

The Cross-border Collaboration on Geology and Mineral Resources of  
Cambodia-Lao PDR-Myanmar-Thailand-Vietnam Meeting

20-24 May 2016, Chiangrai, Thailand



**MYANMAR**



**Myanmar – Thailand – Laos Cross Border  
Project Issue**

**Dr. Ye Myint Swe (Director General)**

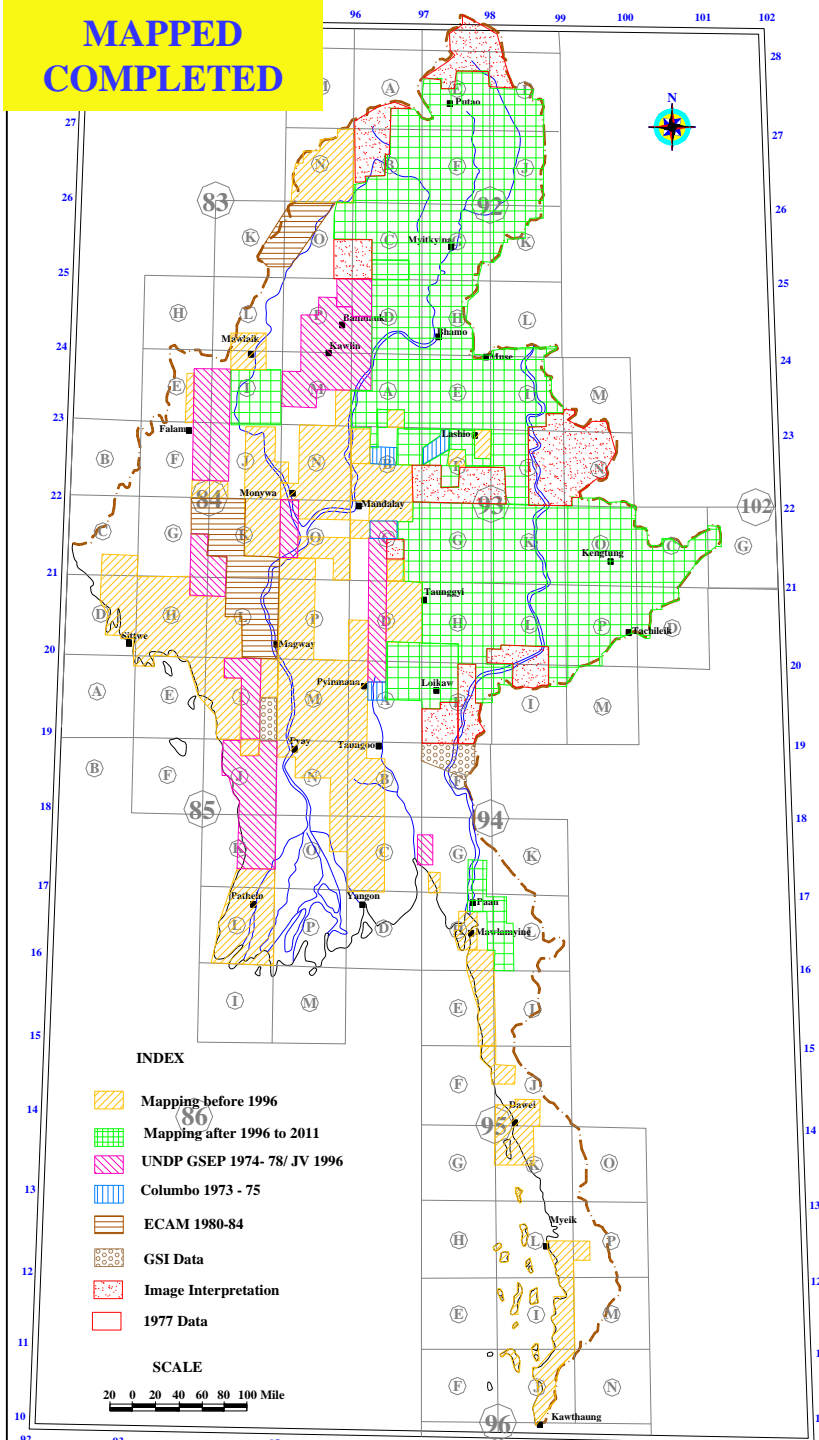
**Dr. Myint Soe (Director)**

**Department of Geological Survey and Mineral Exploration**

**Ministry of Natural Resources and Environmental Conservation**

May, 2016  
Thailand

**MAPPED  
COMPLETED**



## STATUS OF GEOLOGICAL MAPPING

Area extent of Myanmar – 261227 sq miles

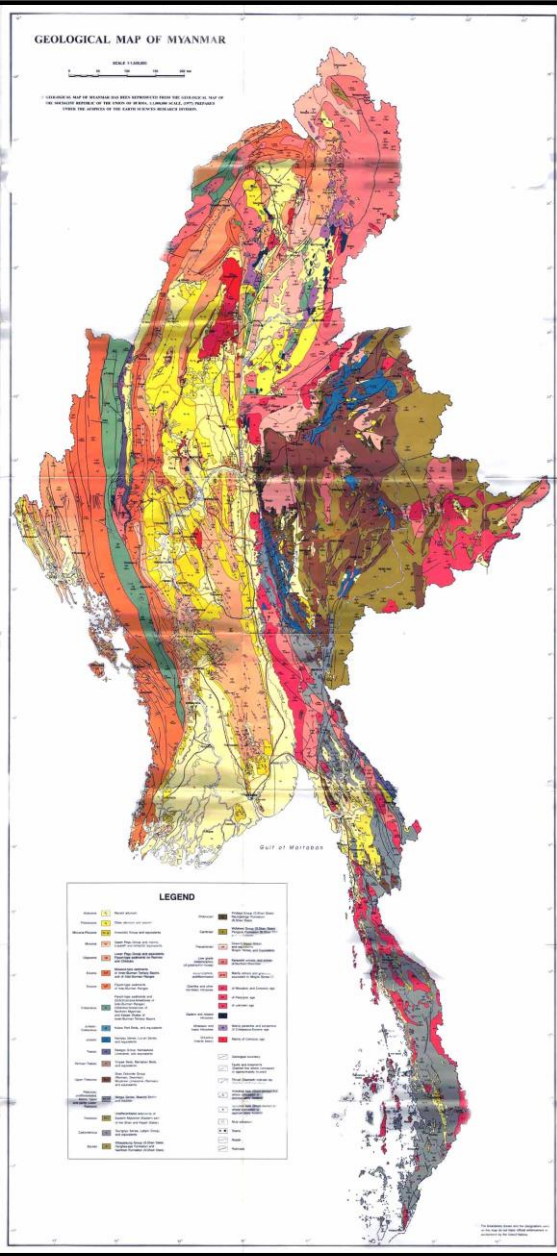
Geological mapping area(on ground) ~70%

1:50,000

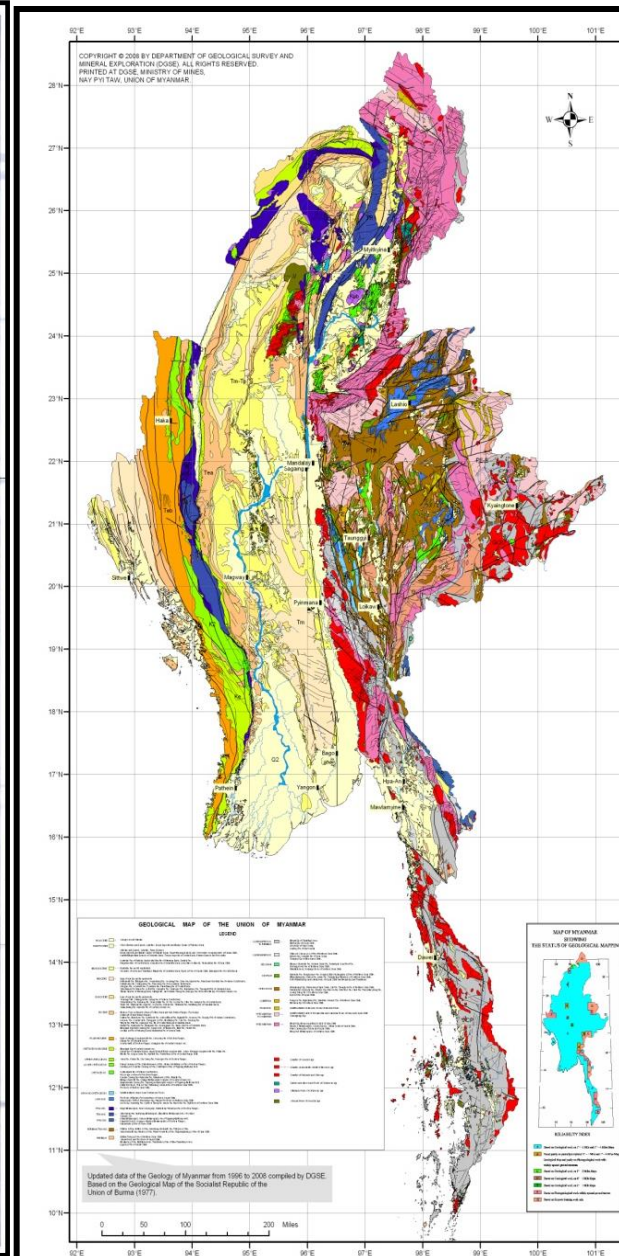
Geological mapping(by the aid of  
Aerial Photos & RS-GIS techniques) ~30%

1. Columbo Plan (1970 – 1973).
2. Geological Survey and Exploration Project (GSEP), UNDP (1972 –78)
3. UNDP offshore Project (1971 -1978)
4. German Geological Mission Burma (GGM – Burma), (1972 – 1975).
5. East Chin and Arakan Mineral Survey (ECAMS) Project (Germany), (1980 -1989).
6. Geological Survey and Exploration Project, MMAJ, Japan (1999- 2003).
7. Technical and Expertise Aid on Digital geological mapping of Myanmar using GIS and Remote Sensing , JICA, Japan (2003 - 2006)
8. Ela Metallurgical Research and Development Project by Japan International Cooperation Agency, Japan in 1980.

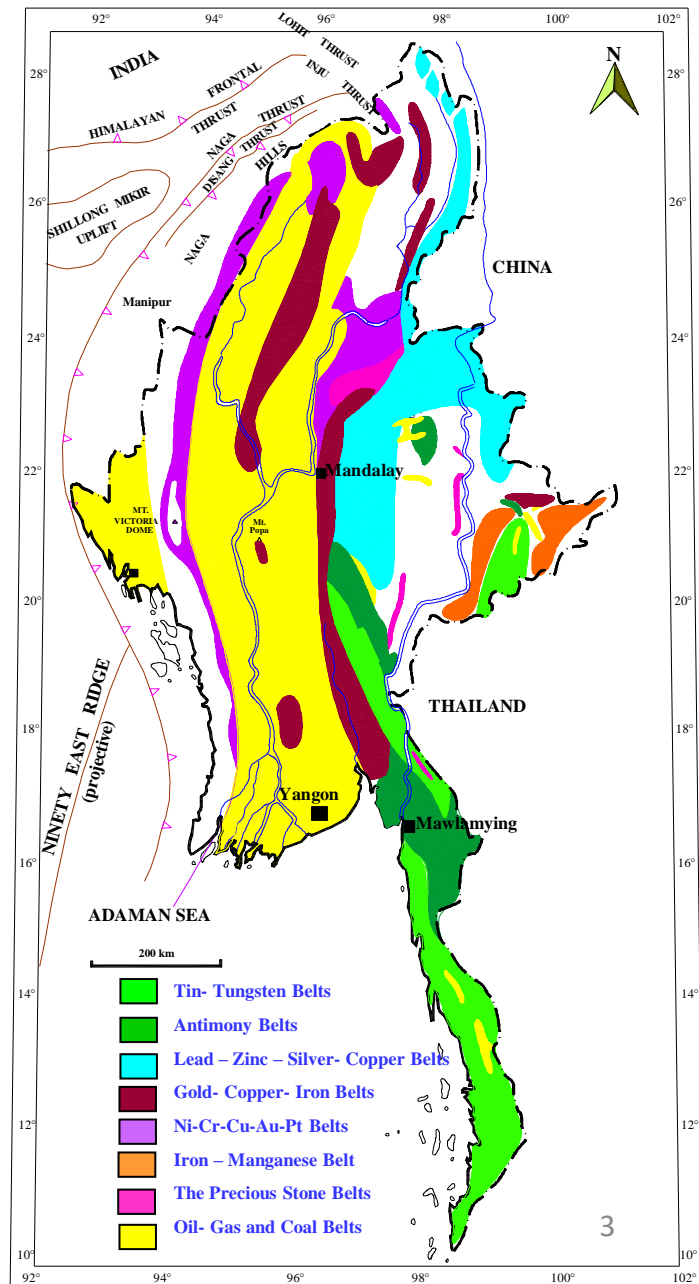
# Geological Map of Myanmar (1977)



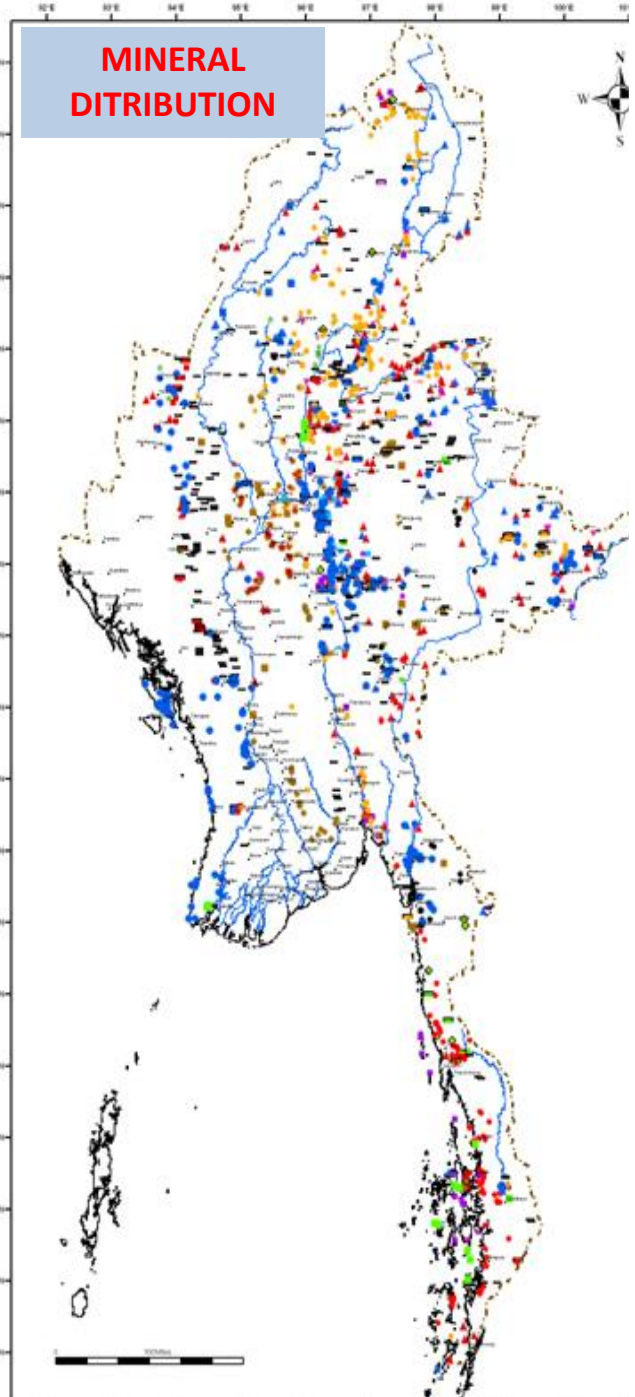
# Geological Map Of Myanmar (2008),



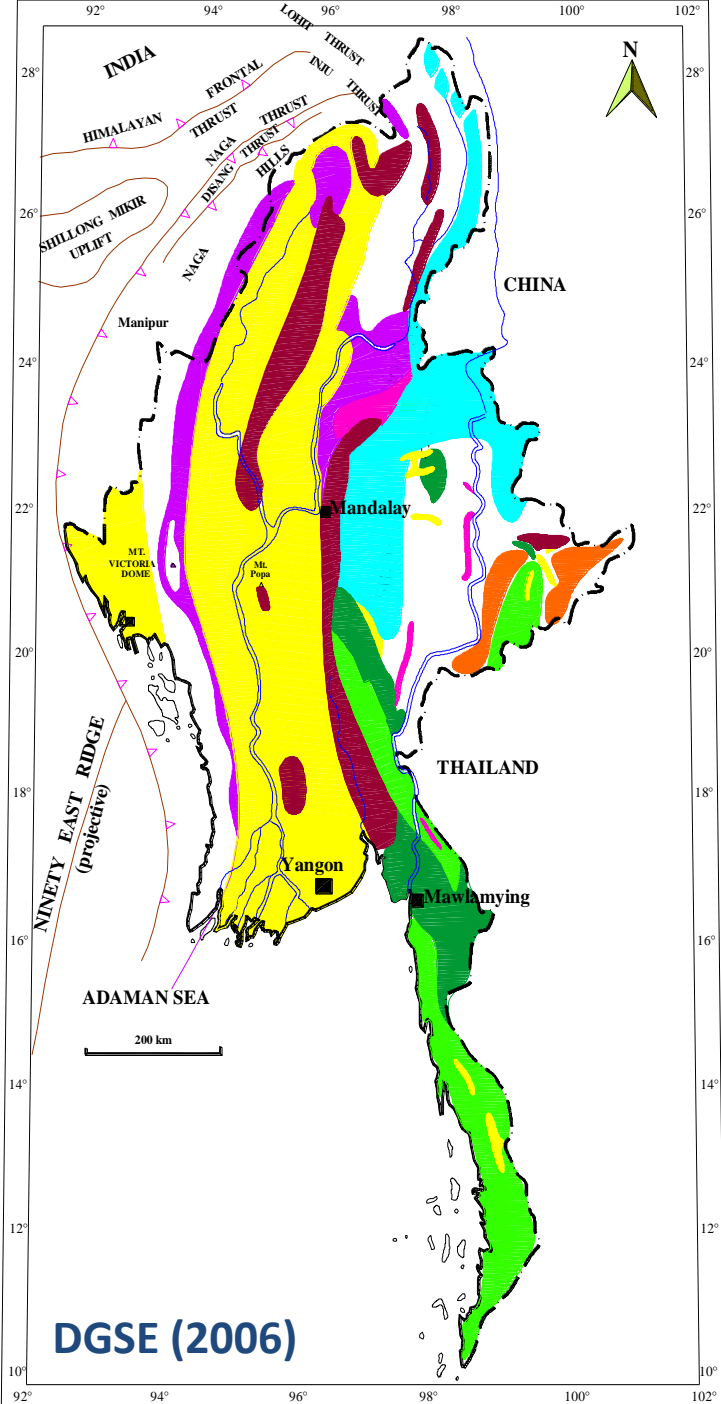
# MINERAL PROVINCES OF MYANMAR



## MINERAL DISTRIBUTION



## MINERAL PROVINCES OF MYANMAR



- Tin- Tungsten Belt
- Antimony Belt
- Lead – Zinc – Silver-  
Copper Belt
- Gold- Copper- Iron Belt
- Nickel- Chromite-
- Copper- Gold- Platinum  
Belt
- Iron – Manganese Belt
- The Precious Stone Belt
- Oil- Gas and Coal Belt

