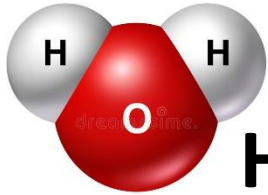
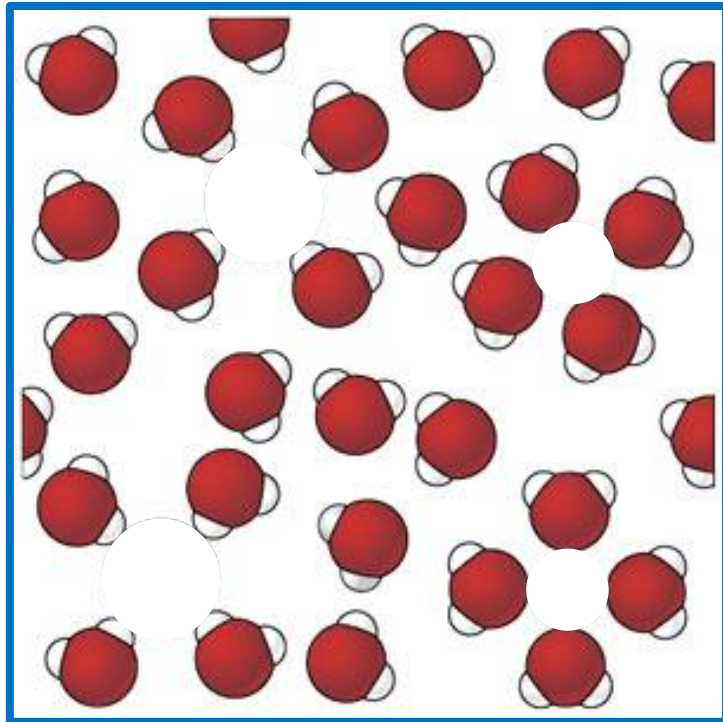


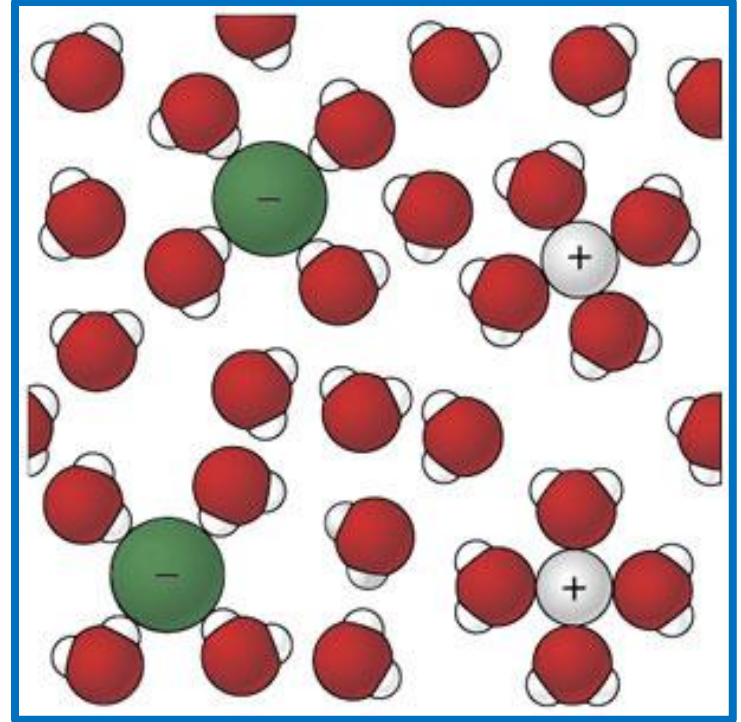
What Kind of Water?



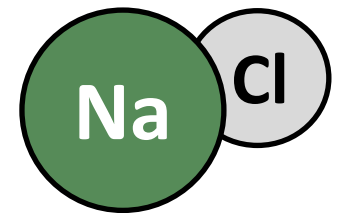
H₂O (water)



VS



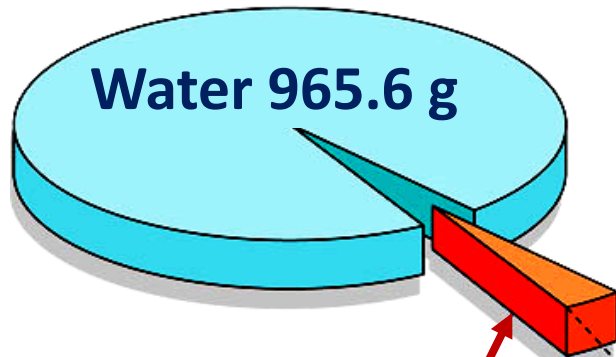
NaCl
(table salt)



