



# Katla Geopark: An Educator's Guide and Worksheets

*Geology and history*



## Sólheimajökull – Outlet Glacier. Teaching Instructions

### Formations under the glacier

**Drumlins** are elongated hills or knolls that resemble an upside-down spoon. Such dunes can become very large, or 1 km in length, but at Sólheimajökull glacier, they are much smaller.

**Eskers** are formed from gravel and sand that melting water carries via tunnels under the glacier. Eskers in front of Icelandic glaciers are often 5–10 m high.



Image 1: Eskers  
Photo: Lilja Rún Bjarnadóttir

### Formations on glacier margins

**Moraines** build up or are pushed up at the snout of the glacier from sediment that the glacier has carried with it. How the moraines are formed varies depending on the behaviour of the glacier; either they are pushed up, or they build up when the glacier margins deposit sediment.

**Terminal moraines** are the outermost moraine that the glacier forms, and it shows how far the glacier has advanced during its growth period.



Image 2: Moraines near Gígjökul glacier  
Photo: Ólafur Ingólfsson



Image 3: A glacial erratic left by the glacier in 1995

Photo: Hreggviður Norðdal

**Recessional moraines** are younger than the terminal moraine and are closer to the glacier. They are formed during a temporary advance of the glacier after the glacier has started retreating from the terminal moraine.

**Annual moraines** are formed by the slight advancement of the glacier in late winter before the summer melt causes the recession of the snout of the glacier.

### Formations on the glacier

**Moulins** are formed when water starts to flow down through narrow cracks in the ice that widen constantly throughout the summer as the water melts the ice walls. The circular openings can become several metres in diameter, and they are often very deep.

**Lateral moraines** are formed along mountain slopes on the margins of the valley glaciers, below the equilibrium line. In some cases, the lateral moraines combine, e.g. in front of nunataks, and therefore form moraines.

**Dirt cones** are alluvial cones, which can be seen in many places on glaciers. Sediment and ash collect in hollows on the glacier and manage to insulate the ice so it melts more slowly than the area surrounding it. When the ice surrounding it has reduced due to melting, picturesque cones are left behind.



Image 4: Dirt cone on Sólheimajökli  
Photo: Hreggviður Norðdal

### Formations in front of the glacier

**Jokulhlaup channels** were formed during glacial outburst floods that came from the margin of Sólheimajökull glacier in 1999, probably due to a small eruption under the glacier. The outburst flood peaked at 1,700 m<sup>3</sup>/s and dug a gorge 5–19 m deep in the glacial sediment at the glacial margins.



Image 5: Kettle hole  
Photo: Þorsteinn Jónsson

**Kettle holes** are depressions that are formed when icebergs are carried over sand during glacial outburst floods. If the icebergs are partly buried in sediment and then melt, a depression is left in the sand. Kettle holes are extremely dangerous for many years after an outburst flood, as quicksand forms at the bottom that can easily swallow people. There are even stories of men on horseback disappearing into such holes.

**Dead-ice landscapes** can be found near the glacier in cases where the glacial ice is under a layer of sediment. Although the ice cannot be seen, it is slowly melting. The only indication on the surface are cracks that sometimes form. Such areas are generally very wet and have quicksand; travelling here should be avoided. Kettle holes are one form of dead-ice landscapes.

### CAUTION

Never travel on a glacier without a specially trained guide and equipment provided by such guides. Remember to dress warmly, as areas near the glacier are often much colder than the surrounding area.

## Sólheimajökull – Outlet Glacier. Worksheet

### **Purpose:**

To learn the basic terms used in glaciology.

### **Execution:**

A hike to the glacier and then onto it under the guidance of a glacier guide. On the way, participants must keep their eyes open for the following geological formations and draw a schematic image of them.

**Lateral moraines, nunataks, drumlins, kettle holes, glacial erratics, median moraines, dirt cones, moulins**

