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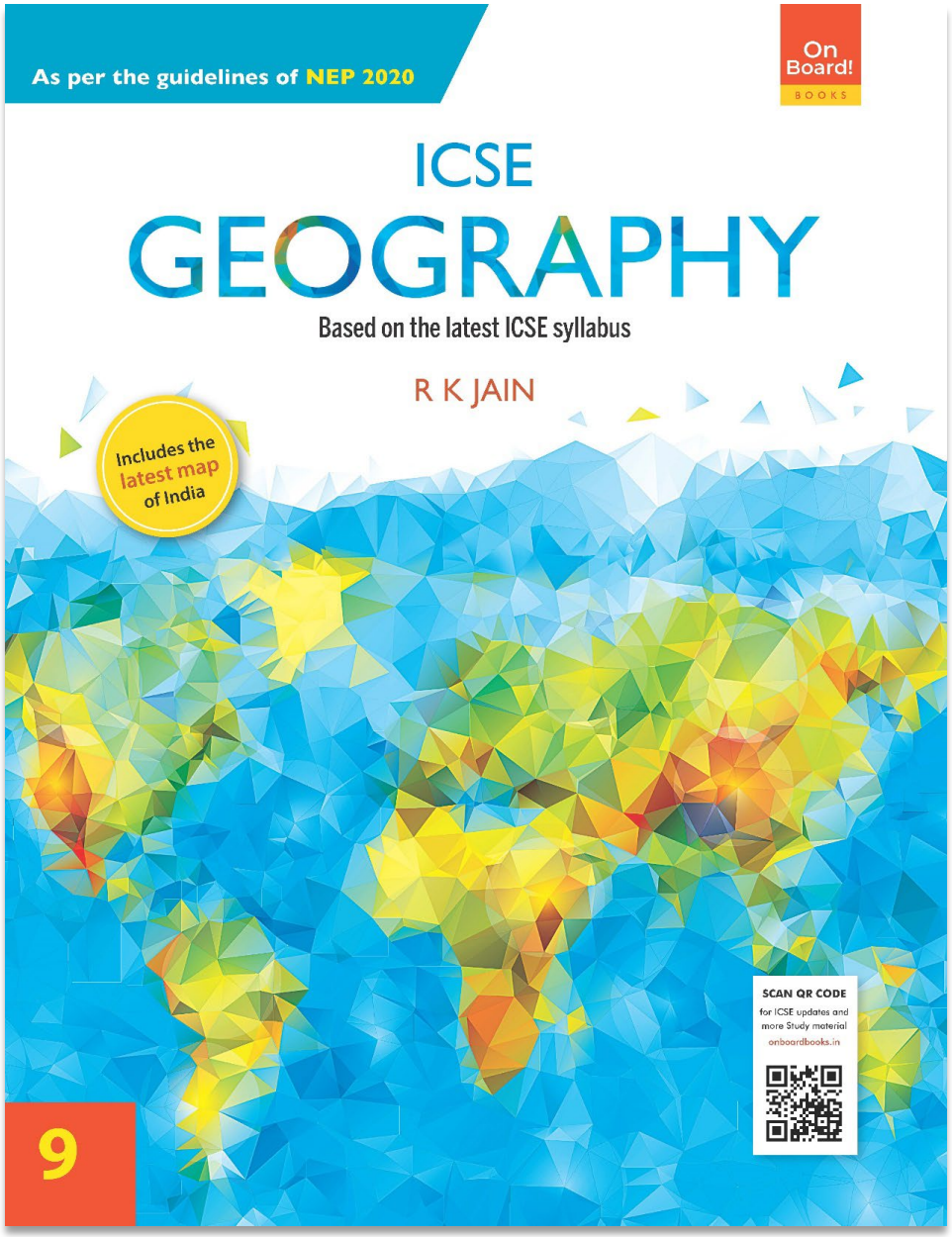
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GEO-GLOSSARY

