

Activity Highlights

43rd CCOP ANNUAL SESSION AND 48th STEERING COMMITTEE MEETING

30 OCTOBER - 5 NOVEMBER 2006, DAEJEON, REPUBLIC OF KOREA



The 43rd CCOP Annual Session and the 48th Steering Committee Meeting was held at the Yousung hotel, Daejeon, Korea, from 30 October - 3 November and 4-5 November 2006 respectively. The host facilities were provided and sponsored by Korea Institute of Geoscience and Mineral Resources (KIGAM).

The 43rd CCOP Annual Session was attended by 113 delegates from Member Countries, Cooperating Countries/Organizations, Honorary Advisers and staff of the CCOP Technical Secretariat (CCOP T/S). Finland was also in attendance as observer.

H.E. Mr. Won Gul Lee, Vice Minister for Energy, Ministry of Commerce, Industry and Energy, Korea delivered the opening keynote address at the Session's Opening Ceremony, followed by welcome addresses of Dr. Eikichi Tsukuda, CCOP Steering Committee Chairperson, Dr. David Prior, Chairperson of CCOP Advisory Group and Dr. Tai-Sup Lee, President of Korea Institute of Geoscience and Mineral Resources (KIGAM). In conjunction with the opening ceremony, the work on the history of CCOP—a book entitled *"A World of Difference"* commemorating the 40th year anniversary of the founding of CCOP was launched.

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Ms. Ta Thi Vinh Hien**CCOP Newsletter**

The CCOP Newsletter, issued biannually, is a publication of the Coordinating Committee for Geoscience Programmes in East and Southeast Asia (CCOP). First issued in 1974, its main purpose is to keep readers abreast with information of CCOP concerns and interest, to disseminate information of CCOP activities and projects either in progress or to be implemented, as well as to publish short scientific papers or notes concerning recent discoveries and new findings.

Articles or information in this Newsletter may be copied, summarized or translated into any language provided that acknowledgement is made and a copy of said print sent to CCOP.

Contributions are invited from all interested persons and organizations, whether or not associated with CCOP, in the following forms:

1. Concise and informative newspaper clippings with date and sources;
2. Announcement of meetings, seminars, field trips, or publications relevant to CCOP's scope of activities;
3. Articles on any subject related to geoscientific investigations in the region. Results or progress reports of scientific or technical work are welcome and will be published under the authors' name as a scientific paper or notes. Reports should not exceed 5,000 words in length including diagrams and references.

Diagrams for publication should be clear and drawn to fit an A4 size full page. As space is limited, authors are urged to consider the relevance of all illustrations, tables and diagrams. Photographs can be included where necessary. The Editor reserves the right to reject or edit any articles submitted for publication in the CCOP Newsletter.

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Member Countries:

Cambodia, China, Indonesia, Japan, Republic of Korea, Malaysia, Papua New Guinea, The Philippines, Singapore, Thailand and Vietnam.

Cooperating Countries:

Australia, Belgium, Canada, Denmark, France, Germany, Japan, The Netherlands, Norway, Russian Federation, Sweden, Switzerland, United Kingdom, and United States of America.

Cooperating Organizations:

ASCOPE, CIFEG, CPC, UN-ESCAP, EuroGeosurveys, GETECH, IOC, IOMAC, IUGS, PETRAD, UNEP, UNESCO, The World Bank.

Dr. Dae Gee Huh, on behalf of the Head of the Delegation of Korea, was elected Chairperson of the Session and **Dr. Seville David Jr.**, Head of the Delegation of the Philippines, was elected Vice-Chairperson.

The thematic session was jointly organized by CCOP, KIGAM, together with Korea Gas Hydrate R&D Organization (GHDO) on 1-2 November 2006, with the topic "New Energy Resources in the CCOP Region on two themes Gas Hydrates and Coalbed Methane".

Additionally, a new agendum at this Annual Session was the roundtable dialogue on the 'Role of Geoscience in Governance for Sustainable Development and Human Security', held in cooperation with the Commission on Geoscience for Environmental Management of the International Union of Geological Sciences (IUGS-GEM). It was chaired by **Dr. Satoshi Murao**, Japan and co-chaired by **Dr. David Ovadia**, UK. This dialogue was organized for geoscientists in CCOP to deliberate the issue of disconnects between the mainstream policy arena for sustainable development and geoscience institutions from the perspective of governance. A summary of the dialogue will be produced in June 2007.

48th STEERING COMMITTEE MEETING



The **48th Steering Committee Meeting** was held at the Korea Institute of Geoscience and Mineral Resources (KIGAM), Daejeon, KOREA, from 4-5 November 2006. The Meeting was attended by delegates of the following Member Countries: CAMBODIA, CHINA, INDONESIA, JAPAN, REPUBLIC OF KOREA, MALAYSIA, PAPUA NEW GUINEA, PHILIPPINES, THAILAND and VIETNAM, and **Dr. David Prior**, Chairman of the CCOP Advisory Group. Also present were the Director and staff of the CCOP Technical Secretariat (CCOP T/S).

Dr. Eikichi Tsukuda, Chairperson of the Steering Committee, opened the Meeting. **Dr. Tai-Sup Lee**, Permanent Representative of Korea to CCOP and President of the Korea Institute of Geoscience and Mineral Resources (KIGAM), welcomed the representatives of CCOP Member Countries and delivered the keynote address to the meeting.

CCOP Technical Activities

Petroleum Policy and Management (PPM) Project

The Norwegian government-supported Petroleum Policy and Management (PPM) Project which commenced in July 2002 completed the 4 case studies that were supported by workshops, expert visits, and seminars. The overall goal is to develop human resources and to promote public sector institutional capacity-building in the petroleum management of the CCOP Member Countries. One of the objectives is to utilize the lessons learned from the previous NORAD-funded projects into a hands-on setting using country data from diverse settings. These 4 case studies were carried out in the following countries:

1. **Cambodia** - Khmer Basin (frontier)
2. **Philippines** - East Palawan and Sulu Sea Basins (frontier)
3. **China** - Sichuan Basin (semi-mature)
4. **Indonesia** - Kutel Basin (mature)

The Project has capitalized on the expertise available in the CCOP region that resulted in significant savings for the project and, at the same time further enhanced the friendship and cooperation among Member Countries. The Project has also availed the expertise of Norway particularly in the areas of petroleum resource management and development, and was made possible through the strong support provided by the Norwegian Petroleum Directorate, the technical advisor to the Project. PETRAD, a Norwegian Foundation and a CCOP Cooperating Organization, has also helped in identifying experts that were invited as resource persons through its international network.

This period is the latest stage of project's implementation and the dissemination seminars for the 4 case studies were completed with activities as follow.

The 5th PPM Seminar

July 26-29 2006, Bangkok, Thailand



Mrs. Che Zan Binti Yassin of PETRONAS, Malaysia giving a lecture on the Practice of Knowledge Management during the 5th PPM Seminar in Bangkok

The 5th seminar of the PPM Project was conducted in Bangkok on 26-29 July 2006 and attended by 26 participants from 9 Member Countries of CCOP, majority are National Coordinators of the PPM Project. The case study countries presented the results and recommendations of their respective case studies. These were similar to the presentations that were given by the host team members to their stakeholders during their respective dissemination seminar. The other participating countries (non hosts) were also given the opportunity to present the knowledge learned from their case study participations and how knowledge were given value to enhance their own capacities.

