International Conference on Geology, Geotechnology and Mineral Resources of Indochina (Geo-Indo'95)
22 -25 November 1995, Khon Kaen, Thailand

Paleomagnetic Result of Phu Thok Red Beds of NE-Thailand : Implication for Mesozoic Tectonic History of SE Asia

S. Imsamut[1], P. Charusiri[2] , Z. Zhuang[3] , and V. Daorerk[2]
[1] Geological Survey Division, Department of Mineral Resources, Bangkok, Thailand.
[2] Department of Geology, Chulalongkorn University, Bangkok, Thailand.
[3] Chengdu Institute of Geology,and Mineral Resources, Chengdu, Sichuan Province, China.

Extended Abstract

More than 350 specimens of continental Red Beds of Indochina block have been collected from two areas (Phu Thok and Phu Wua) in northern part of NE Thailand (Fig. 1), for paleomagnetic study. Stratigraphically (Fig. 2), the composite section (with total estimated thickness of 156 m) reveals that 3 members, namely Phu Wua Bon member (fine-grained arkosic sandstone with dominant dissication cracks and ripple marks), Phu Thok member (thick-bedded, coarse-grained arkosic sandstone). All these individual members depict significant coarsening upward sequences, possibly indicating fluvio-lacustrine to aeolian-lacustrine environments.

Detailed petrographic , X-ray diffraction and magnetic examination reveal the preservation of detrital remanent magnetization (DRM) by the presence of hematite and some magnetic fragmants. The relationship of magnetic intensity and magnetic succeptibility of some selected samples verified that there are single- to multi- domains of hematite components and single-domain of magnetite component (Fig.3). These data correspond to those of Ziderveld plots examined by Imsamut (1995). The paleomagnetic measuremant confirm the alternation of at least 7 normal and 8 reverse polarities (see Fig.2). When compared with geomagmetic polarity time scale (1987), it is recognized that the magnetostratigraphy of these two areas corresponds to the reliable age Long normal polarity. Cretaceous above subchron M_3 which regarding to the age is younger than 116 Ma (Middle Cretaceous). The currently revised result places these Red Beds older than that proposed earlier by Sattayarak (1983) and younger than that of Pattarametha et al. (1988) and Imsamut et al. (1994) .

Progressive thermal demagnetization reveals at least three categories of magnetized specimens :- A) exhibiting single - component (hematite or magnetite) magnetization; -B) showing two components of magnetization - low T° (< 250° c, goethite or secondary hematite) and high - T° (<680° c hematite) components; -C) displaying three - component magnetization, low T° (<250°C, goethite or secondary hematite) , high-T° (< 575 - 680° C hematite and magetite components). The presence of more than one types of magetized components of samples favours the tectonic activity as a major controlling factor. confirming to the results obtained from field and LANDSAT interpretations. Composite magnetostratigraphy (Fig. 4) reveal the magnetostratigraphy polarity including normal dominant, mixed occasionally reverse polarities and can be fit fairly well with the lithostratigraphy (Fig. 2)

The declination (D) estimated varies from 35° to 55° and the obtaind inclination (I) ranges from 35° to 45 °. Therefore, we tentatively infer that rocks of Phu Thok formation were deposited in paleolatitude of 20° - 30° north, located close to southern China. The overall results in conjunction with the earlier results strongly indicate that the Khorat plateau during Middle Cretaceous shows clockwise rotation with respective to the present position (Fig. 5). Our current result is similar to those proposed earlier by Maranate and Vella (1986), Yang (1993), except for the Khok Khuat Formation (D=16 °) of Bunopus (1981). The Clock wise rotation of paleopoles of Indochina continents may perhaps indicate the sinitral 1,000 (+500) km displacement along the Red River Fault. The displacement may be interpreted as an intergral interaction of India-Asia collision during after Middle cretaceous period.

