

Global Change SCI 215

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Office Hours: by Appointment

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Topics Covered in the Class

Dr. Heydari

- 1/. Introduction to global change
 - Global change on a short time scale
 - Global change on a long time scale
- 2/. Daisyworld: An introduction to system
 - The system approach
 - Daisyworld of climate system
 - Graphs and graph making
- 3/. Geological time scale
 - Relative and radiometric dating in Earth science
 - Formation of the Earth
 - Formation of the atmosphere and ocean
 - Major time divisions of the geological time scale
 - Characteristics of Precambrian, Paleozoic, Mesozoic, and Cenozoic intervals
- 4/. Circulation of the solid earth: global tectonics
 - Anatomy of the Earth
 - Characteristics of the crust, mantle, and core
 - Principle characteristics of global tectonics
 - Mid-ocean ridge vents
 - What drives plate tectonics
- 5/. The circulation of the oceans
 - Ocean circulation
 - Winds and surface currents
 - Circulation of deep ocean
- 6/. Cycling of Elements
 - Systems approach to carbon cycle
 - Systems approach to oxygen cycle
 - Systems approach to sulfur cycle
 - System approach to phosphor cycle
- 7/. Megacycles of the Earth

- Cycle of global tectonics (the Wilson cycle)
- Cycle of global sea-level change
- Greenhouse – icehouse cycles
- Cycles of change in ocean chemistry
- Cycles of catastrophic events on Earth

Dr. Fadavi

8/. Astronomy

9/. The Sun

Dr. Reddy

10/. Evolution of atmosphere

- Prebiotic atmosphere
- Origin of life
- Effect of life on early atmosphere
- The rise of oxygen: geological evidence
- Oxidation state of iron
- Possible causes of the rise of oxygen
- Modern control on atmospheric oxygen

11/. Global energy balance

- Electromagnetic variation
- Planetary energy balance
- Atmospheric composition and structure
- Mechanisms of heat transfer
- Greenhouse effect at work
- Climate feed back

12/. Atmospheric circulation

- Global circulatory subsystems
- Atmospheric circulation
- Temperature – pressure – volume relationships
- Global distribution of temperature and rainfall

13/. Long – term climate regulation

- Long-term climate record
- Causes of long-term climate change

14/. Short-term climate variability

- Holocene climate change
- Present-day climate variability
- Pleistocene glaciation
- Milakovitch cycles

Glacial climate feedbacks

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15/ Global Warming

- Carbon reservoirs and fluxes
- CO₂-removal process and time scales
- The chemistry of CO₂ uptake
- Long-term CO₂ projections

Dr. Reddy

16/ Ozone Depletion

- Ultraviolet radiation and its effects
- Vertical distribution of ozone
- Catalytical cycle of N, Cl, and Br
- Sources and sinks of ozone
- The Antarctic ozone hole

17/ The changing atmosphere

- Acid deposition
- Photochemical smog

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18/ Earth Ecosphere

- Classification of biota
- Ecosystems and their dynamics
- Terrestrial and aquatic ecosystems

19/ Biodiversity through time

- Introduction to biodiversity
- Fossil record and biodiversity
- Major mass extinctions of the earth
- Permian – Triassic mass extinction
- Cretaceous – Tertiary mass extinction
- Extraterrestrial influence on mass extinction

Class Presentations

Final Exam: Wednesday, December 15, 7:00 to 9:00 am.