ATMO 650 Fall 2007
Advanced Synoptic Meteorology
1:00-2:15 T R

Instructor: Prof. Donna Tucker
Office: 404 Lindley, Phone: 864-4738
Hours: 1:30-2:45 M,W, 2:30-3:30 T,R
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Prerequisites: ATMO 630 and ATMO 660.

References: Doswell, C.A., Ed., Severe Convective Storms, American Meteorological Society(handout, available from AMS and on reserve - Anschutz) (SCS)

Moore, J., Isentropic Analysis and Interpretation, (handout) (IA)

Ray, Peter S., Ed., Mesoscale Meteorology and Forecasting, American Meteorological Society (handout and available from AMS) (MMF)

Carlson, T.N., Mid-Latitude Weather Systems, American Meteorological Society. (C)

Holton, James, An Introduction to Dynamic Meteorology, 4th edition(on reserve - Anschutz)(H)

Church, C., D. Burgess, C. Doswell, and R. Davies-Jones, Eds., The Tornado: Its Structure, Dynamics, Prediction, and Hazards. (on reserve - Anschutz) (T)

Web Materials: This class will make extensive use of materials from the Web site www.meted.ucar.edu. Note that modules listed with a (q) have an associated quiz - sometimes called final exam. You are to do this quiz (open book), list your instructor as your supervisor, and have it sent by the due date (to be announced)

Course Outline	**Readings**
I. Introduction	
A. What is synoptic meteorology?	
B. Definition of mesoscale	/mesoprim/mesodefn
II. Isentropic analysis	
A. Advantages and disadvantages	IA, pp 1-23
B. Equations in isentropic coordinates	IA, pp 23-30
C. Construction of isentropic charts	IA, pp 30-57
D. Operational uses of isentropic charts	IA, pp 82-91
E. Tropopause folds	IA, pp 67-73 C, pp 420-436
III. Sounding analysis	
A. Stability parameters	/mesoprim/cape/index.htm
B. Changes to stability	Handout
C. Helicity and the hodograph	/mesoprim/hodograf/index.htm
Exam I	
IV. Forcing Mechanisms for Convective Weather	
A. Necessary conditions for convective weather	SCS, pp. 94-100.

B. Discontinuities	
1. Symmetric instability	IA, pp 73-83, H, pp 279-283
2. Fronts	/mesoprim/bandedprecip, sections 1-4
a. kinematic frontogenesis	H, pp 269-274
b. anafronts/katafronts	
3. Jet Streaks	/nortlat/jetstreaks (q) C, 404-417
4. Drylines	MMF, Chapt. 23
C. Mesoscale Winds	
1. Mountain and coastal influence	/mesoprim/seabreez /mesoprim/mtnval SCS pp. 78-82
2. Low level jets	Handouts

Exam II

V. Types of Mesoscale Systems	
A. Banded Precipitation	/mesoprim/bandedprecip, sections 5-7 (q)
B. Air Mass Thunderstorm	SCS pp. 4-14
C. Supercell Thunderstorm	T, pp 161-172; H, pp 298-304 /mesoprim/shear/index.htm (q)
D. Mesoscale Convective Systems	/mesoprim/severe2/index.htm (q)
1. Squall lines	
2. Cluster types	SCS, pp 323-345
VI. Thunderstorm Hazards	
A. Tornadoes	SCS, pp 167-169, 190-196
B. Downbursts	SCS, pp 255-272, 282-292
C. Derechos	
D. Hail, heavy precipitation	SCS 489-505

Final Exam: Friday Dec. 14, 2007 1:30 p.m.

Course Requirements and Grading

For most weeks Thursday's class will begin with a student led map discussion. Students are expected to integrate concepts discussed in this course into their map discussions. Students are encouraged to use satellite and radar data as well as other displays from McIdas and GEMPAK in their map discussions. Each map discussion will focus on a city to be chosen by the instructor and will conclude with a 48 hour forecast for that city. Each student must do at least one map discussion. Students may give more than one map discussion if they want to try for a higher grade.

Each student will do a project related to short term weather forecasting and analysis and report their results in a paper. A project consisting solely of a literature review is <u>not</u> acceptable. Possible types of projects are:

- A synoptic and mesoscale analysis of a particular weather event
- A severe weather climatology
- A study of operational numerical model performance
- A computer project consisting of a <u>series</u> of batch or script files focused on the forecasting of a particular weather phenomenon

Other types of projects may be acceptable. The specific topic for the project must be approved by the instructor. An abstract consisting of a 100 word summary describing the project and a list of at least 7 references you expect to use in your paper is due Sept 27, 2007. If you need data for your project, the abstract must state that you know the data are available and where you will get the data. A student who wishes to do a case study of an event over 2 years old needs advance permission from the instructor. A typed first draft of the paper is due Nov. 20, 2007. The first draft is expected to be a complete paper. Students will turn in the final version of their paper on or before 5 p.m. on Stop Day, Dec. 7, 2007. Students may be penalized for failure to meet these deadlines and for final papers which are not consistent with their abstract. If the final paper is not turned in by the deadline, students will be graded mostly on their typed first draft.

Grades will be determined from the following:

Map Discussion	5%
Homework	20%
Exam I	15%
Exam II	15%
Project	20%
Final Exam	25%