

Petrography of Pyroclastic Rock Mount Masurai Jambi Province

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Abstract

The magmatic arc of Sumatra Island, which is indicated by the presence of the Barisan Mountains zone on the west side of Sumatra Island with a general direction northwest - southeast, makes Mount Masurai, which is administratively in Merangin Regency, Jambi Province, become one of the volcanoes on Sumatra Island. Geographically, the peak of Mount Masurai is located at coordinates 101° 51' 28.60" E and 2° 30' 09.19" S with an elevation 2915 masl. The eruption period of Mount Masurai is estimated to have occurred twice during the eruption period. (Rohiman, et al. 2018). In the area around Mount Masurai, remnants of volcanic eruptions were found, in the form of pyroclastic flows and falls. (Kirana, 2019). From data collection based on the results of geological mapping and petrographic analysis, pyroclastic rocks were found in the area around Mount Masurai with lithology in the form of Andesite Breccia, Pumice Breccia, Batulapili and Tuff. This is reinforced by the results of petrographic analysis of rock samples which are dominated by the presence of a glass.

Keywords: *Mount Masurai, Pyroclastic Rock, Petrography analysis.*

1. Introduction

The magmatic arc of Sumatra Island, which is indicated by the presence of the Barisan Mountains zone on the west side of Sumatra Island with a general direction northwest - southeast, makes Mount Masurai, which is administratively in Merangin Regency, Jambi Province, become one of the volcanoes on Sumatra Island.

Mount Masurai is one of the mountains in Indonesia which is located in the southern part of Merangin Regency, Jambi Province. Geographically, the peak of Mount Masurai is located at

coordinates 101° 51' 28.60" E and 2° 30' 09.19" S at an elevation of around 2915 masl. The morphology of Mount Masurai forms a caldera with an area of about 7 km. Based on a study of satellite imagery by Rohiman et al., (2018), it appears that the morphology of Mount Masurai's caldera has openings in both directions, namely the northwest and southeast. Both directions appear to be covered by post-caldera products that led to the formation of Kumbang and Merbuk lakes. There are remnants of parasitic eruption holes in the caldera courtyard, one of which is known as Biru Lake.

The Mount Masurai area is a hilly plateau with a long east-west stretch of around 30 km and a north-south stretch of around 50 km. In the south it is bounded by Bukit Barisan and the main Sumatran fault (Semangko Fault). According to Suwarna et al., (1992) and Kusnama et al., (1992) geologically, this region consists of Quaternary sedimentary units, Qv, Qhv, and Qtv as described on the geological map of the the Sungai Penuh and Ketaun sheet.

The Masurai volcanic-tuff breccia unit (Qhv) is the formation that is the main study in this research with lithology in the form of tuff, lava, volcanic breccia, tuff breccia and lava. The direction of distribution of this formation is relatively spread towards the northeast - east of the center of Mount Masurai.

Pyroclastics are clastic rocks formed from volcanic eruption material. Pyroclastic types: Ash, Lapilli, Bomb, Block (Marshak, 2013). Pyroclastic material has a diversity of fragments with a certain magnitude which will decrease as the distance from the eruption center increases (De Belizal, et al. 2013). Based on the mechanism, pyroclastic deposits can be grouped into 3 types, namely pyroclastic flows, pyroclastic surges and pyroclastic falls.

