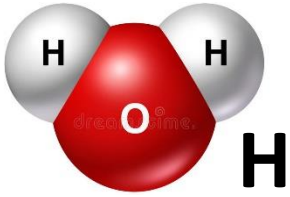
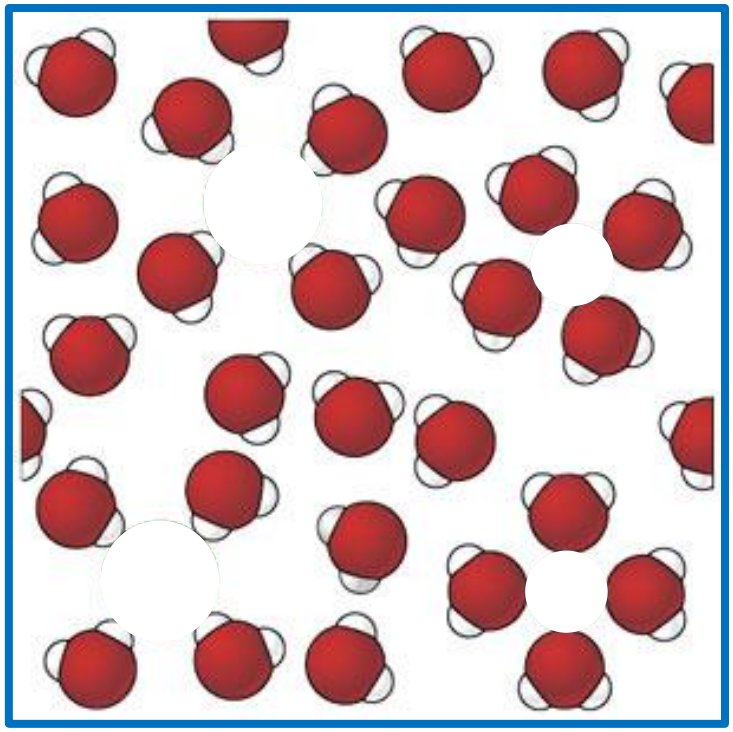
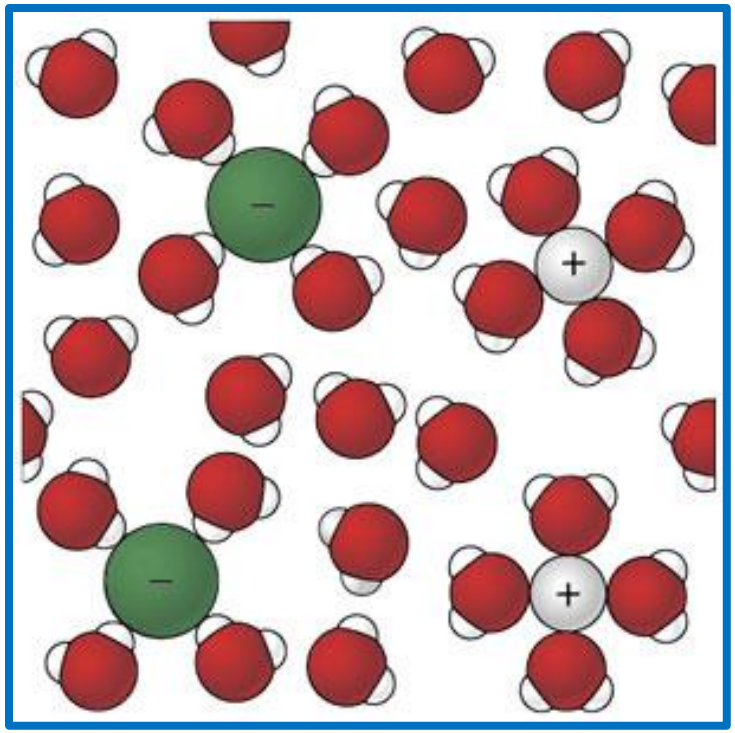
What Kind of Water?



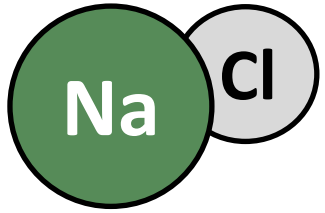
H_2O (water)



