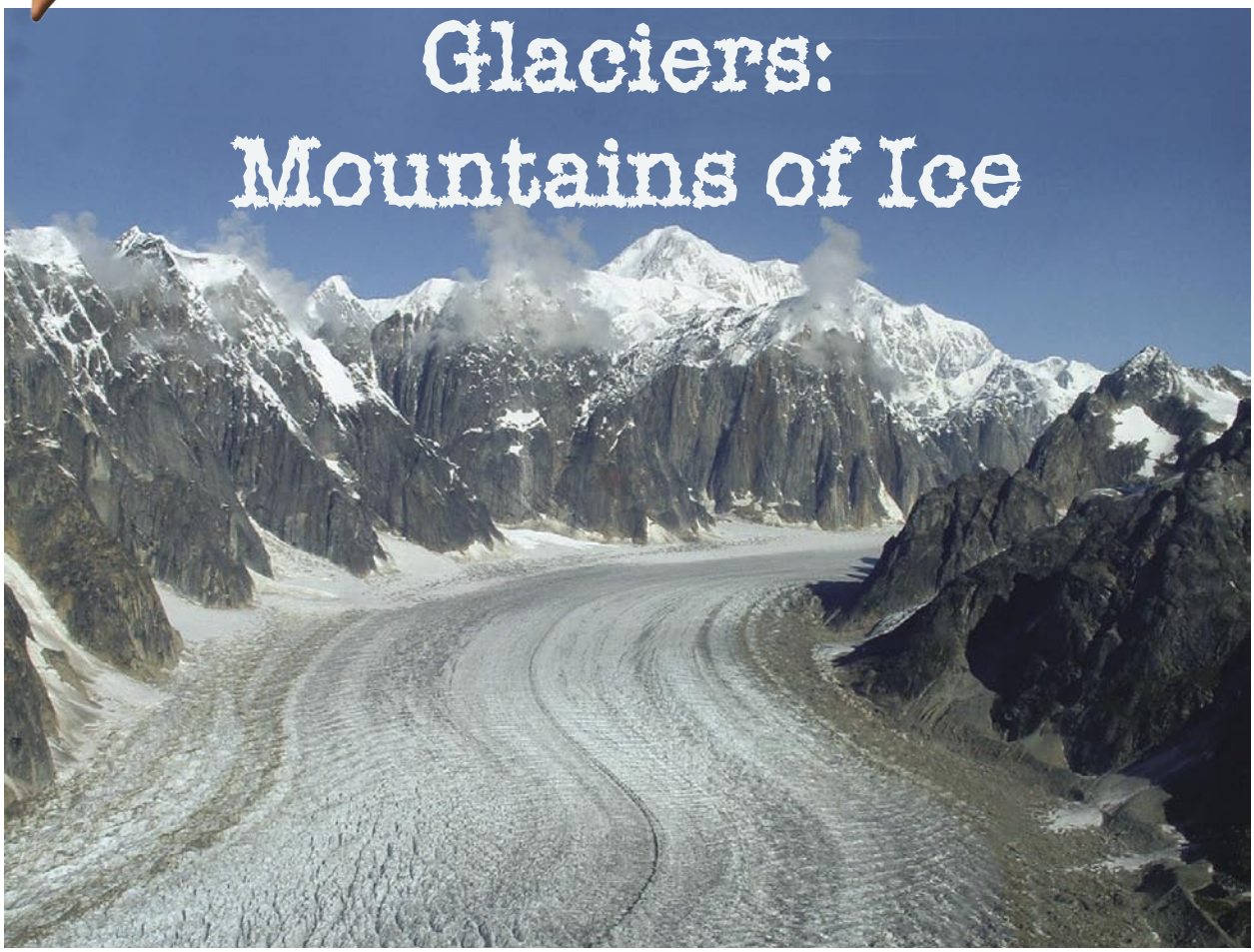
WATER Kidz

Glaciers: Mountains of Ice



Does the word 'glacier' make you think of a mountain of cold ice and snow? This is because glaciers require very specific climatic conditions. Most are found in regions of high snowfall in winter and cool temperatures in summer. These conditions ensure that the snow that accumulates in the winter isn't lost during the summer.

While most of the world's glaciers are found near the Poles, they exist on all of the world's continents, even Africa. The glaciers of Africa are limited to three specific geographic locations; two volcanoes (Mount Kenya and Kilimanjaro) and one mountain group (the Ruwenzori).

DID YOU KNOW?

