Moraine

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A **moraine** is any accumulation of unconsolidated debris (regolith and rock), sometimes referred to as glacial till, that occurs in both currently and formerly glaciated regions, and that has been previously carried along by a glacier or ice sheet. It may consist of partly rounded

particles ranging in size from boulders (in which case it is often referred to as boulder clay) down to gravel and sand, in a groundmass of finely-divided clayey material sometimes called glacial flour. Lateral moraines are those formed at the side of the ice flow, and terminal moraines were formed at the foot, marking the maximum advance of the glacier. Other types of moraine include ground moraines (till-covered areas forming sheets on flat or irregular topography) and medial moraines (moraines formed where two glaciers meet).

Moraine of Lake Garda.

Types of moraines

Moraines can be classified either by origin, location with respect to a glacier or former glacier, or by shape. The first approach is suitable for moraines associated with contemporary glaciers—but more difficult

to apply to old moraines, which are defined by their particular morphology, since their origin is debated. Some moraine types are known only from ancient glaciers, while medial moraines of valley glaciers are poorly preserved and difficult to distinguish after the retreat or melting of the glacier.

Lateral moraines

Lateral moraines above Lake Louise, Alberta, Canada.

Lateral moraines are parallel ridges of debris deposited along the sides of a glacier. The unconsolidated debris can be deposited on top of the glacier by frost shattering of the valley walls and/or from tributary streams flowing into the valley.[6] The till is carried along the glacial margin until the glacier melts. Because lateral moraines are deposited on top of the glacier, they do not experience the postglacial erosion of the valley floor and therefore, as the glacier melts, lateral

moraines are usually preserved as high ridges.

*Moraines clearly seen on a side glacier of the Gorner Glacier, Zermatt, Switzerland. The **lateral moraine** is the high snow-free bank of debris in the top left hand quarter of the picture. The **medial moraine** is the double line of debris running down the centre-line of the glacier.*

Lateral moraines stand high because they protect the ice under them from the

elements, causing it to melt or sublime less than the uncovered parts of the glacier. Multiple lateral moraines may develop as the glacier advances and retreats.

Ground moraines

Ground moraines create irregular, rolling topography.

Ground moraines are till-covered areas with irregular topography and no ridges, often forming gently rolling hills or plains. They are accumulated at the base of the ice as lodgment till, but may also be deposited as the glacier retreats. In alpine glaciers, ground moraines are often found between the two lateral moraines. Ground moraines may be modified into drumlins by the overriding ice.

Rogen moraines

Rogen moraines or ribbed moraines are a type of basal moraines that form a series

across a valley behind a terminal moraine. They form perpendicular to the lateral moraines that they reside between and are composed of unconsolidated debris deposited by the glacier. They are created during temporary halts in a glacier's retreat.[1][8]

Medial moraine

Medial moraines, Nuussuaq Peninsula, Greenland.

A medial moraine is a ridge of moraine that runs down the center of a valley floor. It forms when two glaciers meet and the debris on the edges of the adjacent valley sides join and are carried on top of the enlarged glacier. As the glacier melts or retreats, the debris is deposited and a ridge down the middle of the valley floor is created. The Kaskawulsh Glacier in the Kluane National Park, Yukon, has a ridge of medial moraine 1 km wide.