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THE OFIOLITE COMPLEX AS SUPPORTED OF NATIONAL GEOPARK OF MERATUS MOUNTAIN, SOUTH KALIMANTAN

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Abstract

The Meratus Mountain in South Kalimantan Province have many geosites variations as geodiversity of National Meratus Mountain Geopark with theme *the oldes ofiolite in Indonesia.* Meratus Mountain was formed since 200-150ma from collision interaction of eastern part of Sunda Land with Pasternoster Continent who striking towards NE-SW in South Kalimantan Province. This mountain bordered Asam-asam Basin inthe eastern and Barito Basin in the western. The process of multideformation process formed the Meratus Mountain and exposed the ofiolite complex in Indonesia, aged between 200-150 million year ago. This rocks include : dunite, peridotite, pyroxenite, gabro, pillow basalt and chert.
Keywords : Geopark, Meratus Mountain, ofiolite, geodiversity.

INTRODUCTION

The Meratus Mountains or Meratus Range is a Cretaceous subduction complex, located in southeast Kalimantan. This mountain separate Barito Basin in the west from the Asem-asem Basin which lies to the east. The directions of main folding are NNE – SSW (in the northern part) and NE – SW (in the southern part). Three major units are exposed in the southern part: The Peridotitic Nappe, overthrust (together with its metamorphic thrust sole) on the Alino formation (Koolhoven, 1935). Both units are unconformably overlain by the Manunggul Formation. All these Cretaceous units are then overlain by younger marine and continental deposits. The Peridotitic Nappe is made up mostly of serpentinites. gabbros and plagiogranites. The metamorphic thrust sole of the Peridotitic Nappe is composed of crystalline schists and amphibolites, and is intruded by several gabbroic an basaltic plugs.

The Alino Formation is made up mainly: of volcanic and volcaniclastic rock series: lava flows. dykes. volcanic breccias. greywackes and tuffs. The volcanogenic rocks are interbedded with predominantly sedimentary layer, radiolaria-bearing tuffaceous clays and turbidite. Orbitolina and radiolaria-bearing limestones. ammonite-bearing argillaceous limestones and finally cong1omerates containing pebbles and blocks of the former rocks toward the upper part of the sequence. The

corresponding faunistic ages range from Upper Aptian to Cenomanian (Priyomarsono, 1985). The Manunggul Formation is also made up mostly vo1canogenic rocks, but it was deposited after the over thrusting of the Peridotitic nappe: thus it has the geological character of a molasse deposit. Volcanic sediments (tuffs and greywackes) are interbedded with conglomerates, sandstones, tuffaceous c1ays, and Upper Turonian clays near the bottom of the formation. Senonian conglomerates and clay beds occur near the top of this this sedimentary sequence, transitional to the lower units of Eocene detrital Tanjung Formation. The Manunggul formation, as well as the underlying Perioditc Nappe, are intruded both by basalic and andesitic dyekes and by a number of gabbroic, dioritic, microdioritic and granitic plugs.

The Geopark is a single geographic area that is merged, where the geological sites and landscape are managed holistically. Where the components of Geopark Region development includes Society Development, Economy Development and Conservation. The Meratus Mountains Geopark is located in the Province of South Kalimantan, there is one of the icons of tourism and the pride of the Banjarmasin community in particular. The Landscape of Meratus Mountains stretches in the Northeast-Southwest direction, which is located in South Kalimantan Province. The Meratus Mountains hold many stories in terms of geodiversity, cultural diversity and biodiversity, which are very complete and diverse. The Meratus Mountains are composed groups of Ultramafic, Malihan, Melange and breakthrough rocks (Ofiolite series) which are estimated to be Yura (150–200) years ago until Early / Lower Cretaceous (100-150) million years ago.

