ISSN 0126 - 5539
PP2509/02/2010(024604)

PERSATUAN GEOLOGI MALAYSIA

WARTA GEOLOGI

NEWSLETTER of the GEOLOGICAL SOCIETY OF MALAYSIA

Jilid 35
No. 3

JULY–SEPTEMBER
2009

Volume 35
No. 3

PERSATUAN GEOLOGI MALAYSIA
GEOLOGICAL SOCIETY OF MALAYSIA

The Society was founded in 1967 with the aim of promoting the advancement of earth science particularly in Malaysia and the Southeast Asian region. The Society has a membership of about 600 earth scientists interested in Malaysian and other Southeast Asian region. The membership is worldwide in distribution.

Warta Geologi (Newsletter of the Geological Society of Malaysia) is published bimonthly by the Society. Warta Geologi covers short geological communications and original research, as well as reports on activities and news about the Society. It is distributed free-of-charge to members of the Society. Further information can be obtained from:

GEOLOGICAL SOCIETY OF MALAYSIA
c/o Department of Geology,
University of Malaya
50603 Kuala Lumpur,
MALAYSIA
Tel: 603-7957 7036   Fax: 603-7956 3900
E-mail: geologi@po.jaring.my
URL: www.gsm.org.my

The Baram Line in Sarawak: Comments on its anatomy, history and implications for potential non-conventional gas deposits

Franz-Luitpold Kessler

Department of Mathematics and Sciences
Curtin University of Technology, Miri, Sarawak

Abstract — This mainly fieldwork-based study reveals the Baram Line's complex history. The lineament acted as a tectonic discontinuity that joins the relatively stable Luconia Block to the relatively mobile Baram Delta Block. It acted as a boundary for both extension and compression occurring in the Baram Delta and further East in Brunei and Sabah. The more rigid Luconia was less affected by both extension and compression, whilst the neighboring Baram Delta-Sabah Foredeep crust was first stretched and later recompressed. The Baram Line may also be of interest from a gas prospector's standpoint. Reverse faulting and overthrusting is likely to have occurred in several portions of the lineament, hence creating traps. Presence of active gas charge is documented, and a potential for non-conventional gas present in slightly more porous and permeable intercalations of siltstone within the shale-dominated Setap Fm is recognized and discussed.

Keywords: Baram Line, Sarawak, tectonism, compression, strike-slip, Sundaland

INTRODUCTION

The area of studies in Sarawak encompasses coastal areas South of Miri (red rectangle in Figure 1). The Baram Line (Figure 2, Hutchison 1989) constitutes one of the most prominent lineament in Sundaland and can be traced some 140 km on the NW Borneo shelf, and some further 125 km in the molasses foreland between the coastline and the island's rugged interior. It forms an S-shaped boundary between the Luconia Block and the NE adjacent Baram Delta Block. The Southern onshore extension of Luconia is sometimes also called Balingian, and/ or Tinjar province. In this paper Luconia is referred as to the entity West and South of the Baram Line. A comprehensive description of the Baram Delta is provided by Tan *et al*. (2000), and also Tate (2001). The Baram Line is seen as a boundary of geothermal gradient, and of crustal thickness (Hutchison 1989, 2007), as well as of hydrocarbon properties (Luconia dominated by gas, the Baram Delta by oil). Questions remain what kind of tectonic boundary the Baram Line really is; how local changes of tectonics can be explained; and how segments of this lineament may have functioned in tectonically different ways during Neogene periods.

Figure 1: Overview map of Sundaland with area of studies. From Google Earth 2009.

FOLLOWING THE BARAM LINE FROM THE SEA TO THE ISLAND'S INTERIOR

In the South China Sea, the eastern edge of Central Luconia is formed by the Baram Line. On seismic as well as on gravity (Figure 3) there is little indication of deformation in the offshore part of Central Luconia. In the onshore portion, the amount of deformation is always stronger on the Baram Delta side, a mosaic of blocks which show different patterns of compressive deformation (Figure 4). As displayed in the block diagramme of Figure 5, the Luconia Block forms always the footwall, whilst the Baram Delta blocks constitute the hangingwall, with elements of inversion, folding, and thrusting. Given that portions of the onshore Baram Delta are topographically elevated (Bukit Lambir, Miri Hill, Marudi area), we are hence seeing a typical example of relief inversion.

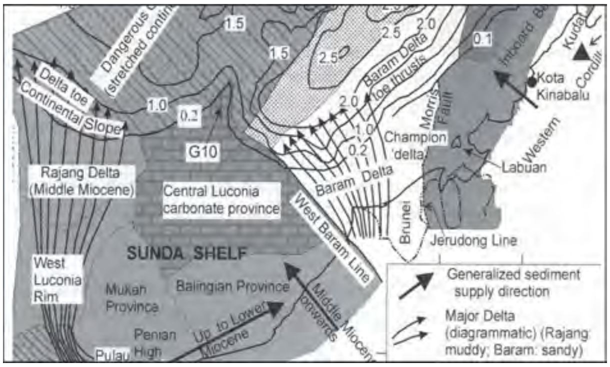


Figure 2: Map illustrating tectonic and sedimentary drivers in NW Sarawak, Brunei and Sabah (from C.S.Hutchison, 1989). The Baram Line ("West Baram Line'") is shown here to separate the stable Central Luconia carbonate shelf from the siliciclastic provinces of the Champion Delta and Baram Delta. The Baram Line originated in Oligocene - Early Miocene, when the Baram-Sabah Foredeep opened, creating a large monoclinal half-graben system, subsequently filled with Neogene clastics. During that period the Baram Line constituted the stable edge of a carbonate platform.

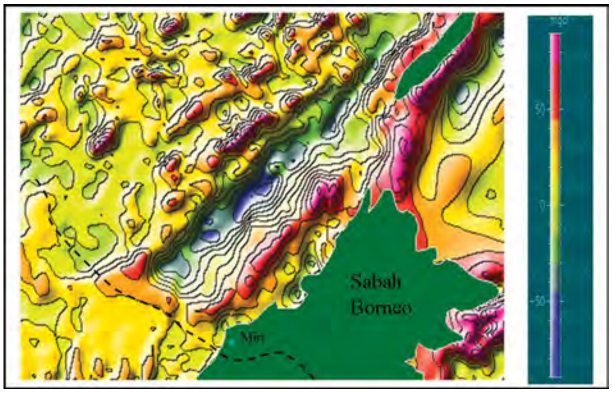


Figure 3: Map (extraction of a web-based picture, DEOS Indian Ocean Gravity project, TU Delft), illustrating Bouguer gravity west of the Borneo coast. Note the marked gravity contrast when comparing Luconia (South-West of dashed line) with the area adjacent NE, where gravity anomalies of up to -65 mgal are observed, possibly identifying an area of crustal stretching, and little compacted sediments. The alignment of gravity highs parallel to the Borneo coast further inboard can possible be correlated to overthrust belts and clay ridges.

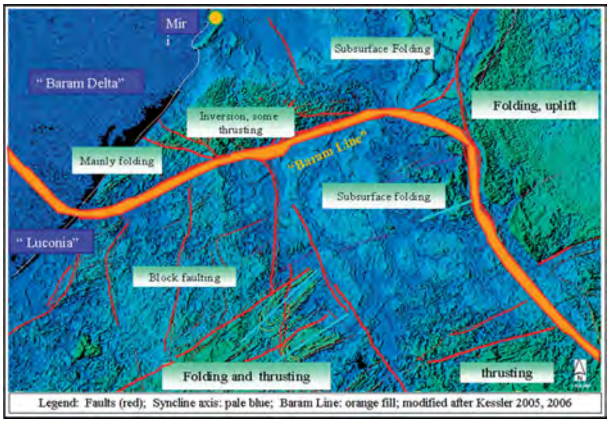


Figure 4: Northwestern Borneo can be described as a mosaic of blocks that display different style of deformation (Kessler 2005, 2006).

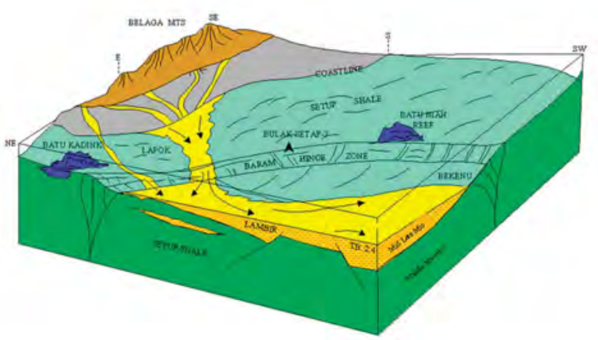


Figure 5: From a regional perspective, Central Luconia blocks are always on the footwall side, the Baram- and Champion deltas on the hanging wall facing the lineament. Given the folding of areas such as the Belait syncline, Bukit Lambir, Miri etc, NW Sarawak serves as an example of relief-inversion.

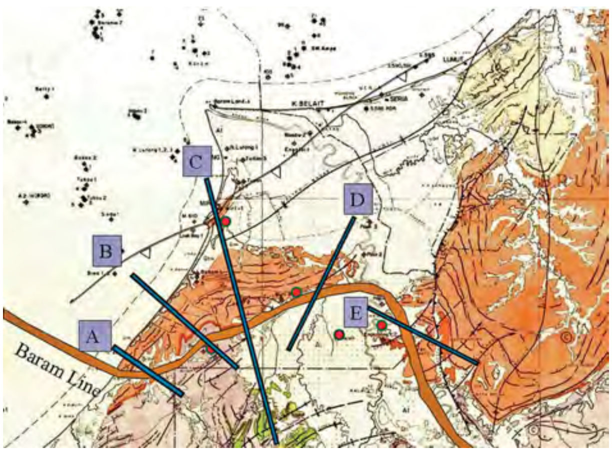


Figure 6: Geologic map of a section of NW Borneo modified after Liechti et al (1960). The map shows the location of five geologic profiles (A, B, C, D, E) , and several seep locations (full circles).

Figure 6 shows a geological index map with five geological cross-sections, wells and hydrocarbon seep locations. Delineating the course of the lineament, we start at the Pantai Bungai (Bungai Beach), some fifty kilometers Southwest of Miri. Here, the strike of the line changes from NW-SE offshore to E-W direction. In Pantai Bungai, as shown in Figure 7, the Lambir anticline is seen plunging in western direction, with fossiliferous Sibuti beds outcropping at the beaches surf zone – plunging anticlines with an axial strike direction shifting from SW to NW being a common feature for many Baram Delta oil fields in the vicinity of the lineament (Hutchison 2007, p. 114).

Figure 8 shows the geological cross section "A" that runs from the Pantai Bungai toward Bukit Peninjau. As we follow the line further to the east, the hangingwall (Baram Delta) is always expressed as a high shoulder (Figure 8, Table 1), which is suggestive for inversion

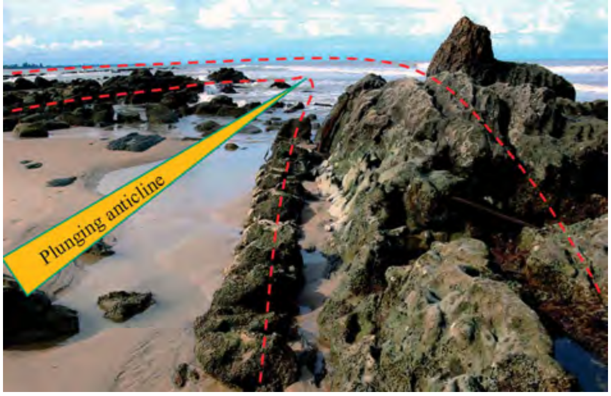


Figure 7: Bungai Beach, at seasonal low tide. Fossiliferous beds (Sibuti Fm.) rich in crab burrows and foraminifera are seen here to contour the plunging axis of the southwestern-most extension of the Lambir system.

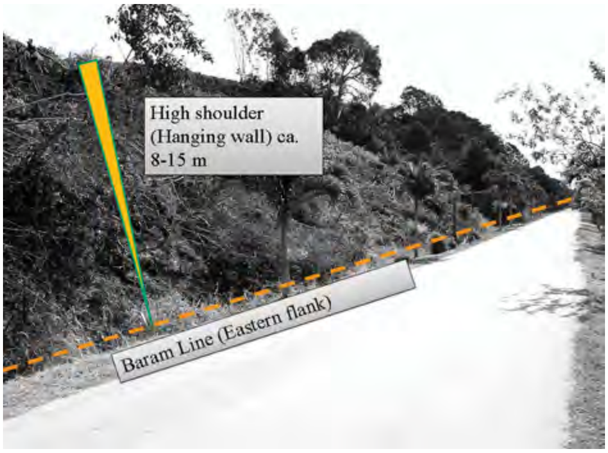


Figure 9: Section "A" leading from the Bungai Beach, where Sibuti beds are found to dip almost vertically, towards Bukit Peninjau, where Setap Shale is only moderately folded.

Figure 11: Section "B" leading from the Pehliau Beach, where Sibuti beds are found to dip almost vertically, towards the Bulan Setap 3 area, where gas emanates from the Ngebol mud volcano and also from a leak of a corroded wellhead. Both natural and accidental seepages document the presence of gas – entrapped stratigraphically or tectonically in Setap shale and siltstone members.

