



Katla Geopark: An Educator's Guide and Worksheets

Geology and history



Höfðabrekkujökull – Subglacial Outburst Floods. Teaching Instructions

Mýrdalsjökull is the fourth largest glacier in Iceland and is approximately 600 km² in size. At the site of Iceland's most infamous central volcano, Katla, there is constant geothermal activity at its base. Katla is the fourth most active volcanic system in Iceland after Grímsvötn, Bárðarbunga and Hekla. If account, however, is taken of the productivity of these volcanic systems during historic times (i.e. after the settlement in the year 874), then Katla takes the prize. The volcano has produced around 25 km³ of volcanic material in 20 eruptions. Known eruptions during historic times were in 1918, 1860, 1823, 1755, 1721, 1660, 1625, 1612, 1580, 1500, the 15th century, 1440, 1416, 1357, 1262, 1245, 1179, the 12th century, 934, 940, 920 and in the 9th century. The last eruption to breach the surface of the glacier was in the autumn of 1918. It was a big eruption, followed by a huge flood. In 1955, 1999 and 2011, there were outburst floods from Mýrdalsjökull that were possibly linked to volcanic activity in Katla, but these eruptions did not manage to break through the glacial shield. The eruptions and subsequent floods vary in size, with few reports of some, while others live on in written histories and folktales. Eruptions can cause enormous glacier outburst floods, and the flood water can reach 100,000 to 300,000 m³/s in just a few hours.

Höfðabrekkujökull (jökull=glacier) is not a glacier as such but a gravel dome believed to have formed in the Katla outburst in 1721. After the outburst, icebergs lay on top of the dome for decades, and as a result, it was given the name Höfðabrekkujökull. According to the maps of the Danish General Staff from 1904, Höfðabrekkujökull was approximately 1100 m long, 600 m wide and reached approximately 35 m above sea level on the north side. It was then, and still is, fairly uneven, although it is mostly 10–15 m higher than the desert to the east. It is clear that a large proportion of it has disappeared, particularly in the Katla outburst on 12–13 October 1918. Múlakvísl has also eroded it considerably on the east side. Höfðabrekkujökull is a natural protective barrier and probably the only protective barrier that is likely to be of significant use as protection for Vík in connection with the predicted Katla outburst.

Höfðabrekkujökull. Worksheet

Purpose:

Participants are to understand the power of Katla outbursts, the damage that such outbursts cause, their impact on the environment and to train themselves in developing hypotheses and in providing reasoning for them.

Execution:

Drive out to the airstrip just east of Höfðabrekka and walk to Múlavísl. Examine the erosion where Múlavísl is eating at Höfðabrekkujökull (the ridge on which the airstrip stands).

