Activity 1: Cause of the Eyjafjallajökull eruption

1. Figure 1 shows the build-up of magma beneath the Eyjafjallajökull ice cap prior to the eruptions in 2010.

   (a) Describe the shape and extent of the magma chamber.

   Elongated, roughly oval shaped chamber with a maximum width of 8km, tapering with depth to 4km below sea level

   (b) How does Figure 1 help to explain why there were two neighbouring eruptions in 2010?

   The magma chamber is very broad near the surface so magma could have broken through over a wide area rather than a single point

   (c) A sill is a crack in-between two layers of rock infilled with igneous rock (magma). The magma chamber was filled by magma flowing along Sill 1 and Sill 2. At what depths are these two sills?

   Sill 1 is roughly 5,000m below sea level; Sill 2 is roughly 4,200m below sea level

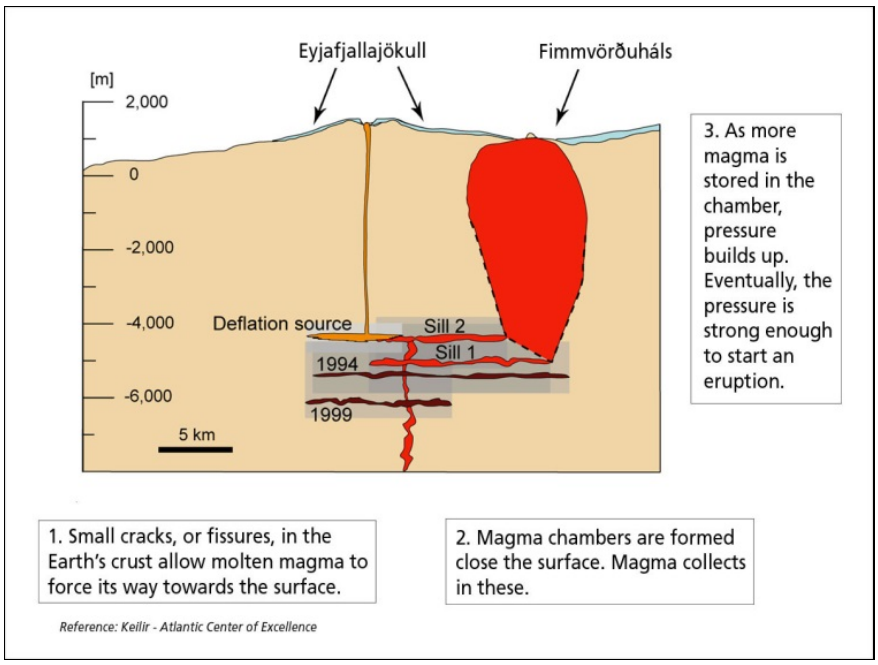
   (d) What is the evidence that magma had been moving towards the surface since the 1990s?

   Two old sills dated 1994 and 1999

(e) Suggest why earthquakes are caused by magma rising towards the ground surface?

Rising magma creates fractures and breaks in the overlying rocks causing earthquakes

Figure 1
Magma chamber beneath Eyjafjallajökull ice cap



Activity 2: Iceland - the tectonic background

2. Figure 2 shows the tectonic plates and active volcanoes in Iceland.

(a) Name the two tectonic plates in Iceland.

North American Plate and Eurasian Plate

(b) Describe the movement of the plates.

The plates are moving apart – diverging

(c) How many active volcanoes are shown on the map?

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(d) Under which ice cap is the volcano Katla located?

Mýrdalsjökull

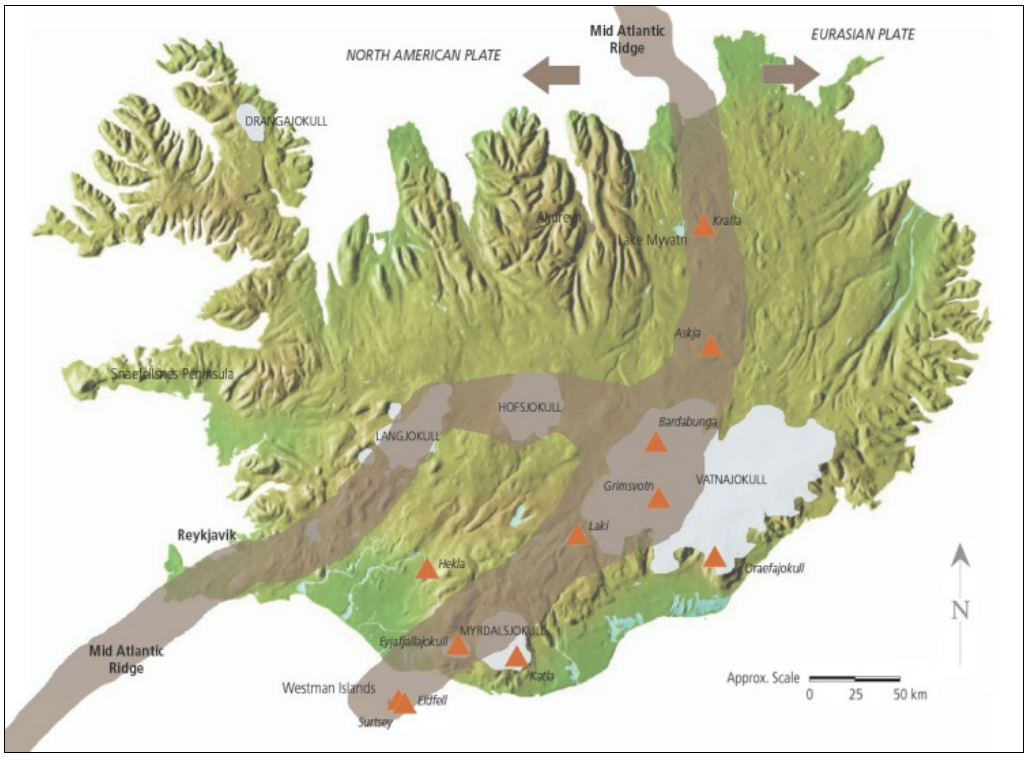
(e) Why are most of the volcanoes located at the plate margin?

