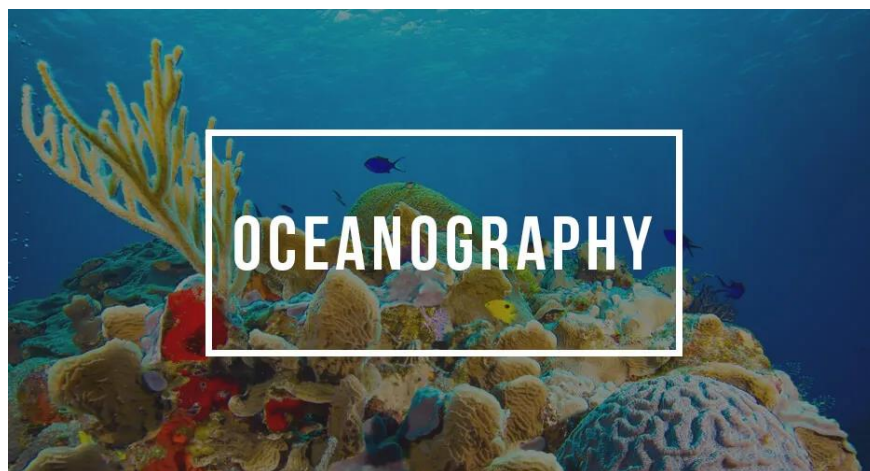


## Department of Oceanography



**Course Title: Oceanography**

**Course code: OC-3201**

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**Abyssal:** The abyssal zone or abyssopelagic zone is a layer of the pelagic zone of the ocean. At depths of 4,000–6,000 m, this zone remains in perpetual darkness. It covers 83% of the total area of the ocean and 60% of Earth's surface. The life that is found in the Abyssal Zone includes chemosynthetic bacteria, tubeworms, and small fish that are dark in color or transparent. It also includes sharks and invertebrates such as squid, shrimp, sea spiders, sea stars, and other crustaceans.

**Abyssal plain:** An abyssal plain is an underwater plain on the deep ocean floor, usually found at depths between 3,000 and 6,000 meters. Lying generally between the foot of a continental rise and a mid-ocean ridge, abyssal plains cover more than 50% of the Earth's surface. Animals that commonly occur in abyssal sediments include molluscs, worms (nematodes, sipunculids, polychaetes, hemichordates and vestimentiferans) and echinoderms (holothuroids, asteroids, ophiuroids, echinoids, and crinoids).

**Basin:** Ocean basins are the regions that are below sea level. They can be either inactive and collect sediment or be active. Active ocean basins undergo changes mainly due to plate tectonics. Ocean basins are the largest depressions on Earth. Edges of the continents, called continental shelves, form the sides of ocean basins. There are five major ocean basins, coordinating with the major oceans of the world: the Pacific basin, the Atlantic basin, the Indian basin, the Arctic basin, and the Southern basin.

**Bathypelagic:** A layer of the oceanic zone lying below the mesopelagic zone and above the abyssopelagic zone, at depths generally between about 1,000 and 4,000 m (3,280-13,120 ft). The bathypelagic zone receives no sunlight and water pressure is considerable. Vampire Squid, Deep Sea Anglerfish, Snake Dragon Fish, Deep-Sea Amphipod, Gulper Eel are found in bathypelagic zone.

**Benthic:** The benthic zone is the lowest ecological zone in a water body, and usually involves the sediments at the seafloor. These sediments play an important role in providing nutrients for the organisms that live in the benthic zone. Benthic zones are found in brackish, freshwater and saltwater. Benthic ecosystems in the sea are separated into four groups based on their depth:

The nearshore and estuarine zones (less than 200 m)

Bathyal zone (200 to 2,000 m)

Abyssal zone (2,000 to 6,000 m)

Hadal zone (over 6,000 m)

**Continental shelf:** A continental shelf is a portion of a continent that is submerged under an area of relatively shallow water, known as a shelf sea. A continental shelf typically extends from the coast to depths of 100–200 meters.

Lobster, Dungeness crab, tuna, cod, halibut, sole and mackerel can be found. Permanent rock fixtures are home to anemones, sponges, clams, oysters, scallops, mussels and coral. Larger animals such as whales and sea turtles can be seen in continental shelf areas as they follow migration routes.

