

PERSATUAN GEOLOGI MALAYSIA

WARTA GEOLOGI

NEWSLETTER OF THE GEOLOGICAL SOCIETY OF MALAYSIA

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CATATAN GEOLOGI (GEOLOGICAL NOTES)

ENGINEERING GEOLOGY CHARACTERISTICS OF A GRANITIC MASS, PENANG

Lim Tow Ho,
4, Solok Scott, Penang.

Introduction

This note discusses the engineering geology characteristics of a granitic mass with emphasis on discontinuities. References had been made in Attewell and Farmer (1976) and Zaruba and Mencl (1976) on engineering geology classification and discontinuities. In engineering geology, mechanical properties of the rocks are of importance because there is a need to know and understand the stability of slopes and response of rock to loading. Among the mechanical properties, rock strength and discontinuities are of prime importance. The rock mass examined is a quarry located in Telok Bahang, Penang. As in most quarries, the slope of the examined rock surface is near vertical and exposed by blasting.

Engineering geology characteristics

Rock material predominates in the examined mass. The examined rock is a medium to coarse grained biotite granite. The granite is homogeneous meaning that the entire quarry exposes granite only. Colour of the granite is indicative of it's grade of weathering. The area examined was blasted some time ago and the granitic surface is discoloured. Some areas near the bottom is dark grey and towards the top it is greyish yellow. The granite is slightly weathered or Grade II. Towards the Southern area of the quarry where rock blasting is ongoing, the rock surface is greyish white. The granite there is fresh rock or Grade I. In some areas the granitic surface is covered with a thin layer of clayey material and other areas with fine organic material.

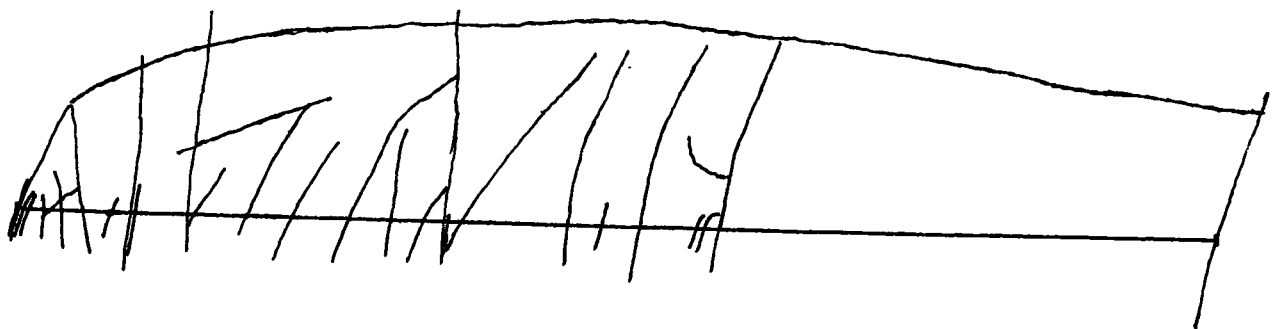
The strength of the granite is high as indicated by blows from a geologic hammer. Deere and Miller (1966) stated that the uniaxial compressive strength of intact granitic rock ranges from 100 to 200 MPa. This rock material could be considered as strong.

Discontinuities are common and are either joints or faults with the former predominating. Rock failure is generally along the plane of discontinuities and rock slope stability heavily influenced by it. Rock slope failure is well discussed by Hoek and Bray (1977). A major fault zone occurs along the center of the quarry and has a dip of 60 degrees. Discontinuities which are joints are either near vertical or near horizontal. The joints also occur in sets and in parallel formation. Some near horizontal joints which are sheet joints, when exposed, show surfaces which are curved. The length of the discontinuities is quite extensive. Some near vertical discontinuities extend almost the entire height of the quarry which is approximately 100 metres.

Two line scans were performed in areas which are representative of the granite. Sketches showing the line scans and discontinuity patterns are shown in Fig. 1. The total length of the two line scans is 18.8 metres. The spacing of the discontinuities measured ranges from 0.4 cm to 380 cm, average spacing is 29.3 cm and the standard deviation is 56.5 cm. The standard deviation is higher than average spacing because the spacing shows wide variations from areas where there are many and close to others where there are few and very wide apart.



Line Scan A : 8.0 metres



Line Scan B : 10.8 metres

Fig. 1. Sketches showing the two line scans and discontinuity patterns in granitic mass, Telok Bahang Quarry, Penang.

The surface of the discontinuities is slightly rough. Opening of the discontinuities is generally less than 1 mm. Generally where the length of the discontinuities are short, the openings are small and where it is extensive, the openings are wider. Brekke and Howard (1972) commented that discontinuities may have infillings of quartz, calcite or chlorite. It is possible that some of the discontinuities examined may have infillings but I am uncertain of their nature.

In the granitic mass examined, groundwater was not observed. The discontinuities appear to be dry. However in one area of the quarry, the surface of the rock is wet. It is concluded that the water there is surface runoff from rainwater precipitated on the top of the quarry.

Conclusion

The examined rock mass is granite, though strong it has many discontinuities. Grade of weathering being Grade II is fairly consistent but discontinuities vary in their occurrence. In areas where discontinuities are abundant overall, rock strength and stability would be lower than in areas where there are no or very few discontinuities. Rock strength is also influenced by the state of weathering.

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THE KUANTAN BASALTS - A MULTI-VENT ORIGIN

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Jabatan Geologi, Universiti Malaya, 59100 Kuala Lumpur.

Abstract

The outcrop pattern of the Kuantan basalts, in relation to present-day topographic features, indicates that they have been extruded at more than one site. In the immediate vicinity of Kuantan town, interpreted palaeo-flow directions show the presence of two vents; one at Bt. Tinggi, and the other at a hill located 1.9 km to the northwest of Bt. Ubi.

Introduction

Basaltic lavas and dolerite dykes in the Kuantan area were first mapped and described in detail by Fitch (1951). The basaltic lavas cover an area of some 125 km² and are the youngest rocks of the Malay Peninsula for K-Ar dating shows them to range in age from 2.5 ± 0.1 Ma to 1.2 ± 0.1 Ma with an average of 1.7 ± 0.2 Ma (Bignell, 1972; Bignell and Snelling, 1977a; Haile *et al.*, 1983). The dolerite dykes, ranging in thickness from 2 cm to about 5 m, mainly trend between northeast and east (Hanif, 1975) and intrude Upper Palaeozoic sedimentary rocks (Fitch, 1951) as well as Late Permian to Early Triassic granitic rocks (about 250 Ma, Bigness and Snelling, 1977b). Fitch (1951) considered that these dolerite dykes represented feeder fissures to the basaltic lavas and thus implied a consanguineous relationship between them. K-Ar dating of a dyke sample at 1.1 ± 0.4 Ma and a basalt sample at 1.6 ± 0.2 Ma (Bigness and Snelling, 1977b), however, indicates a long time interval between the two igneous events. Haile *et al.* (1983), furthermore, pointed out that although the dolerite dykes and basaltic lavas were closely associated spatially, they differed in petrology, age and in palaeomagnetic direction and were thus not genetically related. K-Ar dates for the dolerite dykes, some of which cross-cut one another, however, show a considerable range from 79 ± 2 Ma to 129 ± 2 Ma and it was noted by Haile *et al.* (1983), that the age of the dolerite dykes *has not been established as certainly as might be desired.*

Fitch (1951) furthermore, considered that although the very numerous dolerite dykes showed that eruption of the basaltic lavas was of the fissure type, the centre of extrusion was probably near Bt. Tinggi (at an elevation of 138 m above sea level); this being the highest point where the basalts were found. Bignell (1972) considered the basalts to be of a central volcanic vent type eruption and similarly suggested that this vent was located at Bt. Tinggi. Hanif (1975) also considered that the basalts were of a central volcanic vent type eruption (the vent being

situated at Bt. Tinggi) and pointed out that two types of lava flow (i.e. an alkali olivine basalt and a basanite) could be differentiated; the basanite type being extruded over the alkali olivine type. Chakraborty (1977) considered that these basaltic lavas mainly originated from two different and mutually independent types of magma (alkali olivine basalt magma and olivine nephelinite magma) that erupted from a single centre (Bt. Tinggi as suggested by Fitch) without any significant time difference. Chakraborty (1980) and Charkraborty *et al.* (1980), furthermore, considered that these basaltic lavas comprise three distinct petrographically distinguishable groups, namely alkali olivine basalt, limburgite and olivine nephelinite. Fitch (1951) and Hanif (1975) have also recorded the presence of vertical columnar joints within the basaltic lavas and this has been used as a criterion for tectonic stability of the Peninsula during the Late Cenozoic by several writers (including Stauffer, 1973 and Gobbet and Tjia, 1973).

Kuantan basalts - outcrop pattern

The writer is presently attempting to decipher the Late Tertiary (i.e. pre-Basalt) landscape of the Kuantan area and has, as such, been mapping (at a scale of 1:25,000) the outcrop pattern of the basaltic lavas. Fresh and unweathered exposures of these basalts are of a restricted and isolated occurrence for they are usually deeply weathered, with regoliths often exceeding 20 m in thickness. These regoliths are, however, extremely distinctive for they are characterized by dark brown to red colours and clayey textures which readily differentiates them from the yellowish to orange coloured, and silty to sandy textured, regoliths developed over the other bedrock types (i.e. granitic, acidic volcanic and sedimentary rocks) of the Kuantan area. All of these regoliths are only exposed in undulating to hilly areas, for in the low-lying areas (mostly located below the 50 ft contour line, as in flat bottomed valleys, flood-plains and the coastal plain) unconsolidated, alluvial and littoral deposits are found. Small pockets of colluvial sediments (Raj, 1983), as well as dolerite and quartz dikes, are also found locally, though they cannot be represented at the chosen scale of mapping.

