

OCEAN CURRENTS

Ocean currents are general movements or drifts of the surface water of the ocean in a fairly defined direction. They are continuous general movement of masses of surface ocean waters horizontally and in a fairly defined direction. They tend to be persistent. Most ocean currents drift very slowly and that is why they are commonly referred to as drifts.

Ocean currents may be either warm or cold i.e. there are warm ocean currents and cold ocean currents.

Causes of ocean currents

1. **The prevailing winds;** winds influence oceanic circulation, this is because as winds blow friction is generated between the wind and water surface causing the water to move in the general direction of the wind. Some winds such as trade winds which almost continuously blow in the same direction cause surface waters over which they blow to move in the direction to which they blow e.g. across the Atlantic ocean westerlies produce the North Atlantic drift and Kuro Siwo currents (in the Pacific).
2. **Rotation of the earth;** the earth's rotation influences the direction of movement of ocean currents. It causes the currents to be deflected to the right in the direction to which they flow in the northern hemisphere and in the southern hemisphere the currents tend to be deflected towards the left.
It is generally because of the Coriolis force that the ocean currents are deflected.
3. **Differences in temperature;** ocean currents may be caused by differences in temperature. Such currents are generally referred to as convection currents.
Heating by the sun in the low altitudes makes the waters less dense and the waters therefore drift pole wards.
In the equatorial belt, temperatures are high and therefore waters are warm and tend to be less dense, unlike the polar region or high latitude region waters. As a result, the warm waters of the equatorial region drift towards the higher latitudes.
4. **Salinity of the waters;** salinity may increase the density of the waters. Saline waters (these of high PH/basic waters) tend to be denser than waters of low salinity. It is generally noted that waters of high salinity tend to flow to areas of low salinity e.g. the surface water current from the Mediterranean Sea which enters the Atlantic Ocean

is due to difference in salinity. The high rate of evaporation and limited rainfall may result into high salinity.

This means that the Mediterranean Sea is made up of waters of high salinity and therefore flows into relatively less saline waters of the Atlantic Ocean while the under current flows in the opposite direction.

5. **Coastal configuration**; the alignment the coast and the existence of sub marine ridges is partly responsible for the direction of flow of ocean currents. The shape of the land helps in the direction of moving currents e.g. the North equatorial current tends to be deflected north wards because of the shape of the horn of Africa.

Ocean currents may be characterized by under currents. These are return or compensating currents that normally flow within the equatorial latitudes. They flow in the opposite direction from which the opposite currents are flowing. They are normally known as counter currents that replace the surface waters that may have moved to another region.

WARM OCEAN CURRENTS

These are ocean currents with warm waters and may include, the warm Mozambique current or the warm Agulhas current or South equatorial current in Africa. Other warm currents include; the warm gulf stream, the North Atlantic drift, the North pacific current, the Kuro siwo current, the East Australia current, the Brazilian current and the North east monsoon drift.

Characteristics of warm ocean currents

1. They have higher temperatures i.e. tend to be warm.
2. They generally tend to flow on the eastern side of the continental landmasses in the low latitudes (except for Guinea current).
3. They generally tend to flow on the western side of the continental landmasses in the mid and high latitudes e.g. the Pacific current and the North Atlantic drift.
4. They tend to flow from the lower latitudes to the higher latitudes i.e. flow pole ward away from the equator.
5. In the northern hemisphere, their circulation tends to be clockwise while in the southern, their circulation tends to be anti-clockwise.
6. They generally tend to be of lower density/high salinity.
7. They flow on the surface but later lose temperatures and become under water currents.

