

MPO 531: Physical Meteorology

Spring 2007

Time & Place: Tu Th 3:30-5:00 room MSC 343

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Why do hurricanes rarely produce lightning ? How can aerosols affect convection ? How is rain initiated ? How can satellite remote sensing help answer these questions ? The past decade has seen an explosion of research into new areas of cloud physics. At the same time, more precise remote sensing facilitated by a new suite of satellites, surface-based sensors, and aircraft instrumentation have encouraged new views of old problems. The goal of this class is to explore new ideas while strengthening one's grounding in already accepted concepts. This includes a grounding in principles of atmospheric radiation to encourage a critical attitude towards remotely-sensed data.

The 1st half of the class is devoted to cloud physics, the 2nd half to atmospheric radiation. An incoming knowledge of both at the level of Wallace & Hobbs is assumed. Several guest lectures will be incorporated into the class. Because this is an elective course, students will be expected to participate actively through class review of influential papers. The class syllabus is open to student input if done in a timely manner. Grading will be based on class participation (20%), homeworks (50%, approx. 8 or 1 every 2 weeks), and an end-of-class project of the student's choice (30%).

Primary Texts: Rogers and Yau "A Short Course in Cloud Physics"
Pruppacher and Klett "Microphysics of Clouds and Precipitation"
Grant Petty, "A First Course in Atmospheric Radiation"
A selection of journal articles.

Topics:

Observed Properties of Clouds

Review of Cloud Thermodynamics

Particle Nucleation of Cloud Water and Ice, Homogeneous and Heterogeneous

Diffusional Growth

Warm Rain Production

Riming and Hail Production

Cloud-Aerosol Interactions

Cloud Radiation

Properties of Radiation

The EM spectrum/wavelengths selected for remote sensing

Reflection & Refraction

Thermal Emission (current topics in TOA radiation balance; flux calculation)

Atmospheric Transmission

Scattering: overview

Scattering and Absorption by Particles (application to SAL layer)

Multiple Scattering