Atmospheric Sciences 5700
Mesoscale and Radar Meteorology
Spring 2022

Instructor: Steve Krueger
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Description: This course deals with the fundamental aspects of mesoscale and non-hydrostatic motions in the atmosphere. Such motions occur in the atmospheric boundary layer, in flow over mountains, in cumulus convection, mesoscale convective systems, lake effect snow, extratropical cyclones, and tropical cyclones. The course also describes how modern weather radars are used for the quantitative description and physical understanding of precipitating mesoscale systems. Whenever possible, we will undertake real-time examination of mesoscale events as they develop around the country.

Prerequisites: ATMOS 5100 Introduction to Atmospheric Dynamics; ATMOS 5300 Atmospheric Thermodynamics and Boundary Layer Processes

Classroom: CANVAS

Class hours: Tu Th 12:25 pm – 1:45 pm

Office hours W 1:00 pm – 2:00 pm or by appointment. Email works well.

Holidays: (none)

Classes that may be rescheduled: [TBD]

Midterm exam: Thursday, March 3

Reading days (no class): March 8, 10

Last day of class: Tuesday, April 26

Final exam: Tuesday, May 3, 10:30 am – 12:30 pm

Format: Lecture and assigned problem sets.

Grading: The course grade will be determined from problem sets (25%), a mid-term exam (20%), a final exam (30%), a report (20%), and attendance (5%).

The grading scale will be A or A-: ≥ 90; B-, B, or B+: 80-89; C-, C, or C+: 70-79; D-, D, or D+: 60-69; F: < 60.

Class policies: Students must take every exam with exceptions governed by University Policy. Plagiarizing, copying, cheating, or otherwise misrepresenting one's work will not be tolerated.

Missing class will not be penalized directly, but usually results in poor problem set and exam performance. Some course material that you are responsible for will only be presented during lectures (i.e., will not be found in the text or online notes).

Homework is due at the start of class on the due date, unless otherwise noted. *Late homework will generally not be accepted.*

Required Textbook: *Mesoscale Meteorology in Midlatitudes* by Paul Markowski and Yvette Richardson.

Supplementary Textbook: *Radar Meteorology: A First Course* by Robert M. Rauber and Stephen W. Nesbitt. Highly recommended: comprehensive and clearly written. A must-have for anyone serious about radar meteorology.

Other Course Materials: The class web page includes links to notes, skew-T log p diagrams, and resources on forecasting convection.

Topics to be Covered:

1. Scale analysis; vertical momentum equation; buoyancy force (1 lecture)
2. Radar and its applications (2)
3. Lake effect snow (1)
4. Boundary layer phenomena (low-level jet, dry line, horizontal convective rolls, sea breeze)(1-2)
5. Convective storms (5)
6. Tornadoes (3)
7. Midterm exam (1)
8. Downbursts, bow echoes, derechoes (1)

9. Hail and lightning (1)
10. Flash floods (1)
11. Mountain waves and downslope windstorms (2-3)
12. Mesoscale aspects of extratropical cyclones (sting jets, rain bands, CSI) (1)
13. Tropical cyclones (1-2)
14. Mesoscale NWP (1)
15. Special topics (1-4)
16. Student reports (1)
17. Review (1)

Drop and Withdrawal dates:

- Last day to add or drop (delete) classes: **Friday, January 21.** (Students can drop classes by phone or web through this date, and the classes will not appear on their transcripts.)
- Last day to withdraw from classes: **Friday, March 4.** (Students can withdraw from classes by phone or web, but "W" will appear on their transcript for these courses.)

Disability Services

The University of Utah seeks to provide equal access to its programs, services and activities for people with disabilities. If you will need accommodations in the class, reasonable prior notice needs to be given to the Center for Disability Services, 162 Olpin Union Building, 581-5020 (V/TDD). CDS will work with you and the instructor to make arrangements for accommodations.

All written information in this course can be made available in alternative format with prior notification to the Center for Disability Services.