Ablation

Ablation refers to all processes by which snow, ice, or water in any form are lost from a glacier. Ablation is the loss of snow or ice by evaporation and melting. The rate at which ablation occurs depends on the atmospheric conditions present, such as air moisture content, solar radiation, temperature, and the reflectivity (Albedo) of the snow or ice surface. Fresh snow has a high albedo (0.7 to 0.9), indicating that 70 to 90 percent of the radiation received is reflected; glacier ice has a lower albedo of 0.2 to 0.4. Therefore, more radiation may be absorbed by glacier ice than by snow. Glaciers around the mountain receive different amounts of sunlight, so each glacier has its own characteristic ablation pattern.

Ablation area

Ablation area is the lower region of a glacier where snow ablation exceeds snowfall. A line that marks the limit on a mountain above which snow persists from one winter to the next is called the annual snowline, and this line on a glacier is called the firnline. Above the firnline, snow that falls each year packs down and changes into glacier ice as air is slowly forced out of it. This part of the glacier is its accumulation area where more snow falls each year than is lost by melting. Below the firnline is the ablation area, where melting predominates.

Accumulation area

Accumulation area is the upper region of a glacier where snow accumulation exceeds melting. A line that marks the limit on a mountain above which snow persists from one winter to the next is called the annual snowline, and this line on a glacier is called the firnline. Above the firnline, snow that falls each year packs down and changes into glacier ice as air is slowly forced out of it. This part of the glacier is its accumulation area where more snow falls each year than is lost by melting. Below the firnline is the ablation area, where melting predominates.

Albedo

Albedo is the percentage of the incoming radiation that is reflected off a surface. An albedo of one indicates that 100 percent of the radiation is reflected. Fresh snow has a high albedo (0.7 to 0.9), indicating that 70 to 90 percent of the radiation received is reflected; glacier ice has a lower albedo of 0.2 to 0.4. Therefore, more radiation may be absorbed by glacier ice than by snow.

Cirque

A deep, steep-walled recess in a mountain, caused by glacial erosion.

Crevasses

Crevasses are open fissures in glacier ice. Crevasses form where the speed of the ice is variable, such as in icefalls and at valley bends. The surface may appear blistered with crevasses where the ice flows over bedrock knobs and ridges. Crevasses are a glacier's most awesome features and are a constant hazard for climbers. They form where adjacent parts of a glacier are moving at different speeds. This unequal rate of flow produces stresses in the ice that cause it to break. Groups of crevasses often form where the glacier flows over a steep place in its bed. The ice moves faster here, and pulls apart, and a crevasse is formed. Although a large crevasse may seem to be bottomless to the observer, most crevasses are less than 100 feet deep because ice pressure tends to close the open spaces in the ice below that depth.

Density

Density is the ratio of the mass of an object to its volume. Snow has a density averaging about 0.1, firn has a density greater than 0.55, and glacier ice has a density of about 0.89. The density of unmineralized fresh water is 1. Glaciologists measure snowpack density frequently so that they may anticipate future water supplies, and to assess avalanche hazards. The density of a fresh snowpack is about 0.1; firn has a density of about 0.55 and glacier ice, of about 0.89. Each annual snow layer has a characteristic grain size and density.

Equilibrium line

Equilibrium line is the boundary between the accumulation area and the ablation area.

Erratic

A rock of unspecified shape and size, transported a significant distance from its origin by a glacier or iceberg and deposited by melting of the ice. Erratics range from pebble-size to larger than a house and usually are of a different composition that the bedrock or sediment on which they are deposited.

Firn

Firn is old snow that has been recrystalized into a more dense substance. Firn has a density greater than 0.55. Snowflakes are compressed under the weight of the overlying snowpack. Individual crystal near the melting point have slick liquid edges allowing them to glide along other crystal planes and to readjust the space between them. Where the crystals touch they bond together, squeezing the air between them to the surface or into bubbles. During summer we might see the crystal metamorphosis occur more rapidly because of water percolation between the crystals. By summer's end the result is firn -- a compacted snow with the appearance of wet sugar, but with a hardness that makes it resistant to all but the most dedicated snow shovelers! Several years are usually required for the snow to settle and to season into the substance we call glacier ice.

Firnline

A line that marks the limit on a mountain above which snow persists from one winter to the next is called the annual snowline, and this line on a glacier is called the firnline. Above the firnline, snow that falls each year packs down and changes into glacier ice as air is slowly forced out of it. This part of the glacier is its accumulation area where more snow falls each year than is lost by melting. Below the firnline is the ablation area, where melting predominates.

