Japan Geoscience Union Meeting 2015
(May 24th - 28th at Makuhari, Chiba, Japan)

SVC48-P01 Room:Convention Hall Time:May 24 18:15-19:30

Augmentation of Magma Database by using a simple method to estimate groundmass SiO2 content

TAKEUCHI, Shingo[1*] ; TOSHIDA, Kiyoshi[1] ; MIURA, Daisuke[1]

[1]Central Research Institute of Electric Power Industry

We developed a simple method to estimate groundmass SiO2 contents (preeruptive melt SiO2 contents) by using masabalance calculation between bulk rock, bulk phenocryst and melt compositions. This method helps us to augment the Magma Database, which has been constructed to examine relationship between magma properties and eruption behavior for volcanic eruptions in Japan during the last one hundred thousand years.

The simple method is based on uniformity in total phenocryst SiO2 content. We examined total phenocryst SiO2 contents of 44 magmas, ranging from basaltic to rhyolitic bulk composition, in the Magma Database. The total phenocryst SiO2 contents were calculated from modal data and representative phenocyrst compositions. We found that the magmas have uniform total phenocryst SiO2 contents of 47.4 wt% (S.D.=1.5 wt%) if their phenocyst assemblages are quartz-free. If quartz phenocyrst are contained, the total phenocryst SiO2 contents increase with fractions of quartz phenocyrst and have 64 wt% at the maximum. This evidence validates an assumption of uniform total phenocryst SiO2 contents (47.4 wt%) in massbalance calculation for the quartz-free magmas.

We compiled ca.40 literature data of bulk SiO2 and phenocryst content for mainly lava eruptions, which are minor in the Magma Database. Melt SiO2 contents of the compiled examples were estimated by the simple method, and their relationship between melt SiO2 content and eruption magnitude (M) were compared with those of the Magma Database. This compilation augmented examples of small to intermediate magmatic eruptions (M=3-5) with basaltic to rhyolitic melt compositions. This data augmentation has little effect on the already known maximum magnitude of M=5 for basaltic to dacitic melt eruptions.

Keywords: magma, petrological analysis, eruption magnitude, database

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Probabilistic assessment of ash fall at Meakan-dake Volcano, Hokkaido, Japan

KANAI, Hiromichi[1*] ; FUJIWARA, Shinya[1] ; NAGATA, Naomi[1] ; SAKAGAMI, Masayuki[1]

[1]Kokusai Kogyo Co., Ltd.

Meakan-dake is an active volcano, erupted four times in the last 20 years, latest eruption occurred in 2008, located on the east of Hokkaido, Japan. Municipalities around this volcano have already published hazard maps regarding the hazardous area when it erupts to citizen. However, the expected area where fallout products will cover is drawn as true circles centered at the craters on the maps. We have therefore tried to assess the probability of the ash fall area using “Tephra2” , by considering the tephra volume of the past eruption and the wind data. We have used latest wind data obtained online from Japan Meteorological Agency of Kushiro, the nearest observatory from Meakan-dake, located 55 km away from the craters. We also have assumed three patterns of the tephra volumes selected when its hazard maps were made. As a result, the probability distributions of the more voluminous ash falls are drawn as ellipses extended toward east, affected by westerlies. On the other hands, those of the smaller volume types show more likely true circle shapes. It means lower column is more affected by the wind of lower layer which have relatively wider variability than that of higher regarding the wind directions. It is important for us to have knowledge which directions ash falls would likely distribute on preliminarily because these knowledge provide us the higher priority area to prepare possible volcanic hazards. We have shown that Tephra2 would be an effective tool to assess the probability of ash falls. Especially, there are three airports, broad daily land and world natural heritage (Shiretoko) around Meakan-dake. We believe that our attempts will be developed to assess the risk of these important facilities and lands.

Keywords: volcanic hazard, tephra fallout simulation, probabilistic assessment, Meakan-dake volcano

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Detailed bathymetric map of Lake Monoun, Cameroon: A new interpretation for the limnic eruption in 1984

OHBA, Takeshi[1*] ; OGINUMA, Yu[1] ; SAIKI, Kazuto[2] ; ISSA, I[3] ; FOUEPE, A[3] ; NTCHANTCHO, R[3] ; TANYILEKE, G[3] ; HELL, J v[3]

[1]Dep. Chem. School Sci., Tokai Univ., [2]Dep. Earth Space Sci., Grad. School of Sci., Osaka Univ., [3]Inst. Res. Geol. Miner. (IRGM)

Introduction

In August 1984, the Lake Monoun discharged a large amount of CO2 gas killing 37 of residences around the lake. The explosive discharge of CO2 gas is called as limnic eruption. Accepting the request by the Cameroonian government, Sigurdsson et al (1987) carried out a field research at the lake and found a remnant of water wave on the east shore of lake with a scarp on the shore. They also detected a dissolved CO2 with high concentration in the bottom layer of lake. Sigurdsson et al (1987) conclude that the rock dropped from the scarp disturbed the bottom layer of lake, then a CO2 enriched water was lifted, triggering the trigger of limnic eruption. On the other hand, Kusakabe et al (2008) suggested a spontaneous start of limnic eruption is possible in Lake Monoun based on the temporal variation of lake water after the eruption in 1984. On the floor of Lake Monoun seems to preserve the remnant of eruption which is an important key to reveal the fact of limnic eruption. In this study, a detailed topographic map was obtained by a multibeam sonar survey. In the map, a feature was recognized which is inconsistent to the conclusion by Sigurdssson et al (1987).