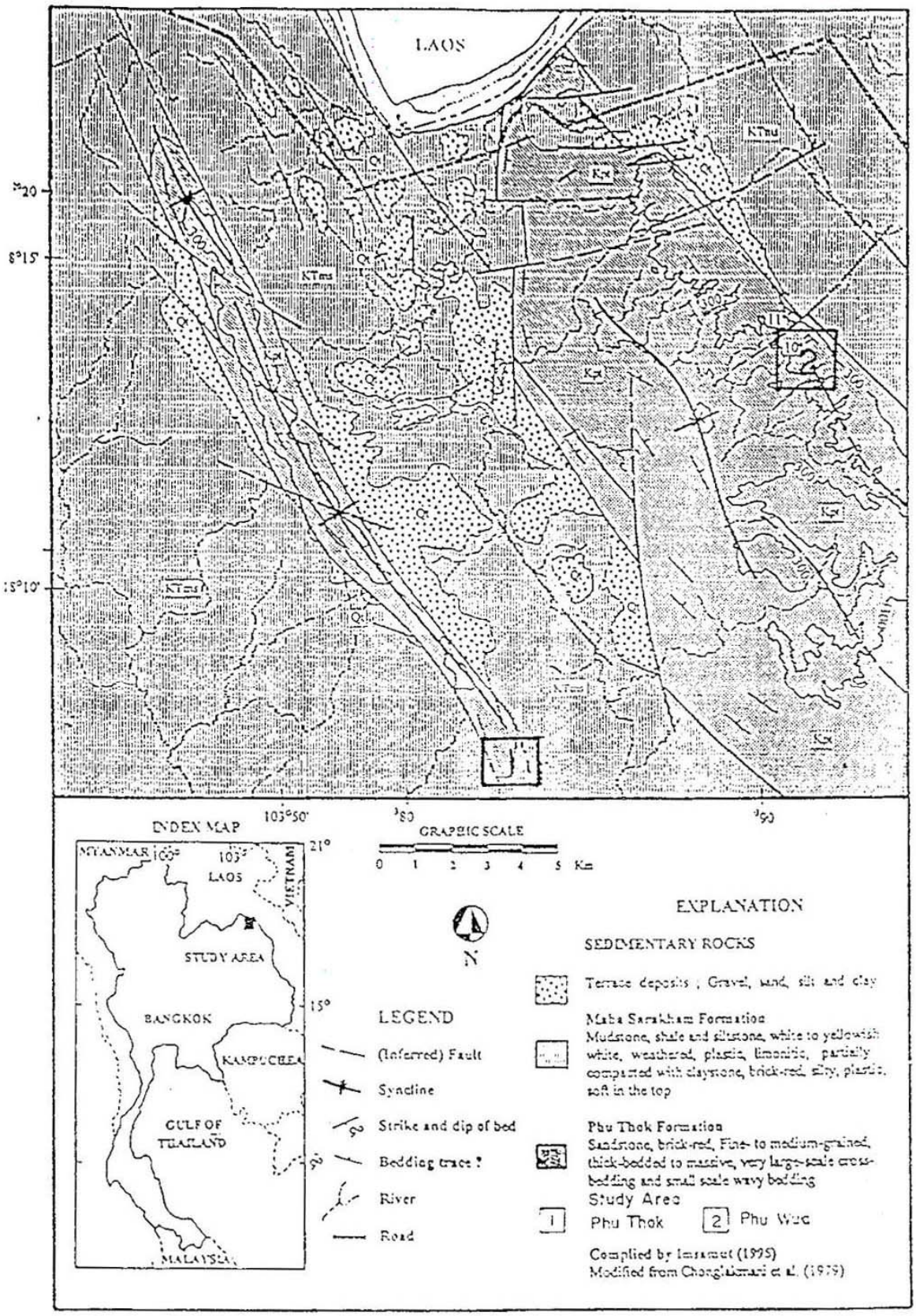

Figure 1. Study area.

