Chapter III. Lava Outflows.

23. Rate of lava flow. The lava of the recent Sakura-jima eruption, like those of the 1779 and 1468–76 outbursts, had a low degree of fluidity and became quickly coated with crust broken up into angular blocks, being in this respect quite similar to the Temmei (1783) lavas of Asama-yama. (See figs. 56, 57, 59, 78, 89, 103, and 128.) On the western eruption field, the lava began to flow out probably at about 8 p.m. on the 13th of January, 1914, and has run down a slope distance of about 2.7 km in the subsequent 11 hours, till the advancing front of the stream was within about 500 m from the coast at about 7 a.m. on the next morning. Then, the lava reached the coast in the morning of the 16th, advancing thence into the shallow Kagoshima strait, till it covered a distance of 600 m and reached the islet of Karasu-jima at about noon, on the 18th. On the morning of the 25th of the same month the lava front was found to have advanced a further distance of about 400 m. The approximate average velocities of the lava progress during these different epochs were as follows:—

(Jan. 1914.)			Mean epoch.
13th, 8 p.m.—14th, 7 a.m.	Velocity	=245.4 m/h	(14th, $1\frac{1}{2}$ a.m.)
14th, 7 a.m.—18th, noon.	,,	= 10.9 ,,	(16th, $9\frac{1}{2}$ a.m.)
18th, noon—25th, noon...	,,	= 2.4 ,,	(22nd, 0 a.m.)

The increase with time of the distance travelled by, and the decrease in the average frontal velocity of, the lava stream is illustrated in fig. 63; the velocity decrease, which was from 245.4 to 10.9 metre/h in the course of the $2\frac{1}{3}$ days from the 14th to the 16th, being approximately in the relation of a logarithmic curve. It may be remarked that on Jan. 22nd, 1914, the velocity of the north *side* of the lava stream flowing to the south of Hakamagoshi was found to be about 1 foot per hour, which is much smaller than that of the frontal motion corresponding to the same date, namely, of 2.4 metre/hour.

On the eastern eruption field, the lava flowed down on the 4th of March, 1914, already to a submarine point 3 km distant from the original coast of Arimra, giving the average velocity of 4 m/h during the time interval concerned. In June next, when the soundings were taken by the Imperial Navy, the lava front was found to have advanced a further distance of about 1 km, giving the average velocity of 0.28 m/h. As may be seen from the diagram (fig. 63), this flow velocity was several times higher than

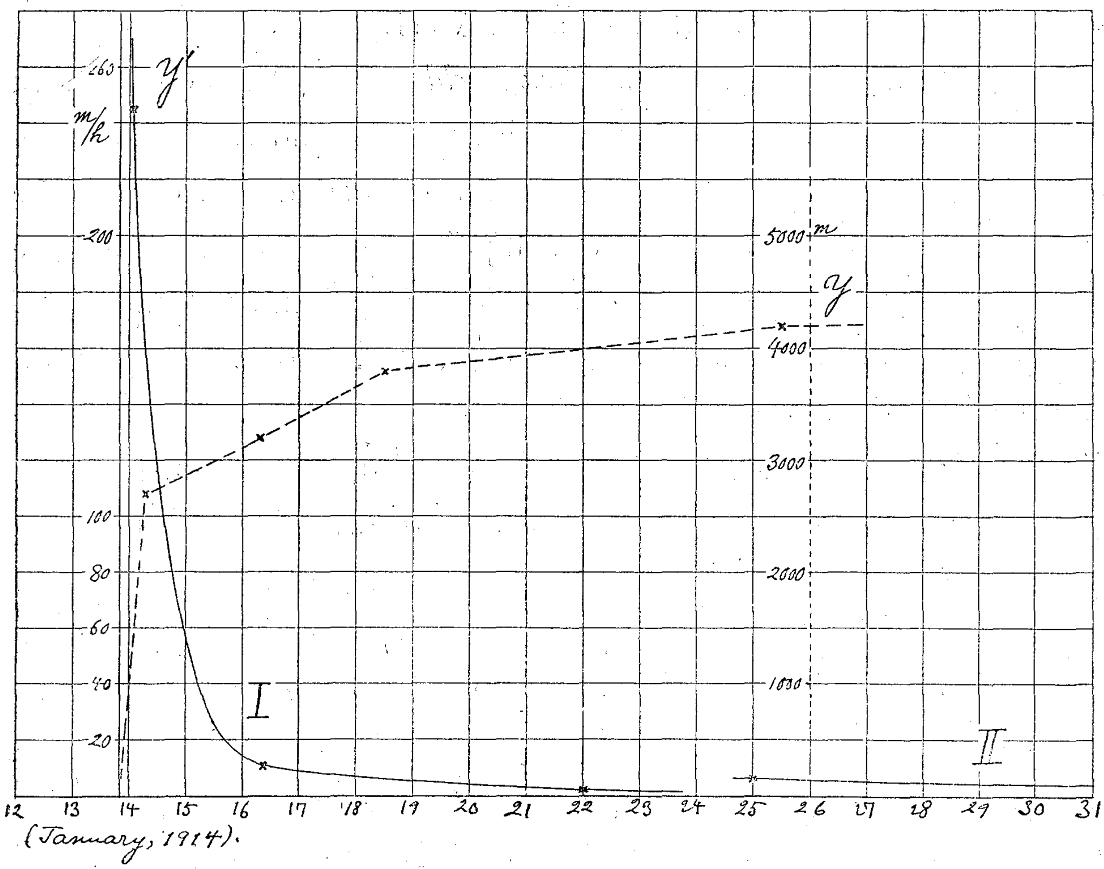


Fig. 63. Progress of the Western Lava Stream.
I: y' = Mean transit velocity of the lava stream in metre/hour.
y = Extension (length) of the lava stream, in metres.
[II relates to the mean velocity of the eastern lava flow.]

the corresponding value for the west side field, due doubtless to the difference in the volume of the moving lavas and the sea-depth off the two different coasts of Sakura-jima.

24. Condition in 1914 and 1915. The western lava field attained nearly its full extension in the course of one month or so, owing to the early cessation of the outbursts from the western craterlets. The eastern lava field, whose submerged portion reached approximately the maximum elongation also in a comparatively short time (§ 23), continued to exhibit till the beginning of 1915 signs of activity consequent to its forward displacement; the terminal front, or the new sea coast, giving rise to innumerable vapour issues and to very frequent occurrences of small avalanches of the hot lava masses. (See Chapter VIII.)

Jan. 19th, 1914; *Western Lava Field.* The sides of the lava streams were constantly crumbling down with loud rustling noises, and caused each time an uprush of brownish dusts; during the night red glares being seen at several points of the lava fields. The distance between the S. base of Hakamagoshi and the N. side of the main lava stream, which had been about 120 ft. at 2 p.m. on the previous day, was reduced to about 12 ft. at 11$\frac{3}{4}$ a.m. on the 19th; this space having again been covered up in the course of the next 1 hour, due partly to the shaking down of the lava masses and partly to the lateral extension consequent to the settling down of the lava along the central portion of the stream. The velocity of the downward progress of the lava stream *side* was then about 1 ft. per hour. At the end foot of the N.W. branch stream of the western lava area, where it emerges from the valley along the hill groups above Akobaru, there were several large rock pieces which had crumbled down the slope (fig. 57). One of these was a massive parallelopipedal block measuring 9×9×15 ft., which was cleft at a corner to the width of about 4 inches. The exterior side of the block was still too hot to be conveniently touched with hand, and had probably a temperature of 60° or 70° C. The inside of the block was, however, still in a semi-molten condition, and was red-hot to within 1 metre from the edge, representing approximately the rate of cooling of the surface lava mass during the 5 days since the morning of the 14th (Jan. 1914), when the molten stream had reached the place in question.

The nearest distance between the beach line of Akobaru and the outermost base of the branch lava flow under consideration was approximately 221 m on April 18th, 1914, at the low-tide time, while it was found to be 216 m on Sept. 23rd of the same year, at a full-tide time. It thus follows that the advance of the Akobaru lava stream came to a standstill some time before the middle of April, in 1914, or within 3 months after the commencement of the eruption.

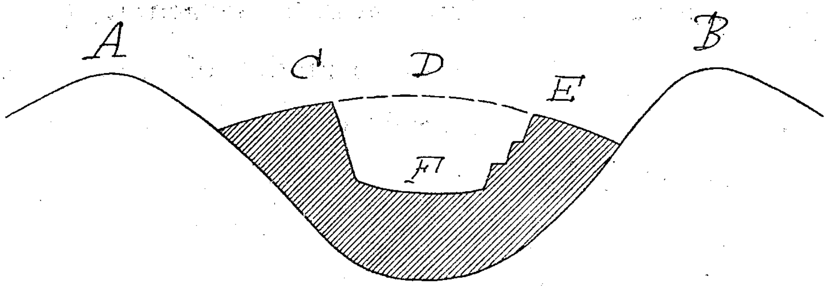
Sept. 27th, 1914 ; *Eastern Lava Field.* It was noticed that the side and front of the lava flows crumbled down from time to to time. The escape of the white fumes from the side moraine of the lava at Yunohama, generally from the middle and lower portions, was limited to the distance of about 300 m from the coast. The distance between the W. boundary of the lava field and the E. limit of the village of Yunohama was 342 m.

April 1915. 19*th* : when it was raining, thin smoke columns were feebly rising from the land lava area to the N.E. of Hakama-goshi, while white vapours were abundantly given out from the portion projecting into the sea to the S. of the latter platform. 21*st* : On the Arimra side, much white vapours were thrown up from several points in the front portions, sometimes accompanied by rustling noises. (See also Chapt. VIII.) There was now no crumbling down of the side moraine of the lava flow at the coast of Yunohama. During an ascent to Nabe-yama on the 22nd, it was noticed that there was at its S.E. foot a small area in which the trees were dead but remained standing ; this being no other than the space left uncovered by the lava streams which flowed down from the craterlets Nos. 4, 4′, and 5 on the one hand and from the craterlets Nos. 6 and 7 on the other.

