56. *Recent Activity of the Long-Dormant Akita-Komagatake*[1] *Volcano in North-East Japan.*

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Introduction.

The long-dormant volcano, Akita-Komagatake, which suddenly became active towards the end of July last, is part of the long mountain range running in a north-south direction and forming the backbone of North-East Japan. This volcano, with Hatimantai[2] and Ebosidake[3], constitute the three conspicuous peaks that rise from this range; the volcano, which is 1800m. high, being the highest of the three. The position of the volcano is approximately 5 km. southwest of the volcano Iwate[4] (Ganzyu[5] in some maps), which lies north-west of the city of Morioka[6] and about 2·5 km. east-north-east of the celebrated lake Tazawa[7] (see index map, fig. 1).

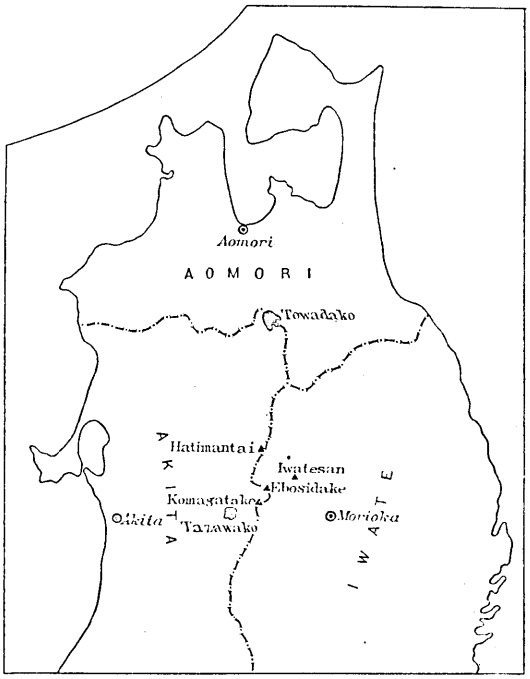

Fig. 1. Index map showing the position of the Komagatake or Akita-Komagatake.

1) 秋田駒ケ嶽. 2) 八幡平. 3) 烏帽子嶽. 4) 岩手. 5) 巖鷲. 6) 盛岡. 7) 田澤.

Brief Geology and Morphology of the Volcano.

North-East Japan is divided into two zones, the Outer and Inner, by the lowlands of the rivers Mabeti[8], Kitakami[9], and Abukuma[10]. The Neogene strata in the Outer zone which thinly cover the basement complex are slightly deformed, while the same strata in the Inner zone consist of thick pyroclastic materials; their geologic structures being complicated by crustal movements and volcanic activities. During the Quaternary they were extruded and covered by many volcanoes. The volcano and vicinity are in the Inner zone.

The basal rocks of this region consist of pyroclastic rocks and hard mud-stones, resembling the so-called green tuff formation and the siliceous shale, respectively, of the Akita-Yamagata[11] oilfields.

For convenience the writer will call these pyroclastic rocks and hard mud-stone the Sakamoto[12] formation. The Neogene formation, which is the bluish-grey tuffaceous muddy sand out-cropping near Hasiba[13] village, probably rests on the Sakamoto formation. Fossil shells reported by S. Nomura[14] from this formation suggest middle Neogene age.

These Neogene formations strike N. 40°W. and dip 40° or more NW. In the Sakamoto valley the greenish tuffaceous beds are often intercalated in the hornfels as hard mud-stone beds. At the summit of the Kunimi[15] pass (894. 4 m.), this formation assumes a folded structure (Fig. 2). Its strike and dip vary, but the former is generally N. 20°–30°E. Fig. 3 is a schematic geologic map of the Akita-Komagatake after the late Sakurai.[16]

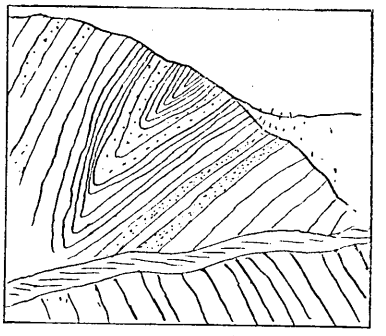

Fig. 2. Fig. shows the folded structure of Neogene strata.

These basal Neogene rocks crop out on the Kunimi pass and at the Kunimi hot springs, where the basal rocks (N. 20° W.: N. 10°) have been metamorphosed by sulphur bearing gases or solutions. Mt. Sasamori consists of these basal

8) 馬淵. 9) 北上. 10) 阿武隈. 11) 秋田山形. 12) 坂本. 13) 橋場.