ICSE GEOGRAPHY

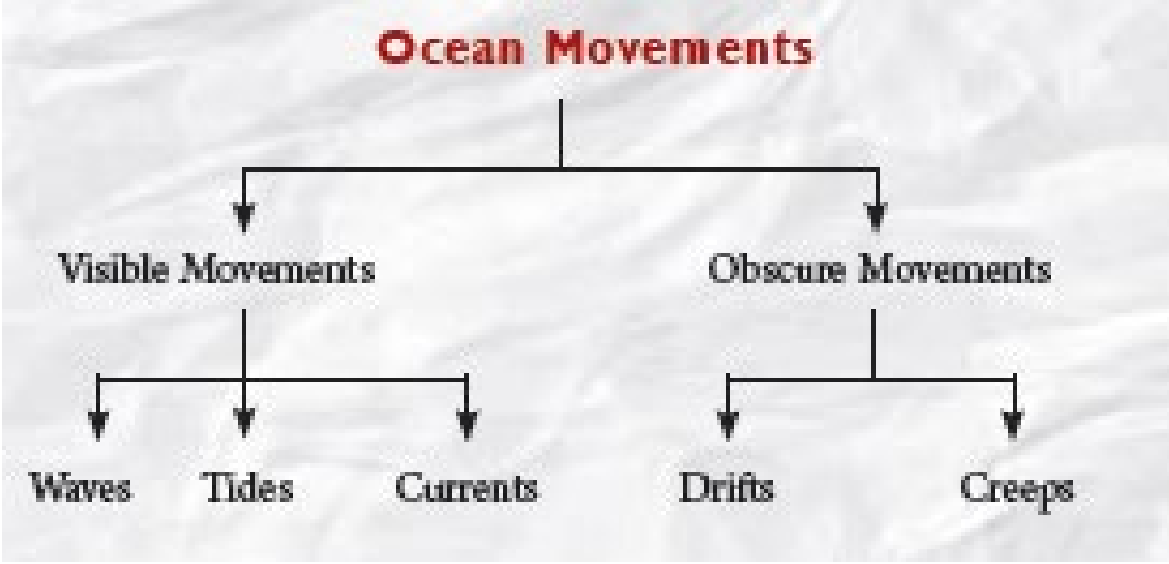
Class 9

Chapter 11: Hydrosphere

About 71 per cent of the Earth's surface is covered with water, which is found mostly in oceans, seas, gulfs, bays, lakes, rivers, ice sheets, etc. The part of the Earth which has water is called the **hydrosphere**. The level of water in the oceans and seas is the same throughout. This level is called the **mean sea level**. The large water bodies are called **oceans**. There are four major oceans–Pacific, Atlantic, Indian and Arctic ocean.

MOVEMENTS OF OCEAN WATER

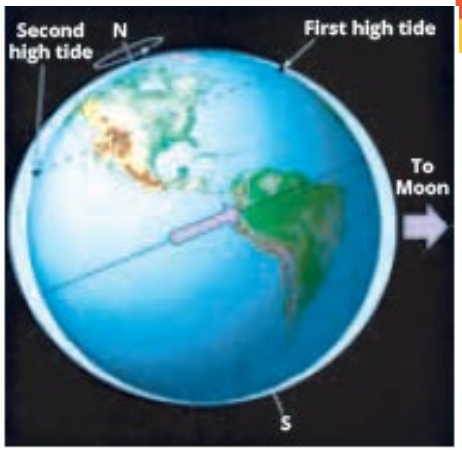
The water of the ocean is always in motion. The movement of ocean water takes place in three different ways – **waves, tides** and **currents**.



The movement of surface water in which the rise and fall of the water surface is more predominant than the actual forward motion of the water particles is called a **wave**. The wave represents a series of parallel crests separated by troughs and are mainly due to winds.

TIDES: Formation and Pattern

Alternate rise and fall in the level of sea water is known as **tide**. We generally speak of the **tide coming in**, when the level of sea water rises and its movement is towards the coast. This is called the **high tide**. When we say the **tide going out**, the level of the sea water falls and the movement of sea water is towards the sea. This is called the **ebb tide** or the **low tide**.

