UNIT - I: Oceanography: Definition, Oceans and seas - Extent and distribution – Surface configuration of the Ocean floor, Hypsometric curve – Continental shelf – Continental slope – Abyssal Plain – Deeps and Trenches.

Definition

Oceanography is the study of the ocean, with emphasis on its character as an environment. It is a science that deals with the oceans and includes the delimitation of their extent and depth, the physics and chemistry of their waters, marine biology, and the exploitation of their resources.

Continental Shelf

• Continental Shelf is the **gently sloping** seaward extension of continental plate.

• These extended margins of each continent are occupied by relatively **shallow seas and gulfs.**

• Continental Shelf of all oceans together cover **7.5%** of the total area of the oceans.

• Gradient of continental is of **1° or even less.**

• The shelf typically ends at a very steep slope, called the **shelf break.**

• The continental shelves are covered with variable thicknesses of sediments brought down by **rivers, glaciers** etc.

• Massive sedimentary deposits received over a long time by the continental shelves, become the source of fossil fuels [Petroleum].

• The shelf is formed mainly due to

1. submergence of a part of a continent
2. relative rise in sea level
3. Sedimentary deposits brought down by rivers

• There are various types of shelves based on different sediments of terrestrialorigin

1. glaciated shelf (Surrounding Greenland),
2. coral reef shelf (Queensland, Australia),
3. shelf of a large river (Around Nile Delta),
4. shelf with dendritic valleys (At the Mouth of Hudson River)
5. shelf along young mountain ranges (Shelves between Hawaiian Islands).

Width

• The average width of continental shelves is between **70 – 80 km.**

• The shelves are almost absent or very narrow along some of the margins like the coasts of Chile, the west coast of Sumatra, etc. [Ocean – Continent Convergence and Ocean – Ocean Convergence].

• It is up to 120 km wide along the eastern coast of USA. On the contrary, the **Siberian shelf** in the Arctic Ocean, the largest in the world, stretches to 1,500 km in width.

Depth

• The depth of the shelves also varies. It may be as shallow as 30 m in some areas while in some areas it is as deep as 600 m.

Importance of continent shelves

1. Marine food comes almost entirely from continental shelves;
2. They provide the richest fishing grounds;
3. **They are potential sites for economic minerals** [20% of the world production of **petroleum** and gas comes from shelves. **Polymetallic nodules** (**manganese nodules**; concentric layers of **iron and manganese hydroxides**) etc. are good sources of various mineral ores like manganese, iron copper, gold etc.]

Continental Slope

• The continental slope connects the continental shelf and the ocean basins.

• It begins where the bottom of the continental shelf sharply drops off into a steep slope.

• The gradient of the slope region varies between **2-5°.**

• The depth of the slope region varies between 200 and 3,000 m.

• The seaward edge of the continental slope loses gradient at this depth and gives rise to **continental rise.**

• The continental slope boundary indicates the end of the continents.

• Canyons and trenches are observed in this region.

Continental Rise

• The continental slope **gradually** loses its steepness with depth.

• When the slope reaches a level of between **0.5° and 1°**, it is referred to as the continental rise.

• With increasing depth the rise becomes virtually flat and merges with the **abyssal plain.**

Deep Sea Plain or Abyssal Plain

• Deep sea planes are gently sloping areas of the ocean basins.

• These are the **flattest** and smoothest regions of the world because of **terrigenous [**denoting marine sediment eroded from the land**] and shallow water sediments** that buries the irregular topography.

• It covers nearly **40%** of the ocean floor.

• The depths vary between 3,000 and 6,000 m.

• These plains are covered with fine-grained sediments like clay and silt.

Oceanic Deeps or Trenches

• The trenches are relatively steep sided, narrow basins (Depressions). These areas are the deepest parts of the oceans.

• They are of tectonic origin and are formed during ocean – ocean convergence and ocean continent convergence.

• They are some 3-5 km deeper than the surrounding ocean floor.

• The trenches lie **along the fringes of the deep-sea plain** at the bases of continental slopes and along island arcs.

• The trenches run **parallel to the bordering fold mountains** or the **island chains**.

• The trenches are very common in the Pacific Ocean and form an almost continuous ring along the western and eastern margins of the Pacific.

Mid-Oceanic Ridges or Submarine Ridges

• A mid-oceanic ridge is composed of two chains of mountains separated by a large depression. [Divergent Boundary]

• The mountain ranges can have peaks as high as 2,500 m and some even reach above the ocean's surface.

• These oceanic ridge systems are of **tectonic origin** and provide evidence in support of the theory of **Plate Tectonics.**

Abyssal Hills

• **Seamount:** It is a mountain with pointed summits, rising from the seafloor that **does not reach the surface** of the ocean. Seamounts are volcanic in origin. These can be 3,000-4,500 m tall.

• **Guyots:** The flat-topped mountains (seamounts) are known as guyots.

Submarine Canyons

• **CANYON:** a deep gorge, especially one with a river flowing through it

• **GORGE:** a steep, narrow valley or ravine

• **VALLEY:** a low area between hills or mountains or a depression, typically with a river or stream flowing through it.