ATM 418: Dynamic Meteorology III
Fall Semester 2023 (3 credits), Class Number 8544
Lecture: Tuesday & Thursday 9:00-10:20 in ETEC 482
https://www.atmos.albany.edu/daes/atmclasses/atm418

Instructor:
Professor Ryan Torn
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Office hours: Monday 10:00-11:00, Wednesday 1:00-2:00, and by appointment

Course Description:
Application of the governing equations to describe and understand mesoscale phenomenon, including flow over topography, organized convection and severe weather, and the atmospheric boundary layer; mathematics and description of the components of numerical weather prediction models.

Course Objective:
Cogently describe the fundamental physical and dynamical processes operating on mesoscale phenomenon, including flow over topography, convection, and the boundary layer utilizing appropriate mathematical formulation.

Prerequisites:
ATM 317, 320

Text:
Mesoscale Meteorology in Midlatitudes by P. Markowski and Y. Richardson (M&R)

Supplementary reading:
An Introduction to Dynamic Meteorology by J. R. Holton and G. J. Hakim (H&H)
Cloud Dynamics, by R. A. Houze
Atmospheric Rivers by F. M. Ralph et al.

Course Requirements:
6 Homework assignments: 25%
In-class quizzes: 10%
2 In-class exams: 17.5% each
Final exam (Monday December 11, 10:30-12:30 pm): 30%
Grading: A-E
Late Homework and off-time exams are only allowed for University-recognized reasons (https://www.albany.edu/health_center/medicalexcuse.shtml). Homework assignments lose 25% of their value per day it is late (i.e., an assignment turned in two days late cannot get better than a 50%).

Quiz Policy:
Most lectures will begin with a 2 question quiz that covers information from the previous lecture. At the end of the semester, the quiz average will be computed, excluding the lowest three scores. Missed quizzes will count as a zero; however, missing quiz scores can be included in the three dropped quizzes at the end of the semester. More than three missing quizzes will count against the student's final quiz score, unless the student has a university-recognized reason for missing classes on specific dates (see https://www.albany.edu/health_center/medicalexcuse.shtml). There are no make-up quizzes.

Course Format:
Students are expected to attend each lecture. In addition, lectures will be recorded when possible and posted to Brightspace, so students can review lectures afterward. **Watching lectures online is not a substitute for attending lecture.** Absences are unavoidable; therefore, in those situations, students are expected to view the lecture recording (Brightspace keeps track of who views each lecture).

Course Communication:
The primary communication method for the course will be through messages through Brightspace. These messages will be archived on the course page and will automatically send to your UAlbany email address. All lecture materials and assignments will be placed on both the course web page and the course Brightspace page. Students may communicate with each other through the Brightspace discussion system. I will answer all emails within 24 h of receipt, except on weekends.

Accommodating Disabilities Policy:
Reasonable accommodations will be provided for students with documented physical, sensory, systemic, cognitive, learning and/or psychiatric disabilities. If you believe you have a disability/disabilities requiring accommodation in this class, please notify Disability Access and Inclusion Student Services (CC 137, 442-5501, daiss@albany.edu). Upon verification and after the registration process is complete, the DAISS will provide you with a letter that informs the course instructor that you are a student with a disability registered with the DAISS and list the recommended reasonable accommodations.

Religious Observance:
Students must notify the instructor of any lectures and assignment due dates that conflict with recognized religious observances (https://www.albany.edu/registrar/academic-calendar/religious-observances) well in advance. The instructor will work with the student to provide an alternative arrangement.

Academic Integrity:
Although students can work together, all homework assignments must be completed independently. Homework assignments that are substantially similar to other students will be given a zero for that assignment. Copying from other students on quizzes and exams may result in a zero for that work and referral for disciplinary action under the University's policy on academic integrity (https://www.albany.edu/undergraduate_bulletin/regulations.html). Every student has the

responsibility to become familiar with the standards of academic integrity at the University. Claims of ignorance, unintentional error, or personal or academic pressures cannot be excuses for violation of academic integrity.

Student Choice Lectures:

At the end of the semester, 1-2 lectures have been reserved for mesoscale topic(s) of interest to the class and have not been covered. Midway through the semester, a request for topics will be sent out to the class. A curated list of topics will then be shared with the class and students will have the opportunity to vote for their favorite choices, with the topic(s) of greatest interest selected, subject to time availability.

Course Outline:

1. Topographic flow (4 weeks)

   - Review of Mountain Waves (M&R 12.1, 12.2)
   - downslope winds (M&R 12.3)
   - flow around topography (M&R 13.1-13.2)
   - slope circulations (M&R 11.1-11.2)
   - orographic precipitation and atmospheric rivers (class notes)

2. Dynamics of Convection (7 Weeks)

   - convective initiation, buoyancy and entrainment (M&R Chapter 7.2-7.4 and class notes)
   - squall lines and RKW theory (M&R 9.1-9.4)
   - supercell dynamics (M&R 8.4)
   - tornado dynamics (M&R 10.1)
   - convective training (M&R 10.4 and notes)
   - sea breezes and dry lines (M&R 5.2, 5.4, 4.7)
   - symmetric instability (M&R 3.4)

3. Boundary Layer (2 Weeks)

   - mean and perturbation form of equations (H&H 8.1)
   - turbulent kinetic energy (H&H 8.2)
   - introduction to K methods (H&H 8.3)
   - Ekman solution and spin-down (H&H 8.3)

4. Student Topic(s) - TBD later in the semester