Quadrant II – Transcript and Related Materials

Programme: Bachelor of Arts

Subject: Geography

Course Code: GED 101

Couse Title: Fundamentals of Geomorphology

Unit: III

Module Name: Glacial Landforms

Module No: 20

Name of the Presenter: Mr. Kiran Prakash Naik, Assistant Professor, Govt. College of Arts, Science & Commerce, Quepem - Goa.

Notes

Glaciers are the masses of ice moving as sheets over the land flowing down the slopes of mountains. The movement of Glacier is slow unlike water flow. The movement can be a few centimeters to a few meters a day or even less or more. Glaciers move basically because of the force of gravity. Glaciers are involved in processes of erosion and deposition.

Glacial Erosion

Glacier erosion is caused by huge mass of ice sliding over the rocks and eroding them by its overweight under the influence of gravity. Two principal processes are important – abrasion and plucking.

Abrasion – the grinding and crushing of rocks is not accomplished by the ice itself as it is too soft but by the rock debris frozen into the lower layers of the ice. The debris land acts rather like a course sandpaper and abrades itself as it is moved by the glacier.

Plucking or Quarrying – occurs in the response to the drag exerted by the moving ice on the bed rock. As the tensile strength of ice is not very great, plucking is most effective where the rock has been already weakened by being well joined beneath the glacier.

Erosional Landforms of Glacial Processes

1. **Cirques**

   Also known as Corrie. A valley resulting from glacial erosion. It is shaped like an amphitheater with an opening on the downhill side and a steep cupped section with cliff-

like slopes on three sides. The highest of these sides is called the headwall. The floor of this valley is bowl-shaped. Found in mountains in different parts of the world.

2. Arête

A narrow ridge of rock between two valleys. When two glaciers erode two parallel U-shaped valleys or two glacial cirques headwards, the ridge in between them stands out as an arête. When the cirques from the two sides of the mountain are enlarged and extend towards each other, the upper part of the mountain begins to destroy. As a result, the summit line becomes serrated and thin like a knife known as arete.

3. Horn

When three or more than three cirques cut back into the sides of a summit and meet one another on their back. The sharply pointed and angular ridge remaining in between the cirques is called a glacial horn. A pyramidal peak is formed. A pyramidal peak is the most extreme form of a glacial horn. Mount Matterhorn in Zermatt is an example of a pyramidal peak.

4. Pass or Col

When the cirque from the opposite sides of a hill develops and meet each other, the summit line is lowered. It creates a pass. Many passes are formed in this way.

5. Glacial Valley Trough

The glacier moves over some earlier formed valley or depression. The glacier abrades its bottom into a broad one. Its sides appear to rise like a wall. Such vessels formed by glaciers are known as glaciated troughs and valleys. They have broad floors a relatively smooth and steep sides. The valley may contain litter debris or debris shaped as moraines with swampy appearance.

6. U-Shaped Valley

Glacier carved landforms that exhibit a characteristic U-shape. These valleys have a flat, rounded bottom. Their slopes are steep and roughly straight. Formed by the scrubbing action of glaciers as they flow down slopes. After the glacier thaws, the rocky valley floor becomes visible. Small boulders called glacial till that were transported with the glacier often remain dispersed throughout the valley floor.

7. Hanging Valley

The glaciers have many tributary glaciers. The ice of tributary glaciers descends to the main glacier in the form of a lip. When later the ice of the tributary glaciers had retreated, the tributary valleys looked like they are hanging over the main valley.

tributary glaciers of the main glacier most often carve out V-shaped valleys that are shallower than those created by the main glacier. Waterfalls often drop down the edges of such hanging valleys.

8. **Albs**

The wall of the glacier valley stands almost vertical. A terrace is formed between the top of walls and the mountain above them. This terrace is an interruption between the steep slope of the mountains and the vertical walls of the glacier. Many villages and fields have developed on the terraces which are known as Albs.