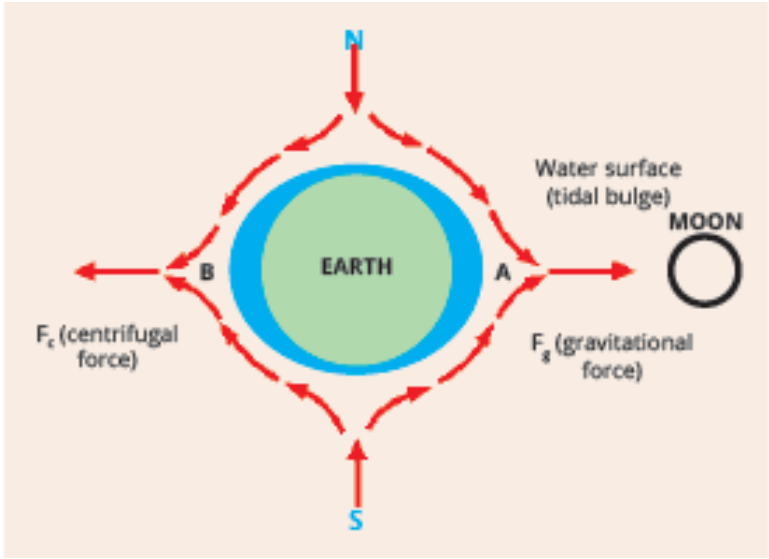


Occurrence of tides

OCCURRENCE OF TIDES

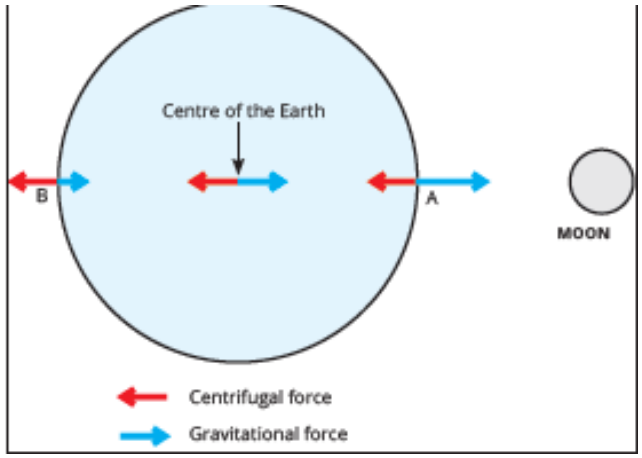
The gravitational attraction of the Sun and the Moon is responsible for the occurrence of tides in the sea water. The Earth exerts an attractive force on the Moon and vice versa. The same is true for both the Sun and the Earth. It is this attractive force of Sun and Moon on the Earth that causes tides.

The tides largely follow the apparent movement of Moon in the sky. The gravitational force of the Moon will be maximum at the Earth's surface facing the Moon, while it will be minimum at the opposite side of the Earth. Point A on the Earth's surface is 12,800 km nearer to the Moon than point B



Tides due to gravitational and centrifugal forces

This is due to the fact that two forces are acting simultaneously at every point on the Earth. These are the **gravitational force** of the Sun and the Moon and the other is the **centrifugal force**, which is the same everywhere. These two forces act in the opposite directions and they balance each other at the centre of the Earth.



Causes of tides

Between the two high tides, there are two low tides. As the Earth rotates on its axis, each point experiences two high tides and two low tides during a day

