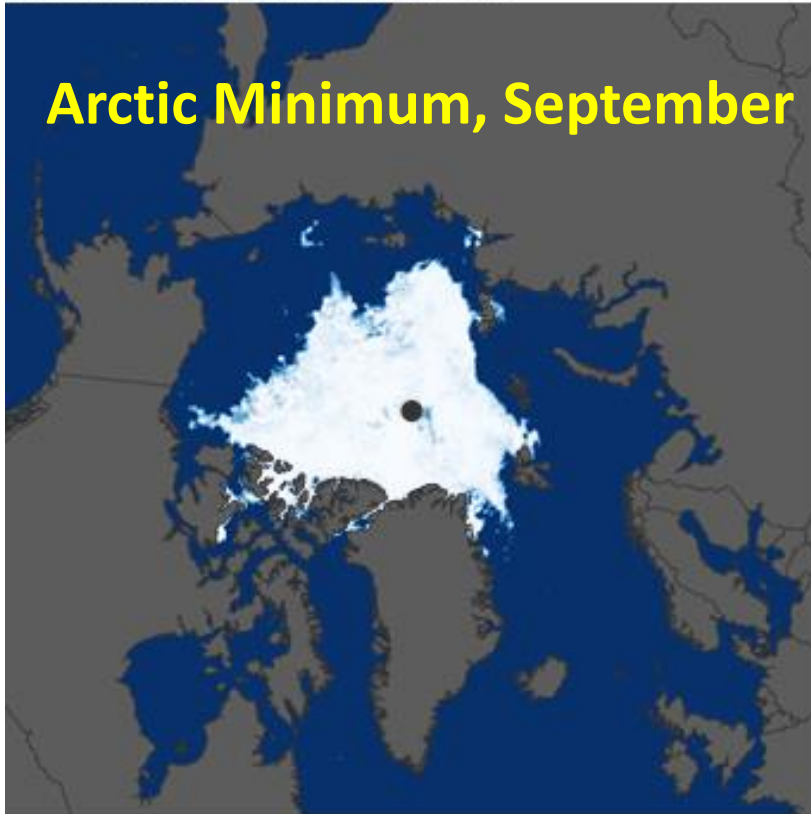


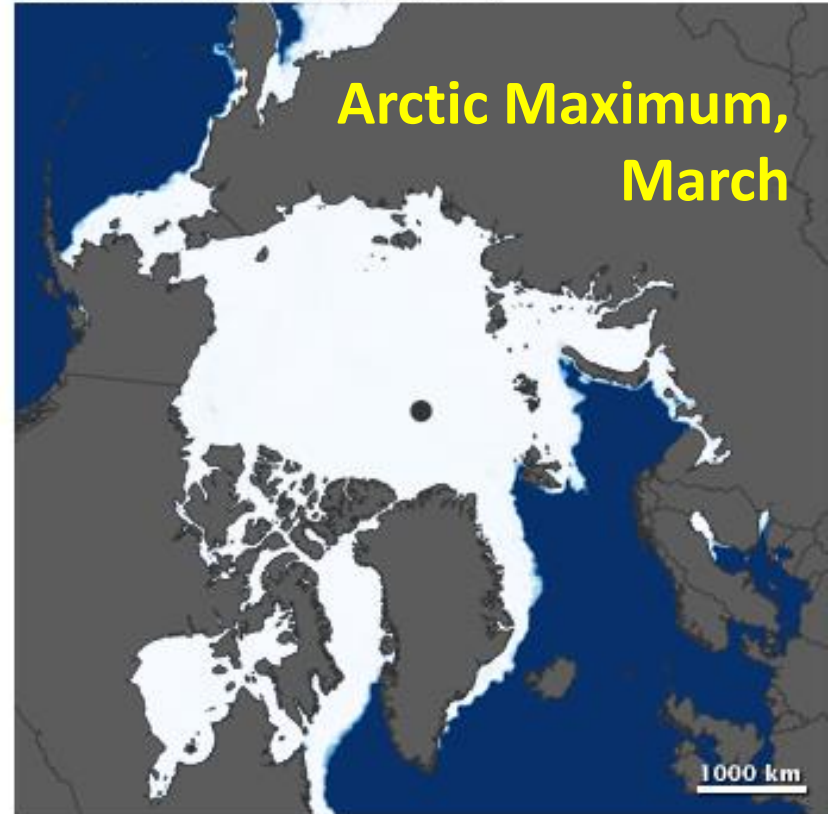
Arctic Sea Ice: rapidly shrinking

Arctic Minimum (September 14, 2008)