Glacial advance

Glacial advance is the net movement of glacier terminus downvalley. Advance occurs when the rate of glacier flow downvalley is greater than its rate of ablation. Advances are characterized by a convex-shaped terminus.

Glacial drift

Glacial drift is the loose and unsorted rock debris distributed by glaciers and glacial meltwaters. As glaciers melt, their remaining load of rocks is distributed in several ways. Rocks may be dropped in place by the melting ice; they may be rolled to the ice margins, or they may be deposited by meltwater streams. Collectively, these deposits are called "glacial drift". "Till" refers to the debris deposited directly by the glacier. Rock debris rolls off the glacier edges and builds piles of loose unconsolidated rocks called "glacier moraine". "Lateral moraines" form along the side of a glacier and curl into a "terminal moraine" at the glacier's downvalley end. Drift and moraines are valuable to geologists because they outline the boundaries of past glaciations.

Glacial flour

Glacial flour is the fine-grained sediment carried by glacial rivers that results from the abrasion of rock at the glacier bed. Its presence turns lake water aqua blue or brown, depending on its parent rock type. Rivers originating beneath glaciers are choked with glacial flour, the silty fine-grained sediment produced by the abrasion of rocks at the glacier bed.

Glacial outburst floods

Glacial outburst floods are sudden outbursts of water released by a glacier. The water may be released from glacier cavities, sub-glacial lakes, and from glacier-dammed lakes in side valleys. Also known as "Jökulhlaups". Glacier outburst flood - a sudden release of melt water from a glacier or glacier-dammed lake sometimes resulting in a catastrophic flood, formed by melting of a channel or by subglacial volcanic activity. The smallest, but most frequent, debris flows (see "lahar" below) at Mount Rainier begin as glacial outburst floods, also called by the Icelandic term "jokulhlaup" (pronounced "yo-kul-h-loip"). Outburst floods at Mount Rainier form from sudden release of water stored at the base of glaciers or within the glacier ice. Outburst floods become debris flows by incorporating large quantities of sediment from valley floors and walls, often by triggering landslides that mix with the flood waters. The transformation from water flood to debris flow occurs in areas where streams have eroded glacially derived sediments and sediment-rich, stagnant glacier ice that was stranded in valleys as glaciers thinned and retreated earlier in this century.

Glacial polish

Glacial polish is the leveling and smoothing of rock by fine-grained debris at the glacier bed. Glacier ice alone is too soft to be a powerful rock-cutting agent. Many glaciers are armed with rock fragments embedded within the ice that are effective cutting tools. The rock-choked ice grazes over the glacier bed, removign rock obstacles and leaving the bedrock rounded and smoothed. In some places fine-grained debris polishes the bedrock to a lustrous surface finish called glacial polish. Coarser rocks may gouge scratches called striations.

Glacial retreat

Glacial retreat is the net movement of the glacier terminus upvalley. Retreat results when the glacier is ablating at a rate faster than its movement downvalley. Retreating termini are usually concave in shape.

Glacial till

Glacial till - an unsorted, unstratified mixture of fine and coarse rock debris deposited by a glacier. As glaciers melt, their remaining load of rocks is distributed in several ways. Rocks may be dropped in place by the melting ice; they may be rolled to the ice margins, or they may be deposited by meltwater streams. Collectively, these deposits are called "glacial drift". "Till" refers to the debris deposited directly by the glacier. Rock debris rolls off the glacier edges and builds piles of loose unconsolidated rocks called "glacier moraine". "Lateral moraines" form along the side of a glacier and curl into a "terminal moraine" at the glacier's downvalley end. Drift and moraines are valuable to geologists because they outline the boundaries of past glaciations.

Glacier

A glacier is a body of ice showing evidence of movement as reported by the presence of ice flowline, crevasses, and recent geologic evidence.

Glacier cave

A cave formed in or under a glacier, typically by running water. Steam or high heat flow can also form glacier caves. Also called Ice Cave.

Glacier ice

Snowflakes are compressed under the weight of the overlying snowpack. Individual crystal near the melting point have slick liquid edges allowing them to glide along other crystal planes and to readjust the space between them. Where the crystals touch they bond together, squeezing the air between them to the surface or into bubbles. During summer we might see the crystal metamorphosis occur more rapidly because of water percolation between the crystals. By summer's end the result is firn -- a compacted snow with the appearance of wet sugar, but with a hardness that makes it resistant to all but the most dedicated snow shovelers! Several years are usually required for the snow to settle and to season into the substance we call glacier ice. Above the firnline, snow that falls each year packs down and changes into glacier ice as air is slowly forced out of it.

