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See-through experiments of explosive eruption for outreach program

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Analog experiments are useful for outreach program. We cannot see the inside of a volcano directly, though an eruption is caused by underground magma. We develop the see-through experiments of explosive eruption to observe a process from magma system to eruption. After eruption, audience can learn hazard areas for various eruption types, and the time sequence of typical eruption. (1) The first experiment is to observe the effect of bubble. This experiment has an advantage to prepare an experiment easily. A plastic transparent sheet is covered on a plastic transparent bottle to build an artificial volcano. Bicarbonate and citric acid with detergent for kitchen (BCD liquid) are put in the bottom of the bottle. Next, just after the bottle is filled up to the middle level with colored juice (or water), the cap with a hole drilled is closed. Eruption will occur with a 1m high explosive column, and change into effusive flow. We observe the process of eruption and the hazard area controlled by the topography.(2) The second is to see the effect of both buoyancy and bubble. The system is installed in a plastic bag, and put in water container. If the liquid in the bag such as a colored juice is denser than water, the liquid mixed with bubble is easy to erupt. However, only a juice-filled plastic bag without bubble sinks in the container. (3) The third is the mixed effect among bubble, buoyancy, and stress of the host material. The liquid with bubble such as BSD liquid or carbonate drink is injected into gelatin as the host material. We can cause an explosive eruption to form a funnel-shaped crater like diatreme. If the liquid injection is slow, the liquid accumulate bubble in it upper part. After bubble escapes like de-gassing, the liquid injects laterally like dike injection.(1), (2) and (3) were carried out at elementary schools, junior high schools, children, science museums, the open house in AIST (Yamazaki et al., 2013), training course for school teachers in YIES (Takada, 2012), and lectures of Tsukuba University. Questionnaire from audience after each experiment are introduced.

Keywords: outreach, analog experiment, see-through experiment, explosive eruption, effusive eruption, kitchen volcanology