25. Lava cascades. Lava cascades were formed by the molten rock which flowed into the crater or the central hollow space of Nabe-yama and along the ravine between the N. side of the latter and the S. side of the adjacent Gongen-yama (figs. 84, 85, and 83). Unlike the ordinary lava streams of Sakura-jima these are compact, giving approximately an even top plane, and not having rugged broken up surface, due doubtless to an immediate proximity to their source, probably the eastern No. 2 double craterlet, and to their formation while the lavas maintained a very high degree of fluidity. In the Nabe-yama crater, the inflow of the lavas took place principally in two successive stages, the lower edge of the cascade being arranged in two steps.

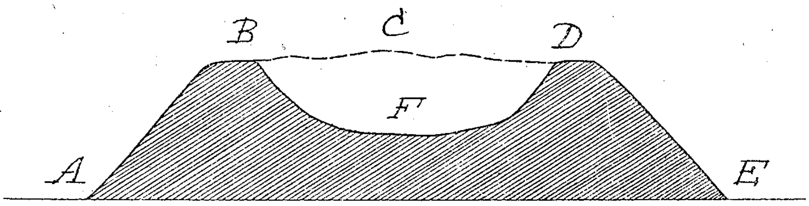
26. Marginal terrace and side moraine. A lava stream of the Sakura-jima type, which continues its progress for a considerable length of time, although with a rapidly decreasing speed, is quickly coated with a layer of solidified rocks. As, however, the inner mass is hot and flows on, there will be soon left a vacant space beneath the surface crust, causing the latter to settle down through a more or less considerable vertical distance. If the lava outflow takes place along a valley, as in fig. 64, there thus results a sort of horizontal or inclined terrace on each side of the central depression CFE. The dislocation boundary at C and E may be very steep or may form a gradual slope. Thus at a point on the S. slope of the

Fig. 64.



Diagrammatic Section of a Lava Stream flowing down a Valley.
CDE......Initial surface.
CFE......Depressed surface.

Fig. 65.



Diagrammatic Section of a Lava Stream flowing down an Inclined Plane.
BCD......Initial top surface.
BFD......Depressed top surface.

elongated 360 m hill above Akobaru, the terrace was 90 m in width and its rough surface sloped down at an inclination of about 17°, while the lower cliff was nearly perpendicular and about 45 m in depth. (See fig. 53.) On the opposite side, at the N. slope of Atago-yama above Akamizu, the dislocation took place in three successive steps, the upper two of which together had a depth of 20 m. If the lava stream expands over a flat ground, the initial surface form BCD of the outflow (fig. 65) will be changed by the middle subsidence into BFD, leaving on each side a well defined ridge moraine of rough rocks. The formation of the moraine may be marginal or terminal and is to be met with almost always in the lower course of a Sakura-jima lava stream. At Yunohama, on the S.E. coast of the island, the western marginal moraine had a vertical height of about 80 m with a side inclination of 35°½. (See also § 27.)

27. Height and slope inclination of lava stream. (See figs. 89 and 128.) The heights and the slope angles of the marginal and terminal sides of the new Sakura-jima lava streams, determined at different places from measurements with a clinometer and a prismatic compass, are as follows.

Place.	Terminal " Moraine."		Marginal " Moraine."	
	Slope Angle.	Height.	Slope Angle.	Height.
Yunohama, at sea-coast.	—	—m	35.°5	80m
Seto Strait Lava opposite Ushine.	30° apprx.	75	—	57
Above Nojiri.	39.°0	—	39.°5	—
"	41.°0	60 apprx.	—	—
Akamizu, on shore.	—	—	41.°0	19
" , in sea.	—	—	32.°5	17
Bummei Lava, near Nojiri.*	35.°5	37	33.°5	—

(*) This refers to old lava outflow.

From the above list the terminal and marginal slope angles seem to be practically alike, both varying from a little above 30° up to 41°, giving the mean value of 36°. The slope inclinations of the side cone Hikinohira and of the upper part of Minami-dake (South Peak) are of a practically equal amount, being from about 33° to 37°, as shown below.

Place.	Slope Angle.*
Kwannon-zaki. (Terminal.)	36°
Tatsu-zaki, near Furusato. (Terminal.)	34°
Minami-dake (S. Peak), W. slope, near the top.	33°
" , E. slope, "	34°
Hikinohira (S.W. slope).	37°
Nabe-yama (N. slope).	39°

(*) Measured from the new Military Survey 1/25.000 map of Sakura-jima.

The slope angle of the old lava outflows of Bummei period (1468–76) and of much earlier dates such as those forming the promontories of Kwannon-zaki and Tatsu-zaki is also equal to 34° to 36°. The very steepness of the slope (=39°) of Nabe-yama, which is originally made up entirely of pumice, might have been caused by the strong denuding influence of rain.

The formation of the terminal and marginal sides of a lava outflow is in the first place due to the greater mobility of its inner and lower positions ; the top surface layer, hardened into crust, tending to lag behind. The final amount of inclination of the slope, however, must be equal to the angle of repose of the volcanic material determined by the coefficient of friction of the latter. It is probably owing to this circumstance that the inclination angle of a lava flow is approximately equal at the terminal and side slopes.

According to the above given table the maximum height or thickness of the new Sakura-jima land lava outflows along the side and terminal slopes was 80 m. The submarine lava outflow off the south-eastern coast of the island was much greater, reaching the amount of 123 m (§ 31). Again the lava accumulation in Seto Strait attained the total vertical thickness of about 180 m (Chapter IV).

28. Soil forced up by advancing lava flow. At the front base of the Akobaru branch lava stream the soil was forced up to stepwise terraces with the maximum vertical height of about 7 metres. (See the photograph, fig. 56.) This is evidently the result of the advancing lava mass having been more or less abruptly brought to a stoppage, which exerted a heavy pressure to the underlying sandy or pumiceous slope soil with a small inclination angle (fig. 66). At the rest of the western eruption field, a similar effect was not observed, either having been masked by the layer of fallen pumice

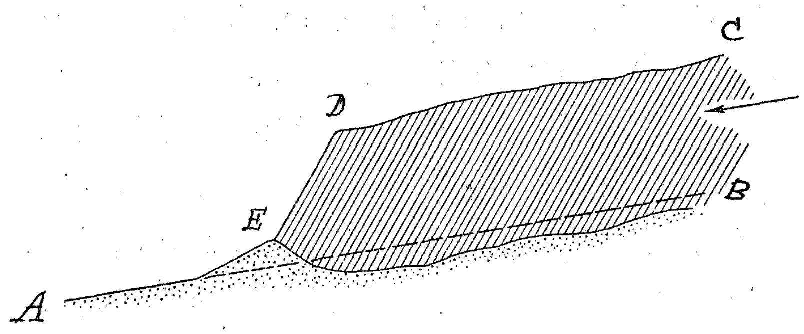


Fig. 66. Hard lava stream (DB) causing the soil (E) in front to be forced up.

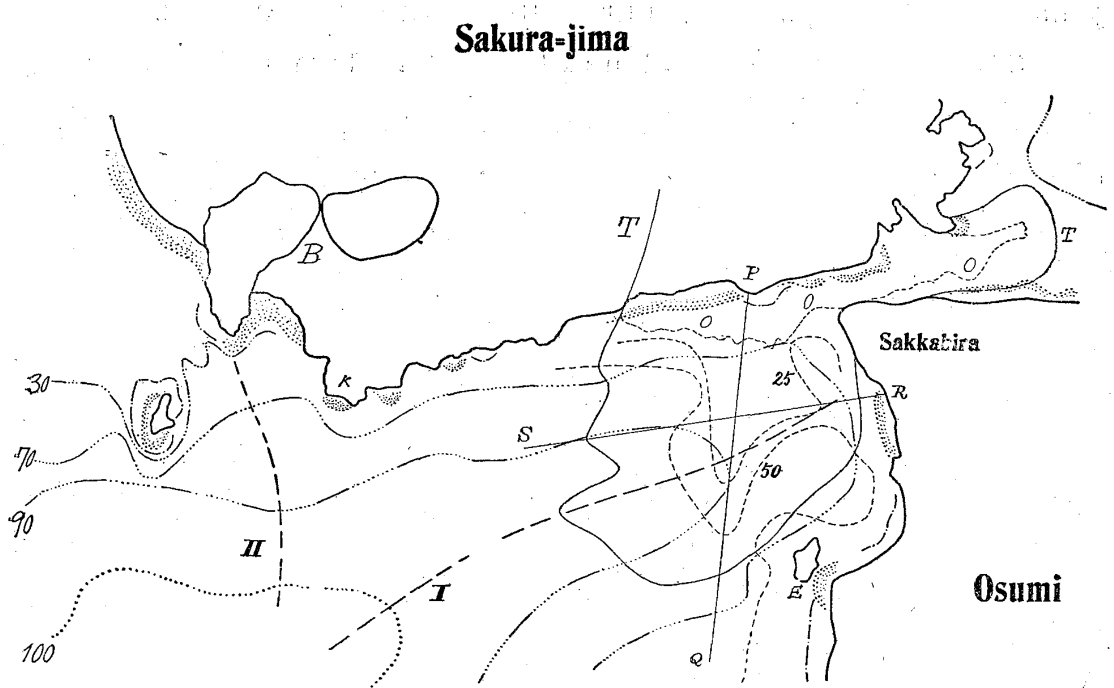
and ash or having been not produced on account of an easy down-flow. Again, at Krokami the lava flow along the nearly level E. base of Nabe-yama was not accompanied by the soil raising.

29. Submarine lava flow and new-islet. According to the report from the Tarumizu police office under the date of March 6th, 1914, vapours had been emitted two days previously from under the sea at three places between Eno-shima and Sakura-jima, and the water depth, originally 70 to 80 fathoms, had been reduced to 40 to 62 fathoms. It thus seems that the eastern side lava stream flowed down into the water and reached, already on the 4th of March, 1914, a submarine distance of some 3 km from the former coast line.

In the photograph (fig. 81) taken from Tarumizu on Feb. 24th, 1914, there is indicated a flat lava islet, which thus had been formed prior to the date here mentioned, and which is the same as that described in Chapter V under the name of Arimra-jima.

30. Note on the form of lava outflow. The outflow of lava takes place of course essentially in the form of stream lines along valleys or lowest portions of mountain sides or bases, both above and below the surface of sea. The form of a new lava promontory is thus determined by the contour of the adjacent sea-bottom. Thus, in

Fig. 67. Map showing the Water Depth off the S. Coast of Sakura-jima and the Dependence of the Direction of New Lava Promontories on the Contour of Sea Bottom.