9. **Roche Moutonnees/Sheep Rock**

There are many swells of hard rock during a glacier. The glacier does not avoid but ride over them and descend to continue their journey. Abrasion action is the main activity in the descending side. Ice plucks the rock and roughens the surface and makes it sloppier. The rock swells which have a gentle slope and polished surface on one side but a rougher surface and steeper surface on the other side known as Roche Moutonnees.

10. **Fiords**

The fiords are formed by the submergence of the U – shaped valley of the glacier. The lower end of such valley is drowsed in the sea. Steep-sided narrow entrance-like feature at the coast where the stream meets the coast. Fjords are common in Norway, Greenland, and New Zealand.

Glacial Deposition

The rock debris carried out by the glaciers down the slopes is known as **glacial drift.** The rock debris is deposited at the base of the glacier through the movement of slowly moving ice mass down the slope. Melting and evaporation separates the deposits from the glacier. Landforms generally include moraine and drumlins.

Depositional Landforms of Glacial Processes

1. **Moraines**

Moraines are long ridges of deposits of glacial tills. The glacier brings with it small pebbles, cobbles, sand, etc. The till which cannot be carried by the glacier is deposited at various parts of the glacier. They are sufficiently long, and their height is usually 30 meters. The size of deposits in moraines vary from tiny particles of sand to large boulders. The deposits accumulate on the surface in an unstratified manner without any type of sorting. When the deposits are at the end of a glacier, they are called **Terminal moraines**. When they are deposited on both sides, they are called **Lateral moraines**. When lateral moraines of two glaciers join, they form **Medial moraines**. When the lateral moraines of both sides of a glacier join, it forms a horse-shoe shape. **Ground moraines** are deposits left behind in areas once covered by glaciers.

2. **Drumlines**

Smooth oval-shaped ridge-like topographies composed primarily of glacial till with masses of gravel and sand. Drumlins are formed in the morainic area. Appears as the backs of the whale and mashes are formed between them. These drumlins are elongated in shape. Their longer side represents the flow of ice. It forms due to the dumping of rock debris underneath

heavily loaded ice through fissures in the glacier. The long axes of drumlins are parallel to the direction of ice movement.

3. Eskers

These are winding ranges formed of till and are found to have spread in a meandering form. The height ranges from a few meters to a hundred meters. The slope on either side is steep. They are usually formed of washed sand and gravel. When glaciers melt, the water flows on the surface of the ice or leaks down along the margins. These waters amass underneath the glacier and flow like streams in a channel beneath the ice.

4. Kame

It is a hill or mound that lacks a proper shape. Kames are composed of till, gravel, and sand that can be observed after the retreat of glaciers. Such a feature is usually formed when debris from a rockfall or other large volumes of debris fall through a crevasse of a glacier and accumulate in the depression. A lot of tills accumulated at the mouth of the glacier where ice melts. When the glacier retreats, the kame becomes visible as an elevation of land on the bedrock through which the glacier previously flowed. The till takes the form of a ridge.

5. Kettle Hole

A hollow typically filled by a lake, resulting from the melting of a mass of ice trapped in glacial deposits. Usually pebbles and other fragments are found lying over the glacier. When the glacier melts, the pebbles and fragments subside and form a depression. The ice becomes buried in the sediment and when the ice melts, a depression is left called a kettle hole. Create a dimpled appearance on the outwash plain.

6. Erratics

A piece of rock that is different in several respects from the rocks of the surrounding landscape. Such rocks are carried by glaciers over long distances and deposited in a land where such rocks do not occur. The size of Erratics varies from pebbles to massive boulders. Such fragments have no similarity with those of the bedrock and are in fact foreign to that area. An example of an erratic is Big Rock in Alberta

7. Glacial Till and Outwash Plain

When the glacier reaches its lowest point and melts. It leaves behind a stratified deposition material, consisting of rock debris, clay, sand, gravel etc. This layered surface is called as till plain or an outwash plain. Usually, such landforms are produced by valley glaciers. As a glacier flows down the mountain slope, it picks up debris from the bedrock. After flowing through a valley, the glacier enters a wider and flatter plain. Here, it deposits the sediments in a fan-shaped body known as an outwash fan.

****