**Before 1990: ~7 million km²
or ~2.7 million square miles**
**2009-2018: ~5 million km²
or ~2 million square miles**

Arctic Maximum (February 28, 2009)



**Before 1990: ~16 million km²
or ~6 million square miles**
**2009-2018: ~14.5 million km²
or ~5.5 million square miles**

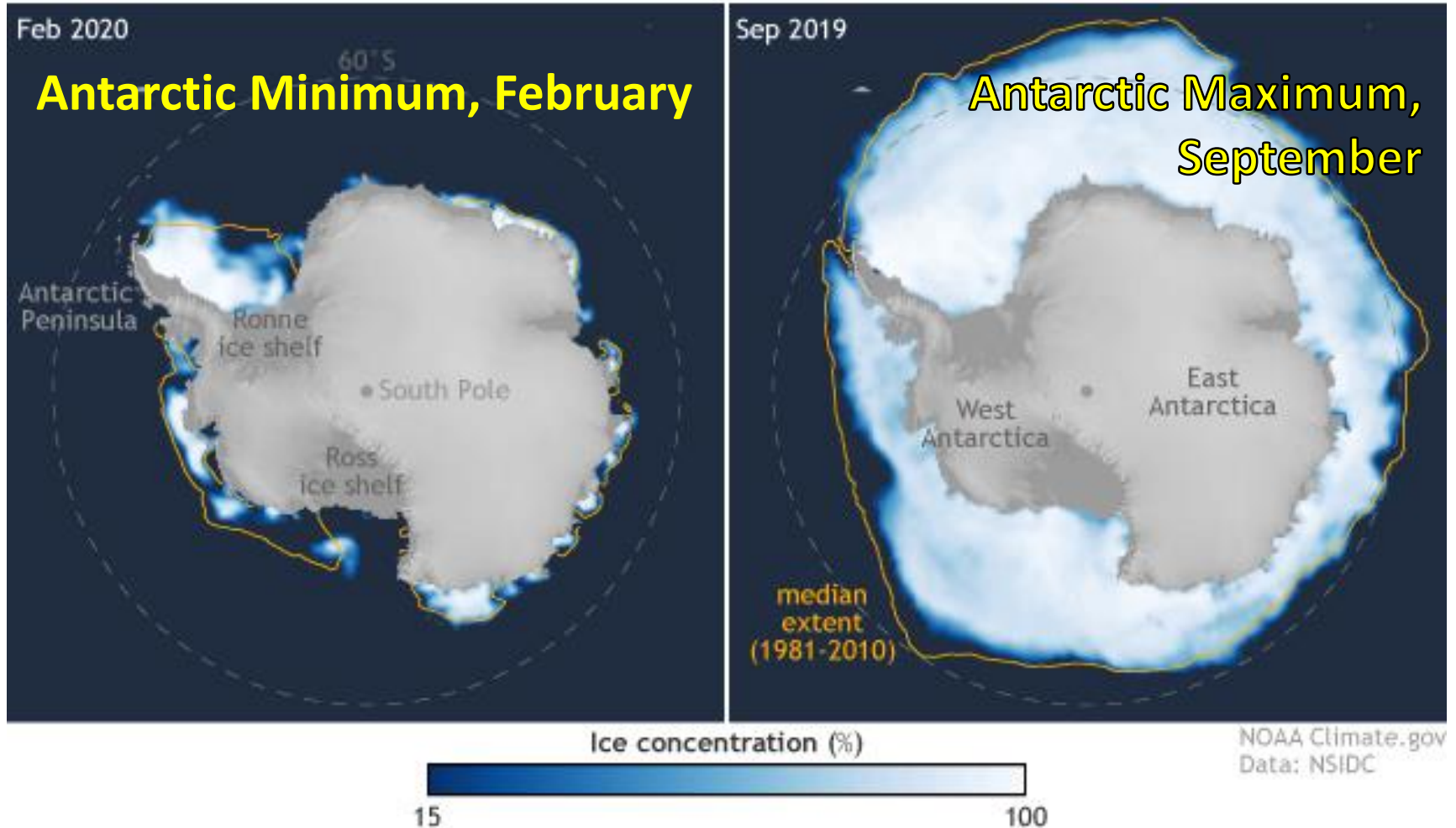
Arctic sea ice drift



Typically,
sea ice is
<3 m (<10 feet) thick.

Antarctic Sea Ice

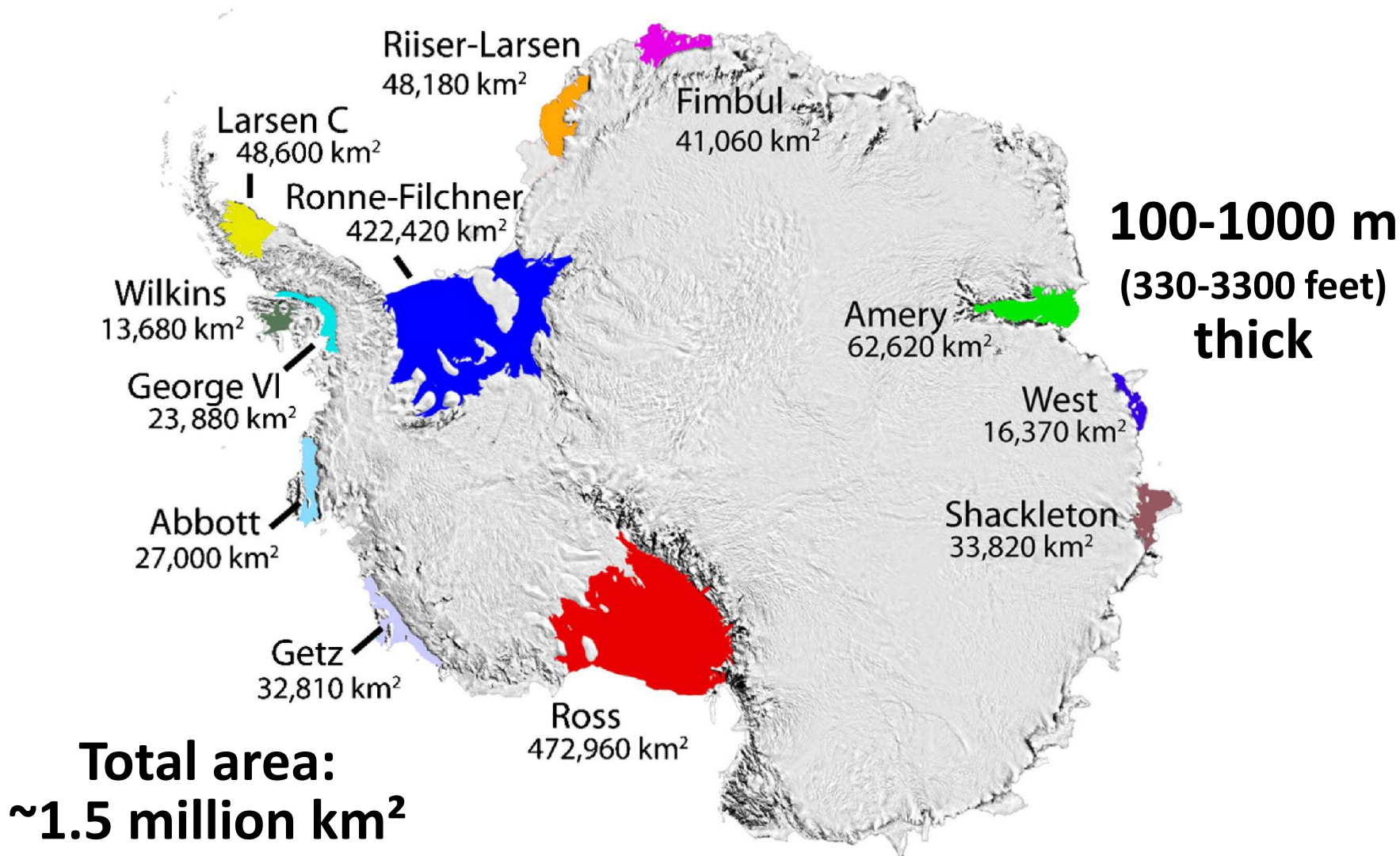
2020 Antarctic sea ice minimum and 2019 maximum



