RELIEF FEATURES OF OCEAN FLOOR

By

Prof. Sanjay Kumar

Professor and HOD

P.G. Deptt of Geography

M.B.R.R.V.Pd.SINGHCOLLEGE,

(Maharaja College), Ara,

V.K.S.University , Bihar

CC-M-102 UNIT-IV

- Water is essential for all the living things and creatures on the earth. They need water for their different uses and continuation of life.In our solar system at present only earth is fortunate to have abundance of water. As you all know; no other planets of the solar system have sign of water except Mars.It is the only resource which is found in all the three stages (i.e. solid, liquid & gas) of matter.

- Geographically 3/4th (i.e. 71%) of the earth surface is covered with water .Out of which 97.3% is salty and 2.7% is fresh water. The large water bodies (remains of Panthalasa) are called oceans. All oceans are connected to each other. The total volume of the world ocean is approximately 1.3 billion cubic kms and the average depth of ocean is 4000 meter. All oceans have salt water. In Pacific Ocean 49.9%, in Atlantic Ocean 25.7%, in Indian Ocean 20.5% and in Arctic Ocean 3.9% of all oceanic water is found.75% of the fresh water is found in the glaciers and ice-sheets(2%) of Antarctica, Greenland and in mountainous regions whereas 25% of the fresh water is found in rivers , lakes , ponds ,streams, wells and in underground level(less than 1%).

- On the globe, Southern Hemisphere has more water; hence is called watery hemisphere. Earth is also called Blue Planet and Water Planet due to huge occurrence of water. Due to Raleigh scattering the propensity is for shorter wavelength at blue end light to be scattered more than longer wavelength red end. The water molecules during daytime absorb blue light as it has short wavelengths. That's why ocean appears blue. The sources of water are- Rivers (surface water), underground water, atmospheric water and ocean water.

- It is impossible to see relief of oceans through necked eye .Challenger expedition has given tremendous and revolutionary information regarding ocean relief. The expedition has broken some earlier myth and gave the new facts based on scientific study/techniques. Challenger expedition concluded that the deepest part is near the coast not in the central/middle part of the oceans.

DISTRIBUTION OF RELIEF

Class interval of relief	% of oceanic area
0-200	7.6%
200-1000	4.3%
1000-2000	4.2%
2000-3000	6.8%
3000-4000	19.6%
4000-5000	33.0%
5000-6000	23.3%
Above 6000	1.2%
Total	100.0%

OCEANS WITH RELIEFS (in %)

Class interval of relief (in m.)	Atlantic ocean	Pacific ocean	Indian ocean
0-200	3.8	5.7	4.2
200-1000	7.1	3.1	3.1
1000-3000	14.1	9.1	10.8
3000-4000	18.5	18.5	24.0
4000-6000	55.9	61.8	57.5
Above 6000	0.6	1.8	0.4
total	100.0	100.0	100.0

- OCEAN BASE APEX
- ATLANTIC OCEAN CAPE HORN- CAPE OF GOOD HOPE EAST OF GREENLAND
- INDIAN OCEAN IN SOUTH BAY OF BENGAL AND ARABIAN SEA
- PACIFIC OCEAN IN SOUTH NEAR ALEUTIAN ISLAND

- Another fact came out that the central part of the oceans has longest mountain ranges in the form of Mid Oceanic Ridge. The relief of ocean is more varied than continents. The average depth of ocean is nearly3800-4000 meters whereas; it is only 840 meters for continents. Hypsographic or Hypsometric curve is suitable for showing the (depth and height) relief of oceans and continents. The line on the map joining the places or points of equal depth on the sea floor is known as Isobaths. From continent to the deep of the ocean; six major reliefs are found successively.

