Kitchen analog for rootless cone eruption; explosive bekkouame?

*Rina Noguchi[1], Kei Kurita[2], Ayako Suzuki[3], Ai Hamada[4]

1. Volcano Fluid Research Center, Depertment of Science, Tokyo Institute of Technology, 2. Earthquake Research Institute, The University of Tokyo, 3. Institute of Space and Astronautical Science, Japan Aerospace Exploration Agency, 4. Central Research Institute of Electric Power Industry

The rootless eruptions, which is a series of explosions by interactions of molten-lava and waterlogged sediments, have been focused in point of both the planetology and the volcanology (Fagents *et al.*, 2002; Hamilton *et al.*, 2010; 2017). On the surface of Mars, thousands of cones formed by rootless eruptions (e.g., Greeley and Fagents, 2001) are found to exist. Since those cones are located on the young surface, they have been spotlighted as an evidence of flood volcanism and existence of subsurface water ice in recent Mars (Dundas and Keszthelyi, 2013). According to laboratory-scale experiments and numerical modelings, the amount of external water, which is available during the eruption and vaporization, influences explosion styles (e.g., Wohletz, 2002). The variety of geomorphology in rootless cones has been thought to show that style difference (Fagents and Thordarson, 2007). In spite of the popularity its formation mechanism has not been well understood even for the terrestrial cases. Why isolated cones are formed instead of widespread fragmentation? Why explosion is maintained steady? Why fragmentation similar to the scoria cone formation occurs? What is the role of vesiculation in rootless eruption? To explore probable answers we conducted kitchen earth science experiments.
In this study, we challenged to reproduce rootless eruptions by using heated syrup and soda. The basic procedure is similar to that in bekkouame (candy) and karumeyaki (honeycomb toffee) recipe. The starting materials are syrup and baking soda (sodium bicarbonate) and a small transparent container. We first heated syrup around 130℃ and poured it on several types of substrate such as sugar and soda mixture so as to cover the surface of them completely. Break down of the baking soda by the heat of syrup produces CO_2 gas, which causes bubble flow in the overlying syrup. As a result, tens of petit eruptions occurred during experiments. The cellularly divided conduits were formed by stable explosions which had not changed its location. Those cells might be comparable to the repelled distribution pattern which has been interpreted in Hamilton *et al.*, 2010. We verified the relationships between explosion styles and the amounts/ratio of soda and heated syrup. In the presentation, we show changes of explosion characteristics in different conditions. Furthermore, we focus on morphology of solidified syrup (as bekkouame) then compare with those of natural rootless cones.

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