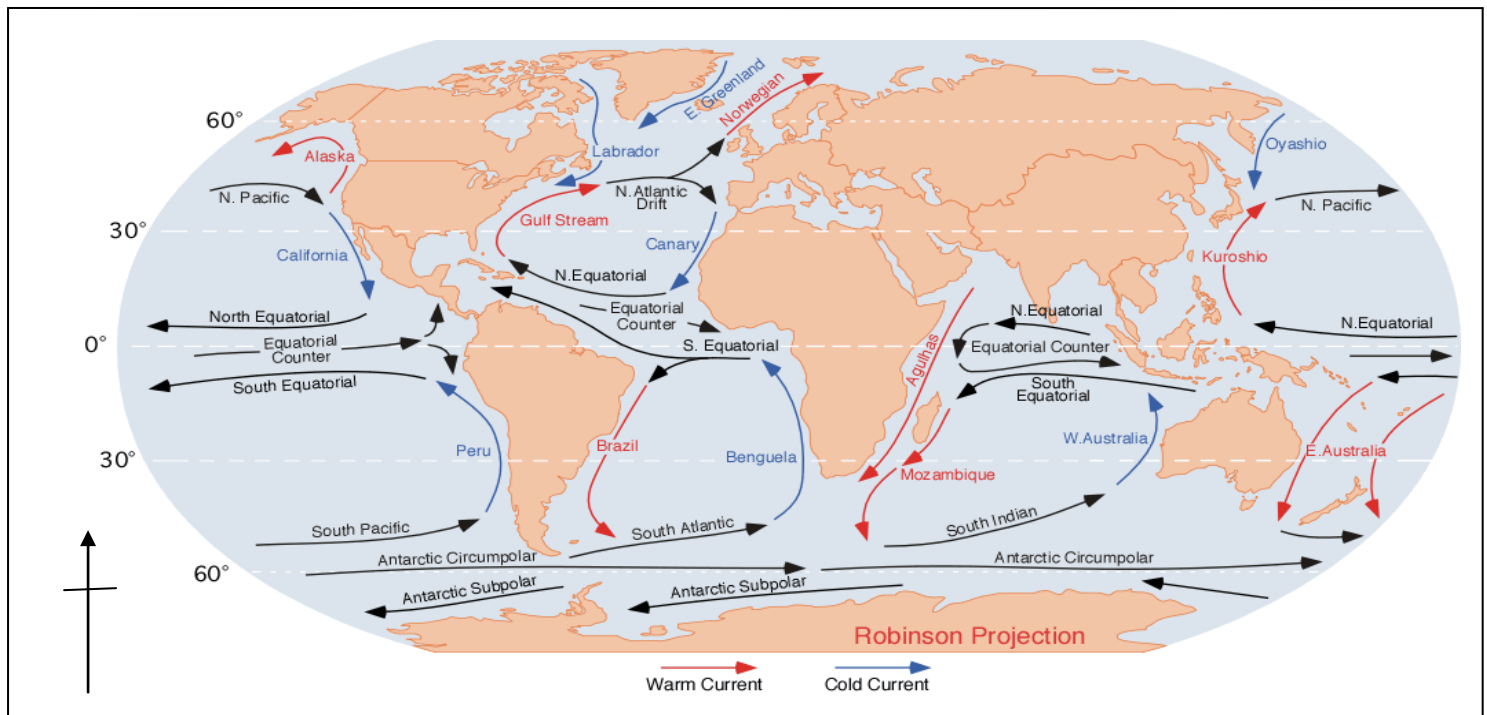
COLD OCEAN CURRENTS

These are ocean currents with waters of low temperature, i.e. the waters are cold. In Africa the main cold ocean currents include; the cold Benguella current and the cold canary current. Elsewhere examples include the Californian current, cold Peruvian current, the North equatorial current, East Greenland current and the West Australian current.

Characteristics of cold ocean currents

1. They are characterized by low temperatures, i.e. they have low waters.
2. They tend to flow from high latitude regions to regions of low latitude, i.e. they flow equator wards from regions of cold conditions.
3. They generally flow on the western side of the continental landmasses. This is true in the lower latitude regions.
4. In the mid and high latitude regions, they tend to flow on the eastern sides of the continents e.g. the Labrador Current, the Oya siwo current.
5. They tend to be characterized by high density/low salinity.
6. In the northern hemisphere their circulation tends to be anti-clockwise while in the southern hemisphere their circulation tends to be clockwise.
7. They are also characterized by up-welling of waters at the coasts.

World map showing the various ocean currents



EFFECTS OF OCEAN CURRENTS

Ocean currents influence the climate and environmental conditions of adjacent lands.

Effects of warm ocean currents

Warm ocean currents have influenced the climate or environmental conditions of the areas adjacent to them in the following ways;

