7. *The 1950-1951 Eruptions of Mt. Mihara, Oshima Volcano, Seven Izu Islands, Japan. Part II. The 1951 eruption.*

B. Activity of the third period.

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(Read March 18, 1952.—Received Dec. 30, 1954.)

IX. Course of the activity of the third period, April—June, 1951.

(*1*) *Changes in activity of Mihara crater early in April, 1951*:

Early in April, 1951, there was a sudden decrease of eruptive activity in Mihara crater. The explosive eruption at the main cinder cone had become quite small on April 1, and by 11 h 30 m the cone was seen ejecting only a few bombs repeatedly, together with puffs of white vapours. The next day, between 10 h and 14 h, the only activity seen from Goshinkajaya was white vapour clouds rising from the cone, without any audible explosion. In the evening of the same day, for about one hour (19 h to 20 h), explosions were heard at Motomura repeatedly about twice a minute, and the cloudy sky above the mountain was seen glowing, with the glow waxing and waning. On April 3, about 10 h 50 m, explosions were again heard at Motomura several times in five minutes, and in the next morning neither explosions nor hissing noises were heard even at a short distance from the crater. During the last two days it was raining hard and the mountain was shrouded with thick clouds, so that just what occurred within the crater was quite vague, being invisible from near the rim of the crater. But volcanic manifestations of the crater must have changed in those days from the preceding continuous eruption (the second period Feb.–March, 1951) into the present intermittent eruption.

Red-hot lava was seen running over the northern rim of the crater and flowing downhill northerly on April 1 and 2, and the flows were found to have become almost dead on April 5. Therefore, the lava outpouring must have ceased some time or other between April 2 and 5, although the slower moving fronts of the flows continued to advance

for some time after the diminishing activity at the source vent cut off the supply of lava.

The above-mentioned changes of activity both at the explosive vent on the cinder cone and the lava vents on the floor of Mihara crater were accompanied by remarkable subsidence of the crater floor. Thus the crater floor, which during the activity of the second period had kept rising with intervening local and temporary subsidences, began to subside early in April, as though the subsidence were a definite reaction from the cessation of the continuous eruption. On April 7, the subsidence was seen going on with the central upthrusted mound as the centre of subsidence; the lava ground was breaking down with cracks around the mound; the top of the mound was found to have subsided several metres since the end of March, while the top of the cinder cone only a few metres in the same period. As the subsidence advanced, new cracks and slump scarps appeared noticeably in the bottom lavas of the crater outside the site of the former central pit, on the upthrusted mound and also on the cinder cone (Fig. 170). Most of the larger cracks and slump scarps run nearly concentrically around the central upthrusted mound and parallel with the rim of the crater. The most striking one of the slump scarps was concentric with the crater-rim to the west and northwest within about 50 m distance. On April 9, the crater floor inside this slump scarp was found to have subsided about 10 m relative to the floor on the other side near the crater rim, which seemed to have been left almost undisturbed. The western section of the slump scarp appeared close to the line of spatter cones (Fig. 72 a, g–l), breaking down some of the cones, and its southeastern extension traversed the cinder cone from west to east, marking the southern limit of the subsiding crater floor.

The subsidence of the crater floor may have been caused locally at least by contraction due to solidification of the new fill, particularly of the lavas outside the former central pit, but it must have been due largely to the withdrawal of active lava from the bottom of the former central pit, subsequent to the voluminous outflows of Feb.—March, seeing that the site of the centre of the subsidence was identical with the former central pit (now occupied by the central upthrusted mound) and that the new slump scarps and cracks were dominantly concentric as though they were guided by the circular rim of the former central pit.

While the subsidence of the crater floor was in progress, small

Table XIV. Volcanic activity of Mihara crater during April-June, 1951.

Date	Activity	Location	Duration (approx.)
April 2, 10^h	Cessation of continuous explosive eruption.	Main cinder cone.	
2, 19^h	Explosive eruption.	Do.	1 hour.
3, 10^h 50^m	Explosions.	?	5 minutes.
5,	Cessation of advance of the lava flows.	North and northeast slopes of the mountain.	
5, 6^h	Explosions.	Main cinder cone.	1 hour.
5, 14^h 15^m	Explosions.	Do.	2–3 minutes.
8, 〃5	Explosions.	Do.	2 minutes.
8^h 30^m	Explosions.	Do.	2 minutes.
9, 0^h 30^m	Small explosive eruption.	Do.	
12, 10^h	Small explosive eruption.		
13, 10^h	Explosion ?	?	
April 16, 8^h | 19, 17^h	Explosive eruption. Lava spattering, fountaining and outpouring.	Main cinder cone. Crater floor to the east and west of the central upthrusted mound.	3.5 days.
April 20, 14^h	Explosions.	Main cinder cone.	5 minutes.
April 30, 0^h 30^m | May 1, 19^h	Explosive eruption. Lava spattering and outpouring.	Main cinder cone. Crater floor to the east and northeast of the main cinder cone.	43 hours.
May 3, 0^h 40^m	Explosions.	Main cinder cone.	5 minutes.
1^h 40^m	Explosions.	Do.	30 minutes.
May 6, 0^h 25^m | May 7, 7^h	Explosive eruption. Lava fountaining and outpouring.	Main cinder cone. Temporary vents on the crater floor to the northeast of the central upthrusted mound.	30 hours.
June 9, 12^h 35^m | 10, 15^h	Explosive eruption. Lava spattering and outflowing.	Main cinder cone. Crater floor to the east and west of the central upthrusted mound.	27 hours.
June 14, 22^h 30^m | 15, 18^h	Explosive erution. Lava outpouring.	Main cinder cone. Northeast wall of the central sink of the crater floor.	15 hours.
June 17, 11^h 15^m | 18, 6^h	Explosive eruption. Lava outpouring. Lava spattering.	Main cinder cone. East wall of the central sink. Southwest rim of the central sink.	19 hours.
June 19, 2^h 30^m | 19, 16^h	Explosive eruption.	Main cinder cone.	14 hours.

(to be continued.)

Table XIV. (Continued.)

Date	Activity	Location	Duration (approx.)
June 21, $7^h\ 35^m$	Explosive eruption.	Main cinder cone.	21 hours.
22, $4^h\ 30^m$			
June 22, $21^h\ 30^m$	Explosions.	Main cinder cone.	40 minutes.
23, 4^h	Explosions.	Do.	
27, $12^h\ 30^m$	Explosions.	Do.	24 hours.
28, $12^h\ 30^m$			

explosive activity occurred intermittently on April 5, 8, 9, 12 and 13, as shown in Table XIV. Though small and short-lived, this activity was rather high in explosive power every time as compared with the eruption of the preceding period, Feb.-March[33]. Thus the explosions now became so powerful that a number of bombs, about the size of man's head, were thrown out as far as the observation point on the west rim of the crater, about 500 m to the west of the summit of the active vent, and black ash clouds were of usual occurrence vomiting with detonations from the vent. Presumably these explosions were due to clogging of the gases in the lava that had retreated within the vent down to levels below the depth where appreciable vesiculation could occur to cause eruption with free welling action. The pressure of gases clogged within the lava was released by an occasional breaking through, hence came the explosions.

(2) *Explosive eruption, lava spattering, fountaining, and outpouring, Aprill 16–19:*

On April 16, about 8 h, bluish fume was seen rising in quantity from the cinder cone, besides white vapour clouds, and by 8 h 45 m black ash clouds began to vomit with detonations from the cone, continuously up to a height of 300 m to 400 m above its summit (Fig. 125-a), and a few minutes later, the explosive vent began to repeat emission of red-hot lava about ten times a minute, flinging up bombs up to a height of about 150 m. The same day, in the afternoon, red-hot lava was found pouring out of two new vents, one on the west side of the central upthrusted mound and the other in a great chasm to the east of the same mound, and spreading over the previously subsided

33) Eight girl-students were wounded by the explosion of April 8, about 9 h 30 m, while observing it from or near the observation point.

craterfloor to the west and north (Fig. 121 a-map). Besides, lava fountainings and spatterings were going on at the source vents and building up spatter cones several matres high, breached like an armchair niche with lava overflows.

Beginning on April 16, the activity continued in almost the same manner as the one just mentioned, but with some ebb and flow in its intensity, for three and a half days until April 19. Thus, on April 18 the new lava flows were found to have spread out into the depression that surrounded the north and west of the central upthrusted mound, forming a temporary semi-circular pool of red-hot lava (Fig. 126 a–b); about a dozen small vents could be counted near the lava source on the west of the mound, vying with each other in lava spattering (Fig. 127); and explosions were being reported with loud detonations about twenty times a minute at the summit crater of the cinder cone, which was now funnel-shaped and about 70 m in diameter, displaying columns of black ash clouds more than 200 m high (Fig. 125 b) and lava flings up to about 130 m high, and adding cinders and bombs continually to the cone which had already grown by the activity of the preceding two days to be a perfect conical hill surmounting the height of Kengaminé (755 m), the crest on the east wall of Mihara crater. The next morning, the explosive activity was as in the preceding days, the lava flows were found to have spread over about two-thirds of the inside of the crater, running over the crater rim to the north and northwest, and a small part of the flows descended the mountain slopes in these directions (Fig. 129).

The activity become weak early in the afternoon of April 19, the explosions stopped about 17 h, and soon after that the glow died out both from the surface of the new flows and from the vents which had just subsided into inactivity. From that time on, the crater continued to be virtually quiet until April 30, when it started another remarkable activity, although it showed small explosions on April 20, about 14 h, and kept on emitting white vapour clouds, sometimes accompanied with bluish fume (Fig. 128).

Almost simultaneously with the activity of April 16–19, the central upthrusted mound and the northern part of the cinder cone was upheaved suddenly and to an appreciable amount, together with the adjoining part of the crater floor, and besides being covered with new ejecta to a depth up to several metres, the upheaving continued for about two weeks, until the beginning of May, thus covering the two

periods of activity, April 16–19 and April 30-May 1. The lava column to which the activities of these periods were due must have had a gas pressure high enough to cause bifurcated and piecemeal extrusions on the one hand, and to keep pushing up the overlying fill of the former central pit on the other hand.

(*3*) *Explosive eruption, lava spattering and outpouring, April 30-May 1*:

On April 28, when in the morning two of the writers (H. T. and R. M.) visited Mihara crater, the cinder cone was seen emitting continuously only white vapour clouds. The southwestern brink of the throat of the cone could be reached without danger by way of its southern slope, but the inside of the throat was quite invisible because of the thick vapour clouds rising from within. There was no sound of internal noises, although small vibrations of the ground underfoot were felt almost incessantly (Figs. 130–132). No fuming or steaming areas were found upon the southern slope of the cone, but the cinders were distinctly warm underfoot, and also considerable heat was felt in places so that in climbing the slope we had to choose large lava boulders cool enough for us to step on with safety. Upon the southeast and northeast slopes of the cone were several steaming cracks radiating from the summit, and on the adjoining crater floor were found countless steaming areas. On the contrary, there were no fuming or steaming areas on the west and northwest slopes of the cone, and also on the adjoining crater floor, the greater part of which was now covered with cinders and bombs ejected from that cone. Immediately adjacent to the same cone and to the west of it were the remains of the spatter cones (c and d) formed by the activity in March (Fig. 132).

The next day the crater seemed to remain quiet as on the day before without reports of any explosion, although nobody could see just what occurred there on that day, because of the stormy weather which shrouded the mountain.

On April 30, about 0 h 30 m, an eruptive activity was confirmed to have started at the cinder cone, throwing up flings of red-hot lava to the night sky which had just cleared up. The same day, by daylight, we were surprised by a magnificent view of lava spattering and effusion going on in the eastern half of the floor of the crater, besides the explosions of the cinder cone (Fig. 133). Thus on the crater floor to the east of the central upthrusted mound were several spatter cones

(Figs. 134, 138), the largest of which was about 10 m in height and 15 m in diameter at its base, and most of these cones were active, emitting red-hot lava pieces intermittently with bluish fume, and ranged northeast, presumably along a fissure in the crater floor. Immediately adjacent to the cinder cone and to the northeast of it was a lava vent (Fig. 121 b-map) pouring a lava flow into the near-by depression to form a lava pool, about 50 m in length and 20 m in width. As nearly as could be ascertained, this vent seemed to be located approximately at the same spot as one of the lava vents of April 16–19 (Fig. 121 a, vent A) and on/or close to a zone of fissures which demarcated the central upthrusted mound toward the east wall of the former central pit and which, now being represented by a long curved line of white steaming vents, was traceable southeast to the northeast slope of the cinder cone.

On the crater floor east of the cinder cone and close to the east bluff of the crater were seen small tongues of red-hot lava oozing out very quietly and slowly from holes in the crust of an older lava and spreading over the older lava along the bluff. They were measured with the eye to have a speed of about 10 cm a second for a short distance near their outlets, but became sluggish in a few minutes with a darker scum continually forming on the surface, and at last became stagnant, being crusted over with a skin of wrinkled and ropy *pahoehoe* after travelling a distance of 20 m to 30 m from their sources (Fig. 136).

As other irregularities which added interest to the scene, several small spatter heaps and steaming vents were found on the crater floor adjacent to the southwest of the vent area of the lava flows just referred to. They were in line with the latter, generally in a SW-NE line radial from the top of the main cinder cone, suggesting a line of cracks in the crater floor (Fig. 137).

The cinder cone continued throughout the day to throw out cinders and bombs up to a height of about 200 m with explosions at intervals of several seconds.

The same day, at night, all the active vents attracted attention by their illumination, and in addition to these vents, glowing spots could be seen at several places, where in day time only vapours could be seen rising quietly (Fig. 138).

Early in the morning of May 1, in cloudy weather, observations from Goshinkajaya showed dense vapour clouds rising from the cinder

cone and from the crater floor northeast of it. The cinder cone was entirely enveloped in the clouds, and the central upthrusted mound visibly became a few metres higher than on the preceding day (Fig. 139). Small explosions were heard at the rate of five times a minute.

In the afternoon of the same day, when the sky cleared with the wind changing from northeast to southwest, the cinder cone was found to be active as in the preceding day, enjecting cinders and bombs, together with puffs of black ash clouds, up to a height of a few hundred metres. The spatter cones on the crater floor adjacent to the northeast of the central mound had stopped spattering lava, although some of them were emitting bluish fume with small jets of flame (Figs. 141, 142). The lava vents near the base of the east bluff of the crater had also become dead with no further issue of red-hot lava, and the surrounding *pahoehoe* flows had cracked and broken down in places (Fig. 143). At the same time, close to the base of the southeast bluff of the crater and on the crater floor to the southeast of the cone, were found several lava vents still sending forth small flows of pasty lava (Fig. 137). Located on or near the southeastern extension of a steaming fissure on the southeast slope of the cinder cone, these lava vents seemed to have been supplied with material through the fissure from the main lava source at the depths, in spite of their being opened in the heap of cinders and bombs ejected from the cinder cone.

The same day, about 16 h, on crossing the lava flows under which the north and northwest crater rim had been buried deep, we found a red-hot lava flowing out of a crevice in one of the older flows on the crater floor northeast of the central upthrusted mound and cascading northward into a deep chasm in streams, about 20 m in breadth, at a speed of about 20 cm a second (Fig. 144). The rock under our feet was in places so hot as to be uncomfortable, easily breaking and dangerous, and was still moving very slowly. On the northwest crater rim, where the overlying lava flows were dominantly of *pahoehoe* and ropy, was found the spatter cone (1 in Figs. 73 a, 74) about 3 m high, remaining active as it was in March (Fig. 169).

By the evening of the same day, when we were observing the activity of the cinder cone from the crest of the west crater rim, explosions of the cone became suddenly less frequent but more or less louder than in daytime, and about 19 h they occurred only once every

twenty minutes, and the explosion, observed from Goshinkajaya about 20 h, marked the end of the present activity (April 30-May 1), displaying fire jets twice in succession, first obliquely upward and then vertically upward (Fig. 140).

The crater was generally quiet during the following four days May 2–5, although there occurred small explosions twice on May 3. During these days, however, the central upthrusted mound had subsided markedly, together with the surrounding crater floor, as an after-effect of the preceding eruption, and in the similar way as observed immediately after the Feb.-March eruption. Thus the central mound, which during the eruptive periods used to stand at levels high enough to be visible from Goshinkajaya, had subsided so much that, viewed from the same place, its top was now hidden from sight behind the higher, lava-covered crater rim. An eye-measurement showed the subsidence to be more pronounced than in the previous occasion, amounting to several score metres, and bringing the top of the mound down to a level only abut 20 m above the general surface of the surrounding crater floor. A semicircular depression had appeared once again surrounding the central mound on the west, north and northeast. It was about 50 m in average breadth and in some places was walled by slump scarps several metres high. Besides, during the same period, the series of subsidences in the crater was breaking down the cinder cone. Thus on May 4 the cone was found subsiding at its central part every moment at a speed of about 6 m a day, and at the same time its summit vent was seen to be enlarged by avalanches of the surrounding walls, sending up cauliflower clouds of dust.

(*4*) *Explosive eruption, lava fountaining and outpouring, May 6–7* :

In the early morning of May 6, about 1 h 25 m, Mt. Mihara resumed its eruption which was to last well over thirty hours. At 2 h explosions were heard more than twenty times every minute at Motomura village (Fig. 145). With each detonation a spectacular fling of red-hot lava shot up like a column of flame, sometimes more than 300 m high, to the glowing sky above the mountain. It was the first time in the present activity that the fling of red-hot lava became visible from the village.

On the same day, about 10 h 30 m, lava bombs were thrown every few seconds from the vent on the cinder cone with greater than

average violence and accompanied by booming, explosive noises. This explosive activity continued with little change until about 17 h on the same day, adding bombs, cinders and spatters to the cone and increasing cinder accumulations on the crater floor to the east and west. Showers of small cinders fell outside of the crater, and within a range of about 800 m to the northwest of the vent. They lay more than 1 m deep on the ground adjacent to the west base of the cinder cone (Fig. 146).

A small amount of lava was spilling from a fissure on the east side of the central upthrusted mound, and a reddish fume was seen rising from the ground thereabout, already during the earliest hours of the eruption. By the noon of the same day, according to an observer from Nomashi village, red-hot lava was gushing out of three or four vents on fissures on the east side of the central mound, and was flowing north in the direction of Kakôjaya, tea-house on the northern crater rim now buried beneath older lava flows.