VS

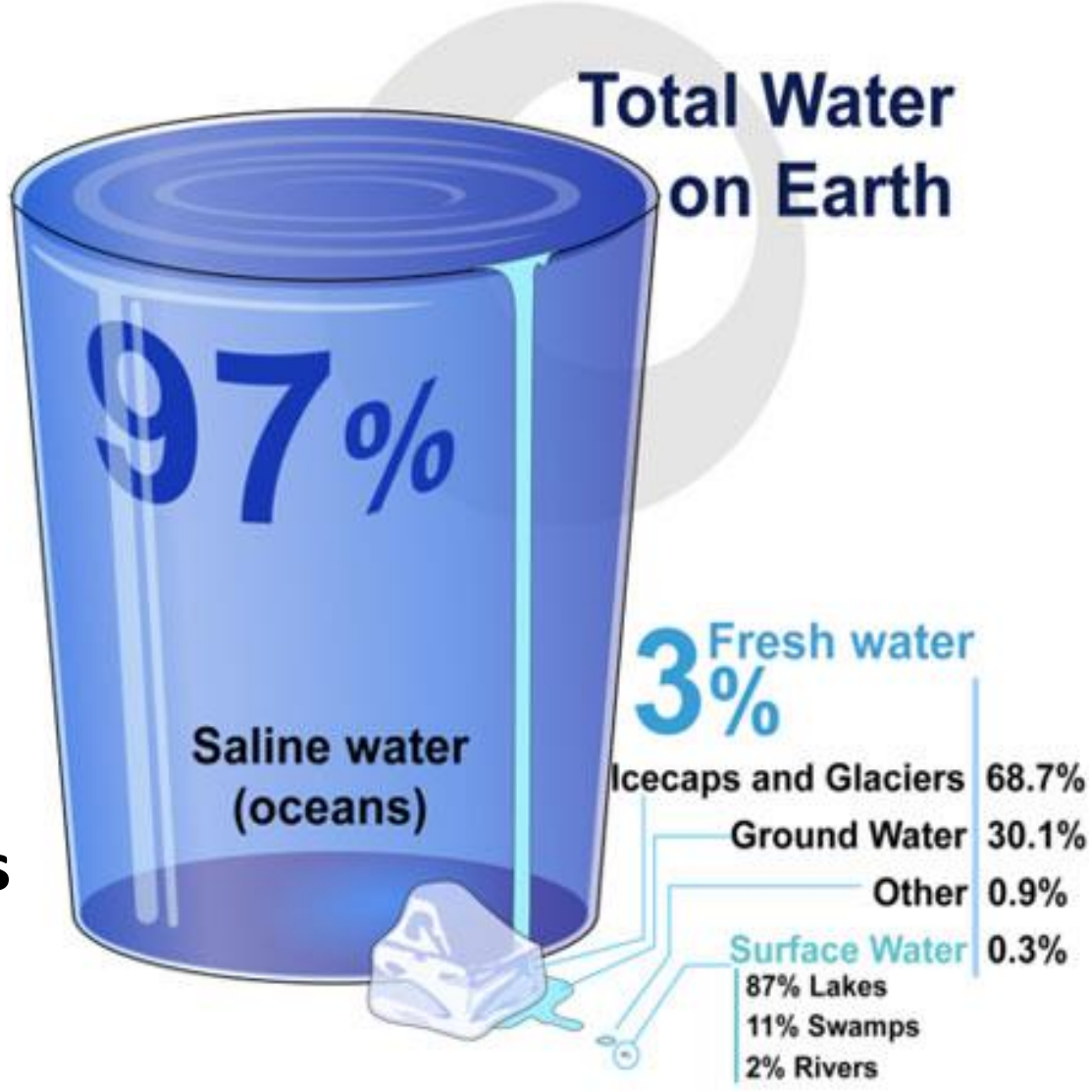


NaCl
(table salt)

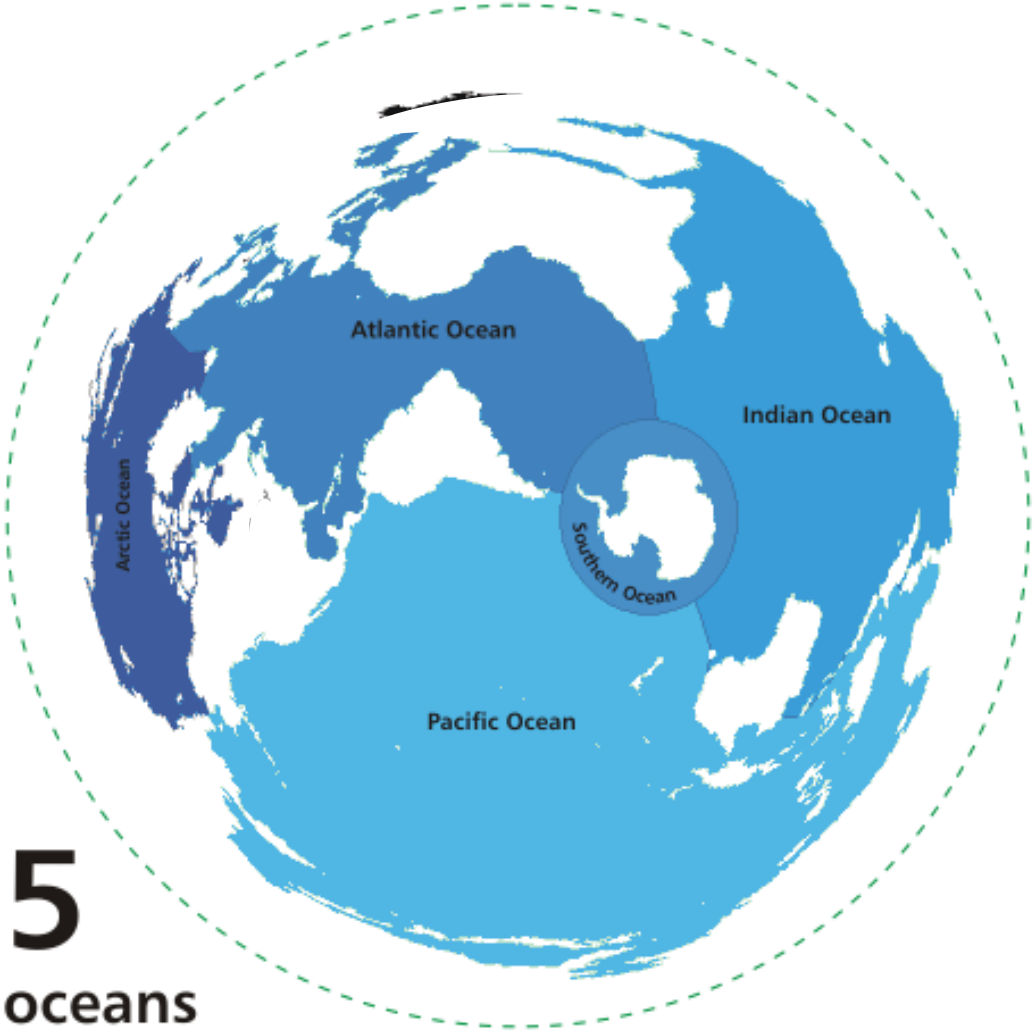


Saltwater (Saline Water)

- **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)

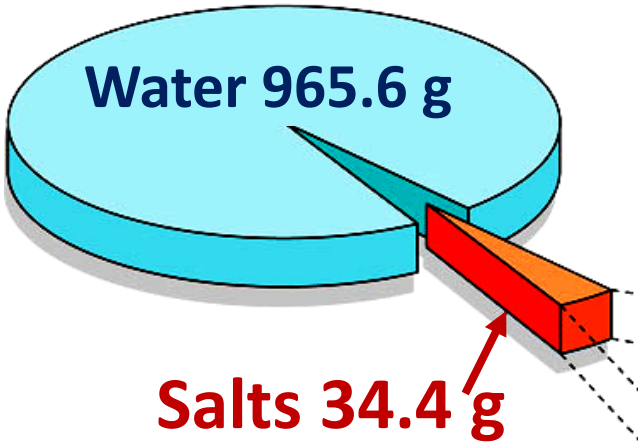


- **Historically, people first began exploring shoreline shape, ocean depth, and tides.**
- **Temperature and salinity are two important factors that influence ocean circulation and as a result, the climate of the Earth.**

How Salty is the World Ocean?

