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THE 5TH INTERNATIONAL CONFERENCE OF GEOLOGICAL

ENGINEERING FACULTY, UNIVERSITAS PADJADJARAN

16TH - 17TH NOVEMBER 2020

"STAY SAFE WITH GEOSCIENCES"

VIRTUAL CONFERENCE

BOOK OF ABSTRACTS

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Book of Abstracts

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(ICGEF 2020)

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WELCOME MESSAGE - ICGEF 2020

Dear respected participants,

On behalf of the organizing committee, We warmly welcome you to the 5th International Conference of Geological Engineering Faculty, Universitas Padjadjaran, Indonesia. Enhancement of researcher branding as well as collaborative networking with international reputable lecturers and researchers are the important keys to improve the quality of global class education in promoting innovation as well as creative thinking to produce excellent researches. Being held periodically, the International Conference of Geological Engineering Faculty (ICGEF), Universitas Padjadjaran promotes and contributes to the diverse application, refreshment, and supremacy of geological engineering faculty. We would like to encourage collaboration between internal university academicians as well as partner universities both national and international through this conference.

The year of 2020 has been a special year for all of us. With the pandemic spread all over the world, we all need to stay at home to keep ourselves and others safe. This brought us to the theme of this year conference, *Stay Safe with Geosciences*. Being held annually, this conference promotes and contributes to the diverse application, refreshment of the latest innovation or research on our faculty.

We have already arranged exciting program at this conference to make sure that we could exchange our knowledge, make a great networking, as well as update our capability as researcher, practitioners, and students in the field of geosciences. We hope that this 5th ICGEF UNPAD will be an opportunity to share the latest unpublished findings and learn the newest geosciences and multidisciplinary geology studies, and ignite a lot of great research in the near future. Almost 100 abstracts were initially submitted by authors from 7 countries. With 70 oral presenters, 23 poster presenters and 4 international attendances for this conference. All accepted abstracts for 5th International Conference of Geological Engineering Faculty 2020 (ICGEF 2020) will be published in the conference abstract book with e-ISBN. All of Author of the best contributions will be invited to submission to one of the planned of the Journals: **The Science of Nature, Nature Geoscience, International Geology Review, Geochemistry, and Journal of Environment, Development and Sustainability.**

Indexed Supporting Journals of ICGEF 2020 published by renowned publishers will provide with the opportunity to publish full papers following the peer review process. Papers of participants opting for conference proceedings will be subjected to double blind peer review process. The e-version of the conference proceedings will be published with eISSN and DOI prefix: 10.17501.

Despite of the fact that the conference will be online, I believe we still have opportunities to discover and discuss the newest research from the region and worldwide. We would like to express our gratitude to the top of researchers from some fields of geosciences, who agreed to present their original work during the keynote sessions: Prof. Tokiyuki Sato and Prof. Tsukasa Ohba from Japan, Prof. Abdelhak Boutaleb from Algeria, Prof. Edy Sunardi and Dr. Surya Darma from Indonesia, Dr. Timothy A. Moore from Australia, Dr. Betchaida D. Payot from the Philippines, and Dr. Rien A.C. Dam from Netherlands.

We are very grateful to be able to involve in this conference, and that we would like to express my sincere thanks to the Dean of Faculty Geological Engineering UNPAD for endless support to this conference, to the International scientific committee for the hard work in reviewing the submitted abstract and papers, to the Conference Committee as well as to all of the organizing committee, and

The International Institute of Knowledge Management (TIIKM) for designing the program and bringing this fruitful conference for all of us.

Lastly, We would like to thank you to the conference participants for their contribution, that without them, this conference would not be happened.

Yours sincerely,

Dr. Eng. Santi Dwi Pratiwi, M.R.Sc

Chairman of the ICGEF 2020

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General Secretariat of the ICGEF 2020

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KEYNOTE SPEECHES

PALEOCLIMATIC CHANGES IN THE NORTHERN HEMISPHERE DURING THE LAST 1 MILLION YEARS -APPLICATION OF CALCAREOUS NANNOFOSSILS TO PALEOCEANOGRAPHY-

T. Sato[1], S.D. Pratwi[2], S. Chiyonobu[1], S. Toyoshima[1]

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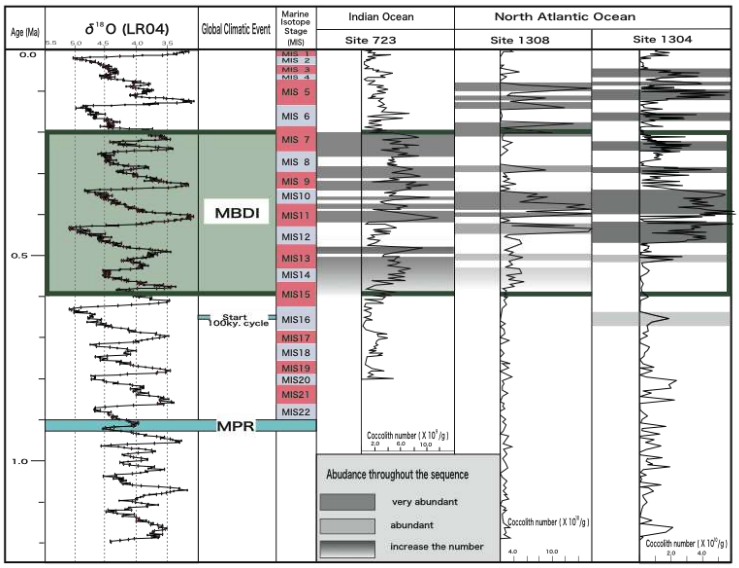
ABSTRACT

We studied in detail the late Quaternary calcareous nannofossil assemblages from ODP-IODP Sites723, 1304, and 1308, located in Indian Ocean and North Atlantic Ocean for reconstruction of the paleoclimatic history. Although the nannofossil number indicates no big changes between 2.0Ma and 0.6Ma in Site 1304 of North Atlantic Ocean, it rapidly increases after 0.5Ma. Focusing to MBDI (0.2Ma to 0.6Ma) interval, large fluctuations of nannofossil number is recognized. Compared the nannofossil number with percentage of warm water species of Site 1304, the strong negative correlation is found. For example, low abundance of nannofossil number and high percentage of warm water species are found in MIS 7, 9, 11 of interglacial stage. Similar characteristics are also found in the sequence from IODP U1308 located in the North Atlantic Ocean.

In contrast to the result in the North Atlantic Ocean, the peaks of nannofossil number are recognized in interglacial age such as MIS 9, 11 and MIS13 in Site 723 of Indian Ocean in MBDI. This indicates that there is a negative correlation between Atlantic and Indian Oceans. This kind of difference between Indian Ocean and North Atlantic Ocean is interpreted as the different climatic condition influenced by Monsoon climate during the MBDI.



UNPREDICTABLE HAZARDOUS VOLCANIC ACTIVITIES IN JAPAN, INDONESIA, AND ELSEWHERE

T. Ohba

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ABSTRACT

Hazardous volcanic eruptions are predicted based on geophysical observations with instruments settled near known active volcanic centers. However, unpredictable hazardous volcanic eruptions often occur over the world. This talk represents two types of unpredictable volcanic activities: steam-blast eruptions with little precursory activity and monogenetic volcanoes that appear in unpredictable locations. Sudden steam-blast eruptions often occur with little precursory seismicity. Even seismicity is detected, it is often very difficult to conclude that it is a precursory activity of an eruption. Most steam-blast eruptions are small in volume and dispersal areas, but they are still dangerous because of their high explosivity. If people stay near the crater, the explosive eruptions could injure and kill them. Some active volcanic craters are developed as tourism sites, and the hazardous steam-blast eruptions often threaten the tourists. The 2019 eruption at Tangkupan Parahu and the 2018 eruption at Dieng are the recent examples. The 2014 Ontake steam-blast eruption, which is one of the worst cases in Japan, killed more than 60 visitors around the crater. Reflecting on the experience, Japanese geologists are trying to find out the traces of past steam-blast eruptions by trench surveys on the flank of some volcanoes. Monogenetic volcanoes also threaten many people over the world because some monogenetic volcanic fields overlap residential areas including big cities. Auckland (NZ), East Izu (Japan), Laguna (Philippines), and Lamongan volcanic fields are the examples that hazard mitigation plans are needed. We also found rare monogenetic volcanoes in the Khangai Mountains, Mongolia, and Palawan, the Philippines, where volcanic activities are not related to subduction systems.

Keywords: Unpredictable eruptions, Steam-blast eruptions, monogenetic volcanoes

GEODYNAMICS AND METALLOGENY OF THE NORTHEASTERN ALGERIAN MVT MINERALIZATION

A. Boutaleb

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ABSTRACT

The Northern area of Algeria (Algerian Maghrebides) is part of the Alpine Metallogenetic Belt within Western Mediterranean part. It was formed during an oblique continental collision between meso-mediterranean terrane and Africa. Metallogenic features of the Algerian alpine chain are strongly linked with major tectonic events reflecting the evolution of Africa–Europe active convergence stages where the meso-mediterranean microplate is thrusted away on Africa margin. The Tellian Chain is subdivised schematically in several zones, we distinguish from the North to the South (Durand-Delga, 1969):

i) The Internal Zones or Kabylides,

ii) The Flyschs domain,

iii) The Tellian over thrust (or the External Zones),

iv) The Atlas system or “autochtonous domains”.

The studied area is located in the eastern part of the Tellian over thrust and the Atlas. System. On both domains, more than several hundreds of MVT (Pb-Zn-Ba-Sr -F-Fe) occurrences and deposits are known.

The aim of this contribution is to provide the geochemical data (fluid inclusion and sulfur isotope data) of the Zn-Pb (Ba-F) mineralizations at “Eastern autochtonous domains”, in order to determine the origin and evolution of the mineralizing fluids.

MAGNETOSTRATIGRAPHY OF QUATERNARY VOLCANIC ROCKS AROUND BANDUNG BASIN, INDONESIA

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ABSTRACT

Although the Bandung area has a fascinating geological setting, no study relating to the magnetostratigraphy have been attempted. Further, the present geological investigation has concentrated mainly on local geological interests. Therefore, the present study was taken up to carry out multi-disciplinary research involving paleomagnetism, radiometric dating, petrography, and geochemistry. The establishment of the detailed history on the directional variations of the Earth's magnetic field as recorded for the past 4 Ma provides a useful guide to isochronous stratigraphic correlation. We have assigned 15 separate volcanic units to the Gilbert, Gauss, Matuyama, and Brunhes chronozones.

Volcanic units assigned to the Gilbert chronozone are mainly of the calc-alkalic (low-K) series, such as the Selacau - Paseban volcanic unit, with a mean age of 4.1 Ma and having reversed polarity.

Three volcanic units of the calc-alkalic (low-K) series are Cipicung, Kromong East, and Kromong West, with mean ages of 3.3 Ma, 3.1 Ma, and 2.9 Ma, respectively, assigned to the Gauss chronozone. The Cipicung lava with clearly intermediate paleomagnetic directions records the transition fields during the Lower Mammoth reversal. On the other hand, the Kromong East, which has a reversed polarity within the Gauss chronozone reflecting a short polarity interval, corresponds to the Kaena sub-chronozone. The Kromong West has normal polarity and is therefore assigned to the Gauss chronozone.

The lava flows from Cicadas found in the eastern part of the Bandung Basin are classified as tholeiitic (low-K) series, with a mean age of 1.7 Ma and are assigned to the Matuyama chronozone. The calc-alkalic (medium-K) series of Batu Nyusun lava with a mean age of 1.09 Ma recorded directional changes within the range from the normal to westerly directions and probably corresponded to the transition during the Lower Jaramillo reversal in the Matuyama chronozone.

All lava flows produced by the Tangkuban Perahu volcano are classified into tholeiitic (high-K) series, with ages ranging from 156 - 43 ka. Paleomagnetic investigation reveals that they show two different times for the acquisition of remanence magnetization. The first period ranges from 156 - 45 ka and shows a predominant normal direction in agreement with most normal polarity within the Brunhes chronozone. With a mean age of 43 ka, the second period is considered an excursion direction and probably correlates with the Laschamp geomagnetic excursion.

Keyword: Palaeomagnetism, radiometric dating, geochemistry, petrography, Bandung

STAY SAFE WITH GEOSCIENCES: LAND SUBSIDENCE AND THE USE OF GEOLOGICAL INFORMATION

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ABSTRACT

Land Subsidence is a widely recognized and fairly well understood geological phenomenon. Geoscientists and other experts are monitoring it, try to explain it and point out the impacts and importance of mitigating it. In Indonesia, we are now familiar with well-known cases in Jakarta, Bandung and Semarang. There are various methods to detect land subsidence, and different ways to present the findings. Sometimes land subsidence is called the "hidden problem" because indeed, it takes place underground and out of sight, there is no clear "owner", and it is not always clear who or which agency is responsible for resolving it. Nevertheless, there are many stakeholders that have to deal with the impacts and problems caused. Besides reliable and accurate ways to monitor land subsidence (for instance by using InSAR satellite methods), it is important that clear, easy-to-understand methods are used to present data and inform stakeholders about the impacts of land subsidence. This not only applies to land subsidence; also information about other geological features and processes (sometimes serious hazards that are common in Indonesia) has to be available and presented in an accurate and understandable way, both to the geoscience community, as well as to the general public and decisions-makers.

In the presentation case studies of land subsidence will be discussed (Bandung, Jakarta, Ho Chi Minh City, Semarang) explaining a geoscientist role to investigate and understand this complex geological process. It will focus on the management and presentation of information, from scientific analysis to informing stakeholders. It serves as a message that the geoscience community in Indonesia is responsible to provide state-of-the-art and useful geological information to (local-regional level) decision-makers and the general public.

Keywords: land subsidence, geological information for stakeholders

UNCONVENTIONAL PETROLEUM SYSTEMS: MORE THAN A COMMODITY – A LINK TO THE EARTH'S PAST

Tim A. Moore [1,2,3]

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ABSTRACT

Both coal seam gas and shale gas are designated as unconventional resources. These resources generate, store and release their gas in fundamentally different ways to that of conventional sandstone and limestone reservoirs. Thus, in order to economically exploit unconventional reservoirs they need to be technically understood as well as developed and regulated differently than conventional oil and gas resources.

The organics in unconventional resources are not just commodities; they are windows into the Earth's past. Organic material tells us what vegetation was around and thus what the palaeoclimate was like at any point on Earth for the last several hundred million years. Organic material also informs us about how basins are formed and how deeply sediments were buried and how much uplift they have undergone. When properly assessed, organic material, which is really just fossil sunshine, enlightens human knowledge about our world, allowing us to see into the past and forecast the future.

WHAT'S BENEATH THE LUZON ARC, PHILIPPINES? A PERSPECTIVE FROM XENOLITHS

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ABSTRACT

Derived from the term "xenos" which means foreign, xenoliths are rock fragments trapped during the emplacement of magma. They provide important information on the processes occurring in the deeper portions of the Earth. Numerous active and inactive volcanoes in the Philippines potentially host such xenoliths. The Luzon Arc which extends from the Coastal Ranges of Taiwan to Mindoro Island in the Philippines is a manifestation of the eastward dipping subduction of the South China Sea along the Manila Trench. In this work, xenoliths from Mt. Pinatubo and Sabtang island located in northern Luzon and Babuyan segments, respectively, were analyzed to determine the petrological characteristics of the sub-arc region (i.e. the underlying mantle wedge and lower crust) of the Luzon Arc.

A suite of peridotite xenoliths were collected from lahar flow deposits near the summit of Mt. Pinatubo. Among the dunites, pyroxenites and websterites, spinel harzburgite is the most dominant lithology. A rare spinel lherzolite xenolith (P12-7) is also present in this sample suite. Our results indicate that the spinel lherzolite xenolith is a typical residue from partial melting of abyssal peridotites whereas the spinel harzburgite xenoliths may have formed via partial melting with subsequent modification during the influx of fluids or melts in the mantle wedge. These further imply that fragments of MOR-derived lithosphere exist in the mantle wedge beneath this region of the Philippine island arc system and that conversion of abyssal to arc peridotites occurs in the mantle wedge.

Hornblende pyroxenites, hornblende gabbros, hornblendites and dunites occur as xenoliths within calcalkaline lava flows in Sabtang Island. The abundance of pyroxene-replacing amphibole, the occurrence of plagioclase as an interstitial phase, and the formation of secondary orthopyroxenes at the expense of olivine in the dunites suggest crystallization from arc-related magmas. Some of the Sabtang xenoliths also show notable features that cannot be explained by common magmatic processes in the sub-arc setting. These include the granoblastic texture in some of the xenoliths which postdates the extensive formation of amphiboles as well as the elevated LREE contents of clinopyroxenes in the pyroxenites and gabbroic xenoliths resulting to convex upward REE patterns. We relate these peculiar characteristics of the Sabtang xenoliths to the subduction of a buoyant plateau directly affecting this particular segment of the Luzon Arc. Lastly, our combined work on the xenoliths from the two different localities shows that there is variability in the petrological characteristics of the sub-arc region of the Luzon Arc.

Keywords: xenoliths, sub-arc, Luzon Arc

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ORAL PRESENTATIONS

A1 **[01]**

THE MORPHOLOGY OF LARGE-SCALE DEBRIS AVALANCHE DEPOSIT IN CIANJUR PLAINS, WEST JAVA, INDONESIA

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ABSTRACT

The large-scale debris avalanche deposit (DAD) process with large megaclast block are quite rarely occurring but the impacts are catastrophic and potentially disastrous for the nearby communities since it may destroy the whole affected area. Large-scale flank collapse from ancestral Gede volcano resulted in the deposition of debris avalanche deposit that manifested as prominent hummocky hill morphology covering 250km area in Cianjur plains. Although the deposit covers large areas and showing unique volcanic landscape morphology, the study on the debris avalanche deposit is limited. Here we show the result of field reconnaissance, satellite photo and digital elevation model analysis to understand the morphology of large-scale debris avalanche deposit including distribution, volume and morphological characteristics. The debris avalanche deposit showing fan-like morphology that covers roughly 250 km2 of Cianjur plain, with the interpreted thickness of 200-500m. The hummocky hills have rounded to sub-rounded texture with diameter ranging from 100-500m and 50-100 m height, with the remaining portion of the megaclast blocks buried. The mouth of debris avalanche deposit located just south of Cianjur Township with the highest concentration of megaclast block as block facies that interpreted as the depositional axis that resulted on the majority of giant megaclast fragments (100-500m) constitute most of the hummocky hills. The block facies apparently stopped by lineament of Cisokan River that considered as the barrier to confine flow of block facies deposition. The remaining Cianjur plains covered with the matrix facies of such deposits with sparse megaclast block occurrence. It is noted that the Cisokan river lineament may represent buried normal fault.

Keywords: Cianjur plains, Gede volcano, volcanic debris avalanche, hummocky hills, morphology

A2 ` [02]

PRELIMINARY STUDY OF EPITHERMAL GOLD DEPOSIT AT KAIDUNDU AND MAMUNGAA AREA, GORONTALO, NORTH ARM OF SULAWESI, INDONESIA

D.A.N. Uno, M. Mawaleda, H. Umar

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ABSTRACT

Kaidundu and **Mamungaà** areas are situated about 50 km eastern part of Gorontalo Province, North Arm of Sulawesi Indonesia. Administratively, this area is included in Bone-Bolango Regency. The preliminary study conducted of gold deposits in this area covers representative alteration rock sampling. A total of 60 samples were collected from 21 stations in two locations which consists of 9 samples from **Kaindundu** and 12 samples from **Mamungaà**. This research can be seen to determine the type of alteration and ore mineral paragenesis, especially the presence of Gold and its associated minerals. A total of 13 samples were petrography analyzed to identify the alteration mineral assemblage and their alteration types, and 6 samples have been ore microscopic analyze to identify the structure and texture of Gold and its accompanying minerals. The results of petrographic analysis show that the developed hydrothermal alteration mineral assemblages are: **(1) Sericite, Quartz, Carbonate and Opaque Minerals; (2) Sericite, Quartz, Chlorite, Epidote, Clay, Carbonate; As well as (3) Sericite, Epidote, Clay, Chlorite and Opaque Minerals**. In general, Native Gold is found to be present with chalcopyrite, Sphalerite and Arsenopyrite. Two polish section samples showing Gold found to be present with the bearing Quartz Veins. In addition Gold is also present as inclusions and spots on the chalcopyrite. There is an ore texture in the form of replacement of Chalcopyrite and Sphalerite by Bornite and Malachite. The results of petrographic analysis show that the hosts of gold deposits in this area are Andesite from the Bilungala Volcanic and Diorite from the Bone Diorite Core Complex. Based on the alteration mineral assemblage, it is known that the hydrothermal alteration that develops accompanying gold mineralization in this area is: (1) Phyllic alteration type overprinting Propylitic: (2) Phyllic alteration type overprinting Argillic; (3) Propilitic alteration type overprinting Argillic.