At 17 h there came a comparative lull in the explosive eruption from the vent on the cinder cone, and the explosion for a time died down. With occasional small explosions lava pieces were thrown up to a height of less than 50 m above the top of the cone, while ash and vapour clouds were discharged faintly. On the contrary, at that time, lava spouting was taking place with increasing violence on the east side of the central mound. Here two big lava fountains (Fig. 148) were developed, besides a few smaller ones. One of the big fountains appeared just like a kettle full of melting slag. It was a pool of incandescent lava, 50 m or more in diameter, bordered by high ramparts built up by overflow and by splashing fountains. The lava in the pool was running high vigorously and was being spouted once every minute or two up to a height of about 15 m above the lip of the pool. The other fountain, situated about 100 m south of the preceding one, was a big surface saucer full of rushing golden melt, building up a high spatter rampart at one side, with a gap on the opposite side. A very powerful continuous fountaining was displayed all over the saucer-like opening, about 40 m in diameter, sending incandescent jets 20 to 30 m high, and at the same time a torrential flow of lava was pouring out through the gap in the rampart on the east side of the fountain and spreading over the crusts of previous flows in the northeastern part of the crater floor. The flow which at first spread eastward like a fan showed the usual bright-line pattern radiating from the source fountain (Fig. 149). Approaching to the eastern crater wall, the flow

divided into three streams with two branches heading toward the southeast and east crater walls respectively, and the rest toward north. The former two branch flows were stopped by the crater wall, and thus dammed, was prevented from moving farther to the southeast and east and consequently caused a filling in of all the low areas, while the northern branch flow became a great feature, advancing to surround the northern half of the central mound and filling the semi-circular belt of depression in the crusts of previous flows on the crater floor. This northern branch flow appeared like a mighty river of fire, winding its way round the central mound, with a width varying from 100 m to 40 m (Fig. 122 a-map).

The eruption continued almost steadfastly during the evening hours of the same day, with explosive activity at the cinder cone and fountaining activity at the big fountains in the crater floor, accompanied by gush of lava. At 20 h the explosive vent on the cinder cone was sending incandescent jets a few hundred metres high, almost continuously like a jet from a hose, swinging around the central vertical position. The molten lava that gushed out of one of the big fountains spread over more than half of the northern part of the crater floor, giving spectacular glowing cloud effects over the mountain. At Kengaminé, the eastern crest of the crater rim, even small printed letters could be read by the glow of the lava, while the heat from the lava was almost unbearable.

On May 7, about 8 h, the exlosive activity at the cinder cone subsided, although white vapour cloud was rising continuously from its vent. The lava activity at the fountains also became less pronounced than on the preceding day, but it continued throughout the day, giving a glowing cloud effect to the evening sky above the mountain.

On May 9, after the daylong rainfall of the preceding day, the hot lava fill in the crater was seen to have crusted over, the fountains became completely inactive, and on the new lava flow adjacent to the west of the central mound were found two spatter cones, of which one 3 m high and 15 m wide was inactive and the other 4 m high and 15 m wide was giving vent to a glowing flow about 20 m long, with hissing noises. The crater floor was steaming from hundreds of small vents all over the surface, the cinder cone was ringed by steam, and moreover there was steam on the Feb.-April flows on the northwest outer slope of the volcano (Fig. 147). During the activity on May 6–7, there was no visible surface flow overrunning the crater and descending

the outer slope, but judging from the heavy steaming from the older flows, it seemed likely that some of the hot lava accumulated on the crater floor on May 6-7 had found its way down the outer slope through tunnels and crusts in the older flows.

From then on throughout the remainder of May and the first week of the next month, the volcano was very quiet, some steam and a little fume rising from both the cinder cone and the surrounding crater floor being the only surface activity observed every day.

(5) *Explosive eruption, lava spattering and outflowing, June 9-10 :*

After the eruption of May 6-7, no very marked topographical change occurred on both the crater floor and the cinder cone until June 7, almost exactly one month later, suggesting continued upward pressure of the underlying magma column without sufficient gas potential to make it break out with visible lava flowing and spattering during this interval. But on June 7, about 17 h, the crater floor was found to have settled down several metres, leaving again a terrace-like lava ledge around its outer margin adjacent to the crater rim, and the central mound was now subsiding steadily and magestically, maintaining its identity as it went down. The site of the centre of the new sink was identical with the old central pit, which had merely been enlarged. The subsidence of the central mound caused engulfment of the northern side of the cinder cone into the new sink (Fig. 122 b-map).

On June 8, about 2 h, a bright red glow, illuminating the sky over the mountain, was visible from Motomura, not because an eruption might take place in the crater, but because glowing lava was exposed on the newly-formed cracks and slump scarps in the subsiding crater floor. The same day, by 14 h 30 m, the central mound had sunk more than 40 m, in company with the new cauldron subsidence at the site of the old central pit, thus the top of the central mound was now several metres lower than the general level of the crater floor outside of the new cauldron (Fig. 150 a). The northern half of the cinder cone was seen to have slided down 20 m or more toward the cauldron, and the sliding was still going on with clattering noises, while the other half of the cone seemed to be standing almost stable, as in the preceding days. (Fig. 171 a).

At 15 h 30 m the breakdown of the rim of the central cauldron was

going on in succession with clattering noises. Several small cascades of glowing lava were seen hanging over the walls of the slump scarps around the cauldron. Apparently these flows oozed out from under the lava sheets cut off sharply by slump scarps around the cauldron. Presumably they arose from some of still-molten feeders of the lavas which had poured out when the cauldron was filled with lava to the level of the top of the present scarps.

On June 9, at 10 h, nothing could be seen of the crater, because of a dense fog shrouding the mountain, but clattering noises were heard from near the crater as on the day before, indicating the collapse of the central part of the crater.

At 12 h 35 m, the same day, when it was still very foggy, a heavy explosive eruption began with almost continuous detonations like a thunder and so loud that they could be heard at Goshinkajaya on the somma. At 13 h, the fog lifted considerably for a while to give a better view of the eruption taking place continuously with explosions. Thus, as seen from Shiroishiyama, the highest peak of the southern somma, a vortical column of ash cloud was rising into the air up to a height of more than 1,000 m above the top of the cinder cone that was in eruption within the crater, and through the cloud of rising ash, clots of incandescent lava were flung repeatedly up to a height of about 300 m, dropping several hundred metres away. The area surrounding the crater was found to have been covered with ash and scoria to an appreciable depth. At the northwest crater rim the depth was as much as 15 cm; on the western slope of the central cone (Mt. Mihara), about 600 m away from the active vent on the cinder cone, it was about 3 cm; on the flat of the Sabaku (desert) adjoining the west base of the central cone, about 1 km away from the active vent, it decreased to about 1.5 cm. It was the first time since the beginning of the present eruption of the volcano that so much ash fell on the west side of the central cone to such a distance. The southern slope of the central cone was covered with falling bombs and lava blocks, up to 30 cm in diameter, as far as its base. The heavy explosions in progress were presumably due to clogging of the gases in the lava conduit closed by the subsidence of the central part of the crater floor, and to the confinement in the lava standing at a lower level in the conduit.

The same day, at 20 h–21 h, observation from the western rim of the crater showed the central mound rising again in its former shape, after having sunk into the cauldron about 50 m deep formed by the

subsidence of the surrounding crater floor on the day before; incandescent lava oozing out and spattering from several temporary vents opened on or near the boundary between the rising mass and the surrounding crater floor; and the cinder cone displaying explosive ejection of bombs in succession and growing again into a perfect conical mound with the accumulation of new ejecta on its northern side which had largely slumped on the day before.

The early part of June 10 was cloudy on the mountain, but later the sky cleared up, and the cinder cone was seen continuing its explosive eruption as on the day before, but rather decreasing in intensity. Accompanied by continuous noises like the roar of the sea, explosion was repeated ten to twelve times every minute, flinging up lava about 150 m, and emitting brownish puffs. Lava was oozing out from the fissures at the base of the steady-risng central mound (Figs. 150 b, 151 a; Fig. 123 a-map). On that day, about 15 h, the explosive eruption of the cinder cone stopped, while the upheaval of the central mound was still going on, together with the oozing out of lava from the fissures on the surrounding crater floor, and there activity continued during the evening hours. Possibly at that date the upper part of the lava column came again to stand at levels high enough to permit vesiculation and also enough for a large proportion of the gas bubbles to escape freely without causing any explosive eruption, but supplying the gas for the fume cloud.

(6) *Explosive eruption and lava outpouring, June 14–15:*

Early in the morning of June 13, the central part of the crater floor, including the central mound and the north side of the cinder cone, began to subside again in the form of a cauldron. By 11 h the subsidence was found to have amounted to more than 40 m at the centre, and continued to increase during the remainder of that day and on the following day was accompanied by larger and larger collapse of the cinder cone (Fig. 123 b-map). Thus at 13 h 30 m, June 14, the subsiding cauldron was found to be about 350 m across and 80 m deep below the average level of the surrounding crater floor. Its walls were cut off sharply by slump scarps in their upper parts, giving to debris slopes below, and the central mound was engulfed into the cauldron, together with the north side of the cinder cone, although the apical part of the mound was seen at the bottom of the cauldron, maintaining its identity (Fig. 151 b). Both on the walls of the cauldron

and on the north side of the cinder cone, slumping was still going on with occasional avalanches sending up brownish cauliflower clouds of dust. Besides, on the northeast wall of the cauldron was seen a small flow of red-hot lava spilling over the debris slope (Fig. 171 b).

About 22 h 30 m, June 14, a tremendous column of ash cloud was seen from Motomura village, rising into the air above the mountain and overcasting the sky above the village. A short time later small explosions were heard, glowing clouds were seen over the mountain, and from 22 h 40 m on, loud explosions were heard almost incessantly.

The next day, at 3 h 40 m, volcanic ashes were found falling in the village of Motomura, and explosions occurred in succession with detonations like thunders. Judging from the heights of the columns of black ash cloud and glowing cloud, which amounted to about 5,000 m and 1,000 m above the crater respectively, the explosions at this time were the largest of the explosive eruption since last year. At 4 h 30 m, when it began raining, the eruption still going on was reported by detonations travelling through the rain clouds that shrouded the mountain, and at about 15 h the detonation become so faint that could be heard only by those villagers who were listening with attention. The eruption came to an end at 18 h, when it was raining hard on the mountain, and a lull of the activity continued during that day and on the following day.

(7) *Explosive eruption, lava outpouring and spattering, June 17–18 :*

June 17, at 11 h, the cauldron subsidence was found still going on at the centre of the crater floor, where no marked change in the general feature had occurred by the previous eruption. At that time the cauldron retained its general circularity with the approximate diameter of 350 m, but avalanching from the surrounding walls were of frequent occurrence, and a small gush of lava was breaking out through a fissure in the sloping part of the northeast wall and flowing down to the bottom of the cauldron, which was full of jagged and tilted blocks of lava. Blue fume was seen rising from the bottom of the half-demolished crater bowl on the subsiding side of the cinder cone.

The same day, at 11 h 15 m, explosive eruption began again, sending up a great billowing ash cloud, which arose from the crater with a counterclockwise rotating movement (Fig. 152a). At 12 h 30 m, observations from the west rim of the crater showed the explosive

eruption going on at two vents, one in the half-demolished crater bowl on the cinder cone and the other outside of the northwest base of the cinder cone and near the west rim of the central cauldron (Fig. 152b). As illustrated in the picture, the former was by far the more active of the two, throwing up jets of bombs and scoriae, sometimes 350 m high, together with emission of black ash cloud. The latter acted like a fountain, flinging up lava clots to a height near 100 m. The lava jets from both vents, taking place side by side, were turned from time to time, like a lawn sprinkler, first in one direction and then in another, scattering the fragments about the surrounding ground. The ash cloud was bent by the southwesterly wind, and there was a light but steady fall of ash in the northeast and outside of the crater (Fig. 153). This general type of activity continued with little change for about 19 hours until 6h on June 18, adding cinders, bombs and spatters to the cinder cone and gradually increasing accumulation of these fragmentary ejecta on the crater floor to the east and west.

(8) *Explosive eruption, June 19:*

On June 19, at 2h30m, S. Watanabe and some others in Motomura who were awakened by a big explosion saw incandescent lava jets towering like a column of fire and shining brilliantly on the clouds above the crest of the mountain. From that time on, the explosive eruption occurred continuously but with varying intensity for about 13.5 hours, ejecting both ash clouds and lava pieces from the vent on the cinder cone. The activity was heaviest at about 8h, when a number of bombs were seen falling on the slope outside of the west rim of the crater, in company with explosions being repeated every several seconds (Fig. 154). At 9h40m, observation from Goshinkajaya showed a small mound rising above the crest line of the crater rim and in the direction of the south side of the central cauldron in the crater.

The same day, at 15h57m, the eruption stopped, and the subsidence of the central crater floor was all that had happened during the rest of that day and on the following day. Thus by the early morning of June 20, the small mound mentioned above had subsided so that it was no longer seen from Goshinkajaya.

(9) *Explosive eruption, June 21–22:*

At 7h35m, June 21, preceded by emission of a thick cloud of whitish vapours for a few minutes, an explosive eruption began at the

vent on the cinder cone, with emissions of volumes of ash cloud. Big explosions occurred intermittently four times in the morning hours, at 7 h 40 m, 8 h 30 m, 9 h 32 m, and 12 h 10 m, each lasting for five to ten minutes, and sending forth a large mass of ash cloud (Fig. 155). But smaller explosions occurred almost continuosly during these hours, with ejections of cinders and bombs to heights 100 m to 170 m above the top of the cinder cone.

In the afternoon the eruption went on steadily, but without emitting any considerable mass of ash cloud, and after attaining the height of its activity at midnight, June 22, 1 h, when continuous jets of incandescent lava, in company with explosions, attracted attention by their illumination like daytime, the eruption dwindled to stop at 4 h 30 m of the some day. Since then an apparent lull of the activity continued until 21 h 30 m when a single, moderate explosion occurred.

The eruption added much cinders and bombs to the cinder cone, building up large heaps of these ejecta around the east and north sides of the explosive vent (Fig. 156 d), and immediately after the eruption, avalanches of new cinders were observed falling from the steep walls of the vent showing glow beneath.

(10) Explosive eruption, June 27–28 :

On June 23, explosions occurred four times at 4 h, 4 h 10 m, 4 h 30 m and 4 h 40 m, each lasting for a few minutes and sending forth volumes of black ash cloud to a height as far as 3,000 m. The new heap of cinders and bombs which had been built up around the north side of the vent by the eruption of June 21–22 was seen subsiding during that day, and on the following day, observation from Goshinka-jaya showed that it disappeared below the level of the crest line of the crater rim. This incident, being quite similar to that observed during June 19–20, seemed to indicate that since June 13 the cauldron subsidence in the middle of the crater had been going on to break down the north side of the cinder cone, but with intervening local and short-lived rises by the intermittent explosive eruptions.

In the morning of June 27, the crater showed blue fume rising from the vent on the cinder cone and dust from avalanches rising in brownish clouds from the slump scarps around the central cauldron, but otherwise was clear as in the preceding three days. At 12 h 30 m, a thick vapour cloud mixed with some ash was seen rising from the cinder cone for about twenty minutes, at 14 h 30 m there was again

an emission of a thick vapour cloud up to a height of about 500 m above the top of the cinder cone. At 15 h 50 m, observation from Motomura showed a tremendous column of black ash cloud rising into the sky above the somma, and a few minutes later, detonations like a terrific peal of thunder were heard indicating the resumption of a big explosive eruption. At about 16 h, volcanic ash began to fall in Motomura where the sky had been overcast with the ash clouds carried by the then prevailing easterly wind. The eruption reached its maximum violence at 18 h 30 m, when explosions were heard so loud and ash fall became so heavy in Motomura that a feeling of uneasiness prevailed among the villagers. But soon afterward, the explosions became less violent and the ash fall died down. The eruption continued with intermittent explosions until 12 h 30 m, June 28, when a moderate explosion was heard.

This eruption was the largest of the explosive activity observed since the beginning of the 1950–51 eruptions of the volcano. Thus the area surrounding the crater was covered with ash, scoriae and bombs ejected by the eruption to an appreciable depth. The crater floor, except a small part near its northern rim, was covered with these ejecta so thickly that its former rugged surface of the crater-filling lava flows became quite flat and passable without trouble. At the west crater rim the depth of the ejecta was as much as 2 m in places; at the east crater rim, it was less than 1 m. The greater depth at the west was due to the easterly wind that had been prevailing during the eruption. That violent explosions had taken place during the eruption was indicated by the large number of bombs, some of which were as large as 5 m in diameter, scattered not only over the cinder cone and the adjoining crater floor but also over the slopes outside the crater rim (Fig. 157). Northwest of the central cone a blanket of ash and scoriae covered a wide area including the new lava field on the northwest caldera floor and the northwest slope of the somma (Fig. 158). It reached a depth of as much as 30 cm at the south margin of the lava field on the caldera floor and near the west base of the central cone (Fig. 159), about 3 cm at Goshinkajaya, 1.5 cm on the halfway of the trail from Goshinkajaya to Motomura village, and only 0.5 cm in the village.

X. Mihara crater as observed in July and August, 1951.

Following the end of the big explosive eruption on June 28, the

area of the central mound underwent a rapid subsidence of more than 50 m in a few days, turning into a long-lived central pit, and at the same time, the northern sector of the cinder cone was cut off, in the form of a pyramid, from the rest of the cone and partly slid down toward the bottom of the subsiding central pit. Both fume and vapour rising from clefts in the walls of the vent of the cinder cone were visible, together with dust clouds caused by slumping of the walls, during the first half of July, but they became scarcely visible afterwards.

About the middle of August the crater was visited; no further sign of activity could be detected, except a slight emission of fume and vapour. There was no further sign of subsidence of the central pit, which by that time had a diameter of about 300 m at its upper rim and a depth of 50 m below the average level of the surrounding crater floor (Figs. 160, 173, 174). The central pit had its bottom sealed with the subsided central mound and covered with a pile of lava pieces ejected by the last eruptions, so that no liquid lava was now observable there (Fig. 160). The lava flows exposed in the walls of the pit also appeared to be lifeless except for some heat felt at places, particularly at small secondary fumaroles.