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

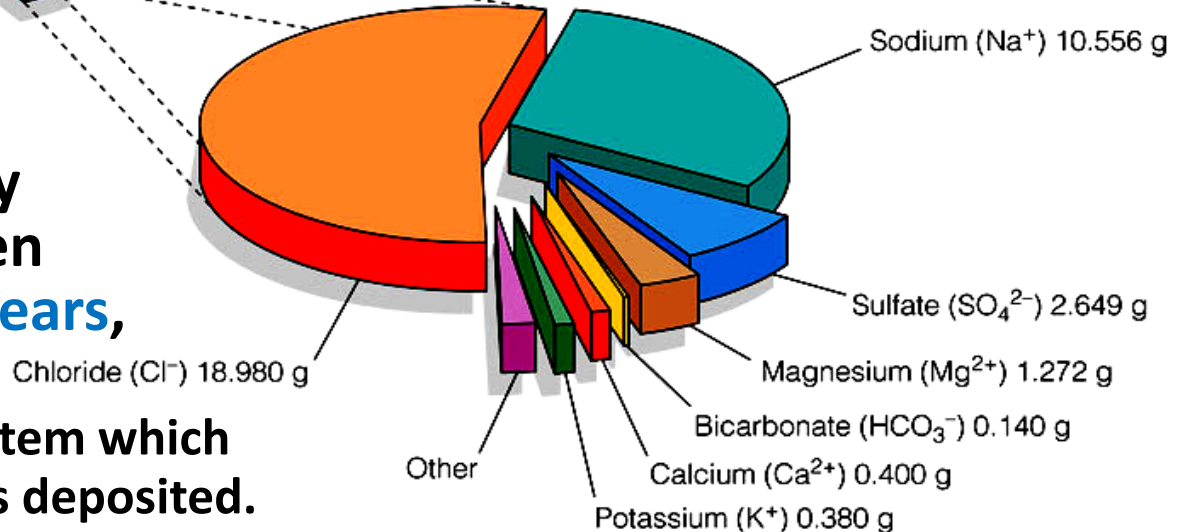


Salts 34.4 g

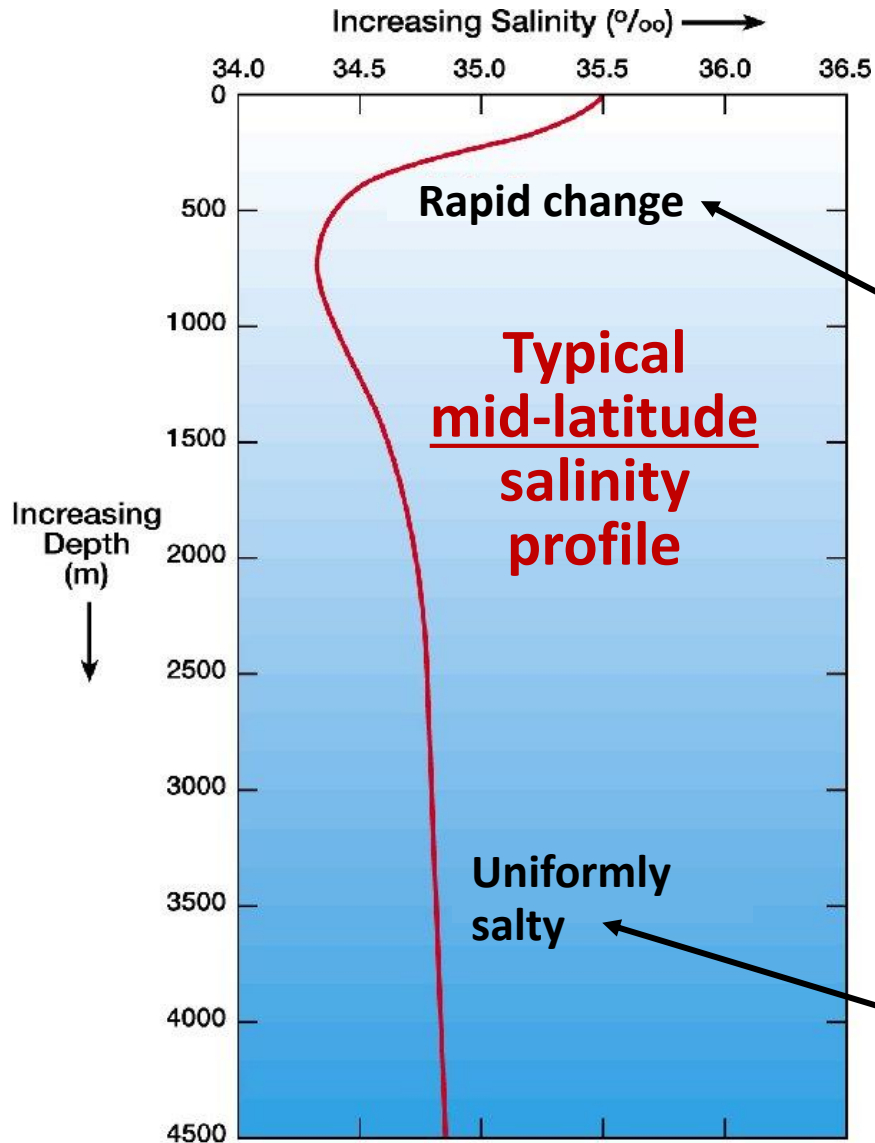
Salty seawater formed due to salts dissolved from the lithosphere:

- 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.