**Continental slope:** A continental slope is the slope between the outer edge of the continental shelf and the deep ocean floor.

Continental slopes form a large portion of continental margins that lie at water depths ranging from 100 to 3000 m with an average slope of 4 degrees. We can find animals like Crab, cod, tuna, lobster, sole, halibut, mackerel and Dungeness in the continental rise depth. Permanent rock fixtures are home to anemones, clams, corals, mussels, oysters, scallops, and sponges.

## Lagoon

A lagoon is a shallow body of water that is isolated from a deeper one by coral reefs, islands, or sandbars. Lagoons are common in tropical regions. Lagoons are often distinguished from the deeper and more choppy seas of the open sea by their calm and relatively shallow waters. Lagoons come in a variety of sizes and shapes, are frequently crucial habitats for many aquatic species, and may be utilized for leisure pursuits like swimming, boating, or fishing. Lagoons can also be found in upland, coastal, or estuarine settings, depending on their creation and location.

For example: The Blue Lagoon in Grindavk, Iceland, Lençóis Maranhenses National Park in Maranhão, Brazil, The Venetian Lagoon, etc.



## Euphotic Zone

The layer that is closest to the surface and gets sufficient light for photosynthesis is called the euphotic zone. The disphotic zone is below, but it is so dimly lit that respiration rates are higher than photosynthesis rates. The uppermost region of the ocean where photosynthesis may take place is known as the euphotic zone. Depending on the location and the quality of the water, its depth fluctuates. The marine food web is built on tiny plants called phytoplankton, which utilize sunlight to transform energy and nutrients into organic matter. The euphotic zone is crucial for understanding marine ecosystems and the global carbon cycle because it has important

characteristics such as nutrient availability, marine life, and biological productivity. It is observed by scientists to evaluate the state of the environment and the effects of climate change on the seas.

## Littoral Zone

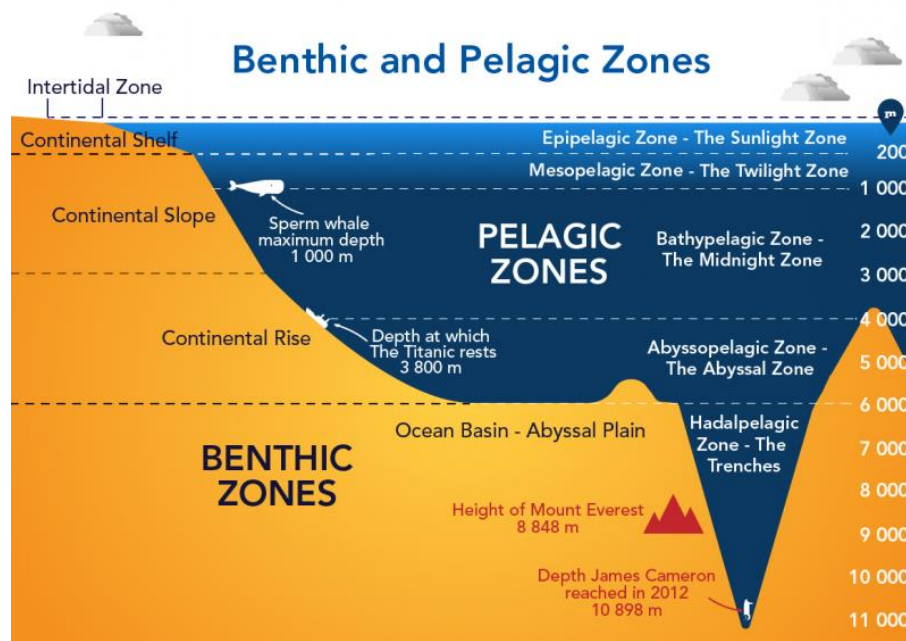
In aquatic ecosystems including lakes, rivers, and seas, the area along the coastline where water meets land is known as the littoral zone. It is an ecologically significant area because it is a dynamic and shallow area that harbors a wide variety of aquatic and terrestrial species. This region is renowned for the diversity of its habitats, the efficient cycling of nutrients, and its function as a species nursery. Due to its accessibility and different habitats, it also acts as a focal point for recreational and ecological activities.