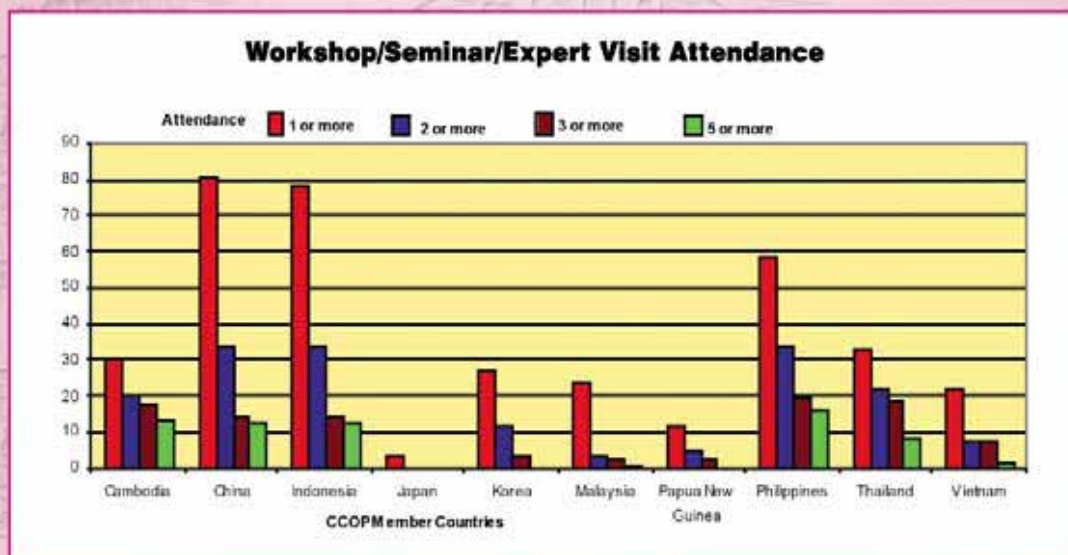
Indonesia Case Study Dissemination Seminar

August 3, 2006

The Dissemination Seminar of the Indonesia case study was conducted on 3 August, 2006 at the LEMIGAS conference room. The Seminar was an opportunity for the Indonesian case study team members to present the results and recommendations of the study to the stakeholders.

Summary of project outcome

With a budget of NOK 19.527 Million (~USD 2.798 Million), the PPM Project has implemented a total of 19 workshops, 19 expert visits, 5 seminars, and 4 dissemination seminars. The total number of participants in the PPM Project is 395 personnel from the CCOP Member Countries. If we multiply the number of participations of each participant to the activities conducted in the PPM Project, the product would represent the total number of participations that equal to 1,127. Of the total number of participants, more than 70% are geologists and petroleum engineers, the rest are economists, accountants, civil/mechanical/chemical/mining engineers, IT specialist, etc. About 25% are women and more than 20% of the participants have managerial status (ranging from Division Chiefs to Vice President). The chart below illustrates the total number of attendance in the PPM Project activities.



It is interesting to note that a number of participants have attended many of the supporting activities and followed closely the case studies of the PPM Project.

From the report of the National Coordinators, listed below are some of the impacts of the PPM Project in the CCOP Member Countries:

- a) *Improved understanding of the petroleum potential and policies of the CCOP Member Countries, especially the case study countries*
- b) *Information and Knowledge learned are disseminated through reporting and conduct of seminars in the participant's respective organization*
- c) *Adoption of some concepts learned in basin assessment and exploration investment promotions. This is evident in Cambodia, where the CNPA staffs now, and on their own, have better understanding on resource assessment and have performed realistic assessment of the Khmer basin. The teams that participate in the PPM Project from Philippines and Thailand are also members of their investment promotion team and has actually applied the knowledge learned into their own investment promotion campaign*

- d) *The Project provided a good forum of building closer relationship and cooperation. The open sharing of experiences of expert in the region during expert visits and workshops are evidence of enhanced (internal) cooperation among Member Countries.*
- e) *Indonesia supported the education and training of CNPA staff at their petroleum training center (PUSDIKLAT MIGAS) in Chepu.*
- f) *The technical staff from PNG and Cambodia participated in the resource assessment works in the Philippines DOE - as an on-the-job training.*
- g) *China supported the attendance of 4 participants from CCOP Member Countries by sponsoring the daily subsistence allowance during the China case study workshops (workshop 1-3). China also covered the cost of workshop materials, equipment rentals, expenses for the field trip, and airport transfer.*
- h) *Experts are provided by Member Countries to address issues and challenges faced by a case study country. The mother agency of the experts contributes to the travel expenses. In a way, promotes a **"Member Country helping another Member Country"** in CCOP.*
- i) *PPM is easily implemented based on the already established network. This network also functions outside the project. The collaborative project initiated by KIGAM and LEMIGAS to enhance further the cooperation and knowledge on oil and gas research is open to participation to other members. KIGAM has also offered to cooperate in other petroleum geoscience project with the Member Countries.*
- j) *Easier facilitation of new projects in the CCOP T/S. The experience of the Technical Secretariat in the management and coordinating the PPM project has considerably helped in efficient facilitation of new projects in CCOP.*

Institutional Capacity Building Project Phase I (ICB-CCOP 1)

The 3-year Danish government-supported ICB-CCOP 1 Project started in January 2005. The implementation of the ICB-CCOP1 Project composed of two parts for reaching the goals and objectives of the project. One part is project activities and another part is project case studies. According to the work plan of 2006, the implementation of project activities during the 3rd and 4th Quarters have been progressing well. Most of the planned activities, which were scheduled in the second half year of 2006, have been conducted. The project involved cross-border case study activities in Vietnam, China, Indonesia, Malaysia and the Philippines. Scientists from all CCOP Member Countries were invited to participate in regional project meetings, seminar and training courses. The project also involved a pool of Danish and regional experts, as well as management and coordination support from the CCOP Technical Secretariat. A total of 2 meetings, 1 seminar and 1 training were organized with 28, 19 and 31 participants respectively from the Member Countries.

ICB Events and Activities

1. **CCOP-DANIDA Institutional Capacity Building Project ICB-CCOP1 1st Bangkok Meeting on Sulu Sea - East Sabah Basin & Yinggehai - Song Hong Basin Case Study**, August 10-11 2006, Bangkok, Thailand.
2. **CCOP-DANIDA Institutional Capacity Building Project ICB-CCOP1 1st Qingdao Meeting on Yinggehai - Song Hong Basin Case Study**, 28-29 August, 2006, Qingdao, China.
3. **CCOP-DANIDA Institutional Capacity Building Project ICB-CCOP1 Training Course on Organic Geochemistry and Petrology in Petroleum Exploration**, 11-14 September 2006, Beijing, China.
4. **CCOP/ICB-PETRAD-CNOOC-MLR-CGS Seminar on CO₂ Issues in Petroleum E&P**, 23-25 November 2006, Guilin, China.

The impact of the above mentioned activities is very outstanding. ICB Bangkok meeting and Qingdao meeting facilitated the cross-border case studies outputs merging. During the meeting the experiences have been shared, the common issues have been discussed, as well as the work plan for next step joint study has been made. Effective communication mechanisms have been set up among the case study host countries.

Denmark, through the scientists from GEUS facilitated as speakers to the ICB-CCOP1 Project training course and seminar, provides state-of-the-art, world-class technology applicable and appropriate to meet the needs in capacity building and human resource development efforts of the CCOP Member Countries, especially for the joint case studies. These expertise and technology can be beneficially shared and used to enhance the knowledge and advance the technology development of CCOP Member Countries.

CO₂ has increasingly become one of the most crucial issues in the petroleum industry. It is not only the matter of the petroleum exploration and production but also of the potential environmental impacts. This issue, especially in the Southeast Asia offshore area (one of the ICB-CCOP1 Project case study area), became more and more outstanding. The scientists from CCOP Member Countries made the presentations and exchanged the views, sharing the experience and knowledge. Participants were also informed of the current situation of technology and engineering on CO₂ exploration and production in Norway, Netherlands, and Denmark oil industry which are amongst the most advanced technology leaders in the world oil industry. Participants learnt a lot and felt that it was urgently needed and necessary to import and share such technologies, analyze the key points, strengthen basic technology system to support CO₂ issues in petroleum exploration and production and technology development.

Through the project activities the relationship and friendship among geoscientists from our CCOP Member Countries have been enhanced. The new connection has been built up and the spirit of the team work and cooperation has been established among the participants from different countries through workshop and field study activities. The trust and confidence have been built among the case study host countries' partners and, in some cases, the conducted geo-scientific work is unique in the history of cross-border cooperation between the neighbouring countries. This new model is broadly accepted and adopted by the CCOP Member Countries.

