

## GEOL 117 Class 9: Sea Floor Features revisited, using Plate Tectonic Theory

### What Drives Plate Motions?

Understanding the ocean basins in light of Plate Tectonics

Modern Depth Measurement

Mid-Ocean Ridges revisited

Trenches revisited

### **What Drives Plate Motions?**

Recall that the major problem Wegener's continental drift hypothesis faced was:

He could not explain what made the continents move.

Scientists were skeptical- reasonable at the time

### **Convection cells drive plate motions:**

Why does this motion occur? -- heating within the mantle, cooling at the top

Kind of like a pot on a stove

Radioactivity: source of heat in the mantle

Hot things tend to rise, cold things tend to sink

Less hot parts of the mantle sink because they are denser than the surrounding mantle.

The upper mantle becomes relatively cool because heat is lost from the earth's surface.

So the upper mantle is constantly moving laterally toward places where it sinks.

### **Bathymetry- depth measurement**

Older method (1930 to present)- Echo sounding

Travel time of sound pulse

$\text{depth} = \text{sound velocity} \times \text{measured time} / 2$

Recently: Satellite measurements of ocean surface height

Ocean surface height has small differences that reflect the much larger variations in depth below- caused by gravity differences

### **Mid-Ocean Ridges Revisited**

Composed of basalt rock- result from small amounts of mantle melting

Rift valley at the plate boundary- earthquakes

Heat flow high- Magmas carry additional heat into upper crust

Some magmas erupt to form lavas

Water circulation driven by heat/convection cells

Hydrothermal vents at points where water exits the crust

- influences ocean chemistry

### **Trenches Revisited**

Where are they?

Almost all found around the Pacific

Why are they deep?

Bending of plate

Downward pull of dense, sinking slab

Continental margins greatly altered by trenches- no continental rise where there is a trench