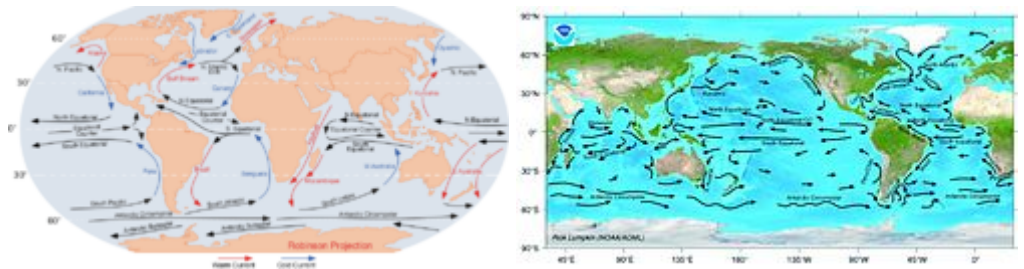


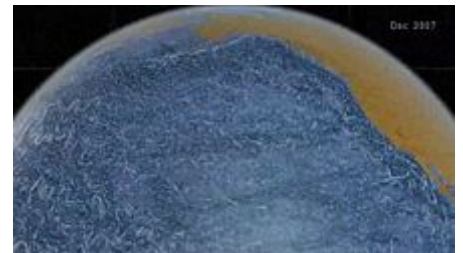
Ocean current



The ocean currents.

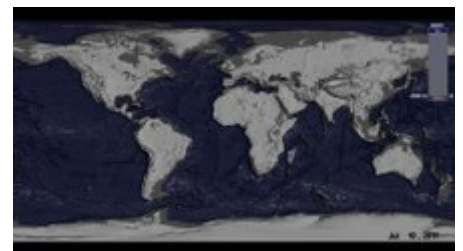
An **ocean current** is a seasonal directed movement of seawater generated by forces acting upon this mean flow, such as breaking waves, wind, the Coriolis effect, cabbeling, temperature and salinity differences, while tides are caused by the gravitational pull of the Sun and Moon. Depth contours, shoreline configurations, and interactions with other currents influence a current's direction and strength. Therefore, ocean currents are primarily horizontal water movements.

Ocean currents flow for great distances, and together, create the global conveyor belt which plays a dominant role in determining the climate of many of the Earth's regions. More specifically, ocean currents influence the temperature of the regions through which they travel. For example, warm currents traveling along more temperate coasts increase the temperature of the area by warming the sea breezes that blow over them. Perhaps the most striking example is the Gulf Stream, which makes northwest Europe much more temperate than any other region at the same latitude. Another example is Lima, Peru, where the climate is cooler, being sub-tropical, than the tropical latitudes in which the area is located, due to the effect of the Humboldt Current



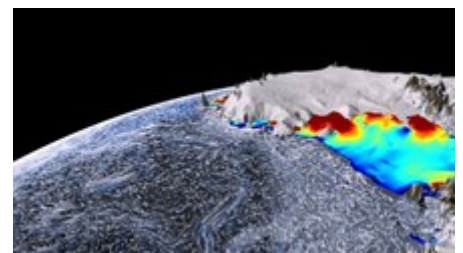
Play media

Distinctive white lines trace the flow of surface currents around the world.



Play media

Visualization showing global ocean currents from Jan 01, 2010 to Dec 31, 2012 at sea level then at 2000 meters below sea level.



Play media

Animation of circulation around ice shelves of Antarctica.

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Function

Surface oceanic currents are sometimes wind driven and develop their typical clockwise spirals in the northern hemisphere and counter-clockwise rotation in the southern hemisphere due to imposed wind stresses. In these wind-driven currents, the Ekman spiral effect results in the currents flowing at an angle to the driving winds. In

addition, the areas of surface ocean currents move somewhat with the seasons; this is most notable in equatorial currents.

Deep ocean basins generally have a non-symmetric surface current, in that the eastern equatorward-flowing branch is broad and diffuse whereas the western poleward flowing branch is very narrow. These western boundary currents (of which the Gulf Stream is an example) are a consequence of the rotation of the Earth.

Deep ocean currents are driven by density and temperature gradients. Thermohaline circulation is also known as the ocean's conveyor belt (which refers to deep ocean density-driven ocean basin currents). These currents, called submarine rivers, flow under the surface of the ocean and are hidden from immediate detection. Where significant vertical movement of ocean currents is observed, this is known as upwelling and downwelling. Deep ocean currents are currently being researched using a fleet of underwater robots called Argo.

Surface currents make up only 8% of all water in the ocean, are generally restricted to the upper 400 m (1,300 ft) of ocean water, and are separated from lower regions by varying temperatures and salinity which affect the density of the water, which in turn, defines each oceanic region. Because the movement of deep water in ocean basins is caused by density-driven forces and gravity, deep waters sink into deep ocean basins at high latitudes where the temperatures are cold enough to cause the density to increase.

Ocean currents are measured in sverdrup (sv), where 1 sv is equivalent to a volume flow rate of 1,000,000 m³ (35,000,000 cu ft) per second.

