Characteristics of the mechanism of released volcanic block’s trajectory by explosive eruption and necessity of the “disaster prevention” education –by the data of Habuminato crater in 838AD -.

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The explosive eruption occures, irrespective of the nature of the magma, when the existing rocks or lava flow that had closed the conduit at the time of the initial explosion were heated or contacted by the magma and then expanded the volcanic gas(mainly water vapor) in the mountain body due to it. At that time, when the rock masses and gravels that were produced and ejected by the same initial velocity in the same exit angle in a state like throwing together with large and small rock masses on a single boardwere , they depend onso called Ballistic trajectory discharge mechanism. In that case, it has the feature that "more bigger volcanic block reaches far away. Therefore, in this case, the shape of the sedimentary hill formed after that sort of the eruption often becomes the marl landform raised like a low-height ring shaped one around the crater. On the other hand, in the case of a Strombolian eruption by basaltic magma, there is a mechanism of release of the rock mass called "Jet flow dscharge" which is derived from mainly the volcanic gas flow that will be the support matrix for discharging the boulders and gravels. Compared with the former release mechanism, the force supporting the rock mass of this case is weak, and conversely crushed rocks and gravels near the crater, smaller blocks and gravels tend to reach far away. As a result, a conical scoria hill is formed to cover the crater.
As described above, the mechanism for ballistic discharge of the ejecta like steam eruption, magmaphreatic eruption and the initial starting sudden explosion of other many general volcanos, rock masses of large size (1 m to several meters) are able to attain a few kilometers away beyond the boudary of smaii size rocks distribution area. This fact will invite the unexpected volcanic disasters and weremember the cases of Ontakeyama a few years ago and Kusatsu Shiraneyama recently. For this reason, I think that from the viewpoint of disaster preventing education of volcanic disaster, we must introduce these contents like this in the class and textbooks of Earth science and Physics, especially in our volcanic country,Japan.

References
(1) Shunichi Sato, "Mechanism of Causing Base Surge, inferred from the Bomb Sag's Structure and its Trajectories", autograph, Kagoshima International Conference on Volcanoes, International Volcanic Congress (Kagoshima), Proceedins, NIRA, pages 79-82
(2) Shunichi Sato, "Initial morphology of black smoke pillars caused by steam explosion, relationship between pre-eruption topography and location of explosion point source near the crater", Journal of Volcanographical Society of Japan volcano, 39 (3), Pages. 99-111
(3) Shunichi Sato, "volcanic energy teaching material made from a buried hole by a stone", single author, junior high school education research association ·Journal of Japan Science Education Association "SCIENCE IN EDUCATION", Vol. 18, No. 1 , Pages 24-27
(4) Shunichi Sato, "Ballistic trajectory and steam explosion process estimated from Block sag", Journal of Volcanological Society of Japan Volcano Vol. 2, 29, pages 140-147

Keywords: Volcanic disaster , Explosive eruption , Ballistic ejection, Disaster education, Volcanic block

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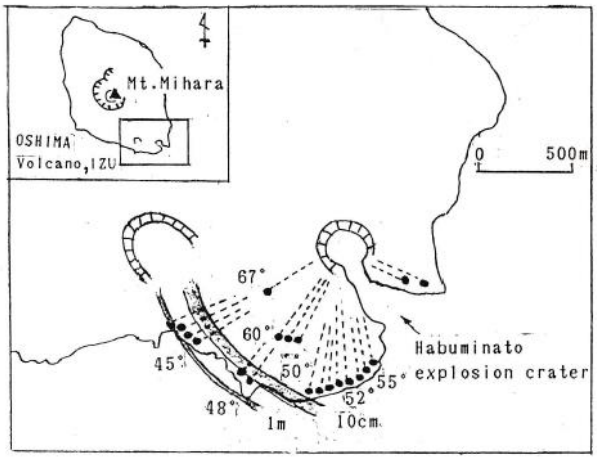

Fig.1 Representative sampling points of block sags. Angular numbers show the inclination angles of arrival trajectories of blocks at H_5 explosion and broken lines show the azimuths of them. Thick or thin curve respectively corresponds to the arrival limit front of volcanic blocks with the size of 10cm in diameter, or of 1m.

(S.Sato, 1988)

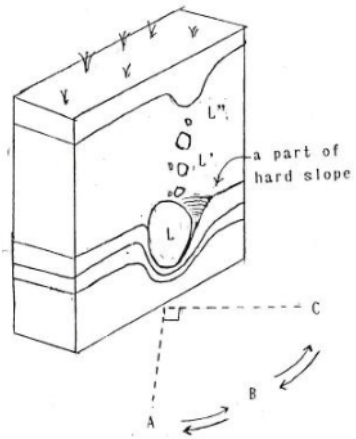

Fig.3 A: The only one point where line L-L'-L" stand verticaly to be seen. And the direction A-L is accord to the azimuth of block's arrival trajectory.
C: The direction for observing the inclination angle of block's arrival trajetory.

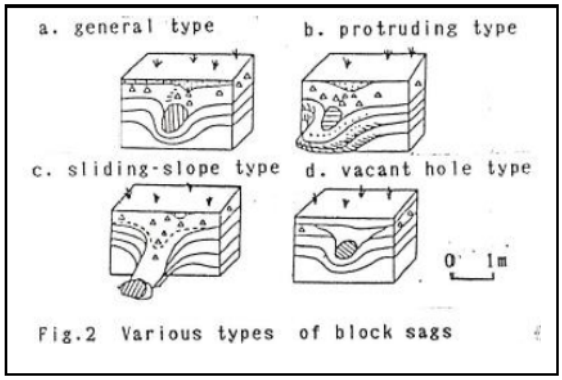

Fig.2 Various types of block sags

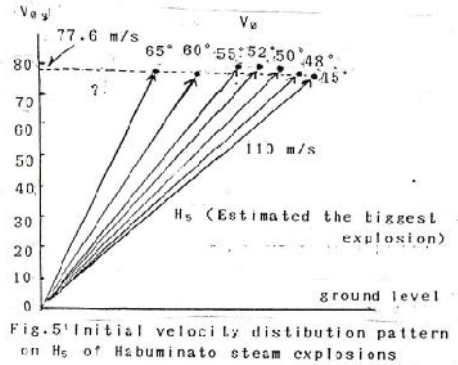

Fig.5 Initial velocity distibution pattern on H_5 of Habuminato steam explosions

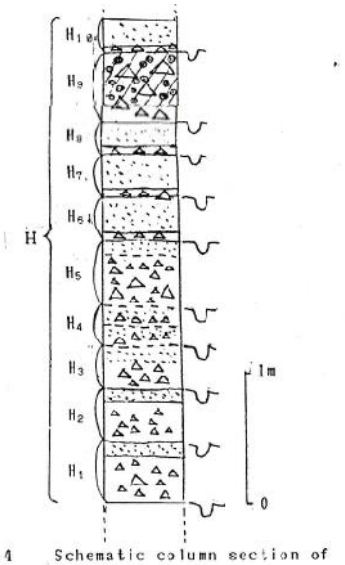

Fig.4 Schematic column section of Habuminato maar's air fall deposites.

△ → explosion breccia
⁝⁝ → volcanic ash
∞ → accretionary lapilli
∿ → block sag's level

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