Antarctic sea ice reaches its **maximum extent each September** of **~18 million square kilometers** or **~7 million square miles**.

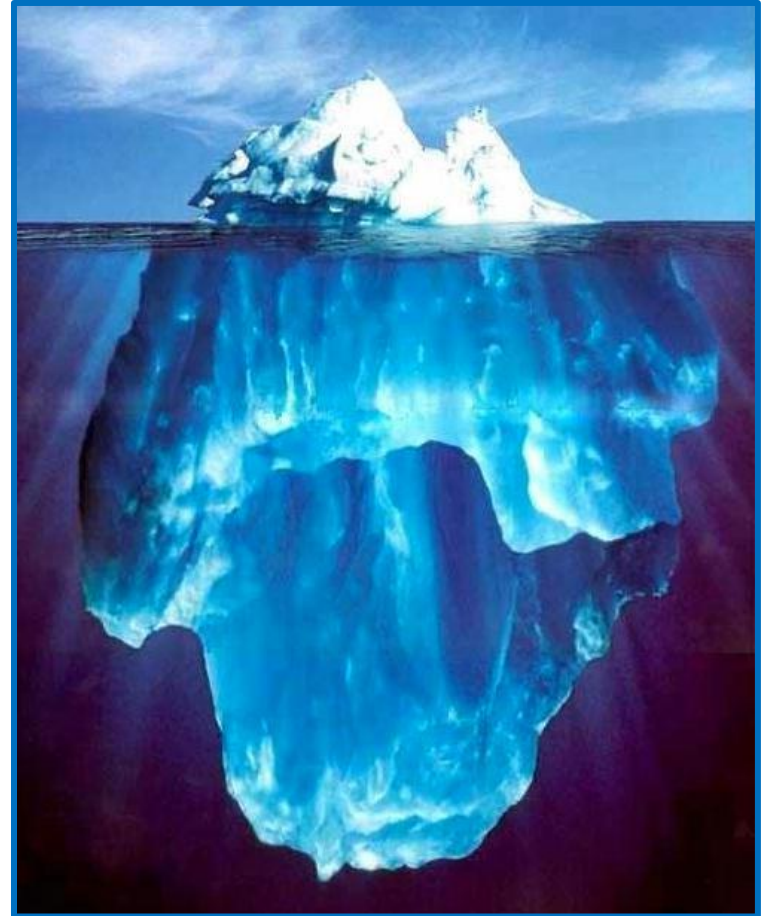
Antarctic Ice Shelves

Ice shelves are attached to ~44% of the Antarctic coastline.



Frozen Water Locations: Icebergs

An iceberg (Dutch “ice mountain”) is a large piece of freshwater ice that has broken off a glacier or an ice shelf and is floating freely in open water.

