

# Class 11 Geography Notes Chapter 13 Movements of Ocean Water

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The ocean water is dynamic. The horizontal and vertical motions are common in ocean water bodies.

The horizontal motion refers to the ocean currents and waves. The vertical motion refers to tides. Ocean currents are the continuous flow of huge amount of water in a definite direction while the waves are the horizontal motion of water.

Water moves ahead from one place to another through ocean currents while the water in the waves does not move, but the wave trains move ahead.

Water particles only travel in a small circle as a wave passes. Wind provides energy to the waves. Wind causes waves to travel in the ocean and the energy is released on shorelines.

The largest waves are found in the open oceans. Waves continue to grow larger as they move and absorb energy from the wind.

Most of the waves are caused by the wind driving against water. When a breeze of two knots or less blows over calm water, small ripples form and grow as the wind speed increases until white caps appear in the breaking waves. Waves may travel thousands of kilometers before rolling ashore, breaking and dissolving as surf. A wave's size and shape reveal its origin.

The moon's gravitational pull to a great extent and to a lesser extent the sun's gravitational pull, are the major causes for the occurrence of tides. Another factor is centrifugal force, which is the force that acts to counter balance the gravity.

Together, the gravitational pull and the centrifugal force are responsible for creating the two major tidal bulges on the earth.

On the side of the earth facing the moon, a tidal bulge occurs while on the opposite side though the gravitational attraction of the moon is less as it is farther away, the centrifugal force causes tidal bulge on the other side.

The highest tides in the world occur in the Bay of Fundy in Nova Scotia, Canada. The tidal bulge is 15 – 16 m. Because there are two high tides and two low tides every day (roughly a 24 hour period); then a tide must come in within about a six hour period. As a rough estimate, the tide rises about 240 cm an hour (1,440 cm divided by 6 hours).

The most common tidal pattern is semi-diurnal tide, featuring two high tides and two low tides each day. The successive high or low tides are approximately of the same height.

The height of rising water (high tide) varies appreciably depending upon the position of sun and moon with respect to the earth. When the sun, the moon and the earth are in a straight line, the height of the tide will be higher. These are called spring tides and they occur twice a month, one on full moon period and another during new moon period.

Normally, there is a seven day interval between the spring tides and neap tides. At this time the sun and moon are at right angles to each other and the forces of the sun and moon tend to counteract one another.

Once in a month, when the moon's orbit is closest to the earth (perigee), unusually high and low tides occur. During this time the tidal range is greater than normal.

When the earth is closest to the sun (perihelion), around 3rd January each year, tidal ranges are also much greater, with unusually high and unusually low tides. When the earth is farthest from the sun (aphelion), around 4th July each year, tidal ranges are much less than average.

Usually, the currents are strongest near the surface and may attain speeds over five knots. At depths, currents are generally slow with speeds less than 0.5 knots. We refer to the speed of a current as its "drift." Drift is measured in terms of knots. The strength of a current refers to the speed of the current. A fast current is considered strong. A current is usually strongest at the surface and decreases in strength (speed) with depth. Most currents have speeds less than or equal to 5 knots.

Surface currents constitute about 10 per cent of all the water in the ocean, these waters are the upper 400 m of the ocean and deep water currents make up the other 90 per cent of the ocean water. These waters move around the ocean basins due to variations in the density and gravity.

Heating by solar energy causes the water to expand. That is why, near the equator the ocean water is about 8 cm higher in level than in the middle latitudes. This causes a very slight gradient and water tends to flow down the slope. Wind blowing on the surface of the ocean pushes the water to move.

Ocean currents are classified into cold currents and warm currents on the basis of temperature. Cold-water ocean currents occur when the cold water at the poles sinks and slowly moves towards the equator. Warm-water currents travel out from the equator along the surface, flowing towards the poles to replace the sinking cold water.

The mixing of warm and cold currents help to replenish the oxygen and favour the growth of planktons, the primary food for fish population. The best fishing grounds of the world exist mainly in these mixing zones.

### **Class 11 Geography Notes Chapter 13 Important Terms:**

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- Waves: Waves are actually the energy, not the water as such, which moves across the ocean surface.

- Tides: The periodical rise and fall of the sea level, once or twice a day, mainly due to the attraction of the sun and the moon, is called a tide.
- Surges: Movement of water caused by meteorological effects (winds and atmospheric pressure changes) are called surges.
- Tide generating force: The 'tide-generating' force is the difference between two forces; i. e. the gravitational attraction of the moon and the centrifugal force.
- Tidal currents: When the tide is channelled between islands or into bays and estuaries they are called tidal currents.
- Ebb: The time between the high tide and low tide, when the water level is falling, is called the ebb.
- Flow or Flood: The time between the low tide and high tide, when the tide is rising, is called the flow or flood.
- Crest: The highest point of a wave is called the crest
- Trough: The lowest point of a wave is called trough.
- Wave height: It is the vertical distance from the bottom of a trough to the top of a crest of a wave.
- Wave amplitude: It is one-half of the wave height.
- Wave period: It is merely the time interval between two successive wave crests or troughs as they pass a fixed point.
- Wavelength: It is the horizontal distance between two successive crests.
- Wave speed: It is the rate at which the wave moves through the water, and is measured in knots.
- Wave frequency: It is the number of waves passing a given point during a one second time interval.
- Semi-diurnal tide: The most common tidal pattern, featuring two high tides and two low tides each day. The successive high or low tides are approximately of the same height.
- Diurnal tide: There is only one high tide and one low tide during each day. The successive high and low tides are approximately of the same height.
- Mixed tide: Tides having variations in height are known as mixed tides. These tides generally occur along the west coast of North America and on many islands of the Pacific Ocean.
- Spring tides: The position of both the sun and the moon in relation to the earth has direct bearing on tide height. When the sun, the moon and the earth are in a straight line, the height of the tide will be higher. These are called spring tides.
- Perigee: The time when the moon's orbit is closest to the earth is called perigee.
- Apogee: The time when the moon is farthest from earth is called apogee.
- Perihelion: When the earth is closest to the sun.
- Aphelion: When the earth is farthest from the sun
- Gyres: Gravity tends to pull the water down the pile and create gradient variation. The Coriolis force intervenes and causes the water to move to the right in the northern hemisphere and to the left in the southern hemisphere. These large accumulations of water and the flow around them are called Gyres.