

Thermohaline circulation

By Lennart Kiil



A meltwater river on the Greenland ice sheet. The fresh meltwater running into the sea may in time disturb the thermohaline circulation.

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Circulation of the oceans driven by differences in water salinity and [temperature](#).

The ocean currents are connected in a "conveyor belt", which transports heat around the planet. Part of the driving force behind the current is differences in density of the water in the oceans, created by differences in temperature and salinity, this is called the thermohaline circulation.

Wind and tidal forces also drive ocean currents to some extent, but it is difficult to estimate their part, see [Gulf Stream](#) for a wind driven ocean surface current.

Salinity and temperature drive ocean currents by affecting the density of water. When water warms it expands, and becomes less dense than cold water. Adding salt to water makes it more dense, because the salt fills the spaces between the water molecules.

Water masses of different density can exist in the same ocean. However, the water will arrange itself according to density, with dense water below less dense water. The vertical movement of water masses, created by the density differences, create the thermohaline circulation.

The thermohaline circulation is mainly driven by the sinking of high density surface water masses in areas of the North Atlantic and the Southern Ocean. Here the wind has cooled the surface water, and evaporation and sea ice formation have increased the salinity. All together this increase the surface water's density enough to make it sink.

The ocean conveyor belt influences the [climate](#) significantly by moving warm water from the tropic regions towards the poles, and cold water the other way.

Should [global warming](#) affect and change the thermohaline circulation, it would probably cause [climate changes](#) globally.

Particular concerns have been raised that increased addition of melt water from the Greenland Ice Sheet ([inland ice](#)) could decrease the salinity of the sea water in the area enough to interfere with the thermohaline circulation. This could lead to a cooling of the climate in the Northern Hemisphere.

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