

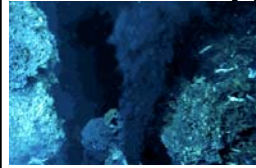
Lecture 2 - A tour of the ocean floor..

A computer generated view from the Grand Bahama Bank, across the Atlantic ocean

Credit - Nat geo "Drain the Ocean".



The Shape of the Ocean Floor



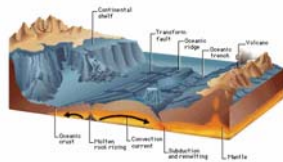
Deep sea floor, at depths below 4000 meters, accounts for 30% of the earth's surface



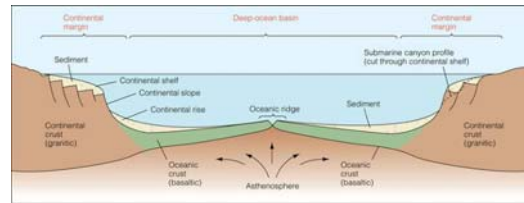
Dark, deep, hot vents of boiling water, dangerous gases..... And miles of flat abyss..

Features of the deep ocean floor

- Oceanic Ridges & hydrothermal Vents
- Abyssal Plains & Abyssal Hills
- Seamounts & Guyots
- Deep ocean Trenches & Island Arcs



Shape of the ocean floor



© 2008 Brooks/Cole, Thomson

Two classifications of ocean floor: Deep ocean floor

Continental Margins – the submerged outer edge of a continental land mass

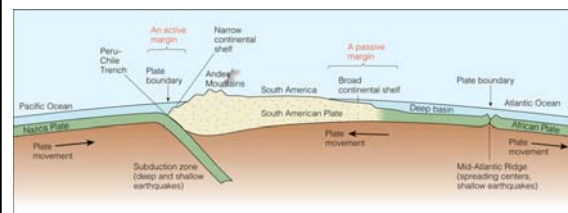
- Two types of continental margins

Passive margins -



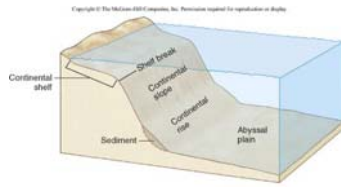
Active margins

Continental Margins



© 2008 Brooks/Cole, Thomson

Key components of the continental margin

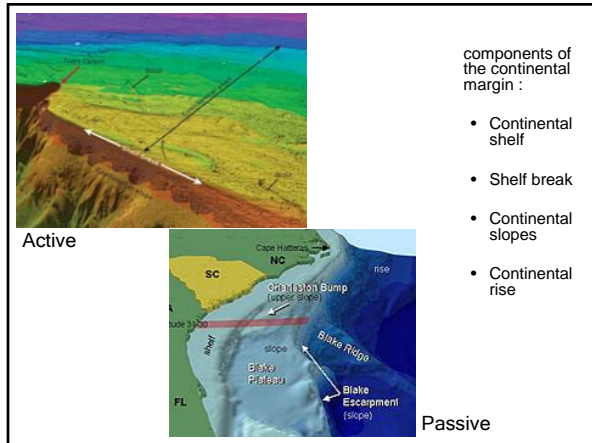
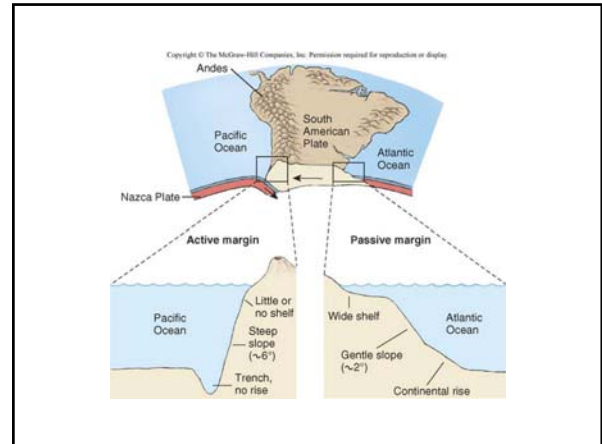


Continental shelf – shallow, submerged edge of the continent.