It is here where magma is rising from deep within the Earth – constructive/divergent plate margin

(f) Use the internet to find out about the volcanic island of Surtsey.

!t is a new island, formed by underwater eruptions in the 1960s - it is a World Heritage Site, protected from any human interference to enable it to be a pristine scientific laboratory for studying the development of life

Figure 2
Iceland's tectonic background



Activity 3: Flooding resulting from Eyjafjallajökull

3. Figure 3 is a map showing the extent of flooding following the eruption of Eyjafjallajökull.

(a) Describe the location of the active craters. (central beneath the Eyjafjallajökull ice cap)

Central beneath the Eyjafjallajökull ice cap

(b) Describe the course of the floodwaters that escaped from beneath the ice cap.

The floodwaters emerged at the northern side of the ice cap and flowed westwards and then southwards around the western edge of the mountain to eventually reach the south coast

(c) Use the Internet to:

- name the glacier beneath which the floodwater emerged from the ice cap

Gígjökull

- name the river along which the floodwaters flowed

Markarfljót

(d) Notice the straight edges of the flooded area shown on the map. These mark the position of artificial embankments. How successful were the embankments in containing the floodwaters?

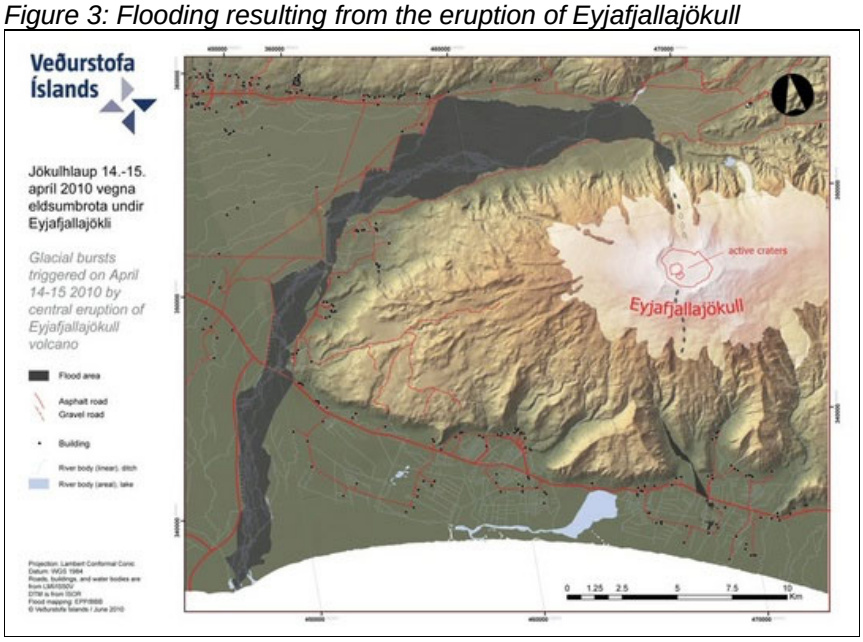
Very successful with few obvious breaches

(e) The main road in Iceland – the N1 – follows the southern edge of the mountain, crossing the Markarfljót River at the south-western edge of the mountain. Label this on Figure 3. Remember that quick action by road engineers breached embankments saving the metal bridge from being destroyed.

(f) If the river embankments had not been in place, suggest the possible impacts of the flooding on the area.

There would have been much more widespread flooding over the flat land, inundating farmland and flooding properties. Roads may well have been damaged cutting off communities. Farmland may have been strewn with rocks.)

Figure 3: Flooding resulting from the eruption of Eyjafjallajökull



Activity 4: Using earthquakes to predict the eruption of Eyjafjallajökull

4. Figure 4 shows the epicentre of earthquakes recorded in the days prior to the first eruption in March 2010.

   (a) Define the term ‘epicentre’. How is it different from the earthquake focus?

   The epicentre is the point on the ground surface immediately above the point where the earthquake occurred – this is the focus

   (b) What is the significance of the different colours?

   The colours indicate the time that has elapsed since the earthquake; most occurred with the previous 24 hours

   (c) Describe the location of the earthquake epicentres.

   Most are very concentrated beneath the Eyjafjallajökull ice cap

(d) Why does the increased concentration of earthquakes suggest that a volcanic eruption is likely? Use Figure 1 to help you.

A concentration of earthquakes suggests rising magma breaking through and fracturing the overlying rocks

Figure 4
Earthquakes recorded in the 48 hours before the March 2010 eruption