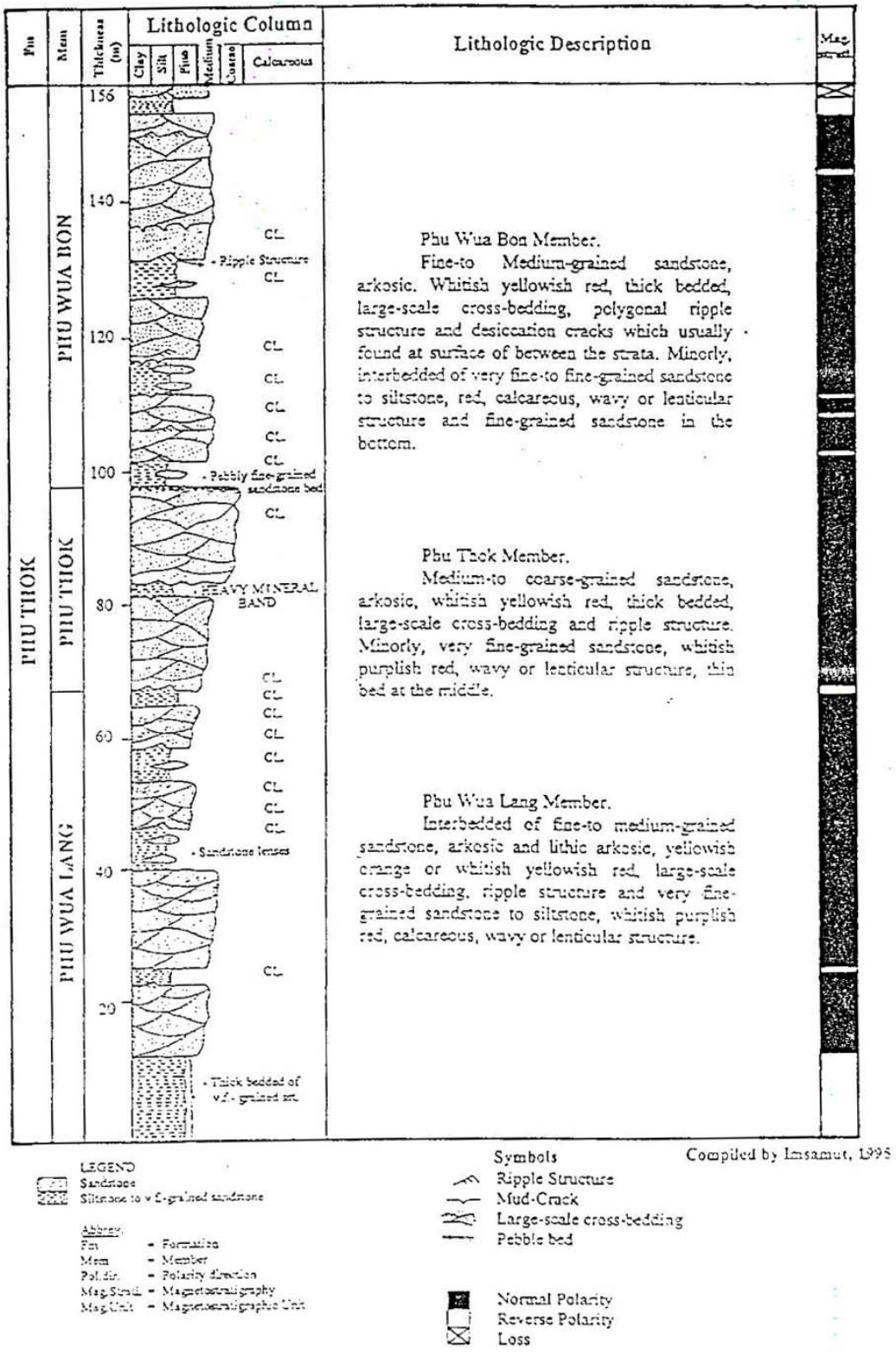

Figure 2. Lithostratigraphy of Phu Thok Formation.