Further information can be access through <http://www.ccop.or.th/techdetail.asp>

CCOP-PETRAD Seminars

The International Programme for Petroleum Management and Administration (PETRAD), Norway has been conducting tailor-made courses and seminars together with CCOP T/S and CCOP Member Countries. Continued efforts are being exerted and PETRAD had been particularly resourceful in soliciting support for the seminars requested by the Member Countries. The following PETRAD seminars in the second half of 2006 have been arranged in cooperation with CCOP.

1. Seminar on Petroleum Policy and Management, Chengdu, China

14-19 August 2006



The seminar was co-organized by The Strategic Research Center for Oil and Gas, Chengdu Institute of Geology and Mineral Resources, Ministry of Land and Resources (MLR), China Geological Survey (CGS), in cooperation with PETRAD and CCOP Technical Secretariat. It was held at Wangjiang Hotel in Chengdu, China from 14-19 August, 2006. A total of 57 participants attended the seminar. There were 6 Guest Speakers.

The Opening Ceremony of seminar was attended by **Mr. Sun Baoliang**, Deputy Director General, Department of International Cooperation, Science and Technology, Ministry of Land and Resources (MLR), **Mr. Zhang Dawei**, Deputy Director General, The Strategic Research Center for Oil and Gas (MLR), **Mr. Wang Jie Min**, Deputy Director General, Chengdu Institute of Geology and Mineral Resources, China Geological Survey (CGS), **Mr. Jiang Shijin**, Director, International Co-operation Division, (CGS), **Mr. Ma Yongzheng**, Deputy Permanent Representative of China to CCOP, Deputy Division Director, Department of International Cooperation, Science and Technology (MLR), **Mr. Bjarne Moe**, Director General, Norwegian Ministry of Petroleum and Energy, **Dr. Øystein Berg**, Managing Director, PETRAD, and **Mr. Chen Shick Pei**, Director, CCOP Technical Secretariat.

Through the Seminar on Petroleum Policy and Management, participants had the opportunity to share their knowledge and experiences with the guest speakers from The Norwegian Ministry of Petroleum and Energy, The Norwegian Petroleum Directorate, and The Petroleum Safety Authority, Norway, Simonsen Law, and DNV Technology Services Asia Pacific, which have been involved with the development of one of the most modern regulatory regimes within Resource, Safety and Environmental Management.

2. PETRONAS - PETRAD - INTSOK - CCOP Seminar on Drilling, Well Service and Completion New Technology "Acquiring New Technology for Local Content", Langkawi, Malaysia

4-6 September 2006



The seminar topic was requested to PETRAD/CCOP by PETRONAS in the beginning of 2006. It was organized by PETRAD, INTSOK and CCOP in close co-operation with PETRONAS. In-kind contribution on cost sharing was provided by Ministry of Oil and Energy, Norway through PETRAD and INTSOK.

The Seminar was held in Langkawi, Malaysia from 4-6 September 2006. A total of 85 participants, from the company delegations: IPRES, AkerKvearner Well Service, Royal Norwegian Embassy in Malaysia and Singapore, AEMOS Sdn. Bhd. Reslink AS, Greenland Nusantara Sdn. Bhd., and PS Contractors: PCPP Operating Company S/B, CS Mutiara Petroleum Sdn. Bhd., SSB/SSPC Ltd., Talisman (M) Ltd., Nippon Oil Exploration (M) Ltd., Murphy (PM, Sarawak, Sabah) Oil Co., Ltd., Newfield Sarawak Malaysia Inc., Service Providers: Schlumberger (M) Sdn. Bhd. Weatherford (M) Sdn. Bhd., Halliburton Energy Services (M) SB (Speery), Baker Hughes INTEQ (M), Delcom Oilfield Services Sdn. Bhd., Romstar Group, Sisma Holding, Neural Oilfield Service, HZN Sdn. Bhd. Transocean, Petroserve (M) Sdn. Bhd., and PETRONAS. There were 20 Guest Speakers, with expertise on the main topics of Drilling, Downhole, Well Service and New Technology.

The Opening Ceremony was graced by **Mr. M. Nazori Janor**, Chairman of Organizing Committee, **Mr. Svein Michelsen**, Charge d'Affaires a.i., the Royal Norwegian Embassy in Malaysia, **Mr. Mohammed Hatta abd. Karim**, Deputy Director General (Operations), Minerals and Geoscience Department (JMG) on behalf of **Mr. Yunus Abdul Razak**, Permanent Representative of Malaysia to CCOP, Director-General, Minerals and Geoscience Department (JMG) and **Mr. Rosli Boni**, General Manager, PSC Management, PETRONAS.

The scope of the seminar was aspects related to the exploration, drilling, development and operation of deepwater fields, with a special emphasis on technology. Malaysian Keynote Presentation was also made by a guest speaker from Petronas Carigali Sdn. Bhd., Mr. Mahbob Abd Manan, Head Drilling Department, the topic on "Challenges in Drilling Operations in Malaysia".

The keynote focused on the Availability of Resources, Technical Challenges and Operational Challenges. Outcome of the Seminar was to present the new technology and knowledge transfer in the Drilling and Well Service and Completion New Technology, and development of the petroleum sector, which are developing at a rapid pace.

Dialogue Session was conducted by **Mr. Mohd Nazori Jonor**, Chairman, Organizing Committee, **Mr. Per Hagen**, Regional Director, INTSOK, and the Guest Speakers. The Dialogue Session gave great opportunities for the participants and guest speakers to share expertise and experiences.

The cooperation between Malaysia and Norway in the petroleum sector is continuously improving, and the door is further opened through this seminar.

3. PETRONAS - PETRAD - INTSOK - CCOP Brownfield Technology Seminar "Creating Value Through Brownfield Re-development", Penang, Malaysia

11-13 December 2006

The special seminar topic on Brownfield Technology "**Creating Value through Brownfield Re-Development**" was requested by PETRONAS. The Seminar was organized and in-kind contribution on cost sharing provided by PETRONAS, PETRAD, INTSOK, and in co-operation with CCOP Technical Secretariat.

The Seminar was held in Penang, Malaysia from 11-13 December 2006 with a total of 113 participants, from the Company Delegations, PS Contractors, Service Providers, and Petronas. There were 30 guest speakers, with expertise on the various and world wide basis.



The Keynote Presentation was made by invited Guest Speaker **Mr. Abdullah Karim**, Vice President E&P Business, PETRONAS the topic on "**Challenges in Brownfield Re-Development in Malaysia**".

The scope of the seminar was aspects related to the increased recovery measures and topics related to improved production reliability and rejuvenate aging facilities and evacuation infrastructure with a special emphasis on technology.

Amongst the issues addressed were effective treatment and disposal of produced water as well as sand management. The guest speakers shared the expertise through various presentations and questions and answers during each presentation, e.g. Petronas' Journey increasing producing fields' recovery efficiency, Asset integrity management: Petronas' perspective, Integrity management and lifetime extensions of old platforms: structural integrity management (SIMS), ELASTOPIPETM – Field experience with the new way of upgrading Brownfield fire water piping systems, Experiences from platform decommissioning in the North Sea and Gulf of Mexico, HSSE: Safeguarding Personnel against Toxic Gases (e.g. H₂S), experiences and value creation gained from MASA project, System maximizing efficiency in Brownfield projects, Maintenance and operational execution of topside process facilities.

The Panel session was organized; the experience learnt, sharing knowledge and technology transfer, was focused and presented under this session. Also focused are the availability of resources, technical challenges, and operational challenges.

CCOP CASM-Asia Project

The Communities and Small-Scale Mining in Asia (CASM-Asia) project, coordinated by CCOP, had organized two workshops in the second half of the year.

CASM-Asia Workshop on Artisanal/Small-Scale Mining Social Issues was held in Hanoi, Vietnam on 16th -18th August 2006, by CCOP, Geological Survey of Japan, AIST and the Department of Geology and Minerals of Vietnam. Twenty four participants from the CCOP Member Countries, India, Mongolia and United Kingdom joined the workshop.



The CASM-Asia workshop participants visiting the KUD Mekarjaya's gold mine in Ceneam Sub-District, Tasikmalaya Regency, Indonesia, November 2006

At the workshop, participating actions of each country to the project were reviewed and stories of social issues of artisanal/small-scale mining in Asia were presented and discussed. The workshop also provided the participants an opportunity to learn a methodology of enlightening people on environmental issue.

