

THE STATE OF ANAK KRAKATAU IN SEPTEMBER 1968

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ABSTRACT

An Indonesian-Japanese volcanological team paid a five days visit to the Krakatau Complex in Strait Sunda between September 27 and October 2, 1968. Though no increased activity was recorded in the crater area of Anak Krakatau, morphological changes were observed in the top region of the volcano. These changes must be due to a minor phreatic eruption which is supposed to take place some time between March 1963 and September 1968.

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INTRODUCTION

A joint expedition between the Indonesian and Japanese volcanological team was undertaken to the Krakatau complex in Strait Sunda between September 27 and October 2 this year. During this five days visit gravity measurements by means of a Lacoste-Romberg gravimeter were carried out at several points scattered over the entire island complex and also on the adjacent volcanic islands of Sebesi and Sebuku. A topographic survey and a new geologic map of Anak Krakatau was completed. In this paper only the geological changes observed at Anak Krakatau are discussed.

This expedition was sponsored by the Indonesian Institute of Sciences, the Geological Survey of Indonesia and by the Tokyo Earthquake Research Institute. A five ton vessel from the Fishery Department at Labuhan (Bantam, Western Java) served as a means of transportation.

Weather condition was favorable and during this short visit geological as well as geophysical observations were carried out over the whole island complex and a new geologic and topographic map of the Anak Krakatau volcano were completed.

Since 1960 three scientific expeditions frequented Anak Krakatau. The first one in 1960 (Decker and Djajadi, 1961), the second in 1963 (Zen and Djajadi, 1964) and the last one in September - October of 1968.

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MORPHOLOGICAL CHANGES IN THE TOP AREA OF
ANAK KRAKATAU

During the five days visit no increased activity of the volcano were recorded. The crater area was found very quiet. Normal solfataric activities prevailed in all solfataric fields of the inner zone. However, the following morphological changes can be noted (compare Fig. 1 and Fig. 2):

1. The outer ringwall has developed into a perfect circular ring measuring 800 meters across.
2. The two fissures which dissected the innercones had disappeared completely.

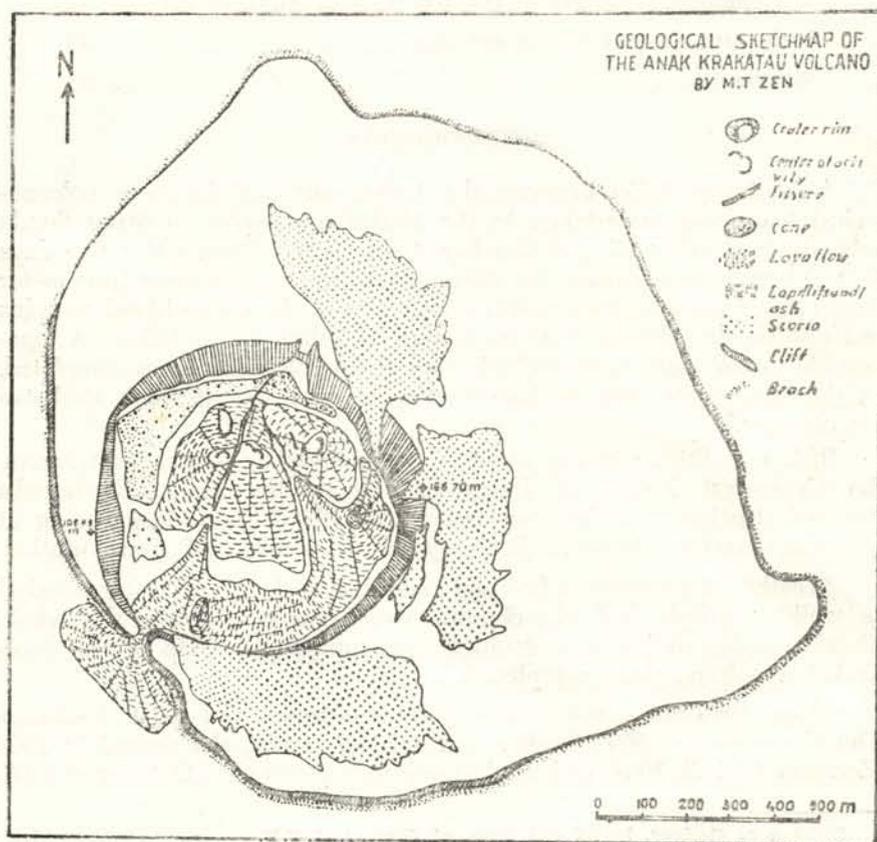


Fig. 1. The state of Anak Krakatau in 1963.

