ATS 421/521

Climate Modeling

Spring 2015

Final Review

June 5, 2015

Student Evaluations

- ▸ Important feedback for me

- ▸ May improve future deliveries

- ▸ Please fill out evaluations

Lecture 9

- ▸ Hadley Circulation

    - ▸ Held and Hou (1980)

    - ▸ Sketch Hadley Circulation

    - ▸ Effect on Hydrological Cycle

- ▸ GCMs

    - ▸ Primitive Equations

    - ▸ Surface Fluxes

    - ▸ Parameterizations

Lecture 10

- GCMs

    ▸ Parameterizations

    ▸ Grids, Resolution, Spectral Models

    ▸ Evaluation

Lecture 11

- ▸ Vegetation Models

  - ▸ Biogeography

  - ▸ Biogeochemistry

  - ▸ Plant Functional Types, Competition, Fire

  - ▸ Interactions with Physical Climate?

Lecture 12

▶ Non-Linear Dynamics, Chaos, Lorenz

   ▶ Limited Predictability

   ▶ Does this affect climate predictability?

Lecture 13

▶ Regional Climate Models

  ▶ Purpose

  ▶ Resolution

  ▶ Boundary Conditions

  ▶ Advantages

  ▶ Disadvantages

Lecture 14

- ▸ Ice Sheet Models

  - ▸ Oerlemans (1981)

  - ▸ Elevation - Mass Balance Feedback, Hysteresis

  - ▸ Bedrock adjustment

  - ▸ Time scales

  - ▸ Coupling to GCMs

Lecture 15

- ▶ Ocean Models

  - ▶ wind-driven, thermohaline circulations

- ▶ Sea Ice

  - ▶ interactions with ocean & atmosphere

- ▶ Carbon Cycle

  - ▶ biological pump

Lectures 16/17

▸ Ocean Carbon Cycle

  ▸ chemistry

  ▸ biological pump

  ▸ solubility pump

  ▸ NPZD models

  ▸ nutrients, oxygen

Lecture 18

- ▶ Paleoclimate

  - ▸ LGM

- ▶ Projections

  - ▸ Scenarios

  - ▸ Uncertainties

  - ▸ Spatial Patterns, T, P

Lecture 19

- Projections

  - Extreme Events

  - Ice, Snow

  - Ocean Circulation

  - Ocean Acidification

  - Long-Term Projections

  - Sea Level