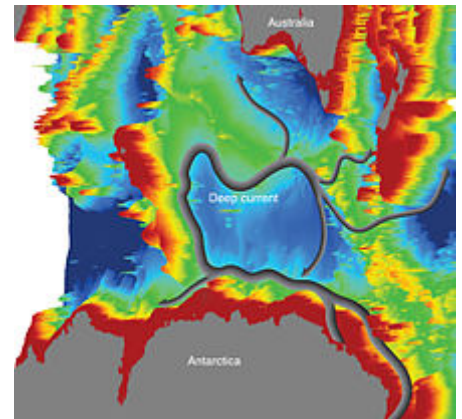
Surface currents are found on the surface of an ocean, and are driven by large scale wind currents. They are directly affected by the wind—the Coriolis effect plays a role in their behaviours.^[1]

Thermohaline circulation

The thermohaline circulation is a part of the large-scale ocean circulation that is driven by global density gradients created by surface heat and freshwater fluxes.^{[2][3]} The adjective *thermohaline* derives from *thermo-* referring to temperature and *-haline* referring to salt content, factors which together determine the density of sea water. Wind-driven surface currents (such as the Gulf Stream) travel polewards from the equatorial Atlantic Ocean, cooling en route, and eventually sinking at high latitudes (forming North Atlantic Deep Water). This dense water then flows into the ocean basins. While the bulk of it upwells in the Southern Ocean, the oldest waters (with a transit time of around 1000 years)^[4] upwell in the North Pacific.^[5] Extensive mixing therefore takes place between the ocean basins, reducing differences between them and making the Earth's oceans a global system. On their journey, the water masses transport both energy (in the form of heat) and matter (solids, dissolved substances and gases) around the globe. As such, the state of the circulation has a large impact on the climate of the Earth. The thermohaline circulation is sometimes called the ocean conveyor belt, the great ocean conveyor, or the global conveyor belt. On occasion, it is imprecisely used to refer to the meridional overturning circulation, *MOC*.

Importance

Knowledge of surface ocean currents is essential in reducing costs of shipping, since traveling with them reduces fuel costs. In the wind powered sailing-ship era, knowledge of wind patterns and ocean currents is even more essential. A good example of this is the Agulhas Current, which long prevented Portuguese sailors from reaching India. In recent times, around-the-world sailing competitors make good use of surface currents to build and maintain speed. Ocean currents are also very important in the dispersal of many life forms. An example is the life-cycle of the European Eel



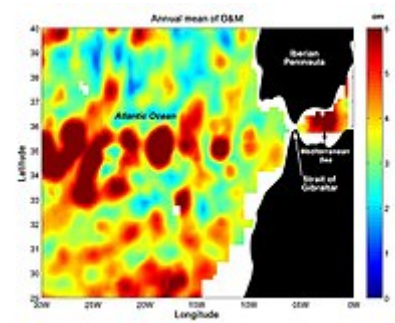
The bathymetry of the Kerguelen Plateau in the Southern Ocean governs the course of the new current part of the global network of ocean currents (Source CSIRO)



A recording current meter

Ocean currents are important in the study of marine debris and vice versa. These currents also affect temperatures throughout the world. For example, the ocean current that brings warm water up the north Atlantic to northwest Europe also cumulatively and slowly blocks ice from forming along the seashores, which would also block ships from entering and exiting inland waterways and seaports, hence ocean currents play a decisive role in influencing the climates of regions through which they flow. Cold ocean water currents flowing from polar and sub-polar regions bring in a lot of plankton that are crucial to the continued survival of several key sea creature species in marine ecosystems. Since plankton are the food of fish, abundant fish populations often live where these currents prevail.

Ocean currents can also be used for marine power generation, with areas off of Japan, Florida and Hawaii being considered for test projects.

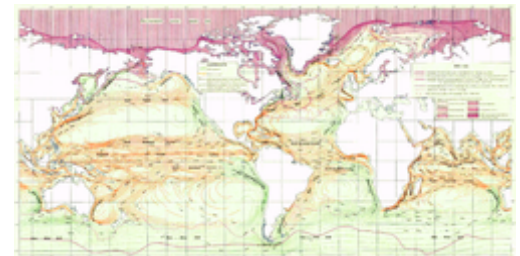


Coupling data collected by NASA/JPL by several different satellite-borne sensors, researchers have been able to "break through" the ocean's surface to detect "Meddies" – super-salty warm-water eddies that originate in the Mediterranean Sea and then sink more than a half-mile underwater in the Atlantic Ocean. The Meddies are shown in red in this scientific figure.

OSCAR: Near-realtime global ocean surface current data set

The OSCAR Near-realtime global ocean surface currents website describes the project and links to data validation and data downloads.

OSCAR data is used extensively in climate studies. maps and descriptions or annotations of climatic anomalies have been published in the monthly Climate Diagnostic Bulletin since 2001 and are routinely used to monitor ENSO and to test weather prediction models. OSCAR currents are routinely used to evaluate the surface currents in Global Circulation Models (GCMs), for example in NCEP Global Ocean Data Assimilation System (GODAS) and European Centre for Medium-Range Weather Forecasts (ECMWF).^[6]



A 1943 map of the world's ocean currents.

See also

- Currentology
- Deep ocean water
- Fish migration
- Latitude of the Gulf Stream and the Gulf Stream north wall index
- List of ocean circulation models
- Marine current power
- Oceanic gyre
- Physical oceanography
- Thermohaline circulation
- Volta do mar

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External links

- [RSMAS Ocean Surface Currents](#)
 - [Coastal Ocean Current Monitoring Program](#)
 - [Ocean Motion and Surface Currents](#)
 - [Data Visualizer from OceanMotion.org](#)
 - [ocean currents map](#)
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