Shelf break – the abrupt transition from continental shelf to the continental slope.

Continental slope – the transition between the continental shelf and the deep-ocean floor.

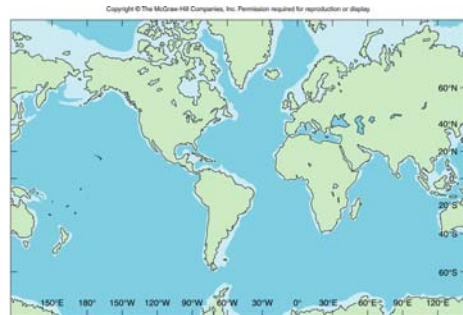
Continental rise – accumulated sediment found at the base of the continental slope.



components of the continental margin :

- Continental shelf
- Shelf break
- Continental slopes
- Continental rise

Distribution of continental shelves - marked in light blue.

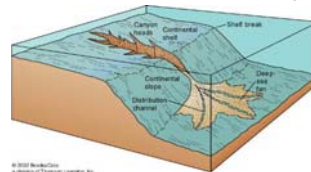


Submarine Canyons

Formed by water erosion and / or turbidity currents.



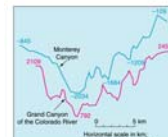
Submarine Canyons



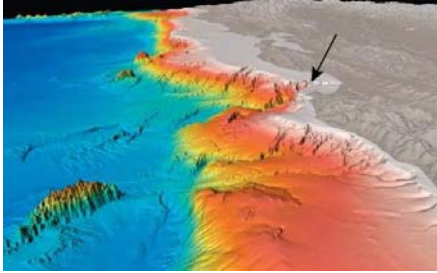
Cut into the continental shelf and slope

Terminate on the deep-sea floor

Fan-shaped wedge of sediment.



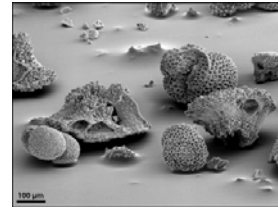
Monterey Canyon



Sediment

Sediment samples - the ocean's memory

Material that covers the ocean floor

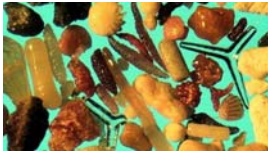


Particles of organic or inorganic matter that accumulate in *loose, unconsolidated* form.

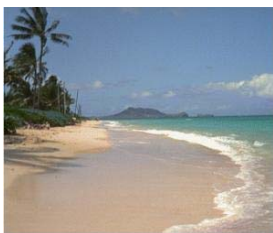
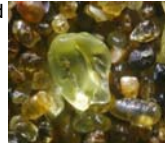
Most familiar sediment ?

Sand!

Biologically derived variation



Variation may be chemical - and relate back to parent rock



Biological processes also impact sediment



Sediment is generally classified according to its source.

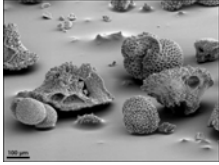


Terrigenous - from the earth (lithogenous)

Most common form, originally the product of wind and water erosion on land

Washes down thru rivers - ends up on the ocean floor

Biogenous - from living material



Silicon and calcium delivered in river flow, fixed by corals, calciferous algae and tiny animals, like foraminifera, in shells.

The animals die, the shells form sediment.