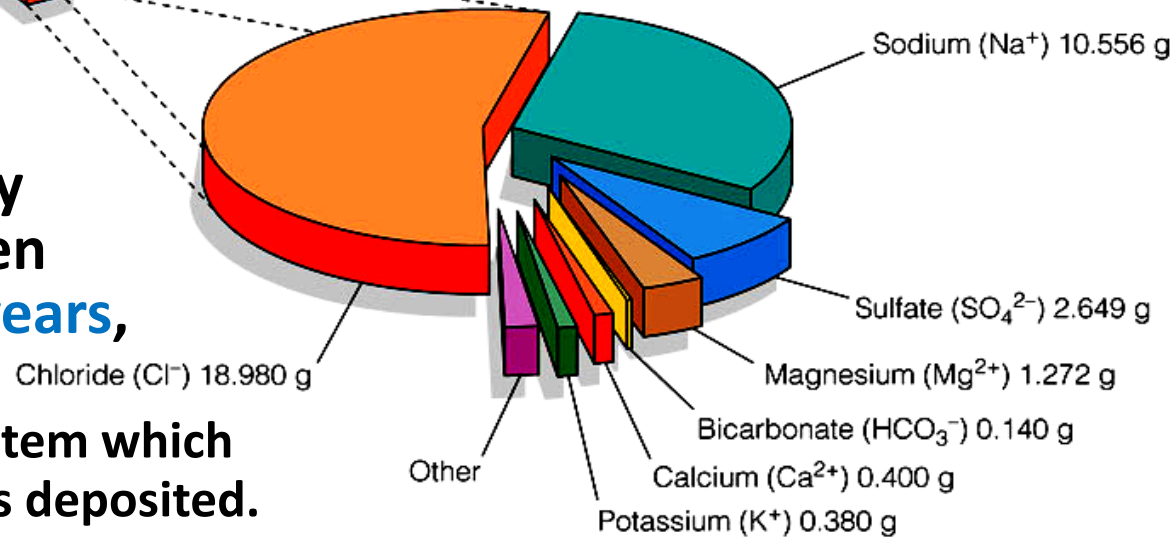
Salinity (measured in *percent ,%* or *parts per thousand, ppt or ‰*) **is a measure of the amount of salt dissolved in a liquid.**

1 kg seawater



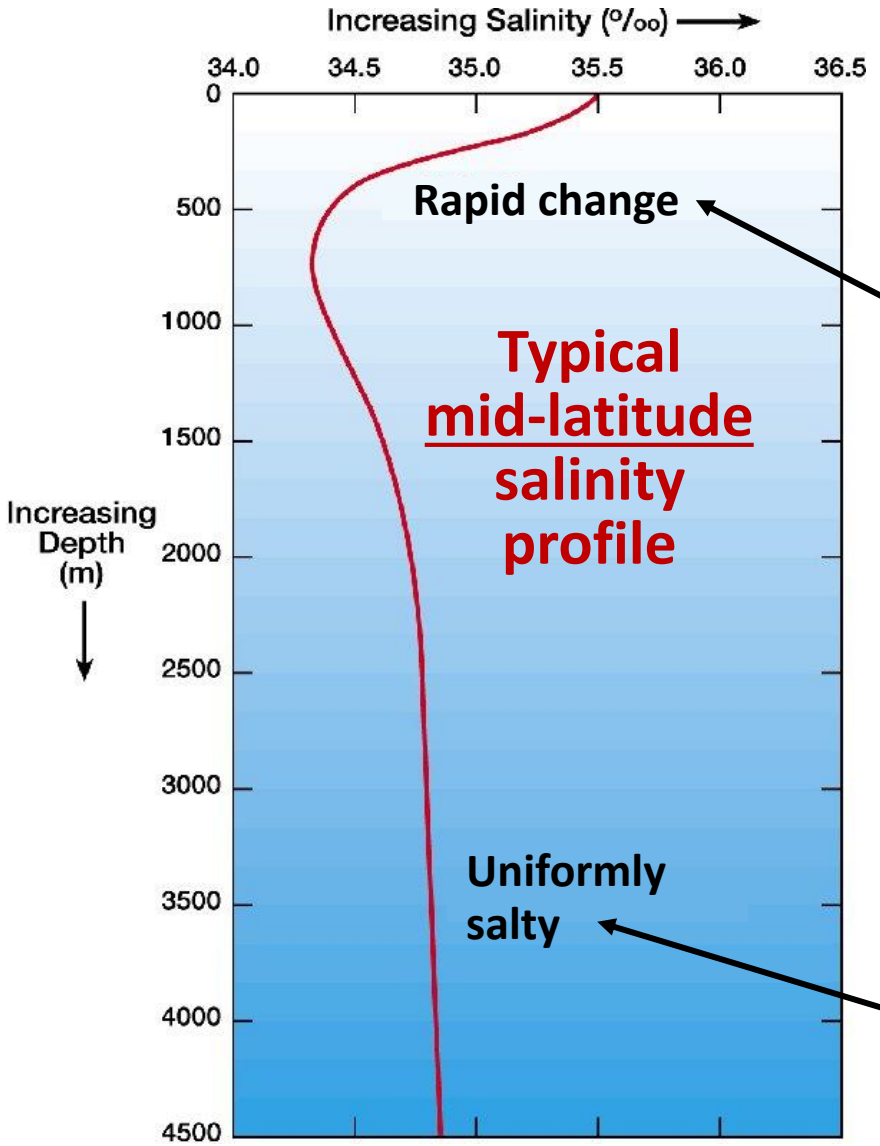
Salty seawater formed due to salts dissolved from the lithosphere:

- **leached out of the ocean floor when the ocean formed**
- **brought by river flow over the ground and into the ocean**



Average ocean salinity is ~3.44% and has been stable for billions of years, most likely a result of a chemical/tectonic system which removes as much salt as is deposited.