14) S. Nomura, 「化石標本蒐集報告」, *Bull. Saitô-Hôonkai Museum*, 8 (1931). Following species are reported: *Anadara trilineata amicula* (Yokoyama), *Ostrea gravitesta* Yokoyama, *Mytilus crassitesta* Lischke, *Dosinia* cf. *kaneharai* Yokoyama.

15) 國見.

16) H. Sakurai, "Geology of the Iwate volcanic group", *Sinsai Yobô Chôsakai Hôkan* (*Report of the Imperial Earthquake Investigation Comittee in Japanese Language*), 44 (1903).

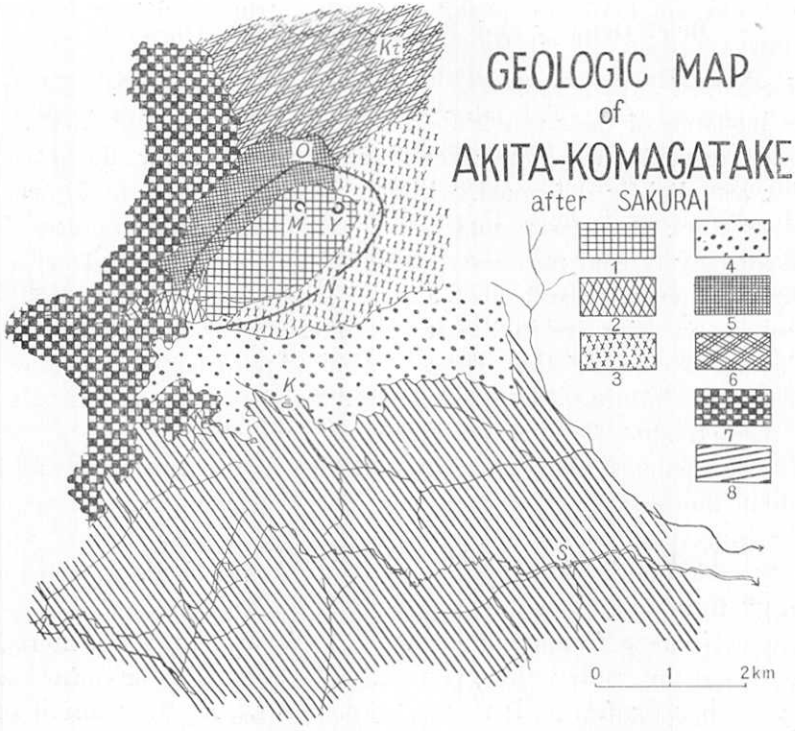

Fig. 3. Geologic map of Akita-Komagatake after H. Sakurai (1903). 1=Me-lake lava, 2=Hinokinai-zawa lava, 3=Ooyakesuna lava, 4=Southern Komagatake lava, 5=Katakura lava, 6=Oodake lava, 7=Midusawa lava, 8=Sakamoto formation; K=Kunimi Hot Springs, Kt=Katakura-sawa, M=Medake, N=Yokonagane, O=Oodake, S=Sakamoto valley, Y=Yokodake.

formations, exhibiting a beautiful stratification. The development of basal rocks at high altitudes suggests that the volcanic materials composing Akita-Komagatake is not thick.

The late Sakurai,[16] who studied this volcano in 1903, published his results in "Report of the Imperial Earthquake Investigation Comittee in Japanese Language," No. 44, illustrated with excellent geologic maps. He states that the basal Neogene develops also on the north and south side of the mountain.

The Akita-Komagatake is a volcano that rose during the Quaternary on the erosion reliefs of basal rocks. It consists of two central cones, Medake[17] and Yokodake,[18] surrounded by the sommas Yokonagane,[19]

17) 女岳. 18) 横岳 (not of topographic map of Military Land Survey, Sidukuisi (雫石) sheet, 1/50000).

19) 横長根 ("Yokodake" of topographic map (Sidukuisi sheet)).

Ôdake[20] and the 1115·7 m. peak. A broad atrio, which is formed of lava flows, spreads out on the south side of these two central cones. Fig. 6 shows the lava-flows which were exposed on the wall of the recent explosion pits. The late Sakurai classified the lava-flows of the Akita-Komagatake into the following kinds:

Medake lava (Olivine-Hypersthene-Andesite),
Hinokinai-zawa[21] lava (Hypersthene-Augite-Andesite),
Ooyakesuna[22] lava (Olivine-Hypersthene-Andesite),
Southern Komagatake lava (Olivine-Hypersthene-Augite-Andesite),
Katakura[23] lava (Olivine-Hypersthene-Andesite),
Ôdake lava (Hypersthene-Augite-Andesite),
Midusawa lava (Hypersthene-Andesite).