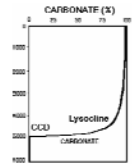
Often incorporated into fecal pellets

•Oozes -

•sediment containing at least 30% biogenous material

-Siliceous ooze

-Calcareous ooze



Lysocline - carbonate starts to dissolve

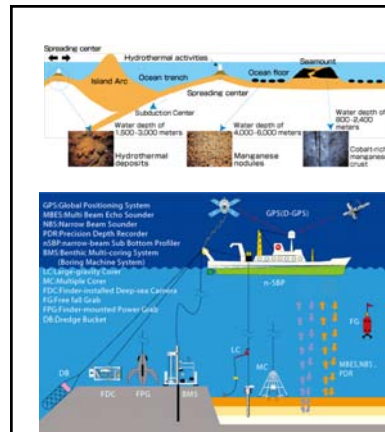
CCD - Carbonate compensation depth - all carbonate dissolves

Hydrogenous sediment

- minerals derived from sea water....

- may leaking from the magma

- formed in the area of occurrence



Manganese nodules as a mineral resource

Oolitic sands -

High productivity lowers carbon dioxide levels, reduces acidity and allows precipitation of calcium carbonate granules

- onion like deposition around tiny central nuclei

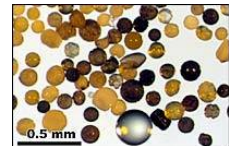
- The best beaches.....



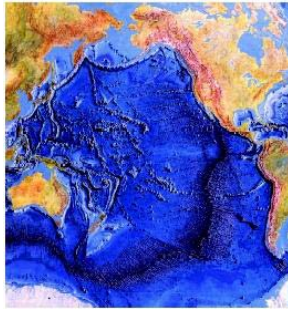
Cosmogenous sediment

- comes from.....space - meteorites.

Relatively rare, but very informative



The Sea Floor - Pacific Ocean tour

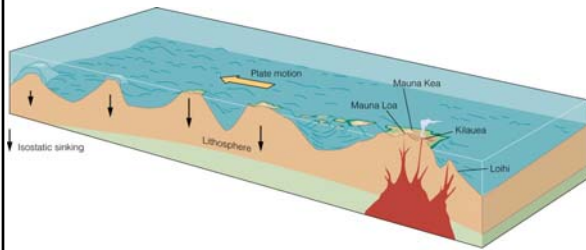


The Abyssal Plains



Abyssal plains are flat areas of sediment-covered ocean floor found between the continental margins and oceanic ridges.

2. Island chains may be due to hotspots in the ocean floor

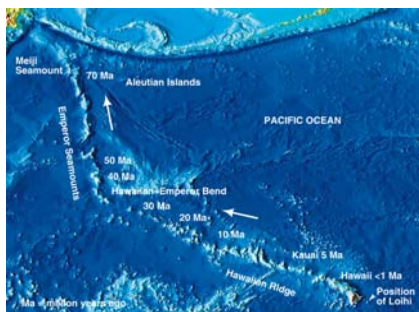


© 2008 Brooks/Cole - Thomson

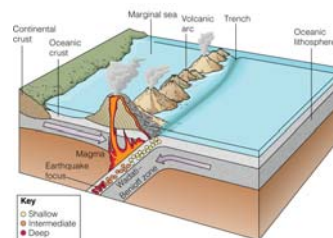
The Hawaiian islands.....

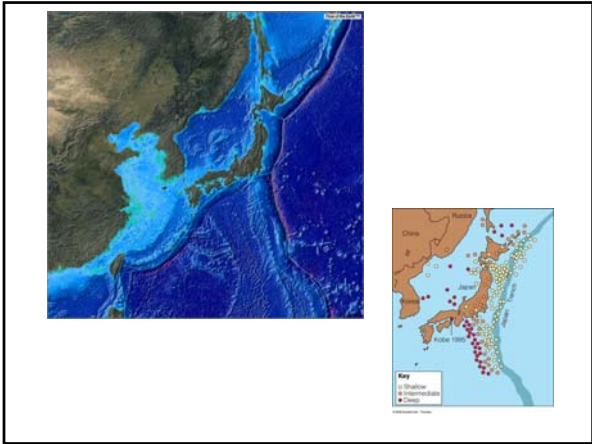


Current theories suggest these could be huge cracks in the crust / lithosphere




Island arc chains form where plates meet and subduction occurs



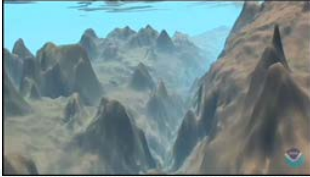


Deep ocean trenches -




The Mariana Trench

- depth reaches 11,022 meters (36,163 miles) below sea level.