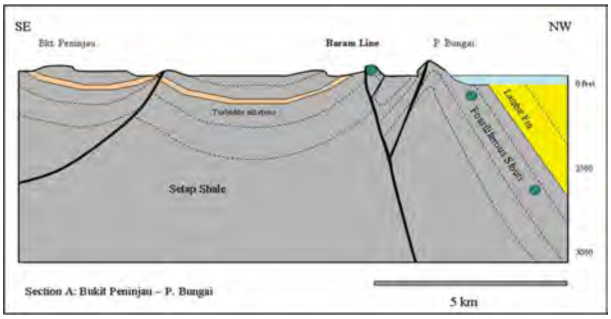


Figure 8: View of the Baram Line at the road leading to the Pantai Bungai market, near to the start of the "A section" in figure 8. The Hanging wall is formed by fossiliferous Setap Shale, the Sibuti member. Possibly the original rock wall has been shaved off during road construction work.

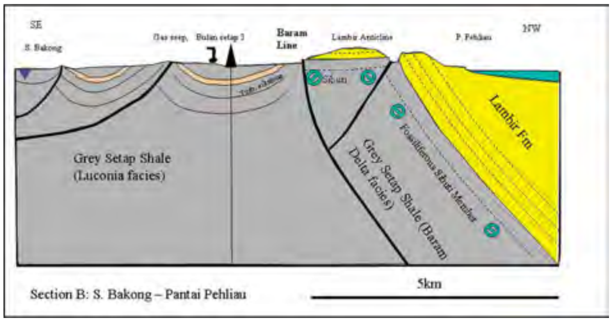


Figure 10: The Ngebol mud volcano, located only a few kilometers South of the Baram Line emanates mud and gasses at shifting rates. Flammable gas is also seeping-off from the corroded wellhead of Bulan Setap 3 (Sawarak Oilfields Ltd, abandoned in 1935).

occurring along the fault, with the strong possibility of over-steepening and faultplane-rotation from vertical to reverse-fault or even to overthrust angle. The hangingwall section is characterized by minor faulting with fold axis perpendicular or oblique to the Baram Line. This is also a typical feature on the Kawang thrust sheets of the Miri Hill, where several folds oblique to the thrusts are observed.

In cross-section "B" (Figure 9) we observe a mildly deformed Luconia Foreland, with grey Setap Shale at surface. This Setap section contains a sequence of siltstone-fine sandstone turbidites. These are not seen on the Baram Delta side, which is dominated by the fossiliferous Sibuti Fm. The section "B" also crosses the Bulak Setap 3 location, and the near-by mud volcano of Ngebol (Figure10).

Several kilometers further East, section "C" crosses the highest areas of both Bukit Lambir and also, further NE, the Siwa-Miri-Seria overthrust (Figure 11). From here onwards, the Baram Line now roughly follows the course of the Sungai Bakong, occasionally incising into the hangingwall by up to 20 meters. Section "D" (Figure 12) characterizes an area of less deformation compared to the previous "C", as the Lambir/Belait beds are seen dipping monotonously in NE direction.

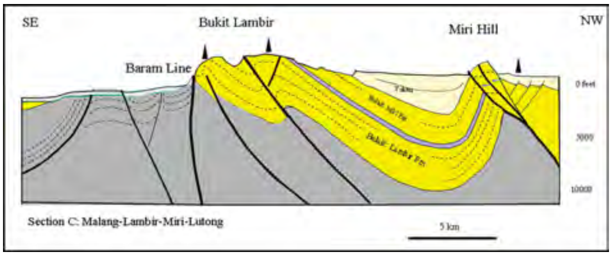


Figure 12: Section "C" leads from Miri to Lambir, and the Beluru area. Both Lambir and Miri are shaped by folding, and overthrusting. The overthrust component in the Baram Line is difficult to judge in absence of reliable subsurface data. Entrapment of non-conventional "shale" gas in the hanging wall below Lambir could be considered in presence of proven gas charge.

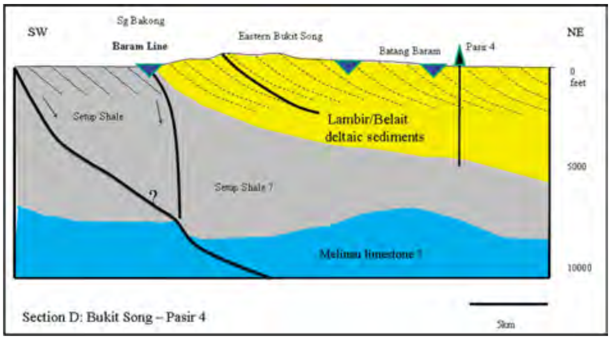


Figure 13: Section "D" features Eastern Lambir (Bukit Song). The style of deformation appears less strong if compared with "C".

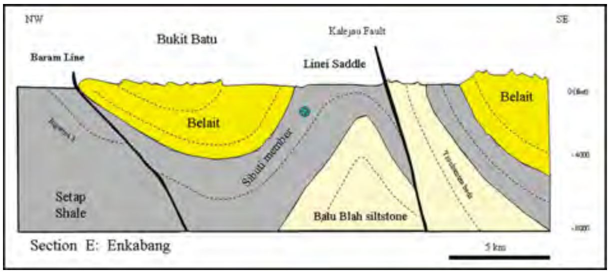


Figure 14: Section "E" runs from the Belait escarpment, the Kalejau fault system into the foothill area of Bukit Enkabang. Similar to Section "C", the amount of overthrusting by the Baram Line might be significant and offer similar entrapment possibilities as quoted for section "C". Modified after Kessler 2005, 2006 and partly based on SOL data generated by Knecht (1928), Whooley (1928), Morgan (1931) and Avang Damit (1940).

Near to the confluence point of the Sungai Bakong with the Batang Baram, the Baram Line is taking a turn from hading East to South-East. From there it also runs parallel with another fault zone, the Kalejau fault, a few kilometers afar. The area around marudi is characterized by intense block-faulting and block-rotation, with block sizes in the order of several square kilometers. As shown in Section "E" of Figure 13, there could be an important element of overthrusting along the faults, and several oil/gas seeps have been reported by SOL geologists in unpublished reports. From the Marudi area further South-East, the Baram Line hades on with the same strike direction, and can be traced until Long Lama. There it merges near Batu Gading with overthrusts at the suture of the foreland with the Rajang mountain belt. Further fieldwork seems required to delineate the path of the Baram Line.

TECTONIC HISTORY OF THE BARAM LINE

Given that the Baram Line is strongly associated with the formation of the Baram Delta, it could be argued that the lineament originated as early as the late Oligocene. Recent work by Simons *et al*. (2007) also suggests that at least some segments of the Baram Line are still actively moving at present (Figure 15). We are hence dealing with a lineament that has relatively old origins (Oligocene), but also a very recent overprint. Accordingly, one might expect complexity when describing the movements along the Baram Line as vectors of extension and compression may have changed during the Neogene.

In simplified terms, one could describe the history of the lineament in three phases: Extension plus strike/slip; compression; compression plus strike/slip but in an opposite direction.

Figure 16 describes the earliest part of the history: East of central Luconia, the crust is being stretched and thinned, which lead to the formation of the Baram-Sabah Foredeep, and an associated rapid subsidence. The rise of the (Rajang Group) Belaga Mountains, occurring at the onset of the Middle Miocene, provided massive amounts of clastics that filled up the new depocenters.

Compression occurring at the late Miocene/Pliocene boundary caused inversion, folds and thrust-sheets, and the stretched crust underlying the Oligo-Mio graben system may have buckled and shrunk by some estimated 1 to 5 % in width (Figure 17).

With ongoing compression, but crustal consolidation being realized, the Baram Line was remobilized as a strike-slip system (Figure 18). Studies encompassed by Simons *et al*. (2007) indicate active movements against or along the Baram Line in the order of 3 mm/y, but the existing data are too sparse to judge, if the stress is relieved by the Morris Fault/Jerudong Line, the Baram Line, or both systems combined.

DISCUSSION

Remains the question where the 3mm/year of crustal shortage are accommodated. The most simple answer is that most of it could be released in deep reverse faulting/overthrusting within the Baram Delta- Sabah Foredeep, and the Bouguer map shown in Figure 2 suggests this might have happened, though requiring further confirmation by deep seismic data and perhaps also geodetic measurements. A more farfetched possibility is to bring the Baram Line in context with the Sulawesi subduction zone and possibly the Red River Fault system of China and Indochina.

Regarding the latter, conclusive evidence for genetically linking those two intra-continent fault systems (Baram Line, areas of Sundaland to Sulawesi; Red River Fault, east of the Himalayas) has not been provided.

Economic aspects: Potential for non-conventional gas deposits

Previous exploration campaigns carried out in the onshore Baram Delta mostly targeted deltaic topset reservoirs of the Belait Group. In most areas reservoir were found too shallow and too poorly sealed to yield substantial petroleum deposits – exceptions being the Miri Field, Rasau/Asampaya at the Brunei border and the very large Seria in Brunei. The quest for deeper clastic reservoirs of good quality has so-far been disappointing.

Regional charge

From regional drilling results and seep data it is known that two charge systems seem to co-exist side-by-side: A predominantly oil charge system for the Baram Delta area, and predominantly gas for the Luconia area. This view, however, excludes the potential differential effect of sealing capacity. Deeper (and potentially more gassy) levels of the Baram Delta remain poorly explored to date. Post-WW II exploration in the Miri Field has pointed toward the existence of deeper reservoirs and a gas potential.

Oil and gas window

In respect to the depth of oil and gas generation, vitrinite reflectivity measurements (VRM) were carried out. Samples from Lambir/Belait sediments above the Grey Setap Shale on the Luconia side of the lineament, as well as in the middle-to-upper section of Lambir sandstone gave values of VRM 0.42 and 0.43 (Kessler 2008, in print). These values are suggestive for a removal of sediments in the molasses foreland area South of Miri in the order of some 2000 feet. This would put the top of economic oil generation at ca. 7000 feet below surface, and top gas generation at some 11000 feet. These numbers are based on an estimated temperature gradient of 3 deg C/ 100 m.

Evidence of charge

In respect of hydrocarbon charge, there is plenty of evidence that charge is active on both sides of the Baram Line, and gas may be contained in marginal siltstone reservoirs such as turbiditic siltstones in the Bukit Peninjau area, the Batu Blah siltstone South of Marudi. Expected poroperm values at target depth might be in the order of 8 % porosity and less than 10 md permeability (in comparison with regional data). To date it is not known if the Setap Shale Fm sensu stricto can be a host rock for gas.

Trap characteristics

The size of entrapment may be correlative to the amount of inverse faulting/overthrusting along sectors

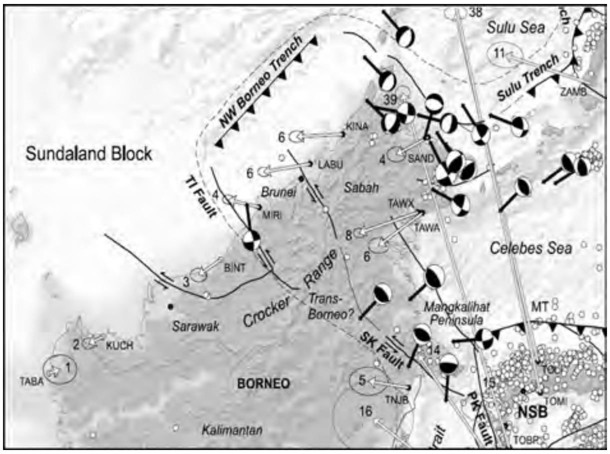


Figure 15: According to GPS measurements, (Simons et. al. (2007)), conjugated pair of Jerudong and Baram Line form a boundary between relatively stable SW Sundaland crust, and the more ductile and possibly thinner Eastern Borneo. Measurements are suggested of E-W compression, and compression/absorption of crust in the order of 3 mm/year between SW and NE Borneo. These data may explain the presence of Late Miocene and Pliocene overthrusting as well as movements along lineaments in strike-slip mode.

of the Baram Line, with sealing provided by clay and clay gouging along the fault plane. Typically tectonics as described above lead to elongated lenticular-shaped traps. Most likely the lateral amount of overthrusting may be in the order of hundreds of meters, or perhaps several kilometers but this cannot be certified without good quality seismic data.

Play summary

A play section is shown in Figure 19. The question remains how much recent tectonism is at work, having possibly affected gas traps in negative ways. This said, non-conventional gas is less sensitive to breach-and-spill compared to gas located in high porosity/permeability reservoirs. Using modern high-resolution and high-fold 2D seismic the overthrust-related traps can easily be imaged.

CONCLUSION

The study, mainly based on fieldwork, reveals the Baram Line's complex history. The lineament acted as a tectonic discontinuity that joins the relatively stable Luconia Block to the relatively mobile Baram Delta Block, acting as boundary for both extension and compression occurring in the Baram Delta. A potential for non-conventional gas in the Setap Shale and/or slightly more porous and permeable intercalations of siltstone is recognized along segments of the lineament.