Keywords: Epithermal, Gold, Kaidundu-Mamungaa, Gorontalo, Sulawesi, Indonesia

A3 **[03]**

SURFACE WATER AND GROUNDWATER BEHAVIOUR ON THE SOUTHEASTERN SLOPE OF GEDE VOLCANO, WEST JAVA, INDONESIA

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ABSTRACT

Research area is focused on the southeastern slope of Gede volcano, the most prominent volcano in West Java, Indonesia. Located at the upstream of Cianjur city, abundance groundwater resources contained at the volcano becomes very important for supplying the local drinking water demand. Various springs are exploited and several boreholes pump groundwater from the aquifers. Nevertheless, location of the recharge area are still badly delineated, as bad as determination of the main groundwater flow paths. Managing both surface water and groundwater resources in such volcano is a complex issue due to the heterogeneity of the geological setting and the lack of knowledge about aquifers extension, hydrodynamic parameters, groundwater flows and storage capacities. Therefore, in this researh, all data were collected through an integrated observation of geological, hydrological, and hydrogeological conditions. Location and amount of water recharge at the volcano scale and rainfall - discharge models at the aquifer scale were then determined by measuring the properties of surface water and groundwater, such as EC (Electrical Conductivity), TDS (Total Dissolved Solid), and pH. The measured physical properties of surface water from 29 sites and groundwater from 49 sites show pH range from 4.6 to 8.3, EC range from 60 to 490 µS/cm, and TDS from 20 to 240 mg/L. Afterwards, by comparing these data with chemical properties resulted from laboratory analysis which was also supported by measuring elevation of the river and groundwater level, the interaction between surface water and groundwater can be classified as gaining stream (effluent) system, i.e. the system where groundwater discharges into the surface water. Thus, we can validate the main groundwater flow paths of the area resulted from hydrogeological mapping and geophysical mesurement. It will provide an efficient tool for water management at all scales, as a significant result of the research.

Keywords: surface water, groundwater, aquifer, volcano, recharge, discharge

A4 **[04]**

GEOCHEMICAL AND ISOTOPE ANALYSIS IN GEOTHERMAL SYSTEM OF MOUNT RENDINGAN AND ITS SURROUNDINGS, LAMPUNG PROVINCE, SOUTHERN PART OF SUMATRA

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ABSTRACT

Mount Rendingan and its surroundings in Lampung is chosen as the research area because it has unique landscape forming a large depression area (caldera) which has a complex geological structure inside. Besides that, it has a surface geothermal manifestations such as steaming ground has temperature 97.4°C, hot mud pool temperature 97.2°C, and hot springs temperatures in range of 41.3°- 99.4°C. Their appearance to the surface is due to normal faults which have Northwest-Southeast (NW-SE) and Northeast-Southwest (NE-SW) directions.

Geochemical method applied to waters and gases. Anion-cation and isotope analysis was carried out to describe the characteristics of the geothermal fluid. One of the most prominent uses of geochemical analysis is to determine subsurface temperature using geothermometry which are applied in understanding reservoir conditions.

Based on the analyses of manifestations type, fluid and isotope geochemistry, then water and gas geothermometry describe that the research area is a high terrain model associated with stratovolcano volcanoes, where the upflow area is in the Mount Rendingan, and the outflow area flows far to the southern part of the research area is in the Way Panas.

Geothermal geothermometer of Mount Rendingan has a temperature range of 250°-300°C. The reservoir zone occupies in depth of 700 -1980 meter depth measurement which has a temperature range of 150° - 320°C. There is a correspondence between the result of geothermometer calculation and the alteration minerals assemblages analysis which is supported by the results of well temperature measurements. The geothermal system in Mount Rendingan can be categorized as medium to high enthalpy system and water dominated reservoir system.

Keywords: geothermal manifestation, fluid characteristic, reservoir temperature

A6 **[05]**

THE ROLE OF DEEP-SEATED FAULT ON THE MAGMATIC PROCESS OF GEDE AND SALAK VOLCANOES, WEST JAVA, INDONESIA

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ABSTRACT

The geochemical data of modern Gede and Salak volcanic rock deposit in the tholeiitic to calc-alkaline magmatic series showing complex magmatic histories with multiple mixing events of crustal contamination and magma mixing with strong influence of fractional crystallization, which shows anomalous phenomena in comparison to other volcanic in West Java. We review the published information on petrology and geochemistry and indication of deep-seated Pelabuhan Ratu fault. The majority of Salak volcanic deposits are dominated by andesitic rocks but with the occurrence of Late Pleistocene silicic tephra deposit and anomalous granite xenolith, with unusually high concentration of minor and trace elements compared to other volcanoes in Java. Gede volcanic deposit ranging from basaltic andesite to rhyodacite that indicating intrusion of mafic magma into shallow crustal contamination of silicic reservoir. The NNE-SSW trending regional fault was inferred from the major indentation of southern coast of West Java that located south of Pelabuhan Ratu that continue to the similar trending of trench curvature. It is proposed that the Pelabuhan Ratu is crustal-related fault that continue to the NNE crossing nearby Salak and Gede area. The deep-seated Pelabuhan Ratu that involve the silicic crustal rocks of may influence the shallow crustal contamination in Gede and Salak in addition to the subduction tectonic system and resulted in the variation of volcanic deposit that differ compared to other Javan volcano.

Keywords: Gede, Salak, magmatic, deep-seated fault

A7 **[06]**

DISTRIBUTION OF RARE EARTH ELEMENT (REE) IN GRANITOID ROCKS IN KELANTAN

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ABSTRACT

Peninsular Malaysia is being distributed into three parallel belts (Western, Central and Eastern). Kelantan is one of the states in Peninsular Malaysia and consider as a unique territory to have all three belts (Western, Central and Eastern). Each belts divided into several formations which are Western Belt (Main Range Granite), Central Belt (Jeli Granite, Kemahang Granite, Noring Granite, Kenerong Leucogranite, Berangkat Tonalite and Senting Granite) and Eastern Belt (Boundary Range Granite). Rare Earth Elements (REE) are usually concentrated related to the alkaline – peralkaline, carbonalite igneous rocks, as well as sedimentary rocks. Granitoid andsome intrusive volcanic rocks are widely exposed in Malaysia, as well as Kelantan state. REEs are relatively abundant in the Earth crust, however these elements are rarely concentrated in the mineable ore deposit. There are a lot of research about granitoids, but very limited studies about the distribution of the REE. The objective of this study is to investigate the distribution of REEs in different type of granitoid rocks in Kelantan. For this purpose, 15 samples were selected and analysed using Inductive Coupled Plasma Mass Spectrometry (ICP-MS). Result shows that, distribution of light REE in all samples up to 78% and heavy REE up to 22% with total value 5350.690 ppm and 1491.268 ppm respectively. Surprisingly, Jeli Granite formation is high potential of REE among the samples tested with total REE 3164.934 ppm and Kemahang Granite is least potential with total REE 31.946 ppm. The granitoid distribution can be found widely in Kelantan with special characteristic and detailed study about mineral composition will help identifying the REE potential as well as generate more relatable study about genesis and nature of rocks in Malaysia.

Keywords: Geochemistry, Rare Earth Element (REE), Granitoids, Kelantan

A8 **[07]**

TRACE ELEMENT CHARACTERIZATION OF THE BASIC VOLCANIC UNITS OF INDUS SUTURE ZONE OPHIOLITES, LADAKH HIMALAYA, INDIA: TECTONICALLY DIVERSE EVOLUTION OF THE TETHYAN OCEANIC CRUST

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ABSTRACT

The volcanic rocks from ophiolite suite provide a good opportunity for the comprehensive study of fragments of oceanic lithosphere, especially the tectonic environment can be deduce based on their trace elements behaviour. The Indus suture zone ophiolite (ISZO) is one of the few ophiolite suites of Tethyan ophiolites where all the important components of ophiolite suite are well exposed. In present study, we present the trace element geochemistry of mafic volcanic from ISZO to elucidate there genesis and tectonic setting

These basalts show glomeroporphyric texture with mineral assemblage plagioclase, clinopyroxene, orthopyroxene, hornblende, olivine, magnetite and some secondary calcite. In the ternary AFM diagram theses rocks show tholeiitic- calc-alkaline nature. In TAS—total alkalis vs. silica and Nb/Yb–Zr-Ti diagrams they are show basaltic composition. Mg number is varies from 45 to 88.

In chondrite normalized spidergram these rocks shows relatively enriched LREE and almost flat HREE pattern, (LaN/YbN = 0.32-3.32, LaN/SmN = 0.45-1.4 and GdN/YbN = 0.53-1.33) with positive Eu anomaly. Nb and Ta are showing marked depletion against MORB value. TiO2, Zr and Y exhibit high degree of intercorrelation in fresh, altered and metamorphosed rocks in ocean floor basalt. These rocks also shows significant inter-correlation between TiO2, Zr and Y (r(TiO2-Zr) =+95, r(TiO2-Y) =+88, r(Y-Zr) =+92). The Ti vs. Zr binary plot of the basalts exhibits IAT, tectonic settings The Th/Yb vs, Nb/Yb diagram also suggests that these basalts are formed at volcanic arc environment.

Based on all the above observations it is inferred that the basalts from the ISZO are formed at island arc tectonic setting in the subduction related environment.

Keywords: Indus suture zone, ophiolites, trace element, tectonic environment

A9 **[08]**

DISCONTINUITYES ADJUSTMENT FCTOR FOR THE MOST CRITICAL FAILURE

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ABSTRACT

Some of the rock cut slopes observe from the field shows difference mode of failure compare to the result obtain form the Markland Test method. The number of slope failure using Markland Test also shows variances compare to the result obtain from field observation. Therefore, the selection of the most slope potential failure for stability analysis and slope design will become a difficult task. There is no standard procedure to select the most slope potential failure except the experience of a geologist or geotechnical engineer. The experience criteria not always acceptable by others geologist or geotechnical engineer because most of them believe in numbers in order to design the slope stabilization procedure. To solve this problem, the discontinuity adjustment factors (F) approach in Slope Mass Rating (SMR) was proposed and found suitable to determine the most potential failure for slope stability analysis. This F approach's result is also supported by limit equilibrium analysis (FOS value).

Keywords: Discontinuity adjustment factors (F), Modified Slope Mass Rating (M-SMR), Mode of failure, Stability analysis, Factor of safety

B1 **[09]**

CHEMOSTRATIGRAPHY AND PALEOENVIRONMENT OF THE MIOCENE ORGANIC RICH SEDIMENTS IN THE EAST KUTAI SUB BASIN, INDONESIA

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ABSTRACT

The Miocene sedimentary rocks in Samarinda area constrains organic rich sediments, which are considered as a good source rocks hydrocarbon in the East Kutai Sub Basin, Kalimantan. The high organic material content within the sediments is related to the dynamics of depositional environment in deltaic setting. The accumulation and characteristics of organic matter in this area may be influenced by multiple factors, under a complex physical-chemical process. Geochemical data of major and trace elements obtained for a total 363 outcrop samples from 4 locations were interpreted to define chemostratigraphic and paleo-environmental conditions (detrital influx, paleoproductivity, paleosalinity and paleoredox) responsible for organic carbon accumulation and source rocks characterization. Stratigraphic variation in inorganic geochemistry allows two chemostratigraphic packages to be defined and correlated within the Miocene sedimentary sequences. This chemostratigraphic packages are geochemically differentiated using SiO_2/Al_2O_3, TiO_2/Al_2O_3, NaO_2/Al_2O_3, TiO_2/Nb and Sr/Ba ratio values. The chemical alteration index (CIA) suggests that the sedimentary unit was deposited in a hot and humid climate, with moderate to intensive weathering intensity. Detrital material input proxies (Si/Al, Ti/Al) indicate that the low Si/Al and Ti/Al ratios reflect a low material input providing an increasing organic matter accumulation in the Middle Miocene. However, paleoproductivity proxies (P/Ti, Ba/Al) show the organic matter enrichment is not restrained by water column productivity, as indicated by a weak correlation between TOC and Productivity Index. In addition, paleosalinity index (Sr/Ba) and redox indicators (V/Cr, V/SC, V/(V+Ni), U/Th, and Mo/Al) indicate that the sediments were deposited in a brackish environment with dysoxic to suboxic conditions and might be the main control in the enrichment of organic matter in the study area. Thus, the detrital material influx and paleoredox conditions controlled organic accumulation in the Miocene sedimentary sequence of the Kutai Basins.

Keywords: Chemostratigraphy, Paleoenvironment, Source Rocks, Kutai Basin

B2 **[10]**

ORGANIC GEOCHEMICAL CHARACTERISTICS OF LACUSTRINE/ PARALIC DEPOSITS IN JAMBI SUB-BASIN, SOUTH SUMATRA BASIN, AS AN INDICATIVE OF POTENTIAL UNCONVENTIONAL RESOURCES

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ABSTRACT

Identification of source rock both in conventional and unconventional resources exploration process took an important part as a fundamental analysis to reduce exploration risk. Organic geochemical analysis has been done on several possible Formation in Jambi Area both from field outcrop samples and well data. This analysis includes the evaluation of the source rock with several important parameters such as richness, maturity, kerogen type, organic matter input, as well as depositional environment of the source rock. The particular study was aimed to serve detail information on the source rock potential, which moreover could be considered as a basis in conducting the exploration in the area. The results of this study suggest that there are several Formations with high organic content which could produce significant amount of hydrocarbon. The organic content represented by TOC values indicates the richness of the source rock, in which Gumai Formation has fair to good richness (0.77 – 1.22% TOC), Upper Talangakar Formation has fair to very good richness (0.54 – 3.05% TOC), Lower Talangakar Formation has fair to good richness (0.88 – 2.28% TOC), while Lahat Formation has fair to very good richness (0.9 – 2.65% TOC). According to the Hydrogen Index (HI), which showed a low average HI values, the type of hydrocarbon potentially generated from these formations were gas. The maturity study according to the vitrinite reflectance data showed that Lower Talangakar Formation were generally in oil window, although in several wells the Middle Gumai Formation has also reached the oil window. The organic matter input in these Formations differed in several wells with distinct depth showed the presence of algal and higher plant organic matter indicating the transitional depositional environment.

Keywords: geochemistry, source rock, unconventional, shale, hydrocarbon

B3 **[11]**

A GEOMECHANICAL APPROACH TO DELINEATE SHALE HYDROCARBON RESERVOIR OF TALANG AKAR FORMATION IN JAMBI SUB-BASIN

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ABSTRACT

Talang Akar Formation (TAF) is well known as the primary source rock in South Sumatera Basin, where Jambi Sub-basin is located. Talang Akar Formation has a huge potential to be a shale hydrocarbon reservoir because of its role in the conventional petroleum system. A shale hydrocarbon reservoir should have mature kerogen, a good amount of total organic carbon (TOC), and a high level of brittleness index (BI). It's proven that a high level of BI is more preferable in most shale hydrocarbon reservoirs in the world which are located in a basin with a relaxed tectonic regime. In contrast, Jambi Sub-basin has undergone an intensive basin inversion during Miocene-Pliocene time, thus the stresses that acted in this basin are different from most proven shale hydrocarbon-bearing basins. As a result of this condition, geomechanical aspect needs to be incorporated in this study to understand the application of BI in delineating shale hydrocarbon reservoir of Talang Akar Formation. BI of Talang Akar Formation in the research area was derived from both elastic moduli and mineralogy with available wireline log and lab measurement data. Meanwhile, in-situ stress was calculated using wireline log which then validated with leak-off test data and fault interpretation from seismic section. BI was then propagated to the subsurface map of Talang Akar through acoustic impedance derived from seismic inversion. Based on the analyses of the study, it's found that there is no correlation between BI and vertical stress gradient that acts as the fracture gradient in the research area. Therefore, it is concluded that the shale of Talang Akar Formation could be theoretically fractured during well stimulation despite its brittleness value. Result of this research opens more possibilities in shale hydrocarbon exploration in Jambi Sub-Basin, due to the occurrence of high and low BI area with its respective TOC characteristic.

Keywords: Geomechanics, Unconventional, Brittleness, Sweet Spot

B4 **[12]**

THE EFFECT OF AUTOCLAVE TEMPERATURE AND PRESSURE ON CHANGE COAL RANK AND CHEMICAL ELEMENTS OF COAL UPGRADING PROCESS BY HYDROTHERMAL TECHNOLOGY

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ABSTRACT

At this time, Indonesia is developing a national energy source based on New and Renewable energy, according Presidential Decree no. 5/2006, the role of coal in the energy mix in 2025 become 33 % . Based on data from the Geological Agency of Indonesia (2014). Total coal reserves are approximately 28 Billion tons. The coal reserves are classified based on quality; consisting of a very high quality 231 Mt (million tons) (0.8%), high quality 1,655 Mt (5.9%), medium quality 16,128 Mt (57.5%) and low rank quality coal 10,002 Mt (35.8%). The condition forces Indonesia to move quickly in managing the coal utilization to create added value such as Coal Upgrading. Various kinds of upgrading coal has been done, one of which is hydrothermal technology with autoclave instrument.

The research is carried out by looking at the effect of pressure, temperature, and autoclave time on coal rank and coal chemical elements. Methods are conducted in literatur study research by analyzing data related to coal and hydrothermal technology based on the result of previous studies. Autoclave setted with temperatur mode 105^{o}C-350^{o}C and 17-25 mPa. From several studies on hydrothermal, there are changes in ligniteto sub- bituminous, and bituminous, sub-bituminous to anthracite, and for chemical properties the value of carbon increases, with nitrogen, sulfur and oxygen experiencing a decrease in value.The autoclave temperatur variation can also increase the value of coal reflectance.

Keyword: Coal, Upgrading, Hydrothermal, Autoclave, Low Rank, Refletance

B5 **[13]**

GEOCHEMISTRY CHARACTERIZATION OF OIL AND SOURCE ROCK IN SOUTHERN TOMORI BASIN

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ABSTRACT

Tomori Basin lies adjacent to Banggai Basin, has recently become a potential subject for further investigation. Some hydrocarbon samples taken from Tomori Field lies in the north and northeast of the basin proved to come from different source rocks. Therefore, identifying hydrocarbon and source rock characteristics at this basin using geochemical analysis and biostratigraphical approach becomes an important work to be done. Rock-Eval Pyrolysis, gas chromatography (GC), Gas Chromatography-Mass Spectrometry (GC-MS), and biostratigraphy analysis was conducted to determine the degree of maturity, depositional environment, the origin of organic matter, oxic and anoxic degree of depositional environment, and oil to source rock correlation. Two oil seepage samples from Bungku (16 LS 10 and 16 KW 08) and rock samples from Matano Formation and Tokala Formation are used for source rock evaluation. TOC analysis shows 0.61% (fair) for Matano source rock with type II-III kerogen, and 0.52-1.24% (good) for Tokala source rock with type II- III kerogen, indicating mixing of oil and gas prone. Triterpene data based on hopane ββ ratio, 22S/(22S+22R) C31, C30hopana/C30moretana ratio shows the maturity level of Matano source rock is in an early mature stage, the same result is showed by the Tokala source rock which has an early mature-mature level of maturity. The sterane ratio of 20S/(20S+20R) C29 and αββ/(ααα+αββ) C29 also show exactly similar maturity level results with all triterpene ratios. The presence of oleanane indicating that both Matano source rock and oil seepage samples are composed of higher plant components, as all of them are derived from a terrestrial source. C27, C28, and C29 sterane ratios show that Matano source rock and oil seepage samples are derived from a transitional (estuarine) environment, while Tokala source rock derived from a marine depositional environment. Biostratigraphy analysis shows the presence of a marine palynomorph Dinoflagellata cyst. and Foraminifera test lining indicating that Tokala Formation is derived from a marine depositional environment. The presence of Classopolis sp. and Neoraistrickia sp. suggested that the age of Tokala Formation is Late Trias.