Fig. 1 shows the distribution pattern of the regoliths developed over different bedrock types in the immediate vicinity of Kuantan town. The distribution pattern of the fluvial and littoral deposits of the area is also shown. It is to be noted that Fig. 1 is a form of 'Drift Map', for it only shows the distribution pattern of unconsolidated and loose earth materials, be they regoliths or sedimentary deposits. It is furthermore, to be noted that a minimum thickness of 1 m has been used for the field mapping and delineation of the different regoliths. This feature of minimum thickness needs to be particularly emphasized, for in several places (as along the Kuantan By-Pass Highway), slope cuts expose basalt regoliths of variable thicknesses unconformably overlying granitic regoliths (Fig. 2).

Kuantan basalts - Palaeo-flow directions

In view of the significant age difference between the basaltic lavas and granitic rocks, it can be considered that the interface between their two regoliths represents the original ground surface over which the lavas

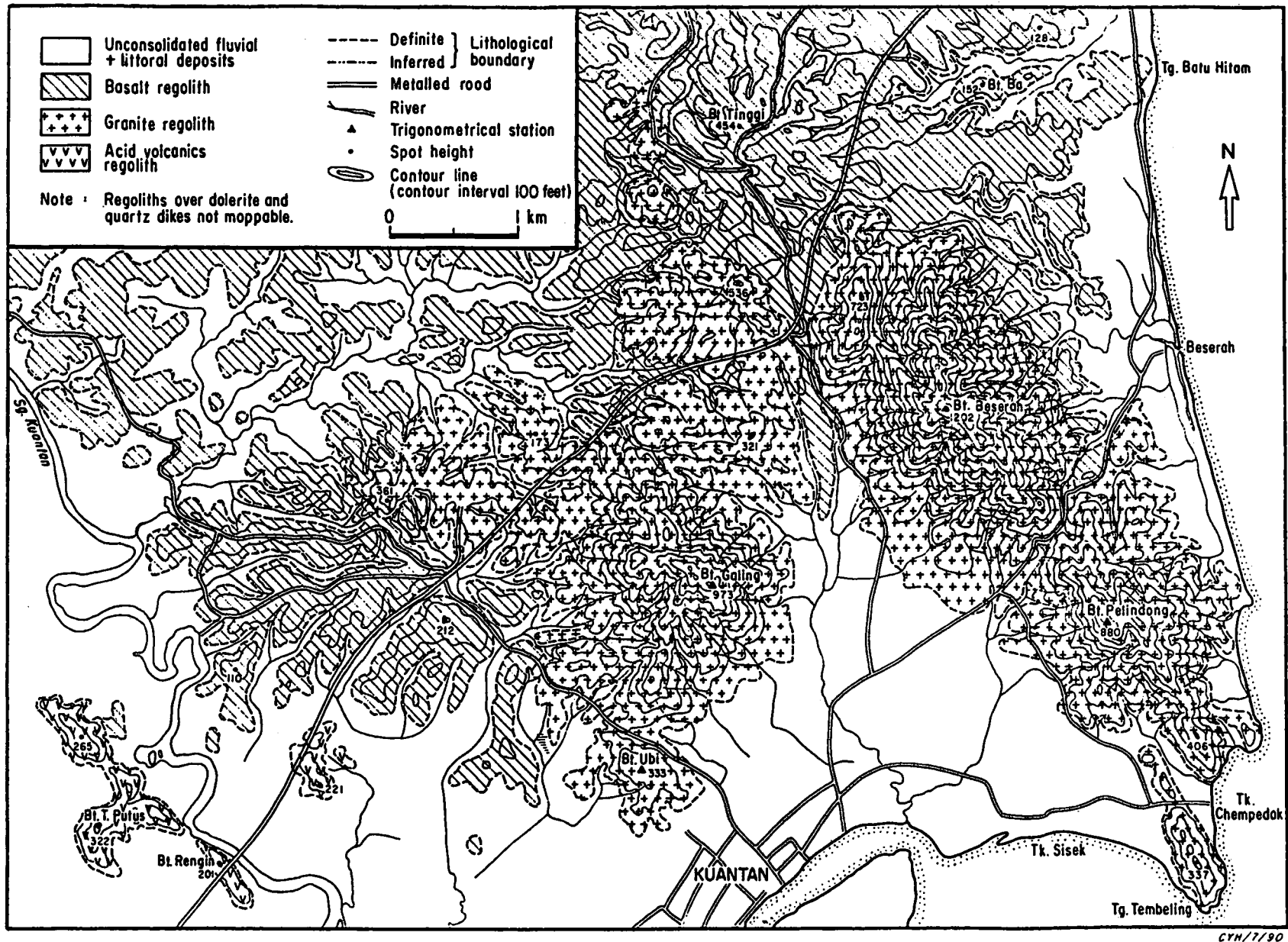


Fig. 1. Distribution of bedrock regoliths and unconsolidated fluvial and littoral sediments within the Kuantan area.

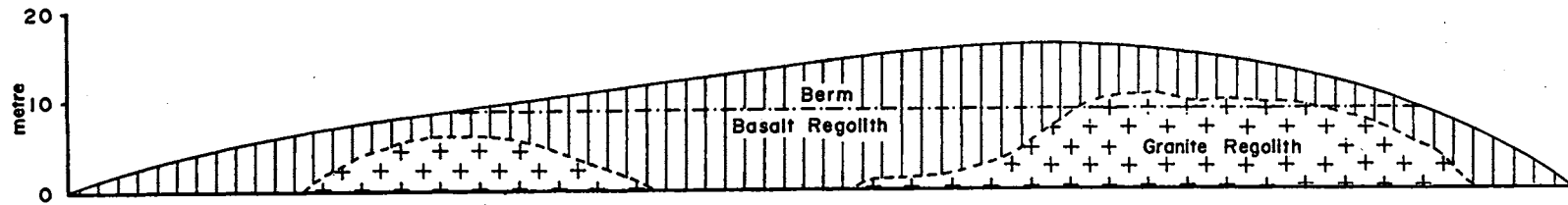


Fig. 2. Basalt regolith unconformably overlying granite regolith. Loc. - Slope cut on north side of Kuantan Bypass Highway between kilometre posts 209 and 208 to Kuala Trengganu.
 Note - 1. Horizontal scale = Vertical scale.
 2. Cut mapped in 1981, presently covered with vegetation and scree.

flowed. The relative elevations of these interfaces (along the Kuantan By-Pass Highway and other sites within the study area) have been determined through a Pocket Theodolite survey and have been used to interpret the palaeo-flow directions of the basaltic lavas. These interpreted directions (Fig. 3), point to the indisputable presence of a vent at Bt. Tinggi for the palaeo-flow directions all clearly radiate away from this topographic high. It is interesting to note that the palaeo-flow directions have a close relationship with the present-day topography; the lavas appearing to have flowed through depressions within, or alongside, the present-day granitic hills. It can thus be speculated that the granitic hills were already present in the Kuantan area when the basaltic lavas were extruded.

In the southwest part of the study area (Fig. 1), however, there is a hill (some 1.9 km to the northwest of Bt. Ubi) with a spot height of 212 ft (64.6 m) that appears to be completely built-up of basaltic lavas for slope cuts all along its sides expose basalt regoliths. The exact type of original bedrock is unfortunately indeterminate as unweathered bedrock outcrops have not been seen. The regoliths and completely weathered corestones found here, are, however, more reddish in colour in comparison with those at Bt. Tinggi and suggest that there are differences in the compositions of the basaltic lavas extruded at the two sites. The slope cut exposures all along the sides of this Hill 212 furthermore, indicate that it is developed over a considerably thick sequence of basaltic rocks (probably exceeding 60 m). This would suggest that the basaltic rocks constituting Hill 212 are not derived from the vent at Bt. Tinggi for whom an extruded thickness of 20-25 m has been suggested by Hanif (1975).

The elevation of Hill 212, in comparison with that of Bt. Tinggi (454 feet) furthermore, suggests that Hill 212 is not built-up of basaltic lavas that flowed from Bt. Tinggi. An area of granitic bedrock presently forms a ridge between Bt. Tinggi and Hill 212 and this would thus have been a barrier to the flow of basaltic lavas from Bt. Tinggi towards Hill 212. The granitic hill (with a spot height of 351 ft) to the immediate north-northwest of Hill 212 is furthermore, surrounded by regoliths derived from basaltic lavas that apparently never flowed higher than the 150 ft contour line. This would certainly preclude the possibility that Hill 212 is built-up of basaltic lavas that flowed from Bt. Tinggi. Flow directions (Fig. 3), assuming a vent at Hill 212 finally show a clear relationship with the surrounding, flat-topped low ridges and are reminiscent of tongues of lava flowing out from such a vent. Arising from these features, it is clear that there must have been a vent at the Hill 212 to account for the basaltic regoliths presently exposed in its vicinity. Hill 212 can thus be considered to represent a palaeo-volcano; its shape being due to the concentric accumulation of lava around a central vent.