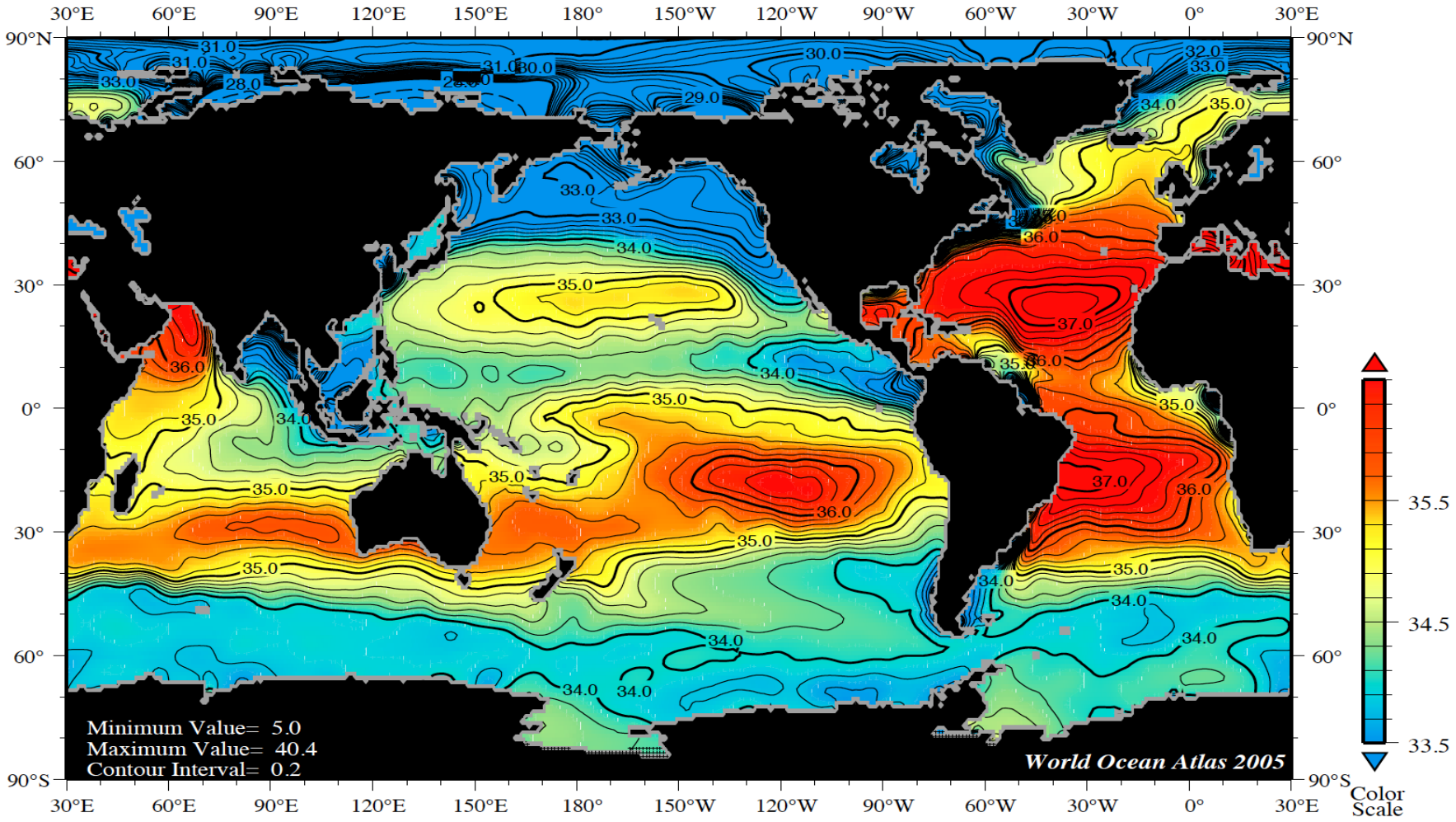
Salinity Varies with Depth



Seawater is not uniformly saline throughout the world.

- **Surface (mixed) layer salinity is influenced by:**
  - **evaporation of water (‰↑)**
  - **precipitation (‰ ↓)**
  - **ice formation (‰↑)**
  - **ice melting (‰↓)**
- **Saltier water is denser and consequently, it sinks down.**
- **Beyond ~1000 m, salt content changes very little.**