Keywords: geochemistry, biomarker, source rock, oil seepage, Tomori Basin

B6 **[14]**

GEOCHEMISTRY AND METALLOGENY OF PALEOPROTEROZOIC MALANJKHAND GRANITOIDS IN BASTAR CRATON, CENTRAL INDIA

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ABSTRACT

The Malanjkhand granitoid comprises of dominant granite-granodiorite phase having age of 2.48 Ga and hosting one of the largest economic Cu-Mo-Au deposit in the India. It is exposed over an area of nearly 1400 km^2 situated in the northern part of the Bastar or Bhandara craton in Central India. The Malanjkhand Cu-Mo-Au deposit located in the form of a fracture-controlled quartz sulphide reef running for a strike length of 2.8 km and 70-80 m width in the central part. It has over 225 million tons of copper at a cutoff grade of 0.45%. Fluid inclusion studies of quartz grain from the granitoids and barren quartz veins occurring in the host granitoid indicates identical low-temperature hydrothermal fluids in both cases (Pandit et al., 2014). They differ from the hydrothermal fluid in the mineralized zone associated with Cu-Mo-Au deposit in the Malanjkhand granitoids. The hydrothermal activity after the granite emplacement seems to have operated under identical temperature conditions, and the aqueous fluid at the two occurrence seems to have been broadly similar. In both cases, internal evolution of the exsolved fluid to low temperatures and moderate salinity are observed. Geochemical studies of the Malanjkhand granitoid displays a moderately fractionated rare earth element (REE) distribution pattern without any significant Eu anomaly, shows depletion in mid rare earth elements (MREE) and no depletion in heavy rare earth element (HREE). It shows more restricted geochemical composition features and possibly originated as a result of crystallization from a homogenous granodioritic magma (Pandit and Panigrahi, 2012). Geochemical investigation inferred that the parental magma derived by low-degree of partial melting of heterogeneous mafic source probably amphibolitic in composition, followed by progressive differentiation. Geothermobarometric estimations indicates that the Malanjkhand granitoid emplaced at upper level in the continental crust and attributed to the magma mixing processes between crustal derived felsic and mafic magma contributed by basaltic under-plating in continental rift settings.

Keywords: Petrogenesis, Geochemistry, Granitoids, Malanjkhand, Metallogeny

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C1 [15]

GEOELECTRICAL RESISTIVITY SURVEY TO DETERMINE SLIDING SURFACE OF LANDSLIDES PRONE AREA – CASE STUDY IN PONJONG SUBDISTRICT, GUNUNG KIDUL REGENCY, INDONESIA

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ABSTRACT

The research area is located in Ponjong Subdistrict, Gunung Kidul Regency. Ponjong area specific at Tambakromo village is one of potential in landslide disaster since 2011. The outspread information about landslide and mitigation should be done in research area. The aim of this research is to get the subsurface condition and determine of landslide surface based on geoelectrical resistivity in Tambakromo area, Ponjong Sub district, Gunung Kidul regency. The method of this research is used geoelectrical survey by using Dipole - dipole configuration. The result of this research is the lithology of sliding surface is claystone – fine tuffaceous claystone with resistivity value of 29.9 ohmmeter based on Dipole – dipole subsurface cross section at Grogol village. The sliding surface could be found at 5 metres to 20 metres underground. At Sumberejo village, based on dipole-dipole subsurface the lithology of sliding surface is claystone – fine tuffaceous claystone with resistivity value of 6.18 to 29.9 ohmmeter at depth of 20 to 25 metres. Regional stratigraphy correlation showed that the claystone or tuffaceous claystone is included in Semilir Formation. This research should be able to held for local government to prove landslide mitigation in research area.

Keywords: Geoelectrical, Dipole – Dipole, sliding surface, Ponjong

C2 **[16]**

DETERMINATION OF THE DOLINES PHENOMENON USING BY GEOLOGICAL AND GEOELECTRICAL RESISTIVITY SURVEY APPROACH IN BEDOYO VILLAGE, PONJONG SUBDISTRIC, GUNUNG KIDUL REGENCY

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ABSTRACT

Gunung Kidul Regency is a highland consisted by carbonate rocks dominantly. Bedoyo village in Ponjong subdistrcit has a lot of dolines, but in the summer season the dolines become dry and could not be water storage. By geological mapping and subsurface survey, the surface water storage could be solved. Geological mapping included in geomorphological, rock observation and structural mapping also petrographical analysis in the laboratory. Geophysics survey is to observe the subsurface rock distribution laterally and vertically with dipole-dipole configuration. The resistivity method is to determine of resistivity value for the depth of less 40 metres with the length of electrodes about 250 meters. The result of geological and geophysical analysis is to review the dolines phenomenon that could not be shallow aquifer. It caused by the subsurface condition beneath the dolines consisted of carbonated rocks with poor porosity, lenses of impermeable tuffaceous claystone and igneous rock. Those rock basements have a moderate to poor porosity in aquifer. The less opportunity to be good aquifer if the deeper rock is impermeable igneous rock. The alternative geophysical survey is needed to observe the deeper rock vertically.

Keywords: Dolines, Aquifer, Bedoyo, Geoelectrical, Resistivity

C3 **[17]**

APPLICATION OF GIS ANALYSIS IN MAPPING LANDSLIDE VULNERABLE AREA: CASE STUDY IN SELAJAMBE DISTRICT, KUNINGAN REGENCY

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ABSTRACT

Selajambe District is included as one of the sub-districts in Kuningan Regency with a high intensity of landslides disaster. The phenomenon of landslides caused a number of losses for the government and the community, both physical losses such as facilities and infrastructure and also casualties. To find out the area distribution and probability of occurrence, further observation and analysis is needed to map and analyze the potential of landslide disaster. The method uses in this study was studio analysis using Geographic Information System consist of scoring of rainfall, slope, land use, lithology, and structural geology. The distribution of landslide-prone areas in Selajambe District is categorized into three levels of hazard class. Low vulnerability class has an area of 4,788663 Km^2 or about 13,53380622% characterized by the type of slope from flat to gentle slope. The low-class regions are dominant in the southern part and a slightly in the northern part of the Selajambe sub-district. Medium landslide hazard class has an area of 11.720804 Km^2 or 33.12554883% characterized by steep slope, found also in the southern part and slightly in the northern part of Selajambe District. The high vulnerability class has an area of 18.873506 Km^2 or 53.34064495% stretches from the West to the East in the middle of the Selajambe District, characterized by steep slopes to very steep with the land use of rice fields, shrubs, plantations , and also found several settlements. Padahurip, Jamberama, Begawat and Kutawaringin are the villages whose areas are mostly dominated by high landslide susceptibility classes. It is hoped that the landslide hazard map in Selajambe District can be given more attention as a reference in the construction of public infrastructure facilities, residential areas, and also in planning landslide disaster mitigation.

Keywords: Landslide, GIS, Selajambe District

C4 [18]

HYDROCHEMICAL OF GROUNDWATER AND THE POTENTIAL OF SEA WATER INTRUSION IN TANAH LAUT, SOUTH KALIMANTAN

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ABSTRACT

The Tanah Laut area in South Kalimantan Province is a rapidly developing area, in line with the plan to relocate the country's capital. Therefore, the need for groundwater as a water resource in community life in that area needs to be supported by various studies. This research is intended as a hydrogeological survey in Tanah Laut District, to determine the local groundwater hydrochemistry and its potential for sea water intrusion. The research was conducted in the field by collecting data on the physical properties of groundwater in 155 dug wells and 50 artesian wells. Several groundwater samples representing free and confined aquifers were tested for physical/chemical properties in the laboratory. The analysis was performed based on groundwater table, pH, electrical conductivity (EC) and groundwater facies. The results showed that free groundwater has a pH of 6.1 - 8.4 and a total dissolved solid (TDS) ranged from 20.3 - 964 µS/cm, while the confined groundwater had a pH of 4.01 - 9.95 and a TDS of 28 – 2,670 µS/cm. Groundwater facies vary widely, generally dominated by Na and bicarbonate ions. Brackish groundwater was found in confined aquifers in two locations, namely Asam Jaya and Mekar Sari, indicating that the research area has the potential of sea water intrusion.

Keywords: Groundwater, Hydrochemical, Seawater Intrusion, Potential

C5 **[19]**

ASSESSMENT ON PHYTOGEOGRAPHY OF ARACEAE IN LIMESTONE ROCKS IN KELANTAN, PENINSULAR MALAYSIA

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ABSTRACT

One of the least well-studied and overlooked aspects of plant conservation particularly for Araceae is geology. The purposed of this study is to evaluate the diversity and distribution association of Araceae in limestone rocks in Kelantan. The random sampling method was applied. A total of 61 sampling sites were visited including 15 sites of limestone areas. A total of 1,429 samples of Araceae species were collected covering all sites throughout the state. The results revealed a total of 41 species out of 17 genera of Araceae from limestone areas in the State of Kelantan, Peninsular Malaysia. This represents about 28.7% out of an estimated 143 species and 60.7% out of 28 genera of Araceae reported for Peninsular Malaysia. Six species of Araceae are considered as limestone specialists, these are *A. farisii*, *A. marginatum*, *A. roxburghii*, *F. mixta*, *H. scortechinii* and *P. kingii*. The findings indicated that limestone is one of the hotspot for plants species endemism particularly on Araceae which need to be sustainably managed and protected.

Keywords: Araceae, limestone rocks, conservation, Kelantan

C6 **[20]**

THE INFLUENCE OF SEAWATER ON CHANGES IN THE PHYSICAL PROPERTIES OF CLAYEY SOILS AND ITS IMPLICATION FOR INFRASTRUCTURE DEVELOPMENT IN SEMARANG CITY, CENTRAL JAVA

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ABSTRACT

Semarang City is located on the Holocene sediment comprises of the coastal, swamp, and alluvial deposit materials on the Quaternary flood plains that characterized by the intercalating of silty-clay and sandy materials and the presence of a thick clay layer underneath. The city has recurrence problems of tidal floods in which the physical properties of the clayey deposits are affected. The volumetric changes of the soil properties in a swelling-shrinkage and consolidation behavior reduced the bearing capacity of Semarang city. It leads to an impact on the damages on buildings such as cracks on the floor and structures, tilting, and sinking of the earth-fill areas; meanwhile, in infrastructures, it may lead the damages on the roads and drainage system, also degradation of the groundwater quality due to seawater intrusion. This research is intended to discover the seawater impacts on the physical characteristics of the clayey soils by using some methods i.e. geotechnical investigation, laboratory analysis on some immersed soil models, and X-Ray Diffraction (XRD) tests. The immersion and the XRD test results are compared by the statistical tests to obtain the correlation of seawater impact on the changes of clays properties and reveal the most effected clay minerals by seawater. It results that the seawater has a significant influence on the clayey soils with a significance value of the montmorillonite clay mineral shows a value of 0.005 (less than 0.05) so it has the greatest influence on the volumetric changes when immersed in seawater. By this study, it is expected to provide an understanding of the impacts of the tidal floods on the clayey soils and how its implications for infrastructure development in Semarang City.

Keywords: Seawater, Montmorillonite, clayey soils, physical properties, tidal floods

C7 [21]

HYDROGEOLOGICAL CLUSTER ANALYSIS WITH AVERAGE LINKAGE AND WARD'S METHOD IN THE SOUTHERN SLOPE OF MERAPI MOUNTAIN

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ABSTRACT

This study aims to see the cluster analysis process using the average linkage method and the Ward method, and comparing thus results in analysis to clustering several related variables deciding to use the data of depth and hydrochemical character of groundwater. Processing cluster analysis with the average linkage method is pairing objects that combine into one cluster. Then, calculating the two proximity of the object to another variable, the next merging occurs in the clusters that are the most similar compared to other variables, thus forming the second cluster. Then the second combination is calculated using the average linkage method formula, thus forming a new distance matrix.

The cluster analysis steps with the Ward method started by close look to N clusters, which have one respondent for each cluster (all variables consider cluster). The first cluster is formed by selecting two of these N groups, which, when combined, have the smallest value of Error Sum of Squares (SSE). N-1 clusters then considered again to determine which of these two clusters can minimize heterogeneity. Thus, N clusters systematically reduced by N-1, then become N-2, and so on until they become one cluster. The results of clustering the two methods compared with the criteria for standard deviation within groups (SW) and standard deviation between groups (SB). The best method has a smaller SW and SB ratio. The results showed that the average linkage method and the Ward method has an SB and SW ratio value. This result shows that the average linkage method has better performance than the Ward method.

Keywords: Hydrogeochemical, groundwater, cluster analysis, linkage method, Ward method

C8 **[22]**

ACTIVE FAULT SYSTEM IMPACTS ON URBAN PLANNING IN EASTERN MARGIN OF BANDUNG BASIN

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ABSTRACT

In urban planning process, knowledge of the areal distribution of active fault systems, and also seismic zonation may be very important in many cases. Bandung city, one of the biggest cities in Indonesia, is sitting on Bandung basin. As the second largest economic corridor in Indonesia, Bandung basin is the place for at least five big cities developed over thick layers of Quaternary lake sediments deposit. This research aims to identify active faults system in eastern part of Bandung Basin, as new future development area of Bandung city. To achieve this goal, the research is based on an integrated analysis of all existing relevant data coming from published map and field work data including geology, geomorphology, and geophysics. Understanding the system of active faults in urban planning is very important to measure seismic damaging effects on building. From published literature, there are five active faults namely Lembang, Cileunyi Tanjungsari, Cicalengka, Jati, and Legok kole faults. The active faults are locating and crossing some areas of eastern part of Bandung basin such as Cileunyi-Tanjungsari and Cicalengka faults. However, in general, people tend to consider Lembang fault only as truly active fault and source of seismic hazards. On the other hand, the fault system seems to be involved in neotectonics, affecting the geomorphology within Bandung cities. The preliminary result of study shows the differences of activeness of fault considered as active, capable or potential faults within Bandung basin.

Keywords: Active fault system, Bandung Basin, Gedebage

C9 **[23]**

CORRELATION OF GROUD-PENETRATING RADAR (GPR) AND 2-D RESISTIVITY IMAGING METHODS TOWARDS SHALLOW SUBSURFACE LAYER AT COASTAL AREA

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ABSTRACT

Ground-penetrating radar and 2-D resistivity imaging are geophysical methods that offer fast and high-quality data acquisition for structures detection. The research was focused on the reclaimed area, which was very significant to the reclaimed land's stability. Once the reclamation land is not well executed, cracks and subsidence may happen in the future. In this research, GPR and resistivity were carried out to study the shallow subsurface layer with seasonal variation in the coastal area at Teluk Kumbar, Pulau Pinang, Malaysia. The study area was covered with unconsolidated marine clay, gravel and sand deposits. A 250 MHz shielded antenna was used for GPR survey while Wenner-Schlumberger electrode arrays with 2.5m electrode spacing was used for 2-D resistivity imaging. During the dry season, the GPR results show a high contrast of layer at a distance 22 – 28m, which indicate as a boundary between the reclaimed soil and hard layer. Results from 2-D resistivity show the subsurface layer consists of hard layer/boulder with resistivity value > 1000 Ωm, reclaimed soil of 600-1000 Ωm and original soil of 100-600 Ωm. However, during the wet season, the anomaly in GPR results become unclear due to high conductivity in the subsurface. Meanwhile, for resistivity results, the low resistivity areas become larger at a certain distance. There is a potential of soil subsidence at distance 40 – 50 m with depth of 6 – 16 m due to very low resistivity and low amplitude signal. The relationship between geophysical methods performance and seasonal variations has been successfully characterized the shallow subsurface layer with high accuracy.

Keywords: Coastal area, GPR, Resistivity, Seasonal variation, Signal

C10 [24]

CHARACTERIZATION OF GROUNDWATER BASE ON GEOLOGY, HYDROCHEMICAL AND STABLE ISOTOPE AT VOLCANIC MOUNTAIN AS ASSOCIATED WITH PHENOMENA OF RECHARGE AREA. CASE STUDY: WEST FLANK OF MOUNT TALANG, WEST SUMATRA, INDONESIA

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ABSTRACT

West flank of Mount Talang, lies at Great Sumatra Fault Zone. This geological setting impact lithologies by cross-cutting fault, high density fracture and variability in Quaternary volcanic deposit and Tertiary make the hydrogeology complex. Geology, stable isotope techniques (^{18}O, ^{2}H and ^{14}C), and hydrochemical analysis (Piper & Gibbs Diagram) are employed to identify the main recharge areas and conceptual hydrogeology model. Samples for major ion and stable isotope are collected from eight springs, one dug well and one borehole, on two seasons while the rain water samples are collected monthly from three rain stations that installed at 770, 1055 and 1266m above sea level (a.s.l.) for a year. Base on stable isotope analysis, the recharge area range between 993 to 1840m a.s.l. while the age of the water from 6035 BP to modern. The developed conceptual model for study area demonstrates different hydrogeological conditions during Rainy and dry periods, which showed by the evolution of hydrochemical characteristic, deep circulation aquifer (borehole) from Na-K-HCO_3 to No type-HCO_3 controlled by Quaternary breccia and second recharge by cross cutting fault, Intermediate aquifer on Tertiary volcanic deposit from Na-K-HCO_3 to Mg-HCO_3, controlled by the Tertiary welded tuff and at Quaternary intermediate aquifer remain the same No type-HCO_3, while the shallow aquifer remains the same Ca-HCO_3, associated with PMC data, 46.64 to 67.69 at borehole and 80.14 to 101.15 for springs and enrichment of ^{18}O and ^{2}H due to exposed to evaporation before or in the recharging process. The geological and hydrochemical, along with the relative stable isotope composition revealed that the groundwater system had four groundwater flow system, Shallow, intermediate and deep circulation on Quaternary geological setting and intermediate on Tertiary geological setting. This study, will contribute for Water Resources Integrated Management to ensure the sustainability and avoid water conflict for the future.

Keywords: Groundwater, Stable isotope, Hydrochemical, Mount Talang, Volcanic

C11 **[25]**

ANCIENT FURNACE DISCOVERY USING INTEGRATED GEOPHYSICAL METHODS AT KUALA KETIL, KEDAH

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ABSTRACT

Integrated geophysical methods were conducted at the archaeological site of Kuala Ketil in Kedah, Malaysia and it is located near the junction of Muda River and Ketil River. This research presents geophysical results that aimed to map the subsurface and identify the characteristics of buried furnaces at Kuala Ketil using three methods which are ground magnetic method, 2-D resistivity and Ground Penetrating Radar (GPR). Ground magnetic method used GEM GSM 19T proton precession magnetometer over 21 profiles while 2-D resistivity method was performed at line surveys R1 to R16 using pole-dipole array with 0.5 m electrode spacing and 1 m line interval. Ground Penetrating Radar (GPR) method was also conducted on G1 to G14 using MHz 800 shielded antenna with 0.5 m line interval. The results were processed with Excel Spreadsheet and Oasis Montaj software for ground magnetic survey, Res2Dinv and Surfer 8 software for 2-D resistivity while RAMAC software for GPR to enhance the results. The results were presented in magnetic residual contour map, 2-D pseudosections and radargrams. Based on 2-D inversion model, the subsurface is classified into three zones: low resistivity zone indicates saturated area or clay (20-100 Ωm), intermediate resistivity zone represents sandy clay soil or clayey sand (100-1000 Ωm) and high resistivity zone is dry clayey soil or residual soil of sandstone or sand (> 1000 Ωm). High magnetic residual value of >73 nT in that area indicated the original land. The results of magnetic showed low magnetic anomalies (< 77 nT) with high resistivity anomalies of 500-700 Ωm and negative reflection amplitude on radargram were interpreted as dry baked clay mixed with some sand/silica.