It is interesting to speculate on the age relationship of this proposed vent at Hill 212 and the vent at Bt. Tinggi. Differences in elevation, and the present-day subdued topographic expression of the area around Hill 212 suggest that it has experienced a lot more erosion than the area around Bt. Tinggi. This suggestion is, however, only valid if similar volumes of basaltic lavas were extruded and similar resistances to erosion and weathering were shown by the basalts in the two areas. Depths of weathering are furthermore, variable, with regoliths around Hill 212 exceeding 20 m and marked by the absence of bedrock outcrops, whereas

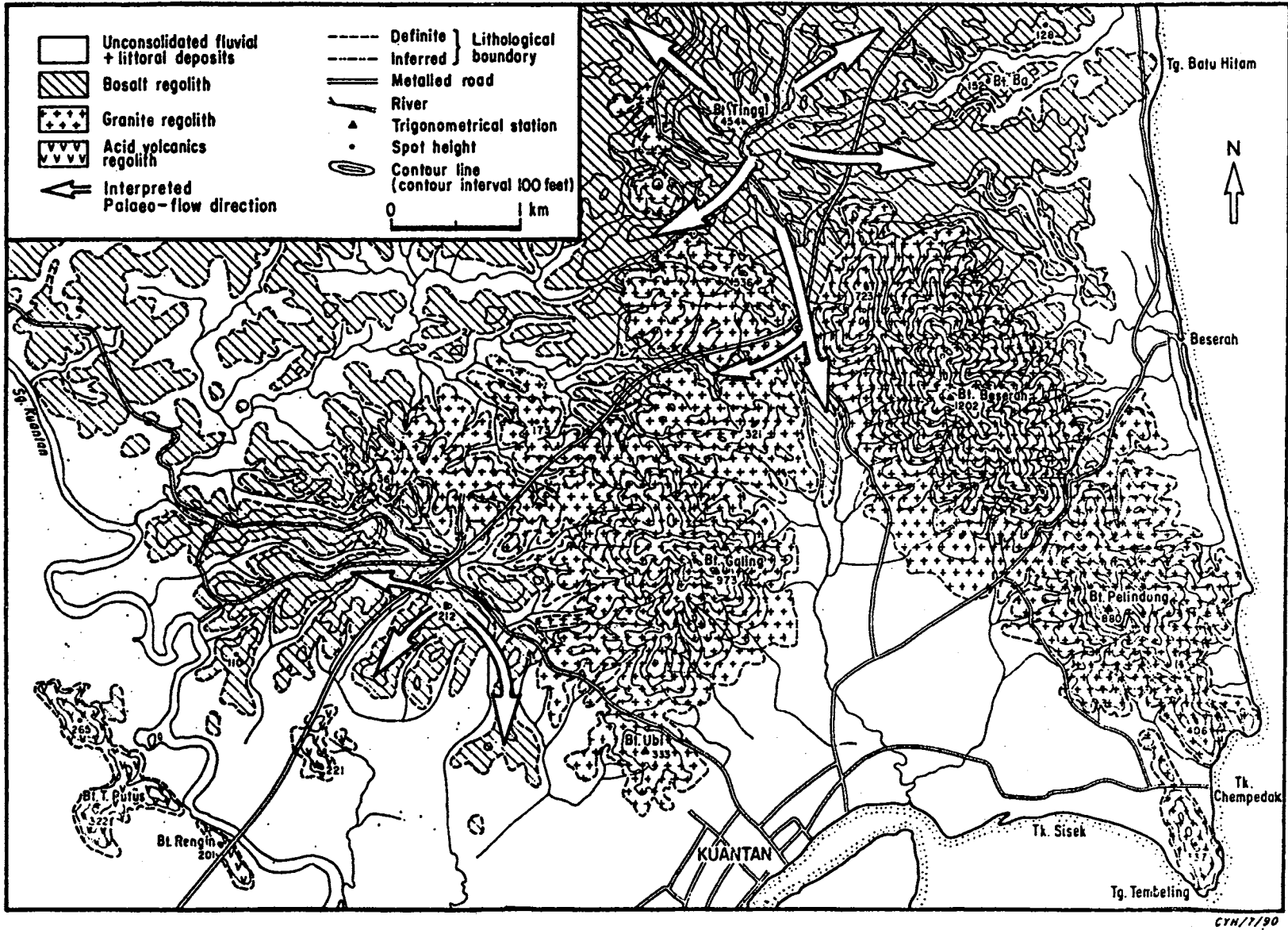


Fig. 3. Interpreted palaeo-flow directions of basalt lavas within the Kuantan area.

regoliths around Bt. Tinggi are shallower and sometimes expose bedrock. This would suggest that Hill 212 has experienced a longer period of weathering in comparison with that experienced at Bt. Tinggi. In view of these features, it is suggested that the basaltic lavas at Hill 212 were extruded somewhat earlier than those at Bt. Tinggi.

Conclusions

Arising from the above discussion, it is concluded that the basaltic lavas of the Kuantan area have been extruded at, at least, two vents; one situated at Bt. Tinggi, and the other at Hill 212 to the northwest of Bt. Ubi. The shape of the present-day Hill 212 is furthermore, concluded to result from a palaeo-volcano once situated there. In view of this second vent, it is further concluded that there may be other vents in the Kuantan area through which basaltic lavas were also extruded.

Acknowledgements

Y.H. Ching and Roshdy are thanked for drafting the figures. This study has been supported by a F-Vote Research Grant from the University of Malaya.

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PERTEMUAN PERSATUAN (MEETINGS OF THE SOCIETY)

CERAMAH TEKNIK (TECHNICAL TALK)

N.S. Haile: Aspects of Basin Modelling - Application to Petroleum Exploration

Laporan (Report)

Dr. N.S. Haile made a welcome return to the Department of Geology in the University of Malaya on 12 September, when he gave a talk on "Aspects of basin modelling" to an audience of about 50 members.

Introducing the speaker, Professor C.S. Hutchison referred to Dr. Haile's long association with Malaysia, and in particular with the Geological Society of Malaysia, of which he was the first president.

Dr. Haile said that basin modelling, the reconstruction of all aspects of the history of a sedimentary basin, is not in fact new, but is what geologists have striven to do ever since the beginning of the science. However, new techniques of investigation and use of computers enable this to be done more quantitatively.

The stages in basin modelling can be divided into steps:

1. Collection of primary data, such as seismic, gravity/magnetics, well data, and data from surface mapping and remote sensing.
2. Analysis, including sedimentology, paleontology, radiometric age dating, determination of source rock quality and maturity, and estimation of formation temperature and pressure.
3. First order integration. Construction of structural time maps, biostratigraphic zonations, lithostratigraphic schemes, lithologic distribution maps, geothermal maps, mapping source rock thickness, quality, and maturity.
4. Second order integration. Construction of depth structure maps, back-stripping, and decompaction. Seismic sequence stratigraphy. Estimation of paleobathmetry, paleogeography, and paleoenvironments. Reconstruction of depositional, thermal, and subsidence history, and evolution of source rock maturity through time.
5. Basin modelling. Final integration to give a detailed continuous geologic history, including: locality, timing, and amounts of petroleum generation, expulsion, migration, and accumulation; evolution of traps through time; and quantitative simulations using computer programs where appropriate.

Dr. Haile illustrated his talk with reference to the Central Graben and North Viking Graben of the North Sea. He stressed that the situation in Malaysia differs in that here no widespread rich source rock such as the Kimmeridge Clay Formation of the North Sea is known.

In answer to questions, Dr. Haile agreed that several aspects of Malaysian petroleum basins are puzzling, in particular the remarkable thickness (>10 km) of parts of the Malay Basin, which involved rapid subsidence since the Oligocene, which did not seem to be explicable on a simple crustal stretching model. Current models of the evolution of the South China Sea did not seem to explain the formation and orientation of the Malaysia basins satisfactorily, in particular the change in strike between the Malay Basin (NNW-SSE) and the Penyu Basin (E-W).



N.S. HAILE



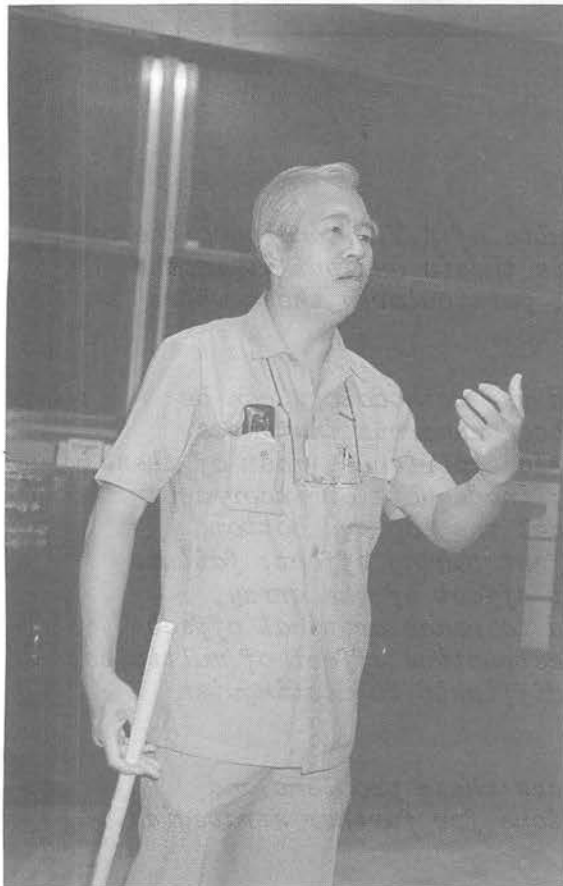
Chumpon Kuentag: Ceramic raw materials and dimension stones of Thailand.

Mr. Chumpon Kuentag, Head, Economics Geology Division, Dept. of Mineral Resources (DMR) Thailand gave the above talk on the 20th September 1990 at a new laboratory of the Geology Dept. in the new wing of the Science Faculty. The last minute change in venue was due to the Geology Dept. being sealed off following an explosion in the Geochemistry Laboratory the day before (19th September, 1990).

In his talk, well illustrated by colourful slides, Mr. Chumpon showed the types of ceramic raw materials and dimension stones exploited in Thailand together with location maps, chemical compositions, production figures, inferred reserves and main uses. The raw materials discussed include white clays, ball clays, plastic clays, bentonite, dickite, feldspars, silica sand, quartz, diatomite, dolomite and gypsum while for dimension stones, granite and marble were dealt with.

The meeting was well attended by an audience of about 30 and chaired by Mr. Chong Foo Shin of the Geological Survey of Malaysia. The Society is grateful to the Geological Survey of Malaysia for making it possible for the Society to sponsor Mr. Chumpon's talk.

G.H. Teh



CHUMPON KUENTAG

A. Easton Wren: A review of contemporary A.V.O., it's problems and suggestions for an enhanced approach.

Laporan (Report)

Dr. A. Easton Wren (Consultant, Calgary, Alberta, Canada) gave the above talk on Wednesday 3rd October 1990 at 6.00 p.m. at Raya Room, Equatorial Hotel, Kuala Lumpur. The talk was in collaboration with Span Corporation (M) Sdn. Bhd.

A. EASTON WREN



Abstract

Since Ostrander (1983) presented his results of A.V.O. analyses the exploration community has gradually accepted his thesis and put it to the test in numerous areas of exploration interest, particularly those where the fluid content of the reservoir was in question.