ACKNOWLEDGEMENTS

The author would like to thank Prof. Dr. Charles S. Hutchison, Andrew B. Cullen (Shell), M. Wiemer (Shell), Prof. Dr. Chai Peng Lee and Dr. Eswaran Padmanabhan for discussions.

Table 1: Calibration points for the course of the lineament with GPS coordinates.

Area	Northing	Easting	Altitude (m)	Comment
Bungai Beach	04°03.733`	113°47.041`	2.5	50 m east of market, high shoulder (hanging wall)
Bridge, Sg. Jangalas	04°03.890`	113°49.918`	5	Junction to Kampong Menjelin
Kg. Menjelin road	04°04.752`	113°50.466`	6	Several meters of high shoulder (hanging wall)
Kg. Kejapil Beraya road	04°08.582`	113°54.290`	18	Relief contrast (hills on Lambir side)
Old Miri-Bintulu trunk road	04°08.772`	114°00.325`	52	Strong relief contrast (rise towards Bt. Lambir)

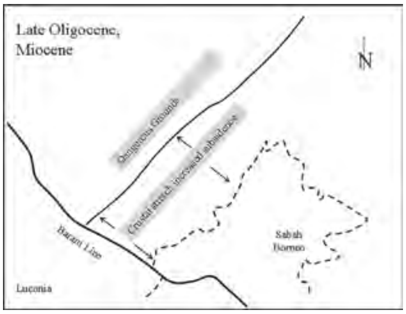


Figure 16: With the opening of the Baram Delta – Sabah Foredeep (compare Tan et al 2000), the Baram Line may have acted as a transform fault for a while. Little deformation is quoted from Luconia areas opposite to the opening foredeep.

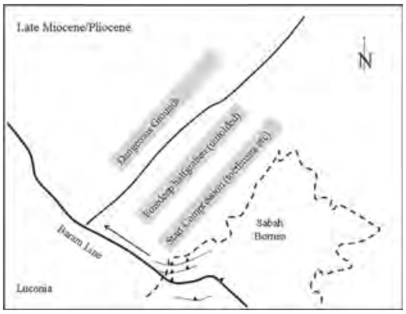


Figure 17: Compression affected the area during the late Miocene to Pliocene period (Kessler 2005, 2006), leading to inversion, folding and some thrusting features.

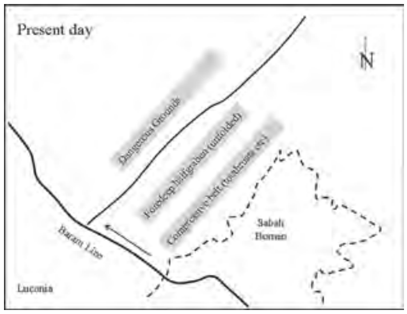


Figure 18: Present day measurements are suggestive for strike-slip movements along the Baram Line; compressive stress may be accommodated by toethrusts and mobile clay ridges from Sarawak to Labuan island

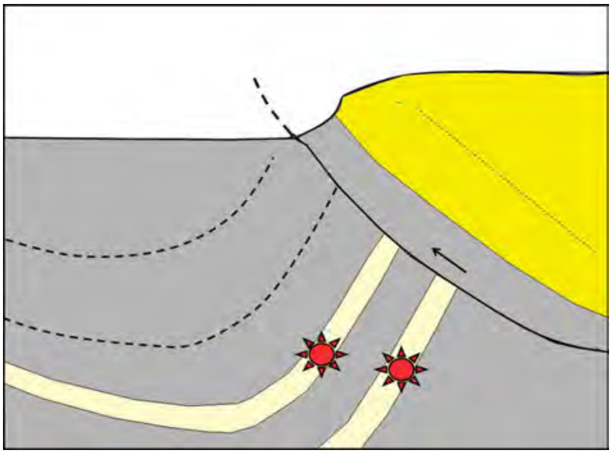


Figure 19: Play section for reverse fault / overthrust segments of the Baram Line. Depending on the fault angle, there is an entrapment potential in the footwall section; seep data are suggestive that hydrocarbon charge is still being generated, whereas reverse faulting/thrusting may be confined to the Pliocene.

REFERENCES

Hutchison, C.S., 1989. Geological Evolution of South-East Asia. Geological Society of Malaysia

Hutchison, C.S., 2005. Geology of North-West Borneo. Elsevier.

Hutchison, C.S., 2007. Geological Evolution of South-East Asia. Geological Society of Malaysia

Kessler, F.L., 2005. Comments on the evolution of the Bukit Lambir Area, Sarawak, Malaysia. Paper presented at the GSM conference, Kuala Lumpur, December 2005.

Kessler, F.L., 2006. Observations on Subtle Deformation in the Folded Foreland, Sarawak, Borneo. Paper presented at the Geo Asia conference, Kuala Lumpur, June 2006.

Kessler, F.L., 2007. Visiting Two Sarawak Mud Volcanoes. Warta Geologi Vol. 33, No 5, September-October 2007.

Liechti, P., Roe, F.W & Haile, N.S., 1960. The geology of Sarawak, Brunei, and the Western Part of North Borneo. Bulletin Geol. Survey. of Sarawak, 3, 1960.

Simons, W. J. F., Socquet, A., Vigny, C., Ambrosius, B.A.C, Haji Abu, S.,Chaiwat Promthong, C., Subarya, C., Sarsito, D.A., Matheussen, S., Morgan, P., Spakman, W., 2007. A decade of GPS in Southeast Asia: Resolving Sundaland motion and boundaries. Journal of Geophysical Research.

Tan, D.N.K, Abdul Hadi b. Abd. Rahman, Azlina Anuar, Boniface Bait, Chow, K. T., 1999. West Baram Delta. In: The Petroleum geology and resources of Malaysia. Petroliam Nasional Berhad (PETRONAS), Kuala Lumpur, 293-341.

Tate, R., 2001. The geology of Borneo Island. Geological Society of Malaysia.

Manuscript received 29 May 2009

Penemuan bivalvia *Daonella pahangensis* Kobayashi berusia Trias Tengah dari Aring, Kelantan

Ahmad Rosli Othman[1,2,*] & Mohd Shafeea Leman[2]

[1]Jabatan Mineral dan Geosains Malaysia,
Wisma Persekutuan, 15200 Kota Bharu, Kelantan
*Email address: ahmadrosli@jmg.gov.my
[2]Institut Alam Sekitar dan Pembangunan (LESTARI)
Universiti Kebangsaan Malaysia, 43600 Bangi, Selangor

Abstrak— Satu spesimen Bivalvia *Daonella pahangensis* Kobayashi telah ditemui pada satu singkapan batuan di Lokaliti QZ467 dalam Formasi Telong di kawasan Aring, Gua Musang. Ini adalah penemuan pertama spesies tersebut di Kelantan selain yang telah ditemui dan diperihalkan oleh Kobayashi (1964) di Temerloh, Pahang. Spesies ini tergolong dalam Kumpulan *Daonella sturia-Daonella lommeli* yang bersifat endemik dan terhad dalam rantauan Tethys. Spesies bivalvia ini berasosiasi rapat dengan *Posidonia* sp. dan wujud bersama ammonoid *Frankites regoledanus* (Mojsisovics) yang merupakan penanda subzonal bagi Subzon *Regoledanus* yang berusia Ladinian akhir, Trias Tengah.

The discovery of Middle Triassic Bivalve *Daonella pahangensis* Kobayashi from Aring, Kelantan

Abstract— A sigle specimen of bivalve *Daonella pahangensis* (Kobayashi) has been discovered from an outcrop at Lokality QZ467 within the Telong Formation, in the vicinity of Aring, Gua Musang. This is the first discovery of such species in Kelantan besides those described by Kobayashi (1964) in Temerloh, Pahang. This species is commonly included in *Daonella sturia-Daonella lommeli* Group, an endemic group and restricted to the Tethyan region. This bivalve species is closely associated with *Posidonia* sp. and it often co-exists with late Ladinian ammonoid *Frankites regoledanus* (Mojsisovics) which is a subzonal marker for *Regoledanus* Subzone of late Ladinian, Middle Triassic.

Keywords: Bivalve, *Daonella pahangensis*, Aring, late Ladinian, *Regoledanus* Subzone

PENGENALAN

Fosil *Daonella* adalah biasa didapati dalam batuan sedimen Trias Tengah di Malaysia. Berdasarkan kewujudannya, Kobayashi (1964) membahagikan strata batuan sedimen kepada dua zon iaitu zon di sebelah barat meliputi kawasan Kedah hingga ke Perak dan zon timur yang meliputi kawasan selatan Kelantan, Pahang dan Johor. *Daonella* dalam zon di sebelah barat berassosiasi rapat dengan *Halobia* dan *Posidonia*. Manakala *Daonella* dalam zon di sebelah timur pula dicirikan dengan kehadiran batu pasir *Myophoria* dan himpunan ammonoid yang berusia Anisian.

Laporan ini mendokumentasikan penemuan fosil Bivalvia *Daonella pahangensis* Kobayashi dalam strata batuan sedimen berusia Trias di Aring, Gua Musang Kelantan yang terletak dalam zon di sebelah timur.

KAJIAN TERDAHULU

Fauna Bivalvia Trias *Daonella* telah banyak dilaporkan penemuannya di kawasan Perak, Kelantan, Pahang dan Kedah oleh beberapa pengkaji terdahulu. Jones *et al*. (1966), Jones telah melaporkan bahawa Kobayashi merekodkan penemuan *Daonella indica* Bittner di Kuala Nerang, Kedah. Manakala Kobayashi (1964) dan Jaafar Ahmad (1976) telah melaporkan penemuan beberapa spesies *Daonella* yang telah ditemui oleh Procter di beberapa lokaliti di Temerloh, Pahang. Spesies-spesies tersebut termasuklah *Daonella indica* Bittner, *Daonella sakawana* Mojsisovics, *Daonella pahangensis* Kobayashi, *Daonella pichleri* Mojsisovics dan *Daonella lommeli* Wissman. Metcalfe *et al*. (1982), menemui *Daonella lommeli* Wissman dan *Daonella sakawana* Mojsisovics di kawasan Mentakab, Pahang. Di Kelantan, Kobayashi *et* *al*., (1966) merekodkan penemuan *Daonella* sp. di Sungai Lebak manakala Yin (1963) pula menemui *Daonella* cf. *indica* Bittner di Sg. Chiku, Gua Musang.

Berdasarkan penemuan *Daonella* tersebut, didapati *Daonella* yang ditemui di kawasan Aring, Gua Musang, Kelantan memperlihatkan morfologi yang menyamai spesimen *Daonella pahangensis* Kobayashi.

GEOLOGI

Fosil ini ditemui dalam lapisan batu lumpur kelabu yang sebahagiannya bertuf. Batu lumpur ini berlapis nipis dan telah termiring, dengan jurus sekitar 340˚-350˚ dan kemiringan 25˚-30˚ ke timurlaut. Kawasan penemuan fosil terletak pada koordinat RSO: QZ 467902 WMR: 536601 yang dirujuk sebagai Lokaliti QZ467. Kawasan kajian berada dalam Jajahan Gua Musang dan terletak di bahagian tenggara Negeri Kelantan (Rajah 1). Berdasarkan pemetaan geologi yang dilakukan oleh Aw (1990) di kawasan Aring, kawasan ini terletak dalam Formasi Telong yang setara dengan Formasi Semantan.