Keywords: Magnetometry, Electrical Resistivity, GPR Survey

C12 **[26]**

THE ELECTRODE CALIBRATION IN SELF-POTENTIAL ENHANCEMENT TECHNIQUE (SPET)

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ABSTRACT

Self-potential (SP) method is a passive geophysical method, and it is conducted in Padang Senget, Universiti Sains Malaysia (Malaysia). It measured the natural potential differences which exist between any two points on the ground such as the roving station with respect to the fixed base station. In self-potential method, these electrodes often called 'porous pots' which are designed not to create any chemical potential once it's contacted with the ground. A reference electrode is used as a fixed base and the second electrode is used to measure the potential at the ground surface. This main purpose of this paper is to correct the error during data measurement by calibrating the porous pot. The gradient technique has some disadvantages in the data quality, such as cumulative error, electrode polarization, drift effect, time varying potential, soil contact effect and reading errors (Corwin, 1990). Therefore, fixed based technique has been selected to obtain distribution of potential in the subsurface. The SP data were exported from the ABEM SAS4000 system and processed using Microsoft Excel. A tutorial, made by S. Barde Cabusson and Anthonny Finizola on data reduction for self-potential mapping is provided on the website associated with this paper (file SP_Processing_tutorial, provided with permission of the authors). A new technique (EC) of porous pot calibration is proven to be vital correction in measurement reading and provide us promising data. In addition, using multiple porous pot may give more stations reading compare to common technique. It is proven to be fast moving station and less time-consuming method during data acquisition. The time duration for case two took only 36 minutes compared to case one which took about 53 minutes.

Keywords: self-potential, environmental, calibration, electrical potential

C13 [27]

PRELIMINARY SUBSURFACE INVESTIGATION FOR ARCHAEOLOGICAL SITE AT GUAR KEPAH, PENANG (MALAYSIA) USING ELECTRICAL RESISTIVITY IMAGING

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ABSTRACT

Electrical resistivity imaging was conducted at the archaeological site located at Guar Kepah, Seberang Perai (Penang, Malaysia). Penang is one of the potential state which has the archaeological findings in Malaysia. This paper presents the electrical resistivity imaging results for preliminary subsurface investigation. Total of fifteen survey lines using Wenner-Schlumberger array with 0.5 m minimum electrode spacing and separation for each line is 1 m. The electrical resistivity imaging results were then processed with Res2Dinv and Res3Dinv software. Surfer 13 and Voxler 3 were used for visualization and simulation to help for interpretation. The subsurface profile at the study area was successful analysed and determine by resistivity inversion model. The 2-D resistivity inversion model and 2-D oblique image shows similar subsurface profile results proved that the Voxler software is suitable for modelling. The study area shows two main zones which is shell middens and sandy clay, the estimation volume calculation was also successful calculated. Hence, the preliminary investigation of the archaeological area was successful.

Keywords: Archaeological, shell middens, electrical resistivity imaging, volumetric study

C14 [28]

APPLICATION OF 2D RESISTIVITY AND SEISMIC REFRACTION METHOD WITH PARTICLE SIZE DISTRIBUTION ANALYSIS IN CLASSIFYING THE TYPE OF SOIL

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ABSTRACT

Integrated geophysical methods in conducting a field survey is important as it can help to improve the subsurface interpretation and could reduce the ambiguity inherent from inversion of geophysical method. 2D resistivity and seismic refraction method were conducted to map and characterize the subsurface at Desasiswa Indah Kembara, Universiti Sains Malaysia, Pulau Pinang. The inversion profile managed to show that the subsurface has two layers with resistivity value of 130-600 Ωm (Layer 1) and 10-90 Ωm (Layer 2). On the other hand, the velocity of the subsurface is 0.3-0.7 km/s (Layer 1), 0.8-1.3 km/s (Layer 2) and 1.4-1.9 km/s (Layer 3). Besides that, geological method was also conducted to assist the interpretation. Augured holes were drilled on resistivity line at 11.5 m to a depth of 3.8 m to acquire soil sample for particle size distribution (PSD) analysis (hydrometer analysis and mechanical sieving). Data from both parts were used to plot a PSD graph. Percentage clay, silt and sand can be obtained through PSD analysis and can be used for soil classification based on the U.S. Department of Agriculture (USDA) textural classification chart. At the same time, the value of total dissolved solids (TDS) and salinity of the area are also recorded for saturated area with resistivity value of 20 Ωm. The area has TDS (138-176mg/L) and salinity (0.007-0.08PSU) values indicating the fresh pore-fluid characteristics. Resistivity and seismic inversion profile manage to show the underlying subsurface layers. Results from PSD analysis has contributed into the interpretation of the geology of the study area.

Keywords: 2D resistivity, Seismic refraction, Particle size distribution

C15 **[29]**

MINERALOGICAL CONTROL OF ROCK SLOPE STABILITY ASSESSMENT OF COLUMNAR JOINTED BASALTIC ROCK MASSES IN THE CENGKEHAN RIVER VALLEY, INDONESIA

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ABSTRACT

The research area is located in Cengkehan River, Bantul Regency, Yogyakarta Special Region, Indonesia. There are several unstable rock slopes, where rock masses move through rock discontinuities into rock falls. This study aims to determine the relationship between the influence of mineralogical control and stability assessment of rock slopes by using RMR and SMR for columnar jointed basaltic rock masses. In basalt, many joints are found with three joint sets plus random joints. Physical characteristics of the cliff section are commonly found in core stones. Some core stones are found as a spheroidal weathering formation, wherein it measured between 10 and 40 cm in diameter. Based on the RMR value between 38 and 54 and the SMR value between 53 and 69. In the weathered joint walls, dominantly the composition of plagioclase minerals that have been altered to smectite (8% - 26.67%). Several joints are filled with material rich in iron sulfide minerals that have been oxidized to sulfate mineral, natrojarosite, with a composition reaching 44.64%. The presence of joint-filling minerals is commonly found on the lower cliffs where the RMR and SMR values are low.

Keywords: basalt, mineral, altered, RMR, SMR

C16 **[30]**

3-D ELECTRICAL RESISTIVITY IMAGING STUDY OF BURIED FURNACE AT PADANG CICAK, SIK (KEDAH, MALAYSIA)

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ABSTRACT

Electrical Resistivity Imaging (ERI) was conducted at the archaeological site located at Padang Cicak, Sik (Kedah, Malaysia). Kedah is one of a state which has potential on archeological findings in Malaysia. This paper presents the geophysical results that identify the existing buried furnace at Padang Cicak, Kedah. ERI method was performed at Sik, Kedah with total of fifteen survey lines using Pole-Dipole array with 0.5 m minimum electrode spacing. The ERI results were then processed with Res2DInv and Res3DInv softwares. Resistivity contrast shows good variation to correlate well with lithology of the earth materials. To enhance the results, data were visualized using Surfer 13 and Voxler. The ERI shows convincing results of anomalies with low resistivity value <15 Ωm varies from 0.48 – 1.97 m depth. This paper shows preliminary study to identify buried relics in the study area. The results obtained in this study area gives reliable interpretation for archaeological interest

Keywords: Electrical Resistivity Imaging, Archeological, Buried, Anomaly, Relics

C17 [31]

SPATIAL TEMPORAL VARIABILITY OF GROUNDWATER HYDROCHEMICAL ON THE PANGALENGAN-MALABAR VOLCANIC, WEST JAVA INDONESIA

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ABSTRACT

The Malabar Pangalengan volcanic is a very potential water resource area. The abundant water resources in this area are used to fulfil raw water in the Bandung Basin. The Pangalengan Malabar volcanic area has complete volcanic facies consisting of the central, proximal, medial, and distal facies. Research on the spatial, temporal variability of groundwater hydrochemical of volcanic facies is needed. This study aims to determine groundwater hydrochemistry's temporal and spatial variability in the Malabar Pangalengan volcanic area. The method used is piper diagrams, Gibbs diagrams, correlation, and major ion bivariate. Retrieval of 20 groundwater samples consisting of 8 dug wells, seven drilling wells, and five springs. Statistical analysis was carried out to identify the main factors affecting groundwater chemistry. The correlation matrix shows a strong relationship between variables: EC, TDS, Na^+, K^+, Mg^{2+}, Ca^{2+}, Cl^-, HCO^{3-}, NH4N. Bivariate plots defined the mineralization effect, dissolution of the geological materials, and anthropogenic factor. The results showed the hydrogeochemical process of major ions in groundwater volcanic regions is characterized by silica weathering. Groundwater facies in the rainy season are CaCl, $CaMgHCO_3$, CaMgCl, and in the dry season are CaCl, $CaMgHCO_3$, CaMgCl, $NaKHCO_3$. The mineral dilution process causes the difference in $NaKHCO_3$ facies during the rainy and dry seasons. Groundwater in the central facies is influenced by hydrothermal activity, characterized by a high Cl value. Groundwater in the proximal and medial facies has a high enough HCO_3. Groundwater at the distal facies has higher TDS values indicate that this area is much influenced by anthropogenic activity. The process showed improvement upstream to downstream, visualization of temporal variation, and the dilution process of identifying natural mineralization during aquifer recharge.

Keywords: spatial, temporal, hydrochemical, groundwater evolution, anthropogenic

C18 **[32]**

THE OPTIMUM ELECTRODE TIME (OET) IN SELF-POTENTIAL ENHANCEMENT TECHNIQUE (SPET)

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ABSTRACT

Self-potential (SP) method is a passive geophysical method, and it is conducted in Padang Senget, Universiti Sains Malaysia (Malaysia). It measured the natural potential differences which exist between any two points on the ground such as the roving station with respect to the fixed base station. In self-potential method, a reference electrode is used as a fixed base and the second electrode is used to measure the potential at the ground surface. This main purpose of this paper is to measure the electrode optimum time (OET) during for pre-data acquisition. OET defined as the time it takes for an electrode to have equilibrium or steady state reading on the ground. Measuring OET is essential to minimize noise as data error where SP data need to have a stable reading at designated stations. The SP data were exported from the ABEM SAS4000 system and processed using Microsoft Excel. Results shows the initial potential value is 0.8550 mV at 0 seconds, the value increases rapidly towards 2.1290 mV at 200 seconds, the value is at steady reading, but it decreased at duration 400 seconds with a value of 2.0160 mV. Observing the SP data value and the graph, it shows that the OET for the electrode to steadily on the ground is estimated for 200 seconds. Thus, this paper shows similar result at the vicinity of the area. This study shows the electrical potential has its designated value at where this value will have its initial stage and stable stage. This technique is a pre-process in SP data acquisition to estimate the time for electrode steadily on the ground.

Keywords: self-potential, environmental, electrode optimum time, electrical potential, time

C19 [33]

GEOLOGICAL ENGINEERING MODEL FOR OFFSHORE SEAWALL FOUNDATIONS OF JAKARTA BAY INDONESIA

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ABSTRACT

In term of designing the foundations for offshore seawall structures, this paper provides a new insight of marine sediment behaviour in reclamation response of Jakarta Bay. The goal is to deliver a realistic reference case study for research and practice in the field of an offshore seawall foundation. The marine sediment data used are field investigation and laboratory testing, besides the correlation among boreholes that was assisted by high resolution seismic reflection which all taken in 2016. Marine sediment characteristic model was analyzed due to the further reclamation and piling system as the substructure for the offshore seawall. By the seismic analogue record interpretation, five top units of the Jakarta bay subsurface have been identified that comprising deltaic alluvial sediment in unit 4 while the other units are shallow marine deposits. Furthermore, the deltaic alluvial sediment characteristic gives higher engineering properties values than marine sediment although the index properties are quite similar. Due to the seawall requirements of sub-bottom structure such as reclamation and pilling system thus the finite element model has been conducted to describe where the piles should be located. Based on model results, it can be concluded that the pilling system is sufficient to be positioned in the unit of alluvial plain sediment, besides, the requiring an effective foundation design and the best selection of the material reclamation are also needed to increase the safety.

Keywords: marine sediment, reclamation, pile foundation, offshore seawall

C20 [34]

IDENTIFICATION OF POTENTIAL GEOLOGICAL DISASTERS FROM GEOMORPHOLOGY DESCRIPTION OF TECTONIC PROCESSES IN LIWA AREA, WEST LAMPUNG REGENCY

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ABSTRACT

Liwa City was destructed by a major earthquake in 15 February 1994. This tectonic earthquake has 6.5 Richter scale, killed about 200 people and damaged infrastructures. This geological event was generated by the movement of the Semangko Fault. This major fault in Sumatera Island has frequently become the locations of epicenter for a major earthquake. Geomorphology of this study area is characterized by mountains, river, valley, volcano and lake. This study is aimed to reveal the condition of geomorphology related to the tectonic subject as basic concern on the geological hazard in the study area. Methodology in this study consists of field survey, topographic and satellite image analysis as well as drainage pattern discussion. Results from this study show that the topographic landscape consists of hilly mountains that arranged mainly in NW-SE direction. Digital Elevation Models (DEM) generally shows that rivers and valleys are in NE-SW direction, where some stream segments are dissected by lineaments. Lineament is an important factor in determining the influence of structural geology such as faulting into the morphography. Faulting process in this study area has been proven to be active and create a major earthquake in the past. The combination of faulting and geomorphology in the study area has produced several phenomena such as lineaments of, e.g. spring water and scarps. It can be concluded that geomorphology of the study area has closed correlation with landscape formation due to tectonic processes on the surface. In some parts of the Sumatra Fault there is very thick layer of the Ranau Tuff in the city of Liwa.

Keywords: Geomorphology, Liwa City, earthquake, landslide, mitigation, Sumatra Fault

C21 [35]

MITIGATION OF CITATAH LANDSLIDE THROUGH ENGINEERING GEOLOGY AND FORENSIC GEOLOGY APPROACHES

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ABSTRACT

Citatah Landslide, at Gunungmasigit Village, West Java, Indonesia, occurred in 1995. After the landslide incident, engineered stable slopes were built. Monitoring from 1996 to 2019 shows that there are slope damage and landslide indications, thus landslide mitigation is required through engineering geology and forensic geology approaches. Slope stability depends on Factor of Safety (FS). FS value is based on variables of slope geometry, cohesion, internal friction angle, unit weight, and water content. Weathering analysis is based on concept of rock-forming minerals from Bowen and weathering concept from Goldich. Minerals from aluminium silicate group will be more easily weathered if Ca content increases. Level of soil weathering was analyzed using Ca-Na ratio. Soil elements, Ca and Na, were obtained through Atomic Absorption Spectroscopy (AAS) method. The results showed the relationship between water content and FS is FS = 5.641 (-0.382) with r = 0.96; while the relationship between the slope and FS is FS = 17.928 (-0.699) with r = 0.98. Through Ca-Na ratio analysis, the most weathered area is slope body that will experience landslides. The value of Ca-Na ratio is 95.46%. It can be concluded that factor of safety decreases when water content and/or slope angle increase, as well as when there is most weathered soil on upper slope. Landslide mitigation is required by controlling groundwater, reengineering slopes at a safe slope angle, and carrying out soil improvement. Environment around the slopes needs to be monitored regularly so that if any damage occurs it can be repaired immediately.

Keywords: Citatah landslide, factor of safety, weathering, mitigation

C22 [36]

GEOLOGY OF ADVANCE ARGILLIC AND OTHER ALTERATION ASSOCIATED WITH THE GAJAH TIDUR Cu-Mo PORPHYRY SYSTEM, ERTSBERG DISTRICT, PAPUA, INDONESIA

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ABSTRACT

The Gajah Tidur Cu-Mo porphyry deposit lies adjacent to and at a lower elevation (1,500 – 2,750 m) than the Grasberg porphyry Cu-Au ore deposit within the Erstberg District, Papua, Indonesia. The study focuses on three drill holes that intersect 3.4 Ma age, potassic, phyllic and advanced argillic altered Gajah Tidur porphyritic monzonite as well as the roots of the Grasberg Igneous Complex (GIC) and their carbonate and siliciclastic sediment wall rocks.

Rock geochemistry analysis includes petrographic study, quantitative XRD, XRF, SEM, and fluid inclusion carried out to characterize advanced argillic alteration and host rock geochemistry at Gajah Tidur area. Major and trace element cross plots are used to classify and discriminate intrusions, and to determine the trends over time. Quantitative XRD multi elements geochemistry and mineralogy cross plot also applied to present the occurance of the alteration mineralogy. Potassic alteration is comprised of brown biotite and K-feldspar, overprinted by silica-sericite (phyllic)-advanced argillic alteration. Advanced argillic alteration minerals assemblage included pyrophyllite, alunite, kaolinite-dickite, and diaspore as well as high sulfidation mineralization composed of pyrite-chalcopyrite-covellite, chalcocite, trace amount of enargite and digenite have identified by drill core mapping, NIR, quantitative XRD and SEM analysis.

Gajah Tidur is a separate porphyry Cu-Mo that is older than the Grasberg Cu-Au system which has no significant copper grades prior to phyllic and advanced argillic alteration. This is implying that copper was not very mobile in fluids and causing the alteration above and related to earlier potassic alteration hosted in Dalam andesite and Dalam diorite (GIC). Gajah Tidur advance argillic alteration is patchy and minor in volume compared to the abundant phyllic alteration that overprints much of its stockwork and the rocks around this. Advance argillic alteration has emplaced at the upper side of the quartz stockwork and is probably due to late-stage Gajah Tidur porphyry hydrothermal fluids becoming cooler and highly acidic. Like at Oyu Tolgoi, because Gajah Tidur is a deep porphyry system its hydrothermal fluids did not reach the surface to form an epithermal lithocap but instead ascended towards the surface and cooled so that advance argillic alteration was formed at depth.

Fluid inclusion studies of quartz stockwork vein samples has identified homogenezation temperature at intermediate to highly temperature and salinity indicates that the magmatic-hydrothermal fluid is playing significant role than the meteoric fluid. The studies has shown represent two separated hydrothermal system to proved the present of two separated porphyry system, consist of Gajah Tidur porphyry Cu-Mo and Grasberg porphyry Cu-Au±Mo systems.

Keywords: Grasberg Igneous Complex (GIC), Gajah Tidur porphyry Cu-Mo, phyllic, advanced argillic, pyrophyllite, enargite

C23 **[37]**

ANALYSIS OF THE FONDATION BEARING CAPACITY FOR BRIDGE CONSTRUCTION IN THE MANTUIL REGION, MUARA HARUS DISTRICT, TABALONG REGENCY, SOUTH KALIMANTAN PROVINCE

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ABSTRACT

The safety and stability of a new bridge structure are dependent on the safety and the compatibility of the foundation itself, like for constructing a new bridge to replace a damaged bridge in one of the rivers in Mantuil Village, Muara Harus District, Tabalong Regency, South Kalimantan Province. This paper aims to calculate the bearing capacity of the foundation for bridge construction. This area geologically is dominated by clay soil. The method used for bearing capacity analysis in this area is conducted using the Standard Penetration Test (SPT) obtained from 3bore holes. The bearing capacity was calculated using the Meyerhof method for its single-pole bearing capacity and the American Association of State Highway and Transportation Officials (AASHTO) method for its group pile bearing capacity., Based on the analysis, it was found that the lithological layer with the strongest bearing capacity was found in the conglomerate with N SPT value of 12 to 50 and has single pole bearing capacity of 62 to 536 ton/m2, and coal layers with N SPT value of 25 to 50 and has single pole bearing capacity value of 136 to 643 ton/m2. The configuration of the foundation with 3 by 5 piles and 3 by 4 piles was appropriate for the foundation to be able to support the bridge's target load capacity.

Keywords: Foundation, Bearing Capacity, Bridge Construction, Standard Penetration Test

C24 [38]

LANDSLIDE DISASTER POTENTIAL MAPPING IN FEASIBILITY STUDY OF WALINI AREA AS THE CANDIDATE FOR THE CAPITAL CITY OF WEST JAVA

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ABSTRACT

Walini, Cikalongwetan District, West Bandung Regency is one of the 3 plans for the relocation of the capital city of West Java. This area is also projected to become a high-speed train station from Bandung City to Jakarta. This paper is aimed to reveal the feasibility of the Walini areabased on landslide potentials. The methodology of this research is the Weighted Linear Combination (WLC) method using the parameters of Landslide Hazard Assessment parameters (rainfall, geology, slope, elevation, vegetation) and Landslide Vulnerability Assessment parameters (population, LULC, proximity to the road, proximity to stream). The results show that this area has 5 classes of risk, from Very Low to Very High. Kanangasari Village is filled by Moderate to Very High Class but the dominant class is High with an area 8,179 km^2 (68,01% of the area). Mandalasari and Mandalamukti are in High to Very High Class. Very High Class in Mandalamukti is 4,959 km^2 (86,5% of the area). Meanwhile, Mandalasari has 7,906 km^2 (62,7% of the area) of Very High Class. It can be concluded that the Walini area is less suitable as a candidate for the capital city of West Java and the High-Speed train station based on landslide disaster because the potential risk of Very High class is up to 50 % and High class is 40% of the total area.