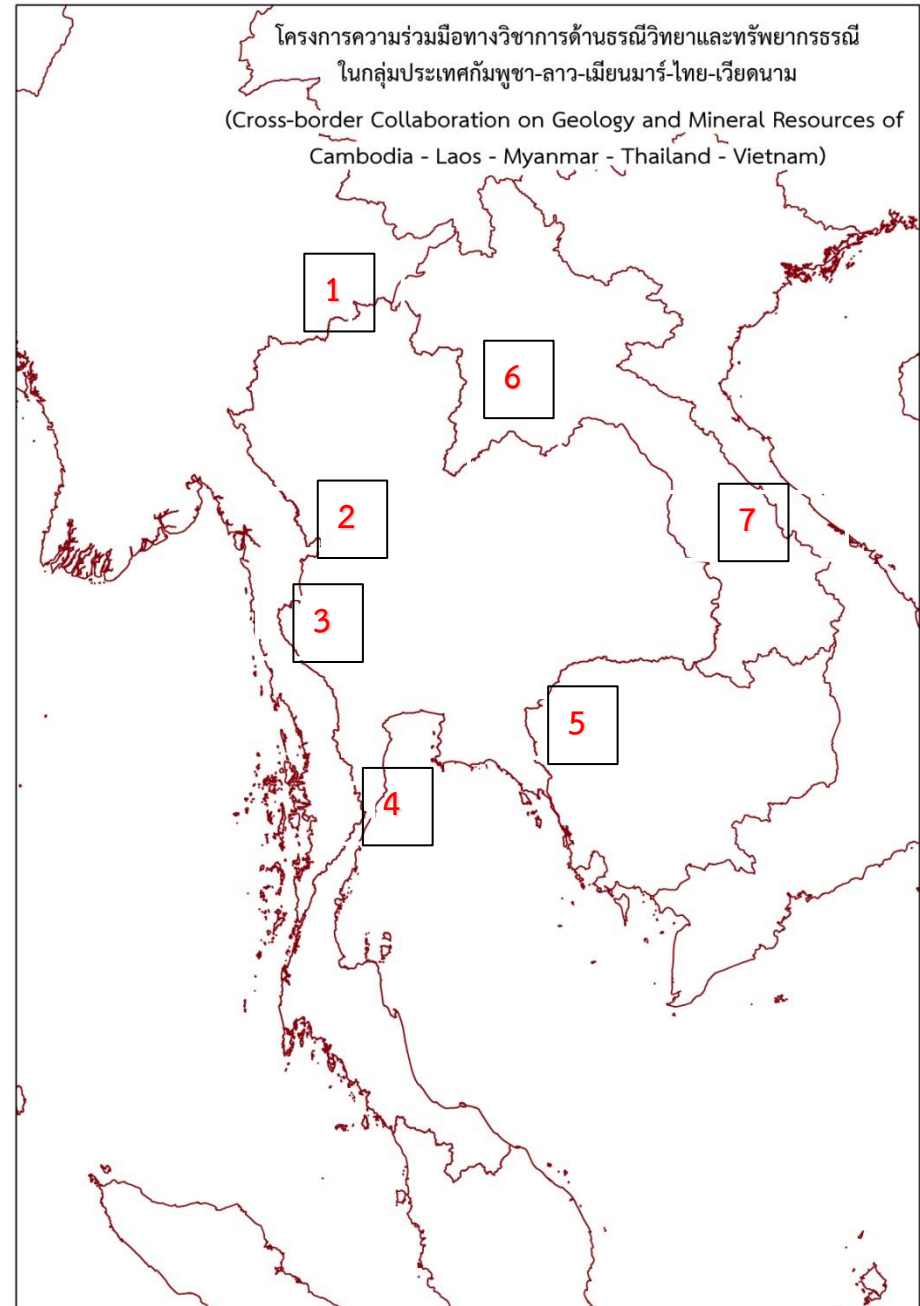
DGSE (2006)

## Details of Project

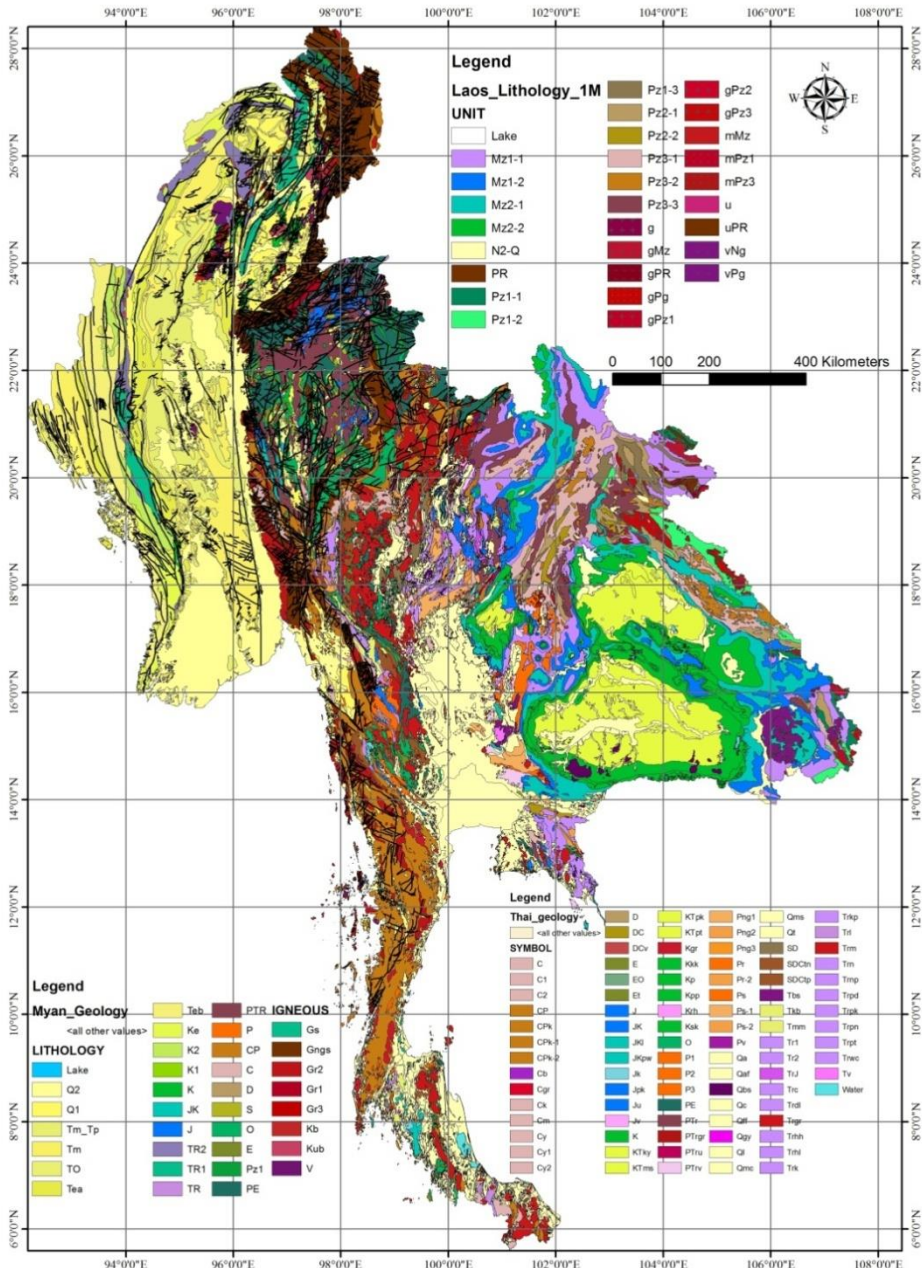
### Project Sites

joint study areas at a scale of 1:1,000,000 with geological discontinuous boundaries as follows;

- 1) Mae Sai – Tachileik
- 2) Maesot – Myawaddy
- 3) Dawei – Kanchanaburi
- 4) PrachuapKhiri Khan – Myeik
- 5) Chanthaburi – Battambang
- 6) Loei – Nongkhai – Vientiane
- 7) Mukdahan – Savannakhet – Hue – Danan

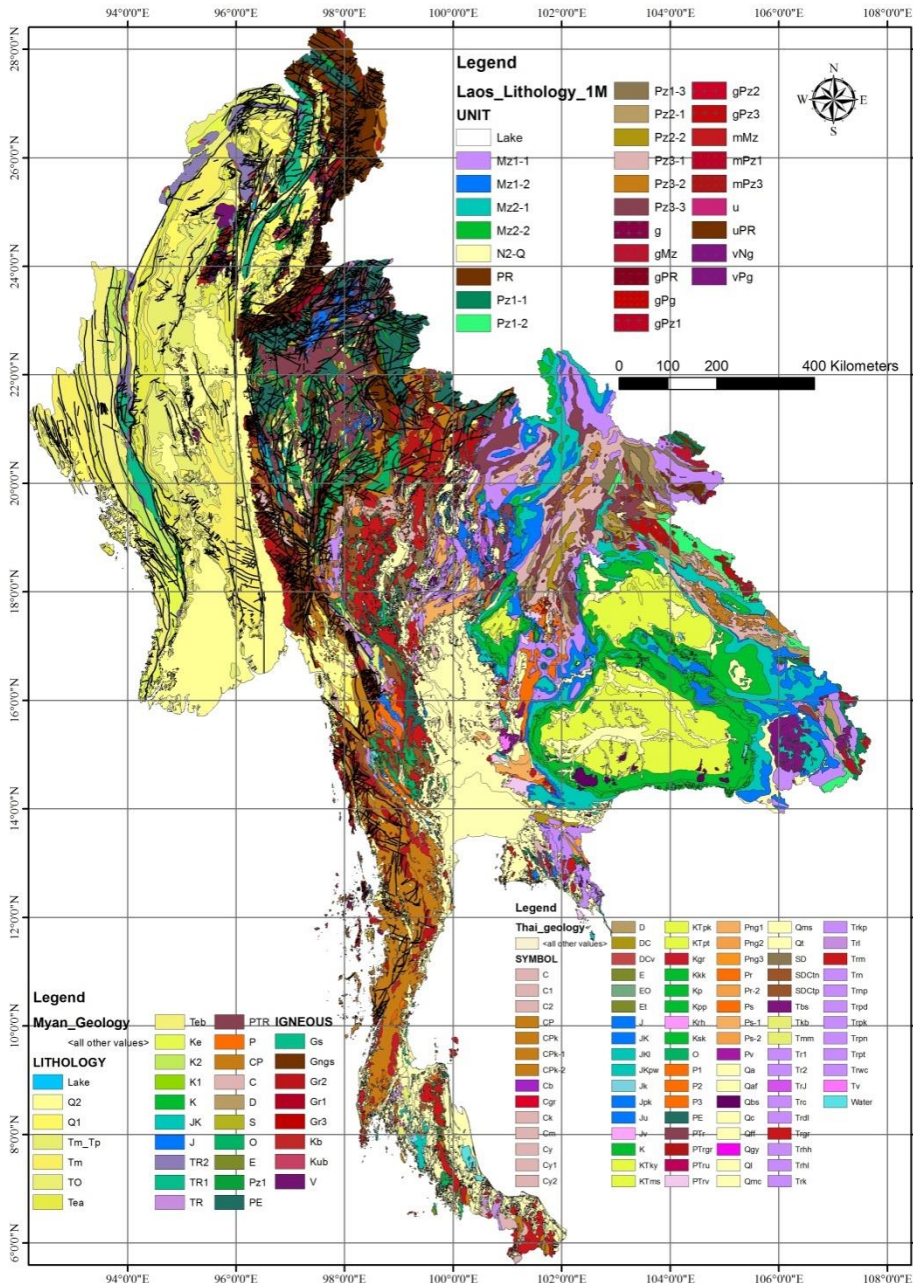


# Geological Map of Myanmar-Thai-Lao



Unified Legend	Geological Map 1:1M			Color code		
	Thailand (1999)	Myanmar (2008)	Laos PDR (2008?)	R	G	B
Q_S	Qa, Qaf, Qff, Qms, Qmc, Qt, Ql, Qc		N2-Q	255	255	180
Q2_S		Q2		255	250	150
Q1_S		Q, Q1		255	250	100
Pg3_S		To		235	240	115
Pg2_S		Te		230	235	70
Pg12_S		Tpe		245	240	120
N_S		Tm		250	240	100
PgN_S	Tmm, Tkb	Tm-Tp, Tp		232	238	110
K2N_S		Ke		229	250	76
KPg_S	KTms, KTpt, KTpk, KTky			230	250	65
K2_S		K2		194	235	90
K1_S		K1		145	215	0
K_S	K, Kkk, Kpp, Ksk, Kp	K	Mz2-2	0	190	45
JK_S	JK, JKpw, JKl	JK	Mz2-1	0	200	185
J_S	J, Jk, Jpk, Ju	J	Mz1-2	0	120	255
TrJ_S	Trj			215	80	240
Tr_S	Trl, Trwc, Trkp, Trpd, Trdl, Trhh, Trpk, Trpt, Trnp, Trhl, Tr1, Tr2, Trpn, Trn, Trc, Trk	TR	Mz1-1	200	140	255
P3_S	Png3			250	150	30
P2_S	Pr-2, Ps-2, Png2			245	160	70
P1_S	Ps-1, Png1			245	175	95
PTr_S	PTr	PTR	Pz3-3	135	65	80
P_S	Pr, Ps, P1, P2, P3	P		253	109	0
C_S	C, C1, C2, Ck, Cm, Cy, Cy1, Cy2	C	Pz3-1	225	180	180
CP_S	CP, CPk, CPk-1, CPk-2	CP	Pz3-2	200	125	20
D_S	D	D	Pz2-1	185	155	100
SD_S	SD		Pz1-3	140	120	80
DC_S	DC		Pz2-2	175	150	15
SC_S	SDCtp, SDCtn			155	85	40
O_S	O	O		0	180	100
OS_S			Pz1-2	50	250	120
E_S	E, Et	E		125	140	40
EO_S	EO			115	170	130
Pz1_S		Pz1		10	160	60

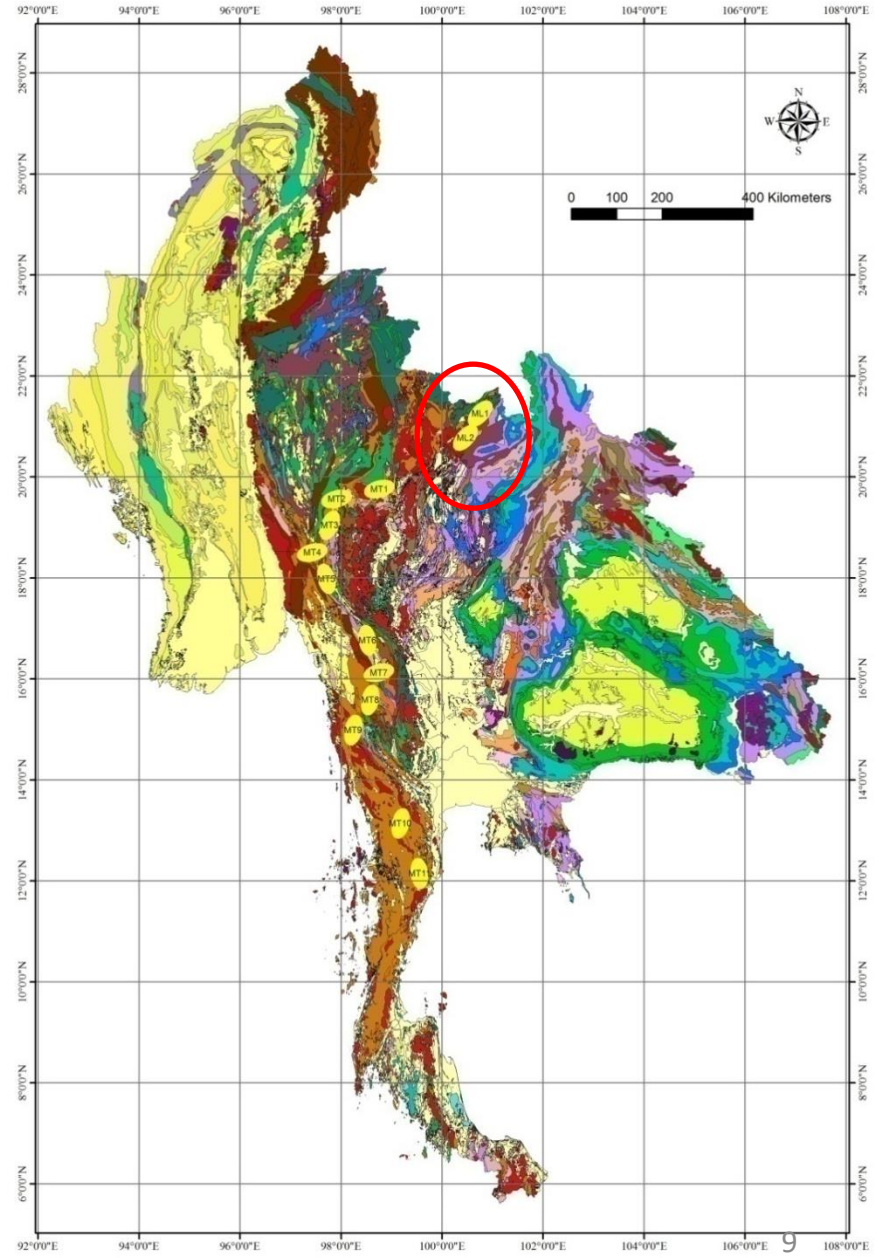
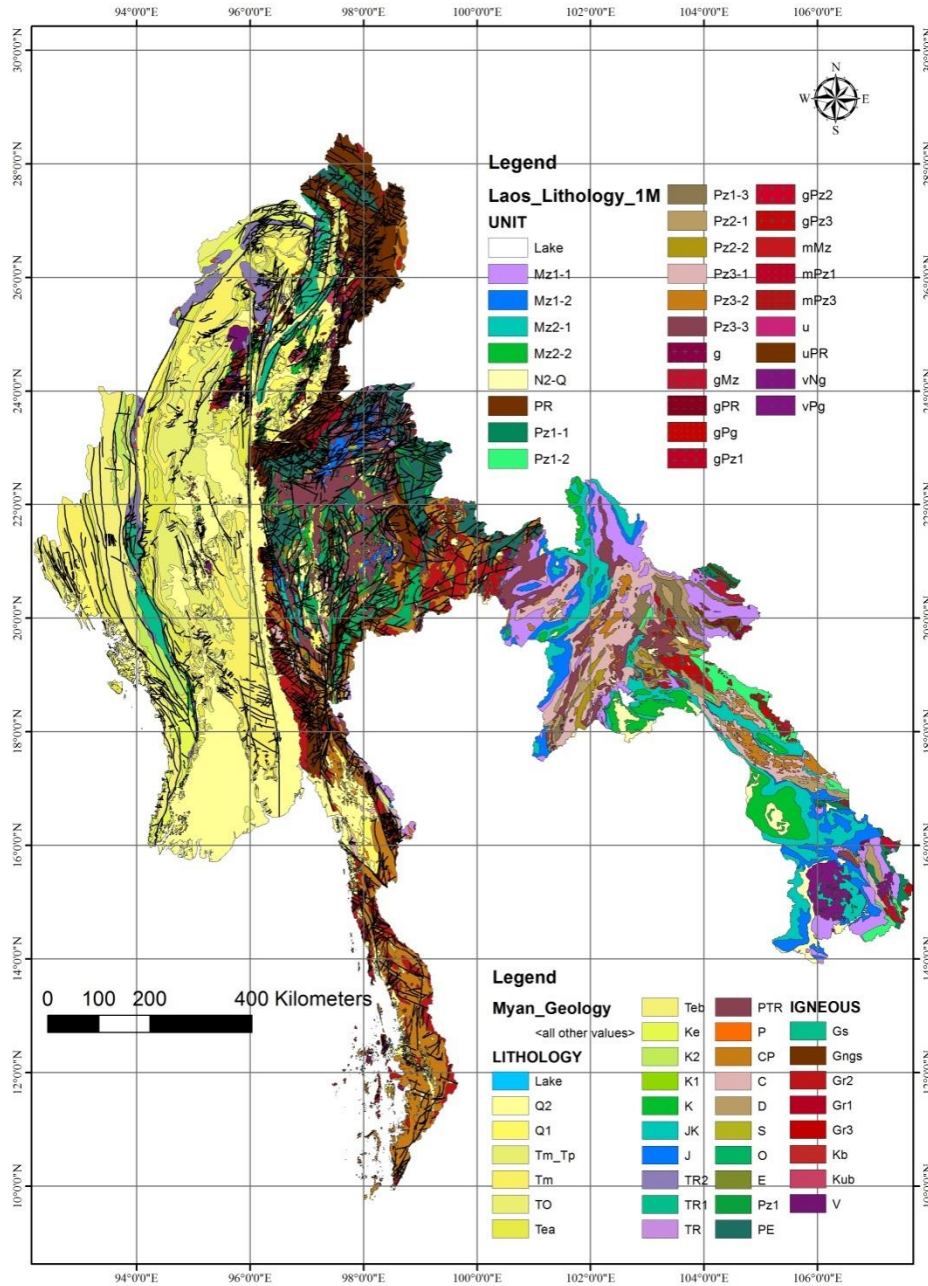
# Geological Map of Myanmar-Thai-Lao