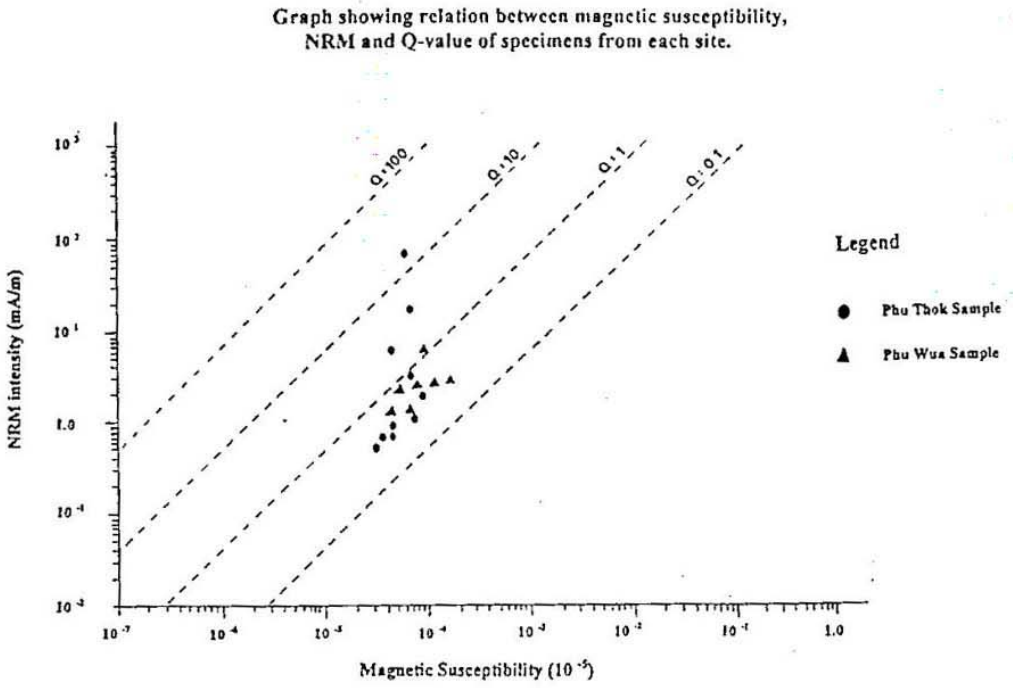

Figure 3. Graph showing relation between magnetic susceptibility, NRM and Q - value of specimens from each site.

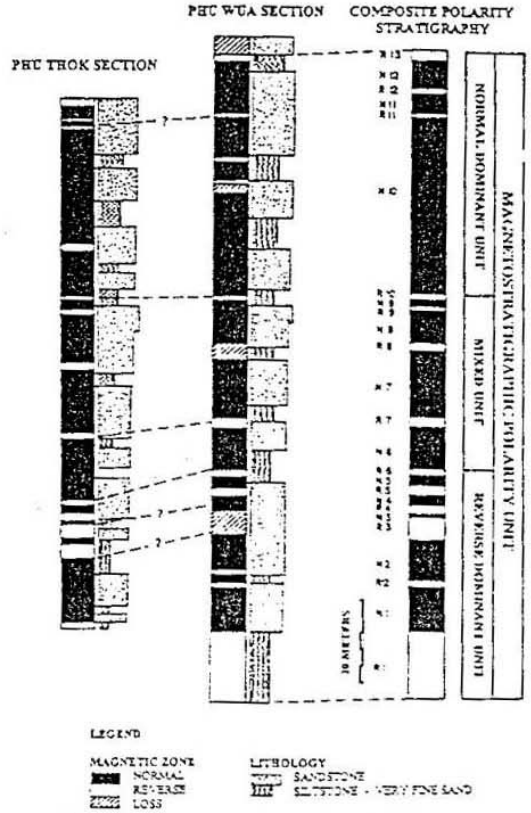

Figure 4. Magnetosratigraphy of Phu Thok and Phu Wua.

