Tectonic Setting, Magmatism, and Associated Mineralization of Lao PDR with special references to Thailand: A revisited

From the previous one in 2012

Tectonic Setting, Magmatism, and Associated Mineralization of Lao PDR with special references to Thailand: A revisited

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With the contribution of Apivut Veeravinantanakul

Academic Agencies

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topics

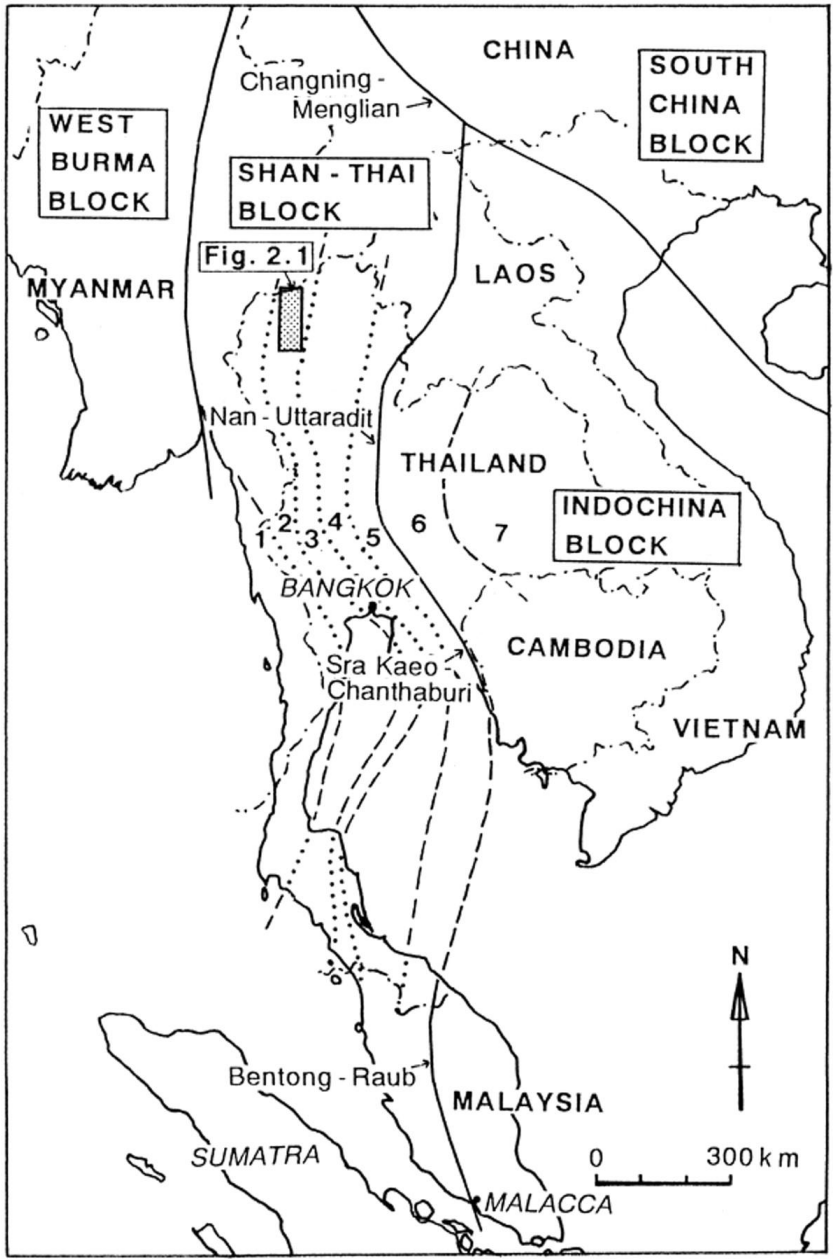
- Tectonic setting
- Magmatism
- mineralization
- conclusion

objectives

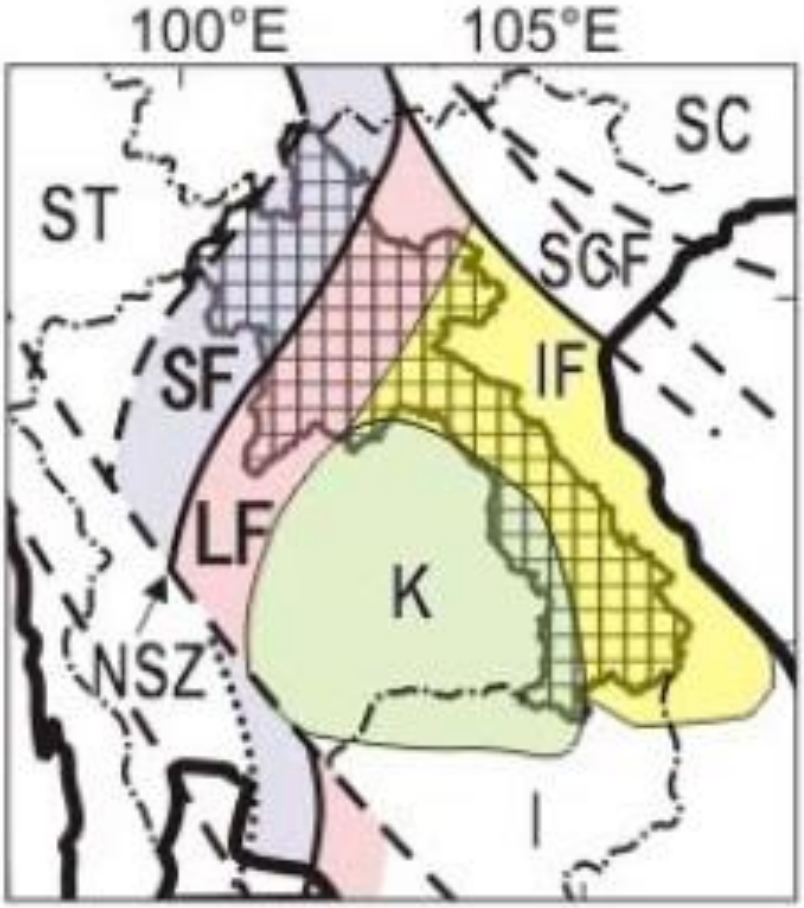
- To document new data on geochronology and petrochemistry of igneous rocks;
- To provide more accurate data on mineralization related to tectonics; and
- To discuss on tectonic/magmatic evolution

Thailand Tectonics by Bunopas (1981)

Pioneer work
And still can be applied



Previous studies of tectonic setting of Lao PDR and eastern Thailand



K : Khorat Plateau

SF : Sukhothai Fold Belt

LF : Loei Fold Belt

IF : Indosinian Fold Belt

SCF : South China Fold Belt

SC : South China Terrane

ST : Shan-Thai Terrane

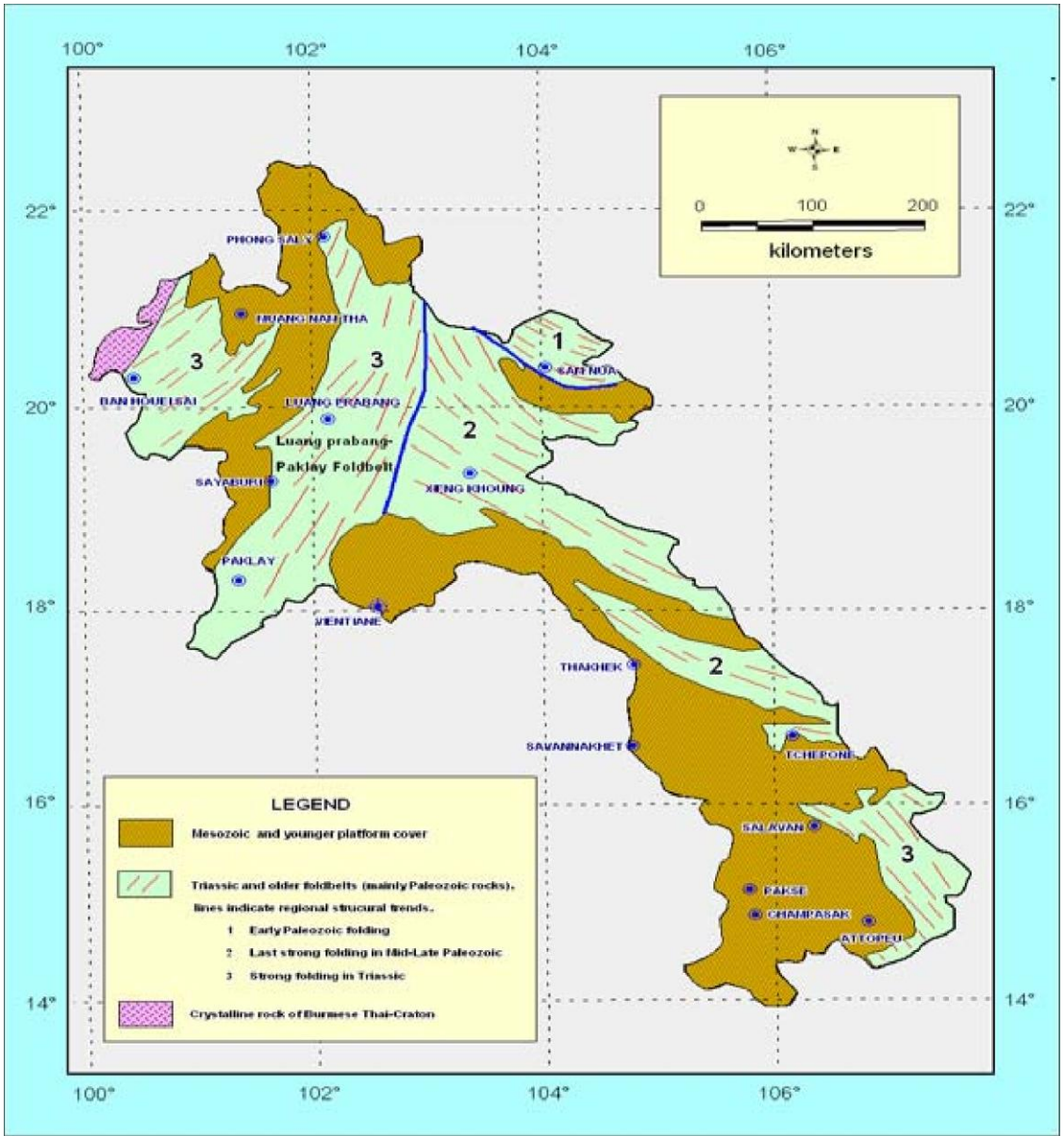
I : Indosinian Craton

NSZ : Nan River Suture Zone

Indochina geologic setting

(Modified after Copper *et al.*, 1989)

Lao PDR tectonic map by ESCAP (1996)



Ealier work for tectonic division in Lao PDR by Manomai Vilaihongs et al. (1997)