High tide

Low tide

SPRING TIDE AND NEAP TIDE

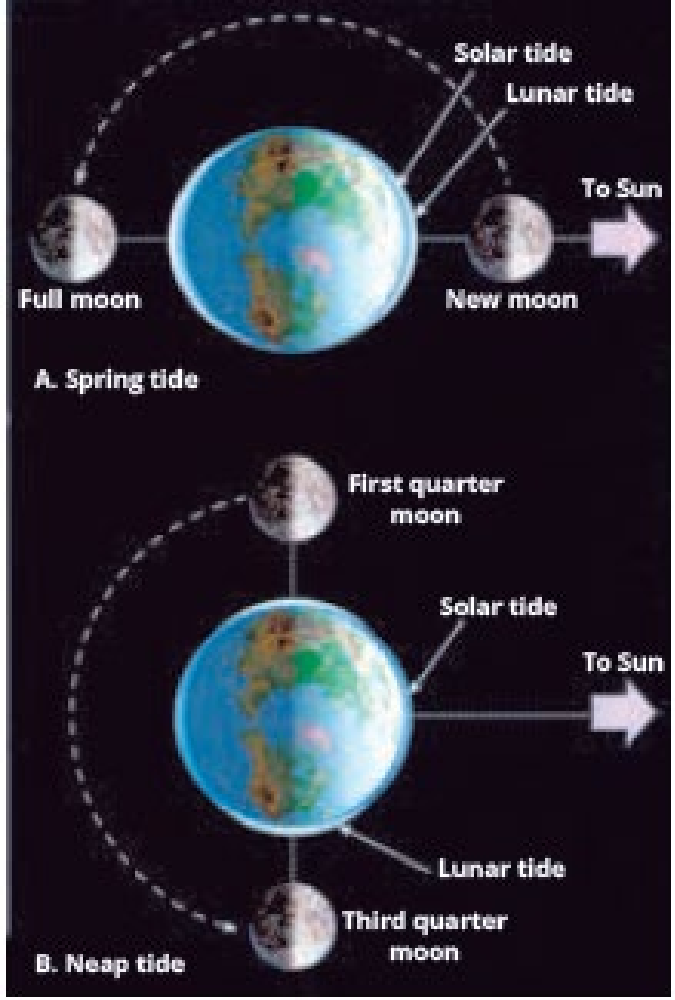
The relative position of the Moon and the Sun with respect to the Earth is responsible for the variation in the height of tides. The difference between the high tide water and the low tide water is called the **tidal range**.

Spring Tide

On **full moon** and **new moon** days, the Sun, the Moon and the Earth are almost in the same line. On these days, the Sun and the Moon exert their combined gravitational force on the Earth. Thus on these two days the high tides are the highest and are known as **spring tides**.

Neap Tide

On **half Moon** days (i.e. first and last quarter phases of the Moon), the Sun and the Moon are at right angles to the centre of the Earth. The tide producing force of the Moon and the Sun, work in opposite directions and they partly cancel each other's force. In such cases, the high tide is lower than the normal and low tide is higher than the normal.



Formation of spring tide and neap tide

IMPORTANCE OF TIDES

1. Tides generally help in making some of the rivers navigable for ocean going vessels. Large ships enter the harbour of a shallow sea during high tides and they go back also at the time of high tides.

2. The river mouths and estuaries are kept clean of sedimentation due to the action of tidal currents.

3. At the time of high tides, the salty sea water is stored in the low-lying coastal areas. This water is spread out in fields and used for preparing common salt.
4. The tidal force can also be used as a source for generating electricity.

5. The water, during the high tide, strikes the coastal areas with a great force and breaks the regular coastline. Thus it helps in the development of creeks and inlets along the coast.
6. The inflow of the salty tidal water, especially along the coast of cold countries, retards the process of freezing and prevents the harbours from becoming ice-bound.
7. The fishing industry is helped by the rhythm of high and low tides.
8. A large variety of sea creatures such as oysters live in the rocky front of the sea coast. The high tide brings food for them and helps in their growth and development.

OCEAN CURRENTS

The general movement of oceanic water in a definite direction is called the **ocean current**. The ocean currents are like rivers in the sea and their banks and beds are of sea water.

Tidal current

When a gulf is connected to the open sea by a narrow channel, the water flows into the gulf at the time of high tide and comes out of the gulf at the time of low tide. This inward and outward movement of water is known as the **tidal current**.

TYPES OF OCEAN CURRENTS

Ocean currents can be broadly divided, on the basis of temperature, into two main types:
1. The **warm currents** are those which flow from the low latitudes in the tropical zone towards the high latitudes in the temperate and sub-polar zones.

