A volcano in the laboratory. A model of igneous processes with wax and sand

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In order to motivate and learn how a volcanic eruption takes place, this experience could be carried out:
https://www.earthlearningidea.com/PDF/89_Spanish.pdf

Simulate the ascent of magma through the crust and observe how one part reaches the surface and represents a lava flow, while another part stops in the water mass, representing an igneous intrusion.
Prepare a 500 ml glass beaker as described in the "Materials" section and place it on a tripod ready to be heated with a Bunsen burner. Before lighting it, ask your students to predict what will happen when the contents of the beaker are heated. To stimulate discussion you can ask them:

- Which will melt first, the wax or the sand (the wax)?
- What will happen to the wax once it has melted (it will rise)?
- Why will it rise? (The melted wax is less dense than water).
- Will the molten wax reach the surface of the water? (Yes, at least some of it normally erupts onto the surface of the water and spreads out to form a layer of molten wax).
- Will wax remain in the water? (Yes, especially if the water has been previously cooled).
- Will the melted wax undergo convection around the beaker? (No, the beaker is too small and the wax floats on top of the water).

Now heat the glass and ask the students to watch carefully from a safe distance or through a protective screen.
Often, nothing seems to happen until the lava suddenly erupts. Ask how the molten wax can reach the surface if the surrounding water is cold (often a wax tube forms in the water, through which the remaining wax rises, isolated from the water by the consolidated wax tube).
(Remove the Bunsen when there is still some wax at the bottom of the glass).
Materials:
- a 500 ml beaker
- coloured candle wax
- washed sand
- cold water (if possible, pre-cooled in a refrigerator).
- a Bunsen or camping gas burner, tripod, grid, fireproof mat, matches, eye protection or safety shield.

Note: Although a wax eruption may seem dangerous, experience shows that the worst that can happen is that the beaker may break if it gets too hot, causing wax and water to spill out. Prepare the activity before the class by melting wax in the bottom of the beaker (about 1 cm high) and allow it to cool. Add washed sand (again 1 cm) and fill with cold water to about three-quarters full. After adding the water, make sure that the sand has a uniform thickness throughout the base of

the vessel. To ensure the formation of some igneous intrusions, the beaker can be cooled.Real-world applications of the model can be discussed, for example:
- Sand and water represent layers of the earth's crust.
- The wax represents the upper mantle, which is normally solid, but may be partially molten in places.
- In the same way that wax rises because of its lower density than its surroundings, magma can rise to intrude into the crust or reach the surface and form a lava flow.
- The wax that reaches the surface is highly mobile and spreads out to form a layer simulating the frequent basaltic plateaus, such as those in Iceland or Antrim (Northern Ireland), where huge volumes of lava erupted not from point volcanoes but from fissures.
-Feeder tubes also occur in nature and effectively isolate the rising magma from the cooler rocks it passes through, just as they do in the glass.
- Consolidated wax forms within the water are similar to those formed by intrusions of real igneous rocks. These can be brought to the surface by removing the wax lava to simulate real-world erosion.

- Students can be challenged to say which aspects of the model do not represent the real world. (In reality, surface lavas would solidify before intrusive masses because of lower surface temperatures. Most real rocks will crystallise as they cool, and not simply freeze as wax does. The use of water to represent solid layers may present difficulties for some students, but there is no other way to make the processes visible).
- The model can be related to the theory of plate tectonics.