

GLACIATION IN EAST AFRICA

Glaciation: it refers to the overall effect of glaciers on the landscape resulting into both erosional and depositional features

Glacier is a thick/large mass of ice of limited width, moving from the area of accumulation (snow field) following pre-existing valleys due to gravity. Or Glacier is an accumulated/compacted mass of ice/snow moving in a restricted channel/valley from a highland to a low land.

Glaciers have different names for example mountain glaciers and valley glaciers/alpine glacier. Glaciers move continuously from higher ground to lower ground under the influence of gravity and are enclosed within the valley walls.

The action of glacier includes glacier erosion, transportation and deposition. These processes will lead to the formation of glacier scenery.

Glaciers in East Africa are only found in high mountainous areas of Kenya, Kilimanjaro and Rwenzori. This is mainly because those mountains (Kenya, Kilimanjaro and Rwenzori) are high above the snow line (4500m).

In East Africa glacial activities are limited to a few places, this is due to a number of factors that limit the formation of snow and this include:

- ❖ The latitudinal position of East Africa across or astride the equator hence, the temperatures are generally hot and therefore not conducive for the existence of glacier anywhere and anyhow in East Africa.
- ❖ In East Africa the snowline is very high about 4800m, which only the three highest mountains can reach which explains them having the glacial activities. Snowline is that line where there is permanent snow and ice. It can be at ground level at poles.
- ❖ Precipitation in East Africa is mainly in the form of rainfall but in a very small area it is in the form of ice and snow that is limited to tops of the three mountains, that explains why glacial activities are limited a few places.
- ❖ The effect of the tectonic activities in East Africa has also contributed to the limited glacial activities. Volcanic eruptions have raised the surrounding temperatures leading to the snow and ice to retreat to slopes of the high mountains, namely Ruwenzori, Kenya, Kilimanjaro.
- ❖ The rocks of East Africa are very hard formed from old basement complex. They cannot be worked by actions of ice and snow very easily so that is why glacial activities are limited to a few places.

FORMATION OF THE ICE (GLACIERS)

Glaciers are formed when the temperatures of the air fall below freezing point (0°C) which makes water vapour to condense and form snow in the valley.

When the snow accumulates for a long time in successive layers there is increasing pressure on the overlying layers that compresses and hardens the snow into ice. Permanent snow fields or neve are formed when the rate of snow accumulation is greater than the rate of ice melting and flowing down slope following the existing river valleys.

CONDITIONS FAVOURING GLACIATION IN EAST AFRICA

In East Africa glacial activities are limited to only three areas like Mountains Kilimanjaro, Kenya, and Rwenzori. These areas have conditions suitable for glacial formation, for instance

1. Presence of high altitude of above 4500m above sea level with very cold temperatures which encourages freezing
2. The existence of very cold temperatures of below 0° allows water freezing to form snow.
3. Presence of several hollows/depressions that collect and accumulate water/snow thereby turning into ice.
4. Existence of high rates of precipitation in form of snow fall which accumulate and compress to form ice
5. Existence of high humidity in the atmosphere that condenses leading to precipitation
6. Existence of gentle sloping relief accelerates glacial movement by gravity.

THE WORK OF THE ICE OR GLACIERS

The effect of ice on the landscape is important both directly and indirectly. Directly ice is a major agent of erosion, transportation and deposition and indirectly ice affects landscapes through the melt waters that issue from the ice front. All materials transported and deposited by ice are called till (moraine). This includes materials carried on, within and beneath the ice and they range from very small particles to huge boulders like sand, clay, gravel, rocks and boulders.

i) **Glacial erosion**, which predominates in the highlands, consists of three processes:

Plucking is a quarrying process by which parts of the underlying rocks are frozen into the base of the ice and pulled away.

It is more effective on well-jointed rocks where melt water can freeze into the cracks. The cracks are then widened and deepened due to increase in the volume hence breaking of the rock.

Glacial abrasion is the grinding process in which stones and boulders frozen into the moving ice are dragged over the underlying rocks thereby polishing and scratching the surface.

Sapping is the break-up of rocks by alternate freezing and thawing of water at the bottom of cracks between a mass of ice and the side and floor of the valley or the side of the rock of the mountain.

Erosion of the valley glaciers depends on the following factors:

- Resistance of the rock
- Speeds of the glacier - fast glaciers have a great effect compared to slow glaciers.
- Hard rocks will resist erosion while weak rock will be eroded.
- The thickness and weight of the glacier (ice) will determine the rate of erosion. It will increase the pressure.
- Availability of rock debris as erosion tool which has a binding effect as it moves.