Ocean Surface Salinity Pattern



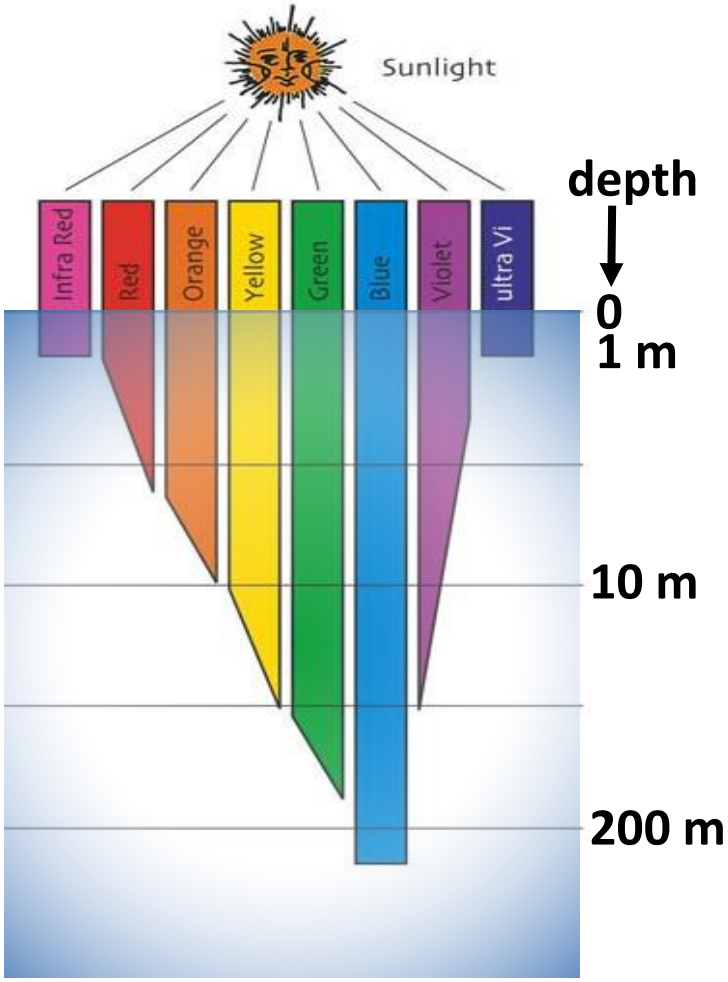
Salinity is an ecological factor of great importance, influencing:

- **the types of organisms that live in a body of water,**
- **the kinds of plants that grow either in a water body, or on nearby land.**

Ocean Temperature

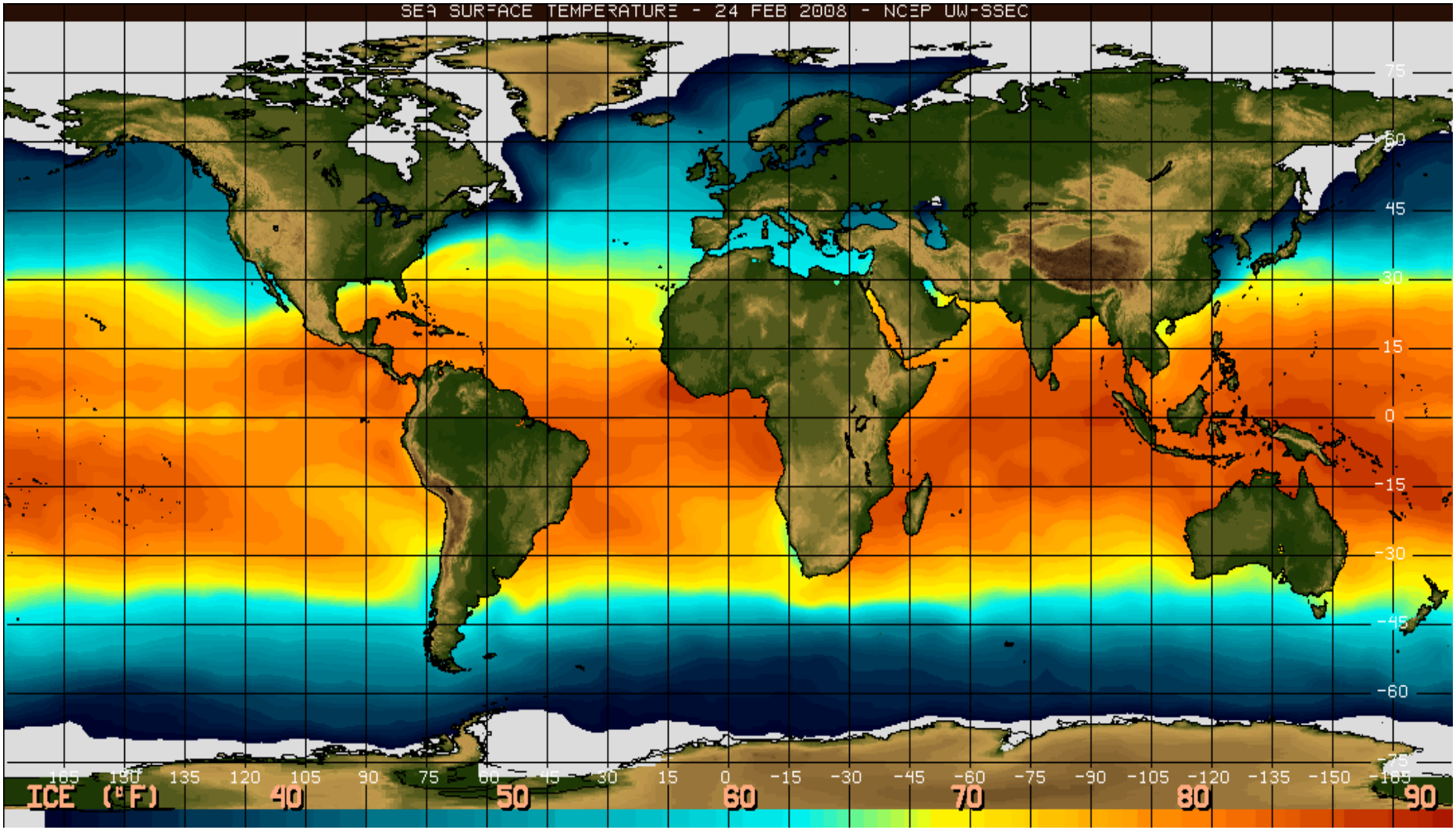
Ocean temperature varies with depth, latitude, and season.