2. The **cold currents** are those which flow from the high latitudes towards the low latitudes.

CAUSES OF OCEAN CURRENTS

The ocean currents are caused due to the combined effect of several factors acting internally as well as externally. Some of them are as under:

- Variation in the Temperature of Ocean Water
- Variation in the Salinity of Ocean Water
- Evaporation from Ocean's Surface
- Direction of the Prevailing Winds
- Rotation of the Earth

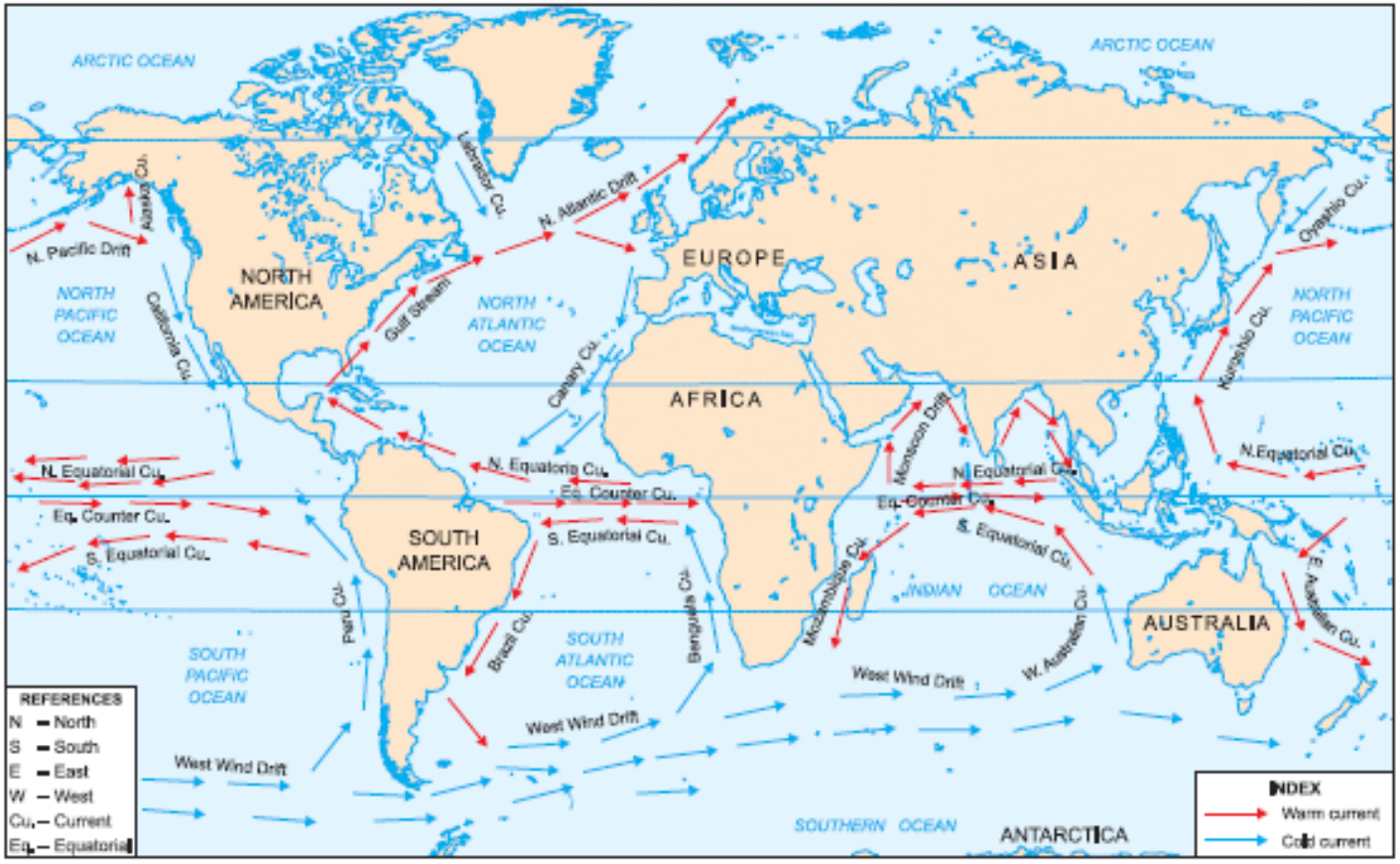
CURRENTS OF THE ATLANTIC OCEAN

To the north and south of the equator, there are two westward moving currents – the **North Equatorial Current** and the **South Equatorial Current**.

