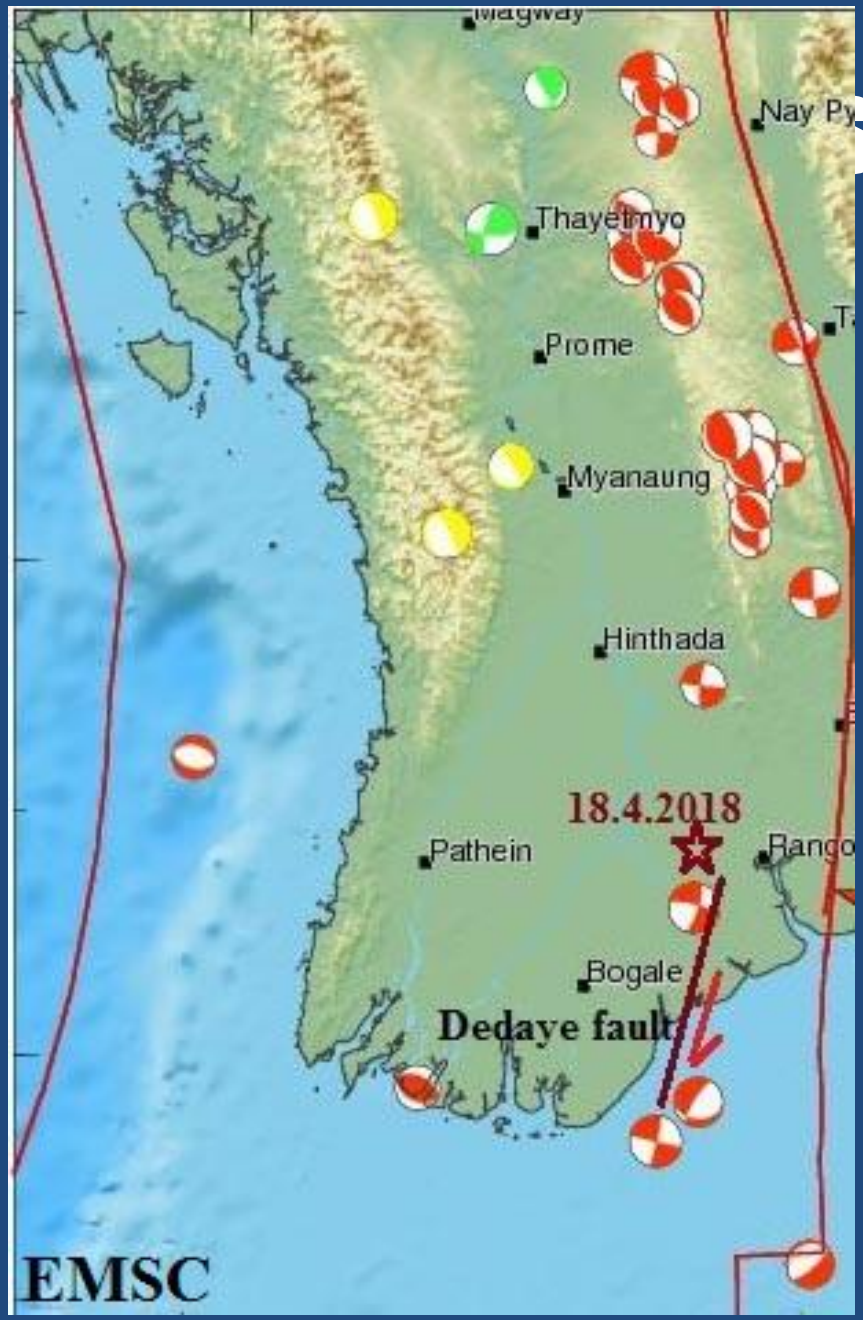
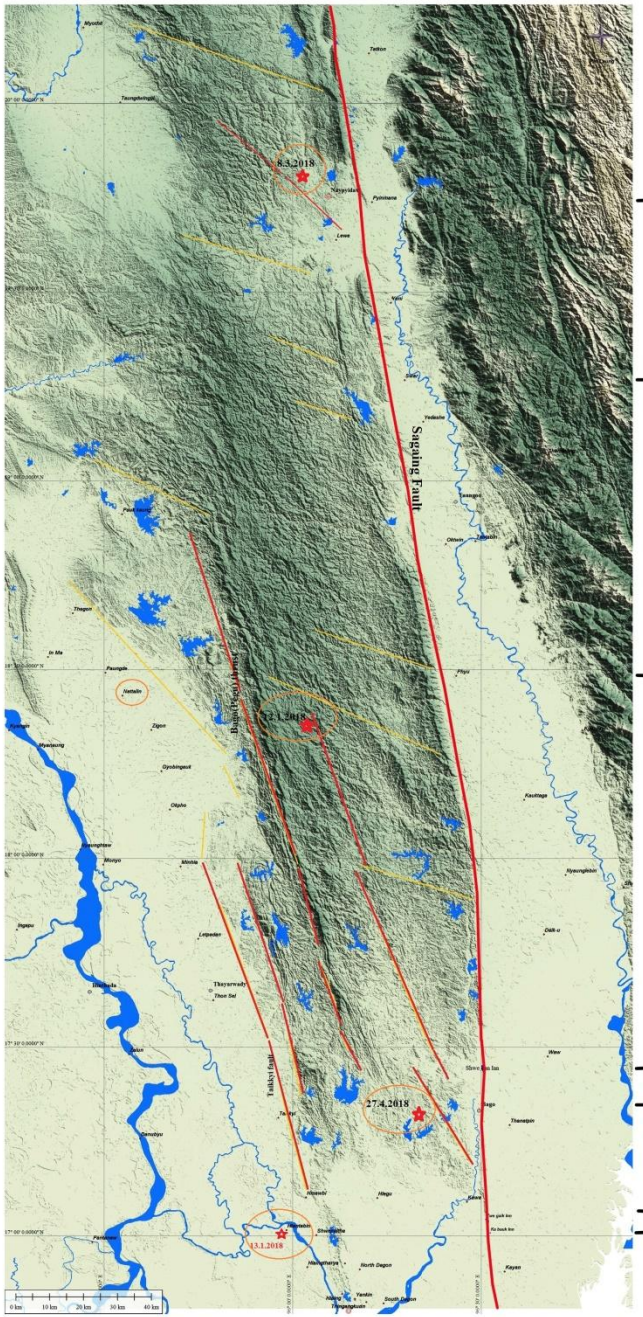