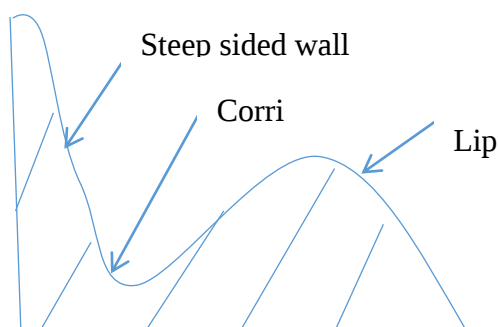
LANDFORMS RESULTING FROM GLACIAL EROSION (Highland areas)

Both depositional and erosional landforms develop during glacial processes.

In East Africa, the most impressive features result from glacial erosion and are both highland and lowland erosional features but the former are more dominant. The most common landforms produced by glacial erosion are:

- | | |
|--|-------------------------------------|
| • Glacial troughs (U-shaped valleys) | • Pyramidal peak or horns |
| • Hanging valleys | • Roche moutonnée |
| • Arêtes | • Crag and Tail |
| • Cirques (Corries, Cwm, Coire, Kar, Tarn) | • Col/pass, Rock basins, Rock steps |

A **corrie/cirque/tarn** is an arm chair like depression or a steep sided semi-circular rock basin. It is formed when ice occupies a small hollow on the side of the mountain. The hollow is enlarged and deepened by abrasion and steepened by plucking. Eventually the hollow becomes arm chair like in appearance. When a corrie is filled by melt water, it forms a glacial lake known as a tarn. When it is filled with water it becomes a cirque lake or tarn (corrie or cwm)

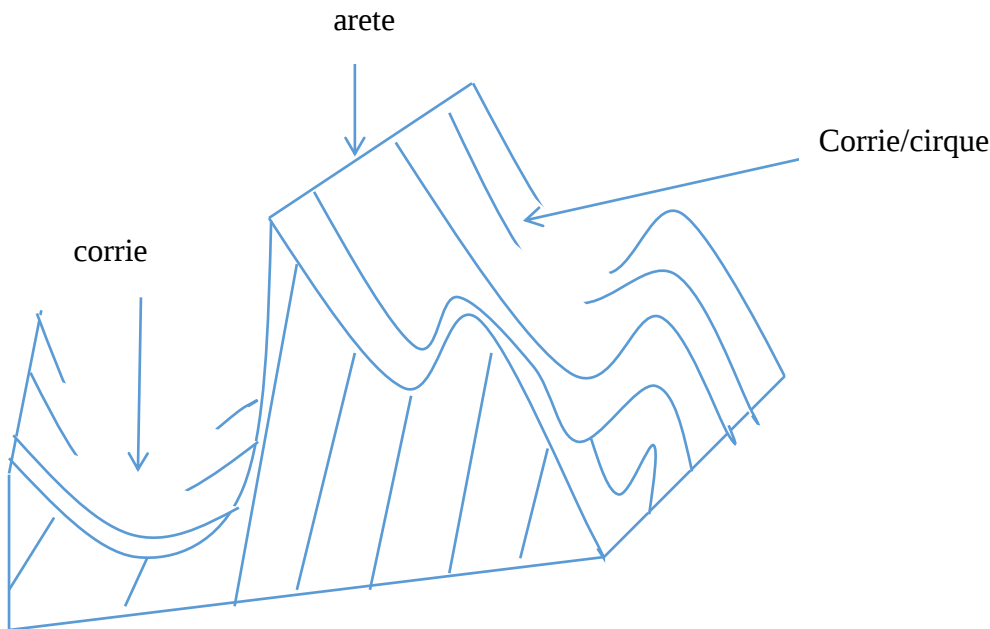


Examples of the cirque lakes in:

- Uganda: Lac du Speke, Lac Noir, Lac Catherine, Lac Vert, Irene lakes, on Mount Rwenzori,
- Kenya: Teleki Tarn, Hobley, Hidden on Mountain Kenya and
- Tanzania: - Mawenzi tarn on Mountain Kilimanjaro in Tanzania

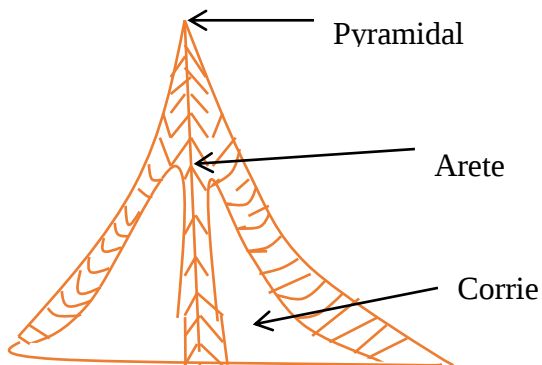
Arêtes: This is a steep sided knife edged ridge separating two corries. It is formed when two corries cut back to back in a process known as back wall recession/head ward recession by plucking.