The lava flows forming the surface of the atrio, the hypersthene bearing Olivine Andesites (Sakurai's Medake lava), is the most recent in age.

Past References to the Activity of the Volcano.*

This volcano must have continued its activities for a very long time in the remote past. The rich sulphur beds of the Katakura valley on the northeast side of the mountain are mute witnesses of these bygone activities. Beyond the escape of gases from these sulphur beds observed 50 years ago[25], the volcano has been perfectly quiescent so far as recorded history is concerned. When Sakurai studied this mountain it was absolutely devoid of any sign of activity; not even a solfataric vent could be found on the crater. It would seem from these data that the volcano has been dormant for untold ages.

Exact Date of the Recent Explosion.

On account of the secluded and isolated situation of the locality concerned, there is disagreement about the exact date of the recent explosions. On the morning of July 21, 1932, visitors to the Kunimi-hot springs, only 2·5 km. east of the new explosion pits, felt shocks (or

20) 男岳.
21) 桧木内澤. 22) 大焼砂. 23) 片倉. 24) 水澤.
25) *Chigaku Zassi* (*Journal of Geography*) II, 22 (1890), (in Japanese).
* In 1891, the following report appeared in the "Journal of Geography" in Japan, vol. 3, p. 43:—People living near the Akita-Komagatake volcano spoke about the volcano having rumbled and ejected hot stones from the crater during December, 1890. But no particular sighns of such could be seen.

earthquakes), but that day and the two days which followed were so inclement that no one ascended the volcano. On July 24 some mountaineers crossed the mountain along the somma on their way from Obonai[26] to the Kunimi hot springs. The day was so cloudy that they failed to notice the new activity, but they were puzzled to find their clothes discoloured black by fine dust in going over the Yokonagane. (Fig. 4).

The discovery by the other party of the new explosion pits on the atrio the following day (25), which turned out fine, caused great excitement at the Kunimi hot springs and the village of Obonai.

Several Japanese newspapers erroneously reported the new explosion of the Akita-Komagatake as having occurred on July 25 and 26[27], while others gave the dates as the 27th and 29th[28].

From the informations obtained at Obonai village and elsewhere the writer concludes that the new explosion occurred on July 21.

The New Explosion.

Position. As stated above, the new explosion occurred in the "Atrio" (locally called Isibora or Isipora)[29] surrounded by the "Somma," at the southern foot of Medake, one of the central cones. The southern most explosion pit lies about 700 m. east of the 1115·7 m. triangulation point, or 500 m. south of the top of Medake. These pits lie between about 1000–1150 m. above sea-level. (Fig. 4).

Distribution of the New Explosion Pits.

On the atrio, explosion pits were hitherto unknown. The 11 or more new explosion pits are arranged in a line in direction about N. 45° E. for about 600 m., as shown in Fig. 4; the southernmost one lying at a distance of 700 m. from the triangulation point 1115·7 m. in a N. 84° E. direction. Fig. 4 is a sketch map showing their distribution. Fig. 5, which is a photograph taken from the southern side of the central cone Medake, gives a complete view of the new explosion pits.

For convenience, they are numbered from 1 to 11, counting from south to north (Fig. 4). Their descriptions follow.

Explosion pit No. 1: (Fig. 6 and 8). Explosion pit No. 1, which

26) 生保内.
27) *Iwate Nippô*, Aug. 6, 1832; *Akita Sakigake Shinpô*, July 31, & Aug. 2, 1932.
28) *Hôchi Shimbun*, July 28, 1932; *Nippon*, Aug. 2, 1932.
29) 石ボラ.

is the largest and deepest of all, is nearly subpentagonal. Its long axis is about 18 m. The pit wall is vertical except for small collapses, one each on the northern and the western walls. The three lava flows (Hypersthene bearing Olivine andesite) which form the surface of the atrio are clearly seen on the pit wall. Fig. 6 shows a complete view of the first explosion pit and the lava flows. The floor of the pit is filled partly with water and partly with mud, which on drying has formed beautiful suncrack figures. Fig. 8 shows the floor. Surrounding the pit, large andesite blocks (about 1 m. or more in diameter) and lapilli and ashes are scattered about, the thickness of the last-named in places being about 3 m. Most of these blocks, lapillus, and ashes are fragments of the Hypersthene bearing Olivine andesite seen exposed on the pit wall. The root-like forms seen on the upper part of the pit wall in Fig. 6 are Ditake[30] (a species of bamboo) buried by the ejecta. The pit being now quiet no gases are emitted.