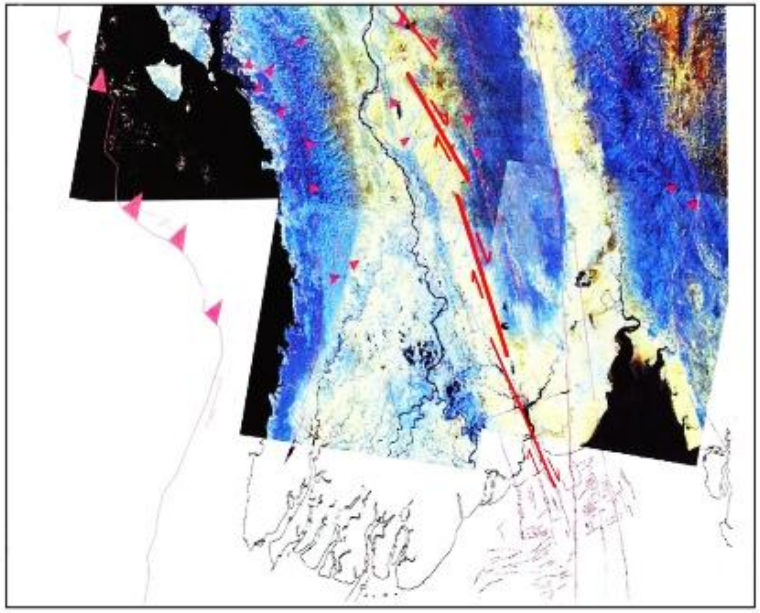