Unified Legend	Geological Map 1:1M			Color code		
	Thailand (1999)	Myanmar (2008)	Laos PDR (2008?)	R	G	B
PtE_S				145	110	75
Tr_Mi		TR2		140	125	18
Mz_MI		Gs, TR1		5	190	14
EO_MI			Pz1-1	0	135	90
Pt_Mh		Gngs, Grn, PE	PR, uPR	115	50	0
PE_MI	PE	PE-E		30	110	10
Q_Vf	Qgy			246	0	24
Q_Vm	Qbs			100	0	10
PgN_Vf	Tv			255	115	25
PgN_Vm	Tbs		vNg, vPg	130	20	13
Cz_Vm		Cv, Ev, Kv, Qv		115	20	11
K_Vf	Krh			255	150	25
J_Vf	Jv			255	165	25
PTr_Vf	PTrv			245	200	24
P_Vm	Pv			165	25	16
Pz2_Vm	Cb			165	35	20
PgN_Pf		Gr3		195	0	0
Pg_Pf			gPg	206	0	0
K_Pf	Kgr			202	24	45
K_Pm		Kb		195	40	40
K_U		Kub		200	65	10
TrJ_Pf			gMz	192	18	47
Tr_Pf	Trgr, Trm		mMz	203	23	27
Mz_Pf		Gr2, Kd, Kgd		189	21	25
PTr_Pf	PTrgr		mPz3	180	20	22
PTr_U	PTru			190	0	90
CP_Pf			gPz3	196	8	12
C_Pf	Cgr			226	0	43
Pz2_Pf			gPz2	208	0	40
Pz2_Pm	DCv			196	72	72
Pz1_Pf			gPz1, mPz1	192	0	37
Pz_Pf		Gr1		180	0	34
Pz_Pu			g	140	0	70
Pt_Pf			gPR	135	0	30
Uk_U			u	203	35	12
						0

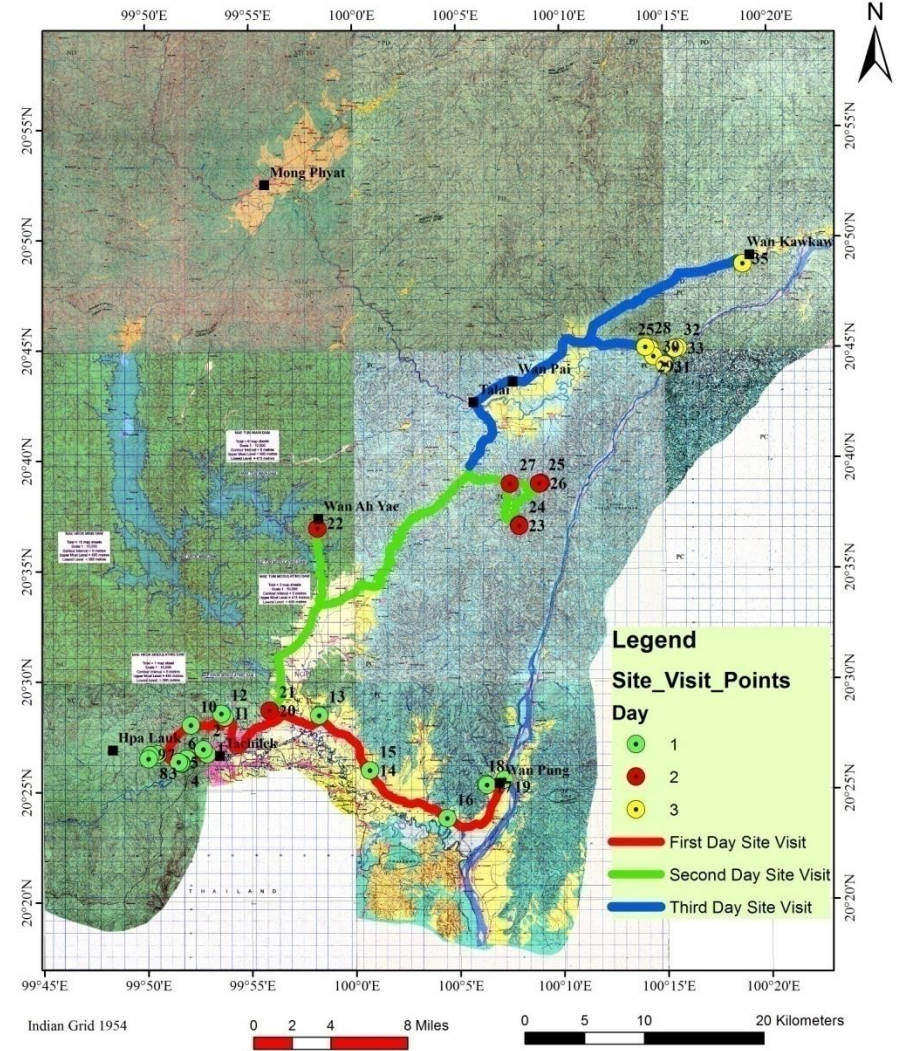
# MYANMAR & LAOS

# Myanmar and Lao Geology

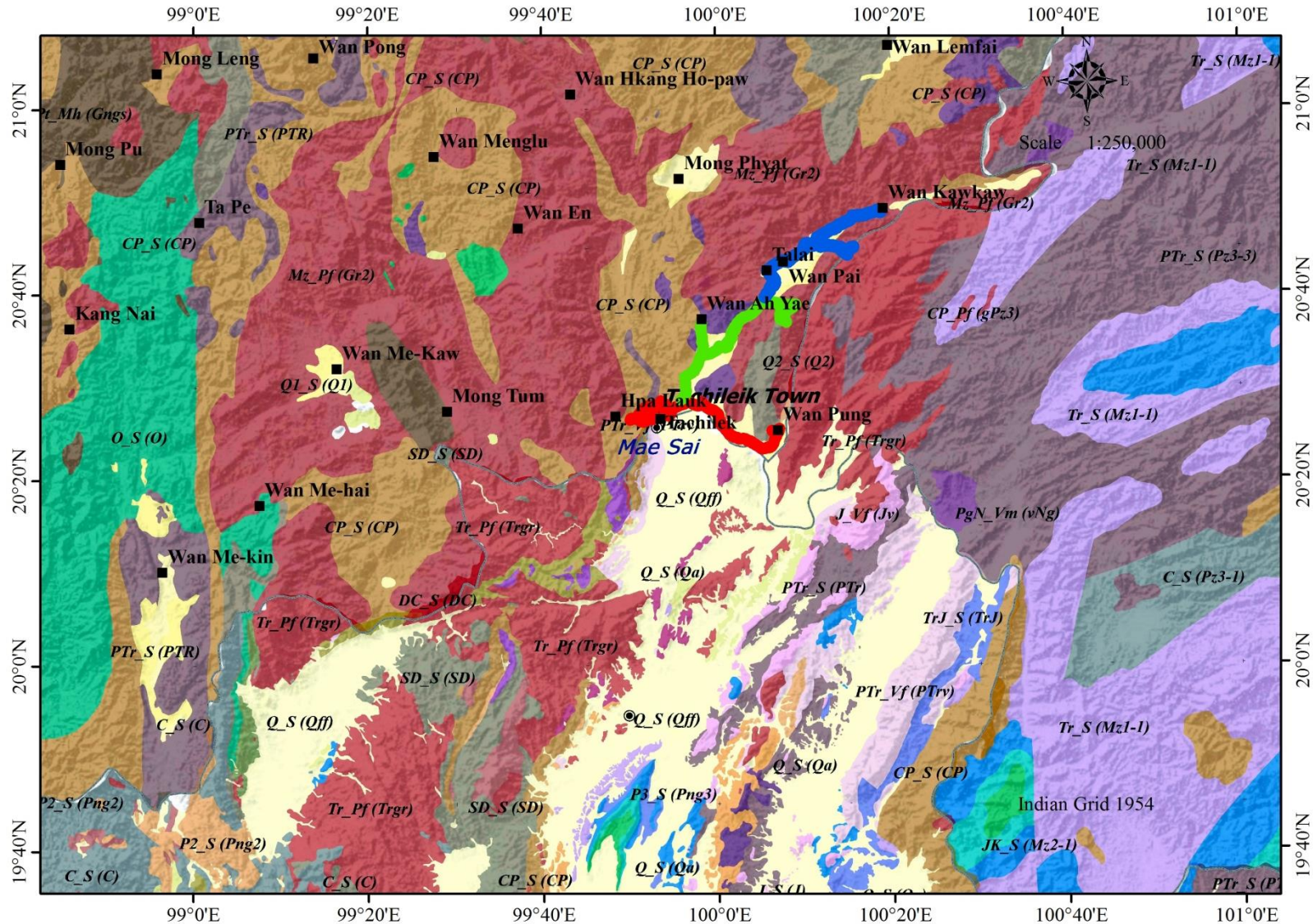


21.8.2016 to 23.8.2016

JICA Site Visit Points of Tachileik Area, Eastern Shan State



# JICA Site Visit Points of Tachileik Area, Eastern Shan State



21.8.2016 to 23.8.2016



- First Day Site Visit
- Second Day Site Visit
- Third Day Site Visit

# ASEAN Unified Legend (9.3) Color Code

Unified Legend (ver. 9) for the Seamless Geologic Map of East and Southeast Asia (1:1,000,000) for ASEAN Mineral Resources Database

		Sedimentary Rocks															Volcanic Rocks										unknown			
		S															felsic		felsic-intermediet		intermediet		intermediet-mafic		mafic		unknown			
																	VI		VE		VI		Vim		Vim		Vu			
Eon/Period	Age (Ma)																													
Cenozoic	Quaternary	Holocene	Q2	6.01																Q_VI		Q_VE		Q_VI		Q_Vim		Q_Vim		Q_Vu
	Pleistocene	Q1	2.6																N_VI		N_VE		N_VI		N_Vim		N_Vim		N_Vu	
		Pliocene	N4	5.3																Pg_VI		Pg_VE		Pg_VI		Pg_Vim		Pg_Vim		Pg_Vu
	Neogene	Late Miocene	N3	11.6																Tr_VI		Tr_VE		Tr_VI		Tr_Vim		Tr_Vim		Tr_Vu
		Middle Miocene	N2	23.0																P_VI		P_VE		P_VI		P_Vim		P_Vim		P_Vu
Early Miocene		N1	23.0																C_VI		C_VE		C_VI		C_Vim		C_Vim		C_Vu	
Paleogene	Oligocene	Pg3	33.9																E_VI		E_VE		E_VI		E_Vim		E_Vim		E_Vu	
	Eocene	Pg2	56.0																O_VI		O_VE		O_VI		O_Vim		O_Vim		O_Vu	
	Paleocene	Pg1	66.0																S_VI		S_VE		S_VI		S_Vim		S_Vim		S_Vu	
Mesozoic	Cretaceous	Late	K2	101																J_VI		J_VE		J_VI		J_Vim		J_Vim		J_Vu
	Early	K1	145																Tr_VI		Tr_VE		Tr_VI		Tr_Vim		Tr_Vim		Tr_Vu	
	Jurassic	Late	J3	164																P_VI		P_VE		P_VI		P_Vim		P_Vim		P_Vu
	Early	J1	201																C_VI		C_VE		C_VI		C_Vim		C_Vim		C_Vu	
	Middle	J2	214																O_VI		O_VE		O_VI		O_Vim		O_Vim		O_Vu	
Triassic	Late	Tr3	237																S_VI		S_VE		S_VI		S_Vim		S_Vim		S_Vu	
	Middle	Tr2	247																E_VI		E_VE		E_VI		E_Vim		E_Vim		E_Vu	
	Early	Tr1	252																O_VI		O_VE		O_VI		O_Vim		O_Vim		O_Vu	
Paleozoic	Permian	Late	P3	260																S_VI		S_VE		S_VI		S_Vim		S_Vim		S_Vu
	Middle	P2	272																E_VI		E_VE		E_VI		E_Vim		E_Vim		E_Vu	
	Early	P1	299																O_VI		O_VE		O_VI		O_Vim		O_Vim		O_Vu	
	Carboniferous	Late	C2	318																S_VI		S_VE		S_VI		S_Vim		S_Vim		S_Vu
	Early	C1	359																E_VI		E_VE		E_VI		E_Vim		E_Vim		E_Vu	
Devonian	Late	D3	385																O_VI		O_VE		O_VI		O_Vim		O_Vim		O_Vu	
	Middle	D2	398																S_VI		S_VE		S_VI		S_Vim		S_Vim		S_Vu	
	Early	D1	416																E_VI		E_VE		E_VI		E_Vim		E_Vim		E_Vu	
	Silurian	Late	S2	423																O_VI		O_VE		O_VI		O_Vim		O_Vim		O_Vu
	Early	S1	444																S_VI		S_VE		S_VI		S_Vim		S_Vim		S_Vu	
Ordovician	Late	O3	461																E_VI		E_VE		E_VI		E_Vim		E_Vim		E_Vu	
	Middle	O2	472																O_VI		O_VE		O_VI		O_Vim		O_Vim		O_Vu	
	Early	O1	485																S_VI		S_VE		S_VI		S_Vim		S_Vim		S_Vu	
Cambrian	Late	E2	509																E_VI		E_VE		E_VI		E_Vim		E_Vim		E_Vu	
	Early	E1	541																O_VI		O_VE		O_VI		O_Vim		O_Vim		O_Vu	
Precambrian	Proterozoic	Late	Pt3	1000																S_VI		S_VE		S_VI		S_Vim		S_Vim		S_Vu
	Middle	Pt2	1800																E_VI		E_VE		E_VI		E_Vim		E_Vim		E_Vu	
	Early	Pt1	2500																O_VI		O_VE		O_VI		O_Vim		O_Vim		O_Vu	
Archean	A																S_VI		S_VE		S_VI		S_Vim		S_Vim		S_Vu			

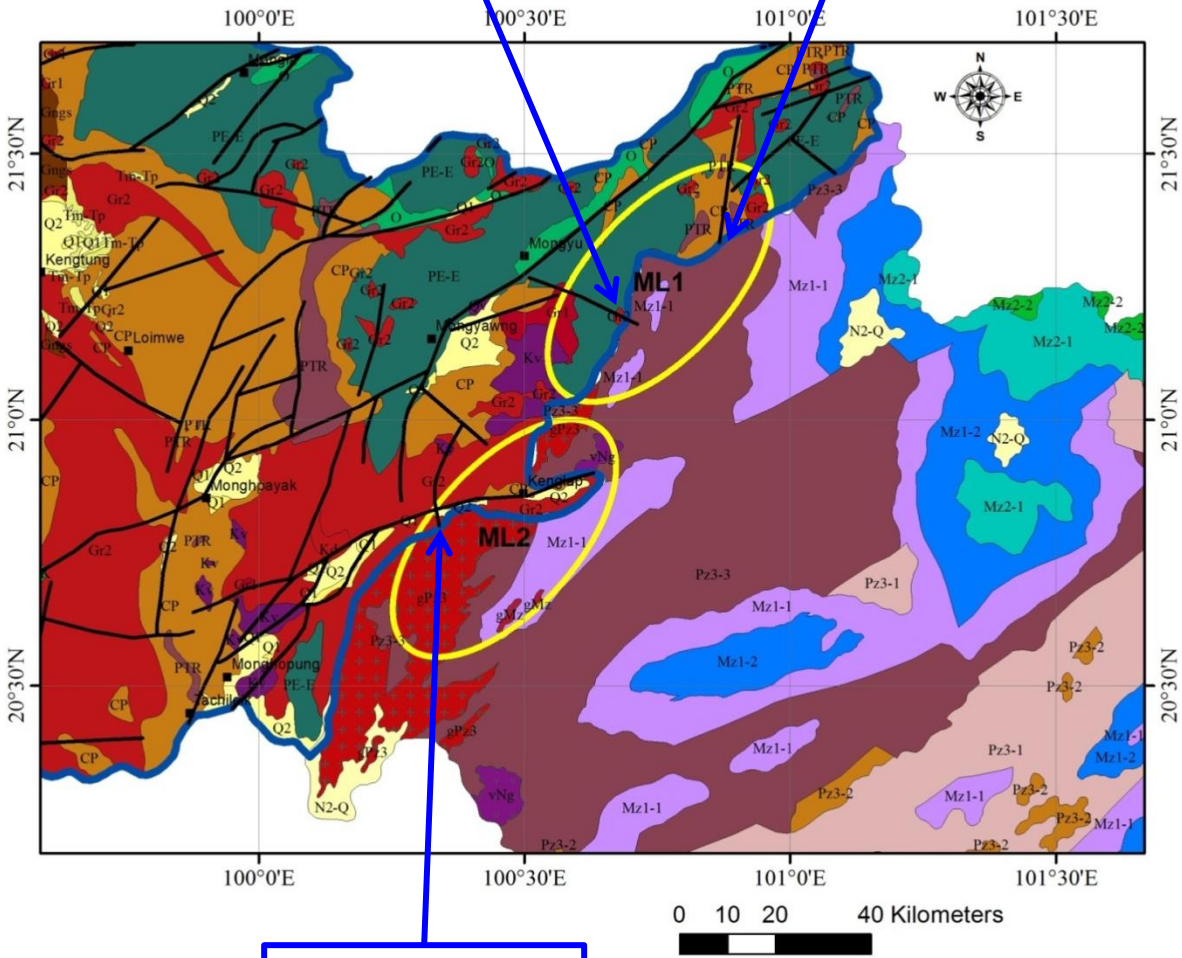
		Plutonic Rocks															Metamorphic Rocks					unknown			
		P															high grade	intermediate grade		low grade		unknown			
		P															Mh	M		Ml		Mu			
Eon/Period	Age (Ma)																								
Cenozoic	Quaternary	Holocene	Q2	6.01																Q_P	Q_Pm		Q_Pm		Q_Pm
	Pleistocene	Q1	2.6																N_P	N_Pm		N_Pm		N_Pm	
		Pliocene	N4	5.3																Pg_P	Pg_Pm		Pg_Pm		Pg_Pm
	Neogene	Late Miocene	N3	11.6																Tr_P	Tr_Pm		Tr_Pm		Tr_Pm
		Middle Miocene	N2	23.0																P_P	P_Pm		P_Pm		P_Pm
Early Miocene		N1	23.0																C_P	C_Pm		C_Pm		C_Pm	
Paleogene	Oligocene	Pg3	33.9																E_P	E_Pm		E_Pm		E_Pm	
	Eocene	Pg2	56.0																O_P	O_Pm		O_Pm		O_Pm	
	Paleocene	Pg1	66.0																S_P	S_Pm		S_Pm		S_Pm	
Mesozoic	Cretaceous	Late	K2	101																J_P	J_Pm		J_Pm		J_Pm
	Early	K1	145																Tr_P	Tr_Pm		Tr_Pm		Tr_Pm	
	Jurassic	Late	J3	164																P_P	P_Pm		P_Pm		P_Pm
	Early	J1	201																C_P	C_Pm		C_Pm		C_Pm	
	Middle	J2	214																O_P	O_Pm		O_Pm		O_Pm	
Triassic	Late	Tr3	237																S_P	S_Pm		S_Pm		S_Pm	
	Middle	Tr2	247																E_P	E_Pm		E_Pm		E_Pm	
	Early	Tr1	252																O_P	O_Pm		O_Pm		O_Pm	
Paleozoic	Permian	Late	P3	260																S_P	S_Pm		S_Pm		S_Pm
	Middle	P2	272																E_P	E_Pm		E_Pm		E_Pm	
	Early	P1	299																O_P	O_Pm		O_Pm		O_Pm	
	Carboniferous	Late	C2	318																S_P	S_Pm		S_Pm		S_Pm
	Early	C1	359																E_P	E_Pm		E_Pm		E_Pm	
Devonian	Late	D3	385																O_P	O_Pm		O_Pm		O_Pm	
	Middle	D2	398																S_P	S_Pm		S_Pm		S_Pm	
	Early	D1	416																E_P	E_Pm		E_Pm		E_Pm	
	Silurian	Late	S2	423																O_P	O_Pm		O_Pm		O_Pm
	Early	S1	444																S_P	S_Pm		S_Pm		S_Pm	
Ordovician	Late	O3	461																E_P	E_Pm		E_Pm		E_Pm	
	Middle	O2	472																O_P	O_Pm		O_Pm		O_Pm	
	Early	O1	485																S_P	S_Pm		S_Pm		S_Pm	
Cambrian	Late	E2	509																E_P	E_Pm		E_Pm		E_Pm	
	Early	E1	541																O_P	O_Pm		O_Pm		O_Pm	
Precambrian	Proterozoic	Late	Pt3	1000																S_P	S_Pm		S_Pm		S_Pm
	Middle	Pt2	1800																E_P	E_Pm		E_Pm		E_Pm	
	Early	Pt1	2500																O_P	O_Pm		O_Pm		O_Pm	
Archean	A																S_P	S_Pm		S_Pm		S_Pm			

