

SYLLABUS

MET 416: TROPICAL ANALYSIS AND FORECASTING

Spring Semester 2013

Location: HIG room 310

Steven Businger, businger@hawaii.edu

13:30-17:30 T & R

Office Hours: by appointment: 956-2569

Student Learning Outcomes: During this semester the science of tropical analysis and forecasting will be emphasized. The first half of the semester, taught by Dr. Businger, will focus on synoptic-scale phenomena, whereas the second half, taught by Dr. Chen, will emphasize mesoscale phenomena. The course will utilize the evolving computer laboratory in HIG 310. Lab exercises will be directed toward analyzing the processes that lead to the development of tropical storm systems and mesoscale weather. Lectures will include a forecasting perspective.

Daily weather map discussions and a forecast contest will provide first-hand experience in predicting current (nowcasting) and expected weather, using all available real-time operational weather data, satellite imagery, and NCEP prognostic products.

WFO weather briefings occur downstairs at 10:30 AM each Tuesday and Friday. Please plan to attend these briefings unless you have a class conflict. Field trips to the North Shore (conditions permitting) and to a local TV station will be arranged. Guest speakers from the WFO will give special insights into forecast problems facing operational forecasters in Hawaii. First day of instruction is 1/8/13, last day of instruction is 4/30/13.

Preliminary Lecture Outline

Introduction to forecasting in the tropics

Overview of forecasting in the tropics	1/8
Review of observations and numerical weather prediction in forecasting	1/10
Orientation to NWSFO	1/15

Large-scale weather phenomena in the Tropics

Review of synoptic-scale dynamics	1/17
Tropical – extratropical interaction	1/22
Cold fronts and shear lines	1/24
Kona lows and Tropical Upper Tropospheric Troughs (TUTTS)	1/29
Review and First exam	1/31
Heavy rain events and flooding	2/5
Hawaiian Highs	2/7
Forecasting ocean swell and surf	2/12

Tropical Storms

Environmental prerequisites for formation, synoptic climatology	2/14
Life cycle and energetics, contrast with midlatitude cyclones	2/19
Hurricane track and intensity forecasting	2/21
Hurricane structure, impacts on land, social issues in forecasts	2/26
Review and Second Exam	2/28

Observational tools

Radar – WSR-88d reflectivity and Doppler theory and interpretation	3/5-9
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Tropical mesoscale phenomena

Review of mesoscale dynamics	3/21
Thermodynamic diagrams	4/2
Convection and instability	4/4

Review and Third Exam	4/9
Summer trade-wind weather based on HaRP	4/11-16
Large-scale influences, Diurnal cycle, Topographic effects	
Trade-wind inversion	
Mountain waves and downslope windstorms	4/18
Local and orographic effects on heavy rainfall and flooding	4/23
Tornados and water spouts in Hawaii	4/25
MCS's in the deep tropics	4/30

Fourth Exam

12-2 pm, May 9

Grading

Oral Weather Briefings	20%	O
Written Lab Assignments	20%	W
Forecast Contest	15%	W
Research paper & oral presentation	15%	W&O
<u>Four Exams</u>	<u>30%</u>	<u>W</u>
Total	100%	

Exam dates are: 2/6, 3/6, 4/10, and 5/6

This class is *Oral Intensive*. See www.hawaii.edu/gened/oc/oc.htm. Oral weather briefings will be presented at the end of each lab period. The weather briefings and an oral research paper presentation will be critiqued and graded for clarity and accuracy in presentation and quality of delivery. Students must adequately complete all oral communication assignments to pass the course with a D grade or better. Students who do not complete all oral communication assignments will not earn O Focus credit.

This class is also *Writing Intensive*. See manoa.hawaii.edu/mwp/. The writing assignments fall into three categories, (i) written lab assignments (14 labs x 2 pages per lab), (ii) written sections in take-home exams, (8 pages) and (iv) written term paper (6 pages). Each of these will be graded for the quality of the technical writing (content and clarity), with drafts returned for revisions. Grades for each step are logged and used to determine a final writing grade for the course. Students must adequately complete all writing assignments to pass the course with a D grade or better. Students who do not complete all writing assignments will get a D- or an F and will not earn W Focus credit.

Reference Texts

1. Forecaster's Guide to Tropical Meteorology by Ramage 1995
2. Midlatitude and Synoptic Meteorology by Gary Lackmann 2012
3. Weather Analysis - Dusan Djuric, 1994
4. Atmospheric Science: An Introductory Survey, Wallace and Hobbs, 2006.
5. Synoptic-Dynamic Meteorology in Midlatitudes, Vols. I&II - Howard B Bluestein, 1993
6. An Introduction to Dynamic Meteorology, 3rd edition - J.R. Holton, 2004.
7. AMS Journals online: <http://ams.allenpress.com/amsonline/?request=index-html>