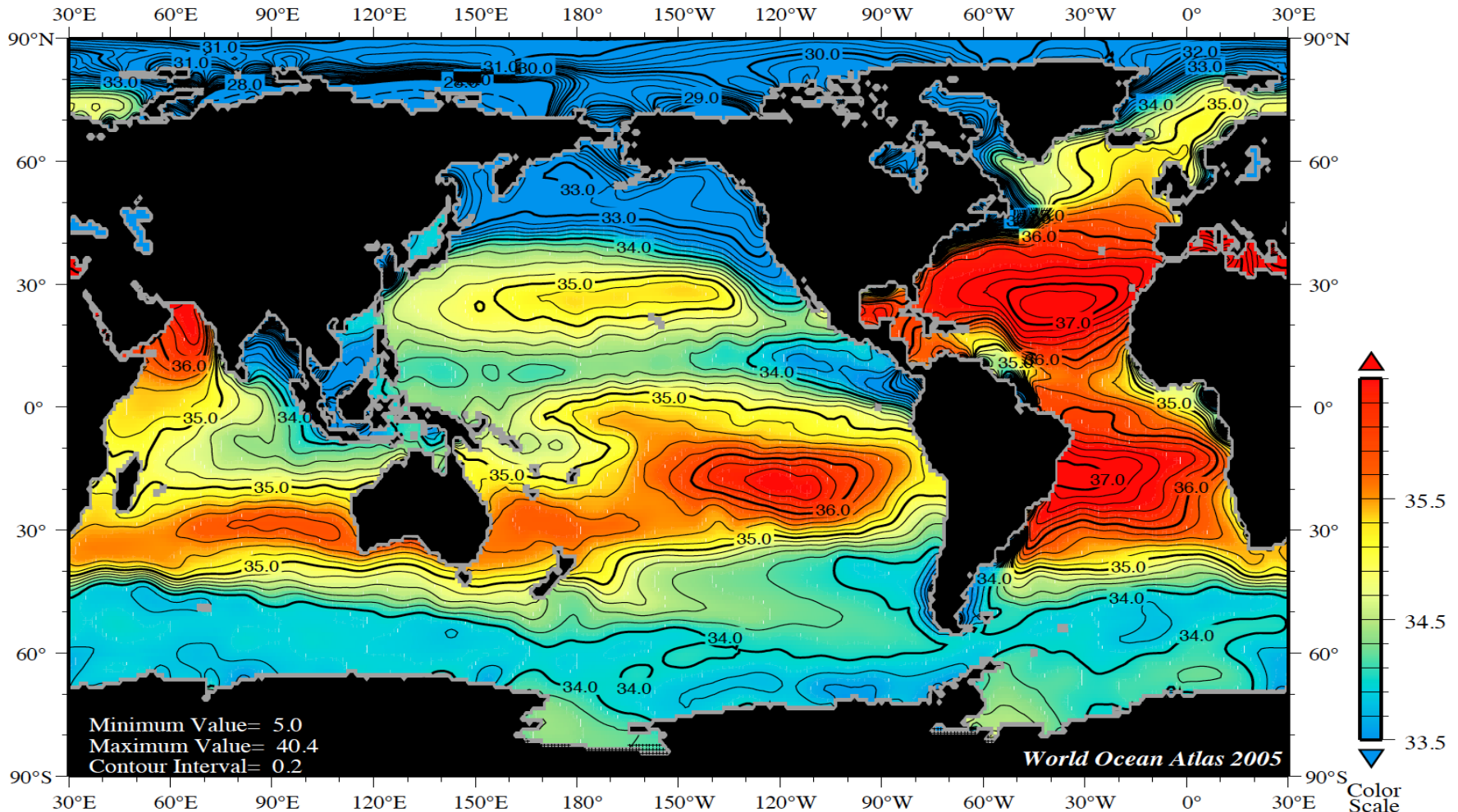
Salinity Varies with Depth



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



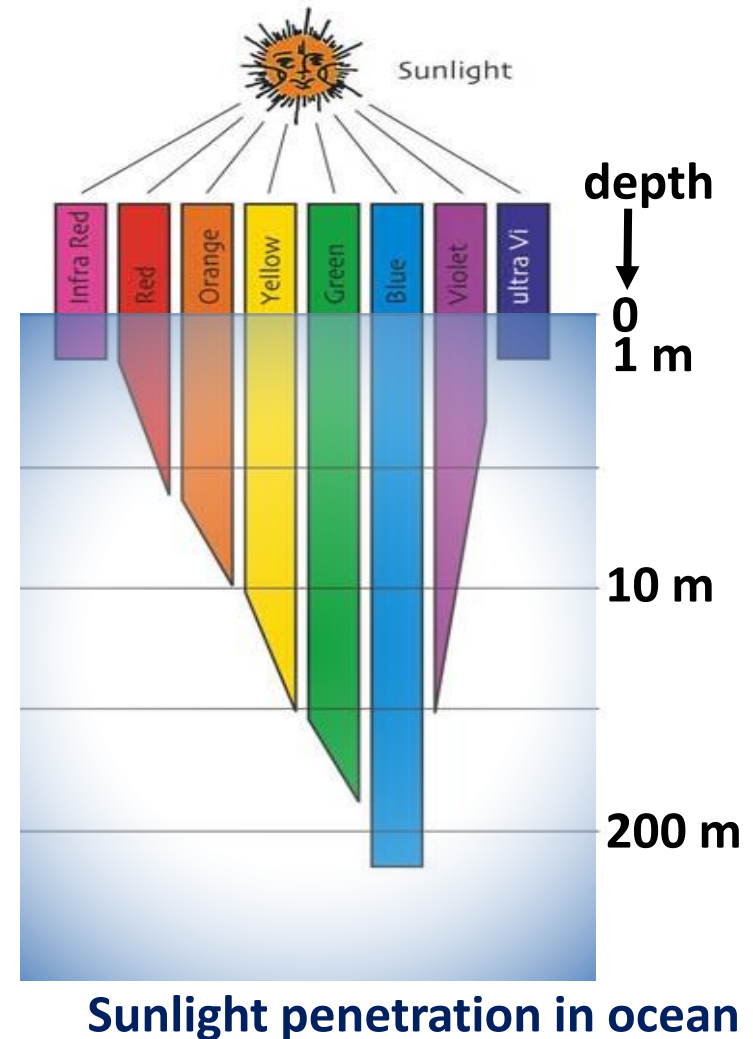
Salinity is an **ecological factor** of great importance, influencing:

- 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.

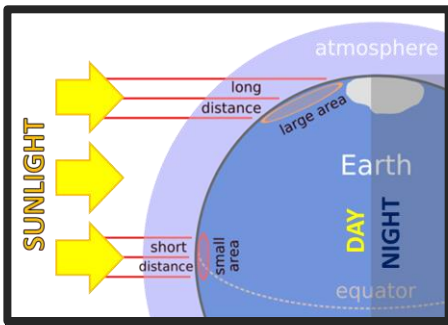
Ocean Temperature

Ocean temperature varies with depth, latitude, and season.

