

Climates of the Past and Future

Day 1:

1. Climate of a Planet

- a. Radiation and energy
activity: rainbow glasses
- b. Albedo
- c. Blackbodies and thermal IR radiation
activity: thermal camera
exercise: cooling rates
- d. Molecules and absorption
- e. Planetary energy budgets
activity: UCAR planet interactive
activity: glass plates
- f. Climate Sensitivity
exercise: Arrhenius calculation

2. Climates of the Past

- a. Geologic time
- b. Origin of the Earth and atmosphere
- c. Plate tectonics & climate change
activity: plate movies
- d. The faint young sun paradox
- e. Geologic carbon cycle
activity: fizzy water
- f. Ice ages
activity: Ice core movie
exercise: Milankovitch calculator
 - i. How glaciers work
 - ii. Ice sheet time scales
 - iii. Ice age cycles
 - iv. Ice sheet collapse
- g. Deglaciation and the Early Holocene
- h. Medieval Warm Period and Little Ice Age
activity: UCAR tree ring builder
exercise: last millennium calculator
- i. 20th Century warming
exercise: historical climate records
- j. Climate variability: ENSO, volcanoes, & the Sun

Day 2:

3. Climates of the Future

- a. The Discovery of Global Warming
 - i. Fourier (1820's)
 - ii. Agassiz (1830's)
 - iii. Tyndall (1860's)
 - iv. Arrhenius (1890's)
 - v. Callendar (1930's)
 - vi. Keeling (1950's)
- b. Climate forcing, response, sensitivity, and feedback
exercise: climate sensitivity calculator
- c. Where does global warming go?
exercise: observations and data
- d. Perturbed carbon cycle
- e. Simple climate model
activity: Earth:carbon calculator
- f. Earth System Models
- g. IPCC Process
- h. Emissions, energy, and the Kaya Identity
activity: emissions calculator
- i. Climate projections for 21st Century and beyond
- j. Climate impacts
 - i. Global
 - ii. Regional
 - iii. Local
- k. Solutions
activity: climate wedges
 - i. Energy
 - ii. Economics
 - iii. Policy
- l. Simple, Serious, and Solvable