## Mesopelagic Zone

The mesopelagic zone, often known as the twilight zone, is a layer of the ocean between 200 and 1,000 meters below the surface. Due to the little sunshine, the varied marine life there has developed adaptations like bioluminescence. Because of the species that live in this area, which feed on sinking particles and act as food for bigger predators, the marine food web is extremely important in this area. Due to its part in carbon cycle and carbon dioxide sequestration in the deep ocean, it is also of scientific interest.

## Tectonic Zone

The lithosphere, the Earth's outermost layer, is divided into big and tiny pieces called tectonic plates. These plates move and interact with one another along borders. These boundaries include transform borders as well as divergent boundaries that move past one another.



Numerous geological processes, including earthquakes, volcanic eruptions, and the creation of mountain ranges, are caused by the movement of these plates. In order to investigate Earth's geological processes and how its surface is shaped, tectonics must be understood.

**Fiord:** A fiord (also spelled "fjord" or "fiord") is a long, narrow, deep inlet of the sea that is typically bordered by steep cliffs or mountains on both sides. Fiords are formed through a combination of glacial activity and geological processes. They often have a distinctive U-shaped or V-shaped profile and can extend for many miles inland from the open ocean. Fiords are a common geographical feature in regions with a history of glaciation, such as Norway, New Zealand, Canada, and parts of Chile. They are known for their stunning natural beauty and are often popular tourist destinations.

**Thermocline:** A thermocline is a distinct layer within a body of water (such as a lake, ocean, or even a swimming pool) where there is a rapid change in temperature with depth. The temperature decreases significantly in a thermocline as you move deeper into the water.

The term "thermocline" is often used in the context of oceans and large bodies of water, where it plays a significant role in the distribution of heat and affects the behavior of marine life and ocean currents. There are typically three main layers in a thermocline:

**Epilimnion (or Epipelagic Zone):** This is the uppermost layer of the water column, where the temperature is relatively warm and consistent with depth. It's exposed to sunlight and is wellmixed, allowing oxygen and nutrients circulation. This layer is often inhabited by phytoplankton and other photosynthetic organisms.

**Thermocline:** This is the middle layer and the main focus of the thermocline. In this layer, the temperature decreases rapidly with increasing depth. The rate of temperature change varies depending on factors such as location, season, and local conditions. The thermocline acts as a barrier, limiting the mixing of water between the upper and lower layers.

**Hypolimnion (or Bathypelagic Zone):** This is the lower layer, below the thermocline, where the water is colder and more stable in terms of temperature. It typically contains water that has been isolated from the surface for an extended period. Nutrient-rich sediments and organic matter may accumulate in this layer, making it an important habitat for certain species of fish and other deepwater organisms.

The presence and depth of the thermocline can vary depending on geographical location, time of year, and other factors. For example, the ocean's thermocline tends to be deeper in tropical regions and shallower in polar regions. The thermocline is a critical feature in oceanography and limnology (the study of inland waters), as it affects water circulation patterns, the distribution of marine life, and the overall climate of a region.

**Deep:** In oceanography, the term "deep" typically refers to the deep ocean or the deep sea, which is the region of the ocean that lies at considerable depths below the surface. The specific depth at which the deep ocean begins can vary depending on context and the definition used, but it is generally considered to start at depths of around 200 meters (656 feet) and extend down to the ocean floor, which can reach depths of several thousand meters (or even more in some of the world's deepest trenches).

**Trench:** A trench is a long, narrow excavation or ditch typically dug into the ground, usually with a specific purpose or function in mind. A deep, elongated depression in the ocean floor, often associated with tectonic plate boundaries. The Mariana Trench in the western Pacific Ocean is the deepest known ocean trench on Earth. Trenches can vary in size, depth, and shape, and they serve various purposes in different contexts. The term "trench" generally implies a long, narrow, and often excavated feature, but its specific meaning can vary depending on the context in which it is used.

**Upwelling:** Upwelling is a phenomenon in oceanography and marine science that refers to the process by which cold, nutrient-rich water from the ocean's depths rises to the surface. This movement of deep water towards the surface is a critical part of the ocean's circulation system and has significant ecological and climatic implications. Upwelling regions are known for their high biological productivity, as the nutrient-rich waters that well up from below support the growth of phytoplankton, which forms the base of the marine food web. This, in turn, attracts various species of fish and other marine organisms, making upwelling areas important for commercial fishing.