Examples are Nelson, sharp ridges of Speke and Gessi



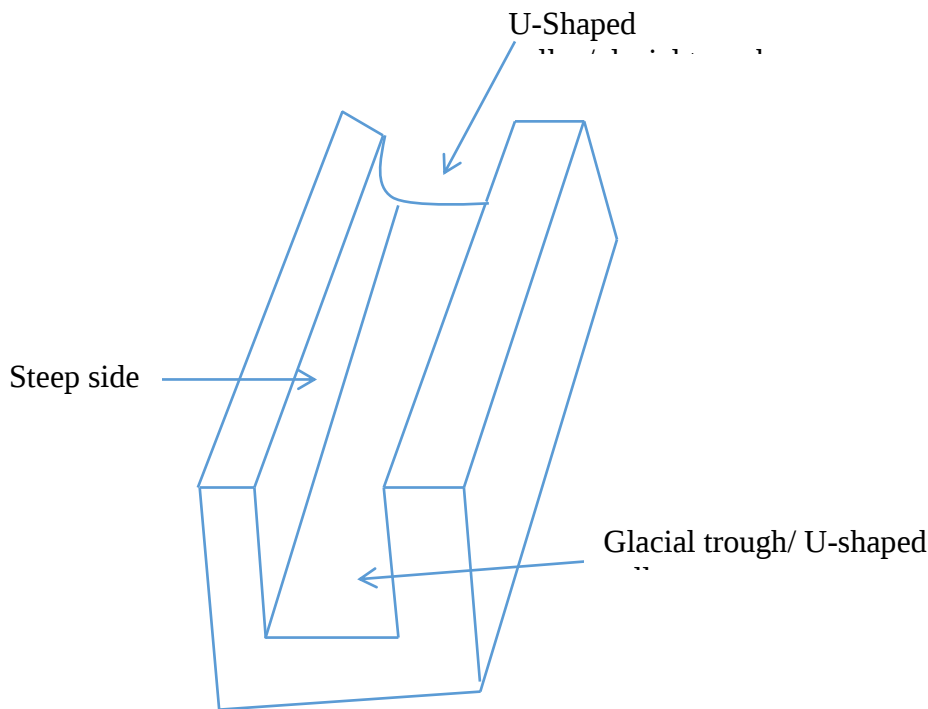
Pyramidal peak: It is a sharp horn-like or jagged mountain peak. It is formed where three or more corries are eroded backwards in a process of back wall recession by plucking leaving a central pillar in the middle called a pyramidal peak.

Examples; point john, midget peak on mountain Kenya, Speke, Stanley, Alexandra Peak on mountain Rwenzori.