Magway
Nay Py
Thayetmyo
Prome
Myanaung
Hinthada
18.4.2018
Pathein
Bogale
Dedaye fault
EMSC


Myanmar Earthquake Committee
1999
8.3.2018
Pyinmana
Swar
Sagaing Fault
Phyu
Shwe Dan Inn
Bago
27.4.2018
Zwe Gaik Inn
Ka bauk Inn
13.1.2018

Tectonic stress field in Aye-ya-wady Delta Basin



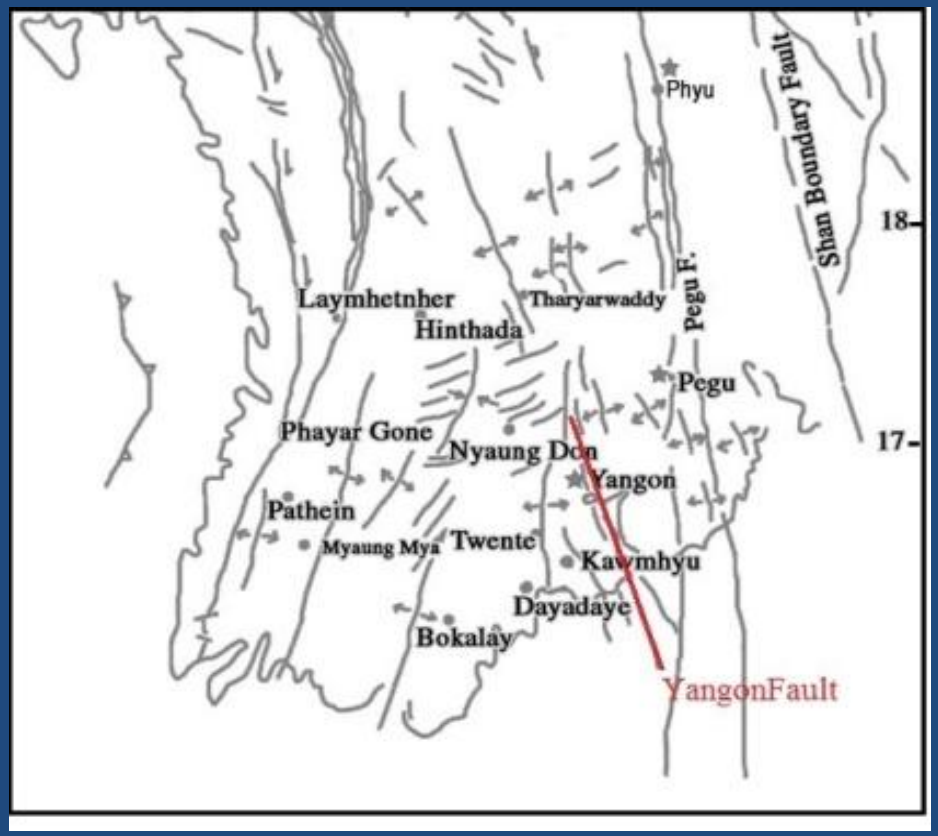
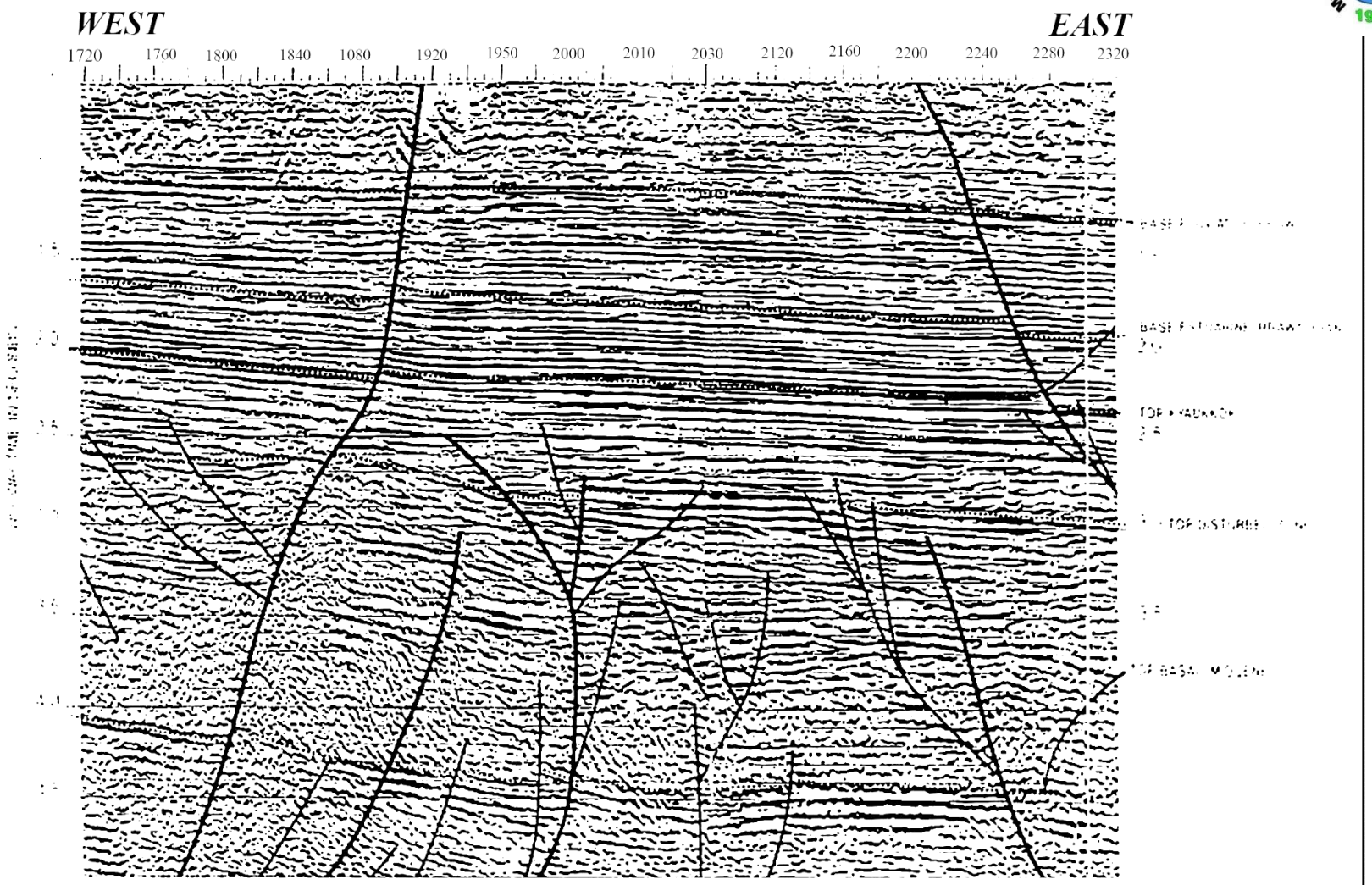
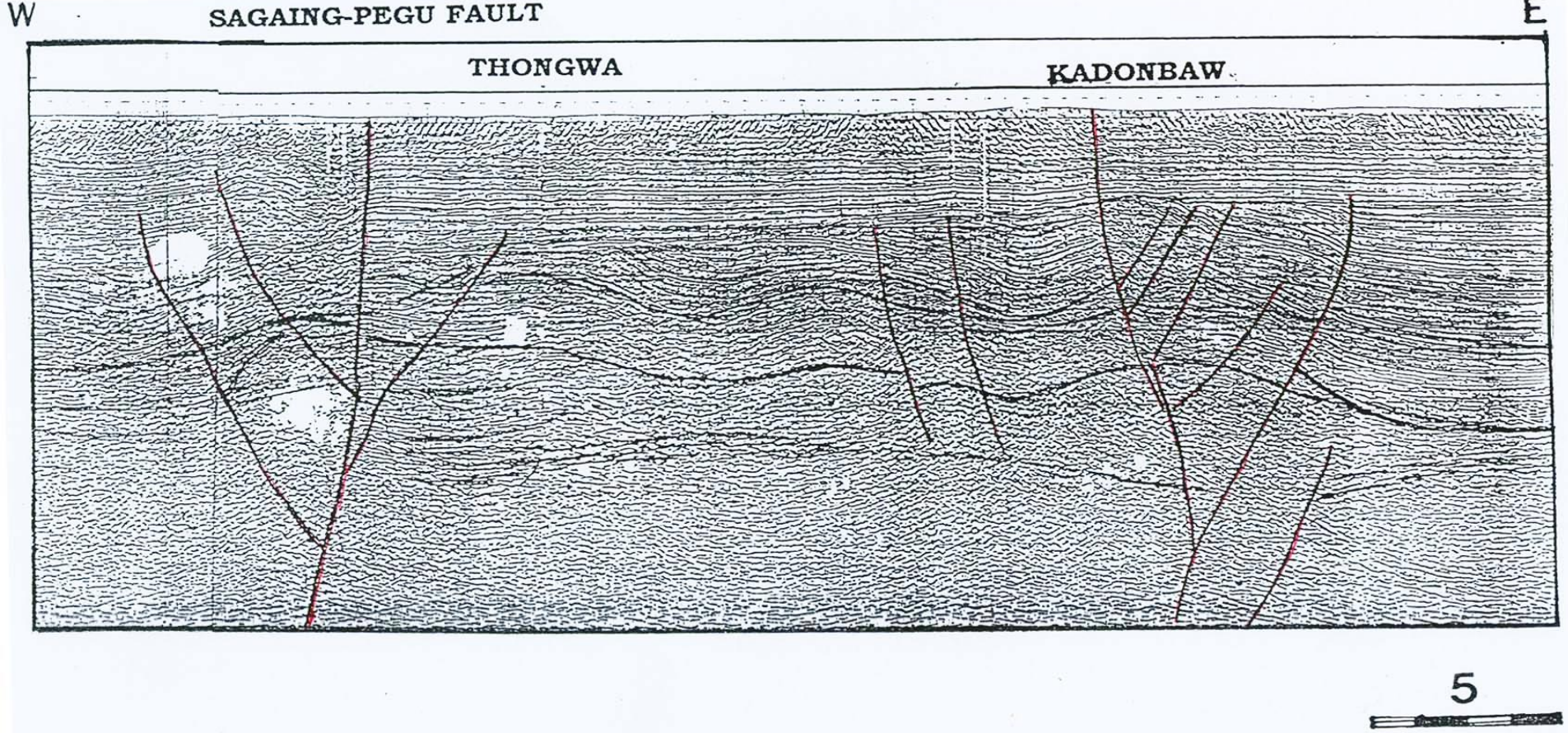