Bathymetric survey

The multibeam sonar emits a flat ultrasonic wave with strong directionality of 200 to 400 kHz targeting the bottom of lake. The reflected ultrasonic wave is received by the array of sonic sensors. The system of sonar is composed by the emitter and receiver of ultrasonic wave, GPS sensors, a gyro-sensor for detecting the perturbation of system, the controller of system and an engine power generator. The above system was assembled and installed on a rubber boat. The operation of the survey was carried out by 2 or 3 persons. Moving on the lake surface, the topography of lake floor was scanned. In this study, we used a multibeam sonar, Sonic2022 of R2SONIC co Ltd. The survey was carried out on 31th Oct to 4th November.

Results and discussions

The topography of lake bottom was measured with the precision ±30 cm. The lake is extending in the direction of east and west. In the lake three basins, west, central and east were recognized. The depth of west and central basin was 46 and 56 m, respectively. Those basin looks to be the remnant of circular explosive crater the diameter of which is 145 and 134 m, respectively. The north wall of the central basin was well preserved. On the other hand, most of the crater wall of west basin was eroded, suggesting the central basin is younger than the west crater. The depth of the east basin reaches to 100 m. The shape of the east basin was ellipsoidal. The length of longer and shorter axis was 360 and 290 m, respectively. The south wall of the east basin was almost vertical. The floor of the east basin was flat with two small depression, the diameter of which was about 40 m and the depth of which was 1 to 2 m lower than the surrounding floor. The depressions were located near the east and south wall of east basin. Between the depression and the wall of basin, a bank was detected for each depression. The bank looks like the remnant of landslide.

The coupling of the depression and the bank brings us a new idea for the triggering of limnic eruption. At first, we assume the depression near the east shore of east basin is the outlet of CO2 enriched fluid, and assume that the CO2 concentration of lake water was close to the saturated concentration just before the eruption in 1984. Because the fluid from the depression is diluted with the lake water, the limnic eruption would happen above the depression. A big wave of water generated by the limnic eruption attacked the east shore of east basin, developing the scarp. If the landslide is the cause of limnic eruption, the coupling of the depression and the bank is difficult to be explained. There is another depression near the south wall of the east basin, suggesting another limnic eruption before 1984.

Keywords: Limnic eruption, Cameroon, Lake Monoun, CO2, Bathymetry

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Disaster prevention issues of sulfur lava

CHIBA, Tatsuro[1*] ; TANBO, Toshiya[2]

[1]Asia Air Survey Co., Ltd., [2]Tateyama Caldera and Sabo Museum

1. Introduction

In Japan, around 1960 all of many sulfur mine sites in craters and geothermal zones of active volcanoes were closed . However, in the the sulfur mine sites, there are many cases that sulfur material has been deposited around the fumarole. Meanwhile, in the case of temperature of the fumarolic gas is increased , it is not a rare case that liquid lava flows out. During the lava flows, there are dangerous cases to generate wildfire and a large amount of sulfur dioxide gas . In this poster , based on the examples of lava flows in active volcanoes in Japan, we discuss the problems against volcano disaster prevention. Meanwhile, we introduce morphological characteristics of sulfur lava flow compared with the case of basaltic lava flow.

2. The case of Tateyama Jigokudani

In Jigokudani of Midagahara volcano , fumarolic activity has been increased recently. Due to that, trail has been closed in 2012 then . In May of 2010, due to sulfur lava flow, wildfire was generated (Masubuchi , 2013) . In this site, it is clear that sulfur lava flows had been repeatedly occurred according to reports and geological observation.

The sulfur lava flow in this site, shows variation of color coordination such as black , yellow and and green. Although the thickness of the lava flows is only about 1 to 10 cm, the flows show morphological characteristics of aa lava flow , pahoehoe flow , columnar joints , and pillow -like lava. In this poster, we will show photos and videos , as well as the real samples .

Analogue model of basaltic lava flow is also interesting.

3. Summary

In Shiretoko Iozan eruption during 1935 and 1936, a large amount of sulfur was erupted. The erupted amount was reached several thousands tons per day in max, the total amount of erupted volume reached about 200,000 tons. Due to the eruption, Kamuiwakka river and beach was covered with yellow sulfur (Watanabe et al , 1937) . In the case of Tateyama , although the scale is different , it is possible to conduct detailed discussion, and also will be an important step to consider the disaster prevention measures against such sulfur lava flow .

Keywords: Tateyama, Sulfer, pillow lava, aa lava, pa-hoe-hoe lava, disaster prevention