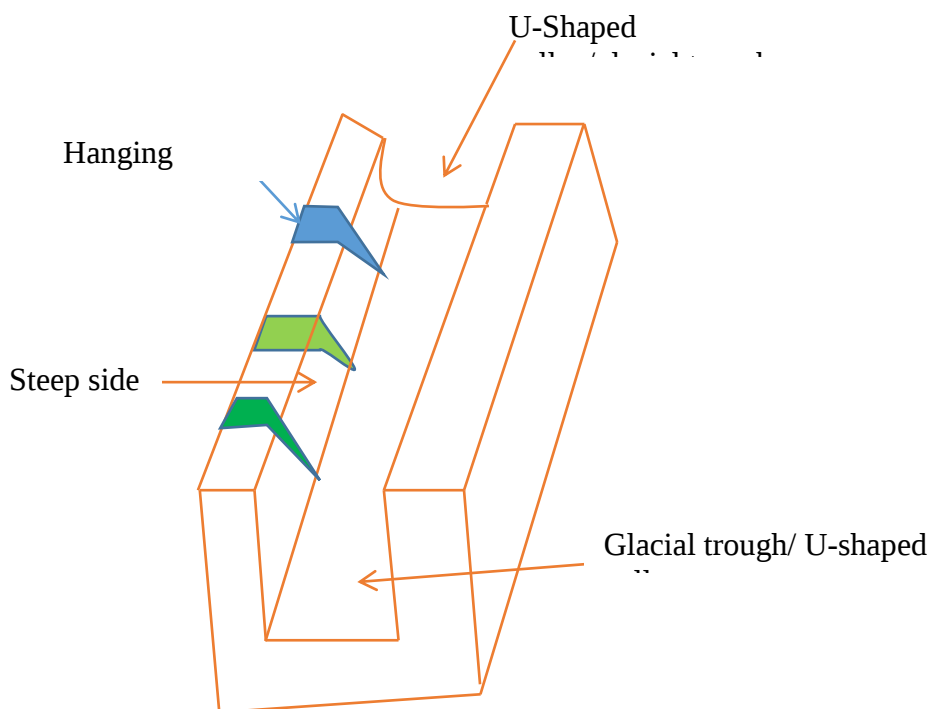


Glacial trough/U-shaped valley: It is a steep sided bottomed U-shaped valley. Before glaciation, it was V-shaped. The V-shaped valley was later widened by plucking and deepened by abrasion. Eventually the V-shaped was transformed into a U-shaped valley/Glacial trough.

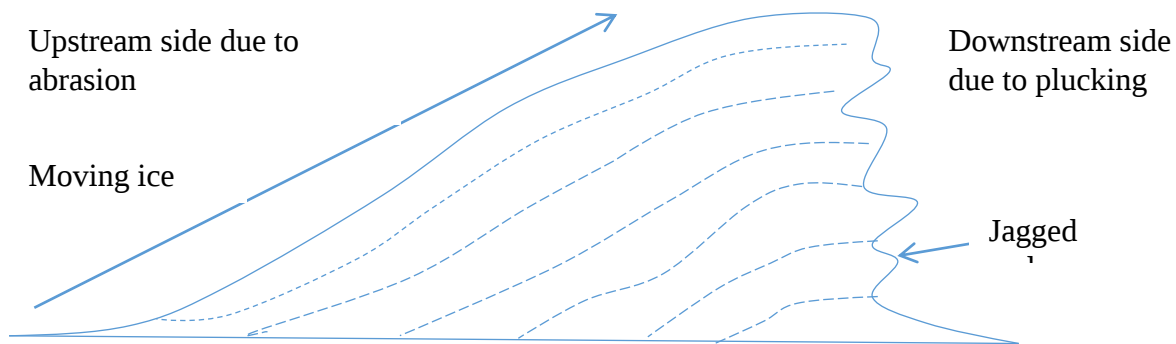
Examples: Kamusoso, Mobuku, Bujuku, Kanywankoko, Lusilubi in Uganda; Karany on mountain Kilimanjaro and Teleki, Naro- movu valley in Kenya



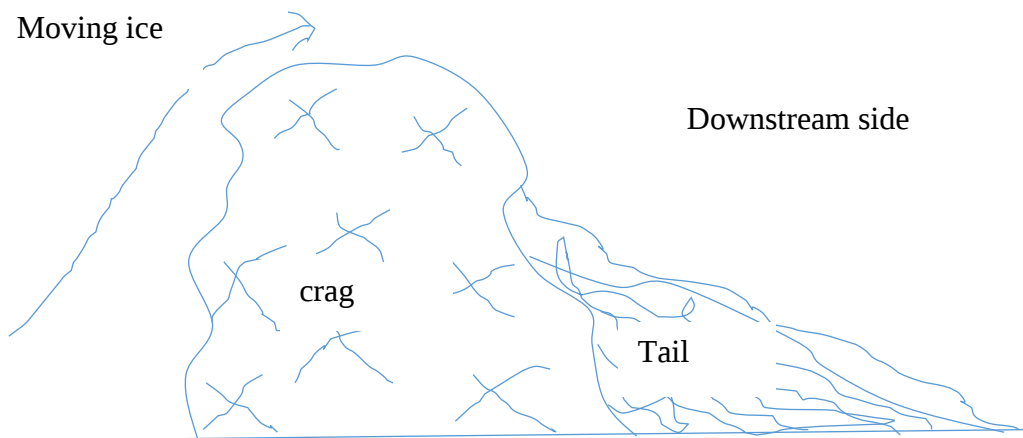
Hanging valley: This is a tributary valley found high above the floor of the U-shaped valley. It is formed due to the presence of much more ice in the main valley (glacial trough) than in the tributary valley. Because of this, there is more erosion in the main valley than in the tributary valley through plucking and abrasion. Thus the tributary valley hangs above the main valley due to less erosion.



Roche montonee: It is an outcrop of resistant rock in the path of a glacier. The upstream end is eroded by abrasion into a smooth gentle slope by the oncoming ice. The downstream end is plucked by the moving ice to give a steep jagged slope.



Crag and Tail: It is a knob of resistant rock which obstructs the movement of the ice. The resistant rock is known as the crag; and protects the weaker rocks downstream. The eroded material is deposited on the downstream to form an elongated tail.