During the foregoing activity, repeated changes in the configuration of the crater floor had occurred not only with the rise and fall of the central pit area, but also with the appearance and disappearance of miniature volcanic forms such as spatter and driblet cones, and at the end the only mound left after the activity was the main cinder cone itself on the south rim of the central pit. This cone, about 300 m in diameter at the base on the adjoining crater floor and 50 m in height above the same floor, had a funnel-shaped vent, about 50 m deep, 150 m across and surrounded by a steep wall on all sides but the north where there was a deep gap through which it opened to the central pit (Fig. 161). The only small fumarole that was steaming was halfway up the west wall of the vent (Fig. 163), while faint fume was seen rising from the northeast wall and the debris-covered bottom of the vent (Fig. 164). The northern slope of the cone, facing the central pit, showed many slides and slump scarps, besides the above-mentioned deep gap, while the slopes in the other directions were kept undisturbed by the subsidence of the central pit, showing a smooth conical surface and an inclination of about 30°, the natural angle of repose of cinders and bombs (Fig. 166). The cone, which had been banked against the southern crater wall and which eventually

over-topped it, projected approximately 35 m above the old rim of the crater at that point, resting partly on the outer slope of the mountain. Upon the northwest slope of the cone was an area of solfataric yellow deposit associated with white salts, but there was not so much heat as to cause danger to walkers (Fig. 165).

The crater floor outside the central pit showed an irregularity of height within a limit of only about 20 m, its average elevation being only a few metres higher than the level of the crest of the northern crater rim, 678 m above the sea, locally left uncovered with new flows, and accordingly being about 35 m above the corresponding floor before the present eruptions. The whole area of the southern half of the floor, which was covered with a pile of cinders and bombs, was nearly flat without any notable irregularities, although it showed many marks of larger bombs (Figs. 165, 174). The rest of the floor, which was left uncovered with these fragmentary ejecta, showed pressure ridges, irregular piles of broken lava and irregular hardened flow patterns, with cracks, slump-scarps and chasms. In this part of the floor were found two features particularly worthy of notice: the one is a lava tunnel and the other a fissure-filling lava dike.

The lava tunnel, situated at the northeast margin of the crater floor and just above the lowest part of the former crater rim, was apparently the location of a very active liquid stream which had fed the lava flows far below the mountain to the north and northeast. There was an incline, probably formed by collapse of the roof of the tunnel, and through which the floor of the tunnel could be reached. The tunnel was about 5 m in diameter, and its floor was 6 m to possibly 8 m below the surface of the lava flow, being covered with slabs of lava which had fallen from the ceiling. The roof was cracked in all directions and its slabby portions seemed most precariously perched and ready to fall at any minute. Thus, in the roof about 10 m away from the entrance, there was a hole, about 2 m in diameter, like a skylight, which was the result of the cave-in of the weak portion of the roof and through which the interior was lighted enough to be seen clearly. Neither lava stalactites nor stalagmites were found, while complex patterns of parallel grooves, folds, slicken-sides and foliations were found as usual on the side walls of the tunnel (Fig. 167).

The dike, located near the northwest margin of the crater floor, was just on the line of the first spatter cones that had been active in

March, 1951, and where the line of the spatter cones had been buried by subsequent flows and fragmentary ejecta. It stood like a stone-wall, about 1 m in thickness, 20 m in length and 1–3 m in height above the surrounding cinder-covered ground of the crater floor, trending S 20°E toward the west base of the cinder cone. The sides of the protruding dike showed grooves and slicken-sides conforming to the walls of the fissure through which it had risen (Fig 168). Apparently the dike was a part of the fissure-filling lava which had fed both the line of the first spatter cone and some of the March flows on the west side of the mountain. Its protrusion into the air might be the result of squeezing-up, in a plastic condition, of the fissure-filling lava, possibly due to the settling of the surrounding crater floor. About 30 m north-west of the dike and at the outer edge of the former crater rim was a spatter cone (or a lava chimney), about 2 m in height and 1 m in diameter at the base, which was the only one preserved as it had been in the line of the first spatter cones (Fig. 169).

The principal effects of the present eruptions, between July, 1950 and June, 1951, were to fill up the Mihara crater with new lava flows and fragmentary ejecta, and at the same tme to make new lava fields covering altogether a large area to the north and west of the crater. The lava fields and the crater floor, as left by the 1950–51 eruptions, were mapped as shown in Fig. 124, and the masses of the new ejecta were calculated with the results as shown in Table XV. The figures in the table are not of high accuracy, indicating only an order of magnitude, but any error in thickness and volume is believed to be on

Table XV. Area, volume and mass of the 1950–51 ejecta.

Division of the ejecta	Area 10^6 m^2	Volume 10^6 m^3	Mass 10^6 tons	Remark
Lava flows outside the crater:				
(1) North and northeast (Senzu) flows	0.75	2.25	5.625	Average thickness=3 m Density=2.5
(2) West (Nomashi) flows	1.01	5.05	12.625	Average thickness=5 m Density=2.5
New fill of the crater:				
(1) Cinder cone		3.62	6.154	Density=1.7
(2) All fill but the cinder cone	0.437	15.44	41.688	Average thickness =30 m* Density=2.7
Total		26.36	66.092	

* Excluding the area of the new central pit about 50 m deep, 300 m across, and where there was a deeper central pit about 165 m deep and 290 m across.

the conservative side. Furthermore, the total volume and mass of the new ejecta must be a little above the corresponding figures in the table, because the latter do not contain the amount of the fragmentary ejecta that fell in the area outside the crater.

On the whole the 1950–51 eruptions of the volcano appear to have been rather quiet, leaving various features in and about the crater, inherent to basaltic volcanoes, and the activity seems to come nearer to the Hawaiian type than anything else in Japan. So far as the amount of ejecta is concerned, the present activity of the volcano is about one thousand times greater than its 1910–12 eruption, and is comparable to the 1940 eruption of the neighbouring volcano Miyake-shima, both being placed in the fifth grade of the writer's (Tsuya's) provisional scale which divides the intensity of volcanic activity into ten grades from 0 (the smallest) to IX (the greatest) according to the volume of ejecta.

XI. Review of the activity of April 2—June 28, 1951.

The activity of Mihara crater of April 2—June 28, 1951, was of the third and the last period representing the declining phase of the 1950–51 eruptions of the volcano. The activity of this period may be divided, according to its course, into three stages, i. e., (1) the first stage: April 2–20, (2) the second stage: April 30–May 7, and (3) the third stage: June 9–28.

The activity of the first stage was first of all the intermittent explosive eruptions of April 2–13 at the cinder cone, then it culminated in the continuous explosive eruptions of April 16–19 at the same cone, in company with lava fountainings and outpourings from several vents on the west and east sides of the central mound, and lastly stopped with a short-lived explosive eruption on April 20 at the cinder cone. Following the tremendous overflowing of the crater rim in March, a remarkable lowering of the entire circle of the crater floor had become visible already by the beginning of the activity of this stage, and continued until the activity attained its culmination on April 16. The central mound subsided more than 20 m, together with the northern slope of the cinder cone, and there appeared a number of new cracks and slumps on their surface. At the same time the surrounding crater floor settled down several metres, leaving border slump scarps along its margin near the crater wall. Apparently the subsidence of the crater floor was occasioned by the back-flow of the crater-filling

lava, still fluid below, into a void left at the depth of the lava conduit by the Feb.-March eruption, although some slumping of the crater floor might be accounted for by the release of gas pressure from the underlying liquid lava and/or by contraction due to solidification of the lava. The central mound was lowered most remarkably by the back flow, because it was most sensitive to the movement of the underlying lava, being the fill of the former central pit, which during the eruptions of the preceding periods had been lifted as a wedge-shaped plug covering the top of the lava conduit.

The activity of April 2–13 was intermittent and purely explosive, sending forth black ash clouds from the vent on the cinder cone, probably owing to clogging of the gases in the liquid lava which had retreated into the depth of the conduit. Meanwhile, the conduit lava had been recharging itself with gases until it could lift the plug, the central mound, as much as 20 m during April 16–20. At the same time, the lava forced its way up to break out of the margin of the plug, displaying fountainings, spatterings and outflowings from several temporary vents on the west and east sides of the central mound, besides erupting explosively from the main vent on the cinder cone.

After the activity of the first stage April 2–20, the central mound and the surrounding crater floor kept standing nearly at the same level brought about by that activity, suggesting continued upward pressure of the underlying lava, though the lava had not sufficient gas potential to make it break out until April 30.

The activity of the second stage consisted of two continuous eruptions, one during April 30-May 2 and the other May 6–7, with an intervening lull but being accompanied with short-lived explosions on May 3. The April 30-May 2 eruption was the formation of flaming and puffing chimneys, spatter ramparts and driblet cones built up over fissures in the eastern half of the crater floor, besides the explosive eruption of the main cinder cone and the gushing of lava from cracks on the east side of the central mound and near the buried wall of the former central pit. Trickle lavaflows were oozing out of the floor close to the northeast and east walls of the crater. It was noticed that most of the active vents in the crater floor were arranged in lines suggestive of fissures radiating from the region of the main cinder cone. The effect was as though a strain of uplift were in progress with that cone as its centre, possibly suggesting that the radial fissures thus formed were receiving the underlying drainage

from the underlying lava conduit and welling up a little of it in the local eruptions in the crater floor. During the activity the cinder cone and the central mound were rapidly rising together, besides getting a little higher by the accumulation of new ejecta. But shortly after the activity, they began to undergo a big subsidence accompanied with collapses of the northern half of the cinder cone and concentric cracking and slumping of the crater floor around the central mound. These changes of the crater floor were indicative of the process of creating a destructive funnel (cauldron) of subsidence at the site of the former central pit.

The May 6–7 eruption was characterized by spectacular lava fountainings on the east side of the central cone, besides the explosive lava ejections from the main cinder cone. Lava gushed out from one of the two larger fountaining vents, spreading in torrents over the crater floor around the central mound. In company with this activity, the area of the former central pit, including both the central mound and the northern half of the cinder cone, rose again as much as 30 m, and the cinder cone became a perfect cone increasing its height with new addition of cinders and bombs.

The volcano had been quiet without displaying any eruptive activity until June 9, almost exactly one month later, when the activity of the third stage began. During almost the whole length of this interval, no remarkable change had occurred in the feature of the inside of the crater, although the central mound and the cinder cone appeared subsiding and breaking down little by little, and shortly before the beginning of the third stage, these parts subsided suddenly as much as 50 m to form a cauldron at the site of the former central pit.

The activity of the third stage was characterized by repetition of explosive eruptions at the cinder cone during June 9–28, sending forth volumes of black ash clouds, with intermission of varying durations. Neither fountaining nor outpouring of lava, accompanied these explosive eruptions, indicating that this activity was no more than an explosive liberation of gases from the liquid lava in the depth of the lava conduit. But a remarkable up-and-down movement of the central mound and the adjoining slope of the cinder cone occurred in concurrence with the rise and fall of the activity, while the apical part of the central mound maintained its identity as it moved. Possibly during the activity, liquid lava stood at a low level in the conduit, but its gas potential

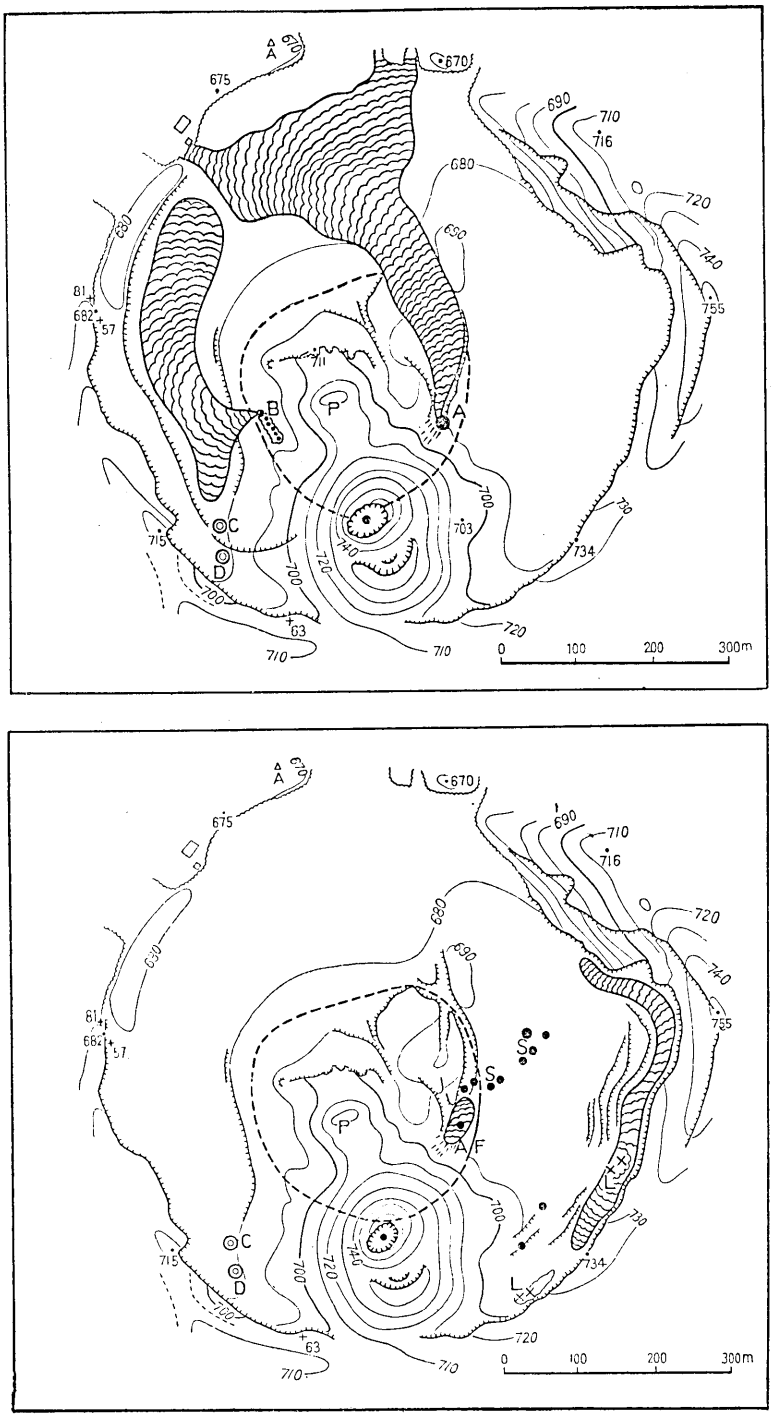
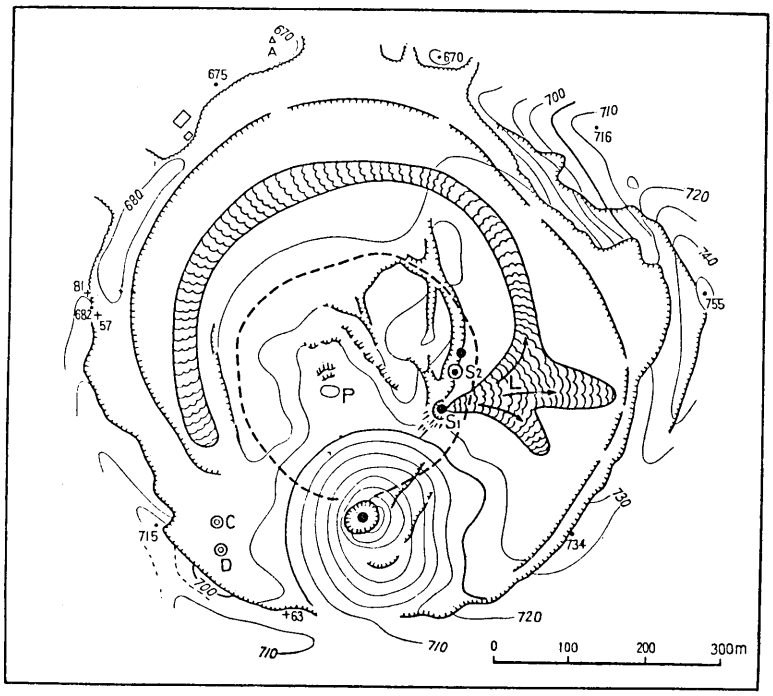
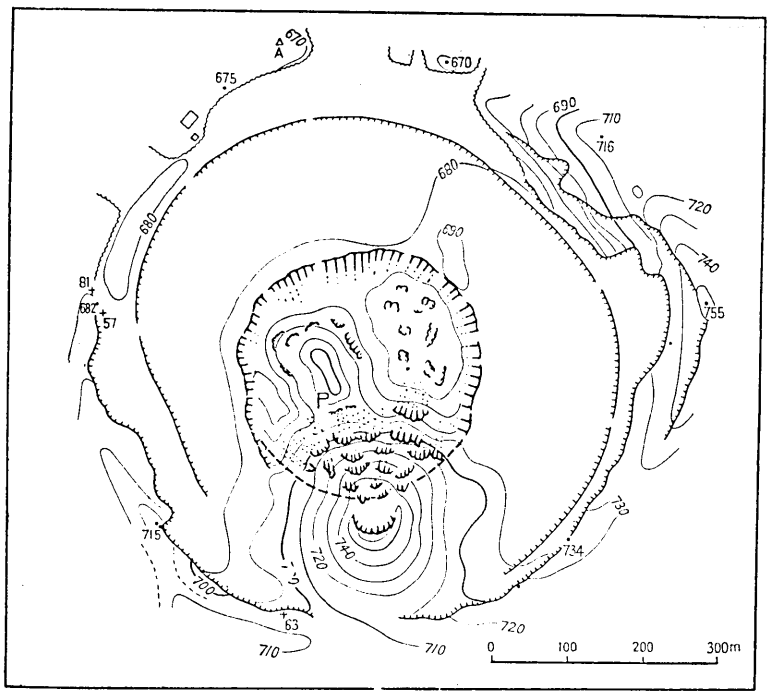


Fig. 121. Maps of Mihara crater, showing changes in crateral conformation in different eruptive stages, (a) April 16–19 ; (b) April 30-May 2, 1951. S : Spatter cones. F : Steaming fissure. L : Lava vents.



(a)



(b)

Fig. 122. Maps of Mihara crater, showing changes in crateral conformation in different eruptive stages, (a) May 6 ; (b) June 7–8, 1951.