The Gulf Stream is one of the largest warm water currents. It originates from the Gulf of Mexico (about 20° N). It leaves the Gulf of Mexico through the Florida Strait and moves in a north-easterly direction along the eastern coast of North America.

The North Atlantic Drift gradually widens and its speed decreases. It becomes a prominent, slow-moving current.

The Labrador Current is a cold water current, which has its origin in the Arctic Ocean and it flows from north to south between Greenland and the Baffin islands.



World – Ocean currents

- The Labrador Current merges with the Gulf Stream near Newfoundland. This helps in the growth of planktons – a feed for fish. Thus the **Grand Banks** near Newfoundland have become the ideal fishing ground in the world.
- The **Canary Current** is a cold current and flows along the western coast of Spain and Portugal and the north-west coast of North Africa.
- The **Brazil Current** is a warm current and flows southwards along the east coast of South America (about 40° S latitude).
- The **Benguela Current** is a cold current which originates in the Antarctic region and flows along the coast of southwest Africa.

- The eastward continuation of the Brazil Current is called the **South Atlantic Drift** or the **West Wind Drift**.

CURRENTS OF THE PACIFIC OCEAN

- The **North Equatorial Current** is a warm current which originates off the western coast of Mexico and flows in the westerly direction.
- The **South Equatorial Current** is a warm current which originates due to the influence of southeast Trade winds and flows from east to west.
- **The Kuroshio Current** is an important **warm current**, which develops partly due to the Coriolis force and partly due to the obstruction by the Philippines in the flow of the North Equatorial Current.
- **The Oyashio or Kurile Current** is a **cold current** which originates from the Bering Strait and moves southwards along the coast of Kamchatka Peninsula to touch the islands of Kurile. It carries with it the cold water and icebergs from the Arctic Ocean to the coast of eastern Russia and Japan.
- The **West Wind Drift** is a strong, cold current, which flows from west to east between Tasmania and South American coast.

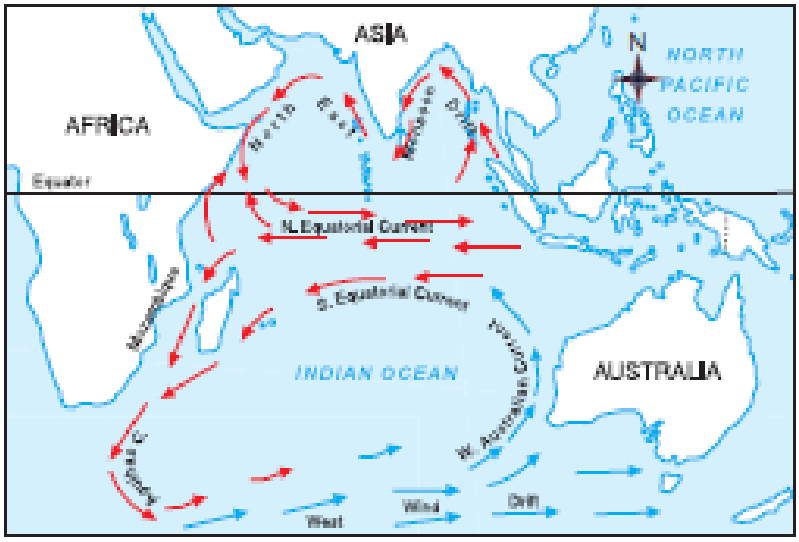
WORK OF WIND

The work of wind as an agent of denudation is not as effective as that of rivers, glaciers or sea waves in the evolution and development of major landforms. It is generally associated with the arid and semi-arid environments. It is not active in cold deserts, as the surface may be hard or covered with ice sheets. The velocity of wind is of primary importance in its erosional work.