**PE-E & Pz3-3**

**CP & Pz3-3**

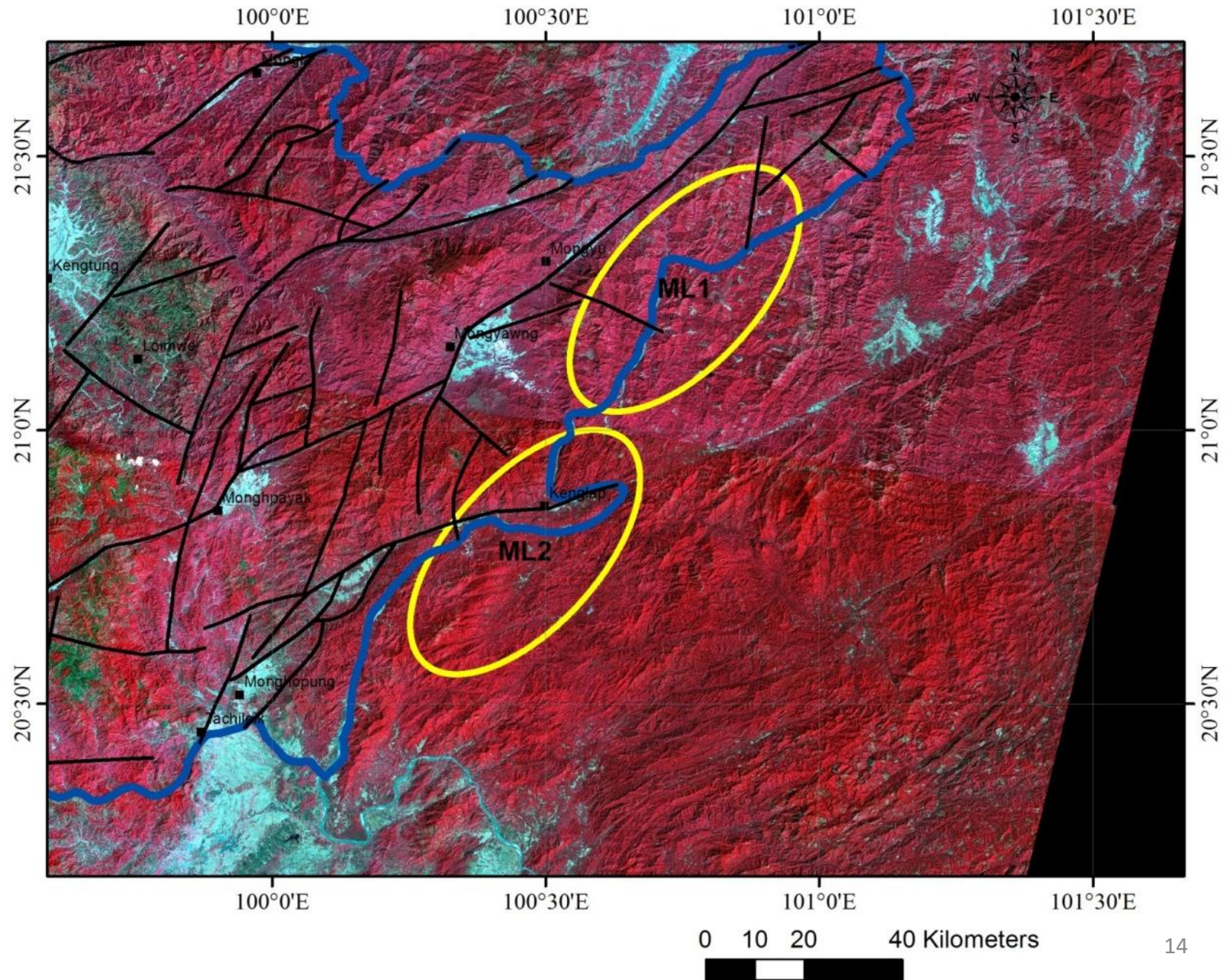
**Gr2 & gpz3**

**Border of Myanmar and Lao Geology**



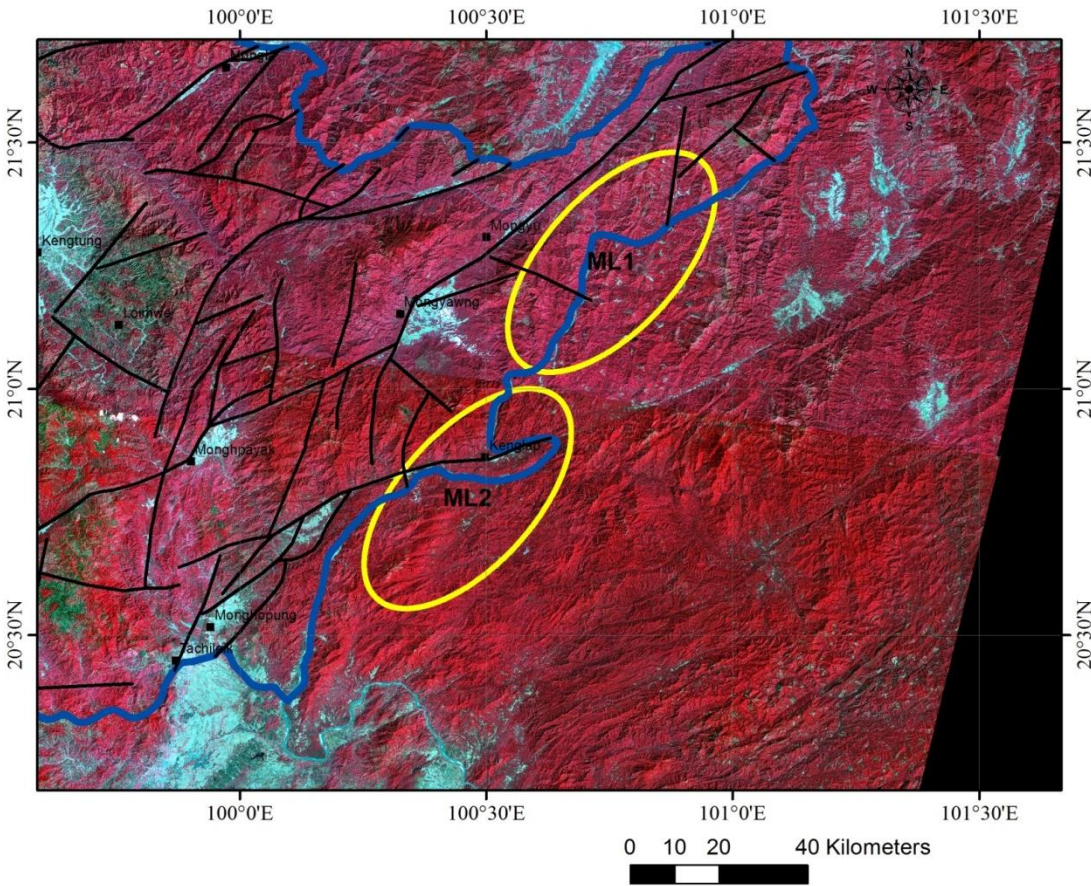
AGE	Myanmar, Eastern Shan state	AGE	Laos
PreCambrian to Cambrian	P E-E Undifferentiated Units of Precambrian and Cambrian Rocks	Permian - Triassic	Pz3-3
Carboniferous to Permian	C P Quartzite, Slate, Phyllite, Pebbly Sandstone, Mudstone greywacke, minor Limestone Lenses	Permian - Triassic	Pz3-3
Mesozoic and Lower Tertiary	G r2 Biotite, hornblende granite, granodiorite, rhyolite	gPz3	Granite?

# Border of Myanmar and Lao Geology

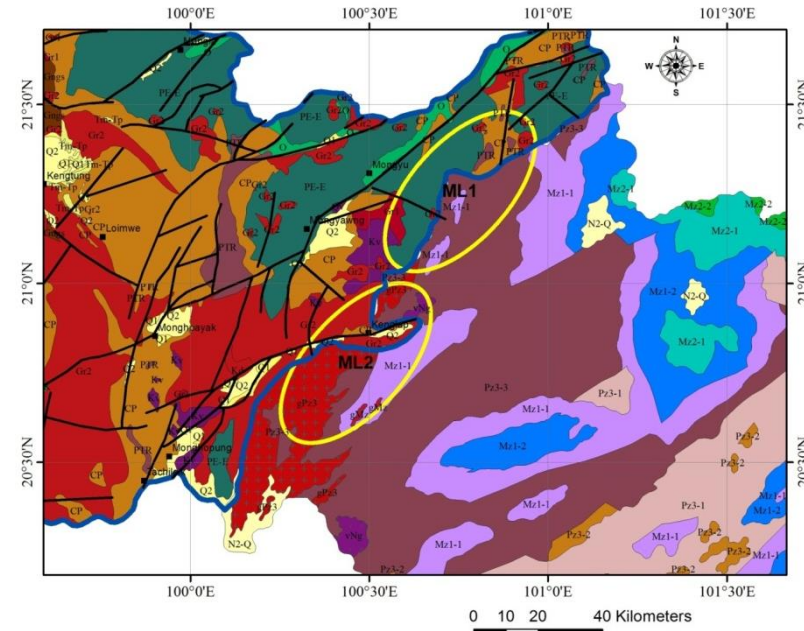


0 10 20 40 Kilometers

**Border of Myanmar and Lao Geology**



**Border of Myanmar and Lao Geology**



**Border of Myanmar and Lao Geology (ML 1 and ML2)**



Dr. Myint Soe  
D.G.O.E  
June, 2015  
GCS\_Indian\_1954  
Datum: D\_Indian\_1954

# MYANMAR & THAILAND





2015/02/10 08:39



Royal Thai Department of Mineral Resources Department (DMR) visit to Naypyitaw in 2015



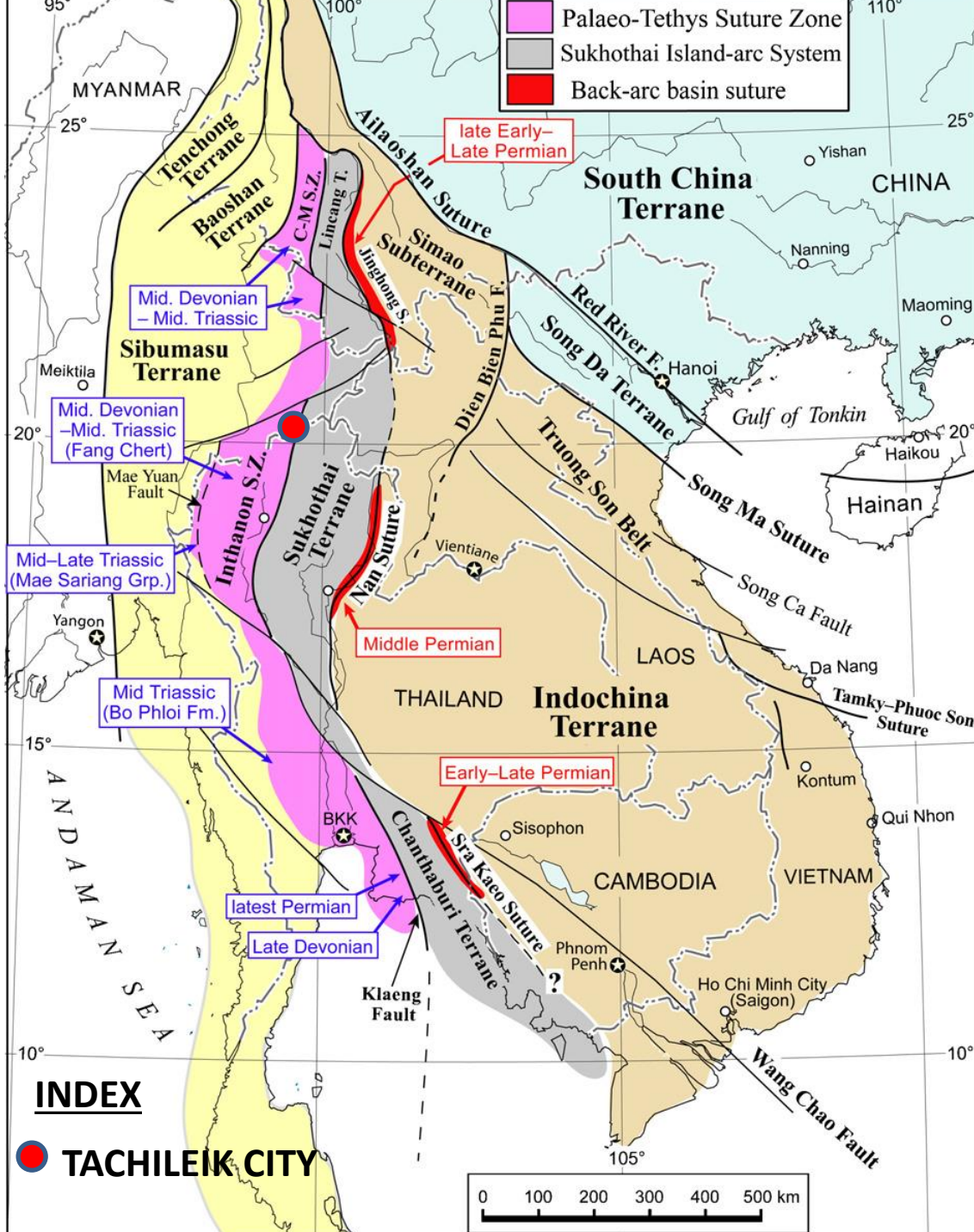
2015/02/11 19:34

**Royal Thai Department of Mineral Resources (DMR) delegation site visit trip**



**Royal Thai Department of Mineral Resources (DMR)  
delegation site visit trip to Mogok Gem stone Tract Area (12.2.2015)**





## Sukhothai Arc terranes

Tachileik city lie at Sukhothai Arc Terranes. The Lincang Terrane of Yunnan, the Sukhothai Terrane and the Chanthaburi Terrane (new name) of Thailand were originally formed as parts of the same island-arc system developed along the margin of the Indochina Terrane, which was subsequently amalgamated to Indochina due to back arc collapse and succeeded as a continental arc in the Triassic. This Permo-Triassic magmatic arc is here named “the Sukhothai Arc”, with the Permian Sukhothai island-arc system. The name is after the Sukhothai tectonostratigraphic zone of Barr and Macdonald, to which this magmatic arc principally corresponds in Thailand. Ueno and Hisada indicated that the Sukhothai Terrane was developed as a Permian island arc marginal to the Indochina Terrane with the opening of the Nan back-arc basin, induced by the eastward subduction of the Palaeo-Tethys in the Inthanon Suture Zone. The Sukhothai Terrane of Barr and Macdonald not Barr et al. is used herein. It is delineated by the Inthanon Suture Zone to the west and by the Nan Suture to the east. It is dominated by folded and faulted sequences of shallow-marine sedimentary rocks and igneous rocks with I-type granitoids, mostly of Permian and Triassic ages. There is general agreement that it is a Permo-Triassic magmatic arc. Two Middle Triassic volcanics, the Lampang and Chiang Khong suites, show chemical characteristics indicative of a continental arc. This may imply that the island arc has a continental basement. Some authors have treated the Sukhothai Terrane as part of the Shan-Thai (Sibumasu) Terrane. However, Permian marine faunas of the Sukhothai Terrane are of warm-water Tethyan type and show no linkage with Sibumasu of Gondwanan origin.

**Ref: Masatoshi Sone and Ian Metcalf (2007): Parallel Tethyan sutures in mainland Southeast Asia: New insights for Palaeo Tethys closure and implications for the Indosinian orogeny, C. R. Geoscience 340, P 166-179.**

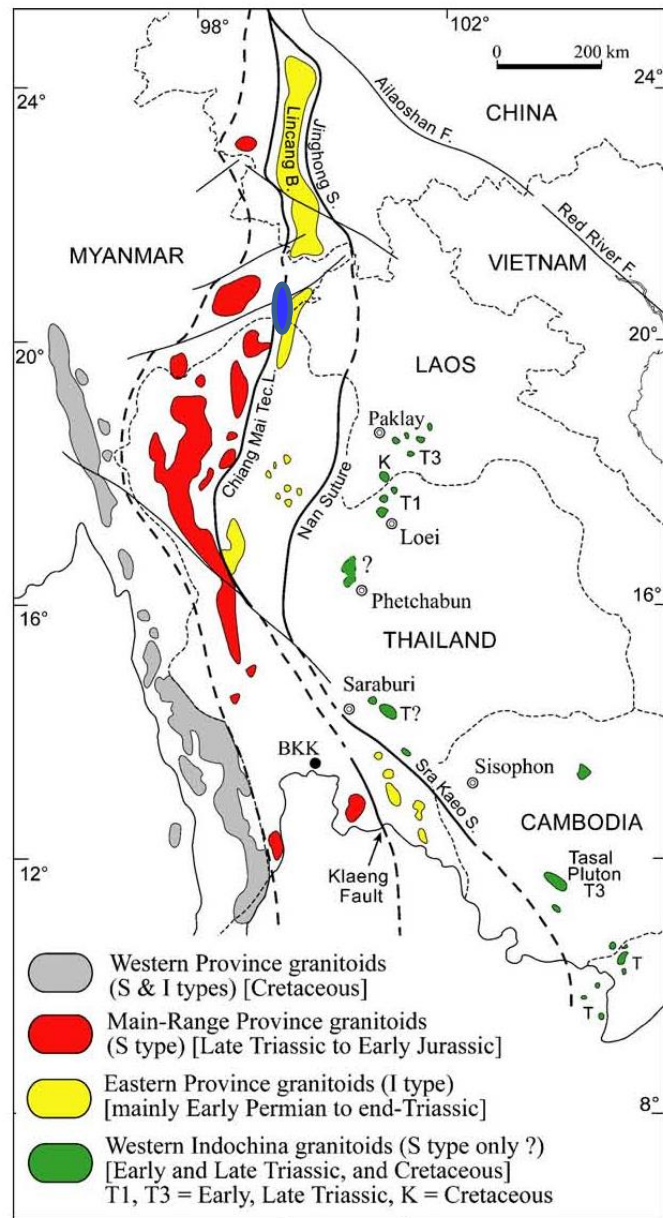


Fig. 3. Revised classification of granitoid provinces in mainland SE

● Tachileik

## Classification of granitoid provinces in mainland SE Asia

Some granodiorites from the Paklay Volcanics in Laos, which is the northern extension of the Loei-Phetchabun Volcanic Belt, are Triassic in age. Even Late Triassic and Cretaceous granites were reported from the Paklay Volcanics by Stokes]. In addition, granites of the Tasal Pluton in central Cambodia, which may be relevant to the Loei-Phetchabun Volcanic Belt, are Late Triassic in age, and show S-type affinity. Thus, so-called Permo-Triassic granitoids of the Loei-Phetchabun Volcanic Belt are supposed to be mostly Mesozoic in age. Their genesis is here interpreted to be related to the crustal thickening of western Indochina induced by back-arc compression and enhanced later by the Sibumasu collision. Therefore, subduction-induced arc magmatism for the Loei-Phetchabun Volcanic Belt is unlikely. The Eastern Province is here revised to consist only of the Sukhothai Arc granitoids delimited to the west of the Jirghong–Nan–Sra Kaeo back-arc suture and to exclude those in the Indochina Terrane.

