Glaciers and Oceans

A lecture to on how oceans impact ice!

What is a glacier?

- A glacier large mass of **ice** that flows very slowly!
- In cold regions more snow falls (**accumulates**) than melts (**ablates**) in the summer season.
- Overtime, this snow will build up into a glacier and will deform under the force of **gravity**

Bear Glacier occurs in iceberg filled freshwater lagoon. Kenai Fjords National Park, Alaska.

National Park Service Photo

Types of Glaciers

There are two main types of glaciers:

Land-terminating glaciers or Mountain glaciers

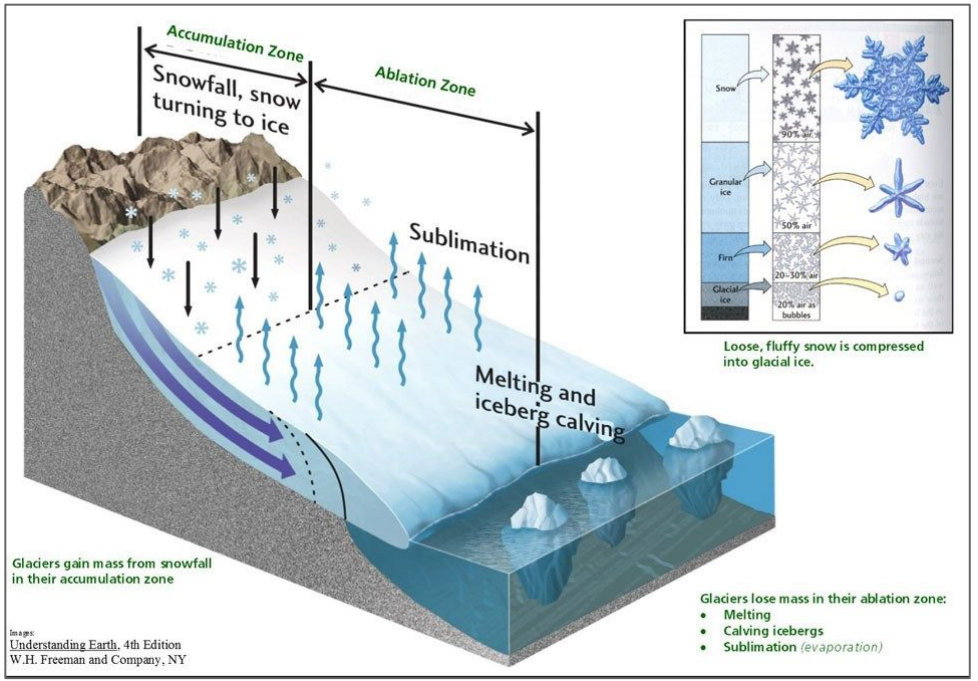
These glaciers end on land and are mainly controlled by atmospheric climate

Marine-terminating glaciers

These glaciers end in either oceans or lakes and are controlled by both atmospheric climate and the temperature of the water they end in

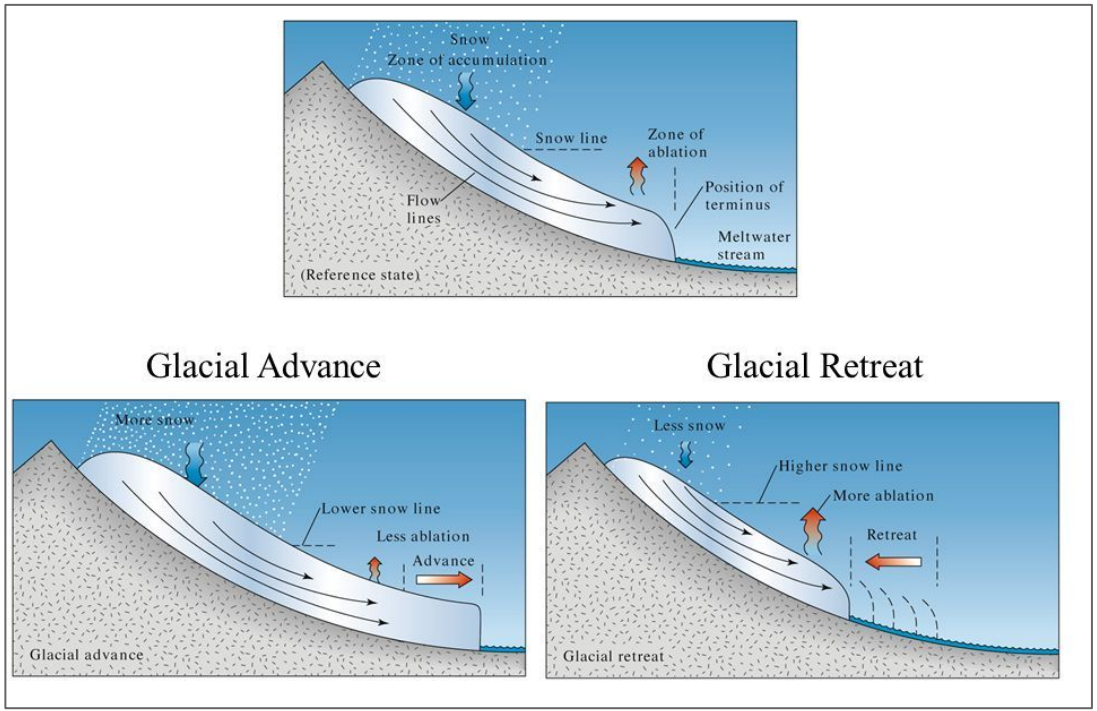
How do glaciers change?

- Glaciers **gain** more ice from snowfall
- Glaciers **lose** mass by melting, sublimating and if they are **marine-terminating,** calving



How do glaciers change?