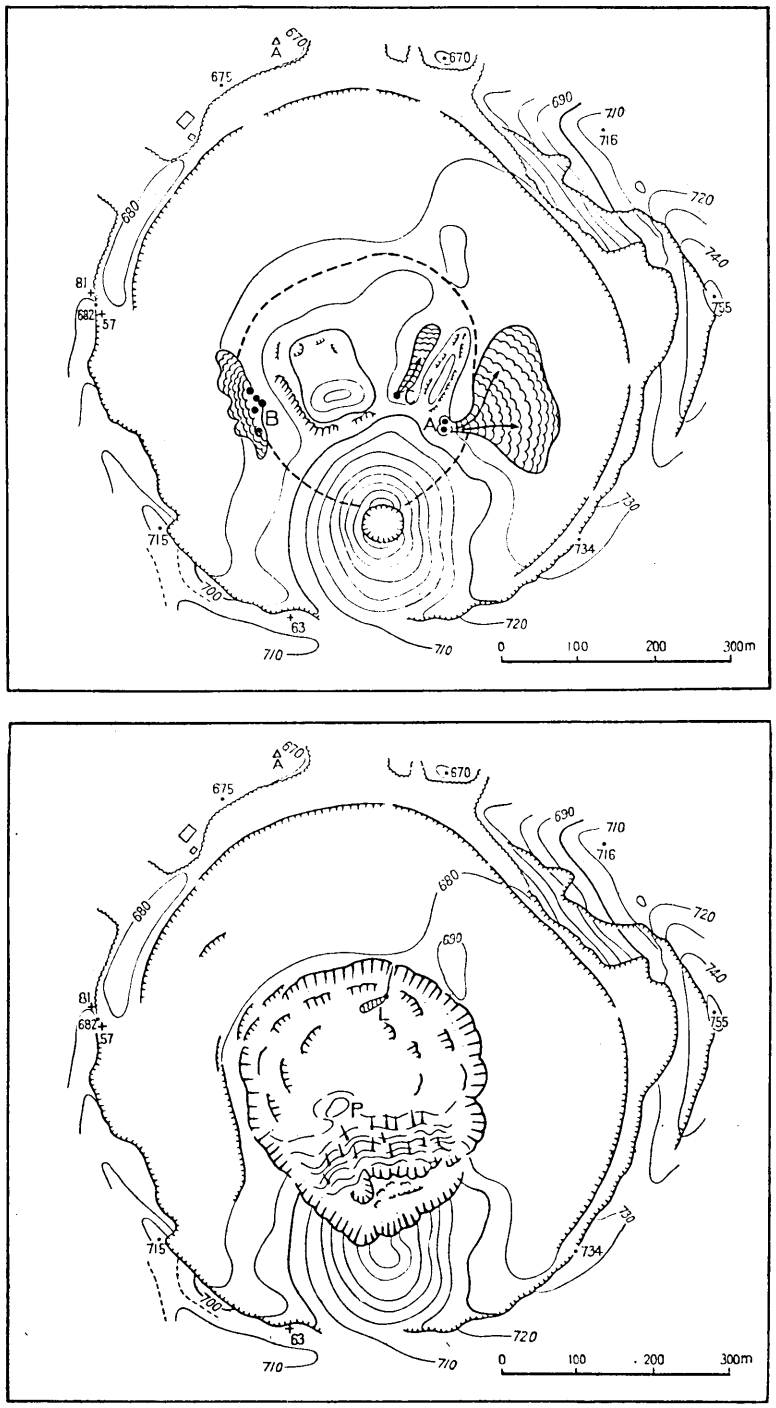


Fig. 123. Maps of Mihara crater, showing changes in crateral conformation in different eruptive stages, (a) June 10 ; (b) June 14, 1951.

became intermittently so high as to cause the big explosions and at the same time to drive the central mound to temporary upthrust, interrupting the otherwise progressively increasing subsidence indicative of the process of creating a new pit at the site of the former central pit.

The activity of the third period came to an end with the unusually heavy explosive eruption on June 27–28, which ruptured the cinder cone and produced a more voluminous ejecta than in any other eruption of that period. This eruption marked also the end of the 1950–51 cycle of eruption of the Mihara crater, leaving a subsiding cauldron (central pit) and a remnant half cone of cinders and bombs in the crater.

(To be continued)

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7. 伊豆大島三原山昭和 25 年及 26 年の噴火
その 2 昭和 26 年の噴火 (B) 第 3 期の活動

地震研究所 津屋弘達 森本良平 小坂丈予

伊豆大島三原山の昭和 26 年の噴火は，第 2 期の活動【地震研究所彙報第 32 号，第 3 冊，昭和 29 年 9 月 290—312 頁】に続いて，同年 4 月 2 日以降 6 月 28 日に至る第 3 期の活動をもつて終つた．この第 3 期の活動の特徴は，三原火口内の新噴石丘に起つた間歇的の爆発性噴火と，同火口中央部の隆起丘（中央丘）及びその周辺に起つた著しい昇降変化とで，前年 7 月 16 日に始まつた，今回の噴火輪廻のうちの活動減退相を表わすものと考へられる．その経過から見ると，この活動は，更に 3 次，すなわち (1) 4 月 2 日—20 日，(2) 4 月 30 日—5 月 7 日，(3) 6 月 9 日—28 日の各活動に分たれる．

(1) 第 3 期第 1 次の活動は，4 月 2 日—13 日に起つた間歇的の爆発を先駆として，4 月 16 日—19 日の連続的噴火で頂点に達し，翌 20 日の短時間の爆発で終つた．同時に，火口底中央部の隆起丘及びその周辺一帯は，この活動が頂点に達するまでは沈下し続けたが，頂点に達して再び上昇した．この最初の沈下は前期 (2 月—3 月) の，熔岩大溢流後の熔岩導管内のガス圧の低下 (熔岩源の後退) によつて起り，また，その間の間歇的爆発は，導管源部に後退した熔岩内の，ガス集積の反復によつて起つたものであろう．これに次いで，導管内の熔岩は，再び上昇し，中央丘及びその周辺を隆起せしめ，同時に，噴石丘及び隆起丘の東西両側の火孔に達した熔岩の自由面における連続的噴火が起つたものと考へられる．

第 1 次活動直後には，隆起丘及びその周辺は沈下せず，つぎの活動時までほとんどそのままの状態を保つていた．この期間には，おそらく熔岩は，導管内の高い位置に止まり，間もなくつぎの噴火を起すに足る十分のガス圧をもつていたのであろう．

(2) 第 2 次の活動は 4 月 30日—5 月 2 日及び 5 月 6 日—7 日の 2 回の連続的噴火と，その間，5 月 3 日に起つた短時間の爆発とである．そのうち，4 月 30 日—5 月 2 日の活動は，噴石

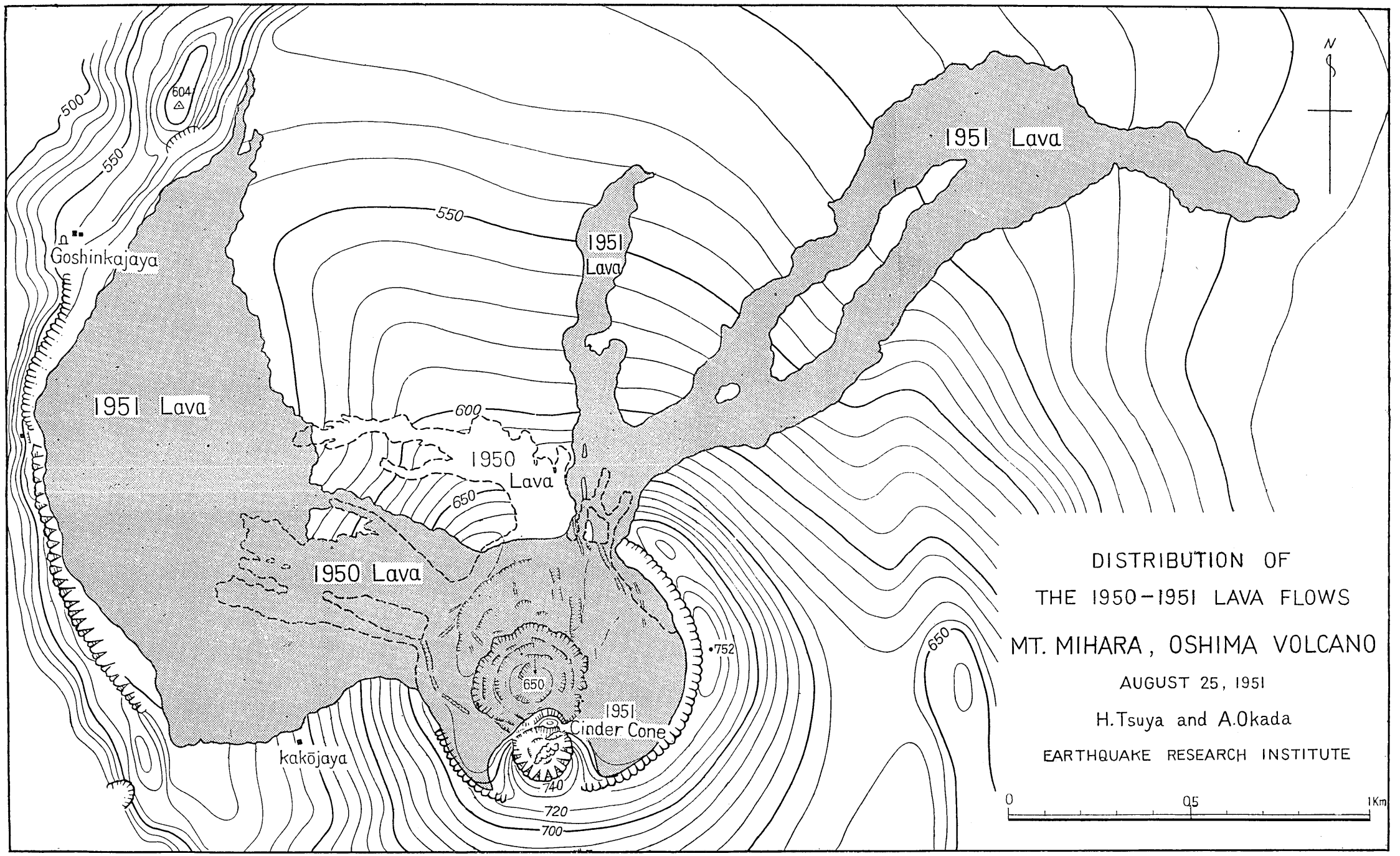
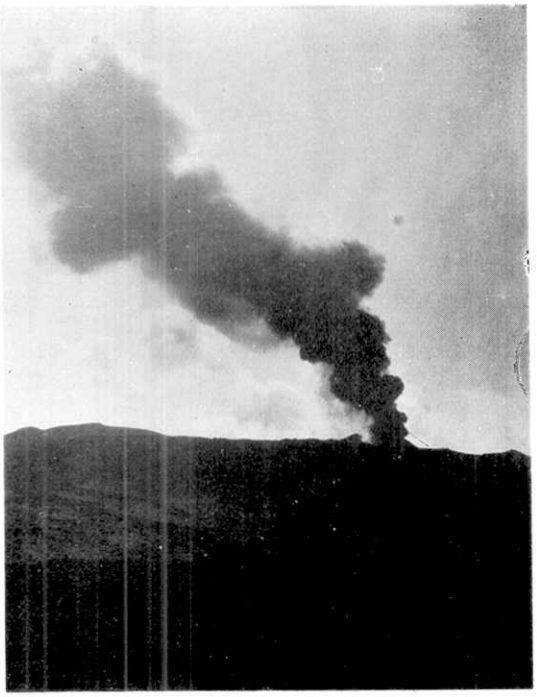
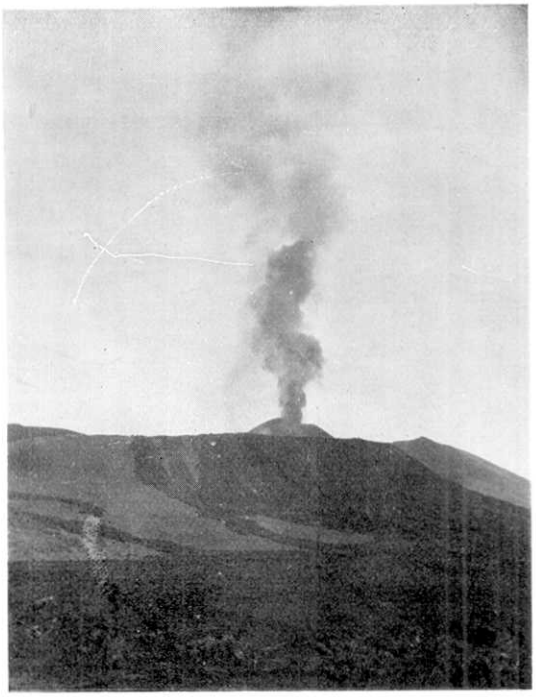


Fig. 124. Topographical map showing the 1950–51 lava flows and the feature of Mihara crater, as observed in August, 1951. "Kakôjaya" on the map is a temporary tea house; the former Kakôjaya at the northern crater rim had been buried beneath the lava flows.



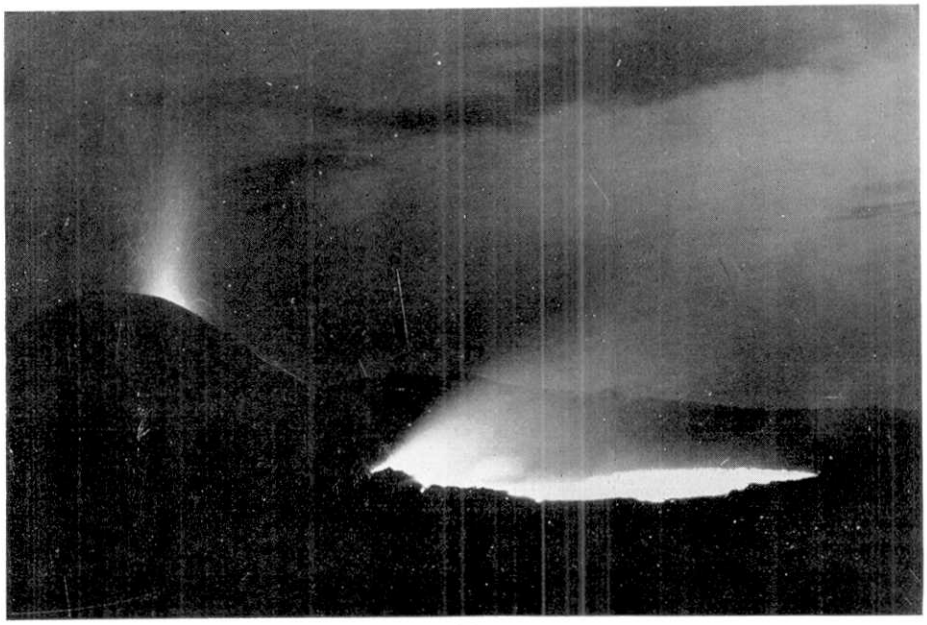
(a)



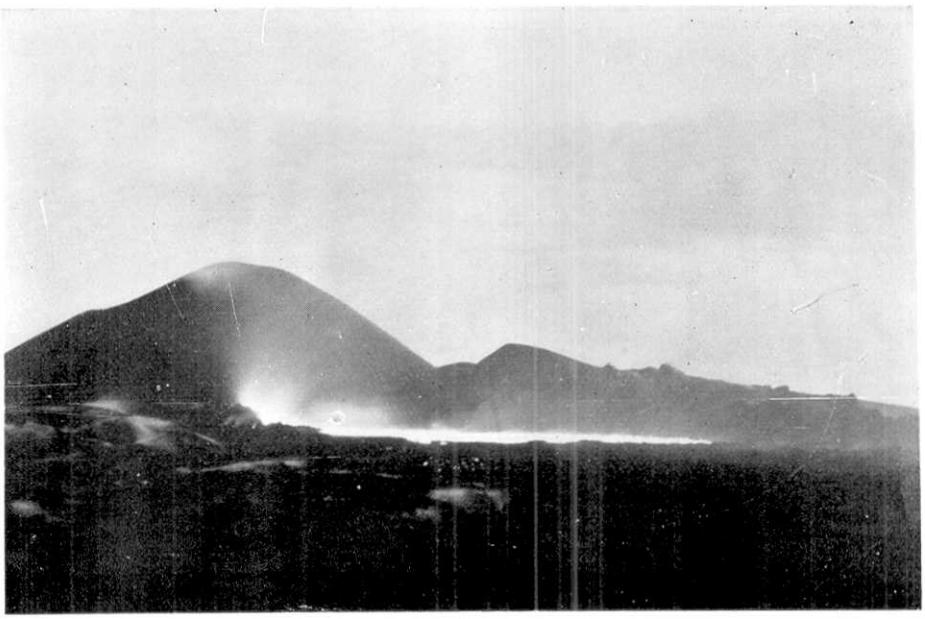
(b)

Fig. 125. Black ash clouds rising with explosions from the active vent on the cinder cone, as seen from Goshinkajaya, (a) April 16; (b) April 18, 1951.

Photo. S. Watanabe.



(a)



(b)

Fig. 126. Lava fountain and flow on the crater floor east of the central mound, and the cinder cone in eruption at left, (a) as seen from the southeast crater rim; (b) from Kengaminé, the east crater rim, April 18, 1951. Photo. S. Watanabe.

Fig. 127. Explosive eruption at the cinder cone (right) and lava fountaining and spattering at the northwest base of the cone (left), as seen from the west crater rim, April 18, 1951.

Photo. S. Watanabe.

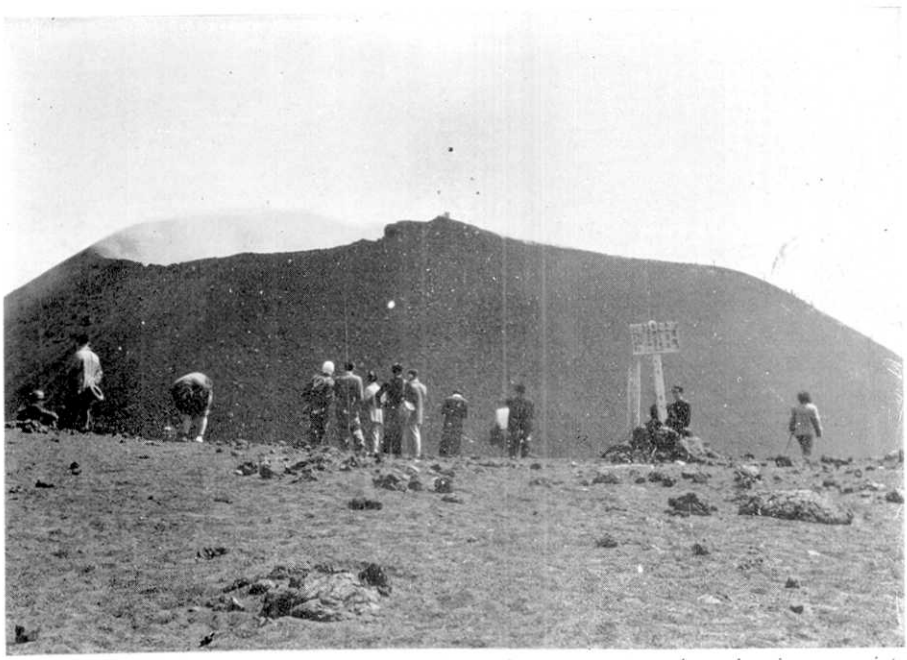


Fig. 128. The cinder cone, as seen from the west crater rim, showing a quiet phase just after the eruption of April 16–19. April 22, 1951. Photo. S. Watanabe.

