

PERSATUAN GEOLOGI MALAYSIA

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About the Society

The Society was founded in 1967 with the aim of promoting the advancement of earth sciences particularly in Malaysia and the Southeast Asian region.

The Society has a membership of about 600 earth scientists interested in Malaysia and other Southeast Asian regions. The membership is worldwide in distribution.

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Notes on magmatic epidote and its probable absence in Peninsular Malaysia granitoids

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Abstract: Textural and chemical criteria of magmatic epidote have been reviewed. The presence of magmatic epidote in granodiorites, tonalites and trondhjemites is commonly used as evidence of magma crystallisation at pressures in the region of 6 to 8 kbar. Application of hornblende geobarometer to the Peninsular Malaysia granitoids indicate that a pressure of crystallisation of the granites of 0.49 to 4.98 kbar. This is supported by the metamorphic assemblage in the country rocks which limits the pressure at which they were metamorphosed to a maximum of 3.75 ± 0.25 kbar. This could be the reasons why magmatic epidote have not crystallised in Peninsular Malaysia granitoids.

INTRODUCTION

The presence of magmatic epidote in granodiorites, tonalites and trondhjemites is commonly used as evidence of magma crystallisation at pressures in the region of 6 to 8 kbar (Naney, 1983; Zen and Hammarstrom, 1984; Brandon *et al.*, 1996). Textural criteria that can be used to distinguish the magmatic epidote from secondary epidote (e.g. subsolidus reaction) are that magmatic epidote is (i) euhedral, weakly pleochroic within biotite (Tulloch, 1979), (ii) an overgrowth on euhedral allanite (Zen and Hammarstrom, 1984; Forizs *et al.*, 1995), (iii) wormy intergrowth with plagioclase, (iv) involvement of epidote in magmatic flow, (v) included in primary muscovite (Sial *et al.*, 1995) (vi) fine scale oscillatory zoning (Evans and Vance, 1987) and (vii) rounded to highly embayed hornblende enclosed in epidote (Zen and Hammarstrom, 1984). Chemical criteria for recognition of magmatic epidote in granitic rocks have also been proposed mainly

based on Ps mole fraction (%Ps). A literature review shows different authors have suggested different %Ps ranges for the magmatic epidote, namely:

- (1) 22.95 to 28.82%Ps (Farrow and Barr, 1992),
- (2) 25 to 29%Ps (Tulloch, 1979, 1986),
- (3) 23 to 27%Ps (Zen and Hammarstrom, 1984),
- (4) 19 to 24%Ps (Dawes and Evans, 1991),
- (5) 21%Ps (Evans and Vance, 1987),
- (6) 27–29%Ps (Brandon *et al.*, 1996),
- (7) 20–30%Ps (Roberts and Clemens, 1994),
- (8) 26–28%Ps (Forizs *et al.*, 1995) and
- (9) 20–29%Ps (Sial *et al.*, 1995).

PRESSURE INDICATED BY MAGMATIC EPIDOTE

Several authors have shown that the magmatic epidote in granitic magma occurs at high pressure. Naney (1983) synthesized epidote in granodiorite melt at 600 to 700 MPa but not

at 200 MPa which indicates the stability of epidote at magmatic conditions. Schmidt (1992) experimentally produced epidote at > 750 MPa in granodiorite melt and > 600 MPa in tonalite. Experimental work by Brandon *et al.*, (1996) investigated the stability of magmatic epidote in granitic magma. They used gem epidote and reacted it with natural granodioritic glass at various pressures. They found that epidote is stable in granodioritic glass at a pressure of 1,150 MPa. At lower pressure (450 MPa) they found that the epidote developed irregular crystal boundaries surrounded by complex reaction rims similar to the reaction textures preserved in granitic rocks. The above works indicate that the magmatic epidote can occur in the granitic magmas at pressures of more than 6 kbar (~ 21 km).

GEOBAROMETRY OF THE PENINSULAR MALAYSIA GRANITOID

The concept of magmatic epidote and its pressure is applied to granitic rocks from Peninsular Malaysia. The Peninsular Malaysia granites are distributed in three parallel belts which have been grouped into 2 granite provinces (Cobbing *et al.*, 1992); the Main Range province with an age range of 200 to 230 Ma and the Eastern province with a range of 200 to 264 Ma. The Eastern granitoid province which consists of the Central belt and the Eastern Belt comprises an extended compositional spectrum from gabbro to monzogranite usually forming small batholiths and small plutons which are generally smaller than those of the Main Range. The latter consists of monzogranites to syenogranites to granodiorite which made up an elongated batholith from north to west central Peninsular Malaysia.

Work on the barometry of Malaysian granitoids based on the aluminium content of amphiboles (Hutchison, 1989; Azman and Khoo, unpublished data) indicate that the highest crystallisation pressure of the granites is 4.98 kbar. The average pressure for the Main Range province and Eastern belt granites are 0.49 to 0.68 kbar and 0.56 to 3.73 kbar respectively. Those from the Central Belt have an average pressure of 2.17 kbar. The geobarometry data

also supported by the metamorphic assemblage in the country rocks. The country rocks, especially in the Eastern Belt, are mainly of andalusite bearing semi-pelites which limit the pressure at which they were metamorphosed to a maximum of 3.75 ± 0.25 kbar (Holdaway and Mukhopadhyay, 1993; Leake and Ahmed Said, 1994).

MAGMATIC EPIDOTE AND PENINSULAR MALAYSIA GRANITOID

Application of hornblende geobarometer to the Peninsular Malaysia granitoid gives the pressure of crystallisation of the granites of 0.49 to 4.98 kbar. The pressure of the granites indicate that the magma crystallised at a depth of less than 15 km. The work on the magmatic epidote indicate that the mineral crystallised at a depth of more than 21 km. If the hypothesis of magmatic epidote is correct, the magmatic epidote could not have crystallised in the Peninsular Malaysia granitic magmas.