While the theory is indeed legitimate and the methodology can be applied successfully in many areas there have been numerous instances where the "method" has "failed". In the author's experience, most of these failures are human errors in several key areas; inadequate or incorrect modeling of the A.V.O. response; failure to model the top and bottom response of a reservoir and acknowledge the offset tuning effect; failure to compensate for the insidious yet significant effect of the array, particularly at far offset; insufficient spread to reach critical offset for an observable response; the constructive/destructive effect of multiples; the gas effect of Domenico (1976) where it is difficult to distinguish between 5% and 95% gas saturation.

This paper reviews A.V.O. theory, addresses these problems and attempts to provide some solutions and suggestions for further strategies.

BERITA - BERITA PERSATUAN (NEWS OF THE SOCIETY)

KEAHLIAN (MEMBERSHIP)

The following applications for membership were approved:

Full Members

1. Idrus Mohd. Shuhud, Petronas Petroleum Research Institute, Lot 1026, PKNS Industrial Area, 54200 Ulu Kelang.
2. Izman b. Hamid, PRI, Lot 1026, PKNS Ind. Est., 54200 Kuala Lumpur.
3. Silvano Pagnozzi, WMC Petroleum, P.O. Box 11990, 50764 Kuala Lumpur.

Student Members

1. Halina Ahmad, Jabatan Geologi, Uni. Malaya, 59100 Kuala Lumpur.

Institutional Members

1. Geometra Surveys Sdn. Bhd. Attn: Patrick Lee, Peti Surat 370, Lot 6.11, Tk. 6, Wisma Central, Jalan Ampang, 50450 Kuala Lumpur.
2. Amoseas Indonesia Inc., Attn: Mr. K.R. Quarfom, P.O. Box 2782, Jakarta 10001, Indonesia.

PERTUKARAN ALAMAT (CHANGE OF ADDRESS)

The following members have informed the Society of their new addresses:

1. Mohammad Roston bin Zakaria, Makmal Penyiasatan Kajibumi Malaysia, Peti Surat 1015, 30820 Ipoh, Perak Darul Ridzuan.
2. Thomas R. Turner, 2314 Stonecrop Way, Golden, Colorado 80401.

PERTAMBAHAN BARU PERPUSTAKAAN (NEW LIBRARY ADDITIONS)

The Society has received the following publications:

1. Commonwealth Science Council, newsletter, no. 3, 1990.
2. Chronique de la recherche miniere, no. 498, 499 & 500, 1990.
3. Seatrad Centre, annual report 1989.
4. Acta Palaeontologica Sinica, vol. 28, no. 6, 1989, vol. 29, nos. 1 & 2, 1990.
5. Palaeontological abstracts, vol. 4, nos. 3 & 4, 1989 & vol. 5, nos. 1 & 2, 1990.

6. Acta Micropalaeontologica Sinica, vol. 7, nos. 1 & 2, 1990.
7. Earthquakes & volcanoes, vol. 21, no. 5, 1989.
8. USGS Bulletin (1990) 1733-E, 1749-C, 1715-E, 1748-A, 1808-I, 1753-A, 1718-E, 1701-F, 1812, 1931, 1939-A, 1754-D, 1869, 1897, 1885, 1805.
9. U.S.G.S. Professional Paper: 1487 & 1510 (1990), 1461 (1989).
10. U.S.G.S. Circular (1990): 930-1, 1048, 1051.
11. AAPG Explorer, Sept. & Oct. 1990.
12. The Science Reports of the Tohoku University, sp. volume no. 7, 1990.
13. Contributions from the Institute of Geology & Paleontology, Tohoku University, no. 92, 1990.
14. The Science Reports of the Tohoku University, vol. 60, no. 1 (1989), no. 2 (1990).
15. IMM Bulletin no. 995, 1990.
16. IMM Transactions, Sect: A, vol. 99, A1-64, 1990.
17. Sopac News, vol. 7, no. 1, 1990.
18. Mountain State geology, 1990.
19. Oklahoma Geology Notes, vol. 50, nos. 1-3, 1990.
20. Guangdong Geology, vol. 5, nos. 1 & 2 (1990).
21. Journal of the Natural History Museum & Institute, Chiba, vol. 1, no. 3, 1990.
22. Natural History Research, no. 1, 1990.
23. U.S.G.S. Yearbook Fiscal Year 1989.

BERITA - BERITA LAIN (OTHER NEWS)

AFRICAN MINING '91

Second International Conference
10-12 June 1991
Harare. Zimbabwe
Organized by The Institution of Mining and Metallurgy

Theme/Call for papers

African Mining '91 will deal with all aspects of the minerals industry - exploration, exploitation, treatment and finance - that have particular relevance to Africa. Papers are invited on technical and operational aspects of geology, mineral exploration, mining, mineral processing, smelting, refining and marketing, as well as finance and investment. Particular emphasis will be given to small mining and appropriate technology and to the role of mining in the establishment of new industries.

Tours

A variety of pre- and post-conference technical tours within Zimbabwe and to Zambia, and possibly Botswana and Namibia, will be available. In addition, a range of local sightseeing tours will include visits to Victoria Falls, Wankie Game Reserve and the National Heritage, Great Zimbabwe.

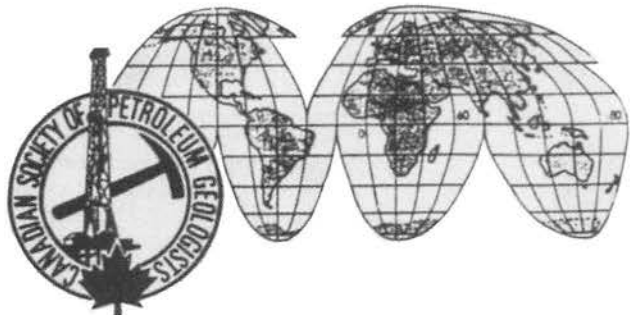
Abstracts (200-300 words) of proposed papers for both conferences should be submitted to:

The Conference Office,
The Institution of Mining and Metallurgy,
44 Portland Place, London W1N 4BR.

Telephone: 01-580 3802; telex: 261410 IMM G; fax: 01-436 5388.

OPPORTUNITIES FOR THE NINETIES

CSPG Convention
June 16-19, 1991
Calgary Convention Centre



Call for papers

The Canadian Society of Petroleum Geologist (CSPG) will host a technical convention to be held from June 16 to 19, 1991 in Calgary, Alberta, Canada. OPPORTUNITIES FOR THE NINETIES will have as its theme

GEOLOGICAL SOCIETY OF MALAYSIA PUBLICATIONS

BULLETIN OF THE GEOLOGICAL SOCIETY OF MALAYSIA
 WARTA GEOLOGI - NEWSLETTER OF THE GEOLOGICAL SOCIETY OF MALAYSIA

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 University of Malaya,
 59100 Kuala Lumpur, Malaysia.

For further information, please ring 03-7577036.

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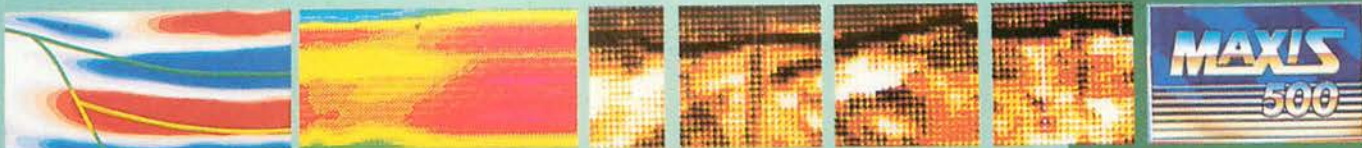
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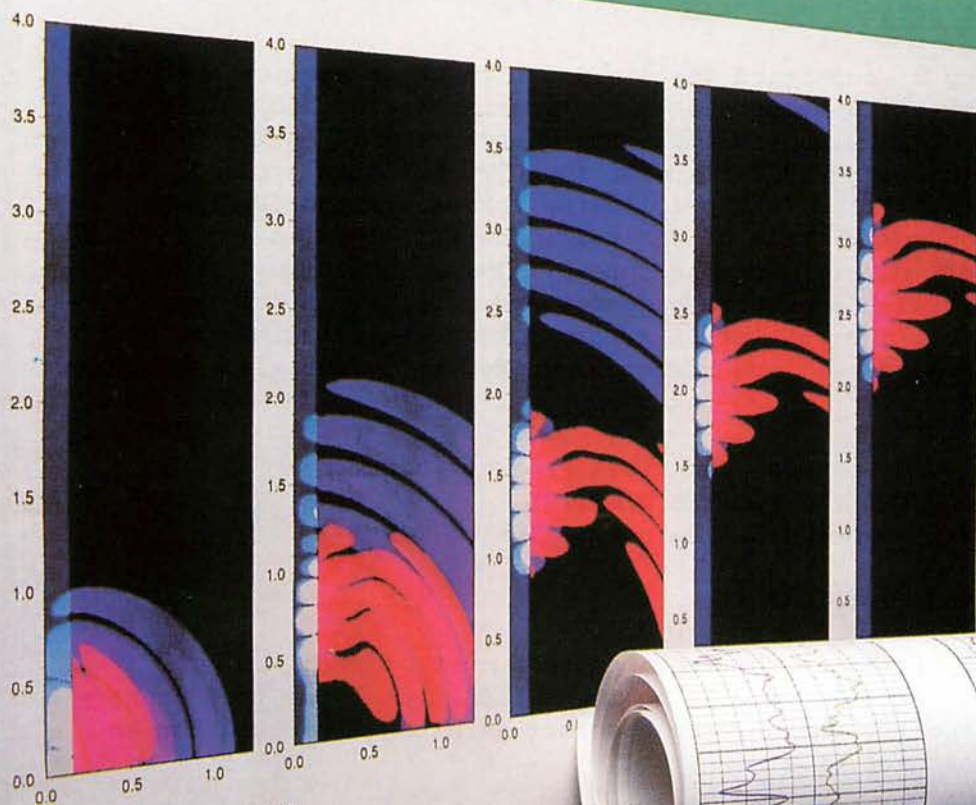
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Signal Evolution Plot

the opportunities and challenges faced by the petroleum industry during the 1990's. This convention will highlight emerging technologies and strategies as the industry moves through the final decade of this century. The technical program will comprise 3 days of oral presentations, poster sessions, technology exhibits, as well as associated fieldtrips and short courses.