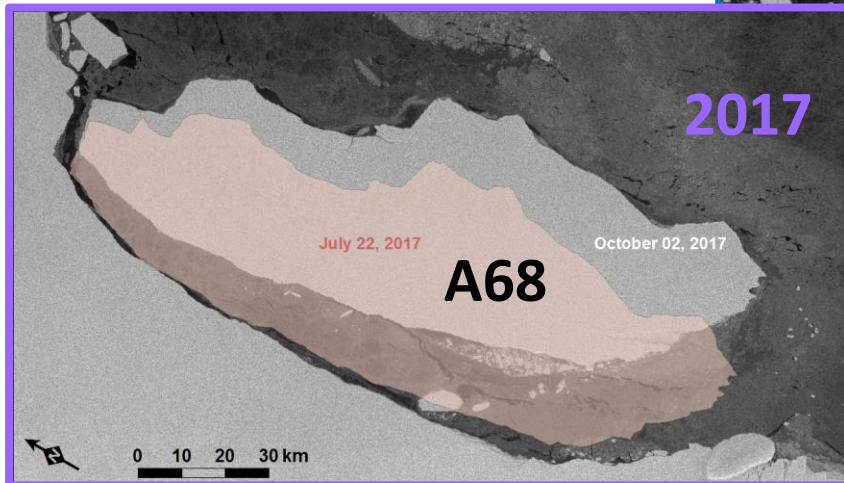
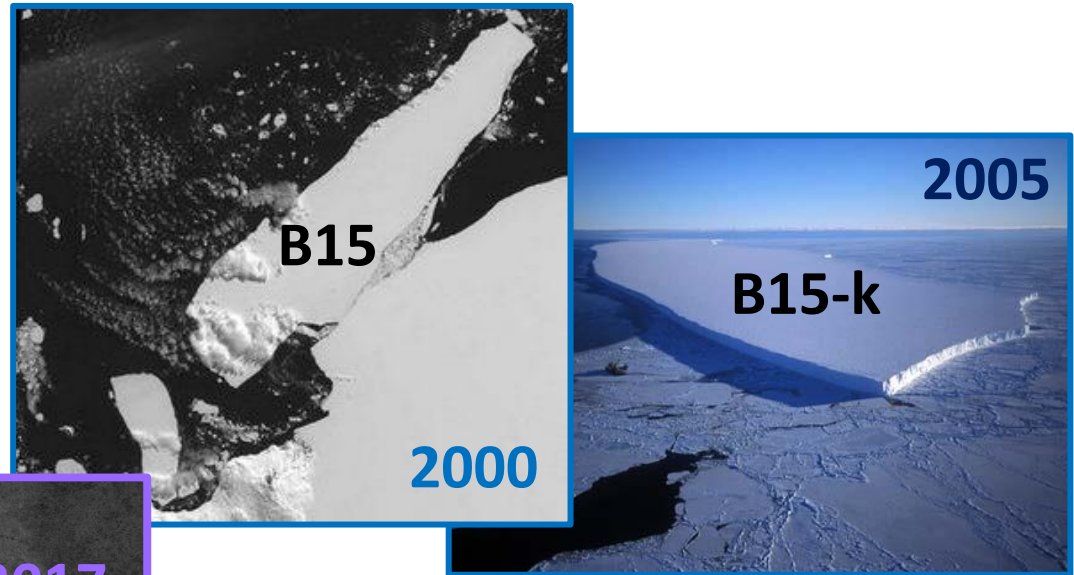


Typically, only **one-tenth** of the volume of an iceberg is **above water**.

How large can an iceberg be?

Formation of an iceberg, as it separates from an ice shelf or a glacier, is termed “calving”. The largest icebergs recorded have been calved from the Ross Ice Shelf of Antarctica.

- **B15**, calved in March 2000, holds an **absolute record ever** with an area of 11,000 sq km (4,200 sq mi, about **the size of the state of Connecticut**). B15 has since broken up, but parts of it still exist around the Antarctic today.



- The most recently formed major iceberg is **A68**, measuring about 2,400 square miles (about **the size of the state of Delaware**) and weighing over one trillion tons. It calved from the Larsen C Ice Shelf in **July 2017**.

Cryosphere and Climate Change

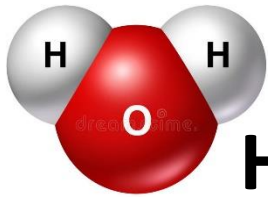
Major changes in sea level can occur during times of global climate change (*ice ages* and *global warming*), due to associated changes in the water content of the cryosphere.