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Manuscript received 15 May 1999

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Casablanca Kav 7, Jakarta 12870,
Indonesia.

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PERTAMBAHAN BAHARU PERPUSTAKAAN (New Library Additions)

The Society has received the following publications:

1. AAPG Bulletin vol. 83/10, 83/11 & 83/12, 1999.
2. AAPG Bulletin vol. 84/1 & 84/2, 2000.
3. Episodes, vol. 22, no. 4, 1999.
4. AGID update, no. 3, 1999.
5. American Museum Novitates, no. 3282, 1999.
6. American Museum of Natural History Bulletin no. 242 & 243, 1999.
7. Geological Survey of Japan, Bulletin vol. 50, no. 10–12, 1999.
8. Explanatory notes of Geological Map Suruga Wan, 1999.
9. Sedimentological Map South of Bungo Channel, 1999.
10. Tin International, vol. 73, no. 1, 2000.
11. Mineralogia Polonica, vol. 29, nos. 1 & 2, 1998.
12. Geological Bulletin of Turkey, vol. 42, no. 2, 1999.
13. Bulletin, Du Centre de Recherches Elf exploration production, vol. 22, no. 1, 1999.
14. AAPG Explorer, Dec 1999; Jan & Feb, 2000; Special Issue: a century.
15. Tin International, vol. 72, no. 12, 1999.
16. Monthly statistics on mining industry in Malaysia, Sept & Oct 1999.
17. Bulletin of the National Science Museum, vol. 25, nos. 1, 2, 3 & 4, 1999.
18. National Science Museum Monographs no. 15, 1999.
19. SEAPEX Proceeding: vol. X (1992); XI (1996) & Silver Jubilee (1998).
20. Journal of Shijiazhuang, University of Economics, vol. 22, nos. 2 & 3, 1999.
21. Acta Geoscientia Sinica, vol. 20, nos. 2 & 3, 1999.
22. U.S.G.S. Professional Paper 1998: 1553-D.
23. U.S.G.S. Professional Paper 1999: nos. 1599, 1578, 1650-A & B, 1609.

BERITA-BERITA LAIN

Other News

Local News

Gold refinery to be set up: hi-tech plant with RM3bil turnover in Tanjung Malim

The country's first high technology gold extraction plant will be set up in Tanjung Malim, Perak, in September.

Menteri Besar Datuk Seri Tajol Rosli Ghazali said yesterday the plant, to be located on a 1,000 sq metre site, was capable of producing three tonnes of gold and six tonnes of silver a month, and a small quantity of other precious metals with an annual turnover of RM3 billion.

"The plant, which will employ about 50 workers, can begin its operation after approval from the Department of Environment," Tajol Rosli said.

He was speaking to reporters after witnessing the signing of a memorandum of understanding among the State Economic Development Corporation, Quantum Refinery Sdn. Bhd. and Inochem (Pty) Ltd of South Africa.

The signatories were SDC chief executive Shamsuddin Hashim, Inochem general manager Dewet Francois Combrink and Quantum Refinery general manager Lim Hock Seng.

Tajol Rosli said a joint venture company would be formed by the three but the equity to be held by them had not been decided yet.

The plant, which will be set up at a cost of RM46 million, would be equipped with machines

and technology from South Africa.

Meanwhile Combrink said gold, silver and other precious metals would be extracted from discarded electroplates bought from electronics industries.

"Our company has developed the technology to refine pure gold and other precious metals and we are happy to establish an operation in Malaysia," he said.

Combrink said Malaysia, the 11th largest producer of jewellery, imported about 100 tonnes of gold and the plant was capable of meeting almost 70 per cent of the local demand.

Shamsuddin said at least 13 downstream activities could be carried out when the refinery was running at peak capacity.

"Factories dependent on the refinery can be set up in Tanjung Malim and this will provide employment opportunities to about 1,000 locals," he said.

Lim said Tanjung Malim had the potential of becoming a "gold city in the silver State" and its current location was strategic due to its proximity to Sepang International Airport and the Klang and Penang ports.

"We expect demand for jewellery to go up as people become more affluent," he said.

NST, 20.1.2000

East Coast Highway construction work to start after Chinese New Year

MTD Capital Bhd., a turnkey contractor for the 338-km East Coast Highway, is ready to begin physical work on the first phase of the highway project after the Chinese New Year.

The company expects the first phase, valued at RM800 million, to be completed within two-and-a-half years, its managing director Datuk Azmil Khalid said yesterday.

"All our machines and people are ready to start the highway project. We are only awaiting the (Federal) Government decision," he said.

The first phase of the RM2.62 billion project links Karak to Temerloh in Pahang and Chendering to Bukit Besi in Terengganu. The Government has yet to tender out the remaining

three phases. They are:

- from Maran to Kuantan and Bukit Payung to Bukit Besi
- from Temerloh to Chenor and Jabur to Kuantan
- from Jabur to Bukit Besi

NST, 29.1.2000

RNA to build new gold plant: company expects to double production

Hong Kong-based RNA Holdings Ltd. expects to double its annual gold production to 100 tonnes of kilo-bars and RM2 billion worth of gold jewellery with the opening of its new plant in Penang.

The company, through its local subsidiary MAHF Precious Metal Refinery Sdn. Bhd., plans to build its second gold refinery and exchange centre adjacent to its existing premises at Jalan Sungai.

With an investment of RM40 million, the new premises will house another refinery and 100 workshops to be occupied by jewellery manufacturers or goldsmiths.

MAHF director Charles Tu said the new facility would further complement the company's output for local gold manufacturing and trade business.

At present, the Penang Gold and Jewellery Exchange Centre is the only private-owned licensed refinery to melt, refine and assay gold and other precious metals in Malaysia.

The refinery is located on the ground floor of the six-storey building, with over 70,000 square feet of built-up space. It produces 50 tonnes of gold kilo-bars annually, mostly 916 fine.