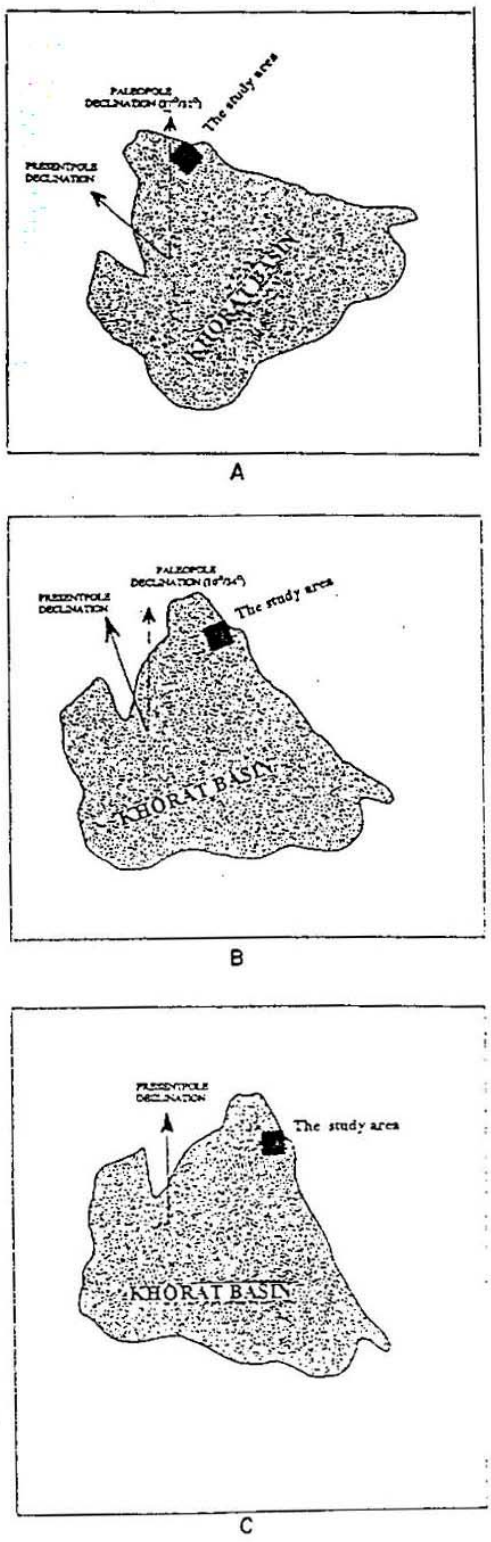

Figure 5. (a) Orientation of the Khorat Basin during Jurassic-Early Cretaceous (Maranate, 1982).
(b) Orientation of the Khort Basin during Middle -Late Cretaceous (Bunopas, 1981)
(c) Present orientation of the Khorat Basin.

References

Bunops, S. 1981. Paleogeofraphic history of western Thailand and adjacent parts of Southeast Asia - A Plate Tectonic interpretation. A Ph. D. Thesis, Victoria University of Wellington, New Zealand, 810 pp.

Imsamut, S., 1995. Paleomagnetic Studies of the Phu Tok Fprmation, Phu Tok , Nong Khai, NE Thailand. A Unpublished M. Sc Thesis, Department of Geology, Chulalongkorn University, Bangkok (in prep.)

Imsamut, S., Bunopas, S., Daorerk, V., Pattarametha, M., Maranate, S., Thitisawarn , V., and Charasiri, P., 1994 Magnetostratigraphy of Phu Thok Mesozoic deposit, NE Thailand : A preliminary investigation : Proceedings of the International Symposium on : Stratigraphic Correlation of Southeast Asia , 15-20 Nov. 1994 Bangkok, Thailand, p 170-182.

Maranate S., and Vella, P,. 1986 Paleomagnetism of the Khorat Group, Mesozoic , northeastern Thailand : Journal of Southeast Asian Earth Sciences., V. 1,p. 23-31

Pattarametha , M., Maranate, S., and Bunopas , S., 1988. Paleomagnetic study of the Khoa Phu Thok Noi and Phu Wua Lang Tham Pai , Amphoe Bung Kan , Changwat Nong Khai : Report of Investigation, no. 12 Department of Mineral Resources , Bangkok, Thailand, 135 p.

Sattayarak, N., 1983. Review of continental Masozoic stratigraphy of Thailand : In Proc. Workshop on Stratigraphic correlation of Thailand and Malasia, Nutalaya, P. (editor), Haad Yai, V.1, pp. 127-149.

Yang, Z. and Besse , J., 1993 Paleomagnetic study of Permian and Mesozoic sedimentary rocks from nortern Thailand supports the extrusion model for Indochina : Earth and Planetary Science Letters , V. 117, p. 525-552