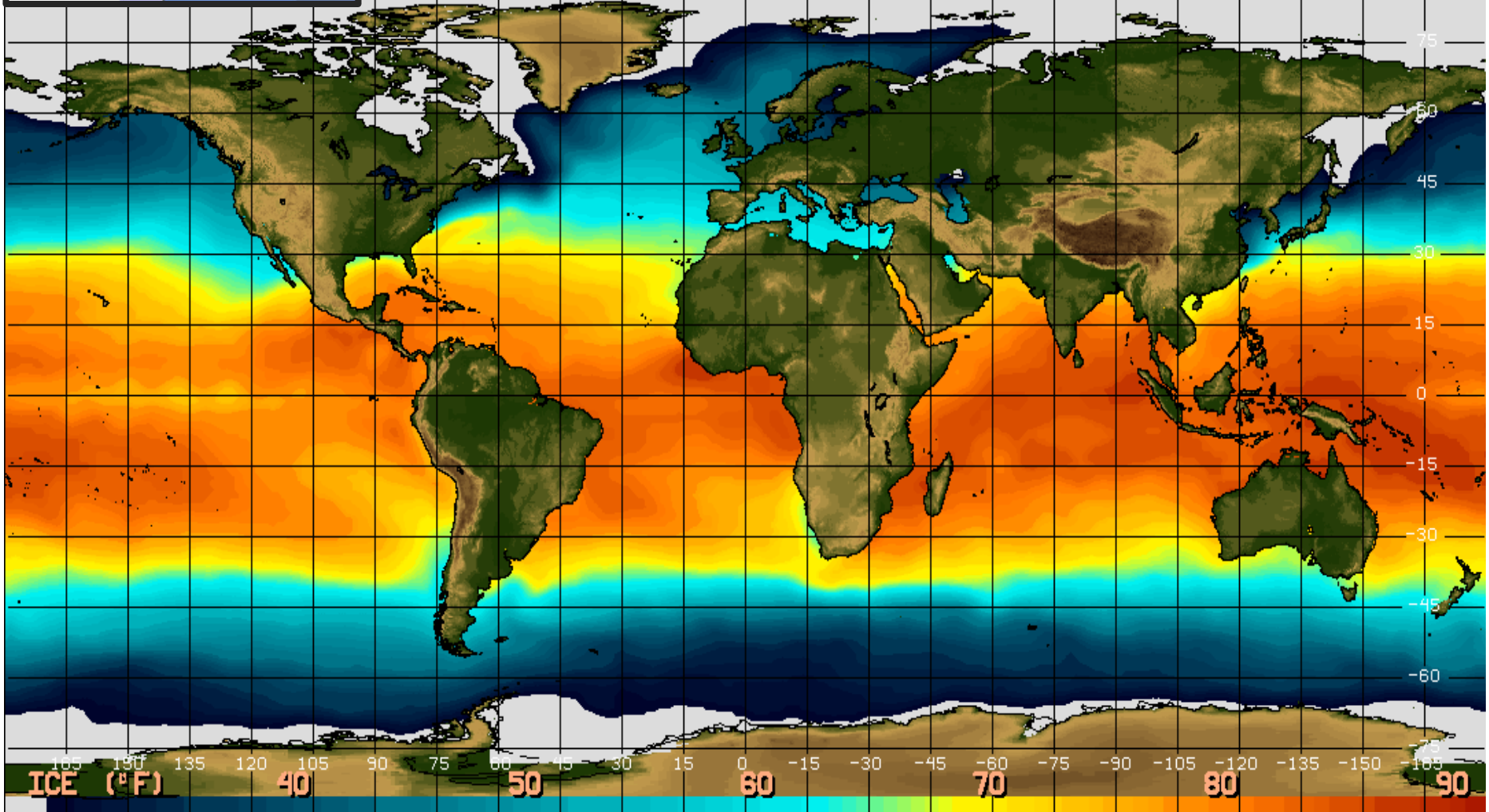
- **Ocean** is **heated by the Sun** from the surface *downward*.
- Most of sunlight energy is absorbed within the top layer of <200 meters.
- Ocean surface temperature can vary a lot, but **deep waters are very cold**, 75% of the ocean is between 30 to 43°F (-1 to +6°C).
- Both *seasonal* and *latitude*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



Ocean surface temperature varies greatly with latitude.



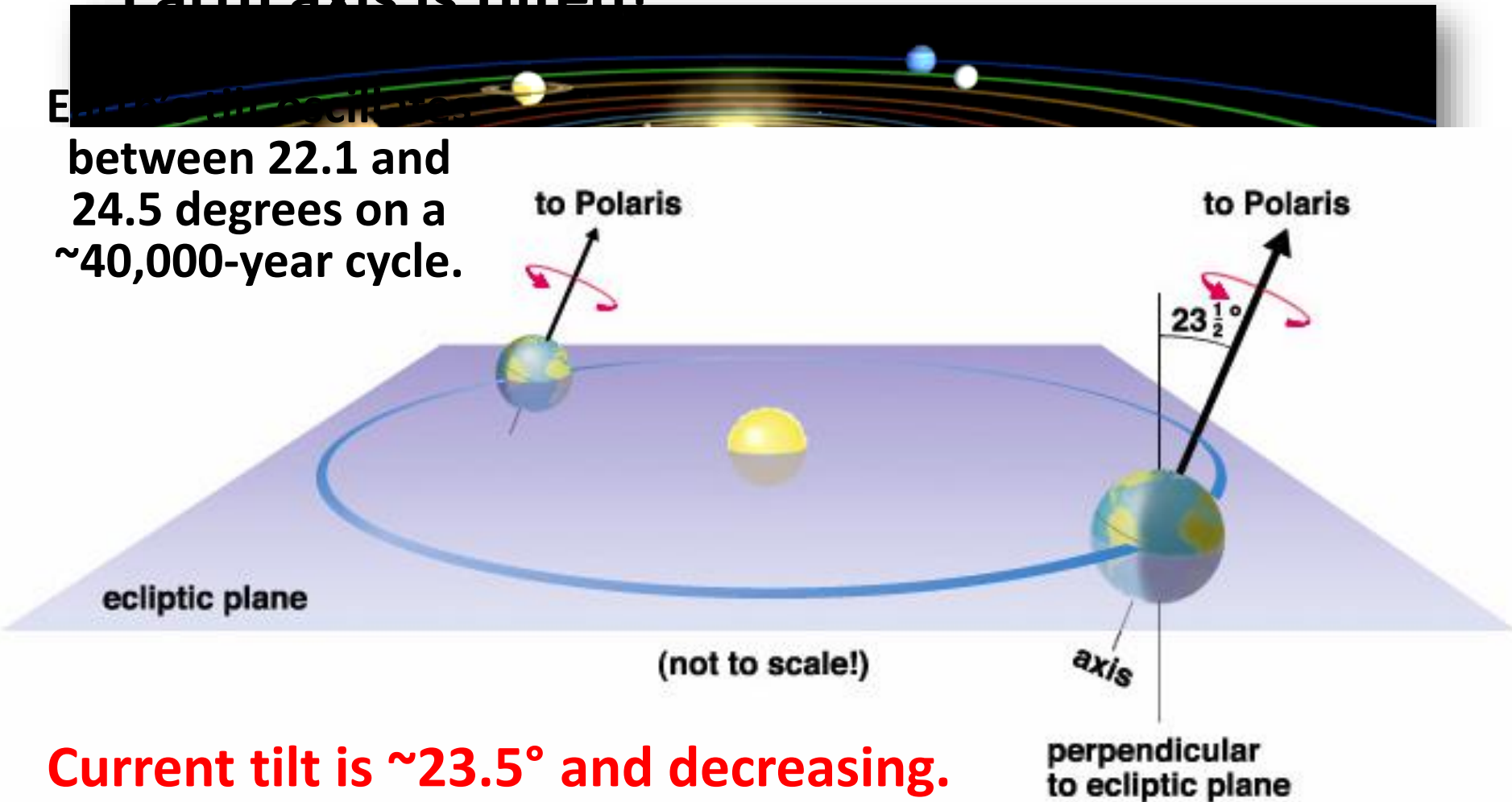
SEA SURFACE TEMPERATURE - 24 FEB 2008 - NCEP UW-SSEC



How *exactly* does the Earth spin?