A total of 60,000 square feet on the upper six floors is occupied by more than 40 small- and medium-scale jewellery manufacturers, who produce RM1 billion worth of jewellery and ornaments per year.

MAHF procures raw materials in the form of scrap gold jewellery, gold ores and bullion, both domestically and abroad. These are melted, refined and assayed in Penang.

In the process the gold is transformed into gold bars.

Besides supplying gold to manufacturers, MAHF has also established a wholesale unit,

which buys finished products from the centre for export markets.

The new centre, built on a 130,000 square feet land, will be linked to the existing facility via a sky bridge and is expected to be completed by year end.

Tu said the centre would cater particularly for goldsmiths in Penang, as the State represented close to 70 per cent of jewellery manufacturers in the country.

"This will make the company one of the largest fully integrated gold manufacturers and traders in the country," he said after a media visit to the plant on Saturday.

MAHF also plans to introduce electroforming technique to produce gold ornaments at its new refinery.

Tu is confident the company's electroforming products will be well received by the local market.

MAHF has been accredited ISO 9002 Quality System Certificate for quality assurance in production, installation and servicing.

During the booming mid-1990s, the company saw record production of 40,000 pieces of 999 gold bullion (each weighing one kg) or a total of 40 tonnes of gold per year.

This was said to represent one-third of the country's demand for gold.

Malaysia's gold market is said to consume 120 tonnes of gold per year, or RM4.2 billion in value.

Tu said Malaysia was one of the biggest gold fabrication centres and exporters of gold jewellery in the world, adding that it ranked 11th in the international export market.

RNA's retail arm, A & R Gold Mart Sdn. Bhd., is the largest gold jewellery retailing centre in Malaysia.

Located in Johor Baru, the gold supermarket

sells gold jewellery direct to consumers at ex-factory prices.

RNA is a wholly-owned subsidiary of gold giant Tem Fat Hing Fung (Holdings) Limited from Hong Kong.

Its principal business is investment holdings, while the core business of its subsidiary companies is related directly or indirectly to gold, platinum, silver as well as diamond.

NST, 28.2.2000

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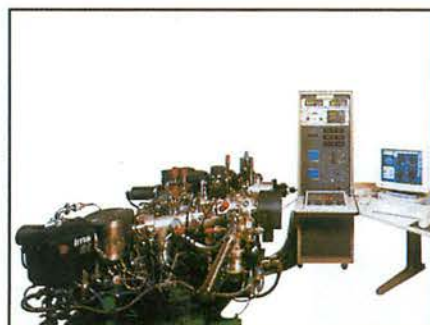
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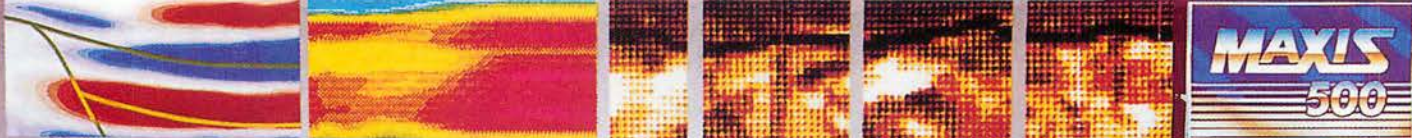


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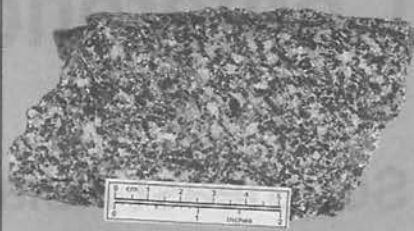
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Granite (Tampin, Negri Sembilan)



5. Diorite (Kg. Kemahang, Kelantan)



6. Basalt (Segamat, Johor)



Serpentine (Fraub, Pahang)



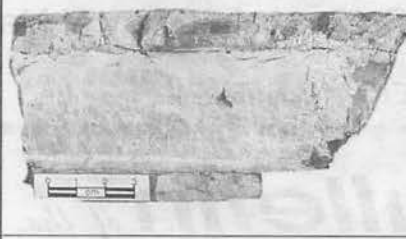
12. Pegmatite (Bukit Mor, Johor)



13. Conglomerate (Pulau Redang, Terengganu)



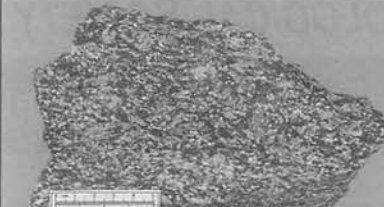
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19. Chert (Nenering, Kedah)



20. Coal (Batu Arang, Selangor)



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Southeast Asian Basins: Oil and Gas for the 21st Century

August 21-24, 1994
Kuala Lumpur, Malaysia

Published by:
Geological Society of Malaysia

Editor: G.H. Teh

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July 1995

SPECIAL PUBLICATION

No. 37

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- Bulletin 10** (Dec 1978). 95 p. A collection of papers on the geology of Southeast Asia. Edited by C.H. Yeap. Price: RM10.00. **Out of stock.**
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- 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: RM6.00.
- Proceedings of the Workshop on Stratigraphic Correlation of Thailand and Malaysia Vol. 1.** (1983). Technical Papers. 383 p. Price: RM25.00 (Members: RM12.00).
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KALENDAR (CALENDAR)

2000

March 6-9

SOCIETY, FOR MINING, METALLURGY, AND EXPLORATION (Annual Meeting), Salt Lake City, Utah, USA. (Contact: SME, 8307 Shaffer Parkway, P.O. Box 625002, Littleton, CO 80162-5002, USA. Tel: 1 303 973 9550; E-mail: smenet@aol.com)

March 8-9

THE NATURE AND TECTONIC SIGNIFICANCE OF FAULT ZONE WEAKENING (International Research Meeting, sponsored by UK Tectonic Studies Group), London, UK. (Contact: R.E. Holdsworth, Department of Geological Sciences, University of Durham, Durham DH1 3LE, UK. Fax: +44 0191 374 2510; E-mail: R.E. Holdsworth@durham.ac.uk; Website: <http://www.dur.ac.uk/~dglms/reh.htm>; abstract deadline: 30 September 1999)