B......Lava flow of Bummei (1475–1476).
TT... „ Taisho (1914), partly submerged.
30 ; 70 ; 90 ; 100......Lines of depths respectively of 30 ; 70 ; 90 ; and 100 fathoms, *before* the Eruption of 1914.
25 ; 50......Lines of equal depths respectively of 25 and 50 fathoms, *after* the Eruption of 1914.
00......New lava coast in June 1914.
I, II......Zones normal to the submarine contour lines.
k......Kwannon-zaki. E......Eno-shima.

the case of the recent lava outflow on the eastern side, the main extension of the submerged portion is very nearly at right angles to the series of the curves of equal depth of 70–90 fathoms, descending and converging to the trough zone I, or the deepest portion in the vicinity (fig. 67). Again, the direction of the Moe-zaki, or "Burning cape," formed during the eruption of Bummei period (§ 8, in the preceding Number of the Bulletin) at the S.W. extremity of Sakura-jima, B in fig. 67, is deflected from the course of the same lava flow on land, having been bent towards the south-east where the sea is much deeper than on the other side. In the recent eruption, the western lava flow was naturally divided into two courses at the obstacle presented by the islet of Karasu-jima, which itself was also buried under the molten mass.

31. Submarine extension of the eastern lava outflow. In fig. 67 are indicated the lines of equal water depth off the S. coast of Sakura-jima before the eruption, as well as those drawn according to the results of the new soundings undertaken by the Admiralty in June 1914. It will be observed that after the eruption the line of 25-fathom depth stretched from the former 103 m hill (P in fig. 67) on the original coast between the villages of Seto and Arimra towards south a little west for the distance of about 1600 m from the new margin. The line of 50–fathom depth is situated generally not much distant from the above-mentioned depth line. In the following table I give a comparison of the water depths before and after the eruption at different points along the nearly north-south line PQ, approximately forming the axis of the greatest submarine lava accumulation, and also along a line RS about 1500 m distant from the former island coast and situated nearly in the east-west direction (fig. 67).

TABLE III. Water Depth off the S.E. Coast of Sakura-jima before and after* the Eruption of 1914.

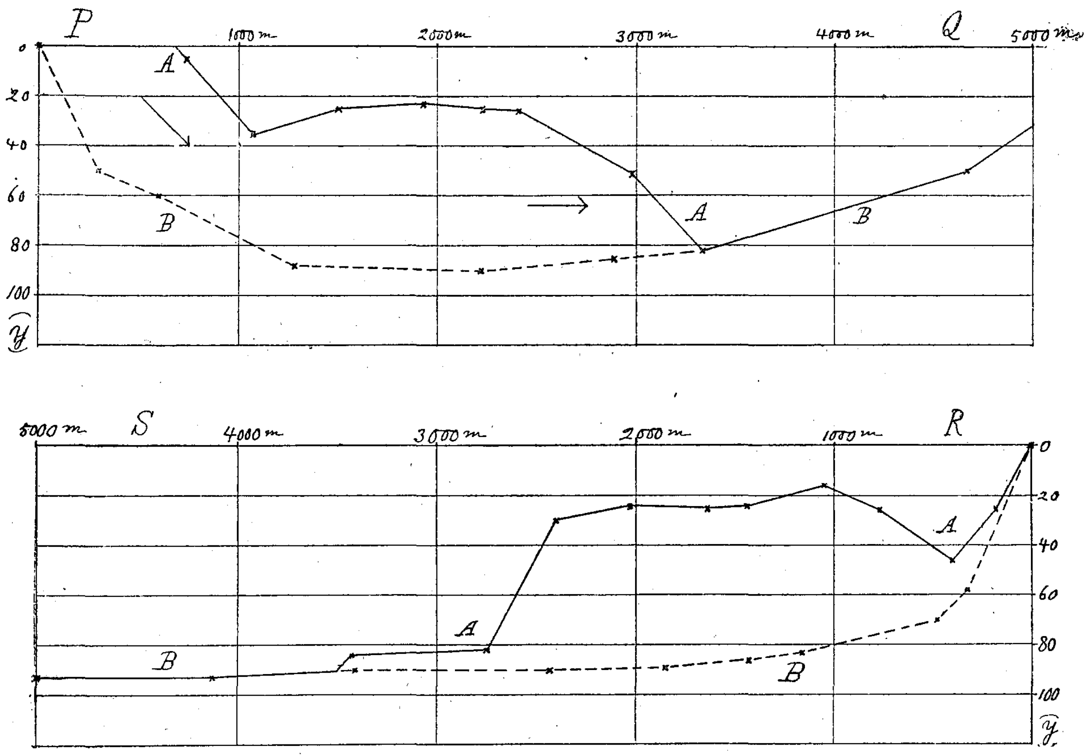
Along the N.-S. Line PQ.			Along the E.-W. Line RS.		
Distance from the coast of Sakura-Jima.	Water Depth. Before.	Water Depth. After.	Distance from the coast of Sakura jima.	Water Depth. Before.	Water Depth. After.
300 m	50 fathoms.	(Filled up.)	185 m	— fathoms.	25 fathoms.
600	60	(Do.)	323	58	—
740	—	5 fathoms.	402	—	46
1070	—	35	480	70	—
1280	88	—	770	—	25
1500	—	25	1050	—	16
1930	—	25	1160	83	--

TABLE III. (*Continued.*)

Along the N.-S. Line PQ.			Along the E.-W. Line RS.		
Distance from the coast of Sakura-jima.	Water Depth.		Distance from the coast of Sakura-jima.	Water Depth.	
	Before.	After.		Before.	After.
2220m	90 fathoms.	— fathoms.	1430m	86 fathoms.	— fathoms.
2230	—	25	1440	—	24
2410	—	26	1640	—	25
2890	85	—	1850	89	—
2980	—	51	2030	—	24
3330	82	82	2400	—	30
4660	50	—	2430	90	—
5030	32	—	2750	—	82
			3420	90	—
			3430	—	84
			4130	93	—
			5250	—	93

(*) In June 1914.

As will be seen from the graphical illustrations in fig. 68, the submarine lava accumulation along the N.-S. line PQ was great for the extension of 3000 m from the former S. coast of Sakura-jima. The maximum thickness of the lava layer was about 67 fathoms or 123 m, such that the depth was reduced from 90 to only 23 fathoms. Again, along the E.-W. line RS the submerged lava layer had a thickness not much different from 65 fathoms or 119 m between the distances of 1000 and 2500 m from the coast of Ōsumi. Making an allowance for the slope of the sea bottom, the submarine lava stream seems to form a flat mound of a nearly constant height in the transverse section, much similar to the hill group of 120 to 400 m height situated above the village of Akobaru on the lower base of the western flank of Sakura-jima mountain.



Figs. 68 (upper) and 69 (lower). Diagrams showing Accumulation of Lava at Sea Bottom off the S.E. Coast of Sakura-jima.

PQ......A nearly N.-S. line forming the axis of the greatest submarine lava accumulation.
RS......A nearly E.-W. line at right angles to PQ.

BB......Original sea bottom.
AA......New sea bottom, or lava accumulation.
y......Depth below the sea surface, in fathoms.

32. Steaming circle (arcs). As will be seen from the sketch (fig. 70), which represents the views taken on April 30th, 1915, from a height of about 500 m above sea-level near Hikinohira, of the lower portion of the eruption field on the western side, a series of white small steam columns was issuing from the western portion of the lava area between Hakamagoshi and the new Karasu-jima bay (k, fig. 71), along a nearly closed ellipse about 100 m parallelly distant from the lava coast, whose diameters were about 1100 m and 500 m respectively in the N.S. and E.W. directions. (See figs. 71, 104, and 105.) The back side of the circle, near which there were also two short series of small steam columns, is located some distance outside the former coast line. This ellipse or circle of steam, which had already been noticed at the time of the present author's 2nd visit to Sakura-jima, in April 1914, still maintained nearly the same condition in Sept.–Oct., 1915,* and is likely to remain so for some time to come. The vapours, whose issue was generally most abundant in the early morning, were sometimes completely invisible in afternoon hours of fine days, being entirely dissolved in the warm air. The steam columns, whose

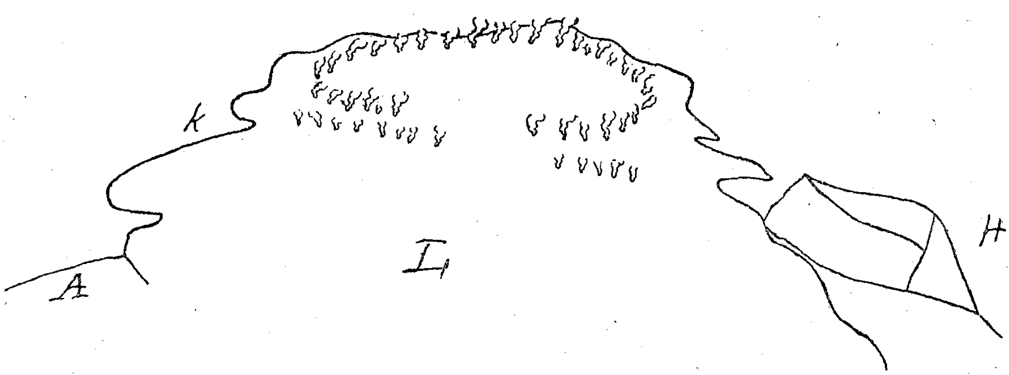


Fig. 70. View of the Steaming Circle on the Western Lava Field taken from the vicinity of the Lava Source No. 2 to the North of Hikinohira.
H......Hakamagoshi. A......Coast of Akamizu. L......Lava field.
k......Small inlet near the former Karasu-jima.