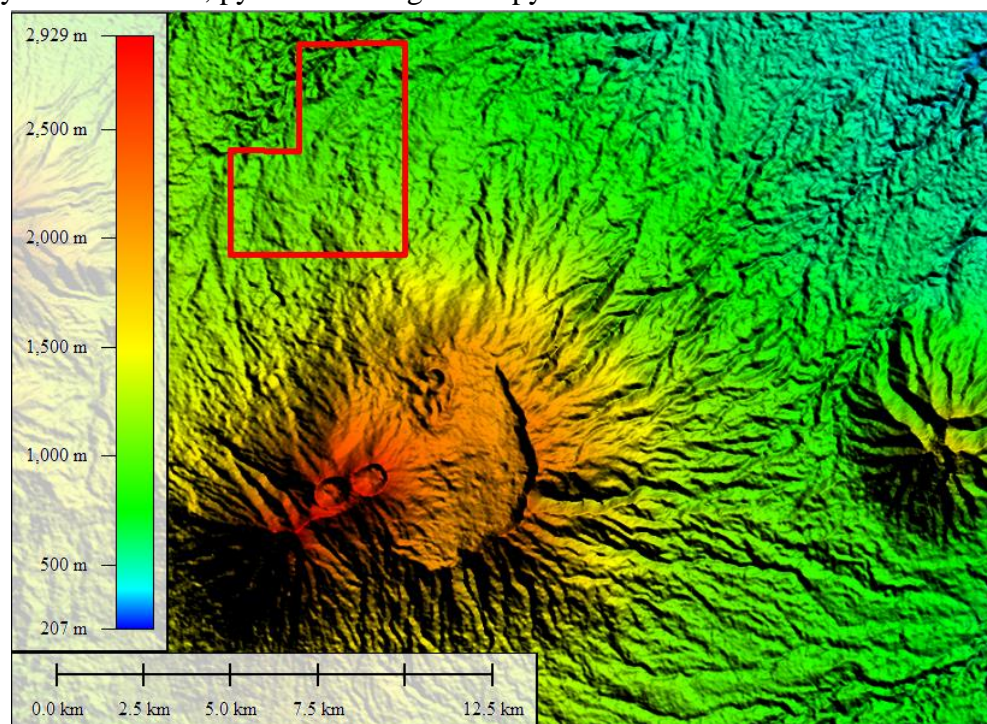


Figure 1. Research Area of Mount Masurai, Lembah Masurai District, Merangin Regency, Jambi Province

2. Data and Method

The method used in the research can be divided into geological mapping activities for takes rock samples which aims to obtain field data that can represent geological conditions and pyroclastic characteristics in the research area and petrographic analysis activities to determine the types of minerals and rock characteristics using a polarizing microscope. Then the last stage is the study activity where the author tries to make a Pyroclastic Characteristic Zoning Map based on field data and laboratory analysis results.

3. Result and Discussion

The pyroclastic characteristics and distribution of Mount Masurai consist of three (3) units, namely: Masurai Old Flow Pyroclastic (andesitic breccia lithology and lavaric breccia with various sizes and ungraded structures); Masurai Young Flow Pyroclastic (breccia lithology with pyroclastic fragments in the form of lithic and pumice with dominant pumice); Masurai Fall Pyroclastic (lapili and tuff lithology). (Figure 2)