Oral presentation

A theme session is planned on exploration opportunities and strategies. In addition, a wide variety of sessions will be offered including:

- Opportunities in international and frontier exploration
- Exploration for tight and shallow gas
- Emerging technologies and integration of technologies in exploration
- Exploration strategies and case histories
- Environment and the oil industry
- Development geology
- Exploration for clastic and carbonate reservoirs
- Computer applications and technology in exploration
- Oil and gas economics

Poster presentations

Poster sessions are an ideal forum for presentation of concepts which require more detailed material than can be accommodated in an oral/slide format. They also encourage feedback and discussion in a one-on-one setting.

Submission of abstracts

Abstracts may be submitted for presentation at an oral or poster session. All abstracts appropriate to the session titles and main theme of the convention will be considered. The abstracts will be type set and published in the March 1991 issue of the CSPG Bulletin (vol. 39, no. 1). Abstracts must be submitted in the following format: author(s)' name followed by full address; title of the talk; abstract text in letter quality type (no dot matrix), double spaced. These should be typed on 8½ by 11 inch paper with appropriate spaces and margins. Up to two pages may be used but the abstract text may not exceed a maximum of 250 words. These guidelines will be strictly adhered to. Inquiries should be directed to:

Christopher J. Le Gallais, Technical Program Chairman,
C.S.P.G. OPPORTUNITIES FOR THE NINETIES,
505, 206 - 7th Avenue S.W., Calgary, Alberta T2P 0W7

Telephone (403) 266-2047

Abstracts submitted to the above address must be received by November 15, 1990. Acceptance will be acknowledged no later than January 1, 1991. Please specify whether the abstract is being submitted for an oral or poster presentation.

NEW WAVES OF GEOLOGY

1ST INTERNATIONAL MEETING OF YOUNG GEOLOGISTS

Organized by the Youth Committee of the Geological Society of Hungary
22-28th August, 1991
Budapest, Hungary

Invitation

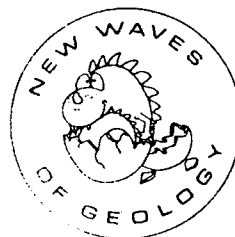
The organizing committee invites you to attend the First International Meeting of Young Geologist, which will be held in 1991, from the 22nd to the 28th of August in Budapest, Hungary. The meeting will be open for students, postgraduate fellows and geologists who wish to gain insight into present and future trends in selected geological specialties.

It will provide a unique forum for young scientists from all over the world to meet and exchange ideas.

Programs and topics

The programs of the meeting will include the following topics:

Sedimentology
Petrology and Geochemistry
Tectonics
Stratigraphy and Paleontology
Hydrogeology
Agrogeology
Engineering geology
Environmental geology
Geomathematics



A leading specialist will present each topic. The participants will have an opportunity to demonstrate their results on posters. During the meeting we shall organize one-day fieldtrips in the Buda Mountains. Following the meeting two- or three-day-course also will be offered.

Official language

Conference activities will be conducted in English.

Location and accommodation

The meeting will be held in Budapest, with different categories of accommodation. In addition sports and recreational facilities will be available and there will be many opportunities for participants to get acquainted with one another.

Registration

Those interested can write to the address below to receive a second circular containing more detailed information, a schedule of scientific

as well as forms for registration, accommodation and abstracts of posters presentations.

Mailing address: Anna Balog,
Technical University of Budapest,
Department of Geology,
1521 Budapest, Hungary.

Telephone: (36 - 1) 1667 370

Telex: 225931

Fax: (36 - 1) 1666 808

SECOND INTERNATIONAL CONGRESS ON PALEOECOLOGY

Nanjing, China
September 6-11, 1991

The Second International Congress on Paleocology will be held on September 6-11, 1991 in Nanjing, the People's Republic of China. In history, Nanjing was a well-known ancient capital of the Six Dynasties (222-589). Now it has become a modernized metropolis with transport facilities. It is especially famous for its beautiful landscapes, such as the Xuanwu Lake and the Ancient Buddhist Temple - Chi-Ming-Ssu, nearby which is the location of Nanjing Institute of Geology and Palaeontology, Academia Sinica (NIGPAS) and Palaeontological Society of China.

With the agreement and financial support of the International Paleontological Association, this Congress will be held under the joint sponsorship of Nanjing Institute of Geology and Palaeontology, and Palaeontological Society of China.

Since the First International Congress on Paleocology held in Lyon, France in July of 1983, great progress and significant achievements in scientific research have been made, especially the aspects with regard to paleocology, its research method, practical application and cross-permeation with other related disciplines, the application of new techniques and new methods, etc. On such a basis this Congress will play a positive role in promoting international exchanges of scientific research achievements among the scientists from different countries over the world.

The scientific themes to be discussed at the Congress will include:

- Paleocology and its research method;
- Relations between organisms and their environments;
- Community ecology;
- Traces of biological activity;
- Relations between paleocology, plate tectonics and paleoclimate;
- Taphonomy;
- Biological sedimentation;
- and some other subjects of significance.

Several pre-Congress and post-Congress geological excursions will be arranged for participants in this Congress to visit different places and sections.

Further detailed information on the Congress will be given in later circulars.

2ND INTERNATIONAL SYMPOSIUM ON ENVIRONMENTAL GEOCHEMISTRY

16-19 September 1991

Uppsala, Sweden

Organized by: Geological Survey of Sweden, Division of Geochemistry, and Swedish University of Agricultural Sciences, Department of Forest Soils.

Introduction

During recent decades there has been increasing interest in studying the interaction between the environment and geochemical qualities and processes. Variations in contents and natural distribution of chemical elements are significant when estimating the tolerance in environment and health to different forms of anthropogenic influence.

Aims

To present and discuss current research associated with natural and man-made environmental effects on soils, vegetation, waters and health.

Themes

Invited and contributed papers will preliminarily be organized in the following themes:

1. Environmental geochemistry and health.
2. Anthropogenic effects on the natural environment, and global changes.
3. Pollution of natural soil- and water-systems.
4. Methods of geochemical monitoring, modelling and mapping.
5. Geochemical aspects of waste disposal.
6. The importance of geology in environmental geochemistry.
7. Natural and man-made radiometric hazards.
8. Biological and geochemical interactions in weathering and element translocation.
9. Impact of climatic changes on the geochemical environment.

Scientific program 16-19 September

The programme will include invited key-note speakers (among others Prof. Iain Thornton, Imperial College, London), oral presentations and posters. A mid-week excursion (half-day) will be arranged with an urban and environmental theme.

Excursion 20-21 September

An excursion preliminarily entitled Nutrient circulation in forest ecosystems and heavy metal aspects in mining areas, will be arranged as a coach trip in south central Sweden. The fee will also cover costs for accommodation, meals and coffee-breaks.

Publishing

It is planned to publish either the full proceedings of the symposium or selected papers in a special issue of Applied Geochemistry. The final decision will be made once abstracts of papers are available. When abstracts are submitted to the conference organizers, authors are requested to send a copy to Dr. Brian Hitchon (Executive Editor, Applied Geochemistry, P.O. Box 8330, Station F. Edmonton, Alberta T6H 5X2, Canada). Abstracts will be compiled and distributed at the symposium.

Call for papers

Proposals for papers and posters must be submitted in English as extended abstracts of up to 500 words by March 28, 1991. No proposals will be accepted after this date.

In addition to typed manuscripts of the abstracts, the organizing committee requests that the manuscripts will be submitted on floppy discs (3.5"), if possible, as ASCII files (IBM or compatible), to facilitate their review in word processor programmes.

Official language

English.

Venue

Assembly hall at the Swedish University of Agricultural Sciences, Ultuna, Uppsala.

Accommodation

Will be arranged at all price levels. Full details and a booking form will be included in the next circular. Please indicate standard preferred when answering this first circular.

Registration and entrance fees

The registration fee covers costs for printing abstracts of oral presentations and posters, final programme, list of participants, get-together party, lunches and coffee/tea and a mid-week excursion.

Registration fee, incl. banquet	2,200 SEK
Registration fee	1,900 SEK
Registration fee, student, incl. banquet	1,100 SEK
Registration fee, student	800 SEK
Excursion, 20-21 September	1,000 SEK

(1,000 SEK is approximately 160 USD)

Correspondence

Contact person: Prof. Dr. Mats Olsson, Department of Forest Soils, Swedish University of Agricultural Sciences, Box 7001, S-750 07 Uppsala, Sweden.
Telephone: 46 18 672212, telefax: 46 18 300831

SYMPOSIUM ON THE DYNAMICS OF SUBDUCTION AND ITS PRODUCTS

Organised by: Indonesian Institute of Sciences,
Research and Development Center for Geotechnology.
Karangsambung Nature Laboratory for Geology
Karangsambung, Central Java, Indonesia.
September 17-19, 1991.

Subduction of the earth crusts is understood to be one of the principal dynamic processes forming world-wide orogenic belts. Economic mineral deposition and hydrocarbon accumulation, in one or the other way, can be linked to such mountain building processes. The subduction complexes formed therefrom in the Indonesian region constitute substantial parts of the archipelago. They occupy a number of mountain ranges, each corresponds to a particular orogeny. Their spatial and temporal arrangement have made them possible to study the evolutionary paths of continental masses growth and the development of island arcs in this region.

The Karangsambung area (Central Java), where most Indonesian geologist were first trained in field mapping, exposes a unique and best collection of rocks traditionally grouped into a subduction complex. Since the birth of the plate tectonics theory, our understanding of subduction and related processes has evolved remarkably. It is within this connection that the Indonesian Institute of Sciences (LIPI) takes the initiative to organize a symposium on this matter, to be held at place where modern ideas will be challenged against the surrounding hard geological facts.

