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Geology Of Tanjung Medan ,Rokan IV Koto , Rokan Hulu District, Riau Province

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Abstract

The Administrative of research area has been in Tanjung Medan, Rokan IV Koto, Rokan Hulu, Riau Province and geographically located at 0 ° 37 '28.488 "- 0 ° 40' 10.3692" LU and 100 ° 24 '55.6884 "- 100 ° 27 '37.5804 "BT. Research method used approach method and laboratory analysis to get data of geology modeling and re-construction of geological history in research area. Based on surface observation, the geology of research area consists of Slate (Permian-carbon), Granite intrusion (Permian-Trias) with distribution SouthWest-SouthEast on the center of map. Arenite Sandstone unit (Easly Eocene) unconformity with slate on the bottom. Alluvial Rokan river crosses all type off rocks from north to south of map. While structure growth in the research area have been joints structure with main stress Southwest-NorthEast, its similar with trend tectonic setting of Sumatra island, on the other hand reverse fault indicates the formation of a basin of extension stress in the early Eocene. the formation of basins in basement rocks begun at the time of the formation of the north-south trending northern form of the fault block forming horst and graben as well as accommodated the precipitation of pre-tertiary clastic materials. Whereas the Oligocene trans-tensional compression system accommodating the sedimentation system in the formed of arenite sandstone (SBPa) unconformity above the basement rocks simultaneously on the basin base decrease. The distribution of arenite sandstones based on the geological reconstruction covering all parts of the rock distribution which then undergoes the same weathering process of the formation of Bukit Barisan volcanic path that controls the development of geological structure up to the present.

Keywords: Rokan Hulu, Intrusion, Granite, Arenite Sandstone.

1. Introduction

The central Sumatra basin has a back-arc basin type that extends along the edge of Sunda exposure in South East Asia (Heidrick and Aulia, 1993). The basin was formed by subduction of the Indian Ocean plate moving relative to the North subduct to the Asian Continent plate that produced the Bukit Barisan mountain path and bordering directly on the edge of the Central Sumatra Basin (Clarke et al.,1983). Regionally the research area has built on the bedrock of greywacke, quartzite, granite and argillite of Paleozoic aged Kuantan Formation. The Clastika Formation Sihapas was formed by early Miocene above on the field of erosional / disconformity to Kuantan Formation and Rokan Granite Intrusion. This research is interesting to describe the history of geology and at the same time data re-registration that can be used as new data in the local area. The research method for mapping and field survey was conducted using the regional geological map sheet of Lubuk Sikaping as the geological approach and the base map of the scale of 1: 12.500 cm to produce more detailed information about the geological aspects in the research area.

Administratively, the research area is located in Tanjung Medan Village, Rokan IV Koto Sub-district, Rokan Hulu District, Riau Province. Geographically the study area is located at the coordinates of 0 ° 37 '28.488 "- 0 ° 40' 10.3692" North Latitude and 100 ° 24 '55.6884 "- 100 ° 27' 37.5804" East Longitude, covered by Bakosurtanal Map Rokan sheet, bakosurtanal 0716 code -62.

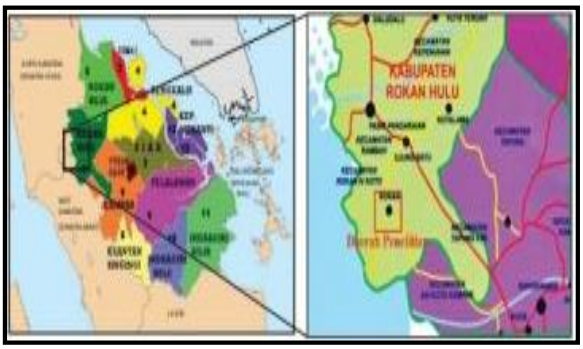

Fig. 1. Map of Administration of research area

2. Geology and Regional Stratigraphy

The regional Stratigraphy of the Central Sumatra Basin is composed of several units of

formation and rock groups, respectively from the old to the young, the Basement, the Pematang Group, the Sihapas Group, the Farmers Formation and the Minas Formation.