USIA DAN TABURAN

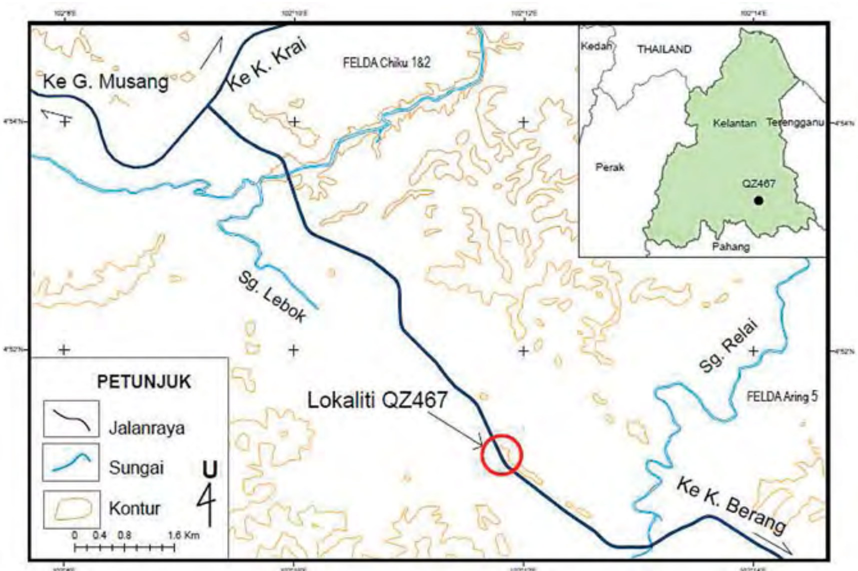
Fosil Bivalvia *Daonella pahangensis* Kobayashi telah ditemui bersama fosil-fosil ammonoid yang berusia Ladinian akhir iaitu *Frankites regoledanus* (Mojsisovics), *Protrachyceras costulatum* Mansuy, *Daxatina* sp., *Protrachyceras* cf. *pseudoa-archelaus* Mojsisovics, *Anolcites* sp., *Joannites* sp., *Clionitites* sp., *Zestoceras* sp. dan *Megaphyllites jarbas* Mojsisovics oleh Ahmad Rosli & Mohd Shafeea (2008). Ammonoid *Frankites regoledanus* (Mojsisovics) adalah merupakan ammonoid yang biasa terdapat dalam laut Paleo-Tethys serta merupakan penanda subzon bagi Subzon *Regoledanus* dalam Zon *Protrachyceras* (Mietto & Mafrin, 1995). Spesies yang bersifat endemik ini juga bersekutuan dengan Bivalvia *Posidonia* sp. Daripada kumpulan-kumpulan spesies *Daonella* di Malaysia yang diutarakan oleh Kobayashi (1964), spesies ini tergolong dalam Kumpulan *Daonella sturia- Daonella lommeli.*

Halobiidae (Bivalvia) iaitu *Daonella* dan *Halobia* adalah bertaburan meluas di lautan Tethys, Panthalassa dan Artik sepanjang zaman Trias Awal ke Akhir iaitu Anisian hingga ke Norian. *Daonella* merupakan pincirian utama terhadap ekologi laut dalam yang tahan terhadap tekanan tinggi dan persekitaran yang kurang oksigen (Kobayashi *et al*., 1966). Turut sama dalam ekologi tersebut termasuklah spesies *Posidonia* dan *Halobia* dan selalunya bersekutuan dengan ammonoid nekton. *Daonella* lebih berkembang semasa Ladinian manakala *Halobia* pula berkembang semasa Karnian (McRobert, 2000; Kobayashi & Tokuyama, 1959).

Menurut McRobert (2000) Bivalvia ini adalah kosmopolitan dan sering ditemui dalam fasies syal hitam dalam persekitaran anoksik atau disoksik. Menurutnya lagi dari segi poligenitik *Halobia* mungkin bukanlah taksa semulajadi tetapi adalah polipiletik (polyphyletic) daripada keturunan *Daonella* atau posidoniid lain. Menurutnya juga, Bivalvia *Halobia daonellaformis* McRobert yang ditemui di British Columbia, Kanada merupakan spesies peralihan antara *Halobia* dan *Daonella*. Menariknya, tidak seperti *Posidonia*, spesies-spesies *Daonella* jarang didapati wujud bersama dalam satu lapisan. Ini menimbulkan persoalan adakah keadaan ini bergantung kepada perbezaan kronologi atau keadaan ekologi (Kobayashi & Tokuyama,1959).

MORFOLOGI

Daonella dapat dibezakan dengan *Halobia* melalui perbezaan cuping aurikel anterior. Bagi *Daonella* cuping aurikel mempunyai rib yang berpusat pada umbo tetapi *Halobia* pula membentuk segi tiga pada cuping aurikel



Rajah 1: Rajah menunjukan lokasi penemuan fosil Bivalvia *Daonella pahangensis* Kobayashi dan kedudukan Lokaliti QZ467.

tanpa rib atau tidak mempunyai cuping aurikel. Morfologi kedua-duanya digambarkan seperti dalam Rajah 2.

Paleontologi Sistematik

Superfamili PECTINOIDEA Rafinesque
Famili POSIDONIIDAE Frech
Genus *Daonella* Mojsisovics
Daonella pahangensis Kobayashi, 1964
Plat 1, Gambar 1 dan 2

1964 *Daonella pahangensis* Kobayashi- Kobayashi: ms 62, Plat V, gambar 11.

Pemerihalan: Cengkerang bersaiz besar dan pipih, inequilateral. Ukuran panjang melebihi tinggi cengkerang. Garis engsel memanjang lurus, lebih pendek daripada panjang cengkerang. Umbo terletak kira-kira setengah daripada garis engsel. Rib berjejari lurus dengan sedikit terserong berhampiran umbo. Rib primer lebih kurang 25 garis menjadi cabang dua berhampiran umbo dan wujud cabang tiga pada jarak satu perdua dari umbo tetapi tidak melebihi bilangan garis cabang dua. Garis pertumbuhan terpusat agak jelas pada jarak satu pertiga melingkari umbo.

Bahan: Satu spesimen cengkerang kanan diperiksa yang mewakili sampel QZ467/B1. Bahagian postero-ventral cangkerang tidak dapat dicerap. Oleh itu ukuran dimensinya adalah berdasarkan anggaran sahaja.

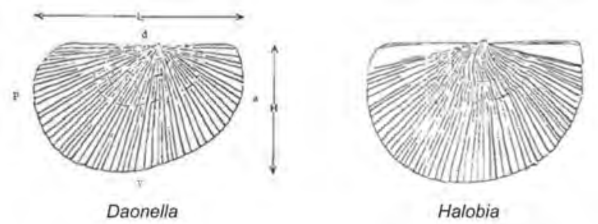
Dimensi:	Tinggi(H)	Panjang (L)
QZ467/B1 (cangkerang kanan)	± 38 mm	± 60 mm
Holotip (cangkerang kiri)	45 mm	70 mm

Pernyataan : *Daonella pahangensis* Kobayashi merupakan spesies bersaiz paling besar daripada spesies-spesies *Daonella* yang lain. Dari segi dimensi dan perhiasan cangkerang, spesies ini menyamai spesimen holotip yang ditemui di kawasan Temerloh oleh Kobayashi (1964). Spesies ini juga menyerupai *Daonella sakawana* Mojsisovics dari segi garis bentuknya tetapi lebih quadrat serta lebih kecil dimensinya berbanding *Daonella pahangensis* Kobayashi. Selain itu garis rib cabang tiga yang wujud pada *Daonella pahangensis* Kobayashi membezakannya dengan *Daonella sakawana* Mojsisovics yang mana rib cabang dua lebih dominan dan jelas.

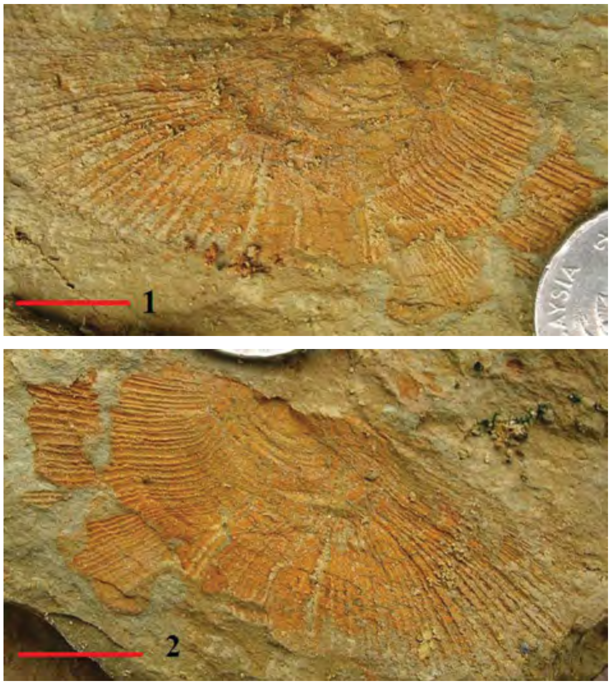
Kewujudan : Lokaliti QZ467, Formasi Telong, Aring, G. Musang

KESIMPULAN

Bivalvia *Daonella pahangensis* Kobayashi yang sebelum ini hanya ditemui di Temerloh, Pahang turut ditemui di Kelantan dalam turutan batuan Trias di Lokaliti QZ467, di kawasan Aring. Berdasarkan assossiasinya dengan fosil penanda subzon iaitu ammonoid Tethys *Frankites regoledanus* (Mojsisovics) usia pengenapan batuan enapan marin laut ini adalah pada usia Ladinian akhir, Trias Tengah.



Rajah 2: Morfologi katup kanan bagi *Daonella* dan *Halobia* digambarkan secara diagramatik. Parameter statistik H: tinggi; L: panjang; d: sisi dorsal; v: sisi ventral; a: sisi anterior dan p: sisi posterior. Dari Silberling (1963).



Plat 1: *Daonella pahangensis* Kobayashi, 1964. Skala bar mewakili 1 cm. Lokasi: QZ467, Formasi Telong, Aring, Gua Musang, Kelantan. Foto 1: Acuan dalaman, cangkerang kanan, spesimen QZ467/B1. Foto 2: Acuan luaran, cangkerang kanan, spesimen QZ467/B1

PENGHARGAAN

Penulisan artikel ini adalah sebahagian daripada hasil penyelidikkan Sarjana yang sedang dijalankan oleh penulis di bawah seliaan Prof. Dr. Mohd Shafeea Leman di Universiti Kebangsaan Malaysia. Ucapan terima kasih ditujukan kepada Pengarah JMG Kelantan, Hj. Zainol Abidin Sulaiman kerana telah memberikan kesempatan dan sokongan untuk menjalankan penyelidikkan ini.

RUJUKAN

Ahmad Rosli Othman & Mohd Shafeea Leman, 2008. The discovery of Triassic Ladinian-Carnian ammonoid assemblage from Aring, Gua Musang, Kelantan. Kertas kerja Persidangan JMG 2008, Kota Bharu, Kelantan. (in press)

Aw, P.C., 1990. Geology and Mineral Resources of The Sungai Aring Area, Kelantan Darul Naim. Geological Survey Malaysia District Memoir 21, 116 p.

Jaafar Ahmad, 1976. Geology and Mineral Resources of the Karak and Temerloh areas, Pahang. Geological Survey Malaysia District Memoir 15, 138 p.

Jones, C.R., Gobbett, D. J., and Kobayashi, T., 1966. Summary of fossil record in Malaya and Singapore 1900-1965. In: Kobayashi, T. and Toriyama, R. (Eds.), Geology and Palaeontology of Southeast Asia, Vol. 2. Tokyo: University of Tokyo Press, p.309-369.

Kobayashi, T. & Tokuyama, A., 1959. Daonella in Japan. Journal of the Faculty of Science, University of Tokyo, Vol. XII : 1-30.

Kobayashi, T., 1964. On the Triassic Daonella Beds in Central Pahang, Malaya. In: Kobayashi, T., (Eds.), Geology and Palaeontology of Southeast Asia Vol. 1, 53-67.

Kobayashi, T., Burton, C. K., Tokuyama, A. & Yin, E. H., 1966. The Daonella and Halobia Facies of the Thai-Malay Peninsula compare with those of Japan. In: Kobayashi, T., (Eds.), Geology and Palaeontology of Southeast Asia Vol. 3, 98-122.

McRobert, C.A., 2000. A primitif Halobia (Bivalve: Halobioidea) from the Triassic of Northeast British Columbia. Journal Palaeontology, 74(4), 599-603.

Mietto, P. & Manfrin, S., 1995. A high resolution Middle Triassic ammonoid standard scale in the Tethys Realm. A preliminary report. Bull. Soc. Geol. France 166 (5), 539-563.

Metcalfe, I., Sivam, S. P., Stauffer, P. H., 1982. Stratigraphy and sedimentology of Middle Triassic rocks exposed near Lancang, Pahang, Peninsular Malaysia. Geol. Soc. Malaysia Bull.,15, 19-30.

Silberling, N.J., 1963. Field guide to haloodiid and monotid pelecypods of the Alaskan Triassic. U.S. Geol. Survey Open-File Report. Available from www.dgss.dnr.stake.ak.us/webpubs/usgs/ot/text/of63-0119.pdf. Accessed October 2008.

Yin, E.H., 1963. Report on the geology and mineral resources of the Gua Musang area, south Kelantan (Sheet 45), unpublished, 49 p.

Manuscript received 29 June 2009

RETIREMENT LECTURE No. 3

Effects of the financial crisis on the global mining industry

Teoh Lay Hock

Monday, 27 July 2009
Department of Geology, University of Malaya

Mr. Teoh Lay Hock who retired from the Minerals and Geoscience Department gave his retirement lecture on the effects of the financial crisis on the mining industry globally. The talk was attended by academic staff and students from University of Malaya and Universiti Kebangsaan Malaysia, as well as several private practioners. This talk is the third in the series organised by Mr. Tan Boon Kong, Chairman of the Working Group on Engineering Geology, Hydrogeology and Environmental Geology.

MALAM GEOSEA RE-RUNS

Friday, 14 August 2009,
Department of Geology, University of Malaya

5.00 – 5.30 pm :	Tea
5.30 – 6.00 pm :	Sdr. Zakaria Mohamad (JMG) The Canada Hill Landslide, Miri, Sarawak
6.00 – 6.30 pm :	Sdr. Chow Weng Sum (UTP) A Case Study on Limestone Clff in Tambun, Perak
6.30 – 7.00 pm :	Q & A

Mr. Tan Boon Kong, Chairman of the Working Group on Engineering Geology, Hydrogeology and Environmental Geology organised the re-run of two papers presented at the Eleventh Regional Congress on Geology, Mineral and Energy Resources of Southeast Asia (GEOSEA 2009). This event was organised in collaboration with the Institute of Geology Malaysia. The event was well attended by academics, engineering geologists and engineers.