Keywords: landslide, risk, Walini, overlay, WLC

C25 [39]

GEOLOGICAL WEAKNESS IN CINTARATU VILLAGE, PARIGI PANGANDARAN DISTRICT IN TERMS OF SOIL AND ROCK GEOTECHNICAL CHARACTERISTICS

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ABSTRACT

Geotechnical research was conducted to determine the soil types (megascopic, physical and mechanical features) and rocks (description of physical properties and rock structures), distribution patterns, to identify potential geological weaknesses based on geotechnical and geological characteristics in Cintaratu Village. This study used the Schmidt hammer, soil penetration and hand drill tests (to determine rock-, soil- resistance and soil type). The land in the Cintaratu area is karst hills (80 to 160 m), which is divided into five slope classes, namely flat (0 ° -2 °), slightly sloping (2 ° -4 °), gentle (4 ° -8 °), slightly steep (8 ° -16 °), and steep (16 ° -35 °). The karstisified characterized by caves with stalactites and stalagmites, dominance of multibasinal river flow patterns, and limestone outcrops on hilltops. A complete weather zone mapping of CWZ and rocks is carried out with a scale of 1: 5000 with a distance of ± 50 m. Sampling was carried out by handauger at a depth of ± 1.5 m with soil characteristics that were relatively different from the top soil. The rock compressive strength test is carried out at each surface rock outcrops. The compressive strength of rocks varies between 16 to 40 MPa that are classified as strong medium weak rocks (ISRM, 1981). Soil compressive strength obtained in units of kgf / cm^2 is then converted into units of tonnes / m2 ranging from 10 to 27.5 tonnes / m^2. The compressive strength value of this soil is classified as solid soil - very weak rock

Keywords: Cintaratu, geotechnics, strength, rock, soil

C26 [40]

ENDPOINTS DISTANCE AND BARRIER LOCATION FOR ROCK FALL SIMULATION OF SELECTED PINOUSUK GRAVEL SLOPES IN MESILOU, SABAH, MALAYSIA

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ABSTRACT

The research is conducted to simulate the possibility of rock fall occurrences in the study area. It is located at highland area of Mesilou, Kundasang, Sabah which consists of Late Pleistocene age of tilloid deposits named as Pinousuk Gravel. It consists of boulder-sized to fragmented granodiorite and ultrabasic rocks. Four slopes of Pinousuk Gravel were chosen to estimate the distance of rock endpoints by using 'Rocfall' simulation software. The software is commonly used for risk assessment of potential rock slope failure. The location of barrier to minimize the damage from the rock fall is also estimated using this software. The result of analysis shows the endpoints distance ranges from the toe of the slope to 4.9 meters with bounce height from 0.6 meters to 2.2 meters during downfall. Based on the total kinetic energy received by the selected slopes, the location of the proposed barriers is within 1 meter to 4 meters from the toe of the slope. As a conclusion, the endpoints distance is depending on the height and angle of the slope, while the barriers location is proposed based on the ability to withstand the velocity and kinetic energy released during the rock fall.

Keywords: Endpoints, Barriers, Rock fall, Pinousuk Gravel, Simulation

C27 [41]

GEOLOGICAL SETTING AND GEOCHEMISTRY OF TRACE ELEMENTS FROM WEATHERED ANDECITE ROCK AROUND NEW GOLD MINE IN TAWAU SABAH, MALAYSIA

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ABSTRACT

New gold mine in Tawau, Sabah was officially opened in 2017. The mining area located at the eastern coast of Sabah, Malaysia. The open pit mine currently situated at the south and southwestern of Bukit Mantri Hill. The geological setting of the proposed area overlain by andesitic lavas and pyroclastic erupted from Mt Wullersdrof, Tawau. The volcanic activities take through the period of Neogene to Quaternary. Previous researcher also classified the rock as silicified dacitic-andesite rock; but undergo similar silicification process due the hydrothermal alteration. The alteration processes produced low-sulphidation gold deposit, gold in quartz-sulphide hydrothermal breccia veins and suphide minerals. Gold mining is a major source of trace metals emissions into the environment. These metals could be adsorbed by soil particles or leached to surrounding water bodies. Rocks and soil samples were collected along the road cuts and other man-made exposures. Mineralogical identification using polarizing microscope, x-ray diffraction (XRD) and Scanning electron microscope (SEM) shows the appearance of quartz, gold, sulphide minerals and clay minerals. The concentration of trace metals in rock, soil and sediment were measured using ICP-OES. The result of analysis shows that the level of Arsenic in river sediment ranged from 1−25 mg/kg for surrounding rivers that received inputs from the gold mining area. For silicified andesite soil, arsenic levels ranging from below detection limits to 15 mg/kg. The maximum value of copper in soil (71 mg/kg) was found higher than the normal range of concentrations but appear to be lower than the upper limit of critical value. In sediment, maximum value of copper (368 mg/kg) was detected higher than the upper critical value (150 mg/kg). Manganese concentrations ranged from 11−1125 mg/kg in river sediment and from 8−883 mg/kg in soil. Both maximum values of Mn are higher than the normal concentration in soil. Other metal elements such as Co,Cr, Ni, Pb and Zn, were found to be in normal range or below the upper limit of critical soil concentration..

Keywords: Geochemistry, volcanic rocks, gold mine, trace metals

C28 [42]

GEO-MECHANICAL ASSESSMENT OF COARSE AGGREGATES FOR CLASS B CONCRETE AT FIXED WATER CEMENT RATIO

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ABSTRACT

This paper investigates the relative physical and mechanical characteristics of the Limestone and basement rocks aggregates as construction material and an effect of these aggregates sizes on class B concrete at a fixed water cement ratio. Physio-mechanical investigations for Limestone aggregate demonstrate flakiness Index (12.0 to 18.0%), elongation Index (21.8 to 30.0%), specific gravity (2.65 to 2.90), water absorption (0.56 to 0.83%), Sodium Sulphate Soundness (1.20 to 2.50%), Los Angeles Abrasion Value (12.1 to18.4%), Aggregate Crushing Value (14 to 22%), Aggregate Impact Value (5.2 to 12.0 %) and settlement in mould (1.8 to 2.7) while basement rocks aggregate shows flakiness index (16.6 to 32.5%), elongation index (21.5 to 33.6%), specific gravity (2.50 to 2.90), water absorption (0.29 to 1.25%), Sodium Sulphate Soundness (1.90 to 5.80%) Los Angeles Abrasion Value (12.1 to19.8%), Aggregate Crushing Value (16.0 to 22.5%), Aggregate Impact Value (6.4 to 12.5 %) and settlement in mould (2.0 to 3.6) following the standard guidelines of AASHTO, ASTM, BS and NHA standards. Slates from basement rocks aggregate reflect higher values of ACV and AIV. Similarly their shape tests e.g. flakiness index, elongation index depicts that they do not qualify the required standards. Various size combinations of coarse aggregates of both aggregates used in concrete mix at fixed water cement ratio of 0.47. The compressive strength of normal strength concrete is slightly affected by aggregate size. Collectively 8 mix design of class B concrete were prepared for strength evaluation. Obtained compressive strength of resulted limestone aggregate achieved higher strength at fixed water cement ratio. It is revealed that suitable aggregate size for maximum compressive strength of concrete achieved is 3/ 4” and 1/ 2” down aggregate material.

Keywords: physio-mechanical, fixed water cement ratio, class-B concrete, compressive strength, construction material, settlement in mould

C29 **[43]**

THE PRIORITY OF MORPHOMETRY IN CIMANUK UPSTREAM WITH CORRELATION BASED ON LITHOLOGICAL RESPONSE

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ABSTRACT

In this study morphometric analysis of 84 sub-watersheds upstream Cimanuk watershed, Garut, Indonesia. The study area lies at coordinates 107º42'0" E to 108º8'16" E 'and 6º56'52 "S to 7º24'0" S. Present study includes morphometric, lineaments and lithology analysis of upstream Cimanuk watershed for management of watershed. The aim of this study is to find geomorphology, lineament and lithological responses in the upstream Cimanuk watershed, based on morphometric analysis. Remote Sensing & GIS technique were utilized for the upper Cimanuk sub-watershed. ASTER DEM and topographical maps have been employed to extract the drainage networks and lineaments. Geological field investigation carried out during the field work to validate geological maps.

The morphometric parameters considered for analysis are stream order, stream length, bifurcation ratio, drainage density, texture ratio, form factor, circulatory ratio, elongation ratio, and length of overland flow. Each sub-watershed is prioritized by assigning ranks based on the calculated compound parameter (Cp) and classified into three categories of priority; high (55 sub- watersheds, 65.5% of the total), moderate (14 sub- watersheds, 16.7% of the total), and low (15 sub- watersheds, 17.8% of the total)

The upper Cimanuk sub-watershed influence of structural disturbances on the drainage networks and its attributed to the lineament density value of 0.93 to 3.22 km/km^2. The significant effect shows the influence of the lithology response to the study of morphometric priorities study area. High priority indicates that those watersheds are dominated lithology by alluvium, tuff compared to other volcanic lithology units. The present results is a useful for planning strategies in control of soil erosion and reducing the possibility of flooding downstream.

Keywords: Cimanuk Watershed, Morphometric, Priority

C30 [44]

INVESTIGATIONS OF SPRING WATER BASED ON RADON GAS TECHNIQUE: IMPLICATION FOR ACTIVE TECTONICS, NEELUM VALLEY ROAD, NORTH WEST HIMALAYA, PAKISTAN

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ABSTRACT

Radon monitoring method can be used for earthquake prediction, hydrocarbon and Uranium exploration as a geological and neotectonics tool. A radon base study has been carried out in Districts Muzaffarabad and Neelum Valley from Kahori to Authmuqam, Azad Jammu and Kashmir. The main aim of study was to delineate the radon base characteristics of the area and their chemical parameters, locating and reporting of springs that are prone to human health and act as warning parameter of active tectonics. In this study, 20 spring (Drinking) water samples were analyzed with RTM 1688-2 along Neelum Valley road from Kahori (District Muzaffarabad) to Authmuqam (Neelum Valley). The exposed geological formations in the study area were metasediments of Kundalshahi Group of Precambrian to Cambrian age, Jura Granite of Cambrian age, Panjal Trap of Carboniferous to Triassic age and sedimentary rocks of Murree Formation of Early Miocene age. The study area has multiple faults i.e., Main Boundary Thrust (MBT), Panjal Thrust (PT), Kawai Fault (KF) and Devaliyan Fault (DF). The highest radon concentration value was found at NN-08 "Nauseri, District Muzaffarabad" which lies exactly on Main Boundary Thrust. Out of 20 samples, 13 were found to have radon levels in over-excess of the EPA (Environmental Protection Agency) prescribed maximum contamination level (MCL) of 11.1 Bq/L over the study area. The study demarcates the active nature of MBT and PT faults with higher concentrations of radon i.e., 972 Bq/L. It was observed that the radon concentration value in the study area was directly proportional to the distance from active faults. The high value of radon concentration at ND-07 "Devaliyan" i.e., 476 Bq/L also confirms the presence of active Devaliyan Fault (DF). The maximum values of radon concentrations are observed at Nauseri NC-09 and NC-08 i.e., 902 Bq/L and 772 Bq/L due to the influence of igneous and metasedimentary rocks of Kuttar Unit (intercalations of paragneisses and mica-schist with minor metaconglomerates and marbles) at Chaliyana and Panjal Traps (metabasites of basaltic composition in flows, sills and dykes with various grades of transpositions) at Nauseri. The sample NN-08 "Nauseri" lies exactly on the MBT that's why it has the maximum values of radon concentration i.e., 772 Bq/L. The sample NC-09 "Chaliyana" has the values of 902 Bq/L as it is about 5.5 kilometers away from Panjal Thrust. Similarly, the ND-07 "Devaliyan" (i.e., 476 Bq/L) and NP-06 "Panjgraan" (i.e., 849 Bq/L) are 1.75 and 1 kilometers away from MBT and KF respectively. While, World Health Organization (WHO) recommends that drinking water should have radon level of concentration less than 11 Bq/L and not exceeds this limit.

C31 [45]

ROCK PHYSICS BASED AVO MODELING OF MUBARAK BLOCK, CENTRAL INDUS BASIN, PAKISTAN

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ABSTRACT

In the present study a gas sand reservoir of cretaceous age (Lower Goru Formation) is studied for sand classification and reservoir characterization based on rock physics platform by adopting quantitative seismic interpretation approach from Mubarak block in central indus basin, which is a part of lower indus basin, onshore Pakistan known for structural hydrocarbon traps. Quantitativeseismic interpretation consists of Synthetic seismogram generation, standard conversion of time to depth contour maps generation, Petrophysical analysis, Rock physics, Amplitude Variation with Offset (AVO) attribute analysis and well-log derived modeled AVO gathers. The work is based on 3D Seismic reflection post stack migrated data and petrophysical logs of Rehmat-02 well. Two horizons are marked of cretaceous age which is Lower Goru formation. One horizon represents shale of Lower Goru formation and the other is E-Sand layer of Lower Goru formation. By the demarcation of reservoir sands and their hydrocarbon potential calculation, petrophysical analysis is carried out, which shows 63% hydrocarbon saturation for E-sand layer. Rock physics cross plots analysis performed for pay sands and non-pays sands within reservoir which gives a best match with petrophysical measurements. Additionally, AVO attribute (intercept and gradient) and AVO modeling are performed for further interpretation confirmation, which confirmed the reservoir potential for E-sand layer as possible AVO (class II) sand by inspection of its amplitude behavior.

Keywords: Quantitative Interpretation, Lower Goru, Petrophysics, Rock Physics, AVO, Sand classification

D1 **[46]**

DELINEATION OF GEOTHERMAL POTENTIAL AREA USING REMOTE SENSING: CASE STUDY IN GALUNGGUNG VOLCANO COMPLEX, WEST JAVA

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ABSTRACT

The geothermal energy potential in Indonesia is the one of the biggest energy sources in the world. Recently, renewable energy reaches 7,7% of total national energy which is targeted to contribute to 23% or equivalent to 45 GW in 2025. Therefore, to meet national energy needs, it is necessary to increase exploration of geothermal energy. The Galunggung volcano complex is one of the geothermal potential areas that needs to be developed which is estimated to have a speculative resource of 25 MWe and an estimated reserve of 264 MWe. The presence of surface manifestations proves that the Galunggung volcano has an active geothermal system. Remote sensing techniques using Landsat 8 OLI imagery and National DEM (DEMNAS) as input data are the research methods used. Analyzing and correlating Land Surface Temperature (LST), Normalization Difference Vegetation Index (NDVI), Lineament Orientation, and Lineament Density to predict the most potential areas for geothermal systems in the Galunggung Mountain Complex are the objectives of this study. The study area has a range from -0,162603 - 0,582116 for NDVI values, areas with low NDVI values are in the southeast and around the Galunggung volcano crater. NDVI values have a good correlation with LST analysis, which shows that it has the highest value of 38.5887oC in the Southeast part of the study area. The straightness orientation is dominated by the Northwest-Southeast trend with the highest straightness density value of 3.53 Km / Km² in the southeast, which indicates the most permeable zone. It can be concluded that based on the correlation analysis, the most potential areas for geothermal systems occur in the Southeast part of the study area.

Keywords: Landsat 8 OLI, Geothermal, DEMNAS, Remote Sensing

D2 **[47]**

IMAGING AND CLASSYFYING FINE SCALE INTERTIDAL SEAGRASS USING SUPERVISED MAXIMUM LIKELIHOOD

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ABSTRACT

Fine-scale seagrass such as H. Ovalis usually grows in patches along the intertidal zone. This species is commonly covered by epiphytes and other vegetative plants that limits satellite imagery to obtain a clear image of the seagrass due to high spatial resolution needed. Hence, to overcome this problem, a commercial drone (DJI Spark Drone) was used to cater high resolution image of the seagrass which can be used to monitor and obtain information on the seagrass condition at Pulau Gazumbo, Penang, Malaysia. This study aims to distinguish the potential application of remote sensing using drone imagery as a direct source for mapping fine scale seagrass. The survey was carried out at peak low tide (0.5 m) during neap tide season. 8 sampling stations around the islet were situated using a hand-held GPS. Each station consists of 3 replicate quadrants which were placed along a 50 m transect line perpendicularly to the shore with the size of 0.5 m × 0.5 m. Seagrass leave and shoot count were collected and ground truth image were taken using a 12-megapixel smartphone within the quadrat area. Meanwhile, the drone captures image of each quadrat at 1.5 m above ground and stored in JPEG file. Image classification was done using supervised maximum likelihood method which shows 3 different classes such as seagrass, substrate and others. From the result, each class represents the percentage cover within the quadrat indicating the state of the seagrass. Error matrix using ground truth image was used to calculate the overall accuracy and Kappa Coefficient to determine accuracy assessment. This study has proven that commercial drone is effective to produce a reliable map source for fine scale seagrass due to the < 80 % accuracy percentage achieved.

Keywords: intertidal seagrass, commercial drone, percentage cover, seagrass monitoring

D3 **[48]**

INTEGRATION OF LANDSAT AND SRTM DATA FOR PRELIMINARY EXPLORATION OF BAUXITE DEPOSITS, CASE STUDY: SOUTH EASTERN BINTAN ISLAND, RIAU ISLANDS PROVINCE

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ABSTRACT

Bintan and surrounding islands in Riau Archipelago are well known with the vast reserves of bauxite and related mineral deposits in Indonesia. Bauxite in Indonesia is generally formed through a lateritization process in rocks such as granite, granodiorite, diorite, gabbro and andesite which are rich in minerals containing aluminum oxide (Al2O3). The exploration cost which is quite expensive is a challenge for the mining industry to get a new reserve, so remote sensing can be used as the tools to identify the potential areas that contain bauxite. This study present the used of Landsat 8 imagery data, integrated with Shuttle Radar Topography Mission (SRTM) data to analyze the spatial distribution of bauxite deposits around Bintan Islands. Then these data were processed and analyzed by response of soil reflectance which may similar with the ex-bauxite mining area. The interpretation keys such color, hue, drainage pattern and geological knowledge are used as a guidance of visual interpretation. The results of this study showed the distribution of the mining zones along with new potential areas of laterite bauxite deposit in Poto Island which can be used in the future and proved the ability of Landsat data in mapping these feature. This study thus establishes the importance of remote sensing application in bauxite exploration to identify the potential but unexplored zones.

Keywords: Bauxite, remote sensing, Poto Island

D4 **[49]**

ANALYSIS OF MANGROVE DISTRIBUTION AND DENSITY USING LANDSAT 8 OLI IN BADUNG REGENCY AND DENPASAR CITY, BALI PROVINCE, INDONESIA

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ABSTRACT

Bali Province is one of the provinces in Indonesia which has the potential for natural coastal resources, one of which is the mangrove forest. Mangrove quality is determined by changes in canopy density. Along with the development of remote sensing technology, there have been many uses of satellite imagery, one of which is Landsat satellite imagery to analyses mangrove distribution and density. This study using Landsat 8 OLI satellite image to analyze the distribution and density of mangroves using vegetation index in Badung Regency and Denpasar City, Bali Province, Indonesia. The stages of mangrove identification were carried out using a composite band RGB 564, then separation of mangrove and non-mangrove objects using unsupervised classification methods. The next step is to analyze mangrove density using the NDVI formula. The results showed that the mangrove area in Badung Regency and Denpasar City, Bali Province was 1,373.5 hectares with an accuracy rate of 83 %. The results of the vegetation index analysis in the mangrove area show that the condition of mangrove density is dominated by medium density.