Glacier moraine

As glaciers melt, their remaining load of rocks is distributed in several ways. Rocks may be dropped in place by the melting ice; they may be rolled to the ice margins, or they may be deposited by meltwater streams. Collectively, these deposits are called "glacial drift". "Till" refers to the debris deposited directly by the glacier. Rock debris rolls off the glacier edges and builds piles of loose unconsolidated rocks called "glacier moraine". "Lateral moraines" form along the side of a glacier and curl into a "terminal moraine" at the glacier's downvalley end. Drift and moraines are valuable to geologists because they outline the boundaries of past glaciations.

Glacier snout

The terminus is the downvalley end of a glacier. It is sometimes referred to as the glacier snout.

Hydrothermal alteration

Hydrothermal alteration is the alteration of rocks or minerals due to the reactions of geothermally heated water with minerals. The process weathers and weakens the rocks such that they may become unstable.

Ice cave

A cave formed in or under a glacier, typically by running water. Steam or high heat flow can also form glacier caves. Also called Glacier Cave.

Icefalls

Icefalls are somewhat analogous to waterfalls in rivers. The flow of the ice down a steep gradient often results in crevasses and seracs.

Jökulhlaup

Jökulhlaup's (an Icelandic term pronounced Yo-kul-hloips) are sudden outbursts of water released by a glacier. The water may be released from glacier cavities, sub-glacial lakes, and from glacier-dammed lakes in side valleys. Also known as "glacial outburst floods". A glacier outburst flood resulting from the failure of a glacier-ice-dam, glacier-sediment-dam, or from the melting of glacier ice by a volcanic eruption.

Kinematic waves

Refers to a wave of ice moving downglacier propagated by its increased thickness. The wave of ice may move at two to six times the velocity of surrounding thinner ice.

Lahar

A lahar is a mudflow or debris flow originating on a volcano. Lahars (also called debris flows or mudflows) are mixtures of water, rock, sand, and mud that rush down valleys leading away from a volcano. They can travel over 50 miles downstream, commonly reaching speeds between 20 and 40 miles per hour. Sometimes they contain so much rock debris (60-90% by weight) that they look like fast-moving rivers of wet concrete. Close to the volcano they have the strength to rip huge boulders, trees, and houses from the ground and carry them downvalley. Further downstream they simply entomb everything in mud. Historically, lahars have been one of the most deadly volcanic hazards. Lahars can form in a variety of ways, either during an eruption or when a volcano is quiet. Some examples include the following: (1) rapid release of water from the breakout of a summit crater lake; (2) generation of water by melting snow and ice, especially when a pyroclastic flow erodes a glacier; (3) flooding following intense rainfall; and (4) transformation of a volcanic landslide into a lahar as it travels downstream.

Lateral moraine

Lateral moraines are piles of loose unsorted rocks along the side margins of the glacier. The rocks may be pushed there by the moving ice or dumped from the glacier's rounded surface. As glaciers melt, their remaining load of rocks is distributed in several ways. Rocks may be dropped in place by the melting ice; they may be rolled to the ice margins, or they may be deposited by meltwater streams. Collectively, these deposits are called "glacial drift". "Till" refers to the debris deposited directly by the glacier. Rock debris rolls off the glacier edges and builds piles of loose unconsolidated rocks called "glacier moraine". "Lateral moraines" form along the side of a glacier and curl into a "terminal moraine" at the glacier's downvalley end. Drift and moraines are valuable to geologists because they outline the boundaries of past glaciations.

Mass balance

Mass balance describes the net gain or loss of snow and ice through a given year. It is usually expressed in terms of water gain or loss.

Medial moraines

Medial moraines form where two mountain glaciers bearing lateral moraines unite. They appear as dark streaks of rock along the glacier centerline.

Neoglaciation

Neoglaciation refers to the advances made by mountain glaciers since the great Pleistocene ice age. In the Cascades the advances have occurred since 6,600 years before present.

Ogives

Ogives are arc-shaped features occasionally found across the glacier surface below icefalls. They may be ridges and swales in the ice or bands of darker or lighter ice. One theory of their formation suggests that the ice is stretched and sometimes dirtied when exposed in the icefall during the high velocities of summer; it is compressed during the winter so that bands of different ice thickness form.

Perfectly plastic solid

A solid that does not deform until it reaches a critical value of stress, after which it will yield infinitely. Some glaciologists say that ice is a perfectly plastic substance. That is, brittle and capable of cracking like a solid, yet deformable and capable of flowing at other stresses.