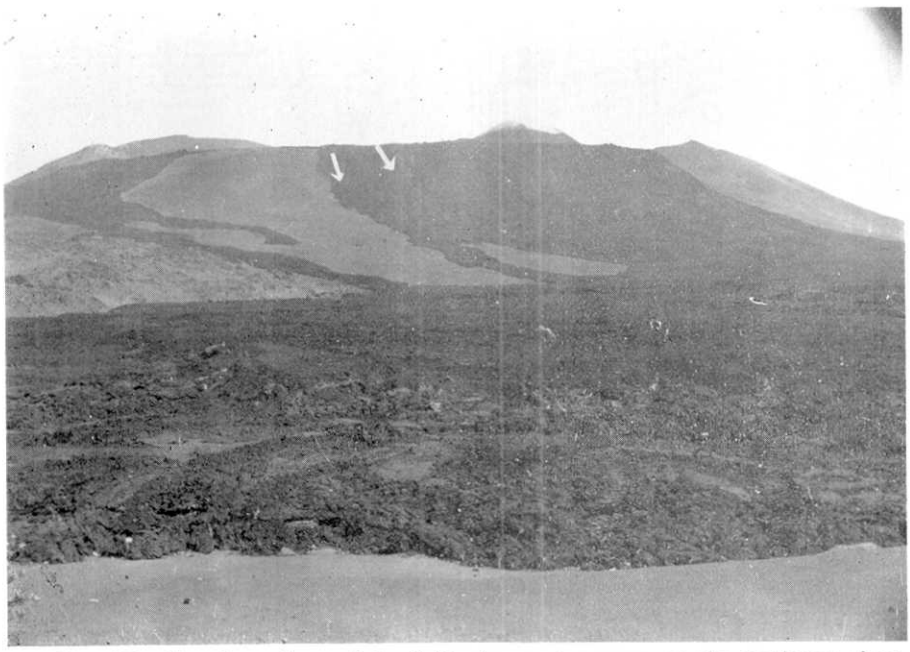


Fig. 129. New lava flows of April 19, shown at arrows, on the northwest slope of Mt. Mihara. Cf. Fig. 125 b. April 27, 1951. Photo. S. Watanabe.

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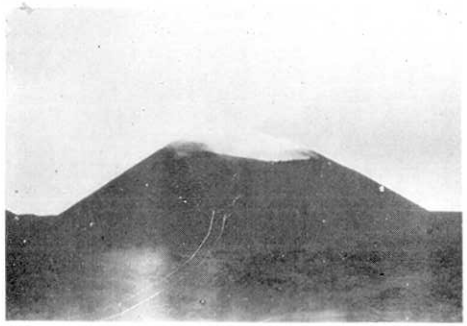


Fig. 130. View of the finished cinder cone from the northwest, April 28, 1951.

Fig. 131. Closer view of the cinder cone from the west, April 28, 1951.

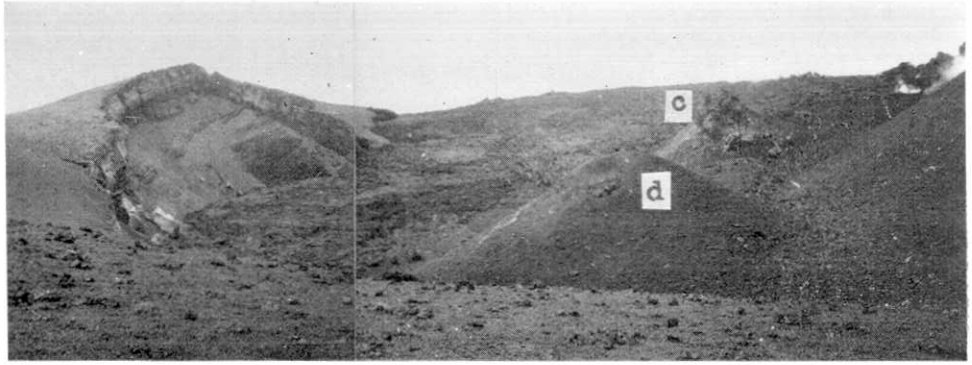


Fig. 132. Two spatter cones (c, d), now extinct and covered with cinders. At left, the west rim of the crater, at extreme right, the west base of the main cinder cone, April 28, 1951.

Fig. 133. Mihara crater, showing the cinder cone in eruption (right) and the central upthrusted mound (centre). Kengaminé, the east crater rim, at distant left. April 30, 1951.

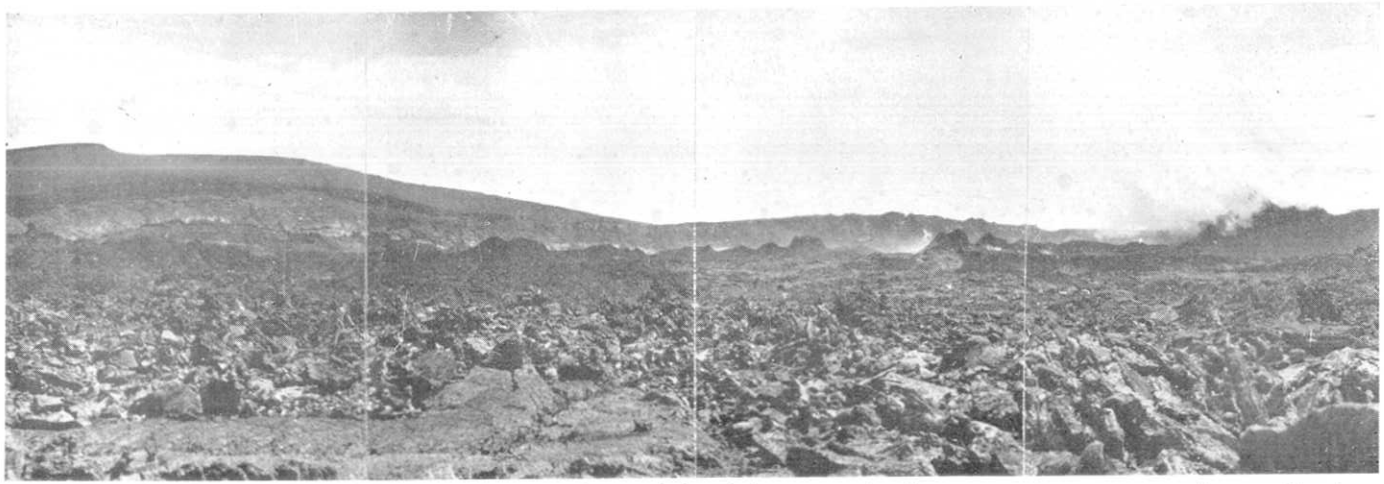


Fig. 134. General view of the crater floor northeast of the cinder cone, showing new spatter cones ranging northeast toward the bluff of the east crater rim (Kengaminé) from the base of the main cinder cone (in vapour clouds at extreme right). April 30, 1951.

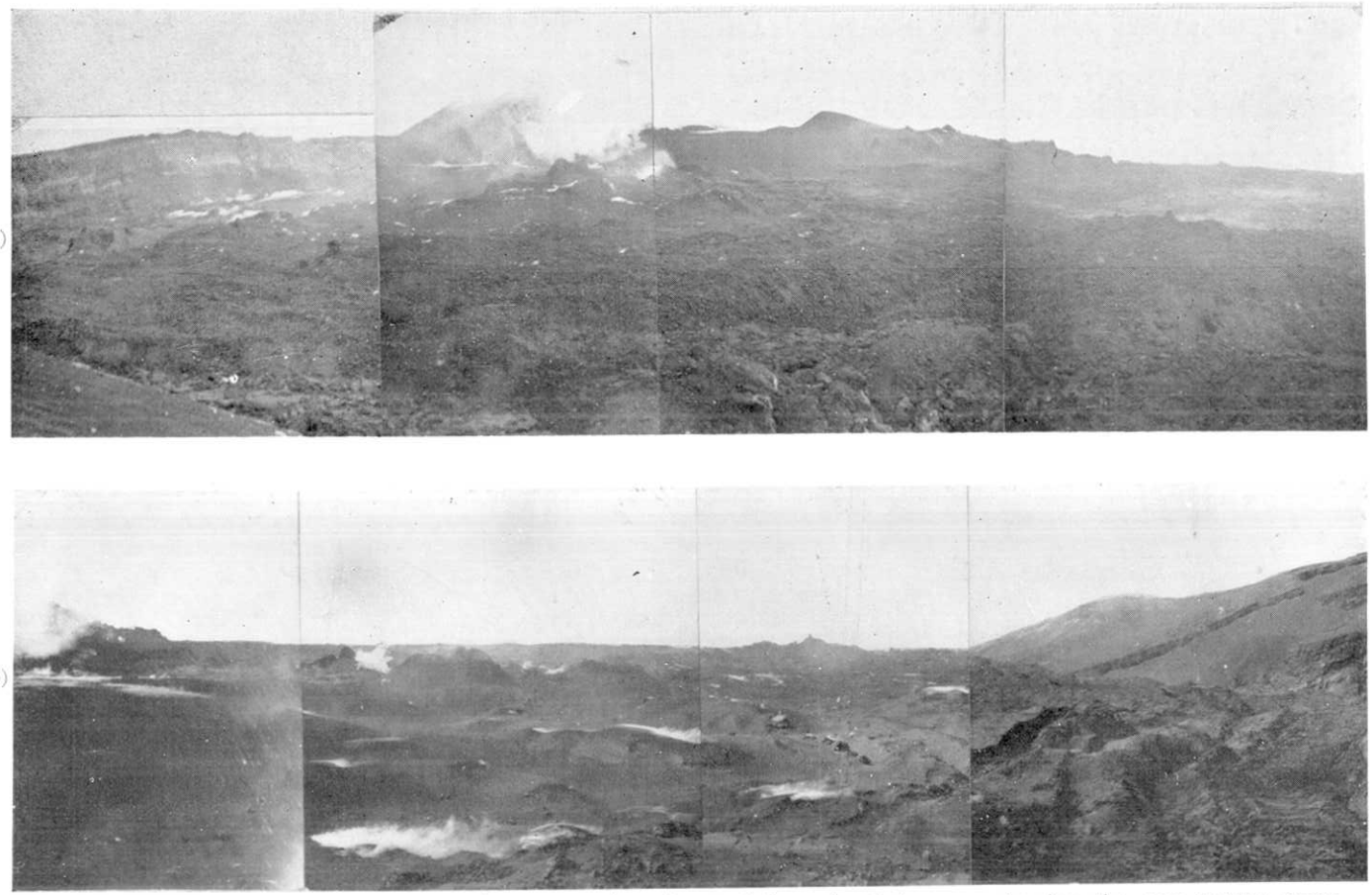


Fig. 135. General view of the crater floor east and northeast of the main cinder cone, showing the new spatter cones and steaming fissures, (a) looking down from Kengaminé ; (b) from the southeast crater rim, May 1, 1951.

(a)

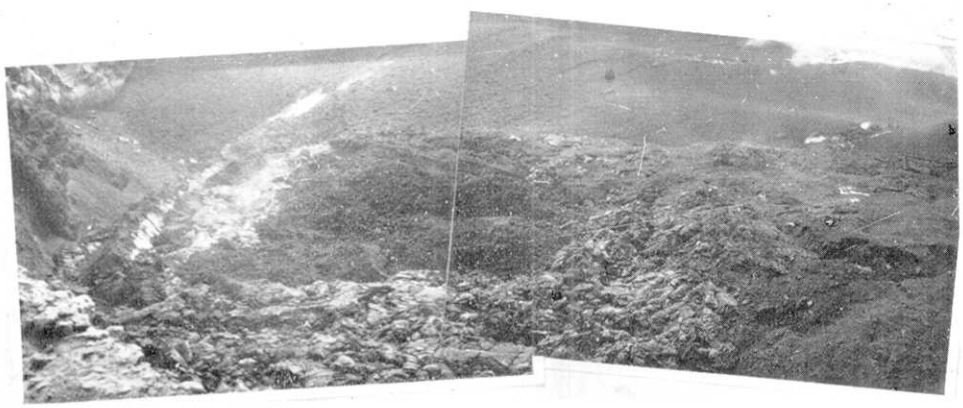
(b)

(c)

(d)

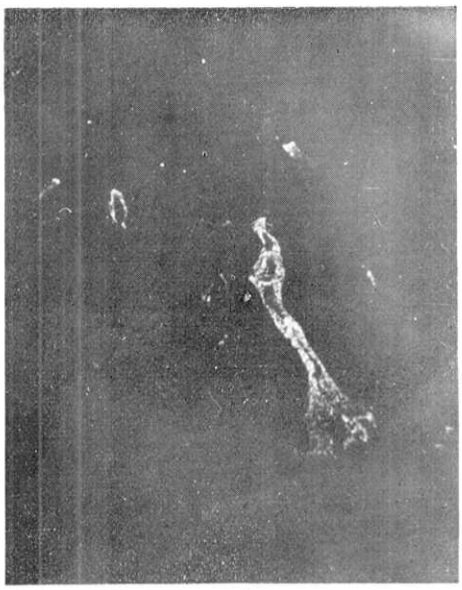
Fig. 136. Lava oozing out of temporary vents in the crater floor near the base of the east crater wall, May 1, 1951.

(a) General view, looking down from the upper edge of the crater wall.
(b) Closer view of the flows.
(c) Showing one of the flows and its source vent (upper left).
(d) Front of the same flow, showing a skin of wrinkled and ropy pahoehoe.



(a)

(b)



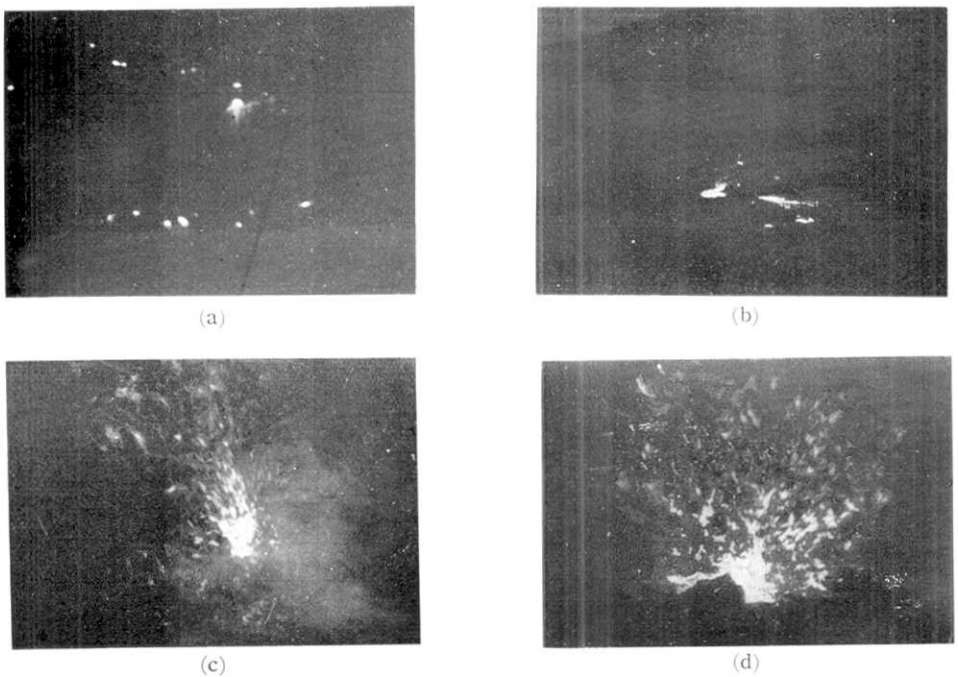
(c)

Fig. 137. Lava oozing out of small vents in loose pile of cinders at the east base of the cinder cone, April 30, 1951.

(a) General view, with the bluff of the southeast crater rim at extreme left and the east base of the cinder cone in background.

(b) One of the lava flows by day.

(c) The same by night.



(a) (b) (c) (d)

Fig. 138. Night view of the acivity in the crater floor northeast and east of the cinder cone, April 30, 1951.
(a) General view slowing glow of the active spatter cones and lava vents, as seen from the southeast crater rim.
(b) Glow of a small lava flow and a near-by spatter vents.
(c), (d) Telephoto night views of one of the active vents, showing lava spattering.

Fig. 139. Vapour clouds rising from both the cinder cone and the crater floor, as seen from Goshinkajaya, May 1, 1951.

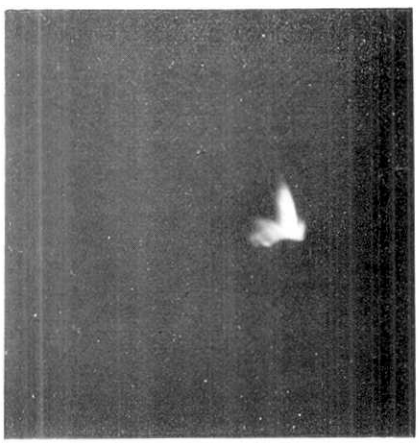


Fig. 140. Night view of the last explosion of the activity of April 30-May 1, as observed from Goshinkajaya, May 1, 20h, 1951.

Fig. 141. The crater floor northeast of the central mound, as seen northward from the edge of the southeast crater rim, showing spatter cones now dormant, and steaming fissures, May 1, 1951.

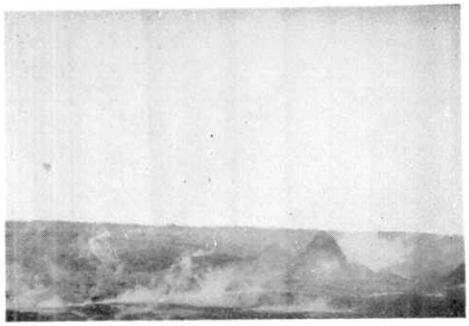


Fig. 142. Telephoto view of the upper left part of Fig. 141, showing a steaming fissure, with two spatter cones in the opposite side of the fissure, May 1, 1951.

Fig. 143. Pahoehoe flows of April 30, showing ropy, wrinkled structure of their skin, May 1, 1951.

