



# Proceedings of International Symposium on Earth Science and Technology 2023

**November 30 - December 1, 2023**

**Shiiki Hall**

**Kyushu University, Fukuoka, Japan**

**Organized by**

**Cooperative International Network for Earth Science and Technology (CINEST)**

**Sponsored by**

**Leading Enhanced Notable Geothermal Optimization (LENGO)**

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# **International Symposium on Earth Science and Technology 2023**

## Greetings from Cooperative International Network for Earth Science and Technology (CINEST)

We are facing with global environmental problems with problems on resources depletion at behind. In particular, the rapid increases in mineral resources and energy consumptions have cast a shadow over the sustainability of human activities. The CINEST was founded in 2008 to enhance cooperative studies and activities by young researchers and engineers, because their boldly tackles must be keys and absolute foundation to solve problems found on the earth, especially in Asia and Africa. I would like to emphasize to young researchers that performing research “by hand” rather than “by manual” may develop their potential to find new solutions.

This international symposium started from 2008 cooperating with The JSPS International Training Program during 2008 to 2012, supported by Mitsui-Matsushima Co., Ltd. from 2013 to 2020, and supported by Leading an Enhanced Notable Geothermal Optimization (LENGO) Project of Science and Technology Research Partnership for Sustainable Development (SATREPS) from 2021. The important objective of the symposium is strong networking of young researchers to enhance international collaboration to solve both of global and domestic problems on mineral resource and environment.

Finally, I would like to sincerely thank all of the organizations and participants, and believe the symposium will provide fruitful successes for all.

Welcome to “International Symposium on Earth Science and Engineering 2023.”



*Y. Fujimitsu*

Yasuhiro Fujimitsu  
CINEST Chair

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9:00~ 9:05	Opening Session
9:05~ 9:40	Plenary Lecture I: Education Programs and Research Activities in the Graduate School of International Resource Sciences, Akita University Hikari Fujii (Akita University, Japan)
9:40~ 10:15	Plenary Lecture II: Sustainable Processing of Precious and Critical Minerals Richmond K. Asamoah (University of South Australia, Australia)
10:15~ 10:40	Coffee Break
10:40~ 12:00	Technical Sessions
12:00~ 13:00	Lunch
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16:20~ 17:40	Poster Session
18:00~ 19:30	Banquet

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\* Best Papers, Best Presentations and Best Posters will be announced at the Awards Ceremony.

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## **Plenary Lecture I: Education Programs and Research Activities in the Graduate School of International Resource Sciences, Akita University**



**Hikari Fujii**

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## **Plenary Lecture II: Sustainable Processing of Precious and Critical Minerals**



**Richmond K. Asamoah**

University of South Australia, UniSA STEM, Future  
Industries Institute, Mawson Lakes, Adelaide, SA 5095,  
Australia

Dr Richmond K. Asamoah is a Postdoctoral Research Fellow at the Future Industries Institute (University of South Australia) with over twelve years in-depth knowledge of and hands-on experience in mineral processing and extractive metallurgy in tandem with surface, interfacial and data science. Richmond holds BSc (Hons) Minerals Engineering and PhD Engineering (Minerals and Resources), obtained from the University of Mines and Technology and University of South Australia, respectively. His research interests are in physical separation and beneficiation of complex mineral ores (low grades and wastes), hydrometallurgy (including bio-), and machine learning and data analytics, having links with environmental sustainability.

## Facies Model of Coal Nampol Formation and Limestone Punung Formation in Sudimoro Region, Pacitan, East Java.

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### ABSTRACT

*Physiography of the research area includes the Southern Mountain Zone of Eastern Java (Van Bemmelen, 1949), administratively located in Pacitan, East Java. The southern mountain zone of eastern Java has a "V" shaped fault pattern which is thought to be a deep seated fault. This structure is trending northeast - southwest and northwest - southeast causing the formation of highs and lows which control the sedimentation of the southern mountains of eastern Java (Untung & Sato, 1978). The research area is located between the high and low in the Southern Mountain Basin of Eastern Java.*

*The interesting thing in geological research is that there is a facies change contact between the Nampol Formation coal and Punung Formation limestone in the Middle Miocene (Sartono, 1964). The results of observations of field geological outcrops, the depositional environment for the Nampol Formation coal is shore, whereas the Punung Formation limestone is shelf. This condition begins with the formation of a mangrove swamp environment containing gastropod fossils with high plants as the source of coal-forming plants in freshwater conditions, then the environment changes to a back reef lagoon, forming a carbonate facies due to transgression in saltwater conditions (saline water).*

**Keywords:** *fasies, coal, limestone, shore, mangrove swamp, shelf, back reef lagoon.*

### INTRODUCTION

Based on regional physiography the research area includes the Southern Mountain Zone of Eastern Java, which is a mountainous area located in the southern part of central and eastern Java (Figure 1).