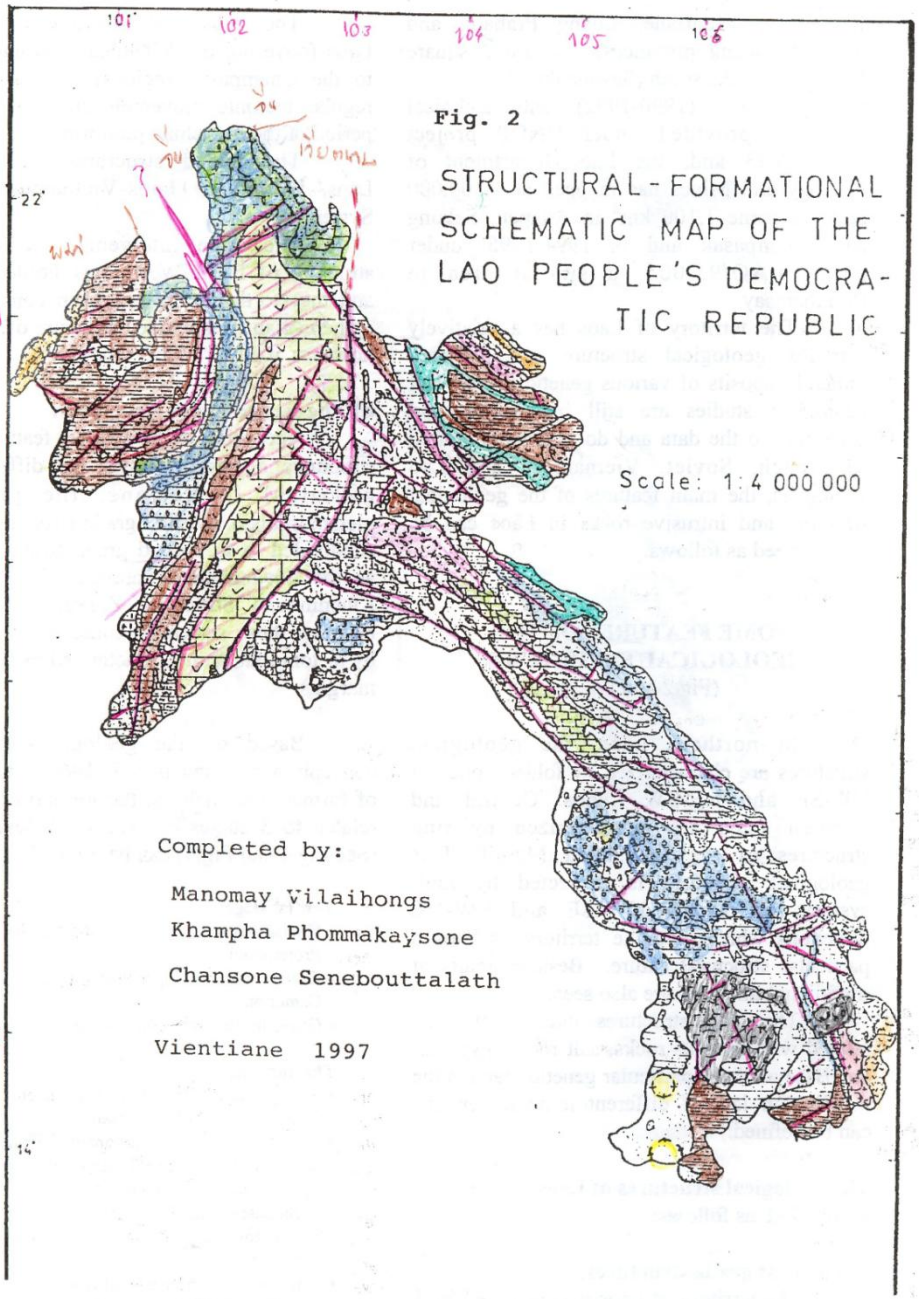
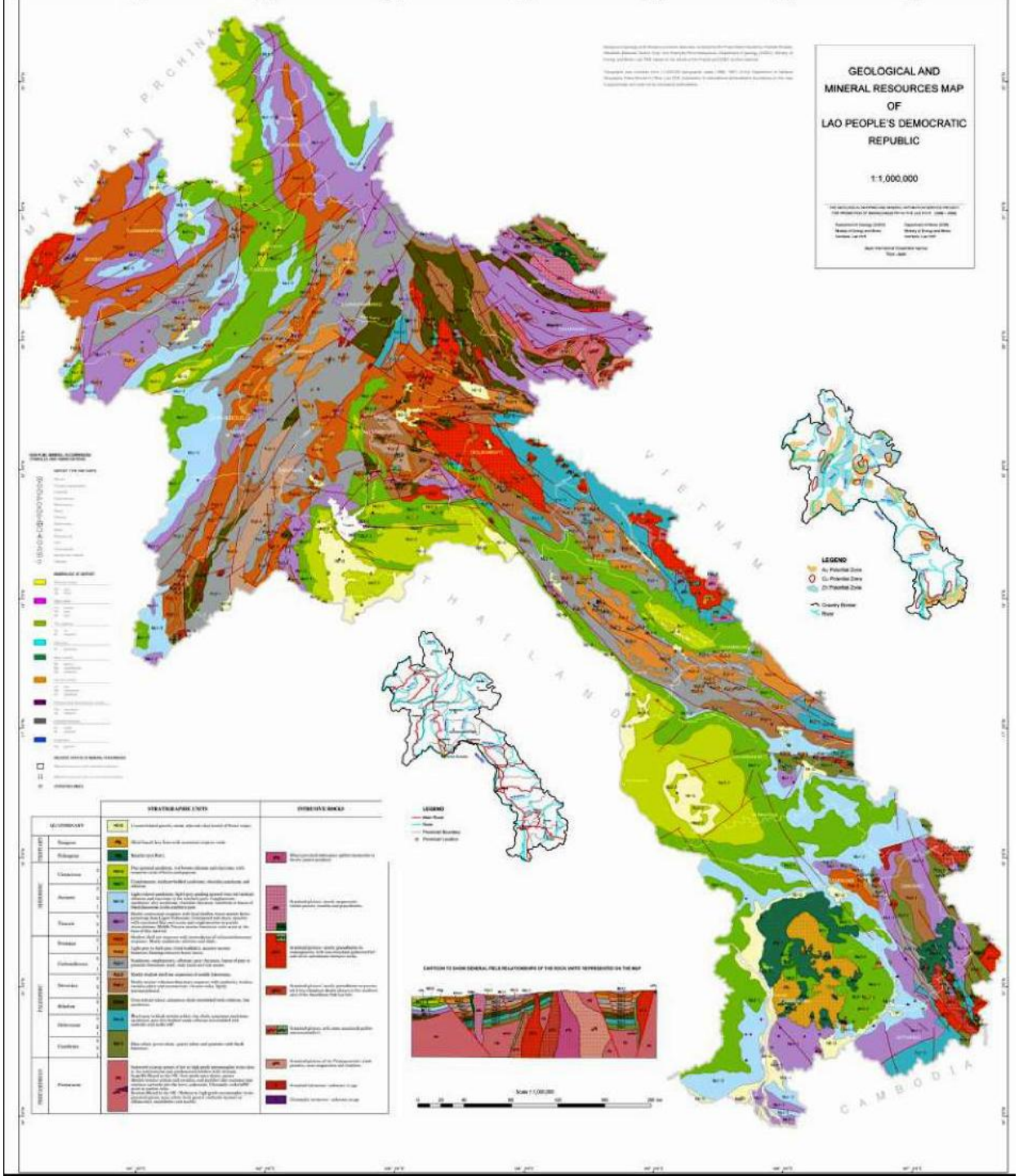
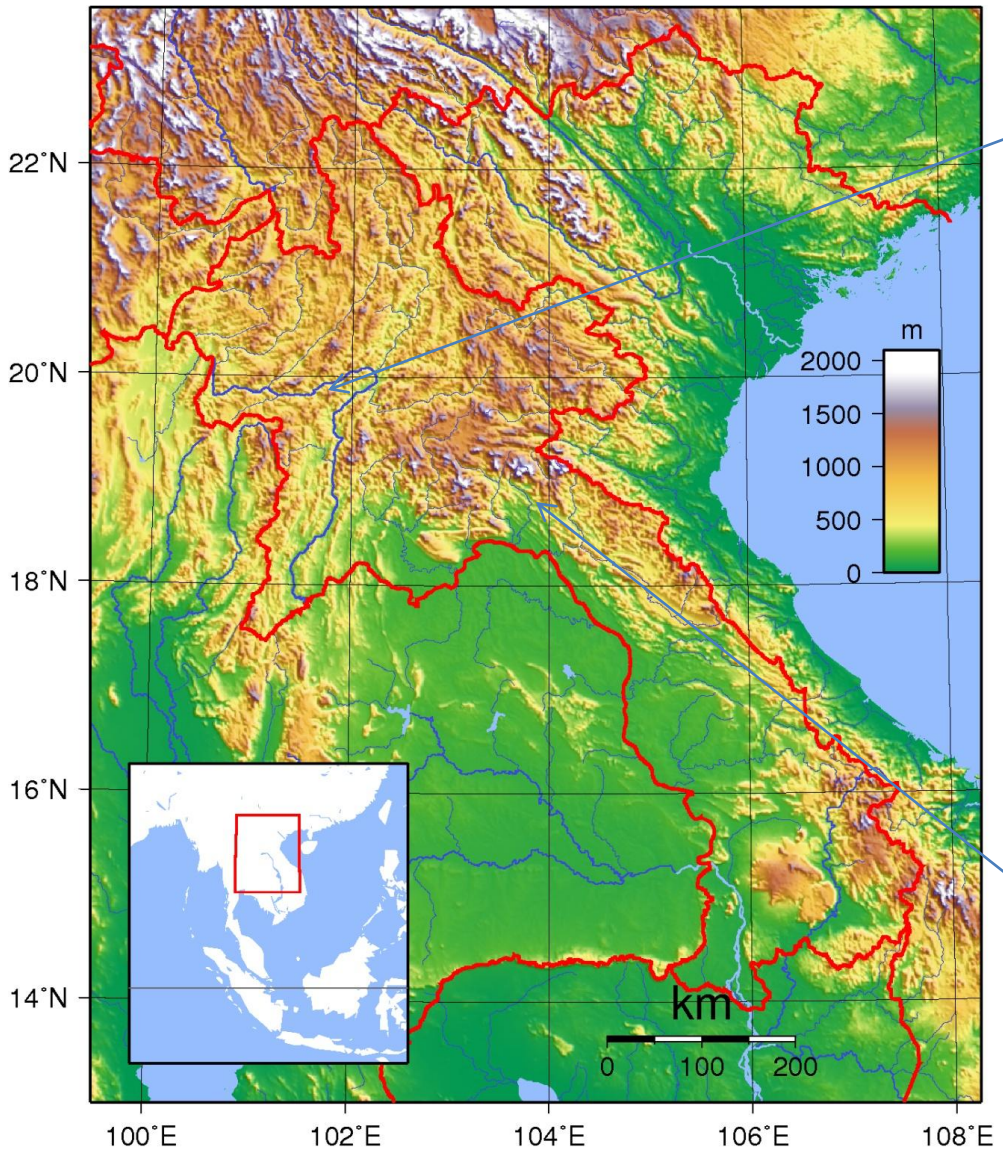


Figure 2 Structural-formational schematic map of the Lao People's Democratic Republic

JAICA Geologic map of Lao PDR following BGS (2003)



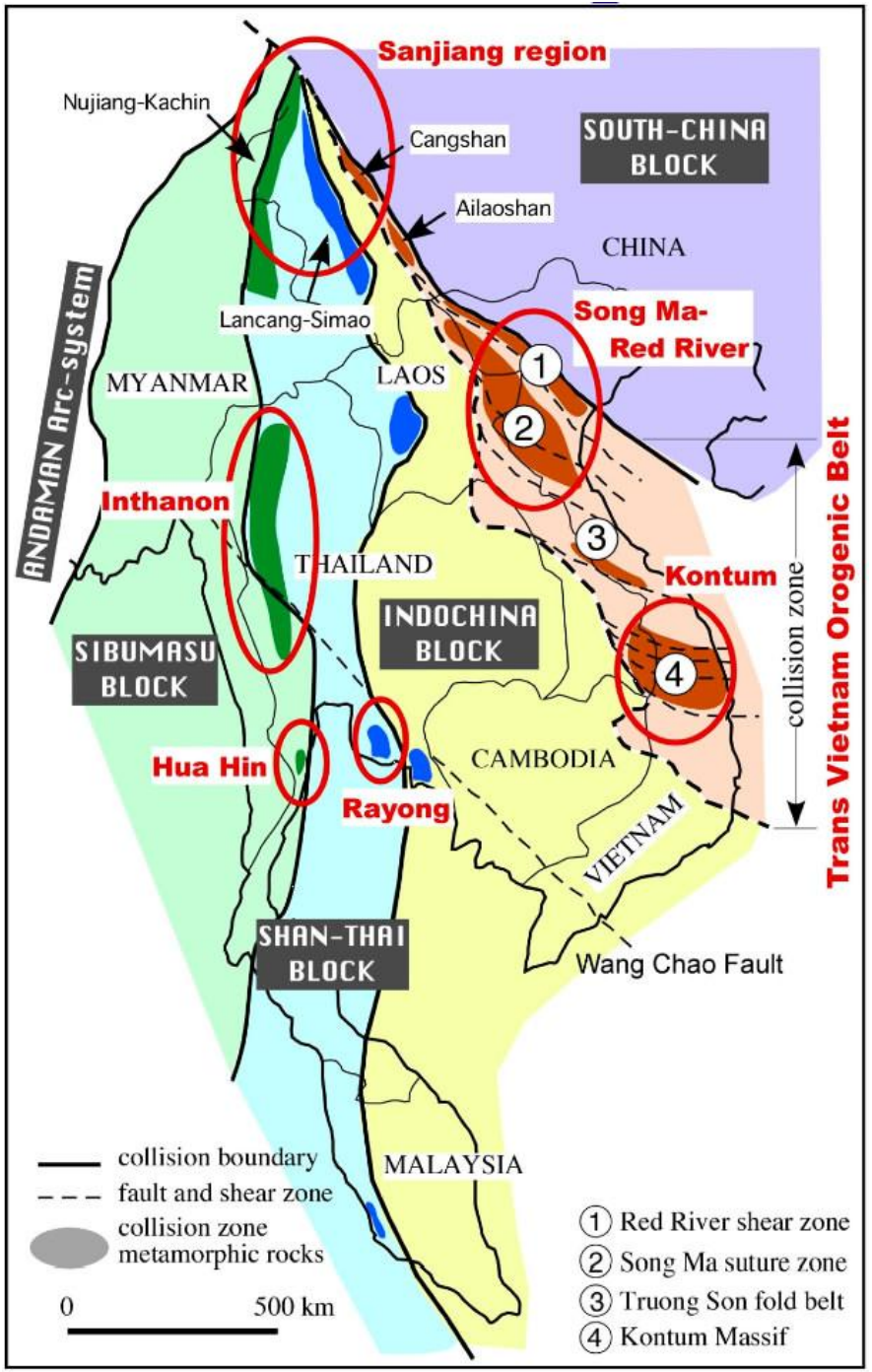


NE-SW lineaments

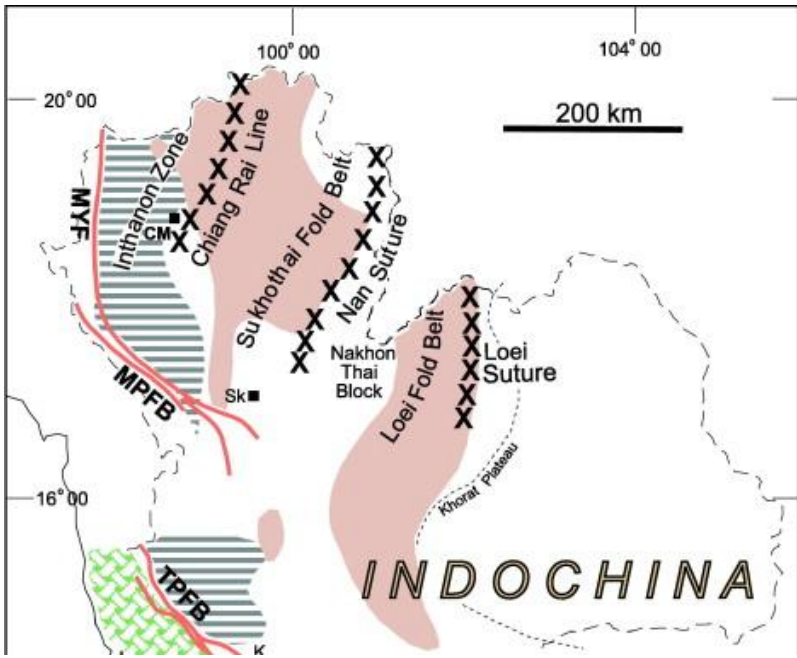
Lao Sattelite Image DEM data

NW-SE lineaments

Tectonic framework of SE Asia by Osanai et al. (2011)



Michael Ridd (2015) applied charusiri et al. (2002) data for his map



Charusiri et al.(2002)

2 minor blocks

Luang Namtha Block

Xam Nua block

4 major blocks:

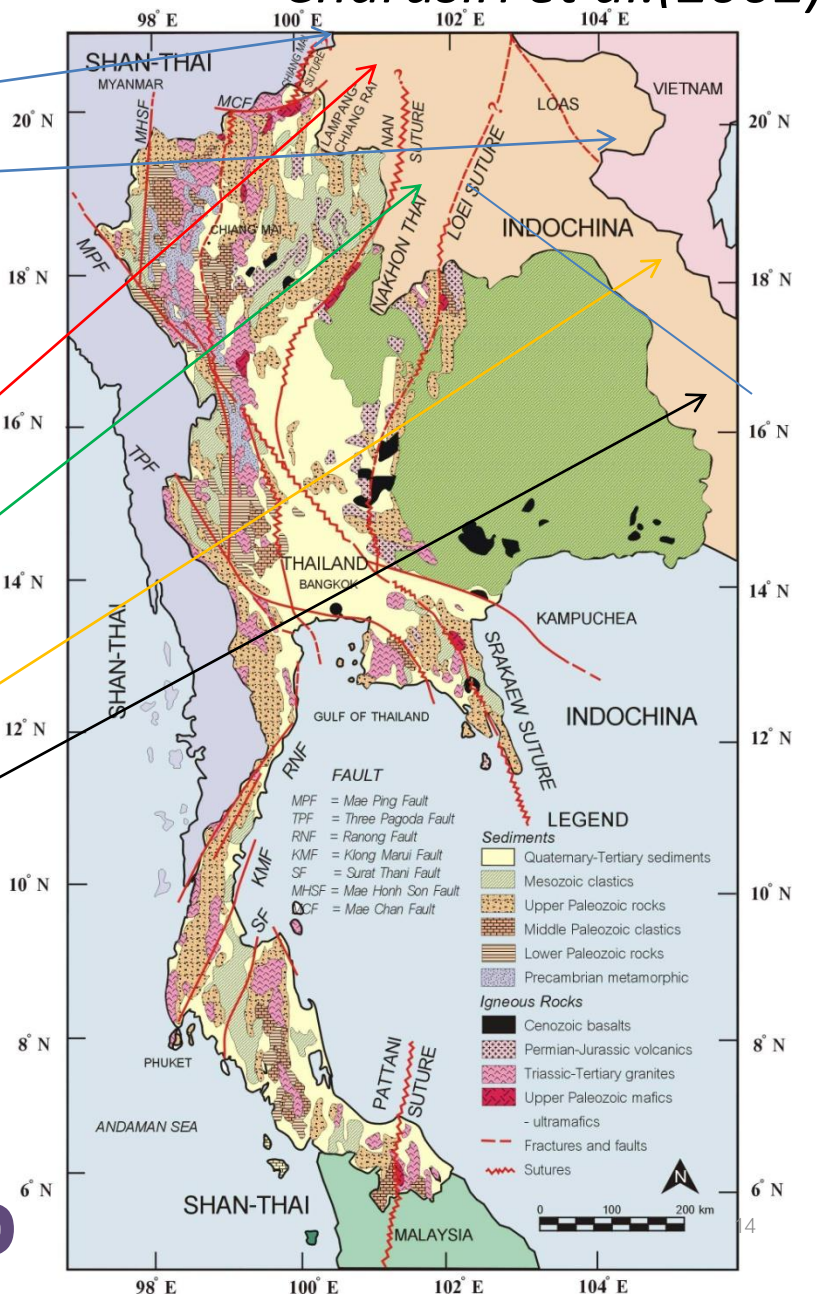
Oudomxai block -West,

Paklay block - Centgral,

Phuluang block - East

Indochina block-South

6 tectonic blocks in Lao



1. Bo Kaeo

E Tr Suture.

2. Nam Ma

P-Tr Suture.

3. Xaiyaboury

E Tr Suture.

