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## How does glaciers cause erosion and deposition

Discuss the different erosion characteristics created by the Alpine glaciers. Describe the processes by which glaciers change the underlying rocks. Discuss the particles deposited by the glaciers as they move and recede. Describe the landforms created by ice deposits. Alpine (valley) glacier continental glacier at the end moraine glacier unpredictable glacial grooves glaciers, until glaciers earthly moraine dependent valley lateral moraine moraine pluck terminal moraine varve glaciers cover about 10% of the earth's surface near Earth's poles and they can also be found in high mountains. During the Ice Ages, glaciers covered 30% of the Earth. About 600-800 million years ago, geologists believe that almost the entire Earth was covered in snow and ice. Scientists are using evidence of erosion and deposition left by glaciers to do a kind of investigative work to find out where the ice was. The formation and movement of glaciers in glaciers is solid ice that moves extremely slowly on the surface of the earth (figure below). Ice erodes and shapes the underlying rocks. Glaciers also deposit sediment in characteristic element forms. There are two types of glaciers: continental glaciers are large ice sheets that cover relatively flat ground. These glaciers flow outwards, from where the greatest amount of snow and ice accumulates. Alpine or valley glaciers flow down the mountains along existing valleys. The moon image of the glaciers in the Himalayas has some features labeled. Glacier erosion glaciers erode the underlying rock by abrasion and plucking. The ice-like meltwater seeps into the cracks in the underlying rock, the water freezes and pushes the rock fragments outwards. The rock is then ripped out and dragged away by the flowing ice of the moving glacier (figure below). With the weight of the ice, these rocks can scratch deep into the underlying bed rock, making long parallel grooves in the bed rock, called icy grooves. The glacier shakes point in the direction a glacier went. Mountain glaciers leave unique erosion characteristics. When a glacier cuts through a V-shaped river valley, the glacier discs rocks from the side and bottom. This widens the valley and steepens the walls, making it a U-shaped valley (figure below). A U-shaped valley in Glacier National Park. Smaller tributaries of glaciers, like tributaries, flow from the main glacier to their shallower U-shaped valleys. It is made up of a hanging valley where the main glacier cuts off the tributary glacier and creates a rock. Streams plunge over the cliff to create waterfalls (Figure below). Yosemite Valley is known for its waterfalls that plunge into hanging valleys. High on a mountain where a glacier is formed, the rocks are pulled away from the Walls. Some of the resulting erosion characteristics are shown: the figure below and the figure below. a) Bowl shape cirque cirque Glacier National Park was carved by glaciers. (b) A high-altitude lake, known as tar, is formed from meltwater trapped in cirque. (c) Many cirques from glaciers in different directions from the mountain top leave a sharp-sided horn like the Swiss Matterhorn. (d) When glaciers move on opposite sides of a mountain, a sharp ridge, called arête, develops between them. The roche moutonnée forms where the glacier smooths the upward side of the bed rock and plucks the rock from the slope side. Depositional Features of glaciers The flow of glaciers, mechanical weather loosens rock on the valley walls, which falls on the debris of the glacier. Glaciers carry rock of any size, from giant rocks to silt (Figure below). These rocks can be transported many kilometers for many years. These rocks are of a different rock type or origin from the surrounding bed rock to the icy unpredictable. Melting glaciers are deposited from the large and small rocky material that is transported in a pile. These indiscriminate rock sites are called ice age tills. A large rock crashed by a glacier is a glacier unpredictable. The glacier pot is located in different types of inserts. Linear rock sites are called moraine. Geologists are studying moraines to figure out how far the glaciers stretched and how long it took them to melt. Moraines are named after their location relative to the glacier: Lateral moraines form

on the edge of the glacier as the material falls from the erosion of the valley wall to the glacier. Medial morae are formed, where lateral moraines of two side glaciers merge in the middle of a larger glacier (figure below). The long, dark lines are medial and lateral moraine. From under the glacier bending sediment after the melting of the glacier becomes soil moraine. Terrestrial moraine contributes to fertilized soil in many regions. Terminal moraines with long ridges up to the left of the furthest point of the glacier have reached. Moraines are placed where the glacier paused long enough to create a rocky ridge as it retreated. Long Island in New York was formed at both ends moraine. (a) The esker is a winding ridge sand and gravel deposited under a glacier in a stream of meltwater. (b) Drumlin is an asymmetrical tip consisting of sediment pointing in the direction of movement of ice. Usually drumlins are found in groups called drumlin fields. While glaciers drop indiscriminate sediment, ice meltwater can settle and resat the sediment (figure below). (a) A selection of sand and small particles is stratified drift. A wide area of layered drift drift away from meltwater over the wide region is an overwashing plain. (b) Kettles are formed as blocks of ice until ice melts. In ice regions, several stratified deposits are formed, but not directly ice. Varves form where lakes are covered with ice in winter. Dark, fine granular clay sinks to the bottom in winter, but melting ice in spring brings running water to the deposits of lighter-colored sand. Each alternating dark/light layer represents a one-year deposition. If a glacier accumulates more ice in a year than it melts, the glacier moves downwards. If a glacier melts more than it accumulates in a year, it retreats (figure below). The Grinnell Glacier in Glacier National Park has retreated for the past 70 years. Lesson summary The movement of ice in the form of glaciers transformed mountainous earth surfaces with the enormous force of erosion. U-shaped valleys, hanging valleys, cirques, horns, and cirques are features of carved ice. The eroded material is later deposited as the great glacier unpredictable, with moraines, layered drift, outwash plains, and drumlins. Varves is a very useful annual deposit, which is formed in icy lakes. Review Questions How much of the Earth's land surface is covered with glaciers today? Where do you find them? What are the two types of glaciers and how do they differ? What shape is a valley eroded by rivers? How does a glacier change this shape and what does it become? What two different features make up the smaller side glaciers that connect to the central main glacier? How do glaciers tear down the surrounding rocks? Name the erosion features that glaciers form at a height of the mountains and describe how they form. Describe the different types of moraine formed by the glaciers. Describe the difference between glacier-till and stratified drift. Give an example of how each deposit form is used. Name and describe the two asymmetrical mountain-shaped element shapes created by glaciers. For more reading/additional links points to consider, what features would you be looking for to determine if glaciers were ever present? If the glaciers never formed, how would soil in Central-West North America be different? Can the process of erosion cause beautiful formations? Go to the main content Go to the table of contents Ice erosion involves loosening rock, sediment or soil by ice processes, as well as transporting this substance with ice or meltwater. A wide range of easily recognizable landscape features brought about by glaciers and ice flows include many classic element shapes produced by glacier erosion, including U-shaped valleys, cirques, arêtes, roches moutonnées, hanging valleys, grooves, glacier polishing, rock steps, fjords and icy grooves. These earth forms, which range from metre to kilometer, result from differentiated patterns of rock loss. These patterns reflect spatial changes in glaciological regulation of glacial erosion, with the history and extent of ice development and retreat, and changes in sediment resistance in space. Some of the earliest research on ice erosion is a species specific to the glacier effect, and then... This is a preview of subscription content, sign in to check access. Anderson, J.B., Kurtz, D.D., and Weaver, F.M. Its sediment is the continental edge of West Antarctica. Craddock, C. (ed.), Antarctic Geoscience. Madison: University of Wisconsin, 1003-1012. 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