1. Base Rock (Basement). The Tertiary Pre-existing basement serves as the cornerstone of the Central Sumatra Basin. Eubank and Makki (1981) and Heidrick and Aulia (1993) mentioned that the Central Sumatra Basin rocks consist of Mesozoic-aged rocks and Paleozoic-Mesozoic metamorphic carbonate rocks. Unconformity over the bedrock precipitated succession of Tertiary sedimentary rocks. Tertiary Stratigraphy in the Central Sumatran Basin from the oldest to the youngest was the Pematang Group, the Sihapas Group (Menggala Formation, Bangko, Bekasap and Duri), Telisa Formation, Farmers Formation and terminated by Minas Formation.
2. Group of Pematang (Pematang Group). Pematang Group is the oldest sedimentary layer of Eocene-Oligocene deposited in an unconformity over the bedrock. The Group Pematang sediments have been referred to as the Syn Rift Deposits. This group has been deposited in fluvial and lake environments with sediments derived from the surrounding height. In its lithologic fluvial environment it consists of a conglomerate, coarse sandstone, and multicolored claystone. While the lithologic lake environment consists of claystone and fine sandstone with lake flakes rich in organic material Eubank and Makki (1981) and Heidrick and Aulia (1993).
3. Sihapas Group (Sihapas Group). The Sihapas group has been deposited above the Group of Pematang, a series of sediments as tectonic activity begins to decrease, occurring during the Late Oligocene to the Middle Miocene. The localized compression has characterized by the formation of Faults and folds at the inversion stage that occurs regression in global sea level. The geological process occurring at the time was the formation of an almost flat morphology (peneplain) that occurred in the Group of pematang and the exposed basement. This period is followed by subsidence any longer and transgression into the basin. The Sihapas group consists of Menggala Formation, Bangko Formation, Bekassap Formation, Duri Formation and Telisa Formation.

2.1 Regional Structure

The Central Sumatra Basin has two main structural directions; the older ones trend tended to the North (NNE - SSW) and the Northwest trending (NNW - SSE). Block-fracture systems, especially north-north-trending, form a series of horst and graben, which controlled the sedimentation pattern of Lower Tertiary sediments, especially Paleogene rocks (Heidrick and Aulia, 1993).

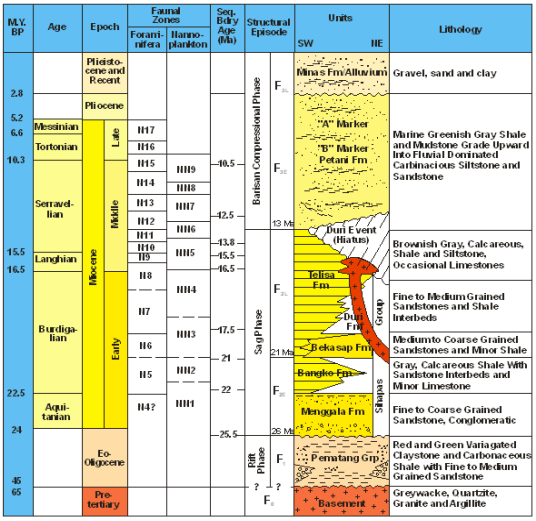

Fig. 2. Regional Stratigraphy of Central Sumatera Basin (modified from Heidrick and Aulia, 1993).

The northward-oriented structure associated with the Pre-Tertiary orientation found in Peninsular Malaysia was a structure that influences the direction of precipitation of Paleogenic rocks. The Northwest-trending structure, which is younger than the Tertiary structure, controls the current structure. Both affect tertiary sediment deposition, tertiary structure growth and subsequent fault section. The structures currently existing in the Central Sumatra and South Sumatra Basin are the result of three main tectonic phases, namely Central Mesozoic orogenesis, Tectonic Cretaceous-Early Tertiary and PlioPleistocene Orogenesis. Heidrick and Aulia (1993) divide the Tertiary Tectonic order in the Central Sumatra Basin in three tectonic episodes (Fig. 3),

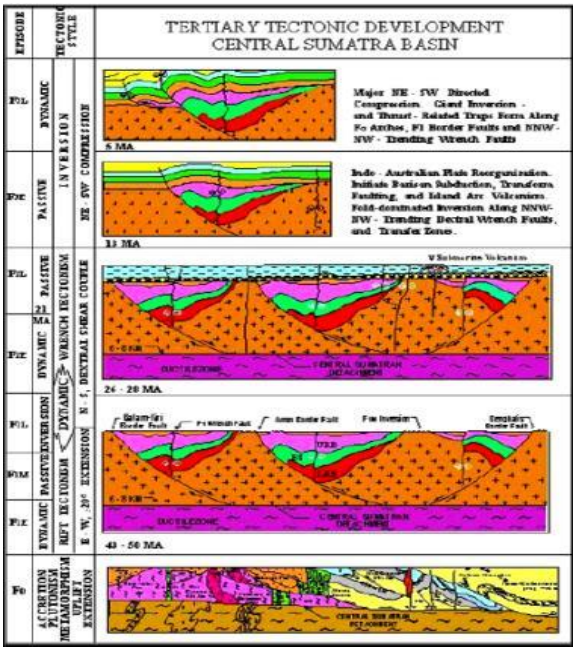

Fig. 3. Tectonic evolution of the Central Sumatera Basin (Heidrick and Aulia, 1993).