April 16-19

AMERICAN ASSOCIATION OF PETROLEUM GEOLOGISTS (Annual Meeting), New Orleans, Louisiana, USA. (Contact: AAPG Conventions Department, P.O. Box 979, 1444 S. Boulder Ave., Tulsa, OK 74101-0979, USA. Tel: +1 918 560 2679; Fax: +1 918 560 2684; E-mail: dkeim@aapg.org)

April 22-24

15TH HIMALAYA-KARAKORAM-TIBET WORKSHOP, Chengdu, China. (Contact: Dr. Deng Bin, 15th HKT Affairs Office, Chengdu University of Technology, No. 1, Erxianqiao, Dongsan Road, Chengdu, 610059, P.R. China. Tel: +86-28-4 079 488, -28-4 079 887; Fax: +86-28-4 077 099, -28-4 077 163; E-mail: 15hkt@cdit.edu.cn; Website: <http://www.cdit.edu.cn/15hkt/>)

April 24-28

ENVIRONMENTAL GEOCHEMISTRY (5th International Symposium), Cape Town, South Africa. (Contact: Department of Geological Sciences, University of Cape Town, Private bag, Rondebosch 7701, South Africa; Fax: +27-21 650 3783; E-mail: 5iseg@geology.uct.ac.za)

April 29-30

MODERN & ANCIENT ICE-MARGINAL LANDSYSTEMS (International Symposium), Keele, Staffs, UK. (Contact: Dr. Andrew J. Russell, Dr. David J.A. Evans, School of Earth Sciences & Geography, Keele University, Staffs, ST5 5BG, UK. E-mail: a.j.russel@keele.ac.uk or devans@geog.gla.ac.uk)

May 7-11

SALT SYMPOSIUM, The Hague, The Netherlands. (Contact: Secretariat Organizing Committee, 8th World Salt Symposium, P.O. Box 25, 7550 GC Hengelo Ov, The Netherlands. Tel: 31 74 244 3908; Fax: 31 74 2443272; E-mail: Salt.2000@inter.NL.net)

May 15-16

PERMO-CARBONIFEROUS CARBONATE PLATFORMS AND REEFS (A Research and Field Conference jointly sponsored by SEPM and IAS), El Paso, Texas, USA. (Contact: Judy Tarpley, SEPM 1731 E, 71 Street, Tulsa, OK 74136, USA. Tel: +1 918 493 33 61; Fax: +1 918 493 20 93; E-mail: jtarples@sepm.org; Website: <http://www.sepm.org/research/conferences/permcarb2000.html>)

May 15-18

GEOLOGY AND ORE DEPOSITS 2000: THE GREAT BASIN AND BEYOND (Conference), Reno-Spark, Nevada, USA. (Contact: Geological Society of Nevada, P.O. Box 12021, Reno, Nevada 89510, USA. Tel: +1-702 323 3500; Fax: +1-702 323 3599; E-mail: gsnsymp@nbnmg.unr.edu; Website: <http://www.seismo.unr.edu/GSN>)

May 15-19

EARLY VERTEBRATES-LOWER VERTEBRATES (International Meeting), Flagstaff, USA. (Contact: Dr. D.K. Elliot, Department of Geology, Box 4099, Northern Arizona University, Flagstaff, Arizona 86011-4099, USA. Tel: +1 520 523 7188; Fax: +1 520 523 9220; E-mail: David.Elliot@nau.edu)

May 23-25

TRACERS AND MODELLING IN CONTAMINANT HYDROLOGY (International Conference), Liege, Belgium. (Contact: TraM2000, LGIH, University of Liege, B19 Sart-Tilman, 40000 Liege, Belgium. Tel: +32 4

366 2216; Fax: +32 4 366 2817; E-mail: adassarg@lgh.ulg.ac.be)

May 29 – June 2

62ND EAGE CONFERENCE & TECHNICAL EXHIBITION, GLASGOW, Scotland, UK. (Contact: EAGE Conference Dept., P.O. Box 59, 3990 DB Houten, The Netherlands. Tel: +31 30 6354055; Fax: +31 30 6343524)

May 30 – June 3

AMERICAN GEOPHYSICAL UNION (Spring Meeting), Washington, DC, USA. (Contact: AGU Meetings Department, 2000 Florida Avenue, NW, Washington, DC 20009 USA. Tel: +1 202 462 6900; Fax: +1 202 328 0566; E-mail: meetinginfo@kosmos.agu.org; Website: <http://www.agu.org>)

June 4–8

GSA PENROSE CONFERENCE "GREAT CASCADIA EARTHQUAKE TRICENTENNIAL", Seaside, Oregon, USA. (Contact: John Clague, Department of Earth Sciences, Simon Fraser University, Burnaby, British Columbia V5A 1S6 Canada. E-mail: jclague@sfu.ca)

June 4–9

INTERNATIONAL SYMPOSIUM ON THE BIOGEOGRAPHY OF SE ASIA 2000, Leiden, The Netherlands. (Contact: Rienk de Jong, Nationaal Natuurhistorisch Museum, Department of Entomology, P.O. Box 9517, NL-2300 RA Leiden, The Netherlands. Tel: +31 71 516 26 52; Fax: +31 71 513 33 44; E-mail: jong@nrm.nl.)