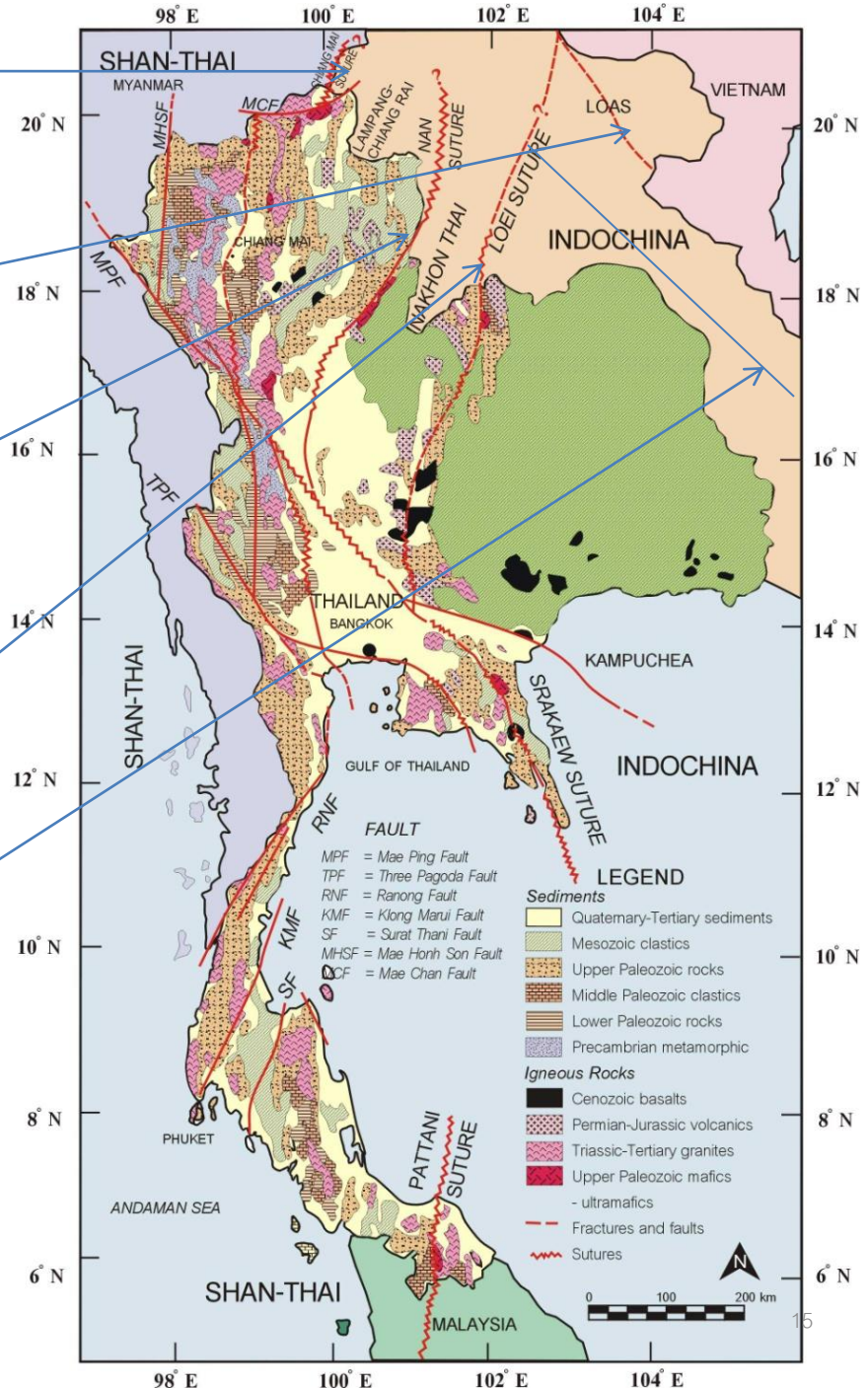
4. Luang Prabang

E Tr Suture.

5. Nam Thoen

P-Tr Suture.

5 sutures in Lao-Thailand



Luang Namtha Block

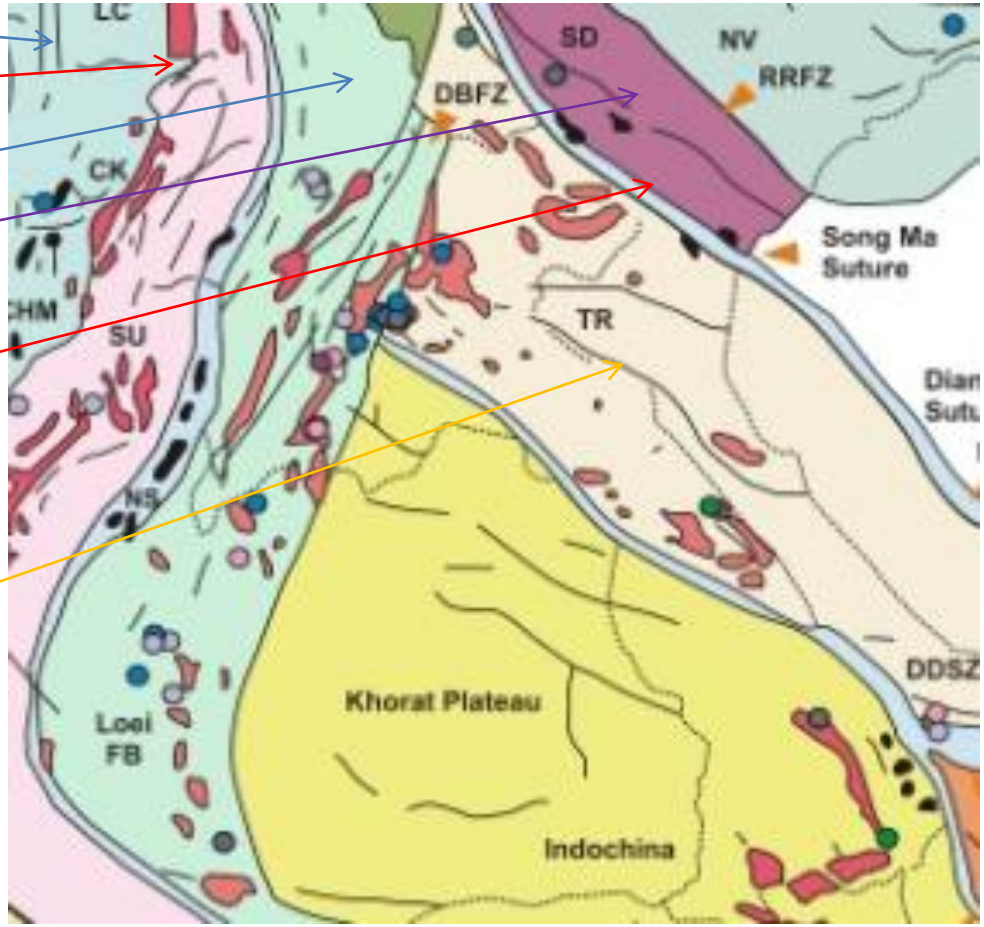
Bo Kaeo S.

Oudomxai block

Xam Nua B.

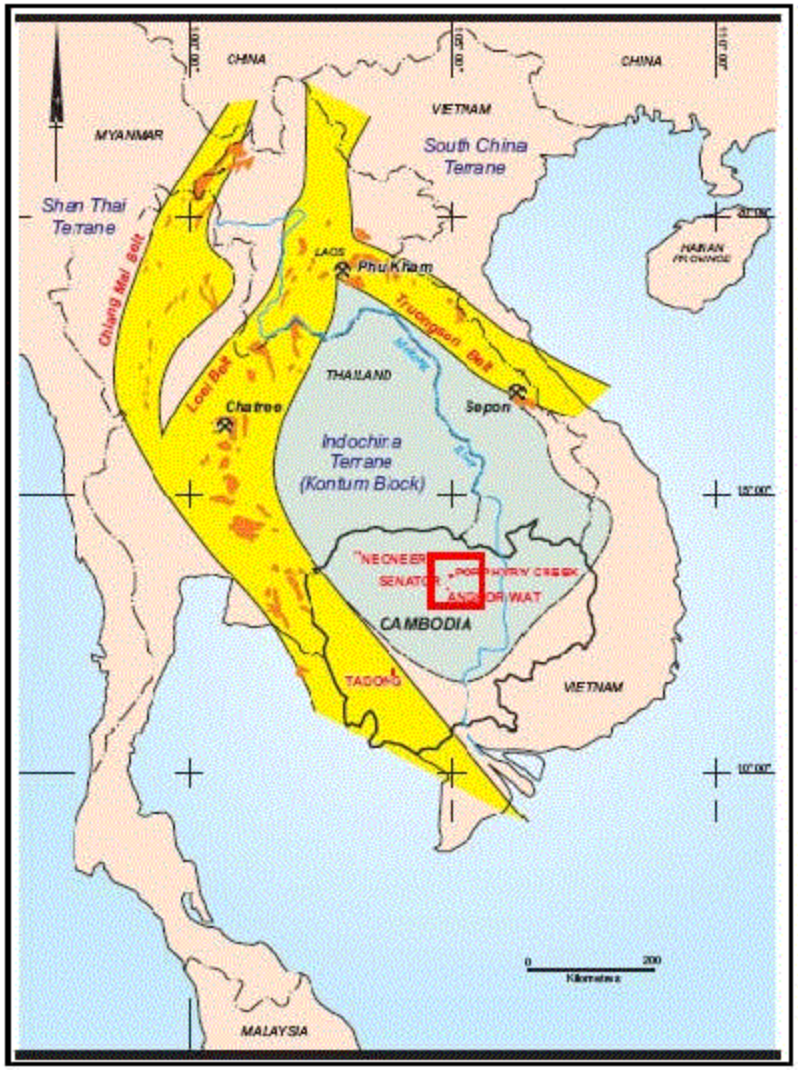
Nam Ma S.

Phuluang B
(Trung Son B)

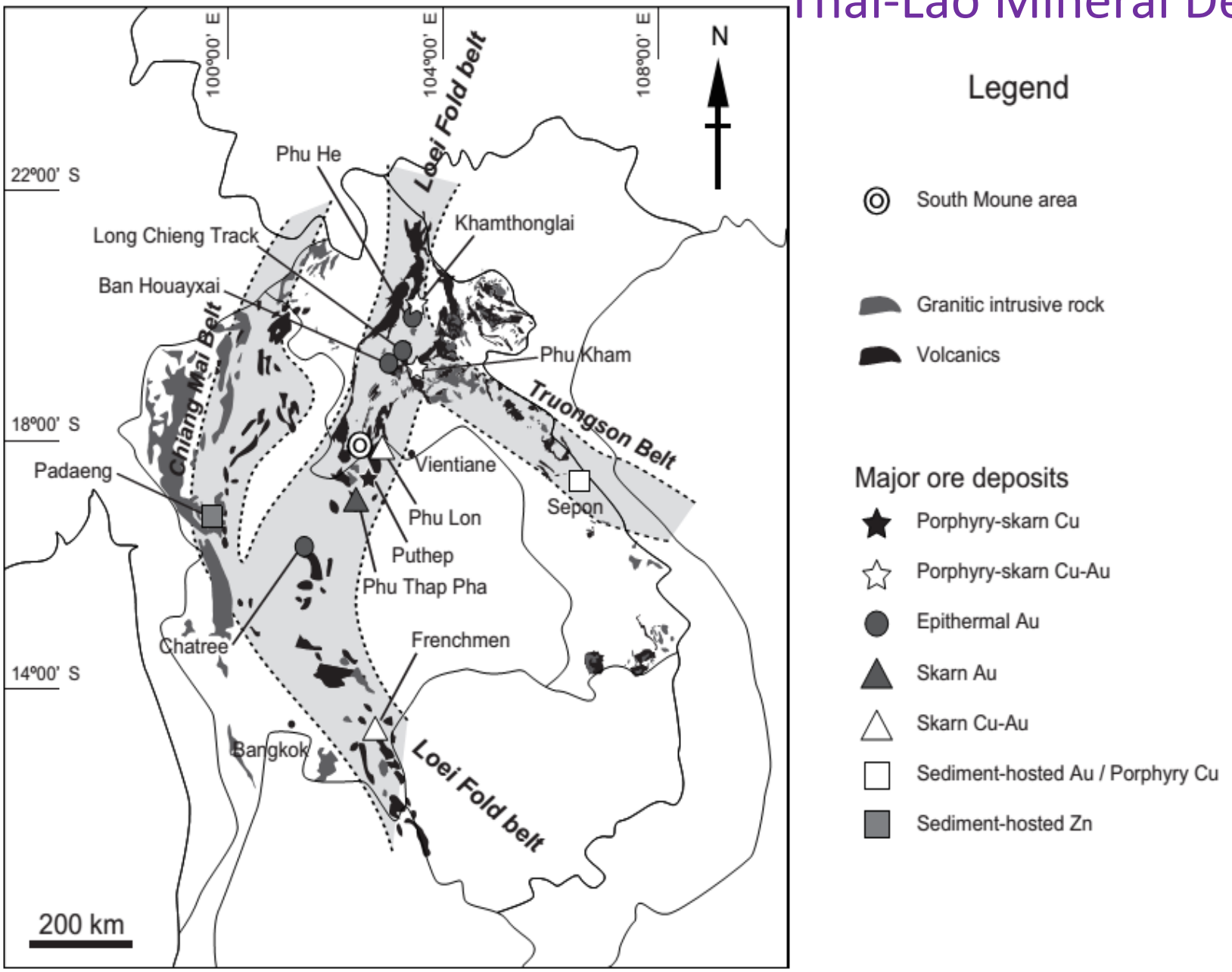


Modified after Burrte et al. (2015)

Thai-Lao Gold belts



Thai-Lao Mineral Deposits

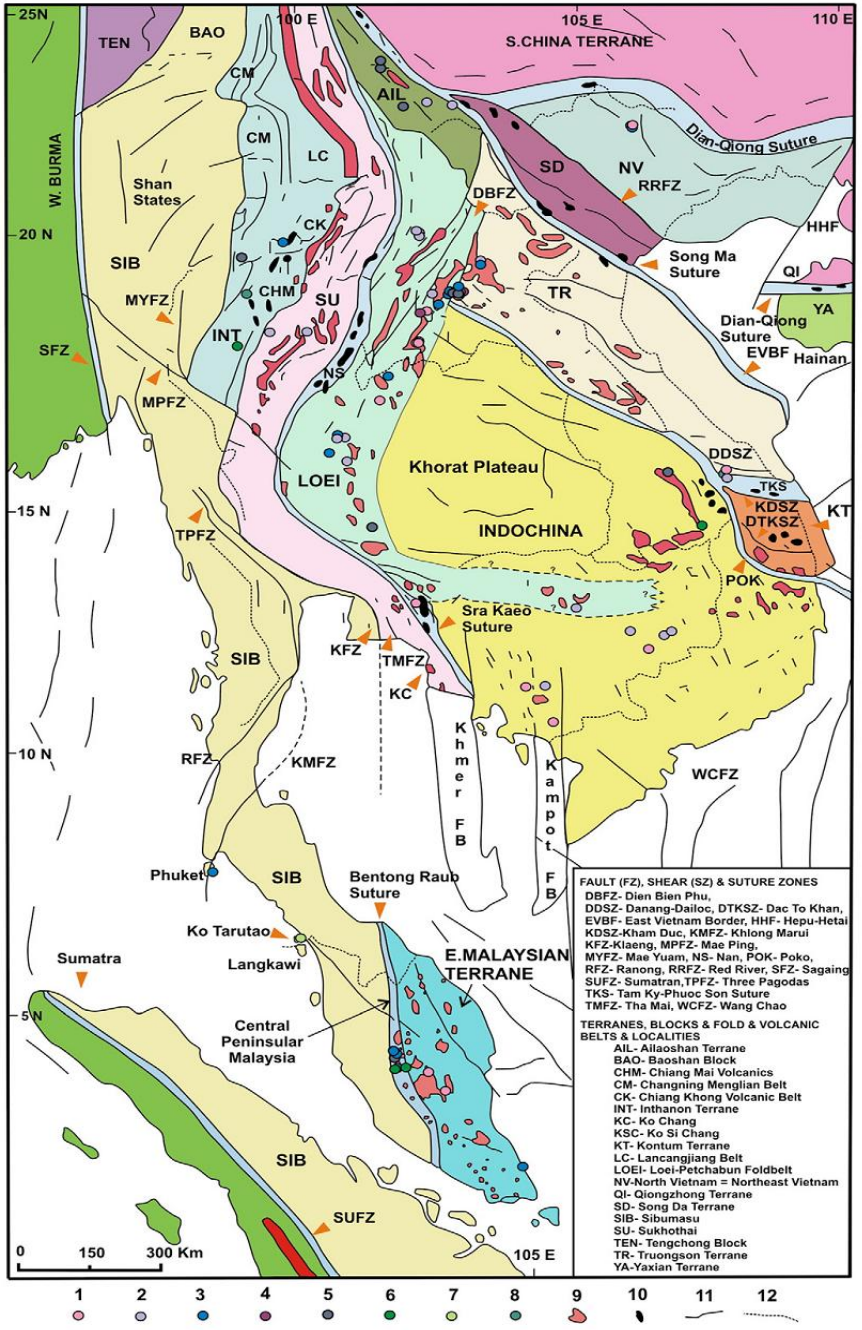


g. 3 Distribution of igneous rocks and major ore deposit in Lao PDR and Thailand, compiled after Nakapadungrat and Put-thapiban (1992), Panjasawatwong et al. (2006), Kamvong and Khin Zaw (2009) and BGS and DGM (1991).

