

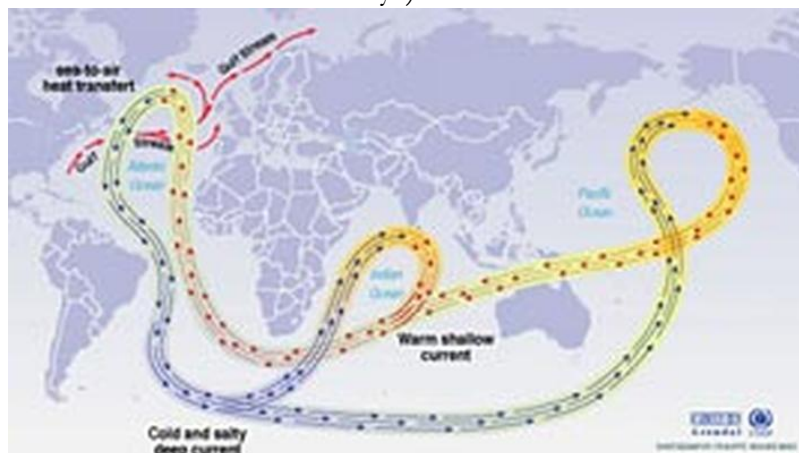


Oceans

- This video provides an entertaining and informative view of the thermohaline circulation (4:28) <https://www.youtube.com/watch?v=boFGOZ1X5Bo>

The ocean covers 70% of Earth's surface. It dominates Earth's energy and water cycles. It can absorb large amounts of solar energy. This ability to store and release heat over long periods of time gives the ocean a central role in making Earth's climate system stable. How does it do this? It moves heat and water vapor around the globe through ocean currents and atmospheric circulation.

Ocean currents are massive, constant flows of water. They form a series of connected loops throughout the global ocean system. Temperature, salinity (saltiness), and landmasses are the three biggest factors that influence the direction and depth of the currents. The circulation is known as the “thermo-haline circulation” due to the combined effects of temperature (“thermo”) and salt concentration (“haline” which is Greek for “salty”).



pbs.org

Temperatures are rising on the ocean surface because of global warming. Large amounts of fresh water are flowing in because of melting polar ice. Together, these events are changing ocean currents. Scientists predict that these events could even stop the thermo-haline circulation of altogether.

So far, the ocean has absorbed around 90% of the heat that greenhouse gases have trapped in the Earth system. It will take 30-50 years for this heat to spread evenly throughout the ocean system. This means that the atmosphere has been spared from the full extent of global warming for now. However, heat already stored in the ocean will eventually be released into the atmosphere. This time lag commits Earth to additional warming in the future.

In systems terms. In systems terms, the ocean can be thought of as one component or “reservoir” of heat energy in the global distribution of heat. Further, heat energy is an input from the atmosphere, and heat energy is an output to sea ice.

More information

- This animation shows the thermohaline circulation in three dimensions flowing around a detailed globe



<https://www.youtube.com/watch?v=LkRQjTdTvFE>

- This video discusses the Gulf Stream, its drivers, and its effects on Europe.
<https://www.youtube.com/watch?v=UuGrBhK2c7U>
- This simulation shows how heat energy excites water molecules and results in “thermal expansion” (~10:00) (scroll down to “Heat energy and moving molecules”)
<http://mare.lawrencehallofscience.org/curriculum/ocean-science-sequence/oss68-overview/oss68-simulation-activities#carboncycle>