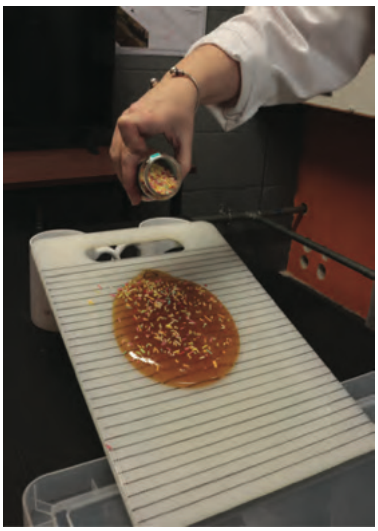
# GOLDEN SYRUP LAVA FLOWS

**A student activity booklet from GeoHub Liverpool and the Liverpool MAGMA Lab**

*Suitable for GCSE school students studying science, geography or geology*
*www.geohubliverpool.org.uk  www.liverpoolmagmalab.org*

*Illustrations by Suraya Hilmi Hazim*



## About golden syrup lava flows:

In this activity you will create your own lava flows in the laboratory and take measurements to document how they flow. Lava flows in nature can be extremely destructive and dangerous. Using fluids such as golden syrup as an analogue for lava is a safe way to study lava flow dynamics, and by adding sugar crystals to the syrup we can explore how magma viscosity (*stickiness!*) affects how they flow. This relatively simple approach can provide important insights into what controls how far and fast lavas flow. By modelling lava flows in the laboratory or classroom we can build understanding which can be used to mitigate lava flow hazards and help to reduce the risks of volcanic eruptions.

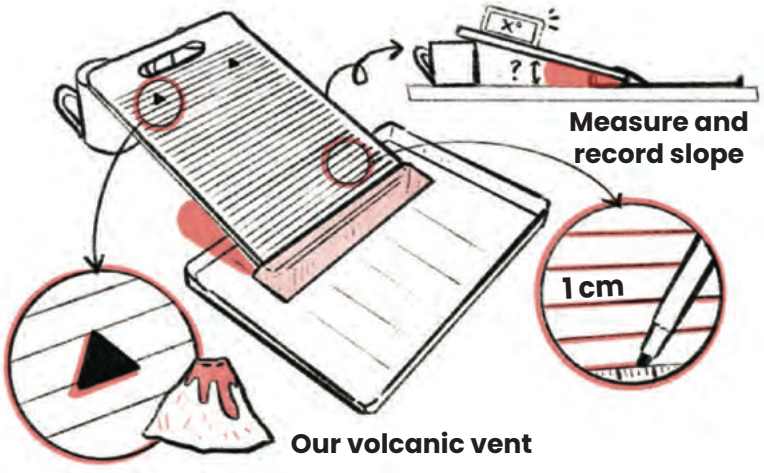
A basalt lava flow from Fagradalsfjall volcano, Iceland (August, 2021). *Photograph by J. Kavanagh.*

## What you will need:

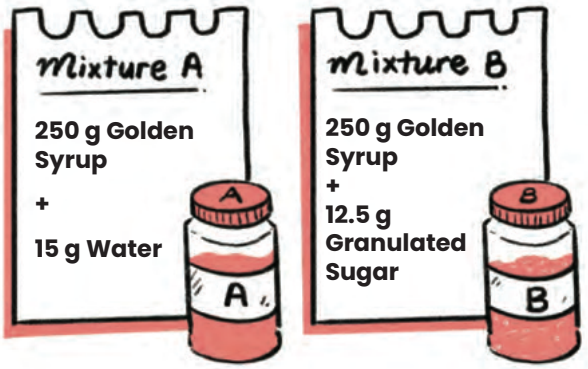
- A washable flat board (approx. 25 cm wide, 30 cm long)
- Something for the board to tilt against
- A plastic tray to catch the flow
- Strong adhesive tape (e.g. Duct tape)
- Plastic spatula or spoon
- *Protractor
- Permanent marker pen
- 30 cm length ruler
- *Stopwatch
- 2 x approx. 1 litre empty plastic containers
- Digital scales
- 500 ml Golden syrup
- 12.5 g Granulated sugar
- 15 g Water
- 12.5 g Sugar Strands
- Paper towels
- Access to a sink with warm soapy water
- Graph paper and calculator


*These may also be available as apps on your phone! Feel free to use them as part of the experiment

## Preparation Instructions - Making our volcano:




1. Firstly, use the permanent marker pen to **draw horizontal lines** across the width of the flat board at 1 cm intervals. Number every fifth line to help your measurements later. At the top of the board **draw two small triangles** approximately 10 cm from each edge. Then lean the plastic board against the rest (we have used mugs!), marked side up, and letting the end of the board sit in the plastic tray. **Fix in place** using the strong tape.
2. Use your protractor (or phone app) to **measure the angle of the slope** and record this in your notebook. The slope now represents the flank of a volcano, and each triangle represents a volcanic vent.




