ATS 780A9: Earth System Predictability

Monday and Wednesday at 10:00 in 212B ACRC

Spring 2026

Instructor: Prof. James Hurrell (jhurrell@rams.colostate.edu)

Office hours: – by appointment

Required Textbook: None

Course Summary: This course focuses on the physical and dynamical foundations of predictability in the atmosphere and the coupled Earth system. The course examines why some aspects of the atmosphere are predictable while others are not, how predictability depends on timescale, and how coupling with the ocean, land, cryosphere, and external forcing extends or limits atmospheric predictability.

Course Goals: Students will:
- Understand predictability from synoptic to climate timescales
- Connect atmospheric dynamics to coupled Earth system memory
- Critically assess prediction systems and forecast skill

Course structure: The course is offered for two credits. The class will be conducted in a lecture/discussion format. PDF files of course notes and slides will be made available by no later than the end of every class session. **Homework** will mostly involve assigned readings, which will form the basis for in-class discussion and student-led presentations. **Grades** will be based on the in-class discussions and exercises. The course will facilitate broad discussion of the many facets of Earth system prediction, informed and enriched by the diverse perspectives of the students and guest speakers.

Grading:

Class Discussions: 60%
Presentations: 40%

Tentative Schedule (Spring 2026):

Week 1 (Jan 19):	Introductions and Welcome: Course Objectives
Week 2 (Jan 26):	AMS (No Class)
Week 3 (Feb 2):	What is Prediction in Atmospheric Science?
Week 4 (Feb 9):	Internal Variability, Forced Response, and Signal-to-Noise
Week 5 (Feb 16):	Modes of Variability
Week 6 (Feb 23):	Subseasonal Prediction
Week 7 (Mar 2):	Land Influence on Atmospheric Predictability
Week 8 (Mar 9):	Ocean Influence on Atmospheric Predictability

Week 9 (Mar 16):   Spring Break
Week 10 (Mar 23):   Seasonal Prediction
Week 11 (Mar 30):   Decadal Prediction
Week 12 (Apr 6):   Ensembles and Representation of Atmospheric Uncertainty
Week 13 (Apr 13):   Forecast Verification and Skill Assessment
Week 14 (Apr 20):   Extremes and Compound Events
Week 15 (Apr 27):   Machine Learning and Hybrid Prediction
Week 16 (May 4):   Synthesis and Wrap-up
Week 17 (May 11):   Finals Week

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 reading and 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/).

POLICY ON LATE HOMEWORK ASSIGNMENTS: Late homework assignments will not be accepted, unless alternative arrangements have been made in advance with the Instructor.

POLICY ON REMARKING HOMEWORK: Students who disagree with how their assignment 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.

POLICY ON MISSED PROJECTS: Alternative arrangements for completing missed projects will be made given the submission of appropriate documentation.