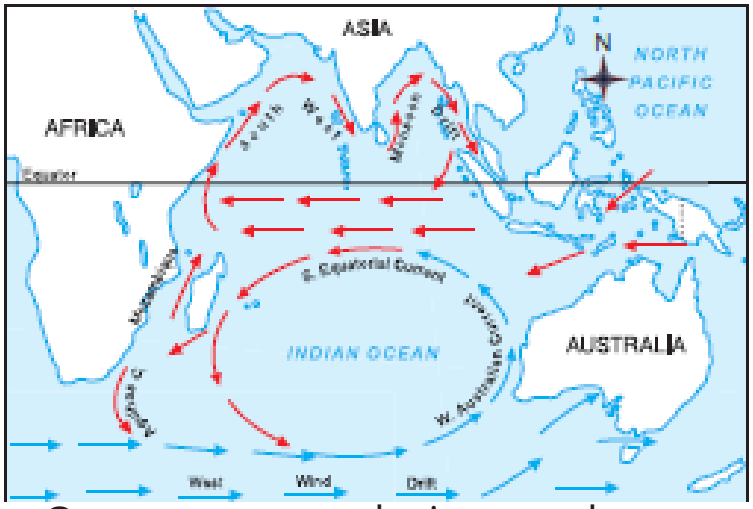
CURRENTS OF THE INDIAN OCEAN

The ocean currents in the northern part of the Indian Ocean are controlled and modified by the landmasses and the Monsoon winds. The ocean currents of the North Indian Ocean flow under the influence of the North-east and the South-west Monsoon winds. Thus, ocean currents change the direction of flow twice a year.

- The **North-east Monsoon Current**, under the influence of Northeast Monsoon winds (in the winter season), flows from northeast to southwest.
- The **South-west Monsoon Current**, under the influence of Southwest Monsoon winds (in the summer season), flows from southwest to northeast. The reversal in the direction of winds also reverse the direction of the ocean current.
- The warm **South Equatorial Current** flows from east to west between 10° S and 15° S latitudes from the western coast of Australia to the eastern coast of Africa.
- The **Agulhas Current** is a warm current which is a branch of the South Equatorial Current and flows along the eastern coast of Madagascar.
- The **Mozambique Current** is a warm current which is the southern branch of the South Equatorial Current and enters the Mozambique Channel around 10° S latitude.



Ocean currents during north-east monsoons in the Indian Ocean



Ocean currents during south-west monsoons in the Indian Ocean

- The **West Wind Drift** is a cold current in the southern part of the Indian Ocean and moves from west to east around 40° S latitude.
- The **West Australian Current** is a cold current which flows along the western coast of Australia.

EFFECTS OF OCEAN CURRENTS

The ocean currents influence the distribution of temperature, pressure, wind and precipitation in the adjoining coastal areas.

1.The ocean currents can influence the distribution of temperature over the globe. The warm and cold currents increase and decrease the temperature of the coastal regions respectively.

2. The ocean currents help in balancing the ocean temperature as the warm currents carry the warm water of the tropical regions to the colder areas of the temperate and polar regions. The cold currents bring cold water of the high latitudes to the low latitudes.

3. The warm currents increase the moisture-bearing capacity of the wind, while the cold currents decrease the same. Regions under the influence of warm currents experience heavy rainfall, while the cold currents bring dry conditions. Deserts are found mostly along the western side of the continents along which the cold currents flow.

4. The mixing of warm and cold currents causes dense fog, which hampers smooth navigation. Such conditions are found near Newfoundland and Japan.

5. The ocean currents used to decide the ocean routes for navigation of commercial ships in ancient times. Today the motor-powered ships do not care much for the ocean currents or prevailing winds.

6. The ocean currents distribute various nutrients and other things necessary for the existence, survival and growth of fishes. They transport the planktons, the food for fishes, from one area to another.

7. The warm currents help in keeping the seaports ice-free and hence they remain open throughout the year, even in the higher latitudes.

8. Icebergs coming with the cold water currents from the Arctic Ocean and Antarctica cause heavy damage to vessels. So ships avoid such routes.

9. The ocean currents affect the route of cyclones as the low pressure conditions created by warm currents attract cyclones.

THANK YOU