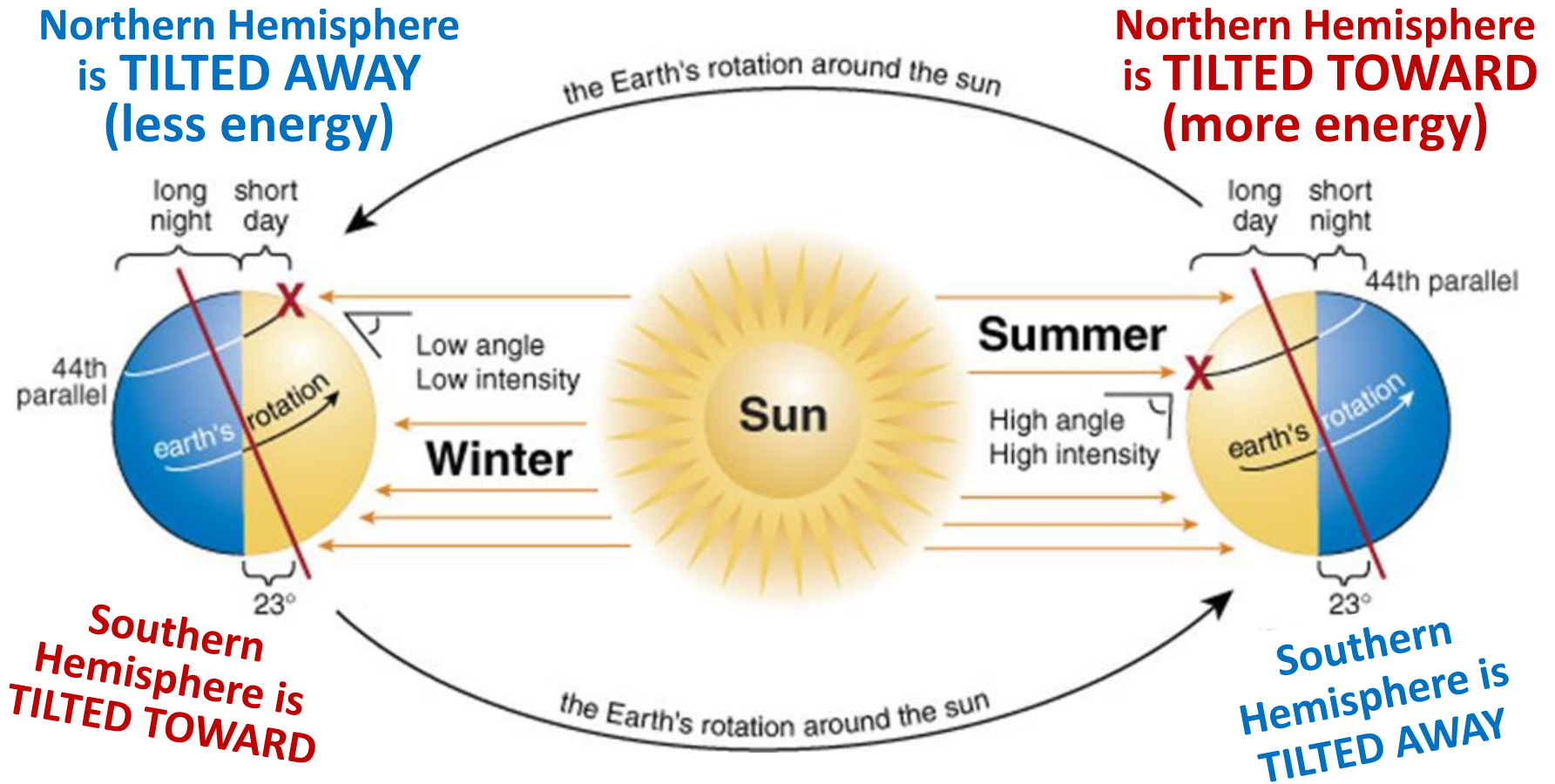
Earth axis is tilted!

Earth's tilt oscillates between 22.1 and 24.5 degrees on a ~40,000-year cycle.