**Ref: Masatoshi Sone and Ian Metcalfe (2007): Parallel Tethyan sutures in mainland Southeast Asia: New insights for Palaeo Tethys closure and implications for the Indosinian orogeny, C. R., Geoscience 340, P 166-179.**

# CORRELATION

	<b>AGE</b>	<b>Myanmar, Shan state, Kayah State, Karen State and Tanintharyi Region</b>	<b>Thailand</b>	
QUATERNARY	Holocene Quaternary	<b>Q2</b> -River gravel, sand, silt, shale <b>Q1</b> - Terrace deposit, laterite, sand silt, Uru boulder gravel and conglomerate	<b>Qa</b> <b>Qff</b> <b>Ql</b> <b>Qmc</b> <b>Qms</b> <b>Qaf</b> <b>Qc</b> <b>Qt</b>	-Coastal tide dominated deposit -Flood plane deposit -Lagoon deposits -Coastal tide dominated deposit -Coastal wave dominated deposits -Alluvial fan deposits -Colluvial and residual deposits -Terrace deposits
	Mio-Pliocene	<b>Tm-Tp</b> Argillaceous Sandstone, Shale Marl with coal beds, Oil shale	<b>Tmm</b>	clay stone and silt stone, gastropods, conglomerate
	Miocene	<b>Tm</b> Conglomerate, grit, siltstone, clay		
	Oligocene	<b>To</b> Turbiditic sandstone, siltstone, clay, coal. lenses, pebble layer		
	Eocene	<b>Tea</b> Pebbly sandstone, turbidites, chert, limestone, volcanogenic sediment		
	Paleo-Eocene	<b>Teb</b> Conglomerate, sandstone, shale, Algae Limestone, Volcanoclastic rocks	<b>Tkb</b>	Shale, calcareous shale, sand stone and siltstone

# CORRELATION

AGE	Myanmar, Shan state, Kayah State, Karen State and Tanintharyi Region		Thailand	
Cretaceous- Eocene	<b>Ke</b>	Tuff and conglomerate, shale	<b>Ktpk</b> <b>Ktky</b> <b>KTpt</b>	-reddish brown siltstone -sand stone and gypsum -brick red sandstone
Upper Cretaceous	<b>K2</b>	mudstone, micrite	<b>KTms</b> <b>Kkk</b> <b>Kpp</b>	-siltstone, clay stone -silt stone and sandstone -sand stone and igneous rock
Mio-Pliocene	<b>K1</b>	Albian limestone	<b>Kp</b> <b>Ksk</b>	-siltstone and arkosic sandstone - purple color siltsotne and sandstone
Cretaceous	<b>K</b>	Red radiotaria volcanic, limestone, volcanogenic sediments, metamorphic rock	<b>K</b>	-Red color sand stone and Mudstone
Jurassic- Cretaceous	<b>JK</b>	Undifferentiated Jurassic and cretaceous rocks	<b>JK</b>	Arkosic sandstone conglomerate
Jurassic	<b>J</b>	Limestone, Shale, turbiditic sediments, read siltstone	<b>JKJ</b> <b>JKpw</b> <b>Jk</b> <b>Jpk</b> <b>Ju</b> <b>J</b>	-Arokosic sandstone and mud -Quartzitic sandstone, silt, clay - Mudstone, argillaceours limestone -Mud, silt, sandstone and limestone -Mud, silt, sandstone and limestone -- Conglomerate, sandstone, shale

CRETACEOUS

JURASSIC

# CORRELATION

**TRIASSIC**

<b>AGE</b>	<b>Myanmar, Shan state, Kayah State, Karen State and Tanintharyi Region</b>		<b>Thailand</b>	
Triassic	<b>TR2</b>	metamorphic	<b>TrJ</b> <b>Trk</b> <b>Trnp</b> <b>Trhl</b> <b>Trpn</b> <b>Trn</b> <b>Trc</b> <b>Trwc</b> <b>Trkp</b> <b>Trpd</b> <b>Trdl</b> <b>Trhh</b> <b>Trpk</b> <b>Trpt</b> <b>Trit</b> <b>Tr2</b>	-conglomerate, sandstone - crystalline Limestone - sandstone, conglomerate -Basal limestone conglomerate -argilaceous limestone, gray -Tuffaceous sandstone, bedded chart - Limestone, dolomitic limestone -dark grey mudstone, sandstone - grey limestone, thin bedded to massive - Sandstone, siltstone, mud, conglomerate - light grey limestone -mudstone, intercalated sandstone -dark grey limestone, massive - red sandstone, siltstone and conglomerate - basal conglomerate, shale - Shale, chert, thin bedded limestone
Triassic	<b>TR1</b>	metamorphic	<b>Tr1</b>	- Basal conglomerate, shale
Triassic	<b>TR</b>	shale, clay, mart, limestone, Dolomite and Evaporite		

# CORRELATION

AGE	Myanmar, Shan state, Kayah State, Karen State and Tanintharyi Region		Thailand	
Permian - Triassic	<b>PTR</b>	Carbonate sequence of Limestone, Dolomite, turbiditic Limestone	<b>Ptr</b>	tuffaceous sandstone,
Permian	<b>P</b>	limestone, red bed of conglomerate, sandstone	<b>Pr-3</b> <b>Pr-2</b> <b>Pr-1</b> <b>Pr</b> <b>Ps-2</b> <b>Ps-1</b> <b>Ps</b> <b>Png3</b> <b>Png2</b> <b>Png1</b> <b>P3</b> <b>P2</b> <b>P1</b>	-sandstone, siltstone, shale - sandstone, siltstone, shale - phyllite, sand, silt, limestone - limestone, dolomitic limestone - Tuffaceous sandstone, shale - Limestone, chert, sandstone - Fossiliferous limestone, basalt - shale and mudstone, sandstone - bedded limestone, shale, sandstone -Tuffaceous sandstone, sandstone shale -Sandstone, siltstone and shale -Shale, sandstone - Limestone, chert nodule

PERMIAN

# CORRELATION

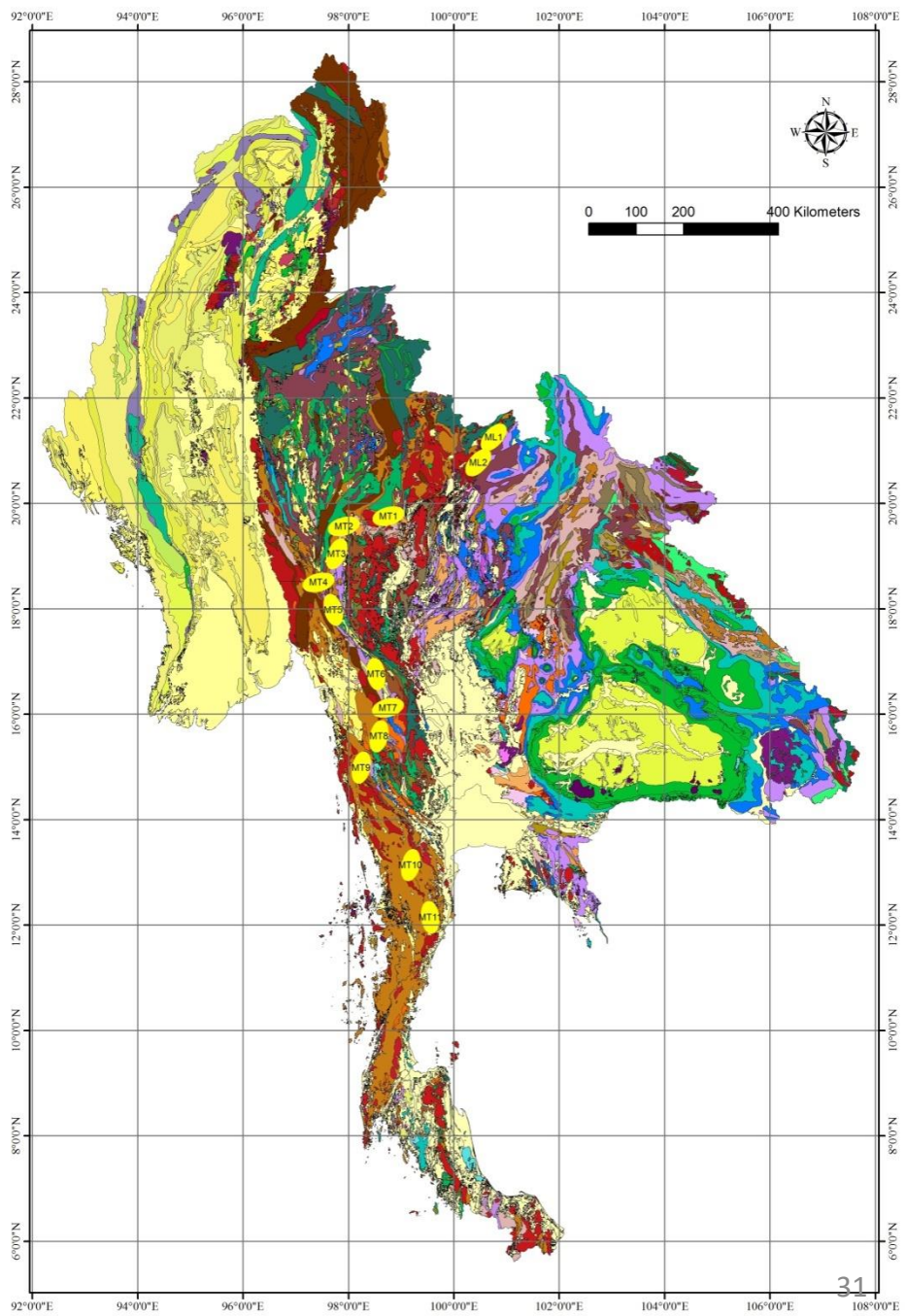
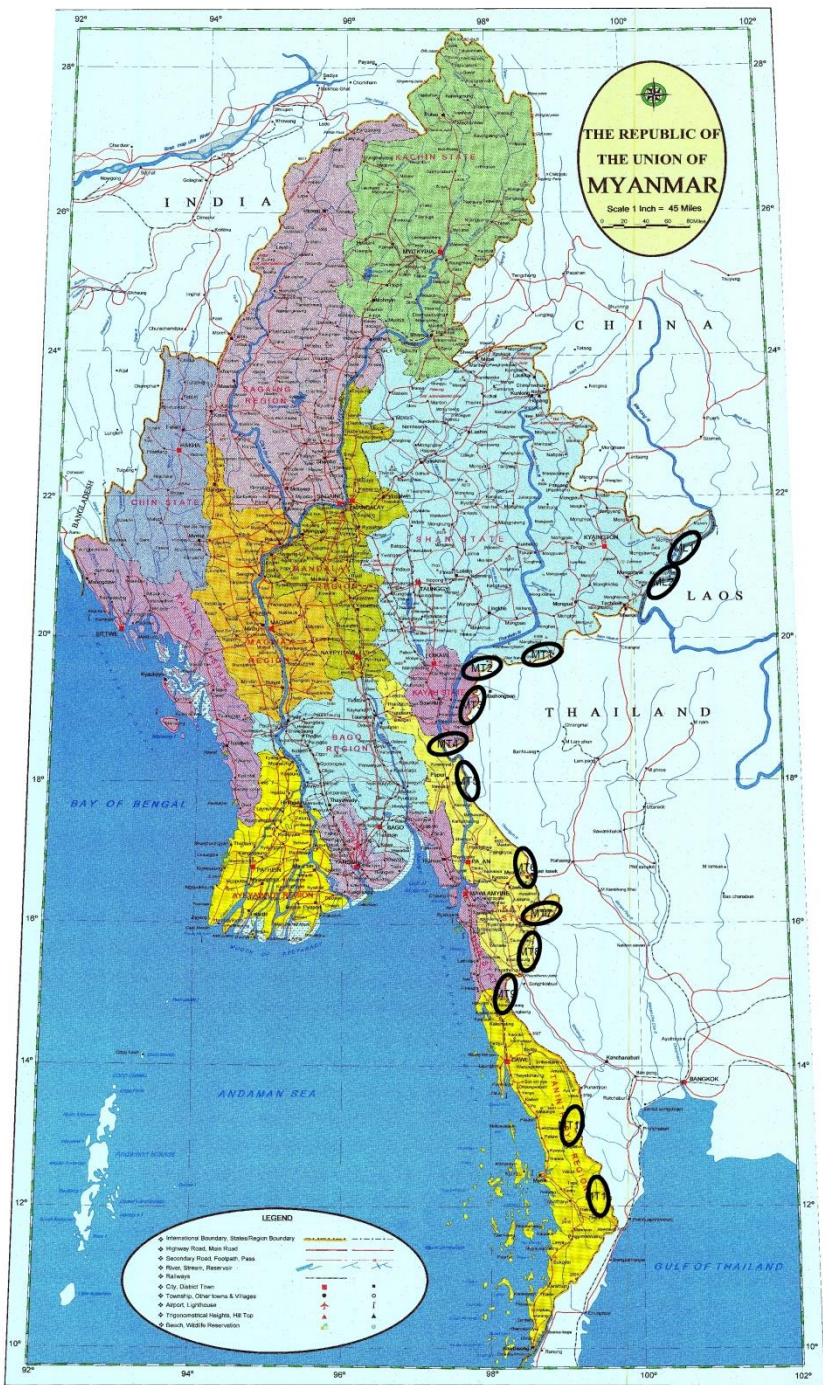
**CARBONIFEROUS**

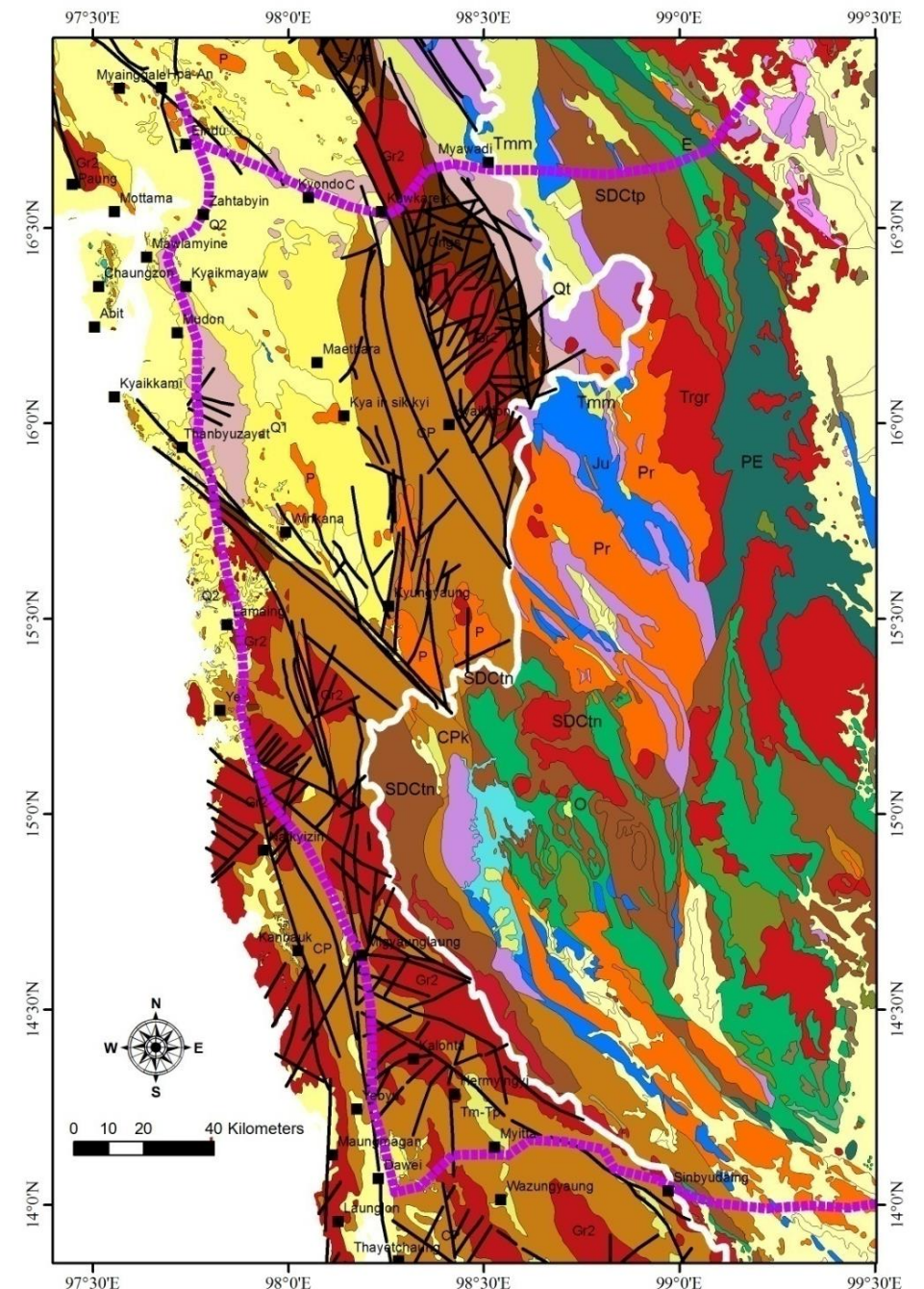
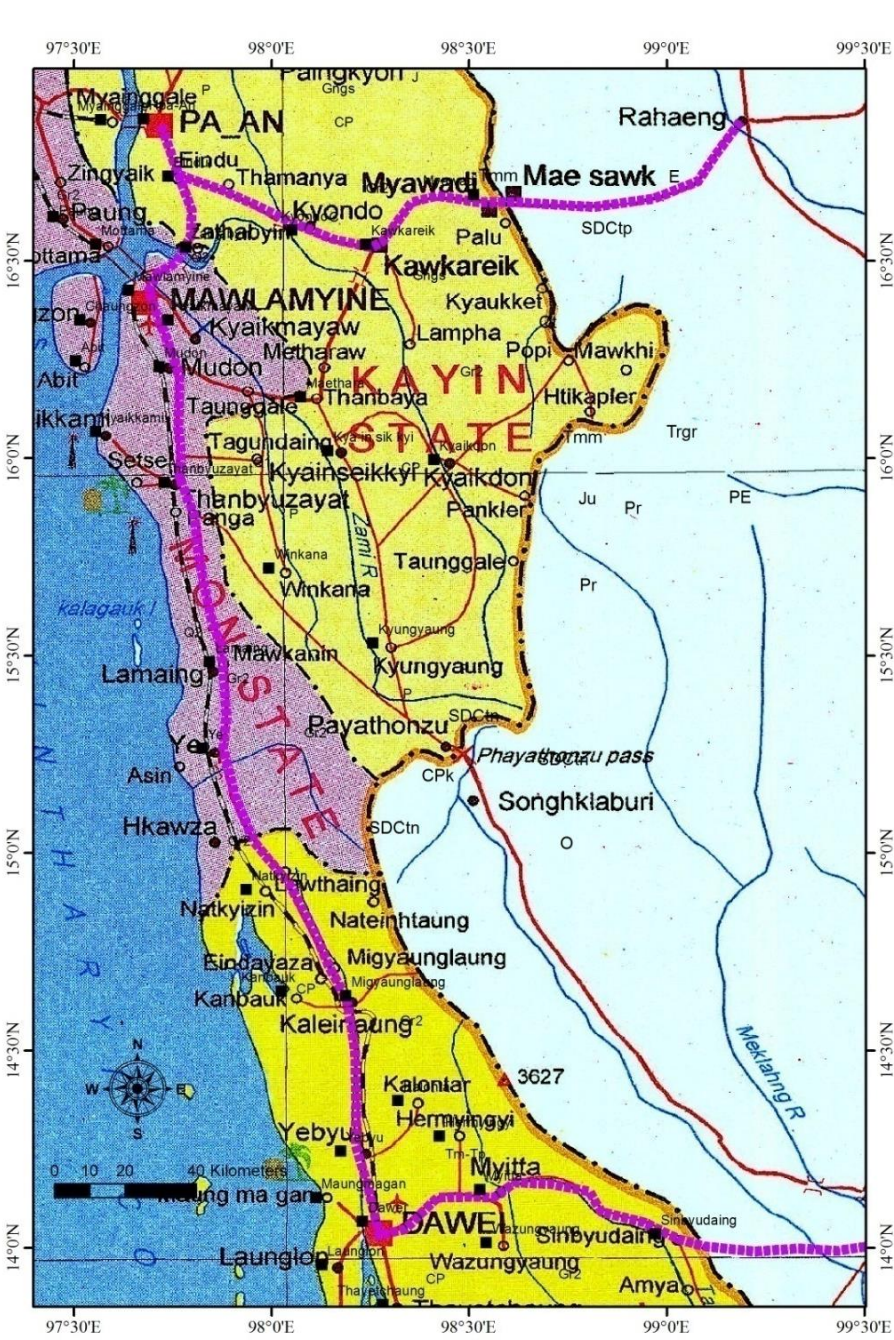
<b>AGE</b>	<b>Myanmar, Shan state, Kayah State, Karen State and Tanintharyi Region</b>		<b>Thailand</b>	
Carboniferous to Permian	<b>CP</b>	Quartzite, Slate, Phyllite, Pebbly Sandstone, Mudstone greywacke, minor Limestone Lenses	<b>CP</b>	Shale, sandstone
Carboniferous	<b>C</b>	limestone, coral reef limestone, dolomite, brown sandstone and shale	<b>C2</b> <b>C1</b> <b>CPk-2</b> <b>CPk-1</b> <b>CPK</b> <b>Ck</b> <b>Cm</b> <b>Cy</b> <b>Cy2</b> <b>Cy1</b> <b>C</b>	-Conglomeratic phyllite -Quartzose sandstone, shale - Shale, sandstone, tuff -Shale, sandstone - pebbly mudstone, shale, silt -Shale, quartzitic sandstone - tuffaceous sandstone, siltstone - thick bedded Sandstone, shale - Shale, schist, phyllite, quartzite -sandstone, mudstone - Conglomerate, sandstone, shale
Devonian	<b>D</b>	Dolomite, shale, coral reef	<b>Dc</b> <b>D</b>	-Chert, tuff, limestone and volcanic -Chert, shale, limestone, tuff
Silurian	<b>S</b>	Marl, limestone, metasediments	<b>SDCtn</b> <b>SDCtp</b> <b>SD</b>	-Graywacke, siltstone, mudstone -black shale, chert and siltstone - carbonaceous phyllite, quartzitic phyllite