June 14–16

MANAGEMENT INFORMATION SYSTEMS, INCORPORATING REMOTE SENSING, Lisbon, Portugal. Organised by Wessex Institute of Technology, UK. (Contact: Gabriella Cossutta. Tel: +44 (0)238-029-3223; Fax: +44 (0) 238-029-2853; E-mail: gcossutta@wessex.ac.uk; Website: www.wessex.ac.uk/conferences/2000)

June 24–30

INTERNATIONAL PALYNOLOGICAL CONGRESS (10th), Nanjing, China. (Contact: Secretary of the Organizing Committee for 10th International Palynological Conference, Nanjing Institute of Geology and Palaeontology, Academis Sinica, 39 East Beijing Road, nanjing

210008, China. Website: <http://members.spree.com/sip/spore/index.htm>)

June 27–30

PETROGRAPHY ON THE VERGE OF THE XXI CENTURY: RESULTS AND PERSPECTIVES (The Second Russian Petrographic Meeting), Syktyvkar, Komi Republic, Russia. (Contact: Dr. Irina Golubeva, Institute of Geology of Komi Sc. Centre UD RAS, Pervomaiskaya st., 54, Syktyvkar, 167610, Russia. Tel: +7(8212)447262; Fax: +7(8212)425346; E-mail: petr@geo.komo.ru)

July 3–7

GEOLOGICAL SOCIETY OF AUSTRALIA (Biennial Meeting), 15TH AUSTRALIAN GEOLOGICAL CONVENTION (Theme: Understanding Planet Earth — Searching for a sustainable future), University of Technology, Sydney, Australia. (Contact: Misha Frankel, Geological Society of Australia, Suite 706, 301 George Street, Sydney, NSW, Australia. Tel: +61 2 92902194; Fax: +61 2 9290 2198; E-mail: 15thagc@gsa.org.au; Website: www.science.uts.edu.au/agc/agchome.html)

July 3–7

18TH COLLOQUIUM OF AFRICAN GEOLOGY (Hosted and organized by the Austrian Geological Society and the Austrian Mineralogical Society), Graz, Austria. (Contact: Institut für Geologie und Paläontologie, Karl-Franzens-Universität Graz, Heinrichstraße 26, A-8010 Graz, Austria. Tel: +43-316-380-5587; Fax: +43-316-380-9870; E-mail: cag18@bimn22.kfunigraz.ac.at)

July 9–12

INTERNATIONAL CONFERENCE ON CATASTROPHIC EVENTS AND MASS EXTINCTIONS: IMPACTS AND BEYOND, Vienna, Austria. Sponsored by: University of Vienna, Lunar and Planetary Institute, European Science Foundation IMPACT Program, Federal Ministry of Science and Transport, Austria, and the Geological Survey of Austria. (Contact: Elizabeth Wagganer, Impact 2000 Conference, Lunar and Planetary Institute, 3600 Bay Area Boulevard, Houston TX 77058-1113. Tel: (281)486-2177; E-mail: wagganer@lpi.jsc.nasa.gov; Website: <http://cass.jsc.nasa.gov/meetings/impact2000/>)

July 11-15

APC-2000, COMBINED AUSTRALIAN PALAEOONTOLOGICAL CONVENTION; 3RD INTERNATIONAL SYMPOSIUM ON THE SILURIAN SYSTEM; AND 2ND AUSTRALIAN CONODONT SYMPOSIUM, New South Wales, Australia. (Contact: George Wilson, Department of Earth and Planetary Sciences, Macquarie University, Sydney, NSW 2109, Australia. Website: <http://www.es.mq.edu.au/MUCEP/auscos/auscos.htm>)

July 12-14

GEOFLUID-III 2000 (The third international conference on fluid evolution, migration and interaction in sedimentary basins and orogenic belts), Barcelona, Spain. (Organized by the University of Barcelona and Instituto Jaume Almera. Website: www.ub.es/geoquimi/geofluids)

July 16-22

APPLIED MINERALOGY — ICAM 2000 (6th International Congress), Göttingen & Hannover, Germany. (Contact: ICAM 2000 Office, P.O. Box 510153, D-30631 Hannover, GERMANY. Tel: +49-511 643 2298; Fax: +49-511 643 3685; E-mail: ICAM2000@bgr.de; Website: www.bgr.de/ICAM2000; abstract deadline: September 1, 1999)

July 16-22

"GEO-INFORMATION FOR ALL" (19th International Congress of the International Society for Photogrammetry and Remote Sensing), Amsterdam, The Netherlands. (Contact: Prof. K.J. Beek, P.O. Box 6, 7500 AA Enschede, The Netherlands. Tel: +31 (0) 53 4874214; Fax: +31 (0) 53 4874200; E-mail: beek@itc.nl)

July 18-23

INTERNATIONAL ASSOCIATION OF VOLCANOLOGY AND CHEMISTRY OF THE EARTH INTERIOR (IAVCEI) GENERAL ASSEMBLY 2000, Bandung, Indonesia. (Contact: Secretariat, Volcanological Survey of Indonesia, Jalan Diponegoro 57, Bandung 40122, Indonesia. Tel: +62-22 772606; Fax: +62-22 702761; E-mail: iavcei@vsi.dpe.go.id; Website: <http://www.vsi.dpe.go.id/iavcei.html>; abstract deadline: February 29, 2000)

July 31 - August 4

JOINT WORLD CONGRESS ON GROUNDWATER, Fortaleza, Brazil. (Contact: ABAS, Ceara Chapter, Av. Santa Dumont, 7700 Papicu, Fortaleza, CEP 60 150-163, Brazil. Tel: +55 85 265 1288; Fax: +55 85 265 2212)

August 6-17

31ST INTERNATIONAL GEOLOGICAL CONGRESS, Geology and Sustainable Development: Challenges for the Third Millennium, Rio de Janeiro, Brazil. (Contact: 31st IGC Secretariat Bureau, Av. Pasteur, 404-ANEXO 31 IGC, Urca, Rio de Janeiro RJ, CEP 22.290-240 Brazil. Tel: +55 21 295 5847; Fax: +55 21 295 8094; E-mail: 3ligc@crystal.cprm.gov.br; Website: www.3ligc.org. To request current Circular, send e-mail to <mailto:address@3ligc.org>)

