Analog experiments on mantle plumes in general education classes

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As mantle convection is related to Earth's evolution such as plate tectonics and hotspot magmatism, it is essential to visualize and understand the flow pattern in the mantle. However, the visualization of the realistic mantle convection is difficult in a class room because of difference of spatial and time scales. Therefore, we have developed an experimental kit of Kitchen Earth Science (KES) aiming at understanding the mantle plume behavior in general education classes. In order to save the cost for the experimental kit, we performed analog laboratory experiments using sugar syrup and common laboratory tools such as rubber plugs and syringes. In the analog experiments, a cylindrical transparent acrylic tank is filled with the sugar syrup. More buoyant less viscous sugar syrup colored with food dye is injected from a nozzle at the bottom of the tank. The flow behaviors of the upwelling plumes depend on the injection flow rate, the rheological properties and volume fraction of the injected and filled sugar syrup, and boundary condition (wall effect), which give insights into the mantle dynamics. In the presentation we will show some interesting flow behaviors observed in the class room experiment.

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