

Considering controlling factors of eruption styles through syrup eruption experiments

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An eruption experiment by mixing vinegar and baking soda is a simple but indicative analog experiment to study volcanic eruptions. Based on the original work by Takcuchi (2006), we have developed an apparatus that allows us also to simulate geophysical observations like ground inflation and eruption infrasound. Also, to reproduce a typical eruption scenario that is “an eruption is triggered by mixing of two magmas,” we have employed a method that is to make an eruption by mixing two syrup solutions one with acid and another with sodium hydrogen carbonate. This experiment has been used in outreach activity and also provided new insights that are useful in volcanology (Kanno and Ichihara, 2018). This paper reports our improvement by which we can reproduce a variety of eruption styles in a more realistic way.

The model volcano consists of a PET bottle and a transparent plastic tube. The tube is fixed to the bottle cap by an original connector. The tube end is initially closed by a rubber plug. When sufficient pressure builds up in the bottle by foaming, it spontaneously opens and an eruption starts.

In the previous method, we poured the syrups into the bottle one after another and closed the cap. We left a sufficient empty volume to prevent overflowing. Then, the tube needed to extend to the bottom of the bottle to lead a syrup eruption instead of a short gas burst. These points have been pointed out to be unrealistic.

We have developed a new connector, which allows to input a second syrup into an arbitral position of the reservoir containing the first syrup and output the mixture upward into the conduit. Then, we can reproduce various eruption styles in better controlled and more realistic ways. We are going to use this apparatus in an experimental volcanology seminar for the graduate students in volcanology. We report the results and effects of the seminar as well.

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