

ATMO 416: TROPICAL ANALYSIS AND FORECASTING

Semester: Spring 2019

Location: HIG room 310

13:30-17:30 T & R

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The purpose of this class is to acquaint you with various forecasting techniques applicable to tropical and mesoscale phenomena. For the Tropics we will discuss forecasting issues for the various planetary, synoptic, mesoscale, and convective scale features that impact society. We will also look at the southernmost U.S. because of the large amount of data available. You will learn how to apply the information from a wide range of web sites to make a forecast. You should all have had ATMO 302 and ATMO 303 or the equivalent.

A typical class will start with a lecture lasting about 60+ minutes that will provide some background for the lab. This will be followed by a preparation time (20-30 min) for the map discussions that will be conducted by a few students, with an often-animated critique by the professor. The teaching assistant will run the forecast contest. Typical locations to forecast for are Honolulu and Miami.

This course has two foci: writing intensive and oral intensive. The approximately dozen labs will constitute over 5000 words. There will be ~4 short quizzes that will have essays that will be graded on presentation as well as content. Feedback on writing style will be given for each of the labs. The lab reports (save for hand analyses) should be done on a computer and it will be necessary to provide links to the maps that you used for your analyses.

Each student will make several map briefings throughout the semester with each map briefing lasting 20 to 30 minutes. Early in the semester there will be plenty of feedback on both the scientific as well as the presentation portion of the map briefings. The last map briefing near the end of the semester will have written feedback after the entire map briefing is complete. Here we assume that you have developed a much-improved technique compared to your initial presentations.

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 Hawai'i.

Student Learning Objectives

Upon completion of the course, the student should be able to:

1. Demonstrate familiarity with basic terminology of Tropical Meteorology.
2. Demonstrate familiarity with the tools used for weather diagnostics and
3. Understand Quasi-Geostrophic theory and its implications for midlatitude weather.

4. Understand the structure of tropical cyclones.
5. Identify on a weather map the main synoptic features in any tropical location.
6. Synthesize available data to discuss the past and present weather in a particular location.
7. Have a qualitative understanding of the evolution of the weather at a given tropical location given past and present conditions and model predictions.

Preliminary Lecture Outline

Dr. Businger

Introduction to forecasting in the tropics

Introduction to the course	01/08
Overview of forecasting in the tropics	01/10
Numerical Weather Prediction	01/15
Forecast verification	01/17
Tropical circulations/Trade winds	01/22
Downslope Windstorms	01/24
Subtropical Fronts	01/29
First Exam	01/31

Heavy rain events/ Flash Flooding	02/05
Kona Lows	02/07
Review of Planetary and Synoptic Waves	02/12
Local and orographic effects on heavy rainfall and flooding	02/14
Hurricane Force Wind Fields/Swell Generation	02/19
Swell and Surf Forecasting	02/21
Introduction to vog/ vog modeling	02/26
Review and Second Exam	02/28

Dr. Torri

Tropical Cyclones

Radar – WSR-88d reflectivity and Doppler theory and interpretation	03/05
Environmental prerequisites for formation, synoptic climatology	03/07
Life cycle and energetics, contrast with midlatitude cyclones	03/12
Hurricane track and intensity forecasting	03/14
Hurricane structure, impacts on land, social issues in forecasts	03/28
Visit to the Central Pacific Hurricane Center	04/02
Review and Third Exam	04/04

Tropical mesoscale phenomena

Review of mesoscale dynamics	04/09
Thermodynamic diagrams	04/11
Convection and instability	04/16
Summer trade-wind weather based on HaRP	04/18
Tornados and waterspouts in Hawai'i	04/23
MCSs in the deep tropics	04/25

Grading

Oral Weather Briefings	25%	O
Written Lab Assignments	30%	W
Forecast Contest	15%	W
Four Short Exams	30%	W
Total	100%	

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 based on how clear, correct, and well enunciated the English is. Students must adequately complete all oral communication assignments to pass the course with a D grade or better. Forty percent of the grade depends on the oral component of this class. 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 exams, (8 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. Severe Local Storms in the Tropics (AMS Monograph) – Gary Barnes, 2001.
6. AMS Journals online: <http://ams.allenpress.com/amsonline/?request=index-html>

Title IX Statement:

The University of Hawai'i is committed to providing a learning, working and living environment that promotes personal integrity, civility, and mutual respect and is free of all forms of sex discrimination and gender-based violence, including sexual assault, sexual harassment, gender-based harassment, domestic violence, dating violence, and stalking. If you or someone you know is experiencing any of these, the University has staff and resources on your campus to support and assist you. Staff can also direct you to resources that are in the community. Here are some of your options:

As members of the University faculty, your instructors are required to immediately report any incident of potential sex discrimination or gender-based violence to the campus Title IX Coordinator. Although the Title IX Coordinator and your instructors cannot guarantee confidentiality, you will still have options about how your case will be handled. Our goal is to make sure you are aware of the range of options available to you and have access to the resources and support you need.

If you wish to remain ANONYMOUS, speak with someone CONFIDENTIALLY, or would like to receive information and support in a CONFIDENTIAL setting, use the **confidential resources available** here: <http://www.manoa.hawaii.edu/titleix/resources.html#confidential>

If you wish to directly REPORT an incident of sex discrimination or gender-based violence including sexual assault, sexual harassment, gender-based harassment, domestic violence, dating violence or stalking as well as receive information and support, contact: Dee Uwono Title IX Coordinator (808) 956-2299 t9uhm@hawaii.edu.