

- 1) What are the main mechanisms for eustatic sea level change and over what timescales do they operate?
- 2) What are the three main types of subsidence and give an example of a basin created by each type.
- 3) Give a brief synopsis of Phanerozoic relative sea level change around Wyoming and the major lithologic units that are the evidence.

Due: Wed, May 3, 10 AM

- 1) Changes in the shape of ocean basins (global hypsometry) through tectonic processes. These occur at timescales of 10s to 100s of millions of years, *tectono-eustasy*.

Changes in the ocean water volume through storage of water on continents as ice. This occurs at timescales of 10s to 100s of thousands of years, *glacio-eustasy*.

- 2) Flexural subsidence is caused by loading of an elastic lithosphere and its associated nearby downwarping. The Denver, Laramie, and Powder River Basins are examples.

Thermal subsidence is caused by cooling and sinking of the lithosphere into the mantle. The Michigan and Williston Basins are examples.

Extensional subsidence is caused by the thinning of lithosphere resulting from extension due to tensile stresses in the lithosphere. The Rio Grande and Atlantic Basins are examples. Oceans are the extreme condition (spreading ridges) of extension.

- 3) There are two major cycles of sea level. Starting with transgression in the Cambrian creating the Flathead sandstone, representing a beach and the first marine incursions. This culminated in a shallow carbonate platform as evident by the Mississippian Madison Formation. The last vestiges of the Paleozoic sea level high are recorded by the Permian Phosphoria Formation. Relative sea level continued to fall and the Triassic is represented by continental, fluvial strata, the Chugwater Formation. Relative sea level rose again to create the deltaic strata of the Cretaceous Frontier Formation. Finally, relative sea level fell again (Paleogene White River Formation) leading to the modern.