CINEST

Proceedings of
International Symposium on Earth Science and Technology 2021

November 25 - 26, 2021
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)
Science and Technology Research Partnership for Sustainable Development (SATREPS)
Japan Science and Technology Agency (JST)
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JSPS Core-to-Core Program
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Assisted by
MMIJ The Mining and Materials Processing Institute of Japan
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Supported by
Mining and Materials Processing Institute of Japan (MMIJ) Kyushu Branch
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International Symposium on Earth Science and Technology 2021

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 2021”.

Y. Fujimitsu

Yasuhiro Fujimitsu
CINEST Chair

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9:00~ 9:10	Opening Session
9:10~ 9:45	Plenary Lecture I: Quantitative Analysis of Nano-porous Microstructures Naoki Shikazono (The University of Tokyo)
9:45~ 10:20	Plenary Lecture II: Basic Geological Survey to Lower Exploration Risk of Rare Geothermal Manifestation Prospectus Area Agung Harijoko (Universitas Gadjah Mada)
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12:00~ 13:20	Lunch
13:20~ 15:00	Technical Sessions II JPSRE Special Session
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Ancient-Modern Sangatta Deltaics and Its Implication to Coal Spliting and Washout of Middle Seam, Sangatta, East Kalimantan, Indonesia.

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ABSTRACT

This research is interesting because the Delta Plain in Sangatta, East Kalimantan from ancient to modern deltaic is still developing today, especially the development of coal swamp and its implications for coal splitting and washout.

The deltaic environment in the Sangatta area has prograded from west to east from the Early Miocene to the Pliocene, this is referred to as the ancient delta plain. Rapid progradation is mainly seen in the delta plain, causing intensive delta development, resulting in varied coal seams and coal bearing sediments consisting of channel deposits, overbank deposits, levee deposits and splay deposits, are deposited in Marsh Habitat environments. Each deposit changes vertically or laterally, this change is caused by lateral channel moving (migration) followed by rapid progradation. Modern delta plain from the aerial photos is seen as a flood plain deposit (swamp) as product of a river channel (fluvial) which ends up on the coast.

The process of channel laterally migration causes coal splitting and washout. Simple Splitting occurs in the Middle Seam to become the Middle Upper Seam and Middle Lower Seam, while river channel erosion (washout) occurs in the Middle Lower Seam.

Keywords: progradation, channel, washout, swamp.

INTRODUCTION

This research will discuss the development of the Sangatta Delta Plain sediment in the Kutai Basin, East Kutai Regency, East Kalimantan from the Miocene to the Pleistocene (Ott, 1987); (Figure 1). Sediments carrying coal seams in the study area include the Balikpapapan Formation, Middle Miocene age, Stratigraphy-tectonic development of the Kutai Basin from Paleogene to Neogene (Chambers, J.L.C., 1995); (Figure 2).

The Sangatta delta plain sediments of Miocene age (ancient deltaic) are coal bearing sediments which are currently being mined by several coal companies, while the Sangatta delta plain sediments of the Pleistocene age (modern deltaic) cont
inue to progress to form deltas. plain in the form of peat swamp plain, the result of flooding from a meandered river system.

The interesting thing in this study is that the sedimentation progradation process in the modern deltaic provides clear evidence of the type of coal bearing sediment in the ancient deltaic. The deltaic sedimentation progradation process also has an impact on the presence of multiple seams and the geometric shape of the coal seam such as splitting and washout.

Figure 1. Kutai Basin to Regional Tectonic Elements (Ott, 1987).