Highlight of the workshop is the presentations on risk communication with game simulations by the invited resource person, **Dr. Seiji Suzuki** from Tezukayama Gakuin University, Osaka, Japan. The participants were put into a simulated situation through card-games, where they experienced realities of social and environmental issues in artisanal and small-scale mining, and risk communication management. Crossroads were also demonstrated, as means of communicating risks. On the last day, the participants went to Halong City to visit a coal-mining company, a stone quarry and the World Natural Heritage Ha Long bay in Quang Ninh province.

CCOP-GSJ/AIST-GAI CASM-Asia Workshop on the State-of-the-Art of Science and Technology to Protect the Environment and People was conducted on 27th-29th November 2006, in Bandung, Indonesia. The Workshop was organized by CCOP and Geological Agency Indonesia with sponsorship from CCOP, World Bank, Geological Survey of Japan, AIST, and Geological Agency Indonesia. Forty-one participants from CCOP Member Countries, resources speakers from Japan, India, UK, Mongolia, Germany, and representatives from UNIDO in Indonesia were joining the workshop.

The workshop had discussed the ASM database and technological issues, latest understanding of epithermal gold mineralization, clay minerals, extraction of gold using halogen-containing organic system, environmental sampling for mercury study, and application of PIXE to environmental studies, analysis of traditional versus alternative technologies, technical solutions for ASM etc. The participants also had gone through practical training on sample preparation for PIXE analysis and visited the KUD Mekarjaya's gold mine in Ceneam Sub-District, Tasikmalaya Regency, West Java Province, which is 15 km. South East of Bandung, to get first hand information on technological issues of local ASM workers.

Cooperation of the United States Geological Survey (USGS) and CCOP

The United Nations Educational, Scientific and Cultural Organization (UNESCO), the U.S. Geological Survey (USGS), and earth science organizations in the South Asia Region have sponsored a series of workshops on reducing earthquake losses in Nepal, China, Sri Lanka and Bangladesh.

The 6th International Workshop on Seismic Analysis in the South Asia Region was co-hosted by CCOP and the Department of Mineral Resources, Thailand and co-sponsored by The United Nations Educational, Scientific and Cultural Organization (UNESCO) and the U.S. Geological Survey (USGS). The workshop was held from 4 to 7 December 2006 at the Imperial Mae Ping Hotel, Chiang Mai, Thailand.

A total of 48 participants from Bangladesh, Bhutan, China, India, Indonesia, Iran, Nepal, Pakistan, Sri Lanka, Thailand, The United Kingdom, The United States of America attended the workshop.

This sixth workshop of the series focused on:

1. Processing of the 8 October 2005 Kashmir earthquake and associated aftershock data using SEISAN;
2. Seismicity map and ISC data - input from the participants whether they are satisfied with the ISC seismicity listing; and
3. Regional fault map - Resolve nomenclature for the geologic/tectonic features, create a cross-reference table that will relate terminology for the various national maps.
4. With Mr. Niran Chaimanee of CCOP T/S and Mr. Suwith Kosuwan of DMR as field-trip leaders, a one-day excursion was organized. The group visited the Chiang Mai Seismic Station and other tectonic-induced sites of Chiang Mai province.



CCOP-GSJ/AIST Field Workshop for Volcanic Hazard Mitigation

With the support of the Geological Survey of Japan, GSJ/AIST, the field workshop series for Volcanic Hazard Mitigation is organized annually since 2005. The main objectives of these workshops are to study volcanic hazard mitigation for young volcanologists on understanding different types of volcanoes in Asian countries, and to disseminate outputs of the workshops to the CCOP Member Countries and the public.



Following the second workshop in Yogyakarta, Indonesia in 2005, the third workshop of the series was held in Bandung, Indonesia on August 29 - September 3, 2006. A total of 22 participants include 14 from Directorate of Volcanology and Geological Hazard Mitigation, Indonesia (DVGHM), 5 from Geological Survey of Japan (including **Dr. Akira Takada** as the Project Leader), 2 from Philippine Institute of Volcanology and Seismology (PHIVOLCS) and 1 from CCOP/TS.

The workshop started with opening speech of Mr. Bambang Dwiyanto, Head of Geological Agency and Keynote speech by **Dr. Sorono**, Head of DVGHM and Mr. Niran Chaimanee, Regional Expert of CCOP/TS. Fifteen papers were presented. The Volcanic Survey for Hazard Potential, Measures and Monitoring in Indonesia were elaborated and extensively discussed among the participants. The present status of Mayon Volcano Eruption and Volcano Hazard Mitigation and Eruption Forecasting in the Philippines were reported. Lastly, Volcano Geology of Japan and new technology for volcano monitoring were introduced by Japanese participants. Field excursion including visiting volcano observatories was carried out on August 31 to September 2.

Volcanologists could learn the various types of eruption and hazard assessments in Indonesia, the Philippine and Japan in this workshop. It can be concluded that understanding the mechanism and typical character of each volcano type can lead to the monitoring and evacuation before eruption. Alarm system, and education also are important for public resilience.

It is planned that the Philippines will be the host country for the final workshop/technical seminar of this project in conjunction with the Annual Session of CCOP in 2007.

CCOP-AIST/GSJ Project on Groundwater Assessment for Delta in Southeast and East Asia

The CCOP-AIST/GSJ Project on Groundwater Assessment for Delta in Southeast and East Asia is a 4-year project which commenced in February 2005 with the support of the Geological Survey of Japan/AIST. The main purpose is to evaluate groundwater resources and environments through its monitoring within the region. Three sub-projects were established as Groundwater Environment and Management in the Urban Coastal Area, Groundwater and Land Subsidence Monitoring and Groundwater Evaluation Using Monitoring System. These sub-projects were started in 2005 and will be finished in 2008. The results and products are convened in the last year (2009).

The Geological Survey of Japan (GSJ/AIST) and China Geological Survey (CGS) jointly, organized the CCOP-GSJ/AIST-CGS Meeting & Training under the Groundwater Project 2006, with the theme "**Groundwater Assessment and Control in the CCOP Region**". The Meeting & Training on Groundwater Project was held on 25 - 27 September 2006 in Beijing, China. The objective of this programme is to follow-up the progress of the three sub-projects activities and to have better understanding on groundwater data evaluation. It was attended by a total of twenty-nine distinguished guests from China, participants from Cambodia, China, Indonesia, Japan, Korea, Malaysia, Papua New Guinea, Philippines, Thailand, Vietnam, and the CCOP Technical Secretariat.



The Meeting was officially opened by **Dr. Zhang Hongtao**, Permanent Representative of China to CCOP, Deputy Director-General, China Geological Survey, **Mr. Chen Shick Pei**, Director of the CCOP Technical Secretariat and **Dr. Atsunao Marui**, Project Leader of the Geological Survey of Japan, AIST welcomed the participants to the Meeting and Training Program.

A training course was carried out after the project meeting. A total of six lectures were made by resource persons from China, Japan and Korea during the one and a half day training.

In 2007, the meeting is planned to be held in Japan or Korea. It is expected to be the final meeting to complete each sub-project while the final product of this total project is expected to be a combination of the sub-projects to be made in 2008.

CCOP-GSJ/AIST Project on Geoscience Asian Information Network (GAIN)

The CCOP-GSJ/AIST Project on Geoscience Asian Information Network (GAIN) is a 3-year project and is being supported by the Geological Survey of Japan/AIST for establishing a clearinghouse of geoscience information of East and Southeast Asia where customers worldwide can get the necessary information on the availability of geoscientific information in this region.

CCOP with the China Geological Survey and the Geological Survey of Japan, AIST organized the **Seminar on Geo-Information Technology and the 4th Workshop of CCOP Metadata Working Group** on 5-7 September 2006 in Guangzhou, China. Twenty-three participants from the CCOP Member Countries joined the activity.