Fig 144. Lava tongue (centre) flowing out of a crevice in one of the older flows. At upper right, the central mound. May 1, 1951.

Fig. 145. Black ash clouds, showing explosive eruption at the cinder cone, May 6, 1951. Photo. S. Watanabe.

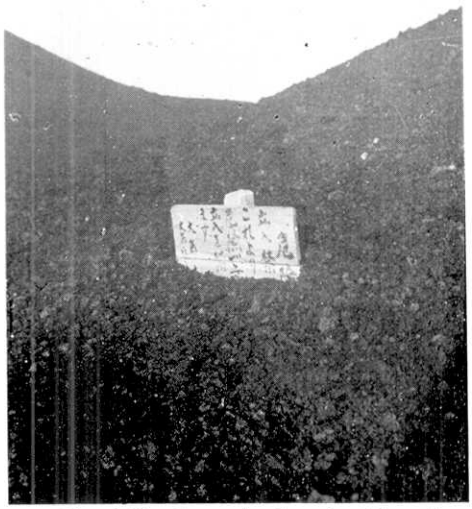


Fig. 146. A wooden board with notice "Keep off ! Danger ! ", buried deep in the new pile of cinders and bombs. At upper left, the southwest slope of the cinder cone. May 1, 1951. Photo. S. Watanabe

Fig. 147. General view of Mt. Mihara, with the finished cinder cone in its crater, as seen from Goshinkajaya, showing heavy steaming of the lava flows in the caldera floor, May 9, 1951. Photo. S. Watanabe.

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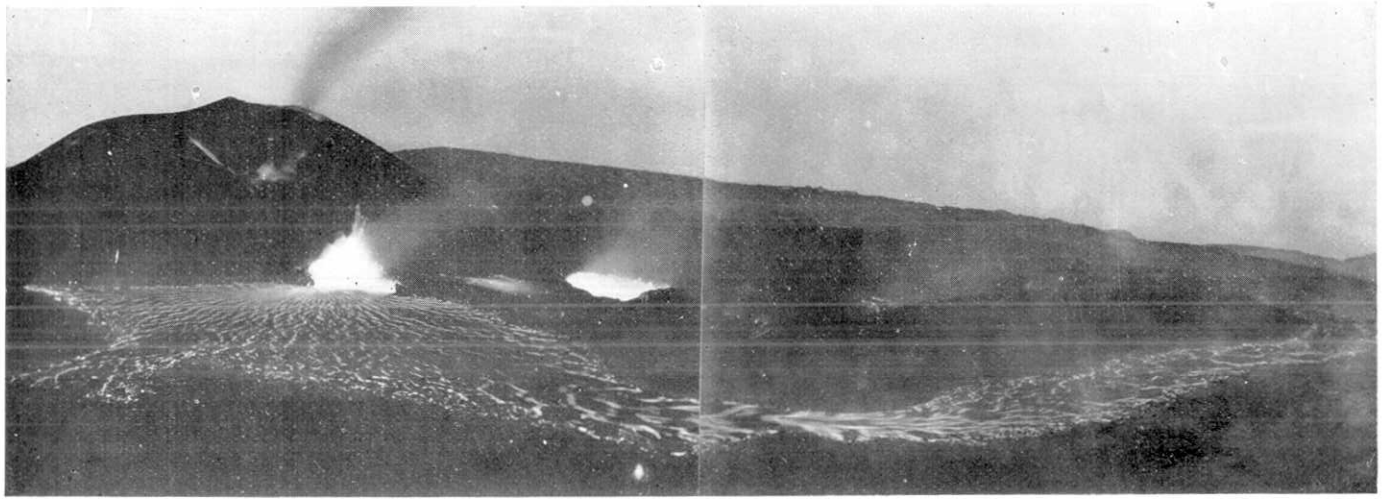
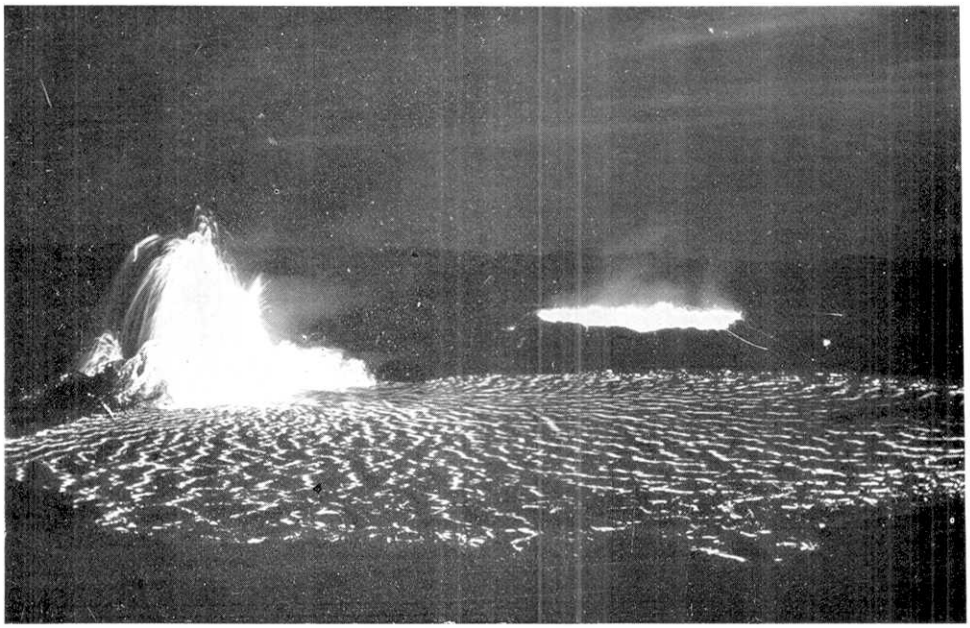
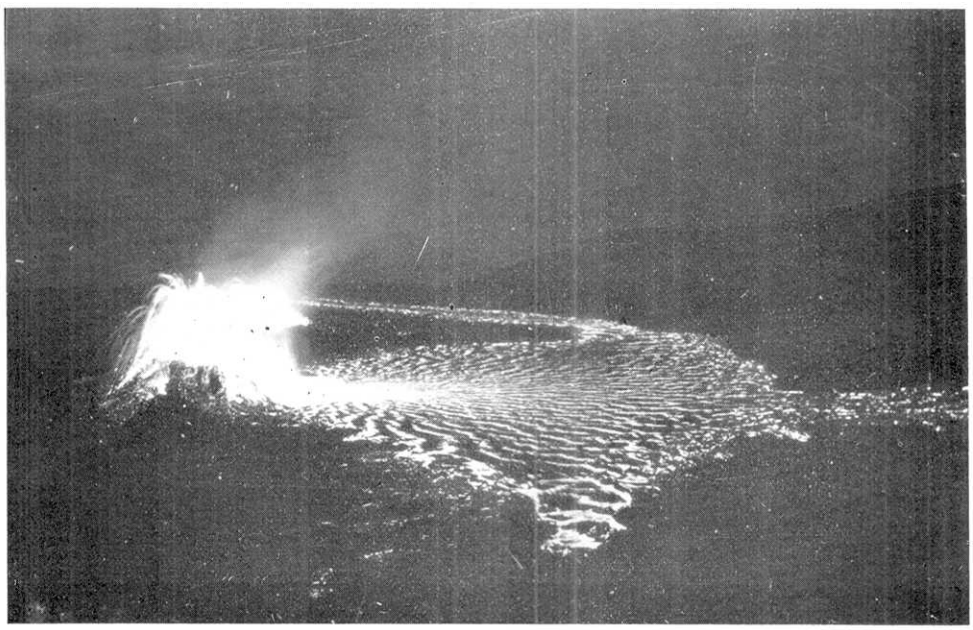


Fig. 148. Mihara crater as seen westward from Kengaminé, the east rim of the crater, showing lava fountains and flow. At upper left, the cinder cone in explosive eruption, May 6, 1951. Photo. S. Watanabe.

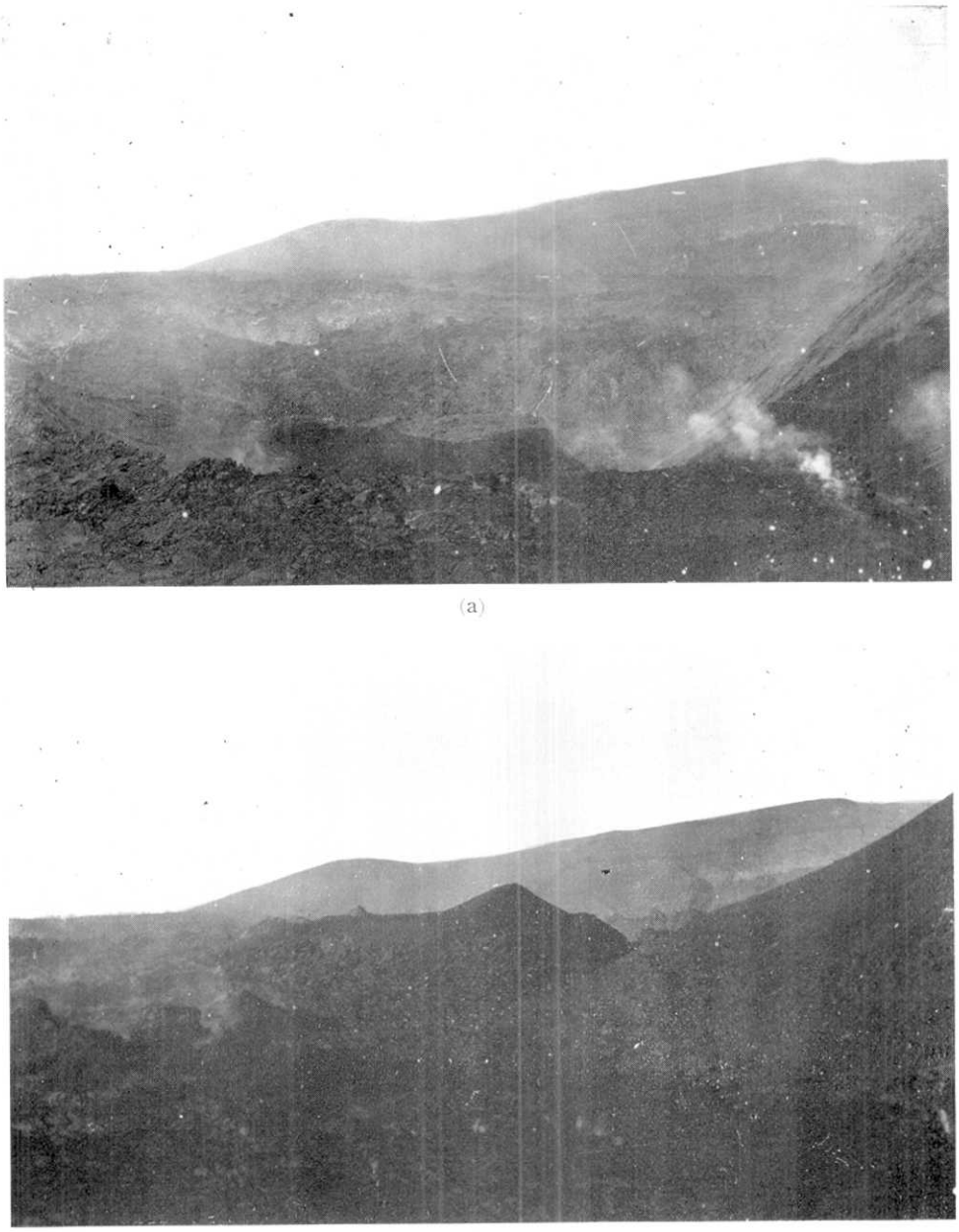


(a)



(b)

Fig. 149. Lava flow and fountains, (a) as seen from Kengaminé; (b) from the southeast rim of the crater, May 6, 1951. Photo. S. Watanabe.



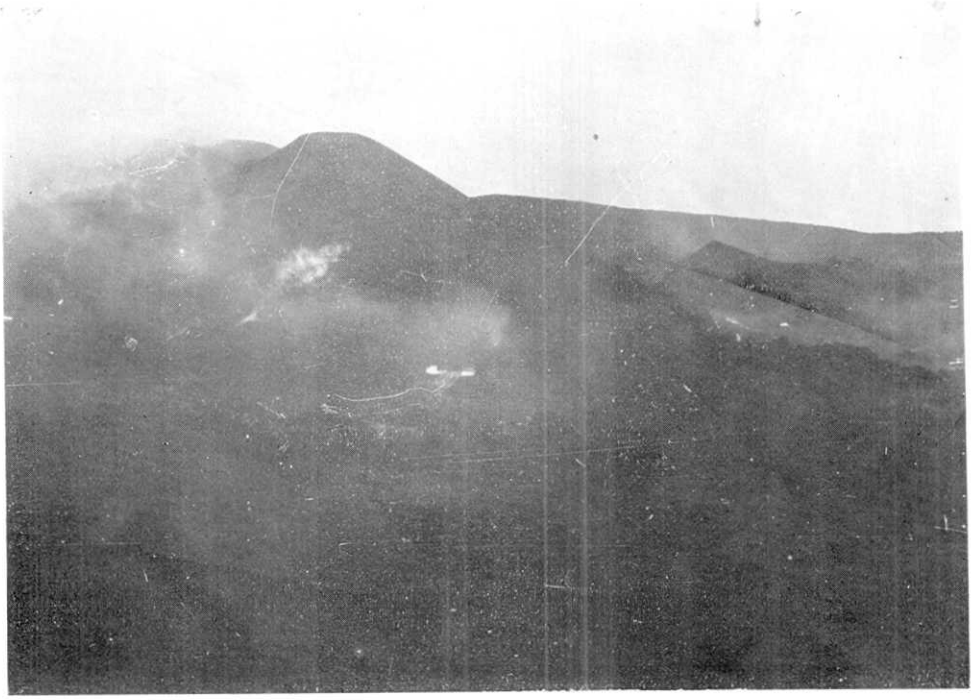
(a)

(b)

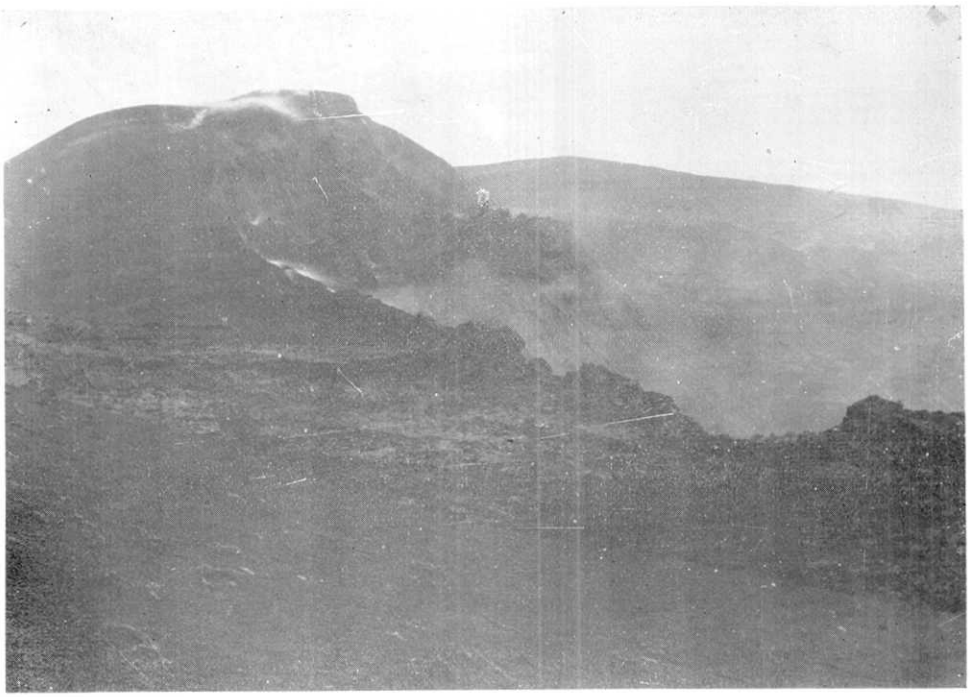
Fig. 150. View of the crater, showing great changes in feature by the ups and downs of the fill of the former central pit. Photo. S. Watanabe.

(a) New cauldron formed by subsidence, June 8, 1951. Cf. Fig. 171 a.

(b) The central mound rising again above the general level of the surrounding crater floor, June 10, 1951. Cf. Fig. 171 b.



(a)



(b)

Fig. 151. View of the cinder cone and the central mound, showing great changes in conformation, (a) June 10 ; (b) June 14, 1951. Cf. Fig. 172 a. Photo. S. Watanabe.