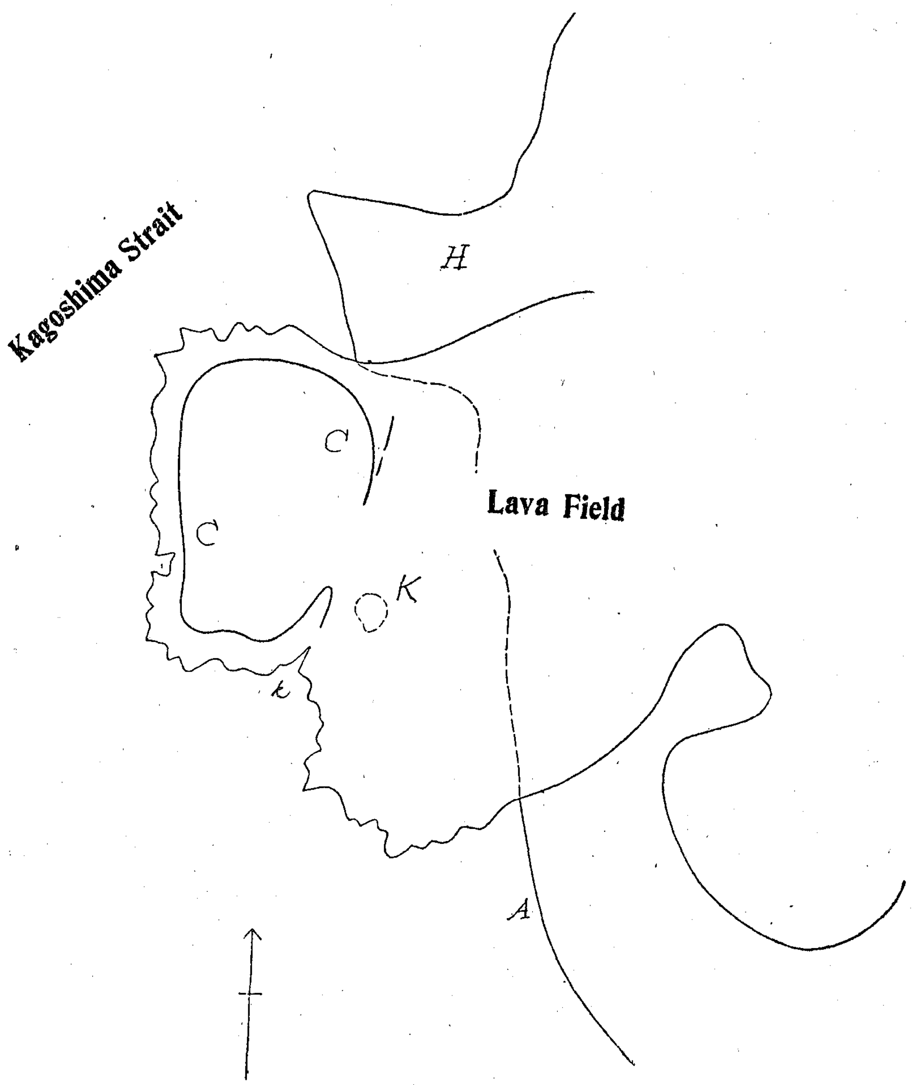
usual height was 50 to 100 metres, were much augmented in force and rose to about 300 m above sea-level, after a heavy precipitation of rain as, for instance, on Oct. 1st, 1915.

The *circle* of steam is evidently no other than a particular sort of the line of dislocation or subsidence, formed inside the boundary "moraine" of a lava field (§ 26), the sea-water soaked through which constituting the white smokes given out along it. The width of the marginal terrace, or the space between the lava edge and the curve of dislocation CC (figs. 71 and 105), is broader than

* On Sept. 28th, 1914, the steaming was taking place from about 30 different places along the circle situated inside the lava coast line.

in the case of the descent of a lava stream along a valley course, as the absence of barriers (mountain sides) allows the free side expanse of the lava in its first outflow.

Fig. 71. Plan showing the Position of the Steaming Circle (CC).



H......Hakamagoshi. A......Coast of Akamizu. K......Karasu-jima (buried).
Dotted line between A and H marks the former sea-coast.

33. Absence of steaming circle on Arimra lava field. A striking feature in connection with the steaming circle on the western lava field considered above is the absence of a similar phenomenon on the much more extensive Arimra lava field, with the result that at the end of 1915, the latter became perfectly quiet with practically no issue of smokes. The cause of this difference seems to be two-fold, as follows :—Firstly, as the bottom of the

Fig. 72.

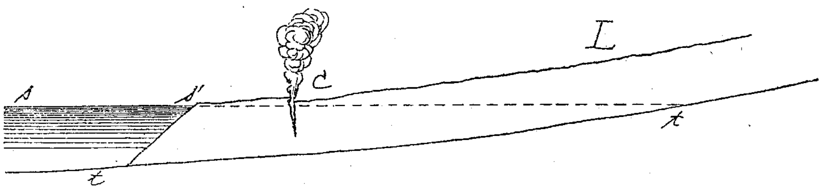
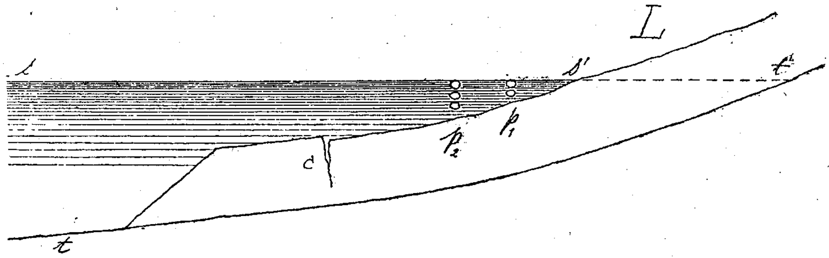


Fig. 73.



Figs. 72 and 73 illustrate respectively the Existence of Steaming Circle on the western lava field and the Absence of it on the Arimra lava field.

strait between Kagoshima and Sakura-jima is shallow (with the maximum depth of only about 23 fathoms) and of a gentle declivity, the inner hot mass of the lava stream tended to remain in its position, and conserve its heat ; while, as the sea off the southern coast of Sakura-jima is deep (maximum original depth=90 fathoms) and of a steep gradient, the interior lava mass must have progressed swiftly on, tending to discipate the heat with a comparatively quick rate. Secondly, unlike the western lava field whose surface is practically above water, the Arimra lava is submerged for an extension of about 4 km, thereby sustaining a weight of water column increasing at the top surface near the front margin of the lava stream to a depth of about 30 fathoms. This pressure must effectively prevent the escape of steam from the surface of the submerged lava field except in the form of bubbles through shallow water, a fact which has actually been observed.

34. Temperature of fumaroles. (See Table IV.) The thick layer of ashes and sand covering the higher portion of the lava streams on the eastern side maintained in 1914 and 1915 still fairly high temperatures of over 80° C. This heating effect seems to be due to the hot gases and steam set free from the buried lava masses which were partly diffused among the pumice bed and loose surface deposits, and partly escaped into the air along innumerable fissure lines, forming the miniature fumaroles and solfataras. The temperature of these latter was sometimes above 100° C, but was reduced, with the decline of their force, to a degree not much different from that of the ash and sand layer.

On the western lava field there was no very thick covering of ash and sand, and the temperature measurements given in Table IV have been made mostly at the vicinity of the lava source to the S.W. of the 400 m hill ($1\frac{1}{2}$ km to the N.W. of Hikinohira), where the ridge ground was very much cracked and dislocated, and was emitting hot gases of bad smell. In April 1914, one of the small fumaroles indicated a temperature of 87° C. In April 1915, the ground, where no actual fumarole existed, had in an instance a temperature of 76° C, while a fumarole indicated at a 25 cm depth a temperature of 90° C. On the whole, it seems that there existed no special difference in the temperatures of the fumaroles and solfataras between the E. and the W. side lava fields. According to Table IV, there were cases in which the surface temperature of the fumaroles decreased from 87° C to 68° C in the course of one year between April 1914 and April 1915, and also from 87° C to about 70° C during the 5 months, April to Sept., in 1915. Other, possibly newer, ones had much higher temperatures of 88°.6 to 91°.0 at the latter date.

Fig. 75. General view of the Eastern Craterlets Series taken from the S.E. shoulder of Nabe-yama. Minami-dake top (M) is shown on the background.
1′, Uppermost "chimney." 1, 2, 3, 3′, 3″, 4′, 4, 5 are respectively Nos., 1, 2...5 craterlets.

Fig. 74. Western No. 1. Craterlet, showing the bottom and the upper portion of the southern side wall.

Sakura-jima Eruption of 1914. (F. Omori, photo.)

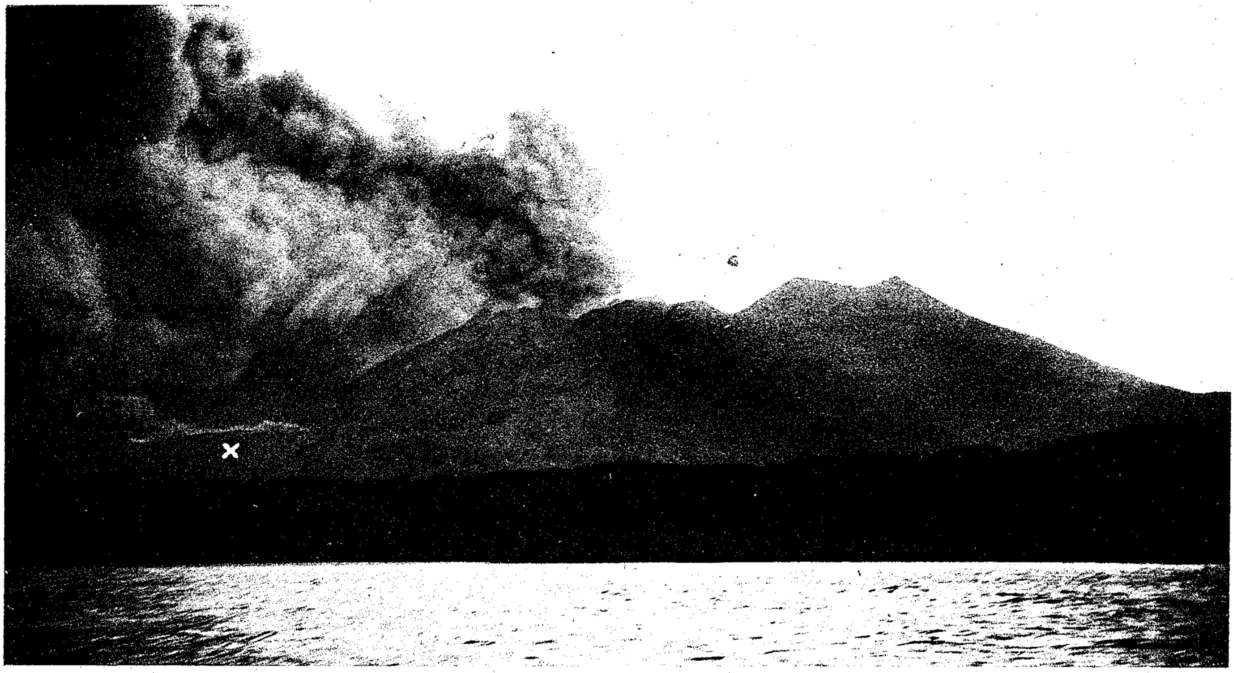


Fig. 76. Sakura-jima and the eastern outbursts seen from the east, showing amongst the others the horizontal ejection of white smokes (×) from the uppermost orifice, or the "Chimney". (Jan. 16th, 1914.)

