GEO 390
EXAM 1
SPRING 2006

STUDY GUIDE

Exam 1 covers chapters 5-8 in *The Earth System* by Kump et al.
Generally questions will focus on material presented in class and the review questions and key terms at the end of each chapter.

Specifically

Chapter 5 The Circulation of the Oceans

- Key terms: omit absolute vorticity, evaporate deposit, half-life, planetary vorticity, relative vorticity, vorticity.
- Understand the relationship between wind and surface ocean currents.
- Understand the concepts of convergence and divergence in ocean currents and their relationship to upwelling and downwelling.
- Describe the Ekman spiral, Ekman transport, and geostophic flow.
- Understand gyre formation and describe the general pattern of gyre circulation in the northern hemisphere and the southern hemisphere.
- Describe how the temperature, salinity, and density of the ocean change with depth.
- Understand the driving mechanism of the thermohaline circulation and describe the general pattern of these currents including regions of upwelling and downwelling.
- Understand the relationship of the thermohaline circulation to global heat transport, climate, and climate change.

Chapter 6 Modeling the Atmosphere-Ocean System

- Key terms: omit finite difference models, spectral models.
- Understand why we model the climate system.
- Define conceptual/qualitative models, empirical/statistical models, and numerical models.
- Describe a global climate model (GCM) in terms of: 3-D grid structure, ocean/atmosphere/solid earth/ vegetation/etc components, physical and chemical processes mathematically represented, time-step calculation, interaction between grid boxes.
- List reasons for uncertainty in GCM.

Chapter 7 Circulation of the Solid Earth: Plate Tectonics

- Key terms: omit basalt, chemosynthesis, craton, half-life, Moho, radiometric dating
- Understand the mechanism of earthquakes.
- Define seismic waves, S waves, P waves.
- Describe the structure of the Earth in terms of the crust, asthenosphere, mantel, outer core and inner core.
- Define continental drift and plate tectonics and describe the geomagnetic evidence that supports the movement of continents and plates on the Earth's surface.
- Understand the mechanism that drives plate movement.
- Define 3 types of plate boundaries.
- Describe Wilson Cycles and how they can explain plate movement

Chapter 4

- Key Terms: omit Redfield ratio
- List the Earth's carbon reservoirs. Which are in the organic and inorganic cycles? Which are in the long-term and short-term cycles?
- What processes are involved in the short-term organic and inorganic carbon cycles and on what time-scale do these processes take place?
- What processes are involved in the long-term organic and inorganic carbon cycles and on what time-scale do they take place?
- Write the chemical equations for photosynthesis, respiration, anaerobic decomposition, and CO_2 dissolving in water. How does each process transform carbon and how does it transport carbon from one reservoir to another?
- Describe the biological pump and the role of plankton and ocean circulation in the carbon cycle.
- Understand how and why the fossil fuel carbon reservoir has shifted from the long-term carbon cycle to the short-term cycle. What does this mean for the climate system?