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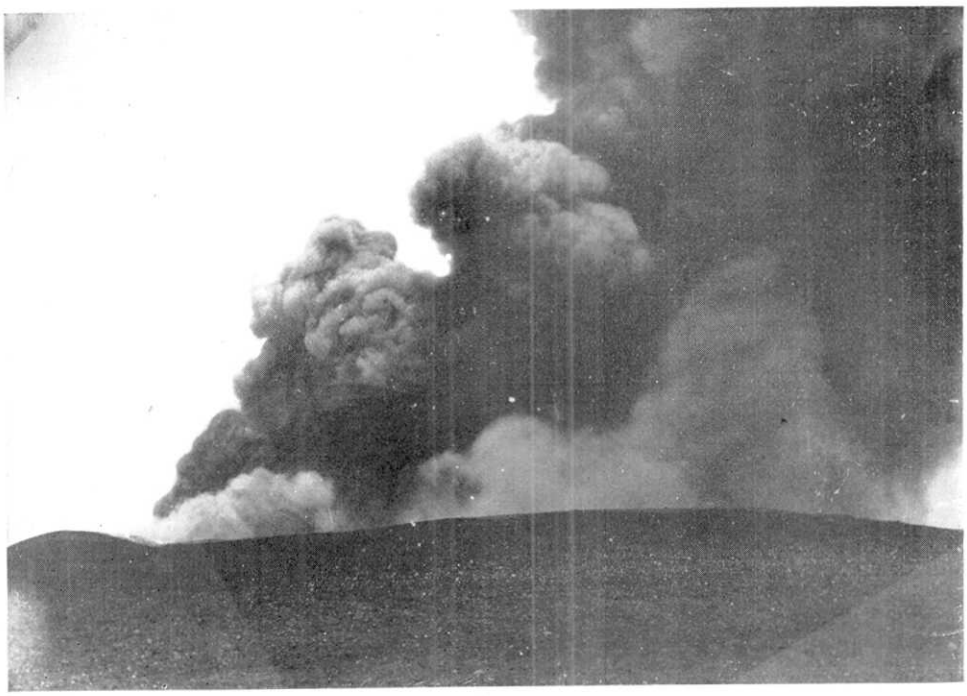
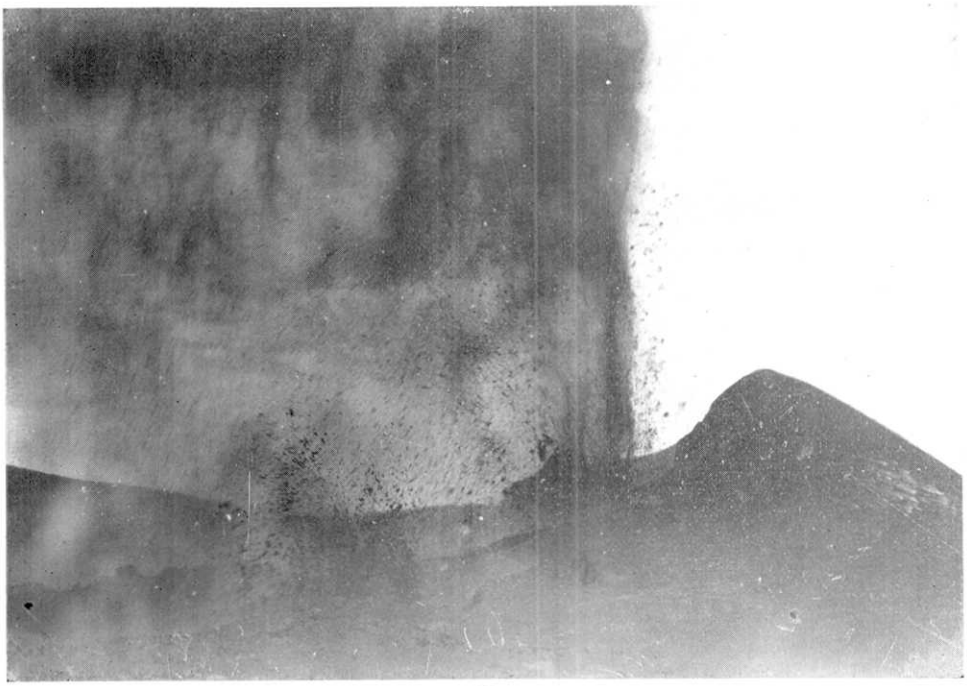


(a)



(b)

Fig. 152. Explosive eruption, June 17, 1951. Photo. S. Watanabe.
(a) Volumes of black ash clouds rising from the cinder cone, as seen northwestward from halfway down the outer slope of the southeast rim of the crater; (b) Explosive emission of bombs and cinders both at the main vent on the cinder cone and at a subsidiary vent at the northwest base of the cone.

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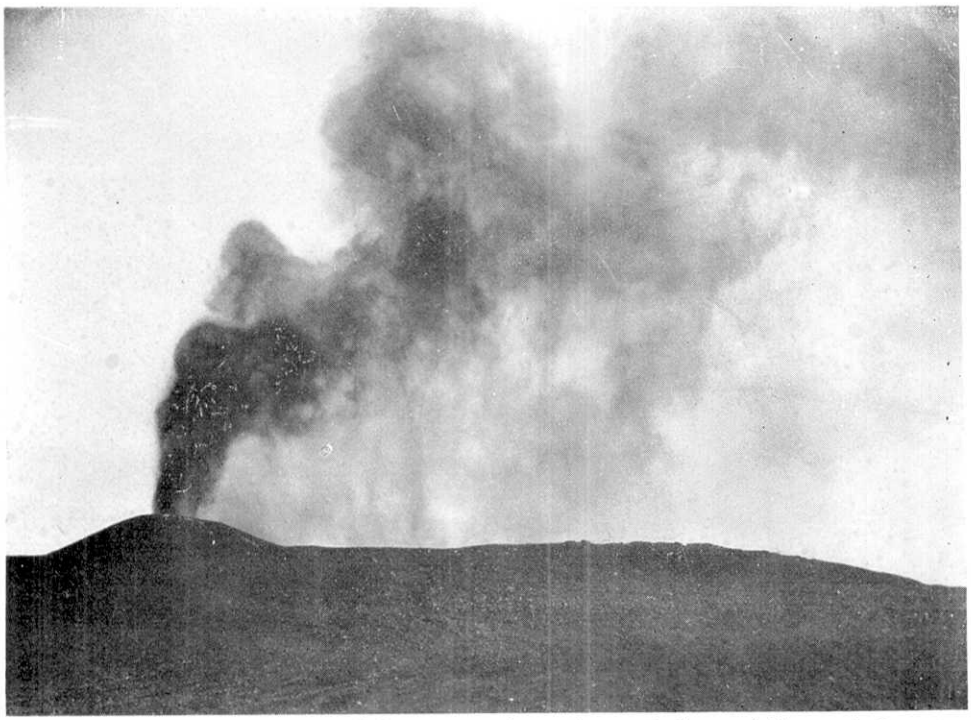

Fig. 153. The cinder cone (left), as seen from the south base of the central cone (Mt. Mihara), showing a phase of explosive eruption, June 17, 1951. Photo. S. Watanabe.

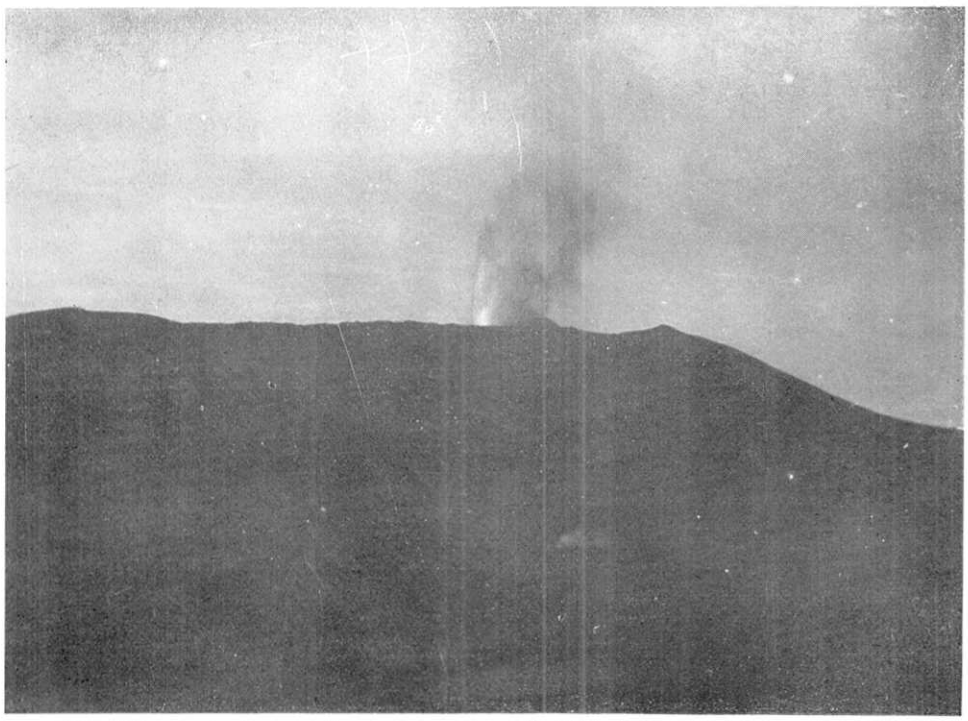

Fig. 154. Explosive eruption, as seen from Goshinkajaya, showing a column of fire accompanied by ash cloud, June 19, 1951. Photo. S. Watanabe.

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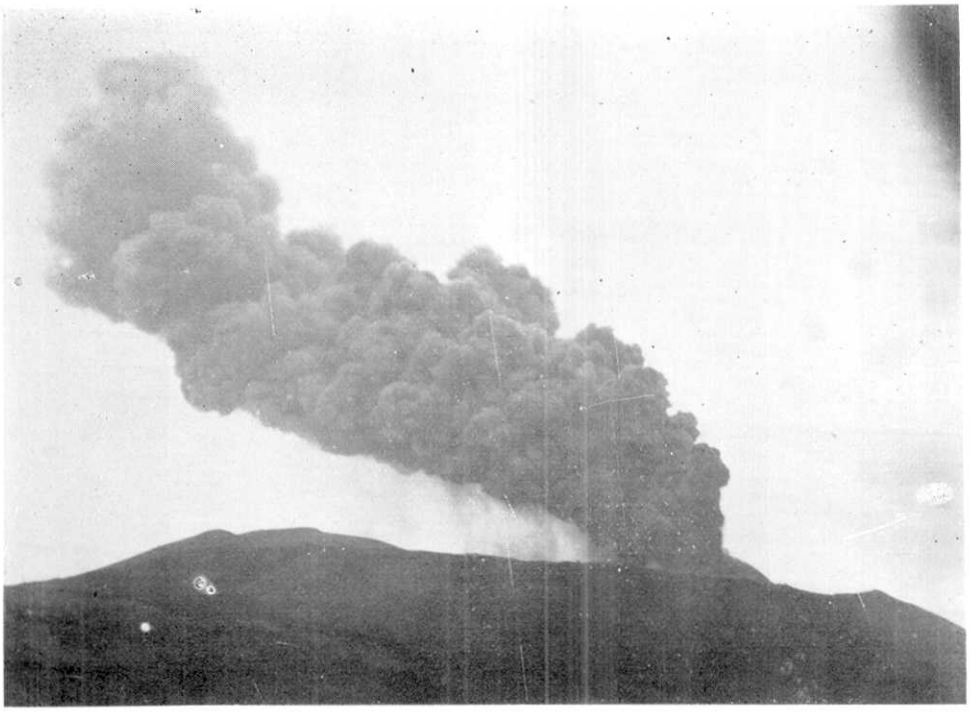
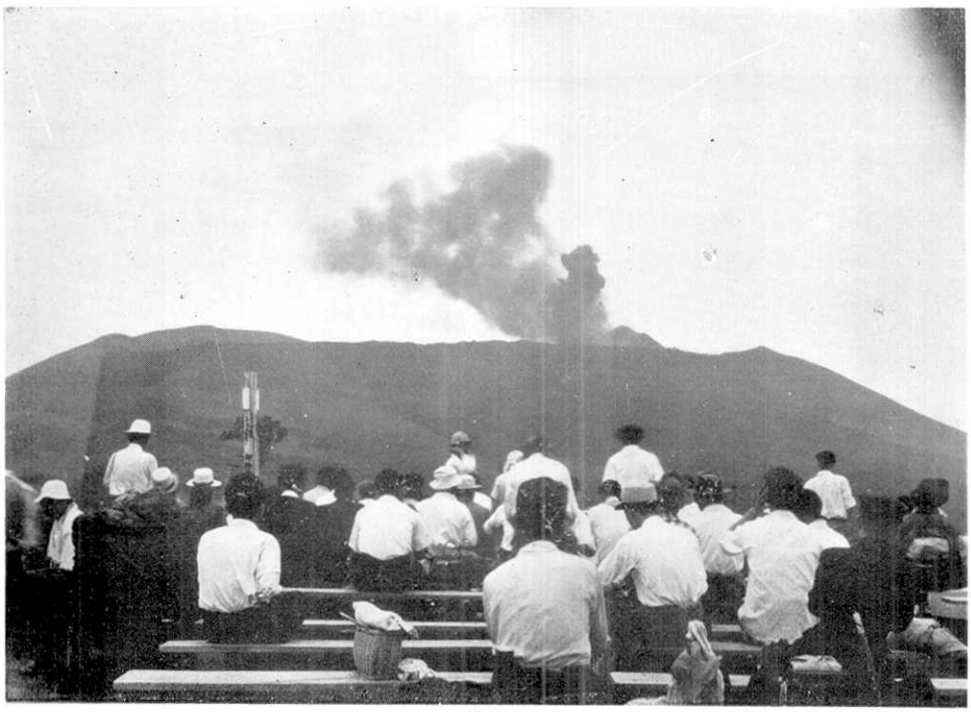
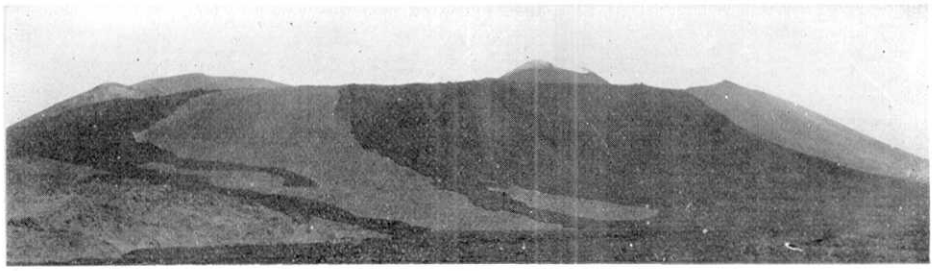


(a)



(b)

Fig. 155. Explosive eruption, as seen from Goshinkajaya, showing (a) continuous spouting of ash cloud ; (b) intermittent puffs of ash cloud, June 21, 1951.
Photo. S. Watanabe.



(a)

(b)

(c)

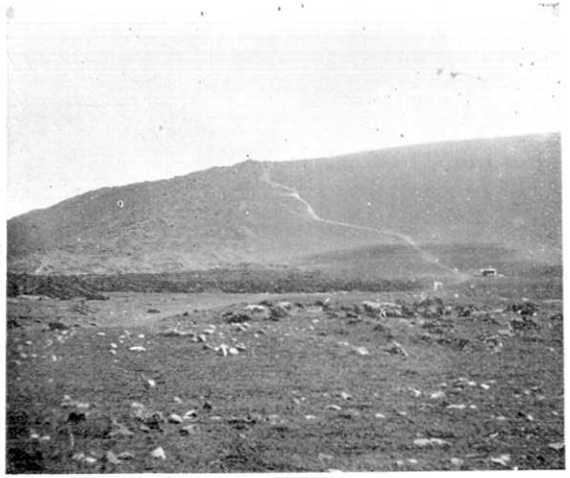
(d)

Fig. 156. View of Mt. Mihara, as seen from Goshinkajaya, showing successive changes in conformation of the cinder cone during the third period of eruption, (a) April 26 ; (b) May 4 ; (c) June 13 ; (d) June 22, 1951. Photo. S. Watanabe.

Fig. 157. Bombs and cinders on the west rim of the crater, ejected by the eruption of June 27–28, 1951.

Fig. 158. General view of the new lava flows in the west caldera floor, showing their surface covered with later ejecta (ash and cinders). August 15, 1951.

(a)



(b)

Fig. 159. The deposit of ash and cinders that has covered the southwest margin of the new flows (Fig. 158, at left), (a) View as seen east toward the mountain ; (b) View as seen west toward the caldera wall. August 15, 1951.

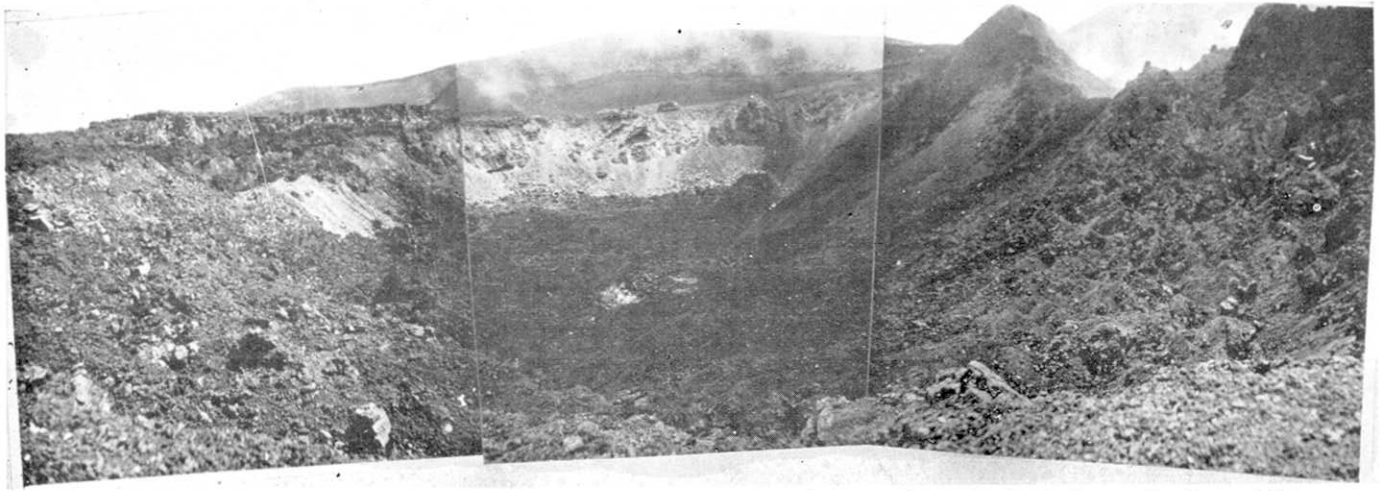


Fig. 160. The central cauldron (new central pit), as seen from its west rim. At right, the north slope of the cinder cone. August 15, 1951.

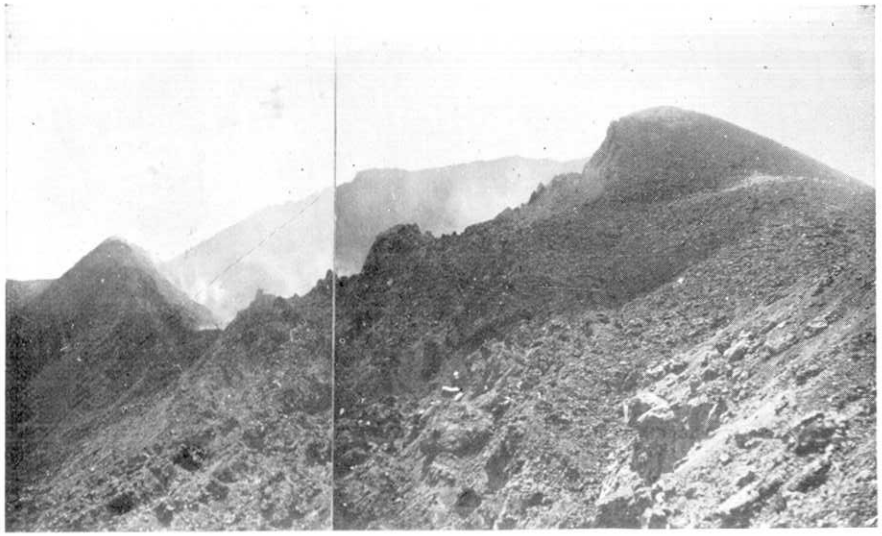


Fig. 161. The cinder cone, as seen from its northwest base, showing collapses of its north slope. August 15, 1951.

