

2/5/08

GEOL 117, Class 10: Understanding the ocean basins in light of Plate Tectonics (cont'd)

CONTINENTAL MARGINS

Origin of continental shelves and slopes
Contrasting types of continental margins
Continents vs. Ocean Basins

2 TYPES OF CONTINENTAL MARGINS

1) "Passive" margins-

- no earthquakes/volcanoes/mountain-building
- e.g., Atlantic coasts - well-developed shelf, slope, rise

Origin:

Long ago, continental rift grew to form new ocean
Passive margin is the "trailing edge" of a continent
Sediment deposited over this, eventually makes a vast platform

Typical profile: Shelf, Shelf break, Slope, Rise

Continental shelf

Flooded continent and coastal plain, exposed during ice ages (lower sea level)
Continental, low-density lithosphere, that happens to be under water (up to 200m)

Shelf break (Edge of shelf)

Abrupt change: Depth increases much more quickly
Beginning of transition from continental crust to oceanic crust.

Continental slope

Transition from continental crust to oceanic crust: Continental crust gets thinner and eventually completely transitions to denser basalt rock- oceanic crust

10-100 km wide

Base of the continental slope is at roughly 3,000 m depth in Atlantic

Continental rise

Slope/ocean basin transition, gently sloping

Well developed in Atlantic

100-1,000 km wide

Origin: thick accumulation of sediment from land- many millions of years

2) "Active" margins: Typical of Pacific – Oregon, California, Washington

Earthquakes, mountain-building, volcanoes

Narrow shelf; narrow, steep slope: Continental Slope goes directly down into trench (roughly 8,000 m) in many areas of the Pacific

Continental rises uncommon

Origin (plate tectonics): Convergent or transform boundary

Margin is "leading edge" of plate

In subduction zones: crunched-up material forms continental shelf

Earthquakes related to plates sliding unevenly past each other

Mountains related to compression and volcanoes

Volcanoes related to melting of certain materials carried down by subduction

Continents vs. Ocean Basins

Why does the earth have continents and oceans, instead of just a smooth solid surface with a thin (~3000 m) layer of water everywhere?

(Class discussion)