IF ALL ICE MELTS...

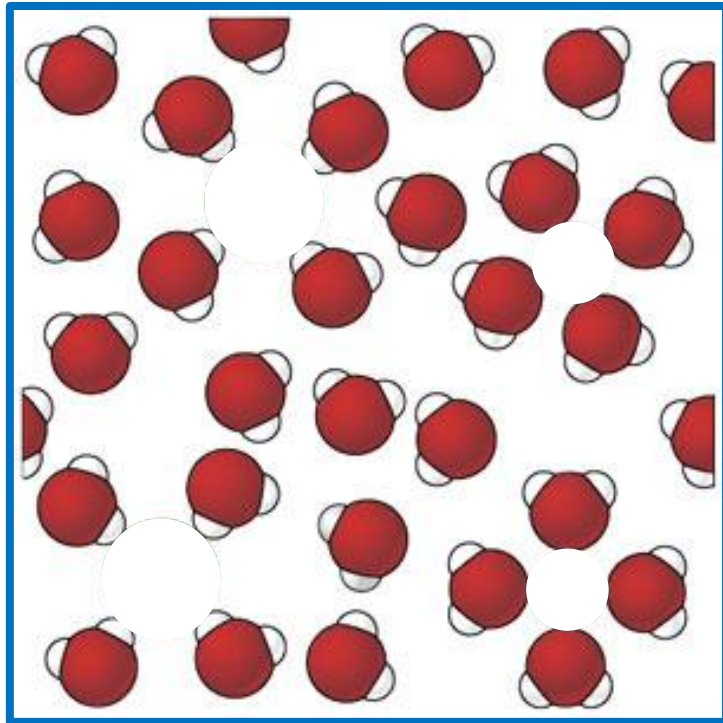
Global warming could potentially result in melting of the polar ice caps, which would raise the water level of the oceans by more than 200 feet and cause flooding of coastal areas of the continents.



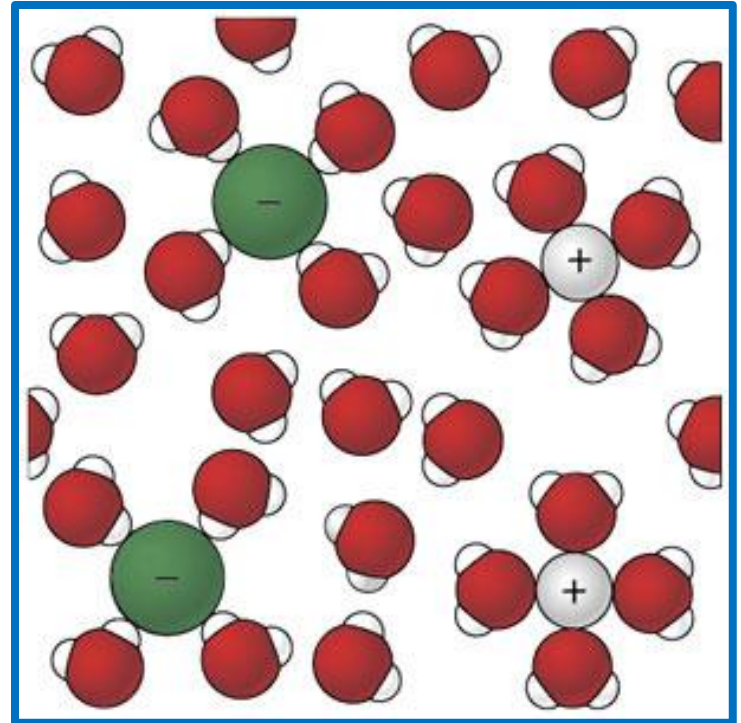
What Kind of Water?



