

PLATE TECTONICS: Part II - The evidence

Objectives -

Relate each type of plate margin activity to the resulting products and processes.

Compare and contrast the processes and features associated with plate margin activities.

List and explain Wegener's continental drift evidence.

Explain why plate tectonics is considered critical to Earth science.

List and explain a variety of evidence used to support the plate tectonic theory.

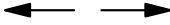
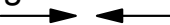

Explain the mechanics and significance of the supercontinent cycle.

Plate margins & margin activity

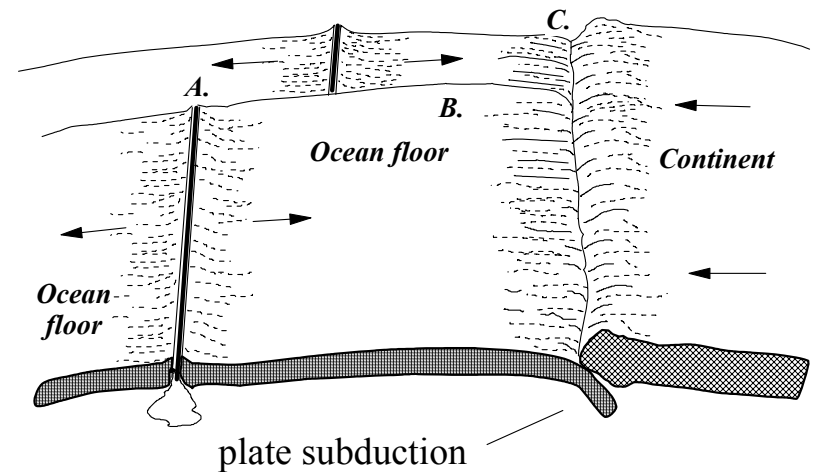
■ Margin types

- oceanic : oceanic
- oceanic : continental
- continental: cont.

■ Plate motion

- divergent 
- convergent 
- transform 

Match the letters below to the correct plate margin type & motion



List the tectonic activities and features associated with each of the plate settings listed below.

	Divergence	Convergence	Transform motion
Ocean-ocean.			
Ocn-cont.			
Cont.-cont.			

PLT-2

Plate margins of the Indian & Atlantic Oceans

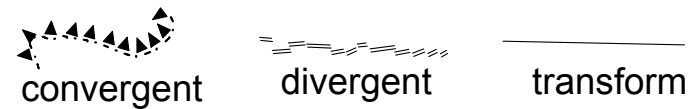
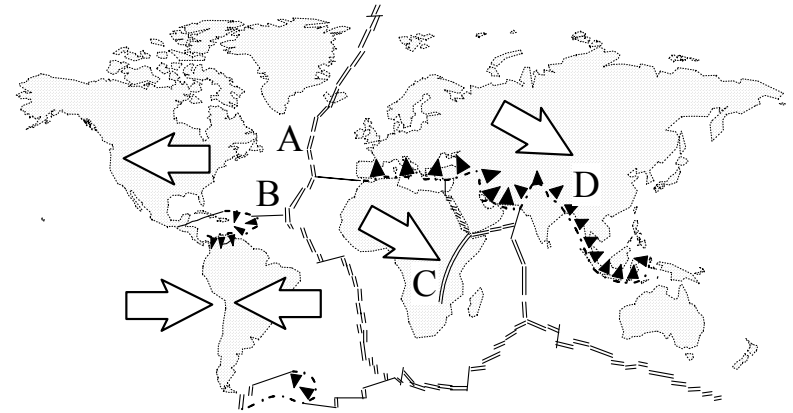
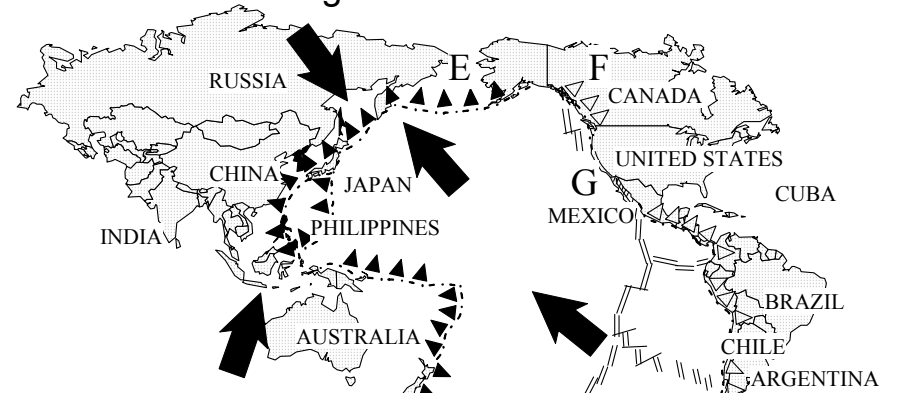