Explosion pit No. 2. Explosion pit No. 2, which ranks second in size, lies north of the first. It appears from fig. 5 that the second pit is a continuation of the first. The long oval horse-shoe form opens toward the south. While the southern wall of the pit is either low or level with the surrounding surface, the northern wall is similar to those of pit No. 1. Mud fills the pit floor and overflows the lower southern wall. Activity having subsided no gases are being emitted.

Explosion pit No. 3. This pit, which is situated northeast of pit No. 2, is also of an oval, horse-shoe form opening southward. The northern wall of the pit is about 3 m. high. Explosion ejecta around the pit have buried tall trees, such as Didake, Sugi[31], and Sirakaba[32] etc., only their tops being visible above the new ground surface. The longer axis of the pit is about 35 m. and the shorter 23 m.

Explosion pit No. 4. Explosion pit No. 4 is situated northeast of No. 3. It forms an irregular quadrilateral, as shown in fig. 4; its south and north ends being closed crevice-like. The floor of the pit here is also filled with mud.

Explosion pit No. 5. Explosion pit No. 5, which lies northwest of No. 4, is relatively small, shallow, and almost round. Its radius is about 12 m. Mud also fills the floor of this pit from which gases issue no longer.

Explosion pit No. 6. Explosion pit No. 6, situated 100 m. east of

30) 地竹. 31) 杉, (a species of cedar). 32) 白樺, (a species of birch).

No. 5, is relatively large and nearly ellipse, with its longer axis about 30 m. long and the shorter about 15 m. The pit wall (about 3 m. high) is a low ridge formed by materials ejected from the pit. The topography is that of a small "Maar" near the Rhine in Germany. The east part of the outer slope of the low ridge is eroded by a gully, forming cliffs. Fig. 9 shows the explosion pit and the inner slope of the low ridge. Its full view is seen in fig. 4. Water and mud fill the floor of the explosion pit.

Explosion pit No. 7. This pit, situated 40 m. east of No. 6, is round, about 15 m. in diameter, with its horse-shoe formed part opening toward the south. The only wall, which is on the northern side, is 5 m. high. Although pit No. 6 is now quiescent, some vapour still issues from a fissure under the northern wall of pit No. 7.

Explosion pit No. 8. Pit No. 8 is very small, round with its horse-shoe formed part opening toward N. E. E. Its diameter is about 4 m. and its depth about 1 m. The floor of the pit is filled with mud and water. It lies 70 m. east of No. 7.

Explosion pits Nos. 9 to 11. These three active pits emit gaseous H_2O, and SO_2. The distribution of the fumaroles are shown in fig. 4. These three pits are connected, forming a long narrow active explosion fissure about 200 m. long; pits Nos. 9 and 10 lying close together. Their depths are about 10 m. or more, and their widths about 23 m. No. 11, the northernmost one, is about 16 m. wide and about 7 m. deep. Nos. 10 and 11 are connected by a narrow fissure, from which also issue SO_2 and H_2O. Fig. 10 shows pit No. 9. and its fumarole.

Distribution of the Ejecta.

The materials ejected are distributed along the atrio and the eastern region of Akita-Komagatake, and are mainly confined to the eastern parts of the explosion pits, near which the large blocks (about 1 m. or more in diameter) are scattered. Fine gray ash, about 5 cm. deep, is deposited on the ridge of Yokonagane. In Iwate prefecture, lying north of the volcano, occurred a slight ashfall. Fig. 4 gives some idea of the effects of the ejecta, destroying the vegetation buried by it, as shown in the light coloured parts of Fig. 5 and 7.

Damage.