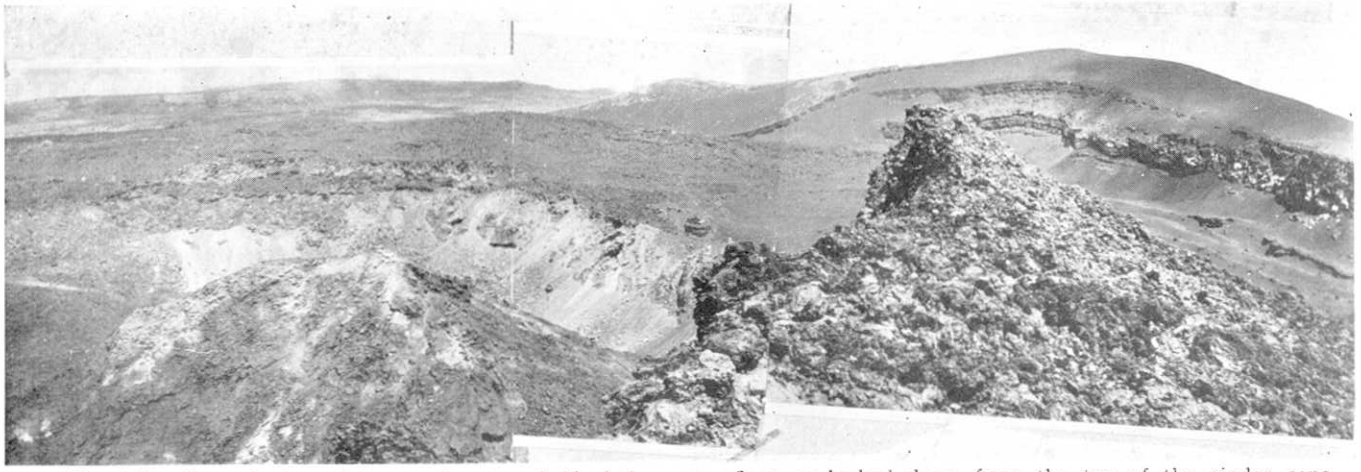


Fig. 162. General view of the northeastern half of the crater floor, as looked down from the top of the cinder cone, August 15, 1951.

Fig. 163. Southwest wall of the vent on the cinder cone, showing a fumarole, August 15, 1951.

Fig. 164. Bottom of the vent on the cinder cone, August 15, 1951.

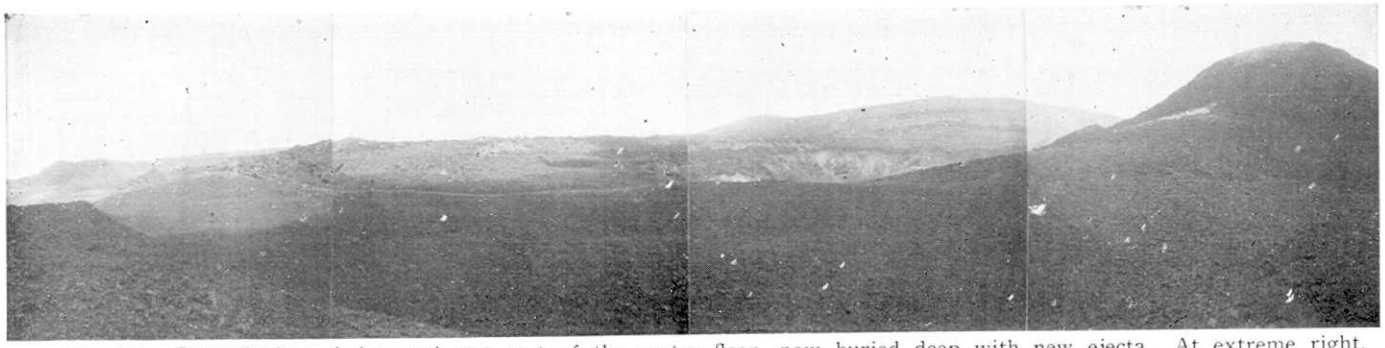


Fig. 165. General view of the northwest part of the crater floor, now buried deep with new ejecta. At extreme right, the cinder cone ; at centre, the new central pit. August 15, 1951.

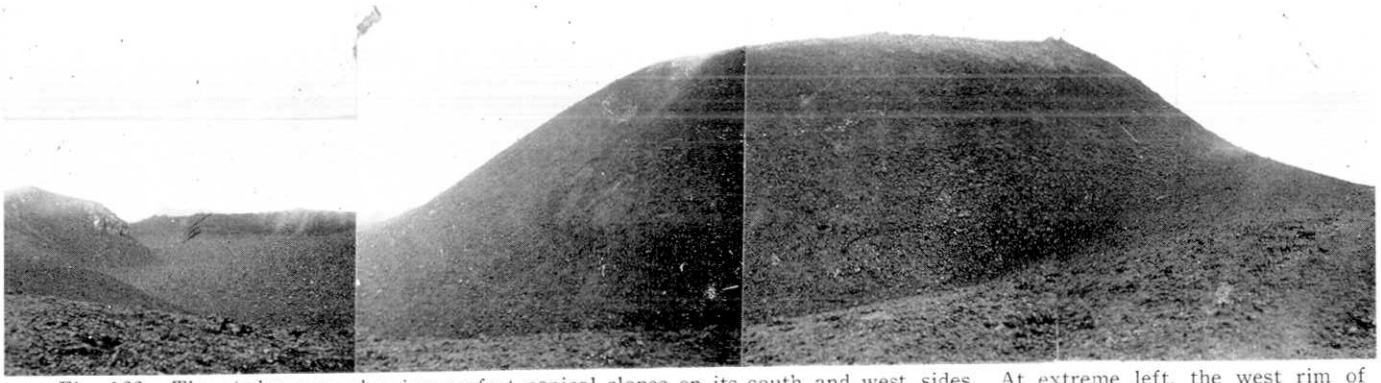


Fig. 166. The cinder cone showing perfect conical slopes on its south and west sides. At extreme left, the west rim of the crater. August 15, 1951.

(a)

(b)

(c)

(d)

(e)

(f)

Fig. 167. Lava tunnel, (a) a hole in the roof; (b) entrance to the tunnel; (c) interior of the tunnel; (d) the hole in the roof, as seen from the interior; (e) parallel grooves in the side wall; (f) a low ridge of lava running alongside the wall.

(a)

(b)

(c)

Fig. 168. Lava dike, possibly representing a part of solidified feeder of the first spatter cones which were active in March, 1951. (a) Longitudinal view of the dike; (b) side view; (c) slickenside on the wall of the dike.

Fig. 169. The only spatter cone left uncovered with later ejecta. August 15, 1951.

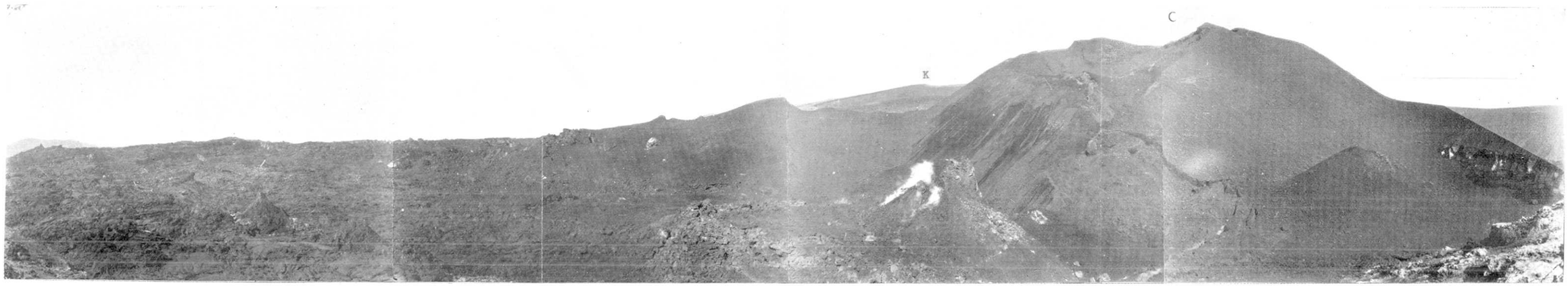


Fig. 170. General view of the western half, of Mihara crater. The cinder cone (C) and the central upthrusted mound (P), both showing fissures and slump scarps. The half demolished spatter cone (c) show a steaming activity, and the spatter cone (d) has become extinct, being covered entirely with cinders. Kengaminé (K), the east rim of the crater, in the centre back ; the northwest somma (S) at distant left. April 9, 1951. Photo. S. Watanabe.

(a)

(b)

Fig. 171. General view of the northwest part of Mihara crater, showing changes in conformation of its central part, (a) June 8 ; (b) June 14, 1951. Photo. S. Watanabe.

(a)

(b)

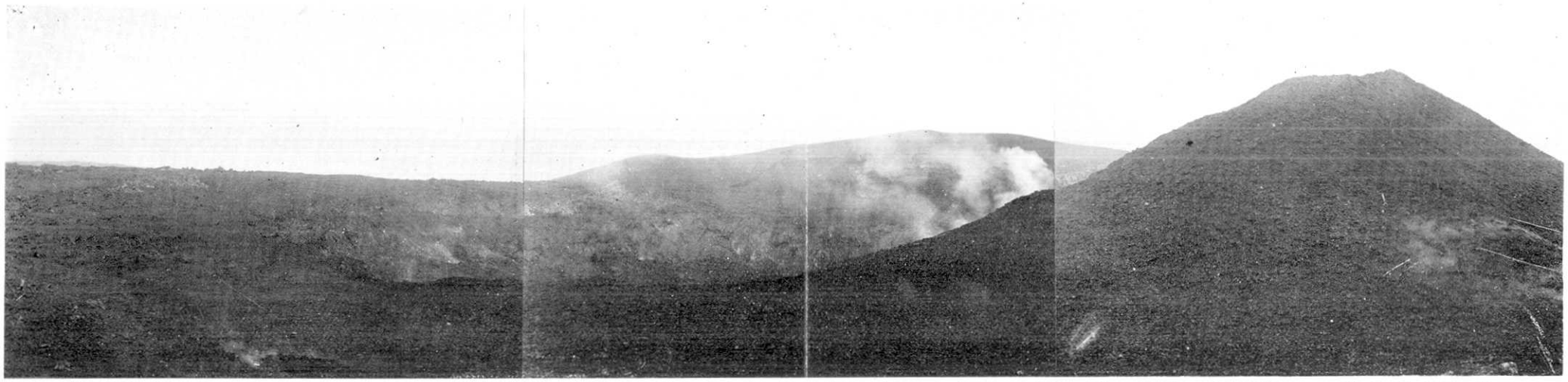


Fig. 172. General view of the northwest part of Mihara crater, showing changes in conformation of its central part, (a) June 10 ; (b) June 25, 1951. Photo. S. Watanabe.

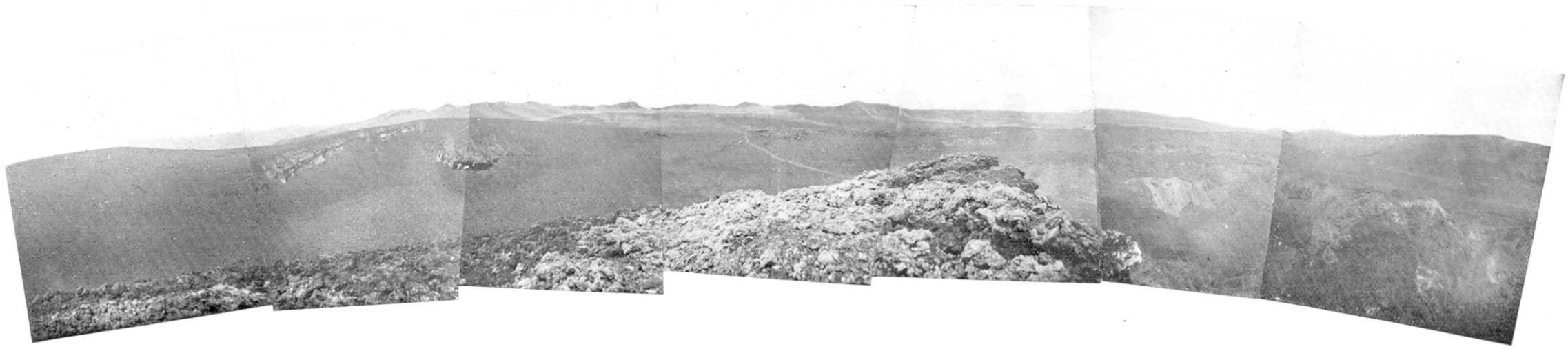


Fig. 173. General view of the northwest part of Mihara crater, as seen from the top of the cinder cone, August 15, 1951.

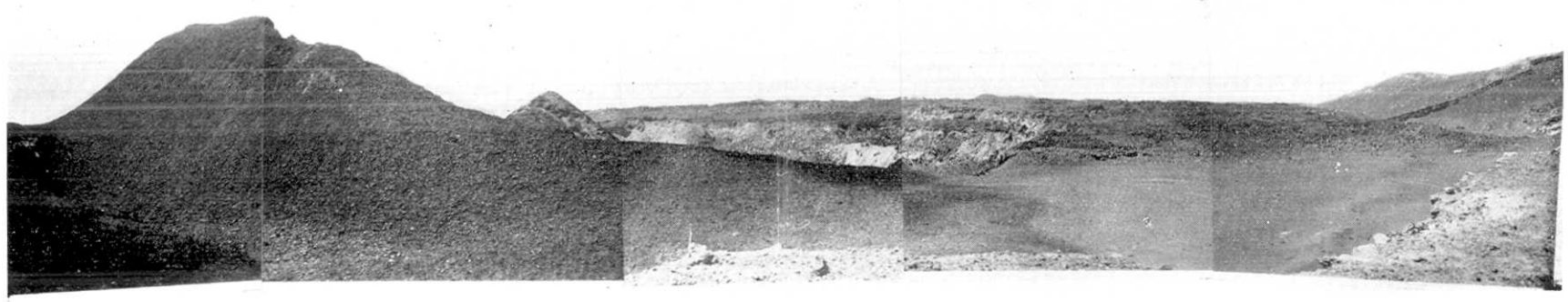


Fig. 174. General view of the northeastern half of the crater, with the cinder cone at left and the new central pit in the middle, August 15, 1951.

Errata

H. Tsuya, R. Morimoto, and J. Ossaka, *Bull. Earthq. Res. Inst.*, **32** (1954), 36–66.
Page 50, Foot-note. ....from the 2nd vent into a continued....:
Read ....from the 2nd vent continued.....
Page 63, Table VII, 3rd column, 6th line, 75 seconds: Read 65 seconds.
Pl. XXII. Fig. 20. Scale of the map being *1/3,000*.

Errata

H. Tsuya, R. Morimoto, and J. Ossaka, *Bull. Earthq. Res. Inst.*, **32** (1954), 289–312.
Page 295, Fig. 72. Map of....: Read Maps of.....
Page 296, Fig. 73. Map of....: Read Maps of.....
Pl. XXXIII, Fig. 64. Photo. Miyajima.: Read M. Miyajima.
Pl. XLIII, Fig. 36. ....and filowing away....: Read Fig. 86.....flowing away.....
Pl. XLVII, Fig. 97. downsteam: Read downstream.
Pl. LIII, Fig. 113. vLaa: Read Lava.

丘における爆発性噴火のほかに，火口底東半部に，10 個以上の大小の熔岩々滴丘が新しく生じて熔岩滴やガスを噴出し，また，東側火口壁近くの数ケ所から熔岩が湧出したことが，もつとも著しい現象である．この熔岩々滴丘や熔岩湧出孔の多くは，噴石丘を中心とする火口底の放射状割目の上に配列されており，あたかも地下の導管内の熔岩が，噴石丘を中心として，火口底を押し上げ，そのために生じた放射状割目に沿つて迸入し，さらに，その一部が火口底に噴出するに至つたことを示すもののようである．この第2次前半の活動に伴つて，噴石丘及び隆起丘は，急激に隆起したが，その活動休止直後に，再び沈下し，隆起丘周辺の火口底に，同心円状の割目や陥落崖が現れ，また，噴石丘の北半に崩壊が起つた．これらの変動は，火口中央にあつた旧中央孔の位置に，それと同様の桶状陥落孔を再現しようとする作用のあらわれであつたと考へられる．5 月 3 日の短時間の爆発は，この沈下の進行中に起つたもので，第 1 次の活動の場合と同様に説明される．

第 2 次後半 (5 月 6 日—7 日) の連続的活動は，噴石丘における爆発性噴火のほかに，隆起丘東側の旧中央孔東壁辺りの割目上に，二つの大きい熔岩噴泉を現出した．この噴泉の一つからは，熔岩が連続的に噴騰すると同時に，孔外に溢れ出て東部火口底上に扇状に拡がり，さらに，中央丘の北側を廻つて，帯状の流れとなつて西に進み，同丘西側の火口底にまで達した．この噴火に伴つて，先に沈下した隆起丘及びその周辺は再び隆起し，同時に噴石丘は，新噴出物の堆積によつて，完全な円錐丘となり，その高さを増した．

そのごの 1 箇月間，噴火活動は全く停止し，火口内の形状に著しい変化は起らず，隆起丘及び噴石丘に多少沈下する傾向が認められたのみであつたが，6 月 9 日に第 3 次の活動が始まる直前に至つて，これらに急激な沈下が起り，旧中央孔の位置に陥没孔が現れた．

(3) 第 3 次の活動は，6 月 9 日から同月 28 日までの間，噴石丘において繰返された爆発性噴火である．その間，隆起丘及びその周辺が，著しい隆起沈降運動を行つたが，最後には桶状陥落孔として停止した．この期間中，おそらく活動性熔岩はその導管内の深部に後退しており，そのガス圧が間歇的に十分高まつて爆発を起し，また隆起丘及びその周辺を押上げたものと考へられる．

第 3 次の活動は，6 月 27 日—28 日の異常な大爆発をもつて終り，これがまた昭和 25 年—26 年の三原火口噴火輪廻の終末を告げるものとなつた。その結果，同火口中央部には旧中央孔に匹敵する桶状陥落孔が残り，その南縁には同孔に向つて欠潰した噴石丘が残つた．(未完)