Plate margins of the Pacific Ocean

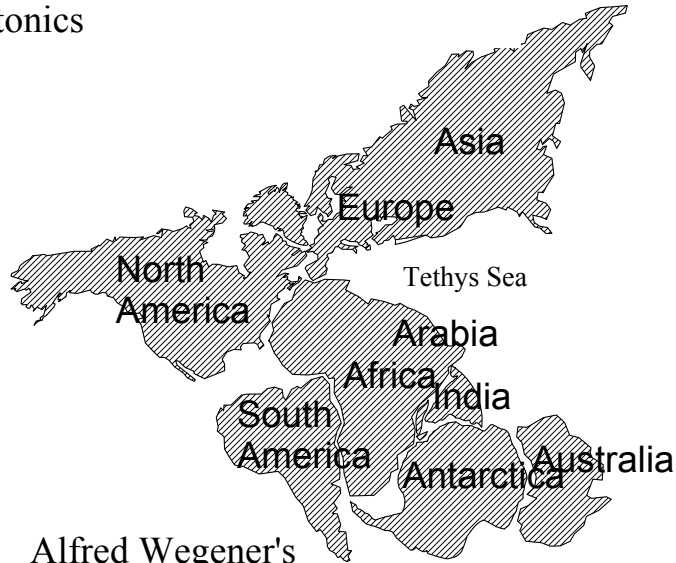


Determine the margin type (e.g. O-O div.) at each of the following locations:

- A.
- B.
- C.
- D.
- E.
- F.
- G.

PLT-3

Continental drift, precursor to plate tectonics



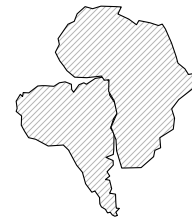
Alfred Wegener's
Pangaea ("all lands")

(note: the separation of Asia from Africa and North from South America is due, in part, to map distortion)

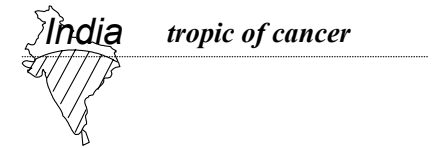
D? When compared at the water line (sea level) the "fit of the continents" is far from ideal. Develop several hypotheses as to why.

PLT-4

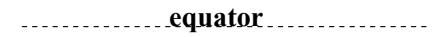
Wegener's continental drift evidence



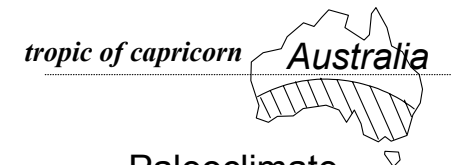
"Fit" of the continents



tropic of cancer



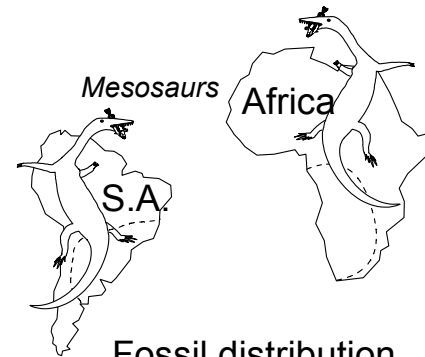
equator



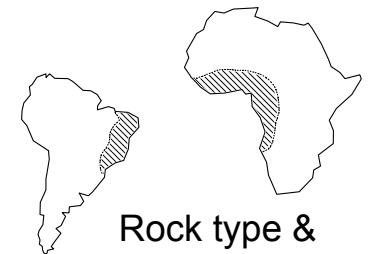
tropic of capricorn

Australia

Paleoclimate distribution



Fossil distribution



Rock type & structural similarities

D? Which of these types of evidence do YOU find most compelling? Why? Least compelling? Why?

PLT-5

Assumptions: 1950

- Ocean basins are old
- Bottom sed. should be 3+ miles thick, w/little topography
- All crust of consistent thickness; homogenous
- No knowledge of litho/asthenosphere
- Only cont. margins and volcanic islands are seismically active
- Seamounts & guyots probably drowned PC islands
- Cont. rocks more radioactive, therefore higher heat flow (geothermal gradient)

Knowledge: 1970

- Rocks < 175 m.y.
- Thin, discontinuous; oldest near margins; very rugged bottom
- Oceanic crust thinner than continental; different lithology
- Complex layers; mechanically distinct
- Oceanic ridges are very seismically active
- Cretaceous or younger; due to isostatic adjustment
- Ocean basins assoc. w/ convection currents & higher heat flow