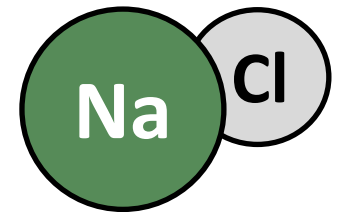
H₂O (water)



VS



**NaCl
(table salt)**

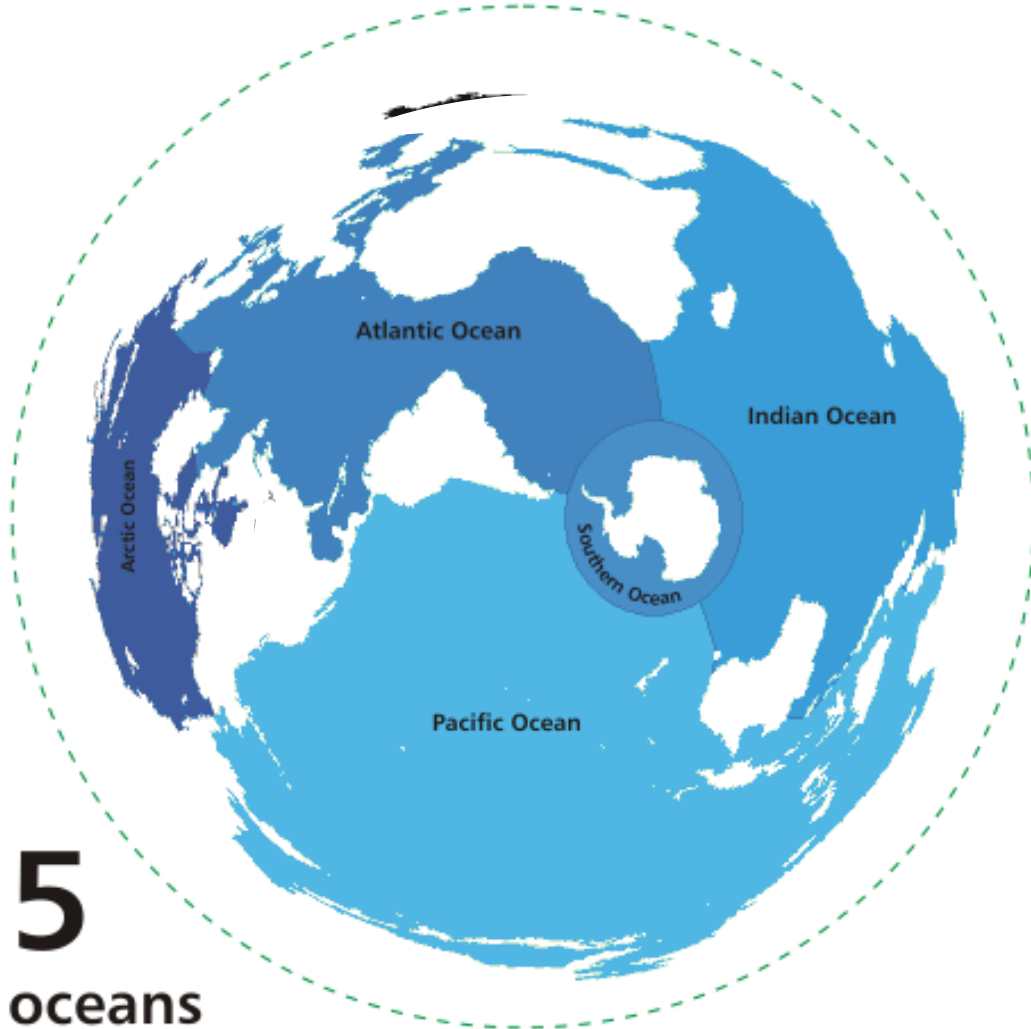


Saltwater (Saline Water)

- Saltwater is water that contains a **certain amount of salts** with dissolved salt concentration of **more than 1%**.
- **Oceans and seas.**
- Saltwater is also found in some lakes and ponds as well as underground.



Oceans are the **largest bodies of water** on Earth (contain salt water only)



- **Temperature** and **salinity** are two important factors that influence **ocean circulation** and as a result, the **climate** of the Earth.
- Historically, people first began exploring **shoreline shape**, **ocean depth**, and **tides**.