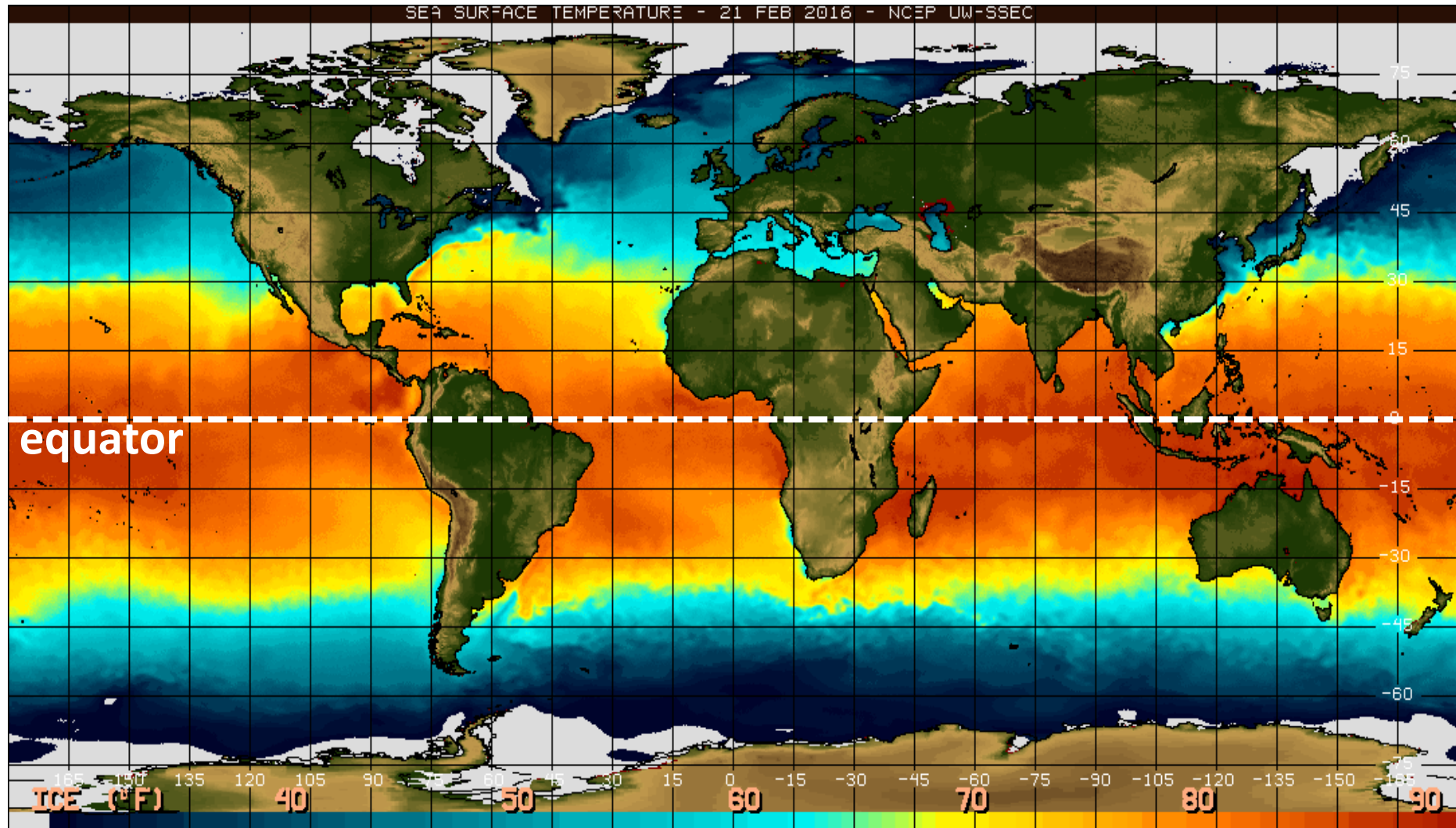


Current tilt is $\sim 23.5^\circ$ and decreasing.

Due to the Earth's tilt with respect to its orbital plane, the **amount of sunlight energy** reaching any given point on the surface varies over the course of the year, giving us **SEASONS**.