- If a glacier loses more ice than it gains, it will **retreat**
- If a glacier gains more ice than it loses, it will **advance**



How does the ocean impact glaciers?

- **Calving** is the breaking off of ice from a glacier margin
- **Calving** is an important component of glacier mass loss
- A glacier is always flowing forward, but it can **retreat in the opposite direction** due to calving and melt

How does the ocean impact glaciers?

- As the ocean warms, this increases heat to a glacier and it **melts** the front of the glacier in the water

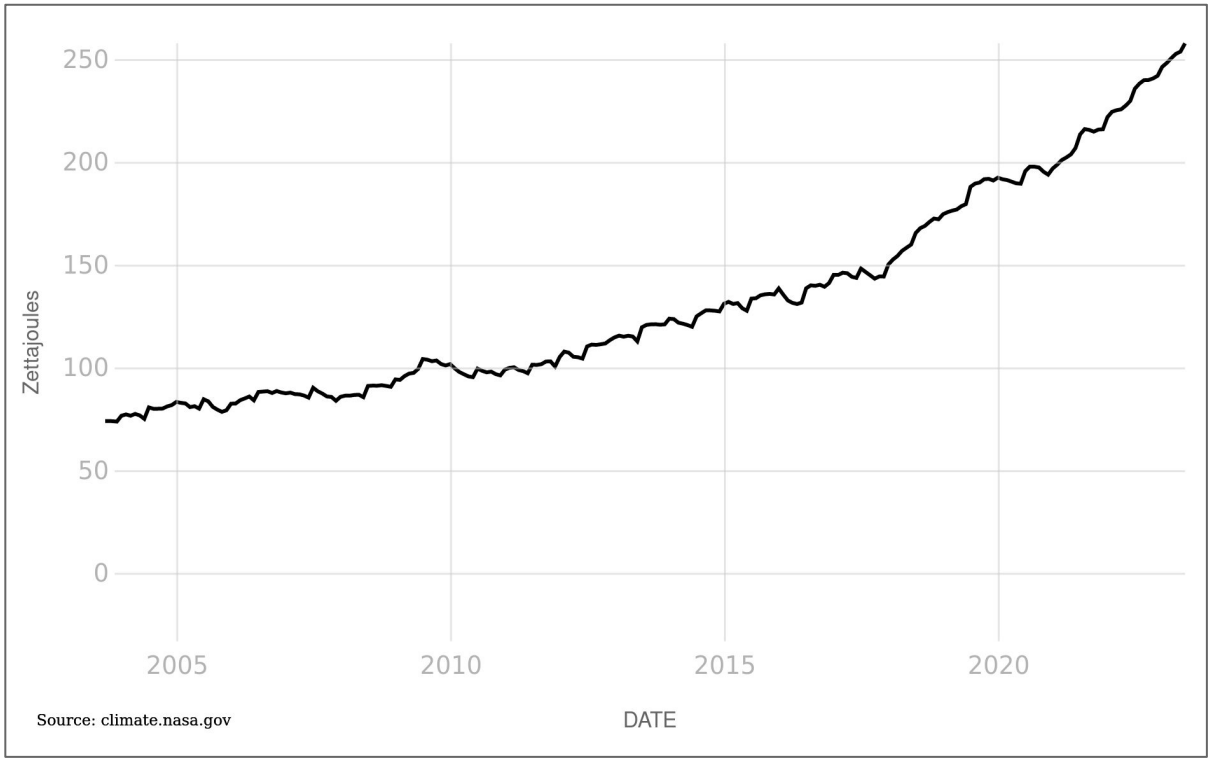
- If **melt** outpaces the **flow** forward of a glacier, it will **retreat**

How are melting and calving related?

- A glacier is always flowing forward, but it can **retreat in the opposite direction** due to calving and melt

OCEAN HEAT CONTENT CHANGES SINCE 2005 (NASA)

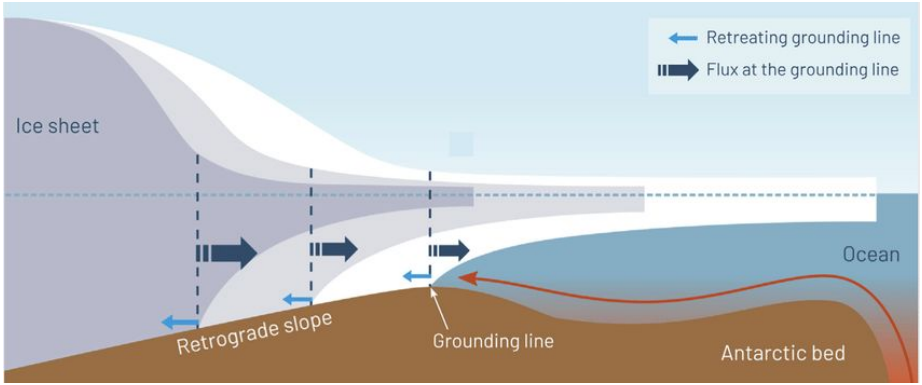
- Ninety percent of global warming is occurring in the ocean
- A zettajoule a unit of heat energy



How does the shape of the bed affect a glacier?

- **Retrograde** or **negative slopes (areas where the bed becomes deeper)** are slopes that move away in the direction opposite to ice flow

- As a glacier retreats on a negative slope or deeper bed, the **rate of retreat** can increase



Discussion topics

- What do you think would happen to a glacier if the ocean started warming rapidly?
- What do you think would happen to a glacier if the ocean started cooling rapidly?
- What would happen to a glacier if ocean switched between warming and cooling?
- How does the shape of the bed affect glacier retreat?
- Explain in your own words how calving and melting are related