September 3-8

GOLDSCHMIDT 2000 (International Conference), Oxford, UK. (Contact: P. Beattie, Cambridge Publications, Publications House, P.O. Box 27, Cambridge UK CB1 4GL. Tel: +44-1223 333438; Fax: +44-1223 333438; E-mail: Gold2000@campublic.co.uk; Website: <http://www.campublic.co.uk/science/conference/Gold2000/>)

September 11-15

8TH INTERNATIONAL NANNOPLANKTON ASSOCIATION CONFERENCE, Bremen, Germany. (Contact: Prof. Helmut Willems, FB-5-Geowissenschaften, Universität Bremen, Postfach 330 440, 28334 Bremen, Germany. Tel: +49 421 21 82 198; Fax: +49 421 21 84 451; E-mail: willems@micropal.uni-bremen.de; Website: <http://uni.bremen.de/~micropal/ina8.html>)

September 17-21

7TH INTERNATIONAL CONFERENCE ON PALEOCEANOGRAPHY, Sapporo, Japan. (Contact: Prof. Helmut Weissert, Geological Institute, ETH-Zurich, CH-8092 Zurich Switzerland. Tel: +41 (0)1 632 37 15; Fax: +41 (0)1 632 10 30; E-mail: helmi@erdw.ethz.ch; Website: <http://www.ijnet.or.jp/jtb-cs/icp7/>)

September 17-26

KARST'2000: 6TH INTERNATIONAL SYMPOSIUM AND FIELD SEMINAR ON PRESENT STATE AND FUTURE TRENDS OF KARST STUDIES, Marmaris, Turkiye. (Contact: Hacettepe University, International Research and Application Centre for Karst Water Resources (UKAM), Beytepe Campus, 06532 Ankara, Turkiye. Fax: 90 312 299 213; E-mail: ukam@naim.jeo.edu.tr)

September 25-29

12TH INTERNATIONAL SYMPOSIUM ON PLACER AND WEATHERED ROCK DEPOSITS, Moscow, Russia. Pre-congress and post-congress workshops and field excursions. Abstract deadline: May 1, 2000. (Contact: Prof. Patyk-Kara N.G., Secretary General, IGEN RAS, 35. Staromonetny Per., 109017 Moscow. Tel: 7(095)230-8427; Fax: 7(095)230-2179; E-mail: rkv2000@igem.ru; Website: <http://www.igem.ru/symp/rkv2000/>)

October

INTERNATIONAL MILLENNIUM CONGRESS ON GEOENGINEERING, Melbourne, Australia. (More information soon)

October 11-13

RISK ANALYSIS 2000, Second International Conference on Computer Simulation in Risk Analysis and Hazard Mitigation, Bologna, Italy. Organised by Wessex Institute of Technology (WTT), Ashurst Lodge, Ashurst, Southampton SO40 7AA, UK. (Contact: Karen Savage, RISK 2000/1479. Tel: +44(0)238 029 3223; Fax: +44(0)238 029 2853; E-mail: ksavage@wessex.ac.uk; Website: www.wessex.ac.uk/conferences/2000)

October 15-18 (Provisional)

AMERICAN ASSOCIATION OF PETROLEUM GEOLOGISTS (International Meeting), Bali, Indonesia. (Contact: AAPG Conventions Dept., P.O. Box 979, Tulsa, OK 74101-0979, USA. Tel: 1 918 560 2679; Fax: 1 918 560 2684)

October 23-27

9TH INTERNATIONAL CORAL REEF SYMPOSIUM, Bali, Indonesia. (Contact: Secretariat of the International Coral Reef Symposium, c/o COREMAP, Jl. Raden Saleh 43, Jakarta 10330, Indonesia. Tel: +62 21 314 30 80; Fax: +62 21 327 958; E-mail:

coremap@indosat.net.id; Website: <http://www.coremap.or.id>)

October 23-27

INTERNATIONAL ASSOCIATION OF HYDROGEOLOGISTS (30th Annual Meeting), Cape Town, South Africa.

November 13-16

GEOLOGICAL SOCIETY OF AMERICA (Annual Meeting), Reno, Nevada, USA. (Contact: GSA Meetings Dept., P.O. Box 9140, Boulder, CO 80301-9140, USA. Tel: +1 303 447 2020; Fax: +1 303 447 1133; E-mail: meetings@geosociety.org; WWW: <http://www.geosociety.org/meetings/index.htm>)

November 19-24

GEOTECHNICAL AND GEOLOGICAL ENGINEERING — GEOENG 2000 (International Conference), Melbourne, Australia. (Contact: GeoEng2000, ICMS Pty. Ltd., 84 Queensbridge Street, Southbank, Vic 3006, Australia. Tel: +61 3 9682 0244; Fax: +61 3 9682 0288; E-mail: geoeng2000@icms.com.au; Website: <http://civil-www.eng.monash.edu.au/discipl/mgg/geo2000.htm>)

December 3-6

DEEP WATER RESERVOIRS OF THE WORLD (Gulf Coast Section of Society of Economic Paleontologists and Mineralogists Foundation Research Conference), Houston, Texas. (Contact: GCSSEPM Foundation, 165 Pineburst Rd., West Hartland, Conn. 06091-0065. Tel: 800/436-1424; Fax: 860/738-3542; E-mail: gcssepm@mail.snet.net; Website: <http://www.gcssepm.org>)

December 11-16

INTERNATIONAL SYMPOSIUM AND FIELD WORKSHOP ON GEODYNAMIC EVOLUTION OF HIMALAYA-KARAKORAM-EASTERN SYNTAXIS (INDO-BURMA RANGE)-ANDAMANNICOBAR ISLAND ARC AND ADJOINING REGION, Lucknow, India. (Contact: Prof. A.K. Sinha, Director/Dr. Anil Chandra, Organizing Secretary, Birbal Sahni Institute of Palaeobotany, 53 University Road, Lucknow 226 001, India. Tel: 0091-0522-333620/32491/323206/325822/325945; Fax: 0091-0522-381948/374528; E-mail: bsip@bsip.sirnetd.ernet.in)

