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REPORT OF THE SUB-COMMITTEE ON VULCANOLOGY 1951.

Australian National Committee on Geodesy and Geophysics.

by

N.H. Fisher.

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REPORT OF THE SUB-COMMITTEE ON VULCANOLOGY

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Rabaul

During the year vulcanological observations were resumed at Rabaul, Territory of New Guinea, with the appointment of Mr. G.A. Taylor as vulcanologist. Points for routine temperature control have been established on and inside the craters of Matupi Vulcan, Rabalanakaia and Sulphur Creek, and along the foreshores of Matupi Harbour. An Omori-type two-component seismograph has been installed at Rapindik, (1.6 miles N.W. of Matupi crater). A recording tide-gauge has been set up at Rabaul and tide marks established around the harbour at critical points. Simple gas analyses have been made and a photographic record begun of fumarole areas. Preparations have been made to rebuild the former observatory on the original site, where the instrument cellars are still intact.

After the 1937 eruption of both Vulcan (Raluan) and Matupi, (Tavurvur) temperature observations were maintained continuously until 1941. Seismographs were installed in April 1940 at the Rabaul Observatory and at Matupi Observation Post in June 1941. The writer, N.H. Fisher, was in charge of this work.

Visible signs of activity at Vulcan decreased continuously from 1937 to the present and since the war the only sign of activity is an area at sea-level in the embayment on the northern side of Vulcan over which ground water temperatures a little above normal can be obtained.

At Matupi volcano, a strong cloud of gas continued to be given off after the 1937 eruption and from about the end of 1938 an increase in activity became apparent. The volume of gas given off was somewhat greater, hydrochloric acid gas was occasionally noticed, and from July 1939 a strong smell of sulphur dioxide was present.

On March 3rd, 12 and 16th 1940 small steam explosions took place in a mud pool in the bottom of the crater. A general increase in volume of gas and amount of sulphur dioxide was noticeable, and towards the end of the year several areas of hot ground on both the inner and outer slopes of the crater increased in size, active vents were formed and sulphur dioxide given off copiously. On September 12th, 1940 and again in January 14th 1941, very severe earthquakes of tectonic origin, but with epicentres close to Rabaul, were felt throughout Gazelle Peninsula. The one on Jan. 14th 1941, was preceded by strong tilting movements at Rabaul Observatory (Fisher 1944).

During the first week in November 1940 temperatures about 100°C. were recorded for the first time in one of the fumaroles in what is known as the 1878 crater, on the western side of the main Matupi crater. During the month of December the temperature of this fumarole rose from 103° to 230° and during the first five months of 1941, the signs of activity steadily increased. At the beginning of June a temperature in some of the fumaroles of 400 degrees was recorded, gas pressure had increased, many new vents were formed, and very corrosive gases were given off. At 7.40 am. June 6th 1941, the volcano burst into eruption and continued erupting spasmodically and at times spectacularly until about March or April 1942.

During the first two days only dust and solid rocks were thrown out, after that hot bombs, including many very fine examples of breadcrust bombs were ejected. Periods of continuous eruption ranged up to six weeks in length, with breaks up to 10 days in between. Each eruptive period was preceded by a crop of volcanic tremors recorded on the seismograph. While eruptions were in progress tremors of a different type were recorded.

Very little damage was done by the eruption but from June to November the dust cloud was blown directly over Rabaul and was a very considerable nuisance. Most of the damage that was done

was due not so much to the mechanical effects of the dust as to the corrosive effects of the gases in the dust cloud and the salts deposited with the dust. During the North-West season, December to March, the dust cloud was blown out to sea and did no damage.

The Japanese invaded Rabaul on January 21st, 1942, and all seismograph records up to that time were destroyed, also most of the other records and all the observatory equipment.

In 1946 the craters were examined by the writer for the first time since the war. Decrease in activity at Vulcan was found to have been continuous (there was no response at all from Vulcan to the 1941-42 eruption at Matupi). The Matupi crater was descended for the first time - it had been quite inaccessible before the war - and it was found that only a comparatively small crater in the bottom of the 1937 crater had been built up by the 1941-42 eruption. The state of activity at Matupi has reverted approximately to what it was before the 1937 eruption and no apparent change has taken place from 1946 to the present. The volcano appears to have settled down for a long period of dormancy.