CERAMAH TEKNIK TECHNICAL TALK

The pre-opening history and opening of the Black Sea

DR. RANDELL STEPHENSON
Reader in Geophysics, School of Geosciences, University of Aberdeen

Monday, 17 August 2009
Department of Geology, University of Malaya

Abstract— The Black Sea is a back-arc basin with active extension beginning in Early-middle Cretaceous times. Extensional structures within and around the basin are poorly known and are mostly overprinted (inverted) by a subsequent Tertiary compressional stage. Black Sea extension itself probably reactivated earlier extensional structures dating from at least the Permo-Triassic and probably to the Late Devonian. There is a fairly vigorous debate about the relative ages of western and eastern segments of the Black Sea basin, with the former usually considered to be somewhat older than the latter. What this could mean for the geometry of extension and mechanism(s) of back-arc rifting processes in terms of the broader plate configuration and kinematics are poorly defined. I'll summarise these issues, including the present-day tectonic regime and what can be inferred about underlying lithosphere structure, and consider these in the context of models of modern back-arc basin systems. The idea is to elucidate the processes responsible for the formation of the Black Sea and to help define a template for interpreting its under constrained observational dataset.

PERTUKARAN ALAMAT CHANGE OF ADDRESS

1. Abd Rasid Bin Jaapar
   Asian Geos Sdn Bhd, 8th Floor, Menara KH, Jalan Sultan Ismail, 50250 Kuala Lumpur
2. Azrina Abd Aziz
   Blok 18-7-5, Desaview Tower Condominium, Taman Melawati, 53100 Kuala Lumpur
3. Khoo Mei Ai
   109-05-08 Bistari Condominum, Jalan 1/64D, 50350 Kuala Lumpur
4. Arthur Chu Yun Shing
   21-03 Casa Kiara II Condominium, 14, Jalan Kiara 15, Mon't Kiara, 50480 Kuala Lumpur

ADDRESS WANTED

1. Flavia Kandau
2. Bakhtiar Azam Md Khalid
3. Nuruldiyana Mohd Saharudin

From chairman's desk....

Over the last few years the leap in technological advancements in acquiring and analyzing our G&G data has been phenomenal. These advancements are tools that have assisted us in delivering ever more challenging discoveries and assist us in solving new challenges in the G&G arena. Lets us not forget though, the critical part of the equation has and will always be the mastermind behind the development and usage of these advancements.

PGCE.2010 invites the members of G&G fraternity to gather in Kuala Lumpur again, to celebrate the real 'master-mind' behind all successful discoveries -- the idea, crafted with the fundamental of the G&G knowledge; meanwhile embracing the advancement of breakthrough technology of the industry, to cater the needs of exploring challenging discoveries.

Thank you.

Chairman
PGCE.2010
"Crafting ideas for challenging discoveries"

Organising Chairman
PGCE.2010
Geological Society of Malaysia.
C/o: Department of Geology,
Universiti Malaya,
50603 Kuala Lumpur,
MALAYSIA.

Attn: Anna Lee
Tel: 603-7957 7036
Fax: 603-7956 3900
e-mail: geologi@po.jaring.my

www.pgcem.com

Co-organized by: PETRONAS

Petroleum Geology Conference & Exhibition
29 - 30 March, 2010.
Kuala Lumpur Convention Centre.

PGCE.2010

Petroleum Geology Conference & Exhibition
www.pgcem.com

"Crafting Ideas for Challenging Discoveries"


PETRONAS
Come join us!
Register yourself now. Enjoy special 'Early-Bird' rate for advanced registration by 28/2/2010. You can make your registration on-line by log on to www.pgcem.com, or submit your registration manually to organizing committee.
Registration
New ideas and new insights in petroleum geolgy; your experiences and your lesson-learnt in HC exploration and development - we would like to invite you to share all these in PGCE.2010. Contact organizing committee for further detail. Dead line of submission:
Technical papers
Abstract: 31/8/2009 Extended abstract/final paper: 15/10/2009
With more than 1000 of expected participants in PGCE.2010, we invite you to come exhibit and showcase your brand, your product
Exhibition & Sponsorships
and your services here. Interested organization may contact the organizing committee.
Dates to remember..
31/8/2009 -- end of abstract submission
15/9/2009 -- confirmation of paper selection
2/10/2009 -- end of exhibition form submission
15/10/2009 -- end of extended paper/ final paper submision
30/10/2009 -- announcement of exhibitors list
28/2/2010 -- end of advanced registration
PGCE.2010
Petroleum Geology Conference & Exhibition
www.pgcem.com
"Crafting Ideas for Challenging Discoveries"


PETRONAS
Call for papers.
Submit your new ideas and new insights in petroleum geoscience,
share your experiences and your lesson-learnt;
showcase your latest technology in HC exploration and development.
PGCE.2010 would be the best platform for you to share, and have fruitful
discussion with the rest of the members in G&G fraternity.
This year, we classified our technical topics
into 8 categories:
Geophysical & Acquisition
Processing & Imaging
Seismic Interpretation
Petroleum System Analysis
New Play Type
Exploration Case Study
Reservoir Characterization & Modeling
Geosciencs R & D.
**Kindly please mention the category of your paper/ poster.
Due date for abstract submission: 31/8/2009
Confirmation of paper selection: 15/9/2009
Due date for extended abstract/ final paper submission: 15/10/2009.
Please contact Technical Paper Committee for further details
pgcemtech@petronas.com.my
"Crafting Ideas for Challenging Discoveries"
PGCE.2010
Petroleum Geology Conference & Exhibition
www.pgcem.com

PETRONAS

Sponsorship Opportunities

Generous sponsorships have made the conference a huge success on a yearly basis. With more than 1000 of expected participants, PGCE.2010 will be the best opportunity for you to showcase your brand through sponsorship. Please contact Organizing Committee for futher details.

Sponsorship details

Platinum Sponsor	:	RM 100,000 and above
Gold Sponsor	:	RM 50,000 to RM 99,999
Silver Sponsor	:	RM 25,000 to RM 49,999
Bronze Sponsor	:	< RM 25,000

Item	Value (RM)	Item	Value (RM)
Conference doorgift	100,000	Programme Book	30,000
Luncheon Day 1	50,000	Registration/ Badge/ Lanyards	15,000 x 3
Luncheon Day 2	50,000	Directional Signages	20,000
Opening Ceremony	50,000	Student Sponsorship Program	20,000
Ice-Breaker Reception	35,000	OC T-Shirt	15,000
Morning Coffee Day 1	25,000	Wireless Cyber Cafe'	10,000
Afternoon Tea Day 1	25,000	PGCE Growth Sponsorship	Minimum 5,000
Morning Coffee Day 2	25,000		
Afternoon Tea Day 2	25,000		

Sponsorship Recognition

Each sponsor will be recognized for its contribution in the PGCE.2010 Program Book (logo, company name, address and items sponsored), Conferene Backdrops, Comapany logo on signage at entrance to the Exhibition Hall, the official website and signage at specifically sponsored events or logo on items sponsored.

Priority points will be given to exhibiting companies in booth location selection process.

"Crafting Ideas for Challenging Discoveries"

PGCE.2010

Petroleum Geology Conference & Exhibition

www.pgcem.com

PETRONAS

Registration Form

Full name: ____________________

Profession & Position: ____________________

Company/ Organisation:
& Business address: ____________________

Type of membership: ____________________

NRIC/ Passprt number: ____________________

Contact number: ____________________

Fax: ____________________

Email: ____________________

Signature: ____________________

Membership	Advanced registration by 28/2/2010	Late registration after 28/2/2010
Full members	RM300 / USD90	RM550 / USD162
Non members	RM500 / USD148	RM750 / USD220
Student members	RM40	RM50
Student non members	RM70	RM80

Note:
Advanced registration will be accepted until 28/2/2010.

Payment by credit card is now available through online registration, with automatic 4% service charges.

For local participants, payment by crossed cheque to be made payable to the Geological Society of Malaysia. Outstation cheques should over bank charges.

The registration fee for overseas participants can be paid by telegraphic transfer. Details are as follows:
Standard Chartered Bank, 30-36, Jalan 52/4, 46200 Petaling Jaya, Selangor D.E., Malaysia.
The current account number is 794 105402263
The code is SCBLMKXXXX.
Please mail/ fax the remittance advice slip of the telegraphic transfer transaction.

Alternatively, the payment can be made by cash at the registration counter on 28/3/2010 (6pm to 9pm) or 29/3/2010 (8am to 10am).

""Crafting Ideas for Challenging Discoveries"

PGCE 2010
Petroleum Geology Conference & Exhibition
www.pgcem.com

UPCOMING EVENTS

February 8-12, 2010: Applied Reservoir Simulation & Modelling, Kuala Lumpur, Malaysia. Email: info@asiaedge.net; website: www.petroedgeasia.net

March 8-12, 2010: Basic Petroleum Geology, Kuala Lumpur, Malaysia. Tel: 603 21684751; email: ap-enquiries@petroskills.com

March, 8-11, 2010: Oil & Gas Libya Expo 2010. Contact: Vijay Arjun, Dubai; Tel: 00971 4 2988144; Fax: 00971 4 2987886; email: vijay@orangefairs.com; website: www.orangefairs.com

March 16-18, 2010: Offshore Asia Conference & Exhibition 2010, Kuala Lumpur Convention Centre, Kuala Lumpur, Malaysia. Secretariat: Suthi Chatterjee, Tel: 662 247 6533; Fax: 662 247 7868; email: suthi@prmcthailand.com; Web: www.offshoreasiaevent.com

March 29-30, 2010: Petroleum Geology Conference & Exhibition, Kuala Lumpur Convention Centre, Kuala Lumpur, Malaysia. Contact: Tel: 603 79577036; Fax: 603 79563900; email: geologi@po.jaring.my; website: www.pgcem.com

April 5-9, 2010: Basic Geophysics, Kuala Lumpur, Malaysia. Contact: Tel: 603 21684751; email: ap-enquiries@petroskills.com

April 6-8, 2010: Asiawater '10 Expo, Kuala Lumpur Convention Centre, Kuala Lumpur. Contact: Tel: 603 4045 4993

April 12-16, 2010: AVO, Inversion and Attributes: Principles and Applications, Kuala Lumpur, Malaysia. Contact: Tel: 603 21684751; email: ap-enquiries@petroskills.com

April 13-15, 2010: Offshore Australasia Conference, Burswood Convention Center, Perth, Australia. Contact: marketing@neoventurecorp.com; website: www.neoventurecorp.com/2010/0ac

April 14-15, 2010: Offshore Australasia Conference 2010, Perth, Australia. Website: www.neoventurecorp.com/2010/oac

April 19-23, 2010: Sequence Stratigraphy, Vienna, Austria. Tel: +43 3842 43053-33; Fax: +43 3842 430531; email: training@hoteng.com; website: www.hoteng.com

April 26-28, 2010: 1st International Applied Geological Congress, 2010, Department of Geology, Faculty of Science, Islamic Azad University – Mashhad Branch (IAUMB), Mashhad-Iran. Email: info@iagc.ir; website: http://www.iagc.ir

May 3-7, 2010: Fundamentals of Petroleum Geology, Vienna, Austria. Tel: +43 3842 43053-33; Fax: +43 3842 430531; email: training@hoteng.com; website: www.hoteng.com

May 3-7, 2010: Mapping Subsurface Structures, London, UK. Tel: 603 21684751; email: ap-enquiries@petroskills.com

May 10-14, 2010: Sandstone Reservoirs, Kuala Lumpur, Malaysia. Tel: 603 21684751; email: ap-enquiries@petroskills.com

May 10-14, 2010: Analysis of Structural Traps in Extensional Settings, London, UK. Tel: 603 21684751; email: ap-enquiries@petroskills.com

May 18-20, 2010: The 34th Indonesian Petroleum Association Convention & Exhibition 2010, Jakarta Convention Center, Indonesia. Tel: 62 21 5155959; Fax: 62 21 51402545; email: tpc@ipa.or.id; website: ipa.or.id/34th-Convention/CFP2010.htm

June 7-11, 2010: Reservoir Geology – Integrating Data for Reservoir Modelling, Vienna, Austria. Tel: +43 3842 43053-33; Fax: +43 3842 430531; email: training@hoteng.com; website: www.hoteng.com

June 14-18, 2010: Geochemical Techniques for Solving Reservoir Management and Field Development Problems, Houston, USA. Tel: 603 21684751; email: ap-enquiries@petroskills.com

June 21-25, 2010: Operations Geology, Kuala Lumpur, Malaysia. Tel: 603 21684751; email: ap-enquiries@petroskills.com

June 21-25, 2010: Sequence Stratigraphy: An Applied Workshop, Kuala Lumpur, Malaysia. Tel: 603 21684751; email: ap-enquiries@petroskills.com