The Kutiah Glacier in Pakistan holds the record for the fastest glacial surge. In 1953, it raced more than 12 kilometres in three months, averaging about 112 metres per day.

Glaciers begin to form when snow remains in the same area year-round, where enough snow accumulates to transform into ice. Each year, new layers of snow bury and compress the various layers. This compression forces the snow to re-crystallize, forming grains similar in size and shape to grains of sugar. Gradually, the grains grow larger and the air pockets between the grains get smaller, causing the snow to slowly compact and increase in density.

After about two winters, the snow turns into firn – an intermediate state between snow and glacier ice. At this point, it is about half as dense as water. Over time, larger ice crystals become so compressed that any air pockets between them are very tiny. In very cold glacier ice, crystals can reach several hundred millimetres in length. For most glaciers, this process takes over a hundred years.

Under the pressure of its own weight and the forces of gravity, a glacier will begin to move, or flow, outwards and downwards. Valley glaciers flow down valleys and continental glaciers (ice

GLACIER FACTS

- About 10% of land area is covered with glaciers at present.
- Glaciers store about 75% of the world's freshwater.
- Glacierised areas cover about 15 million square kilometers.
- Antarctic ice is more than 4 200 metres thick in some areas.
- If all land ice melted, the level of the sea would rise about 70 metres worldwide.
- Glacier ice crystals can grow to be as large as baseballs.
- Almost 90% of an iceberg is below water – only about 10% shows above water.

GLACIER SPEAK

Ablation: Loss of ice from a glacier caused by melting of vaporisation.
Arete: Sharp, narrow ridge formed as a result of glacial erosion from both sides.
Calving: The process by which ice breaks off a glacier's terminus. (Usually the term is reserved for tidewater glaciers or glaciers that end in lakes, but it can refer to ice that falls from hanging glaciers)
Crevasse: Open fissure in the glacier surface.
Esker: A sinuous ridge of sedimentary material (typically gravel or sand) deposited by streams that cut channels under or through the glacier ice.
Firn: Rounded, well-bonded snow that is older than one year.
Glacier terminus: The lowest end of a glacier. Also called the glacier toe or glacier snout.
Mountain glacier: A mountain or alpine glacier is a glacier that is confined by surrounding mountain terrain.
Ogives: Alternate bands of light and dark ice seen on a glacier surface.
Sintering: The bonding together of ice crystals.
Sublimation: The change of state from ice to water vapour or water vapour to ice.
Sun cups: Ablation hollows that develop during intense sunshine.
Surging glacier: A glacier that experiences a dramatic increase in flow rate, ten to one hundred times faster than its normal rate. Usually surge events last less than a year, but periodically, it can last between 15 and 100 years.
Tarn: A small mountain lake or pool.
Valley glacier: A mountain glacier whose flow is confined by valley walls.

sheets) flow outward in all directions from a central point. Glaciers dramatically impact their surrounding environment by reshaping the underlying and surrounding landscape as they move, through both erosion and deposition.

Not all glaciers move slowly. For example, surging glaciers experience dramatic increases in flow rate, sometimes travelling as much as ten to one hundred times faster than the normal rate of movement.

At some stage glaciers will stop growing and start to move in retreat. As large glaciers retreat, the underlying ground surface is typically scoured to most materials, leaving only scars on the underlying surface. Glacier retreat results from increasing temperature, evaporation and wind scouring. As long as snow accumulation equals or is greater than melt and ablation, glacier health is maintained.

Over the past 60 to 100 years, glaciers worldwide have tended toward retreat. Alpine glaciers, which are typically smaller and less stable to begin with, seem particularly susceptible to glacial retreat. Whether this is due to a predictable climate trend or because of increased human impacts on global climate remains to be determined.

Glaciers are a natural resource on which many people depend. For example, the people living in the city of La Paz, Bolivia, rely on glacial melting from a nearby ice cap to provide water during the significant dry spells they experience. In Switzerland's Rhone Valley, farmers have irrigated their crops for hundreds of years by channelling meltwater from glaciers to their fields.

More recently, scientists and engineers in Norway, Canada, New Zealand and the Alps have worked together to tap into glacial resources, using electricity that has been generated in part by damming glacial meltwater. In Japan, there are tremendous amounts of snow, but no glaciers. Because the country endures frequent droughts, scientists are now examining ways to create artificial glaciers that could provide more water for people.

- For more information about glaciers visit the US National Snow & Data Centre's glaciers website (http://nsidc.org/glaciers)