Figure 1. Physiographic map of parts of Java and Madura (van Bemmelen, 1949).

Based on Bouger's gravity map (Untung & Sato, 1978), the southern mountain zone of eastern Java has a "V" shaped fault pattern, thought to be a deep sitting fault. This structure is trending northeast - southwest and northwest - southeast causing the formation of highs and lows which control the sedimentation of the southern mountains of eastern Java, including the research area which is the intersection of these two fault patterns.

Administratively, the research area is located in the Pacitan area, East Java (Figure 2).

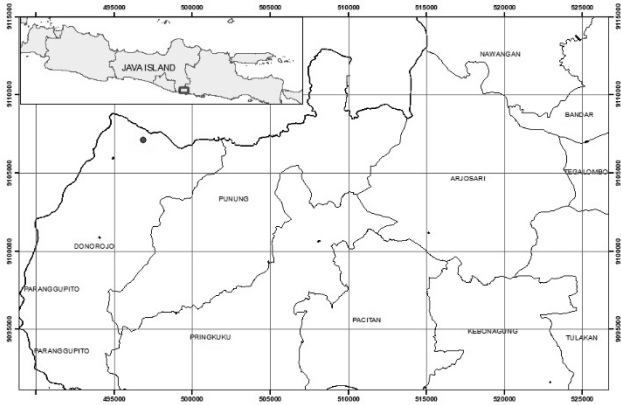


Figure 2. Location of research

Stratigraphy of the Southern Mountains of Eastern Java, according to Sartono (1964), Nahrowi (1979), the lithostratigraphic arrangement is from old to young: Besole Formation, Jaten Formation, Wuni Formation, Nampol Formation, Punung Formation (Figure 3).

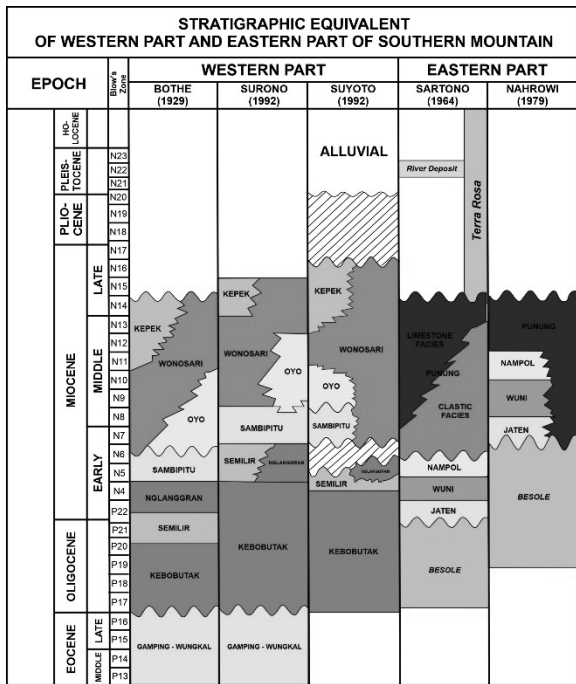


Figure 3. Regional stratigraphy of the Southern Mountains of Eastern Java.

The target formations in this research are the Nampol and Punung formations (Figure 3). The Nampol Formation is well exposed in the Nampol River, Punung District, Pacitan (Sartono, 1964), with the following rock arrangement, the lower part consisting of conglomerate, tuffaceous sandstone, and the upper part: consisting of interbedded siltstone, tuffaceous sandstone, and inserts of carbonaceous shale and lignite. Deposited in the Early Miocene (Sartono, 1964) and Nahrowi (1979/1989), the age is Early Miocene - Middle Miocene. According to Nahrowi (1989) the Jaten, Wuni and Nampol Formations are connected menjari to the lower part of the Punung Formation.

Type of location Punung Formation in the Punung area, Pacitan, is composed of two lithofacies, namely: clastic facies and carbonate facies (Sartono, 1964). Carbonate facies, composed of reef limestone, bioclastic limestone, sandy limestone, marl, where this unit is a deposit of the shelf carbonate facies system. The thickness of this facies is 200-300 m, the age is Middle-Upper Miocene (N9-N16). Whereas, the clastic facies is composed of interbedded tuffaceous sandstone, calcareous sandstone, silt and shale. The thickness of this unit is 76 -230 m. Based on the foram fossil content, it shows the age of the Middle Miocene (N15), deposited in a peripheral nectar environment. The relationship with the carbonate facies is menjari, and these two facies units unconformably cover the Nampol Formation (Sartono, 1964). Whereas, according to Nahrowi (1979), the Punung Formation covers the Besole Formation unconformably, by fingering each other with the Jaten, Wuni and Nampol Formations.