The participants were introduced to the geoinformation technology in China including MapGIS - widely used Chinese commercial GIS, Digital Regional Geological Survey Mapping Technique and RGMap 3.0 System and GeoExpl - Multi - Source GeoData Management & Analysis System. Geo-information technology and activities of the CCOP Member Countries were also presented and discussed at the seminar.

The workshop of the CCOP Metadata Working Group discussed on the updates and progress of the CCOP Metadata Project. The metadata on geological maps is near to its completion. More data from China, Japan, Korea, Thailand and Vietnam are available at its clearinghouse, <http://www.aist.go.jp/RIODB/GeoMetaData/ASIA/editQuery.do>. As of the workshop date, the total number of metadata records available at the clearinghouse is 4,115.

The workshop also recommended extension of metadata to other geoscience information, such as minerals, groundwater, geohazard, coastal zone (marine and quaternary geology), geophysics and geochemistry, and energy (sedimentary basins, geothermal). This could be carried out after the completion of the CCOP Metadata Project on Geological Maps.

CCOP Texas A & M University Fellowship Programme

The CCOP Texas A & M University (TAMU) Fellowship is a cooperative programme between CCOP and the Texas A&M University in the USA. Under this programme TAMU will provide graduate education fellowships to outstanding government and industry personnel from the CCOP Member Countries. In addition to the educational aspects, the project hopes to develop joint research projects between TAMU faculty and scientists and agencies in the CCOP Member Countries.

The first recipient of the award is Ms. Corazon Sta. Ana from the Department of Energy of the Philippines. She successfully completed her studies under the fellowship in the second half of 2006. With Ms. Sta. Ana completing her studies, there will be three places available for the CCOP Member Countries under this program.

East Asia Geoscience and Environmental Research (EAGER) Project

The EAGER Project is a trust fund set up in the Geological Society of America with personal contribution of **Dr Maurice "Ric" Terman**, CCOP Honorary Advisor, to be used for funding research in geosciences in the region. Under the programme, a grant will be made available for researches in Geosciences and Environment in East and Southeast Asia to candidates from the Member Country hosting the CCOP Annual Session.

For 2006, the recipient of the award was **Mr. Seung-Pil Jung** of Seoul National University with his research entitled **"Integration of DFN Model and Production Data for the Characterization of a Fractured Reservoir Using the Ensemble Kalman Filter"**. He is a PhD student at the School of Civil, Urban, and Geosystems Engineering of Seoul National University. **Dr. Ric Terman** awarded the grant to Mr. Jung during the CCOP 43rd Annual Session held in Daejeon, Korea on November 2006.

Meetings, Visitors and Guests

July

- 3-7** * Dr. Anthony Reedman and Prof. Dr. Yoshihiko Shimazaki, CCOP Honorary Advisors, visited CCOP T/S
- 10, 12-13** * Dr. Satoshi Murao from GSJ/AIST visited CCOP T/S
- 12** * Geo-Information Sector Manager, Ms. Marivic P. Uzarraga and Dr. Satoshi Murao from GSJ/AIST met Mr. Sompob Wongsomsak at the Department of Mineral Resources to discuss about Geo-GRID
- 18** * Mr. Stephen Janson, Managing Director of Community Sponsorship, visited CCOP T/S
- 19** * Dr. Atsunao Marui from GSJ/AIST visited CCOP T/S
- 25** * Prof. E. Di Geronimo from Universita degli Studi di Catania, Italy visited CCOP T/S

August

- 1-3** * Dr. Joy Jacqueline Pereira from Institute for Environment and Development (LESTARI), Malaysia visited CCOP T/S
- 9-10** * Dr. Yasukuni Okubo and colleague from GSJ/AIST visited CCOP T/S

September

- 4-8** * Mr. Niran Chaimanee, Regional Expert, attended the Merapi International Workshop and Volcano International Gathering 2006 in Yogyakarta, Indonesia
- 7-9** * Mr. Simplicio P. Caluyong, PPM Project Coordinator, and Mr. Liu Liqun, ICB-CCOP1 Project Coordinator, attended ASCOPE Working Committee & Joint Committee Meetings in Hanoi, Vietnam
- 18-22** * IT Manager and assistant attended Seventeenth UN Regional Cartographic Conference for Asia and the Pacific at UNCC, Bangkok
- 19** * Mr. Hiromichi Maruyama, Director of Geographic Department, Geographical Survey Institute of Japan visited CCOP T/S
- 20-22** * Mr. Liu Liqun, ICB-CCOP1 Project Coordinator, attended TSOP (The Society for Organic Petrology) in China
- 21** * Mr. Chen Shick Pei, Director, and Mr. Niran Chaimanee, Regional Expert, attended "Capacity Strengthening for Management of Thailand's Andaman Sea Coastal Zone" at the Evergreen Laurel Hotel, Bangkok
- 22** * Mr. Somsak Potisat, Director-General of Department of Mineral Resources and staff visited CCOP T/S
- 25-29** * Geo-Information Sector Manager went on a Mission Trip to Japan - GEOGrid & CASM-Asia discussion GSJ/AIST in Tsukuba, Japan

October

- 24** * Geo-Information Sector Manager, ICB-CCOP1 Project Coordinator and PPM Project Coordinator attended a Seminar on Offshore Technology and Management Program, School of Engineering and Technology, Asian Institute of Technology, Bangkok, Thailand

November

- 7-10** * Mr. Niran Chaimanee, Geo-Environment Sector Manager, attended The 6th Asian Seismological Commission General Assembly 2006 and the Symposium on Earthquake and Tsunami Disaster Preparedness and Mitigation
- 10** * Dr. Frederick Simon from UNESCO visited CCOP T/S

December

- 6** * Dr. Nguyen Hong Minh attended the International Conference Jewelry & Mining in Bangkok

Scientific Note

Geological basin evolution of Offshore Eastern Sabah, MALAYSIA

BY

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1. Regional Geology and Stratigraphy

Sabah occupies a central position between three marginal basins the Sulu, Celebes and South China Seas. The main tectonic elements of Sabah are a major fold-thrust belt trending northeast in the west (NW Borneo Trend) and bending to the east and southeast towards the north and eastern part (Sulu Trend) of Sabah (Figure 1). This arcuate belt consists of a deep-marine Eocene-Oligocene accretionary complex of the Crocker Formation (Tongkul 1990). The fold-thrust belt extends further west offshore along the northwestern continental margin of Sabah (Hinz et al. 1989) and northeast into Palawan and the NW Sulu basin (Rangin 1989).

In Sabah, five distinct tectono-stratigraphic provinces can be recognized.

- (a) An ophiolite complex, which is considered to form the basement to the sedimentary succession of Sabah ;
- (b) The Rajang-Crocker accretionary prism, an arcuate belt consisting of deformed deep-marine, Eocene-Oligocene sediments;
- (c) Broken formations and melanges which show characteristics of tectonic, sedimentary and diapiric origin and are thought to have formed in a series of related events in the Early to Middle Miocene;
- (d) Neogene sedimentary rocks, which are mostly shallow marine to fluvio-deltaic facies deformed into sub-circular to elliptical-shaped outliers and fault bounded are structurally controlled synclines and interpreted as remnants of a single large proto-basin deformed in NW-SE trending transpressional fault zones (Balaguru et. al. (2003)).
- (e) The Semporna-Sulu Arc, a region andesitic to dacitic volcanic activity of Miocene to Quaternary age in the Dent and Semporna peninsulas.

The central and southern parts of Sabah are underlain by Paleogene to early Neogene sediments formed in a deep to shallow water marine basin. These sediments are unconformably overlain by later Neogene sediments which are mostly shallow marine to fluvio-deltaic and contain coal beds.

The melanges of eastern Sabah have been interpreted as related to basin initiation in an intra-arc setting and not related directly to subduction/accretion processes (Hutchison 1992, Clennell 1991, 1996). The melanges are composed predominantly of deep-water clastic sediments deposited in the Central Sabah basin, mixed with ophiolite material (Clennell 1992). They have not been metamorphosed. Similar clast types suggest that all the eastern Sabah melanges formed in a series of related events during the late early Miocene to earliest mid Miocene. Some are slump features from unstable submarine escarpments, triggered by tectonic rearrangements interpreted to be related to the coeval onset of extension and seafloor spreading in the SE Sulu Sea (Clennell 1996, James and Koopman 1996). However there is little evidence of extensional structures in most of eastern Sabah (Clennell 1996). However, Rangin et al. (1990b) suggest that a compressional regime may have existed in Middle Miocene and earlier times as a result of northward thrusting of the Semporna volcanic arc.