- **Ocean is heated by the Sun from the surface *downward*.**
- **Most of sunlight energy is absorbed within the top layer of <200 meters.**
- **Ocean surface temperature can vary a lot, but deep waters are very cold, 75% of the ocean is between 30 to 43°F (–1 to +6°C).**
- **Both *seasonal* and *latitude* variation of ocean surface temperature are mostly due to the relative position of the Earth and the Sun.**



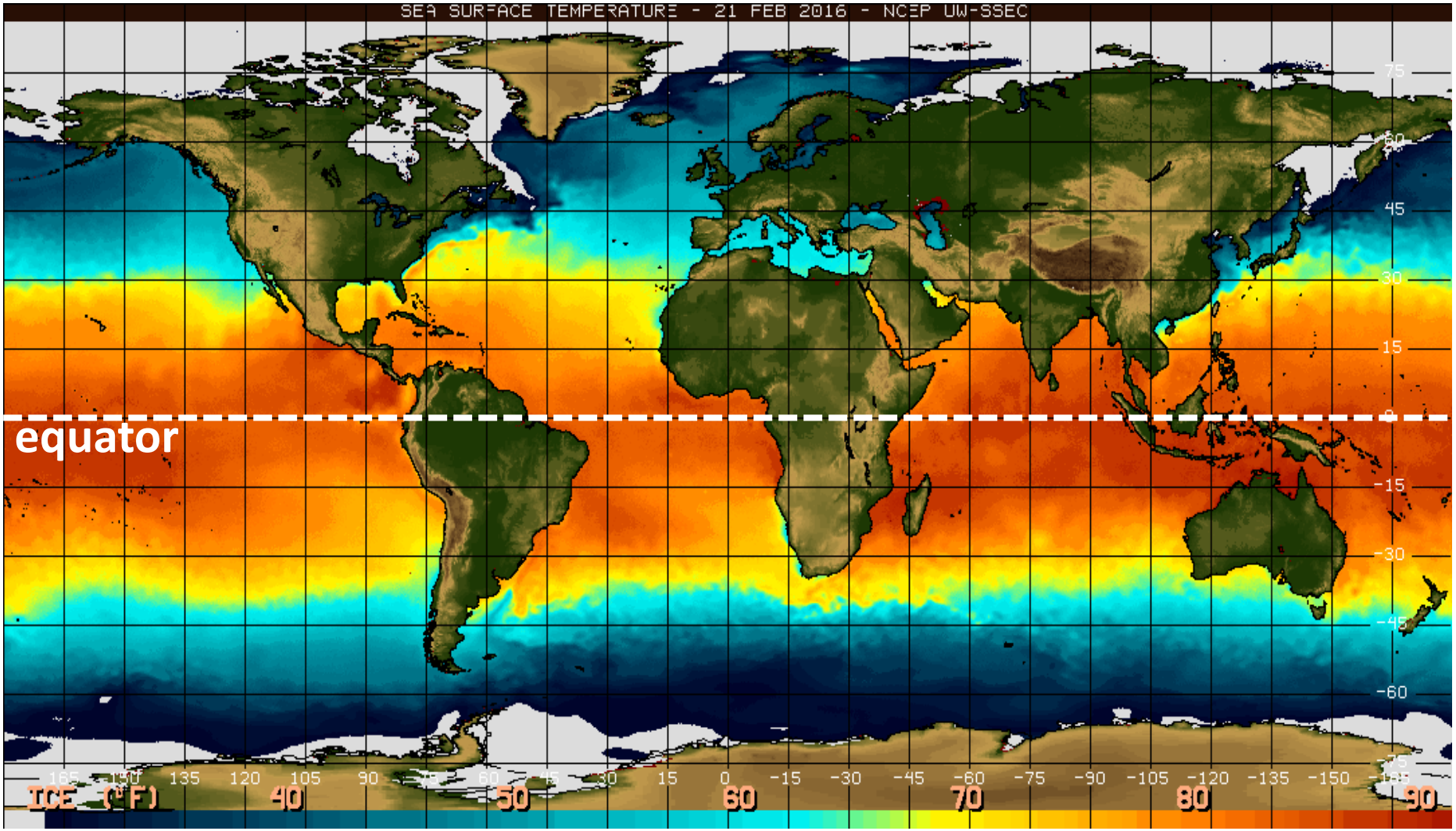
Sunlight penetration in ocean

Temperature: Latitude Variation



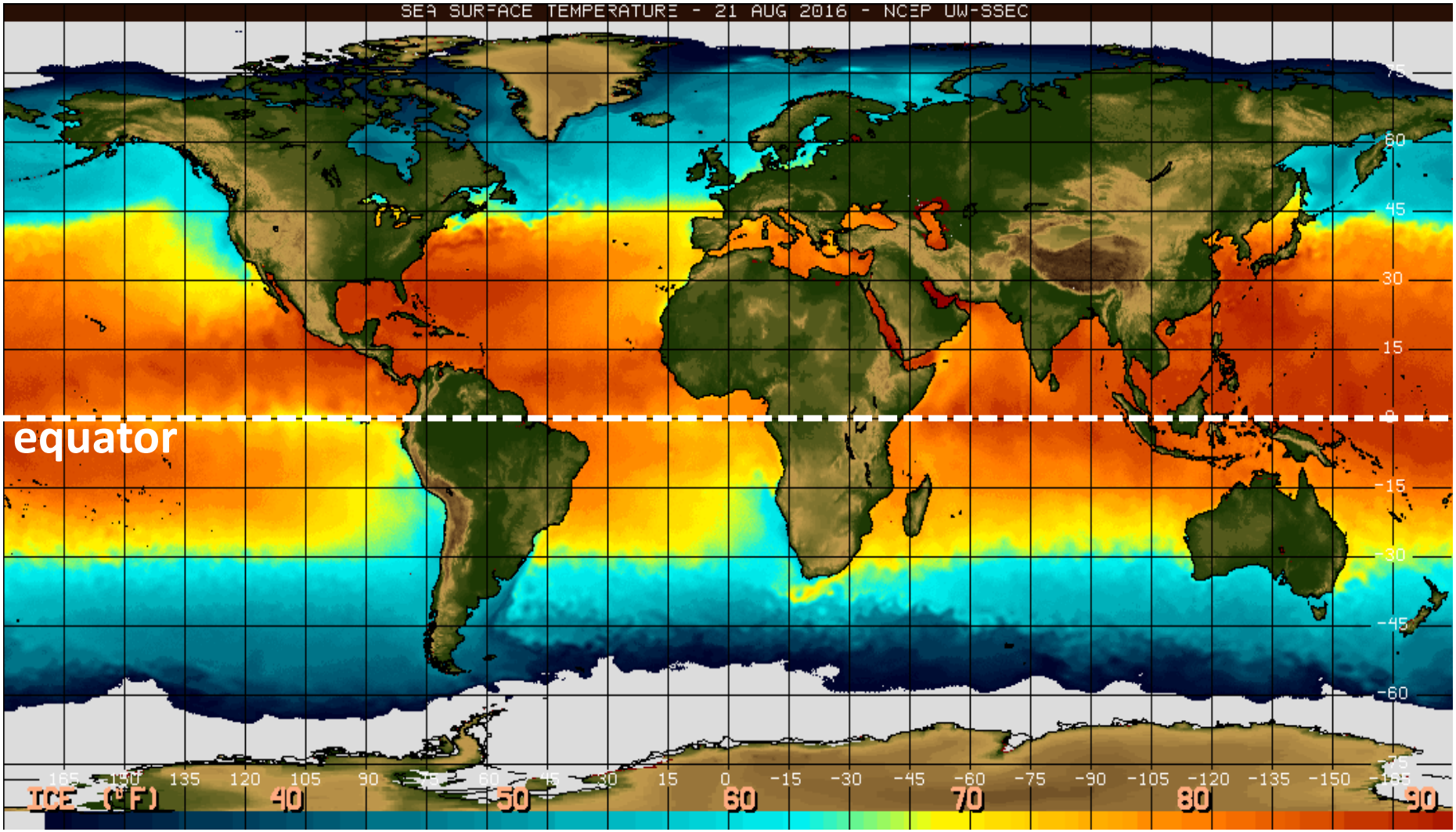
Ocean surface temperature varies greatly with latitude.