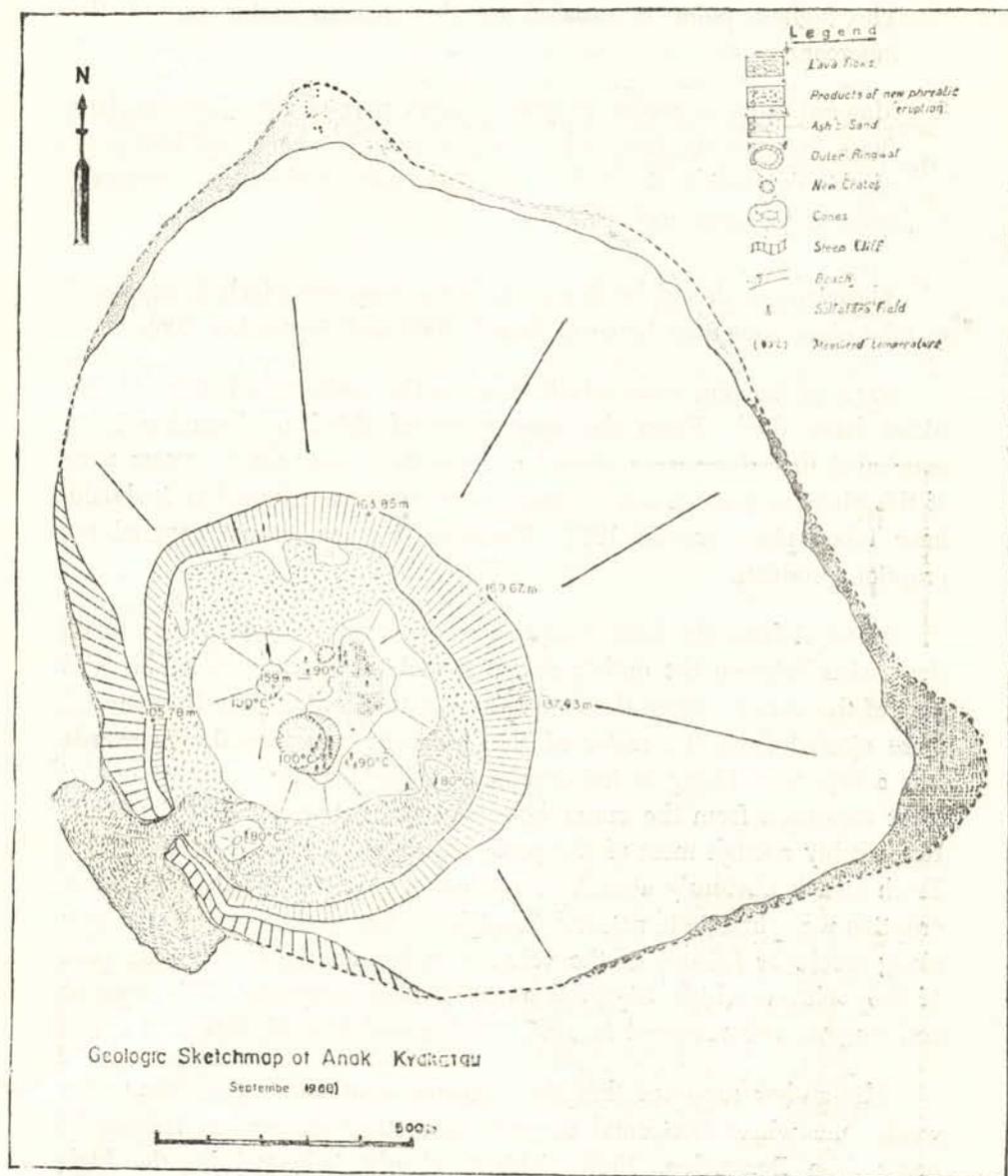


Fig. 2. Geologic sketchmap of Anak Krakatau.