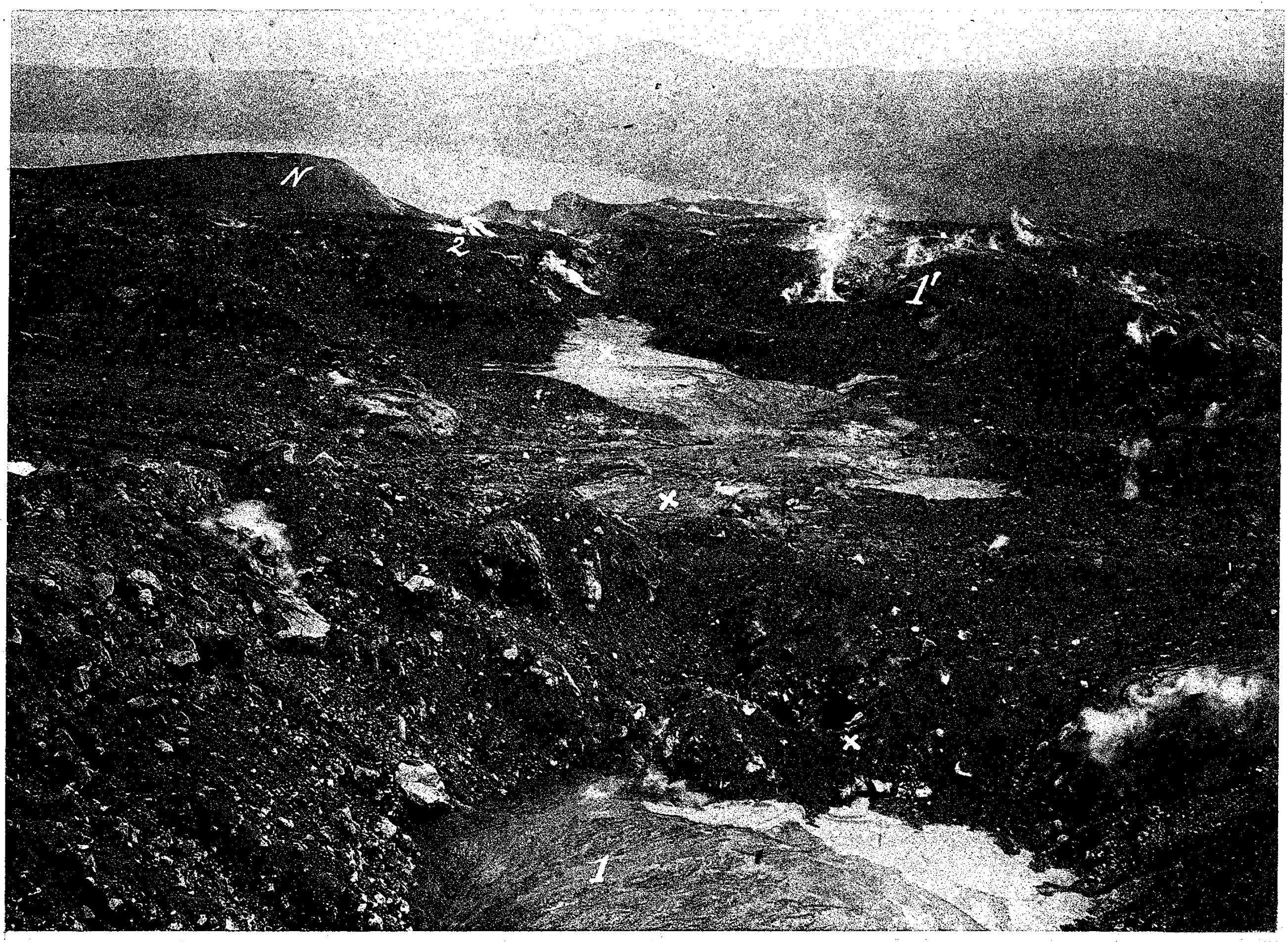


Fig. 77. General view of the Eastern Eruption Field taken from the upper rim of the No. 1 Craterlet (1). From the latter a depression zone or Eruption Canal (×......×) leads toward the Nabe-yama Crack. (April, 1915).

(N), Highest point of Nabe-yama. (1'), A small craterlet. (2), Craterlet No. 2.

Sakura-jima Eruption of 1914 : the Outbursts from the Eastern Craterlets seen from the north eastern or Krokami side. (F. Omori, photo.)

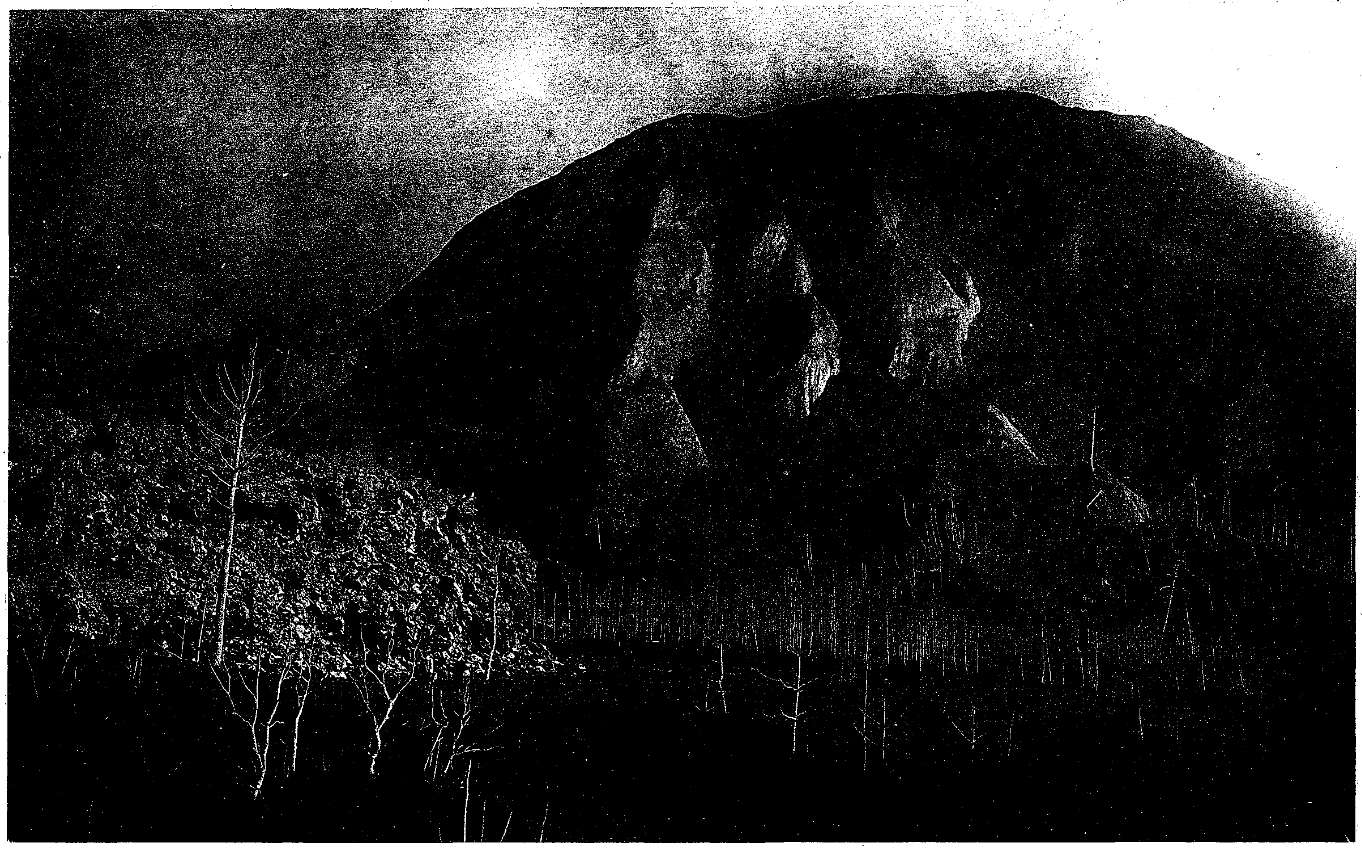


Fig. 78. Nabe-yama, seen from the N.E., with a lava stream at the left-hand side base. (Jan. 23rd, 1914.)

Fig. 79. Nabe-yama (at centre of figure) seen from the plateau ground of Krokami, with the smoke columns rising principally from the No. 4 and the more eastern craterlets. The central and S. peaks of Sakura-jima are shown at the right-hand side. The heads of two stone gate posts, near which a man is standing, are shown out of the accumulated layer of pumice and ash. (April 1914.)