Temperature: Seasonal Variation



Ocean surface temperature on February 21, 2016.

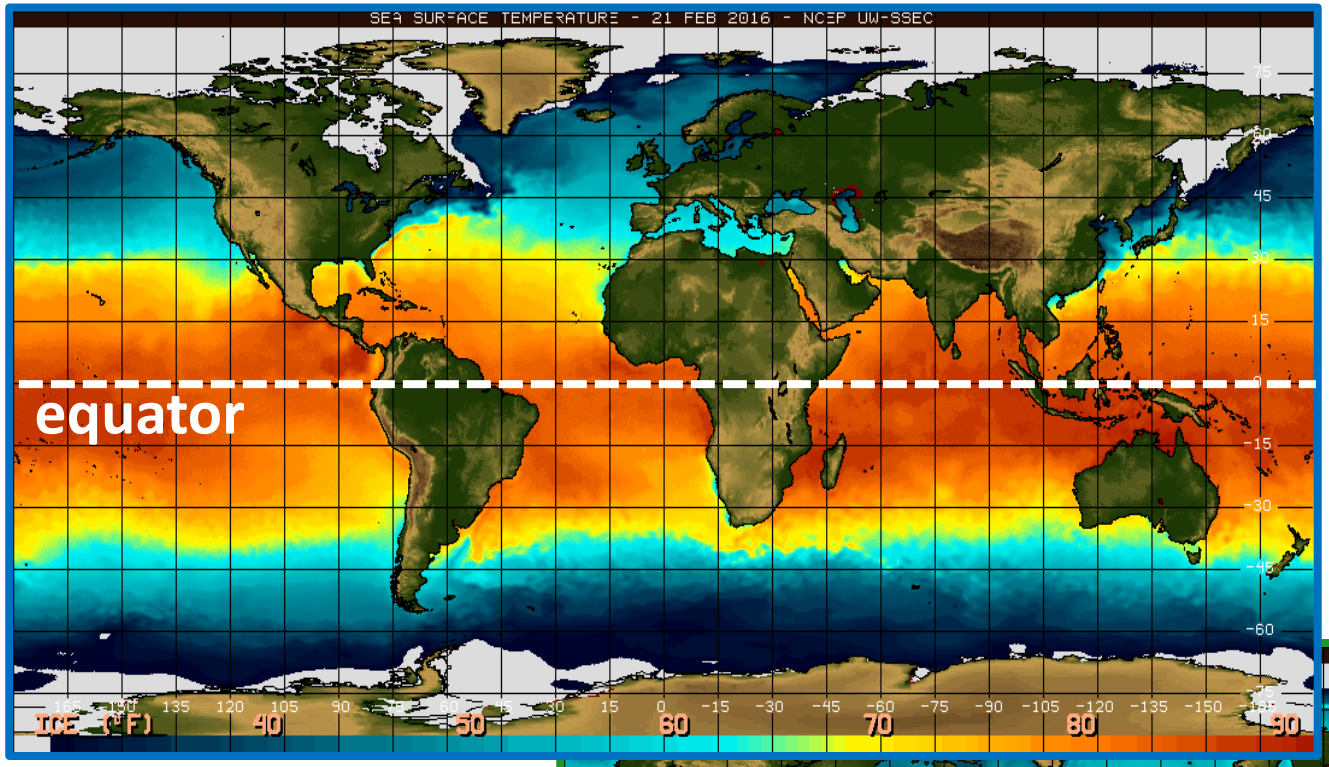
Temperature: Seasonal Variation



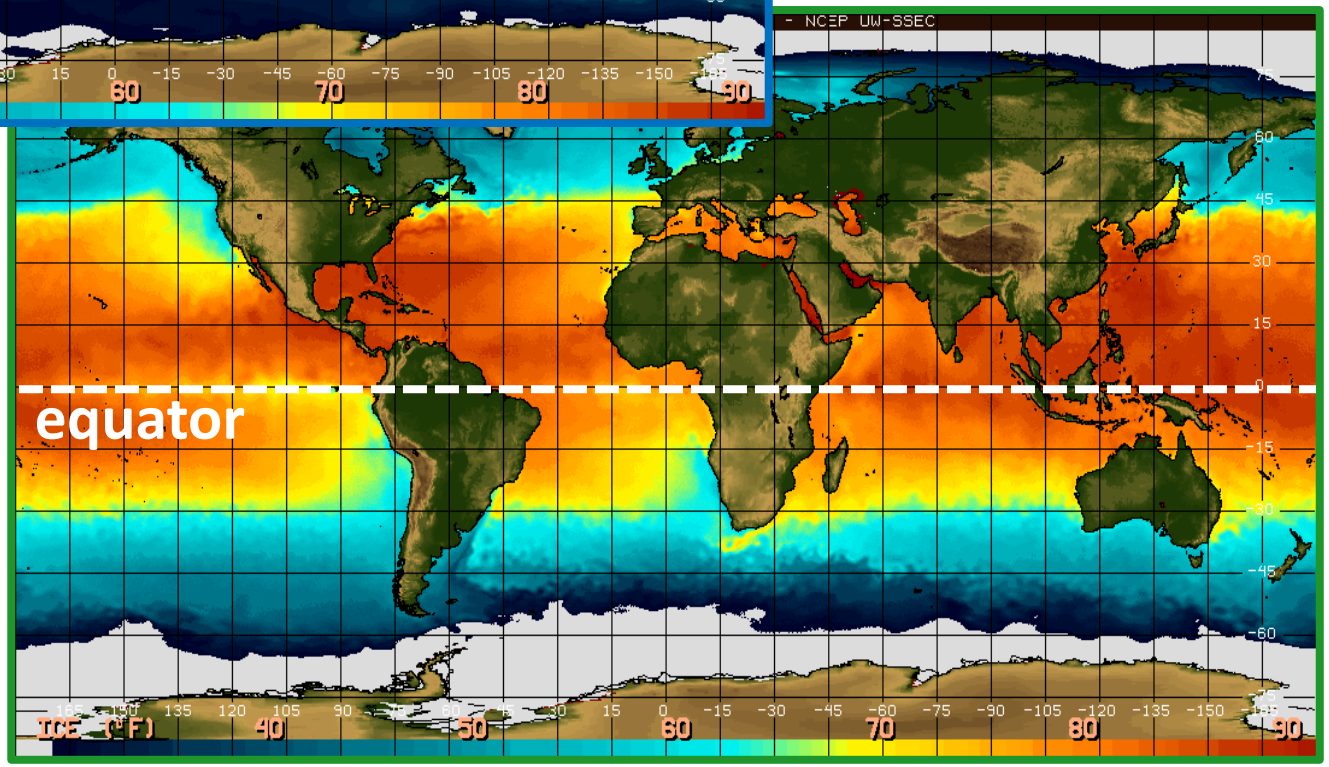
Ocean surface temperature on August 21, 2016.

Ocean Surface Temperature:

seasonal variation is slight since water loses or gains heat much more slowly than land.