3. The two innercones, formerly separated from each other by a fissure, have grown into one, and increased in height.

The highest point is situated on the western crater rim of the innercone.

4. Material from a recent eruption covers part of the previous lava flows between the inner cone and the outer ringwall and fills most of the depression situated in the NW part of the crater formerly covered by sand and ash.

The changes should be due to a minor eruption which is supposed to take place sometime between March 1963 and September 1968.

80 % of the pine trees which grow on the northern periphery of the island have died. From the appearance of dried up branches it is concluded that those trees could not have died more than 3 years ago. If this phenomenon has any bearing on the eruption referred to, it should have taken place around 1965. However this area is not covered by eruption products.

Material from the latest eruption is distributed mostly in the small depression between the outer ring wall and the inner cone in the NW part of the crater. From the morphology it is accepted that this material were ejected from the crater of the innercone and flowed downwards like a lava flow filling in the depression. The average thickness of the front measured from the crater bottom varies between 2 and 6 meters. Remarkably enough most of the produced material consists of old rocks. Fresh lava is obviously absent. Therefore it is concluded that the latest eruption was phreatic in nature. It might be due to the surge of seawater along cracks or fissures of the volcanic body into the hotter inner part of the volcano which triggered a steam blast eruption. This type of activity was also recorded in 1960 (Decker and Djajadi, 1960).

The author supposes that this volcano is situated in a structurally weak zone where horizontal as well as vertical movements frequently occur (van Bemmelen, 1949). This is clearly indicated by the high seismicity of the area. (Gutenberg, B. and Richter C. F., 1949, Sutadi, 1965). By these tectonic movements cracks or fissures are easily formed in the volcanic body of which most part is still under the seawater. These cracks or fissures give passage to seawater to penetrate into the hotter inner part of the volcano to trigger a steam blast eruption.

FROM AND GROWTH OF THE VOLCANO



Fig. 3. View of Anak Krakatau from the SE.

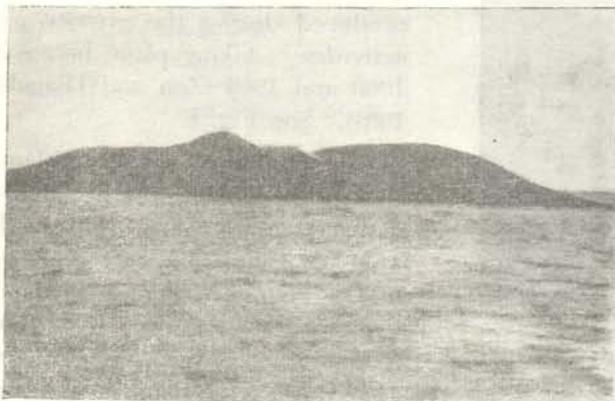


Fig. 4. View of Anak Krakatau from the SW.



Fig. 5. The steep cliff which bounds Anak Krakatau in the SW. View to the SE.

Since this volcanic island emerged above sea water on the 5th of January 1928 (Stehn, 1929) its SW-NE profile maintains an asymmetrical appearance (See Figs. 3-4). The SW side of the island terminates into a steep cliff bounding the sea of Strait Sunda (Figs. 5-6). A beach and a gentle coastline have never developed here. Since this SW periphery faces the open sea it is formerly thought that this asymmetrical profile is mainly caused by the strong waves (Zen and Djajadi, 1964).

After studying the bathymetric chart more carefully (Fig. 7) this phenomenon can be explained more easily. According to the soundings taken in 1928 (Stehn, 1929) the new eruption point of Anak Krakatau is situated right on the edge of a steep submarine ridge which drops to 250 meter in the southwestern direction. Besides, eruption products falling into the water in this

part of the sea are being carried away immediately by the swift current which runs from the SW towards the NE. In the NE the submarine slope is not so steep so that the ejected material could accumulate freely to develop a gentle volcanic slope as it is now being displayed by the Anak Krakatau volcano.



Fig. 6. The steep SW. side of Anak Krakatau built of pyroclastics.

It is interesting to note that on the SW side where the volcano terminates into a steep cliff and where all the layers are clearly exposed, no lava layers were observed. The whole wall from sea level to the top of the ringwall consists of well stratified pyroclastics (ash, sand and lapilli). Through the whole course of its history, lava flows were only produced during the activity (or activities?) taking place between 1960 and 1963 (Zen and Djajadi, 1964). See Fig. 8.