Keywords: Mangrove, Landsat 8 OLI, vegetation index

E1 **[50]**

PALEODEPOSITIONAL, PALEOCLIMATE OF THE COALS SUCCESSION OF THE STEENKOOL FORMATION IN BINTUNI BASIN, WEST PAPUA

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ABSTRACT

The aims of the research are determining the paleo depositional and paleoclimatic conditions of coals succession from Steenkool Formation, Dataran Beimes, Bintuni Regency, West Papua., Indonesia. The major oxide elements were obtained by X-Ray Fluorescence (XRF) and the Laser Ablation Inductively Coupled Plasma-Mass Spectrometry ICP-MS) analyses were used identified trace element composition. The high value (near 100%) of paleo-weathering parameters such as the Chemical index of alteration (CIA), Chemical index of weathering (CIW), Plagioclase index of alteration (PIA), Index of Composition Variable (ICV), a plot of CIA against Al_2O_3 as well as the Al_2O_3-CaO+Na_2ON-K_2O Ternary diagram suggest a strong degree of weathering of the source rocks. The positive correlation between Al_2O_3 with TiO_2, K_2O, Fe_2O_3, and MgO implies that they occur in clay minerals formed from weathering. The average K_2O/Al_2O_3 ratios of the investigated samples are ≈0.05, which suggests the prevalence of clay minerals relative to other minerals. The average boron contents in the coal seams (> 120 ppm) suggested stronger marine water influence on the coal seams during formation. The Bivariate plot of SiO_2 vs. (Al_2O_3 +K_2O+Na_2O) indicated paleoclimate during coal formation is in an arid to semi-arid climate. The paleo-redox parameters base on trace elements composition indicated all the samples were deposited under oxic to suboxic conditions. The coals from Steenkool Formation was deposited in low saline water with a strong marine influence in an arid and semi-arid climatic condition.

Keywords: coal, Steenkool Formation, major oxide, trace element, paleoclimate

E2 **[51]**

TRAVEL TIME SEISMIC TOMOGRAPHY IMAGING OF THE SUB-SLAB MANTLE INFLOW ON THE SLAB GAP OF INDO-AUSTRALIAN PLATE BENEATH EASTERN JAVA

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ABSTRACT

Slab tearing, shearing, and necking has been widely reported in convergent settings while are commonly accepted due to the geodynamics subduction process of the development of down-dip extensional stresses within the down-going slab. Indo-Australian plate's slab gap is one of the slab tearing results and estimated formed since about Miocene subduction between 9-13 Ma beneath Eastern Java. Duration of slab detachment is defined between onset slab thinning and the slab-pull force loss at the interval period. A pronounced seismic gap between earthquake focal depth of 250 km and 500 km is evident for this slab gap is actively nowadays comes primarily from hypocenters plotting of earthquake data between 2015-2020 by IRIS earthquake catalog. The slab gap may lead to a slowdown in subduction velocity due to sudden loss of slab pull force at the detachment segment and instantaneous temperature increasing in the overriding plate by hot sub-slab asthenosphere of beneath Indo-Australian inflow. P-wave travel time tomography cross-section distinctly shows viscous hot sub-slab mantle inflow through the slab gap by negative low P-wave velocity perturbation relative to the AK-135 velocity model. The non-continuous down-going positive high-velocity P-wave perturbation leads to the slab gap indication identified at the 250-450 km depth beneath the Eastern of Java. Damped linear inversion calculation is applied for the P-wave perturbation model using a shooting straightforward ray-tracing method. Sub-slab mantle inflow is regularly acknowledged as an efficient mechanism to heat advection at the lithosphere to subcrustal level following magmatic activities' effect in many cases.

Keywords: Slab Gap, Tomography, P-wave, Mantle Inflow

E3 **[52]**

BIOFACIES CHANGES OF BOJONGMANIK FORMATION DURING MIDDLE MIOCENEIN THE RANGKASBITUNG BASIN

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ABSTRACT

In the Rangkasbitung Basin, a part of Mandala Banten province, the depression was formed by a normal fault, and then filled by marine deposits. This research carried out to understand the sedimentation process of Middle Miocene Bojongmanik deposits, the age, paleoenvironment and lithology (sediment sequence). In this research, 55 samples were taken from the study area, approximately 595 km2. The measuring stratigraphic sections and correlation (vertical and lateral stratigraphic position) was applied.

The residue of dissolving peroxide method was carried out during the samples preparation. Then genus and species of planktonic and benthonic foraminifera were identified and determined. The foraminifera analysis guide has been used to determine the age and depositional environment.

The sequences of Bojongmanik Formation were deposited in Middle to Upper Miocene (N9 to N17). Based on the planktonic foraminifera distribution, the succession of each sequence can be correlated. During Middle Miocene (N9 - N12), the lowest part of Bojongmanik Formation is deposited at 100m-200m and 100m-80m depth, while in the other site, the correlated sequence is recorded that deposited at 80m-20m depth (outer to edge of inner neritic facies). In late Middle Miocene (N13 - N14), the regression process was happened. Almost the succession was deposited on land, while in deep site, a less part of sediments was formed as land facies but the most of it deposited as marine facies. In Upper Miocene (N 15 - N 17), the sedimentation continued in the transitional to edge neritic in back mangrove to mangrove environmental setting (upper to lower delta plain), and in other sites the sediment is no longer formed.

Based on distribution of benthonic foraminifera there are observed the biofacies changes laterally. In bathymetric of depositional environment maps it can be depicted two higher paleoenvironmental sites (Cigudeg and Muncang highs) and two lower sites (Leuwiliang and Jasinga basins).

Keywords: biofacies, foraminifera, Bojongmanik Formation, Rangkasbitung Basin

E4 **[53]**

RELATIVE AGE VERIFICATION AND DEPOSITIONAL ENVIRONMENTIN THE SANDSTONE UNIT OF CILETUH FORMATION IN CILETUH-PALABUHANRATU GEOPARK

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ABSTRACT

Sandstones are part of the Ciletuh Formation of Tertiary sedimentary rocks widely exposed in the Ciletuh Palabuhanratu Geopark, Indonesia. Previous studies have stated that the relative age of the Ciletuh Formation is Eocene. Therefore, this study aims to verify the relative age of the sandstone units and analyze the depositional environment. Five samples from Ciletuh sandstones are selected for palynomorphs analysis. Measure section sampling method is applied, and the acetolysis method was used for the separation of palynomorphs from sediment, respectively. Haseldonckx plant association model refers to depositional environment interpretation, and cluster analysis is applied for palynomorphs grouping. The samples were further characterized by age markers and divided into two groups. The first cluster is Proxapertites, dominated by Proxapertites operculatus and Proxapertites cursus, while the second cluster is Podocarpidites dominated by Podocarpidites spp. All samples were deposited in the Late Eocene in a different environment. The result showed that the Proxapertites cluster is characterized by microforminifera test linings and dinocysts deposited in the lagoon environment, while the Podocarpidites cluster characterized by plant debris, microforaminifera test linings, and dinocysts deposited in the sublittoral environment. In general the percentage of marine fossil in the sublittoral is higher than in the lagoon.

Keywords: Relative age, depositional environment, palynomorphs, Cileutuh

E5 **[54]**

SUBSURFACE MAPPING USING GRAVITY METHOD FOR SUSTAINABLE DEVELOPMENT IN RAJAMANDALA-CITATAH, WEST BANDUNG, INDONESIA

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ABSTRACT

Mitigation taken an important part in sustainable development. One of the mitigation approaches is identifying the structural geology potential by subsurface mapping. This study aimed to identify the subsurface structural geological condition using the Gravity Method. This method is a powerful tool to identify the subsurface structural geological potential along with the surface geological mapping. The research location is in Rajamandala-Citatah Karst Landscape Area (KBAK), West Bandung Indonesia. In this area lies sinistral strike-slip fault called Cimandiri Fault. Likely Karst area, Rajamandala-Citatah has heterogeneous subsurface, beside that activities of human: mining, agriculture, housing, and tourism are the pulse of the area's activities. The government seeks to protect and prosper its citizens by managing sustainable deveopment of spatial planning.

The Gravity Method was done in Rajamandala-Citatah Karst, using 133 point to cover 52.000 ha area. After processing the gravity data, we found residual anomaly: high from 1 to 11.3 mGal, intermediate from -0.3 to 0.7 mGal, and low from -11.3 to -0.4 mGal. It is interpretated the Rajamandala-Citatah Karst area has several structural geologies developed this area. By managing a proper mitigation, using map of subsurface, sustainable development will be reached.

Keywords: Subsurface Mapping, Gravity Method, Mitigation, Rajamandala-Citatah Karst Area

E6 **[55]**

TERTIARY SEDIMENTARY PHASES OF SUMBA ISLAND RECORDED ON THE FORAMINIFERA AND NANNOFOSSILS ASSEMBLAGES

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ABSTRACT

The Sumba Island located in the southern row of islands of the Eastern Nusa Tenggara province of Eastern Indonesia is a part of the Sunda-Banda magmatic arch and subduction system. The stratigraphy of Sumba is composed of slightly to unmetamorphosed Mesozoic sediments, unconformably overlain by less deformed Tertiary and Quaternary deposits. The new data on foraminifera and nannofossils assemblages will provide the geological characteristics differences observed in the western and eastern parts of Sumba Island. A larger large benthic- and twelve planktic- foraminifera, as well as eleven nannofossil Tertiary zones can be used to correlate rock successions. The Paleogene phase formed volcaniclastic rocks series and neritic sedimentation. It is found the corresponding deposits include tuffs, ignimbrites, greywackes, intercalation of Ta-Tb letter aged foraminiferal limestones, and P14 to P20 foraminifera (NP16 to NP23 nannofossils) zones aged - marls, micro-conglomerates and claystone. The unconformities between Paleogene and Neogene are recorded along Sumba. The Neogene phase (begins N7 to N20 or NN2-NN14) was a period of widespread transgression, characterized by rapid sedimentation in a deep marine. The sediments in Sumba display corelated two different facies; in the western part, they are represented by mostly limestone and marl, interbedded with tuffaceous marls, whereas the sediments from the eastern part of Sumba are dominantly volcanic turbidites with interbedded pelagic chalks and limestones. In the central part of Sumba, these facies show interfingering relations. They undisturbed tectonically indicated that Sumba has never been subjected to intense deformation. In Quaternary, the sandstones, conglomerates, marls and reef limestones terraces are uplift that unconformably overlie gently dipping Neogene sediments along coasts.

Keywords: Sumba, Paleogene, Neogene, foraminifera, nannofossil

E7 [56]

CALCAREOUS NANNOFOSSIL BIOEVENTS AND PALEOECOLOGY OF TONASA LIMESTONE AT KARAMA AREA SOUTH SULAWESI, INDONESIA

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ABSTRACT

The Tonasa Formation has been widely investigated by many researchers, whereas several studies have revealed organisms that are the primary components of coral reefs and as part of the carbonate platform, where the Tonasa Formation was developed. Calcareous nannofossils is one of components have been found in Tonasa Limestone at Karama Area of Jeneponto, South Sulawesi. The rock exposure consists of interbedded between marl and limestone. There are two well exposed of Tonasa Formation in this area, and we call Karama Section A and Karama Section B. Herein, our study focuses on the Karama Section B, and the purpose is to determine marker species and bioevent based on nannofossil. Samples collected using measuring section methods, then observating and determining species by quantitative analysis. As a result of data analysis are obtained 2 (two) bioevents of nannofossils during Oligocene (NP 22 –NP 25), marked by the Last Occurence (LO) of Dictyococcites scrippsae, and the second are the Last Occurence (LO) of Dictyococcites scrippsae and the Last Occurence (LO) of Cyclicargolithus abisectus or be correlated to the lower part of Early Miocene (NN1). Zonal boundary is determined based on this organism, and that is resulted Oligocene to Miocene boundary of Tonasa Formation in this section. Calcareous nannofossil is better to understanding the paleoecologic condition of Tonasa Formation, and result that during Oligocene to early Miocene the study area was an oligotrophic and warm water temperature in photic zone.

Keywords: Marker species, Calcareous nannofossil, Carbonate platform, Oligotrophic, Tonasa Formation

E8 **[57]**

OCEAN STABILITY IN THE PACIFIC AND ATLANTIC OCEAN DURING THE NEOGENE BASED ON CALCAREOUS NANNOFOSSIL PRODUCTIVITY AND SIZE VARIATIONS - WITH SPECIAL REFERENCE TO FORMATION OF PETROLEUM SOURCE ROCK

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ABSTRACT

A high-resolution investigation of Oligocene to Pleistocene calcareous nannofossils stratigraphy was carried out on four ODP Holes in the Pacific and Bahama Bank of Caribbean Sea to reconstruct the paleoceanography and correlate with the global events. This is a new study with special reference to the formation of petroleum source rock based on paleoceanography analysis and the influence of global climatic events from three different Ocean study sites. Size variations of nannofossil assemblages of Reticulofenestra, Discoaster productivity and relative abundance of coccolith the parameters being studied indicated that the thermocline and nutricline developed during the Neogene sequences at ODP Hole 782A and ODP Hole 1006A, 1007B, and 1007C, and collapsed at 8.80 Ma resulting in eutrophication of the surface waters. The strong mixing or eutrophic ocean condition changes to stronger in 5.40 Ma and high eutrophic species abundant in the 3.75 Ma. Comparison of the present investigated results of the size variation of Reticulofenestra in the western Pacific Ocean and Caribbean Sea with those in Indian Ocean, Equatorial Pacific and northwestern Pacific Ocean show that these changes in Reticulofenestra maximum size strongly related to the collapse of stability of Ocean surface and are clearly traceable at 8.8 Ma. The timing of formation of petroleum source rocks in the Hokkaido, Niigata, and Akita at Japan oil field areas was established in the middle to the late Miocene sequences. Monterey Formation on Santa Barbara, Los Angeles basin, Palos Verdes Hills and Santa Monica Mountains basin showed that the source rocks also were found during the middle to late Miocene age. We suggest that the timing of the collapse of sea surface condition or eutrophication condition (8.80 Ma) is related and applicable to the formation of petroleum source rock and traceable to the Pacific, Equatorial Pacific, Atlantic and Indian Ocean.

Keywords: Oligotrophic; Eutrophic; Closure of Panama Isthmus; Intensify of the Asian Monsoon; Messinian Salinity Crisis; Formation of petroleum source rocks

F1 **[58]**

MORPHOMETRIC ANALYSIS OF THE BEROK RIVER DRAINAGE BASIN ON POTENTIAL FLOOD DISASTERS

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ABSTRACT

The geometric character of the Berok watershed is closely related to the character of the geological hazard that occurs in area of Lojing, Gua Musang, Kelantan. The purpose of this study is basically to determine and analyze the geometric aspects of the Berok river basin. Data used were the topographic maps and satellite imageries of the region. The data used are topographic maps and satellite imagery of the area. Data were analyzed according to the hydrological study method with the help of a geographic information system for basin delineation, river ordering and geometric aspects. Result of the study showed the Berok river basin drainage density is 3.82km/km2 with. The stream of the study area has a. It is observed dendritic drainage pattern mostly and has 7 stream orders that the drainage density value is high which indicates the basin is less permeable subsoil, sparse vegetation cover and more surface runoff. The value of stream frequency is 6.78, texture ratio of 23.64, circulatory ratio of 0.24 and elongation ratio of 0.36. From the circulatory and elongation ratio value reveals that the Berok river basin is strongly elongated and highly permeable with homogenous geologic materials. In general, it can be concluded that the morphometric aspects determine the character of geological disasters that may occur in a place, especially those related to flood disasters through the interpretation of the relationship between geological and hydrological data obtained.

F2 [59]

GEOSCIENCE KNOWLEDGE TO ENHANCE LEADERSHIP FACTOR IN HUMAN RESOURCES MANAGEMENT IN MINING COMPANIES OF EAST KALIMANTAN, INDONESIA

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ABSTRACT

East Kalimantan is one of the most potential regions for coal mining in Indonesia. Mining companies are dependent of human resources to lead their operations, where leadership is a crucial factor in management. Geoscience knowledge is important factor in leadership management for mining industry. The objective of this paper is to reveal the geoscience knowledge of coal industry management as factor for enhancing leadership to support the achievement of good mining practice. Methodology in this study consists of semi-quantitative survey through questionnaires for top and middle management in coal companies. It also includes statistical analysis to overlook the relationship between factors. Results from this study show that data of basic geoscience knowledge are identified from management such as simple geology of coal mining sites, rivers, hills, lakes, land covers, etc. Leadership factors are questioned to personnel in survey, which consist of motivation, communication, creativity, and responsibility. More than 76% of participants have knowledge about basic geoscience of their mining operation area and 87% of them have experiences of training for management including leadership skills. Statistical analysis shows that there is a strong and positive correlation between 2 factors above with degree of confidence 0.05 (5%). It can be concluded that geoscience knowledge is important to enhance leadership skills such as motivation to support mining operations, communication with clients or inhabitants in mining site, and responsibility to do the job.

Keywords: Geoscience, leadership, human resources, management, East Kalimantan

F3 [60]

HEXA HELIX INNOVATION FOR GEOTOURISM AND SUSTAINABLE DEVELOPMENT AT CITATAH-RAJAMANDALA REGION, WEST JAVA, INDONESIA

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ABSTRACT

In sustainable development, innovation plays an important role in increasing the excellence of safe and durable infrastructure development. For this reason, participation of various parties is required. The concept of participation that is developing now is the concept of helix participation. The purpose of this paper is to assess geotourism of Citatah Region through the helix concepts. Several helix concepts have been developed, starting from simple Triple Helix, Quadruple Helix, Penta Helix, and now Hexa Helix. The Hexa Helix concept is a development of Penta Helix by adding law and regulation component. This concept is originally used in the Starlet-Perdana Model (Stabilisasi dan Rancangbangun Lereng Terpadu – Perkuatan Dayadukung Tanah or Integrated Slope Stabilization and Design - Strengthening Soil Bearing Capacity). For further development, it will be used in assessing the Citatah-Rajamandala Region's geotourism in Southern Side of Bandung Basin. The six components of Hexa Helix are Academics, Business/Industry, Community, Government, Mass Media, and Law/Regulation (or ABC-GML). Equalization of perception between helixes can be done by modifying PRA (Participatory Rural Appraisal) methods, for example, through counseling or seminar. By using the Hexa Helix concept, sustainable development with environmental friendly will be monitored by the six helixes. Every developer who builds tourism infrastructure will be more careful, because all helix agent participate in monitoring the result of their work.

Keywords: geotourism, Hexa Helix, sustainable development, infrastructure

F4 [61]

CHANGES IN PHYSICAL AND CHEMICAL PROPERTIES OF PANGALENGAN SOIL CULTIVATED WITH KING GRASS POST DAIRY EFFLUENT LAND TREATMENT

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ABSTRACT

Pangalengan is located in Southern part of Bandung, approximately 29 kilometers from Bandung Regency capital, Soreang. Pangalengan is well known as a dairy farm area and the home of national dairy industry giants such as Ultra and KPBS. Environment in Pangalengan supports the production of high quality dairy products due to its high soil fertility and quality. Dairy effluent is an unwanted byproduct from dairy farming practice and its application to soil has been a subject of many pros and cons. Therefore it is necessary to analyze the loss and gains of dairy effluent application in Pangalengan soil. In this study, dairy effluent was applied as land treatment in uncultivated and cultivated areas. Chemical and physical changes of disturbed soil sample from various slopes were observed after the application. Result shows that dairy effluent influenced chemical properties of the soil such as cation exchange capacity and organic carbon, and physical properties such as porosity, bulk density, and permeability both in cultivated and uncultivated soil.