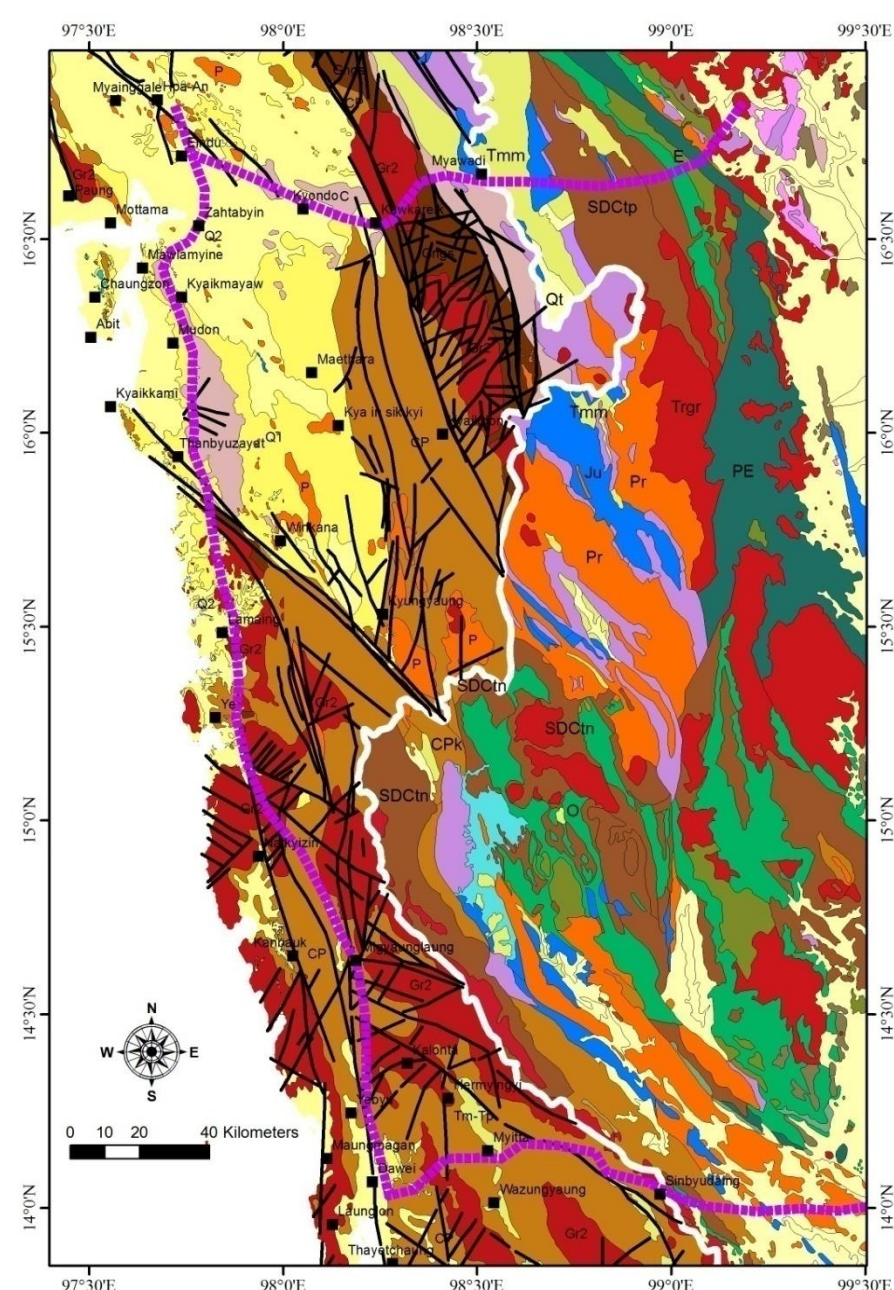
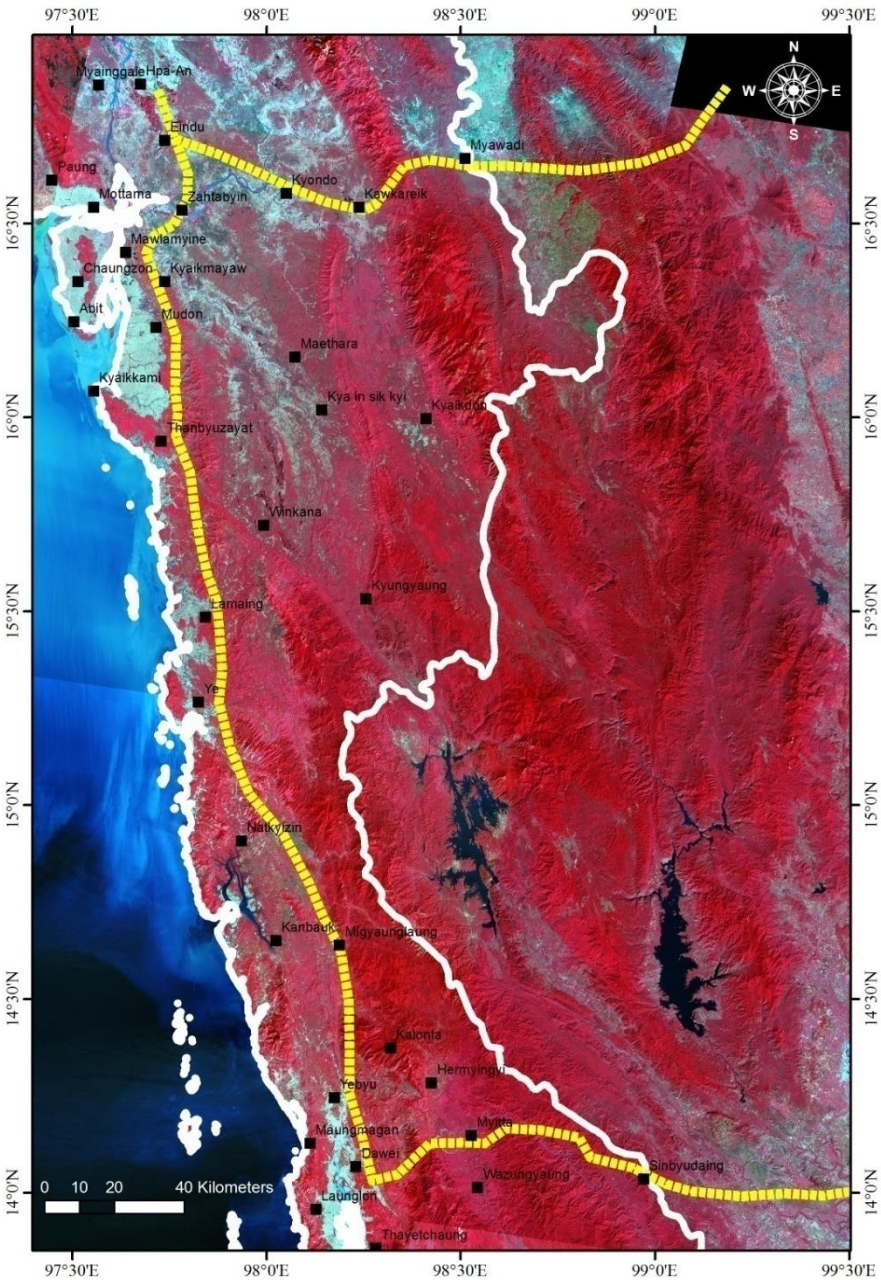
# CORRELATION

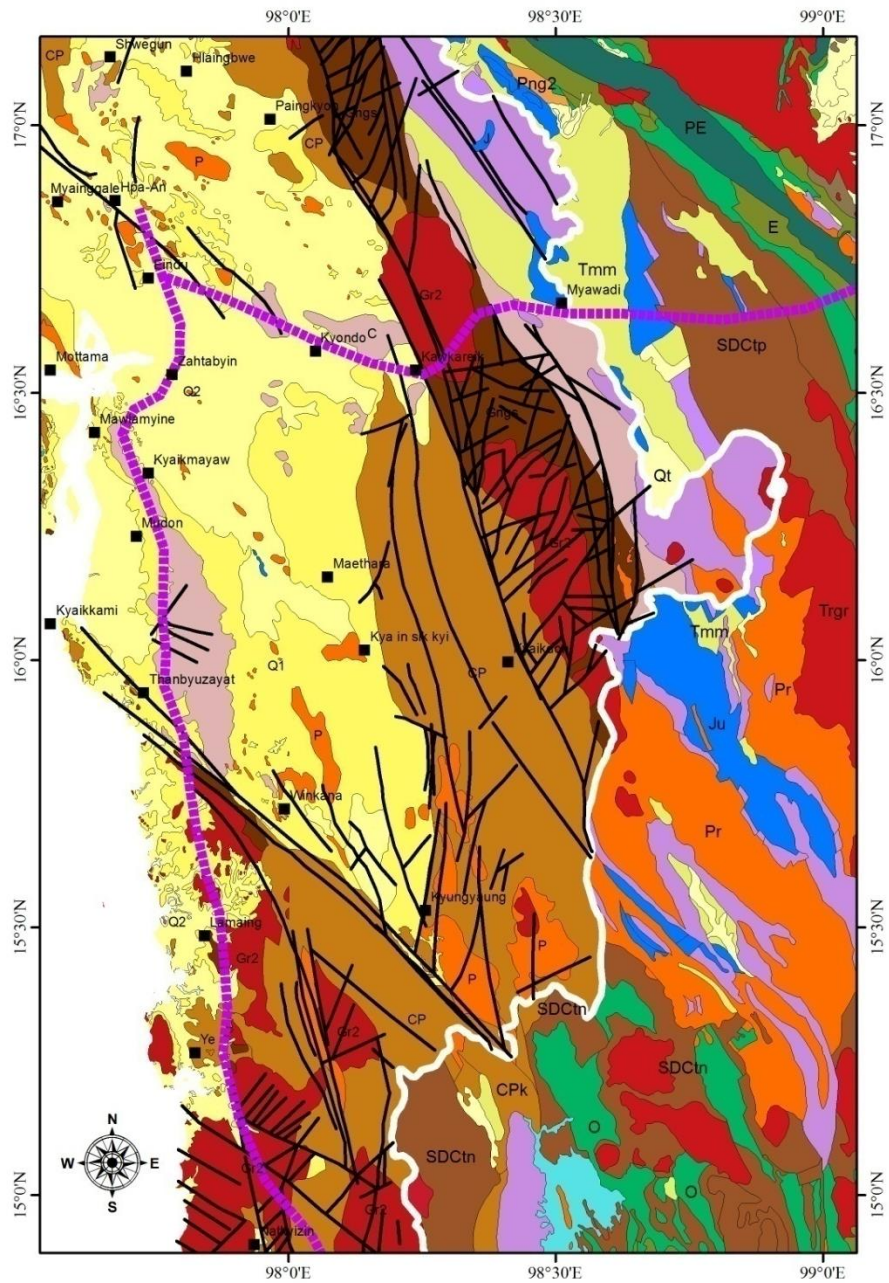
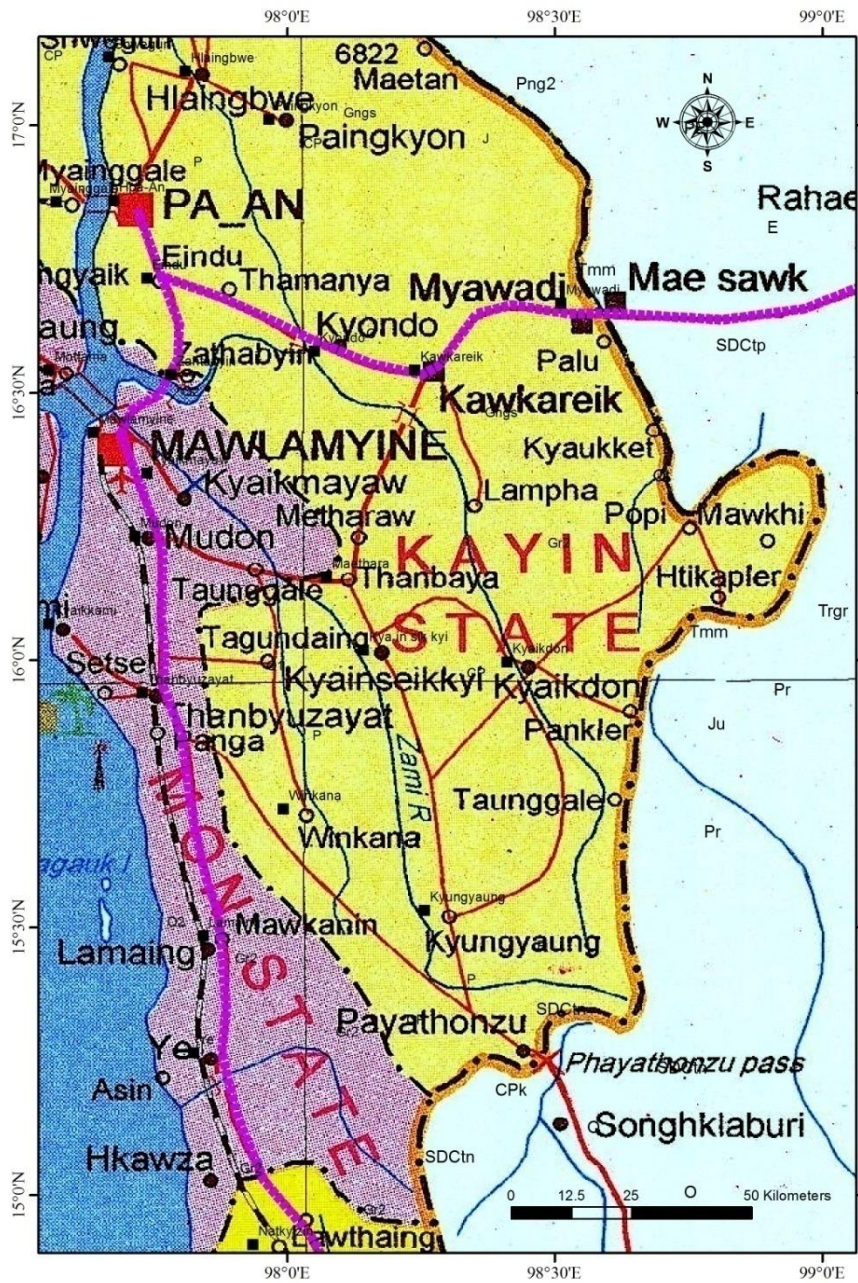
**ORDOVICIAN**

