

## **AT 722: Spring 2005**

Course Objectives: This class focuses on the role of radiative processes in the Earth's climate systems and is concerned with topics of Earth radiation and energy balance, radiative and radiative convective equilibrium, climate thermodynamics, and climate feedbacks.

Course Structure: Selected overview lectures, guest lectures on key topics, paper reviews and course project.

Web site: *langley.atmos.colostate.edu*, review papers on web site

# 1. The Earth's Radiation Budget

- *ERBE, CERES & GERB*
- *Cloud-Radiation-Forcing*
- *The Greenhouse Effect*
- *Aerosol Direct Effects*
- *Atmospheric radiative cooling*
- *ERB trends and other topics*

# 2. Radiative Forcing of Climate

- *Greenhouse Gas forcing*
- *Aerosol direct forcing*
- *Aerosol Indirect forcing*
- *Contrail Climate Forcing*
- *Land-surface climate forcing*
- *Monitoring Climate change*

### **3. Radiative Equilibrium**

- *Radiative-equilibrium climate models*
- *Radiative equilibrium with convective adjustment*
- *Radiative-convective equilibrium with semi-explicit convection*
- *RCE with CRMs*

### **4. The Energy Balance Theory of Climate**

- *Energy Balance Climate Models (EBM)*
- *Ice-albedo Feedback and Ice Catastrophe*
- *The faint young sun paradox*
- *Climate-biosphere feedbacks*
- *Time dependent EBM*
- *Stochastically forced EBM*

## **5. Climate Feedbacks**

- *Water Vapor Feedbacks*
- *Ice albedo feedbacks*
- *Dynamical feedbacks*
- *Cloud feedback*
- *SST regulation*
- *Approaches and tools*

## **6. Thermodynamical principles of Climate**

- *Entropy of Radiation*
- *Entropy as a governing principle of climate*
- *Entropy and climate - Prigogine's Theorem*
- *Ziegler's Principle of Maximum Dissipation*