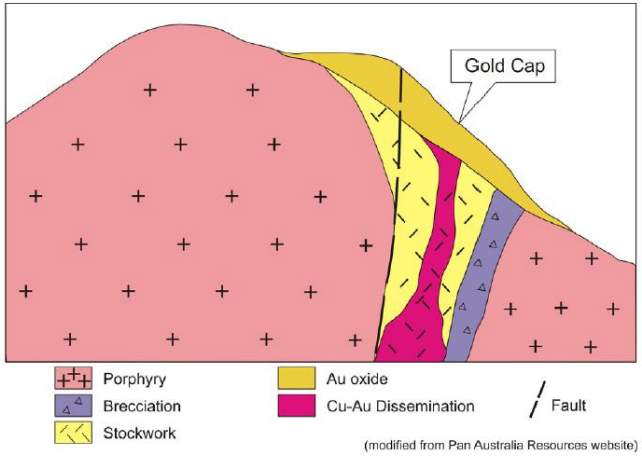
Ages of major magmatism and mineral deposits

- Silurian – Devonian (Phuloan volcanic)
- Carboniferous – Permian (plutonics and polymetallic deposits / Au-Ag ores)
- Permian – Triassic (Plutonic/ volcanic
- Juro-Triassic (A-type magma, rifting)
- Plio-Pleistocene (gem/basalt)

Major tectonic features based on new geochronology and petrochemistry

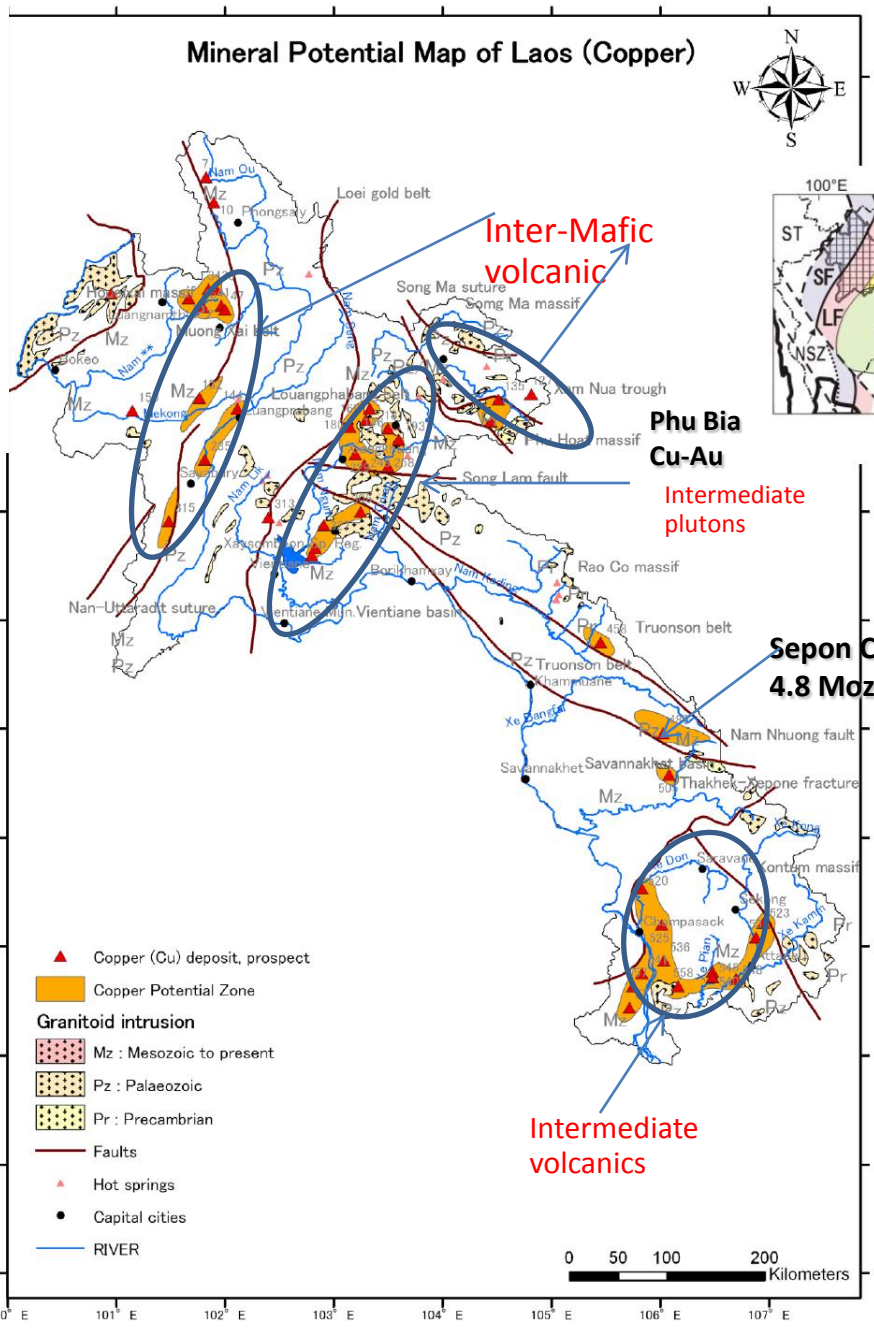


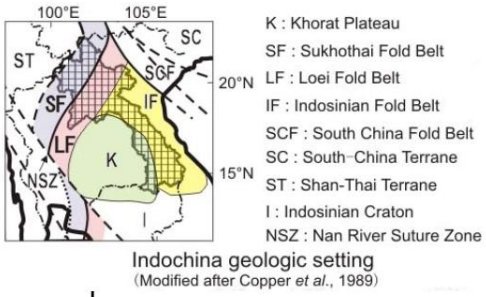
Modified after Burret et al. (2015)



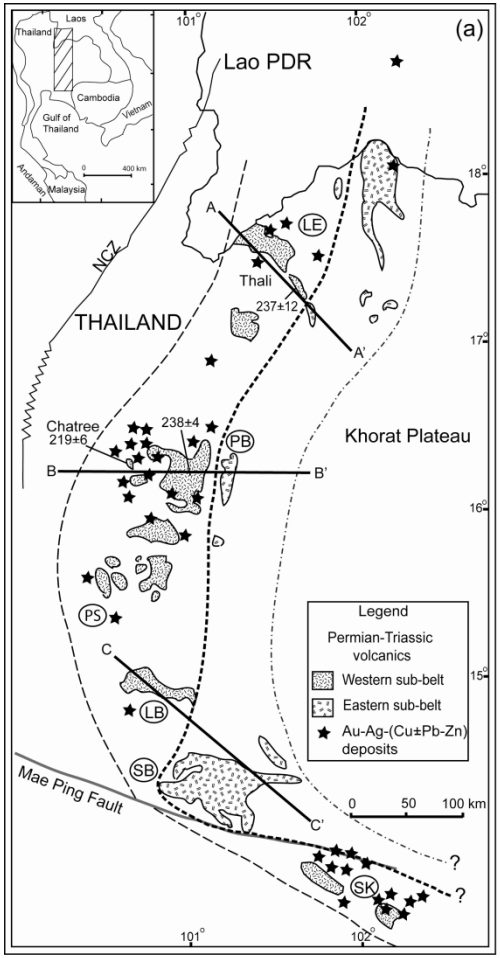
Cu potential map of Lao PDR

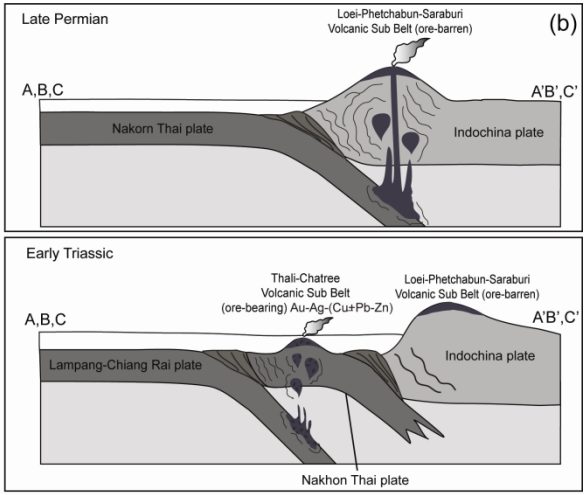
(Phommakaysone, 2010)

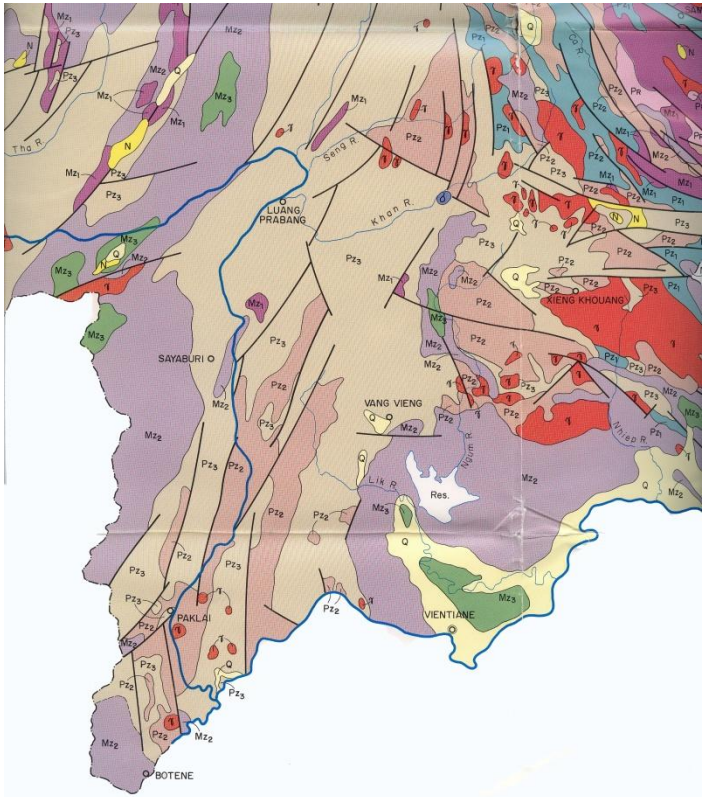




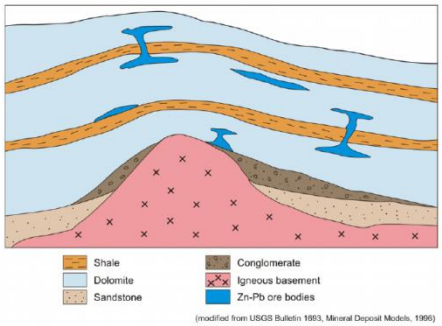
Paklay B subducted beneath Indochina B during Permo-Triassic time





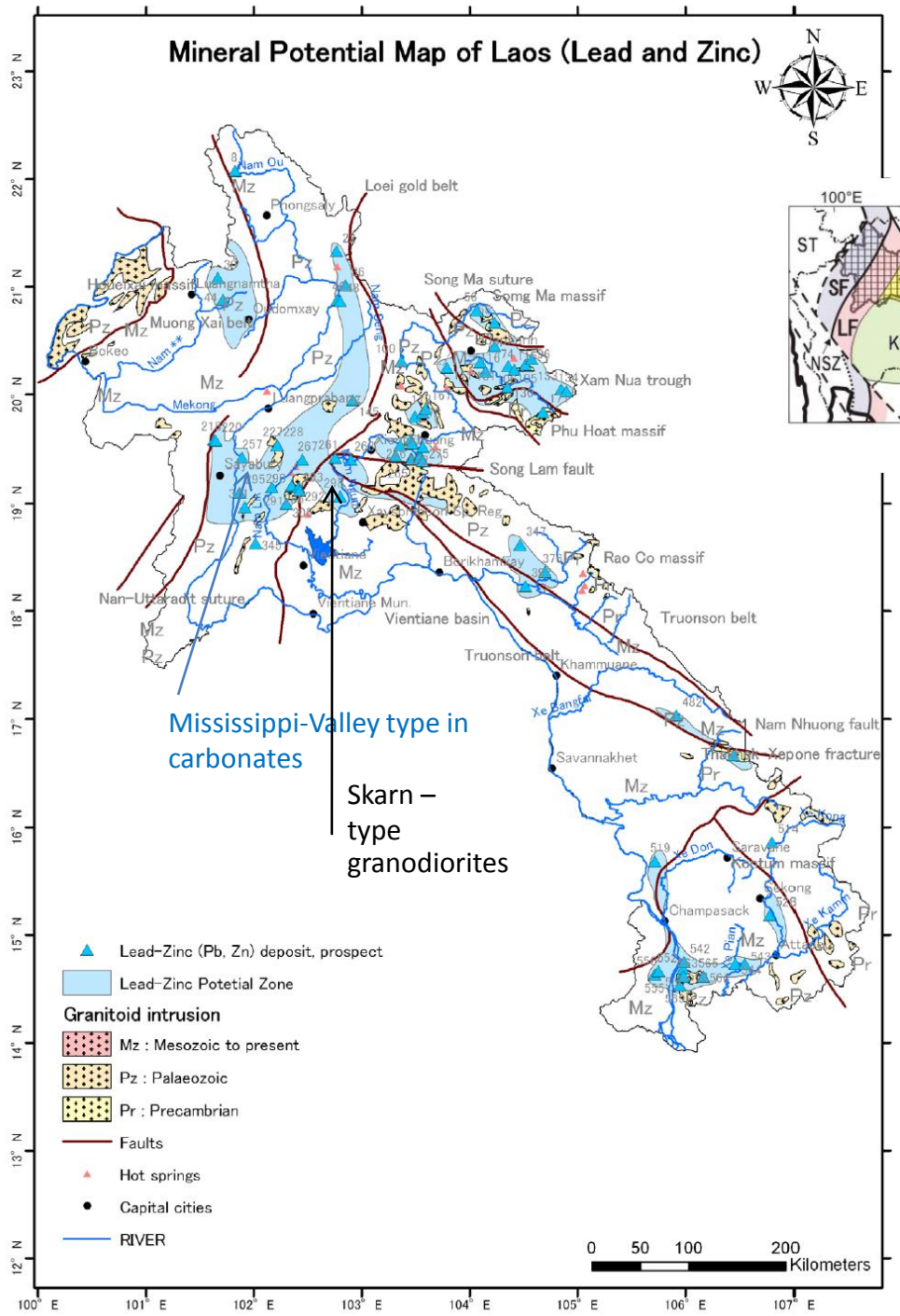


Vivatpinyou et al. (2014)



Pb-Zn potential map of Lao PDR

(Phommakaysone 2010)