1. F1 (50-26) Ma. The tectonic Phase of F1 takes place at the time of Eo-Oligocene (50-26) Ma. As a result of the collision of the Indies plate to Southeast Asia at about 45 Ma formed a trans-tensional fracture system extending southward from southern China to Thailand and to Malaysia to Sumatra and South Kalimantan (Heidrick and Aulia, 1993; Yarmanto and Aulia, 1988). This formation led to the formation of a series of half graben in the Central Sumatra Basin. Half graben is then a lake where sediment of Pematang formation Made. At the end of phase F1 there is a shift from a fraction to a basin decline marked by weak structural reversals, denudation and the formation of a plain plate. The result of the erosion is paleosoil deposited on Upper Red Bed Formation.
2. F2 (26-13) Ma. The tectonic Phase of F2 (26-13) Ma takes place in the Early Miocene - Middle Miocene. At the beginning of this episode or the end of the F1 phase there was dextral fault with North-South direction. In this phase the Central Sumatra Basin has been transgression and sediments from the Sihapas Group are deposited.
3. F3 (13 - now).. The tectonic Phase of F3 (13-present) occurs at the Miocene End until now, also called the compression phase. F3 tectonic symptoms along with the expansion of the Andaman Sea ocean floor, regional appointment, volcanic mountain formation. At this phase formed regional unconformity and precipitated Petani and Minas Formations have been unconformity above the Sihapas Group.

3. Research methods

The Methods used in the study are divided into two methods. The first method has been using research literature to get a regional description of the formation basins was formed and field survey to determine the geological conditions in the study area (Hindartan, 1994; Rock et al, 1983) . The second method has laboratory analysis to determine the micro-optical type including type of rock and reconstruction of geological history that has occurred in the research area. The detailed stratigraphic measurements including qualitative-quantitative data in the form of lithologic observations, textures, primary-secondary sedimentary structures, biogenic sedimentary structures, mineral rock compositions (Pettijohn, 1975; Dunham, 1962; Streickesen, 1976), the thickness of each layer and the general layers of rock layers (Kausarian et al., 2018). Measurement structures include taking primary and secondary data in the form of indications that shown structural processes that occur such as joint, fold, and fault (Choanji, 2016; Prayitno, B, 2016; prayitno B., 2017; Yuskar et al, 2017).

4. Results and Discussions

Based on the results of research, rock units found in the research area of the old-young in succession can be divided into three units of rock, namely Slate, Granite, Arenite sandstone and Alluvial.

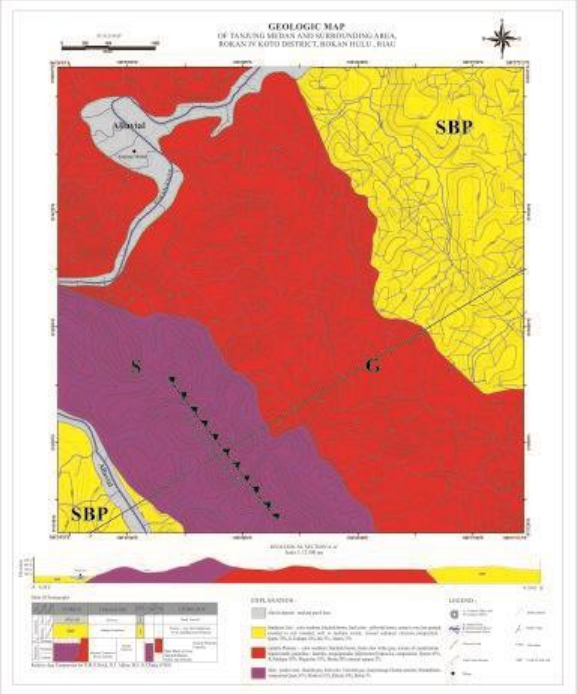

Fig. 4. Geological Map of Research Areas

Fig. 5. Slate Outcrop from Pawan Member

1. Slate. Slate spreads range 25% residing section Southwest along the map with southeast-northwest straightness from the research area. Microscopic Slate description is dark brownish gray color and fresh gray color, nematoblastic foliation, lepidoblastic, with mineral size: 0.05 mm - 0.3 mm, composed of top mineral quartz (45%), Muscovite (35%), Chlorite (10%), Biotite (5%), Opak Mineral (O'Dunn and Sill, 1986). Slate in the research area is a basement rock with terrestrial environment. Slate on the research area has been member of Pawan Kuantan formation, Was made in paleozoic era. Eubank & Makki (1981), Heidrick dan Aulia (1993) mentioned basement of central Sumatra basin consist of Paleozoic – Mesozoic rocks. The Characteristic of slate in research area shown strong deformation with had mylonite zone, at several observation points

associated with the tectonic motion for approximately 45 Ma last. Here is the distribution of Batusabak in the research area.