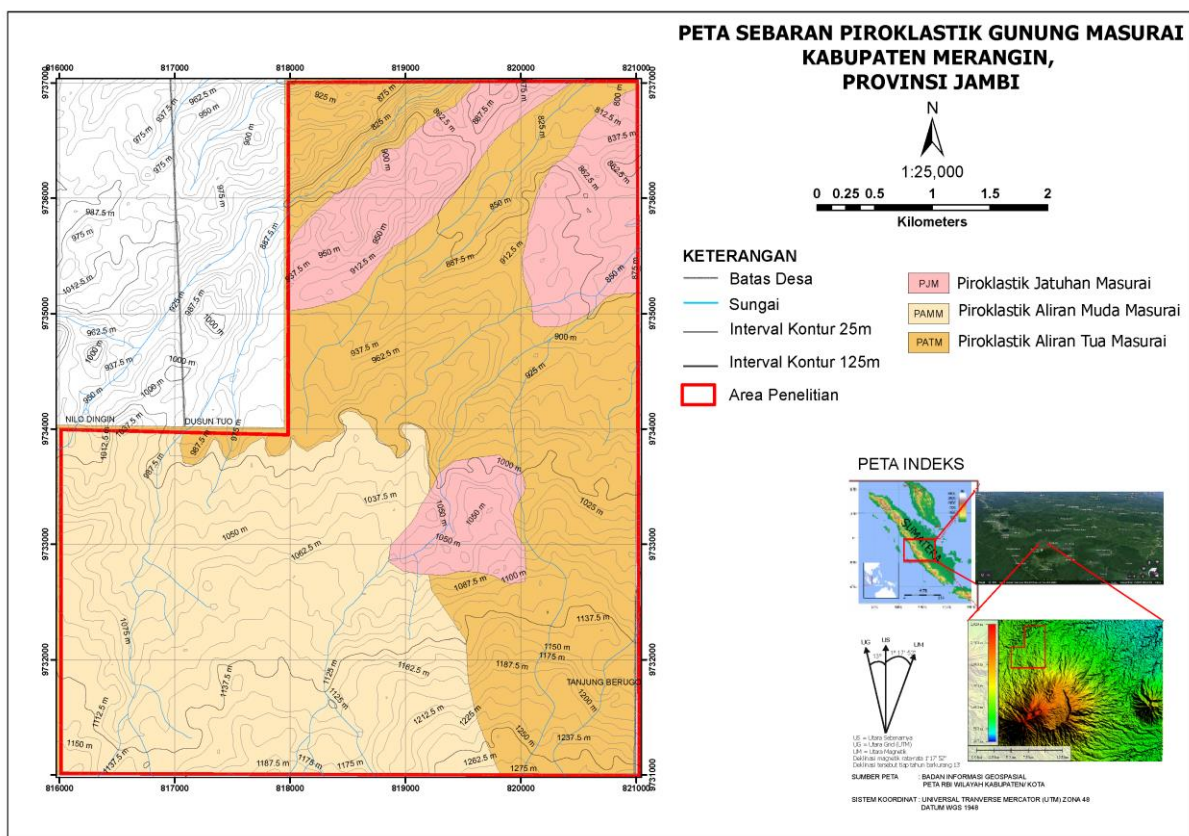


Figure 2. Pyroclastic Distribution Map of Research Area

3.1 Masurai Old Pyroclastic flows

Old pyroclastic flows have a characters that depends on the explosion of the eruption, changes in the mechanism of the eruption, and the distance from the source. Based on the physical appearance of old pyroclastic flows, the outcrops were found to be in a weak - moderate weathering condition. The matrix is slightly brown in color. The dominant fragment found in

this rock unit is igneous rock in the form of andesite with a generally bright gray color with a size of 3 – 640 mm with an afhanitic texture. The shape of the fragment is generally angular. This pyroclastic flow is produced by andesite breccia of various sizes and does not have a graded structure and alignment of the fragments this is because the material flows at high speed and randomly. (Fig.3)

Based on petrographic analysis of rock fragments, thin sections of parallel nicol and cross nicol show that these are andesite fragments. In thin section the rock shows a porphyritic texture as shown in Figure 3. The degree of hypocrySTALLINE crystallization, euhedral-anhedral crystal form, inequigranular packing, hypidiomorphic inter-crystal relationships, consisting of altered plagioclase and pyroxene phenocrysts with a ground mass of microcrystalline plagioclase, opaque minerals and altered glass and The secondary mineral is chlorite which is yellowish in color.

Based on petrographic analysis of the rock matrix, thin sections of parallel nicol and cross nicol show that the matrix filling this lithology is lithic tuff. In a thin section the rock shows a clastic texture, the grain size of the tuff ash is shown in Figure 4, subrounded shape, open packing, moderate sorting, the components consist of rock fragments and weathered volcanic glass embedded in a matrix of volcanic glass and cement in the form of iron oxide cement. Rock fragments, gray in color, trachytic texture, composed of plagioclase and opaque minerals, possibly volcanic rock fragments such as andesite or basalt, clustered, measuring up to 2 mm.