DATA AND DISCUSSION

Meratus Mountains is a meso-tethys suture resulting from collision between Schwaner and Paternoster microcontinents in the Early Cretaceous period, in which its emplacement was done through the obduction process of detached oceanic slab which then rose to the surface due to the exhumation of Paternoster slab underneath (*Satyana, 2003 -HAGI & IAGI; Satyana & Armandita, 2008-HAGI, Satyana, 2010-IPA; Satyana, 2012-AAPG*). Exhumation is the re-lifting of a mass that once sank. Meratus Mountains Geopark has a relatively tectonic activities. It is based on two tectonic sutures assessed with metamorphic evolution performed by Soesilo et.al. (2015) and limited by Paternoster Microcontinent.

- The First Suture is the residue of Jura Accretion located in the West part of microcontinent reflected by Meratus Suture. The continuation of metamorphic belt extends from Java Sea continues to the North up to the Mangkalihat High or the West part of Central Sulawesi.

- The Second Suture is the Complex of Limestone Accretion situated in the East of microcontinent. This Suture stretches from Karangsambung in the West to Bantimala-Latimojong-Pompangeo of West part of Sulawesi.

The South Kalimantan Mountains is an ophiolite mountain, in which since Paleogene has been located in an area far from the edges of the plate convergence zone. The Meratus Mountains began to rise in the Late Miocene and effectively confined the Barito Basin in the west during the Pliocene-Pleistocene epochs (Satyana). Based on the results of reconstruction carried out by Satyana (2003) on the tectonics of the Southeast part of Sundaland (Southeast Kalimantan, Central Java-East Java, South Sulawesi), it stated that the ophiolite of the Meratus Mountains should not be associated with the ophiolites found in Ciletuh and Luk Ulo (Karangsambung) as has been described by Katili (1974) and Hamilton (1979) who called it as the Late Cretaceous subduction pathway. The emplacement process of Meratus ophiolite is different from that of Ciletuh and Luk Ulo emplacement processes. Ophiolites in Ciletuh and Luk Ulo (Krangsambung) should be connected with outcrops of ophiolite complex in Bantimala, South Sulawesi, in which based on the age of metamorphism and radiolaria formed around the Maastrichtian (late Cretaceous), while the emplacement of Meratus ophiolite occurred during the Albian-Aptian (the upper part of Early Cretaceous).

The rocks found in Meratus Geopark are ophiolite series that had been exposed due to the obduction of Paternoster Microcontinent over the Sundaland in the Early Cretaceous (137–110 million years ago). During this period, the continental crust was located at the rear part (Southeast) of Paternoster Microcontinent, i.e. South Sulawesi Block which started to pierce downward of the microcontinent and the obduction process that began the occur up to the collision in the Late Cretaceous. So that the ophiolite series in Meratus and Karangsambung – Cileutuh had different age and period for Meratus Ophiolites were the products of subduction-obduction and collision of Paternoster Microcontinent over the Sundaland where in the end had caused the ophiolite series were exposed to the surface, whereas the ophiolites of Karangsambung–Ciletuh were the results of subduction-collision of South Sulawesi Block (Bantimala) over the Paternoster Microcontinent.

During the periods of tectonic activities found in South Kalimantan, in this case the formation of Meratus Mountains, there was found the building rocks of Meratus ophiolite series and sedimentary basin consisted of 8 (eight) process of geological periods, among others,

1. Period 1: Pre-Tertiary/Early Jurassic (190-165 million years ago);
2. Period 2: Late Jurassic – Early Cretaceous (165-137 million years ago);

The process of multideformation process formed the Meratus Mountain and exposed the ofiolite complex in Indonesia, aged between 200-150 million year ago. This rocks include : schist, gneiss, dunite, peridotite, pyroxenite, gabro, pillow basalt and chert. The historical sequence of tectoni processes and the resulting ophiolite rocks include;

Period 1: Pre-Tertiary/Early Jurassic (190-165 million years ago)

