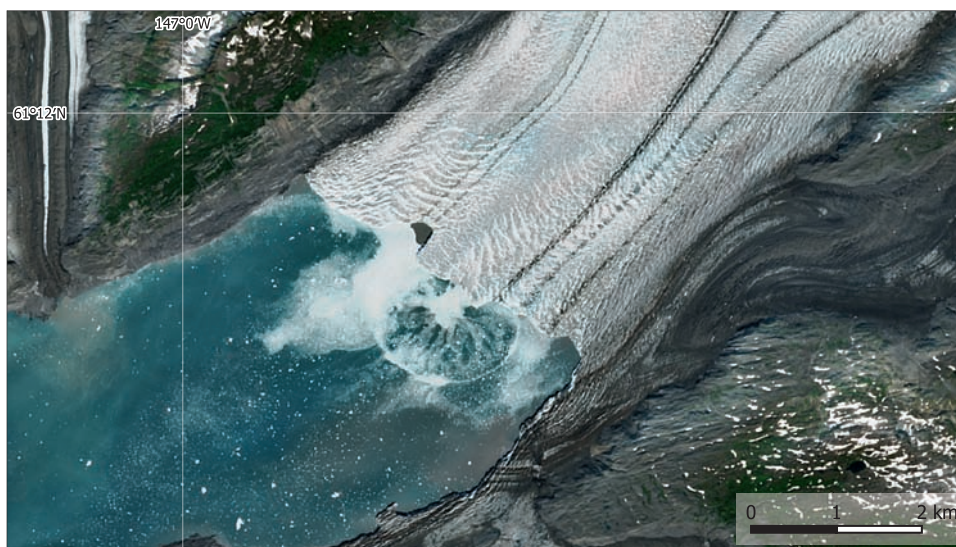
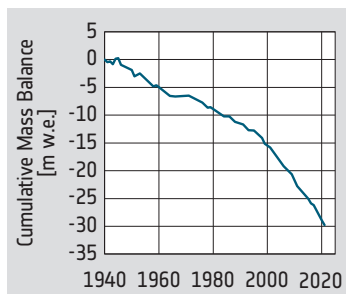




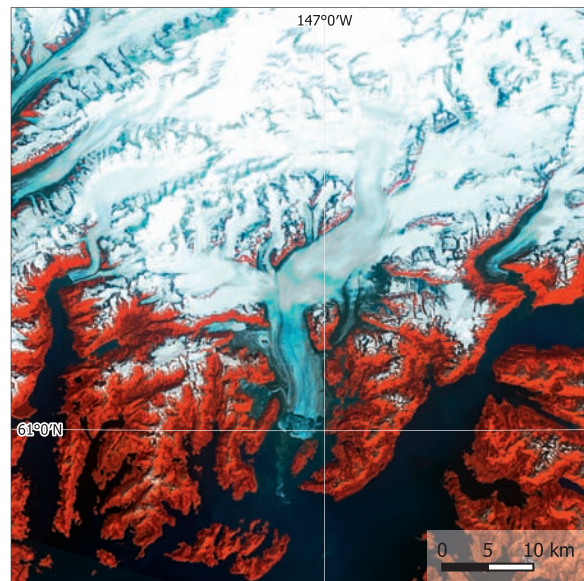
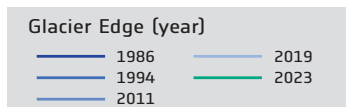
1. Overview satellite image map of Alaska. The glaciers are concentrated in the mountain ranges along the south coast of Alaska. Data: Spot Vegetation



2. Detail satellite image of the terminus of the Columbia Glacier. Note the circular wave spreading from the centre of the terminus, where an iceberg has calved. Data: Sentinel-2, 2023-07-30.



3. Global average of the cumulative mass loss of glaciers since 1940. The unit „metre of water equivalent“ roughly corresponds to the loss of thickness of the glaciers.



4. False-colour infrared image of the Columbia Glacier, Alaska. Data: Landsat 5, 1986-07-28.

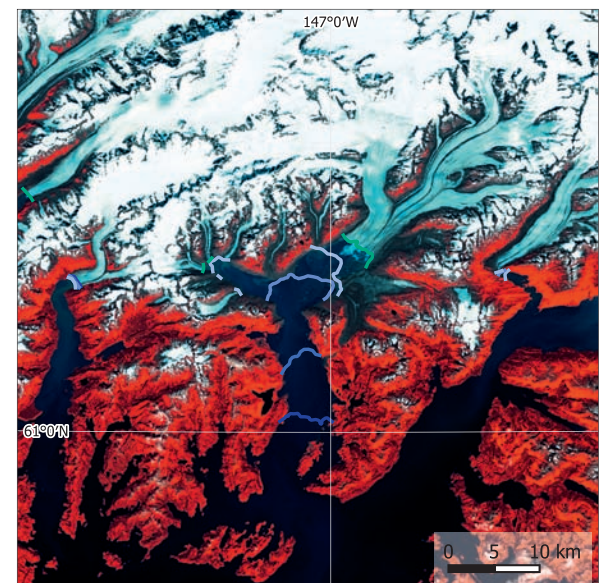
### Columbia Glacier, Alaska

For decades now glaciers all around the world have been retreating, a phenomenon directly linked with climate change. On an average, the glaciers worldwide have lost about 30 metres of their thickness since 1940. Currently, on an average, they are losing about one metre per year.

The retreat of several tidewater glaciers, which are glaciers ending in the sea, is particularly spectacular. Tidewater glaciers exist in Alaska, in Patagonia and along the coasts of Greenland. These glaciers end directly at sea level, therefore their environment is relatively warm during summer. As a consequence, the end zones of these glaciers are among the fastest flowing ice streams on Earth. Their lower end floats on the water of the sea and follows the tidal movement. This movement enhances the formation of cracks and of the calving of icebergs that float off into the sea.

The Columbia Glacier is located in Alaska. Descending from more than 3000 metres above sea level, it flows into the Prince William Sound at the coast of the Pacific Ocean. For a long time, the nose (or terminus) of the glacier remained stable near the mouth of Columbia Bay. However, since the 1980s it has retreated by more than 20 kilometres.

The Columbia glacier shows that the combination of different effects can lead to a highly dynamic evolution. At the beginning, the nose of the glacier was supported by the gravel of the end moraine. After the initial phase of the retreat it floated on water, making the tidal forces more effective and thus increasing the speed of the retreat, even more so as this allowed warmer water from the ocean to flow under the ice.



5. False-colour infrared image of the Columbia Glacier, Alaska. The overlay shows the edges of the glaciers in different years. Data: Sentinel-2, 2023-07-30.