Mt. Lamington.

This violent Pelean type eruption took place on January 21st at 10.45 am. and completely devastated an area of 6 to 7 miles radius, killing all the population within the area, except a few on the marginal fringe of the devastated area. A further eruption, not as severe as the first one, occurred the same night at about 9.30 pm. and this was characterised by more explosive activity. Porous bombs were ejected and smaller fragments were carried to the north-east for a considerable distance - up to ten miles or more.

The volcano was comparatively quiet for the next ten days and then the building up of a lava-dome in the crater began. This was accompanied by repetitions on a small scale of the glowing cloud type of eruption, particularly on February 11th, 18th, 22-23th and March 5th. The last one was easily the most severe and destroyed a considerable part of the northern side of the lava-dome which by this time had built up to more than 1000 feet above the crater floor. Extensive ash flows took place on the northern side of Mt. Lamington.

A two component Wood-Anderson seismograph was installed at Sangara Plantation 6½ miles from Mt. Lamington and began recording on February 7th. An average of about 30 tremors per hour was recorded during the first few weeks of operation. The glowing cloud type of eruption is generally immediately preceded by a very great increase in the number of tremors recorded.

A very complete photographic record is also being maintained of the progress of the eruption. Visits have been made to the crater to obtain samples and preliminary petrological examination of some of these has shown that the material ejected during the 1951 eruptions is a porphyritic hornblende andesite, consisting of strongly zoned basic labradorite, green hornblende, biotite, magnetite, apatite, anhydrite and a little pyroxene in a glassy ground-mass. Older volcanic rocks are somewhat more basic in composition and contain brown hornblende, partly or wholly replaced by magnetite, pyroxene and plagioclase, monoclinic pyroxene and a small percentage of olivene. Experiments conducted with deformed plastic materials recovered from Higaturu indicate that the temperature of the glowing cloud at a distance of 6 miles north of the crater was about 200 Centigrade or a little higher for a period of 1 to 2 minutes.

Other volcanoes.

Mt. Goropu in Papua, about 80 miles south-east from Mt. Lamington, was in eruption in 1943 and 1944. A description of this activity was published by Baker (1946). This eruption is of particular interest in that it took place in an area previously thought to be occupied entirely by pre-Tertiary rocks. Examination in June 1951 by G.A. Taylor and A.K.U. Edwards showed that the 1943 eruption did actually break through highly metamorphosed rocks, but a number of old volcanic cones lie between this new crater and the coast.

On Long Island, off the north coast of New Guinea, the large crater lake known as Lake Wisdom was shown by air photographs during the war, to have a small crater in its southern part which has obviously been active in the not too distant past. Long Island must therefore be added to the list of active volcanic centres in New Guinea.

Mt. Gallowsulo, on the north coast of New Britain, is another volcanic cone that has been shown by recent examination to possess a definite crater, from which small quantities of steam are still being given off. The crater is situated on the western rim of a large closed caldera, which is partly occupied by a crater lake.

An aerial examination of Mt. Toroko, also, in the souther portion of Bougainville Island, has established the presence of a crescentic lake situated between an old crater rim and what appears to be a central lava dome. Several solfataras lie around the lake area; the largest one is on the north-western side of the lava dome.

The presence of previously unknown craters has also been established on Rooke Island (2) and Vakar Island. None of these show signs of activity.

Aerial examination of the Father (Ulawun) volcano on the North Coast of New Britain, shows that the former deep crater throat has caved in and no eruption has taken place for many years, though no details are available of its behaviour since 1937.

A similar examination of Mt. Victory, south-west of Tufi in Papua, showed that several areas around the crater, which is not well-defined, are steaming gently. This volcano has obviously not been active for a very long period.

