

Geol 285 - Petrology, Dr. Helen M. Lang, West Virginia University, Spring 2009

Sedimentary Rocks

Rocks resulting from the consolidation of loose sediment or chemical precipitation from solution at or near the Earth's surface; or organic rocks consisting of the secretions or remains of plants and animals

Sedimentary Rocks are mostly marine. Why?

Sediments are deposited in Basins (low places on the Earth's surface)

There are several common Sedimentary Basin Types related to different Plate Tectonic Settings

Six Major types of Sedimentary Basins

- Oceanic basins
- Arc-trench system basins
- Continental-collision basins
- Grabens along continental margins
- Intracratonic basins

Plate Tectonic Settings

Oceanic Basins

- On oceanic lithosphere - Atlantic and Pacific Ocean basins
- Terrestrial muds near continents
- Away from continents, sediments are the remains of planktonic (floating, usually within light-penetration distance) organisms that "rain" down from the surface
- Some planktonic organisms have carbonate remains, some have siliceous remains

Carbonate Compensation Depth (CCD) - see handout

Arc-trench System Basins

- Trench sediments - in trench above subduction zone
- Fore-arc basins - in front of (relative to the trench) the volcanic arc
- Intra-arc basins - within the volcanic arc (between the volcanoes)

- Retro-arc or Back-arc basins - behind the volcanic arc

Arc-Trench System Basins - see handout

Trench Sediments

- Turbidites - deposits from submarine flows of sediment water mixture; they commonly develop from submarine landslides and are transported along the trench
- Mélanges - chaotic tectonic mixtures of very large fragments of older sedimentary and crystalline rocks in a muddy matrix

The Aleutian Trench

Fore-arc Basin Sediments

- Sediment from volcanic arc: mainly volcanic and plutonic source rocks
- Lithic sandstones and wackes common
- Sandstones rich in volcanic rock fragments and calcic plagioclase grains

Continental Collision Basins

- Low places where sediments accumulate when two continental blocks collide
- Convergence of the southeastern part of North America and the northeastern part of South America in the Caribbean
- Convergence of Africa and Europe in the Alps/Mediterranean
- Convergence of the Indian plate with the Eurasian plate in the Himalayas

Himalayan Collision Zone: high erosion rate, enormous quantities of sediment, many sites for sediment accumulation

Grabens along Rifted Continental Margins like east coast of U.S.

Intracontinental Basins

- Epicontinental seas - upon the continent
- Covered the interior of North America during most of the Paleozoic
- Relatively shallow water sediments
- Many unconformities
- Preponderance of nearshore sediments
- Abundant carbonates and evaporites
- e.g., the Michigan Basin

Michigan Basin