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PRELIMINARY REPORT TULUMAN VOLCANO, LOU ISLAND,
ST. ANDREW STRAIT, NEW GUINEA.

by

J. G. Best.

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STRAIT, NEW GUINEA

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Summary.

On the 12th July the writer was informed by signal originated by the A.D.O. Baluan Island, that explosive activity had recommenced at the St. Andrew Strait vents.

The writer departed Rabaul by air for Momote on the 14th July and arrived at Baluan per Administration work boat on the evening of the 15th July.

En route to Momote on the evening of the 14th a brief aerial inspection was made of the active area. Two small craters were visible above sea level and some minor explosions originated from the western crater during this inspection.

The writer spent one week in the area and departed Baluan on the 21st July. During this period, as no further explosive activity was manifest, two ground inspections were made of the western crater.

The day after the writer departed Baluan mild activity (mainly effusive) recommenced at the eastern crater.

The name Tuluman (tuluman being the word for hot in the Manus language) has been proposed for this new volcano. The name embraces the whole of the structure, that is, the two small cones above sea level as well as the submarine portion of the structure. The two small structures above sea level are referred to as east and west Tuluman craters respectively.

Past Activity.

Since June 1953 the vents in St. Andrew Strait have been active on three occasions.

The initial eruption commenced on the 27th June and ceased on the 6th July.

The second, of much longer duration, commenced on the 14th November and continued intermittently until 18th February 1954.

The third period of activity commenced on the 10th July 1954 and finally succeeded in erecting two small cones above sea level. By the 27th July eruptive activity had ceased and the volume of steam being emitted was gradually diminishing.

Recent Eruption.

About 0100 hours on the 10th July 1954, submarine eruptive activity commenced in the vicinity of the focus of the two previous eruptions. The initial activity was practically inaudible at Baluan Island (about 4 miles to the south) and no premonitory tremors were felt in any of the surrounding islands.

Mr. J. Landman, A.D.O. Baluan, stated that the early stages of this eruption differed from the previous two, in that explosive ejections of material appeared to be more frequent and the volume of steam generated much less. This, as was subsequently demonstrated, was undoubtedly due to the fact that the crest of the submarine structure was by this time very close to sea level.

As the eruption progressed it became clear that two vents were operative. On the 11th July a small cone was built up above sea level in the eastern portion of the active area. Thereafter activity declined at this centre and intensified at the western focus until the 13th when the second cone appeared above sea level about 300 yards to the north west of the original cone. Explosive activity then declined at this vent and ceased on the evening of the 14th July, by this time the emission of vapour had practically ceased at the eastern crater.

During the following week the emission of volatiles (mainly steam) gradually declined at the western crater.

On the morning of the 21st activity recommenced at the eastern crater.

Thanks to the co-operation of the Qantas pilot, the writer, at the time en route from Momote to Rabaul, was able to make a brief aerial examination of this new phase of activity.

At this time the activity was purely effusive; lava was being pushed out from a small vent and flowing outwards in a series of slow moving concentric waves. Where it entered the sea dense columns of steam were rising, whilst from the orifice (a little west of the centre) a bright orange plume of vapour was rising languidly and drifting away to the north west.

Subsequently minor explosive emissions occurred at this vent and by the 27th of July fumarolic activity only was in evidence.

Structure.

The Admiralty Chart of the Admiralty Islands (prepared in 1944) reveals in St. Andrew Strait a shoal area about one mile south of the southernmost tip of Lou Island. This shoal area (shallowest point 67 fathoms) coincides approximately with the focus of recent activity and in all probability indicates the presence of an old submarine volcano.

Since June 1953 volcanic agencies have built up on this foundation a structure about 450 feet high, culminating in two minor craters, the rim of the highest being about 40 feet above sea level. These two craters are surrounded by a shoal area half to three quarters of a mile in diameter. Since most of the structure is submarine, it is not possible without a hydrographic survey, to compute the volume of material contained in it, however it is estimated that it is in excess of 100 million cubic yards.

East Tulumon Crater.

At the time of the ground inspections (18th and 19th July) the east Tulumon crater was practically avash. It consisted of an arcuate shaped ridge of fragmental material about 100 yards in diameter, the breach being disposed on the eastern side. Minor steam vents were operative around the rim.

West Tulumon Crater.

West Tulumon crater (see map) about two acres in extent and maximum elevation about 40 feet consisted of an arcuate shaped crater breached and open to the sea on the western side.

The prevailing south to south - easterly winds have resulted in an asymmetrical disposition of fragmental products around the crater. Thus the highest point is on the northern rim of the crater, whilst the maximum area extent also lies north of the crater and in fact connects with the fringing reef surrounding the southern tip of Lou Island.

Superficially the northern portion of the structure appears to be composed entirely of fragmental products, however as lava flows crop out on the southern side it is probable that they are present but buried on the northern side.

The products of explosive activity are predominantly pumice and comminuted pumice, with subordinate amounts of scoriaceous, vesicular and massive vitreous lava fragments.

