Quadrant II – Transcript and Related Materials

Programme: Bachelor of Science (Second Year) Subject: Geology Paper Code: GEC-103 Paper Title: Earth's Dynamics and Structural Geology Unit: 3 Module Name: Oceans (continental shelf, slope, rise, abyssal plains, mid-oceanic ridges, trenches, islands). Module No: 29 Name of the Presenter: Dr. Ankeeta Amonkar

Notes

Morphological features of the ocean floor

The ocean profile begins from the shore, which is an irregular boundary where the surface of a continent descends first to a sea level fluctuations and the ocean floor profile starts.

The following sequence of bottom features are typically seen.

- 1) Continental Shelf
- 2) Continental Slope
- 3) Continental Rise
- 4) Abyssal Plains



Continental Shelf

The flat wide margin which start after a shore line is known as Continental shelf. The continental shelf is an area of relatively shallow water, usually less than a few hundred feet deep, that surrounds land. It is narrow or nearly nonexistent in some places; in others, it extends for 70 to 1000 km. The waters along the continental shelf are usually productive consisting of sufficient light and nutrients from upwelling and runoff.

Continental Slope

The sudden change in the slope of the continental shelf is called the shelf break. Beyond the shelf break, the slope or continental slope of the ocean floor begins. The slope is relatively steeper with a slope angle of 4° and can go upto 25°. The steep slope is known to consist of submarine canyons and gullies. The continental slope on an average is about 16 km wide and descends to a depth of about 2.4 km.

Continental Rise

At the base of continental slopes, the steep gradients of the slope decreases to 1 degree or less continuing into the abyssal hills or plains. This gentle slope area is known as Continental Rise.

Continental Rise is composed of fine grained continental sediments (silt and clay) which are brought by the submarine canyons.

Abyssal Plain

Continuing further down from a steep plain of continental slope and rise to a nearly leveled surface of the ocean floor is called as the **Abyssal Plain**. They mainly occur at depth below 4 kilometers and go up to several 1000 kms. Abyssal plains are the largest habitat on earth. Sunlight does not penetrate to this region, making these deep, dark ecosystems less productive than those along the continental shelf. But despite their name, these "plains" are not uniformly flat. They are interrupted by features like hills, valleys, and seamounts (underwater mountains that are also hotspot for biodiversity).

- Abyssal hills: Small hill on the ocean floor
- Seamounts: Abyssal hills with more than 1km height from the ocean floor
- Guyots or Table mounts: Seamounts with flat top

Mid-Ocean Ridge: Beyond the abyssal plain, which may be several hundred kilometers wide, the ocean floor begins to rise again with a gentle slope. These are the flank of the Mid-oceanic ridge. Mid-oceanic ridge are long undersea mountain chains that usually extends down the middle of the ocean. Typically has a depth of ~ 2,600 meters (8,500 ft) and rises about two kilometers.

Seafloor spreading takes place along a divergent plate boundary and associated with Mid-oceanic ridges. The rate of seafloor spreading determines the morphology of the crest of the mid-ocean ridge and its width in an ocean basin. The first discovered mid-ocean ridge was the Mid-Atlantic Ridge, which is a spreading center that bisects the North and South Atlantic basins.

Rift Valleys (Associated with Divergent plate): Along the center of the midoceanic ridge there is a deep V-shaped valley notch which is called as Rift Valley. Rifts are formed as a result of the pulling apart of the lithosphere due to extensional tectonics. From rift valley, the new oceanic crust is constantly being extruded to the surface of the ocean floor.

Ocean trenches: Oceanic trenches are prominent long, narrow topographic depression on the ocean floor. They are typically 50 to 100 kilometers (30 to 60 mi) wide and 3 to 4 km (1.9 to 2.5 mi) below the level of the surrounding oceanic floor, but can be thousands of kilometers in length. There are present worldwide, mostly around the Pacific Ocean.

The greatest ocean depth measured is in the Challenger Deep of the Mariana Trench, at a depth of 11,034 m (36,201 ft) below sea level. Oceanic trenches mark the locations of Convergent Plate boundaries on the ocean floor.

Oceanic islands: Oceanic islands are islands that rise from the ocean floor due to seismic or volcanic activity, as opposed to islands which form as part of a continental shelf where the water is shallow. Oceanic islands form far away from continents and are not linked with any large land masses. They can be found alone or in groups surrounded by deep water on all sides.