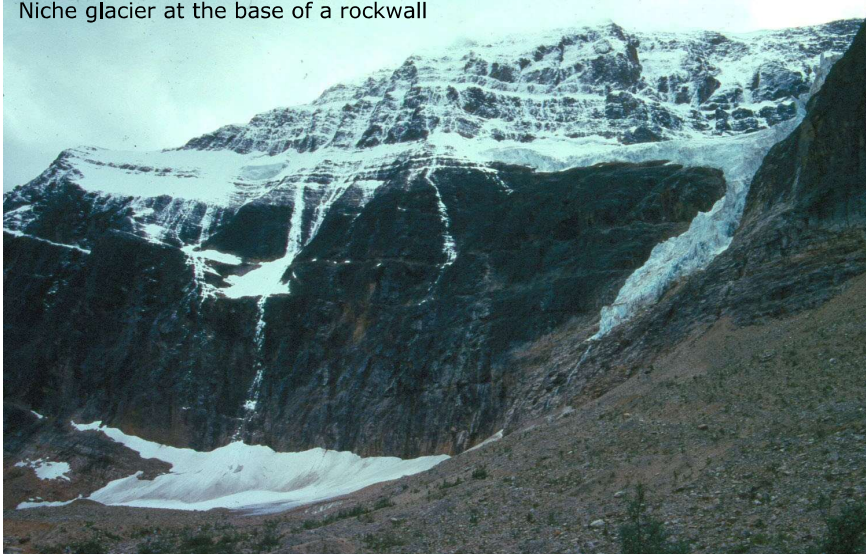


Glaciers are large bodies of ice that flow downhill in response to the stress caused by gravitational forces. They form in areas where temperatures are sufficiently low to allow snow to persist from year to year, enabling thick banks of snow to accumulate which will eventually form glacial ice. Glaciers range in size from the small valley glaciers found in mountainous areas, to the vast ice sheets that cover much of Antarctica and Greenland. At present, glacial ice covers approximately 14.9 million km<sup>2</sup> or 10 per cent of the Earth's land surface. Glaciers can be classified according to size and shape and by the temperature of the glacial ice.

### Size and Shape

Niche glaciers are patches of both glacial ice that occupy small topographic hollows and gully's on north facing mountain slopes. In contrast to other glacier types, their small size ensures that they have little impact geomorphic impact.

Niche glacier at the base of a rockwall



Cirque glaciers are ice masses that occupy cirque basins, i.e. arm-chaired shaped hollows. Many glaciers within cirque basins may spill over the front and flow downhill to feed valley glaciers.

A cirque glacier in Norway, with adjacent niche glaciers



Valley glaciers are large streams of ice that flow within a valley from an upslope ice cap and cirque glacier.



Mer de  
Glace, one  
of the larg-  
est valley  
glaciers in  
the French  
Alps

Piedmont glaciers are large lobes of spreading ice formed when valley glaciers expand onto a flat plain.

ice front of the Skeidarajokull piedmont glacier in Iceland. Note the vast outwash plains or sandur in front of the glacier



Ice sheets are large masses of glacial ice (> 50 000km<sup>2</sup>) that cover the entire landscape, except exposed high mountain summits called nunataks. For example, the Antarctic ice sheet covers an area of 12.5 million km<sup>2</sup>, attains a maximum thickness of 4000m and contains approximately 85 per cent of world's fresh water.

Valley glaciers flowing off the Patagonia icesheet, Chile.



Ice caps are dome-shaped masses of glacial ice (< 50 000km<sup>2</sup>) that cover the high peaks and plateau areas of mountain ranges.

The Summit  
ice cap of  
Mont Blanc,  
French Alps



Ice shelves are expanses of floating ice, which form where glaciers extend out to sea. The world's largest example is the Ross Ice Shelf Antarctica, which ranges in thickness from 1000m close to the shore to 500m at its margins where it calves into the sea to form icebergs.

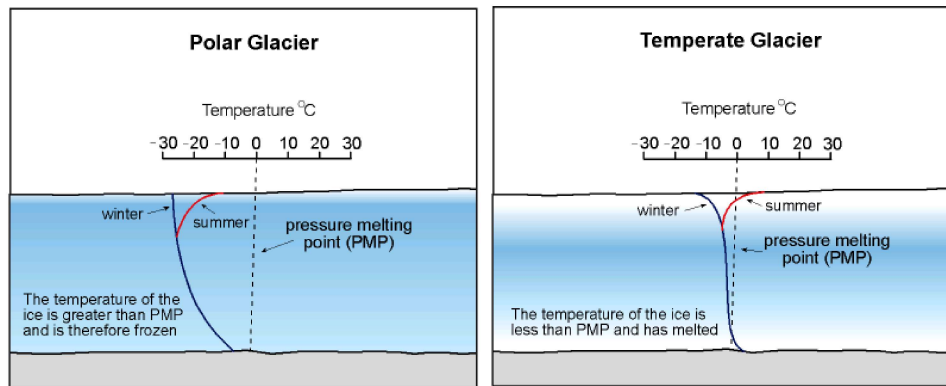
Iceshelf at the front  
of the San Raseal  
Glacier, Patagonia,  
Chile



Temperature regime

**Polar or cold-based** glaciers occur in very cold environments, such as Greenland and Antarctica. In these areas glaciers are frozen onto the bedrock beneath and melting only occurs at the surface during the short summer season

**Temperate or warm-based** glaciers occur in areas where mild summer temperatures cause melting, such as the European Alps, Norway and New Zealand. Melting also occurs at the base of these glaciers since temperatures are close to the pressure melting point



The relationship between temperature and depth in polar and temperate glaciers

**Polythermal** glaciers contain both warm and cold ice. Their thermal regime is controlled by changes in ambient air temperature and glacial pressure and as a result they can occur in either polar or temperate areas. For example, in temperate mountain ranges many glaciers are cold based in their high altitude source ice cap and become warm based as the ice flows downhill into lower altitude, and hence, warmer settings. In contrast, in some very thick polar ice sheets melting can occur deep within the ice mass in response to the very high pressures generated.