This research will discuss the depositional facies of rock outcrops from bottom to top exposed by mudstone, coal layers and limestone. The interesting thing in this research is the contact between mangrove swamp mudstone in a freshwater environment and limestone in a saline water environment (Picture 4).

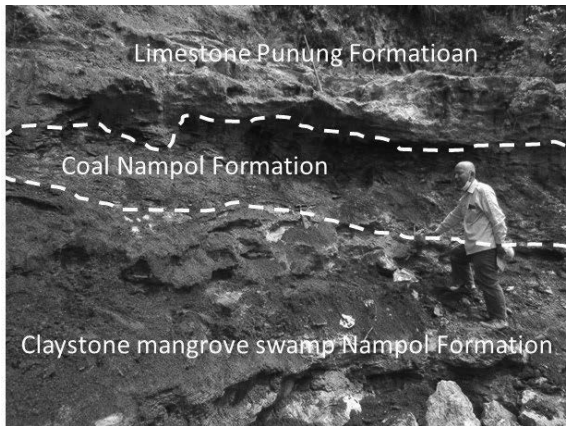


Figure 4. Contact Coal and Limestone

**METHODS OF RESEARCH**

The method of this research is observation of field geological outcrops including: making outcrop profiles, describing coal and limestone and then analyzing depositional facies based on reference studies.

**RESULT AND DISCUSSION**

The results of the field geological survey show that the lithology from bottom to top consists of greenish mudstone containing gastropod fossils, a 0.9 m thick coal layer and a limestone layer (Figure 4). Based on the facies model of Walker & James, 1992 (Figure 5), the depositional environment of the Nampol Formation is shore while the Punung Formation is Shelf. This condition begins with the formation of a mangrove swamp environment containing gastropod fossils with high plants as the source of coal-forming plants in freshwater conditions, then the environment changes to a back reef lagoon, forming a carbonate facies due to transgression in saltwater conditions (saline water); (Picture 6).

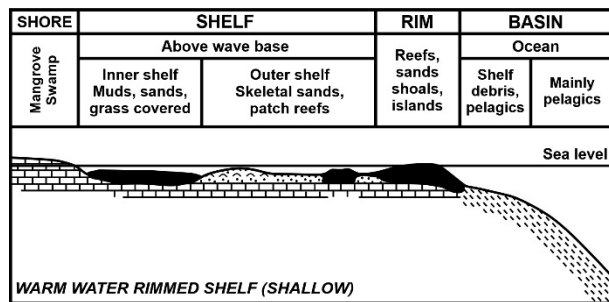


Figure 5. Facies model of warm water rimmed shelf (shallow); (Walker & James, 1995)

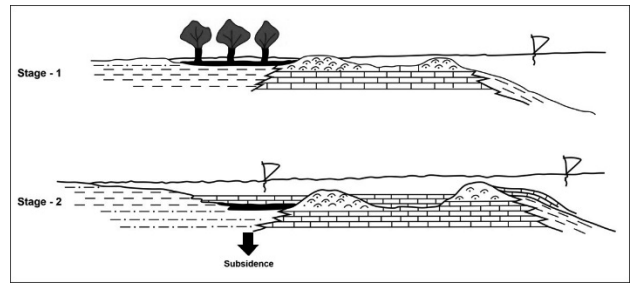


Figure 6. Model of facies coal Nampol Formation and limestone Punung Formation

**CONCLUSION**

- Depositional environment of the Nampol Formation and Punung Formation from Shore to Shelf
- The Nampol Formation coal deposition facies is in the mangrove swamp environment while the Punung Formation limestone is in the back reef lagoon

