

# Aerosol Physics, Chemistry, Clouds & Climate

## ATS772

Fall 2017

Tuesdays and Thursdays @ 11:00 – 12:15 in 212B ACRC

Instructor: Dr. Jeffrey Pierce <[jeffrey.pierce@colostate.edu](mailto:jeffrey.pierce@colostate.edu)>, Atmos 220  
<http://pierce.atmos.colostate.edu/>

Office hours: After class (or by appointment)

Prerequisites: Grad student in Atmospheric Science or permission from instructor.

Class Website:

Recommended textbooks:

“Atmospheric Chemistry and Physics” by Seinfeld and Pandis, 2<sup>nd</sup> ed.

“Microphysics of Clouds and Precipitation” by Prupacher and Klett

Additional text: “A Short Course in Cloud Physics” by Rogers and Yau, 3<sup>rd</sup> ed. (this text contains much less detail than Prupacher and Klett, but is much easier to read)

Objectives: (1) Become well-versed with the major concepts of physics and chemistry of atmospheric aerosols including composition, size, and interaction with radiation and clouds. (2) Develop research-grade models of aerosols, clouds, and radiation that synthesize the above concepts.

Grading:

Participation .....	10%
Homework (~6-10) .....	50% total
Project .....	40%

Homework: There will be an assignment every 1-2 weeks (about 6-8 assignments total). The homework is designed to guide you on your project. The homework and project should be synergistic.

Midterm/Final: There will be no exams in this class.

Project: The project is designed to incorporate much of the aerosol (and aerosol-cloud interactions) phenomena we discuss in class. I will assign students into teams and hand out a draft of the project in the first day of class. However, I may revise the project if there are topics that we are not able to cover in class.

On the last day of class, the teams will present their project in a Power Point type presentation and turn in a 5-page (or longer... you may have many plots)

describing the results and interesting things you found.

Additionally, each team must turn in a description of what each team member contributed to the project that is signed by each team member. Each member is expected to contribute relatively evenly. If you feel that this is not occurring in your group, please see me.

Grading (grads):	A .....	90-100%
	B .....	80-89.9%
	C .....	70-79.9%
	F .....	< 70%

Potential topics (I will not be able to cover all of these in the detail that I would like. If you have preferences, please let me know early in the semester):

1. Overview of aerosols
2. Particle/droplet size distributions
3. Single-particle/droplet dynamics
4. Microphysics
  1. Condensation
  2. Coagulation
  3. Aerosol nucleation
  4. Solution of the General Dynamic Equation
  5. Cloud Condensation Nuclei and cloud-droplet activation
  6. Cloud ice
5. Aerosol thermodynamics/chemistry
  1. Inorganic aerosol
  2. Aerosol water uptake
  3. Organic aerosol
  4. Cloud chemistry (inorganic)
6. Optics (for both aerosols and clouds)
  1. Aerosol direct effect
  2. Aerosol indirect effect
  3. Remote sensing instrumentation
7. Aerosol dry deposition

## CLASS POLICIES

UNIVERSITY POLICIES: Students are expected to follow the CSU Student Honor Pledge ( <http://tilt.colostate.edu/integrity/honorpledge/>). This course will adhere to the CSU Academic Integrity Policy as found in the General Catalog (<http://www.catalog.colostate.edu/FrontPDF/1.6POLICIES1112f.pdf>) and the Student Conduct Code (<http://www.conflictresolution.colostate.edu/conduct-code>). At a minimum, violations will result in a grading penalty in this course and a report to the Office of Conflict Resolution and Student Conduct Services.

POLICY ON COLLABORATION: Students are encouraged to discuss homework assignments. However, each student must complete their own assignment. If I determine that students are simply copying assignments, I will pursue action through the Office of Academic Integrity (<http://tilt.colostate.edu/integrity/>). Any copying on tests will be similarly not tolerated.

POLICY ON LATE HOMEWORK ASSIGNMENTS: Late homework assignments will not be accepted, but I will drop the assignment with the lowest score.

POLICY ON REMARKING HOMEWORK: Students who disagree with how their assignment, test, or project has been marked should resubmit their work with a written explanation of their concern. The work will be re-evaluated by the instructor in its entirety.