Keywords: Dairy Effluent, Manure, Dairy Cattle

F5 [62]

SOIL PROPERTIES PERSPECTIVE OF STRAWBERRY CROP FAILURE IN BARUDUA, WEST JAVA, INDONESIA

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ABSTRACT

Barudua village is a part of West Java Southern Mountain Range Zone and Bandung Zone. Barudua landscape is consisted of four morphological units: volcanic, coarse hillocky, fine hillocky, and plateau. These conditions resulted in a various soil associations. Andisols and Entisols associations in Barudua are fertile and often considered as a suitable soil for agricultural practice, hence the village became one of strawberry producers in West Java based on the merit. During 2010 to 2015, Barudua strawberries were marketed all over Indonesia and became an export commodity to neighboring countries such as Malaysia. But in 2016, crop failure caused rapid production depletion and has followed ever since. The production decreases greatly to 2-5 ton per day from only 2-3 ha of plantation in 2017 mainly due to improper fertilization. The objective of the study was to identify the crop failure based on soil properties and fertilization. Sample collection was conducted from December 2017 to February 2018 in uncultivated land and strawberry farm in Barudua village. Samples of original soils used in as growth medium were taken, analyzed, and compared to treated soils from a local strawberry plantation that has been used for cultivation. Result shows that organic carbon and nitrogen status of the original soil were classified as medium, potassium and cation exchange capacity were classified as high, and soil salinity was low. Over fertilization tendency was shown by overly high status of carbon, nitrogen, and potassium despite the relatively medium cation exchange capacity compared to original soil samples.

Keywords: strawberry, soil property, fertilization

F6 [63]

SUSTAINABLE GEO-TOURISM POTENTIAL IN CINTARATU VILLAGE, PANGANDARAN, INDONESIA

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ABSTRACT

Within three years, the development in Cintaratu Village experience significantly as the result of appearance of PSDKU Universitas Padjadjaran (Unpad). Previously, this village is well-known of tourist attraction spots as alternative vacation in Pangandaran regency. As the development of housing or settlement increasing rapidly, the tourism in this village decreasing slowly. Whereas in line with the presence of the Unpad campus, this area can be developed into sustainable geo-tourism. This study aims to identify the sustainable geo-tourism potential by SWOT (Strengths-Weaknesses-Opportunities-Threats) qualitative analysis. The TOWS matrix also created with additional basic strategies for local community and local government. Based on the field survey, the Cintaratu village geologically form by clastic limestone or calcarenite of Pamutuan Formation of limestone member. The Karst landscape form this area with the geo-tourism potential such as caves, waterfalls, river, and water springs. However, the weakness experiences in this area such as lack of clean water sources, rockslide potential, and poorly maintained tourist spots. By determined the TOWS matrix based on SWOT analysis, it is expected that the local government and community will develop the village more sustainable and various in economics benefits.

Keywords: Geo-tourism, Sustainable development, PSDKU Unpad, Karst, Clastic limestone

F7 [64]

DISTRIBUTION OF BENTHIC FORAMINIFERA IN RESPONSE SEDIMENTATION AND SUBSIDENCE OF JAKARTA BAY

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ABSTRACT

The development of the waters of Jakarta Bay as a buffer for important economic growth in Indonesia requires a study of environmental problems, especially sedimentation and marine geological hazards, especially those related to subsidence. Two hundred and sixty-two sediment samples from six cores with a length up to 150 m were taken from the Jakarta Bay Waters. The samples are analyzed to determine grain size, mineralogical composition, (micro) organism content and dating. Sea bed sediments consist of clay, clayey silt (cZ), silt (Z), sandy silt (sZ) and sand (S), containing minerals (quartz, feldspar, calcite, ilmenite), rock fragments, organic material (carbon) and shells of organisms. Benthic foraminifera as depth indicator that identified in the sediments are grouped into the sub-orders Rotaliina (87 species), Milioliina (65 species) and Textulariina (25 species). Age dating using the 210Pb and 14C methods resulted in sediment ages ranging from 1.90 to 20,160 years ago. Sediment succession (indicated by texture and composition as well as microorganism content) which correlates with age illustrates the rate of sedimentation and subsidence land in Jakarta Bay. Sedimentation in the western and eastern parts of Jakarta Bay is more intensive than central part during a period due to supply materials from the river. The sediment piles were recorded to be getting thicker over time. The subsidence in the eastern part is more actively associated with the half graben.

Keywords: Jakarta Bay, benthic foraminifera, sedimentation, subsidence

F8 [65]

THE CHARACTERISTIC OF QUANTITATIVE GEOMORPHOLOGY INDICATED TECTONIC CONTROL ON QUATERNARY VOLCANIC LANDFORM IN SOUTHERN PART OF WEST JAVA AREA, INDONESIA

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ABSTRACT

The southern part of West Java, mainly composed by Quaternary volcanic material. The material properties are not compressed properly cause the land is still easy labile. This condition causes the rock was not able to record tracks of tectonic well. However, certain geomorphological units can provide an indication that lead their tectonic control. The shape of geomorphology units, qualitatively can give an indication of tectonic control. Several variables quantitative geomorphology may even provide clues to the intensity. This area is known to be controlled by tectonic based on a review of the literature already available. Fault is one tectonic product, which phenomena are found in the southern part of West Java. The method used includes observation and measurement of the dimensions of the elements of geomorphology and geologic structures in the field, measurement and calculation of quantitative variables in the laboratory, and data analysis using a probabilistic approach. Field observations include a description of the elements of geomorphology, the measurement of the width of the valley, the valley height measurement, measurement joint, and other geological structure elements if possible. Activities in the laboratory include measurements of river segment, the stream order, bifurcation ratio calculation, sinuosity of the mountain-front, valley ratio calculation. Data were then analyzed using a probabilistic approach by comparative testing and correlation testing. Empirical data related to the presence of active faults are found along the track landslides. The results showed that the activity of the fault can be classified as inactive fault, potentially active fault, and active fault. Spatial distribution is also uneven, but forming zones in certain locations.

Keywords: quantitative geomorphology, watershed, tectonic, volcanic landform, West Java

F9 [66]

GEOBIODIVERSITY OF HEAT FOREST IN BELITONG ISLAND: THE UNIQUENESS OF QUARTZ SAND FOREST

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ABSTRACT

The uniqueness of Belitong quartz sand forest is rarely found in the world. Particularly, the weathering process of siliceous parent material resulting white sands in the forest surface soil. A broad review of this potential quartz suggests a strong consideration to preserve Belitong forest as one of the geoparks in the world. Despite the vegetation growing stunted and thin, various benefits of quartz sand vegetation are useful for local people, such as for medicinal plants. We focused on geological components and conducted in the ecological primary heath forest (Rimba), secondary heath forest (Bebak) and particular heath forest (Padang) at East Belitung. Our study showed that East Belitung is divided into four geomorphological units, namely moderately steep hills, rolling hills, undulating plains, and flat plains which covered 12%, 63%, 8%, and 17% of total area, respectively. Lithology distribution composed of sandstone, shale stone, claystone, granodiorite, diorite, granite and alluvium. Study of composition vegetation in Belitung, found Rhodamnia cinerea, Tristaniopsis obovata, Symplocos adenophylla, Ilex cymosa, Adinandra domosa, Ploiarium alternifolium, Garcinia parvifolia, Dillenia suffruticosa are the common species in typical quartz sand forest. The most dominant family of medicinal plants is Myrtaceae, especially the species Rhodamnia cinerea, Rhodomyrtus tomentosa and Malaleuca leucadendron. Local people use those medical plants to keep their health and sustain the local wisdom. In addition, the abundance of protected plants such as Nepenthes spp. must be considered to protect Belitong forest as their habitat. Sufficient content of clay in soil has an important role to maintain the hydrological system of this forest. Hence, due to high fragility of biodiversity in this forest, opening forest is strongly prohibited in order to keep ecosystem function. Therefore, conservation effort by establishing geopark is promoted to save natural resources and habitat for living things and local people in Belitong forest.

Keywords: Geobiodiversity, Belitong Island, Quartz Sand Forest, medicinal plants, biodiversity, conservation

F10 **[67]**

GEOHERITAGE VALUES OF FOSSILS OCCURENCES IN ARING, GUA MUSANG

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ABSTRACT

This study in the Aring area was done within latitude of 4° 51' 00" N to 4° 58' 17" N and longitude of 102° 19' 24" E to 102° 24' 40" E. Three geological formations were observed in this area, namely the Aring Formation, Telong Formation and Koh Formation. The lithology of the Aring Formation in this study area includes volcanic rocks such as lapilli tuff, andesite as well as autobreccia, and also three sedimentary rocks, namely limestone, sandstone and shale. Roughly similar to Aring Formation, the Telong Formation in this area is comprised of Mudstone Unit I, which consists of mudstone, carbonaceous shale, sandstone and tuffaceous mudstone. Koh Formation, however, has quite distinguished lithology and only comprised of sedimentary rocks. The lithology includes conglomerate, sandstone, shale, chert and Mudstone Unit II; carbonaceous lime mudstone and mudstone. Six fossil phyla, namely Echinodermata, Brachiopoda, Cnidaria, Antropoda, Porifera, Mollusca and unidentified trace fossils, were observed in the study area and give strong evidence of the paleoenvironment of Aring area. In terms of geoheritage, the fossil occurrences in Aring were determined as regionally significant, and are important for regional geology of that area. Fossil are not that significant and rare or unique occurrences to classify the fossil occurrences as high rank for geoheritage value. The development of fossil sites over this area can be considered only for educational and scientific purposes. Although fossil were found to be diversely distributed in several locations at Aring, Gua Musang, Kelantan, the levels of significance and value of Total Heritage Value were not high enough to acknowledge the fossils in Aring as a geoheritage potential site.

Keywords: Aring Formation, Telong Formation, Koh Formation, invertebrate fossils

POSTER PRESENTATIONS

P1 **[68]**

ABUNDANCE OF PLANKTONIC FORAMINIFERA IN BENTANG FORMATION

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ABSTRACT

Foraminifera is known as the most important microfossil in micropaleontology studies due to its abundant amount of sedimentary rocks, and its important role in determining the lifespan of rock layers as well as sedimentary environmental reconstruction. This research aims to determine the age and environment changes during the formation of lithologic units of Bentang Formation based on the abundance of planktonic foraminifera. Lithology of this formation consists of limestone sandstone, tuffan sandstone, sided flakes and limestone lenses. In field, the Measure Section method is carried out as well as observation of sedimentary rock outcropped and sampling. Rock samples were prepared and analysis using a binokuler microscope. The rocks contain a lot of planktonic formanifera besides benthonic foraminifera. The research found that the Bentang Formation is a late Miocene-Pliocene aged, and developed in variety depositional environment due to sea level changes.

Keywords: Planktonic Foraminifera, Bentang Formation, Micropaleontology, Benthonic Foraminifera

P2 **[69]**

PLANKTONIK FORAMINIFERA AS AGE MARKER OF CALCAREOUS SANDSTONE UNIT IN PAMUTUAN FORMATION

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ABSTRACT

The research is located in Sukamulya and Jadimulya, Langkaplancar, Pangandaran, West Java. This research is focus on identification and determination the age of calcareous sandstone unit based on foraminifera assemblages. In the research area, the calcareous sandstone unit included in Pamutuan Formation which aged Middle Miocene to Late Miocene (Supriatna, 1992) deposited with many energy changes and related to the effect of sea level changes. The calcareous sandstone unit consists of massive sandstones with intercalation of fine to very fine sandstone. The research method started with literature study followed by field observation with spotting sampling method, and laboratory analysis. Samples of planktonic foraminifera are prepared and determined using binocular microscope. The planktonic foraminifera such as Globorotalia opima nana, Catappsydrax dissimilis, Globorotalia obesa, Globigerinoides ruber, Globorotalia mayeri, Sphaerodinellopsis disjuncta, Globigerinoides obliquus, and Globorotalia fohsi peripheroronda are identified in samples. Based on the presence of those planktonic foraminifera marker, the age of calcareous sandstone unit in Pamutuan Formation is indicated to be deposited in the relative age range of N6 to N10 or Early Miocene to Middle Miocene.

Keywords: Planktonic Foraminifera, Early Miocene, Middle Miocene, Pamutuan Formation

P3 **[70]**

DISTRIBUTIONS OF PLANKTONIC AND BENTONIC FORAMINIFERA ON SANDSTONE UNIT OF BENTANG FORMATION IN PANGANDARAN, WEST JAVA

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ABSTRACT

The research area is located at 108°27'46.55" to 108°30'29.88"E and 7 ° 41'35.54 " to 6°38'53.60 " LS. Administratively, the research area is included in Parigi, Pangandaran, West Java, Indonesia. Based on digital topographical map (BAKOSURTANAL), this area is a part of the Cijulang Sheet (1308-42). The research was carried out in the field and laboratory. In field, the focus of research is identifying the lithology characteristics in lateral and vertical stratigraphic distributions as well as rock sampling that controlled by its stratigraphic position. The samples then observed to identify foraminifera fossils in the laboratory. The samples analyzed in the laboratory using a binocular microscope after prepared. This research aims to identify planktonic and benthonic foraminifera fossils contained in the sandstone rock unit of the Bentang Formation. Based on foraminifera fossils content and its distribution, the relative age range and zone of bathymetry can be interpreted. In samples that represented 6 layered sandstone units in the research area, foraminifera fossils were identified. Datum markers of age characterized by planktonic foraminifera fossils, there are Sphaerodinellopsis multilobe and Globigerinoides ruber. Foraminifera benthonic dominated by Lenticulina suborbicularis, Nouvigerina ampulaceae, Cibicides tenuimargo, Anomalinoides globulosus, Heterolepa praecincta, Ammonia convexa reflected a shallow marine or middle neritic bathymetry zone (50-100m). Based on planktonic and benthonic foraminifera content, the sandstone units of the Bentang Formation are deposited during Middle Miocene (N12-N13) age in a shallow marine depositional environment.

Keywords: foraminifera, sandstone unit, Bentang Formation, Pangandaran

P4 **[71]**

STRUCTURAL GEOLOGY (GRABEN) BASED ON GRAVITY DATA IN BOGOR WESTJAVA - INDONESIA

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ABSTRACT

Gravity measurements have been conducted, 169 gravity measurement data points with varied heights at each measuring point from 16 to 595.1 meters above sea level which is divided into two measurement paths. With the distance between the measuring points at a certain variation interval (effective 750 meters), using a closed loop method that aims to map subsurface conditions to Identifiying Structural Geology in the Bogor, West Java-Indonesia region. Complete Bouguer Anomaly (CBA) values varies from 26 mGal to 66 mGal. The High Anomalous Area, has a value of > 46 mGal, occupies more than the southern half of the study area, extends in the southwest to the possibility of symmetry in the east, and there is the highest anomaly between them. This high anomaly area is produced by a rock mass that has a greater mass density (≥ 2.507647059 gr / cm^3). The Low Anomaly Area, has a value of ≤ 46 mGal, occupying less than half of the research area in the north. Increasing the anomaly value in the north on the map, forming an indication pattern of an open basin. This low anomaly area is produced by a rock mass which has a lower mass density (≤ 2.507647059 gr / cm). Rock density at the study area based on forward modeling shows values in the range of 1.8 gr / cm^3 s.d. 2.67 gr / cm^3. The results of the study using gravity method based on 2D cross section shows that the main fault in bedrock along the AA 'research path is relatively West - East, with stratigraphic direction of each constituent rock layer to the south. The direction of the fault forms block faulting, making this area graben.

Keywords: Structural Geology, Graben, Gravity, Density

P6 [72]

FACIES DEVELOPMENT AND PALEOENVIRONMENTAL CONTROLS ON VOLCANOGENIC–CARBONATE DEPOSITION UNDER LOW-LATITUDE, TROPICAL CLIMATES IN AN INTRA-ARC SETTING BASED ON ELEMENT GEOCHEMISTRY: THE EARLY MIOCENE JAMPANG – PAMUTUAN FORMATIONS, INDONESIA

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ABSTRACT

The Early Miocene volcanogenic and carbonate facies exposed in West Java's Southern Mountain represent a record of marine deposition in the intra-arc setting of the Sumatra–Java arc-trench system. Development of the volcanogenic–carbonate facies was influenced by the complex interaction between volcanic activity, relative sea-level changes, provenance, low-latitudes, and tropical climate conditions. These sedimentary sequences are divided into twelve main lithofacies. They are grouped into seven significant facies associations: (1) Resedimented pyroclastic–hyaloclastite deposits (FA1), (2) Submarine slump and mass transport deposits (FA2), (3) Offshore-shale dominated turbidite (FA3), (4) Volcanogenic, high-density turbidite (FA4), (5) Mixed siliciclastic–carbonate deposits (FA5), (6) Detrital carbonate deposits (FA6), and (7) Shoal water carbonate deposits (FA7). The development of the FA1–FA2 facies associations are considered to be associated with high-sediment supply during an increase in marine accommodation. The Increased in marine accommodation continues until the deposition of the FA3 facies association, where the sediment supply was relatively much lower than the rate of an increase in marine accommodation. Sedimentation of the FA4–FA5 facies associations is attributed to an increase in sediment supply that is relatively higher than the rate of increased marine accommodation. At a later stage, the FA5–FA7 facies associations' sedimentation were possibly controlled by the relative fall in sea-level in association with a decrease in sediment supply. The Early Miocene volcanogenic–carbonate deposits show the temporal variation in the element geochemistry from FA1 to FA7, which reflect the complex interactions between marine accommodation, sediment supply, precipitation, and weathering in the humid-tropical climates, volcanic activity, and subsidence in the intra-arc setting

Keywords: Volcanogenic, carbonates, sediment, facies

P7 [73]

THE CHARACTERISTIC OF FLUIDS AND TEMPERATURE IN THE GEOTHERMAL REGION, CASE STUDY OF THE FRACTURE AQUIFER SYSTEM IN AROUND TOKATINDUNG-BITUNG, NORTH SULAWESI, INDONESIA

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ABSTRACT

Bitung is an area in North Sulawesi which contains hotsprings as a manifestation of geothermalactivity. The water temperature of the Tokatindung site is known to reach over 80°C. Thepurpose of this research project is to discover the characteristics and temperature of the fluidsin the fracture aquifer system found in the Tokatindung area. The methods of this research areprimary data and literature study. Pumping tests are primary data, which determine thecharacteristics of the aquifer system. A literature study was conducted to determine the type offluid and temperature. Based on the pumping test, the hydraulic conductivity value was foundto be 0.23 to 2.55 m/day and the transmissivity value is 7.99 to 85.49 m^2/day. This means thatthe aquifer in the study area is controlled by a fractured aquifer system, with the ability tocontinue water flow from relatively moderate to very good. A literature study revealed that thefluid is a bicarbonate water type, located in the immature water zone. The surface spring temperature around Duasaudara Mount is relatively low, around 34.56-41.40°C, with a neutralpH, a low concentration of chemical compounds, and a SIO2 geothermometer temperature of148°C. The connection as to why the water temperature is hot around in Tokatindung area isshown by the fractures that are controlled by a local structure in the southwest-northeastdirection that connects from the origin of the heat source, which is the volcanic activity ofDuasaudara Mount.

Keywords: Hydraulic Conductivity, Transmissivity, Fracture Aquifer, Geothermal Reservoir,Gold Mining

P8 **[74]**

IDENTIFICATION AND CONSERVATION OF EARTH HERITAGE (GEOLOGY) BASED ON GEODIVERSITY ANALYSIS (ASPIRING GEOPARK): STUDY OF KALTARA AND SANGKULIRANG-MANGKALIHAT

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ABSTRACT

Aspiring geopark of Krayan Highland (Kaltara) and Sangkulirang-Mangkalihat mountain range is a geodiverity study located in the North and East Kalimantan, aims to characterize geofeature with scientific relevance in the form of geological framework and geoconservation. Kalimantan is a large of complex geological mintakat with interesting history, which has a wide diversity of rock types and landscapes spanning various beautiful and wonderful origins. The diversity of its nongeological aspect is spread over the forests of High Conservation Value and UNESCO world heritage cultural sites. By applying methods for large areas, literature studies and remote sensory observations. Geological data are collected, quantified and qualified through geodiversity, geoabundance, and georichness values, meaning of heritage value (HV) and interpretation score (IS). Adopt a geosite typology and earth science conservation classification (ESCC). Based on its intrinsic value, geosites are grouped within geological hotspots into diverse value areas (geoarea), with compiled data of geodiversity, biodiversity, and culturediversity. This inventory establishes 16 geosite types that are posible in 10 geological frameworks: anthropogenic, sedimentology, paleontology, mineralogy, stratigraphy, igneous rocks, metamorphic rocks, structural geology, neotectonics, geomorphology, hydrology and hydrogeology, geochemistry, geothermal, economic, paleogeography, and geohistory. Some sites are worth extraordinary and amazing Sites of Special Scientific Interest (SSSIs) and Regionally Important Geological and Geomorphological Sites (RIGS). Some geoheritage sites hold valuable evidence of Cenozoic obduction and magmatism, modern carbonate landscape and atolls, as well as distinctive hydrological features. Scientific meanings approach the true value of the potential aspect. Its landscape and geological condition affect cultural tradition and biodiversity, forcing it to adapt. The geoheritage sites of Kaltara and Sangkulirang-Mangkalihat are local, regional and national, even global.

