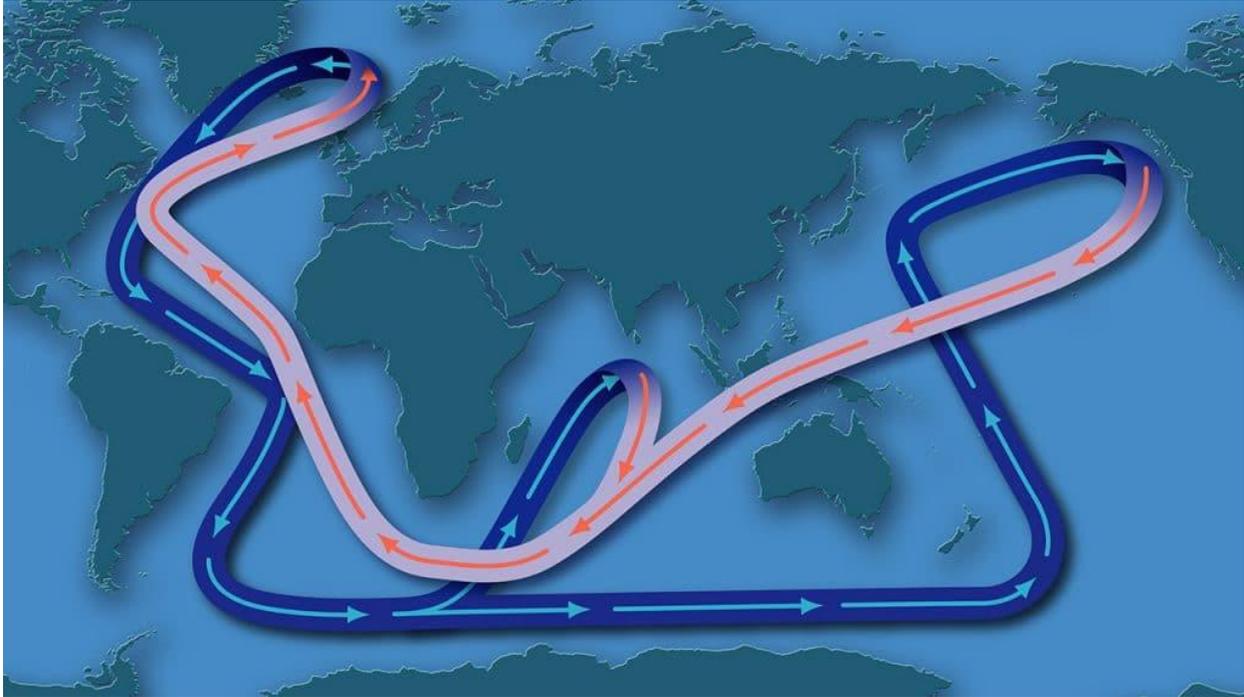


# The Ocean Conveyor



A fundamental element of today's climate system is a conveyor-like ocean circulation pattern that distributes vast quantities of heat and moisture around our planet. This global circulation is propelled by the sinking of cold, salty—and therefore dense—ocean waters.

In today's ocean, warm, salty surface water from the Caribbean, the Gulf of Mexico, and the equatorial Atlantic flows northward in the Gulf Stream. As the warm water reaches high North Atlantic latitudes, it gives up heat and moisture to the atmosphere, leaving cold, salty, dense water that sinks to the ocean floor. This water flows at depths, southward and beneath the Gulf Stream, to the Southern Ocean, then through the Indian and Pacific Oceans. Eventually, the water mixes with warmer water and returns to the Atlantic to complete the circulation.

The principal engine of this global circulation, often called the Ocean Conveyor, is the difference in salt content between the Atlantic and Pacific Oceans. Before the Isthmus of Panama existed, Pacific surface waters flowed into the Atlantic. Their waters mixed, roughly balancing the two oceans' salinity.

About 5 million years ago, the North American, South American, and Caribbean Plates began to converge. The gradual shoaling of the Central American Seaway began to restrict the exchange of water between the Pacific and Atlantic, and their salinities diverged.

Evaporation in the tropical Atlantic and Caribbean left ocean waters there saltier and put fresh water vapor into the atmosphere. The Trade Winds carried the water vapor from east to west across the low-lying Isthmus of Panama and deposited fresh water in the Pacific through rainfall. As a result, the Pacific became relatively fresher, while salinity slowly and steadily increased in the Atlantic.

As a result of the Seaway closure, the Gulf Stream intensified. It transported more warm, salty water masses to high northern latitudes, where Arctic winds cooled them until they became dense enough to sink to the ocean floor. The Ocean Conveyor was rolling, drawing even more Gulf Stream waters northward.

Today's climate system is influenced by the ocean's conveyor-like global circulation. Cold, salty waters sink to drive the conveyor, and warm surface currents complete the loop.  
(Illustration by Jayne Doucette, Woods Hole Oceanographic Institution)