In this period, Paternoster Microcontinent started to move towards the Southeast direction and experienced the subduction process over the Sundaland that led to the volcanism process and the formation of Schwaner Mountains due to the molten of oceanic crust that pierced downward. During this period, it was the beginning of the mantle rocks formation in South Kalimantan in form of **Metamorphic Rocks**. The presence of these metamorphic rocks, such as **Schist** and **Gneiss**, were exposed very well in the Geosites of **Matang Keladan** and **Gunung Belanda** (**Figure 1**)

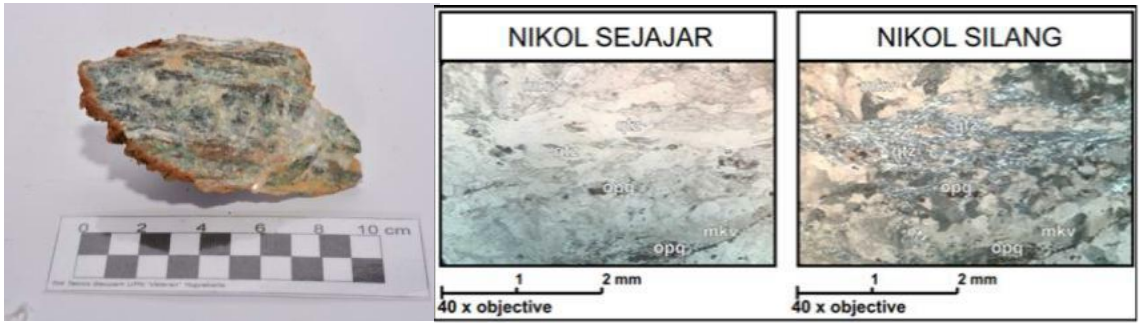

Figure 1. Sample and Petrography of Gneiss in Gunung Belanda

Period 2 : Late Jurassic – Early Cretaceous (165-137 million years ago)

In this period, the Paternosfer continental crust pierced down toward the Sundaland and both continental crusts had getting closer. It led to the pre-collision process towards Paternoster Microcontinent by South Sulawesi Blocks that resulted in the cessation of volcanism activities of Schwaner Mountains. The volcanism process that had formed the Schwaner Mountains began to stop. During this period, rocks in form of ophiolite sequences resulted from previously formed collision and metamorphic processes, were lifted and turned into the High. The formed ophiolote sequences could be found in various locations and constitute the relatively complete ophiolite series (**Figure 2-5**).

Figure 2. The rocks of Ophiolite series (mantle) are: Dunite, Peridotite and Pyroxenite

Figure 3. The rocks of Ophiolite Series: Gabbro

Figure 4. The rocks of Ophiolite Series: *Pillow* Basalt

Figure 5. The rocks of Ophiolite Series: Chert

CONCLUSIONS AND RECOMMENDATIONS

Based on the results of studies in the study area, it can be concluded that:

- The Geopark is a single geographic area that is merged, where the geological sites and landscape are managed holistically. Where the components of Geopark Region development includes Society Development, Economy Development and Conservation. The Meratus Mountains Geopark is located in the Province of South Kalimantan, there is one of the icons of tourism and the pride of the Banjarmasin community in particular. The Landscape of Meratus Mountains stretches in the Northeast-Southwest direction, which is located in South Kalimantan Province. The Meratus Mountains hold many stories in terms of geodiversity, cultural diversity and biodiversity, which are very complete and diverse. The Meratus Mountains are composed groups of Ultramafic, Malihan, Melange and breakthrough rocks (Ofiolite series) which are estimated to be Yura (150–200) years ago until Early / Lower Cretaceous (100-150) million years ago.The geological structure that developed in the study area was in the form of solids (fractures) and faults. The geological structure in the form of stocky has a general direction around the east-west, south north, northeast-southwest and and northwestern southeast. The geological structure in the form of a fault has the general direction of the fault field relative to the northeast-southwest.

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