DEPOSITIONAL GLACIAL FEATURES

Moraine dammed lakes are formed by the damming of a valley by terminal moraine- for example Tyndall tarn Hohnel, and hut tarn on mountain Kenya, lac cris on mountain Ruwenzori.

Moraines refers to all the materials eroded and deposited in low lands by a glacier. There are four types of moraines namely

- Terminal moraines,
- Lateral moraines,
- Ground moraines and
- Medial moraines

Terminal Moraine: Is an irregular mound or ridge of drift. It is formed by extensive deposition of till at the end/snout of the glacial valley for example Kamusoso valley.

Lateral Moraine: is a large glacier material formed at the sides of a glacier valley. It was formed when glacier erodes pre - existing depressions/valleys through sapping/plucking/abrasion. In the process glacier debris are transported down slope. The material is later deposited on the sides of the valley to form lateral moraine due to decrease in gradient and melting of the glacier

Ground moraine: This refers to glacial materials deposited on the floor of the glaciated valley.

Medial moraine: it is the glacial materials deposited in the middle if the valley by the tributary glaciers

NB: Depositional landforms mainly occur in lowland areas and can be classified as those composed of unstratified till deposited by ice which include:

- i. Till plain,
- ii. Eskers,
- iii. Drumlin,
- iv. Erratics,
- v. Outwash plains,
- vi. Kettle holes
- vii. Kame terrace

Drumlins: This is an elongated hills or ridges of oval shape formed when fragments of ground moraine are compresses by ice movement like in Teleki valley.

Till plain: this is an extensive area of monotonous landscape formed when moving ice transports boulders and clay burying former hills and valleys.

Outwash plains: these are wide gently sloping plains of gravel, sand clay and silt. They are formed when melt waters from a stagnant glacier carry and deposit sorted materials near the mouth of glacier and further down slope.

Kettle holes: These are circular holes in glaciated drift, blocks of ice detached/left behind during recession. The ice blocks melt leaving enclosed circular depressions. They may be filled by water forming kettle lakes like Mahoma Lake on Mt Rwenzori.

Kame terrace: This is a narrow flat-topped terrace like ridge of sand and gravel along the valley sides.

Erratics: These are rock boulders eroded and deposited in lowland areas of completed different rock materials. When the ice melts, it is left stranded in low lands.

Eskers: These are long winding steep sided ridges lying parallel to the direction of the ice movement. It extends for a long distance and may be about 30m high passing over even low hills.

BENEFITS/IMPORTANCE/CONTRIBUTION OF GLACIATION IN EAST AFRICA

- Glaciation has led to creation of beautiful scenic landscapes which promote tourism hence foreign exchange earnings; employment to people who earn income thereby improving their standards of living; promoting infrastructural development.
- Glaciation has led to Modification of the micro climate through lowering of temperature and rainfall formation suitable for settlement and farming on the gentle slopes of the mountain Kenya, Kilimanjaro and Rwenzori.
- The eroded rocks, sand and rock boulders brought down by the glacial melt water are used for construction of roads and buildings.
- The water falls in hanging valleys are potential sites for hydro power generation for industrial and domestic use.
- Glaciers are sources of rivers which provide water for Irrigation for example River Sebwe provide water for Mobuku irrigation scheme in Kasese.
- Glaciers are source of water for Industrial and domestic for example Little Athi River on Mountain Kenya and River Mobuku on Mount Rwenzori
- Glaciers promote recreation/sporting activities like mountain climbing, ice skating on the glaciated mountains of East Africa which improves people's lives.
- It has enhanced research and study purposes leading to acquisition of skills.
- Fertile soils like the boulder clay soils on the plains support crop cultivation such as Mobuku irrigation Farm in Kasese
- Glacial landscapes/features are used for filming and photography industry, advertisement in East Africa.
- The U – shaped valleys are also used for settlement and communication passes for roads and railways because they are flat.

NEGATIVE/DISADVANTAGES OF LIVING NEAR GLACIATED AREAS

- The melting of the glaciers leads to the river flooding of the lower areas hence destruction of farm land and property.
- Massive deposition of rock boulders leads to infertile soils hence limiting agricultural activities.
- Rock falls/ice falls from the mountain cause accidents, death and destruction of property in the lower areas of the glaciated mountains.
- Inaccessibility due to glacial activities for example glacial erosion has led to the form of gullies.
- Very cold conditions limit human settlement on the summits of the glaciated mountains.
- Stagnant water on the lower parts of the mountains becomes breeding areas for the diseases vectors like mosquitoes.