SAN FRANCISCO STATE UNIVERSITY FALL 2017
DEPARTMENT OF EARTH & CLIMATE SCIENCES

ERTH 465
Synoptic and Mesoscale Meteorology of the Middle Latitudes
(formerly Weather Analysis and Forecasting I)

Credit: 4 units; 2 units lecture, 2 units laboratory
Room/Time: TH 604 TTH 8:10-12:00
Prerequisites: ERTH 260 (Metr 201), Math 227, and Phys 220 or its equivalent with and/or consent of instructor

Instructor: John P. Monteverdi
Office Hours: W 9-11

Daily Class Schedule:	8:10-9:00	Lecture
	9:10-10:45	Laboratory
	10:45-11:00	Briefing
	11:00-Noon	Spot Forecasts

A. Objectives of the Course and Student Learning Outcomes

All of you have taken (or are taking) coursework which has introduced you to: (1) some of the basic laws which govern atmospheric behavior (ERTH 260); (2) the fundamentals of the hydrostatics, thermodynamics and dynamics of the atmosphere and ocean (ERTH 260).

Modern synoptic meteorology is a essentially an application of the principles of physical and dynamic meteorology to understand the evolution of weather patterns of one sort or another. Many synoptic meteorologists then apply this in operational activities, a large portion of which involve forecasting of some aspect of the meteorological environment. Forecasting often is dependent upon viewing circulation systems at the scale of maps and charts showing continental and subcontinental size areas (termed “synoptic” and “sub-synoptic”). Since the prerequisite ERTH 260 you all took now includes a good introduction to the ingredients of severe weather, we can delve more deeply into the mesoscale aspects of severe and local weather as well. In many respects, the present course can be considered to be an applications course that will be your first inquiry into the theoretical knowledge and observational and analysis with practical application in the field of weather forecasting.

The readings in the text book and in various journals will be selected not only to amplify and show application of previous principles to the “real world" of synoptic meteorology, including weather forecasting, but to stimulate thought and discussion. In some cases, discussion material will be relatively controversial (e.g., "is long range forecasting

possible?"; "has computer-based technology "over-high-teched" weather forecasting?"; "should hand-analysis be reemphasized?") and relate to the future of the field. More importantly, the integration of probabilistic forecasts in replacement of deterministic forecasts will be a key topic.

The traditional tasks of the weather forecaster used to be collected under the heading SYNOPTIC METEOROLOGY. Today, it is probably more proper to designate this branch of the field OPERATIONAL METEOROLOGY since many practitioners of the field actively integrate processes that operate at many scales in producing an operational weather forecast. You will hear much about this in the course.

But the traditional tasks go far beyond simple analysis and forecasting. Meteorologists today must be able to effectively COMMUNICATE the science, both to their peers and the general public. A good portion of this course will be devoted to both, the former in the formal writing and the latter in the weather briefings and spot forecast contest.

Actually, the "quasi-geostrophic" theory to which you will be exposed in this class and ERTH 565 (Metr. 500), is nothing new and has been around since the 1940's. Those of you who took ERTH 260, 360 or 365 know that surface pressure systems can be thought of as being caused either by thermal effects (THERMAL LOWS) or dynamic effects (i.e., divergence aloft not related to surface heating or cooling) (DYNAMIC LOWS) etc. That simple categorization falls out of what is known as quasi-geostrophic (QG) theory. The derivation of the QG equations has allowed teaching meteorologists to create such categories, but, in reality, nature doesn't strictly compartmentalize pressure systems into these categories. Your understanding of the equations you derive in ERTH 465 and ERTH 565 will help you see that many effects (leading to pressure system development) are operating simultaneously, and it is human interpretation that allows us to eliminate minor effects "on an order of magnitude basis". This allows for an easier physical interpretation.

At the conclusion of this course students will be able to:

- Sort through and identify the key factors influencing the development and evolution of mid-latitude weather systems on the basis of quasi-geostrophic thinking.