Being an isolated volcanic island which is under constant observation from the day of its birth Anak Krakatau serves as a model for studying a volcanic-island growth. Its history from the observed submarine eruption 41 years ago till the present time is presented in Fig. 10

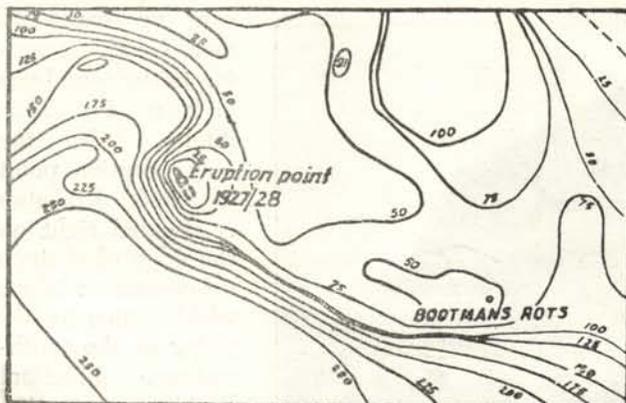


Fig. 7. Bathymetric chart around Anak Krakatau in 1928 (From Stehn, 1929).

and its growth in height is depicted graphically in Fig. 9. Fig. 10 is drawn by the present author based on the figures published in the Bulletin of the East Indian Volcanological Survey for the years 1930 - 1932, - 1933 - 1935, 1936 - 1938 and from Decker and Hadikusumo (1961).

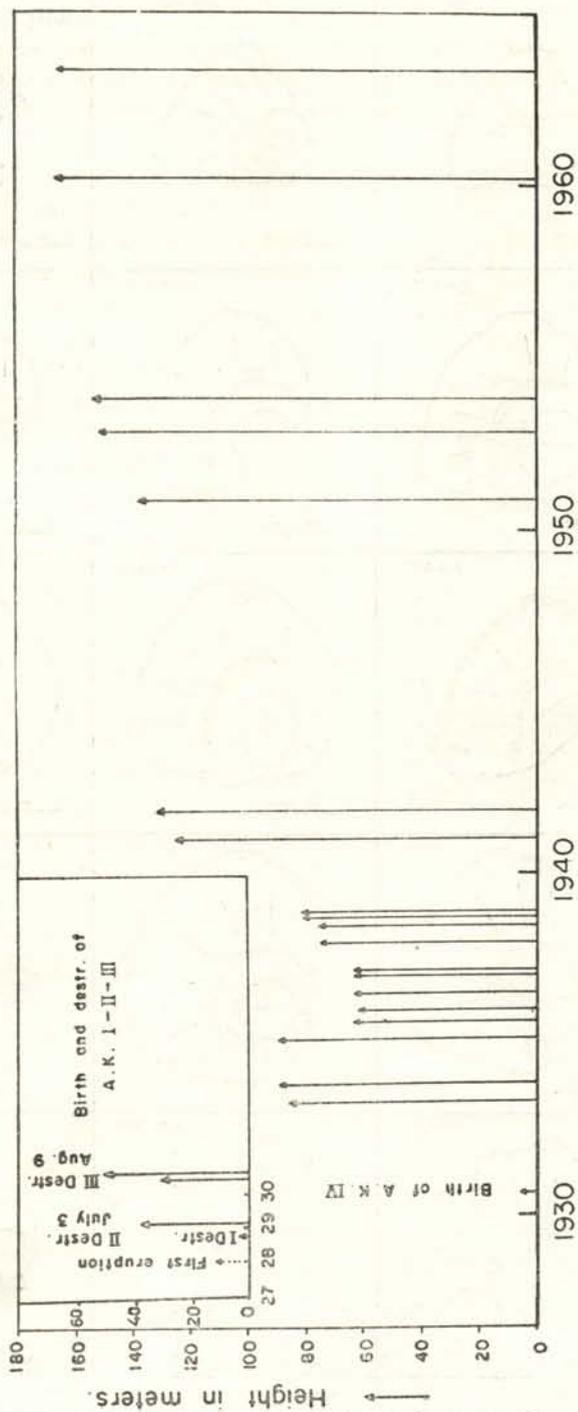


Fig. 9. Graphical presentation of the growth in height of Anak Krakatau I-II-III-IV.