Six major divisions of ocean reliefs:

- 1. Continental shelf- Continental shelf is a granitic structure find up to 200 m. of depth and consider as the part of continent. Average slope of the relief is 17feet per mile (10 to 30).The width of continental shelf can be about 5 kms to 1500 kms. Continental shelves are narrower where mountains are present near the coast and much wider where deltas are found near the coast. Eastern coast of India and eastern coast of China have wider shelves. The wider continental shelves are very gentle. Continental shelf on the eastern coast of U.S.A. is 120 kms wide while it is 1200 kms wide along Arctic Ocean. Maximum extension of continental shelf is in Atlantic Ocean. It is extended from Hudson Bay to North Sea and up to Norway Sea continuously. Continental shelves are formed due to (1) raise in the height of sea level, and (2) increase of deposits in ocean water.-- .

- Due to coastal mountains continental shelves becomes narrower.
- Narrower continental shelf is on the coast of Namibia and Angola Average width of continental shelf is nearly 30 miles.
- 8.6 % area of the total ocean comes under continental shelf.
- Out of the total area of the Atlantic Ocean, Pacific Ocean and Indian Ocean; continental shelf is extended over 13.3%, 5.7% and 4.2% respectively.
- Northern hemisphere is more continental shelf than southern hemisphere.
- Sunlight is present on shelves as it is the shallow part of ocean. Therefore, sea foods are available here.
- Fishes is found here as algae are abundantly found.
- Mineral oil and natural gas are also extracting from shelves region.

2. Continental slope-

- Continental slope is also a part of continent made up of granite. Beyond continental shelf steep slope starts known as continental slope. The average slope of this relief is 68 feet per mile (20 - 50).Actually; it is the submerged part of continent and is the end part of continent .Beyond this, ocean starts. No sea weeds/ plants grow here.
- .average slope of continental slope along St. Helena is 400.It is 300 along Spain, 150 along St. Paul and 50 - 150 along Calicut of India.
- . average depth of continental slope is 200-3000 m.
- .depth of continental slope near Peru and Chili coast is 3700m.
- .continental slope is extended over 8.5 % area of the total ocean.
- .continental slope is extended nearly 12.4 %, 7% and 6.5 % over Atlantic Ocean, Pacific Ocean and Indian Ocean respectively.
- .continental slope is generally devoid of marine deposits or have little layer of materials due to slope.
- Sea canyons are found here. Somewhere it starts from shelves or somewhere it starts from slope and reached up to ocean floor/ deep sea plain.
- The continental slope in Atlantic Ocean, east of U.S.A. starts from 80 kms from the coast and extended up to 383 kms.
- . There are five types of continental slope. They are- gentle slope, steep slope, fault slope, cascade / staircase slope and the slope on which sea mountains are found.

3. Mid oceanic ridge-

- East Pacific ridge, Mid-Atlantic ridge and Karl burg ridge. It makes world's longest mountain system.Karl burg ridge is in Y whereas Atlantic ridge is in S shape. The ridges are fracture zone through which plate slides. The ridge of Pacific ocean is like plateau rise. . Average depth of M.O.R. is 2000-4000m. . Due to diversion of plate, magma comes out and solidifies quickly and forms the ridge like structure along the plate. . Longest ridge is 14000 kms long found in Atlantic Ocean. It starts from Iceland in the north to Bonnet island in the south in 'S' shape. .The ridge is known as Dolphin Ridge in the north and Challenger Ridge in the south. .Indian ocean ridge is 9000 kms long from Lakshadweep to Antarctica with an average depth of 2000m. Hawaii and Honolulu Island is on the peak of the ridge. The extension of the ridge is near about on the 31% of the total oceanic area.

- Different name of Indian Ocean ridge- North of equator =Lakshadweep-Chagos ridge 00-300 S. = Chagos-St. Paul ridge 300-500 S. = St. Paul-Amsterdam ridge South of 500= Kargulen-Gausberg ridge

- Deep sea plain/Basins- Deep Sea plain is basaltic structure formed by plate tectonic activity. According to Harry-Hess it is the result of sea floor spreading (1 fathom=6feet).Deep sea plain starts after continental slope and is the extensive part of the ocean.
- Average depth of Deep Sea plain is 3000 - 6000m. .More than 80% of oceanic area comes under this relief.
- . Deep sea plain have very gentle slope. Some volcanic deposits are found here.

