

Arctic Climate Change

Ocean currents and the role of the Arctic

You will need:

A fish tank or a large clear container.
Potassium permanganate or food colouring.
Ice, a kettle, a hairdryer.

Note: It takes time to create the warm current.

What happens to ocean currents when the water is heated or cooled?

- Fill the fish tank or clear container with water. This represents the ocean.
- Add a little potassium permanganate or food colouring to one end.
- You should see the colouring spread (diffuse) randomly.
- Boil the kettle.
- Add the hot water from the kettle to one end of the tank and the ice to the other end. You have just created the Gulf Stream! Watch what happens to the dye.
- Use a hair dryer to heat the air above the water. This represents the wind, which plays a big role in moving surface currents. Again, watch what happens to the dye.

What happens to the dye at different stages? Does it:

- a) Move from the cold water to the hot water?
- b) Move from the hot water to the cold water?
- c) Stay the same and just move about randomly?
- d) Move along the surface, or sink deeper into the water?

Having a balance of cold and warmer water, and strong currents to keep moving water around is important to keep our climate stable. Warm, less dense (lighter) currents rise at the tropics and move along the surface to the poles, where the water cools down, sinks (cold water is heavier than warm water) and cold, deep currents return to the tropics. The cold waters of the Arctic are vital for this.



Warm, shallow
currents

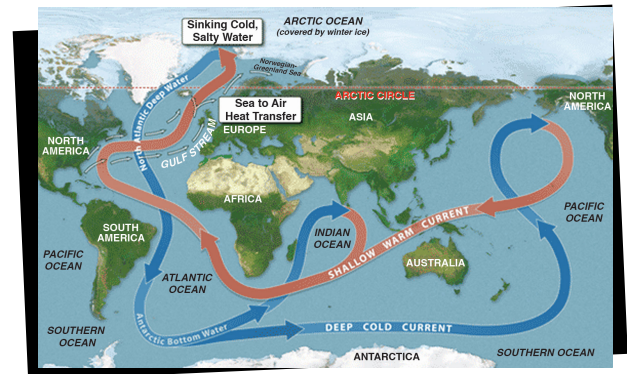
Cold, deep
currents

The science behind the results

Ocean currents and the role of the Arctic

The oceans play a big role in our climate system. Covering 71% of the Earth, our oceans absorb twice as much of the sun's heat as the air or land.

Oceans act like a conveyor belt, moving very large amounts of heat around the planet. They move warm water from the equator towards the poles, and cold water from the poles back towards the tropics. Our weather – if it is hot, cold, rainy or dry – is determined largely by ocean currents.



From our experiment we know that:

When all the water is the same temperature, currents (the food colouring) are weak. In the first part of the experiment the food colouring moved about in all directions at the same time.

When there is a big difference in temperature, currents are strong. In the second part of the experiment the food colouring moved quickly from the warm water to the cold water.

Why does this matter?

Currents regulate global climate. Without strong currents, temperatures in different parts of the world would be more extreme — super hot at the equator and even colder toward the poles. A lot less of Earth's land would be habitable, meaning that people could not live in those parts of the world.

Marine (sea) life is already being affected. Animals, fish and sea plants are adapted to live in different water temperatures. If these temperatures change, species may have to move or could even die. Fish in the North Sea are already moving further north to deeper, colder water. Rising water temperatures could slow the growth of plankton meaning less food for fish and other species that eat it.

More information and Awesome Experiments:

www.wickedweatherwatch.org.uk

Advanced resources on the science:

www.eu-interact.org