June 21-25, 2010: Clastic Sedimentology for Exploration and Development, Vienna, Austria. Tel: +43 3842 43053-33; Fax: +43 3842 430531; email: training@hoteng.com; website: www.hoteng.com

June 21-25, 2010: Applied Reservoir Management, Vienna, Austria. Tel: +43 3842 43053-33; Fax: +43 3842 430531; email: training@hoteng.com; website: www.hoteng.com

June 28-July 2, 2010: Introduction to Petroleum Engineering, Vienna, Austria. Tel: +43 3842 43053-33; Fax: +43 3842 430531; email: training@hoteng.com; website: www.hoteng.com

June 28-July 2, 2010: Seismic Acquisition for Supervisors, Vienna, Austria. Tel: +43 3842 43053-33; Fax: +43 3842 430531; email: training@hoteng.com; website: www.hoteng.com

June 30-July 2, 2010: Use of Neural Networks in Reservoir Characterisation, Kuala Lumpur, Malaysia. Tel: +43 3842 43053-33; Fax: +43 3842 430531; email: training@hoteng.com; website: www.hoteng.com

July 5-7, 2010: Seismic Data Processing for Interpreters, Vienna, Austria. Tel: +43 3842 43053-33; Fax: +43 3842 430531; email: training@hoteng.com; website: www.hoteng.com

July 5-9, 2010: Foundations of Petrophysics, Vienna, Austria. Tel: +43 3842 43053-33; Fax: +43 3842 430531; email: training@hoteng.com; website: www.hoteng.com

July 5-9, 2010: Bayesian Inference and Neural Networks in Formation Evaluation, Kuala Lumpur, Malaysia. Tel: +43 3842 43053-33; Fax: +43 3842 430531; email: training@hoteng.com; website: www.hoteng.com

July 5-9, 2010: Development Geology, Kuala Lumpur, Malaysia. Tel: 603 21684751; email: ap-enquiries@petroskills.com

July 12-16, 2010: Prospect and Play Assessment, London, UK. Tel: 603 21684751; email: ap-enquiries@petroskills.com

July 19-23, 2010: Basin Analysis Workshop: An Integrated Approach, Kuala Lumpur, Malaysia. Tel: 603 21684751; email: ap-enquiries@petroskills.com

July 26-30, 2010: Carbonate Geology for Oil and Gas Exploration & Development, Vienna, Austria. Tel: +43 3842 43053-33; Fax: +43 3842 430531; email: training@hoteng.com; website: www.hoteng.com

July 26-30, 2010: Reservoir Engineering for Non-Reservoir Engineers. Tel: +43 3842 43053-33; Fax: +43 3842 430531; email: training@hoteng.com; website: www.hoteng.com

July 26-30, 2010: Introduction to Seismic Stratigraphy: A Basin Scale Regional Exploration Workshop, Singapore. Tel: 603 21684751; email: ap-enquiries@petroskills.com

August 2-4, 2010: Volcaniclastic Rocks – Classification, Properties, Genesis and Depositional Settings, Vienna, Austria. Tel: +43 3842 43053-33; Fax: +43 3842 430531; email: training@hoteng.com; website: www.hoteng.com

August 2-6, 2010: Advanced Reservoir Simulation Technologies, Vienna, Austria. Tel: +43 3842 43053-33; Fax: +43 3842 430531; email: training@hoteng.com; website: www.hoteng.com

August 2-6, 2010: Advanced Seismic Stratigraphy: A Sequence – Wavelet Analysis Exploration – Exploitation Workshop, Singapore. Tel: 603 21684751; email: ap-enquiries@petroskills.com

August 30-September 3, 2010: 6th Quadrennial Conference GeoSciEd VI of the International Geoscience Education Organisation (IGEO), Johannesburg, South Africa. Email: witsqeoutreach@gmail.com/slab@internode.on.net; website: //web.wits.ac.2a/newsroom/conferences/geoscied/geosciedhome:htm

September 5-10, 2010: 11th IAEG International Congress, New Zealand. Website: www.iaeg2010.com

September 13-17, 2010: Carbonate Reservoirs, London, UK. Tel: 603 21684751; email: ap-enquiries@petroskills.com

September 13-17, 2010: Seismic Interpretation, Kuala Lumpur, Malaysia. Tel: 603 21684751; email: ap-enquiries@petroskills.com

September 13-17, 2010: Petroleum Systems Modelling for Exploration Risk Assessments, Vienna, Austria. Tel: +43 3842 43053-33; Fax: +43 3842 430531; email: training@hoteng.com; website: www.hoteng.com

September 27-October 1, 2010: Petroleum Geochemistry: Tools for Effective Exploration and Development, London, UK. Tel: 603 21684751; email: ap-enquiries@petroskills.com

September 27-October 1, 2010: Petroleum Geostatistics – Integrating Data for Reservoir Modelling and Simulation, Vienna, Austria. Tel: +43 3842 43053-33; Fax: +43 3842 430531; email: training@hoteng.com; website: www.hoteng.com

October 10-14, 2010: Integrated Petrophysics for Reservoir Characterisation, Dubai, UAE. Tel: +43 3842 43053-33; Fax: +43 3842 430531; email: training@hoteng.com; website: www.hoteng.com

October 11-15, 2010: Production Geology for Other Disciplines, Kuala Lumpur, Malaysia. Tel: 603 21684751; email: ap-enquiries@petroskills.com

October 11-15, 2010: Deep-water Turbidite Depositional Systems and Reservoirs, London, UK. Tel: 603 21684751; email: ap-enquiries@petroskills.com

October 17-21, 2010: Carbonate and Fracture Petrophysics, Dubai, UAE. Tel: +43 3842 43053-33; Fax: +43 3842 430531; email: training@hoteng.com; website: www.hoteng.com

October 18-22, 2010: Wellsite and Operations Geology, Vienna, Austria. Tel: +43 3842 43053-33; Fax: +43 3842 430531; email: training@hoteng.com; website: www.hoteng.com

October 18-22, 2010: Compressional and Transpressional Structural Styles, London, UK. Tel: 603 21684751; email: ap-enquiries@petroskills.com

October 19-22, 2010: Oils and Fats International Congress 2010 in conjunction with Oils and Fats International Asia 2010: Oils and Fats Industry: Challenges and Innovative Solutions, Kuala Lumpur, Malaysia. Contact: OFIC 2010 Secretariat c/o MOSTA, C-3A-10, 4th Floor, Block C, Damansara Intan, 47400 Petaling Jaya, Selangor, Malaysia. Tel: 603 71182062/2064; Fax: 603 71182063; email: secretariat@mosta.org.my; website: www.mosta.org.my

October, 25-29, 2010: Structural Styles in Petroleum Exploration, Kuala Lumpur, Malaysia. Tel: 603 21684751; email: ap-enquiries@petroskills.com

November 1-5, 2010: Production Logging and Reservoir Monitoring, Kuala Lumpur, Malaysia. Tel: +43 3842 43053-33; Fax: +43 3842 430531; email: training@hoteng.com; website: www.hoteng.com

November 1-5, 2010: Seismic Velocities and Depth Conversion, Kuala Lumpur, Malaysia. Tel: 603 21684751; email: ap-enquiries@petroskills.com

November 7-11, 2010: Introduction to Open Hole Log Analysis, Dubai, UAE. Tel: +43 3842 43053-33; Fax: +43 3842 430531; email: training@hoteng.com; website: www.hoteng.com

November 7-11, 2010: Reservoir Engineering for Non-Reservoir Engineers, Dubai, UAE. Tel: +43 3842 43053-33; Fax: +43 3842 430531; email: training@hoteng.com; website: www.hoteng.com

November 8-12, 2010: Basin Analysis and Petroleum Systems, Vienna, Austria. Tel: +43 3842 43053-33; Fax: +43 3842 430531; email: training@hoteng.com; website: www.hoteng.com

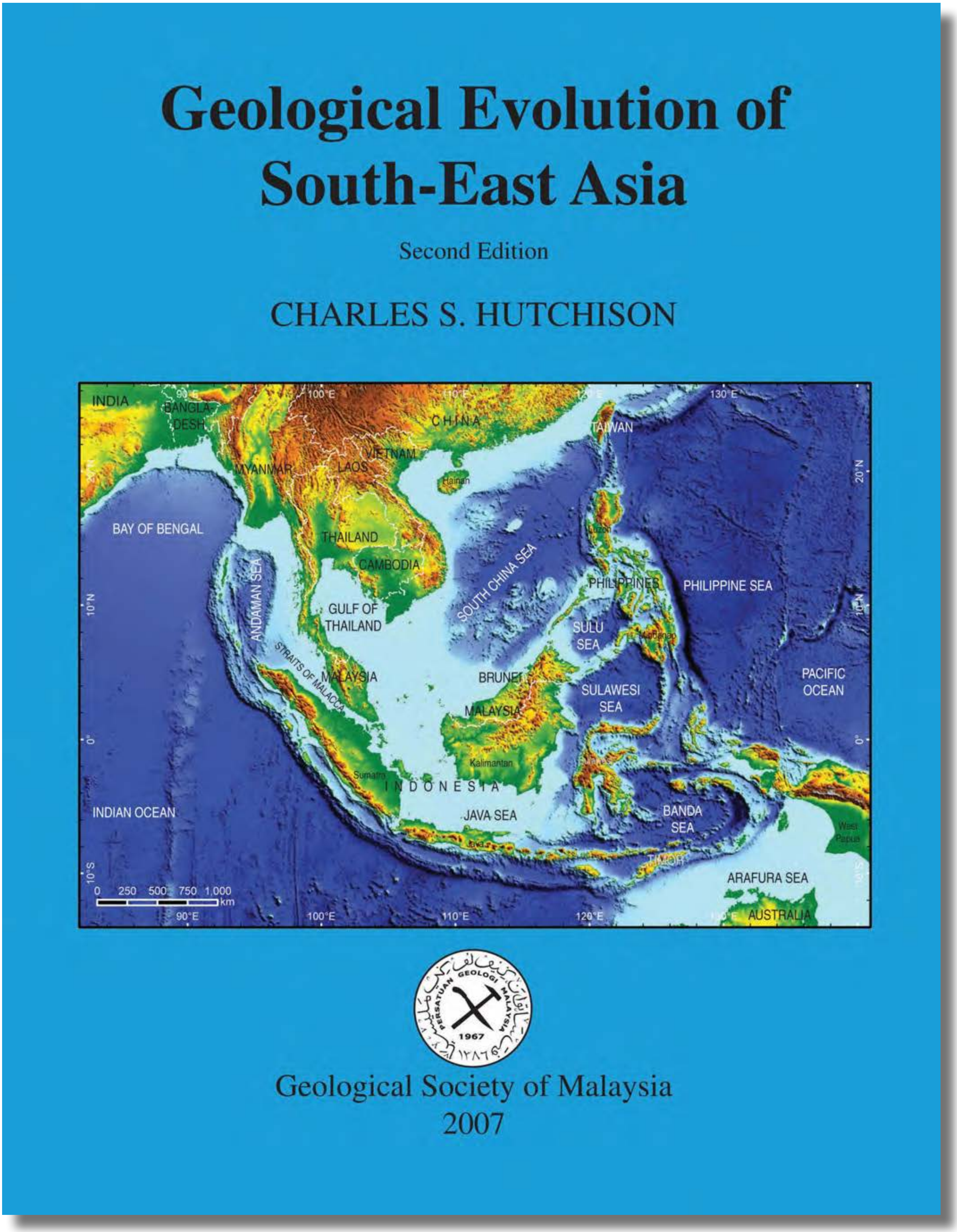
November 8-12, 2010: Special Core Analysis, Vienna, Austria. Tel: +43 3842 43053-33; Fax: +43 3842 430531; email: training@hoteng.com; website: www.hoteng.com