Owing to the isolated character of the district, the amount of damage

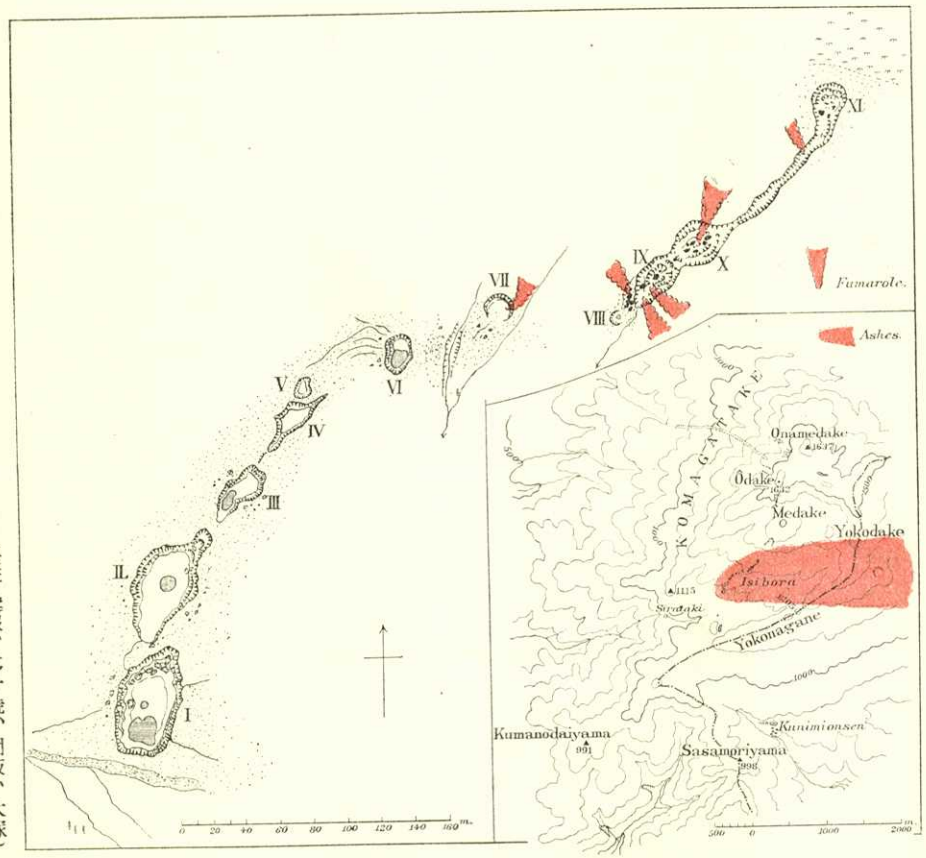

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Fig. 4. Sketch map showing the distribution of the explosion pits and ashes.

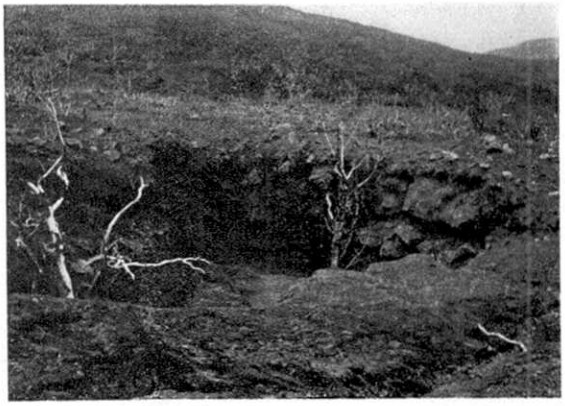

Fig. 6. Photograph of complete view of the 1st pit.

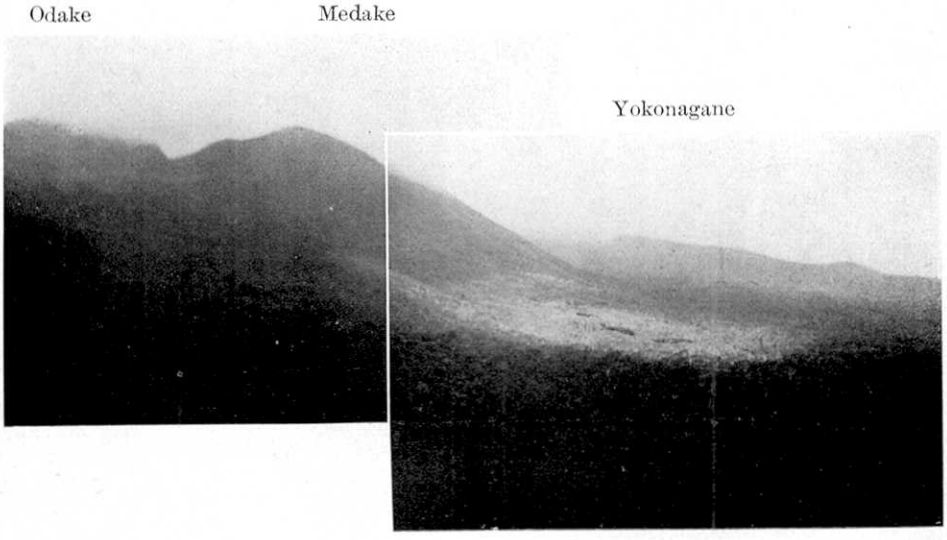

Fig. 7. Photograph of complete view of the explosion area.