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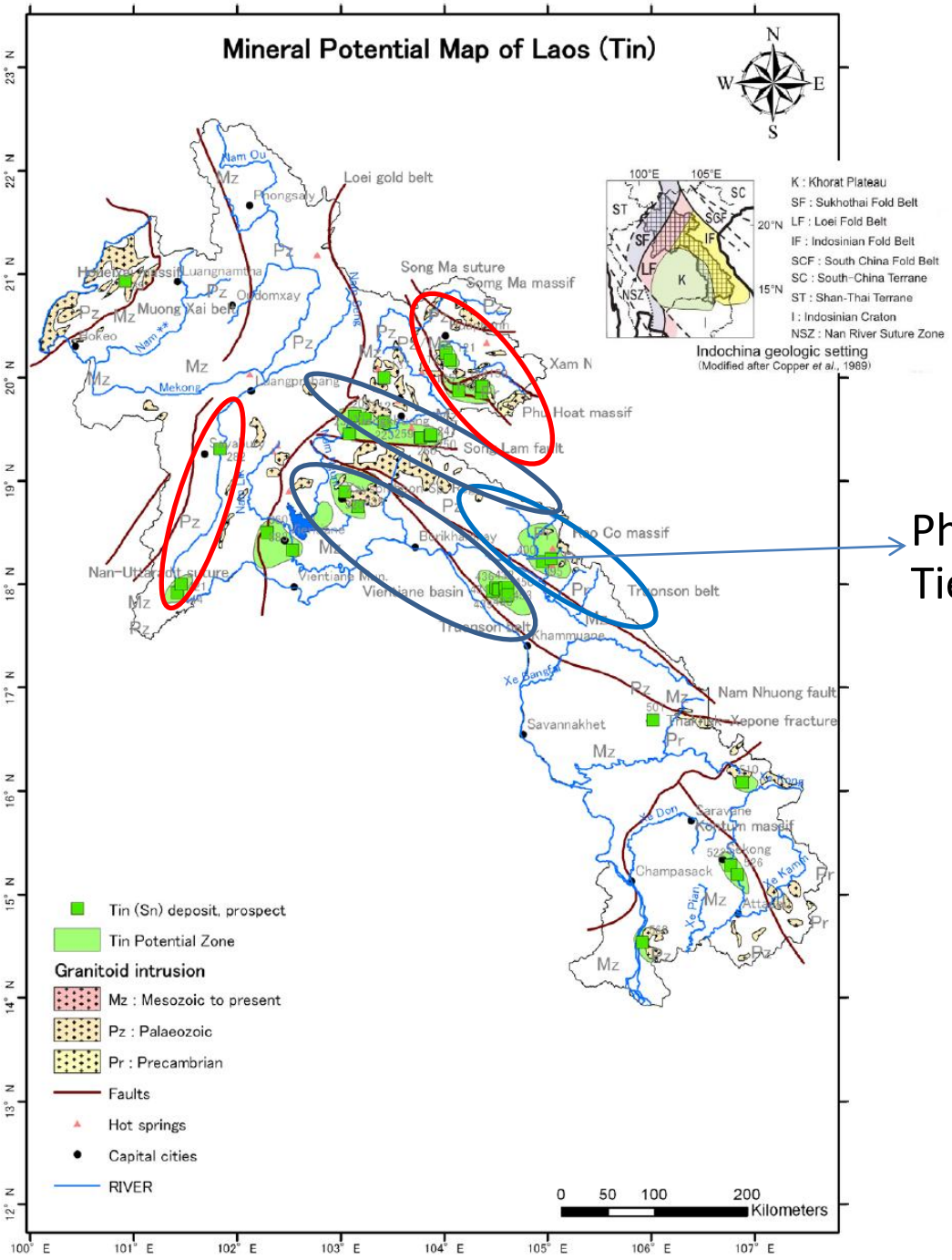
Indochina geologic setting
(Modified after Copper *et al.*, 1989)

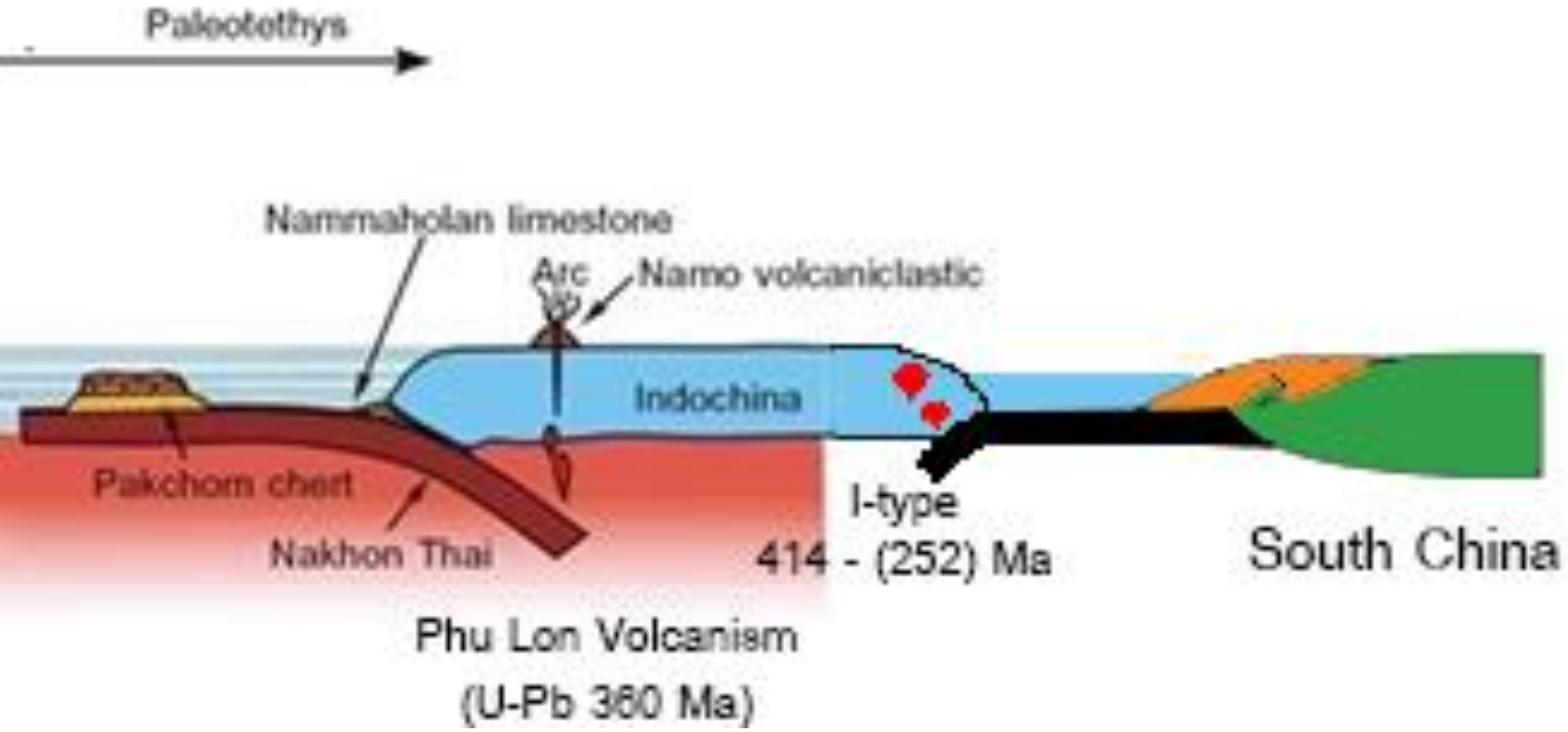
Sn potential map of Lao PDR

(Phommakaysone, 2010)