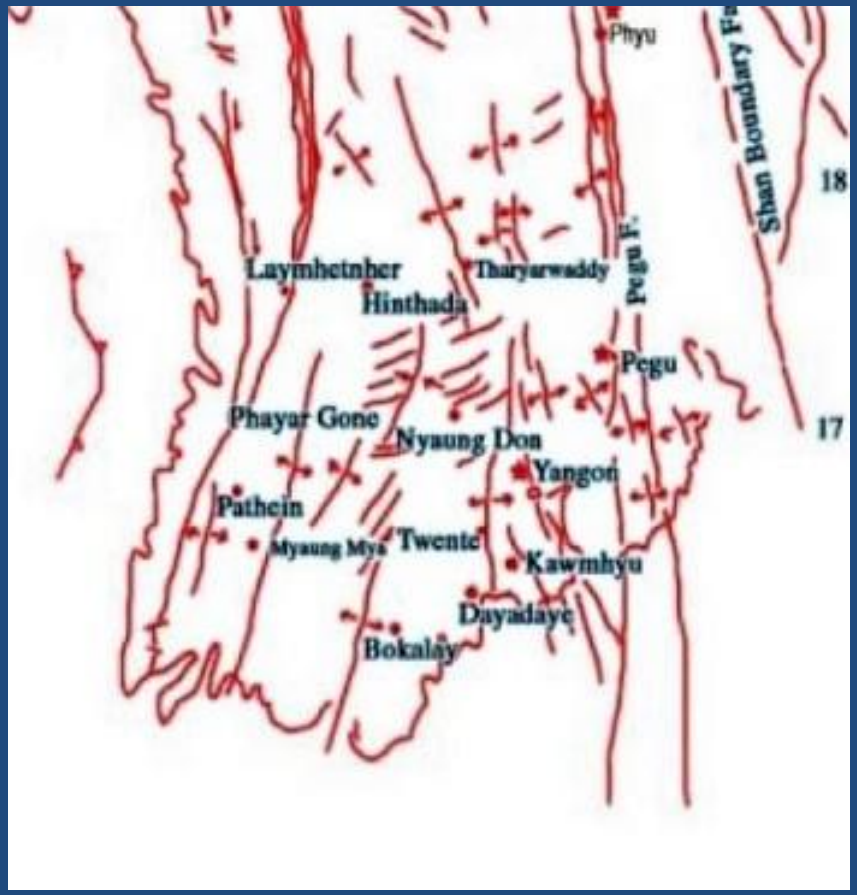
Figure. 15. Seismic Line CFTM - 190 - 012, Showing the roll over anticline associated with listric growth fault