Keywords: geodiversity, geoheritage, aspiring geopark, geoconservation

P9 **[75]**

MANAGING BANK SOIL ON SURFACE MINING OPERATION WITH USLE METHOD

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ABSTRACT

Top soil is a very valuable layer in mining activity and hence adequate management is required to maintain the quality, quantity, and mechanical properties. The soil will be used for revegetation to support success in post mining. It will be placed in one area and taken when revegetation area is ready. Soil has loose property and low mechanical properties, so it is prone to erosion when it rains. This research was conducted to manage top soil so that erosion can be reduced, top soil quality can be maintained, and pond sediment loads can be reduced. The analysis uses the Universal Soil Loss Equation (USLE) method by changing the variable c, namely the overburden factor. This variable is carried out using the Cymbopogon nardus planting option. This plant has long roots which increase soil cohesion, it is fast growing and has economic value. The leaves and stems can be distilled to produce essential oils. The results showed, by implanting Cymbopogon nardus, the value of the constant c in USLE can be changed from 1 to 0.434. The research was carried out on a bank of land with an area of about 3 ha, without planting Cymbopogon nardus, annual erosion of 433m^3. With planting erosion decreased to 101m^3. USLE calculations with modified c values through planting Cymbopogon nardus have helped top soil management both in maintaining quality and reducing erosion and sedimentation in the sedpond. The erosion rate decreased by about 75% when this method was applied. This method can be applied to all disposal areas so that it can provide considerable benefits for mining activities, especially in reducing erosion and sedimentation.

Keywords: Erosion, Sedimentation, USLE, overburden factor

P10 **[76]**

POTENTIAL HYDROCARBON SOURCE ROCKS IN THE KARANGKOBAR AREA, CENTRAL JAVA, INDONESIA

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ABSTRACT

The porpuse of the study which has been carried out in the Karangkobar area, was to investigate whether the surface samples of fine grained clastic sediments, including their lithofacies and possess source rock potential. The method used in this research is field study and laboratory analysis. Field studies were conducted on rock sampling, while the geochemical laboratory analysis includes Total Organic Carbon and Rock-Eval Pyrolysis. Fourteen samples have been analyzed for their Total Organic Carbon (TOC) content. The result indicated TOC values varying between 0,36 - 1,55 %. The hydrocarbon source rock potential level in the investigation are shows a poor – fair organic richness. Rock Eval Pyrolisis was conducted on 14 samples with potential hydrocarbon generating characteristics, with HI values between 15-115 mg HC/g TOC. The kerogens include type II and III, indicative of oil and gas generating potential. Pyrolisis temperature at maximum (Tmax) in range of 276–489oC, which indicate that the samples are thermally immature to post mature. This study is important to complete the understanding of petroleum system in Central Java.

Keywords: fine grain sediment, hydrocarbon, TOC, pyrolisis, sorce rock, potential

P11 **[77]**

QUATERNARY EVOLUTION BASED ON RADIOCARBON ANALYSIS OF THE RASAUJAYA AREA, WEST KALIMANTAN, INDONESIA

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ABSTRACT

Five Quaternary sediment core samples were collected from various places in Rasaujaya area. The purpose of this study was to determine the evolution and geological history of the quaternary of the Rasaujaya area.. The methodology is to take samples by hand core drilling then create a core log that explains the description and characteristics of the rock and its lithofacies and radiocarbon analysis to provide geochronological data. The result of radiocarbon dating indicates that the absolute age range between 3840 ± 80 up to 7210 ± 90) years BP and based on the structure and color it consists of three main sedimentary facies units. - The lowest layer consists of brownish gray clay containing plant debris a little humus is part of the mangrove swamp sediment aged between 7210 ± 90 B.P to 7110 ± 70 B.P. The middle layer consists of plastic bluish ash clay containing shells and peat is part of shallow marine sediment aged 5800 ± 180 B.P The top layer consists of soft dark brown peat containing plant residue roots and wood which is part of the paludal deposits aged 3840 ± 80 B.P. The conclusion from this study is that at 7210 ± 90 B.P there was an increase in sea level followed by coastal abrasion and resulted in mangrove swamp deposits, then at 5800 ± 180 B.P there was another rise in sea level which caused the formation of shallow marine deposits and at 3840 ± 80 B.P. the sea level has been down slowly up to the recent sea level position.

Keywords: Sediment core, Quaternary Evolution, Sea Level Change, Quaternary geochronology

P12 **[78]**

GEOHAZARD RISK MANAGEMENT ON GEOTOURISM, CASE STUDY: PINDUL CAVE, GUNUNG KIDUL - YOGYAKARTA

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ABSTRACT

The geodiversity of Indonesia as an archipelago country has contributed huge benefits in the development of geotourism. One of it is featured as Pindul Cave geosite in Gunung Kidul Yogyakarta, which is already running as a well-known tourism site within the Gunung Sewu Geopark. In order to create a sustainable geoturism, it is necessary to have a good hazard risk management, especially regarding to geohazards. Since Pindul Cave has not prepared the management yet, this study aims to assess the variables in the geosite, this include the likelihood and consequences, that will provide a holistic risk management plan. The highest geohazard risk comes from flood and landslide on the geosite. The assessment result mentioned that Pindul Cave Geosite is included in the High-Extreme category, means that geosite needs immediate repairing action and even requires a specific plan on the managerial level in terms of handling and emergency conditions. In dealing with such risks, it is necessary to have engineering, administrative control, and procurement of personal protective equipment (PPE).

Keywords: Geotourism, sustainable, Pindul Cave, geohazard, risk management

P14 **[79]**

TECTONIC GEOMOPHOLOGY IN KARANGSAMBUNG AREA, CENTRAL JAVA, INDONESIA

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ABSTRACT

Karangsambung is an area with complex geological conditions, which is evidence of deformation due to the subduction of the India-Australia plate with the Eurasian plate on the Cretaceous-Paleocene which are exposed on the island of Java. In this area, faults, stumps, and folds are developed and uncovered rocks of pre-Tertiary age that are rarely found, including eclogite, schist, serpentinite, chert, red claystone, gabbro, lava, and diabase. The geological structure that develops in the form of a fault with a main direction of almost NE-WS, a fold with a W-E direction, shows the influence of compression forces almost North-South. The developing geomorphology is strongly influenced by tectonic deformation which forms sharp hills with steep valleys, and one of them is the anticline valley that forms the Karangsambung amphitheater. Quantitative measurements of geomorphic index such as the ratio of valley floor width to valley height (Vf), drainage basin asymmetry (AF), stream length – gradient index (SL), basin shape index (BS), mountain front sinuosity (Smf) and drainage density (Dd) and correlated hypsometry to produce a relative index of tectonic activity or index of tectonic activity (Iat). The results obtained indicate that the Iat values are mostly in The results showed that Iat scores were divided into three classes, namely class 2 (11%) highly, class 3 (62%) moderately, and class 4 (27%) low. The dominant Iat value in the moderately class and the deformation of the river terrace shows the effect of neotectonic activity in the study area.

Keywords: tectonic geomorphology, index of tectonic activity, neotectonic, Karangsambung

P15 **[80]**

MITIGATION OF LAND MOVEMENT IN WONOSALAM AREA, JOMBANG DISTRICT, EAST JAVA

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ABSTRACT

The ground motion factor is partly due to the mass of soil and or rocks moving along the slope due to gravity. The rainwater factor which increases the saturation of the soil causes the soil to have a heavier mass and reduces the grip strength to the rock. The research location is in Wonosalam District, based on contour data and satellite image data, this area is classified as a mountainous upland area. Wonosalam location was chosen because it is currently the focus of development of natural tourism areas, and doubts both population growth and land conversion are taking place rapidly. So this research aims to (1) determine the distribution of ground motion vulnerability, (2) determine which residential areas are classified as prone to landslides, (3) know how to mitigate so that landslides can be prevented. The research method is quantitative, with two types of secondary data including contour data, satellite imagery, land use, geology, soil texture, primary data in the form of soil type sampling, calculating soil permeability, and land use sampling test. The results of the research can produce (1) the distribution of ground motion vulnerability, (2) identification of ground motion prone settlements, (3) provide recommendations for disaster mitigation.

Keywords; Landslides, Digital Image Management, Disaster Mitigation

P16 **[81]**

IDENTIFICATION OF POTENTIAL GEOLOGICAL DISASTERS FROM GEOMORPHOLOGY DESCRIPTION OF TECTONIC PROCESSES IN LIWA AREA, WEST LAMPUNG REGENCY

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ABSTRACT

Liwa City was destructed by a major earthquake in 15 February 1994. This tectonic earthquake has 6.5 Richter scale, killed about 200 people and damaged infrastructures. This geological event was generated by the movement of the Semangko Fault. This major fault in Sumatera Island has frequently become the locations of epicenter for a major earthquake. Geomorphology of this study area is characterized by mountains, river, valley, volcano and lake. This study is aimed to reveal the condition of geomorphology related to the tectonic subject as basic concern on the geological hazard in the study area. Methodology in this study consists of field survey, topographic and satellite image analysis as well as drainage pattern discussion. Results from this study show that the topographic landscape consists of hilly mountains that arranged mainly in NW-SE direction. Digital Elevation Models (DEM) generally shows that rivers and valleys are in NE-SW direction, where some stream segments are dissected by lineaments. Lineament is a important factor in determining the influence of structural geology such as faulting into the morphography. Faulting process in this study area has been proven to be active and create a major earthquake in the past. The combination of faulting and geomorphology in the study area has produced several phenomena such as lineaments of, e.g. spring water and scarps. It can be concluded that geomorphology of the study area has closed correlation with landscape formation due to tectonic processes on the surface. In some parts of the Sumatra Fault there is very thick layer of the Ranau Tuff in the city of Liwa.

Keywords: Geomorphology, Liwa City, earthquake, landslide, mitigation, Sumatra Fault

P17 **[82]**

CHARACTER OF INCREASING COMMUNITY RESPONSE TO VOLCANIC CRISES AT AGUNG VOLCANOES

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ABSTRACT

After 54 years, Mt. Agung showed increasing volcanic activity level. 14 September 2017, status was raised from Level 1 to Level II. After that, it was in level III in 18 September 2017. During 20.30 CIT, it was raised into Level IV in 22 September 2017. Seismic energy pattern from volcano observatory in Rendang showed decrease, therefore in 29 October 2017, status was down to Level IV. However, eruption can be potentially occurred, therefore, community and other actors recommended to keep aware.Collective memory related to eruption 1963 by community were low, which were from the people who live in 1963, they were still in 8 until 15 years old age. The information were not valid enough. There were not have concept of disaster or how to understand related to disaster and its worst possibility. Their memory were also not clear enough in recollecting the event. Obligatory training is an alternative concept to answer challenge, needs, and problems above. In short term, obligatory training can be used as disaster conscience strategy and strengthening capacity in vulnerable area. Meanwhile, in long term, it can be used as social engineering to create resilient community in form of culture-awareness on disaster or consideration in facing the risk during their daily activity.

Keywords: Agung Volcanu, Obligatory Training, Community Based Disaster Management

P18 **[83]**

THEORETICAL SIMULATION OF CO_2 AND DEGASSED BRINE INJECTION FOR A POSSIBLE CO_2-WATER EGS IN DIENG GEOTHERMAL FIELD, INDONESIA

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ABSTRACT

One of the methods to mitigate excess carbon emission is carbon storage in which CO_2 produced from industrial facilities and power plants are injected to subsurface and stored in a geologic formation. Application of carbon storage in geothermal fields is considered advantageous as it can both reduce CO_2 emission and restore CO_2 content in the reservoir for more sustainable energy production. This study aims to perform a preliminary study to a possible CO_2 storage coupled with water-EGS in Dieng geothermal field (Indonesia) based CO_2 injection scheme done in Umurlu geothermal field (Turkey). A geochemical simulation is created using PHREEQC to evaluate CO_2-brine interaction from injection inlet to well bore and CO_2-brine-reservoir rock interaction in the surrounding of reinjection well based on saturation state of CO_2-brine mixture with respect to possible scaling minerals and reservoir rock minerals. The study utilizes published chemistry of brine, reinjection brine, and reservoir rock minerals reported by previous studies. The results predicted: i) corrosion potential in the injection inlet due to immediate pH drop, ii) the favorable inhibition of silica scaling and undersaturation of carbonate and sulfate minerals along the well bore, iii) spatial distribution of pH rise and temperature drop around injection well and iv) forecast potential chemical process by assessing solubility state of reservoir minerals with respect to CO_2 saturated reservoir brine. The result of study supports the feasibility of CO_2 storage coupled with water-EGS to be done in Dieng geothermal field.

Keywords: CO_2 storage, water-EGS, geochemical simulation, PHREEQC

P19 **[84]**

PALEOENVIRONMENT, PALEOECOLOGY RELATIONSHIP BETWEEN AMPHISTEGINA AND ORBULINA UNIVERSA IN MEMBER OF CALCARENITE PAMUTUAN FORMATION, INDONESIA.

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ABSTRACT

This research focuses on the paleoenvironment, paleoecology and distribution of the foraminifera of the member Calcarenite Pamutuan formation in Pangandaran, Indonesia. Member of Calcarenite Pamutuan formation was deposited during Middle Miocene in large area of shallow water, marine carbonate production. Foraminifera is very abundant in marine sediments and present in all marine environments at all latitudes. Very small sizes ranging from 50 to 400 mm can be easily collected and determined in relatively small samples. Foraminifers consist of several planktonic families and various benthic families. In the low latitudes, planktonic foraminiferal diversity is high (Chaisson, 1995). Large benthic foraminifera (LBF) is a part of bentonic foraminifera where the distribution and abundance of LBF is limited to waters with tropical and warm climates. Analysis of LBF in relationship with planktonic foraminifera can provide important and valuable data for paleoenvironmental and paleoecology reconstruction studies. The paleoenvironmental reconstruction study consist of 26 samples. Based on the analysis of the abundance of genus Amphistegina and planktonic foraminifera (Orbulina universa), it indicates that the Member of calcarenite pamutuan formation is deposited during the middle miocene (Tf) in open marine with quiet water conditions, good nutrition and light penetration.

Keywords: paleoenvironment, Paleoecology , Middle Miocene

P20 **[85]**

GROUNDWATER RECHARGE AREA DISTRIBUTION USING HYDROGEMORPHOLOGY APPROACH AND GOOGLE EARTH ENGINE (GEE) IN BRANTAS WATERSHED

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ABSTRACT

Landuse function has been occurred in Brantas Watershed which is located in East Java Province. By rapid region development, many landuse has changed from vegetation area to be built up area. To predict groundwater recharge area, the research applied hydrogeomorphology as an approach. Hydrogeomorphology factors influencing groundwater recharge area are: slope, geological material, lineament density, density drainage, and landuse. The research aims to obtain spatial groundwater recharge area in Brantas Watershed using hydrogeomorphology as an approach and Google Earth Engine (GEE) platform for data processing. By using GEE, the related data has been collected. GEE is cloud computing-based tool providing wide data availability and data access. Groundwater recharge area classification used weighted overlay for all influence factors, so that it can be obtained groundwater recharge potency index. The result showed that groundwater recharge area distribution can be used for determining any type and method in groundwater conservation based on its own hydrogeomorphology condition for supporting groundwater sustainability.

Keyword: groundwater, hydrogeomorphology, Google Earth Engine

P21 **[86]**

FLEXURER SUBSIDENCE OF MAKASSAR STRAIT

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ABSTRACT

At this time, the formation of Makassar Strait believed to be caused by rifting and concluded as aulacogen, along with the widening of Mahakam River that have its end on that strait. On the other side in the same tectonic period, the structure pattern developed at the onshore of East Kalimantan or in West Sulawesi was formed under the influence of compressional characterized by the development of Samarinda anticlinorium in East Kalimantan and fold thrust belt in West Sulawesi. The object of research is to identify the tectonic regime difference on the same time and the same place within this region. Methodology used in this study were geological interpretation from DEM, seismic interpretation from published data, and structural geological map from the field survey. This study showed that the formation of Makassar Strait and Mahakam River was not caused by extensional tectonics (rifting) which cause the formation of aulacogen. However, this formation is due to the compressional tectonics that cause the flexure subsidence. This tectonic was started during the Eocene, when the collision between Sundaland and Australia continent occured.

Keywords: Makassar Strait, rifting, aulacogen, flexure subsidence, Sundaland, Australia continent

P22 **[87]**

LATE MIOCENE PALEOCEANOGRAPHIC EPISODES IN THE BENTANG FORMATION OF WEST JAVA, AND WESTERN PACIFIC OCEAN INDICATED BY NANNOFOSSIL PRODUCTIVITY AND SIZE VARIATION OF RETICULOFENESTRA

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ABSTRACT

We discuss in detail paleoceanography of the West Java, and western Pacific Ocean based on calcareous nannofossil assemblages from the outcrop samples and compared with ODP Site 782 samples with focus on the Late Miocene studies. West Java of Indonesia field is influenced by the South Equatorial and South Indian current. At each site and samples, we focused on the relationship between coccolith number (N/g), size variation of Reticulofenestra and interpret the cause of the events based on the correlation to global tectonic and climatic events from NN7 to NN12 Zone. Nannofossil datum species covered the NN7 to NN12 Zone are consist of LO Discoaster quingqueramus and D. berggrenii (NN12/NN11 Zone); FO D. berggrenii (NN11/NN10 Zone); the FO Catinaster coalitus (NN8/NN7 Zone); and LO Cyclicargolithus floridanus (NN7/NN6 Zone). The upper part of NN8-NN10, Reticulofenestra abruptly decreased in maximum size from 8-9μm to 3-4μm, as well as minimum and bimodal also show was recognized. The coccolith productivity of Bentang Formation, and western Pacific Ocean increased from NN10 to NN12 and the relative abundance of Discoaster species shows the opposite trends in this interval. The dominance of small Reticulofenestra at 8.8 Ma shows a positive correlation with coccolith productivity in both sites of studies and the drastic decrease of the maximum size of Reticulofenestra in the late middle Miocene. The combination of these parameters suggests that the gradual eutrophication and collapse of sea surface stratification occurred is indicated at 8.8 Ma in the Bentang Formation and western Pacific Ocean. This finding suggests that the nutrient conditions related to collapse of sea surface conditions, increase gradually with floral repetition changes and relation with the timing of intensify the Asian Monsoon, are clearly traceable to the Bentang Formation of West Java, Indonesia.

Keywords: paleoceanography, Late Miocene, Reticulofenestra, Discoaster, coccolith productivity, Asian Monsoon

P25 **[88]**

THE POTENTIAL OF DOLOMITE MINERAL RESOURCES IN THE PACIRAN AREA, NORTHEAST JAVA

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ABSTRACT

Research on dolomite mineral resource potential Paciran, North East Java. Paciran areas are known to have dolomite potential with good potential for cement and fertilizer. The research method uses XRD (X-Ray Diffraction) to find out the composition in quantitative terms and the type of mineral composition. It can estimate the percentage/ratio of each mineral in a dolomite test sample. AAS (Atomic Absorption spectroscopy) analyzes mineral with high sensitivity and petrography study mineral characteristics with microscope rocks. The study results show three examples of XRD that have a dominant composition; from the AAS analysis results, there is dolomite with a composition of 15% - 16.3%. In contrast, petrographic analysis shows dolomite found in packstone-grainstone facies. This research concludes that the potential area for cement and fertilizer industries is very probable.

Keywords: Paciran, Formation, Dolomite, Petrographic, AAS, XRD

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