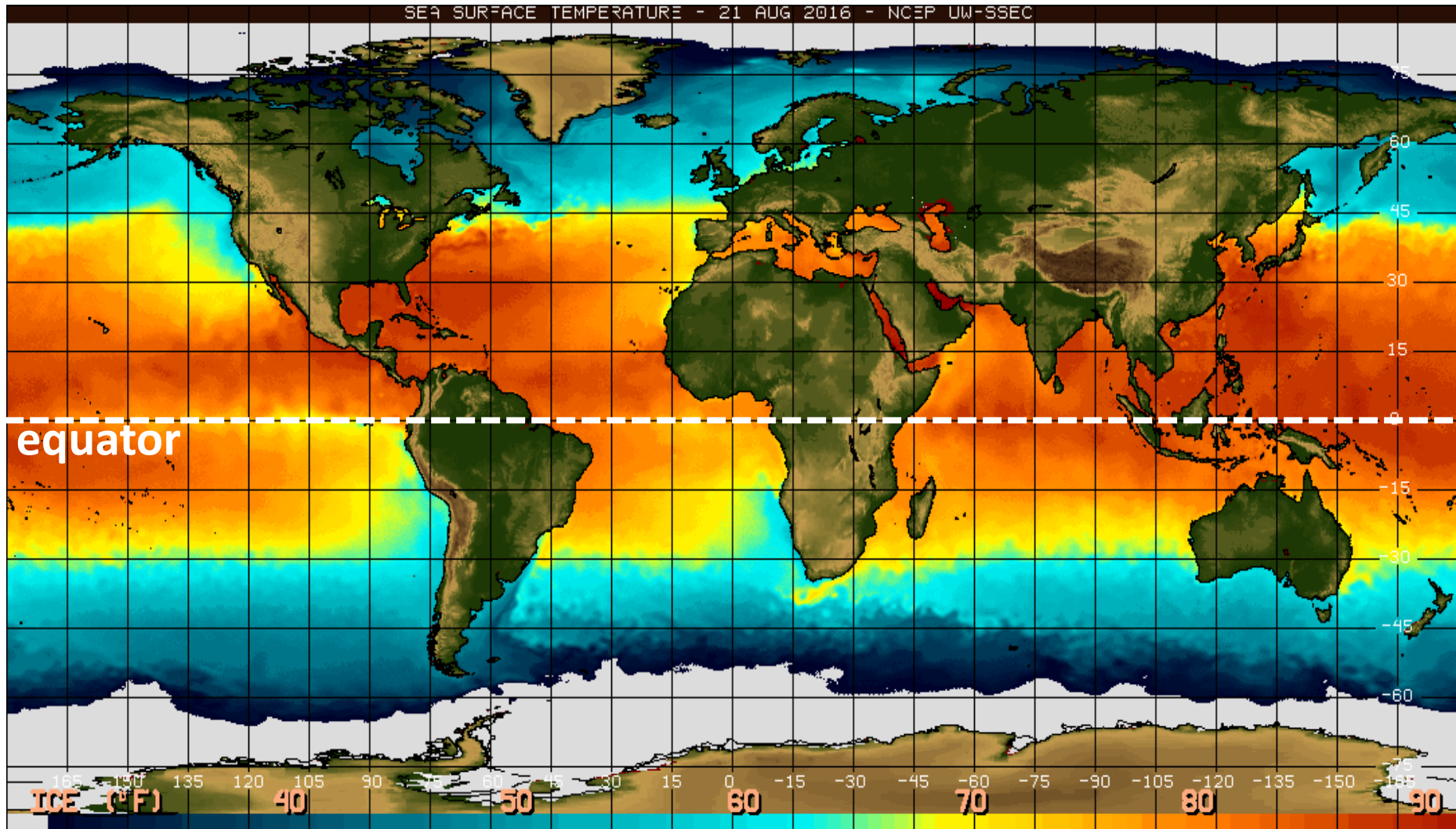


Temperature: Seasonal Variation

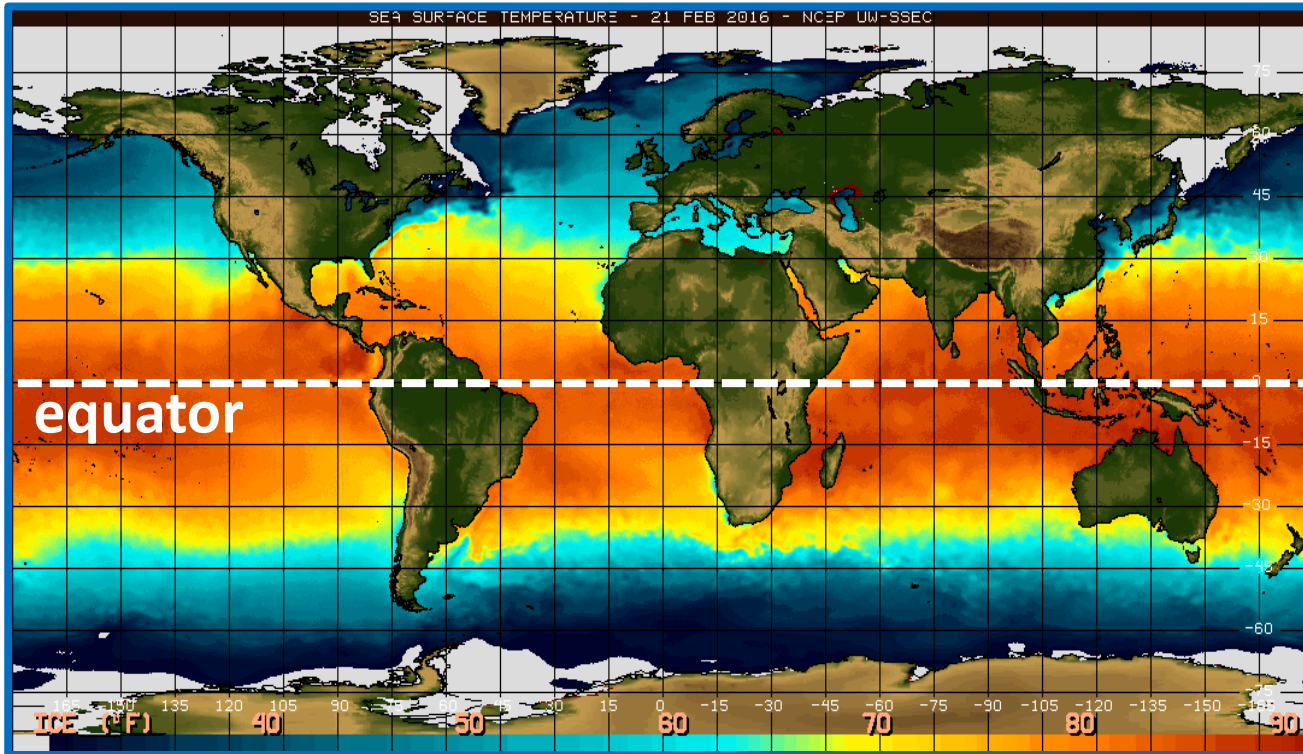


Ocean **surface temperature** on **February 21, 2016**.

Temperature: Seasonal Variation



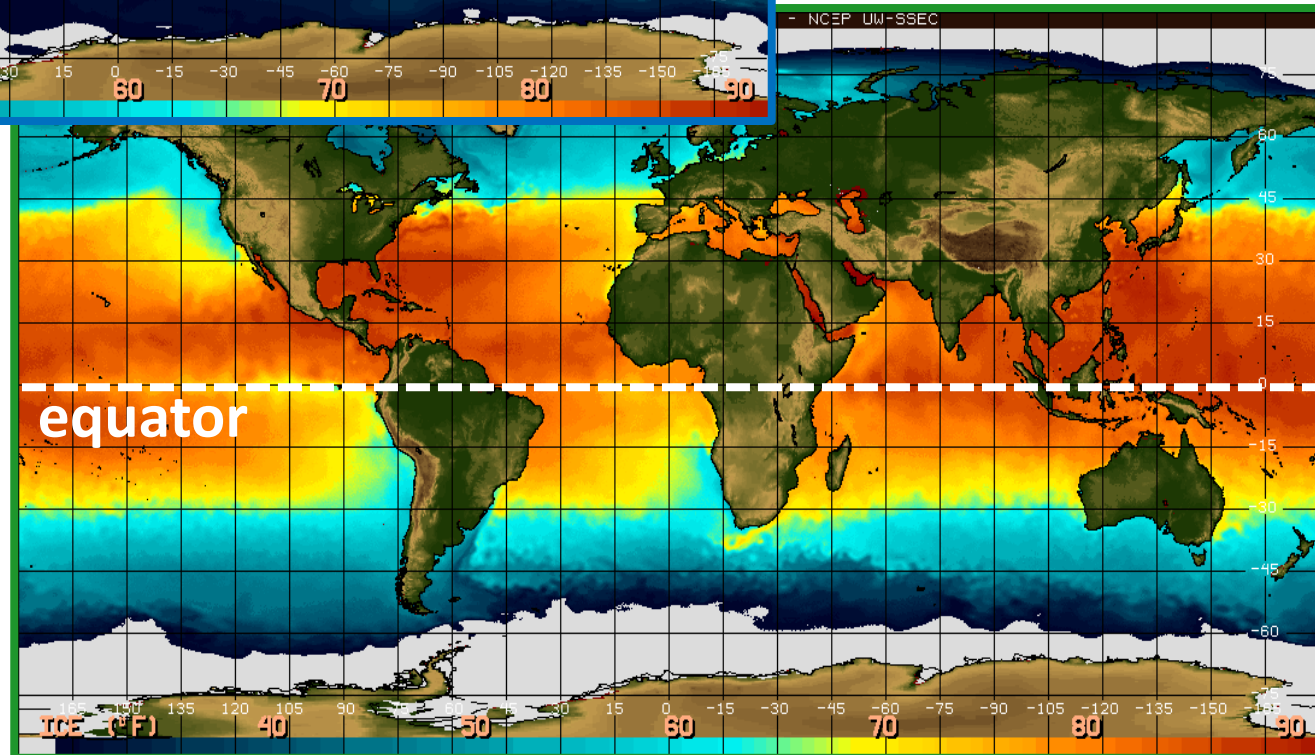
Ocean **surface temperature** on **August 21, 2016**.