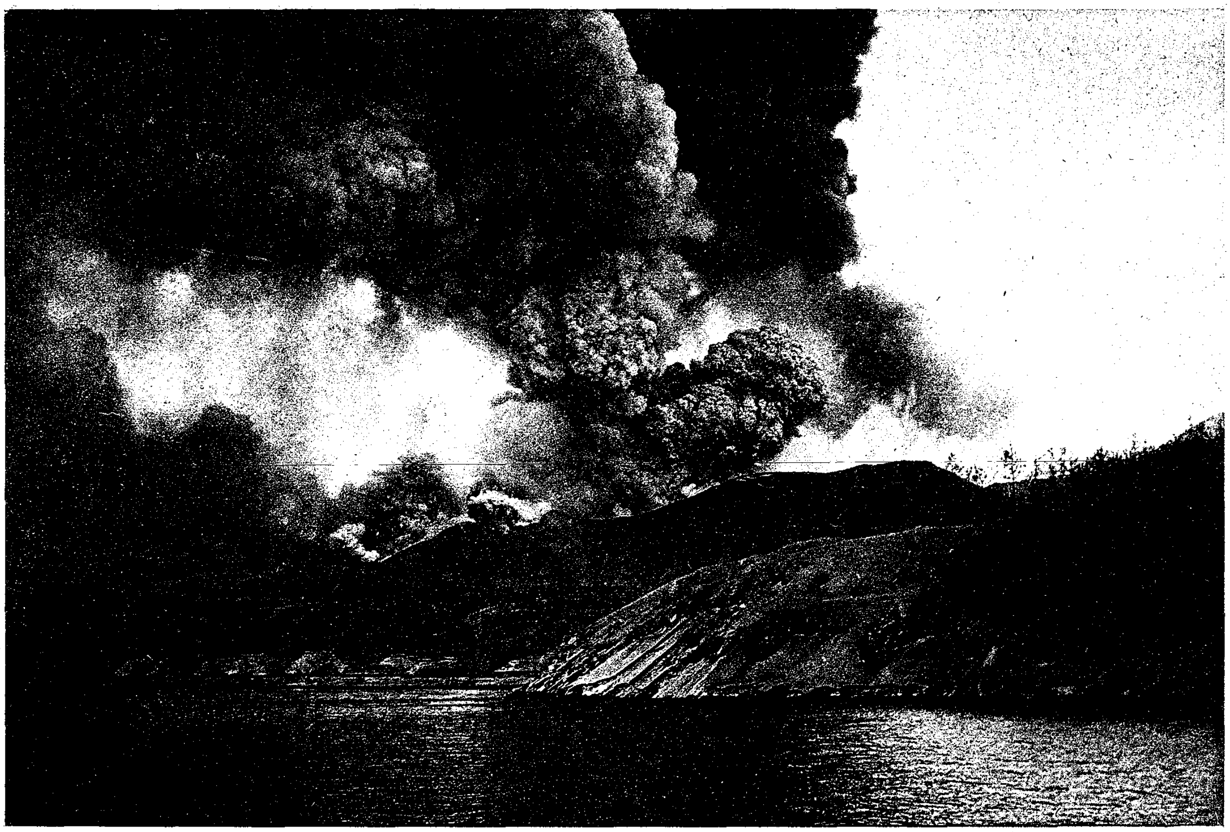


Fig. 80. Nabe-yama seen from the E. on Jan. 30th, 1914, the eruptions taking place actively from the Craterlets Nos. 2, 3, 4, 5, and 7. The houses belong to the Krokami village. (I. Watanabe, photo.)

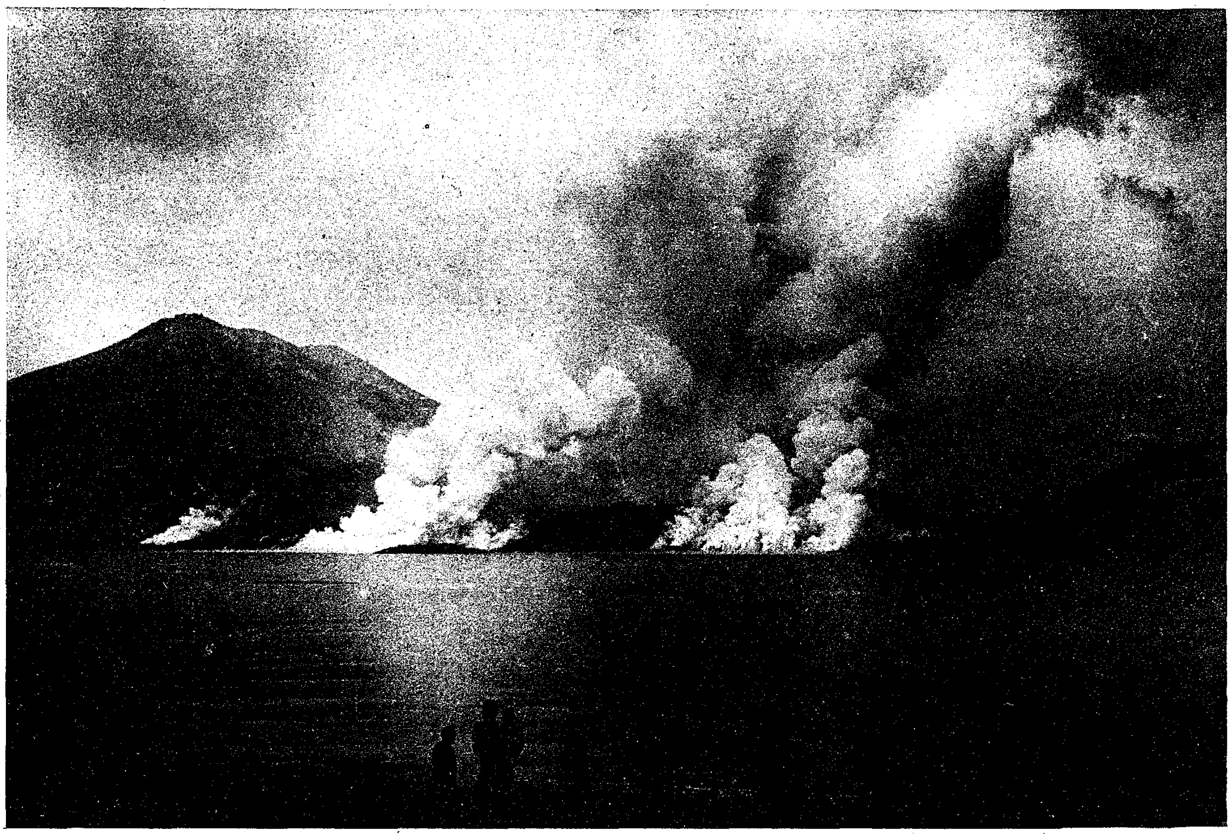


Fig. 81. View of the Sakura-jima peaks (left-hand side) taken from the coast of Kaigata, near Tarumizu (Ōsumi). An islet (Arimra-jima) is in existence in front of the left-hand side vapour column. (Feb. 4th, 1914. R. Higo, photo.)

Sakura-jima Eruption of 1914. (April, 1914. F. Omori, photo.)

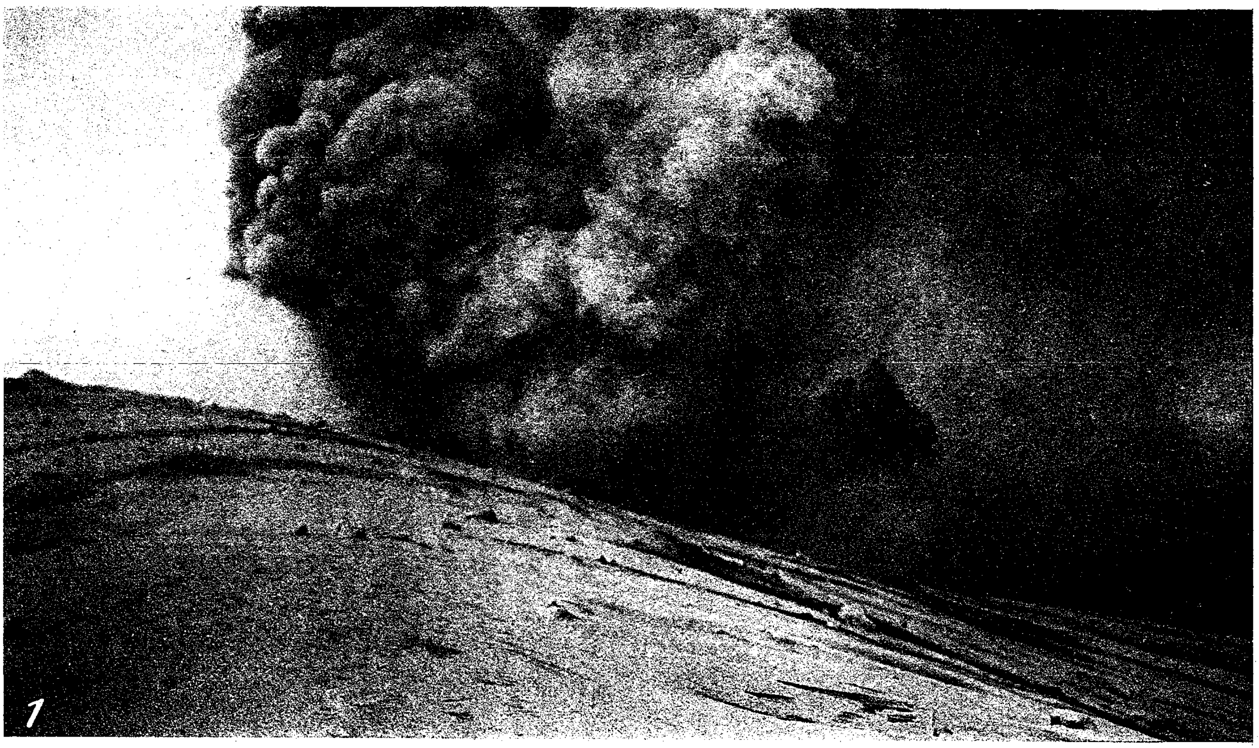


Fig. 82. Outbursts from the Eastern Craterlets Nos. 3 and 4 seen from the W. part of the top ridge of Nabe-yama (1).