- Sort through and identify the key factors influencing the development and evolution of severe weather systems.

- Construct a hierarchy of the major influences on the weather phenomena common to the middle latitudes in general and California in particular.

- Identify the steps that go into a forecast, including assimilation of observations, oral weather briefings, numerical weather prediction, and statistical guidance.

- Make weather forecasts by applying concepts from lecture and lab to real world examples in the guise of a forecasting contest.

- Write and speak in the style demanded by the discipline.

B. Laboratory and Forecast Sessions

The laboratory session will really be broken into three portions: (1) lab exercises which will provide you with several more analysis techniques with which you need some familiarity; (2) exercises designed to illustrate or substantiate lecture material; (3) exercises which involve use and programming of the WGSL or sources on the intenet; (4) objective and subjective forecasting techniques. In the lab exercises, the philosophy is to LEARN THE CORRECT TECHNIQUES regardless of the immediate result. In other words, here I still will emphasize the it is better to be wrong for the right reasons than right for the wrong reasons.

Each individual will be responsible for two weeks worth of weather briefings. The briefings are expected to be highly-polished presentations tailored to aid the class in its spot forecasts which follow. It is up to the briefer to post maps, color maps, select topics, etc. appropriate for the level of ERTH 465 and the needs of the class. He or she will be graded as such.

In addition, I often step in before or during the briefings if the weather situation affords an opportunity to use an "inquiry based" approach to explore current class topics. The material covered is fair-game for examinations and students are expected to participate in the inquiry. The weather briefings also allow the other students to critique the briefer, to hone his or her knowledge and presentation skills, so that when it is his/her turn to do the briefing, a better performance will occur

In "the real world" where the advancement of scientific knowledge is not given high priority unless there are immediate practical results, the value of a weather forecast is its accuracy and not the validity of the method used to forrnulate it nor the skill of the individual making the forecast. You will find out, however, that there definitely is a relationship. In any case, the last 45 minutes of the class period will be devoted to making forecasts for 5 cities across the United States. The skill with which you forecast will be reflected in your grade for this course. In this portion of the class, you will be expected to integrate the theoretical knowledge you have obtained with your facility at map interpretation and INTUITION to produce a correct forecast. Exact scoring methodology and "rules of the game" will be explained in another handout.

C. Grading Plan

Examinations (2) at 15% each (October 12, Nov. 16)	30%
Homework	5%
Quizzes (Two)	5%
Participation	5%
Final (Lecture/Lab) at 15% (Dec. 14, 8:45 - 10:30 am)	15%
Briefings	10%
Forecasts	10%
Written Lab Reports	20%

TEXTBOOKS

Bluestein, Howard B., 1993: Synoptic-Dynamic Meteorology in Midlatitudes. Vol I. Principles of Kinematics and Dynamics. Oxford University Press. 431 pp. ISBN-0195062671.

Djuric, Dusan, 1994: Weather Analysis. Prentice-Hall. 304 pp. ISBN 0-13-501149-3

Duplicated Materials, as needed.

D. Required Statements

1. Disability access

Students with disabilities who need reasonable accommodations are encouraged to contact the instructor. The [Disability Programs and Resource Center (DPRC)] is available to facilitate the reasonable accommodations process. The [DPRC] is located in the [Student Service Building and can be reached by telephone (voice/TTY 415-338-2472) or by email (dprc@sfsu.edu)." (http://www.sfsu.edu/~dprc)]

2Student disclosures of sexual violence .

SF State fosters a campus free of sexual violence including sexual harassment, domestic violence, dating violence, stalking, and/or any form of sex or gender discrimination. If you disclose a personal experience as an SF State student, the course instructor is required to notify the [Dean of Students]. To disclose any such violence confidentially, contact:

[**The SAFE Place** - (415) 338-2208; http://www.sfsu.edu/~safe_plc/]

[**Counseling and Psychological Services Center** - (415) 338-2208; http://psyservs.sfsu.edu/]

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