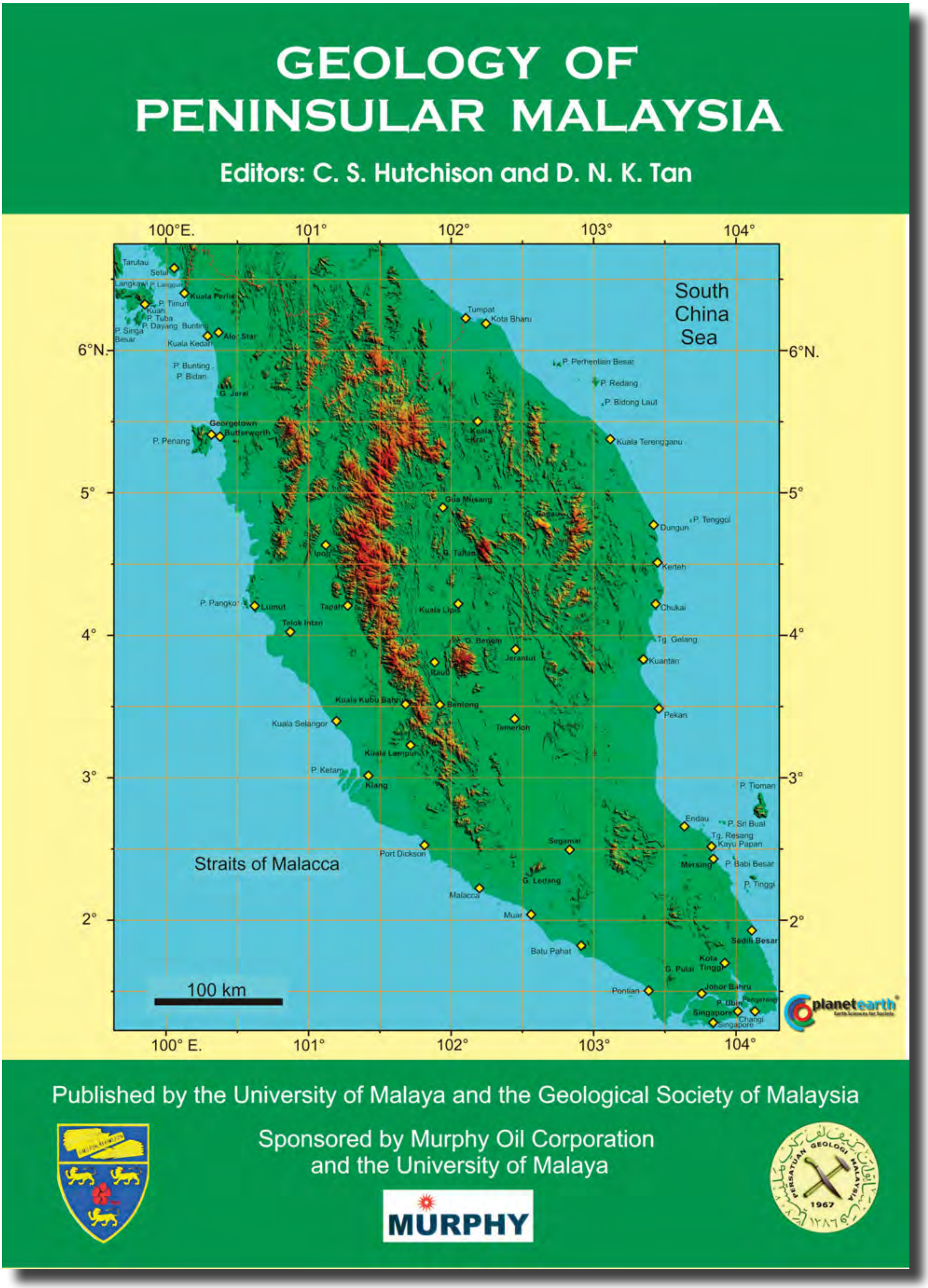
November 8-12, 2010: Petroleum Geomechanics, Kuala Lumpur, Malaysia. Tel: +43 3842 43053-33; Fax: +43 3842 430531; email: training@hoteng.com; website: www.hoteng.com

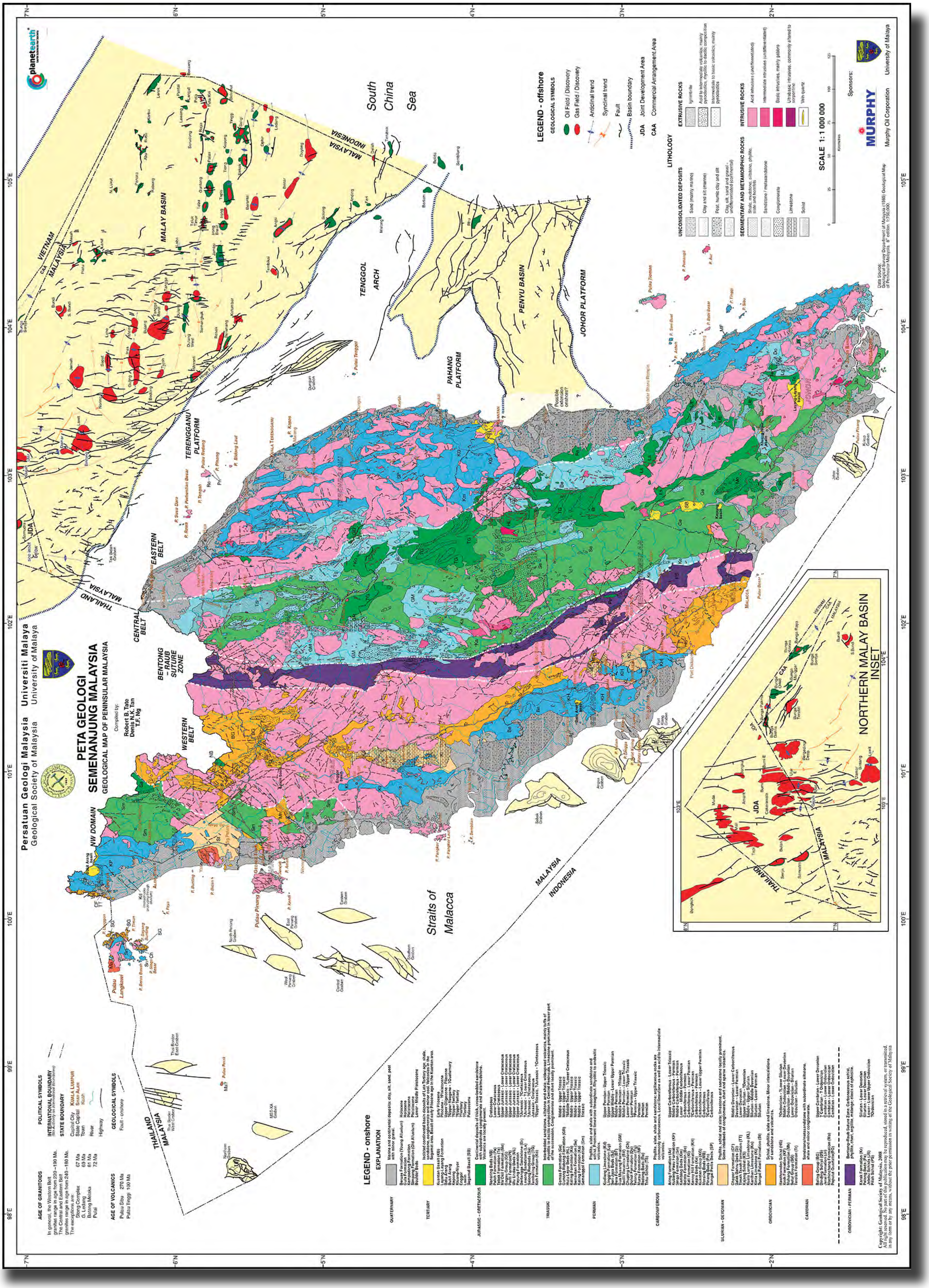
November 29-December 3, 2010: Pore Pressure, Fracture Pressure and Wellbore Stability Management, Vienna, Austria. Tel: +43 3842 43053-33; Fax: +43 3842 430531; email: training@hoteng.com; website: www.hoteng.com

November 30-December 3, 2010: OSEA 2010: Energise Asia's Oil & Gas Industry, Suntec Singapore. Website: www.osea-asia.com

August 5-15, 2012: 34th International Geological Congress, Brisbane, Australia. Contact: Dr. Ian Lambert, Geoscience Australia. Tel: +61 2 62499556; Fax: +61 2 62499983; email: ian.lambert@ga.gov.au; website: www.ga.gov.au/igc2012


Geological Evolution of
South-East Asia
Second Edition
CHARLES S. HUTCHISON
INDIA
BANGLA-
DESH
CHINA
TAIWAN
MYANMAR
LAOS
VIETNAM
Hainan
BAY OF BENGAL
THAILAND
CAMBODIA
SOUTH CHINA SEA
PHILIPPINES
PHILIPPINE SEA
ANDAMAN SEA
GULF OF
THAILAND
SULU
SEA
STRAITS OF MALACCA
MALAYSIA
BRUNEI
MALAYSIA
SULAWESI
SEA
PACIFIC
OCEAN
Kalimantan
Sumatra
I N D O N E S I A
INDIAN OCEAN
JAVA SEA
BANDA
SEA
TIMOR
ARAFURA SEA
AUSTRALIA
0 250 500 750 1,000
km
90°E
100°E
110°E
120°E
130°E
20°N
10°N
0°
10°S
PERSATUAN GEOLOGI MALAYSIA
1967
Geological Society of Malaysia
2007


GEOLOGY OF
PENINSULAR MALAYSIA
Editors: C. S. Hutchison and D. N. K. Tan
South China Sea
Straits of Malacca
100 km
Published by the University of Malaya and the Geological Society of Malaysia
Sponsored by Murphy Oil Corporation
and the University of Malaya
MURPHY



Geological Map of Peninsular Malaysia (2008) Compiled by R.B. Tate, D.N.K. Tan & T.F. Ng.

Scale 1 000 000, 96 cm x 68 cm

Price (excluding postage): RM50.00; Student: RM20.00

For overseas mail order please send your enquiry to : geologi@po.jaring.my

PP/3279/05/2010 (023917) ISSN 0126–6187

BULETIN
PERSATUAN GEOLOGI MALAYSIA

KANDUNGAN / CONTENTS

Penyunting / Editors: T.F. Ng & Y.L. Lau

Bulletin of the GEOLOGICAL SOCIETY OF MALAYSIA

planetearth Earth Sciences for Society

NOVEMBER 2009 No. 55

Price RM30.00 (Exclusive of postage)

Please write in for details on postage. Allow 8-10 weeks for delivery. For orders, please write to the Society and you will be invoiced. Cheques, money orders and bank drafs must accompany all orders.

Orders should be addressed to:
Geological Society of Malaysia,
c/o Department of Geology, University of Malaya,
50603 Kuala Lumpur, MALAYSIA
Tel: 603-79577036, Fax: 603-79563900
E-mail: geologi@po.jaring.my

PP 3279/05/2009 (021534)

ISSN 0126–6187

BULETIN PERSATUAN GEOLOGI MALAYSIA

KANDUNGAN / CONTENTS

Penyunting / Editors: T.F. Ng, Nur Iskandar Taib & Samsudin Hj. Taib

Bulletin of the GEOLOGICAL SOCIETY OF MALAYSIA

planetearth® Earth Sciences for Society

NOVEMBER 2008 No. 54

Price RM30.00 (Exclusive of postage)

Please write in for details on postage. Allow 8-10 weeks for delivery. For orders, please write to the Society and you will be invoiced. Cheques, money orders and bank drafs must accompany all orders.

Orders should be addressed to:
Geological Society of Malaysia,
c/o Department of Geology, University of Malaya,
50603 Kuala Lumpur, MALAYSIA
Tel: 603-79577036, Fax: 603-79563900
E-mail: geologi@po.jaring.my

GEOLOGICAL SOCIETY OF MALAYSIA PUBLICATIONS

Bulletin 2 (Dec 1968). 152 p. Bibliography and Index of the Geology of West Malaysia and Singapore by D.J. Gobbett. Price: RM5.00.

Bulletin 3 (Mar 1970). 146 p. Papers in Geomorphology and Stratigraphy (with Bibliography supplement). Edited by P.H. Stauffer. Price: RM5.00.

Bulletin 4 (Jun 1971). 100 p. Papers in Petrology, Structure and Economic Geology. Edited by P.H. Stauffer. Price: RM5.00.

Bulletin 5 (Feb 1973). 70 p. The Search for Tungsten Deposits by K.F.G. Hosking. Price: RM5.00.

Bulletin 6 (Jul 1973). 334 p. Proceedings, Regional Conference on the Geology of Southeast Asia. A Collection of papers, Kuala Lumpur, March, 1972. Edited by B.K. Tan. Price: RM5.00.

Bulletin 7 (Jun 1974). 138 p. A collection of papers on geology. Edited by B.K. Tan. Price RM5.00.

Bulletin 13 (Dec 1980). 111 p. A collection of papers on geology of Malaysia and Thailand. Edited by G.H. Teh. Price RM5.00.

Bulletin 17 (Dec 1984). 371 p. A collection of papers on geology. Edited by G.H. Teh. Price: RM10.00.

Bulletin 18 (Nov 1985) 209 p. Special issue on Petroleum Geology. Edited by G.H. Teh. & S. Paramanathan. Price: RM15.00.

Bulletins 19 (Apr 1986) & **20** (Aug 1986). GEOSEA V Proceedings Vols. 1 & 11. Fifth Regional Congress on Geology, Mineral and Energy Resources of SE Asia. Kuala Lumpur, 9-13 April 1984. Edited by G.H. Teh & S. Paramanathan. Price for both bulletins 19 & 20: Members: RM30.00: Non-members: RM60.00

Bulletin 21 (Dec 1987). 271 p. Special issue on Petroleum Geology Vol. 11. Edited by G.H. Teh. Price: RM20.00.

Bulletin 22 (Dec 1988). 272 p. Special issue on Petroleum Geology Vol. 111. Edited by G.H. Teh. Price: RM20.00.

Bulletin 23 (Aug 1989). 215 p. A collection of papers on the geology of Malaysia, Thailand and Burma. Edited by G.H. Teh. Price: RM10.00.

Bulletin 24 (Oct 1989). 199 p. A collection of papers presented at GSM Annual Geological Conference 1987 & 1988. Edited by G.H. Teh. Price: RM10.00.