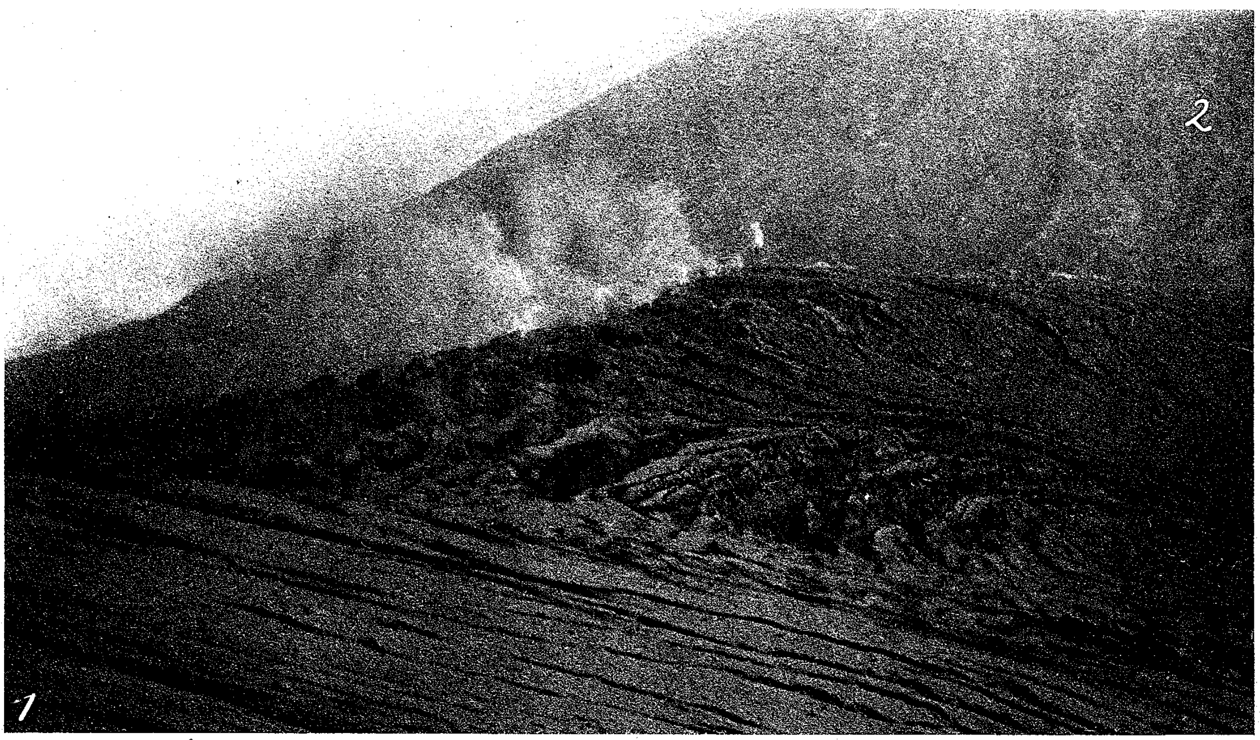


Fig. 83. View from the same point of the ash-covered upper part of the lava cascade which flowed from the Eastern No. 2 Craterlet to the valley between the W. flank of Nabe-yama (1) and Gongen-yama. (2), Eastern side of Minami-dake.

Sakura-jima Eruption of 1914 : the Nabe-yama Lava Cascades. (April, 1915. F. Omori, photo.)

Fig. 84. Lava flow on the N.W. flank of Nabe-yama, seen from Gongen-yama.

Fig. 85. Lava flow into the interior of Nabe-yama, seen from the opening on the east.

Sakura-jima Eruption of 1914 : View of the Eastern Eruption Field. (F. Omori, photo.)

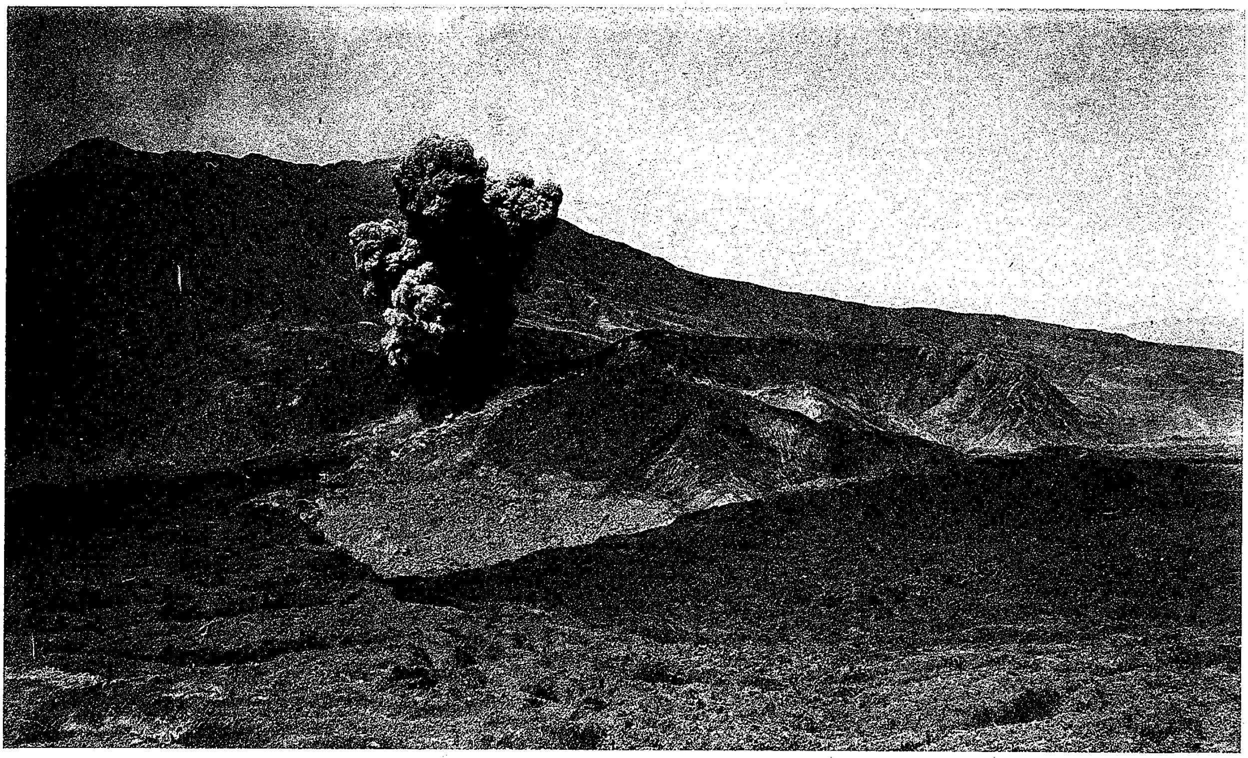


Fig. 86. Nabe-yama and an outburst from the Craterlet No. 4, seen toward the north-west from the top of Sakkabira Promontory. The central peaks of Sakura-jima are shown on the background to the left-hand side. (April, 1915.)

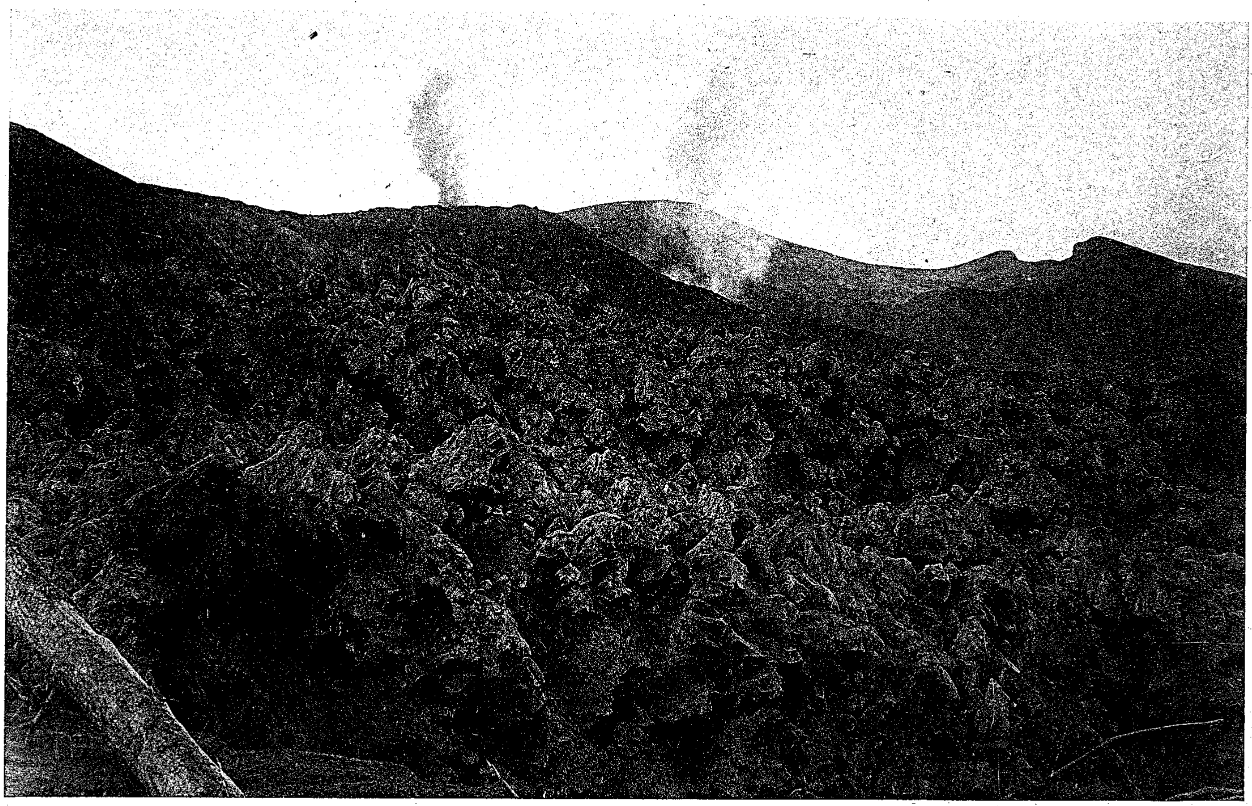


Fig. 87. Nabe-yama Eruption Crack seen from the west, with feeble smoke issues from the Craterlets Nos. 3 (left) and 4 (right). The beautiful patterns in front are the side moraines of the lava flows in the earlier stage of the eruption thickly covered with the ashes. (Sept. 1914.)

Sakura-jima Eruption of 1914. (F. Omori, photo.)

Fig. 88. Higher portion of the Eastern Branch of the Nabe-yama Eruption Crack, showing the ashy material of Nabe-yama and the new lava layer coated with ashes. (April, 1915.)

Fig. 89. S.W. terminal corner of the Eastern Lava Field, at the beach between Yunc-hama and the buried village of Arimra. (April, 1914.)

Sakura-jima Eruption of 1914 : the Eastern Craterlets.