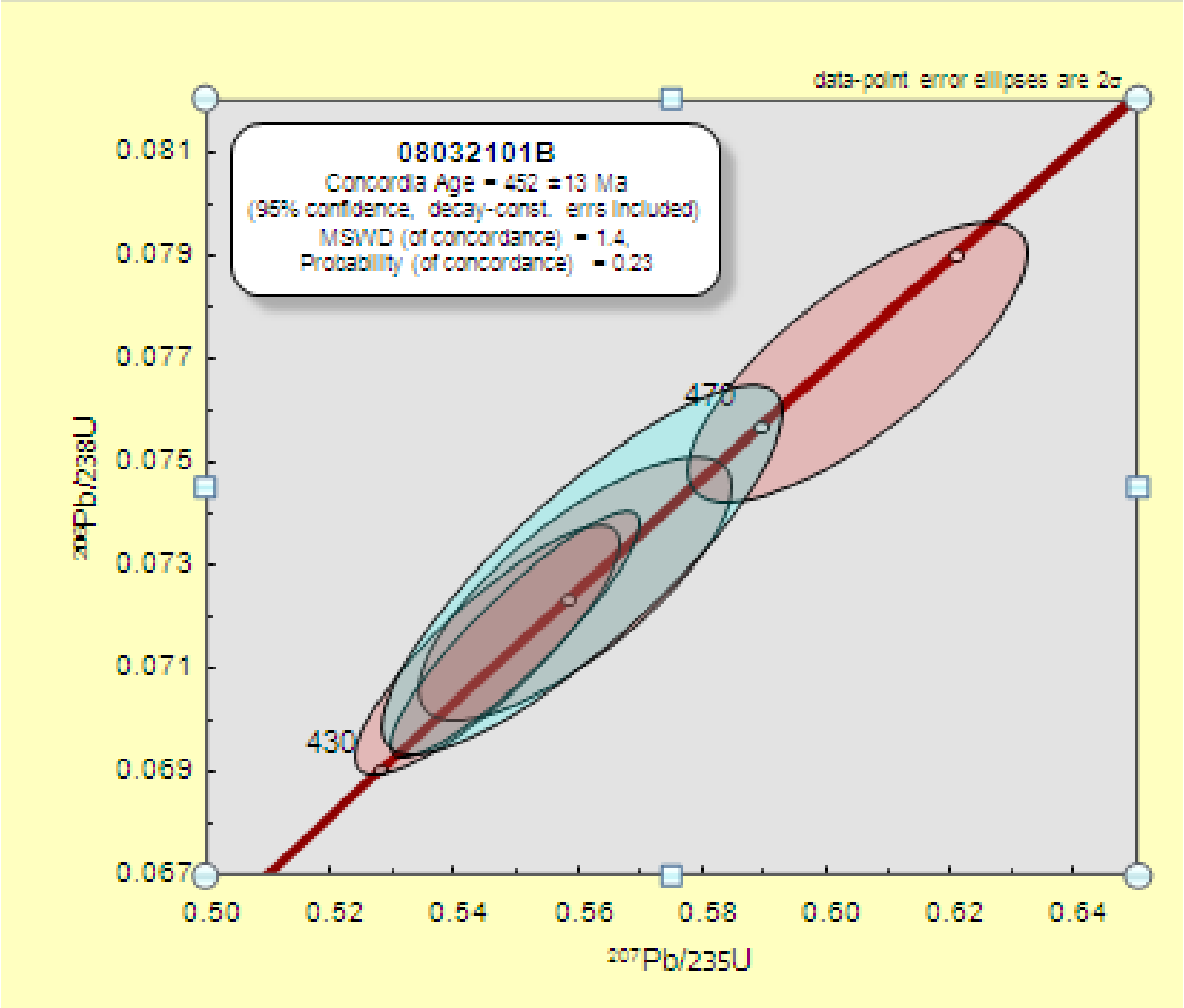


Phoen Tiew

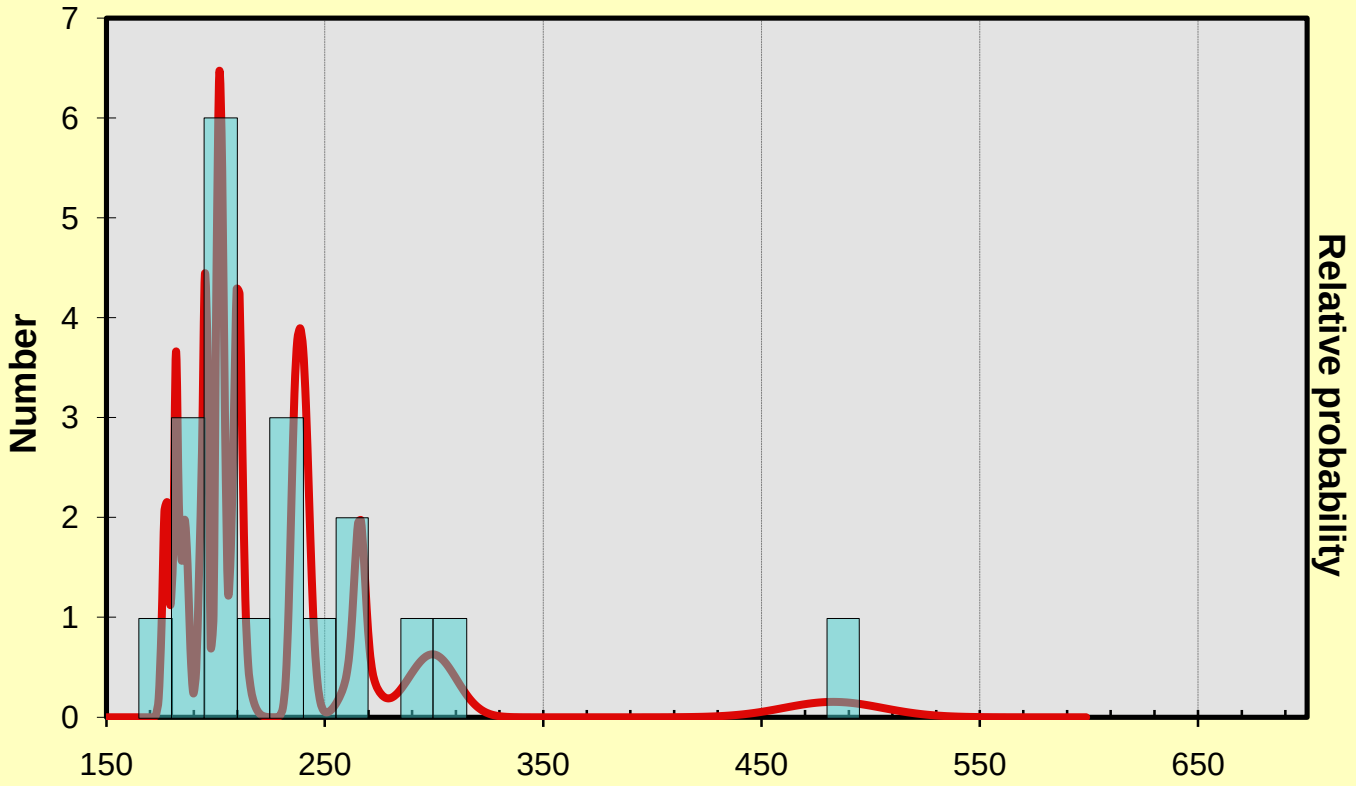
Silurian - Devonian



U-Pb monazite dating age data of Sam Nua Bi granite gneiss



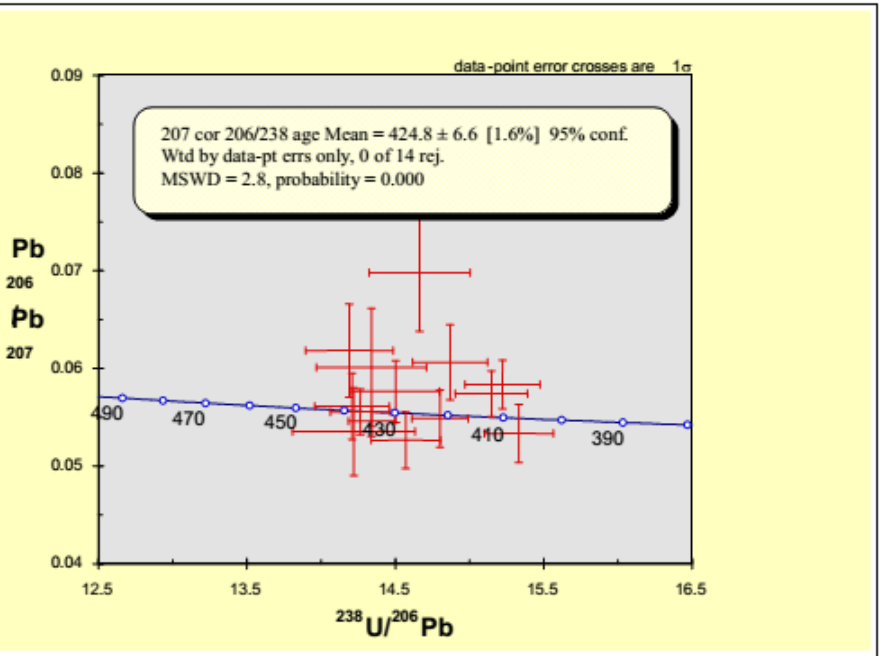
Ar-Ar age data of Sam Nua granite

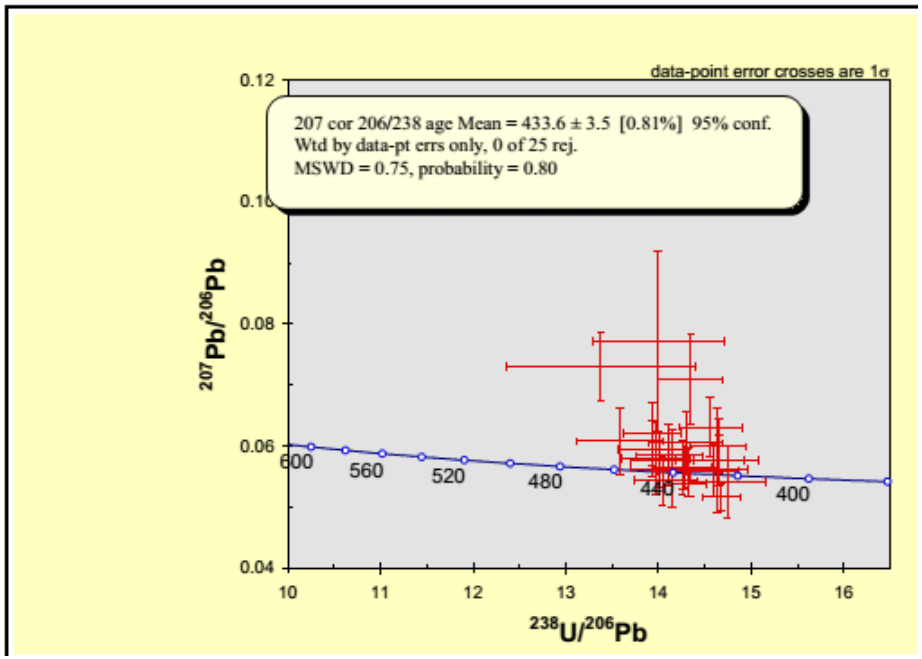


200 Ma Ar-Ar age

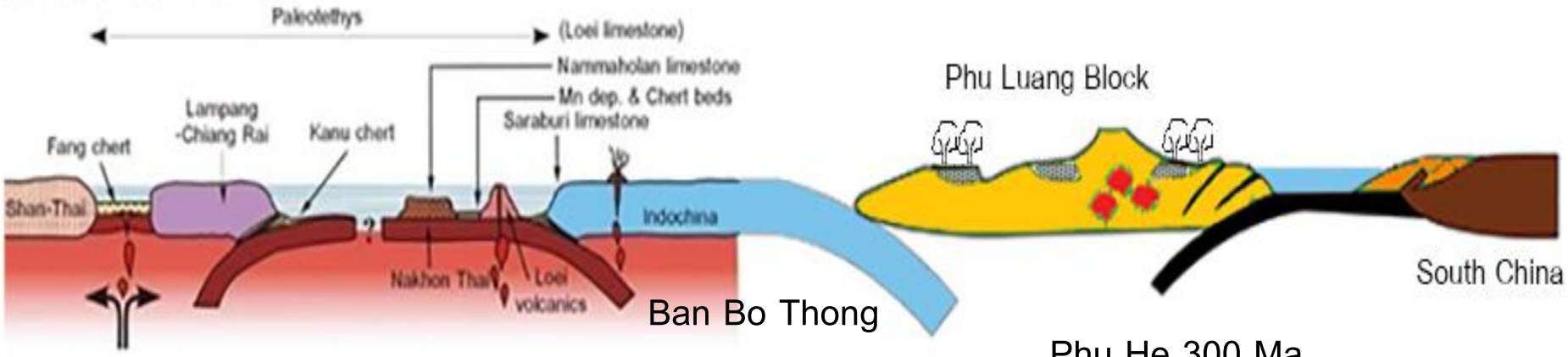
Loei Volcanic-arc Rhyolite/Dacite (Silurian age)

- 428±6 Ma 433±3 Ma
- 361 Ma (Nd-Sm age) of Devonian ocean floor basalt (Intasopa, 1993)





Carboniferous - Permian



Ban Bo Thong

288 Ma

Coal deposits in Carboniferous strata

Phu He 300 Ma

Ban Huai Sai 280 Ma

Se Pon 310 – 280 Ma

Phu Kham 306 – 304 Ma

Padang 297 Ma (Sm-Nd molybdenite)

Tha Khaek 279 Ma

Po Yai 294 Ma

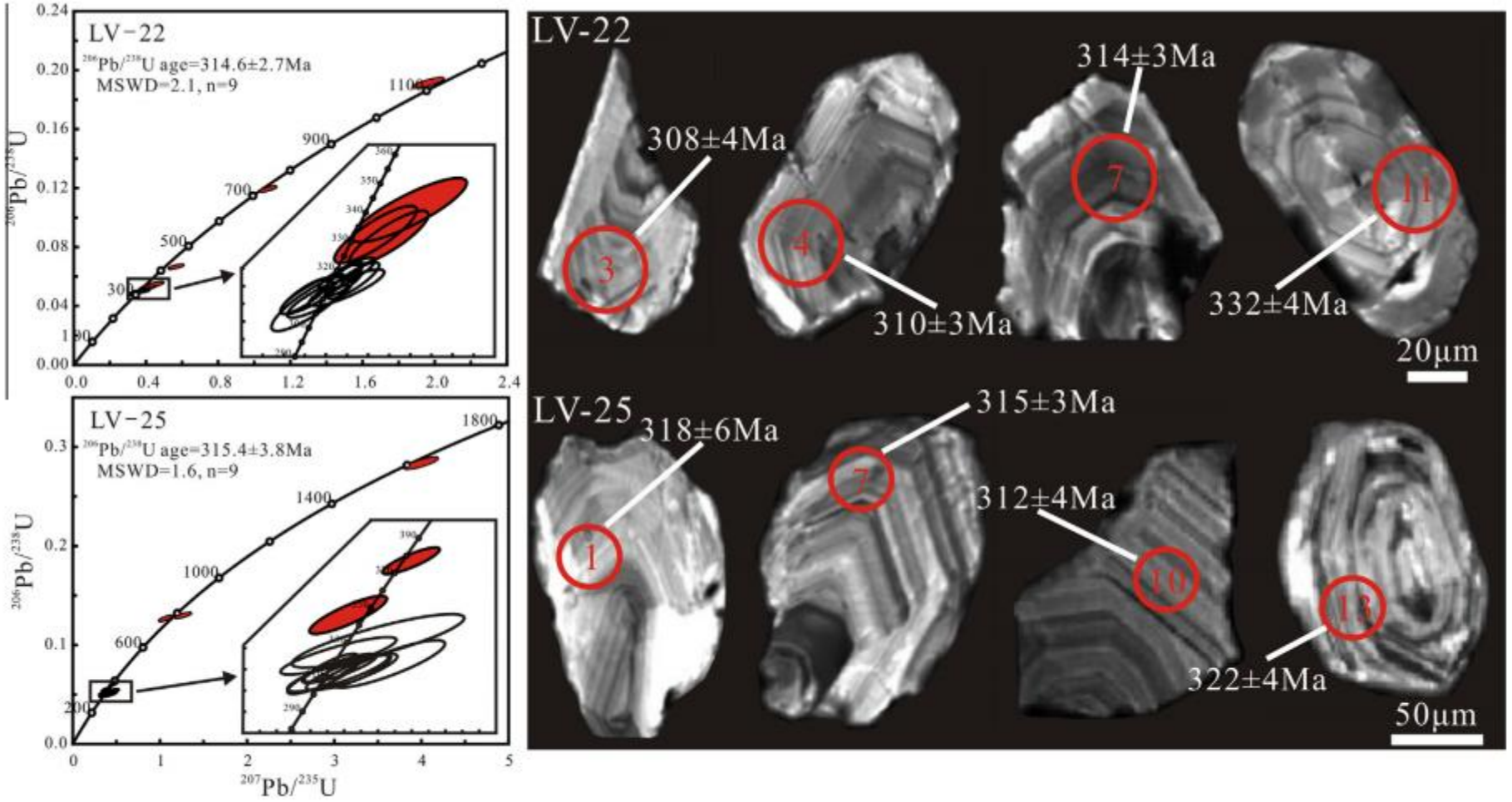
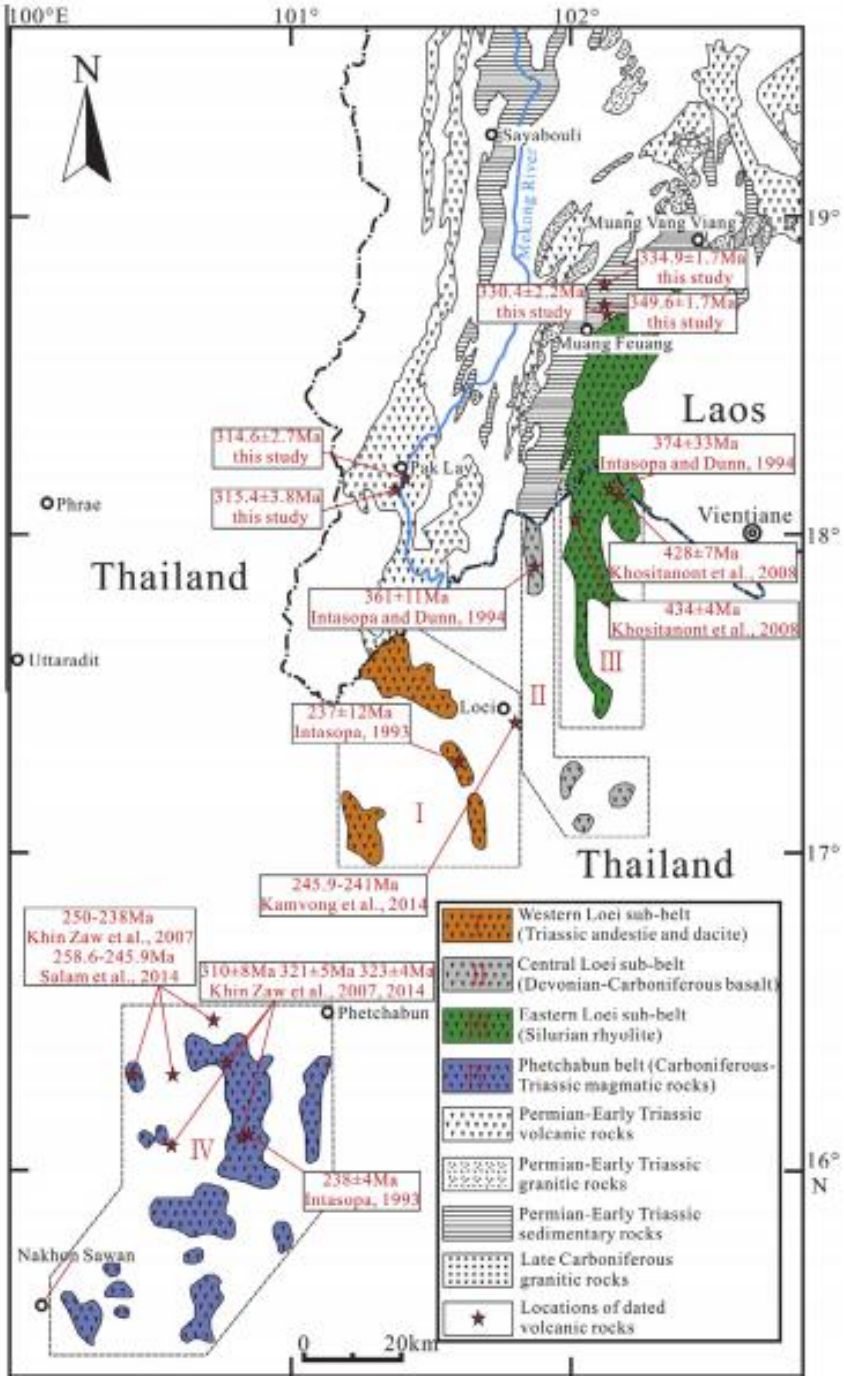


Fig. 5. LA-ICP-MS zircon U–Pb concordia diagrams and cathodoluminescence images (CL) of the representative gains for the Pak Lay volcanic rocks in NW Laos.

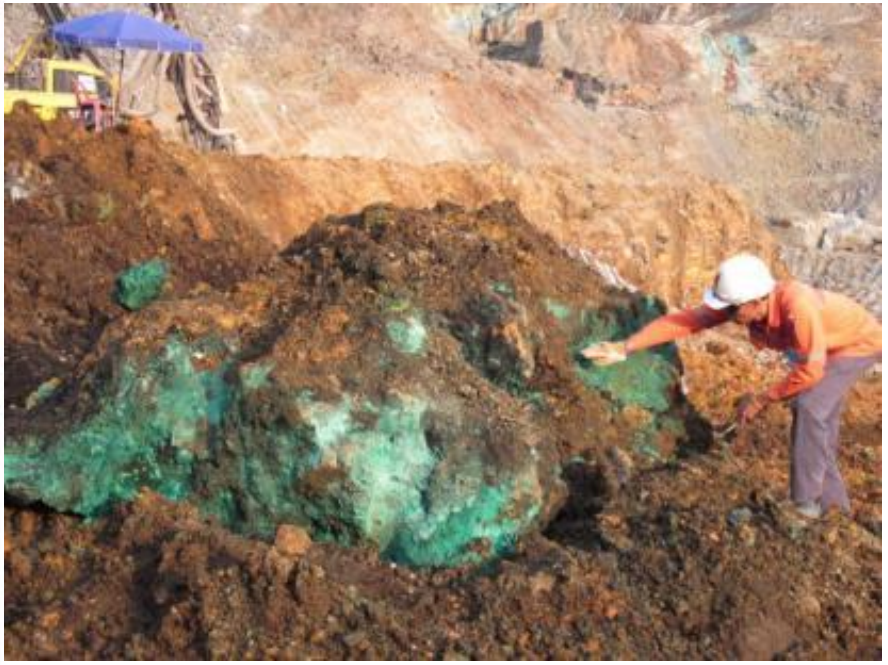
X. Qian et al (2015)



X. Qian et al (2015)

Fig. 10. Distribution of the Silurian to Middle Triassic ages along the Loei Fold Belt and NW Laos (modified from DGM, Lao P.D.R. Geological and Mineral Occurrence map, 1:1000000, 1990; Jungyusuk and Khositanont, 1992; Panjasawatwong et al., 2006; Barr and Charusiri, 2011).