Numerous volcanic bombs were scattered about the outer slopes, particularly on the northern side. These bombs varied appreciably in size and texture. Two most interesting types were quite prevalent. The first consisted of large slab like masses, (up to 20 or 30 cubic feet) pumiceous on one face and grading through a scoriaceous and vesicular median section to a massive vitreous phase with a well developed bread crust structure. The other consisted of a massive vitreous core grading out to a pumiceous periphery.

It is probable that the former represented portions of partly chilled lava flows explosively ejected, whilst the latter resulted from lava explosively expelled in the liquid state.

During the explosive phases fragmental material was thrown to considerable heights. Due to the fact that they were incandescent and emitting vapour their trajectory could be readily discerned both by night and day. Mr. Landman timed the descent of one such projectile at 15 seconds i.e. about 3,600 feet.

The south east portion of west Tulumán crater is composed largely of flow lava. Marked flow structure particularly along the flanks of these flows indicate that the lava was quite liquid when expelled. However except where they have been suddenly chilled by sea water these flows do not exhibit the smooth or ropy surface of the typical pahoehoe flow. This is undoubtedly due to the escape of large volumes of volatiles which has produced a high proportion of vesicular to pumiceous material in these flows.

At the time of the ground inspection these flows were still quite hot, and thus the survey of the south east portion of the crater is only an approximation as it was not possible to walk around this portion of the structure.

The crater about 500 feet long and 350 feet wide was flanked on all but the western sides by cliffs 10-20 feet high. In the western end a breach about 200 feet wide permitted access by the sea, which had inundated the floor of the crater.

A narrow plateau about 20 feet above sea level was developed between the northern edge of the crater and the foot of the main crater rim. This plateau in its western extremity descended to a narrow beach flanking the north west "head" of the crater and in its eastern extremity merged into the southern arm of the crater rim.

Strong peripheral cracking was developed around this plateau close to the crater edge particularly in the eastern portion.

At the time of the ground inspection, four and five days after the cessation of explosive activity sea action had already considerably modified the outer flanks of the cone. Cliffs had been cut on the windward (southern side) and much of the material so derived, redistributed along the north-eastern portion to form a wide beach.

Numerous ebullient springs were discharging volatiles and hot water from the floor of the inundated crater. Particularly strong spring activity was located about midway along the southern side of the crater. In the south east corner of the crater a bright green pool the surface of which was slightly above the general water level in the crater was steadily discharging hot water supplied by the ebullient springs within it.

Temperature.

The only temperatures obtainable of ebullient springs were from the green pool. These were surprisingly low 74 to 76°C.

Beneath the flank of one solidified flow a temperature of 240°C was recorded. This temperature is suspect and could not be checked as during the operation several feet of insulation were burnt from the thermocouple leads. This damage could not be repaired in the field.

Volatiles.

Steam constituted the major volatile emitted, portion of this steam was generated by the contact of hot lava and sea water, the remainder was connate steam.

Mr. Landman reported that during the eruption bright yellow clouds were at times a component of the vapour. A possible explanation for this phenomena is the ejection of finely divided sulphur crystals. Deposits of comminuted pumice containing a high proportion of fine sulphur crystals were noted particularly on the north west flanks of the structure. Such crystals could have been deposited by fumarolic activity within the submarine structure during the preceeding quiescent period.

During the ground inspection the concentration of acid gases and hydrogen sulphide was found to be surprisingly low, at no time was it necessary to don a respirator. Acid halides appeared to be absent and sulphur dioxide and hydrogen sulphide were present in only minor concentrations.

It was somewhat surprising therefore to find that after only a couple of hours in this atmosphere the writers stainless steel wrist watch was excessively tarnished. This tarnishing of stainless steel objects had previously been encountered at Mt. Langila in 1952 and had on that occasion been ascribed to the high concentration of acid gases in the exhalate.

Whilst working in the vicinity of the lava flows an odour similar to that produced by heated tar was most marked. Efforts to trace this odour to a particular vent proved fruitless and the impression was gained that it was emanating from the slowly cooling flows.

Reynolds during his investigations at Mt. Langila in May and June this year encountered a somewhat similar odour whilst in the vicinity of the active crater during a lull in the explosive activity.

Location of Tulumen Volcano.

Compass bearings taken on various features in this area, when plotted on the 163,360 military sheet "Lou - Admiralty Islands," show wide discrepancies with these features detected on the map.

Captain Wilding of the H.V. Bulolo on the 22nd November 1953 witnessed explosive activity at the then submarine vents. He carefully determined the geographic location of this focus and also determined its position relative to Lou Island.

His plots are as follows.

Geographic co-ordinate of active focus on 22/11/53:-

2° 26.8'S.
147° 19.1'E.

Position referred to Lou Island:-

0.9 miles on a bearing 167°
true from the southernmost
tip of Lou.

These two positions when plotted on the military sheet reveal a discrepancy of about 2.2 miles in the azimuth 137°.