Mt. Bagana, on Bougainville Island, has been continuously active and is easily the most active of the New Guinea volcanoes. An attempt was made by Taylor in 1950 to climb the mountain but was not successful because of the continuous eruptive activity. It is suspected that eruptions of the glowing cloud type have occurred at Bagana, but no damage has been done as there is no population in the immediate neighbourhood. Specimens collected by Taylor of eruption products and flows have been subject to brief petrological examination. They are andesitic in character, with phenocrysts of basic plagioclase, magnetite, pyroxene, and in some cases brown hornblende, in a glassy ground-mass. Olivene was found in one specimen only.

Mt. Balbi, 20 miles north-west of Bagana, was examined in November 1950 by G.A. Taylor and in April 1951 by A.K.U. Edwards. Five craters are aligned along a north-south ridge and another old crater lies to the west. The crater second from the south end is the most recently active and is still vigorously giving off steam and sulphur-bearing gases. The date of the last eruption of Mt. Balbi is not known.

No information is available on the behaviour of Lamon Island off the north coast of New Guinea or of the other New Guinea volcanoes during the last ten years.

The attached table summarises the up-to-date information about the volcanic centres in New Guinea.

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Baker, G. 1946 Preliminary Note on Volcanic Eruptions in the Ooropu Mountains, South-eastern Papua, during the period December 1943 to August 1944. J. Geol. Sc. 1. p.19.

Fisher, N.H. 1944 The Cagello Peninsula, New Britain, Earthquake of Jan. 14th, 1941. Bull.Seism.Soc.Amer.Vol. 34 No.1.

(N.H. Fisher)
Secretary

29th June, 1951.

Sub-Committee on Vulcan

SUMMARY OF VOLCANIC CENTRES OF NEW GUINEA

NAME	APPROXIMATE HEIGHT ABOVE SEA-LEVEL OF HIGHEST POINT FEET	TYPE OF ERUPTION AS FAR AS IS KNOWN OR CAN BE ESTIMATED	POPULATION IN ADJACENT AREA.
ISLAND GROUP			
Bam Island	1,960	Mild Explosive	Small native population on island.
Manam Island	4,265	Intermittent explosive, with occasional lava flows	Considerable native population 3 miles from crater.
Karkar Island	6,065 (highest point on actual crater rim is 5,025 feet)	Mild explosive; fragmental cone in old crater.	Large native population and several plantations 5-8 miles from crater.
Long Island	Mt. Reamur 4,278 Crater Lake 500	Small fragmental cone building.	Very small.
NEW BRITAIN GROUP			
Ritter Island	400	Violent explosive after long interval, with tidal wave.	None on island; quite a number on adjacent coasts; nearest 5 miles.
Langila	3,800	Mild explosive; lapilli and sand.	Small coastal villages 7 miles distant.
Benda	1,300	Probably mild explosive, with lava flow.	Small village 3½ miles distant on other side of lake.
Garbuna	2,350	Probably in solfataric stage.	5 miles to Kilu village on east coast.
Pago	2,375	Explosions of pumice, with lava flow.	None nearer than coast, 6 miles N.E.
Galloseulo (Ibi)	3,848	Not known - probably mild explosive type.	Bialla Plantation and several villages 5 miles W. and N.W.
South Son (Bamus)	7,376	Lava plug and possibly glowing cloud - no known eruptions.	Small.
Father (Ulawun)	7,546	Intermittent explosive - basaltic lapilli.	Ulamona Mission 7 miles N.W.
Lolobau	2,720	Pumice fragments and lava flows.	Very small.
Rabaul: Vulcan	742	Violent explosion of pumice fragments after long interval.	Considerable native population to West and north-west Rabaul 4 miles N.N.E.
Matupi	750	Steam explosions and fragmental basaltic eruptions.	Matupi Island 1½ miles W. Rabaul 3 miles N.W.
Rabalanakaia	400	None known.	Rabaul 1½ miles N.W.
BOUGAINVILLE GROUP			
Lihir Island	1,640 (highest point in island)	None known.	Four plantations and many natives villages.
Balbi	8,502	None known - probably explosive type.	Few villages 6-8 miles distant.
Bagana	5,730	Very active explosive lava flows and probably glowing clouds.	None close. Torokina 12 miles S.W.
Taroka	6,320	None known.	Scattered native villages 4 miles away.
PAPUAN GROUP			
Mt. Lamington	5,300	Violent Pelean (glowing cloud) after long interval.	Formerly large - 4,000-5,000 natives and 30-40 whites.
Goropu	?	Explosive - Lapilli dust, etc.	None close.
Mt. Victory	6,135	Probably mild explosive. No recorded eruptions.	Considerable coastal population to east; Wanigela 11 miles S.W.
Fergusson Island (Numa-Numa crater)	1,600	None known	Considerable native population 2-4 miles W. and S.W.