Cu-Au mine opened 27th February 2003. Owned and operated by MMG (subsidiary of China MinMetals)



- www.mindat.org1024 × 768 Khanong open pit, Sepon Mine, Vilabouly District, Savannakhét Province, Laos

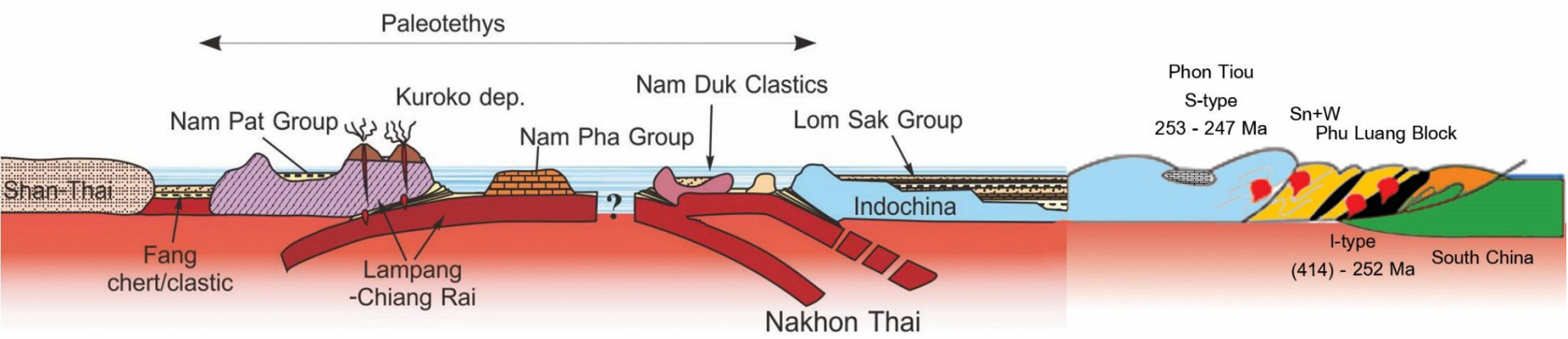
Pillow basalt near Udomsai

Karstic Limestone with ore skarns near Kaiso – Vang Vien

Ban Houayxai Au-Ag Epithermal Deposit, Lao PDR

Photo by Takayuki Manaka

Permo-Triassic (260 – 220 Ma)



Huai Kham On 242 Ma (Lao)

Khao Lek 254 Ma

Chatree 225 - 245 Ma

Phuthep 250 Ma

Early triassic arc volcanic zones of Northern Thailand and Southwestern China passing Northern Lao PDR

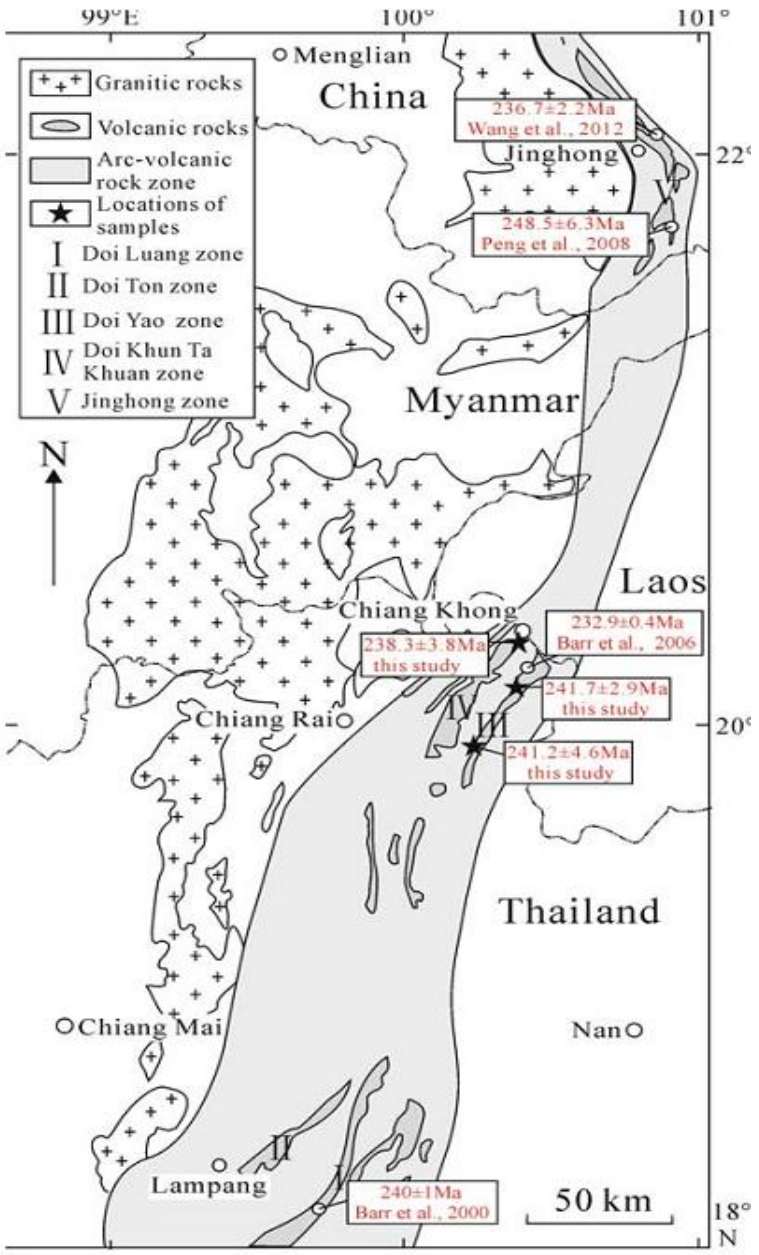
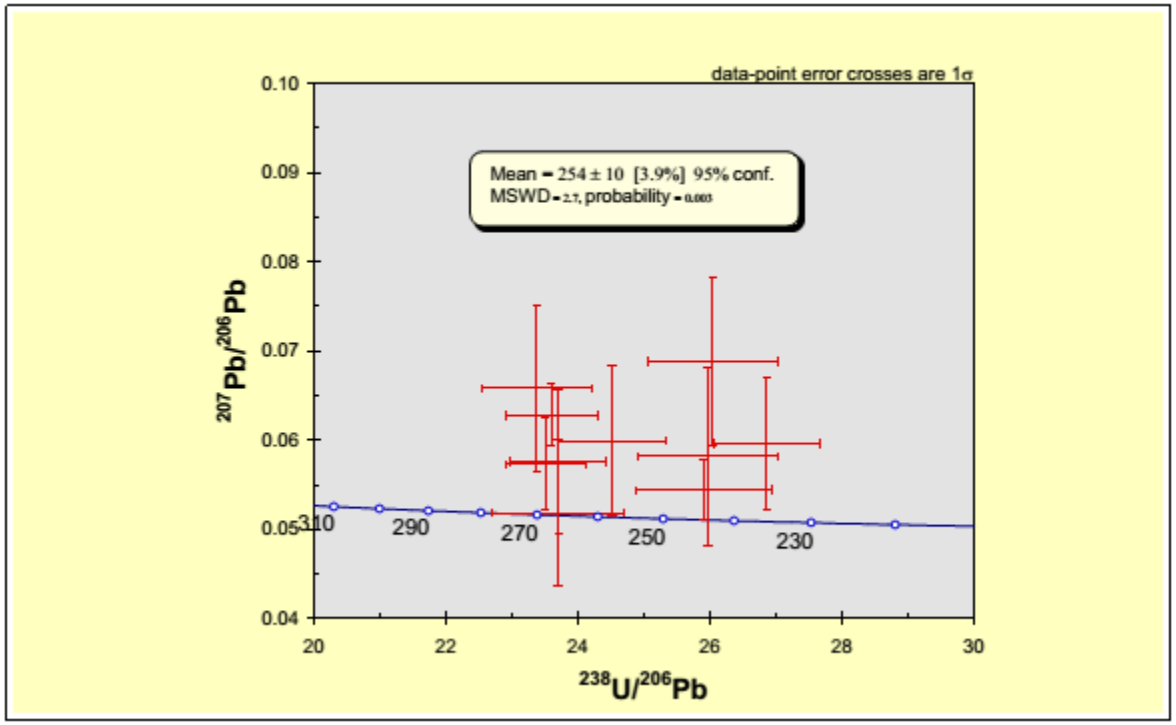


Fig. 9 Geological map of the arc-volcanic zones in NW Thailand and SW China.

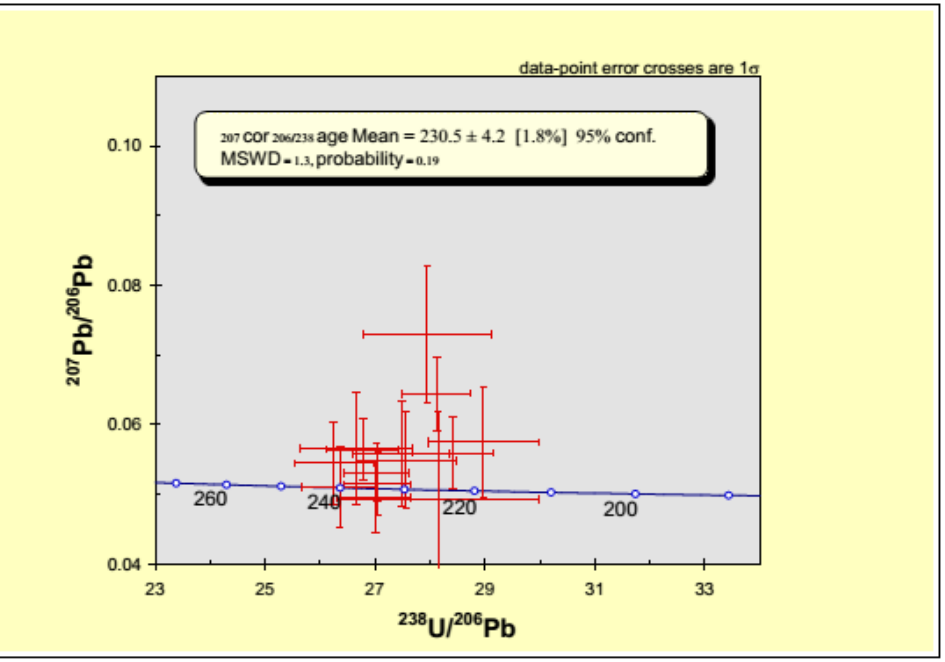
Phetchabun calc-alkaline basaltic andesite

254±10 Ma (Permo-Triassic)

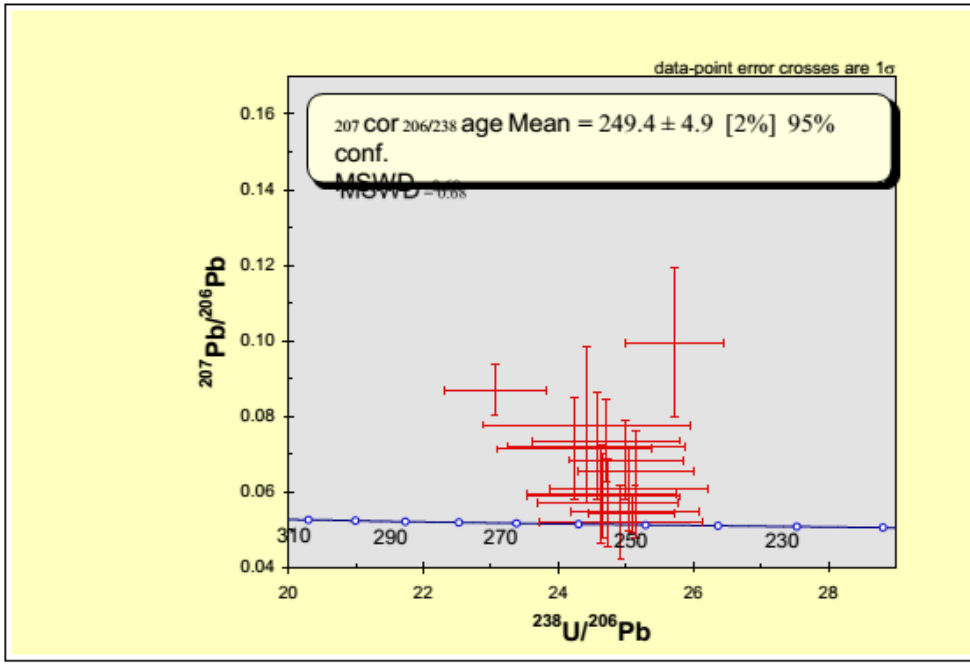


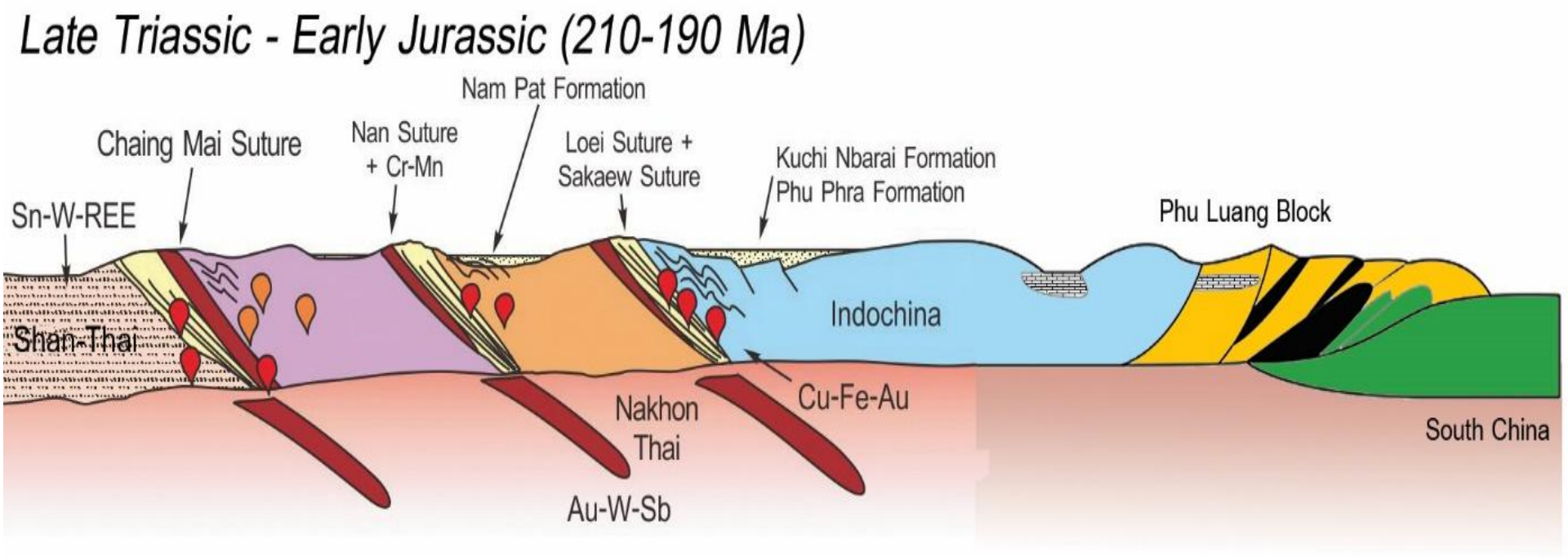
Loei volcanic-arc Granite-Granodiorite

230±4 Ma (Early Triassic)



249±5 Ma (Permo-Triassic)