Mr. J. Landman who witnessed the activity from its inception states that there has been very little wandering of the focus of activity, thus the coordinates determined by Captain Wilding have been accepted as the coordinates of Tulumen Volcano.

Conclusion.

It is not possible to state whether activity at this volcano has yet run its full gamut.

It is possible that further eruptions may take place, however in view of the pattern of the activity in the recent past it is considered that if such do eventuate they are unlikely to prove a danger to the population of the surrounding islands.

J.G. Best,
A/Vulcanologist.

147° 20'

2° 20'



LOU ISLAND

670

710

578

ST ANDREW STRAIT

923

780

Approximate location of Tulumán Volcano

19 July 1954

Scale 1 inch = 1 mile

West Crater

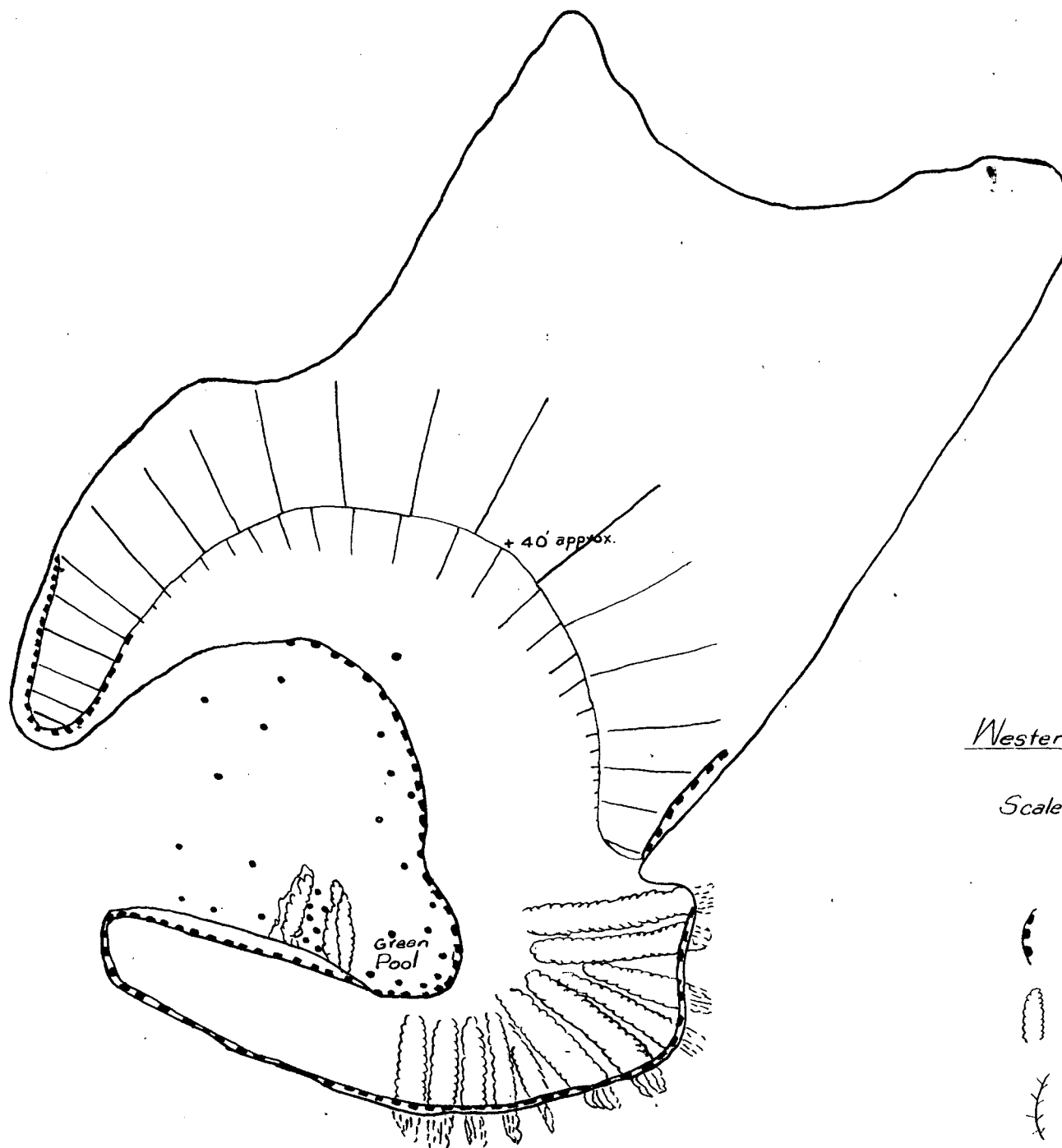
East Crater

2° 26' 50"

147° 18' 55"

Active area plotted by
M. V. Bulolo 22 Nov. 1953.

Approximate upper
boundary of submarine structure



Western Tulumán Crater
as at 19-7-54

Scale 1 inch = 200ft approx.

Legend



Cliffs



Lava flows



Crater Rim

• Approximate position of
ebullient springs