December 15–19

AMERICAN GEOPHYSICAL UNION (FALL MEETING), San Francisco, California, USA. (Contact: AGU Meetings Department, 2000 Florida Avenue, NW, Washington, DC 20009 USA. Tel: +1 202 462 6990; Fax: +1 202 328 0566; E-mail: meetinginfo@kosmos.agu.org; Website: <http://www.agu.org>)

2001**May 11–21**

MID-PALAEOZOIC BIO- AND GEODYNAMICS: THE NORTH GONDWANA-LAUSSIA INTERACTION, Joint meeting of the 'International Geological Correlation Program (IGCP) 421' and the 'Subcommission on Devonian Stratigraphy (SDS)' hosted by the 'Senckenbergische Naturforschende Gesellschaft', Frankfurt am Main at the 'Forschungsinstitut und Naturmuseum Senckenberg' Frankfurt am Main, Germany. (Contact: G. Plodowski, Forschungsinstitut Senckenberg, Senckenberganlage 25. D-60325 Frankfurt am Main. Tel: ++49-69-97075127; Fax: ++49-69-97075137; E-mail: gplodows@sngkw.uni-frankfurt.de)

June 3–6

AMERICAN ASSOCIATION OF PETROLEUM GEOLOGISTS (Annual Meeting), Denver, Colorado, USA. (Contact: AAPG Conventions Department, P.O. Box 979, 1444 S. Boulder Ave., Tulsa, OK 74101-0979, USA. Tel: +1 918 560 2679; Fax: +1 918 560 2684; E-mail: dkeim@aapg.org)

June 11–16

63RD EAGE CONFERENCE & TECHNICAL EXHIBITION, Amsterdam, The Netherlands. (Contact: EAGE Conference Dept., P.O. Box 59, 3990 DB Houten, The Netherlands. Tel: +31 30 6354055; Fax: +31 30 6343524)

July 30 – August

INTERNATIONAL ASSOCIATION OF ENGINEERING GEOLOGY AND THE ENVIRONMENT (IAEG), "Engineering Geological Problems of Urban Areas" (International Symposium), Ekaterinburg, Russia. (Contact: Secretariat, "EngGeolCity-2001, UralTISIZ 79, Bazhov str., Ekaterinburg,

Russia 620075. Tel: +7 3432 559772; Fax: +7 3432 550043; E-mail: UralTIS@etel.ru)

August 23–28

INTERNATIONAL CONFERENCE ON GEOMORPHOLOGY (5th), Tokyo, Japan. (Contact: Prof. K. Kashiwaya, Dept. of Earth Sciences, Kanazawa University, Kanazawa, 920-1192 Japan. E-mail: kashi@kenroku.kanazawa-u.ac.jp)

September 6–12

IAMG2001 (THE ANNUAL CONFERENCE OF THE INTERNATIONAL ASSOCIATION FOR MATHEMATICAL GEOLOGY), Cancún, Mexico. (Contact: IAMG2001 Conference Secretariat, c/o Jorgina A. Ross, Kansas Geological Survey, 1930 Constant Avenue, Lawrence, KS 66047-3724, USA. Tel: +785-864-3965; Fax: +785-864-5317; E-mail: aspiazu@kgs.ukans.edu; Website: <http://www.kgs.ukans.edu/Conferences/IAMG/index.html>)

November 5–8

GEOLOGICAL SOCIETY OF AMERICA (Annual Meeting), Boston, Massachusetts, USA. (Contact: GSA Meetings Dept., P.O. Box 9140, Boulder, CO 80301-9140, USA; Tel: +1 303 447 2020; Fax: +1 303 447 1133; E-mail: meetings@geosociety.org; WWW: <http://www.geosociety.org/meetings/index.htm>)

2002

INTERNATIONAL ASSOCIATION ON THE GENESIS OF ORE DEPOSITS (11th International Symposium), South Africa. (Contact: Dr. Erik Hammerbeck, Geological Survey, Department of Mineral and Energy Affairs, 280 Pretoria Street, Private Bag X112, Silverton, Pretoria 0001, South Africa. Tel: +012 841 1130; Fax: +012 841 1203; E-mail: ehammerb@geoscience.org.za)

April 7–10

AMERICAN ASSOCIATION OF PETROLEUM GEOLOGISTS (Annual Meeting), Houston, Texas, USA. (Contact: AAPG Conventions Department, P.O. Box 979, 1444 S. Boulder Ave., Tulsa, OK 74101-0979, USA. Tel: +1 918 560 2679; Fax: +1 918 560 2684; E-mail: dkeim@aapg.org)

July 7–12

16TH INTERNATIONAL SEDIMENTOLOGICAL CONGRESS, Auckland Park, Gauteng, South Africa. (Contact: Bruce Cairncross, Department of Geology, Rand Africans University, P.O. Box 524, Auckland Park, 2006, South Africa. Tel: +27 11 489 23 13; Fax: +27 11 489 23 09; E-mail: bc@na.rau.ac.za; Website: <http://general.rau.ac.za/geology/announcement.htm>)

September 16–20

INTERNATIONAL ASSOCIATION OF ENGINEERING GEOLOGY AND THE ENVIRONMENT (IAEG), "Engineering Geology for Developing Countries" (9th International Congress), Durban, South Africa. (Contact: The Technical Committee, 9th IAEG Congress, P.O. Box 1283, Westville 3630, South Africa)

October 28–31

GEOLOGICAL SOCIETY OF AMERICA (Annual Meeting), Denver, Colorado, USA. (Contact: GSA Meetings Dept., P.O. Box 9140, Boulder, CO 80301-9140, USA; Tel: +1 303 447 2020; Fax: +1 303 447 1133; E-mail: meetings@geosociety.org; WWW: <http://www.geosociety.org/meetings/index.htm>)

