

ATS 724 - Cloud Microphysics
Fall 2020

Course Objectives:

- To expose students to cloud microphysical processes at an advanced level;
- To assess what we as a community do not know about cloud microphysical processes;
- To investigate how cloud processes are represented in a variety of numerical models; and
- To critique current theories through literature analysis.

Instructor:

Professor Susan C. van den Heever

Email: Sue.vandenHeever@colostate.edu

Meeting Times:

Mondays and Wednesdays: 10-10:50am, online

Classes will be recorded and available on the class website

Prerequisites:

- ATS620 (or equivalent class)
- PhD students, or MS students with written consent of the instructor

Required Textbooks:

There is no required textbook for this class.

Course notes will be distributed for the class via the website:

<http://vandenheever.atmos.colostate.edu/vdhpage/ats724/ats724.php>

Username is 724notes. The password will be distributed in class.

Course Description:

This class will combine an advanced theoretical analysis of cloud microphysical processes with an examination of how these processes are represented within numerical models across the scales. The cloud processes that will be discussed include nucleation, condensation, collision-coalescence, aggregation, riming, freezing, melting, and precipitation. Feedbacks between these microphysical processes and cloud dynamics will also be examined, as will aerosol-cloud interactions. Bin and bulk approaches to the parameterization of microphysical processes in cloud models will be presented.

Course Outline:

1. Introduction, Definitions and Assumptions (~3 classes)
2. Warm Phase Nucleation (~3 classes)
3. Condensation (~4 classes)
4. Collision and Coalescence (~3 classes)
5. Ice Nucleation (~3 classes)
6. Ice Processes (~5 classes)
7. Graupel and Hail (~3 classes)
8. Aerosol-Cloud Interactions (~5 classes)

Course Structure, Expectations, and Grading Criteria:

- The class will meet online for two 50-minute periods each week as indicated above.
- The course material will be delivered through instructor lectures, student analysis and presentation of assigned literature papers, and in-class discussions.
- At least 4 hours of effort (2 hours per each hour of class time) outside of class each week are expected to complete readings and homework assignments.
- The literature analysis and presentations, together with your participation in the class discussions, comprise your grade as shown below.
- There are no exams in this course.

Final Grades:

Your final grade will be weighted as follows:

Literature analysis and Presentations: 90% Class Participation: 10%

Academic Integrity:

This course will adhere to the CSU Academic Integrity Policy as found in the General Catalog (<https://catalog.colostate.edu/general-catalog/policies/students-responsibilities/>) and the Student Conduct Code (<https://resolutioncenter.colostate.edu/wp-content/uploads/sites/32/2018/08/Student-Conduct-Code-v2018.pdf>). 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.

Special Needs:

Please see the instructor during the first two weeks of the semester, if you have special learning needs that should be accommodated in this class, and refer to <http://rds.colostate.edu/csuinto/accommodations.asp> for more information.

COVID-19 Information

- Should you become ill with COVID-19 during the semester, please be sure to follow CSU's instructions in this regard which can be found here: <https://safety.colostate.edu/wp-content/uploads/2020/04/FAQ-Provost-4-10-20-1.pdf>.
- Information and university updates about the status of COVID-19 on campus, testing information, work adjustments and the status of events can be found here: <https://covidrecovery.colostate.edu/>.
- Should you contract COVID-19 during the semester, please let me know as soon as possible. We will make all of the necessary adjustments to your class participation and grades to account for such a circumstance.