Bulletin 25 (Dec 1989). 161 p. Special issue on Petroleum Geology Vol. IV. Edited by G.H. Teh. Price: RM20.00.

Bulletin 26 (Apr 1990). 223 p. A collection of papers presented at GSM Annual Geological Conference 1989 and others. Edited by G.H. Teh. Price: RM10.00.

Bulletin 27 (Nov 1990). 292 p. Special issue on Petroleum Geology Vol. V. Edited by G.H. Teh. Price: RM20.00.

Bulletin 28 (Nov 1991). 292 p. Special issue on Petroleum Geology Vol. VI. Edited by G.H. Teh. Price: RM20.00.

Bulletin 29 (Jul 1991). 255 p. A collection of papers presented at GSM Annual Geological Conference 1990 and others. Edited by G.H. Teh. Price: RM10.00

Bulletin 30 (Apr 1992). 90 p. Annotated bibliography of the geology of the South China Sea and adjacent parts of Borneo by N.S. Haile. Edited by G.H. Teh. Price: RM10.00.

Bulletin 31 (Jul 1992). 176 p. A collection of papers presented at GSM Annual Geological Conference 1991 and others. Edited by G.H. Teh. Price: RM10.00.

Bulletin 32 (Nov 1992). 283 p. Special issue on Petroleum Geology Vol. VII. Edited by G.H. Teh. Price: RM30.00.

Bulletin 33 (Nov 1993). 419 p. Proceedings Symposium on Tectonic Framework and Energy Resources of the Western Margin of the Pacific Basin. Edited by G.H. Teh. Price: RM40.00.

Bulletin 34 (Dec 1993). 181 p. Bibliography and Index – Publications of the Geological Society of Malaysia 1967-1993. Compiled by T.F. Ng. Edited by G.H. Teh. Price: RM20.00.

Bulletin 36 (Dec 1994). 186 p. Special issue on Petroleum Geology Vol. VIII. Edited by G.H. Teh. Price: RM50.00.

Bulletin 37 (Jul 1995). 506 p. Proceedings AAPG-GSM International Conference 1994. Southeast Asian Basins: Oil and Gas for the 21st Century. Edited by G.H. Teh. Price: RM60.00.

Bulletin 38 (Dec 1995). 190 p. A collection of papers presented at GSM Annual Geological Conference 1994 and others. Edited by G.H. Teh. Price: RM30.00.

Bulletin 40 (Jul 1997). 247 p. A collection of papers presented at GSM Annual Geological Conference 1996 and others. Edited by G.H. Teh. Price: RM30.00.

Bulletin 42 (Dec 1998). 268 p. Papers from Petroleum Geology Conference 1997, Seminar on Tertiary Basins of Peninsular Malaysia and others. Edited by G.H. Teh. Price: RM50.00.

Bulletin 43 (Dec 1999). 698 p. Papers from GEOSEA '98 (Ninth Regional Congress on Geology, Mineral and Energy Resources of Southeast Asia). Edited by G.H. Teh. Price: RM70.00.

Bulletin 44 (July 2000). 178 p. A collection of papers from Annual Geological Conference 1999. Western Belt & Paleozoic of Peninsular Malaysia Seminar 1999 & others. Edited by G.H. Teh. Price: RM30.00

Bulletin 45 (May 2002). 375 p. Annual Geological Conference 2002. Conference Issue. Edited by G.H.Teh, Ismail Yusoff, Azman Abdul Ghani & T.F. Ng. Price: RM50.00.

Bulletin 47 (Dec 2003). 179 p. Petroleum Ceology Conference & Exhibition 2002. Edited by G.H. Teh. Price: RM30.00.

Bulletin 49 (April 2006). 167 p. Collection of Geological Papers. Edited by K.K. Liew, Nur Iskandar Taib & T.F. Ng. Price: RM30.00.

Bulletin 50 (May 2007). 160 p. Bibliography and Index of GSM Publications 1994 – 2004. Compiled by Robert B. Tate. Price: RM30.00

Bulletin 51 (2005). 199 p. Annual Geological Conference 2005 Conference Issue. Edited by Nur Iskandar Taib. Price: RM30.00

Bulletin 52 (June 2006). 135 p. Collection of Geological Papers. Edited by Nur Iskandar Taib. Price: RM30.00.

Bulletin 53 (June 2007). 128 p. Collection of Geological Papers. Edited by T.F. Ng, Nur Iskandar Taib & Joy J. Pereira. Price: RM30.00.

Bulletin 54 (November 2008). 169 p. Collection of Geological Papers. Edited by T.F. Ng, Nur Iskandar Taib & Samsudin Hj Taib. Price: RM30.00.

Bulletin 55 (November 2009). 100 p. Collection of Geological Papers. Edited by T.F. Ng & Y.L. Lau. 100 p. Price: RM20.00.

Abstracts of papers (1972). Regional Conference on the Geology of Southeast Asia. Kuala Lumpur, 1972. 64 p. 8 figs. 3 tables, many extended abstracts. Edited by N.S. Haile. Price: RM2.00.

Warta Geologi (Newsletter of the Geological Society of Malaysia). Price: RM5.00 per bimonthly issue from July 1966.

Stratigraphic Lexicon of Malaysia (2004). 162 p. By Lee Chai Peng, Mohd. Shafeea Leman, Kamaludin Hassan, Bahari Md. Nasib & Roshidah Karim. Price: RM30.00.

Geological Evolution of Southeast Asia (2007) (Second Edition) 433 p. by C. S. Hutchison. Price: RM100.00; Student :RM50.00.

Common Rocks of Malaysia (Colour Poster). Price: Member: RM8.00; Non-Member: RM10.00; Student: RM7.00.

Proceedings Annual Geological Conference 2000. 435 p. Edited by G.H. Teh, Joy J. Pereira and T.F. Ng. Price: RM60.00.

Proceedings Annual Geological Conference 2001. 320 p. Edited by G.H. Teh, Mohd. Shafeea Leman and T.F. Ng. Price: RM50.00.

Geology of Borneo Island (2001) (CD, Map (2 sheets) and explanatory notes. Compiled by Robert B. Tate. Price: RM60.00.

Geology of Peninsular Malaysia (2009) 479 p. Hardcover. Edited by C.S. Hutchison & D.N.K. Tan. Inclusive of Geological Map of Peninsular Malaysia. Price: Member RM150.00; Student Member RM70.00; Non-Member RM200.00

Geological Map of Peninsular Malaysia (2008). Scale 1:1 000 000. Price: RM50.00; Student: RM20.00.

All prices quoted are not inclusive of postage. Please write in for details on postage. Allow 8-10 weeks for delivery. For orders, please write to the Society and you will be invoiced. Cheques, money orders and bank drafs must accompany all orders.

Orders should be addressed to: Geological Society of Malaysia,
c/o Department of Geology,
University of Malaya,
50603 Kuala Lumpur, MALAYSIA
Tel: 603-79577036, Fax: 603-79563900
E-mail: geologi@po.jaring.my

Geological Society of Malaysia Publications

General Policy

Papers should be as concise as possible. They may include original results of basic, applied and policy research of national or international significance, current reviews, or discussions on techniques, research programs, organisations, information, or national and international policies in geoscience.

Submission of Papers

Only papers that have not been published elsewhere will be considered for publication. Authors must agree not to publish elsewhere a paper submitted and accepted. All papers will be subjected to review by two or more reviewers. Authors wishing to include published and unmodified figures or text passages are required to obtain permission from the copyright owner(s). Authors of English papers are strongly urged to have their manuscript edited for language before submission by a person whose first language is English.

The Editor reserves the right to reject all or any part of the paper submitted. The Geological Society of Malaysia assumes no responsibility for statements made by authors.

Three (3) original copies of the paper should be submitted to:

The Editor,
Geological Society of Malaysia
c/o Department of Geology
University of Malaya
50603 Kuala Lumpur,
Malaysia
Tel: (603) 7957 7036
Fax: (603) 7956 3900
Email: geologi@po.jaring.my

Manuscript

The paper can be written in Bahasa Malaysia (Malay) or English. For English papers, use either British or American spelling but not a combination of both. The paper should be checked thoroughly for spelling and grammar. The manuscript must be printed at 1.5 spacing in a single column on one side of A4 paper. All pages should be numbered. Length of paper should be between 4,000 to 6,000 words (8 to 12 pages), excluding tables and illustrations. Metric units should be used and all non-standard symbols, abbreviations and acronyms must be defined.

Title

Title must be informative and reflects the content of the paper. Title in Malay should include an English translation. It should be concise (less than 20 words). Avoid using abbreviation in the title.

Author's Address

Addresses of all authors must be provided. The addresses should be sufficient for correspondence. Please include email address, telephone and fax of the corresponding author.

Abstract

Abstract in both Malay and English, each in one paragraph and should not exceed 300 words. It should clearly identify the subject matter, results obtained, interpretations discussed and conclusions reached.

Keywords

Please include 3 to 8 keywords that best describe the content of the paper.

References

In the text, references should be cited by author and year and listed chronologically (e.g. Smith, 1964; Jones *et al*., 1998; Smith & Tan, 2000). For both Malay and English paper, all references must be listed in English. Title of non-English articles should be translated to English.

The list of references should only include articles cited in the text. The list should be arranged in alphabetical order. Please ensure that the reference list is complete and the bibliographical details are accurate. The references should be in the following manner:

Journal articles:
Suntharalingam, T., 1968. Upper Palaeozoic stratigraphy of the area west of Kampar, Perak. Geol. Soc. Malaysia Bull., 1, 1-15.
Books:
Hutchison, C.S., 1989. Geological Evolution of South-east Asia. Clarendon Press, Oxford. 368 p.
Chapter of books and Symposium volumes:
Hosking, K.F.G., 1973. Primary mineral deposits. In: Gobbett, D.J. and Hutchison, C.S. (Eds.), Geology of the Malay Peninsular (West Malaysia and Singapore). Wiley-Interscience, New York, 335-390.
Article in Malay:
Lim, C.H. & Mohd. Shafeea Leman, 1994. The occurrence of Lambir Formation in Ulu Bok Syncline, North Sarawak. Geol. Soc. Malaysia Bull., 35:1-5. (in Malay with English abstract)

Tables

All tables should be cited in the text and numbered consecutively. Tables should have a title and a legend explaining any abbreviation or symbol used. Each table must be printed on a separate piece of paper. Do not insert the tables within the text. Data in tables should be aligned using tab stops rather than spaces. Avoid excessive tabulation of data.

Illustrations

Please make sure that all illustrations are useful, necessary and of good quality. A maximum of ten (10) illustrations (photographs, graphs and diagrams) are allowed and these should be cited in the text and numbered consecutively as Figures. The papers are usually published in black-and-white but it may sometimes be possible to include colour figures at the author's expense. The scales for maps and photomicrographs should be drawn on the figure and not given as a magnification. Originals should not be greater than A4 size and annotations should be capable of being reduced down to 50 percent. The caption should be listed on a separate piece of paper. Do not insert the illustration within the text.

Submission of Electronic Files

Authors are required to submit electronic files together with three hardcopies of their papers. Submission should be made using CD-ROM. The CD-ROM should be accompanied with a listing of all files and the software (name and version) used. The file names should reflect the content of the files (e.g. Ali_Fig1.tif). Please make sure that the files and the hardcopies are the same.

Preferred Software

Text: Microsoft Word. Please save in two versions, Word (.doc) and Rich Text Format (.rtf). Do not insert tables and illustration within the text.

Tables: Microsoft Word or Microsoft Excel. Please submit as separate files.

Illustrations – Vector Graphics: Adobe Illustrator (preferred), CorelDraw and Freehand. Final line thickness should be at least 0.5 point or 0.17 mm. For other software, please submit one copy in the native file format and export one copy as a PDF file with all fonts embedded and one copy as a high resolution TIFF or JPEG image.

Photographs or bitmap (raster) images: Adobe Photoshop. Please save as TIFF or PSD files. Save/scan line art at 600 to 1200 dpi and greyscale figures at 300 to 600 dpi. High resolution JPEG, TIFF or GIF files from other sources are also acceptable. The resolution must be high enough for printing at 300 dpi.

Reprints

Twenty five copies of each article published are supplied free of charge. Additional reprints are available at cost price provided that orders are placed prior to publication. Authors will also received a softcopy of the article published in .pdf format.

PP2509/02/2010(024604) ISSN 0126-5539

WARTA GEOLOGI PERSATUAN GEOLOGI MALAYSIA

Newsletter of the Geological Society of Malaysia

Jilid 35, No. 3 • Volume 35, No. 3 • July–September 2009

KANDUNGAN (CONTENTS)

Published by the GEOLOGICAL SOCIETY OF MALAYSIA
Department of Geology, University of Malaya, 50603 Kuala Lumpur, MALAYSIA
Tel: 603-7957 7036 Fax: 603-7956 3900 E-mail: geologi@po.jaring.my

Printed by Art Printing Works Sdn. Bhd.
29, Jalan Riong, 59100 Kuala Lumpur, MALAYSIA