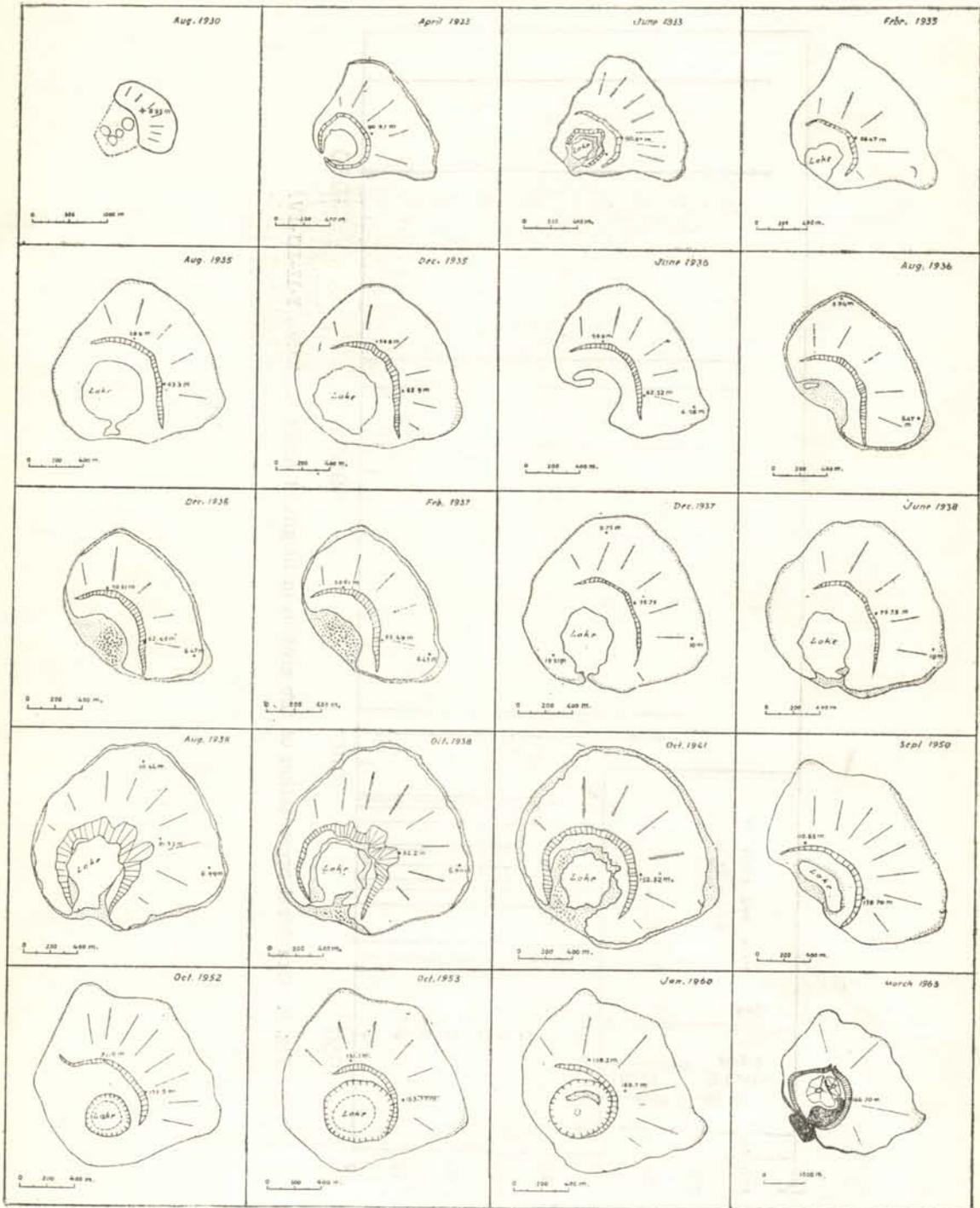


Fig. 10. Growth of Anak-Krakatau from 1930 till 1963.



Fig. 8. The (1963) lava flows which cascaded into the sea.

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