Roche moutonnee

A roche moutonnee is a small asymetrically-shaped hill formed by glacial erosion. The upper sides are rounded and smoothed and the lower sides are rough and broken due to quarrying by the glacier. Bedrock knobs are commonly polished on their upper side and are quarried and broken on the lower. These rounded knobs are formed in all sizes. Observers of the 1700s thought they resembled fashionable wavy wigs of their day and named the rouches moutonnees.

Rock flour

Fine-grained, silt-size sediment formed by the mechanical erosion of bedrock at the base and sides of a glacier by moving ice. When it enters a stream, it turns the stream's color brown, gray, iridescent blue-green, or milky white. Also called Glacier Flour or Glacier Milk.

Rock glacier

A glacier-like landform that often heads in a cirque and consists of a valley-filling accumulation of angular rock blocks. Rock glaciers have little or no visible ice at the surface. Ice may fill the spaces between rock blocks. Some rock glaciers move, although very slowly.

Seracs

Seracs are the pinnacles of ice formed where the glacier surface is torn by sets of crevasses.

Striations

Striations are the scratches etched into the rock at the bed of a glacier. Their presence indicates grinding of sand and rock particles into the bed under considerable pressure. Glacier ice alone is too soft to be a powerful rock-cutting agent. Many glaciers are armed with rock fragments embedded within the ice that are effective cutting tools. The rock-choked ice grazes over the glacier bed, removign rock obstacles and leaving the bedrock rounded and smoothed. In some places fine-grained debris polishes the bedrock to a lustrous surface finish called glacial polish. Coarser rocks may gouge scratches called striations.

Suncup

A suncup is a small depression on a snow or firn surface formed by melting and evaporation resulting from direct exposure to the sun.

Surge

A short-lived, frequently large-scale, increase in the rate of movement of the ice within a glacier. Ice velocities may increase 10 to 100 times above normal flow rates. In some surges, the terminus of a glacier rapidly advances. Although not all glaciers surge, those that do often surge with some sort of a periodicity.

Tarn

A lake that develops in the basin of a cirque, generally after the melting of the glacier.

Terminal moraine

Terminal moraines are piles of loose unconsolidated rock at the glacier's downvalley end. The rocks may be pushed there by the forward motion of the glacier or dumped from the glacier's rounded surface. As glaciers melt, their remaining load of rocks is distributed in several ways. Rocks may be dropped in place by the melting ice; they may be rolled to the ice margins, or they may be deposited by meltwater streams. Collectively, these deposits are called "glacial drift". "Till" refers to the debris deposited directly by the glacier. Rock debris rolls off the glacier edges and builds piles of loose unconsolidated rocks called "glacier moraine". "Lateral moraines" form along the side of a glacier and curl into a "terminal moraine" at the glacier's downvalley end. Drift and moraines are valuable to geologists because they outline the boundaries of past glaciations.

Terminus

The downvalley end of a glacier. It is sometimes referred to as the glacier snout. The lower-most margin, end, or extremity of a glacier. Also called Toe, End or Snout.

Till

Till is the unsorted rock debris deposited directly by the glacier without the extreme reworking by meltwater. As glaciers melt, their remaining load of rocks is distributed in several ways. Rocks may be dropped in place by the melting ice; they may be rolled to the ice margins, or they may be deposited by meltwater streams. Collectively, these deposits are called "glacial drift". "Till" refers to the debris deposited directly by the glacier. Rock debris rolls off the glacier edges and builds piles of loose unconsolidated rocks called "glacier moraine". "Lateral moraines" form along the side of a glacier and curl into a "terminal moraine" at the glacier's downvalley end. Drift and moraines are valuable to geologists because they outline the boundaries of past glaciations.

Trimlines

Trimlines are the sharp vegetative boundaries delimiting the upper margin of a former glaciation. The age differences of the ground surface are often visible because of different ages of the vegetation.

Tuya

A volcano that erupted under a glacier. Because volcanic activity in western Canada was contemporaneous with the ebb and flow of Cordilleran glaciations, many of the volcanoes display ice contact features. Mount Garibaldi itself is a supraglacial volcano which erupted onto a regional ice sheet. Others, such as Hoodoo Mountain, were contained within basins thawed in the ice and assumed the flat-topped form of tuyas. Still others, such as the subglacial mounds of the Clearwater Field, were erupted under glacial ice to form piles of pillow lava and hyaloclastite.

U-Shaped valley

A valley with a parabolic or "U" shaped cross-section, steep walls and generally a broad and flat floor. Formed by glacier erosion, a U-shaped valley results when a glacier widens and over-steepens a V-shaped stream valley.