Synoptic Meteorology
Meteorology 411/511
Fall 2017

Class meetings (all in 3128):

Lecture: W 1:10-2:00 pm Labs: MWF 2:10-2:30; R 9:00-11:50 am

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Web Site for additional course support: http://www.meteor.iastate.edu/classes/mt411
Grades will be posted on Blackboard
Portfolio Web Site for Forecasting Contest and messages:
http://www.meteor.iastate.edu/forecast/

Course Objectives In this course, general characteristics of mid-latitude synoptic weather systems will be explained and compared with the quasi-geostrophic theory of baroclinic development. Thorough understanding of synoptic-scale processes will be emphasized in daily weather briefings given by all students. Students should leave the course able to offer a ``reasonable" explanation for any larger-scale weather event that might occur.

Texts: ``Synoptic Meteorology" Course Notes (required).

You may also find your ``Weather Forecasting Redbook" from 311, and the new synoptic textbook, "Midlatitude Synoptic Meteorology" by Gary Lackmann helpful.

Other handouts will be distributed when appropriate.

Tentative Syllabus

A. INTRODUCTION TO WEATHER FORECASTING

August 23-24: Norwegian cyclone model and related forecasting principles; IN CLASS LAB: Review of weather data sources [A1-B9]. **NOTE: NO CLASS ON AUG 21 or AUG 25*
August 28-29: Hurricanes [1-8]; IN CLASS LAB (CONTEST begins Aug 28)

B. FUNDAMENTALS OF SYNOPTIC-DYNAMIC METEOROLOGY

September 6-7: Kinematics of the wind field: Divergence, Vorticity, and Deformation [9-20].
September 13-14: Balanced flow -- geostrophic and gradient wind [21-31].
September 20-21: Thermal wind, Thickness [32-41].

C. QUASI-GEOSTROPHIC THEORY

September 27-28: Quasi-geostrophic theory; QG Height Tendency Equation [42-64].
October 4-5: Quasi-geostrophic Omega Equation [42-64]; IN CLASS LAB.
October 11-12: Q-vectors, Quasi-geostrophic summary [65-73].
October 18: REVIEW

October 19: MIDTERM - (material through Oct. 5)

D. MISCELLANEOUS SYNOPTIC TOPICS

October 25-26: Fronts, Frontogenesis Equation [74-83].
November 1-2: Baroclinic Development (prediction of surface pressures) [84-88].
November 8-9: Isentropic Analysis [89-96].
November 15-16: Organization of cloud and precipitation systems [97-99]; IN-CLASS LAB: Case study.

November 22-23: No CLASS - Happy Thanksgiving!

November 29-30: Miscellaneous topics (e.g., Observing systems, NWP, newer theoretical models) [100-108]; IN-CLASS LAB.
December 6-7: Long-range Prediction/Ensemble Techniques [109-115], REVIEW
December 11: (noon-2:00 pm) FINAL EXAM

Grading for MT411/511:

40% Lab exercises (due at the beginning of next lab; late assignments receive one-half credit)
23% mid-term exam
27% final exam
411: 10% Forecast contest, weather briefings, special exercises
511: 5% Extra lab questions, special exercises, weather briefings(?)
511: 5% Case Study Project

NOTE ABOUT DISABILITIES: Iowa State University is committed to assuring that all educational activities are free from discrimination and harassment based on disability status. All students requesting accommodations are required to meet with staff in Student Disability Resources (SDR) to establish eligibility. A Student Academic Accommodation Request (SAAR) form will be provided to eligible students. The provision of reasonable accommodations in this course will be arranged after timely delivery of the SAAR form to the instructor. Students are encouraged to deliver completed SAAR forms as early in the semester as possible. SDR, a unit in the Dean of Students Office, is located in room 1076, Student Services Building or online at www.dso.iastate.edu/dr/. Contact SDR by e-mail at disabilityresources@iastate.edu or by phone at 515-294-7220 for additional information.

NOTE ABOUT ACADEMIC DISHONESTY: In this course, you may be permitted to do some weekly lab exercises outside of class. I know it can be helpful to work with others on these exercises, but I caution you to try to do your own work. Traditionally, many students earn far worse grades on exams in this course than on laboratory exercises, which can mean the students relied too much on others when doing the labs. If I receive lab exercises from two or more students that are basically identical, I will regard it as cheating. All cases of such academic dishonesty will be reported to the Dean of Students. Also, if problems persist, I may require that they all be done in-class.

FINAL THOUGHTS: Although a key goal in this class is that you learn to understand the atmosphere deeply enough to be a good weather forecaster, I hope you also learn to appreciate the complexity and beauty of it, and the orderliness of the laws that govern it. I have been a weather fanatic from as early as I can remember growing up in Johnstown, PA (Flood City USA), and am always impressed by those aspects of the atmosphere.