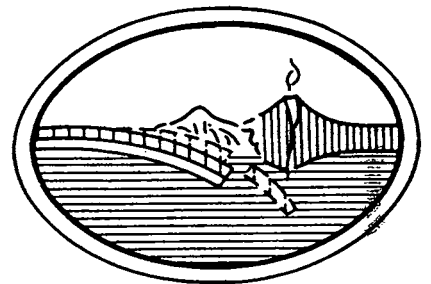
Dates and location

The symposium will be held at the campus of Karangsambung Nature Laboratory for Geology on September 17-19, 1991. The first two days will be devoted to the presentation and discussion of papers and poster sessions, and the third day will be allocated for field excursion to surrounding subduction complex.

Scope

The major topics of the symposium include:

- Subduction related magmatism and volcanism,
- Subduction processes and mineral deposits,
- Sedimentary basin evolution,
- Active Subduction,
- Metamorphism,
- Geologic mapping of melange complexes.



Tentative Special Lectures:

Prof. Dr. J.A. Katili	Prof. Dr. J. Curray
Prof. Dr. Sukendar Asikin	Prof. Dr. Jan Van Hinte

Accommodation

Spartan type rooms are available at the campus, or hotels in towns

nearby Karangsembung. Meals and other facilities will be available at the campus as well as at hotels. Due to the limited rooms availability, the first 50 persons will be accommodated in the campus. The remaining will be lodged in hotels. However, the organizing committee will take care of the participants, if they prefer to be lodged either in hotels or in campus.

Symposium Language

The official language for the symposium is English.

Abstract

Authors are kindly requested to send two copies of abstract, no later than January 31, 1991.

Registration

The registration fees will be US\$350 which covers:

- Proceeding
- Lodging in campus or hotels,
- Meals at the campus or hotels and during field excursion,
- Local transportation between hotels to the campus during symposium and field excursion,
- and Excursion guide book.

Second circular is expected to appear at the end of February, 1991; to be sent to those responding the first circular. It will contain detailed informations to authors.

The organizing committee will arrange the participant's family for cultural program in Yogyakarta (Borobudur and Prambanan Temples, Yogyakarta Palace, Silver and Batik handcrafts, Ceramics center, etc.) and nature sightseeing in the surrounding area of Karangsembung. The cost of families program is US\$110 per person for two days, which includes meals and transportation.

For further information:

Dr. Edi Prasetyo Utomo,
Research and Development Center for Geotechnology,
Indonesian Institute of Sciences (LIPI),
Jalan Cisitu Sangkuriang No. 21/154 D Bandung 40135,
Indonesia.
Tel.: 62-22-83654
Fax.: 62-22-84593

GEOTECHNICA 91

Alfred Wegener Foundation
First Announcement
International Congress for Geo-sciences and Technology
Trade Fair - Congress
September 18-21, 1991
Cologne.



A Forum for an Intact Planet Earth

The preservation of the earth as a challenge to science and technology will be the general theme of the Congress for Geo-sciences and Technology which will take place in Cologne from September 18-21, 1991.

This challenge is being emphatically made by the environment itself. The ozone gap, pollution of the seas and drinking water reserves, the exploitation of natural resources and energy reserves, the problems of contaminant residues and waste disposal, the destruction of primeval forests, dying forests and the perilous consequences for every living organism in the world - these themes have not only concerned specialists for some time. But the specialists, experts, and scientists are being called upon to seek possible solutions to these problems. They are vigorously working toward new methods to ward off the dangers. Many effective solutions for the improvement of the environment situation have already been found and many practicable ways have already been demonstrated.

The congress, conceived for the first time as an interdisciplinary forum of information in the service of an intact planet, will be oriented around the central theme "Preserving the Earth - a Challenge to Science and Technology" on four days and will cover four fundamental allied topics which logically derive from the given tasks.

The Geobiosphere in the Process of Change

The first topic is devoted to the actual condition of the earth's ecosystem as well as its development in the past and in the future. This topic also embraces the question of how the condition of our ecosystem can be measured with the aid of data and other indicators, and leads up to the second topic.

Data Registration and Exploration of Earth's System

This topic deals with data processing and methods of recording, measuring, depicting and illustrating information about the earth gathered from outerspace and from the earth's surface, either with direct or indirect methods.

Exploitation of the Geobiosphere

The third topic deals with the human factor, since human beings in the end are responsible for the problems facing us today and for coming up with the solutions to resolve them. The issue here will be

concerned with the strain on Earth, water and air, with perspectives on the utilization of natural resources and energy and with the reaction of the global ecosystem to the strain.

Adaption of the results for environmental protections

Adaption of the results for environmental protections is the topic of the last day of the congress. Emphasis is placed on objectives and strategies, measures and standards to preserve the geobiosphere.

Experts from geoscience and technology as well as related fields, political officials at all levels, civil authorities and institutions, associations, organizations, and interest groups are called upon all over the world as specialists, appliers, and last but not least as concerned human beings. For this reason, leading politicians, such as the German Federal Minister of the Environment, and acknowledged domestic and foreign experts from the USA, Canada, Australia, and Europe, could be enlisted as speakers and active participants in the discussions of the congress.

Congress Schedule

September 18, 1991

The Geobiosphere in the Process of Change

- Evolution of life on earth
- Influence of the oceans and the cryosphere on climate development
- Influence of climate on the earth's surface
- Human influences on climate

September 19, 1991

Data Registration and Exploration of the Earth's System

- Observation of the earth from outer space
- Cartography and systems of geo-information
- Artificial intelligence
- Sensory analysis
- Analysis
- Sounding out the earth's interior

September 20, 1991

Exploitation of the Geobiosphere

- Cycles and cross linkage
- World population and its needs
- Interactions between atmosphere-hydrosphere-lithosphere
- Natural disaster and risk control
- Supply of natural resources, energy and drinking water
- Mining and ecology
- Disposal sites and contaminant residues

September 21, 1991

Adaption of the results for environmental protection

- Evaluation and sanitation of hazardous waste repositories
- Reduction of industrial wastes
- Utilization of resources adapted to the environment
- Principles of action for environmental policies and environmental law - establishment of technical standards

- Environmental protection from a psychological perspective: public relations work and acception
- Ecological selection and exploitation of natural resources

Organizers

Alfred Wegener-Stiftung
zur Förderung der Geowissenschaften
Wissenschaftszentrum
Ahrstraße 45, Postfach 20 14 48
D-5300 Bonn 2

Telephone: (0) 228/302-260 (261)

Telefax: (0) 228/302-270

Telex: 885 420 wzd

1992 MEETING TO FOCUS ON GLOBAL CHANGE

Leading scientists from around the world will gather in Washington, D.C., August 1-15, 1992, to discuss monitoring global change, in a series of meetings sponsored by the American Society for Photogrammetry and Remote Sensing (ASPRS) and the American Congress on Surveying and Mapping (ACSM). Sessions will spotlight techniques for monitoring and evaluating changes involving the oceans, atmosphere, land, human and wildlife populations, cities and rural areas, across the face of the earth. During the two weeks, ASPRS and ACSM will be meeting in conjunction with the International Society for Photogrammetry and Remote Sensing and the International Geographical Union.

3RD INTERNATIONAL SYMPOSIUM ON JURASSIC STRATIGRAPHY POITIERS (FRANCE)



September 22-29, 1991.

First Circular

The third symposium will be held in Poitiers (France) during the period September 22-29 1991.

Before and after the scientific sessions (September 24-27), the following fieldtrips are proposed.

- a) pre-Symposium fieldtrip (September 22-23)
Cross section in the classic Jurassic series from the northern Aquitaine basin to the South of Paris basin (including the Toarcian stratotype).
- b) post-Symposium fieldtrip (September 28-29)
The Jurassic reef formations on the northern margin of the Aquitaine Basin.

During the sessions, four topics are proposed:

- Section 1 - Paleontological methods of stratigraphy. Subdivision of the Jurassic system by different fossil groups. System, stage and substage boundaries in terms of standard chronostratigraphy.
- Section 2 - Other methods: radiochronology, mineralo-stratigraphy, magnetostratigraphy, seismic stratigraphy, etc....
- Section 3 - Integrated stratigraphy: Tectonic, sedimentological and eustatic approaches. Paleogeographical and paleobiogeographical implications.
- Section 4 - Climates and environments: multidisciplinary methods (geochemistry, sedimentology, ecology, etc...).

Further information:

3rd International Symposium on Jurassic Stratigraphy,
Université de Poitiers, Géologie stratigraphique et structurale,
40, Avenue du Recteur Pineau,
86022 POITIERS Cédex - FRANCE.

1991 AAPG INTERNATIONAL CONFERENCE - CALL FOR PAPERS

London

September 29 - October 2, 1991.

In September 1991, as part of the continuing growth of its worldwide activities, AAPG is holding an international conference in London. The conference sessions and field excursions will focus upon hydrocarbon exploration potential for the coming decade in the USSR, Eastern Europe, the Middle East and Northern Africa. The Petroleum Exploration Society of Great Britain is acting as the host society and the Geological Society of London is a co-sponsor.

In recognition of the steady growth of the international industry, the AAPG Executive Committee is committed to holding annual conferences in centers outside North America. The London meeting is an important step in this development. The conference program is designed to look at areas and problems which are seen to be of interest to the industry in the coming decade. It will become especially important that the industry makes the most of established oil and gas provinces, particularly those which are logistically and commercially accessible.

We hope that the conference will provide a service to and will attract support from the Association's members working in Europe, Africa and the Middle East. A large potential oil business remains in the areas under consideration and they merit the attention this conference will bring.