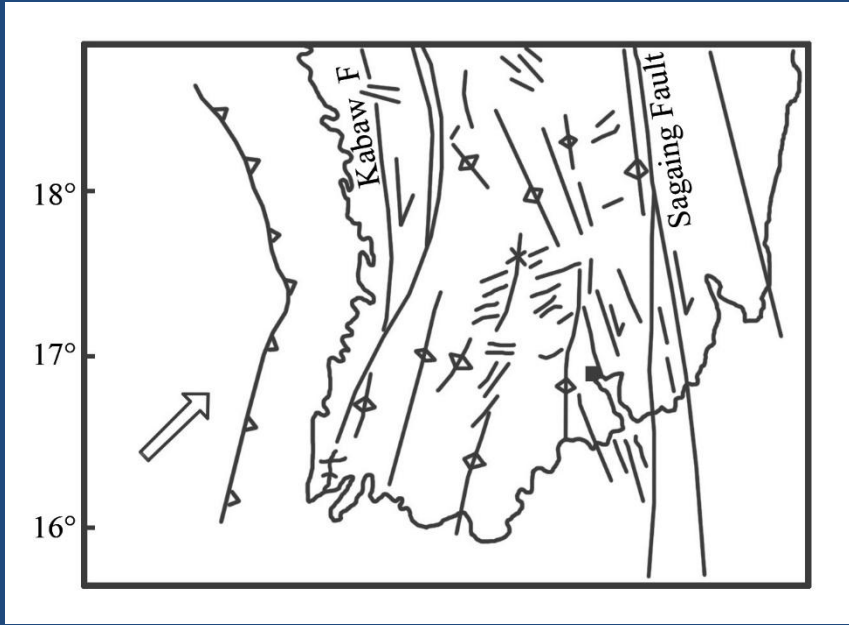




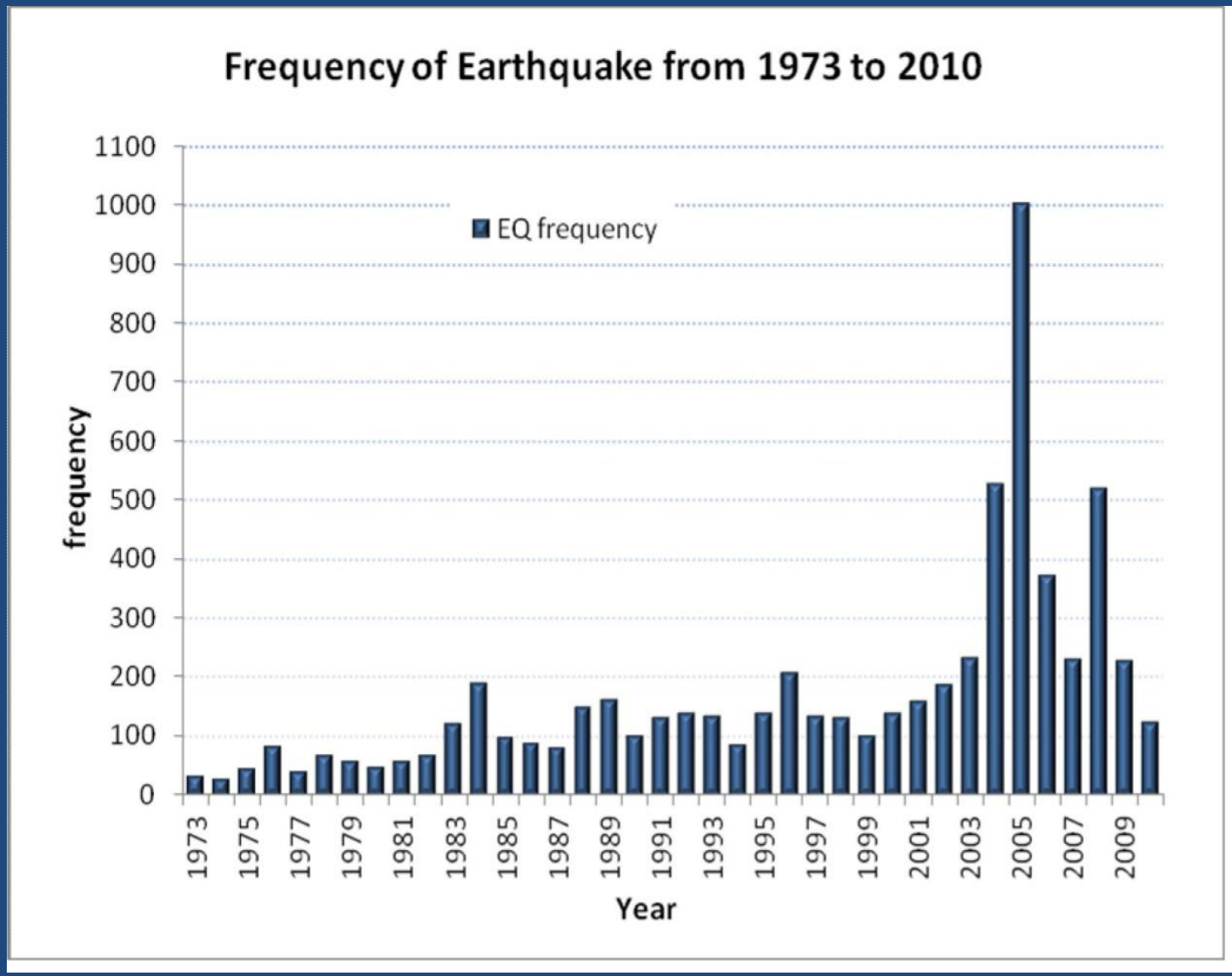
Seismic profile showing strike-slip faults in southeast of Yangon

East Sagaing Fault and West Sagaing Fault


Phyu
Shan Boundary F
18
Laymhetnher
Tharyarwaddy
Pegu F.
Hinthada
Pegu
Phayar Gone
Nyaung Don
17
Yangon
Pathein
Myaung Mya
Twente
Kawmhyu
Dayadaye
Bokalay


18°
17°
16°
Kabaw F
Sagaing Fault

Frequency oF EQ. In 1973 to 2010



Normal Fault Example

Dixie Valley-Fairview Peaks, Nevada earthquake
December 16, 1954

USGS

Thrust Fault Example

USGS

THANK YOU ALL !