Oceanography Chapter 4

Bathymetry: discovery and study of the ocean floor.

- ◆ Earliest Poseidon (85 BC) 2km (1.25 miles) of line
- ♦ Sir James Clark Ross 4893 m (16,054 ft) 1818
- ♦ HMS Challenger 1870's steam powered winch
 - ♦ 492 bottom soundings, confirmed MOR

Echo Sounding

Fessenden (1914)- Iceberg detector/ Echo Soundings

• used also to find subs

Error: 1. Speed of sound waves with T,P, and Salinity

2. Exact Location

By 1959- first ocean bottom maps

Nowadays:

- 1. Multi beam systems
 - ♦ May have up to 121 beams
- 2. Satellite Altimetry
 - ♦ Calculate average of ocean surface
 - ♦ Reflects topography underneath

Topography of Ocean Floors

Continental Margin – submerged outer edge of a continent

Ocean Basin- deep seafloor beyond the continental margin

Figure 4.8 – Passive Continental Margin

Types of Margins

(Atlantic) 1. Passive Margins- diverging plates

(Pacific) 2. Active Margins

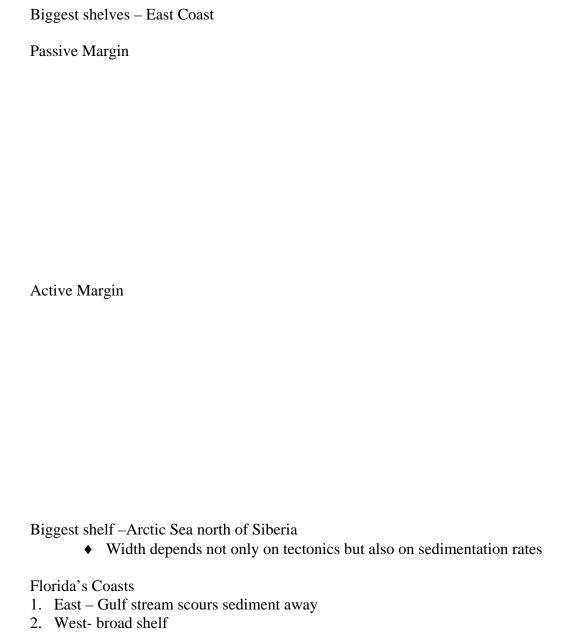
Continental Margins have

shelf \rightarrow slope \rightarrow rise

Fig 4.1

Continental Shelves

- ♦ Extension of continents
- ♦ Base is granite (an igneous rock)
- ♦ Much like the continent
- ♦ 7.4 % ocean area
- Most material of shelf is derived from eroded stuff from the continent
- Width of shelf is determined by plate boundaries



Continental Slopes – transition between the greatly descending continental shelf and the deep – ocean floor.

♦ 4° (70 ml km, 370 ft/mi) - 25°

Continental Shelves are greatly influenced by sea level

♦ Low level - erosion transport of sediments

• steeper in active margins

♦ High level – deposition

Shelf – Passive

♦ Short

♦ bottom is the edge of the continental slope

Shelf Break – makes the abrupt transition from continental shelf to continental slope

- ♦ water depth 140 m (460 ft)
- exceptions in Antarctica/Greenland (300-400)

Submarine Canyons

- ♦ Cut into shelf and slope
- ♦ Some as big as Grand Canyon
- ♦ How?

Originally thought that they may have formed from sea level changes and erosion, but there: 1929 Quake in New F.

♦ Broke cables – immediately, then some others staggered

Underwater Avalanche – Turbidity Currents (Graded Bedding)

Continental Rises

- ♦ Passive Margin only
- ♦ Gentle slope 1/8 of slope
- ♦ Sediment covers over basalt from turbidity
- ♦ Deep ocean currents reshape coast

Oceanic Ridges

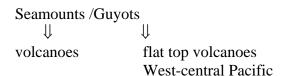
- Mountainous range of young basaltic rock
- ♦ Stretching 65,000 km (40,000 miles)
- Rise about 2 km off of the seafloor
- ♦ Azores, Easter Island, Iceland
- ♦ 22% solid surface area (24% continents)
- ♦ Offset by Transform Faults

Hydro thermal Vents

- ♦ Black Smokers
- ♦ 350° c (660° F)
- ♦ Sulfide rich
- ♦ Tubeworms, clams

Abyssal (without bottom) Planes/Hills

- ♦ Flat, featureless and deep
- ♦ 3700 to 5500m (12k to 18k feet deep)
- ♦ Sediment on top of basalt
- ♦ Small extinct volcanoes hills (see below)



Trench

- ♦ Arc-shaped depression where two tectonic plates meet
- ♦ Subduction Zone
- ♦ Active tectonically
- ◆ 1.9 to 3.7miles deeper than the abyss
- ◆ Trieste 11,022 in (36,163 ft)

Island Arc- ocean- ocean