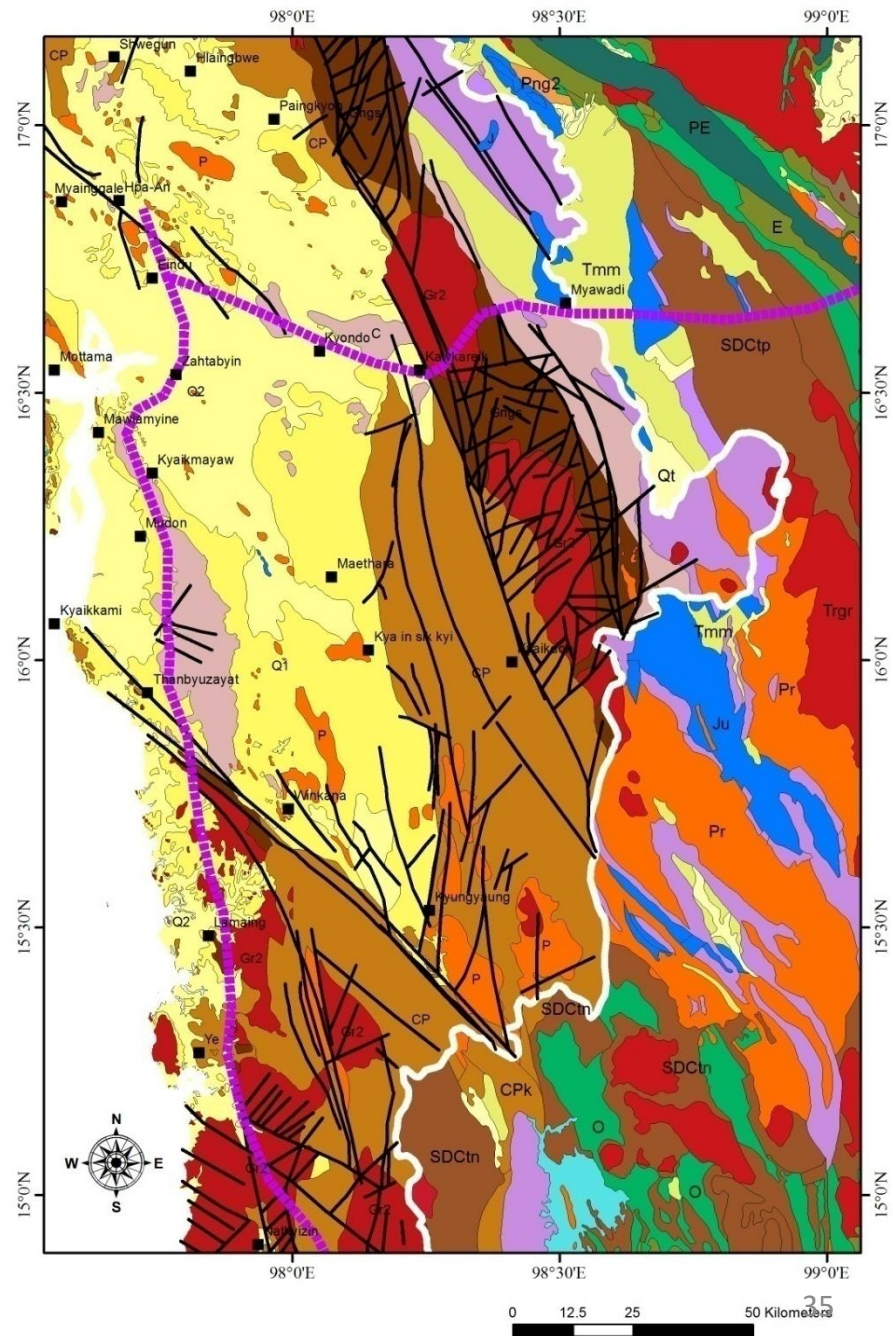
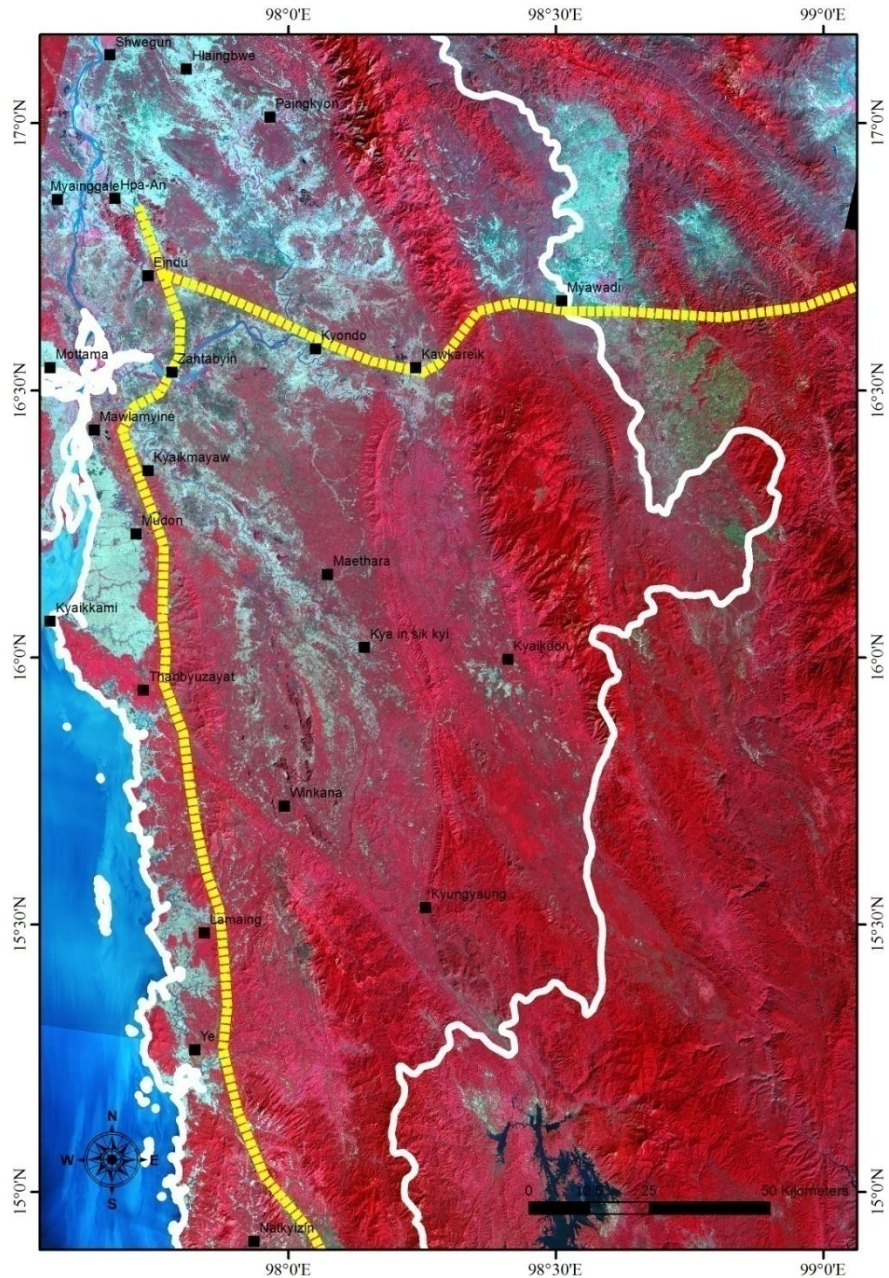
<b>AGE</b>	<b>Myanmar, Shan state, Kayah State, Karen State and Tanintharyi Region</b>		<b>Thailand</b>	
Ordovician	<b>O</b>	Purple shale,	<b>O</b> <b>EO</b>	-Argillaceous limestone, trilobite Marble, quart-mica schist
Cambrian	<b>E</b>		<b>E1</b> <b>E</b>	- red to brown Sandstone -Quartzite, sandstone, calcareous shale
Paleozoic	<b>Pzl</b>	Undifferentiated sediments of lower paleozoic rocks		
Precambrian to Cambrian	<b>PE-E</b>	Undifferentiated Units of Precambrian and Cambrian Rocks		
Precambrian	<b>Gngs</b>	Gneiss, Schist, Quartzite, Marble, Calc-Silicate, Migmatite Amphibolites	<b>PE</b>	orthogneiss and paragneiss, amphibolite schist, marble, calc-silicate, migmatite



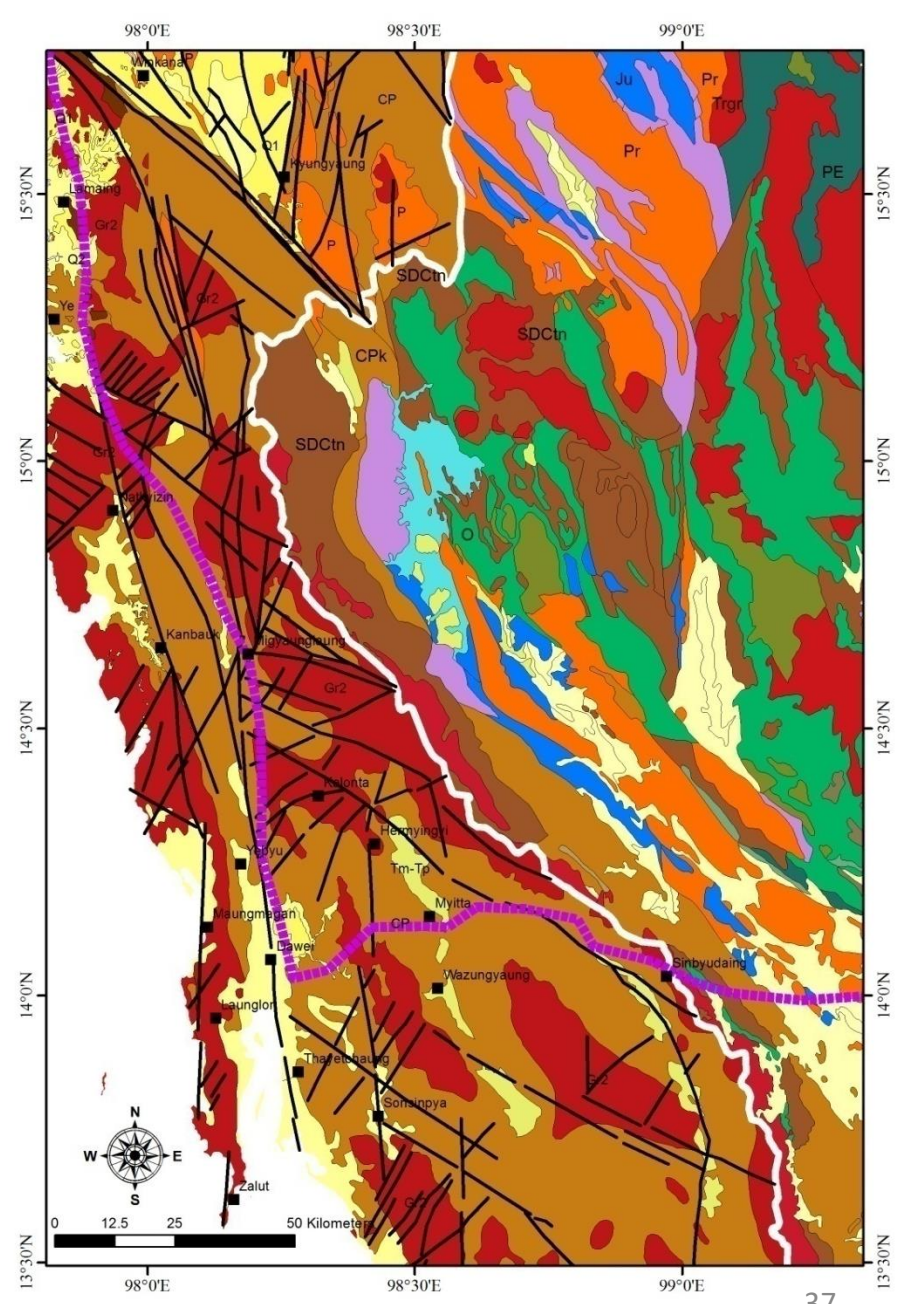
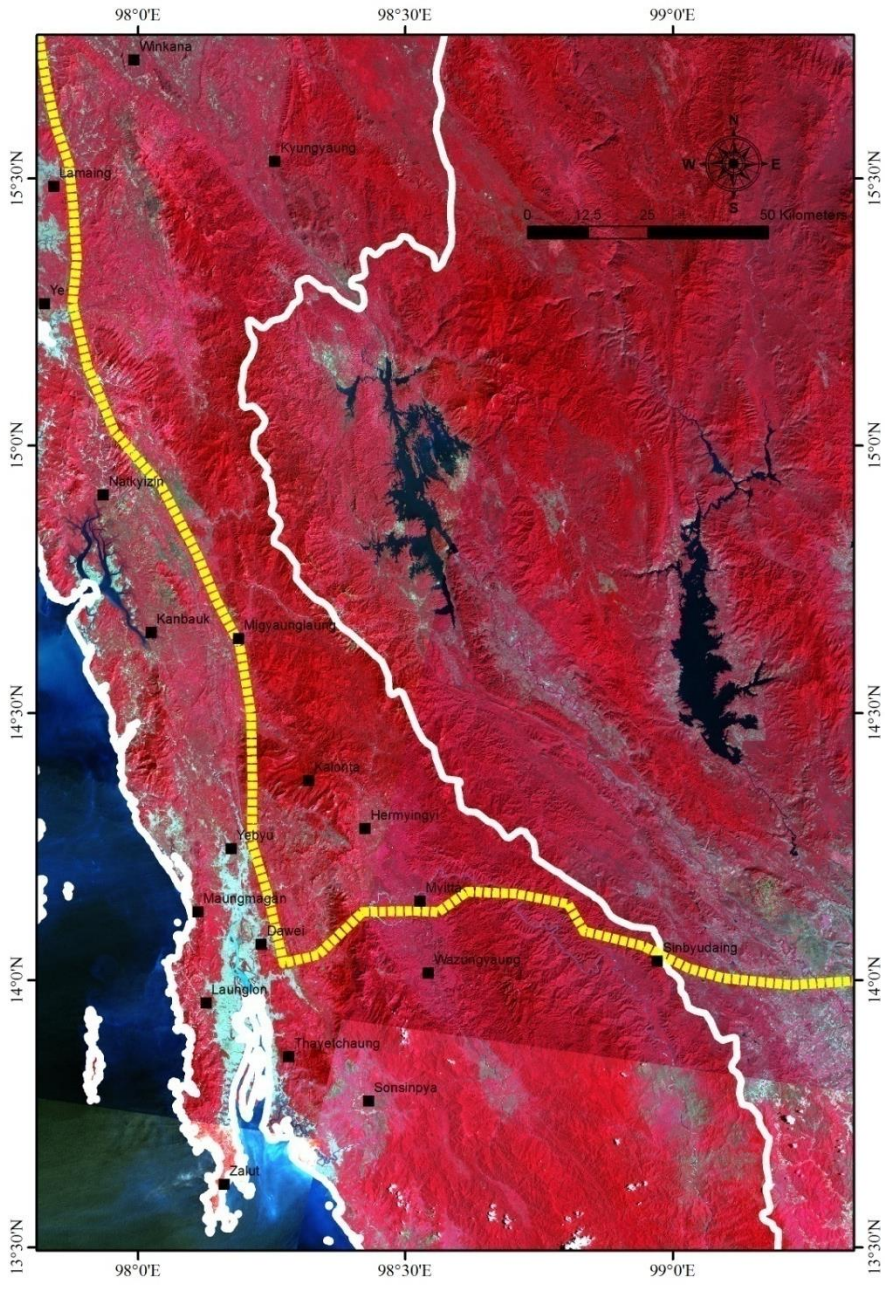




