ATSC 5008 Mesoscale Meteorology Fall 2015

Instructor: Dr. B. Geerts, geerts@uwyo.edu, 6062 Eng Bldg, 766-2261.

Class schedule: Tuesdays 10:00-1150 am in ENG 6060

Textbook: Markowski and Richardson 2010: *Mesoscale Meteorology in Midlatitudes*. Wiley-Blackwell, 407 pp. We will follow this book fairly closely.

Additional books and resources:

Smith, R.B., 1979: The influence of mountains on the atmosphere. *Adv. Geophys*. 21:87-230.

Durran, D.R., 1990: Atmospheric Processes over Complex Terrain. *Meteorological Monographs*, Vol 23, No. 45.

Ray, P.S., 1986: Mesoscale Meteorology and Forecasting. AMS, 793 pp. This book contains many separate, disconnect overview articles, by experts in the field. A good reference, but a bit dated.

Houze, R., 2014: Cloud Dynamics. Academic Press, 432 pp. This book is the best reference for the mesoscale organization of precipitation systems. It also has good chapters on cloud physics, radar meteorology, cloud types, and orographic precip (chap 12). The latter (chap 12) can be found also in Houze, 2012: Orographic Effects On Precipitating Clouds, Rev. Geophys.)

Lin, Y-L, 2008: Mesoscale Dynamics. Cambridge University Press, 623 pp. This is probably the best book for the linear theory of atmospheric wave phenomena, incl. orographic waves. It is rather theoretical, but also has sections summarizing published literature.

Trapp, R.J., 2013: Mesoscale-Convective Processes in the Atmosphere. Cambridge University Press, 377 pp. This book emphasizes moist convection at all scales, and severe weather phenomena.

Select COMET modules (http://www.meted.ucar.edu/topics_meso.php)

Website: http://www.atmos.uwyo.edu/~geerts/atsc5008/ (will include lecture slides, links, assignments …)

Topics:

Not all book Chapters can be covered in a 2cr class. The textbook Chapters I propose we select this year are highlighted in green.

Chapter 1. What is the mesoscale?	Yes
Chapter 2. Governing equations, and analysis tools	Yes
Chapter 3. Mesoscale instabilities	Yes (3.5 only)
Chapter 4. The boundary layer	No
Chapter 5. Mesoscale air mass boundaries	No
Chapter 6. Mesoscale gravity waves	Yes
Chapter 7. Convective initiation	No
Chapter 8. Organization of isolated convection	No
Chapter 9. Mesoscale convective systems	No
Chapter 10: Severe thunderstorm impacts (tornadoes)	No
Chapter 11: Thermally forced circulations near mountains	Yes
Chapter 12: Mountain waves & downslope windstorms	Yes
Chapter 12 in Houze (2014): Orographic clouds and precip	Yes
Chapter 13: Blocked flow	Yes

Assessment:

Homeworks: 5 homeworks, 6 % each: 30%

Midterm: Tuesday 20 October	20%
Final exam:	25%
Term project:	20%
Class participation, effort, evidence of progress:	5%

Term project

- a case study of a mesoscale phenomenon of your choice
- preferably team work, 2-3 people per team
- observational and/or modeling work
- regular updates throughout the semester, oral presentation in last week(s)
    - 9/22: 1-page team summary of proposed project (case specs, objectives, tools)
    - 10/13: 10 min team presentations to discuss issues, raise questions
    - 12/1 or 12/8: presentations (30 min + 10 min Q&A)
    - 12/15: report due
- write-up report, in format similar to an AMS paper submitted (see http://www.ametsoc.org/pubs/authorsguide/pdf_vs/authguide.pdf), double-spaced, references, Figs at the back, but a different word limit: max 3000 words of text, Abstract to Conclusions. A good reference to good writing in our field is the book "Eloquent Science" by Dave Schultz (http://eloquentscience.com/)
- examples from previous years: the Laramie tornado of 5/22/08 (published in Electronic J. Severe Storms Meteor., link), a Laramie dryline case study (Campbell et al. 2014, A Dryline in Southeast Wyoming. Part I: Multi-scale Analysis Using Observations and Modeling on 22 June 2010. *Mon. Wea. Rev.* , **142**, 268 - 289)

Grading

A	4.00	Exceptional
A-	3.67	
B+	3.33	
B	3.00	Very good
B-	2.67	
C+	2.33	
C	2.00	Fair
C-	1.67	
D+	1.33	
D	1.00	Poor
F	0	Failure

A note on academic integrity and plagiarism

Academic integrity is the pursuit of scholarly activity in an open, honest and responsible manner. Academic integrity is a basic guiding principle for all academic activity at the University of Wyoming, and all students are expected to act in accordance with this principle. Consistent with this expectation, all students should act with personal integrity, respect other students' dignity, rights and property, and help create and maintain an environment in which all can succeed through the fruits of their efforts.

Academic integrity includes a commitment *not to engage in or tolerate acts of plagiarism, falsification, misrepresentation, or deception*. Such acts of dishonesty violate the fundamental ethical principles of the academic community and compromise the worth of work completed by others.

Evidence of plagiarism may result in expulsion from the course (with an F grade) as well as dismissal or suspension from the University of Wyoming (Unireg #030-1970).