↑ February 21, 2016

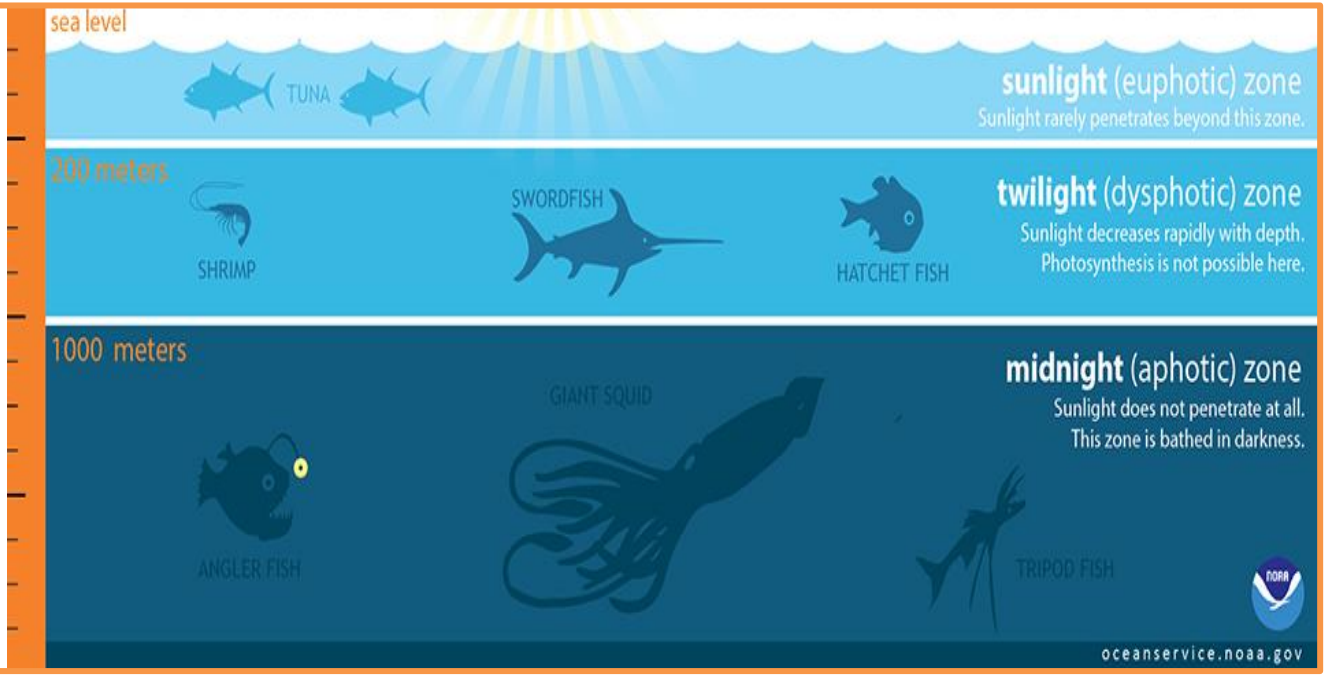


August 21, 2016 →

Ocean Layers

Based on sunlight penetration:

- Sunlight (photosynthesis is possible)
- Twilight
- Midnight



Based on water density:

- Mixed layer
- Pycnocline (rapid change of temperature/salinity)
- Deep ocean (cold and salty)