Some Topics to Study for the Midterm Exam: Geology 334

Week 1. Global Cycles:

- Water; oxygen and carbon; the rock cycle – geologic time and plate tectonics.
- The role of life. The role of rivers.
- Calculate avg. regional erosion rate from sediment discharge and drainage area.

Week 2. Chemical Weathering:

- Chemical wx processes: hydrolysis, dissolution, oxidation. Examples.
- Controls on the rate and intensity of chemical wx: climate, composition, grain size, tectonics.
- Soils = "survival assemblages". Paleosols= ancient soils. Example from a Permian paleosol.

Siliciclastic Sediments:

- Classification by texture and composition. Know grain sizes and names. Cement and Matrix.
- Ternary plots. Information about source area. Major controls on sandstone composition.
- Orinoco River example: first-cycle quartz arenites made by extreme chem wx (spatial change)

Week 3. Chemical Sediments (focus on carbonates and chert):

- Contrast in the chemistry of rivers vs. oceans: what is the contrast and what causes it?
- Dissolution and precipitation of limestone (calcite). Carbonate equilibria. *Know these reactions.*
- Most carbonate sediments are *organic.* Where and how do they form, under what conditions?
- Composition and origin of chert, how and where is it formed?

Fundamentals of Fluid Flow:

- Density. Why are rivers such a powerful force on earth's surface?
- Viscosity: $\mu = \tau / (du/dy)$. Different types of fluids & plastics: plot and explain their behavior.
- Laminar vs. turbulent flow. Reynolds number (dimensionless parameter): $Re = UD\rho / \mu$

Week 4. Sediment Entrainment and Transport:

- Particle entrainment: when applied fluid forces > resisting forces. *What are those forces?*
- Basal shear stress. $\tau_0 = \rho g D \tan\theta$. What does this mean, where/how does it apply?
- Hjulstrom Diagram. Why do we use it, what does it show?

Bedforms and Cross Bedding:

- The basic ripple bedform, how it is formed, resulting different types of cross bedding.
- Various kinds of bedforms as a function of current velocity, flow depth, grain size.
- Froude number: $Fr = U / (\sqrt{gD})$. What does it represent, why is it important?

Week 5. Mass Transport Processes (focus on sediment-gravity flows)

- Most initiate with slope failures (on land or under water)
- Flow transformations (esp. subaqueous): slide => slump => debris flow => turbid. current
- Deposits and sedimentary structures/textures of debris flows and turbidity currents.