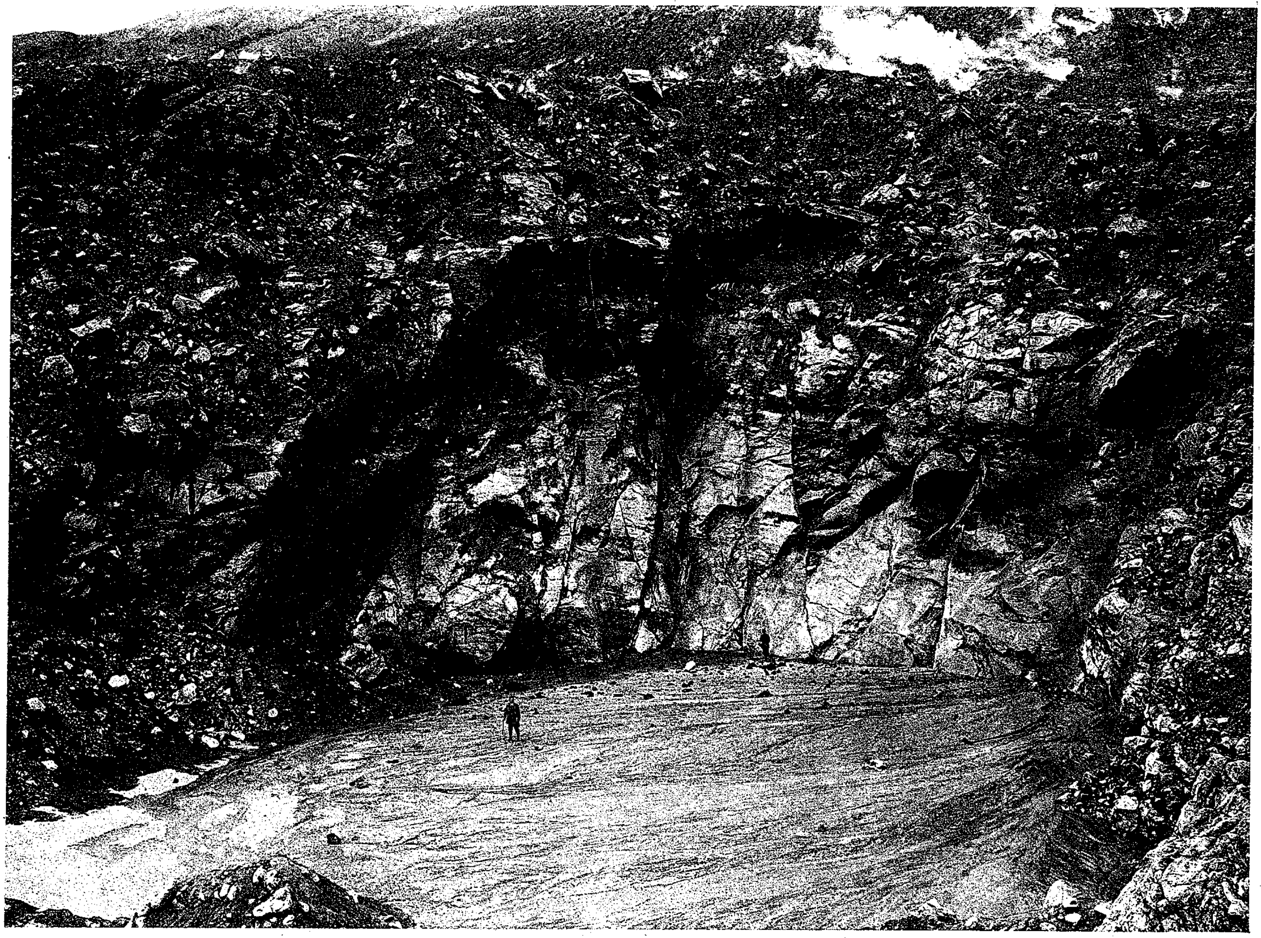


Fig. 90. Craterlet No. 1, seen from the lower or east rim. The bottom is completely filled with pumice and sand.

(April, 1915. F. Omori, photo.)

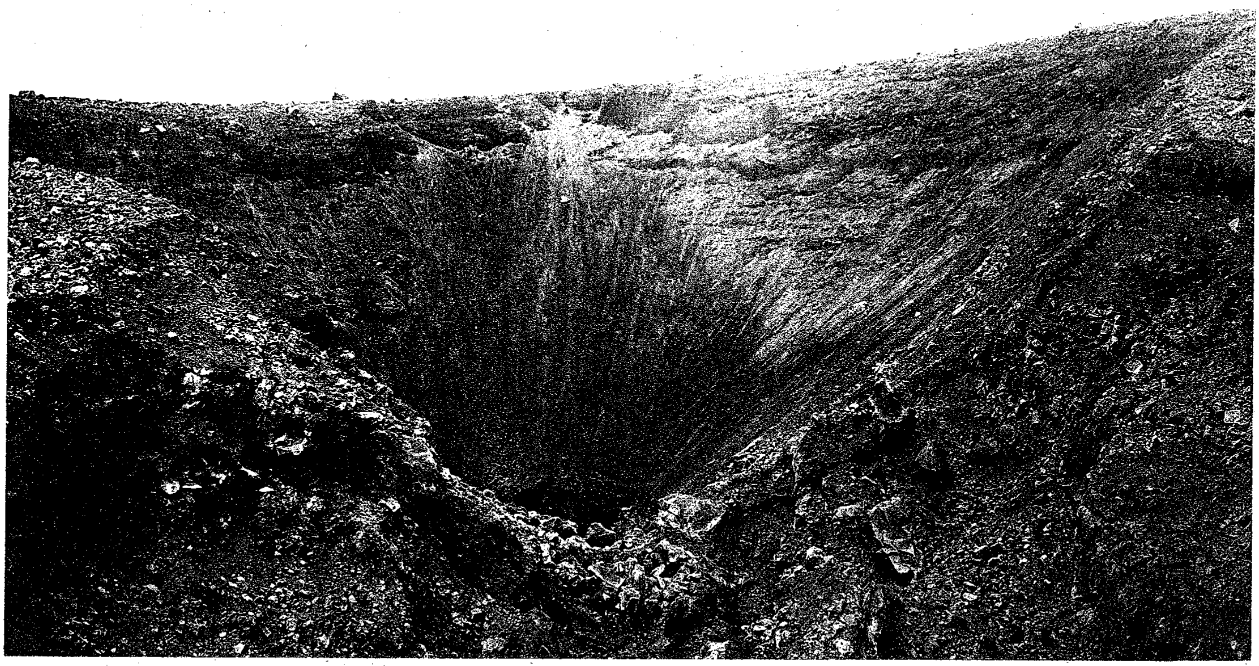


Fig. 91. Craterlet No. 4, seen from the ridge separating it from the lower and secondary craterlet No. 4′. At the bottom, a loose-looking mass of lava is shown.

TABLE IV. Temperature of Fumaroles.

(Figures within brackets denote the simultaneous air temperature.)

Date of Measurement.	Place.	Temperature.
	Western Eruption Field.	
April 8, 1914.	Fumarole on the ridge to the S.E. of 400 m Hill, above the two small secondary craterlets.	87.°0 C
April 30, 1915.	Fumarole at a locality nearly identical with the above, 412 m above sea-level: at surface.	68.°0 (22.°5)
	Do. : ½ feet below the surface.	80.°5
,, ,,	At the S.E. base of 400 m Hill, above the lava source: ordinary ground, at 1 foot depth.	76.°0 (21.°8)
	Do. : where a slight fumarole was issuing, at 25 cm depth.	90.°0
,, ,,	Fumarole on the W. inner side of No. 1 craterlet, near Hikinohira.	88.°6
	Eastern Eruption Field.	
April 22, 1915.	Fumarole orifice, on lava field thickly coated with ash, at the foot of the slope to S. of No. 1 craterlet, 315 m above sea-level.	87.°0 (14.°5)
Sept. 22, 1915.	At the same locality as above: feeble fumaroles.	61.°5; 63.°8; 69.°5; 58.°0 (27.°4)
,, ,,	*Do.* : fumarole issuing from a fissure 1 m long, ½ m deep, and 15 cm wide, at the base of a lava block 1 m in dimension.	Over 127.°
,, ,,	*Do.* : orifice of a very small fumarole.	74.°5
,, ,,	*Do.* : ,, ,,	91.°0

35. Changes in mountain profile. As may be seen from figs. 2 and 3 (Pl. XXXIII), the change in the general E.S.E.-W.N.W. profile of Minami-dake consists on the western side in a height increase to the maximum amount of about 80 m for the slope below the level of 400 m; this being the resultant effect of the thick coating afforded by the lava outflow combined with the elevations and depressions to which the convulsed region in the immediate vicinity of the craterlets must have been subjected before and during the eruption. On the eastern side, the change has been two-fold as follows:—Firstly, the southern portion of Nabe-yama had its height reduced, to the maximum amount of nearly 100 m (§ 3), probably due in the main to the exploding away of the surface layers of the hill along the Eruption Crack ; and secondly, the gentle slope between the craterlets Nos. 1 and 4 was elevated in height, to the maximum amount of about 70 m, due partly at least to the accumulation of the lavas. The marked horizontality of the two new successive ground steps between the craterlets Nos. 1, 2, and 3, seems to have been produced by the upward overflow of the magma from the second and third eruption vents respectively.

The top outlines of the central peaks of Sakura-jima, namely, Kita-dake, Naka-dake, and Minami-dake, indicated in the views taken from Kagoshima, were not sensibly modified by the eruption of 1914. (See figs 9, 10, 11, and 36.)

Chapter IV. Blocking Up of Seto Strait.

36. Blocking up of Seto Strait. A portion of a small colline, 100 to 200 m in height, projecting toward S.S.E. from the southern shoulder of Nabe-yama, remains uncovered by the flowing material, with the remnants of smashed forest trees still standing on it. This forms, in fact, the boundary between the lava masses which spread to the south-east of Nabe-yama and descended into Seto Strait and those which, originating from the craterlets Nos. 1 to 5 situated to the west of the latter, ran mainly southwards and buried the villages of Waki and Arimra and extended 4 km further under the sea toward the S.S.W. The Seto strait lava issued, probably on the night of the 12th-13th, Jan. 1914, mostly from the craterlets Nos. 6, 6′, 6″, and 7 situated in the Eruption Crack of Nabe-yama, and descended along the straight N.-S. valley running from the east foot of the latter, through the length of 2 km to the small plane ground of the village of Seto. From accounts