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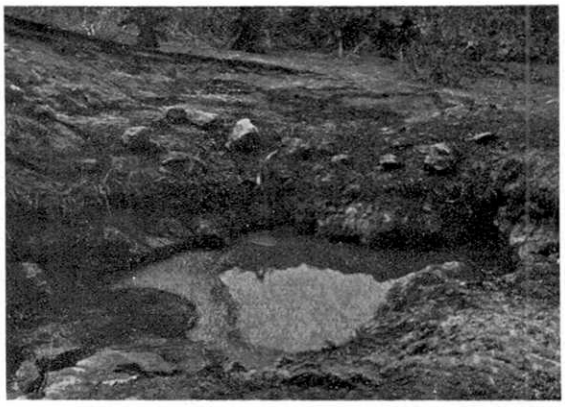

Fig. 9. Photograph of 6th pit.

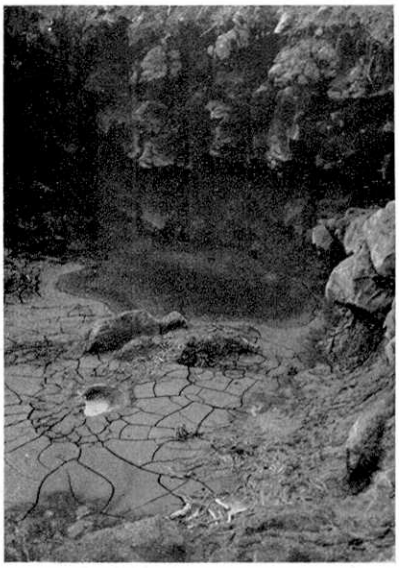

Fig. 8. The floor of the 1st pit.

Fig. 10 The 9th explosion pit and its fumaroles.

(震研彙報、第十號、圖版、大塚)

Fig. 5. Complete view of the new explosion pits.

is small, being limited to destruction of vegetation over an area of 2 km. The cool springs gushing out from the end of the atrio (locally called Ootubo[33]) changed into carbonated springs but without rising in temperature.* The temperature of the Kunimi hot springs rose after the explosion. A few days after the explosion, a guide was temporarily suffocated on the atrio by arsenic?-impregnated gas.

Local earthquakes were felt at the town of Oomagari[34] which is situated on the Alluvial plain, 12 km. S. W. of the volcano, both before and after the explosion.

Summary.

The recent activity of the long-dormant volcano Akita-Komagatake was of the explosive type. The explosion occurred some time between July 20 and 24. The writer believes that the date is July 21, 1932. Eight or more seperate explosion pits and 3 connected pits were formed. They are all quiet now with the exception of pit No. 7 and the three connected ones (Nos. 9, 10, and 11), which were emitting vapours of H_2O, SO_2, and H_2S?, when the writer visited them. On account of its isolated situation the damage was small.

The linear arrangement of the explosion pits seems to suggest a tectonic line lying immediately under the land surface.

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56. 休火山秋田駒ケ岳の活動

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休火山秋田駒ケ岳の最近活動した結果が述べてある。活動は爆裂で、1932 年 7 月 20 日から 25 日の間に行はれた。種々の點から綜合して、21 日に爆裂が行はれたと信ぜられる。爆裂孔は合計 11 個で、その内 8 箇はそれぞれ獨立した爆裂孔で、殘りの 3 つは溝狀の裂罅で續いてゐる。南から數へて 7 番目と 9, 10, 11 番目とは未だ水蒸氣、亞硫酸ガスを噴出してゐるが、他は泥水で充たされて、全く靜止してゐる。最大のものは徑 70 m. に達してゐる。被害は降灰區域の僅な部分の植物にあつたのみ。

尙、この爆裂後國見溫泉の溫度が高まり、大ツボの清水は炭酸泉に變質した。

今度の爆裂は極めて表面的であること、及び爆裂孔が一列に並んでゐることは面白い。

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33) 大ツボ.　34) 大曲.

* Some mountaineers noted that the spring dried up during the few days before the explosion.