- 1) They lead to warm conditions, i.e. they tend to warm or raise the temperature of the adjacent area, this is because the winds which blow over them are warmed up and as they blow onshore they bring in warm conditions e.g. the North Atlantic drift raises the temperatures of the coasts of Portugal, France, Britain, the Netherlands etc. and the ocean ports remain ice free in winter.
Durban on the eastern coast of South Africa is affected by the warm Mozambique current and has temperatures of 24.4°C compared to Port Nolloth on the west coast along the same latitude which has temperatures of 15.5°C because of the cold Benguela current.
- 2) Warm ocean currents lead to heavy rainfall conditions on the adjacent coastal lands. This is because over warm ocean currents there is high rate of evaporation and the winds that blow over them pick the moisture which winds later rise, cool down and condense to form rainfall e.g. along the East Africa coast and along the west African coast there is heavy rainfall because of the warm Mozambique and warm Guinea currents respectively. For instance Beira receives 1,521 mm and Durban receives 1,008 mm of rainfall per annum.
- 3) They results into humid conditions, i.e. high humidity. This is because warm ocean currents are associated with high humidity due to the relatively high temperatures. All these tend to increase the humidity of the surrounding areas e.g. the Natal Province of South Africa and the coasts of Western Europe.
- 4) Warm ocean currents influence the temperatures of winds and result into warm winds. Winds that tend to originate from areas with warm currents are generally regarded as warm maritime winds.
- 5) They lead to increased cloud cover over the adjacent coastal lands. This is because of the high rate of evaporation. The water vapour rises, cools and condenses to form dense clouds (cumulonimbus clouds) which later result into heavy rainfall.

Effects of cold ocean currents

Cold ocean currents influence the climate and environmental conditions of the adjacent land masses in the following ways;

1. Cold ocean currents tend to control the temperatures of the surrounding land masses due to the influence of the land and sea breezes. E.g. the Benguela lowers the temperatures of surrounding areas in Namibia e.g. Walvis Bay has temperatures of 16°C as compared to Durban's 25°C and yet they lie at almost the same latitude.
2. Cold ocean currents lead to arid conditions or the formation of marine deserts on the adjacent coastal lands. This is because of limited evaporation and winds that blow over them hardly pick any moisture. The winds also generally tend to be off shore winds meaning that the level of condensation that will result into rainfall is low. Examples of marine deserts include the Namib Desert which is due to the cold Benguela current. The Californian desert is due to the cold Californian current and the Atacama Desert due to the cold Peruvian current.
3. They tend to result into low humidity; this is because of the low rate of evaporation. This consequently leads to limited cloud cover because of the limited atmospheric moisture.
4. Cold ocean currents lead to the formation of cold offshore fog or misty conditions as a result of rapid radiation cooling. It may also be due to when slightly warm air blows over the cold ocean currents resulting into steam fog e.g. there are frequent foggy conditions in San Francisco in southern California and in the Labrador region in eastern Canada.

Effects of ocean currents on human activities along the coastal areas

The nature of ocean currents has influenced human activities in the coastal regions.

Effects of warm ocean currents

1. The resultant high rainfall experienced has encouraged crop cultivation or rain fed-agriculture.

This is common along the east African coast and West African coast where a number of crops are grown, e.g. cloves, sisal, and sugarcane along the East African coast. Along the West African coast crops like cocoa are grown in Ghana.

2. The high rainfall experienced encourages the growth of forests and people may be involved in forestry activities, e.g. in Gabon, forestry activities such as lumbering are practiced. On the east African coast lumbering is also carried out in the mangrove forests.
3. The high temperatures or warm conditions along the East African coast are conducive for the growth of coral polyps and the resultant rocks and land forms like coral reefs.
These coral rocks have been a potential for the manufacture of cement from the coral limestone e.g. the Bamburi cement.
In addition the coral reefs have been a tourist attraction and have promoted tourist activities along the coast of east Africa. Furthermore, the fringing reefs have tended to be a hindrance to deep sea fishing along the east African coast.
4. The heavy rainfall that may result may be associated with thunderstorms which tend to be destructive to the crops and property and also disrupts the economic activities.

Effects of cold ocean currents

- a) The arid conditions lead to the growth of pastures of short grass which has encouraged pastoralism. It is important to note that pastoralism is common in semi-arid areas such as the Namib Desert and Kalahari Desert.
- b) The arid or desert conditions have promoted tourism. Such areas have been gazetted as wildlife conservation sites e.g. Namib Desert.
- c) The arid or desert conditions have also provided a conducive environment for the film industry. Film making has been carried out in the arid areas such as the Namib Desert.
- d) The ocean currents cause upwelling of ocean waters creating conducive conditions for the growth of planktons and this has encouraged fishing in these areas. The upwelling may be rich in phosphates and nitrates that promote plankton growth e.g. fishing has been an important activity in the coastal waters of Morocco, South Africa, Angola and Mauritania.

- e) Cold ocean currents lead to the formation of fog which tends to reduce on visibility over water and air thereby hindering navigation and aviation.