Balaguru (2001) interpreted that a progressive compressional regime may better explain the highly tectonised nature of the Paleogene formations which form part of the melange and broken formations of Sabah. Balaguru and Nichols (2004) have proposed that the melange formation are genetically related to progressive tectonic deformation in the fore-arc setting and followed by back-arc rifting of the Sulu Sea in which the Neogene formations was deposited.

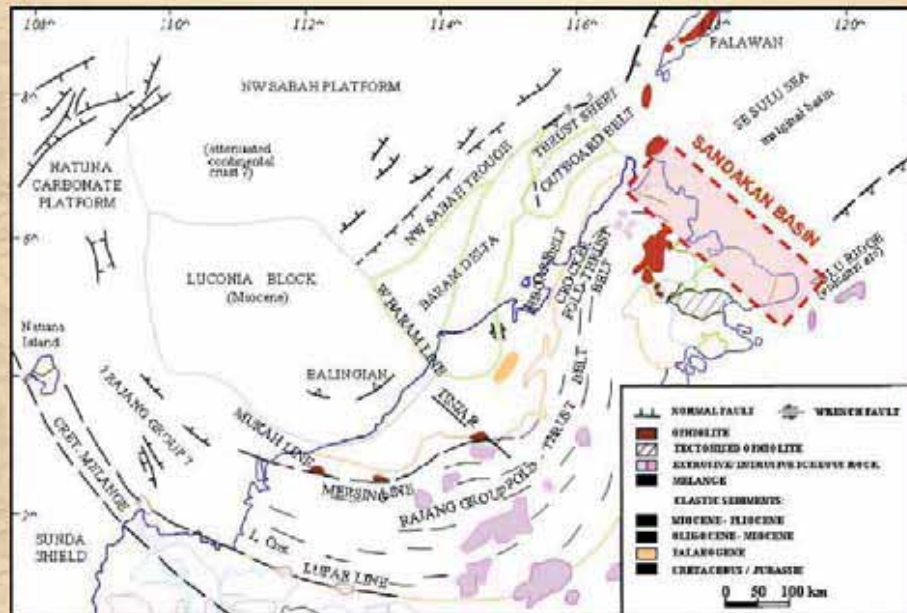


Figure 1. Structural lineaments of the NW Borneo region.

2. Basin Evolution Study

Early Palaeogene Sedimentation

The Palaeogene was a period of continued deposition of deep marine turbidites throughout Sabah, Sarawak and NW Kalimantan regions. A widespread association of Late Cretaceous to Eocene deep water mudstones and turbiditic sandstones of the Rajang Group can be observed on both the east and northeast parts of Sabah. All are thought to have been deposited in a large NE-SW trending Crocker Basin and all are highly deformed with tight isoclinal folds and thrusts. The strongly deformed turbiditic Rajang Group is interpreted as a part of an accretionary prism (Hazebroek and Tan 1993, Hutchison 1996, 2000), related to southeasterly subduction of the proto-South China Sea in the NW Borneo. (Figures 2 & 3).

Late Eocene Uplift

An unconformity within the succession of Palaeogene turbidites between the Middle and Upper Eocene is inferred by Rangin et al. (1990) on the evidence of reworking of nanofossils and Hutchison (1996) also argues that the West Crocker Formation includes detritus from uplifted and eroded Rajang Group rocks. Hutchison (1996) and Hutchison et al. (2000) refer to this uplift as the 'Sarawak Orogeny', and suggest it was probably driven by Luconia Continental Block collision along the northern Borneo margin at this time (Tongkul 1993). The unconformity is generally difficult to recognize in outcrop in Sabah because of similarities in lithologies either side of it and the strong Neogene deformation (Haile 1994, Rangin et al. 1990).

Late Palaeogene Sedimentation

The uplift and erosion of the Rajang Group accretionary complex provided a source of sediment for the Borneo trough to the NW (Hutchison et al. 2000) and also to the SE where material was deposited in a deep-water setting. The Labang Formation, which is exposed in southern Sabah, represents deposition of deep-water clastics in a forearc basin setting from the Late Eocene through to the Late Oligocene. During the Oligocene there was widespread regional subsidence across eastern and northeastern Kalimantan (Lentini and Darman 1996) which has extended into Sabah.

The deformation of the Labang Formation turbidites and mudstones during and after deposition can be considered as part of a continuum of disruption of the strata that includes the broken formations and mélanges in Sabah. The mélanges are interpreted to have formed by progressive deformation in the forearc region during subduction.

Mid-Cenozoic Deformation

The inclusion of Labang Formation clasts in the Gomantong Limestone demonstrates that uplift and deformation in southern and eastern Sabah had started by the Early Miocene, between approximately 22 and 20 Ma (Balaguru et al. 2003). This is earlier than the Early to Middle Miocene boundary age (15.5 Ma) given by other authors for the Deep Regional Unconformity (DRU), a widespread surface recognizable on seismic profiles offshore NW Sabah (Bol and Van Hoorn 1980, Hinz et al. 1991). The time period represented by the DRU is variable, and the early Miocene was a period of widespread melange development. It is therefore likely that deformation continued for several million years, with the Gomantong limestone forming on structural highs during relatively quiescent times in the Early Miocene (Figure 4).

In southern Sabah this unconformity can be identified in the field separating deformed and lithified melange of the Kuamut Formation from the less tectonised strata of the Tanjong Formation (Balaguru 2001, 2003). This is interpreted to mark a major tectonic event, with associated uplift and erosion providing detritus to supply the deltaic to shallow marine Middle to Upper Miocene succession. The cause of this uplift and consequent change in depositional environment has been related to changes occurring along the northern margin of Borneo where the Dangerous Ground Continental Blocks were being thrust beneath the accretionary complex (Hutchison 1989, 1992; Tongkul 1993).

Neogene Clastic Sedimentation

The end of the period of early Miocene deformation is marked by the onset of Miocene clastic deposition, the oldest dates for which are late Burdigalian (NN3/NN4, 18-16 Ma) (Balaguru et al. 2003). The absence of widespread syn-sedimentary deformation in the Tanjong Formation suggests that it was deposited during a period of relative tectonic quiescence which lasted through the late Middle Miocene (approximately 12-10 Ma) or younger. There has been continued subsidence. The Middle Miocene subsidence in the Central Sabah Basin is possibly related to coeval development of the Sulu Sea Basin in a back-arc setting or regional thermal subsidence. An uplifted and eroded stratum of the Rajang and Kinabatangan Groups in the west was deposited in a deltaic to shallow marine system which prograded towards the east in the Sulu Sea area. All the Neogene 'circular basins' of eastern Sabah were part of a single NE-SW trending shallow basin.

The wide spread regional unconformity during Late Miocene is known from onshore and offshore data as the Shallow Regional Unconformity. The present outcrop pattern of the Miocene strata is the product of transpressional tectonics and inversion during the Latest Pliocene (Figure 5) (Balaguru 2001, Balaguru et al. 2003).