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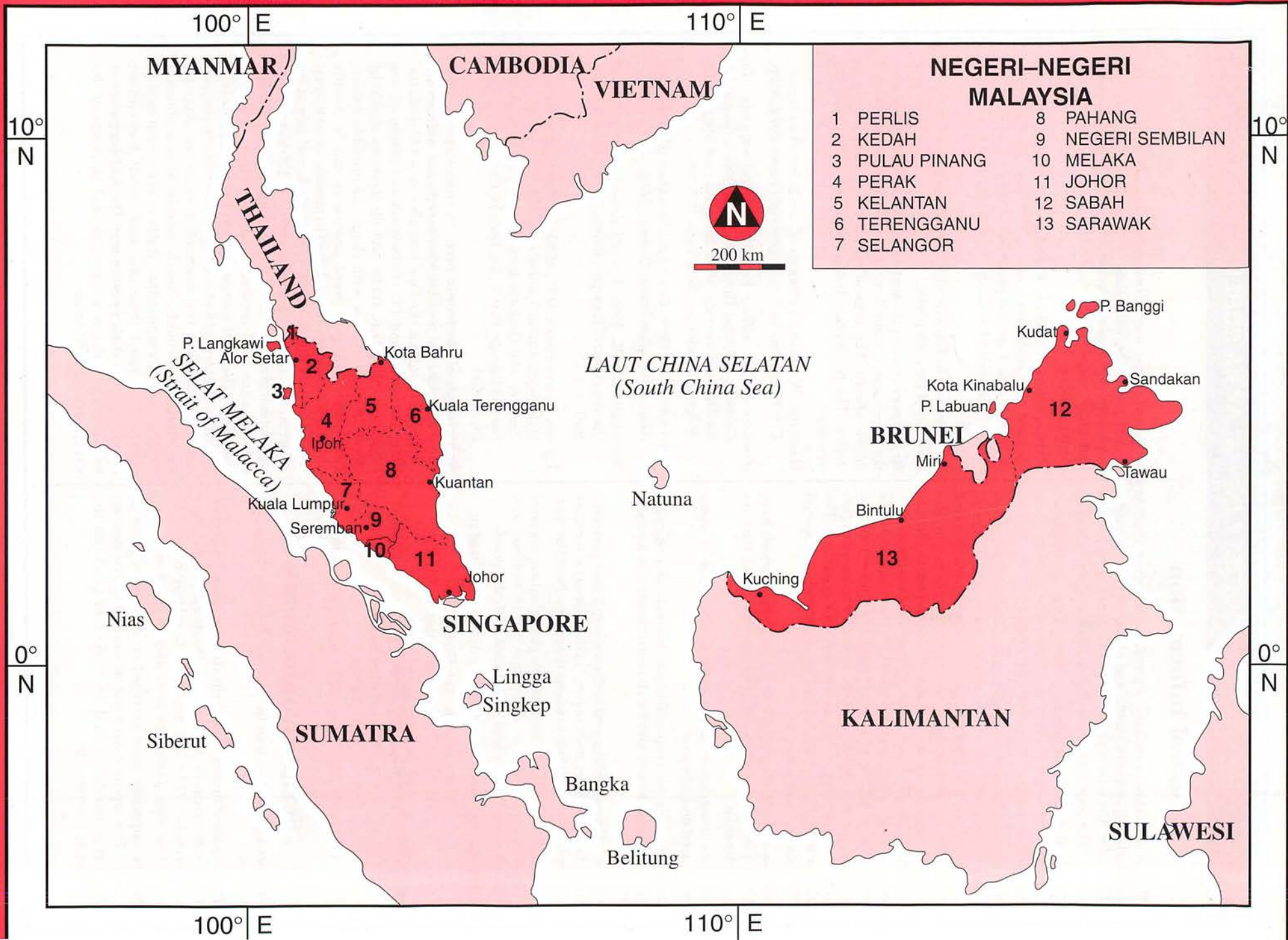
HOSKING, K.F.G., 1973. Primary mineral deposits. In Gobbett, D.J. and Hutchison, C.S. (Eds.), *Geology of the Malay Peninsula (West Malaysia and Singapore)*. Wiley-Interscience. New York, 335-390.

HUTCHISON, C.S., 1989. *Geological Evolution of South-east Asia*. Clarendon Press, Oxford. 368p.

SUNTHARALINGAM, T., 1968. Upper Paleozoic stratigraphy of the area west of Kampar, Perak. *Geol. Soc. Malaysia Bull. 1*, 1-15.

TAYLOR, B., AND HAYES, D.E., 1980. The tectonic evolution of the South China Sea basin. In: D.E. Hayes (Ed.), *The Tectonic and Geologic Evolution of Southeast Asian Sea and Islands, Part 2. Am. Geophys. Union Monograph 23*, 89-104.

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1 PERLIS	8 PAHANG
2 KEDAH	9 NEGERI SEMBILAN
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4 PERAK	11 JOHOR
5 KELANTAN	12 SABAH
6 TERENGGANU	13 SARAWAK
7 SELANGOR	

MYANMAR

CAMBODIA
VIETNAM

NEGERI-NEGERI MALAYSIA

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| 1 PERLIS | 8 PAHANG |
| 2 KEDAH | 9 NEGERI SEMBILAN |
| 3 PULAU PINANG | 10 MELAKA |
| 4 PERAK | 11 JOHOR |
| 5 KELANTAN | 12 SABAH |
| 6 TERENGGANU | 13 SARAWAK |
| 7 SELANGOR | |



SELAT MELAKA
(Strait of Malacca)

LAUT CHINA SELATAN
(South China Sea)

BRUNEI

KALIMANTAN

SULAWESI

Nias

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Seremban
Johor

P. Banggi
Kudat
Sandakan
Kota Kinabalu
P. Labuan
Miri
Bintulu
Kuching
Tawau

10° N

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110° E

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