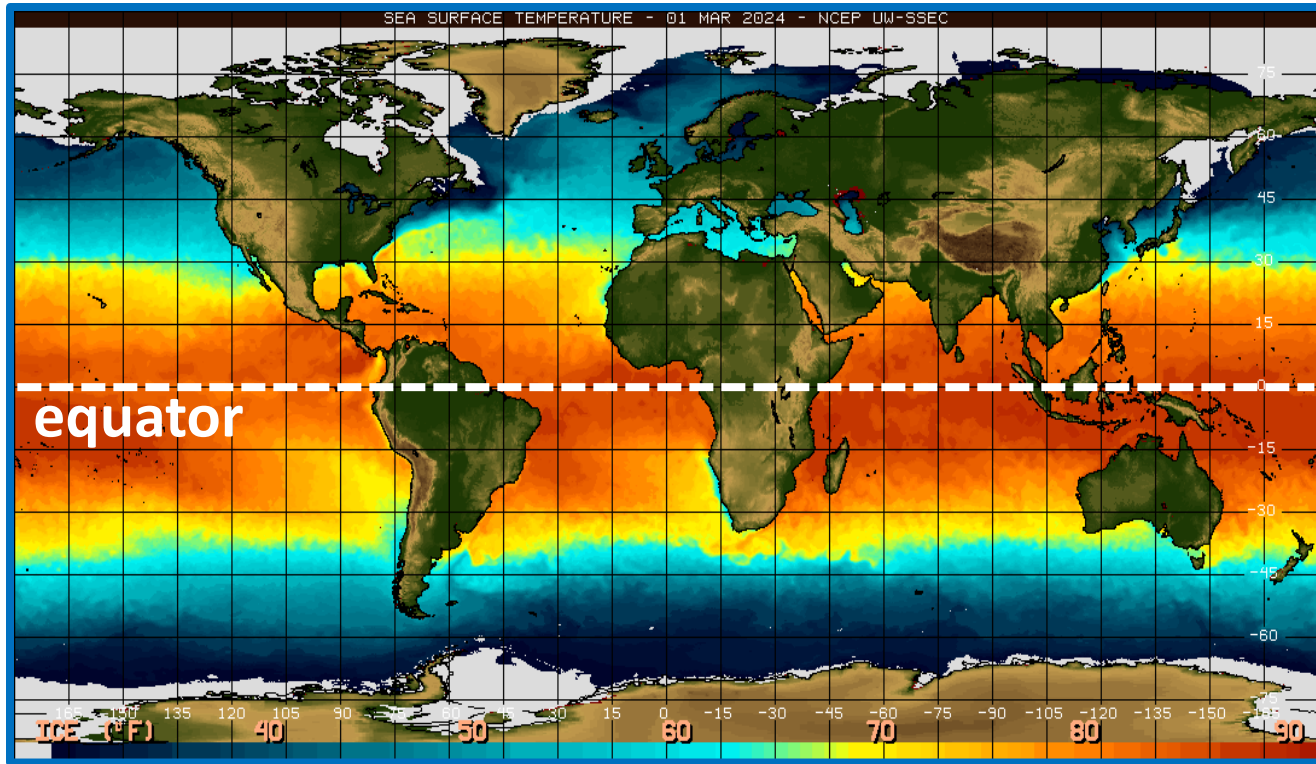
Ocean Surface Temperature:

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

↑
February 21, 2016

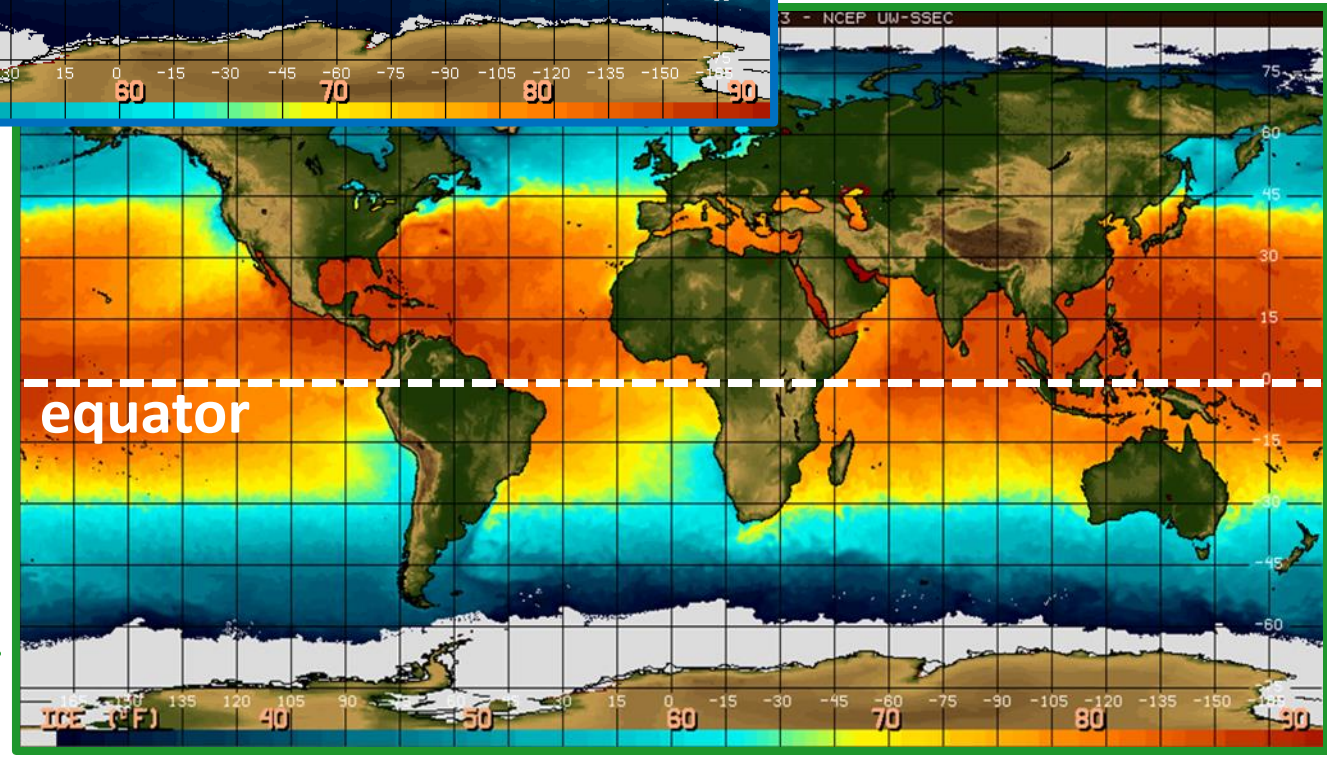


August 21, 2016 →



Ocean Surface Temperature: Latest Data

↑
March 1, 2024



August 31, 2023 →