ATS 606 Introduction to Climate - Spring 2026

Instructor: Maria Rugenstein Maria.Rugenstein@colostate.edu; 316 ATS Main;
Office Hours: right after class, come by any time for 10min issues, or by appointment if you need more than 10min

Teaching assistant: Killian McSweeney Killian.McSweeney@colostate.edu; 303 ATS Main;
Office Hours: Mondays 2:30-3:30pm and Thursday 1-2pm in ATS100

Web: Class webpage is available on Canvas. Class notes, homework, and discussion papers will be posted on this site.

Class Schedule: Class meets in 121 ATS West from 9-9:50am Mon and Wed.

Student Learning Goals and Objectives: This course introduces the fundamentals for the process-oriented understanding of the Earth's climate system, emphasizing radiation and circulation. You will be able to interpret energy and hydrologic cycles of the climate system, explain the maintenance and impacts of general atmospheric and oceanic circulations, quantitively explain the relevance of other climate system components such as the land surface, the carbon cycle, and sea ice, and demonstrate fundamental understanding how the climate system responds to external forcing.

Textbooks: No textbook will be required, and I will largely use my own notes for the course, which will be posted on Canvas. Three good references are: 1) *Global Physical Climatology*, by D.L. Hartmann (second edition); 2) *Atmospheric Science: An Introductory Survey,* by J. M. Wallace and P. V. Hobbs, Second Edition; 3) *Atmosphere, Ocean, and Climate Dynamics, An Introductory Text*, by John Marshall and Alan Plumb.

Expected work outside the class: a very short assignments after each class (daily assignment), a presentation on one subject towards the end of the semester (AR6 FAQ), a programming project running over some weeks (2-layer model), and an extensive take home exam.

- **Daily assignment:** within 24h after a lecture, submit through canvas a) the most interesting thing, b) the most confusing thing, c) a sketch, conceptual drawing, brainstorming scribble; you need to submit them 75% of the time
- **AR6 FAQ:** In pairs of two, from the recent IPCC AR6 report, choose one frequently ask question-box or one section from a chapter. Present a) the problem or question, b) past and ongoing research efforts and c) open research questions and hypotheses in class (10-15min). https://www.ipcc.ch/report/ar6/wg1/
- **2-layer model:** over some weeks (tba, around four consecutive weeks) we will explore a 2-layer model for the global energy balance. You'll be given the model and can experiment with it and write a short report about your finding. There will be questions and tutoring sessions.
- **Final exam**: take home, open book, review-style, one week time to solve it.

Grading: 25% each for: class participation and daily assignment, presentation of AR6 FAQ, 2-layer model, final exam.

Course Outline:

Date	W	Monday	Wednesday	Deadlines / notes
01/19-01/21	1		Climate system components, syllabus, expectations	
01/26-01/28	2	Structure of the atmosphere; global energy budget	Description of radiation	
01/02-02/04	3	Radiative transfer	Maria out	Double class on Monday or online/flipped classroom on Wednesday
02/09-02/11	4	Radiative-convective equilibrium	Clouds in the energy budget	
02/16-02/18	5	Clouds in the energy budget	Surface energy balance	Decide for subject and partner for AR6 presentation
02/23-02/25	6	Surface energy balance/hydro cycle	Climate change in the 20th and 21st century	
03/02-03/04	7	Energy budget (2-layer) model intro	Hydrological cycle	2-layer model ex 1
03/09-03/11	8	Atmospheric circulation	Atmospheric circulation	2-layer model ex 2
03/16-03/18		Spring break	Spring break	
03/23-03/25	9	Atmospheric circulation	Ocean circulation	2-layer model ex 3
03/30-04/01	10	Ocean circulation	Ocean circulation	2-layer model ex 4
04/06-04/08	11	Sea ice	Buffer (for sure needed)	
04/13-04/15	12	Climate variability modern (guest lecture Vanessa Skiba)	Climate variability paleo (guest lecture Vanessa Skiba)	
04/20-04/22	13	land-climate interactions guest lecture	recap for exam (Killian)	
04/27-04/29	14	exam	exam	
05/04-05/06	15	student presentations AR6 FAQ	student presentations AR6 FAQ	

Statement on Academic Integrity:
This course will adhere to the CSU Academic Integrity Policy as found in the General Catalog (http://catalog.colostate.edu/general-catalog/policies/students-responsibilities/#academic-integrity) and the Student Conduct Code (https://resolutioncenter.colostate.edu/conduct-code/). At a minimum, violations will result in a grading penalty in this course and a report to the Conflict Resolution Services and Student Conduct Services.

CSU Atmospheric Science promotes inclusive community:
CSU Atmospheric Science is a leading global institution, and as such, all members of our community regardless of race, ethnicity, culture, religion, sexual orientation, gender identity and expression, physical ability, age, socioeconomic status or nationality are welcome as equal contributors. We value and appreciate diversity, and we believe that diversity on our campus strengthens our entire scientific community.

Absence:
I will not take attendance, no need to tell me if you're sick. However, you need to submit the "daily assignment" 75% of all lectures. I'll record lectures and put them online right after class.