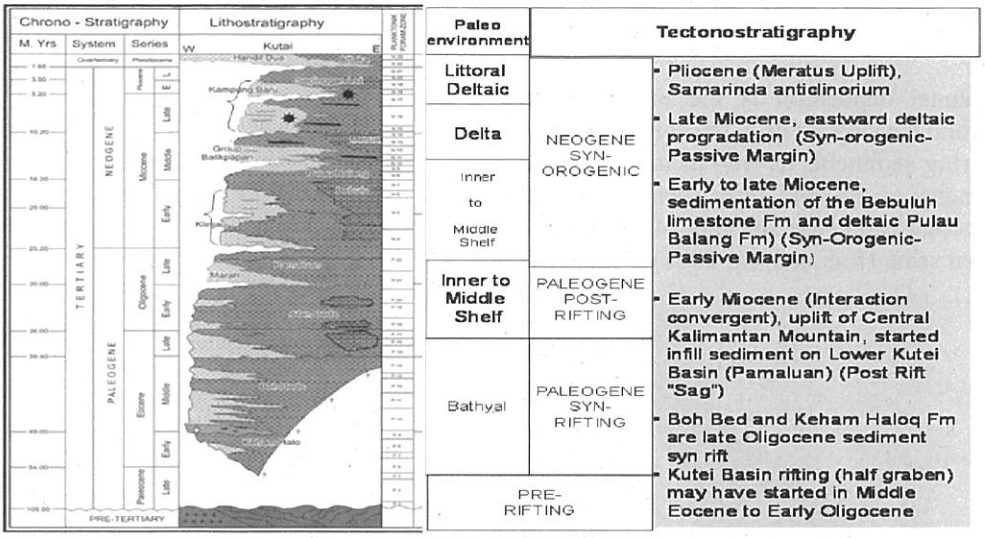

Figure 2. Stratigraphy-tectonic development of the Kutai Basin from Paleogene to Neogene (Chambers, J.L.C., 1995)

METHOD OF RESEARCH

The reasoning methodology used by the author is to carry out functional generalizations by connecting several observational data which include: field outcrop data such as data on the physical properties of coal-bearing sediments and aerial photography observations.

Stage 1: observation of coal outcrops on the mine wall (mine cut) from Middle (before splitting) and Middle Lower - Middle Upper (after splitting) coal seam carrier sediments (after splitting from the Balikpapan Formation (ancient deltaic). Observations of coal-bearing sedimentary outcrops include observations of deposit types such as overbank deposits, levee deposits and channel deposits, observations of internal rock structures such as sedimentary structures, grain sizes and minerals that make up rocks, and observations of contacts between rock layers (firm boundaries and erosion boundaries). Observation of coal seams includes observations of physical properties of coal such as color, luster, fracture and hardness.

Stage 2: Taking aerial photo data along the Sangatta delta using aircraft to prove that the development of the modern Sangatta delta (modern deltaic) is still in progress until now.

THE GEOLOGY OF THE SANGATTA REGION

The Pinang - Sangatta area of East Kalimantan contains sedimentary rocks carrying coal seams which are part of the Balikpapan Formation. Generally, these coal deposits are located around the Dome Pinang structure and are controlled by the folding structure. The main coal seams are: Melawan Seam, Prima Seam, Bintang Seam, Sangata Seam, Middle Seam, Pinang Lower Seam, Pinang Seam (Mc Millan, S., et al., 1997). The rising of mudrock to the surface in the lower delta plain has the potential for continuous growth of peat under reduced conditions. The spread of mudrock is locally cut by fluvial channels, so that in some places it often develops a lacustrine environment, while broadly it will develop into an estuarine environment. This generally results in splitting and washout in the coal seams at the Sangata coal field (Figures 3 & 4).

RESULTS AND DISCUSSION

The results of observations of coal outcrops in the mine walls (mine cut) from sediment carrying coal seams from the ancient deltaic Sangatta revealed that the Middle Seam (before splitting) experienced coal splitting into Middle Lower and Middle Upper. The Middle Seam coal splitting process occurs in sedimentary deposits from the ancient deltaic Sangatta of the Balikpapan Formation.

Based on aerial photo observations of the modern Sangatta deltaic, it is clearly seen that the delta plain of Sangatta is still ongoing, meaning that the progradation of the Sangatta delta from Miocene to Pliocene (ancient deltaic) continues until the Quaternary which is known as the modern Sangatta delta (Figure 5). Observations of ancient deltaic coal-bearing sedimentary outcrops consist of channel deposits as the main supplier of material on the flood plain (overbank), natural levee and crevase splay.