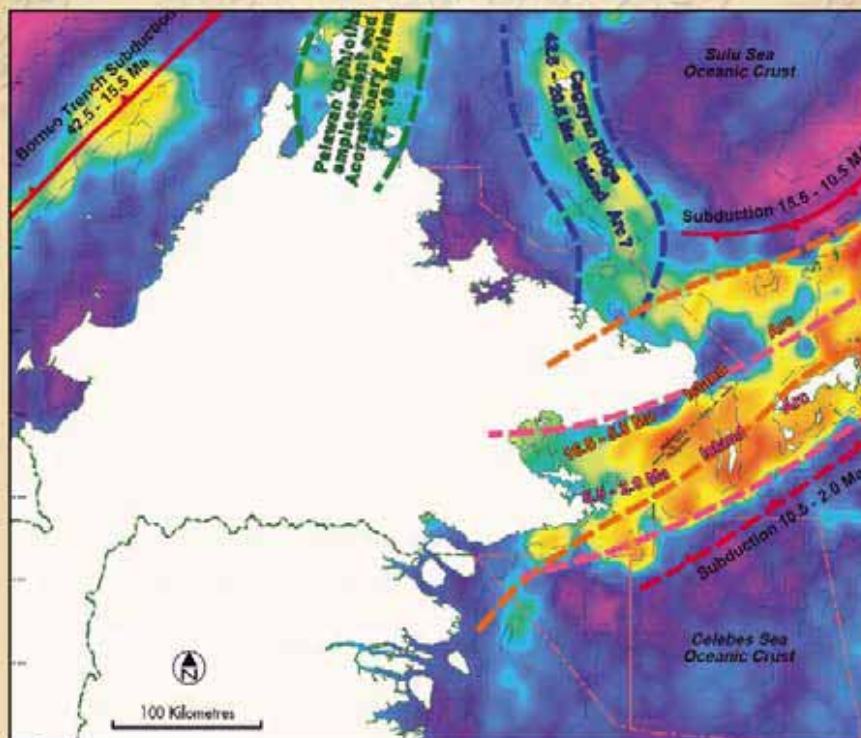


Figure 2. Marine Satellite Gravity and Island Arc Trends in North Borneo region.

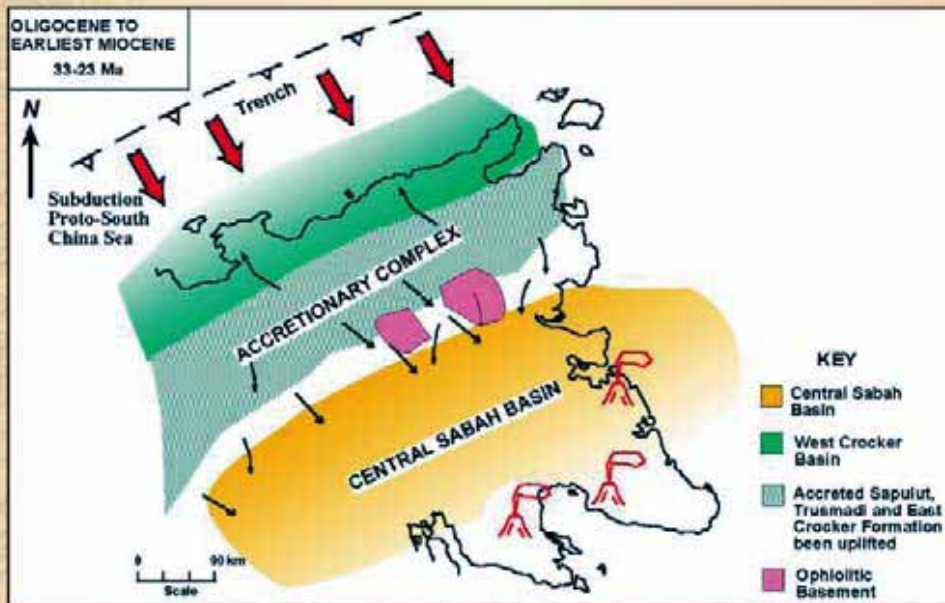
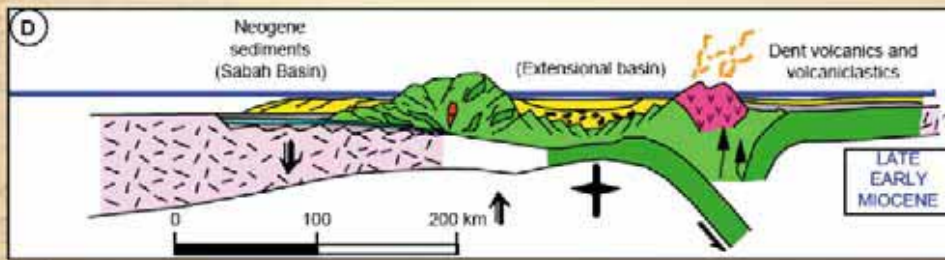


Figure 3. Approximate palaeogeographic reconstruction of the Central Sabah Basin from Oligocene to Early Miocene (Balaguru 2001, Balaguru et al. 2003).

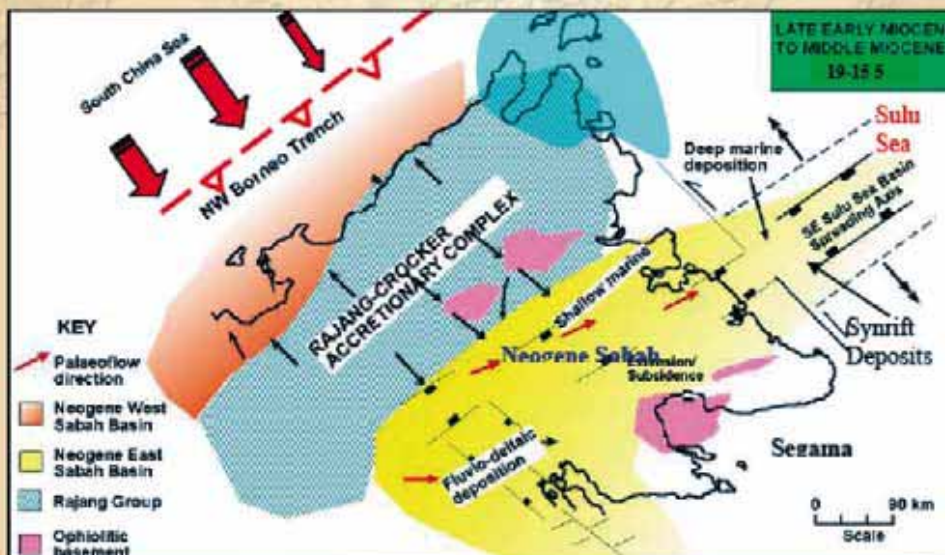


Figure 4. Approximate palaeogeographic reconstruction of the Central Sabah Basin from Late Early Miocene-Middle Miocene (Balaguru 2001, Balaguru et al. 2003).

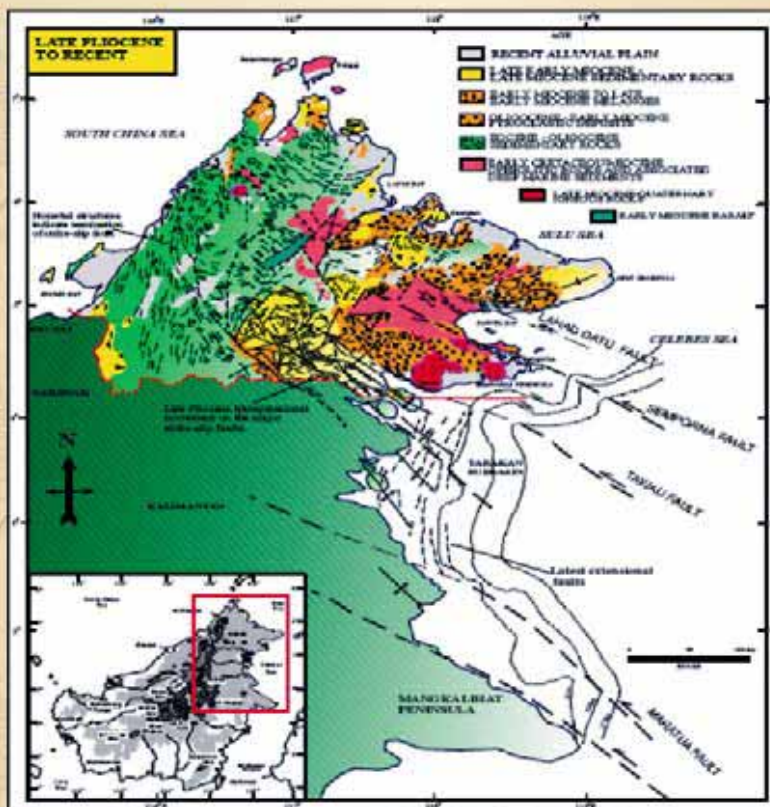


Figure 5: Shows Late Pliocene to Recent transpressional strike-slip movements in the Sabah region.