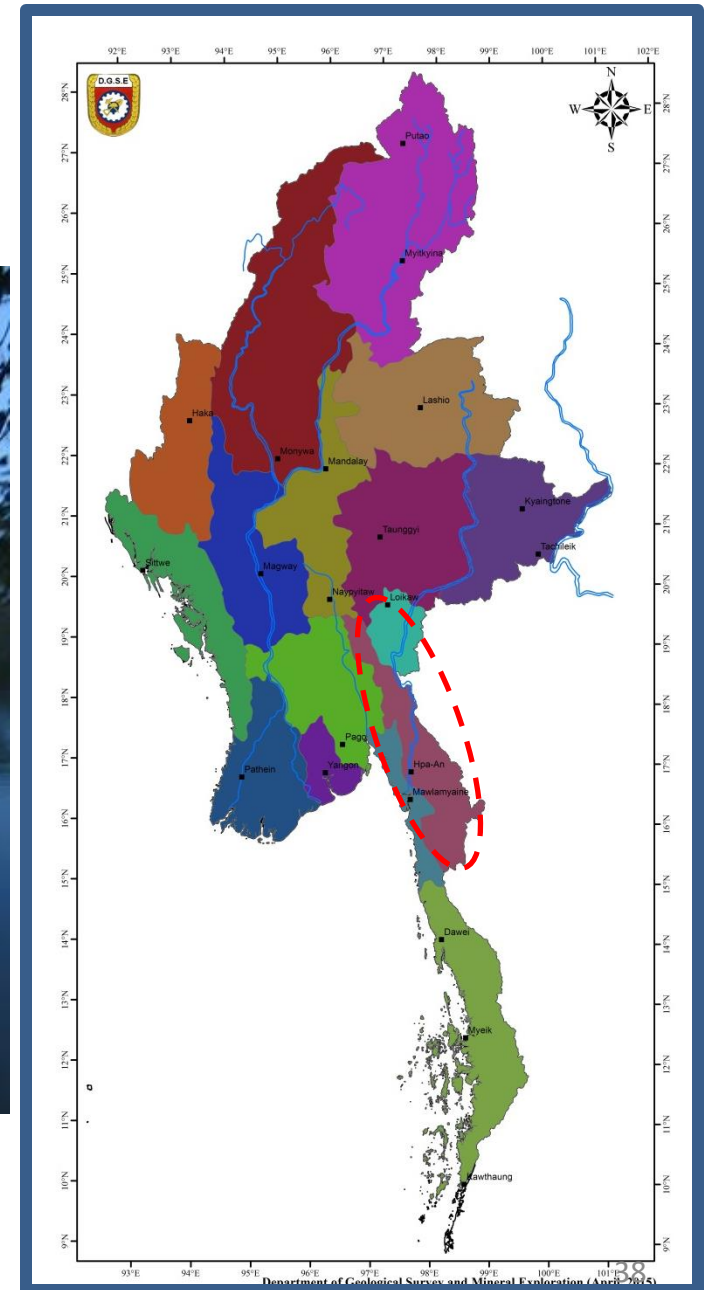








# KAYIN STATE GEO-CONSERVATION





Kyakalat Taung ,Hpa-An Township , Kayin State 39



khonhto waterfall



ကရင်ပြည်နယ်ဘားအံမြို့တော်ဖွဲ့ဘုတ်

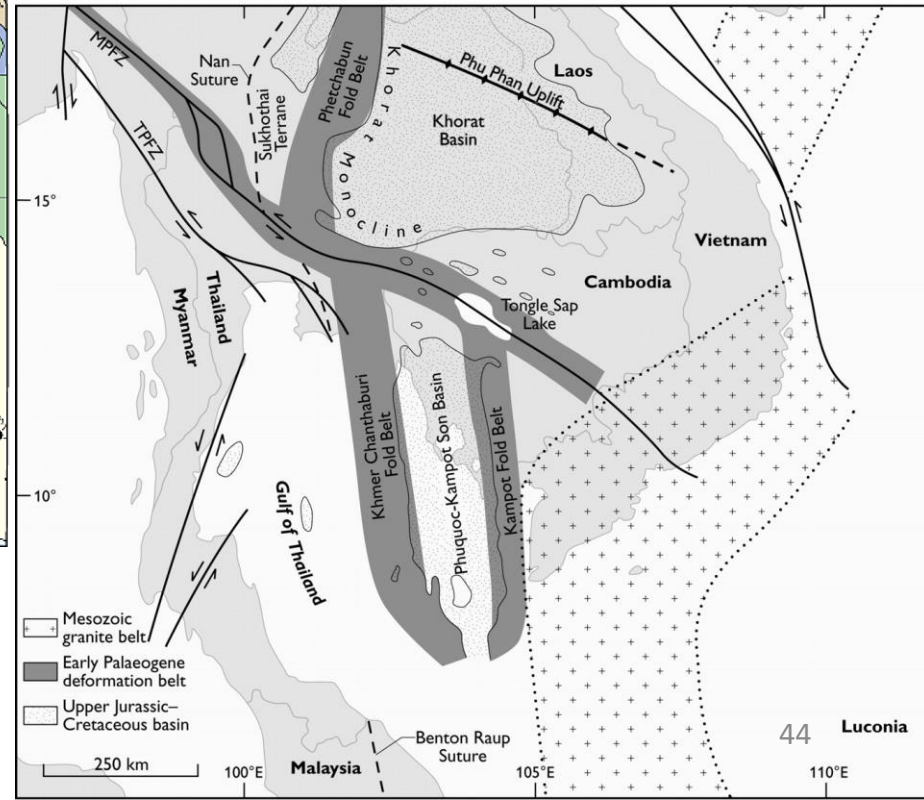
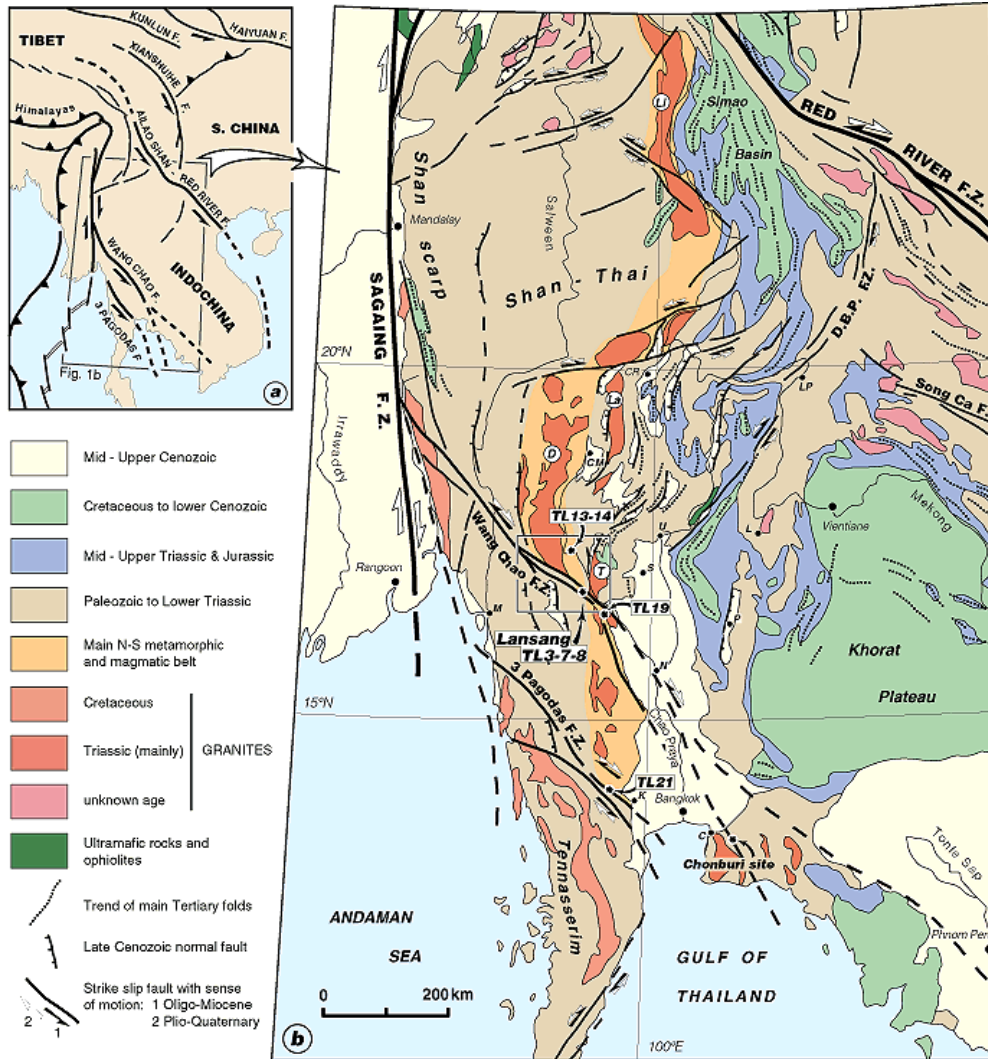


# LIMESTONE CAVE





# THREE PAGODA FAULT



# DISTRIBUTION OF ANTIMONY DEPOSITS

## Antimony deposits

-More than 140 occurrences of stibnite and other sb-bearing minerals are known in Myanmar.

-The majority of antimony mineralization occurs in the late Paleozoic carbonates (Triassic to Permian in age) & also in the late Pleozoic clastic sediments of the Mergui series.

-generally found in veins or lenses, or both.

-So far, the best known antimony deposit s are at Thabyu, Kayin State, near Thai Border. The ore is reported to be of high grade.

Lebyin, Mandalay

Kadaik, Mon

Thabyu, Mon

Nahok, Shan

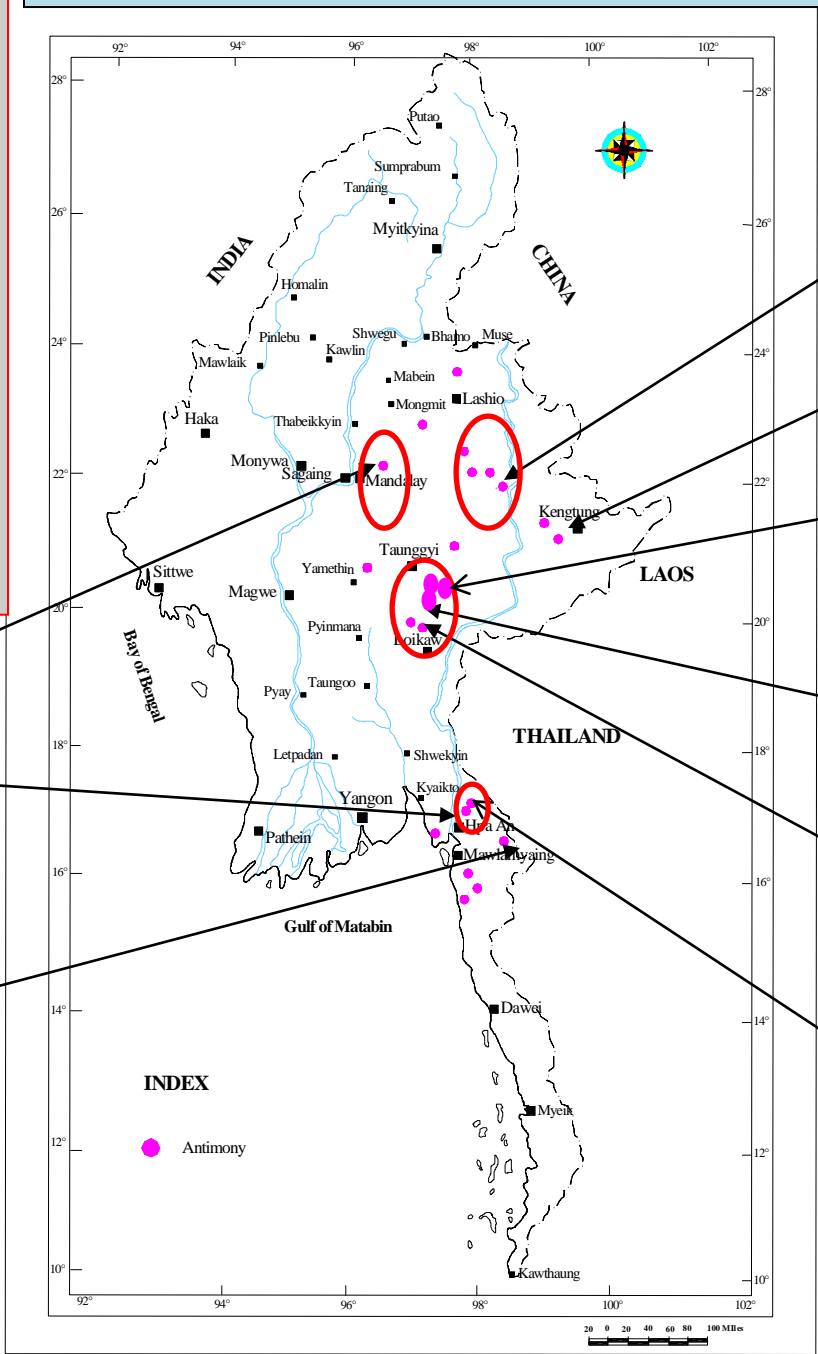
Mong Inn, Shan

Liharmyar, Hopone

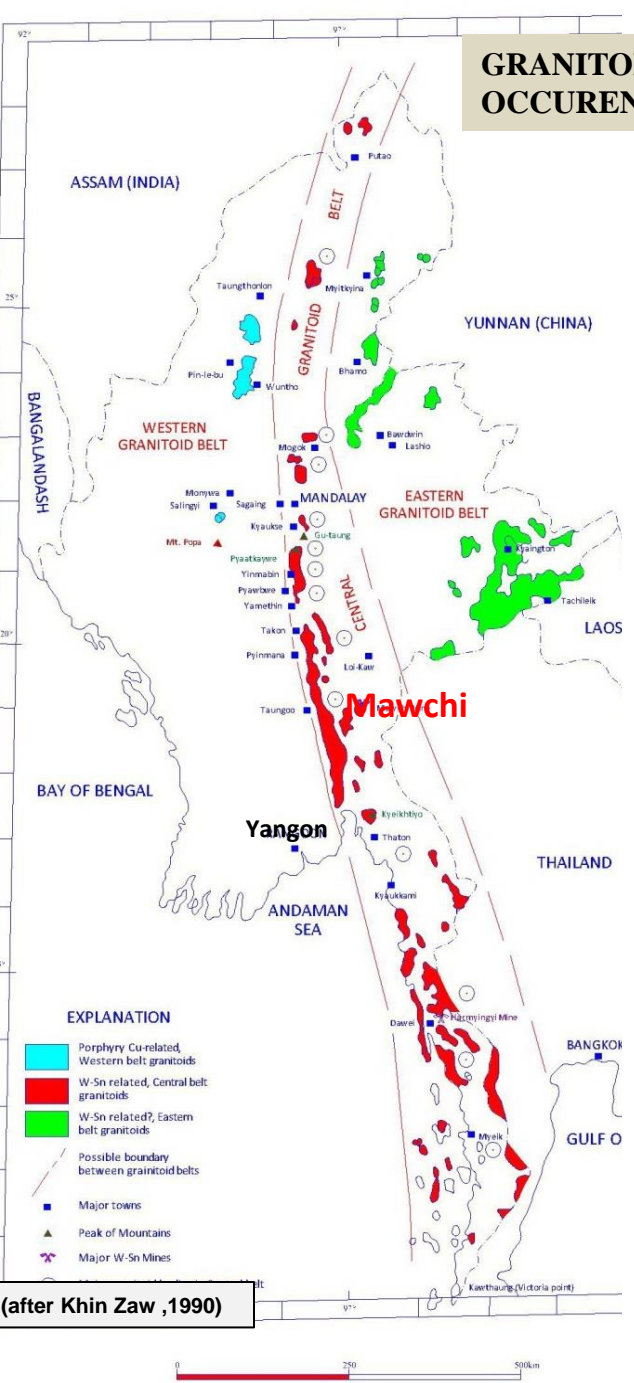
Peinchit, Kayah

Konsut, Kayah

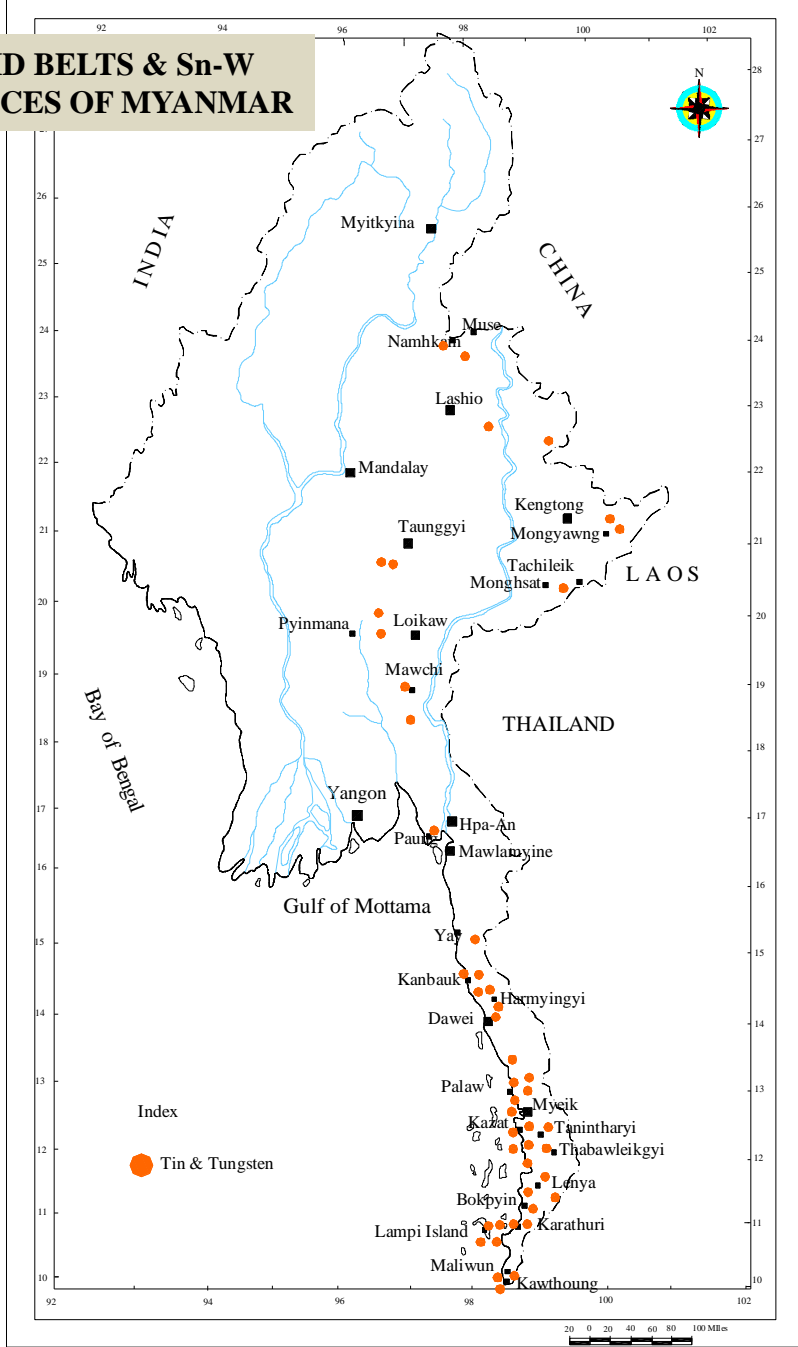
Laga, Kayin



# GRANITOID BELTS & Sn-W OCCURENCES OF MYANMAR



(after Khin Zaw ,1990)



## Western Granitoid Belt

- Cretaceous to Lower Eocene
- characterized by high-level intrusions associated with Porphyry Cu (Au) related, younger volcanics
- emplaced as a magmatic-volcanic arc

## Central Granitoid Belt

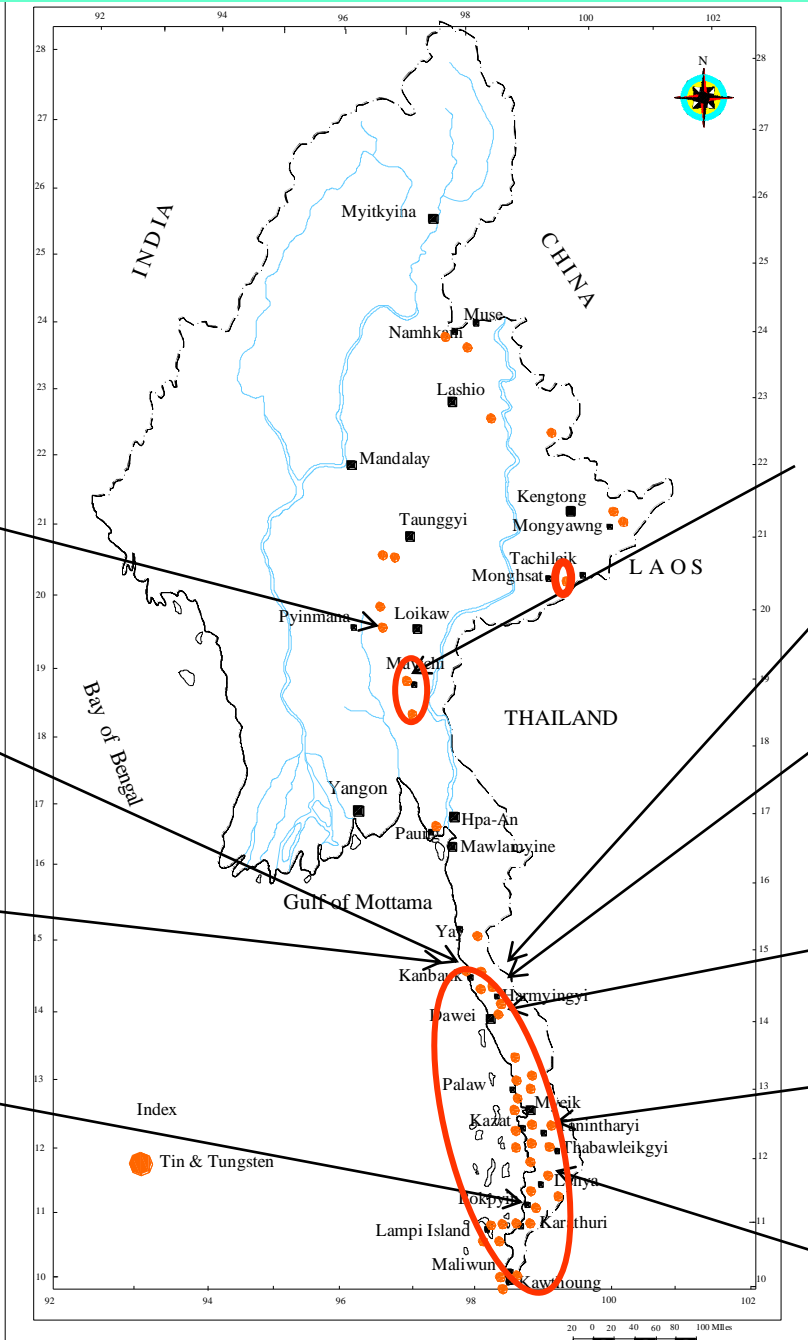
- Upper Cretaceous to Lower Eocene
- characterized by mesozonal plutons associated with vein type *Sn-W* deposits
- associated with abundant pegmatites and aplites and rare co-magmatic volcanics

## Eastern Granitoid Belt

- ? Triassic
- characterized by medium to coarsely porphyritic
- mesozonal and *Sn-W* bearing granites

# DISTRIBUTION OF TIN - TUNGSTEN DEPOSITS

**Sn-W deposits, mainly associated with granitic intrusions along the tainintharyi and western margin of shan plateau**



**Padatchaung (Primary)**

**Heinze (Placer)**

**Kanbauk( Primary/ Placer)**

**Atwin Bokpyin (Placer)**

**Mawchi (Primary)**

**Hermyingyi (Primary)**

**Heinda (Placer)**

**KyaukmeTaung, Pagaye(Placer)**

**Theindaw(Placer)**

**Manawlon(Placer)**



Hermyingyi Sn-W mine, Dawei

# DOCUMENTS REQUIRE FOR SITE VISIT

- i. Proposal letter (submit in **3 weeks ahead** of the trip schedule)
  - ii. Field trip schedule
  - iii. Recommendation letter **from the Embassy** of the concerning country in Myanmar(**including Name and Passport No**)
  - iv. **Letter of undertaken** for each personnel of the group with company letter head
  - v. Individual **Passport copy and visa** (If arrival visa, need to submit within one week in Myanmar)
- Proposal letter submit to the Ministry of Mines and copy to DGSE
  - Two geologists will accompany and assist during the site visit

# Discussion

- Using Satellite Image (Landsat, ASTER)
- Working Group
- Ground field checking with both site
- Dating for Stratigraphic Age, Geo-hazard, Geo-Conservation
- International Standard color and Symbol for stratigraphy
- Reference 2 million scale ASEAN Geological Map
- GIS Application
- Review and Revise



# Conclusion

- 2 Checking Points for Myanmar - Laos Border
- 2 Checking Points for Myanmar- Thailand Border
- Checking Based on Car Road and across border city
- Some Checking Points challenging by Security and hidden Land Bombs and heavy rain.
- Study together both Geological Survey Departments.

The End