Fig 1.

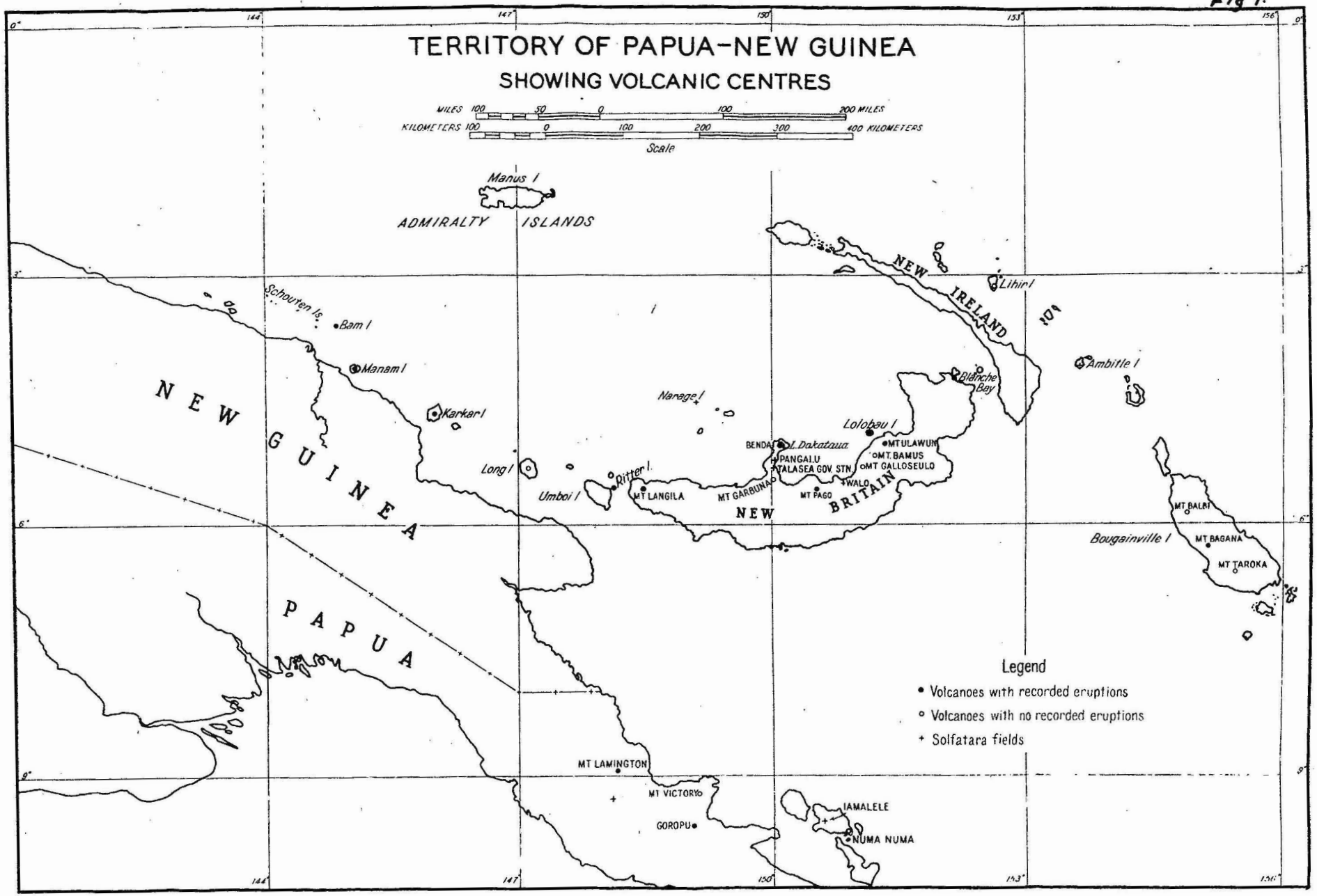
