Ocean Currents: General Information Essay

Ocean currents are the routed movements of oceanic water which are constantly flowing within the ocean or on the ocean surface. An ocean current is created by several forces and elements that act upon a unit mass of water in the ocean and such factors on an environmental scale include the gravitational pull of the Moon and the Sun, wind, salinity levels, and the rotation of the earth, temperature and tidal waves. However, the two forces that create the most conducive conditions for a current to form are the Sun and the rotation of the Earth.

Physical factors such as the depth of the ocean, contact with other currents and the composition of the shoreline will determine a current's course and potency. Ocean currents are known to surge for great distances and the gravitational centrifugal pull of great currents round the earth has a pivotal role in influencing the global climate especially of islands and coastal regions.

It is well know that the California Current makes the weather of the Island of Hawaiian to be cooler as measure up to other regions which are situated at the same latitude, the current is a tropical one leading to the sub-tropical climate of the islands. Ocean currents also determine the marine life of a region because they play a major role in determining the salinity of the water.

Currents can carry a large volume of highly saline water for great distances and the marine life of the region where the water gets deposited can significantly be altered. There are different currents are flowing at different levels in the ocean and it is possible for two or more currents to flow through a single region simultaneously but at different levels.

There are generally two types of ocean currents depending on the water level where the movement of oceanic water takes place and they are the deep ocean currents and the surface ocean currents. Deep ocean currents are mainly caused by the fluctuation in the mass of water and by gravitational forces acting in the deeper parts of the ocean usually below three thousand feet.

Variation in temperature and the salinity levels of the water cause a change in the mass and volume of water leading to deep ocean currents. A submarine river is another term which is used to refer to deep water currents basically because the currents occur in the lower levels of the ocean.

The deep ocean currents carry large volumes of water which flow the greatest distances leading to thermohaline circulation. The submarine rivers are at times responsible for transferring deep water plankton and marine life from one part of the ocean to another and also cause the vertical movement of water in the upwelling and down welling parts in the oceans. On the other hand, surface ocean currents take place on the upper levels of the ocean and are commonly caused by air currents acting on the ocean's surface. Surface currents are composed of about ten percent of the total water volume in the ocean and are usually limited to the upper one thousand three hundred feet of the ocean.

Surface currents form the Ekman spiral effect which is the circular movement of ocean surface water at a given tangent relative to the prevailing air currents. The Ekman spiral effect is usually

in a clockwise direction in the northern hemisphere and in a counter-clockwise spiral in the southern hemisphere due the alternate air movements inflicted.

However, the Indian Ocean does not follow this rule due to the strong torrential rains and the atmospheric system in northern region of the ocean which alters its trend twice every year. The southwest torrential rain which occurs off the coast of Somalia is caused by the Great Whirl, which is a strong current which has a circular motion.

The currents on the ocean basin surface are normally asymmetric with the eastern currents flowing towards the equator and the western currents flowing towards the North and South poles. Such currents are majorly influenced by gravity, with the eastern currents flowing in separate extensive currents whereas the western currents for instance the Gulf Stream are relatively contracted.

Deep water current movement patterns are formed through a complex process which begins with the freezing of the water in the ocean. Once the water is frozen, the salt in the ocean water is also condensed in the freezing process and this leads to the creation of a layer of cold salt concentrated water which forms near the surface of the water where freezing generally takes place.

The brine then gradually sinks because of the density difference, brine being denser than the water below. The salt concentrated water is more viscous which makes it become denser than the water around it. Consequently, the gelatinous salty liquid sinks, leaving the surface levels of the ocean and will only settle when it gets to a region in the ocean where it bears an equal density to the surrounding ocean water.

This process is very prominent in the Greenland and Labrador Seas that are located in the Northern Hemisphere, and the Weddell and Ross Seas in the Southern Hemisphere. Similar to surface currents, most of the current movement takes place on the western sides of ocean basins except that deep ocean currents have their progression towards the north.

Surface currents flow in a succession of nearly circular gyres in the ocean basins. Most of the gyres are located in the western regions of the globe where the currents are contracted and carry large volumes of water for example the Gulf Stream, Agulhas and East Australian Currents.

The oceanic and atmospheric gyres help to move heat generated in the equatorial regions towards the poles. The polar movements of the ocean currents constitute the northward warm water current in the North Atlantic and in the North Pacific and the southward flow through the East Greenland and Labrador Currents. The surface currents that flow towards the equator move alongside the eastern edges of the gyres and are usually cooler than the currents that flow towards the poles located on the western margins.

Air movement causes upwelling and provides the requisite wind stress towards the equatorial region moving water away from the coast and gravitational force pushes cooler subsurface water to replace the unoccupied water spaces. The Southern Ocean region experiences persistent westerly air movement leading to the Antarctic Circumpolar Current, a constant circumglobal current which hinders the formation of gyres.

The Antarctic Circumpolar Current allows for the integration water from different ocean basins making it the largest current on earth. Sverdrup (Sv), is the standard unit used to measure ocean currents with one Sv being equivalent to a volume flow rate of one million cubic meters per second.

The equatorial region experiences little or no gyres and currents here are usually surface currents stirred by the trade winds that originate from the eastern regions of the Northern Hemisphere and the Southern Hemisphere.

The North and South Equatorial Currents which move toward the west are formed by trade winds which lead to an upwelling along the equator due to the movement of the southeast trade winds across the equator. Furthermore, the equatorial region does not incur Coriolis force which is potent even with a one degree shift north or south of the equator.

The Doldrums region is formed in the equatorial region where the northern and southern currents border. The Doldrums region is generally permeable to the Equatorial Countercurrent water that flows back eastwards since the water would otherwise get concentrated on the western boundary allowing the doldrums region to act as an outlet. The velocity of the currents also varies, with the western currents moving faster than the eastern currents.

Marine life in the oceans is totally dependant on ocean currents for survival. Oxygen derived from the atmosphere is mixed with water through the flux of surface water like waves which are more or less generated by surface currents. For the oxygen to be delivered to the organisms, the oceanic currents and welling are needed to translocate the oxygen to all tiers of the ocean.

Furthermore, marine victuals for instant phytoplankton which are minute organisms that are primary in the marine food chain are distributed in the ocean through the ocean currents. The organisms are usually caught in the currents and transported for great distances before being deposited in an ecosystem where they establish sustenance.

Therefore ocean currents play an important role to both shallow and deep water organisms because they push food into the organisms' environment. Surface organisms such as crabs are also reliant on the currents which carry microorganisms from the oceans and deposit them near the shores.

In addition, currents provide inimitable signals in the life cycle of almost all marine organisms through transport of subtle chemical indicators. Turtles for instance migrate for long distances to mate and the precursor to their migration is the sensing of chemical triggers produced by sources that are more than a thousand miles away which are transported by ocean currents.

Warm water used by marine life such as fish and turtles to incubate their eggs is deposited to the nesting grounds through ocean currents. Physical features such as lagoons are put together through the ocean currents which carry marine particles that are then deposited onto the lagoons leading to the expansion of the ecosystem. Due to the fact that ocean currents can move for great distances, they are also likely to spread out toxins in the oceans.

For example, DDT which was a deadly insecticide was commonly used in America in the mid twentieth century. Through deltas, slight concentrations of the insecticide were moved to the

ocean. The eventual consequence was that the product was found in penguins in both the north and south poles which had led to the thinning of the penguin egg shells. The only possible reason as to how the insecticide moved to such great distances is through ocean currents.