**Syllabus – Tropical Meteorology (MET 406)**

Fall 2014, T, TH 9:00 to 10:15, HIG 309

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Office hours: anytime save MWF 10:30 to 11:20 (MET200), W 3:30 seminar

**Summary:** MET406 is designed to introduce you to weather phenomena found in the Tropics. This is a new version of the prior Tropical Meteorology class with an all new set of lectures. The material is primarily derived from Tropical Meteorology (1954) and Climate and Weather in the Tropics (1979), both by Herbert Riehl, the Forecasters Guide to Tropical Meteorology AWS TR 240 Updated (1995) by Colin Ramage which will serve as your textbook, a chapter in the Severe Storms Monograph by the AMS entitled, “Severe Local Storms in the Tropics” (2001) by me, and a series of journal articles by many different authors published in *Monthly Weather Review, Journal of Meteorology, Journal of Atmospheric Sciences*, *Weather and Forecasting*, and the *Quarterly Journal of the Royal Meteorology Society*. Our approach will broadly be from planetary to convective scales, then to synoptic and mesoscale features. All the figures will be on powerpoints. You will receive a PDF of each lecture so you won’t have to sketch the myriad of diagrams. During the lecture a good strategy might be to write down notes about many of the figures so you’ll recall the key aspects. We may occasionally go into the lab in 310 to work on the computers. You will soon note that the text and the lectures are quite different in their approach; this may feel burdensome but you will be looking at the Tropics in two ways instead of one. Perhaps one approach will work well for you.

**Grades:** Writing assignments – 70%, class participation - 10%, final - 20%. There will be a series of writing assignments, about 8, where I will ask you to interpret figures, link topics from various subsections together and prepare “forecasts” based on the material provided as well as what you observe on the various web sites that show tropical weather. Expect to interpret supplied diagrams, make rough sketches of phenomena, and apply basic equations to answer questions. This will constitute about 5,000 words. I will grade your reports on grammar and organization as well as content. We will be looking at a great deal of material, perhaps nearly 500 diagrams, hence the focus on your explanations rather than attempts at memorization. The initial design is too provide you with an encompassing view of Tropical Meteorology that will continue to be useful to you well after the class is completed.

**Final schedule**: TBA in HIG 309 (with a small class we can rearrange if all of you wish). The final is cumulative; in most case I will supply you with figures to interpret.

Topics and their planned order are on the reverse side of this page.

**TOPIC Reading in text**

Definition of the Tropics chapters 1, 2

Basic refresher on equations, definitions, key variables Wallace and Hobbs, Holton, Hess…

Winds in the Tropics chapter 4

Temperature and Water Vapor chapter 5

Clouds and Rain chapter 6

Trades

Near Equatorial Convergence Zone (NECZ or ITCZ) revisit chapters 4, 6

Monsoon chapter 6, 119-126

South Pacific Convergence Zone (SPCZ) revisit chapters 4, 6

Madden-Julian or Intraseasonal Oscillation (MJO) revisit chapters 4, 6

EL-Nino – Southern Oscillation (ENSO) revisit chapters 4, 6

Diurnal Variations chapter 7

Tropical Convection chapter 10

Easterly waves chapter 8

Tropical Upper tropospheric Trough (TUTT) and TUTT cells chapter 8

Kona Lows (subtropical cyclones) chapter 8

Monsoon Depressions chapter 8

Shear Lines, Fronts, Surges chapter 8

Mesoscale Convective Systems chapter 6

Tropical Cyclone Structure and Track chapter 9

Writing assignments will be assigned evenly throughout the semester. No assignments will be offered within two weeks of the end of the semester.

The initial assignment plan appears in the following table and follows the format of the writing intensive program.

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| Hallmark #1: The class uses writing to promote the learning of course materials.  **List each writing assignment or type of assignment that involves the W Focus** (e.g., learning log, research paper, critical analysis).  Below are samples of writing assignments. I may increase the number but decrease the amount of writing per assignment. | Hallmark #2: The class provides interaction between the instructor and students [e.g., conferences, written feedback] while students do assigned writing.  **Explain how you will work with the students to help them successfully complete the assignment** (e.g., give written/oral feedback, do in-class writing workshops, provide the opportunity to revise). | Hallmark #3: Written assignments contribute significantly to each student’s course grade.  **Indicate what percentage of the student’s grade will be a factor of the assignment.**\* | Hallmark #4: The class requires students to do a substantial amount of writing—a minimum of 4,000 words, or about 16 pages.  **Indicate the number of pages required of each student for the assignment.**    *NOTE: Do not include in-class exams or count multiple drafts more than once.* |
| 1 Discuss at least three ways to define the Tropics and the advantages and drawbacks of each | First assignment will be fully reviewed by the professor but no grade will be assigned. This tunes the student to expectations for the class. Each student will meet with the professor and receive written and oral feedback. | 0% | 2-3 pages, double spaced, 12 point font constitutes 600-900 words per assignment |
| 2. Review upper level jet locations in January versus July and their relationship to troughs and ridges. | Written feedback on content, presentation and grammar on 7 more assignments, these are all graded, both on content and writing. Student is encouraged to meet regularly with professor. | Each 10% | Each 2-3 pages, double spaced, 12 point font constitutes 600-900 words per assignment |
| 3. Estimate the divergence and vorticity for two regions in the Pacific.  Discuss the implications of your calculations with respect to cloud and hurricane formation. | “ | “ | “ |
| 4. Use the University of Wyoming web page to pull up soundings for four locations (trades, monsoon, equatorial trough, Amazon) and discuss the stability variations from January to July. | “ | “ | “ |
| 5. Discuss the changes in SST over the Trades and the equatorial trough. Identify regions of upwelling. What impacts do warm or cold SSTs have on the water vapor content in the lowest 500 m of the atmosphere. | “ | “ | “ |
| 6. Tropical convection and MCS. How would moist convection vary for Florida, Borneo, and the Big Island over the diurnal cycle? How would it vary over the tropical ocean? | “ | “ | “ |
| 7. Synoptic phenomena – compare and contrast the vertical velocity and resulting precipitation structure of a monsoon depression, TUTT cell, Kona Low and easterly wave. Include sketches of each. | “ | “ | “ |
| 8. Tropical cyclones – apply the 7 ingredients required for TC formation to the NE Pacific and the S. Atlantic. Where would be the sweet spot for development and a location where it would be rare? | “ | “ | “ |
| A minimum of 7 graded writing assignments. |  | TOTAL: 70% | TOTAL: 5,000-6,000 words |