The Sea Floor - Atlantic ocean floor



Starting out at the Atlantic coast

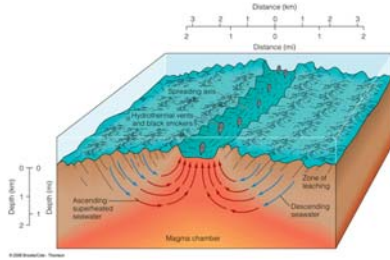
The Grand Bahama Bank sits on a huge sedimentary platform, looking out across the Atlantic ocean



Next stop - the Mid Atlantic ridge

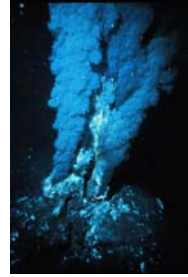
The Mid Atlantic ridge

Hydrothermal vents - sites where superheated water containing dissolved minerals and gases escapes through fissures, or vents.



Hydrothermal vents

Black smokers and white smokers....

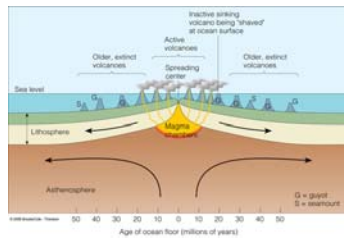


300 - 400°C



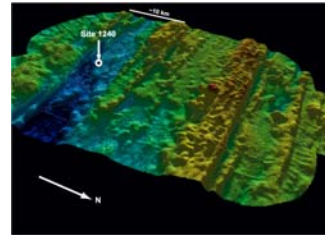
200 - 330°C

Abyssal Hills



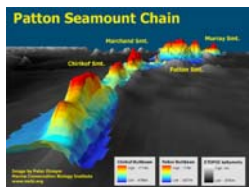
Abyssal hills are small, extinct volcanoes or rock intrusions near the oceanic ridges.

Abyssal Hills



Abyssal hills on the floor of the Atlantic Ocean

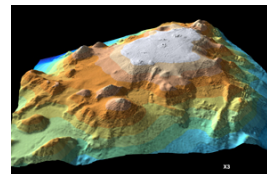
Seamounts



Seamounts are volcanic projections from the ocean floor that do not rise above sea level.

Flat-topped seamounts eroded by wave action are called (9) **guyots**.

Guyots

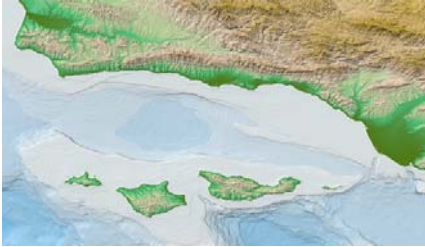


Flat-topped seamounts eroded by wave action are called (9) **guyots**.

Rodriquez guyot, Santa Barbara Channel

The Santa Barbara Channel

Truly complex bathymetry -



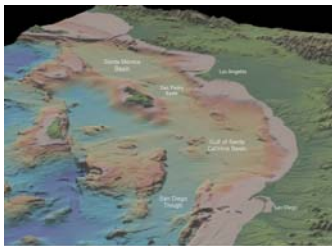
The Santa Barbara Channel

Truly complex bathymetry -



The Santa Barbara Channel

Truly complex bathymetry -



**also crazy currents
..but that's for next week**



Seamounts: Undersea "Islands" of Biodiversity
Scripps Institute