2. Granite. The spread of granite in the research area ranges from 45% in the southeast to the northwest. This granite unit consists of granite lithology that has; blackish brownish color, fresh white to brass color, holocrystalline, inequigranular texture. The composition of mineral composition of minerals Plagioklas (10%), quartz (45%), K-Feldspar (30%), biotite (10%), and opak mineral (5%). The subhegral-anhedral (IUGS, after Steickeisen 1979) classification, in regional compatibility the presence of Granite units is a breakthrough rock (Intrusion). Granite intrusion in the study area Has been indicated as the backbone of Sumatra island which is now a range of Bukit Barisan on plio-plistosen. The presence of muscovite minerals in some parts of the study sites showed symptoms of pressure from over pressure at 260 ° C at stress minerals likes k-Feldspar. This condition is shown there has pegmatite type of intrusion process form magma's differentiation late level. Here is a location observation of granite intrusion and muscovite minerals in granite in the study area. (Figs. 6 and 7).

Fig. 6. Granite Outcrop and limits Pegmatite Zone

Fig. 7. Muscovite Sample from thermal intrusion action on late pegmatite type

3. Arenite sandstone units. Distribution of Arenite sandstone units In the research area ranges 20% which is adjacent Northeast and 10% in Southwest region research area. This Arenite sandstone unit consists of arenite sandstone lithology, siltstone and granite. Microscopically arenite sandstones have dull gray-gray color and gray-gray color, grains of 0.05-1.5 mm, roundabout corners, open packs, massive sedimentary structures, medium sorting, good permeability, non-carbonate, compactness rather loud, and erosional contact. The composite mineral composition is quartz (70%), alkali feldspar (10%), lithic (5%), and opaque mineral (5%). So the name of this sandstone is arenite (Pettijohn, 1972). This unit is deposited unconformity above the Granite Intrusion with the fluvial ground environment. Here is Arenite sandstone units In the research area.(Fig. 8)

Fig. 8. Arenite sandstone from Sihapas Formation

4. Alluvial. In the research area the spread of Alluvial units approximately 10% located next to the Northwest and the Southwest along the Rokan river, consisting of sand lithology, pebbles, cracks to boulder. Distribution alluvial area in the southwest and the northwest of map and shown main river of rokan consist of loose material in the form of sand, gravel, pebble to cobble and mud. Here are alluvial deposits around rokan river floodplains. (Fig. 9).

Fig. 9. Alluvial Deposition of Rokan Hulu River

4.1 Geological Structure

The development of geological structure in the research area are joints structure and reverse fault. Based on surface observation research area has main stress southwest – northeast which that influenced in the development of the basin. While reverse fault, North-east trending also followed the development of geological structures in the research area. The following is the result of structural analysis and offset of lithology in the study area. The following is the result of structural

analysis and offset of lithology in the study area. (Figs. 10 and 11)

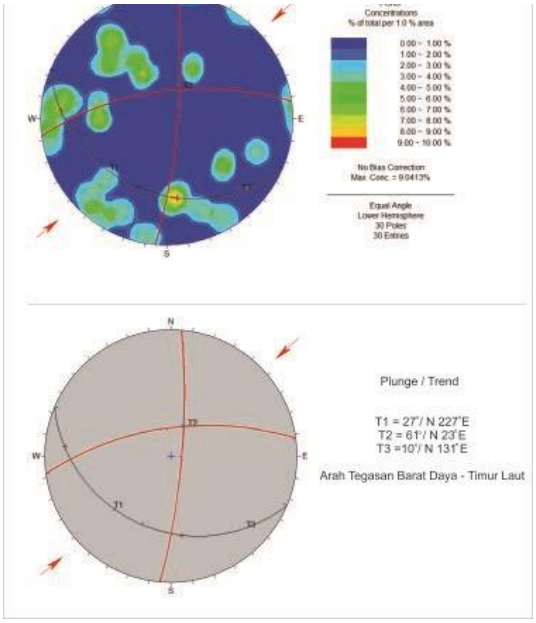

Fig. 10. Development of main stress structure which trending Southwest

Fig. 11. Fold related fault Structure Indication on field.

5. Conclusion

Based on surface observation research area consists of some rocks, such as Slate intrusion by granit on plio- plistosen, and unconformity with arenit sandstone unit on the top at early Eocene and alluvial consist of loose material in the form of sand, gravel, kerakal to bongkah and mud. Structure grown in the research area consist of joints structure and reverse fault.

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