Proposed technical sessions - Oral and poster

Regional themes:

Areas Ready for Re-Exploration:

Middle East Region: Exploration Potential and New Plays,
D.L. Loftus, Chairman

North African Region: Exploration Potential and New Plays,
L. Montadert, Chairman

Areas of Interest New to Western Industry:

USSR: Basin Development - Stratigraphic and Structural
Evolution,
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- Bulletin 18** (1985). 209 p. Special Issue on Petroleum Geology. Edited by G.H. Teh & S. Paramanathan. Price: M\$30.00 (US\$14.00).
- Bulletins 19 & 20** (1986). GEOSEA V Proceedings Vols. I & II, Fifth Regional Congress on Geology, Mineral and Energy Resources of Southeast Asia, Kuala Lumpur, 9–13 April 1984. Edited by G.H. Teh & S. Paramanathan. Price for both Bulletins 19 & 20: Members — M\$50.00 (US\$21.90), Non-members — M\$125.00 (US\$53.20).
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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: M\$6.00 (US\$3.00).
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1990

March 1990 - November 1990

PHOTOINTERPRETATION APPLIED TO GEOLOGY AND GEOTECHNICS (Bogota, Colombia). Annual post-graduate diploma courses organized by the Government of Colombia, Centro Interamericano de Fotointerpretacion, International Institute for Aerial Survey and Earth Sciences and Unesco. Language: Spanish. For Information: Academic Secretariat of the CIAF, Apartado Aereo 53754, Bogota 2, Colombia.

April 1990 - July 1990

RURAL GROUNDWATER DEVELOPMENT (Loughborough, U.K.). A 10-week diploma course organized annually by WEDC. For Information: WEDC, University of Technology, Loughborough, Leics. LE11 3TU, U.K.

April 1990 - July 1990

ENVIRONMENTAL EVALUATION MANAGEMENT AND CONTROL (Liverpool, U.K.). Annual 12-week training course for administrators, consultants and professionals. For Information: Dr. H.W. Pearson, Environmental Management Course, Department of Botany, University of Liverpool, P.O. Box 147, Liverpool L69 3BX, U.K.

May 1990

HYDROLOGY OF FRACTURED ROCKS (Montpellier, France). Annual three-week post-graduate course sponsored by Unesco. For Information: Professeur C. Drogue, Laboratoire d'Hydrogeologie, Universite des Sciences et Techniques du Languedoc, Place Eugene Bataillon, 34060 Montpellier, France.

June 1990

SEDIMENT TECHNOLOGY (Ankara, Turkey). An annual four-week Unesco-sponsored post-graduate course. For Information: Dr. Ergun Demiroz, DSI Teknik Arastirma ve Kalite Kontrol, Dairesi Baskanligi, 06100 Ankara, Turkey.

June 1990 - August 1990

TECHNIQUES OF HYDROLOGIC INVESTIGATIONS (Washington, D.C. and Denver, Colorado, U.S.A.). Annual training course for international participants. For Information: Office of International Hydrology, Water Resources Division, U.S. Geological Survey, 470 National Center, Reston, VA 22092, U.S.A.

July 1990 - August 1990

CRYSTALLOGRAPHY, MINERALOGY, METALLOGENY (Madrid, Spain). Annual course organized by the Department of Geology and Geochemistry of the Universidad Autonoma de Madrid and sponsored by Unesco. Language: Spanish. For Information: Departamento de Geologia y Geoquimica, Facultad de Ciencias, Universidad Autonoma de Madrid, Canto Blanco, Madrid 34, Spain.

October 1990 - September 1992

GEOLOGICAL EXPLORATION METHODS (Nottingham, U.K.). Two-year MSc course starting every other year with emphasis on applied methodology, data acquisition and interpretations). For Information: Dr. M.A. Lovell, Department of Geology, University of Nottingham NG7 2RD, U.K.

September 13-16, 1990

1990 WORKSHOP ON COASTAL ZONE MANAGEMENT (Coastal processes and public risk; sea-level rise; engineering and management aspects; field visits) at the Iwasaki Resort, Yappoon, Queensland, Australia. For Information: Dr. Aro Arakel, CSEG, Dept. of Applied Geology, Queensland University of Technology, Box 2434, Brisbane, Queensland 4001, Australia.

December 1990 - January 1991

METHODS AND TECHNIQUES IN EXPLORATION GEOPHYSICS (Hyderabad, India). Diploma course organized every second year by the National Geophysical Research Institute of the Council of Scientific and Industrial Research, Hyderabad, India, and sponsored by Unesco. Language: English. For Information: The Director, International Training Course on Methods and Techniques in Geophysical Exploration, National Geophysical Research Institute, Hyderabad, 500 007 (A.P.) India.

1991

February 1991 - March 1991

STRUCTURAL GEOLOGY (Dehra Dun, India). A six weeks training course organized every second year by the Wadia Institute of Himalayan Geology, sponsored by the Government of India and Unesco. Language: English. For Information: The Organizer of the Regional Training Course in Structural Geology, Wadia Institute of Himalayan Geology, 33 General Mahadev Singh Road, Dehra Dun 24 8001, India.

May 1991 - November 1991

GENERAL HYDROLOGY with emphasis on groundwater (Buenos Aires, Argentina). A six-month post-graduate diploma course organized every other year and sponsored by Unesco. Language: Spanish. For Information: Comité Nacional para el Programa Hidrologico Internacional de la Republica Argentina, Av. 9 de Julio 1925-15^o piso, 1332 Buenos Aires, Argentina.

August 1991 - June 1993

SOIL SCIENCE AND WATER MANAGEMENT (Wageningen, The Netherlands). A 2-year MSc. course organized by Agricultural University Wageningen. Course starts every other year. Language: English. For Information: The Director of Studies of the MSc. Course in Soil Science and Water Management, P.O. Box 37, 6700 AA Wageningen, The Netherlands.

August 1991 - October 1991

GEOCHEMICAL PROSPECTING METHODS (Prague, Czechoslovakia). Certificate course organized every second year by the Geological Survey of Czechoslovakia and sponsored by Unesco, IAGC and Czechoslovakia. Language: English. For Information: GEOCHIM Unesco CSSR, Geological Survey of Prague, Malostranské nam. 19, 11821 Prague 1, Czechoslovakia.

KALENDAR (CALENDAR)

1990

July 9-13, 1990

GROUNDWATER IN LARGE SEDIMENTARY BASINS (International Conference), Perth, Western Australia. (Groundwater Conference, University of Western Australia, Nedlands, Western Australia 6009).

July 29 - August 3, 1990

CIRCUM-PACIFIC ENERGY AND MINERALS RESOURCES (Conference), Honolulu, Hawaii. (Mary Steward, Circum-Pacific Council on Energy and Mineral Resources, 5100 Westheimer Road, Houston TX 77056, USA).

August 1990

IGES (13th International Geochemical Exploration Symposium), Rio de Janeiro, Brazil. Sponsored by AEG. (Sherman Marsh, USGS, Federal Center MS 973, Denver, CO 80309-0250, USA).

August 6-10, 1990

INTERNATIONAL ASSOCIATION OF ENGINEERING GEOLOGY (IAEG/AIGI) (6th International Congress), Amsterdam. (QIT/CONGREX, Keisersgracht 782, 1017 EC Amsterdam, The Netherlands).

August 12-18, 1990

INTERNATIONAL ASSOCIATION ON THE GENESIS OF ORE DEPOSITS (8th Symposium), Ottawa, Canada. (Dr. R.W. Boyle, 601 Booth Street, Ottawa, Canada K1A 0E8)

August 20-24, 1990

GEOTHERMAL ENERGY (International Symposium), 14th Annual Meeting of the Geothermal Resources Council, Kailua-Kona, Hawaii (GRC Hawaii, P.O. Box 1350, Davis CA 95617-1350, USA).

August 25-31, 1990

GEOCHEMICAL PROSPECTING (International Symposium), Prague, Czechoslovakia, including the 5th IAGC Symposium on Methods of Geochemical Prospecting and the 14th AEG International Geochemical Exploration Symposium. (Dr. Frantisek Mrna, Geological Survey/UUG, Symposium on Geochemical Prospecting, Malostranske nam 19, 118 21 Prague 1, Czechoslovakia).

August 26 - September 1, 1990

SEDIMENTOLOGY (13th International Congress), Nottingham, UK. (Dr. I.N. McCave, Department of Earth Sciences, University of Cambridge, Downing Street, Cambridge CB2 3EQ, UK).

August 26 - September 8, 1990

LATIN AMERICAN CONODONT SYMPOSIUM, La Paz, Bolivia and San Juan, Argentina. (M. Hunicken, Academia Nacional de Ciencias, Casilla Correo 36, 5000 Cordoba, Argentina).

August 27 - September 1, 1990

WATER RESOURCES IN MOUNTAINOUS REGIONS (IAH and IAHS International Symposium) and IAH (22nd Congress), Lausanne, Switzerland. (Dr. A. Parriaux, Laboratory of Geology EPFL (GEOLEP), CH-1015 Lausanne, Switzerland).

August 28-31, 1990

ADVANCES IN GEOLOGICAL ENGINEERING (International Symposium), Beijing, Peoples' Republic of China (Secretariat: Dr. Yang Zhifa, Institute of Geology, Academia Sinica, P.O. Box 634, Beijing, PRC).

September 10-13, 1990

AFRICAN GEOLOGY (15th Colloquium), organised at the Universite de Nancy with the support of CIFEG and CNRS. (Prof. G. Rocci, Laboratoire de Petrologie, Université de Nancy 1, BP 239, 54506 Vandoeuvre-les-Nancy, Cedex, France).

September 17-21, 1990

THIRD INTERNATIONAL ARCHAEOAN SYMPOSIUM, organised by the University of Western Australia. (Dr. Susan Ho, Third International Archaeoan Symposium, P.O. Box 435, Nedlands 6009, Western Australia).

September 20-24, 1990

ANDEAN MAGMATISM AND ITS TECTONIC SETTING (International Meeting of IGCP Project 249 with XI Argentinian Geological Congress), San Juan, Argentina. (Dr. C.W. Repela, Centro de Investigaciones Geologicas, Calle 1 No. 644, 1900 La Plata, Argentina).

September 24-28, 1990

PAST AND PRESENT CLIMATE DYNAMICS: RECONSTRUCTION OF RATES OF CHANGE (International Conference), Canton of Ticino, Switzerland. Sponsored by the Swiss Academy of Sciences (K. Kelts, ProClim 90, Postfach 7613, CH3001 Bern, Switzerland).