3. Stratigraphy of Sandakan Sub-basin

Rifting from the Late Early Miocene to mid-Middle Miocene (19.0 - 15.5 Ma) deposited a thick syn-rift sediment of the Tanjong or Segama Group equivalent in a shallow marine to coastal plain environment. During the mid-Middle Miocene, arc-continent collision in the north caused uplift and erosion which referred to the 15.5 Ma unconformity. Following this, increase sediment supply indicated by very high progradation and moderate aggradation of the post-rift delta system which kept phase with local subsidence of the area. Initial stage of high aggradation and later very high progradation have deposited the Sebahat and Ganduman Formations equivalent (Figure 6).

During the mid-Upper Miocene (8.6 Ma event), major uplift and associated faulting occurred. Strong transpressional wrenching rejuvenated many existing faults and created anticlinal flower structures. The uplift being greatest to the West, resulted in stripping off the upper section of the Sebahat and Ganduman Formations equivalent at the structural highs. Following this the deposition of transgressive sequence continued. Significant structuration interpreted in the Sandakan Sub-basin area indicates the presence of several phases of tectonic event (Figure 6).

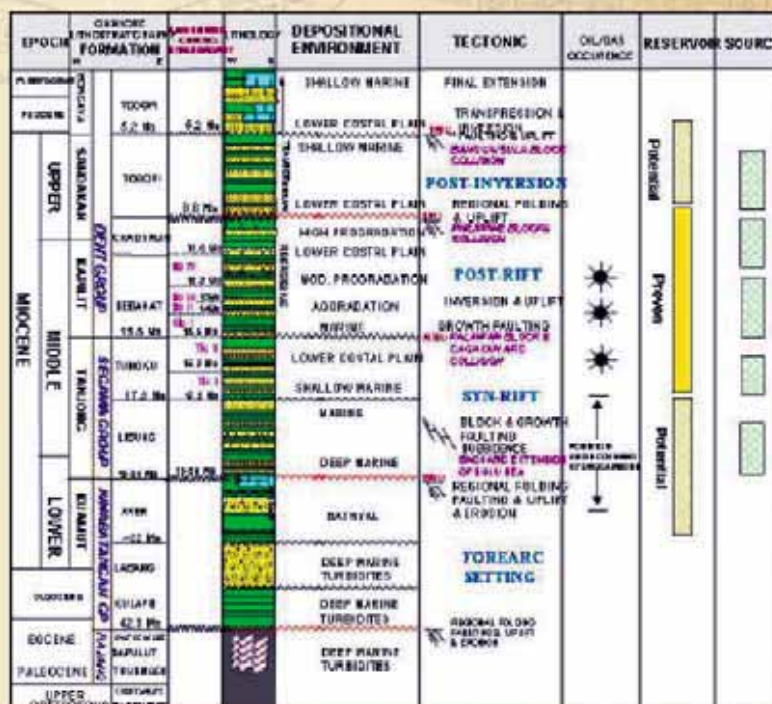


Figure 6. Stratigraphy of the Sandakan Sub-basin (Balaguru 2005).

New CCOP Publications

CCOP Newsletter Vol. 31 No. 1&2 (January-June 2006)

The CCOP Newsletter presents highlights of activities for the period January-June 2006.

CCOP Annual Report for Year 2005

The CCOP Annual Report presents a summary of all the activities of CCOP for the year 2005.

Report of the 48th CCOP Steering Committee Meeting (Hard Copy)

A report of the Steering Committee Meeting held in Daejeon, Korea on 4-5 November 2005.

CCOP's Proceeding of the Thematic Session of 42nd CCOP Annual Session (Hard copy)

A technical documentation of the 42nd CCOP Annual Session, 13-18 September 2005, Beijing, China

Final Report of CCOP Petroleum Policy and Management (PPM) Project (Hard copy and CD-ROM)

A documentation of the CCOP-PPM Project submitted to Ministry of Foreign Affairs, Norway.

A World of Difference (Hard copy)

A book on CCOP, commemorating the 40th Anniversary of the Coordinating Committee for Geoscience Programmes in East and Southeast Asia (CCOP).

Ordering Information

Pre-payment must accompany all orders. We accept bank draft in US\$ payable to CCOP. Payment by bank transfer is also accepted. The appropriate mailing charges for Asia (US\$8), Oceania/Europe (US\$10), N. America & others (US\$12) must be included. Delivery of your order together with an official receipt will be promptly made after payment has been received.

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Information Update

With the support of the Government of the Philippines through the Mines and Geosciences Bureau, Department of Environment and Natural Resources (MGB-DENR) and the Department of Energy (DOE), the 44th CCOP Annual Session and the 50th CCOP Steering Committee Meeting will be held in Cebu City, the Philippines on 21-26 October and 27-28 October, 2007 respectively. The Meeting will be attended by Representatives from the CCOP Member Countries, Cooperating Countries and Organizations and Honorary Advisers to discuss current and future programmes and activities of CCOP.

1st Circular

CCOP 2007



COORDINATING COMMITTEE FOR
GEOSCIENCE PROGRAMMES
IN EAST AND SOUTHEAST ASIA

44th Annual Session

Oct. 21 - 26, 2007

50th Steering Committee Meeting

Oct. 27 - 28, 2007

Cebu City, Philippines



MGB-DENR
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NATURAL RESOURCES



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CCOP Calendar of Events

January - June 2007

Date	Activities	Venue
22-24 January	<input type="checkbox"/> PETRONAS-MPE-NPD-PETRAD-CCOP Petroleum Resource Management Forum	Kota Kinabalu, Malaysia
30-31 January	<input type="checkbox"/> ICB-CCOP 1 Working Group Meeting on Sulu Sea Basin Case Study for DOE and PETRONAS	Manila, Philippines
2-8 March	<input type="checkbox"/> ICB-CCOP 1 Yinggehai-Song Hong Basin & Sulu Sea-East Sabah Basin Case Study Workshop, Training and Expert Visits	Ho Chi Minh / Phu Quoc, Vietnam
2-3 April	<input type="checkbox"/> International Seminar on 'Earthquake and Tsunami Risk and Hazards Management for Resilient Community'	Jakarta, Indonesia
7-10 May	<input type="checkbox"/> Workshop on the Benefits of Implementing the Practice of Knowledge Management (PKM) in the CCOP Member Countries' upstream petroleum business	Pattaya, Thailand
16-18 May	<input type="checkbox"/> ICB-CCOP 1 Seminar on Fractured Basement Reservoir	Hanoi, Vietnam
22-23 May	<input type="checkbox"/> ICB-CCOP 1 Working Group Meeting on Sulu Sea-East Sabah Basin Case Study	Kuala Lumpur, Malaysia
24-25 May	<input type="checkbox"/> CCOP AIST/GSJ DeSEA Workshop on Coastal Erosion and Geological Assessment of Delta Areas in Southeast and East Asia	Bangkok, Thailand
29 May - 1 June	<input type="checkbox"/> CCOP-PPM 2 nd Workshop on Clean Development Mechanism "CDM" (Related to upstream petroleum activities)	Chiang Mai, Thailand
4-9 June	<input type="checkbox"/> ICB-CCOP1 Mapping and Digital Mapping Procedures/GIS in Hydrocarbon Exploration Training and Expert Visit	Yogyakarta, Indonesia
5-8 June	<input type="checkbox"/> ICB-CCOP 1 Training, Expert Visit, Mapping and Digital Mapping Procedures / GIS in Hydrocarbon Exploration	Denpasar, Indonesia
6-7 June	<input type="checkbox"/> PETRONAS-PETRAD CCOP Seminar on Pipeline Integrity Management	Near Kuala Lumpur, Malaysia
12-14 June	<input type="checkbox"/> ASCOPE-CCOP-PETRAD Seminar on Human Aspects of Safety	Indonesia / Singapore
19-22 June	<input type="checkbox"/> CCOP-PPM 3 rd Workshop on Development of Natural Gas Resources Metadata for CCOP	China

Coordinating Committee for Geoscience Programmes in East and Southeast Asia (CCOP)



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