PLT-6

Plate tectonic evidence

- Activities (processes)
 - earthquakes
 - volcanic eruptions

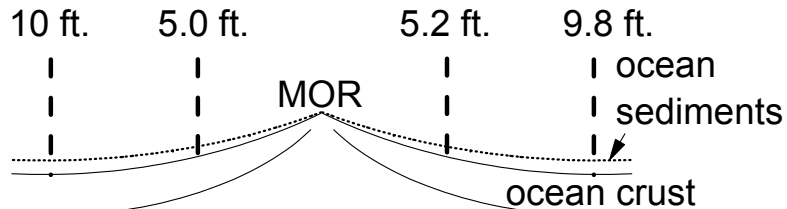
D? What plate margin activities cause these?
- Features (products)
 - volcanoes
 - island arcs
 - mountain arcs
 - mid-oceanic ridges
 - ocean trenches
 - ocean floor sediment thickness
 - paleomagnetism
- Rock dates (age)
 - ocean crust vs. MOR
 - maximum: ocean crust vs. continental crust
 - mid-Pacific island arcs

Note importance of: spatial distribution

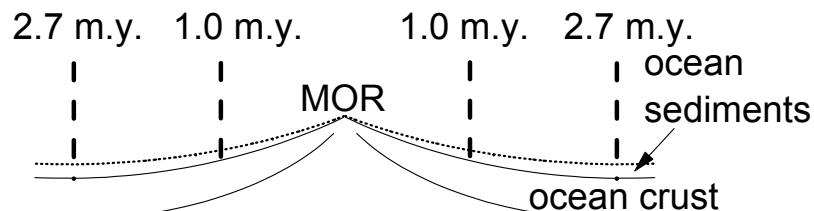
PLT-7

MOR crustal age & sediment thickness

OCEAN SEDIMENT THICKNESS (IN FEET)

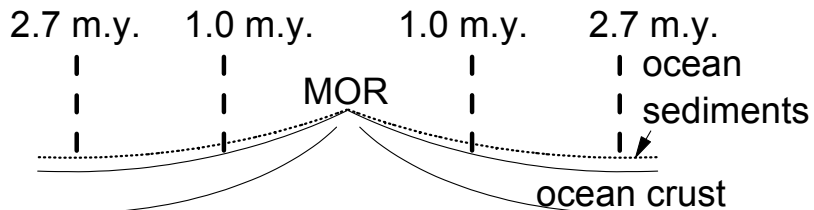


OCEAN FLOOR SEDIMENT AGE (at base)



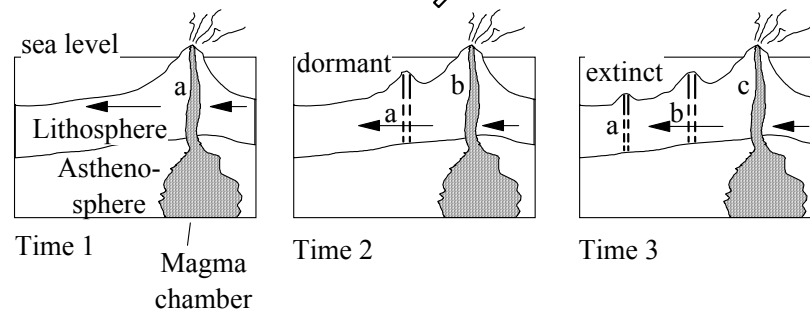
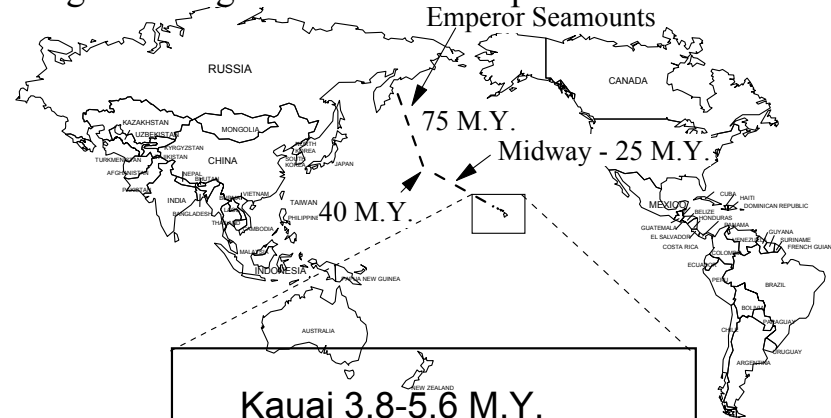
Why does ocean sediment thickness and age increase away from the MOR?

OCEAN CRUST AGE (at base)



PLT-8

Progressive age relations of intraplate volcanic islands



D? Explain what is happening in the time sequence above and why. How does this account for the age relations show?

PLT-9

Wilson's 500 M.Y. supercontinent cycle

C - convergent margin
 D - divergent margin