October 7-13, 1990

COAL DEVELOPMENT IN ASIA/PACIFIC (International Symposium), Hanoi, Viet-Nam. Sponsored by United Nations Economic and Social Commission for Asia and the Pacific (UN-ESCAP). (Dr. Do Huu Hao, General Department of Mines and Geology, 6 Pham Ngu Lao, Hanoi, Viet-Nam).

October 20-25, 1990

GEODYNAMICS OF THE ARABIAN PLATE (International Conference), Kuwait. (Dr. Waris E.K. Warsi, Department of Geology, University of Kuwait, P.O. Box 5969, Safat 13060, Kuwait).

October 20-25, 1990

HYDROLOGICAL BASIS FOR WATER RESOURCES MANAGEMENT (International Symposium), Beijing, People's Republic of China. (Dr. Chen Jiaqi, P.O. Box 366, IWRH, Beijing, PRC).

October 28 - November 1, 1990

MONOCYCLIC VS. POLYCYCLIC EVOLUTION IN BRAZILIAN/PAN AFRICAN FOLD BELTS (Symposium in conjunction with the 36th Brazilian Geological Congress), Natal, Rio Grande del Norte, Brazil. (Emanuel Ferraz Jardim de Sa, Departamento de Geologia - UFRN-Campus, 59.071 Natal RN, Brazil).

November 19-23, 1990

UNITED NATIONS GLOBAL SEMINAR ON URBAN GEOLOGY (International Symposium organized by UN-ESCAP, HABITAT, UNEP and UNESCO), Bangkok, Thailand.

1991

January 23-25, 1991

MINERAL DEVELOPMENT AND ENVIRONMENT (International Conference), New Delhi, India. (Prof. K.L. Rai, Indian School of Mines, Dhanbad 826 004, Bihar, India).

February 2-4, 1991

SMALL SCALE MINING (International Conference), Calcutta, India. (Organising Secretary ICSSM, c/o The Mining, Geological and Metallurgical Institute of India, 29 Chowringhee Road, Calcutta 700 016, India).

February 20-24, 1991

TECTONICS AND MINERAL DEPOSITS OF THE CARIBBEAN (10th Annual Symposium on Caribbean Geology) Mayaguez, Puerto Rico. (J.H. Schellekens, Department of Geology, University of Puerto Rico, P.O. Box 5000, Mayaguez, Puerto Rico 00709-5000).

March 1991

ECONOMIC EVALUATION OF MINERAL RESOURCES (International Conference), Kosice, Czechoslovakia. Languages: Russian and English. (Intergeoekonomika 1991 CSSR, GEOPOND, Eng St Richter, Garbanova 1, 040 11 Kosice, Czechoslovakia).

April 15-19, 1991

AQUIFER OVEREXPLOITATION (23rd International Congress), Puerto de la Cruz, Tenerife (Islas Canarias), Spain. (Dr. Fermin Villaroga, Departamento de Geodinamica, Facultad de Ciencias Geologicas, Universidad Complutense, 29040 Madrid, Spain).

April 26 - May 1, 1991

ASSOCIATION OF EXPLORATION GEOCHEMISTS (15th International Geochemical Exploration Symposium), Reno, U.S.A. (Richard B. Jones, Nevada Bureau of Mines and Geology, University of Nevada, Reno, Nevada 89557-0088, U.S.A.)

May 1991

QUANTITATIVE METHODS OF INVESTIGATION OF THE STRUCTURE OF SOILS AND ROCKS (IAEG International Symposium), Moscow. (Dr. M. Primel, LCPC, 58 Bd. Lafebvre, 75732 Paris Cedex 15, France)

May 7-22, 1991

GOLD '91 (5th International Conference), Belo Horizonte, Minas Gerais, Brazil. (Brazil Gold '91 Organizing Committee, Avenida Alfonso Pena, 3880-3º/5º andares, 30130 Belo Horizonte, MG, Brazil).

May 12-18, 1991

LAND SUBSIDENCE (4th International Symposium), Houston, Texas, USA. (Ivan Johnson, FISOLS, 7474 Upham Court, Arvada CO 80003, USA).

June 10-12, 1991

AFRICAN MINING '91 (2nd International Conference), incorporating PROSPECTING IN AREAS OF ARID TERRAIN and MINE-EX '91, Harare, Zimbabwe: geology, exploration, mining, mineral processing, extractive metallurgy, finance. Organized by The Institution of Mining and Metallurgy in association with The Zimbabwe Section of IMM, The Geological Society of Zimbabwe and The Zimbabwe Institution of Engineers. (The Conference Office, IMM, 44 Portland Place, London W1N 4BR, UK).

August 2-9, 1991

QUATERNARY RESEARCH (13th INQUA International Congress), Beijing, People's Republic of China. (Secretariat, 13th INQUA Congress, Chinese Academy of Sciences, 52 Sanlihe, Beijing 100864, PRC).

August 11-24, 1991

IUGG (XX General Assembly), Vienna, Austria. (IUGG '91 Organizing Committee, c/o Prof. Peter Steihauser, ZAMG, Hohe Warte 38, A-1190 Vienna, Austria).

September 6-11, 1991

PALEOECOLOGY (2nd International Congress), Nanjing, People's Republic of China. (Ma Yu-Ying, Nanjing Institute of Geology and Palaeontology, Academia Sinica, Chi-Ming-Ssu, Nanjing 210008, PRC).

September 16-20, 1991

ROCK MECHANICS (7th International Congress), Aachen, F.R. Germany. (Deutsche Gesellschaft für Erd- und Grundbau, Kronprinzenstrasse 35a, D-4300 Essen 1, F.R.G.).

September 22-27, 1991

CARBONIFEROUS-PERMIAN STRATIGRAPHY AND GEOLOGY (12th International Congress), Buenos Aires, Argentina. Language: English. (Dr. S. Archangelsky, Museo Argentino de Ciencias Naturales, Avenida A. Gallardo 470, Buenos Aires 1405, Argentina).

1992

February 9-12, 1992

LANDSLIDES (6th International Symposium), New Zealand. (Dr. M. Primel, LCPC, 58 Bd. Lafebvre, 75732 Paris Cedex 15, France)

June 1992

WORLD MINING (15th Congress), Seville, Spain. (World Mining Congress, Al Ujazdowskie 1-3, PL-00583, Warsaw; Poland).

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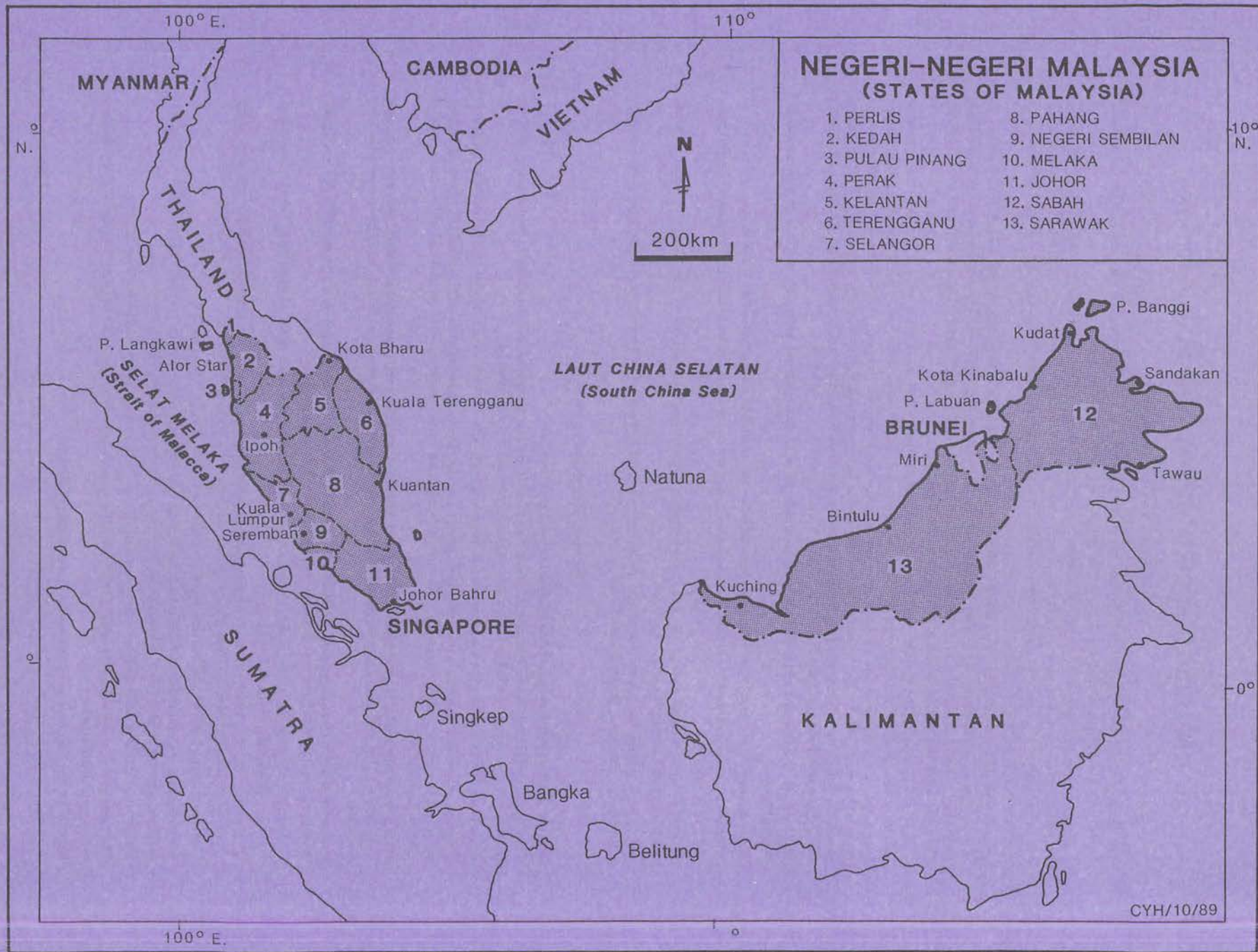
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