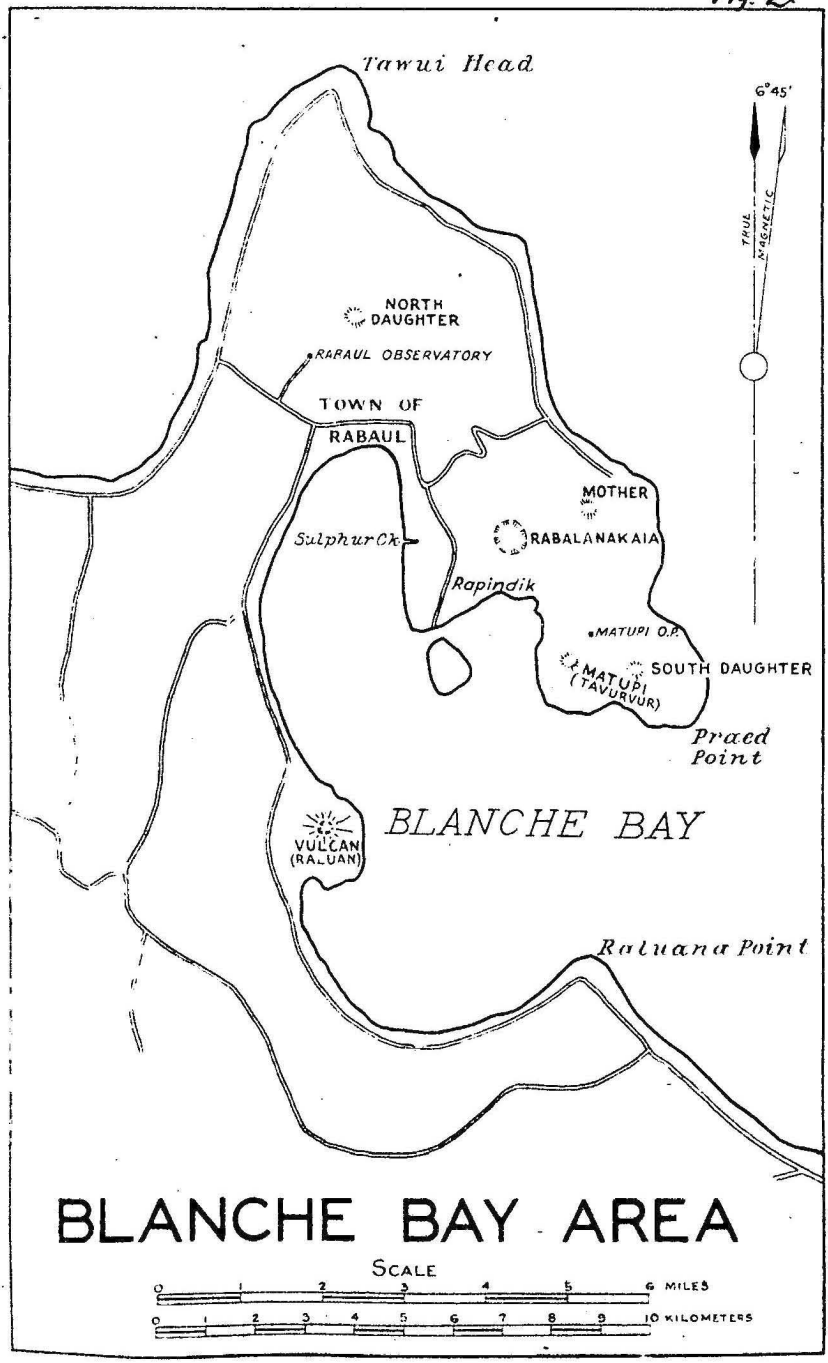

