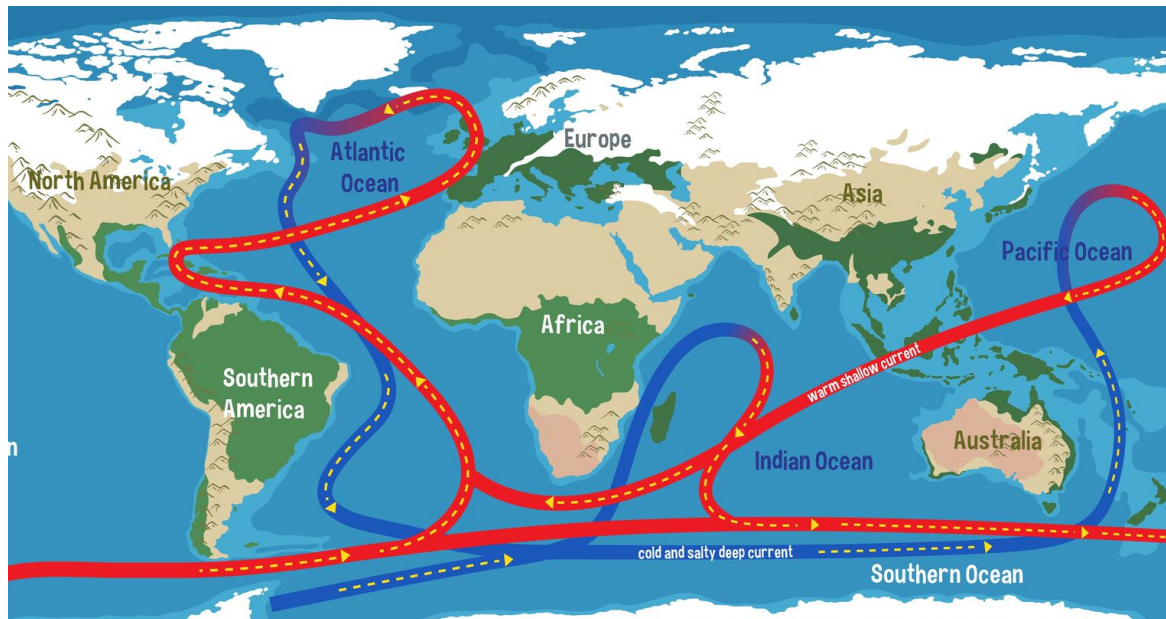


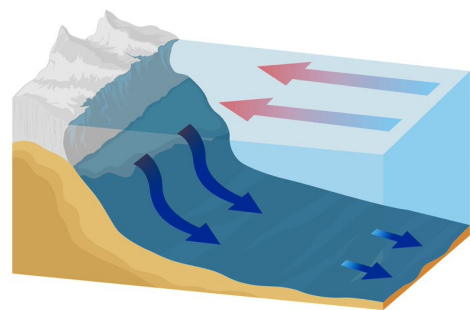
Science V12/S5 - Ocean Currents

The ocean covers 70% of the earth's surface, and it plays a major role in determining what happens in the environment. The ocean's currents are a crucial part of how our world operates, impacting the weather and affecting climates for the entire planet. This large-scale pattern is referred to as "The Global Conveyor Belt", a global-wide current that circulates cold and warm water around the Earth.



The global conveyor belt is driven by temperature, and one of its most important roles is distributing heat around the world. The ocean is able to soak up energy from the sun in the form of heat and distribute it more evenly across the Earth. The "belt" starts in the North Atlantic Ocean, where the water is cooled by the ice. The temperature of the water is a driving force in the motion of the currents.

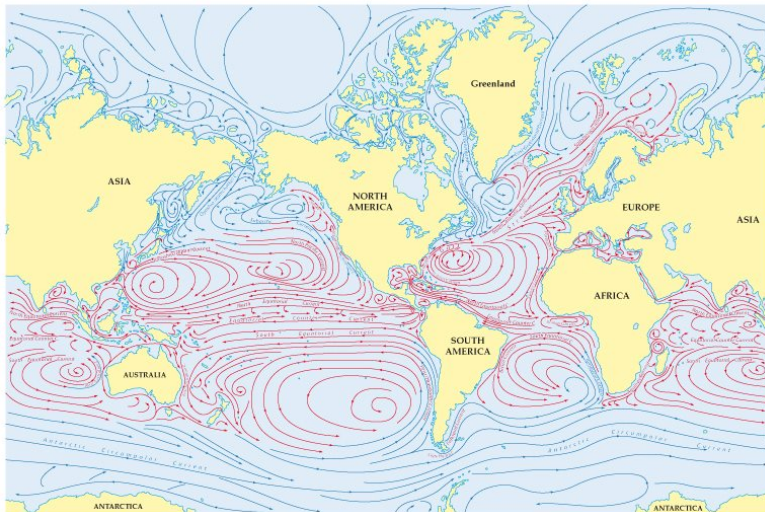
Ocean water's density is affected by its temperature, as well as its salt content; the saltier or the colder the water, the denser it is. Denser water sinks to the bottom of the ocean, while less dense water floats at the surface. In the northern Atlantic Ocean, as water flows north, it cools considerably, thereby increasing its density. As it cools to the freezing point, sea ice forms, extracting salt from the frozen water. This salt is added to the surrounding water, making the water below saltier and therefore denser. The very salty water sinks to the ocean floor. If the water is sinking in the North Atlantic Ocean, then



it must rise somewhere else, creating the cyclic pull that is ultimately responsible for the global current pattern.

Besides creating the global conveyor belt, this phenomenon of rising and sinking ocean water also serves a crucial role in marine ecosystems. The action of the water rising is called “upwelling”, and although it happens all over the world, scientists have studied water samples that indicate that most of the upwelling takes place in the North Pacific Ocean. These are important locations because as the water rises from the bottom, it brings with it rich nutrients that attract life from every level of the food chain.

There are certain ocean currents, like the Gulf Stream (which is part of the global conveyor belt) that have a direct effect on the climates of countries they pass. The Gulf Stream travels past the Caribbean and Florida, carrying warm water, then turns off to the right toward Europe – specifically the United Kingdom and Ireland. That's why the north-eastern part of the United States and Canada has a cooler climate; the Gulf Stream does not bring warm water to its shores, causing colder temperatures.



Besides the global conveyor belt, there are also smaller current patterns, such as surface currents, which are largely impacted by the wind. These types of currents can carry objects far from their origin, which in one case has led to the formation of the Great Pacific Garbage Patch, an area of the Pacific Ocean where the currents have condensed plastic trash and other debris into the center of a cyclic current. The trash breaks

down and releases chemicals into the ocean, harming the environment.

Currents impact various aspects of our planet, but scientists think they may be changing in a way that can disrupt these influences. Evidence shows that the Earth has warmed since 1880, which has caused many of the ice caps in the North and South Poles to melt, thereby disrupting the global conveyor belt. If the ice caps melt, there will be less dense water to move around the globe. And if there is less dense (and therefore cold) water to circulate around the Earth, the Gulf Stream and other currents will be slowed down with global consequences to our climate, making some warm locations colder as a result.