Kitchen Earth Science: brain stimulation by hands-on experiments

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Sun. May 20, 2018 5:15 PM - 6:30 PM Poster Hall (International Exhibition Hall7, Makuhari Messe)

Kitchen Earth Science aims at understanding a natural phenomenon in Earth and planetary sciences by analogue experiments using goods and tools in our daily life. Analogue experiments have a function to unveil the fundamental physics governing the phenomenon. At the same time, they essentially include uncertainties so that unexpected results are frequently obtained, which have a potential for surprising discoveries. These findings also provide a good opportunity for deeply thinking, and raise new questions to explore. Such experience is precious not only for young researchers in Earth and planetary sciences, but also non-expert people who need a scientific thinking to live wisely. In the session of this year, we again focus on "advantages of doing hands-on science experiments" and discuss the significance of analogue experiments with uncertainties, which cause unpredictable results: even if the experiment fails, we learn a lot of things from the failure which may lead to a great success. We are accepting a variety of experimental researches and case studies on scientific education such as introductory educational experiments for Earth and planetary sciences in elementally and junior/high schools, general science education and interdisciplinary researches in post-high schools, and new approaches to citizen science and outreach. We welcome all the participants who are interested in Kitchen Earth Science to stimulate your brain by hands-on science experiments.

What causes “Pele’s tear” in volcanic eruption?

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Keywords: Volcano, Experiment, Pele’s tear

“Pele’s tears” and “Pele’s hairs” are volcanic glass products, which are formed by the breakup, stretching, and cooling of molten magma during their eruption. Their formation process is complicated, and their morphology depends on many parameters such as rheological properties of the volcanic glass, cooling rate, ejection speed, wind velocity, and so on. While we reported the analog experiment on the “Pele’s hair” in the previous presentation, this year we will focus on the formation process of the “Pele’s tear”. Through the simple analogue experiments on the cotton candy formation, we attempted to generate the “Pele’s tear” like morphology and considered the formation process. The experiment was conducted in the cotton candy machine we reported last year. The melted sugar (the analogue of molten magma) was formed after heating the rotating disk and ejected through the outlets at its periphery. The flow behavior of the melted sugar jet was captured by a high-speed video camera, which helped us to understand the formation process. In this presentation, we’ll consider how the difference in morphology between “tear” and “hair” occurs.