TERRITORY OF PAPUA-NEW GUINEA
SHOWING VOLCANIC CENTRES
MILES 100 50 0 100 200 MILES
KILOMETERS 100 0 100 200 300 400 KILOMETERS
Scale
Manus I
ADMIRALTY ISLANDS
NEW IRELAND
Lihir I
Schouten Is.
Bam I
Manam I
Karkar I
NEW GUINEA
Long I
Umboi I
Ritter I.
Narage I
Lolobau I
Blanche Bay
Ambitle I
BENDA
I. Dakataua
PANGALU
TALASEA GOV. STN.
MT ULAWUN
MT. BAMUS
MT GALLOSEULO
TWALO
MT LANGILA
MT GARBUNAS
MT PAGO
NEW BRITAIN
Bougainville I
MT BALBI
MT BAGANA
MT TAROKA
PAPUA
MT LAMINGTON
MT VICTORY
GOROPU
IAMALELE
NUMA NUMA
Legend
• Volcanoes with recorded eruptions
° Volcanoes with no recorded eruptions
+ Solfatara fields

Fig. 2.


Tawui Head
6°45'
TRUE MAGNETIC
NORTH DAUGHTER
RABAUL OBSERVATORY
TOWN OF RABAUL
MOTHER
RABALANAKAIA
Sulphur Ck
Rapindik
MATUPI O.P.
MATUPI (TAVURVUR)
SOUTH DAUGHTER
Praed Point
BLANCHE BAY
VULCAN (RALUAN)
Raluana Point
BLANCHE BAY AREA
SCALE
0 1 2 3 4 5 6 MILES
0 1 2 3 4 5 6 7 8 9 10 KILOMETERS

NEW GUINEA
POPONDETTA – MT. LAMINGTON AREA
SHOWING BLAST AREA

Scale
1 0 1 2 3 Miles
0 1 2 3 4 5 Kilometers

Fig. 3.