## Preparation Instructions - Mixing Magma:

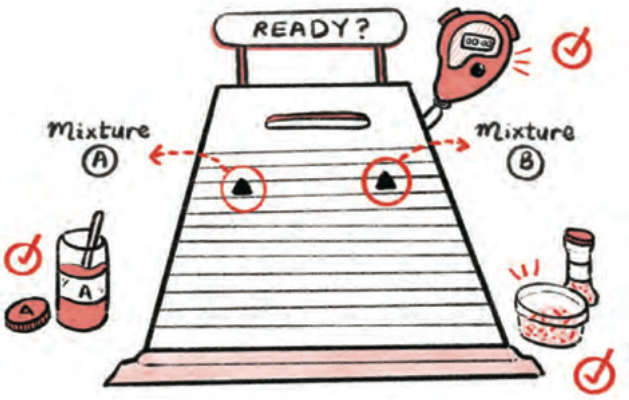
1. Next make your magma analogues. You will make two different mixtures which represent two different magma compositions with different chemistries. Add **250 g of golden syrup** to each of the ~1 litre plastic containers, using the spoon/spatula to make sure your measurement is precise.
2. Mix the **water** into one of the syrups, and call this **'Mixture A'** (write the name on the container so you don't forget).
3. Mix the **granulated sugar crystals** into the other syrup, and call this **'Mixture B'**.

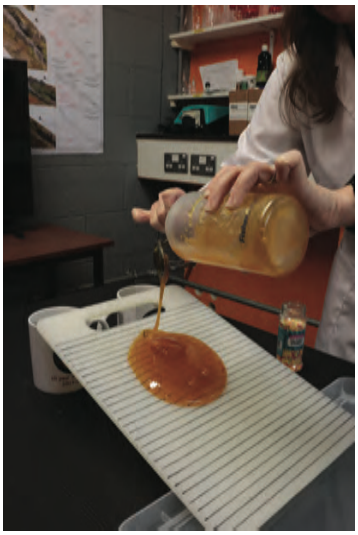
## Experiment Method - Time to start the eruption!

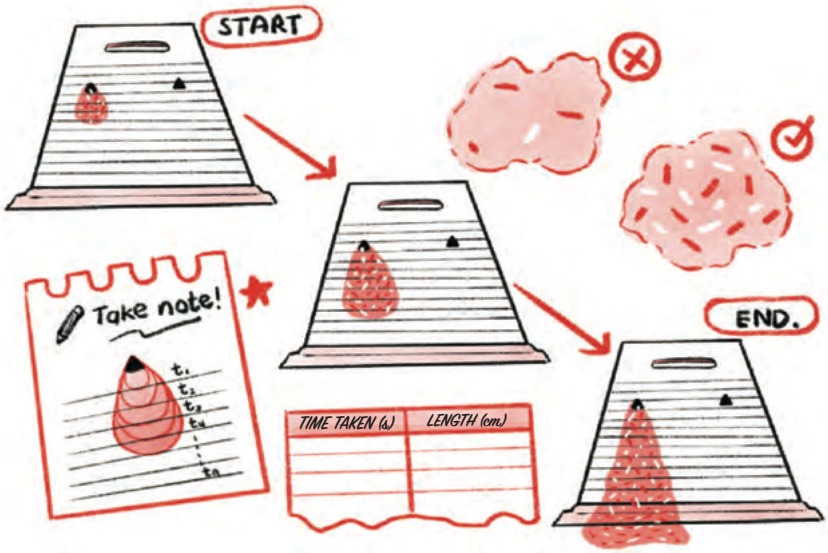
*Now it's time to start the experiment.*

*Get your **sugar strands** and **stopwatch** ready.*

1. **Prepare your Results Tables** for recording your measurements on the following page. You will need onetable for each mixture, each with a column for time (in seconds) and lava flow length (in centimetres).
2. Pour all of Mixture A onto the triangle located on the left of the board. Start the stopwatch and gradually sprinkle on top some of the sugar strands. Using your Results Table, **note down how long the flow is every 5 seconds**. You should aim to get an **even covering of sugar strands**, so keep adding them as the lava flows. Make observations and discuss with your group what you see. **This experiment is finished when the lava flow stops or when it reaches the tray.** Plot the data for Mixture A using the graph paper, making sure time is the x-axis and distance is the y-axis.
3. Repeat the experiment for Mixture B, but this time **noting down the lava flow length every 20 seconds** and pouring onto the right-hand triangle on the board so you will be able to see **how the different mixtures compare** next to each other. Plot another graph for Mixture B.
4. Draw some **sketches of your lava flows**, making sure to include the orientations of the sugar strands. **Add some annotations** to your sketch(es) to record what you observe.






**When the lava flow stops, or**

**When the lava flow reaches the tray.**

**REPEAT WITH MIXTURE B!**

## Stretch Exercise:

*Write a summary paragraph on how your experiment is similar and different to a lava flow in nature. Using your graphs, calculate the velocity of each lava flow. Assuming Mixture A represents a basalt lava flow, what magma composition could Mixture B represent? Explain your reasoning.*

**STUDENT NAME:** _____ **GROUP NUMBER:** _____

## RESULTS TABLES

## SKETCHES & OBSERVATIONS