This channel deposition is the main key to changes and developments in the composition of coal-bearing sediments as well as to changes in the geometry of the coal seam such as channel washouts that can cause splitting of the Middle Seam coal seam (Rahmad, B., 2001) (Figure 6)

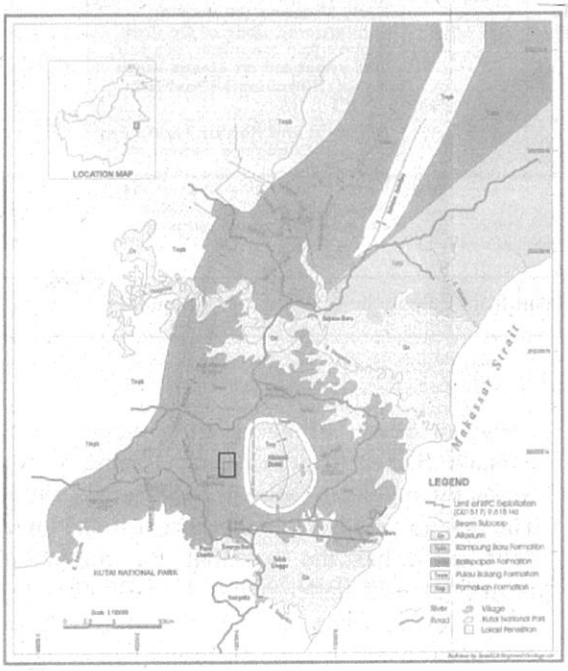

Figure 3. Geological Map of Sangata (Mc Millan, S., et al., 1997)

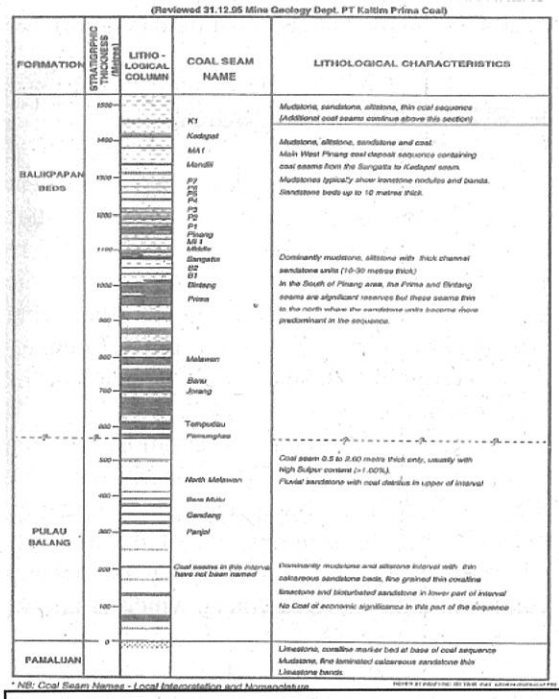

Figure 4. Coal Stratigraphy Column of Pinang and Melawan Areas (Mc Millan, S., et al., 1997)