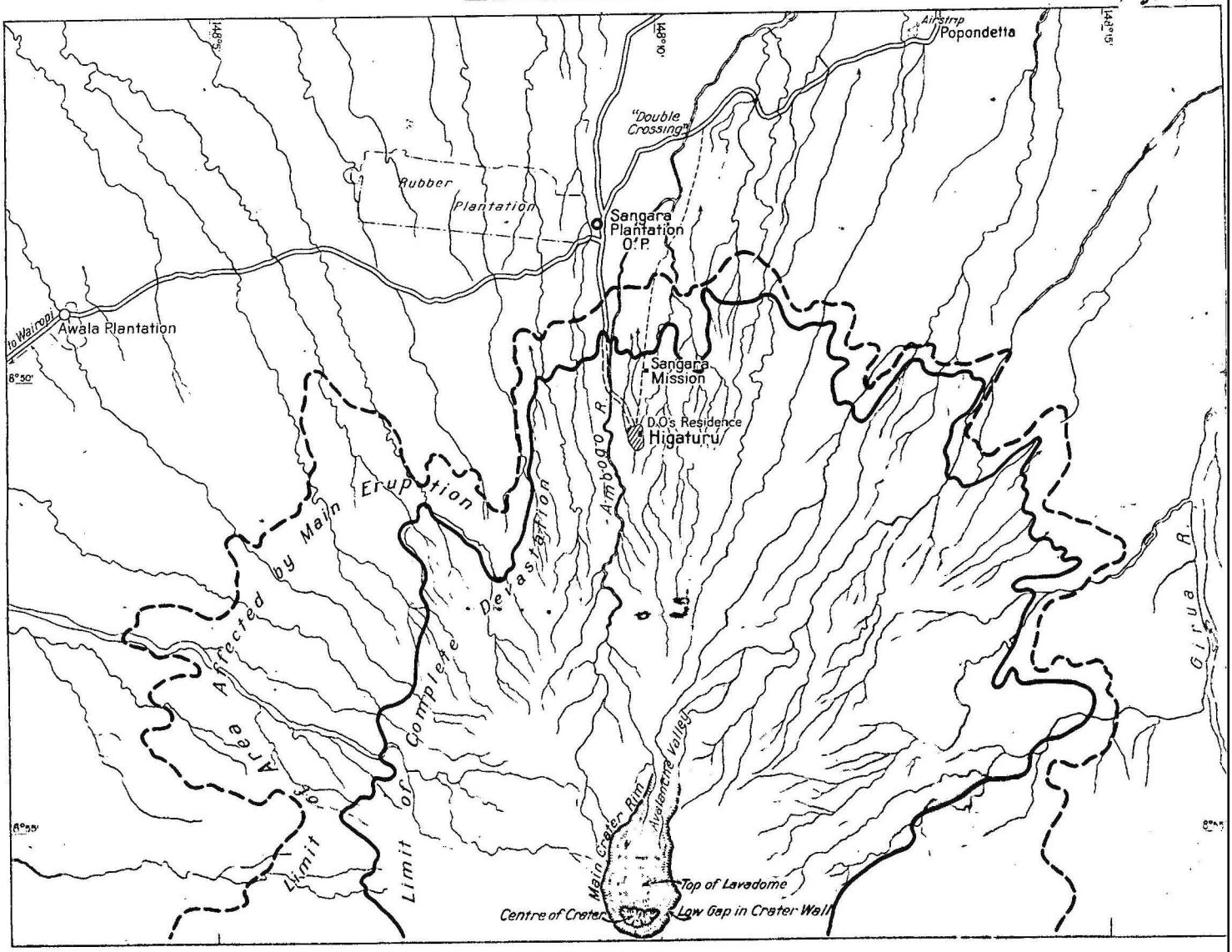


Figure 4. Mt. Lamington as it appeared immediately after the eruption of January 21st. Note the absence of the lava-dome.

