ATSC 5160/5007 Synoptic Meteorology Spring 2015

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

Class schedule:

MW 1:10 – 2:25 pm: lecture, in EN6060
Thu 2:45-4:00 pm: lab, in EN6060, and in a computer lab (EN 1034)
No class on Mon 2 March, Wed 22 April and possibly other days. Make-up class: tentatively on Friday of the same week, same time & place

Textbook: Lackmann, G. 2011: Midlatitude Synoptic Meteorology (AMS). This book contains extensive descriptions and many color example analyses. It excels at the interpretation, applications, and limitations of key equations (such as the QG equations), but it does not rigorously derive the equations. We will do some of these derivations in class, and they can be found in other textbooks, such as Martin (2006) and Holton and Hakim (2012).

Additional books:

Jonathan E. Martin, Mid-latitude Atmospheric Dynamics, 1st Edition, Wiley, 2006. This book emphasizes quasi-geostrophic dynamics, but is rather brief in its treatment of isentropic analysis and the IPV framework. It is more theoretical, focused on the dynamics, than Lackmann's book.

Bluestein, H., 1993: Synoptic-dynamic meteorology in Midlatitudes, Vol II. Oxford University Press. This book is more in-depth but rather poorly organized, and sometimes the details overwhelm the main message.

Shapiro, M., and S. Gronas, 1994: The life cycles of extratropical cyclones. A 3-volume book based on presentations given at a meeting in Bergen (Norway) in summer 1994, at the occasion of the 75th anniversary of the seminal paper on extratropical cyclones and fronts by Bjerkness and his colleagues at the Bergen School of meteorology.

Peixoto and Oort, 1992: Physics of climate. This book deals with the general circulation, with an emphasis on energy transports.

Newton, C., and E.O. Holopainen, Eds., 1990: *Extratropical Cyclones, The Erik Palmen Memorial Volume.* American Meteorological Society, Boston, 262 pp. A more descriptive survey of extratropical cyclones and their role in the general circulation.

Palmen and Newton, 1969: Atmospheric circulation systems: their structure and physical interpretation. This book also views extratropical cyclones in the context of the general circulation. It remains the best source for cyclone lifecycle schematics.

Holton and Hakim, 2012: An introduction to dynamic meteorology, Fifth Edition, Academic Press. This remains the best resource for atmospheric dynamics, and I plan to use some derivations from Holton's book. But Holton does not dwell on weather analysis.

Course website: http://www.atmos.uwyo.edu/~geerts/atsc5160/

Course topics (the numbers correspond with the chapters in the textbook)

2. Quasi-geostrophic (QG) theory
3. Isentropic analysis
4. The Potential Vorticity (PV) framework
5. Extratropical cyclones
6. Fronts & frontogenesis
7. Baroclinic instability

Weather briefings

Each one of us will give two 15 min weather presentations. The idea is to explore an interesting current or recent weather event of your choice. These briefings are part of the regular class meeting, and are held at the end of regular class time. The objective is to improve understanding of atmospheric processes at the synoptic space/time scale through a case study, and to hone your public presentation skills. I 'll give the first briefing. The (somewhat arbitrary) sequence for the first round before spring break is: Dana (2/2), Sara (2/4), Thomas (2/9), Anna (2/11), Adam (2/16), Guotao (2/18), Rachel (2/23), Sharon (2/25), Mingxuan (3/4), and Yun Zhou (3/6). We 'll have a 2nd round after spring break.

Some suggestions about weather briefings

- Read Chapter 11 (Weather Forecasting) in the textbook
- Look at the weather every day. You may have your own links. The ones I have been using are on the course website.
- Have your web links prepared, and prepare a list of fields you want to look at. Don't use powerpoint, or at least not exclusively. In your second briefing, you are expected to build at least some of your analysis imagery using gempak or IDV.
- Be creative with fields (variables) and websites. You can explore any region in the world, although data density is lower outside the US. The focus is on the synoptic scale, but as higher-resolution resources become increasingly available, you may want to delve into the mesoscale.
- When you show unfamiliar maps, please explain what is shown, and provide the necessary background info if needed.
- **Have a thorough insight into the current weather before you start**. You can present some of your material using powerpoint, but a canned presentation is unlikely to suffice to address questions.
- Be ready to answer specific, probing questions. I tend to ask questions intended to demonstrate your understanding of basic atmospheric processes or balances, e.g. thermal wind balance. Many aspects, often beyond the scope of our lecture materials, need to be considered, e.g. atmospheric radiation, instability and convection, orographic effects.
- Please remain focused. You don't have to cover the whole forecast period, or the whole country, or all fields. You can choose a specific weather phenomenon (structure & evolution) or address a specific question (QG forcing, Q-vectors, predictability, …)
- The best briefing demonstrates your ability to do real science and to present this well. Real science means an ability to pick up some interesting weather and the formulation and testing of a hypothesis. The mere mentioning of 'known' concepts is inferior to the questioning of these concepts.
- The audience (other students) should actively participate. The best questions are often those that you did not feel comfortable to ask.
- Assessment will be by your peers and by me.

Assessment

ATSC 5160 (2 cr)

Homeworks: 4 homeworks, 6 % each	24%
Midterm: Wednesday 25 March	33%
Final exam: to be arranged	36%
Class participation, effort, evidence of progress	7%
Total (ATSC 5160)	**100%**

ATSC 5007 (1 cr)

WRF simulation (in preparation for the labs)	0%
Labs (weekly)	80%
Weather Briefings (2 presentations)	20%
Total (ATSC 5007)	**100%**

Note: The Lab ATSC 5007 and the Course ATSC 5160 are not separate, in fact you will see that they are tightly linked, by design. The materials covered in the Lab are a direct application to the theory covered in the lectures, and the Lab content is part of the final exam. Details of the WRF simulation will be provided separately

Grading

A	4.00	Exceptional
A-	3.67	
B+	3.33	
B	3.00	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).

Students with disabilities

If you have a physical, learning, or psychological disability and require accommodations, please let the instructor know as soon as possible. You must register with, and provide documentation of your disability to University Disability Support Services (UDSS) in SEO, room 330 Knight Hall.