- **Atlantic Ocean**
- Western part 1. Labrador basin-4000m.
- 2. N. America basin- 5000m.
- 3. Brazilian basin- 4000m.
- 4. Argentinian basin-5000.
- . Eastern part 1. Spanish basin-5000m.
- 1. Angola basin-5000m.
- 2. Canary basin-4000m.
- 3. Cape basin-4000m.
- 4. Cape Bherde basin - 5000m
- 5. Gini basin-5000m.

- **Indian Ocean**
- Western Part
- 1. Oman basin-6000m.
- 2. Arabian basin-6000m.
- 3. Somali basin-6000m.
- 4. Mauritius basin-4000m.
- 5. Netal basin-4000m.
- 6. Aghulhas basin-6000m
- Eastern Part
- 1. Andaman Basin: 600-2000m. (North of 10degree)
- 2. Cocos-kiling Basin: 2000-4000m. (10degreeN.-50degreeS)
- 3. Indian Ocean- Antarctica Basin- 4000-6000m(South of 50degree)

Pacific Ocean

- Pacific Ocean
- 1. California basin- N.E.Pacific
- 2. Japanese basin- N.W. Pacific
- 3. Peru-Chili basin- S.E.Pacific
- 4. Australian basin- S.W.Pacific

5. Specialized features-

- Specialized features include coral reefs, sea- caves Guyots and sea mount like structures. Coral reef is a depositional features found on continental shelf. Generally, coral reefs are found on the eastern coast of islands or continents between 300North latitude to 300South latitude. Sea -caves are V shaped valley developed in continental shelf. It is found normally on the mouth of large rivers. According to some scientists sea- caves are submerged valley and were the part of landmass during Pleistocene age. Narrow deep V shaped valley cut deep into the continental shelf and slope are also called Submarine Canyons. The longest sea canyon is found in Bering Sea, west of Alaska. One is 400 kms long and other is 2600 kms long.

- There are 102 submarine canyons in the world which are of three types- a- Small gorges found on the shelf and slope. e.g-Oceanographer canyon in New England Region. b- Canyons whichbegins at the mouth of the river and extended over the shelf. e.g- Mississippi River Canyon. c- Deep dissected canyons -along the coast of California. According to Shepherd most of the canyons are found in the bay of California. Guyots and sea-mounts are hill-like structures found on oceans basins. These are residual hills of basalt in which Guyots are flat topped hills and sea-mounts are pointed topped hills.

6. Trenches-

- 6. Trenches- Deeps/trenches are the deepest part / depressions found in the ocean floor. Deeps are called Tiefe and Fosse in Germany and France respectively. Altogether 57 deeps are known in which 32 are in Pacific while 19 are in Atlantic and 6 are in Indian Ocean. It is extended over 5% of the oceanic area. It can be compared with the gorge found on landmass. Oceanic deep or trenches are the result of subduction of oceanic plate. Mariana, Port Rico and Sunda trenches are the deepest trenches of Pacific, Atlantic and Indian Ocean respectively.The deepest part of any ocean in the world is the Mariana trench.

SI.NO.	NAME	DEPTH (in metres)	LOCATION
1	Mariana	10911	North Pacific
2.	Tonga	9185	C.South Pacific
3.	Philippine/Swire	8720	N.W.Pacific
4	Port Rico/Nares	8525	Off W. Indian Islands
5.	Japan/Tuscarora	8515	Off Japan
6.	Romanche /Tizard	7378	S.Atlantic
7.	Sunda/Wharton	7000	E. Indian Ocean
8.	Murray	6475	C.N.Paciic
9.	Bailey	6280	N.W.Pacific
10.	Brooke	6270	N.W. Pacific
11.	Belknap	6105	Central Pacific
12.	Chun	6070	N. Pacific
13.	Moseley	6050	N. Atlantic
14.	Valdivia	5732	S. Atlantic &Indian oceans
15.	Buchanan	5600	Ern. S. Atlantic

Contd.

-
- THANK YOU