French mine 203 Ma

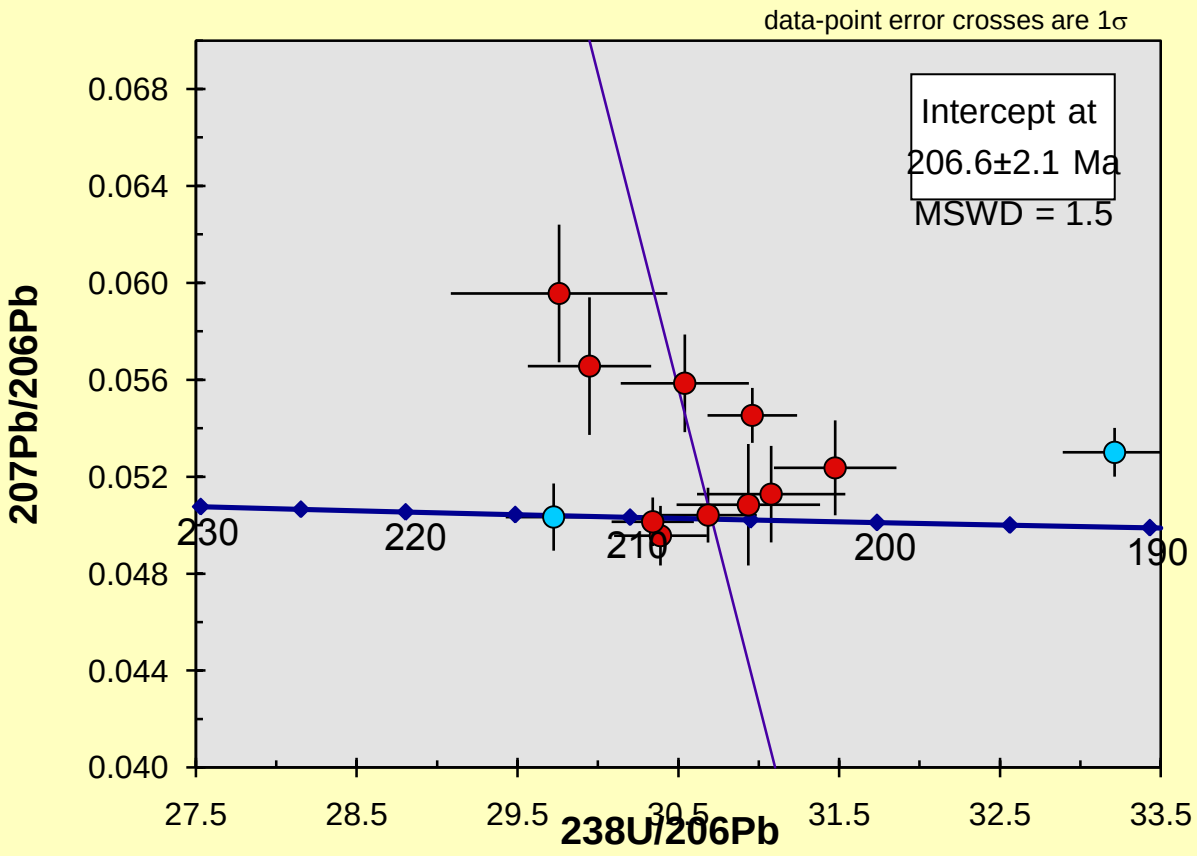
Pliew waterfall 206 Ma

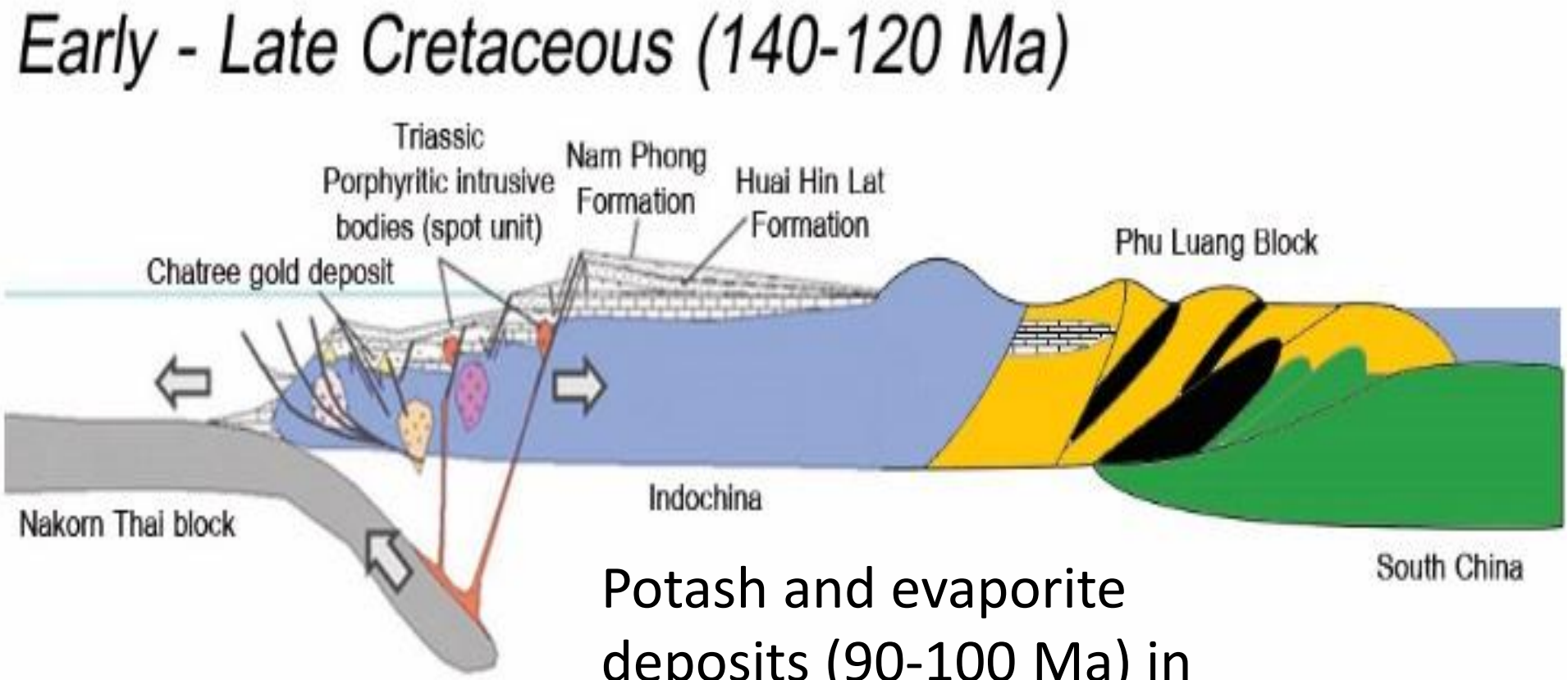
Khao Prangam 208 Ma

Ban Bo Thong 208 Ma

Pliew waterfall I-type subduction- related granite

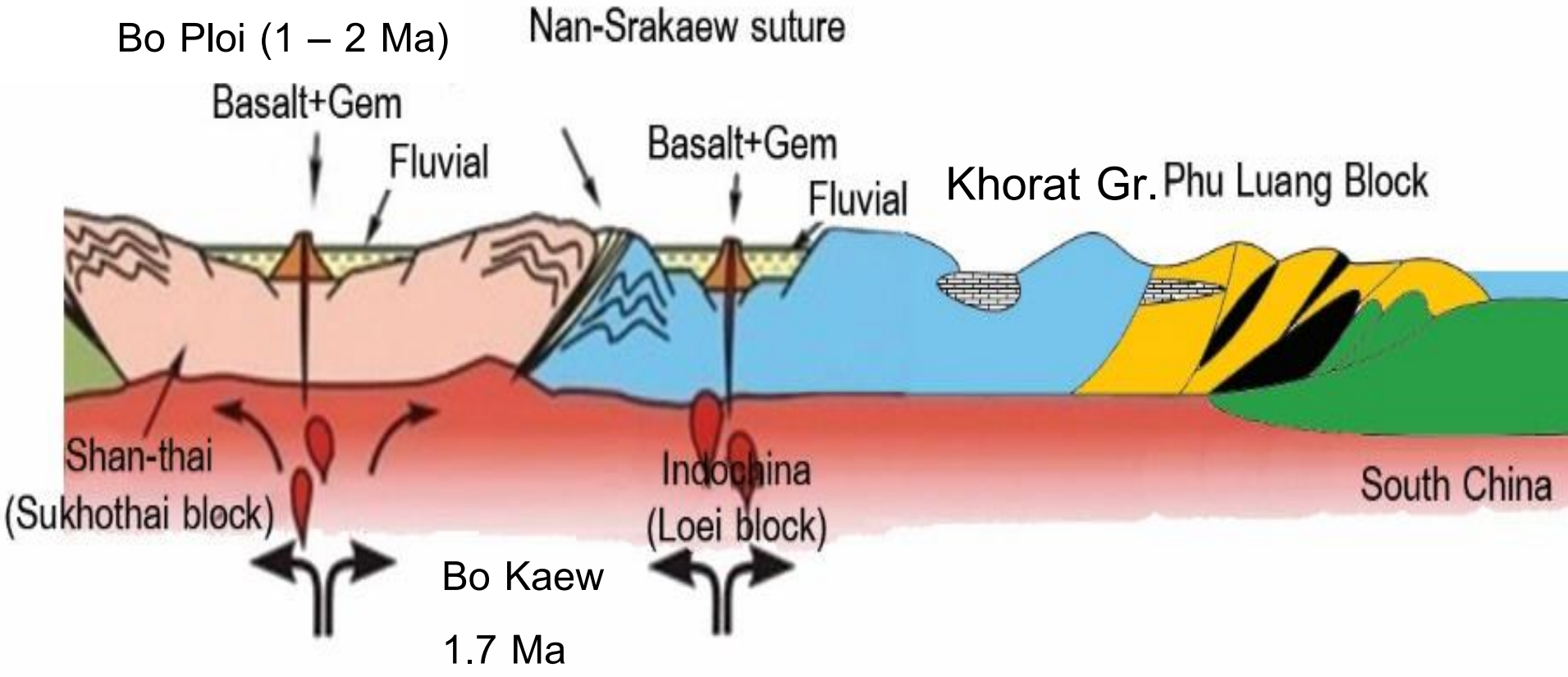
206 ±2 Ma (Late Triassic)



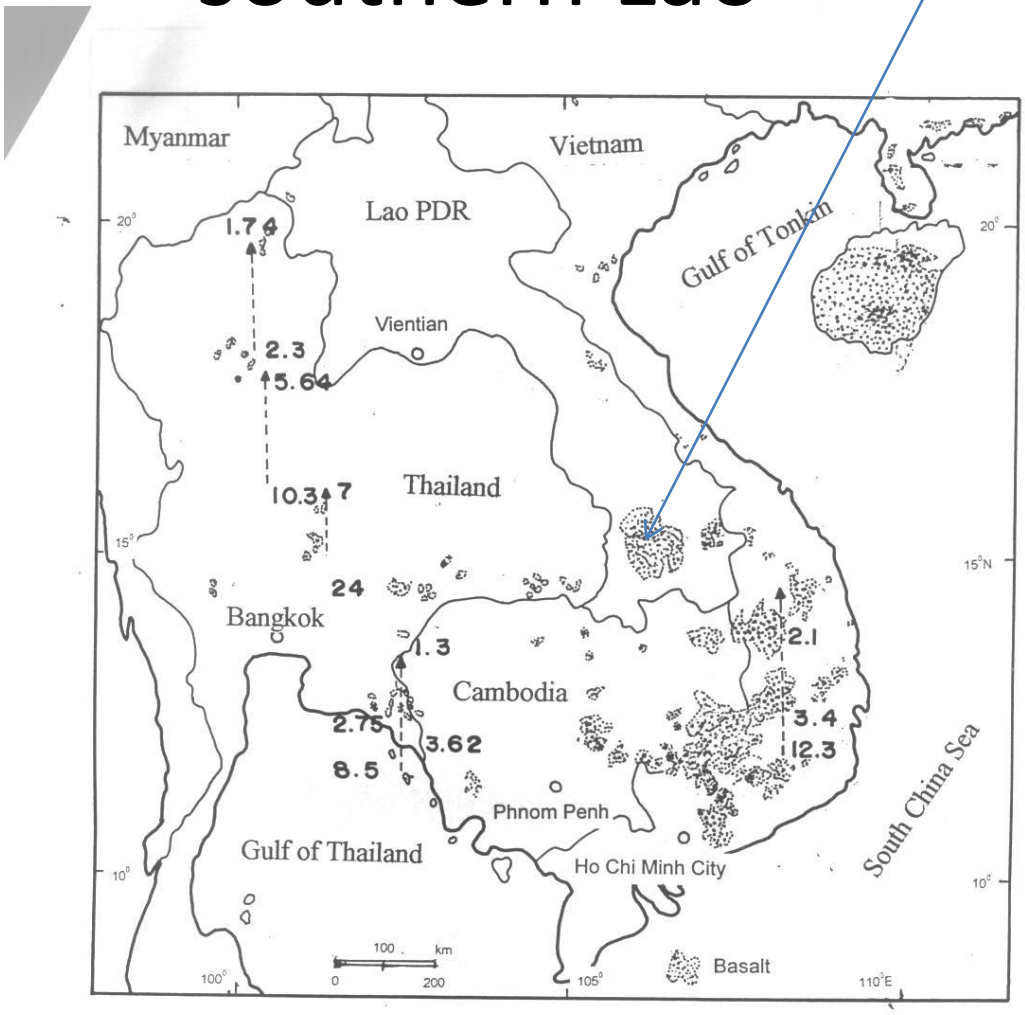


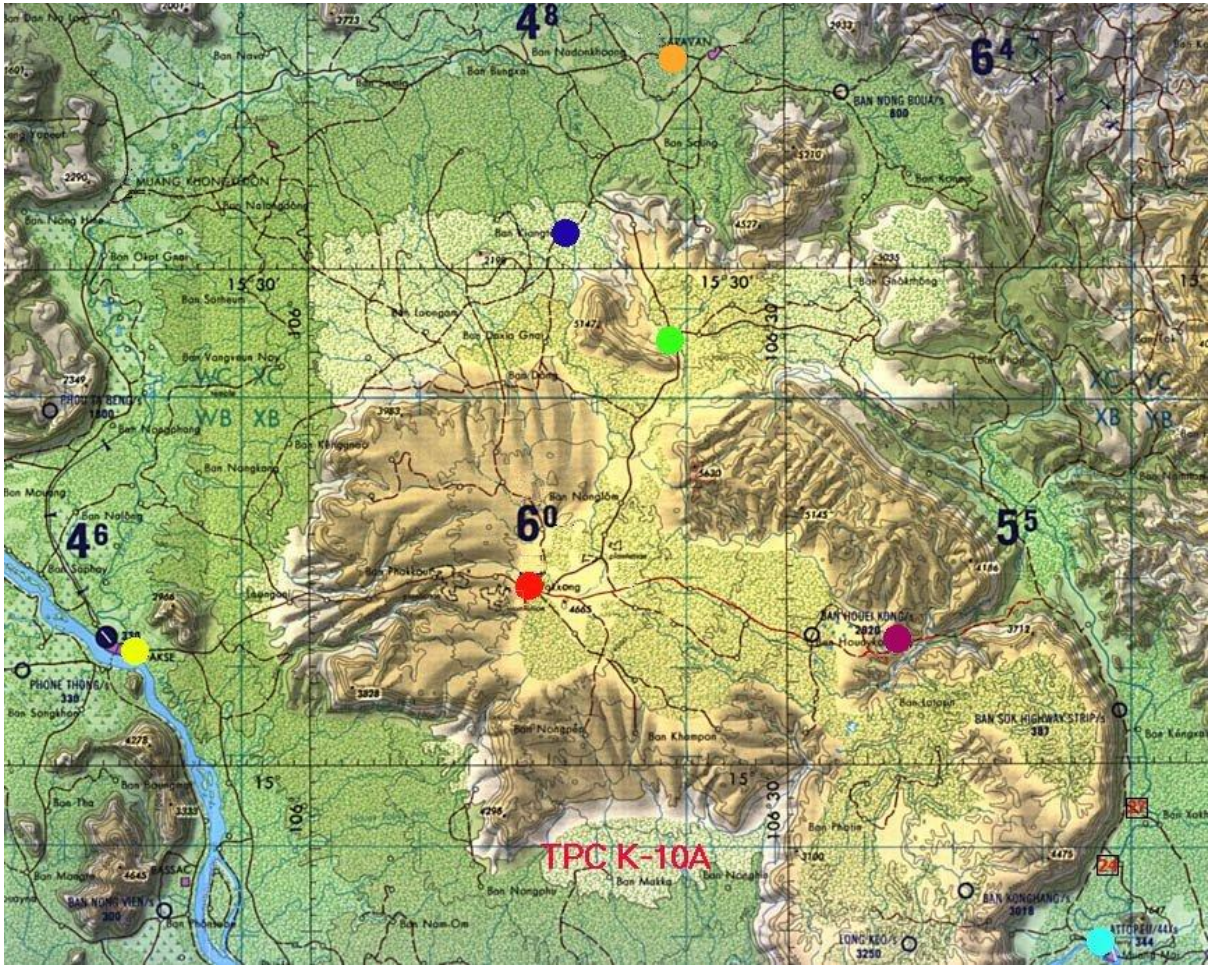
Potash and evaporite deposits (90-100 Ma) in Mahasarakham Fm.

Plio - Pleistocene (1-2.5 Ma)



Cenozoic continental rifting, gem-carrying basalt field in Bolevan, southern Lao





- http://www.bolaven.com/map_bolaven_plateau.php

The beautiful Tat Yuang waterfall
http://www.bolaven.com/

Thanks you

- ขอบใจ

- Karstic tower of the Phu Pha Man limestone in the northwesternmost district of Khon Kaen Province, northeastern Thailand.