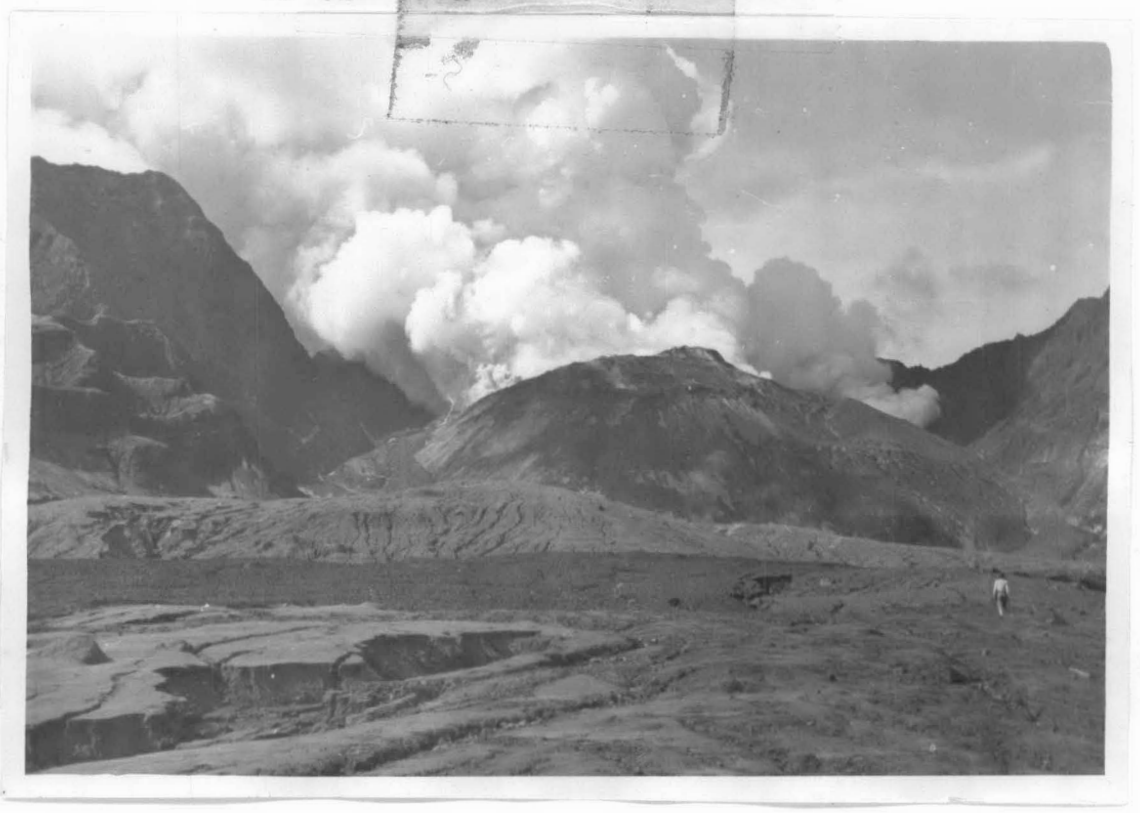


Figure 5. Lava-dome and Avala[illegible] Valley, Mt. Lamington. Ash and boulder deposits of the main eruption in the foreground.

Figure 6. The Mt. Lamington crater and lava-dome. April 1951.

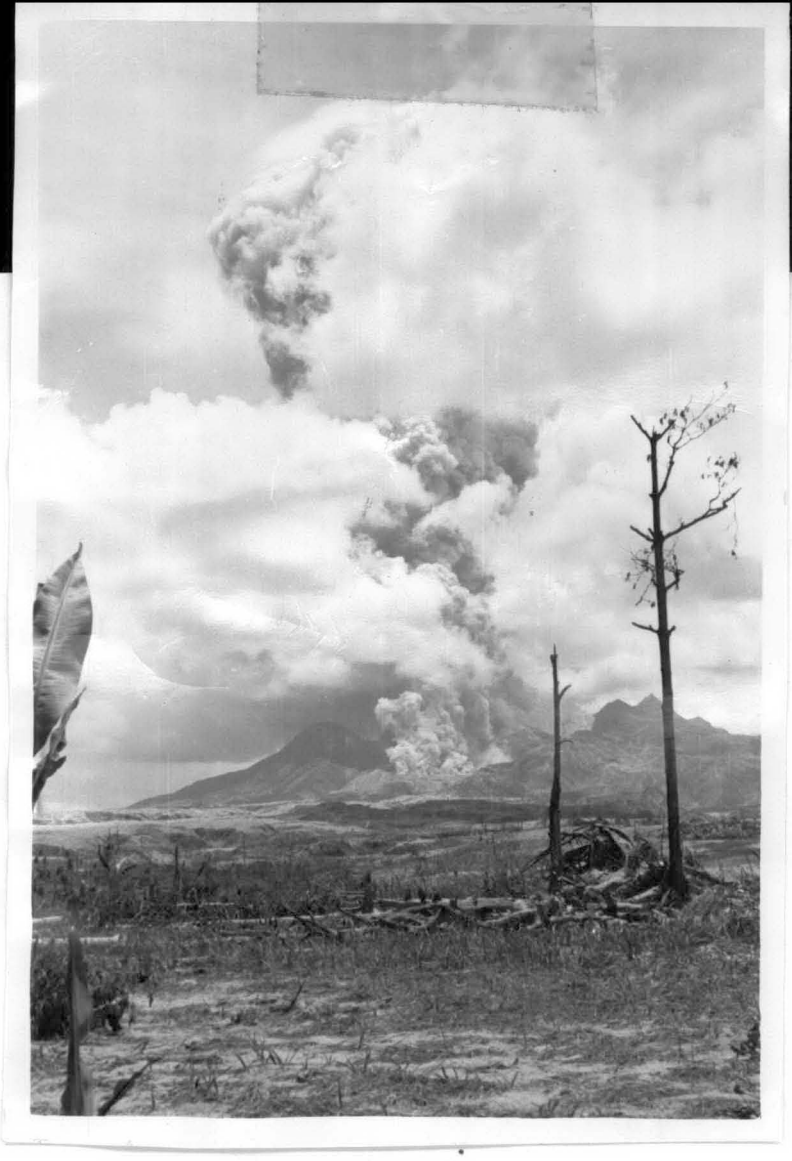


Figure 7. Eruption with small nuee. Taken from Higaturu. February 11th, at 12.45 pm.

Figure 8. The craters of Mt. Balbi, Bougainville Island, looking south.

Figure 9. Lake Loloru on Mt. Taroka, Bougainville Island. Lava-dome on left, with solfataric patches.