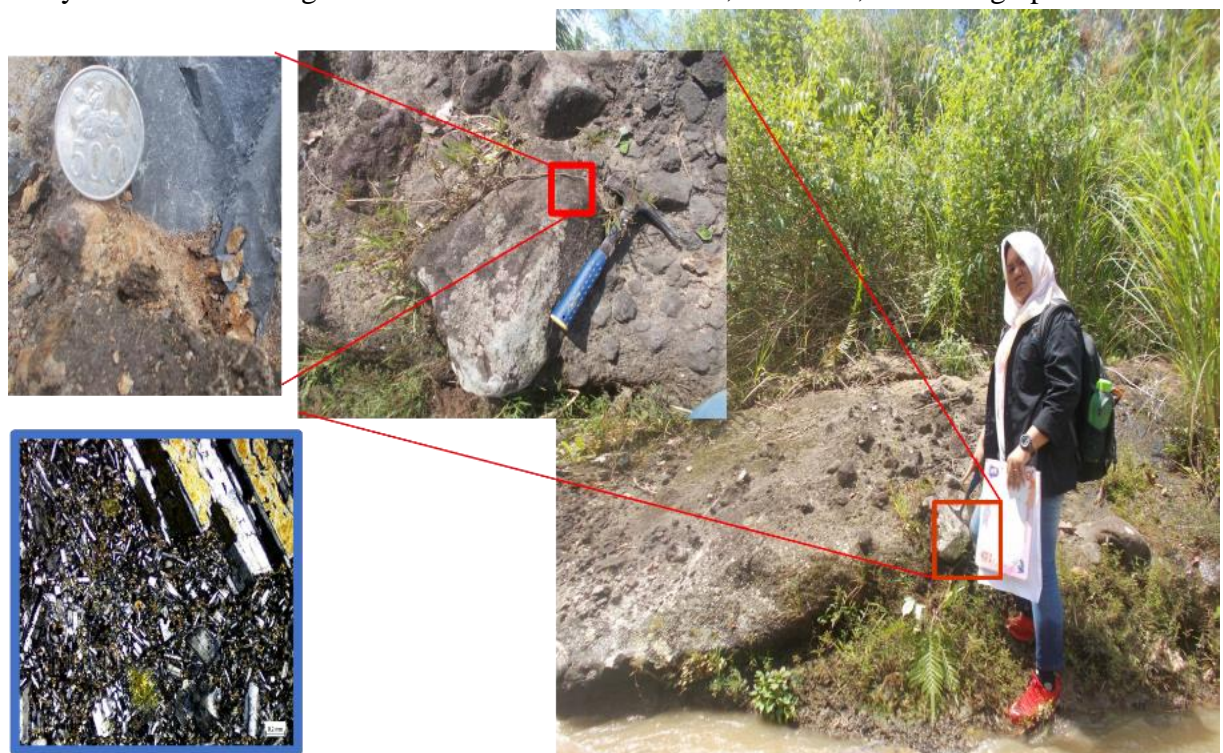
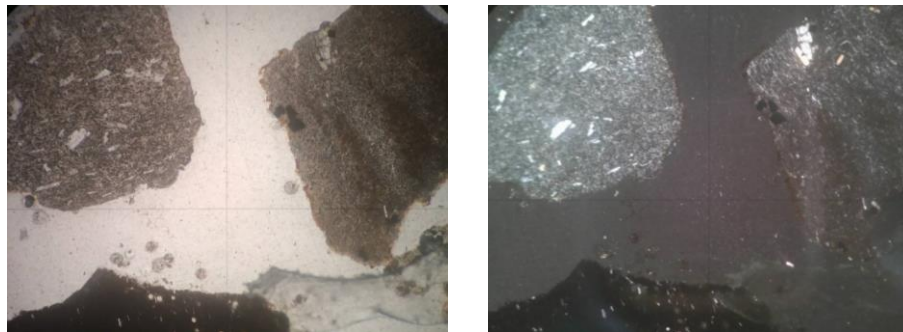


Figure 3. Old Pyroclastic Flow Fragmen Andesite of Andesite Breccia



(a)

(b)

Figure 4. Old Pyroclastic Flow Matriks of Andesite Breccia (a) ppl (b) xpl

3.2 Masurai Young Pyroclastic Flow

Young pyroclastics flow are characterized by breccia pumice with pyroclastic fragments in the form of pumice and lytic. The embedded pumice fragments were 0.1cm - 15cm in size with a fine-medium tuf as a matrices. Fragments lytic found in the form of basalt and andesite measuring in <5cm. There is no graded pattern, either in size or color of the pumice, which can explain that this pumice breccia is a product of pyroclastic flows. based on microscopic observations there is a special texture in the form of vitroviric with fragments in the form of volcanic glass. (Fig.5)

Based on the petrographic analysis of the rock seen in Figure 4, the thin section which has a colorless to brown absorption color has a massive structure with a coarse tuff grain size texture and poor sorting with a vitrophyric texture where there are phenocrysts with a ground mass consisting of glass mass and having fragments in the form of lithics. with sizes 1 - 2.5mm. Lithic fragments have a flow-specific texture.



Figure 5. Young Pyroclastic Flow Pumice Breccia

3.3 Masurai Fall Pyroclastic

Pyroclastic fall are characterized by a breccia pumice with massive structure and graded bedding with embedded pumice fragments measuring 0.5 cm - 7 cm with a matrices of ash and lytic sized < 1 cm.. Based on microscopic observations, this character has a special vitroviric texture. based on grain composition that is Vitric Tuff. (Fig.6)

Microscopically, thin sections of rock samples obtained from the observation location show that the rocks are Vitric Tuff and Crystal Tuff. The names of these rocks are based on Schmid's (1981) classification which is differentiated based on grain composition.



Figure 6. Masurai Fall Pyroclastic Lapilistone

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