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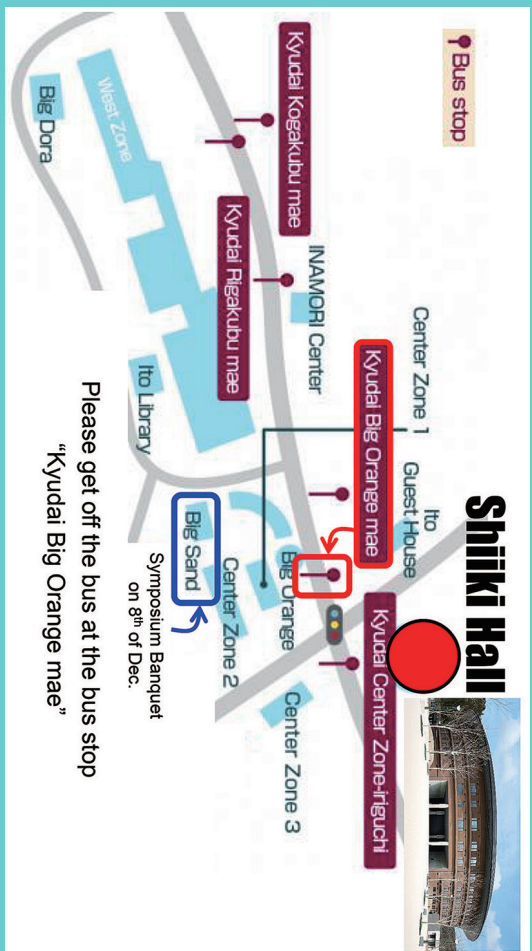
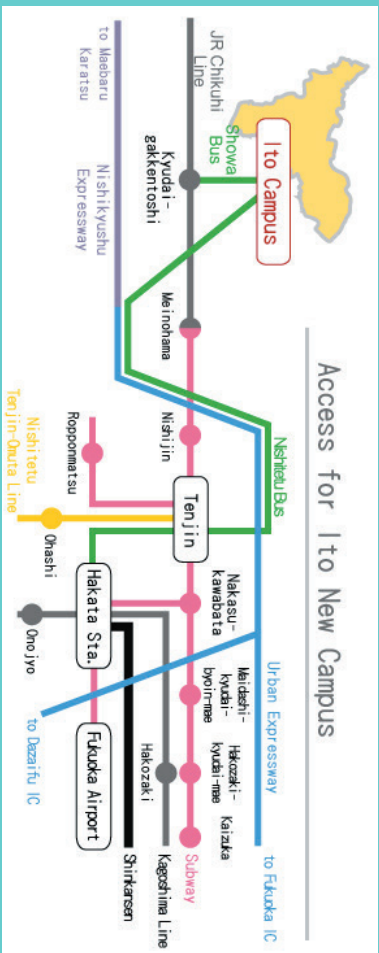
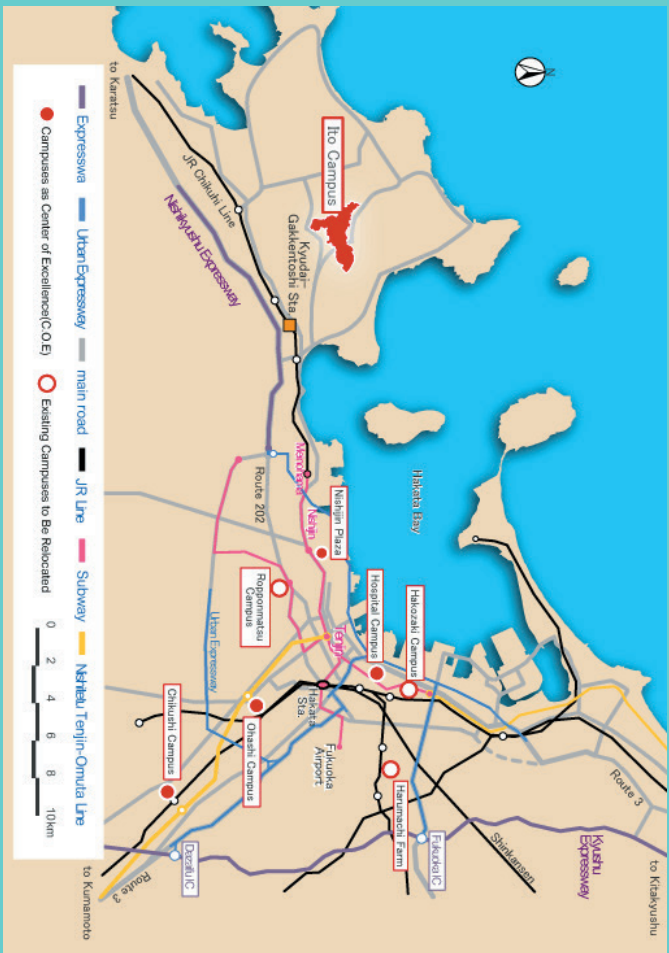
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A handwritten signature in black ink, reading "Y. Fujimitsu". The signature is written in a cursive, flowing style.

Yasuhiro Fujimitsu  
CINEST Chair



Please get off the bus at the bus stop  
"Kyudai Big Orange mae"