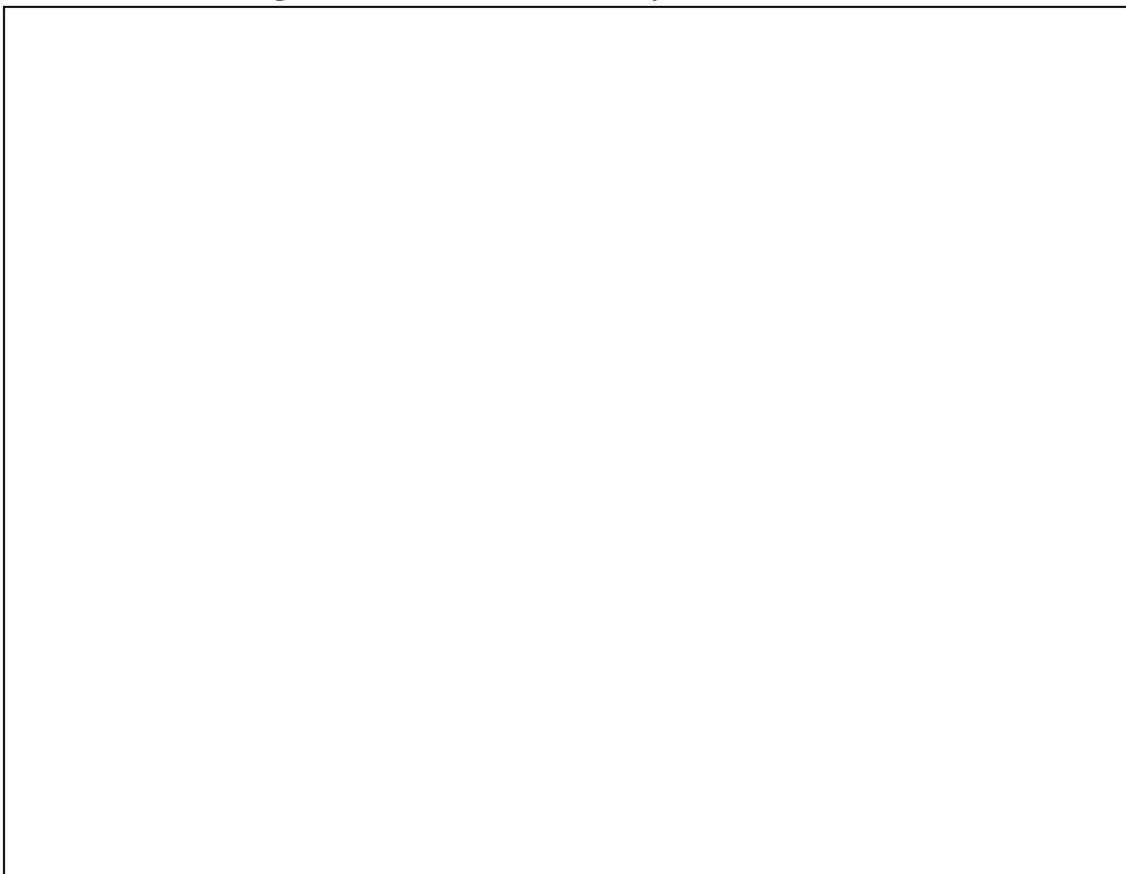
Make sure that the participants understand that they must be wary of Múlavísl, as the river constantly changes and is very dangerous.

Divide the students into three-member groups. Each group should be equipped with pencils and paper and a small shovel or spade.

Students are to draw the cross-section and try to scrape the sand or earth to see how the stack of layers lies and to examine whether any ash layers can be seen in the soil. It is a good idea to speculate about the age of the event and whether this event could have had a positive impact on the built-up areas to the west.

Results:

- a) **Draw a cross-section of Höfðabrekkujökull, label the layers in the drawing as river sediment, glacial sediment, soil, ash layers, ice and more if such can be seen.**



c) How could you prove or disprove your hypothesis?

d) Does the name Höfðabrekkujökull help?

e) Is it possible to find out when this happened? List anything that comes to mind.

Katla Outburst and Mýrdalssandur sand plain. Teaching Instructions

During the time of settlement, the area now known as Mýrdalssandur contained a thriving community (Dynskógahverfi, Lágeyjahverfi and more). At the same time the river Kúðafliót, moreover, was navigable, and there was a harbour virtually at the doorstep of the monastery at Þykkvabæjarklaustur. Now the area is covered with sand and no harbor is located there.

Under Mýrdalsjökull glacier is hidden one of Iceland's most infamous volcanoes, Katla. Katla is part of a much larger volcanic system, which is up to 110 km long and covers Eldgjá and almost all the way north to the Vatnajökull glacier. Katla has erupted twenty times since Iceland was settled. These eruptions can cause enormous glacier outburst floods, due to melting of the glacier, and the flood water can reach 100,000 to 300,000 m³/s in just a few hours. Since settlement, most glacial outburst floods from Katla have flowed down Mýrdalssandur, and only twice have the floods come down Sólheimasandur from beneath Sólheimajökull glacier. Katla eruptions are often accompanied by deafening thunder and lightning that have stopped daily life in the neighbouring countryside and ash fall so dense that men could not see each other even if they held hands. Additionally, the eruptions include toxic fumes that can be carried long distances by the wind, and usually have the greatest impact on the vicinity. Katla has on average erupted twice a century since settlement.

Kjartan Leifur Markússon (1895–1964) lived at Hjörleifshöfða promontory and watched the outburst from Katla. His description of what he saw is as follows: *The speed of the outburst was such that a nimble man would not have been able to save himself by running, not even if the distance was short. Not much water as such could be seen until after the leading edge of the outburst had passed. The outburst pushed a sand dune ahead of itself, sometimes with such speed that the sand appeared to roll over on itself, such as when a wave crashes onto a beach. It seemed to be much more like sludge than water.*

