

Syllabus for Planetary Atmospheres, EART 290M

Lecture #1: Introduction

Topics: P, T, and density structure of atmospheres; winds; composition of planets; basic chemistry principles (equilibrium, kinetics)

Paper reading: Properties of planetary atmospheres (assigned from textbook, and on your own)

Lecture #2: Energy balances

Topics: Radiative heat transfer; greenhouse effect

Paper reading: Faint young Sun paradox in early Mars and early Earth [also possible: Venus]

Lecture #3: Photochemistry

Topics: Photochemistry of oxygen, hydrogen and carbon compounds; absorption cross-sections; rates of reaction

Paper reading: Photochemistry of Titan hydrocarbons and Venus sulfur compounds [other alternatives: Jupiter]

Lecture #4: Atmospheric escape

Topics: Different ways that molecules can be lost to space

Paper reading: Loss of Martian atmosphere; rate of loss of Titan's atmosphere and how it still manages to have one

Lecture #5: Aerosols and their radiative effects

Topics: Aerosol formation, transformation and loss mechanisms; radiative effects of aerosols

Paper reading: Haze on Titan [or Jupiter]; dust on Mars

Lecture #6: Cloud physics

Topics: Thermodynamics of cloud formation; dynamics of precipitation formation

Paper reading: Clouds on Venus [or Jupiter]; intermittent torrential rain on Titan

Topical guest lectures: (choose 3 to 4 to complete the schedule)

1. Habitable Planets – G. Laughlin
2. Zonal wind structure on Jupiter – G. Glatzmeier
3. Early Earth – K. Zahnle
4. Venus – M. Bullock
5. Chemistry of Giant Planets – M. Marley
6. Evolution of Planetary Composition – E. Asphaug