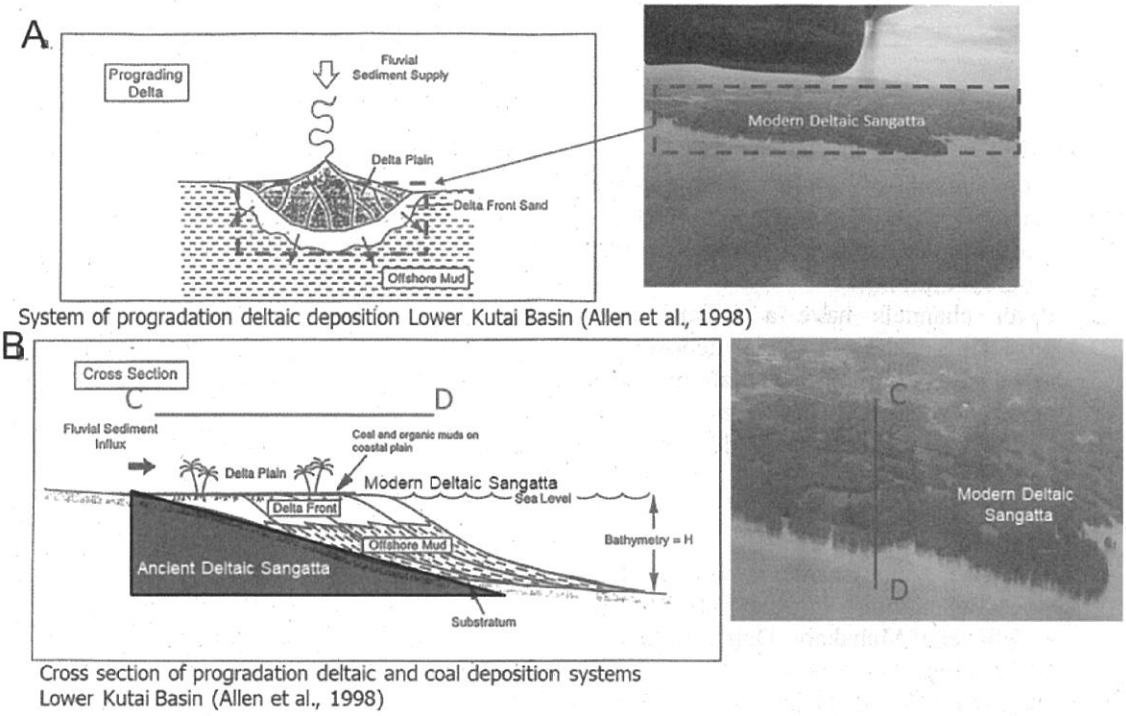

Figure 5. Sangata delta progression system from Ancient – Modern Deltaics (modification of Allen et al., 19980, photograph by Rahmad, B, 2014)

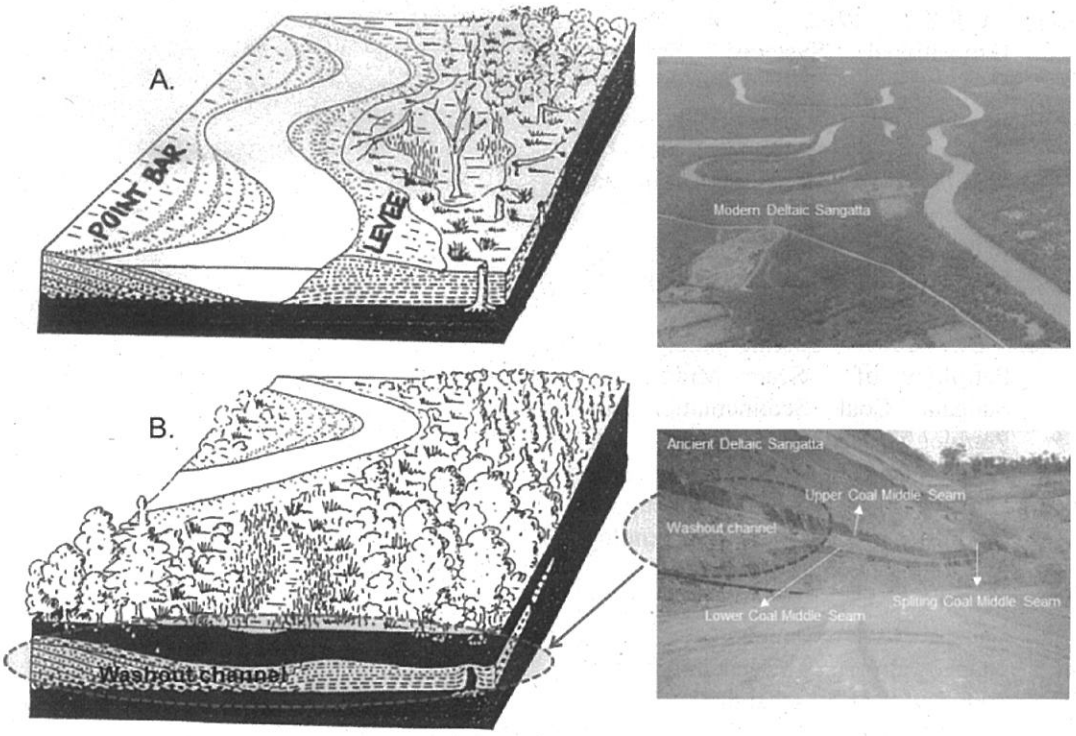

Figure 6. Channel washout causes coal splitting in Middle Seam coal (Diessel, 1982; Rahmad, B. 2001)

CONCLUSION

1. Progradation of Delta Sangatta from Ancient Deltaik Sangatta (Miocene - Pliocene) to Modern Deltaic is still in progress until now
2. River channels have a major role in producing coal seam carrier deposits such as: coal swamp (flood plain/overbank), natural levee and crevase splay.
3. Channel washout causes Middle seam coal seam splitting

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ISBN 978-4-9902357-0-3